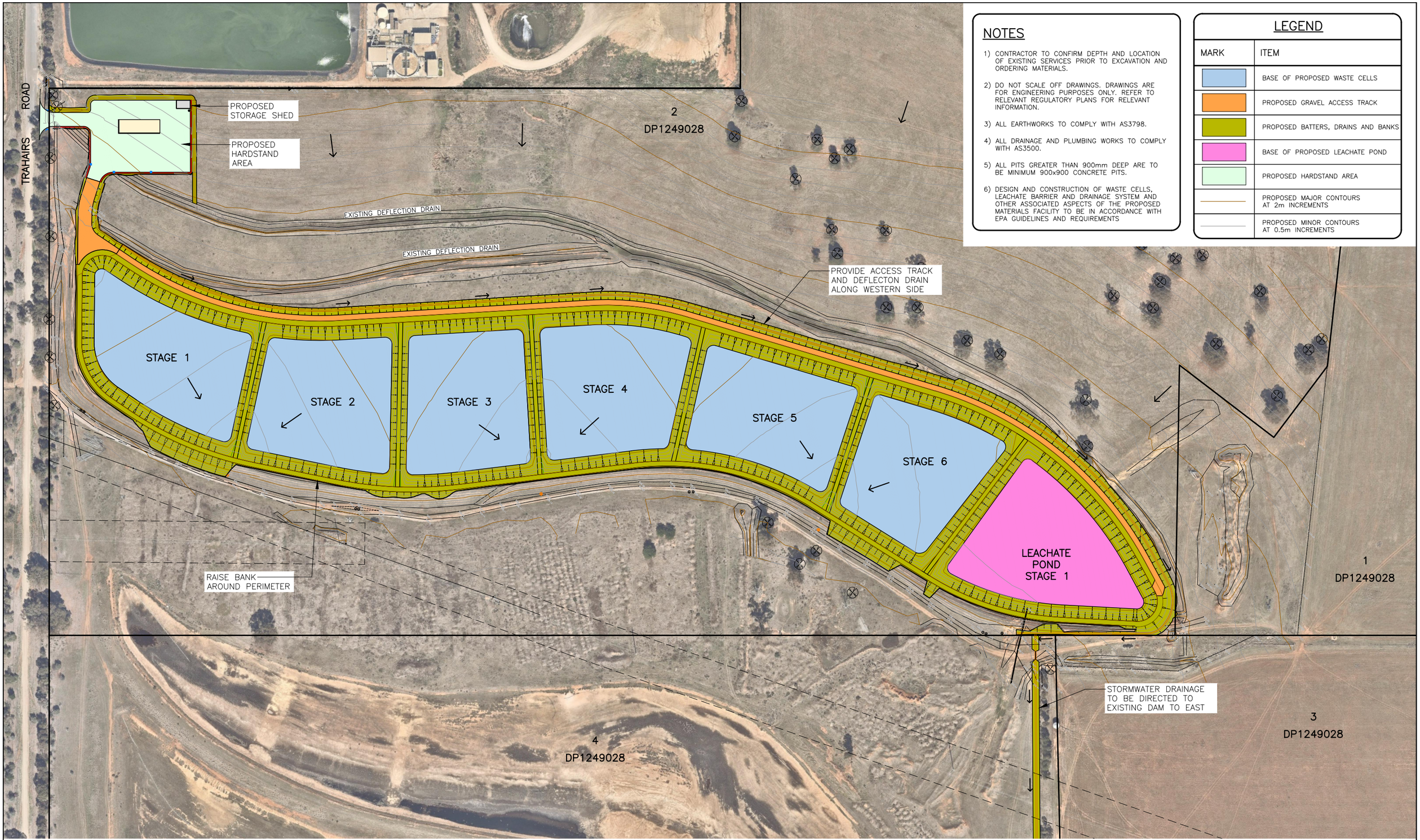

NOTES

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3) ALL EARTHWORKS TO COMPLY WITH AS3798.
4) ALL DRAINAGE AND PLUMBING WORKS TO COMPLY WITH AS3500.
5) ALL PITS GREATER THAN 900mm DEEP ARE TO BE MINIMUM 900x900 CONCRETE PITS.
6) DESIGN AND CONSTRUCTION OF WASTE CELLS, LEACHATE BARRIER AND DRAINAGE SYSTEM AND OTHER ASSOCIATED ASPECTS OF THE PROPOSED MATERIALS FACILITY TO BE IN ACCORDANCE WITH EPA GUIDELINES AND REQUIREMENTS

LEGEND

MARK	ITEM
	BASE OF PROPOSED WASTE CELLS
	PROPOSED GRAVEL ACCESS TRACK
	PROPOSED BATTERS, DRAINS AND BANKS
	BASE OF PROPOSED LEACHATE POND
	PROPOSED HARDSTAND AREA
	PROPOSED MAJOR CONTOURS AT 2m INCREMENTS
	PROPOSED MINOR CONTOURS AT 0.5m INCREMENTS

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No.	DATE	DETAILS	BY
C	11.06.2019	RE-ISSUED FOR COUNCIL AND EPA REVIEW	S.X
B	22.05.2019	ISSUED FOR COUNCIL AND EPA REVIEW	S.X
A	MARCH 2019	ISSUED FOR REVIEW	A.X

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Project:
PROPOSED NORTH RIDGE MATERIALS FACILITY
LOT 2 DP1249028
223 & 299 TRAHAIRS RD, BOMEN NSW

Sheet Title: SITE PLAN
Client: Riverina Sustainability Centre P/L
Checked:
Scale: 1:1250 (A1) 1:2500 (A3)
Approved:
Design: S.X
Drawn: S.X
Date: APR 2019

Project Number: 190201
Sheet Number: C1
Revision Number: C
Sheets in Set: 13

NOTES

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LEGEND

MARK	ITEM
	BASE OF PROPOSED WASTE CELLS
	PROPOSED GRAVEL ACCESS TRACK
	PROPOSED BATTERS, DRAINS AND BANKS
	PROPOSED HARDSTAND AREA
	PROPOSED LEACHATE DRAINAGE LINES
	PROPOSED STORMWATER DRAINAGE LINES
OR	PROPOSED STORMWATER PIT
	PROPOSED GROUNDWATER RELIEF DRAINAGE LINES
	PROPOSED MAJOR CONTOURS AT 2m INCREMENTS
	PROPOSED MINOR CONTOURS AT 0.5m INCREMENTS

CONTAMINATED DRAINAGE FROM DUMP AREA TO BE DIRECTED TO LEACHATE PUMP STATION

EXISTING DEFLECTION DRAIN

STAGE 1

STORMWATER DEFLECTION DRAIN

ACCESS TRACK

PERIMETER BANK

PROVIDE ACCESS TRACK ALONG WESTERN SIDE OF PERIMETER BANK.

FORM DEFLECTION DRAIN ON WESTERN SIDE OF TRACK TO DIRECT STORMWATER RUNOFF AROUND PROPOSED CELLS. GRADE DRAIN TOWARD NORTH

GRADE DEFLECTION DRAIN

GRADE MIN. 1%

123.1m

76.0m

STAGE 1

INTERCEPTION BANK

FORM INTERCEPTION BANK BETWEEN STAGE 1 AND 2. FORM BANK DURING STAGE 1 WORKS

PROVIDE FLUSH POINTS AT UPSTREAM ENDS OF ALL SUBSOIL LINES

RAISE PERIMETER BANK TO NEW LEVEL. REFER TYPICAL SECTONS

PROVIDE CENTRE LEACHATE PIPE IN STAGE 1

STAGE 2

CONNECT STAGE 2 LEACHATE PIPES TO CENTRE PIPE

SUBSEQUENT STAGES ARRANGED SIMILARLY TO STAGES 1 AND 2

STAGE 3

PROVIDE MIN. ø150 SUBSOIL DRAINAGE PIPES THROUGHOUT DRAINAGE LAYER IN CELL LINER DRAINING TO LEACHATE PUMP STATION. PROVIDE MIN. 1% GRADE AS PER EPA GUIDELINES

BOTTOM OF BATTER FROM PROPOSED PERIMETER BANK TO STAY WITHIN EXISTING BOTTOM OF BANK EXTENTS

DIRECT GROUNDWATER RELIEF DRAINAGE PIPE TO HOLDING TANK

GROUNDWATER RELIEF DRAINAGE HOLDING TANK. OVERFLOW TO BE PUMPED TO DRAINAGE TO NORTH

LEACHATE PUMP STATION FOR STAGES 1 AND 2. PUMP TO LEACHATE POND

PUMP TO LEACHATE POND

EXISTING TRACK

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Project:
PROPOSED NORTH RIDGE MATERIALS FACILITY
LOT 2 DP1249028
223 & 299 TRAHAIRS RD, BOMEN NSW

Sheet Title: STAGE 1 CELL GENERAL LAYOUT PLAN
Client: Riverina Sustainability Centre P/L
Scale: 1:500 (A1) 1:1000 (A3)
Design: S.X | Drawn: S.X | Date: APR 2019
Checked:
Approved:

Project Number: 190201
Sheet Number: C2 | Revision Number: C | Sheets in Set: 13

TRAHAIRS ROAD

OPEN DRAIN TO DISCHARGE TO DRAINAGE IN ROAD CORRIDOR

PROVIDE PIPED STORMWATER CULVERT AT ENTRANCE

ACCESS ROAD

PROVIDE OPEN DRAIN ALONG EDGE OF HARDSTAND AREA

CONTAMINATED AREA TO DRAIN TO LECHATE POND

PROVIDE BUND AROUND DUMP AREA

CONCRETE WASTE DUMP AREA

PROPOSED 6x10m STORAGE SHED. REFER TO ELEVATIONS AND FLOOR PLAN

SEWERAGE FROM STORAGE SHED TO DRAIN TO HOLDING TANK TO BE PUMPED OUT AS REQUIRED

PROVIDE OPEN DRAIN ALONG EDGE OF HARDSTAND AREA

KERB AND GUTTER

KERB AND GUTTER

KERB AND GUTTER

DISCHARGE TO DEFLECTION DRAIN

8.64m
14.0m
10.0m
10.0m
6.0m
10.0m
30.0m
20.0m
30.0m
22.5m
72.5m
28.5m
10.0m

234.00
236.00
232.66
232.00

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LEGEND

MARK	ITEM
	PROPOSED CONCRETE DUMP AREA
	PROPOSED GRAVEL ACCESS TRACK
	PROPOSED BATTERS, DRAINS AND BANKS
	PROPOSED HARDSTAND AREA
	PROPOSED BUILDING REFER TO ARCHITECTURAL DRAWINGS
	PROPOSED KERB AND GUTTER
	PROPOSED LEACHATE DRAINAGE LINES
	PROPOSED STORMWATER DRAINAGE LINES
OR	PROPOSED STORMWATER PIT
	PROPOSED STORMWATER HEADWALL
	PROPOSED MAJOR CONTOURS AT 2m INCREMENTS
	PROPOSED MINOR CONTOURS AT 0.5m INCREMENTS

NOTES

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Project: PROPOSED NORTH RIDGE MATERIALS FACILITY
LOT 2 DP1249028
223 & 299 TRAHAIRS RD, BOMEN NSW

Sheet Title: HARDSTAND AREA LAYOUT PLAN
Client: Riverina Sustainability Centre P/L
Scale: 1:250 (A1) 1:500 (A3)
Design: S.X | Drawn: S.X | Date: APR 2019
Checked:
Approved:
Project Number: 190201
Sheet Number: C3 | Revision Number: C | Sheets in Set: 13

LEGEND

MARK	ITEM
	BASE OF PROPOSED WASTE CELLS
	PROPOSED GRAVEL ACCESS TRACK
	PROPOSED BATTERS, DRAINS AND BANKS
	PROPOSED HARDSTAND AREA
	PROPOSED LEACHATE POND
	PROPOSED LEACHATE DRAINAGE LINES
	PROPOSED STORMWATER DRAINAGE LINES
OR	PROPOSED STORMWATER PIT
	PROPOSED GROUNDWATER RELIEF DRAINAGE LINES
	PROPOSED MAJOR CONTOURS AT 2m INCREMENTS
	PROPOSED MINOR CONTOURS AT 0.5m INCREMENTS

NOTES

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Project: PROPOSED NORTH RIDGE MATERIALS FACILITY
LOT 2 DP1249028
223 & 299 TRAHAIRS RD, BOMEN NSW

Sheet Title: LEACHATE POND LAYOUT PLAN
Client: Riverina Sustainability Centre P/L
Scale: 1:500 (A1) 1:1000 (A3)
Design: S.X | Drawn: S.X | Date: APR 2019
Checked:
Approved:

Project Number: 190201
Sheet Number: C4 | Revision Number: C | Sheets in Set: 13

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LEGEND

MARK	ITEM
	BASE OF PROPOSED WASTE CELLS
	PROPOSED GRAVEL ACCESS TRACK
	PROPOSED BATTERS, DRAINS AND BANKS
	PROPOSED LEACHATE POND
	PROPOSED HARDSTAND AREA
	PROPOSED BUILDING REFER TO ARCHITECTURAL DRAWINGS
	PROPOSED LEACHATE DRAINAGE LINES
	PROPOSED STORMWATER DRAINAGE LINES
	PROPOSED GROUNDWATER RELIEF DRAINAGE LINES
	PROPOSED DIRECTION OF FALL
	PROPOSED MAJOR CONTOURS AT 2m INCREMENTS
	PROPOSED MINOR CONTOURS AT 0.5m INCREMENTS

STORMWATER FROM HARDSTAND AREA TO DISCHARGE INTO DEFLECTION DRAIN

EXISTING DEFLECTION DRAIN

EXISTING DEFLECTION DRAIN

PROPOSED STORMWATER DEFLECTION DRAIN. GRADE TO NORTH

PROVIDE PERFORATED GROUNDWATER RELIEF PIPES BELOW CELL LINER. IN ACCORDANCE WITH EPA REQUIREMENTS

GROUNDWATER RELIEF DRAINAGE TO DRAIN TO HOLDING TANK AND OVERFLOW TO BE PUMPED TO NORTH

STAGE 2 GROUNDWATER RELIEF DRAINAGE TO DRAIN TO HOLDING TANK INSTALLED IN STAGE 1

PUMPED LINE FOR GROUNDWATER RELIEF HOLDING TANK OVERFLOW

ADDITIONAL GROUNDWATER RELIEF HOLDING TANKS TO BE INSTALLED AS STAGE CONSTRUCTION PROCEEDS

PROVIDE CULVERT TO MAINTAIN TRACK ACCESS

OPEN DRAIN TO CONTINUE AROUND END OF LECHATE POND

STORMWATER DRAINAGE TO BE DIRECTED TO EXISTING DAM TO EAST. REFER TO INSET PLAN

DIRECT STORMWATER INTO EXISTING DAM

EXISTING DAM

N

PLAN SHOWING STORMWATER DRAINAGE TO EXISTING DAM

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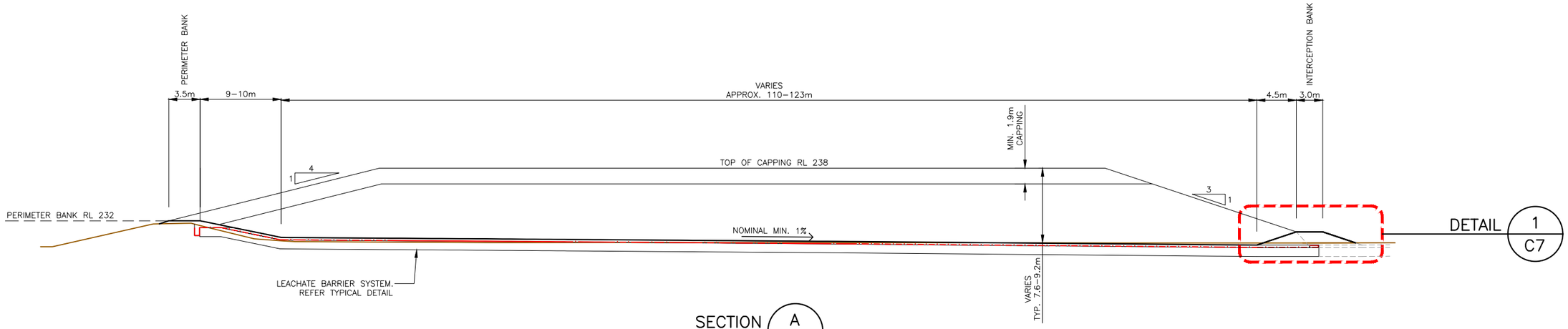
Project:
PROPOSED NORTH RIDGE MATERIALS FACILITY
LOT 2 DP1249028
223 & 299 TRAHAIRS RD, BOMEN NSW

Sheet Title: STORMWATER MANAGEMENT PLAN
Client: Riverina Sustainability Centre P/L
Checked:
Scale: 1:1250 (A1) 1:2500 (A3)
Approved:
Design: S.X
Drawn: S.X
Date: APR 2019

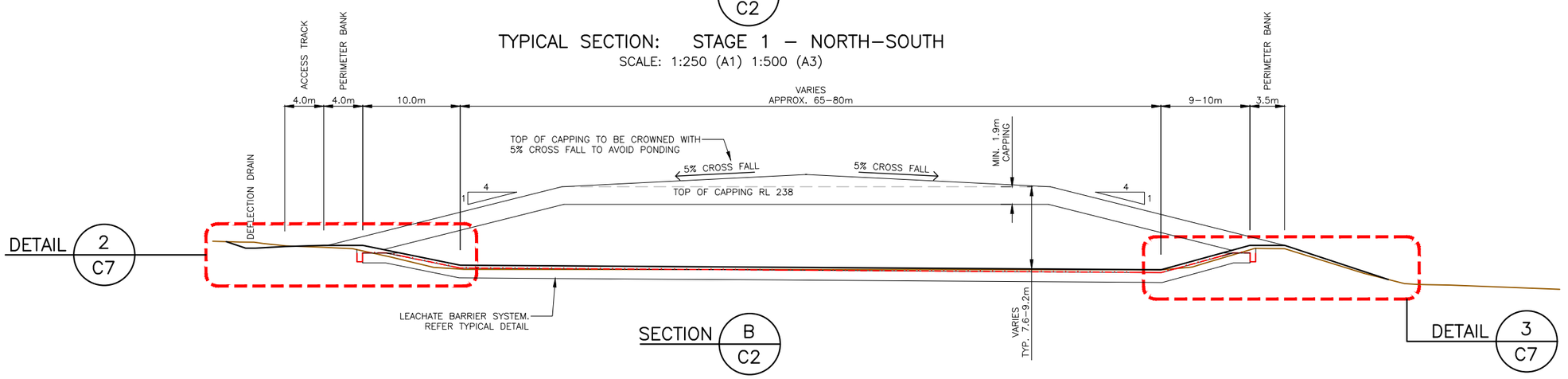
Project Number: 190201
Sheet Number: C5
Revision Number: C
Sheets in Set: 13



SECTION A C2

TYPICAL SECTION: STAGE 1 – NORTH–SOUTH

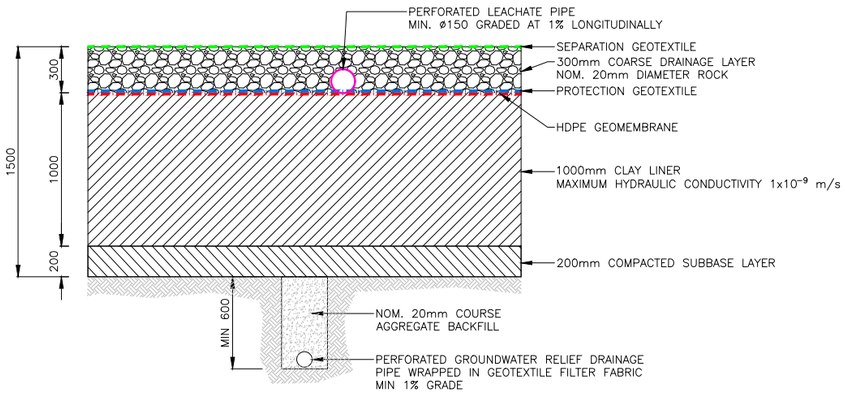
SCALE: 1:250 (A1) 1:500 (A3)



SECTION B C2

TYPICAL SECTION: STAGE 1 – EAST–WEST

SCALE: 1:250 (A1) 1:500 (A3)

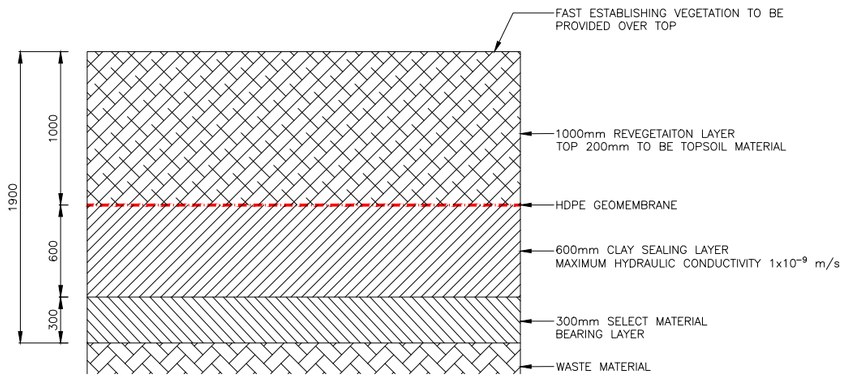


TYPICAL LEACHATE BARRIER SYSTEM DETAIL

SCALE: 1:20 (A1) 1:40 (A3)

NOTES:

1. LEACHATE BARRIER SYSTEM TO BE DESIGNED AND CONSTRUCTED IN ACCORDANCE WITH EPA GUIDELINES AND REQUIREMENTS



TYPICAL CAPPING LAYER DETAIL

SCALE: 1:20 (A1) 1:40 (A3)

NOTES:

1. CAPPING LAYER TO BE DESIGNED AND CONSTRUCTED IN ACCORDANCE WITH EPA GUIDELINES AND REQUIREMENTS

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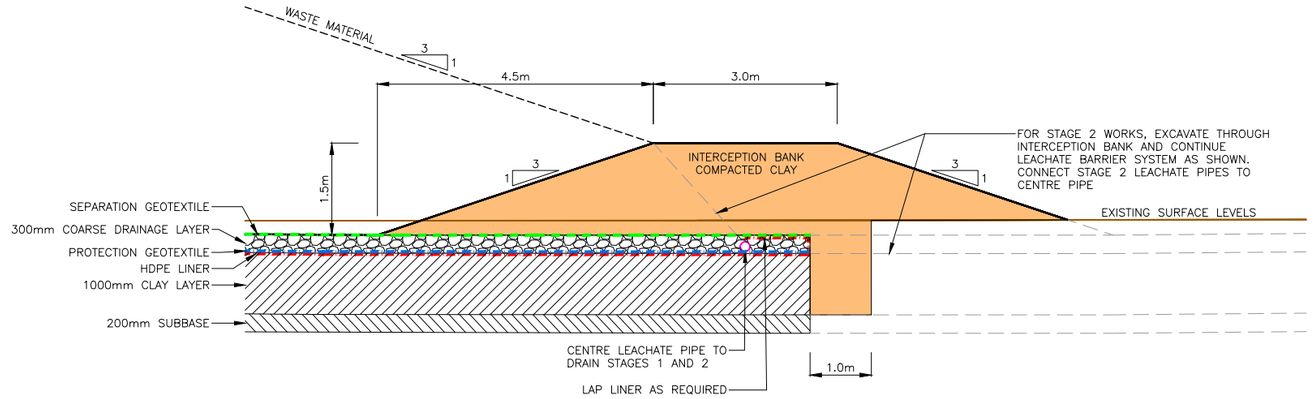
Project: PROPOSED NORTH RIDGE MATERIALS FACILITY
LOT 2 DP1249028
223 & 299 TRAHAIRS RD, BOMEN NSW

Sheet Title: TYPICAL SECTIONS 1
Client: Riverina Sustainability Centre P/L
Checked:
Scale: AS SHOWN
Approved:
Design: S.X | Drawn: S.X | Date: APR 2019

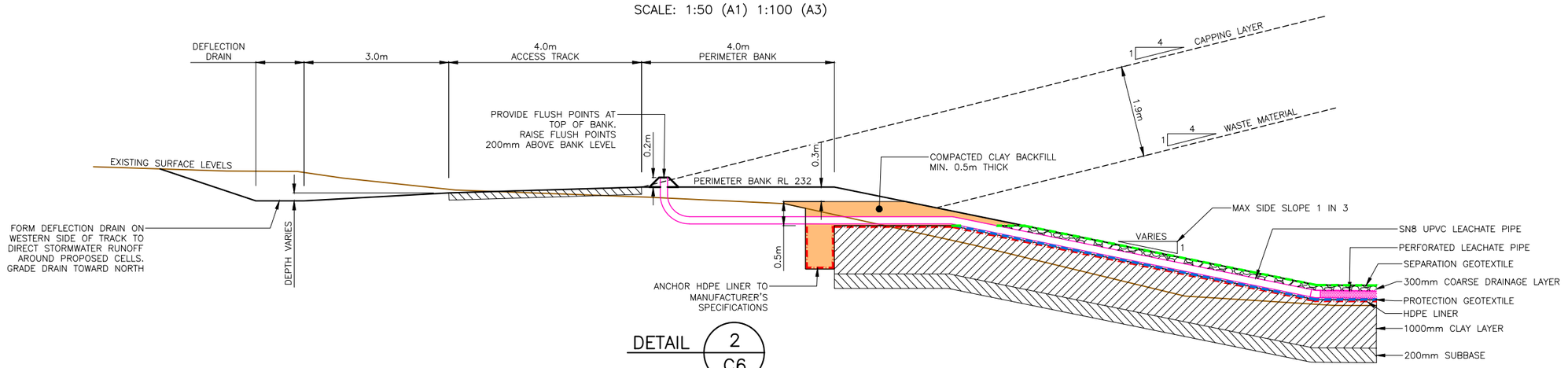
Project Number: 190201
Sheet Number: C6 | Revision Number: C | Sheets in Set: 13



DETAIL 2/C6

INTERCEPTION BANK AND JUNCTION BETWEEN STAGES 1 AND 2

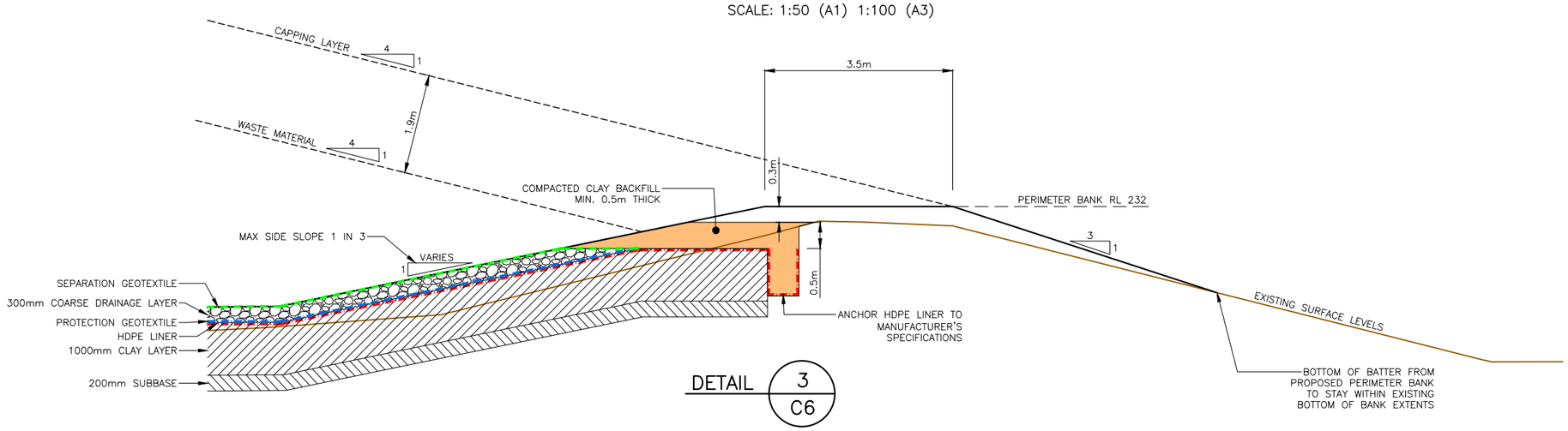
SCALE: 1:50 (A1) 1:100 (A3)



DETAIL 2/C6

TYPICAL WESTERN BANK DETAIL

SCALE: 1:50 (A1) 1:100 (A3)



DETAIL 3/C6

TYPICAL EASTERN BANK DETAIL

SCALE: 1:50 (A1) 1:100 (A3)

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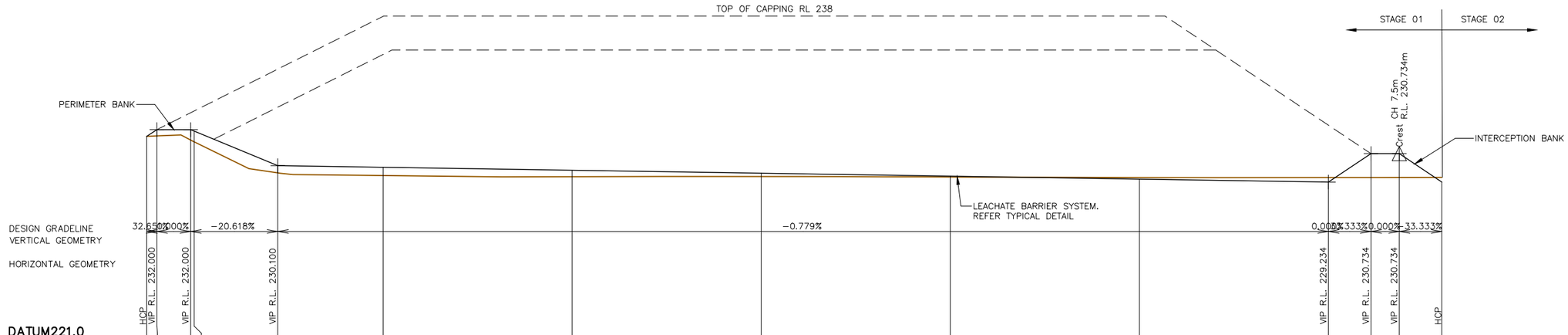
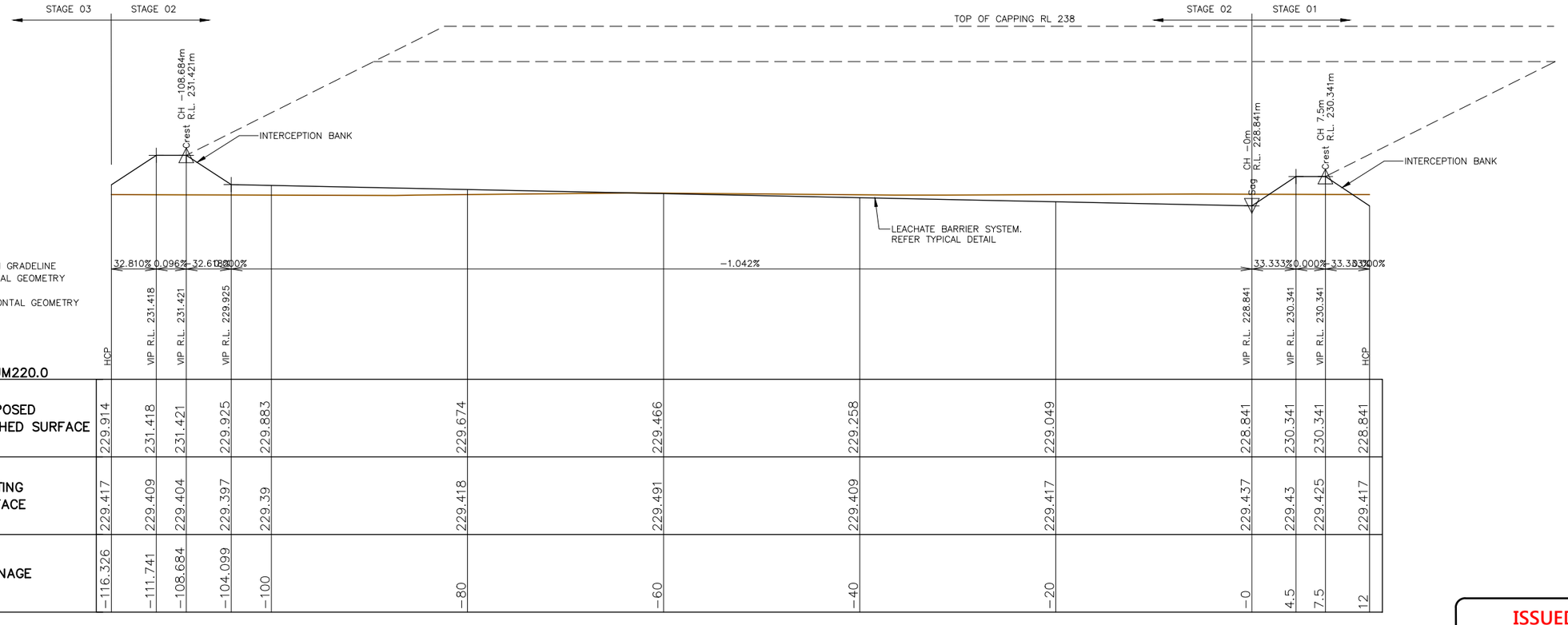
Project: PROPOSED NORTH RIDGE MATERIALS FACILITY
LOT 2 DP1249028
223 & 299 TRAHAIRS RD, BOMEN NSW

Sheet Title: TYPICAL SECTIONS 2
Client: Riverina Sustainability Centre P/L
Checked:
Scale: AS SHOWN
Approved:
Design: S.X | Drawn: S.X | Date: APR 2019

Project Number: 190201
Sheet Number: C7 | Revision Number: C | Sheets in Set: 13



CROSS SECTION THROUGH STAGE 1



CROSS SECTION THROUGH STAGE 2

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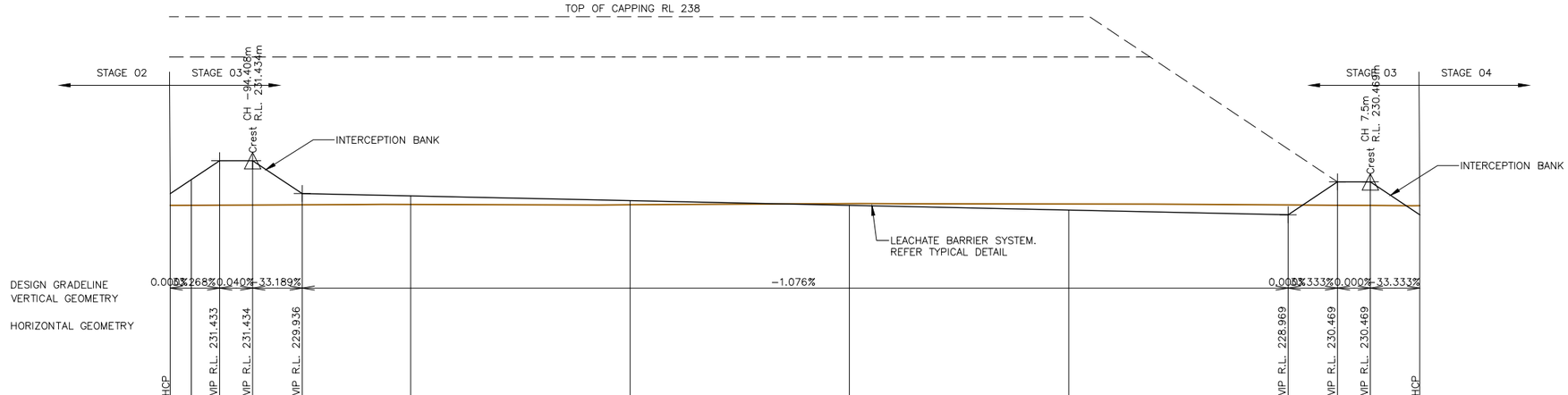
Project:
PROPOSED NORTH RIDGE MATERIALS FACILITY
LOT 2 DP1249028
223 & 299 TRAHAIRS RD, BOMEN NSW

Sheet Title: CROSS SECTIONS THROUGH STAGES 1 & 2
Client: Riverina Sustainability Centre P/L
Scale: HOR. 1:250, VERT. 1:125 (A1)
Design: S.X | Drawn: S.X | Date: APR 2019
Checked:
Approved:

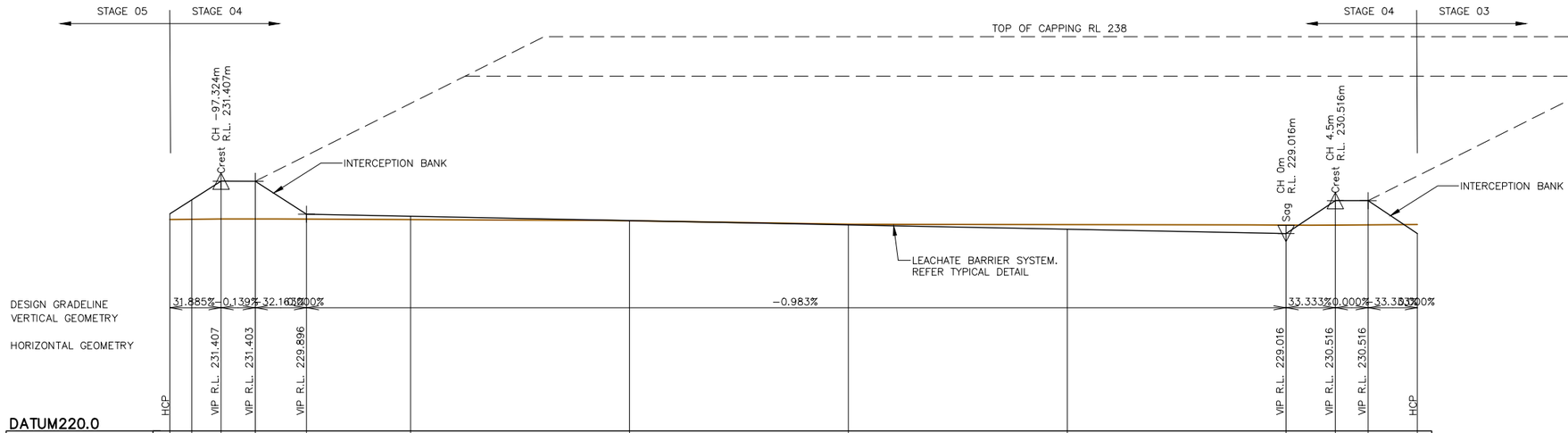
Project Number: 190201
Sheet Number: C8 | Revision Number: C | Sheets in Set: 13



DATUM220.0

PROPOSED FINISHED SURFACE	229.931	230.574	231.433	231.434	229.936	229.83	229.614	229.399	229.184	228.969	230.469	230.469	228.969
EXISTING SURFACE	229.398	229.402	229.407	229.413	229.422	229.439	229.426	229.478	229.46	229.417	229.404	229.394	229.385
CHAINAGE	−101.932	−100	−97.418	−94.408	−89.894	−80	−60	−40	−20	0	4.5	7.5	12

CROSS SECTION THROUGH STAGE 3



DATUM220.0

PROPOSED FINISHED SURFACE	229.913	230.554	231.407	231.403	229.896	229.803	229.606	229.409	229.213	229.016	230.516	230.516	229.016
EXISTING SURFACE	229.652	229.664	229.679	229.68	229.674	229.651	229.599	229.443	229.422	229.403	229.403	229.412	229.426
CHAINAGE	−102.008	−100	−97.324	−94.202	−89.518	−80	−60	−40	−20	0	4.5	7.5	12

CROSS SECTION THROUGH STAGE 4

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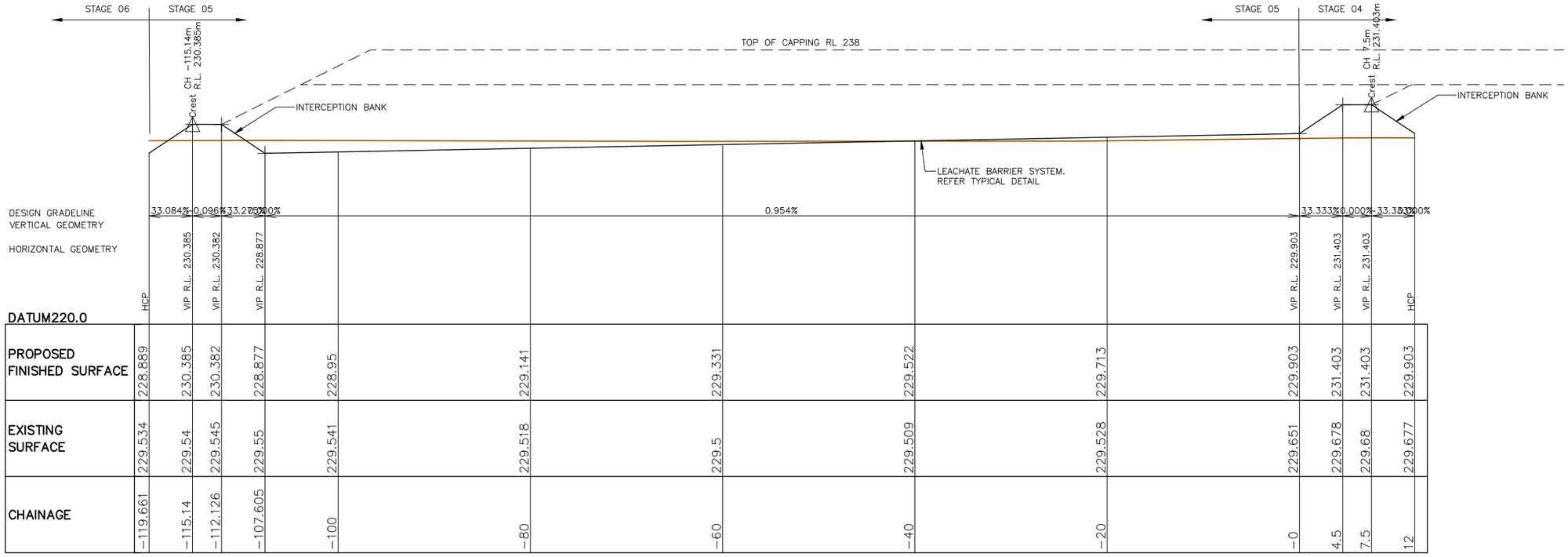

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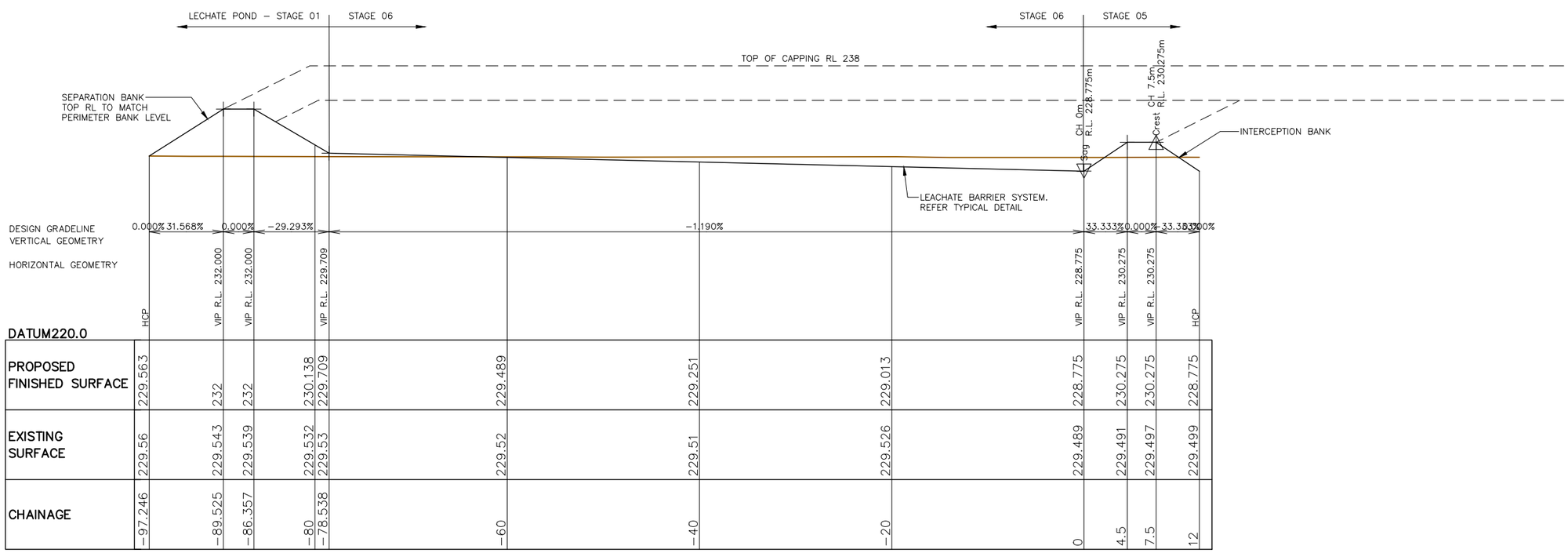

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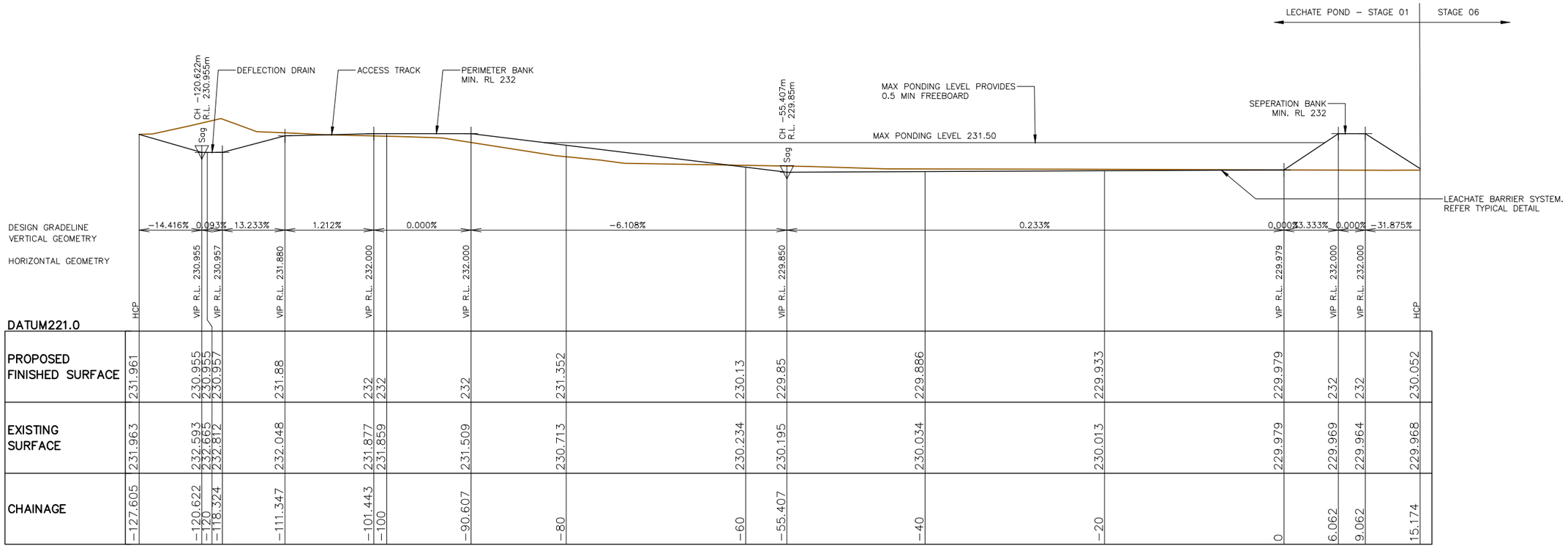

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EXISTING SURFACE	231.963	232.593	232.665	232.812	232.048	231.877	231.859	231.509	230.713	230.234	230.195	230.034	230.013	229.979	229.969	229.964	229.968
CHAINAGE	–127.605	–120.622	–120	–118.324	–111.347	–101.443	–100	–90.607	–80	–60	–55.407	–40	–20	0	6.062	9.062	15.174

CROSS SECTION THROUGH LEACHATE POND (STAGE 1)

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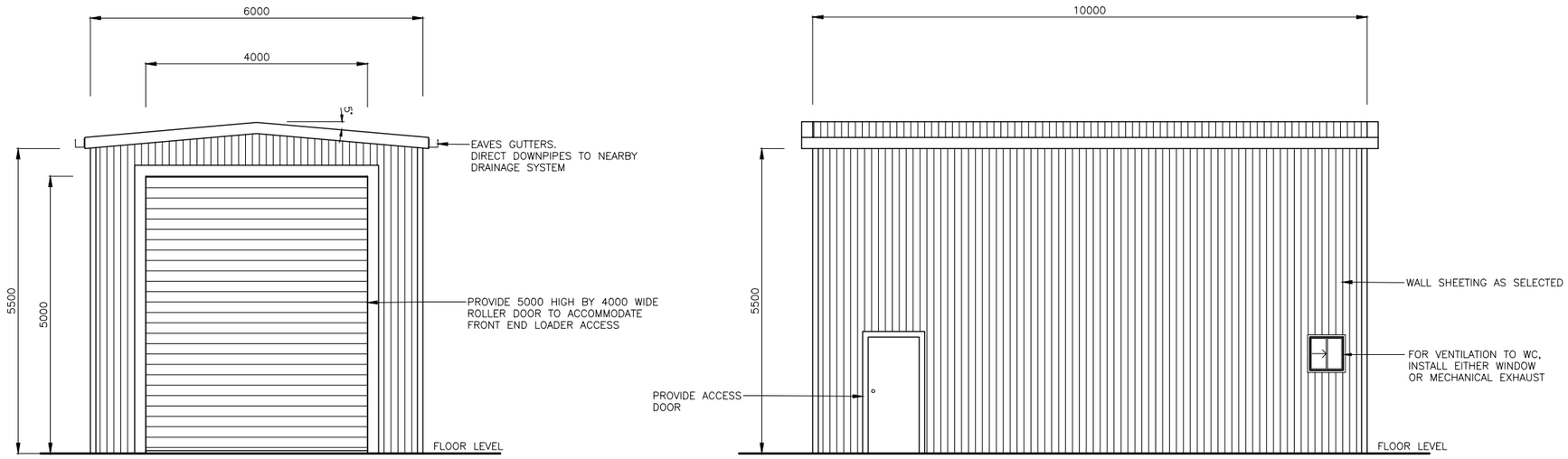

PROPOSED STORAGE SHED

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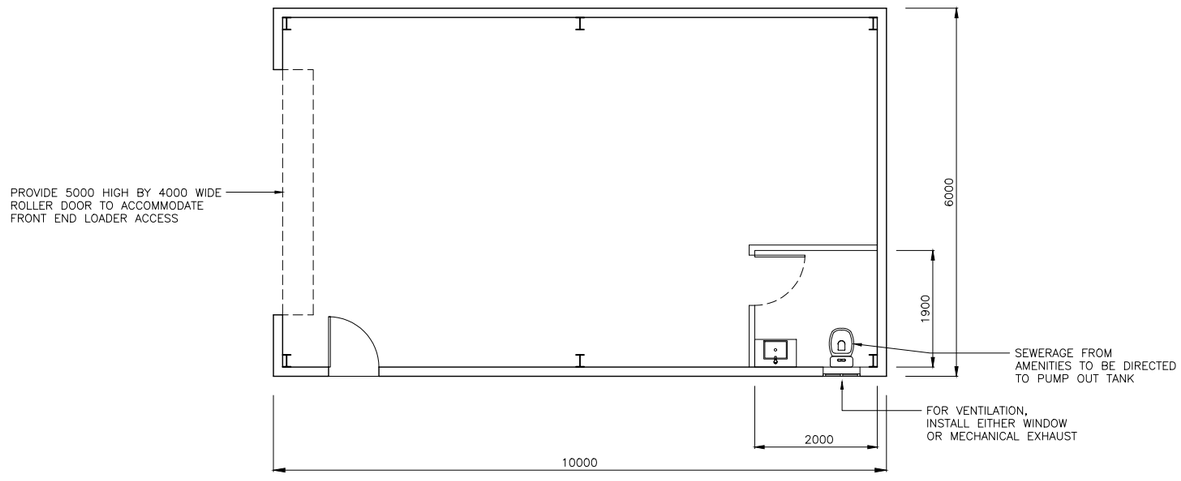

PROPOSED STORAGE SHED FLOOR PLAN

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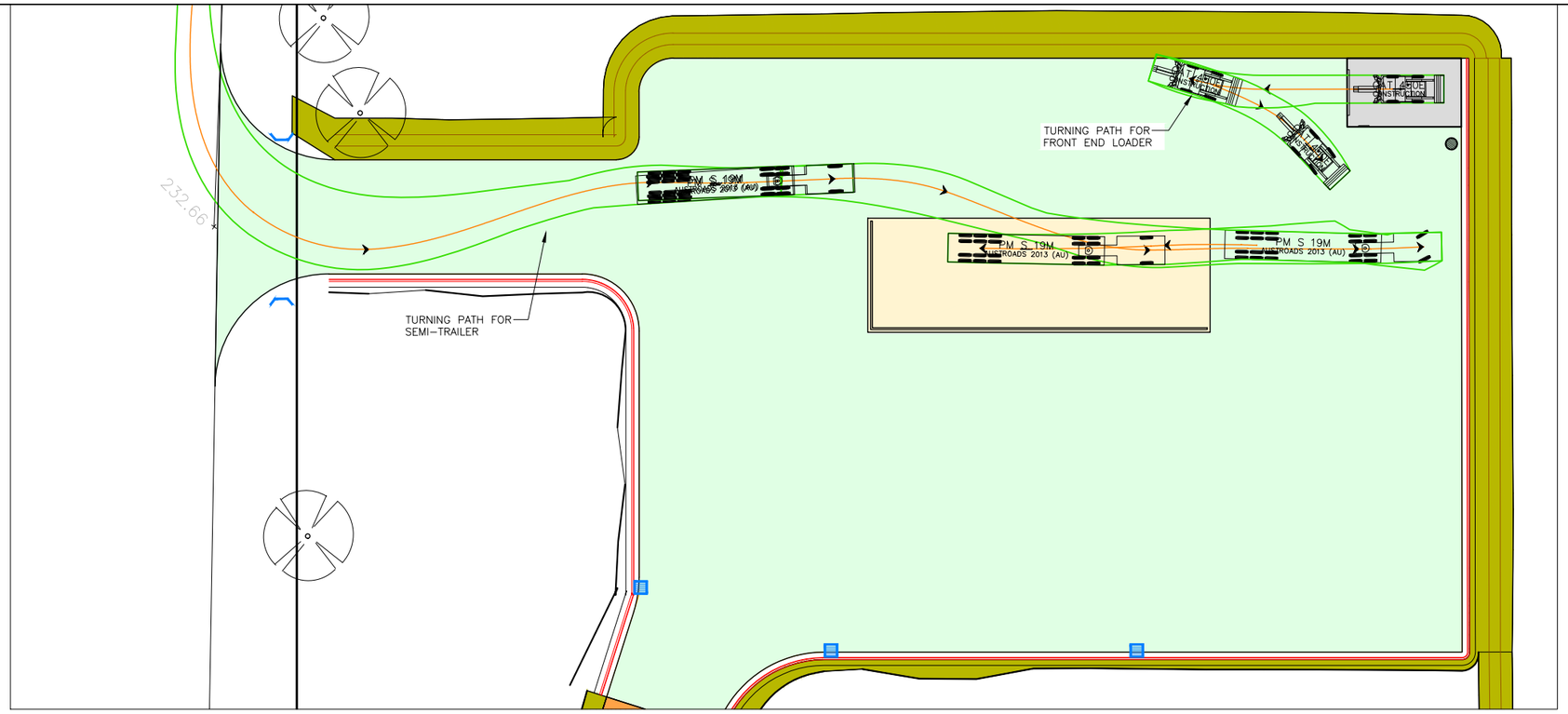
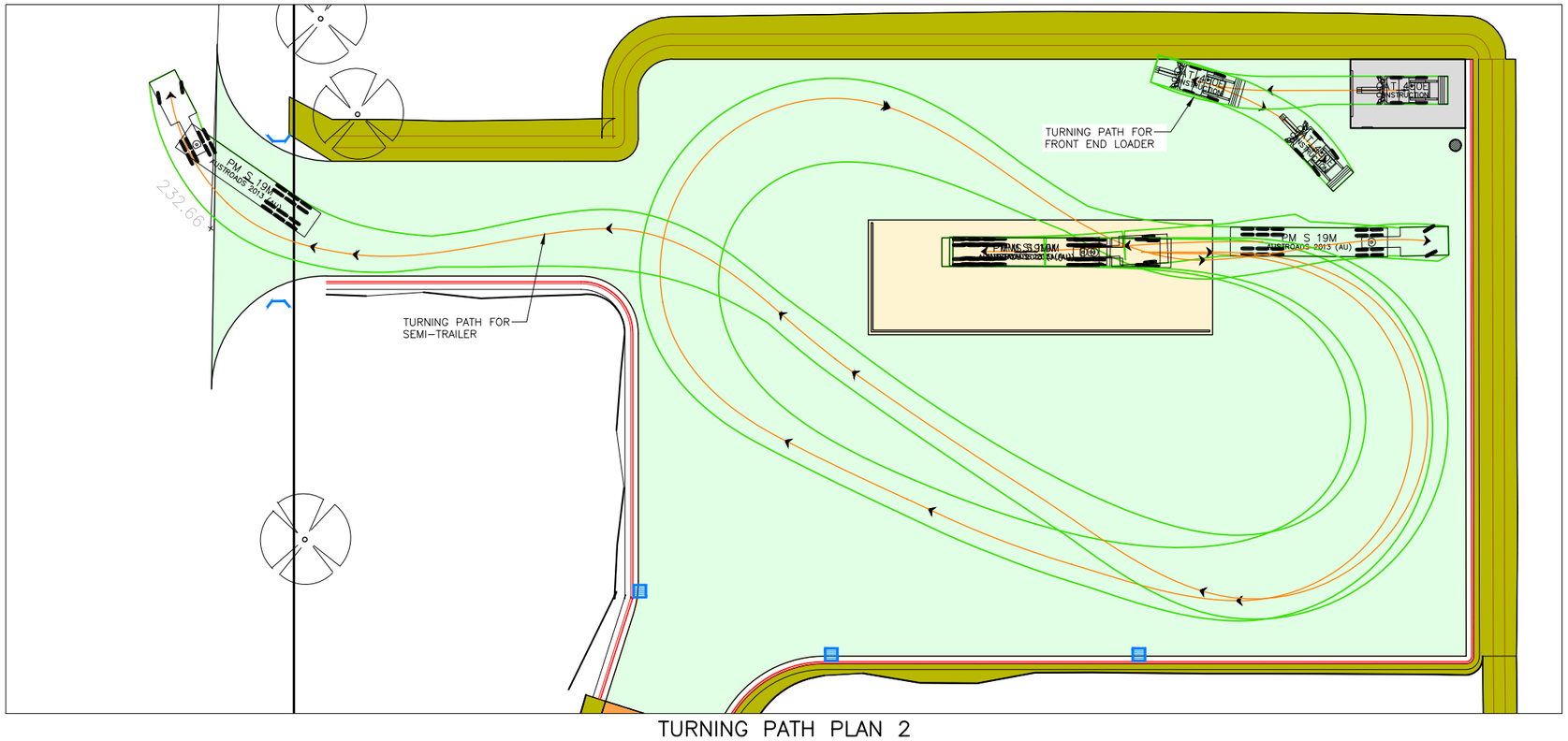


TURNING PATH PLAN 1



TURNING PATH PLAN 2

LEGEND

MARK	ITEM
	VEHICLE TURNING PATH
	PROPOSED CONCRETE DUMP AREA
	PROPOSED GRAVEL ACCESS TRACK
	PROPOSED BATTERS, DRAINS AND BANKS
	PROPOSED HARDSTAND AREA
	PROPOSED BUILDING REFER TO ARCHITECTURAL DRAWINGS
	PROPOSED KERB AND GUTTER
OR	PROPOSED STORMWATER PIT

NOTES

1) CONTRACTOR TO CONFIRM DEPTH AND LOCATION OF EXISTING SERVICES PRIOR TO EXCAVATION AND ORDERING MATERIALS.
2) DO NOT SCALE OFF DRAWINGS. DRAWINGS ARE FOR ENGINEERING PURPOSES ONLY. REFER TO RELEVANT REGULATORY PLANS FOR RELEVANT INFORMATION.
3) ALL EARTHWORKS TO COMPLY WITH AS3798.
4) ALL DRAINAGE AND PLUMBING WORKS TO COMPLY WITH AS3500.
5) ALL PITS GREATER THAN 900mm DEEP ARE TO BE MINIMUM 900x900 CONCRETE PITS.
6) DESIGN AND CONSTRUCTION OF WASTE CELLS, LEACHATE BARRIER AND DRAINAGE SYSTEM AND OTHER ASSOCIATED ASPECTS OF THE PROPOSED MATERIALS FACILITY TO BE IN ACCORDANCE WITH EPA GUIDELINES AND REQUIREMENTS

TURNING PATH NOTES

1) TURNING PATHS PRODUCED USING AUTOTURN
2) TURNING PATHS BASED ON THE FOLLOWING VEHICLES:
   - 19m SEMI–TRAILER (AUSTROADS 2013)
     - TRAVELING AT 25km/h
   - CAT 450E BACKHOE LOADER
     - TRAVELING AT 10km/h

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Legend

- Potential tree impact
- Development footprint
- Development site
- Road

Data Attribution
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Ref: 16-276 North Ridge Materials Facility 201118 \ 16-276 Potential Trees to be removed
Author: N. Smith
Date created: 21.09.2021
Datum: 'EPSG:28355 GDA94 / MGA zone 55

0 10 20 m

NGH

Document Set ID: 5468576
Version: 1, Version Date: 23/09/2021

Environmental Impact Statement

NORTH RIDGE MATERIALS FACILITY

MAY 2019

ngh environmental

Document Verification

Project Title: North Ridge Materials Facility

Project Number:	16-276
Project File Name:	Northridge Waste Disposal EIS FINAL 1.1

Revision	Date	Prepared by (name)	Reviewed by (name)	Approved by (name)
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Final	30/01/19	N Smith	M Sutherland	Erwin Budde
Final 1.1	30/05/19	S. Anderson	L. Olesen-Jensen	L. Olesen-Jensen

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Cover Image

Capped landfill of the Old Dixie Municipal Solid Waste Landfill in Dalton, Georgia, USA.

Source: http://www.dwswa.org/old-dixie-msw-landfill/

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Certification

Submission of Environmental Impact Statement prepared under Part 4 of the *Environmental Planning and Assessment Act 1979*.

Environmental Assessment prepared by:		
Name:	Michial Sutherland Manager Riverina and Western NSW NGH Environmental	Nicola Smith Environmental Consultant NGH Environmental
Qualifications:	BEdu(Sc)	MPhil, BSc
Address:	Suite 1/39 Fitzmaurice Street Wagga Wagga NSW 2650	
Applicant name:	Riverina Warehousing Solutions	
Applicant address:	PO Box 1082 Wagga Wagga NSW 2650	
Proposed development:	Construction of a solid non-putrescible landfill and associated infrastructure within footprint of historic liquid waste evaporation ponds.	
Land to be developed:	Lot 2 and Lot 4 DP1249028 As shown in the Environmental Impact Statement (Figure 1-1).	
Environmental Impact Statement:	This Environmental Impact Statement has been prepared to address all matters in accordance with Part 4 of the *Environmental Planning and Assessment Act 1979* and Schedule 3 of the Environmental Planning and Assessment Regulation 2000.	
Declaration:	I certify that I have prepared the contents of this Environmental Impact Statement in accordance with Schedule 2 of the *Environmental Planning and Assessment Regulation 2000*. To the best of my knowledge, this assessment contains all available information that is relevant to the environmental assessment of the project and that information is neither false nor misleading.	
Signatures		
Name:	Michial Sutherland	Nicola Smith
Date:	30/01/2019	30/01/2019

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TERMS AND DEFINITIONS

AHIMS	Aboriginal Heritage Information Management System
AMO	Aerodrome Meteorological Observation System
ANZG	Australia and New Zealand Water Quality Guidelines for Fresh and Marine Water Quality 2018
ASL	Above sea level
BC	*Biodiversity Conservation Act 2017*
BOM	Australian Bureau of Meteorology
CEMP	Construction Environmental Management Plan
CAA	Controlled Activity Approval
Cwth	Commonwealth
DECCW	Refer to OEH
DPE	Department of Planning and Environment (NSW)
DEE	Department of Environment and Energy (Cwth)
Development footprint	The footprint of the proposed work, including ancillary facilities
Development site	Subject land that the development footprint lies within
DPI	Department of Planning and Industry (NSW)
EEC	Endangered ecological community – as defined under relevant law applying to the proposal
EIA	Environmental impact assessment
EIS	Environmental impact statement
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Cwth)
EP&A Act	*Environmental Planning and Assessment Act 1979* (NSW)
EP&A Regulation	*Environmental Planning and Assessment Regulation 2000* (NSW)
ESD	Ecologically Sustainable Development
Facility, the	Main waste cell, access and transfer station, leachate evaporation pond and pipe work, existing internal access road to toe of waste cell, new roads, stormwater diversion banks, weighbridge, storage shed
FM Act	*Fisheries Management Act 1994* (NSW)
GDE	Groundwater dependent ecosystems
ha	Hectares
Heritage Act	*Heritage Act 1977* (NSW)
ICNG	NSW EPA's *Interim Construction Noise Guideline*
INP	*NSW Industrial Noise Policy*
ISEPP	*State Environmental Planning Policy (Infrastructure) 2007* (NSW)
KFH	Key Fish Habitat
kL	Kilolitres

km	Kilometres
kph	Kilometres per hour
L_{A90}	Background noise levels
LALC	Local Aboriginal Land Council
LEP	Local Environment Plan
LGA	Local Government Area
Locality	Land within 10 km of the development site
LOR	Limit of reporting
m	Metres
mm	Millimetres
Main waste cell	Entire landfill cell within effluent evaporation pond footprint, comprising of 6 sub-cells
M/S	Metres per second
MNES	Matters of National Environmental Significance
NGER	National Greenhouse and Energy Reporting
NEPM	National Environmental Protection Measure
NES	Matters of National environmental significance under the EPBC Act (*c.f.*)
NML	Noise management level
Noxious Weeds Act	*Noxious Weeds Act 1993* (NSW)
NPW Act	*National Parks and Wildlife Act 1974* (NSW)
NSW	New South Wales
NV Act	*Native Vegetation Act 2003* (NSW)
OEH	Office of Environment and Heritage, formerly Department of Environment, Climate Change and Water (NSW)
PHA	Preliminary Hazard Analysis
Proposal, the	North Ridge Solid Waste Disposal Facility
REP	Regional Environmental Plan
RBL	Rating Background Levels
RL	Reduced level (in metres)
SEARs	Secretary's Environmental Assessment Requirements
SEPP	State Environmental Planning Policy (NSW)
SIS	Species Impact Statement
sp/spp	Species/multiple species
Study area	Within 500 m of the development site
Sub-cell	Discrete cells within the main waste cell, constructed in stages as required

EXECUTIVE SUMMARY

PROPOSAL DESCRIPTION

The North Ridge Materials Facility (the proposal) would convert an historic liquid waste evaporation pond into a non-putrescible solid waste disposal cell and leachate evaporation pond. The main waste cell would have the capacity to accept about 630 000 m^3 of non-putrescible waste.

The proposal would include:

- Creation of a waste cell comprised of 6 discrete sub-cells within a historic evaporation pond.
- Creation of a leachate management and groundwater relief system.
- Internal access roads.
- Transfer station and recycling bays.
- A storage shed with amenities.
- Allowance for a future weighbridge.

The historic western evaporation pond has a footprint of about 86 700 m^2 and an existing depth of around 2 m. The existing pond would be reconstructed to create a non-putrescible waste storage facility composed of six waste cells and a leachate management pond of approximately 9 084 m^2. The proposed waste cell would have a footprint of approximately 77 600 m^2, with a finished depth of about 8 m and a finished height of about 6 m above the existing pond surface. It is estimated that the facility would receive about 60 000 t of waste in its first year. Further it is estimated that waste receivals would grow at about 1.5 % annually. Based on the projected waste receival rates the facility would have a lifespan of approximately nine years.

PROPOSAL NEEDS AND BENEFITS

The development is primarily intended to service the waste management needs of Wagga Wagga Local Government Area (LGA) and surrounding LGAs. Wagga Wagga has a population of over 63 000 people (ABS 2017). The population has an ongoing need for the management and disposal of solid waste from building and demolition, light industry, and other activities. The proposal is also anticipated to source solid non-putrescible waste from Kurrajong Recyclers and other waste processors in Wagga Wagga and surrounds.

Gregadoo Waste Management Centre (GWMC) is an example of a local landfill facility that is comparable to the proposed facility. Waste figures provided by Wagga Wagga City Council show that waste to landfill increased steadily from 2011/12 to 2015/16. A decrease of over 15,000 t of waste to landfill between 2015/16 and 2016/17 is an example of improvements in sorting and reuse of materials that are received at GWMC. The waste to landfill figure for the GWMC for the period 2016/17 was 66,394 t.

Another comparable example is the Willis Brick landfill site, which was recently decommissioned as a waste facility. This facility received building and demolition waste from the Wagga Wagga area. It is estimated that the site received an average annual volume of waste of about 3 320 m^3 per year.

The proposal would provide a waste management option for the commercial and industrial sector in the Wagga Wagga area. The proposal has the benefit of achieving this objective while making use of a historic wool scour effluent evaporation pond. Additionally, the facility would be established on a highly disturbed site generally of low environmental value. The facility would be constructed and operated while minimising the potential environmental impacts of the development.

PROPOSAL OBJECTIVES

The proposal objectives include:

- Provide a waste management facility for commercial and industrial general solids waste (non-putrescible).
- Beneficial re-use of land previously used to manage and dispose of greasy saline effluent from the historic Riverina Wool Combing facility at Bomen.
- Ensure that planned measures are implemented to protect the amenity and resources of the surrounding environment.
- Minimise environmental impacts by restricting the footprint of the development to land previously used for waste management and disposal.
- Work with stakeholders to ensure wastes are managed in accordance with the waste management hierarchy and the principles of the Waste Avoidance and Resource Recovery Act 2001, where all possible waste is recovered for reuse prior to disposal.
- Ensure that the facility is operated in a manner compliant with environmental legislation and New South Wales (NSW) Environmental Protection Authority (EPA) waste guidelines.
- Plan for the rehabilitation of the proposed landfill closure to ensure it is compatible with the surrounding landscape and land use. It is envisioned that upon closure of the landfill, the site would be stabilised, landscaped and potentially utilised for a solar farm (or similar).

CONSULTATION AND COMMUNITY ENGAGEMENT

As works are designated development, a request for a Secretary's Environmental Assessment Requirements (SEARS) was made to DPE in June 2017. Following the receipt of the SEARs, consultation with local, State and Commonwealth government authorities, service providers, and community groups was undertaken including:

- Environment Protection Authority.
- Office of Environment and Heritage.
- Department of Primary Industries.
- Roads and Maritime Services.
- Riverina Local Land Services.
- Wagga Wagga City Council.
- The surrounding landowners and occupiers that are likely to be impacted by the proposal.

A range of community engagement has occurred, including:

- A community information session was held at the Wagga Wagga City Council on 24 October 2017.
- A second community information session was held at the Wagga Wagga City Council on 4th October 2018.
- One-on-one consultation was made available to all interested parties.
- Landholders and registered parties will be notified of the intention to lodge and the public exhibition stage.

Issues raised from the community consultation include:

- Potential impacts to water quality and water users.
- The proponent.
- Proposal details.

- Project purpose.
- Traffic.
- Details about the volume, design and materials of the waste cell.
- Sensitive receivers for noise, vibration and odour.

Engagement activities will continue throughout the determination period, particularly in relation to submissions received during the EIS exhibition period.

Consultation requirements will be reviewed regularly. Consultation will be a focus at key transition phases between different stages of project development (e.g. prior to construction or operation).

The local community would be advised of construction work by way of a "pre-notification" issued to residents by letterbox drop at least two weeks prior to the construction of the proposal. The pre-notification would advise of the timing, hours of work, noise and extra vehicle movements associated with the proposal, as well as contact details of relevant construction staff.

KEY ENVIRONMENTAL ASSESSMENT ISSUES

The detailed investigation of risks and impacts was undertaken for the construction and operation phases of the North Ridge Materials Facility. Additional to addressing the project-specific SEARs, a risk assessment was carried out to identify key environmental risks of the proposal, to guide the depth of investigation that would be undertaken in this EIS.

Soil

The topography of the study area is characterised by undulating rises and low hills with slope gradients between 3% and 10%. Silurian granites represent the underlying geology. Soil profile data within proximity to the development footprint indicate that soils are red earth east of the site becoming Mottled Eutrophic Brown Dermosol up-gradient to the west. Dermosols are typically well-structured with a moderate to high erosion hazard depending on slope and groundcover. These soil profiles generally have a localised low wet bearing strength, low fertility and localised sodicity.

Further investigations by McMahon Earth Sciences indicate a yellowish silt layer along the western rim of the proposed waste cell, commonly followed by a layer of black lanolin oil residue resulting from the previous land use. Generally, a medium grey clay exists lower in the soil profile with rigid clay between 1.25m and 3.0 m depth.

Soil bore logs describe lanolin oils throughout the soil profiles in proximity to the evaporation ponds.

The proposed activities for the construction and operation of the materials facility have the potential to increase soil erosion during rainfall events. Proposed activities could lead to the removal of vegetation and ground cover, increased compacted surfaces and decreased permeability.

Impacts during construction could also result from earthmoving activities for the construction of internal roads, site access point, hard stand and sorting area, trenching for underground leachate and groundwater relief, and construction of the Stage 1 sub-cell.

Impact to soils during operation would be minimal and include earthmoving for the construction of subsequent waste sub-cells and maintenance activities. Vehicles would be confined to formalised tracks.

A Preliminary Site Investigation indicated that there is soil contamination in the development footprint and adjacent windrows, which is identified as the waxy residue from the wool combing process. Characterisation of the waxy residue, through this assessment and the assessment by McMahon (2010),

indicates that although immediate intervention is not necessary, remediation of the soil would be required before reuse or alternatively, disposed of at an EPA licensed facility. As the material is naturally derived from sheep's wool, the exceedances do not pose a risk to human or environmental health. Therefore, the site is considered to be suitable for continued commercial/industrial land use without risk to human health or the environment and no further investigation required.

These potential impacts have been accounted for and addressed with a suite of safeguards and mitigation measures. Overall, the risk of erosion impacts resulting in soil loss is considered low and much of the earthworks will be contained within the existing footprint of the proposed waste cell and reused on-site.

Water

The development site is in the Murrumbidgee Catchment and is located around 6 km to the north of the Murrumbidgee River. There are three historic effluent evaporation ponds within the development site. An existing water diversion berm directs stormwater flow from the western side (up-gradient) of the western pond to the north of the pond and then east to an existing farm dam.

The development site is not located in an area identified as having groundwater vulnerability. There are two areas mapped in the study area as having terrestrial groundwater dependent ecosystems. These small areas represent Blakely's Red Gum – Yellow Box grassy tall woodland and are within 50 m to the west of the proposed waste cell. There are 40 licensed bores within 2 km of the site and 12 bores within the development site boundary. There are an additional 10 nested bores on-site, each containing a shallow bore and a deep bore.

Groundwater monitoring over the period of the previous land use until 2010 and recently indicates that the shallow aquifer across the development site is dry and was unresponsive to increased rainfall during 2008 and 2010. Currently, there is water in one deep bore on the site, which is located directly down-gradient to the south-east of the western pond. The standing water level in this bore is around 8 m. Groundwater test results by Riverina Wool Combing and Riverina Oils and Bio Energy show tested analytes are below the threshold of the ANZG guidelines for Primary Industry – Irrigation.

Nine out of 10 bores were dry during sampling in June 2018. The bore (P1B) was sampled and analysed for a range of analytes. The results show that the groundwater quality is within the guidelines for freshwater ecosystems and irrigation.

The site is not listed as flood prone land.

In the Preliminary Site Investigation, groundwater results for the majority of analytes tested are below the Groundwater Investigation Levels for drinking water and for freshwater ecosystems (ANZG 2018). The trace elements that are elevated against trigger levels of the GILs for freshwater ecosystems are copper, chromium, lead and zinc. Elevated background levels of these trace elements are expected to be the result of the fractured granite aquifer source (Kumar 2013) and do not pose a risk to human or environmental health. Therefore, the site is considered to be suitable for continued commercial/industrial land use and no further investigation is required.

The existing drainage and run off configuration on the site would remain in place during operation of the materials facility. The existing evaporation ponds not being used by the proposal would act as flood storages, capturing runoff from up-gradient that is not captured and diverted by the stormwater diversion berm.

Water use during the construction phase would be minimal and mainly for dust suppression during earth works, on unsealed roads and for the construction of site access. The estimated water requirements during

construction are about 1-2 ML in total. Potable water requirements for around 10 workers would be about 21.9 kL for the 12-24 weeks of construction. Water for dust suppression would be sourced from on-site evaporation ponds or trucked in from a commercial supplier if required. Water for staff and workers would be from a bottled water source.

Water use during the operation phase would be minimal and include non-potable water for dust suppression on unsealed roads and on the waste cell, and potable water for the storage shed. The building would contain a pump out toilet facility. Sewerage will be pumped out by a commercial operator. The non-potable water requirement is estimated to be up to 1 ML annually. Potable water requirements for about two staff and workers would be about 21.9 kL annually.

All surface water runoff will be captured on-site and retained for re-use. The additional two effluent evaporation ponds within the development site have capacities of approximately 125 400 m^3 (middle - 125.4 ML) and approximately 229 200 m^3 (eastern – 229.2 ML). The large evaporation pond on the southern side of Trahairs Road has a capacity of approximately 114 520 m^3 (114.52 ML). Leachate could be used for dust suppression within the waste cell. Water will be trucked in when required if these water storages are dry and if there has not been any water captured from the groundwater interception scheme.

The proposal would not directly affect the surface water quality or groundwater quality during construction. Indirectly, the proposed works would involve a range of activities that could disturb soils. This could potentially lead to erosion and sediment laden runoff. This could impact surface water quality in local waterways during rainfall events. The impacts are considered low for this project.

Operation activities have the potential to affect surface water and groundwater quality if interaction of the leachate and surface water or groundwater was to occur. A leachate management system will be installed and in use during the operation of the facility. Leachate that is generated after rainfall over the waste cells will be captured and contained within the leachate management system where it will be subject to evaporation. These potential impacts have been accounted for and addressed with a suite of safeguards and mitigation measures. Overall, the risk of impacts resulting in decreased water quality is considered to be minimal.

Biodiversity

The development site is located within the NSW South West Slopes Bioregion, in the Inland Slopes subregion. Cleared and highly modified industrial land occupies about 24 % of the development site. Agricultural land occupies about 72 % of the site. The development site is dominated by highly modified exotic vegetation. Two patches of remnant box woodland (Blakely's Red Gum – Yellow Box Woodland PCT 277) and several hollow-bearing trees remain within the site. There are linear native plantings along the northern, eastern and southern boundaries. There is a row of planted exotic olives to the east of the site, and a cereal crop in the far eastern paddock.

Degraded riparian and aquatic habitat exists around the existing effluent evaporation ponds. Weed-dominated riparian vegetation exists along the edges of ponds, with exotic annual grasses and agricultural weeds and a low abundance of native vegetation. It is used by common fauna species including large numbers of Black-winged Stilt in shallow mud flats of the three ponds and provides potential habitat for a range of threatened fauna species. The potential impact of the proposal on these species has been assessed using the Assessment of Significance.

Forty flora species were identified during the field survey, none of which are listed as threatened under the TSC Act or the EPBC Act. The background search identified 11 flora species of conservation significance as potentially occurring in the study area. None of these have been recorded in the study area. Based on

consideration of species habitat requirements and distribution, it is considered possible that three of these species may occur in the study area – Dwarf Bush Pea *Pultenaea humilis*, Yass Daisy *Ammodium craspedioides*, and Hoary Sunray *Leucochrysum albicans var. tricolor.* The potential impact of the proposal on these species has been assessed using the Assessment of Significance.

Four endangered ecological communities (EECs) were identified as potentially occurring in the study area. The field surveys identified that species indicative of two of these EECs were present in the study area in small, low-quality patches. These are White Box Yellow Box Blakely's Red Gum woodland and Inland Grey Box woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South bioregions.

The field survey identified 18 fauna species present in the study area. Fifty-three fauna species of conservation significance were identified as potentially occurring in the study area based on habitat and range. None of these were recorded during the field surveys. Based on consideration of species habitat requirements and distribution, it is considered possible that 28 of these species may occur in the study area, including 22 birds and 6 mammals.

The development site has been selected to avoid or minimise impact to biodiversity where possible. Most areas of EEC in the development site have been avoided through the design process.

Site access would be constructed within a gap in the planted tree-line along Trahairs Road. No paddock trees would be impacted as a result of the proposal. Access around the site would be via existing tracks.

Potential direct, indirect and prescribed impacts to biodiversity values of the site that could result from the proposal include:

- Removal of about 0.7668 ha of exotic groundcover.
- Removal of three mature trees.
- Displacement of resident fauna, particularly aquatic species.
- Removal of fauna habitat features particularly mature trees.
- Inadvertent impacts on adjacent habitat or vegetation.
- Transport of weeds and pathogens from the site to adjacent vegetation.
- Loss of breeding habitats particularly for aquatic species.
- Impacts on the habitat of threatened species or ecological communities.
- Impacts of development on water quality, water bodies and hydrological processes that sustain threatened species and threatened ecological communities (TECs).
- Impacts of vehicle strikes on fauna.

The Assessments of Significance concluded that a significant impact was unlikely on any NSW-listed threatened species, population or ecological community, on the basis that the proposal would not:

- Lead to a reduction of the size or area of occupancy of a population, or fragment or disrupt the breeding cycle of a population.
- Affect habitat critical to the survival of these species.
- Affect habitat or introduce disease such that these species would decline.
- Introduce invasive species harmful to these species.
- Interfere with the recovery of these species.

A Biodiversity Development Assessment Report is not required for the proposal.

Assessments of Significance completed for federally-listed endangered ecological communities conclude that a significant impact is unlikely on the basis that:

- The amount of habitat to be removed or disturbed by the proposal is relatively small in the context of the greater area of habitat that would remain.
- No fragmentation or isolation of habitat would occur.
- The proposal would not modify or destroy abiotic factors.
- The proposal would not cause a substantial change in the species composition.
- The proposal would not cause a substantial reduction in the quality of the ecological community.

No referral is considered necessary to the Federal Department of Environment.

A range of mitigation measures would be implemented to ensure that impacts are avoided where possible, and minimised where they cannot be avoided.

Climate and air quality

Climate data was used from the Bureau of Meteorology (BOM) Weather Station at the Wagga Wagga Airport located about 13 km south-east of the development site. The recorded mean summer maximum is 31.8 °C (January) and mean winter minimum is 2.8 °C (July) for the period 1942 to 2018. For the same station for the period 1941 to 2018 a mean annual rainfall of 575.3 mm is recorded. Rainfall is generally greatest over winter and spring with the average monthly maximum occurring in October (56.9 mm).

The air quality in the South West Slopes region is considered to be fair to good (OEH 2016). The development site is located in an industrial area surrounded by rural land used for agriculture. Sources of pollution are associated with activities from industry, freight and agriculture.

An air quality assessment for the construction and operation, and an odour assessment for the operational stage of the proposed development, was conducted. Air quality (primarily dust) risks are associated with the earthworks and construction of the facility and daily activities during operation of the facility. Odour risks are associated with the active filling area or tipping face of the waste cell, residual odour from immediately or permanently covered areas and the leachate pond.

The modelling and assessment of air pollutants followed the *Approved Methods for the Modelling and Assessment of Air Pollutants in NSW* (EPS 2016). Emissions to air during construction and operation were estimated using guidance from the *Emission Estimation Technique Manual for Mining Version 3.1* (DSEWPAC 2012).

The impact assessment criteria for complex mixtures of odorous air pollutants is 7.0 odour units (OU) for a single rural residence and 2.0 OU for an urban area. A very conservative approach was taken and the criteria of 2.0 OU was used.

Modelling results of four scenarios indicate that odour from the proposal are not likely to exceed the 99th percentile one-hour peak-to mean (i.e. corrected to the nose response time average) criterion of 2.0 OU at the identified sensitive receivers for any of the scenarios. These results are in line with the *Environmental Guidelines: Solid Waste Landfills* (EPA 2016).

The impact assessment for total suspended particles, fine particles (PM_{10} and $PM_{2.5}$), nitrogen dioxide, sulfur dioxide and carbon monoxide were compared to the 100th percentile or maximum predicted concentration from the activity and existing background levels. Benzene is 'air toxic' and therefore, the 99.9th percentile of 1-hour averaged incremental concentration impact assessment criterion applies to the site boundary.

Adopted background concentrations of sulfur dioxide, nitrogen dioxide and carbon monoxide surrounding the proposal are expected to be well below the relevant impact assessment criteria from the Approved

Methods. The scale of the plant expected to be in use during construction and operation of the proposal is minor. Therefore, it was determined that exhaust emissions would not represent an issue.

Handling, loading and unloading, transport and storage of bulk materials are all activities that are expected to generate dust. Dust generation is also expected from erosion of exposed surfaces. Only the 24-hour averaged PM_{10} impact assessment criteria was predicted to be exceeded during construction at the nearest residential sensitive receivers R06 and R11. No exceedances were predicted during operation.

Exceedance of PM_{10} at R06 and R11 are primarily a result of elevated local background levels. Further analysis was conducted to determine if construction activities would cause any additional exceedances of the impact criteria at these receivers. No additional exceedances were predicted at R06 and R11.

The findings indicate that the proposal is unlikely to cause adverse odour and air quality impacts at nearby receivers.

Visual amenity

NGH Environmental completed a Visual Impact Assessment (VIA) of the proposal.

There are three residences located within 1.5 km of the development site, with the closest being about 1.25 km to the west. Four Landscape Character Units (LCU) were identified within Bomen and surrounding suburbs:

- Industrial.
- Rural.
- Residential.
- Recreational.

Representative viewpoints within each LCU were identified and the predicted sensitivity of each viewpoint was assessed. The recreational viewpoint was found to have 'High' sensitivity. Rural and residential viewpoints were generally found to have 'High' to 'Moderate' sensitivity, with industrial viewpoints found to have 'Low' sensitivity. The form of the infrastructure is not incongruous with the landscape in the designated industrial area of Bomen.

All viewpoints were assessed to have a low impact. Views of the materials facility infrastructure would be difficult to perceive or indistinct. Low impacts are expected for the majority of the study area and representative viewpoints due to existing vegetative screening around residences, retained on-site vegetation, existing industry and the overall nature of the undulating landscape.

During construction, additional traffic and dust generation are considered the greatest for cumulative visual impacts. During operation, cumulative visual traffic impacts are considered negligible. Any adverse cumulative impacts are anticipated to be manageable due to the existing and retained vegetative screening and undulating nature of the site that blocks out most views almost entirely.

Noise and vibration

Background noise at the development site is considered to be low-moderate, with most noise originating from local industry, vehicles using local roads and agricultural activities. Baseline noise data was used for three close residential sensitive receivers. The closest dwelling is within 1.5 km of the proposed development site. Construction and operation would occur through daytime hours only. The baseline data for the rating background level at the nearest receiver during daytime hours is 32 dB(A) and 53 dB(A) for the ambient noise level.

Noise management levels (NMLs), from the NSW Noise Policy for Industry intrusiveness goals (EPA 2017), are 40 dB(A) during the day, 35 dB(A) during the evening and 35 dB(A) overnight. Acceptable amenity goals for a rural residence in line with the NSW Industrial Noise Policy amenity goals are 48 dB(A) during the day, 43 dB(A) during the evening and 38 dB(A) overnight.

Key activities on site during the construction period that are likely to produce the most noise include earthworks and the delivery and movement of materials on site. The noise levels for identified construction activities were modelled to determine the worst-case scenario for noise generated on site.

Two scenarios were modelled for the construction phase and included the construction of the access road and hard stand area, and the construction of the landfill footprint and leachate pond. There are no predicted exceedances of construction noise levels at any of the 21 residential sensitive receivers or the two industrial sensitive receivers for either scenario.

Noise from the operation of the materials facility would be generated by individual plant including truck deliveries, light vehicle movements, earthmoving plant, compactor and water cart. Three scenarios were modelled for the operational stage of the materials facility and assessed against the NPI criteria.

There are no predicted exceedances of operational noise levels at any of the 21 residential sensitive receivers or the two industrial sensitive receivers for any of the three scenarios. Operational noise emission levels are predicted to be well within the project specific noise criteria at all assessed receiver locations.

Road traffic noise during construction was assessed as being unlikely to result in changes of more than 2 dB(A) above existing noise levels and, therefore, would comply with the road traffic noise criteria. During operation, the operational noise is not predicted to be greater than the construction traffic noise level of 41.7 dB(A) at the nearest sensitive receiver. Therefore, it is unlikely that the operational traffic noise level will exceed 2 dB(A) above the existing noise levels.

Vibration-intensive equipment that could be used during the construction of the project may include compaction equipment. A worst-case scenario distance of more than 500 m was used between the proposal boundary and the nearest residential receiver. Construction vibration was assessed to not adversely impact the building structure or human comfort of surrounding residential receivers.

Mitigation measures were recommended for possible impacts to the industrial premise located 10 m from the western boundary.

Aboriginal heritage

Bomen is within an area identified as part of the Wiradjuri language group. The development site has been heavily modified for the purposes of agriculture and industrial purposes, including clearing of native vegetation and modification of natural drainage lines into farm dams.

There are 120 known Aboriginal sites and five declared Aboriginal Places within the search area. The Bomen Urban Release Area Development Control Plan identified three Aboriginal heritage sites in the Bomen area listed on AHIMS. None of these occur within the development site.

NGH Environmental undertook a Due Diligence investigation of the development site. A series of pedestrian survey transects were undertaken across the development site. The survey was undertaken by two archaeologists from NGH Environmental. The assessment concluded that there is low archaeological potential due to the extensive disturbance from past industrial activities.

Direct impacts are likely to be most extensive where earthworks are to occur. The proposal activities will occur within the existing evaporation pond. Earthworks associated with internal road construction and the

hard stand area could result in an impact. Impacts could result from minimal grading for access tracks. Impacts for this project have been assessed as low.

Traffic, transport and road safety

Transport routes likely to be used by vehicles travelling to and from the site have been determined based on the existing local road network and include the Olympic Highway, Dorset Drive, Bomen Road, Sturt Highway, Eunony Bridge Road and Oura Road. These transport routes are all B-double enabled.

A 50 % split of traffic travelling north and south along the Olympic Highway to and from the site has been assumed. Additional traffic generation along the Olympic Highway is not expected to be significant, given the proximity to Bomen Industrial Estate and the proportion of heavy vehicle traffic currently utilising Olympic Highway.

Construction of the proposal is expected to take 12-24 weeks to complete. Construction vehicle movements may comprise, on average, about 20 heavy vehicles accessing the development site per day or 40 movements per day. For a short period of time during construction there would be traffic impacts on Trahairs and Byrnes Roads, primarily involving truck movements for delivery of materials to the development site.

Light vehicles would be required to transport staff to and from the development site, and in various activities on site. Site personnel would travel to the site in the hour preceding and immediately following their shifts. It is expected that up to 20 light vehicle movements per day would be generated during peak construction times and during operation. The local road network has adequate carrying capacity for this temporary increase in vehicle numbers.

Estimated facility receivals for 60 000 t of waste per year would generate approximately 10 loads or 20 heavy vehicle movements per day. This number can change and is dependent on variables such as weather, waste availability, work load and site conditions. It is estimated that light vehicle movements could be in the order of 20 per day. It is expected that half of the heavy vehicle movements would be by B-doubles and the other half semi-trailers or truck and dog combinations.

The current local road network has adequate carrying capacity for the increase in vehicle numbers during construction and operation.

The intersection of Trahairs Road with Byrnes Road already supports heavy vehicle turning and access for the ROBE facility. It is unlikely that additional upgrades will be required for this intersection. Trahairs Road will be sealed up to the access point for the proposed development. The road access into the site to access the hardstand area will be sealed and around 7.5 m in width.

No significant impact for any of these aspects is expected from the materials facility.

Resource use and waste generation

The resource management options of the proposed development would be considered against the principles of avoidance of unnecessary resource consumption, resource recovery and disposal. These principles would act as a guide to achieve efficient use of resources and reduce costs and environmental harm.

Minimal levels of waste would be produced during the construction and operation stages of the facility. During operation, waste materials would be fuels and lubricants. Waste items that meet the criteria for General Solid ‘non-putrescible’ Waste would be disposed of on-site. Waste that does not meet these

criteria would be disposed of at a licensed premise. The contaminated soil from the historic use of the proposed waste cell will be composted on site within the existing footprint of the pond. Items that cannot be reused or recycled will be disposed of in accordance with the POEO Act.

No significant impact for any of these aspects is expected from the materials facility.

Hazards and risks

It was determined, using *Applying SEPP 33 – Hazardous and Offensive Development Application Guidelines* (2011), that the proposed facility would receive solid waste only, originating from commercial and industrial sources. Dangerous goods that would require transportation and storage were identified and do not exceed the thresholds. Therefore, a PHA under SEPP 33 is not required.

Leachate produced from the waste cell will be captured and managed in a leachate management pond. All specifications for the waste cell and leachate capture and management system will be in compliance with the NSW EPA's *Environmental Guidelines: Solid Waste Landfills* (2016). There is potential for the leachate to be hazardous and, therefore, regular testing of the leachate is required.

The proposed development is not potentially hazardous or offensive according to the requirements of SEPP 33 and a PHA is not required. However, the proposed landfill facility would require an EPL as it is a scheduled activity under the POEO Act.

Additional potential hazards of the proposal include fire, vandalism, explosion from gas accumulation or ignition and natural hazards (i.e. flooding or geological subsidence).

Potential bushfire risks and other hazards associated with the construction and operation activities of the proposal would be highly manageable.

Socioeconomic and community

There are over 63,000 people in the City of Wagga Wagga Local Government Area. Agriculture contributes $105 million to the local economy and employs 3.6 % of the local population. The development site is within the Bomen Industrial Area to the north of the Wagga Wagga central business district.

Community feedback has been sought via community information sessions. Concerns have been raised about the potential impact to water quality of surface and groundwater resources. These concerns have been addressed throughout the EIS.

Construction and operation of the facility could generate some adverse impacts including those associated with amenity resulting from noise, traffic, visual and air quality impacts. The capping and rehabilitation of the proposed landfill would allow the land to be reused in the future.

Impacts from the proposed development are considered to be minimal.

Historic heritage

A desktop study was undertaken by NGH Environmental to identify non-indigenous historic heritage items or places in proximity to the study area, with a focus on the development site.

No items or places are located within the development site. There are two heritage listed items/places in close proximity to the development site under the Wagga Wagga LEP. These include the Bomen Railway Station and the Bomen Stationmaster's Residence. No impact on either of these items would occur from the proposal.

Cumulative impacts

Cumulative impacts can result from a number of different elements within a project as well as from numerous different projects with interacting impacts in the same locality. Cumulative impacts of the proposal may occur as a result of another existing or future project within the locality.

Potential cumulative impacts during the construction and operation of the proposed facility have been identified as those on local air quality, noise levels, traffic on the local road network, surface and groundwater quality and local biodiversity values.

These potential impacts would be mitigated with the recommended safeguards and measures. Therefore, the proposal would be unlikely to cause a significant cumulative impact.

Potential cumulative impacts during the construction and operation of the proposed facility could occur as a result of activities of adjacent businesses. There are three listed projects for the Bomen Industrial Area. The proposed Bomen Solar Farm is on land adjacent to the materials facility.

The proposed development may cause cumulative impacts during construction and operation with any of the developments being undertaken in the Bomen area. However, impacts would be mitigated with the recommended safeguards and measures. Therefore, the proposal would be unlikely to cause a significant cumulative impact.

MANAGEMENT OF IMPACTS

The materials facility has been designed to avoid environmental impacts, including:

- Preserving surface and groundwater quality.
- Avoidance of the majority of native vegetation, including threatened biota.
- Maintaining air quality.

A range of additional management and mitigation measures have been developed to further reduce any residual impact. These strategies centre on the development of management plans and protocols to minimise impacts and manage identified risks and include the following key measures:

- A range of management measures to preserve surface and groundwater quality.
- Traffic management measures during construction.
- A range of standard construction mitigation measures to minimise dust, soil erosion, waste and noise impacts.
- Protocols in place for managing Aboriginal heritage and biodiversity.
- All stages of the development will be designed and operated in accordance with Australian Standards to minimise any risks to the health and safety of the public and employees.

CONCLUSION

Overall, the North Ridge Materials Facility would cater for commercial and industrial waste to service the needs of Wagga Wagga LGA and surrounding LGAs. The development site is on land previously used to manage and dispose of effluent from the historic Riverina Wool Combing facility at Bomen. The site is dominated by highly modified, largely exotic vegetation, with some scattered remnant box woodland, native and exotic plantings, cereal crops, and degraded wetland habitat.

A suite of management measures has been developed to address environmental impacts and risks to these and other physical, social and environmental impact areas.

The impacts and risks identified are considered manageable with the effective implementation of the measures stipulated in this EIS. Impacts are considered justifiable and acceptable.

1 INTRODUCTION

1.1 PURPOSE AND SCOPE OF THIS DOCUMENT

This Environmental Impact Statement (EIS) identifies and assesses the potential environmental impacts associated with the construction and operation of the proposed North Ridge Material Facility. NGH Environmental has prepared this EIS on behalf of the proponent, Riverina Warehousing Solutions.

The proposal is classified as designated development based on the volume of waste to be disposed. The proposal is classified as integrated development, given the requirement for a section 138 approval from Council under the *Roads Act 1993* and an Environmental Protection Licence under the *Protection of the Environment Operations Act 1997*. The proposal is not state significant development; .however, it is considered regionally significant development according to the *State Environmental Planning Policy (State and Regional Development) 2011.*

NGH Environmental has been engaged by Riverina Warehousing Solutions (RWS) to prepare an Environmental Impact Statement (EIS) to assess the potential environmental impacts associated with the construction and operation of the proposal. This EIS has been prepared in accordance with Part 4 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) to support a Development Application (DA) to be lodged with WWCC.

The objective of this EIS is to fulfil the requirements of Schedule 2 of the *Environmental Planning and Assessment Regulation 2000* (EP&A Regulation) and Section 79C of the EP&A Act. The structure and content of the EIS address the Secretary's Environmental Assessment Requirements (SEARs), provided by the NSW Department of Planning and Environment (DPE) on 26 July 2016 (refer Appendix A).

The proponent has engaged NGH Environmental to prepare the EIS. Other independent consultants have been contracted to carry out specialist technical assessments as required. This EIS will be independently evaluated by the Joint Regional Planning Panel, considering input from the community provided during the public exhibition period. The development assessment process places the onus on the proponent to provide the information required for the Joint Regional Planning Panel to make an informed decision. The process provides for public transparency, accountability and participation in development approval decision-making.

1.2 PROJECT OVERVIEW

1.2.1 The proponent

Chris Egan in partnership with Charles Bannatyne, purchased the former Riverina Wool Combing site in late 2014, and founded Riverina Sustainability Centre Pty Ltd. The name has recently been changed to Riverina Warehousing Solutions Pty Ltd.

Charles Bannatyne founded Carbon Mate in 2009 and began operations in the agricultural reuse of biosolids in 2010. In October 2011, Carbon Mate commenced with the purchase of the EPA-licensed facility known as Riverina Compost Mulching, which has since been operating as Carbon Mate Organic Recyclers (CMOR). It is intended for Carbon Mate to manage the operations of the proposed development at the North Ridge Site.

1.2.2 Development site location

The development site is located at 223 and 299 (Lot 2 and Lot 4 DP1249028) Trahairs Road, Bomen New South Wales (NSW). The site is around 9.5 km northeast of Wagga Wagga in southern NSW (Figure 1-1). The development site is located within the Wagga Wagga Local Government Area (LGA) and is accessed from Trahairs Road immediately south of the site.

The development site is situated in a heavily disturbed, largely cleared, rolling hills landscape. There are three existing evaporation ponds that were used for effluent from the former Riverina Wool Combing Plant. Trahairs Road runs along the southern boundary of the site from its intersection with Byrnes Road.

1.2.3 Key components of the North Ridge Materials Facility

The proposal involves converting an existing liquid waste evaporation pond into a non-putrescible solid waste disposal cell and leachate evaporation pond, with the capacity to accept up to 630 000 m^3 of non-putrescible waste.

The proposal would include:

- Creation of a waste cell comprised of 6 discrete sub-cells within a historic evaporation pond.
- Creation of a leachate management and groundwater relief system.
- Internal access roads.
- Transfer station and recycling bays.
- A storage shed with amenities.
- Allowance for a future weighbridge.

Full details of the proposal are contained in Section 3. For a description of 'non-putrescible' waste, refer to section 3.2.1.

1.2.4 Capital investment

The proposal would have a capital investment of approximately $3 million.

1.2.5 Land ownership

The development site is located on the two following Lot and DP numbers:

- Lot 2 and Lot 4 DP1249028.

1.2.6 Development history

A search for State Significant Development (SSD) on the Major Projects website (accessed 31/05/2018) of the Wagga Wagga LGA indicated a Development Application for Bomen Solar Farm on a portion of the development site and adjacent lands.

A search for undetermined development applications and development applications on exhibition on the Wagga Wagga City Council website (accessed 15/08/2018) did not indicate any Development Applications on the development site.

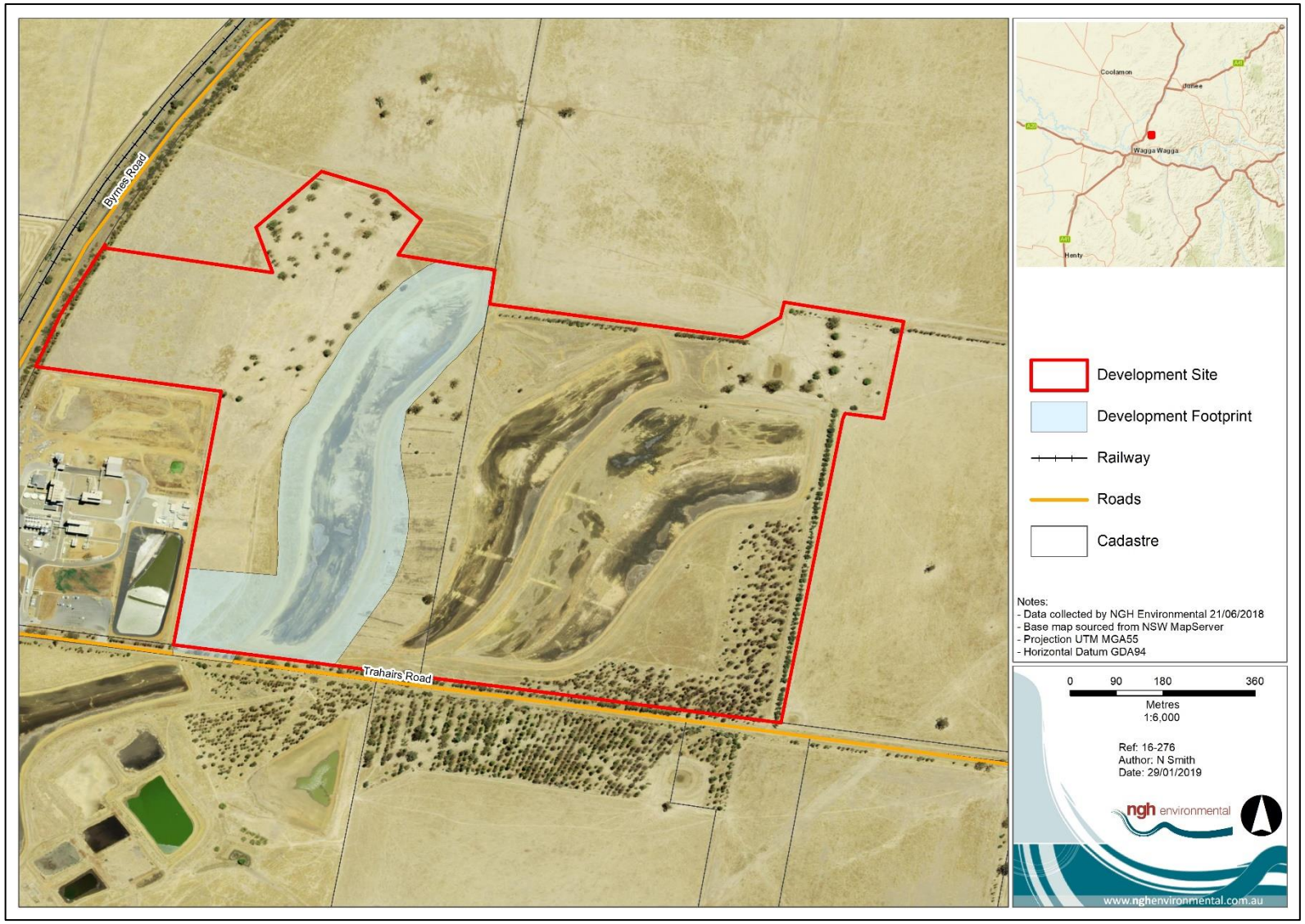

Figure 1-1 Location of proposed development site and development footprint

2 STRATEGIC JUSTIFICATION AND ALTERNATIVES CONSIDERED

2.1 STRATEGIC NEED

The development is primarily intended to service the waste management needs of Wagga Wagga LGA and surrounding LGAs. Wagga Wagga has a population of over 63 000 people (ABS 2017). The population has an ongoing need for the management and disposal of solid waste for building and demolition, light industry, and other activities. The proposal is also anticipated to source solid non-putrescible waste from Kurrajong Recyclers in Wagga Wagga. For a description of non-putrescible, refer to section 3.2.1.

Gregadoo Waste Management Centre is an example of a local 'putrescible' landfill facility. Analysis of the local waste streams to this facility in the 2010/11 Supplementary State of the Environment Report (WWCC, 2011) shows that trend in volumes of wastes was steady or increasing between 2005 and 2011, consistent with the increasing population of Wagga Wagga. The Australian Government's *Australian National Waste Report 2016* reported that in Australia, 831 kg of construction and demolition waste was produced per capita in the year 2014-2015. The types and weight of wastes are summarised in **Error! Reference source not found.**. Construction and demolition wastes are included in the *Other Waste* category, along with commercial and industrial waste, and waste from other facilities.

Table 2-1 Waste received at Gregadoo Waste Management Centre by type and weight

Waste types	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11
Green waste	8 983	8 251	7 947	7 746	8 824	10 607
Municipal waste	13 246	13 338	13 776	31 826	30 212	31 082
Other waste	35 051	39 919	43 084	33 412	35 614	32 675
Total (tonnes)	57 280	61 508	64 806	72 535	74 650	75 084

Another example of a landfill facility in Wagga Wagga is the Willis Bricks landfill pit. This facility serviced industrial building and demolition waste for the Wagga Wagga area. The area of the pit is around 8 300 m^2 and the average depth around 8 m. The capacity of this pit is thus around 66 400 m^3. Willis Brick landfill was active for approximately 20 years. The average volume of waste received was therefore calculated at around 3 320 m^3 per year. It is expected that a similar or greater volume of waste would be received at the proposed facility.

2.2 PROPOSAL BENEFITS

The proposal would provide a waste management option for the commercial and industrial sector in the Wagga Wagga area. The proposal has the benefit of achieving this objective while also making use of the existing wool scouring effluent evaporation ponds on a disturbed site that has generally low environmental values, which would minimise the environmental impacts of the development.

2.3 PROPOSAL OBJECTIVES

The proposal objectives include:

- Provide a waste management facility for commercial and industrial general solids waste (non-putrescible).
- Utilise land previously used to manage and dispose of greasy saline effluent from the historic Riverina Wool Combing facility at Bomen.
- Ensure that planned measures are implemented to protect the amenity and resources of the surrounding environment.
- Minimise environmental impacts by restricting the footprint of the development to land previously used for waste management and disposal.
- Work with stakeholders to ensure wastes are managed in accordance with the waste management hierarchy and the principles of the Waste Avoidance and Resource Recovery Act 2001, where all possible waste is recovered for reuse prior to disposal.
- Ensure that the facility is operated in a manner compliant with environmental legislation and New South Wales (NSW) Environmental Protection Authority (EPA) waste guidelines.
- Plan for the rehabilitation of the proposed landfill closure to ensure it is compatible with the surrounding landscape and land use. It is envisioned that upon closure of the landfill, the site would be stabilised, landscaped and potentially utilised for a solar farm (or similar).

2.4 STRATEGIC POLICY SETTING

Bomen Strategic Master Plan

The Bomen Strategic Master Plan (WWCC 2009) identifies that the community's main objectives for the Bomen area are to:

a) Capitalise on and market the site's competitive advantages:
   i. Its location central to inland south-eastern Australia on the Sydney-Melbourne railway;
   ii. Its infrastructure, especially access to rail and road networks, energy, water, communications, and waste management; and
   iii. Its land, a 1500 ha – plus supply of large parcels of near level to gently undulating land that is easily developed.

b) Establish preferred:
   i. Land use patterns to ensure access to transport infrastructure, primarily the rail corridor, is optimised, by precluding enterprises (not requiring direct access to the rail) from being located a distance from the rail that may inhibit access to the rail by activities that must be adjacent to the rail corridor.
   ii. Road networks that provide a hierarchy of direct and legible routes through and around the Southeast Australian Logistics (SEAL) hub.
   iii. Infrastructure networks that are economically efficient and environmentally effective.

c) Enable SEAL to become a greater strategic asset for Wagga Wagga, the Riverina, NSW, and Australia.

d) To embrace and base future decisions and development upon principles of ecologically sustainable development.

e) To achieve objective (d), industrial ecology is used as a strategy; to minimise or eliminate pollution, via enabling the transfer of materials and resources amongst enterprises so as to create a closed cycle, thus conserving natural resources and minimising environmental impact of development.
f) Improve the region's capability in attracting business, nationally and internationally.
g) Provide for a planning and approvals framework that enables greater predictability of process and certainty of outcomes.
h) Be a conduit for Government funding, administrative, marketing and planning support.
i) Provide for improved compatibility and relationships of SEAL's businesses with their neighbours.
j) Provide for judicious allocation of land for various land uses that best capitalise on SEAL's competitive advantages.
k) Promote and help enable vocational training in the trades and professions that are and will be required by SEAL enterprises.
l) Complement Wagga Wagga's existing supplies of industrial land, by differentiating itself as the location of choice for transport related and support enterprises, or as a location for industry requiring large land parcels or direct access to road and rail.
m) Enable development of a capital works program and a budget for public works.

The proposal aligns with aim a) as the work capitalises on infrastructure at Bomen, specifically waste management; aim b), as the work would contribute to establishing an infrastructure network that is economically efficient and environmentally effective; and with aim j), as the work would provide for judicious allocation of land with the landfill proposed on an existing waste pond.

The proposal would not hinder the opportunity of the wider Bomen area to achieve any of these strategic objectives.

3 PROJECT DESCRIPTION

3.1 DEVELOPMENT SITE DESCRIPTION

The development site is located at 223 and 299 Trahairs Roads, around 10 km north-east of central Wagga Wagga. It is in close proximity to the Sturt and Olympic Highways. Wagga Wagga is around 400 km southwest of Sydney in the South West Slopes (SWS) Interim Biogeographic Regionalisation for Australia (IBRA) Bioregion of southern NSW. This bioregion covers an extensive area of foothills and isolated ranges comprising the lower inland slopes of the Great Dividing Range, and includes parts of the Murray, Murrumbidgee, Lachlan, and Macquarie River catchments.

The development site is around 16.5 ha in size and is located on two individual titles:

- Lot 2 DP1249028 299 Trahairs Road 40.67 ha
- Lot 4 DP1249028 223 Trahairs Road 45.27 ha

The development would utilise the historic effluent disposal and evaporation ponds from Riverina Wool Combing, a wool scouring facility. These ponds were used to store and evaporate saline effluent. These ponds have not been used to store effluent for around 8 years. The evaporation ponds are located within Lots 2 and 4. The evaporation ponds only occupy a small proportion of these lots. The remainder of the lots are currently being used for primary production purposes, including cropping and grazing. Cropping and grazing would continue adjacent to the proposal during construction and operation.

The surrounding land use is principally rural and industrial. Rural land adjacent to the subject lots is currently used for cropping and grazing. Industrial land adjacent to the subject lots is used for oil seed processing and light industry. There are several scattered residences in the area, with the nearest residential receivers at around 1.4 km west of the development site. The Riverina Oils and Bio-Energy industrial facility is 200 m west of the development site.

There are 66 residential receivers within a 3 km radius surrounding the proposal. Receivers are sparsely located around the development site except to the north-west, where the large lot residential suburb of Brucedale is located (Figure 3-2). There are no residential sensitive receivers within one kilometre of the development site. The majority of residential sensitive receivers are located to the west (Figure 3-2).

Receivers R01 to R21 are representative residential sensitive receivers identified around the proposed materials facility for noise and vibration modelling, and for odour and particulate modelling.

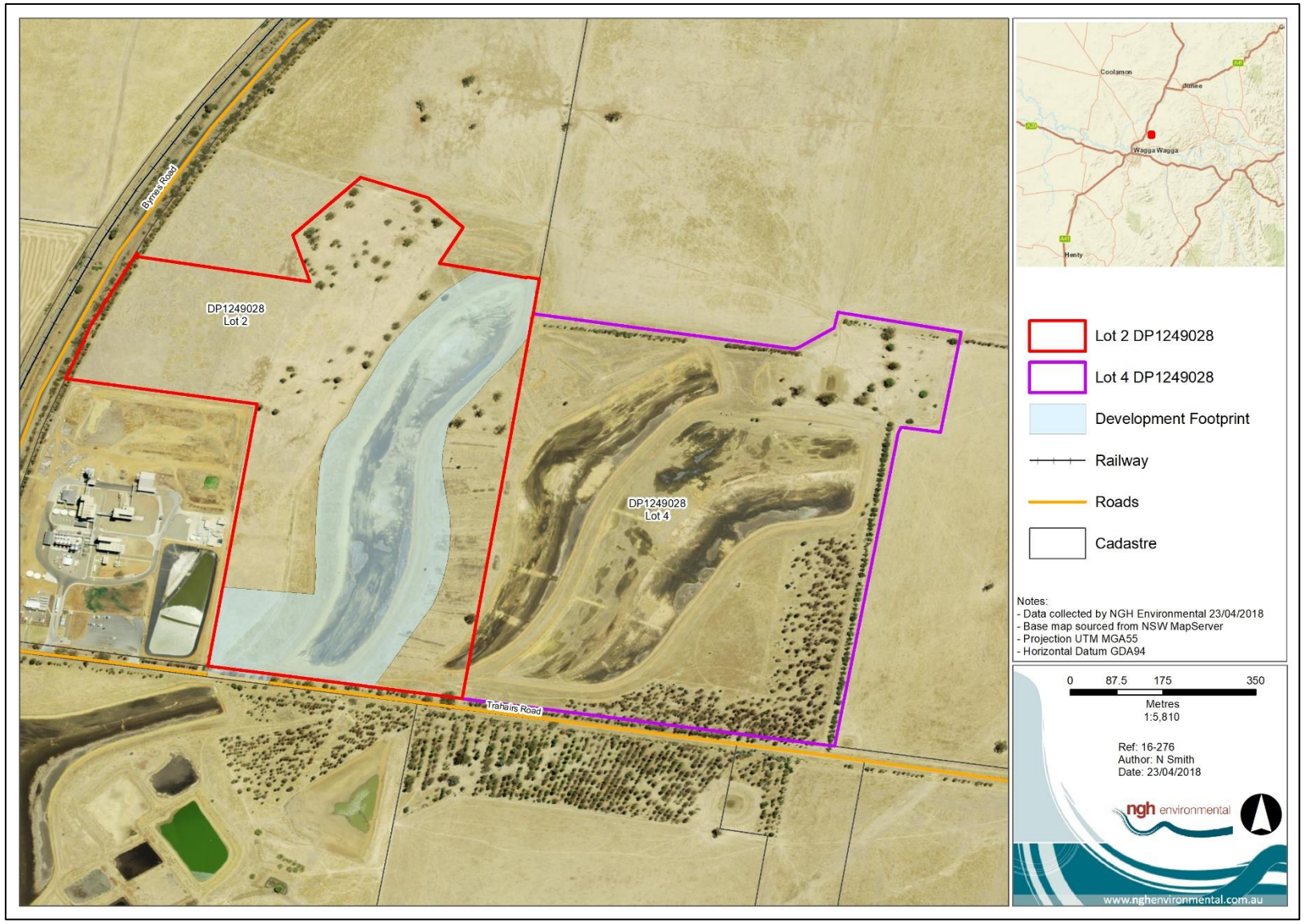

Figure 3-1 Development site and DP numbers.

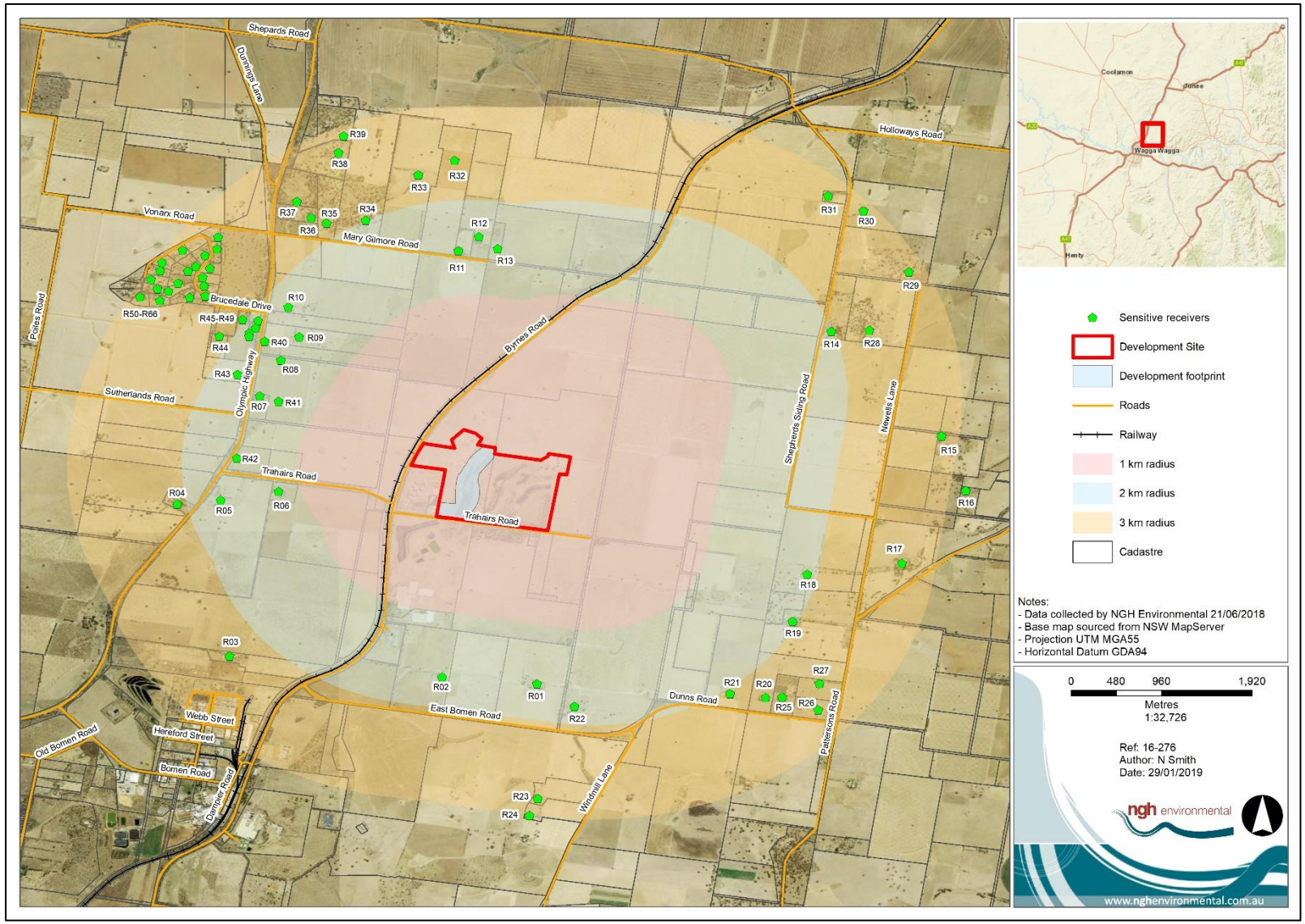

Figure 3-2 Sensitive receivers (residences) to the proposed development site

3.2 THE PROPOSED NORTH RIDGE MATERIALS FACILITY

The proposal involves the construction and operation of a non-putrescible solid waste landfill and associated infrastructure. The landfill would be situated within the footprint of the historic effluent evaporation ponds. These evaporation ponds have been selected as the preferred site to establish the landfill. The proposal would repurpose one of these effluent ponds to a non-putrescible landfill. This would use contaminated land in a beneficial way and allow for more reuse options of the land in the future. The location of the facility at this site minimises the potential for impacts to adjacent land uses while serving the needs of industry in the area.

The proposal would include:

- Creation of a series of 6 staged sub-cells within the existing proposed waste cell.
- Construction of a piped groundwater relief system to intercept and collect groundwater from underneath the sub-cells.
- Lining the sub-cells with an impermeable clay liner, geotextile and HDPE liners, and free-draining aggregate layer.
- Construction of a piped drainage system to collect and drain leachate from the waste cell.
- Construction of a lined leachate storage and evaporation pond with aerator.
- Repair of existing upslope earthen drain to direct overland stormwater flows away from the waste cells.
- Construction of ingress, egress and internal access road of sufficient size to allow storage and turning of semi-trailers.
- Construction of designated waste inspection area and transfer station.
- Storage shed within amenities.
- Possible weighbridge installation in the future.

The initial waste disposal sub-cell would be in the southern end of the proposed waste cell, and subsequent sub-cells constructed progressively to the north. The outer perimeter at any elevation of the landfill cells will be set back at least 15 m from the boundary of the premises. This is to ensure that land is available for the installation of monitoring wells and plume-abatement measures (e.g. construction of barriers) if liquid or gaseous pollutants are found to be escaping off-site.

Waste would be delivered to the site on heavy vehicles using the local road network. All vehicles using the site would use Byrnes Road and Trahairs Road. The site access could accept triaxle semi-trailers and B-doubles. It is expected that vehicles delivering up to 20 t (30 m^3) per load would access the site. Based on predicted receivals per year it is expected that less than 10 loads per day (20 vehicle movements) would be delivered to the facility. Pre-weighed loads would be placed on an inspection pad for screening (or rejection). Accepted loads would be delivered to the waste cell by loader or heavy vehicle. Metals or timber may be removed and stockpiled for recycling.

Waste within the sub-cells would be compacted in layers about one metre thick during placement. Water would be used if required for dust suppression during placement and compaction of waste within the sub-cells. When the sub-cell has reached capacity, the waste would be capped with clean fill from previous excavations. The capping material would be compacted to minimise infiltration and covered with topsoil to the nominated depth and revegetated.

The general layout of the proposal is illustrated in Figure 3-3, with preliminary design drawings provided in **Error! Reference source not found.** The layout of the proposal is subject to detailed design. Some micro-siting of proposal elements is expected in order to minimise environmental impacts and maximise

efficiency. Any changes in design would still be consistent with the environmental assessment and planning approval.

3.2.1 Waste

General solid waste (non-putrescible) sourced from the commercial and industrial sector would be managed at the facility. Non-putrescible general waste includes waste categories classified in the NSW EPA (2014) *Waste Classification Guidelines Part 1: Classifying waste* and are wastes that are not subject to putrefaction. Non-putrescible wastes should not emit offensive odours (EPA 2014). Examples of non-putrescible waste includes:

- Glass, plastic, rubber, plasterboard, ceramics, bricks, concrete or metal.
- Wood waste.
- Waste contaminated with lead (including lead paint waste) for residential premises or educational or childcare facilities.
- Building and demolition waste.
- Virgin excavated natural material.
- Fully cured and dried residues of resins, glues, paints, coatings and inks.

The facility would not be open to the general public and would only accept waste under contract. Materials that could be recycled such as metal and wood waste would be removed and taken to local recycling facilities . This would include screened waste (Table 3-1).

Table 3-1 Predicted waste streams and types for the proposed facility

Waste stream	Type of waste	Waste classification[1]
Construction & demolition waste	• Broken concrete, brick and other rubble. • Soil (uncontaminated). • Road millings. • Timber. • Plaster board. • Compressed cement sheet.	General solid waste (non-putrescible)
Visy Pulp and Paper Mill, Tumut	• Compactor plastics – light mixed plastics. • Grapple Materials – heavy plastics, some metals, rubber and fibre. • Glass material – glass, ceramics and stone chips. • Fines/sand – with a small amount of fibre. • Flotsam – wire, rope, plastics, metal and some fibre. • Carbonates – mix of sodium and calcium carbonates, lime and a small volume of unburnt organics. • Power boiler fly ash – boiler wood ash, inorganics. • Power boiler sand – with some metals and small rocks.	General solid waste (non-putrescible)
Kurrajong Recyclers	• Crushed glass. • Some limited electrical wire contamination.	General solid waste (non-putrescible)

Other undefined non-putrescible waste	• Undefined	General solid waste (non-putrescible)

(1) As classified in the NSW EPA Waste Classification Guidelines Part 1: Classifying waste (2014).

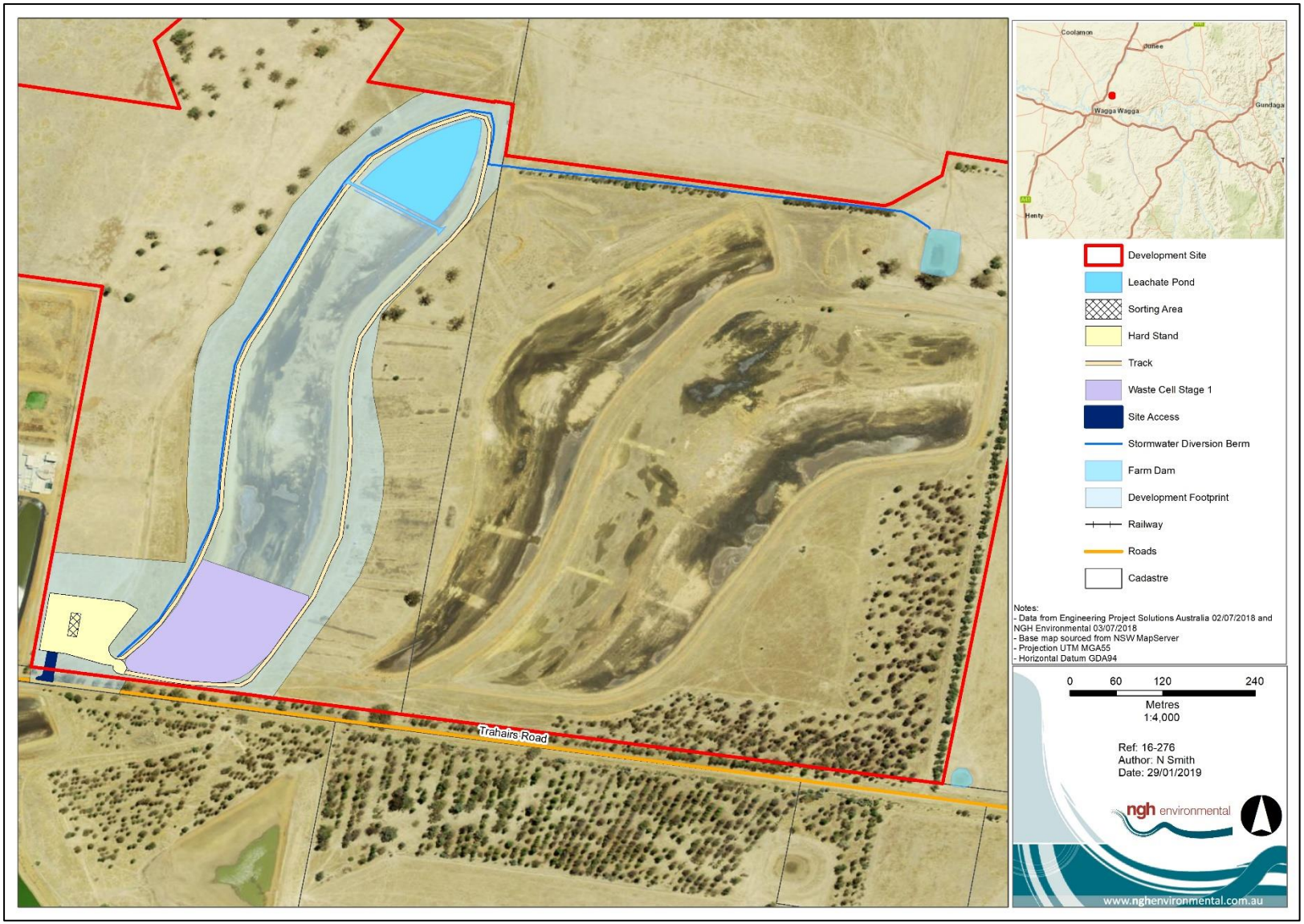

Figure 3-3 Proposal layout

3.2.2 Capacity

The western pond has an existing footprint of about 86 700 m^2, and an existing depth of about 2 m with a 0.5 m freeboard. The proposed waste cell would have a footprint of approximately 77 600 m^2, made up of 6 discrete sub-cells of around 110 m x 110 m, constructed as required by NSW EPA guidelines. The finished waste depth would be about 8 m below the existing pond surface and a height of about 6 m above the existing pond surface. Based on the current design the depth of waste in the centre of the cell would be approximately 8 m.

The proposed facility would hold around 630 000 m^3 of waste, with a lifespan of approximately nine years. It will operate during standard hours of operation (7.00 am to 6 pm Monday to Friday; 8.00am to 1.00 pm Saturday; closed Sundays and Public Holidays). It is estimated that the proposed facility would receive about 60 000 t or about 67 000 m^3 in its first year and grow at about 1.5 % annually. Annual and cumulative receivals have been calculated based on the predicted receival rates and growth (Table 3-2). Included in Table 3-2 are the estimated number of truck deliveries per week for each year assuming that each truck transports a 20t load.

Table 3-2 Annual receivals and cumulative receivals of materials over the approximate lifespan of the facility

Year	Annual receival (m^3)	Cumulative receival (m^3)	Sub cell use	Estimated truck deliveries per week
1	67 514	67 514	1	58
2	68 054	135 567	1/2	58
3	69 075	204 642	2/3	59
4	70 111	274 752	3	60
5	71 162	345 914	4	61
6	72 230	418 144	4/5	62
7	73 313	491 457	5	63
8	74 413	565 870	5/6	64
9	75 529	641 399	6	65

Each sub cell would hold approximately 100 000 m^3 dependant on the sub-cell location and detailed design. It would take approximately 1.5 years to fill each cell. As the current cell is filled with waste the subsequent cell would be designed and constructed. When the current cell reaches capacity, waste would be diverted to the newly prepared cell and the filled cell would be capped and revegetated.

3.2.3 Site Water Balance

The proposed development site has been divided into four sub-catchments for calculating the site water balance (Figure 3-4).

Water balance calculations used decile 5 rainfall statistics sourced from the Wagga Wagga AMO site (station number 072150, -35.016°S, 147.46°E) (www.bom.gov.au), which has a continuous record for 120 years. An 18 % runoff coefficient was used across the site (WWCC 2017), which is predominantly vegetated

with groundcover excepting the middle and eastern evaporation ponds (Figure 6-9). This runoff coefficient is conservative and is higher than the figure used for calculating the harvestable rights for the site using the WaterNSW *Maximum Harvestable Right Calculator* (https://www.waternsw.com.au). Therefore, annual runoff and storage volumes are expected to be lower.

Table 3-3 presents the land size, annual average precipitation volume, storage and runoff for each sub-catchment.

Table 3-3 Water balance details for the proposed site

Sub-catchment	Water quality	Size (m^2)	Annual decile 5 precipitation (m^3)	Annual storage (m^3)	Runoff (m^3)	Comments
1	'Waste'	-	-	-	-	Sub-catchment 1 is comprised of the waste sorting area and the proposed waste cell and leachate management pond. Refer to section 3.2.7 for a detailed leachate balance.
2	'Clean'	245729	1 645	1 645	0	Sub-catchment 2 is comprised of the land west of the proposal. A water diversion berm would re-route stormwater runoff north, around the waste cell, to a farm dam located in the north eastern corner of the site (Figure 3-3 and Figure 3-4). The existing farm dam has an approximate capacity of 3 518 m^3.
3	'Dirty'	378 290	30 015	30 015	0	The majority of sub-catchment 3 is comprised of the middle and eastern evaporation ponds. All precipitation will be captured in the ponds. Runoff from the remainder of the sub-catchment will be diverted into the ponds. The water quality is classed as 'dirty' as it is in contact with the sludge from historical land use (refer to section 6.2.2 and Appendix R).
4	'Clean'	151 996	12 060	0	11 930	Sub-catchment 4 is comprised of the eastern side and south-eastern corner of the site. Around half of this sub-catchment includes planted woodland vegetation and a row of olives (Figure 6-9). All runoff would leave the site in a south-easterly direction.

Figure 3-4 Sub-catchments of the proposed development site

3.2.4 Groundwater relief layer

A groundwater relief layer will be constructed below the leachate barrier as groundwater levels could affect the stability and performance of the leachate barrier. The materials used in this system would be of the same quality as the materials used in the leachate collection system.

Below the HDPE liner will be a 1000 mm compacted clay layer above a 200 mm compacted clay in-situ layer. A perforated groundwater relief drainage pipe (class 1000) in a geofabric sock will be placed in a trench to a depth of 600 mm below the compacted clay layers. The trench will be backfilled with 20 mm aggregates of river run gravel or similar (Figure 3-5).

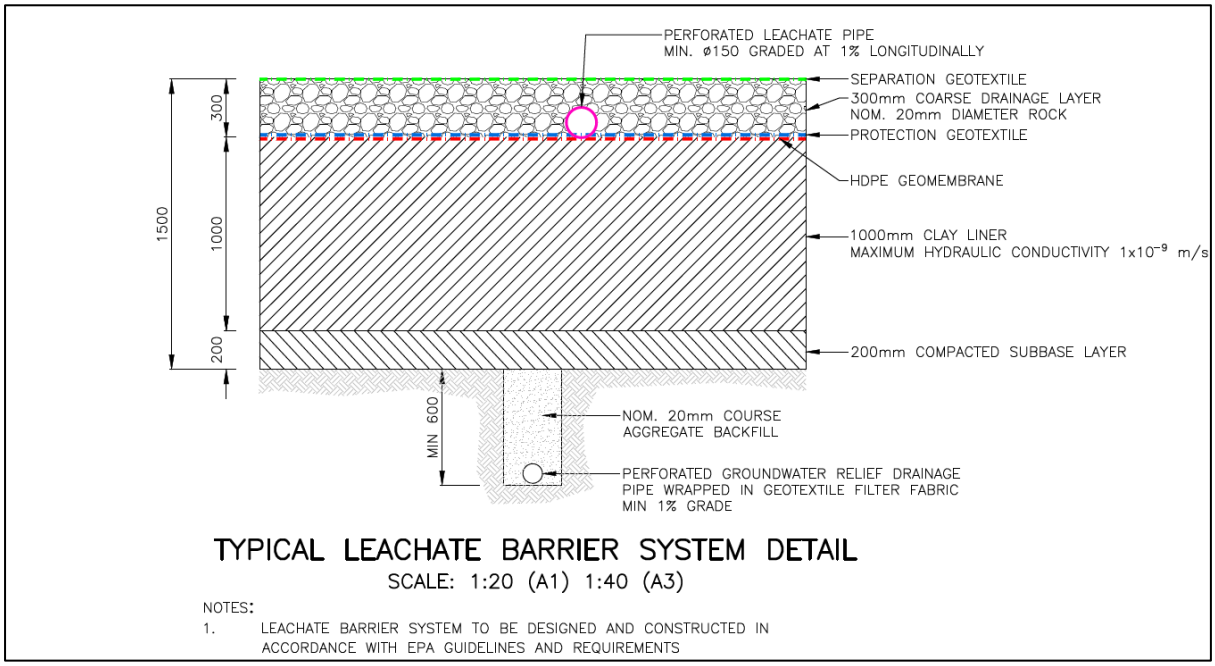

Figure 3-5 Typical leachate barrier system.

Captured groundwater will be directed through the sub-soil drainage system to a water storage tank via one inspection point per cell (Figure 3-6/**Error! Reference source not found.**) with a Type 3 connection (Figure 3-7/Appendix B).

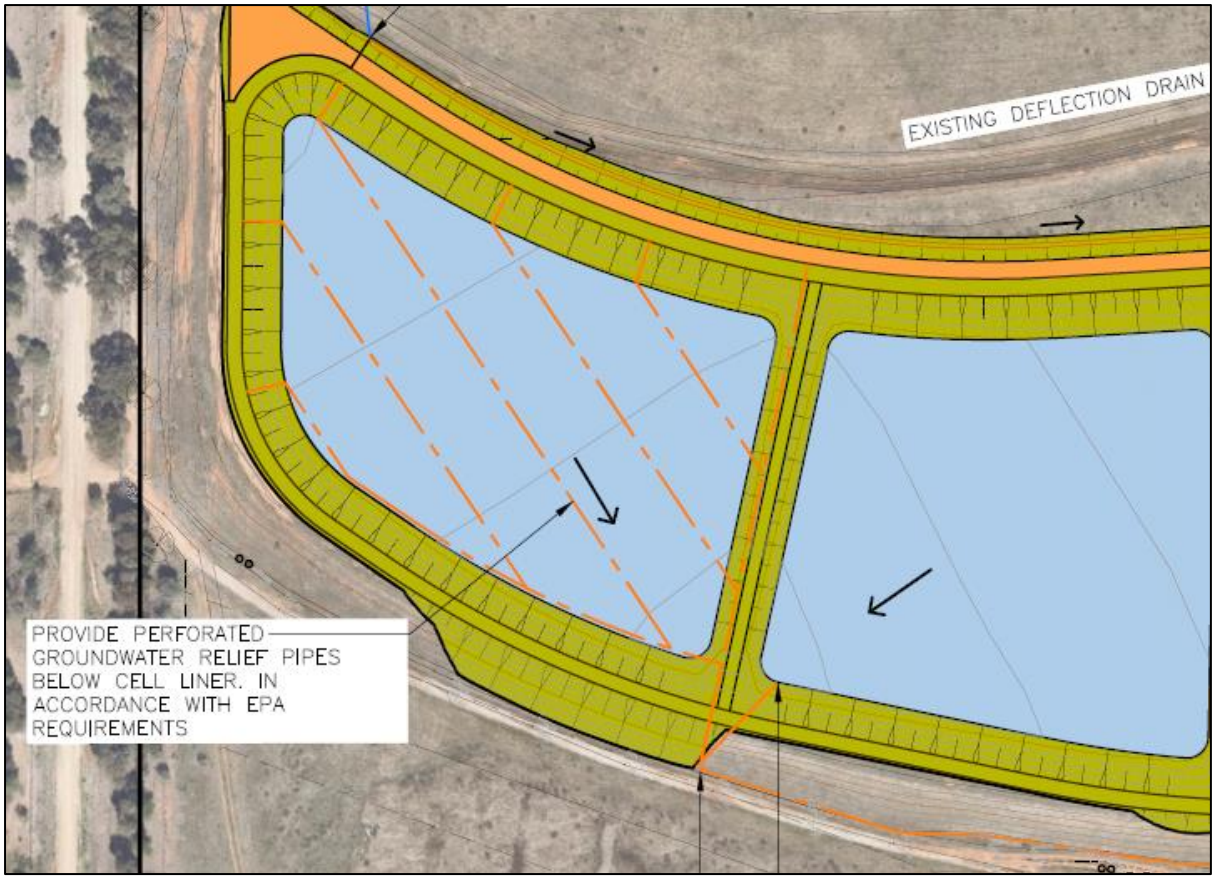

Figure 3-6 Illustration of subsoil drainage capture and movement beneath one discrete waste cell to the inspection point

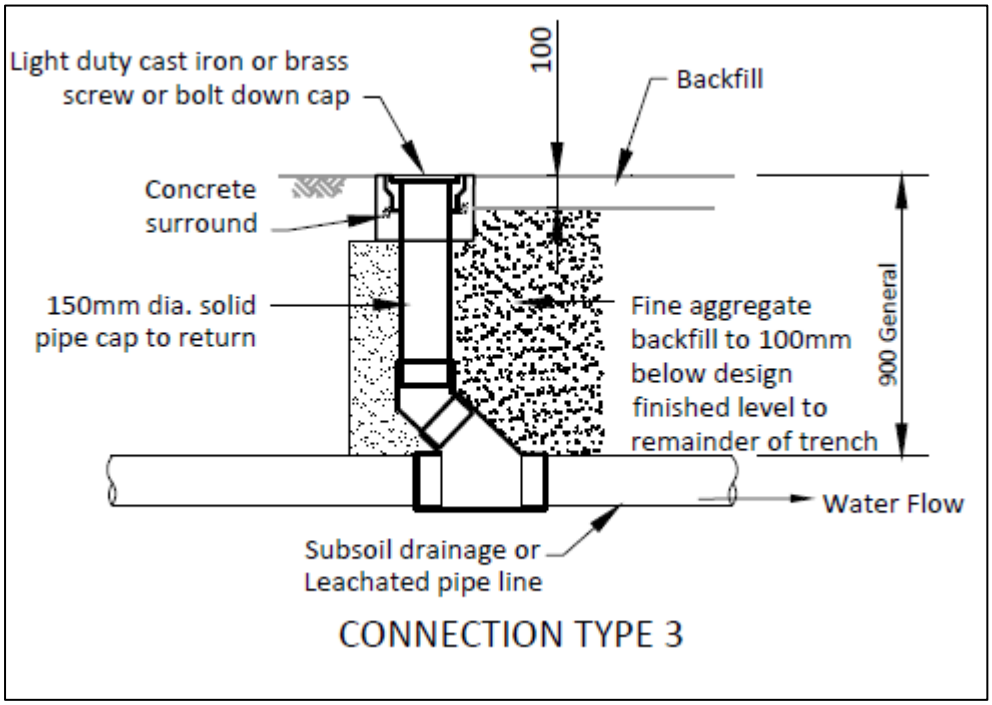

Figure 3-7 Illustration of connection type 3

Groundwater testing will occur at inspection points on a monthly basis to ensure there is no leakage of leachate from the waste cell and the leachate management pond. The groundwater will be diverted to a tank and reused for irrigation and dust suppression.

3.2.5 Leachate barrier system

The landfill would have a leachate barrier system to contain leachate and prevent the contamination of surface water and groundwater over the life of the landfill. The base and walls of the non-putrescible solid waste landfill cells should be lined with a durable material of very low permeability to form a barrier between the waste and the groundwater, soil and substrata.

The leachate barrier system (from bottom to top) includes:

- A 1000 mm in-situ compacted clay layer and followed by a 200 mm compacted clay layer with an in situ hydraulic conductivity of less than 1 x 10^{-9} m/s. It will provide a smooth base to overlay a geomembrane.
- The geomembrane will be a minimum 2 mm think and manufactured from High Density Polyethylene (HDPE). The base liner will have a gradient of 0.5 % longitudinally and 0.7 % in transverse directions.
- A leachate collection layer comprising a 300 mm thick gravel drainage layer including collection pipework, which slopes to a sump from which leachate is conveyed from the cell. The gravel will have a nominal particle size 10-20 mm diameter, a maximum particle size of 40 mm and a saturated hydraulic conductivity greater than 1 x 10^{-3} m/s. The perforated PVC pipes will be at least 100 mm in internal diameter, be placed on the floor at intervals of 10 m (running the length of the cell) and be laid at a gradient of 0.5 % longitudinally and 0.7 % in transverse directions.
- A geotextile layer would be provided both above and below the gravel drainage layer.

3.2.6 Leachate collection system

A leachate collection system to pump, store, and evaporate leachate would manage leachate from the waste cell. Drainage pipe work and drainage aggregate would collect and drain any leachate generated in the waste cell. The leachate would then be directed along the pipework under gravity to a leachate pump well. From the pump well, the leachate would be pumped to the lined leachate evaporation pond. The leachate evaporation pond would be located at the northern end of the proposed waste cell. In addition, some leachate may be reused in wetting down landfill or night cover material within the sub-cells.

The leachate collection system:

- Includes a collection sump and leachate riser(s) to facilitate extraction of leachate from the cell. The riser would be stable under the load of the surrounding waste mass and will be able to withstand stresses due to settling of the surrounding waste. The pipes will comply with the requirements of applicable Australian Standards for the pipe material, for example Australian Standard AS 4058:2007 Precast Concrete Pipes (pressure and non-pressure) (Standards Australia, 2007b).
- Be installed in all cells, can control leachate levels within each cell, and be able to convey collected leachate out of the cell to surface storage or other infrastructure.
- Can keep the leachate level no greater than 300 mm above the upper surface of the base liner, or below some other level that is justified by the design, site conditions and leachate management measures (note: the flow of leachate through the liner is greater when leachate is allowed to accumulate within the cell, and higher leachate levels can also interfere with landfill gas controls).
- Can continue to function effectively until the landfill is considered stable.

3.2.7 Leachate storage and evaporation pond

The proposal includes the construction of a lined leachate storage and evaporation pond and will:

- Have sufficient leachate storage volume, as determined by the water balance calculations as per *Environmental Guidelines – Solid Waste Landfills* (NSW EPA 2016).
- Have a freeboard that can accept rainfall directly on the pond from a 24-hour rainfall event with a 1-in-25-year average recurrence interval without overflowing. The pond will have a visible marker to indicate the bottom depth of the required freeboard. If the freeboard is exceeded, it will be re-established to maintain the required freeboard.
- Be designed and constructed to a standard similar to that of the landfill cell liner (refer to section 3.2.5).
- Calculations predict the dam will dry out often as pan evaporation are greater than the annual production of leachate under average rainfall conditions (see below). The shallow depth of the dam will enable natural aeration of the leachate. The leachate pond will have a storage capacity of 13 627 m^3 (9 084 m x 1.5 m). However, odour monitoring will be conducted on a regular basis by site staff. Should odour be noticeable at or beyond the boundary of the site, steps will be taken to include aeration as required. It should be noted that the leachate management pond is around 500 m from the closest boundary (western) and more than 1.25 km from the closest residential sensitive receiver.

Leachate Balance

Water management is an essential component of this proposed facility. Stormwater from the land above the facility will be directed around the proposed waste cells. Stormwater will be directed away from the waste cells via an existing vegetated earthen drain up slope of the facility. The redirected stormwater is channelled to a farm dam on Lot 4, down slope of the development footprint (Figure 3-3). As waste cells are capped stormwater from the surface of the cells will be directed to the stormwater diversion. Diverting stormwater will minimise the leachate generated by the facility.

Water within the waste cells and runoff from the sorting area will be captured and treated as leachate. Runoff from the sorting area will be captured in a drain and directed via a pipe to the waste cell (Appendix B).

A water balance was prepared for the waste cell as per the requirements of the *Environmental Guidelines – Solid Waste Landfills* (NSW EPA 2016). A water balance assists in determining the required capacity of the leachate pond for the size of the waste cell. The water balance for the proposal has been calculated conservatively, only accounting for 100% infiltration for an open waste sub-cell and 10% infiltration for a capped and revegetated waste cell. It has not accounted for the 90% infiltration of waste below surrounding ground level with intermediate cover or 50% infiltration of waste above the surrounding ground level with intermediate cover.

The water balance has been calculated using the rainfall statistics from the Wagga Wagga AMO site (station number 072150, -35.016°S, 147.46°E) (www.bom.gov.au), which has a continuous record for 120 years. The following climate scenarios have been used Figure 3-8):

- Scenario 1 - the median monthly rainfall (decile 5).
- Scenario 2 - the 90th percentile monthly rainfall (decile 9).
- Scenario 3 - the annual 90th percentile rainfall averaged across 12 months, which is significantly less than the 90th percentile monthly rainfall figure.

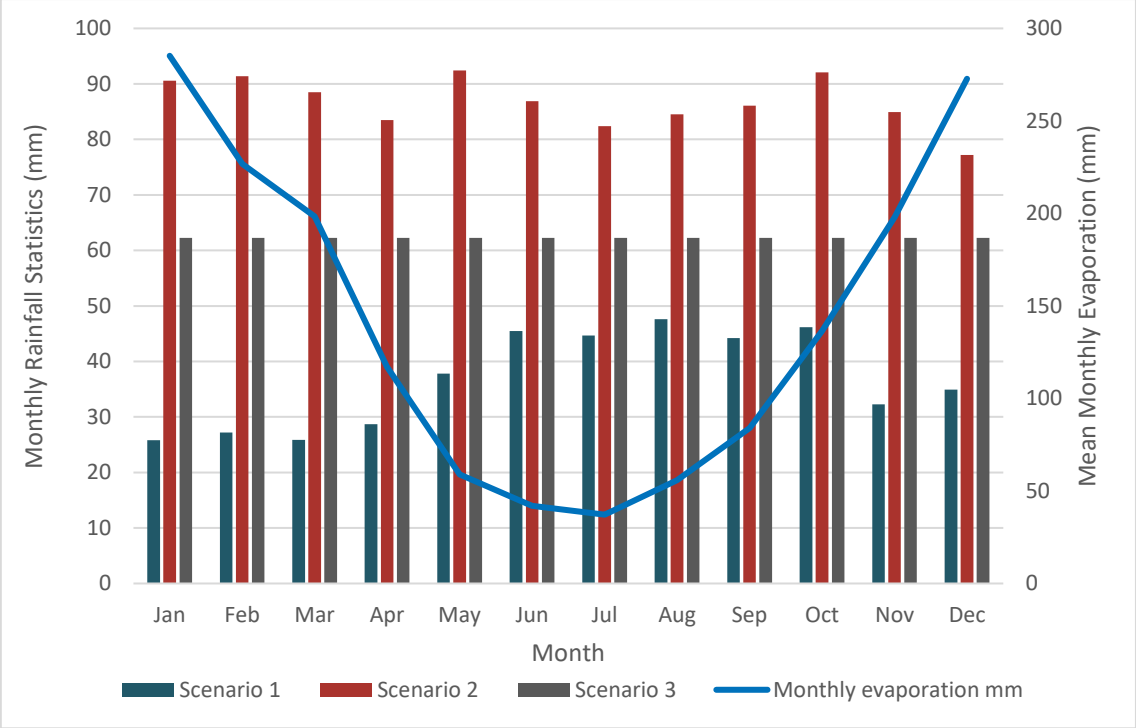

Figure 3-8 Monthly rainfall statistics for Scenario 1, 2, 3 and the monthly mean evaporation (Source: www.bom.gov.au 2018)

An obvious difference exists in the monthly rainfall statistics of the three scenarios. Annual rainfall for Scenario 3 has been averaged across 12 months, thereby assigning an equal value across the months. Pan evaporation remains fairly constant from year to year. Pan evaporation is lowest during the winter months.

The water balance for the proposal has been calculated using 100% rainfall infiltration for an operating cell and 10% rainfall infiltration for final capping with vegetation. A 7% volumetric reduction in rainfall infiltration was included in the calculations for the months February to December to reflect the absorptive capability of the waste as per the *Environmental Guidelines – Solid Waste Landfills* (NSW EPA 2016).

The cumulative total of leachate storage required, less pan evaporation and the absorptive capacity of waste, has been calculated for three climate scenarios for year 1 stage 1 (Figure 3-8) under 100% rainfall infiltration for the active filling area (Table 3-4). The bold values represent the highest level of leachate produced after evaporation.

Table 3-4 Cumulative storage of the leachate pond for the three rainfall scenarios for year 1 stage 1 (peak cumulative volume is highlighted in **bold**)

Month	Scenario 1 (m^3)	Scenario 2 (m^3)	Scenario 3 (m^3)
January	0	0	0
February	0	190	0
March	0	1117	0
April	0	2170	595
May	454	3986	1539
June	1167	5659	2629
July	1579	7391	3731
August	2262	8891	4695

Month	Scenario 1 (m^3)	Scenario 2 (m^3)	Scenario 3 (m^3)
September	2656	10069	5462
October	**2710**	11419	**5834**
November	2176	11922	5799
December	1117	**11971**	5285

The three scenarios represent the following within the approximate 9-year lifespan of this project:

- A statistically improbable year of rainfall (Scenario 2 - decile 9).
- A worst-case scenario (scenario 3 - wet year).
- A probable year of rainfall (scenario 1 - decile 5).

Annual cumulative leachate volumes are markedly different between the three scenarios (Figure 3-9). Monthly evaporation rates from the leachate pond have been included in the calculations for the monthly leachate production volumes. Under scenario 1, pan evaporation is greater than the volume of leachate produced. Under scenario 2, leachate production is far greater than pan evaporation. During the winter months, when evaporation rates are lowest (Figure 3-9), the leachate produced will accumulate (Table 3-4). The monthly total of leachate production for scenarios 1 and 3 are significantly less than for scenario 2. Leachate accumulation in a scenario 3 year is around mid-way between scenario 1 and scenario 2 (Figure 3-9).

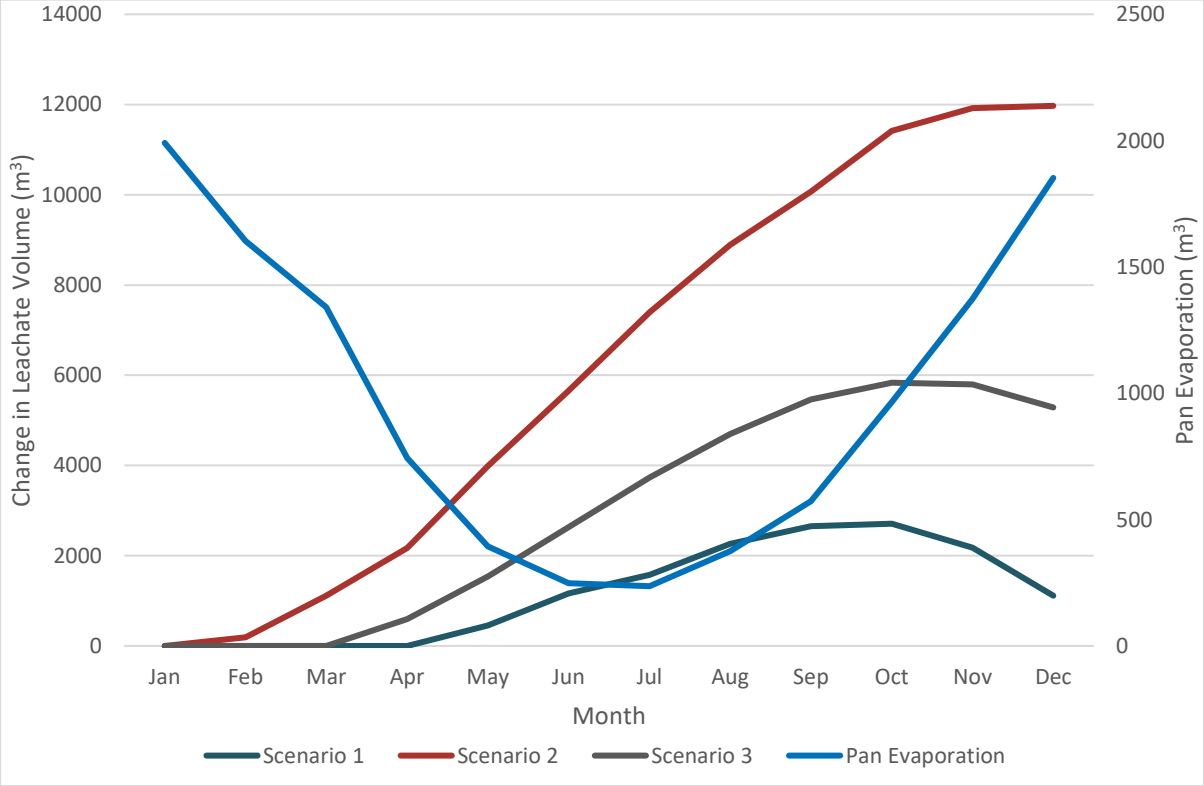

Figure 3-9 Change in cumulative volume of the leachate pond for Scenario 1, 2 and 3 rainfall statistics with monthly pan evaporation for year 1 stage 1

The annual leachate production cycle is dependent on the rainfall received within that year. Figure 3-10 shows the average cycle of a waste sub-cell using scenario 3 low probability wet year and scenario 1 an

average year of rainfall. The high annual leachate production represents scenario 3. The low annual leachate production represents scenario 1. Pan evaporation remains steady year-on-year. The cycle includes 1.5 years of activity using 100% rainfall infiltration and then shows the reduction to 10% rainfall infiltration once the cell is capped and revegetated. This chart does not account for the increase of waste within the cell that would reduce the rainfall infiltration to 90% and if the waste was above the surrounding natural ground level, 50% infiltration (EPA, 2016).

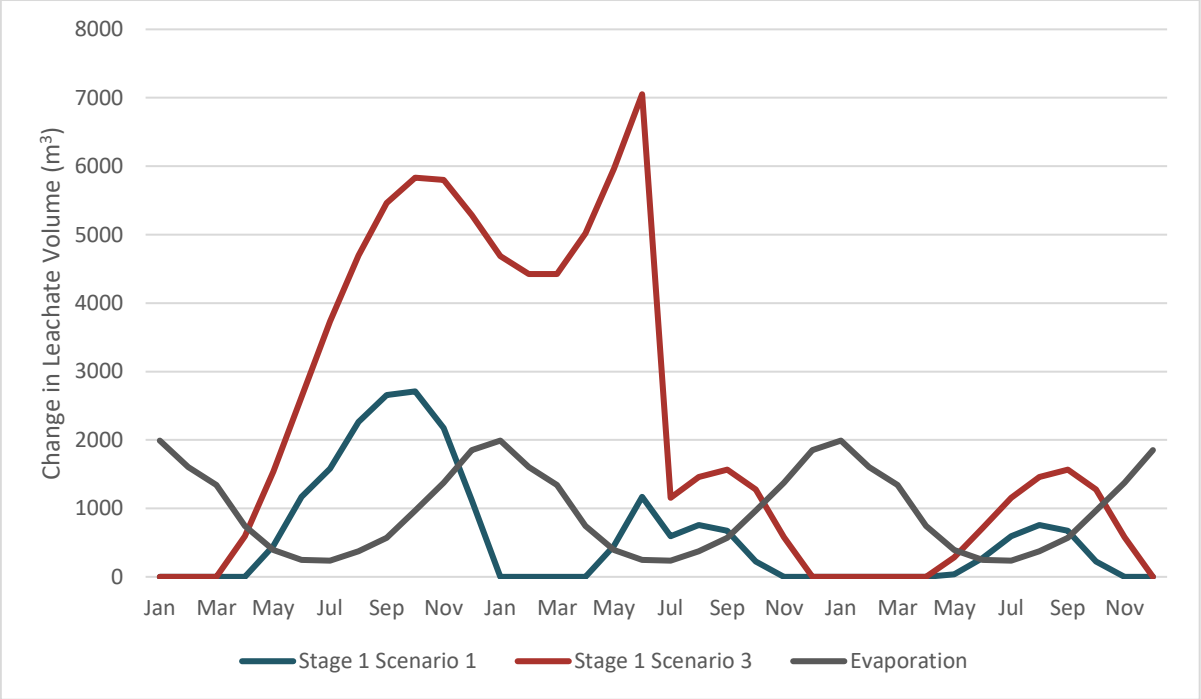

Figure 3-10 Leachate production cycle of an open waste sub-cell for approximately 1.5 years then capped and revegetated

As one waste cell is nearing completion the subsequent waste cell will be prepared. The leachate system will remain off until it is in use. It is possible there could be a crossover period between one waste cell being capped and vegetated, and the use of the subsequent cell.

The proposed capacity of the leachate pond is adequate for the approximate lifespan of the proposal under scenario 1 and scenario 3 as pan evaporation is greater than leachate production. The proposed capacity of the pond is not suitable for continuous scenario 2 rainfall for the approximate lifespan of the facility. This scenario is highly improbable. Therefore, pond storage capacity will be based on the 'worst case scenario' – wetter than average year (scenario 3).

The cumulative leachate volumes for Scenario 3 will advise the capacity of the leachate pond. Over the proposed lifespan of the facility, leachate generation remains less than the evaporation rates for Wagga Wagga. Therefore, a leachate pond capacity of 13 627 m^3 is likely to be more than adequate to service the proposed size of the waste cell. The waste cell, once capped and vegetated, will continue to produce small volumes of leachate. Approximately 10% of rainfall received on the capped cell will result in leachate production. This will continue to be managed in the leachate pond. The capacity of the leachate pond will be ample to manage the small volume of leachate produced from the capped cell year-on-year.

In the unlikely event of extended periods of more than average rainfall, the leachate can be irrigated back on to the active waste sub cell to reduce the leachate level in the pond at a particular point in time. This would be carried out as per the *Environmental Guidelines – Solid Waste Landfills* (NSW EPA 2016).

A 1 in 20-year AEP rainfall event would produce 90.1 mm in a 24-hour period (www.bom.gov.au). This equates to an additional 819 m^3 direct rainfall on to the leachate pond. The proposed pond has a freeboard of 0.5 m, which is an additional capacity of 4 542 m^3. The freeboard capacity is sufficient to accommodate the rainfall of a 1 in 25-year rainfall event in a 24-hour period. In the event of higher than average rainfall, irrigation of the leachate on to the waste cell will assist in managing leachate levels, as per the *Environmental Guidelines – Solid Waste Landfills* (NSW EPA 2016).

Leachate after capping

The volume of leachate for the proposal is heavily reduced after capping. Whilst there is potential it would still produce leachate, the evaporation for Wagga Wagga is far greater than the leachate produced. The leachate balance was conducted as per the *Environmental Guidelines – Solid Waste Landfills* (NSW EPA 2016) and presented in Figure 3-11.

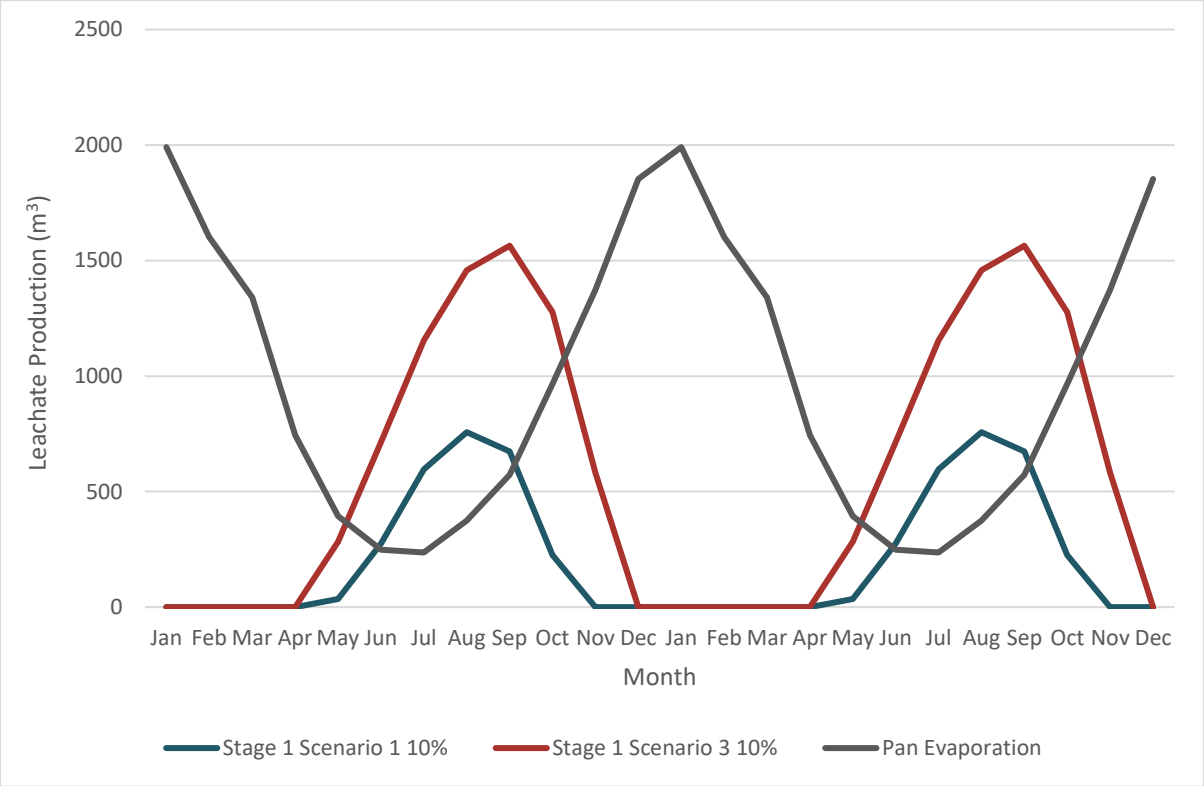

Figure 3-11 Leachate production cycle of a capped waste sub-cell for approximately 2 years then capped and revegetated

3.2.8 Landfill gas emissions

The likely composition of landfill gas emissions, based on the predicted General Solid 'non-putrescible' Waste, is methane. The estimated emissions of greenhouse gases that will be generated over the lifespan of the project, before flaring, are included in Table 3-5 and the full *NGER Solid Waste Calculator* (Clean Energy Regulator 2018) is available in Appendix S.

The approximate lifespan of the facility is nine years if waste receival meets the 60 000 t plus approximate 1.5 % annual growth. As the landfill would only accept non-putrescible waste, the total emissions produced are generally low. Therefore, all estimated emissions are 'non-legacy' emissions, as the total emissions produced remains under the 25,000t threshold of carbon dioxide equivalent (CO_2-e) (Australian Government n.d.).

Once the facility is closed, landfill gas emissions would start to decline as the biodegradable materials continue to degrade. Appendix S shows that in the year 2286, annual CO_2-e gas emission from the landfill is around 9 t.

Table 3-5 Estimated greenhouse gas emissions for the operating lifecycle of the proposed materials facility

Year	Estimated waste entering landfill (t)	Total emissions (CO_2-e) (t)
1	60,000	0
2	60,763	1296
3	61,674	2560
4	62,599	3797
5	63,538	5007
6	64,491	6192
7	65,458	7353
8	66,440	8492
9	67,437	9610
10	0 - closed	10708
11	0 - closed	10308

A range of hazards associated with landfill gases have the potential to increase risks at the proposal. Hazards that increase risk include (EPA Victoria 2018):

- Exposure to explosive concentrations of methane.
- Exposure to asphyxiating conditions.
- Exposure to a range of volatile organic compounds (VOCs) and trace gases.
- Other general hazards related to landfills.

Greenhouse gas emissions could be minimised over the life cycle of the project through composting of uncontaminated organic materials and recycling biodegradable materials.

Applying daily cover to a minimum depth of 150 mm limits rainfall infiltration into the waste, reducing the leachate generated and limiting the emission of landfill gas.

3.2.9 Landfill gas collection system

Landfill gas from the decomposing waste would be collected through a network of pipes and gravel lenses. The landfill gas collection pipes would be below the capping layer for each sub-cell. The landfill gas collection pipes would be connected to a landfill gas flare and located adjacent to the proposed leachate pond. Landfill gas collection would be subject to a Landfill Gas Management Plan.

3.2.10 Groundwater monitoring network

A groundwater monitoring network would be installed to support the assessment of groundwater impacts from construction and operation of the proposal. Additional monitoring bores would be required upstream/ up-gradient of the landfill site. The adjacent neighbour to the west of the site, ROBE, installed three additional bores, one up-gradient of their wastewater treatment pond and two down-catchment. In consultation, these could be used to determine groundwater quality up-gradient. Details of the existing bore network, including hydraulically up-gradient and down-gradient monitoring bores is included in Section 6.2.

Groundwater monitoring bores will be constructed and maintained in accordance with *Minimum Construction Requirements for Water Bores in Australia, Third Edition 2012* (National Uniform Drillers Licensing Committee 2012).

3.2.11 Capping and revegetation of waste sub-cells

Capping and revegetation of the facility would occur progressively. Waste is placed within the sub-cell in discrete layers. Capping and revegetation of the sub-cell would occur when it is safe and feasible to do so. The capping has a proposed thickness of 1900 mm and has been designed to NSW EPA (2016) guidelines. The capping includes (from bottom to top):

- A seal-bearing surface of at least 300 mm thick of an engineered layer of material that meets the *QA Specification 3071: Selected Material for Formation* (NSW Roads and Maritime Services, December 2011).
- A sealing layer comprised of a 600 mm thick compacted clay layer with an in-situ saturated hydraulic conductivity of less than 1 x 10^{-9} m/s.
- A revegetation layer of 1000 mm thick comprised of clean soil and vegetation with root systems that will not penetrate the lower layers. The upper 200 mm should be topsoil.

The revegetation layer would be domed to shed surface water and the plants used will provide effective evapotranspiration, particularly through the winter months, when evaporation rates are lowest. Phyto-capping would include the use of perennial grasses, particularly those that grow well during the cool seasons. The use of grasses would prevent the penetration into the lower layers of the capping material, minimising the escape of landfill gases and plant deaths with contact to the landfill gas.

The cap will undergo post-closure monitoring to assess the continued integrity and performance of the final capping. Monitoring will include the following:

- Regular visual checks for deterioration.
- Regular surveys for indications of differential settlement.
- Repair or replacement of any areas of damaged capping.
- Monitoring of leachate and rainfall volumes. The leachate after capping has been modelled at 5% as per the NSW EPA guidelines.
- Measurement of landfill gas emissions.
- The groundwater relief scheme would remain active to promote the longevity of the cell lining.

Resources for rehabilitation

The capping and rehabilitation activities, as outlined above, for each waste sub-cell would occur progressively. An estimated fee of $8 per tonne of waste delivered would be conserved to fund the capping

and revegetation of the waste sub-cells. This fee includes the cost of material and earthworks, the revegetation with perennial grasses and maintenance (i.e. mowing).

3.2.12 Facility closure

The post-closure management and monitoring of the landfill will be in accordance with the requirements of the EPA (2016). This will occur until there is sufficient evidence that the landfill is stable and non-polluting. The following stabilisation criteria must be met (EPA 2016):

- *Gas concentration levels in all perimeter gas wells have fallen to less than 1% methane (volume/volume) and less than 1.5% carbon dioxide (volume/volume) above the established natural background for a period of 24 months.*
- *Analysis of the leachate composition indicates low levels of contamination posing no hazard to the environment, and surface water and groundwater monitoring indicates no water pollution. These matters should be addressed in accordance with the relevant published water quality guidelines.*
- *The landfill final capping has been assessed over some years and found to be in good condition and stable, with acceptable stormwater drainage and with no evidence of erosion, cracking, dead vegetation, ponding, differential settlement or slope instability.*
- *The level of suspended solids in rainwater running off the final capping should be less than 50 milligrams/litre.*
- *The methane concentration at the surface of the final capping should not exceed 500 parts per million at any point.*
- *The closed landfill no longer poses an adverse amenity risk. It does not generate offensive or excessive odour, dust, noise, litter and debris, present a fire risk, or attract scavengers and vermin.*
- *All other requirements of the Closure Plan and Surrender Notice have been completed and/or satisfied.*

Leachate volumes produced by the landfill after capping are shown in section 3.2.7.

Resources for closure

Table 3-7 outlines the water quality monitoring activities for the proposal post closure and the approximate timing of these activities. An estimated fee of $1.50 per tonne of waste delivered would be conserved to fund the ongoing water quality monitoring activities outlined in Table 3-6 and has been conservatively established for a 30-year post closure period.

Table 3-6 Resources for facility closure

Monitoring	Frequency	Analytes
Piezometer monitoring – monitoring of groundwater quality around and down gradient of the proposal.	Quarterly, the frequency can be relaxed if justified by data assessment following capping of the proposal.	pH, redox potential, temperature, standing water level, TDS, major cations, alkalinity, TDC, ammonia and nutrients, metals, organic contaminants.
Leachate pond monitoring – leachate level, chemistry.	Monthly.	pH, EC, standing water level in all leachate risers, volume, TDS, TSS, major cations, alkalinity, dissolved organic matter, ammonia and nutrients, metals, organic contaminants.

Surface water monitoring – monitoring of surface water quality of the farm dam down-gradient of the proposal.	Biannually and after 24-hour rainfall event with a 1-in-25-year average recurrence interval.	pH, dissolved oxygen, EC, TSS, nitrogen – ammonia, TDC, thermotolerant coliforms, TDS, potassium.
Groundwater interception scheme – water quality monitoring of any groundwater intercepted beneath the proposal.	Biannually if groundwater is intercepted by the scheme.	pH, redox potential, temperature, standing water level, TDS, major cations, alkalinity, TDC, ammonia and nutrients, metals, organic contaminants.

3.2.13 Land use after closure

Development on or near closed landfills should only be considered if the following conditions are met (EPA 2016):

- *The landfill should meet the EPA's stabilisation criteria for reduction in leachate strength, stormwater contamination and gas levels. The gas criteria are particularly important for developments that create enclosed spaces where gas can accumulate or migrate (e.g. buildings, basements, manholes, tunnels, service ducts, stormwater and sewer pipes). These criteria may be less critical in the case of open developments: sporting fields, golf courses and car parks are sometimes created over recently closed landfills.*
- *The development should not compromise the functioning of the environmental controls at the site. Any proposed encroachment into the landfill (e.g. footings, piling or utilities) should not compromise the integrity of the landfill capping, lining and gas collection systems. The development should not impede drainage of rainfall off the cap. Constructed water features such as ornamental ponds should be avoided on landfill caps.*
- *The risk of gas accumulation in any enclosed spaces within the development should be appropriately managed through design measures such as venting systems, sub-floor systems, gas barrier systems and other measures for managing sub-surface gas migration.*
- *The former landfill must be structurally and geotechnically sound for the proposed development. Settlement and slope stability analyses should be conducted by a suitably qualified and experienced person. Buildings and utilities should be designed and constructed to withstand the effects of differential settlement.*
- *Periodic methane monitoring should be conducted in all buildings and underground utilities. Automatic methane sensors should be installed in buildings directly above landfilled areas.*

Potential future land uses for the site post-closure would be investigated around 5 to 10 years prior to the facility reaching capacity and determined in consultation with relevant stakeholders and agencies. Some examples of potential future land uses are described in the following paragraphs.

Only restricted activities would take place on top of the facility that protect or enhance the integrity of the cap. In addition, there are land uses that can occur around the facility at the development site to maximise the potential use of the land for industrial purposes. Potential activities that could occur on top of the capped cells post landfill closure may include:

- Solar farm.
- Grazing.

Potential activities that could occur on the residual 25 ha of industrial land west of the capped cells post landfill closure may include:

- Grain storage for the adjacent facilities.

- Container storage for the Riverina Intermodal Freight and Logistics Hub (RiFL) in Bomen.
- Other industrial activities.

3.3 CONSTRUCTION ACTIVITIES

3.3.1 Indicative construction methodology

Construction of the proposed facility would occur largely within the footprint of the existing proposed waste cell. The staged construction would involve the construction of six sub-cells within the main waste cell, excavation of the existing pond floor and construction of each in stages. Material excavated for each stage would be stockpiled and processed within the existing proposed waste cell adjacent to the sub-cell being excavated. Concurrently, earthworks and other activities would take place for the creation of access and the waste transfer station. In addition, the leachate evaporation pond would be constructed at the same time as the first sub-cell. The construction would include:

- Finalisation of detailed design for the waste cell, leachate pond and other site facilities.
- Site survey and layout.
- Erection of a compound and laydown area.
- Installation of environmental and traffic controls.
- Construction and upgrading of site access and internal roads.
- Excavation of sub-cell.
- Construction of sub-cell.
    - Compaction of foundation.
    - Compaction of clay liner.
    - Placement of flexible HDPE liner.
    - Placement of leachate drainage pipework and pump well.
    - Placement of liner protection drainage materials.
- Excavation, compaction, and lining of leachate pond.
- Connection of leachate drainage system to leachate pond.
- Progressive stabilisation of disturbed areas and landscaping for screening.
- Erect signage and movement path identification.
- Erection of storage shed and amenities.
- Erection of a fence to EPA (2016) guidelines – a 1.8 m high wire mesh fence with a security gate for regional landfills that accept more than 25,000 t per year.
- Demobilisation of construction facilities and landscaping.

3.3.2 Proposed construction equipment

Equipment used during the works is likely to include:

- Excavators.
- Concrete trucks.
- Front end loaders.
- Graders.
- Bowl scrapers.
- Rotor Mill (lime incorporation).
- Telehandler.

- Power tools including drills and grinders.
- Tipping trucks.
- Delivery vehicles.
- Water carts.
- Rollers/compactors.

Scrapers, excavators and dump trucks would be used on site to excavate and shape the base of the sub-cells. Excavators and trucks would be used for trenching associated with the ground water interception trenches. Scrapers, graders, rollers, compactors and watercarts would be used to place and compact the foundation and clay liner. A rotor mill will be used to stabilise material (lime/cement), the clay liner material, where required to meet infiltration rate requirements. Excavators, graders and smooth drum rollers would be used for final trimming of the compacted clay liner. Excavators would be used for excavations for HDPE liner anchor trench, pipework, stormwater drains, and utilities trenches where required. As the site is small it is likely that only three to four pieces of heavy equipment would be operating simultaneously.

Trucks and light vehicles would be used to deliver and move the HDPE liner. Telehandlers or similar would be used to position and roll out the HDPE liner. Jointing and welding of the HDPE liner would be done by hand using hand tools. The placement and positioning of drainage pipes would be installed manually. The placement and positioning of permeable free-draining aggregates would be by earth moving equipment and may include excavators, loaders, and dump trucks.

3.3.3 Earthworks

Earthworks would be undertaken to excavate and shape the base of the sub-cells. The earth works would stockpile excavated soils adjacent to the sub-cell being constructed within the historic pond. Excavated materials would be separated based on the material type encountered to maximise the retention of low infiltration rate material. Lesser quality materials will be retained for use during operation as night cover. Stockpiles of material for operation will be kept within the historic pond. Excavation will continue until the required depth is met. Limited excavation would also be required for the ground water interception trenches below the clay liner. This material will be stockpiled in a similar fashion.

When bulk excavation and interception trenches are complete placement and compaction of the 200 mm thick cell base would commence. Materials of a suitable quality would be placed in layers and compacted to provide a firm, stable, smooth surface of high bearing strength on which to install the liner. Materials would be modified and compacted to achieve an infiltration rate of 1×10^{-9} m/s. This will be achieved with the addition of gypsum or cement. The compacted clay liner 1000 mm thick would then be constructed. Materials of a suitable quality would be placed in layers and compacted to achieve the specified infiltration rate of less than 1×10^{-9} m/se. Geotechnical testing of the placed material following compaction would take place to ensure that the specified infiltration rate is achieved. If required materials may be stabilised with lime or cement to ensure the specified infiltration rate is achieved. The clay lining would have finished gradients of 0.5 % longitudinally and 0.7 % in transverse directions.

Road access and hardstand areas would be constructed at the same time as the cell and leachate pond. Road access (under permit from Council) would include the removal and stockpiling of topsoil and vegetation and boxing out of shoulders and table drains on Trahairs Road. Engineered pavement materials would be placed and compacted to form the designed access roads. Concrete culverts would be added to provide stormwater drainage below the access along Trahairs Road. The access would be sealed,

signposted and line marked as required. Further details on the access road would form part of a S138 permit application to Council prior to construction.

The hardstand area construction would include the removal and stockpiling of vegetation, topsoil and unsuitable materials. Engineered pavement materials would be placed and compacted to form the designed hardstand. A concrete base slab and walls would be formed and placed to provide a waste load inspection bay. Drainage from the inspection bay would be directed to the waste cell and treated as leachate. Drainage from the hardstand would be directed to a sediment trap and then to overland flow.

3.3.4 Source and quantity of materials

Required materials include:

- Pipework;
- Stormwater drains;
- Utilities;
- Plastic liner delivered by heavy vehicle;
- Geotextile liner delivered by heavy vehicle;
- Gravel and sand for drainage and pipe bedding materials; and
- Clay material for sub-cell liner.

Materials would be sourced from appropriately licensed facilities and local commercial suppliers. It is expected that clay for lining would be sourced from the existing evaporation ponds. Surplus material that cannot be used on-site would be classified in accordance with the *Waste Classification Guidelines* (DECCW, 2009) and disposed of at an approved materials recycling or waste disposal facility. Table 3-7 provides details of the resource quantities required for project construction. These quantities are indicative and for guidance only. Final quantities will be design / technology specific.

Table 3-7 Resource quantities required for North Ridge Materials Facility for Stage 1 cell and leachate pond

Stage of development	Resource	Quantity
Subsoil drainage	Drainage pipe – 150 mm class 1000 Pipe connections for class 1000 150 mm PVC	870 m 18 315 m
	Trenching – 150 mm class 1000 150 mm VC	870 m^3 315 m^3
	Trenching filling – crushed glass	900 m^3
	Pits – Inspection points Junction pit	4 1
	Geofabric 3.3 m x 870 m for trench up to 1 m	2800 m^2
Leachate system	Pipes – 100 mm class 1000 150 mm class SHE Pipe connections 150 mm PVC	870 m 220 m 11 320 m
	Coarse crushed glass – 8836 m x 0.3 m area	2651 m^3
	Trenching – 150 mm PVC	288 m
	Trench filling – crushed glass	288 m^3

Stage of development	Resource	Quantity
	Flush out points	7
	Inspection points – pipe on outside of cell discharge	4
Earthworks (cell)	Constructible material – material can be reused after modification	9821 m^3
	Clay liner - 300 mm clay using non-imported material	3902 m^3
	Clay liner - 700 mm clay using imported material or modified clay	10689 m^3
	Top bank construction using imported material or modified clay	3771 m^3
Earthworks (hardstand)	400 mm subgrade / base – road base / DGS40	2660 m^3
	Non-constructible material, on average 300-400 mm clay below top soil	2327 m^3
	200 mm base – DGS20	1330 m^3
Access road	Wearing surface of 14/7 spray seal	330 m^2
	Base – DGS20	95 m^3
	Sub-base – DGS40	101 m^3
	Selected fill – subgrade	10 m^3
	Culvert - 375 mm concrete pipe Headwall	14.4 m 2
	Access track	124 m^2
HDPE liner	Liner for each cell	16000 m^2
	Liner for leachate pond	10500 m^2
	Leachate earth bank	710 m^3
Concrete works	Concrete slab – 30 m x 6 m x 0.2 m / 32 MPa	43 m^3
	SL82 mesh – double layer 6 m x 2.4 m sheet / 20 sheets of SL82	288 m^2
	Dish drain – 25 MPa	2 m^3
	SL72 mesh	9.6 m^2
	Drainage pit – 600 x 600 concrete pit	1
	PVC pipe – pipe must be linked to leachate system	120 m
Structures	Retaining wall (optional) - Blocks 400 x 200 x 200 – 20 m length, 1 m height Reinforcement – 6 m unit length Capping blocks – 3 m wide double gate with fittings	200 20 m 50
Fencing	Property fencing	110 m
	Gate – 3 m wide double gate with fittings	1
Erosion and sediment control	Straw bales (approximate quantity)	36

Stage of development	Resource	Quantity
	Silt fence (approximate quantity)	160 m
	Water during construction – 1 watercart per week (~10,000 L).	1-2 ML

3.3.5 Water resources

Quantities of water for construction and operation are detailed in section 6.2.4. During construction, around 1-2 ML would be required (12-24 weeks). Water resources would be used primarily for:

- Dust suppression.
- Addition of moisture to earthworks and to optimise compaction.
- Machinery wash-down.

During construction, water would be sourced from the two available sites, the middle and eastern evaporation ponds.

Water would also be required throughout operation of the proposal, for the daily wetting down of landfill and cover material. Water for this purpose would be sourced from leachate storage where possible and otherwise from the sources listed above. Other non-potable water required for activities such as dust suppression on access tracks and for environmental management would be sourced from the evaporation ponds and any water captured in the water storages or from the groundwater relief layer management system. Where water is not available on-site, it would be purchased and transported to the site by truck.

Water would be accessed from on-site storages by a pump and standpipe.

3.3.6 Ancillary facilities

The proposal would utilise ancillary facilities, including:

- Machinery storage (hardstand).
- Car parking (hardstand).

Stockpiling and materials storage would occur within the existing footprint of the proposed waste cell.

All ancillary facilities would be located in accordance with siting criteria, which are:

- Be located more than 50 m from a waterway.
- Be located within or adjacent to the development site.
- Have ready access to the road network.
- Be located to minimise the need for heavy vehicles to travel through residential area.
- Be sited on relatively level land.
- Be separated from nearest residences by at least 200 m.
- Not require native vegetation clearing beyond that already required by the proposal.
- Not impact on heritage sites (including areas of archaeological sensitivity) beyond those already impacted by the proposal.
- Not unreasonably affect the land use of adjacent properties.
- Be above the 20 Average Recurrence Interval (ARI) flood level unless a contingency plan to manage flooding is prepared and implemented.
- Provide sufficient area for the storage of raw materials to minimise, to the greatest extent practical, the number of deliveries required outside standard construction hours.

Mobile generators would be used to supply power, and water would be brought in from the town water supply in trucks as required.

3.3.7 Public utilities

Public utilities identified near the project area include an electricity transmission line and an underground natural gas pipeline. The transmission line has a 20 m easement on either side. The underground natural gas pipeline is around 900 m from the eastern rim of the proposed waste cell. The proposal would not involve the adjustment of any public utilities. Any additional utilities that are located during the detailed design phase would be avoided or relocated in consultation with relevant utility operators.

Dial Before You Dig has been assessed for any potential impact to underground services and utilities. The Dial Before You Dig reports are available in Appendix Q.

3.3.8 Timing

It is anticipated that the waste cell would be constructed in a number of stages, with six discrete sub-cells constructed progressively to meet demand at the time. Constructing smaller, discrete sub-cells in series from south to north would provide sufficient waste storage to meet demand. The construction of a series of sub-cells within the footprint of the waste cell also minimises leachate production, leads to faster capping, and conserves resources. The staged, multicell approach also compartmentalises the waste, providing more effective control during storage.

Standard working hours are provided for in the EPA's Interim Construction Noise Guidelines (2009). Work hours during construction would generally be limited to these working hours.

Standard Working Hours	
Monday – Friday	7:00 am to 6:00 pm
Saturday	8:00 am to 1:00 pm
Sundays and Public Holidays	No work

Local residents and businesses would be notified of the proposed work hours before works commence.

It is expected that it would take about 12-24 weeks to complete construction, with work beginning during 2019.

3.3.9 Access and transport

Currently, access to the development site is via Trahairs Road immediately south of the site, which crosses the neighbouring property (ROBE) and is connected to Byrnes Road. The proposal includes construction of a new sealed access road from Trahairs Road, further east of the current access road, in order to provide direct access to the development site.

There are a number of unsealed internal access roads throughout the development site. This internal road network would be upgraded and gravelled to provide access to site facilities for construction machinery, trucks, and light vehicles.

The proposal would generate heavy vehicle movements during construction, mainly associated with:

- Removal of excavated material.
- Plastic liner deliveries by heavy vehicle.
- Geotextile liner deliveries by heavy vehicle.
- Gravel and sand for drainage and pipe bedding materials.
- Delivery and removal of construction equipment and machinery.
- Daily movement of construction personnel.
- Delivery and removal of temporary construction site amenities.

During operation, it is anticipated that the proposal would generate traffic with waste deliveries. Additionally, several light vehicle movements per day for staff and a weekly fuel delivery for vehicles and equipment are also anticipated.

Estimated facility receivals for 60 000 t of waste per year would generate approximately 10 loads or 20 heavy vehicle movements per day. This number can change and is dependent on variables such as weather, waste availability, work load and site conditions. It is estimated that vehicle movements per day could be in the order of 10 to 40.

It is assumed that half of the heavy vehicle movements would be by B-doubles and the other half semi-trailers or truck and dog combinations.

Waste within the cell would be compacted progressively during placement. Water and possibly leachate would be used to enhance compaction and dust suppression during the placement and compaction of waste within the cells. When the cell has reached its capacity, the waste would be capped with clean fill from previous excavations. The capping material would be compacted to minimise infiltration. The capping material would be covered with topsoil to the nominated depth and revegetated for aesthetics and stability. The discreet cells within the waste cell would be constructed progressively to meet the demand at the time.

4 PLANNING CONTEXT

SECRETARY'S ENVIRONMENTAL ASSESSMENT REQUIREMENTS

The EIS must assess the proposal against the relevant environmental planning instruments, including but not limited to:

- *State Environmental Planning Policy (Infrastructure) 2007;*
- *State Environmental Planning Policy No. 33 Hazardous and Offensive Development;*
- *State Environmental Planning Policy No. 55 Remediation of Land;*
- *Wagga Wagga Local Environmental Plan; and*
- *Relevant development control plans and section 94 plans.*

This section describes the planning and approval process for the proposal, as well as statutory requirements.

4.1 STRATEGIC DIRECTION

4.1.1 Riverina Murray Regional Plan 2036

The proposal is supported by the strategic directions outlined in the Riverina Murray Regional Plan 2036. The relevant directions are outlined below:

Direction 4: Promote business activities in industrial and commercial areas.

The Regional Plan identifies that ongoing investment and development in the Bomen Business Park will contribute significantly to jobs and economic growth. The proposal relates to the development of physical infrastructure within the Bomen area and would directly create employment opportunities, investment and economic benefits. Importantly, the proposal would also underpin and service a range of other enterprises in the Bomen area, thereby indirectly generating economic benefits in the region. Adequate physical infrastructure will be necessary to support the future development and growth of Bomen over the short to medium term and includes utilities, roads, rail and waste management facilities.

Under this Direction, Action 4.1 is to *"encourage the sustainable development of industrial land to maximise the use of infrastructure and connectivity to the existing freight network".* The proposal would contribute to this action and ultimately to the strategic direction of the Regional Plan. It would provide for the productive use of industrial-zoned land that is presently vacant. Where land is vacant or underutilised, this also causes existing infrastructure to be underprovided and used to less than optimal capacity. The proposal would also address the existing condition of the land and improve its capability to accommodate future industrial activities once the operational phase of the landfill site is complete.

Direction 17: Transform the region into the eastern seaboard's freight and logistics hub

The Regional Plan identifies Bomen as forming part of one of Australia's key freight hubs servicing the eastern seaboard and projects a rapid growth curve for freight and logistics. As outlined above, the proposal would contribute to the "prosperity" of Bomen as it would comprise part of the physical infrastructure that will be essential to support industrial enterprise.

Direction 22: Promote the growth of regional cities and local centres

The Regional Plan identifies that the immediate and broader regional community will benefit from the growth of Wagga Wagga as it will encourage future investment, increase supply of housing, diversify

industry and increase job opportunities and services. A growing regional city requires an accordant expansion in physical infrastructure, which the proposal will develop towards. The growth of Bomen will be particularly influential in the prosperity of Wagga Wagga as a regional city, as projected in the Regional Plan.

Local Government Narratives

Under the Local Government Narratives, the relevant priorities for Wagga Wagga in the Regional Plan are to:

- Support industrial land development, including at Bomen Business Park in Wagga Wagga.
- Contribute to a sustainable environment for future generations through proactive waste management and responsible sustainable practices.

As outlined above, the proposal would provide for the productive use of industrial-zoned land that is presently vacant. It will directly create employment opportunities, investment and economic benefits in the Bomen locality and the wider community. The proposal would also underpin and service a range of other enterprises in the Bomen area, providing the necessary physical infrastructure to support future development and growth.

Additionally, it is considered the proposal would contribute to a sustainable environment, by increasing the choice and accessibility of waste management facilities to the community. Importantly, the proposal is located on the northern side of the city, where the highest levels of residential and industrial construction activity are predicted to occur over the short and medium term. Greater accessibility to facilities, particularly for building and construction waste, can help to reduce instances of dumping and greater choice and competition can potentially reduce user fees.

4.1.2 Wagga Wagga Spatial Plan 2013-2043

The proposal is supported by the strategic directions outlined in the Wagga Wagga Spatial Plan 2013-2043. The relevant directions are outlined below:

We maintain our current and future infrastructure

The Spatial Plan identifies that infrastructure of all types is vital to the prosperity of the community; however, "*most of it is hidden from view and to a large extent is taken for granted*". It identifies an objective to facilitate the provision of infrastructure and ensure it is utilised in an efficient manner. The Spatial Plan outlines the challenges for infrastructure include *"supplying a range of services and infrastructure to new development areas"*.

The proposal would contribute to this objective and ultimately to the strategic direction of the Spatial Plan. The proposal will contribute to efforts that ensure essential physical infrastructure is in place to meet the evolving needs of the community. As outlined above, the proposal is located on the northern side of the city, where the highest levels of residential and industrial construction activity are predicted to occur over the short and medium term. Therefore, the proposal is considered well-located to meet the emerging needs of the community.

There is growing business investment in our community

The Spatial Plan projects that "*the Bomen Business Park will be a high-quality and nationally renowned place for transport and logistics-based enterprises, well-designed and integrated with existing industry, which meets the requirements of a targeted range of businesses and supporting activities; to complement and nurture a more sustainable City of Wagga Wagga and Riverina Region*".

As outlined above, the proposal would directly create employment opportunities and investment in the Bomen locality and wider community. The proposal would underpin and service a range of other enterprises in the Bomen area, providing the necessary physical infrastructure to support future development and growth. As outlined above, the proposal would also provide for a productive use of industrial-zoned land and address the existing condition of the land, to the potential benefit of future industrial activities once the operational phase of the landfill site is complete.

4.1.3 Draft Wagga Wagga Activation Strategy 2040

The draft Activation Strategy identifies Bomen as "the key development area for industrial growth" and that it will support population growth as it will be a key employment area. The proposal provides for the productive use of vacant land in the Bomen precinct and would directly create employment opportunities, investment and economic benefits. As physical infrastructure development, the proposal would also underpin the expansion of Bomen and serve a range of industrial enterprises in the area.

Additionally, the Activation Strategy identifies that heavy industry should be located on the eastern side of the precinct, east of Byrnes Road. Although not defined as a heavy industry, the impacts of the proposal may be viewed as similarly undesirable by sensitive receptors. The impacts of the proposal may not be considered to be light or standard industrial impacts, as is preferred to be contained to the western side of the precinct. Therefore, the proposal is considered to be consistent with the desired outcomes outlined in the draft Activation Strategy.

4.1.4 Bomen Strategic Masterplan 2009

The proposal is supported by the strategic directions outlined in the Bomen Strategic Masterplan 2009. One of the objectives of the Masterplan is to capitalise on and market the site's competitive advantages including its location and its access to infrastructure. As an infrastructure project, the proposal would be considered to strengthen Bomen's competitive advantages. The Masterplan also identifies an objective of complementing the city's existing supplies of industrial land by differentiating itself. In this regard, it is considered the proposal is best-suited to the Bomen locality, compared with other industrial precincts in the city such as East Wagga Wagga and the Dobney Avenue precinct. Other precincts are not as well-removed from sensitive land uses and are not as conducive to the nature of the subject proposal, compared with the features of Bomen.

4.2 COMMONWEALTH LEGISLATION

4.2.1 Environment Protection and Biodiversity Conservation Act 1999

The EPBC Act governs the Commonwealth environmental assessment process and provides protection for Matters of National Environmental Significance (MNES). The Act is administered by the Commonwealth Department of the Environment and Energy (DEE). Under the EPBC Act, if the Minister determines that an action is a 'controlled action' which would have or is likely to have a significant impact on a MNES or Commonwealth land, then the action may not be undertaken without prior approval of the Minister. If a proposal is declared a controlled action, an assessment of the action is carried out and the Minister decides to approve, approve with conditions, or not approve the proposed action.

Matters of national environmental significance relevant to the proposal are:

- Wetlands of international importance;

- Nationally threatened species and ecological communities; and
- Migratory species.

Impacts to Commonwealth listed threatened ecological communities, threatened species, migratory species and invasive species are considered in Section 6.3. A summary of matters of national environmental significance is included in Section 6.13. A significant impact is considered highly unlikely and the proposed activity is considered highly unlikely to be a controlled action. No other matter of national environmental significance would be affected by the proposal. A referral under the EPBC Act is therefore not required for the proposal.

4.2.2 Native Title Act 1993

The *Native Title Act 1993* provides a legislative framework for the recognition and protection of common law native title rights. Native title is the recognition by Australian law that Indigenous people had a system of law and ownership of their lands before European settlement. Where that traditional connection to land and waters has been maintained and where government acts have not removed it, the law recognises the persistence of native title.

Native title may exist in areas such as:

- Vacant Crown land.
- Some national parks, forests and public reserves.
- Some types of pastoral lease.
- Some land held for Aboriginal communities.
- Beaches, oceans, seas, reefs, lakes, rivers, creeks, swamps and other waters that are not privately owned.

No Native Title claims have been registered within Wagga Wagga LGA.

4.3 NSW LEGISLATION

Development in NSW is subject to the requirements of the *Environmental Planning & Assessment Act 1979* (EP&A Act). Environmental planning instruments prepared under the EP&A Act set the framework for development approval in NSW.

4.3.1 Environmental Planning and Assessment Act 1979

The EP&A Act provides the framework for the assessment and approval of developments proposed within NSW. The relevant objects of the EP&A Act are:

a) to encourage:

i. The proper management, development and conservation of natural and artificial resources, including agricultural land, natural areas, forests, minerals, water, cities, towns and villages for the purpose of promoting the social and economic welfare of the community and a better environment.

ii. The promotion and coordination of the orderly and economic use and development of land.

iii. The protection, provision and coordination of communication and utility services.

v. The provision and co-ordination of community services and facilities.

vi. *The protection of the environment, including the protection and conservation of native animals and plants, including threatened species, populations and ecological communities, and their habitats.*

vii. *Ecologically sustainable development.*

Under the EP&A Act, the determining authority has a duty to consider the environmental impacts of the proposal, taking into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of the proposal, per section 111 of the Act. This requirement is satisfied by the completion of this EIS. Section 79C of the EP&A Act lists matters for consideration in determining a DA which the consent authority must consider. Section 9.1of this EIS provides an evaluation of the proposal against Section 79C of the EP&A Act.

Development consent for the proposal is sought for Designated and Integrated Development under Part 4 of the EP&A Act. Under Section 91 of the EP&A Act, the proposal is defined as integrated development as it requires a section 138 approval from Council under the *Roads Act 1993* and an Environmental Protection Licence under the *Protection of the Environment Operations Act 1997*.

4.3.2 Environmental Planning and Assessment Regulation 2000

Schedule 3 of the *Environmental Planning & Assessment Regulation 2000* (EP&A Regulation) sets out the relevant thresholds for Designated Development. Part 1 Section 32 of Schedule 3 of the EP&A Regulation makes the following provision in relation to waste management facilities or works:

(1) Waste management facilities or works that store, treat, purify or dispose of waste or sort, process, recycle, recover, use or reuse material from waste and:

(a) that dispose (by landfilling, incinerating, storing, placing or other means) of solid or liquid waste:

(i) that includes any substance classified in the Australian Dangerous Goods Code or medical, cytotoxic or quarantine waste, or

(ii) that comprises more than 100,000 tonnes of "clean fill" (such as soil, sand, gravel, bricks or other excavated or hard material) in a manner that, in the opinion of the consent authority, is likely to cause significant impacts on drainage or flooding, or

(iii) that comprises more than 1,000 tonnes per year of sludge or effluent, or

(iv) that comprises more than 200 tonnes per year of other waste material, or

(b) that sort, consolidate or temporarily store waste at transfer stations or materials recycling facilities for transfer to another site for final disposal, permanent storage, reprocessing, recycling, use or reuse and:

(i) that handle substances classified in the Australian Dangerous Goods Code or medical, cytotoxic or quarantine waste, or

(ii) that have an intended handling capacity of more than 10,000 tonnes per year of waste containing food or livestock, agricultural or food processing industries waste or similar substances, or

(iii) that have an intended handling capacity of more than 30,000 tonnes per year of waste such as glass, plastic, paper, wood, metal, rubber or building demolition material, or

(c) that purify, recover, reprocess or process more than 5,000 tonnes per year of solid or liquid organic materials, or

(d) that are located:

(i) in or within 100 metres of a natural waterbody, wetland, coastal dune field or environmentally sensitive area, or

(ii) in an area of high water table, highly permeable soils, acid sulphate, sodic or saline soils, or

(iii) within a drinking water catchment, or

(iv) within a catchment of an estuary where the entrance to the sea is intermittently open, or

(v) on a floodplain, or

(vi) within 500 metres of a residential zone or 250 metres of a dwelling not associated with the development and, in the opinion of the consent authority, having regard to topography and local meteorological conditions, are likely to significantly affect the amenity of the neighbourhood by reason of noise, visual impacts, air pollution (including odour, smoke, fumes or dust), vermin or traffic.

(2) This clause does not apply to:

(a) development comprising or involving any use of sludge or effluent if:

(i) the dominant purpose is not waste disposal, and

(ii) the development is carried out in a location other than one listed in subclause (1) (d), above, or

(b) development comprising or involving waste management facilities or works specifically referred to elsewhere in this Schedule, or

(c) development for which State Environmental Planning Policy No 52—Farm Dams and Other Works in Land and Water Management Plan Areas requires consent.

The proposal is categorised as Designated Development as it pertains to a waste management facility that would dispose of more than 200 tonnes of 'other waste' material. As such, an EIS is required. This EIS has been prepared in accordance with Schedule 2 of the EP&A Regulation and addresses the obligations of the determining authority under Section 79C of the EP&A Act.

4.3.3 Biodiversity Conservation Act 2016

The NSW government introduced new biodiversity legislation for the consideration and assessment of biodiversity impacts in 2017. The *Biodiversity Conservation Act 2016* (BC Act) and *Local Land Services Act 2013* (LLS Act) commenced on the 25th August 2017 and have replaced the *Threatened Species Conservation Act 1995*. Transitional arrangements were established through the Biodiversity Conservation (Savings and Transitional) Regulation 2017. Part 7(d) of the Regulation allows for certain developments to continue to be assessed under the old arrangements:

> *"an application for planning approval (or for the modification of a planning approval) made after the commencement of the new Act if an environmental impact statement is to be submitted in connection with the application and the Secretary of the Department of Planning and Environment determines in writing that the proponent had undertaken substantial environmental assessment in connection with the statement before the commencement of the new Act (but only if the application is made within 18 months after that determination)"*

Confirmation from OEH was received for the adoption of this clause, as substantial work had commenced prior to the date of commencement of the BC Act, provided the EIS is lodged before 25th February 2019. Therefore, biodiversity impacts are assessed under the old arrangements.

Section 5A of the EP&A Act lists a number of factors to be taken into account when deciding if there is the likelihood of a significant impact on threatened species, populations and their habitat or on ecological communities. If there is a chance of an impact, then an Assessment of Significance would be required to determine the significance of the impact. If there is likelihood for a significant impact on threatened species, populations and their habitat or on ecological communities then a Species Impact Assessment is required.

A biodiversity assessment of the site indicated the potential for several threatened species and ecological communities to occur in the study area. The direct and indirect Impacts of the proposed works on these threatened species and ecological communities are discussed in Section 6.3 and Appendix G.

4.3.4 Fisheries Management Act 1994

The NSW *Fisheries Management* (FM) *Act 1994* provides for the protection of threatened fish and marine vegetation and is administered by the Department of Primary Industries (DPI) Office of Fisheries. The FM Act aims to protect fishery resources and marine species, and conserve habitats and diversity.

The FM Act works in conjunction with the EP&A Act. Generally, if the following activities form part of the proposal, a permit from DPI under the FM Act is required:

- Aquaculture
- Harming marine vegetation such as mangrove, seagrass, and seaweed
- Dredging or reclamation of waterways, including removal of snags or aquatic vegetation (28 days' notification)
- Temporary or permanent blockage of fish passage

As the proposal will not involve any of the controlled activities, a permit would not be required from DPI. The potential impacts of the proposal on aquatic habitat and species are assessed in Section 6.3.7.

4.3.5 Biosecurity Act 2015

The *Biosecurity Act 2015* establishes control mechanisms to reduce the negative impact of weeds on the economy, community, and environment. The *Biosecurity Act 2015* guides the management of declared noxious weeds within LGAs. Several noxious weeds were recorded within the proposal study area, which are assessed in Section 6.3.8.

4.3.6 Heritage Act 1977

The NSW *Heritage Act 1977* (Heritage Act) aims to protect and preserve items of non-Aboriginal heritage significance. The Heritage Act provides for the protection of items of local, regional and State heritage significance. It establishes a list of State Heritage Items and outlines processes for approval of development which may impact items of heritage significance.

Impacts of the proposal on non-Aboriginal heritage are assessed in Section 6.6.

4.3.7 Water Management Act 2000

The *Water Management* (WM) *Act 2000*, administered by Department of Primary Industries (Office of Water) NOW and Water NSW, is being implemented throughout NSW to manage water resources, superseding the *Water Act 1912*. The objective of the WM Act is the sustainable and integrated management of NSW's water for the benefit of both present and future generations. It is also intended to provide formal means for the protection and enhancement of the environmental qualities of waterways and in-stream uses as well as to provide for protection of catchment conditions.

The WM Act sets out procedures for issuing water use approvals and water access licences and governs dealings with regard to these approvals and licences whereby they can be bought and sold in part or in full. The WM Act also provides approvals and constraints for controlled activities undertaken on waterfront land or land within 40 m of a water body.

Under Section 89, a water use approval confers the right on its holder to use water for a purpose at a particular location.

Fresh water sources throughout NSW are managed via Water Sharing Plans (WSPs) under the WM Act. Key rules within the WSPs specify when licence holders can access water and how water can be traded. The area is covered by the Water Sharing Plan for the Murrumbidgee Unregulated and Alluvial Water Sources 2012 (the Water Sharing Plan).

Regarding the proposal, there would be no requirement to modify existing entitlements or seek new entitlements under the Water Sharing Plan. The proposal has minimal water requirements that would be satisfied by using stormwater captured onsite including in existing ponds, purchasing water (if required) and using leachate for dust suppression in the landfill cells only.

Regarding the proposal, assessment of the impact and approvals (Works and Use Approvals under the WMA 2000) is required for the taking or storage of water.

Water falling within the former liquid waste facility would be stored and evaporated through an annual cycle. It would be tested and reused for construction, compaction and environmental management of the facility. Captured water is likely to contain a range of substances from the activities of the previous industry, Riverina Wool Combing.

Regarding the proposal and the NSW Aquifer Interference Policy, a Part 5 water licence under the *Water Management Act 2000* would be required to put conditions on aquifer interference activities prior to aquifer interference approvals having commenced. The groundwater interception scheme of the proposal would extract or interrupt groundwater movement.

An aquifer interference activity is defined in the WM Act as an activity involving any of the following:

a) the penetration of an aquifer,

b) the interference with water in an aquifer,

c) the obstruction of the flow of water in an aquifer,

d) the taking of water from an aquifer in the course of carrying out mining, or any other activity prescribed by the regulations,

e) the disposal of water taken from an aquifer as referred to in paragraph (d).

A licence applies if:

A water licence is required under the Water Management Act 2000 (unless an exemption applies, or water is being taken under a basic landholder right) where any act by a person carrying out an aquifer interference activity causes:

- *The removal of water from a water source; or*
- *The movement of water from one part of an aquifer to another part of an aquifer; or*
- *The movement of water from one water source to another water source, such as:*
    - *from an aquifer to an adjacent aquifer; or*
    - *from an aquifer to a river/lake; or*
    - *from a river/lake to an aquifer.*

The aquifers within the development site are classified as *Less Productive Groundwater Sources*. Currently, it is unlikely that the base of the landfill would intercept the perched aquifer as it has remained dry for over 15 years. However, to ensure a robust landfill facility:

- A groundwater relief layer would be included in the design stage and implemented during construction. The groundwater relief layer would intercept and manage any seasonal groundwater that could come into contact with the base of the landfill. Captured water would be diverted through a testing portal and then to a water storage. As the groundwater is non-potable, it would be reused on-site to prevent water requirements from potable sources.

- If additional monitoring bores are required, they would be installed and maintained in accordance with the *Minimum Construction Requirements for Water Bores in Australia Third Edition 2012* (National Uniform Drillers Licensing Committee 2012).

4.3.8 Roads Act 1993

The *Roads Act 1993* (Roads Act) aims to define rights in relation to road use and the use of adjoining land, as well as road function and classification. It also regulates the carrying out of various activities in, on and over public roads, including connecting a public or private road to a classified road under section 138 of the Act.

In order to provide vehicle access to the proposal, an access road would need to be connected to Trahairs Road. Under the Roads Act, a section 138 approval is required from the Council.

4.3.9 Protection of the Environment Operations Act 1997

The *Protection of the Environment Operations Act 1997* (POEO Act) relates to pollution management and waste disposal in NSW and is administered by the NSW EPA. Under section 48 of the POEO Act, premises-based scheduled activities (as defined in Schedule 1 of the POEO Act) require an Environment Protection Licence (EPL). This schedule includes waste disposal (clause 39), and the proposal falls under the scheduled definition. Under this Act an EPL is therefore required.

It is noted that pollution events resulting from the proposal would constitute a breach of the Act under Section 120. Under section 148 of the Act, the proponent would be required to notify the EPA of any pollution incidents that occur as a consequence of the construction or operation of the proposed development. This is acknowledged in Section 6.2 and appropriate mitigation measures are a commitment of the proposal.

4.3.10 State Environmental Planning Policy (Infrastructure) 2007

State Environmental Planning Policy (Infrastructure) 2007 (ISEPP 2007) aims to facilitate the effective delivery of infrastructure in NSW by improving regulatory certainty and efficiency through a consistent planning process.

The proposed development is defined as a waste disposal facility as a type of waste or resource management facility under the provisions of the ISEPP 2007. The proposed development is permissible with consent under the provisions of clause 121(1) given that the development site is within a prescribed zone (IN1 – General Industrial).

In accordance with Schedule 3 of ISEPP, landfill, recycling facilities and waste transfer stations of any size are classified as traffic generating development and referred to the NSW Roads and Maritime Service (RMS). Although landfill is not defined in ISEPP, it is considered that the proposed development fits within this definition and would be referred to RMS.

4.3.11 State Environmental Planning Policy (State and Regional Development) 2011

The *State Environmental Planning Policy (State and Regional Development) 2011* provides a framework for declaring certain types of development to be of State or Regional significance. It aims to facilitate the effective delivery of significant development in NSW by improving regulatory certainty and efficiency through a consistent planning process. The SEPP makes a declaration of 'regionally significant development' in relation to certain Designated Development as outlined below:

Development for the purposes of:

(a) extractive industries, which meet the requirements for designated development under clause 19 of Schedule 3 to the Environmental Planning and Assessment Regulation 2000, or

(b) marinas or other related land and water shoreline facilities, which meet the requirements for designated development under clause 23 of Schedule 3 to the Environmental Planning and Assessment Regulation 2000, or

(c) waste management facilities or works, which meet the requirements for designated development under clause 32 of Schedule 3 to the Environmental Planning and Assessment Regulation 2000.

The proposed development is defined as a waste management facility or works that meets the relevant thresholds for Designated Development under Part 1 Section 32 of Schedule 3 to the *Environmental Planning and Assessment Regulation 2000*. In accordance with the provisions of Section 7 of Schedule 4 of the SEPP outlined above, the proposal is also considered to be 'regionally significant development'.

4.3.12 State Environmental Planning Policy No. 55 (Remediation of Land)

This policy aims to provide for a State-wide planning approach to the remediation of contaminated land and to promote the remediation of contaminated land for the purpose of reducing the risk of harm to human health or the environment. Specifically, this policy aims to ensure that:

- Contamination and remediation are considered in zoning or rezoning proposals and development applications.
- Remediation works are permissible and only require consent where they have the potential for significant environmental impacts (Category 1). In all other cases, no consent is required (Category 2).
- Local government authorities are notified before and after remediation takes place.

- Remediation is carried out to appropriate standards.

The development site is a former wool combing facility. The proposed development footprint is a former effluent evaporation pond. A contamination assessment has been conducted and provided to DPE and WWCC. The site has been certified as being suitable for *commercial/industrial use as a landfill facility*.

4.3.13 State Environmental Planning Policy No. 33 (Hazardous and Offensive Development)

State Environmental Planning Policy – Hazardous and Offensive Development (SEPP 33) presents a systematic approach to planning and assessing proposals for potentially hazardous and offensive development for the purpose of industry or storage. Through the policy, the permissibility of a proposal to which the policy applies is linked to its safety and pollution control performance. If a proposed development has the potential to cause risk to humans or the biophysical environment, or to emit a polluting discharge, then a Preliminary Hazard Analysis (PHA) is required.

The document *Applying SEPP 33 – Hazardous and Offensive Development Application Guidelines* provides assistance in implementing SEPP 33. This document recommends in Section 6.9 a risk screening method for determining whether or not a project is hazardous.

4.4 LOCAL LEGISLATION

4.4.1 Wagga Wagga Local Environmental Plan 2010

The development site is located within the Wagga Wagga LGA and is subject to the provisions of the *Wagga Wagga Local Environmental Plan 2010* (WWLEP).

The LEP makes local environmental planning provisions for land within the Wagga Wagga LGA with the following particular aims:

(a) *to optimise the management and use of resources and ensure that choices and opportunities in relation to those resources remain for future generations;*
(b) *to promote development that is consistent with the principles of ecologically sustainable development and the management of climate change;*
(c) *to promote the sustainability of the natural attributes of Wagga Wagga, avoid or minimise impacts on environmental values and protect environmentally sensitive areas;* and
(d) *to co-ordinate development with the provision of public infrastructure and services.*

This EIS takes into account the proposal's compatibility with these aims.

Land zoning

The development site is located on land zoned IN1 General Industrial under the provisions of the WWLEP. The proposed development is defined as a 'waste or resource management facility' under the Wagga Wagga LEP. The proposal is permissible with development consent in the IN1 zone.

The objectives of this zone are:

- *To provide a wide range of industrial and warehouse land uses.*
- *To encourage employment opportunities.*
- *To minimise any adverse effect of industry on other land uses.*
- *To support and protect industrial land for industrial uses.*

The proposal would provide an industrial land use and encourage employment opportunities with the creation of 4 to 5 full time equivalent jobs and therefore the first two objectives are satisfied. The proposal is located on an existing liquid waste evaporation pond and would not adversely affect other industry. The proposal is considered to be generally compatible with the types of industry envisaged for the area. The proposal is reasonably separated from sensitive receptors and would contain its impacts within the subject land. It is considered that the third objective is satisfied. As indicated above, the proposal is an industrial use and further, it would not compromise other industrial activity on the land in the future. The fourth objective is considered to be satisfied by the proposal.

The WWLEP raises the following environmental issues which are addressed in the relevant assessment sections of this EIS:

Environmental Issue	Section
Flood planning	Section 6.2
Biodiversity	Section 6.3
Vulnerable land (steep slopes, shallow soils, soil salinity, permanently inundated, rock outcrops, removing native vegetation)	Section 6.2 and 6.3
Riparian land and waterways	Section 6.2 and 6.3
Groundwater vulnerability	Section 6.2 and 6.3

4.4.2 Section 94 Plan

The City of Wagga Wagga Section 94a Levy Contributions Plan 2006 applies to the subject land. According to Section 6 of the Plan, the proposed waste management facility is a type of development to which the Plan applies. Under Section 7.12 of the *Environmental Planning & Assessment Act 1979*, the Council may impose a condition requiring the payment of a contribution to the value of 1 percent of the proposed cost of carrying out the development.

4.4.3 Wagga Wagga Development Control Plan 2010

The *Wagga Wagga Development Control Plan 2010* (DCP), which applies to all land within Wagga Wagga LGA, supports the Wagga Wagga LEP by providing additional objectives and controls, in particular specific controls for preferred development and land use outcomes. The DCP is based around a set of guiding principles in four major areas. Relevant guiding principles to the proposal include:

- Sustainability, climate change management, and efficient use of resources;
    - To protect and enhance the viability of natural systems.
    - To achieve good environmental outcomes.
    - To manage incremental change to retain sustainable outcomes,
    - To support waste minimisation strategies,
    - To protect Indigenous, European, and natural heritage, and
    - To avoid use of rainforest and old growth timbers.
- Site responsive development;
    - To design for compatibility with topography, physical characteristics, and setting.
    - To achieve a positive contribution to the streetscape and/or natural environment.
- Design quality;
    - To achieve quality sustainable development.
    - To respond to site conditions.

The development site is within the Bomen Urban Release Area.

Under the DCP, the proposal is subject to a range of requirements that are addressed in this report. The relevant requirements are summarised in Table 4-1.

Table 4-1 Relevant requirements of Wagga Wagga Development Control Plan.

Reference	Requirement	Summary of compliance	Addressed
Industrial development design principles			
P1	Development is to be suited to the site in terms of the nature of the use, relationship to adjoining uses and availability of land for industrial development.	WWDCP	Section 3.1
P2	Development should be consistent with the principles of Industrial ecology.	WWDCP	Section 6.15
Natural resource and landscape conservation and management design principles			
P1	Development should not interrupt the hills and visually prominent ridges throughout the local government area of Wagga Wagga	WWDCP	Section 6.12
P2	Design and construction should be in accordance with best practice catchment management principles	WWDCP	Section 3.2 and 6.2
P3	Design and construction should be in accordance with biodiversity and riparian lands conservation management principles.	WWDCP	Section 6.3
5.2	Prescribed trees and vegetation in the Industrial zone: • Any living tree or plant whether indigenous, endemic, exotic, or introduced species with a height equal to or exceeding 5 m. • Any dead tree or plant with a trunk diameter greater than 50 cm (measured at 1.4 m above ground level). • Any native vegetation occurring in a wetland. • Any tree or plant, irrespective of size, listed in a Register of Significant or Heritage trees being kept by Council at any time.	WWDCP	Section 6.3
Design principles for environmental hazards and management			
P1	The design and construction of development should recognise and be designed within the environmental hazards and constraints of the site.	WWDCP	Section 6.2
Bushfire			
C1	Applications are to satisfy the relevant provisions of *Planning for Bush Fire Protection 2006* (or any later versions) and Australian Standard: 3959 Construction of Buildings in Bush Fire Prone Areas.	WWDCP	Section 6.9
C2	Where required, a clear separation is to be provided between buildings and bushfire hazards in the form of a fuel-reduced Asset Protection Zone (APZ). In all cases, the APZ is to be located wholly within the land zoned Residential. Refer to the requirements of Planning for Bush Fire Protection 2006.	WWDCP	Section 6.3 and 6.9
Bomen: site topography and landscape character			
C1	Retain existing vegetation along the Olympic Highway and Byrnes Road and along creek lines and all other treed locations indicated on the Bomen Site Topography and landscape character plan.	WWDCP	Section 6.3

Reference	Requirement	Summary of compliance	Addressed
C2	Protect ridgelines as visual features of Bomen. Ridgelines at all times are to remain visible above the topmost ridge of all new buildings when viewed from any point along the eastern boundary of the Bomen Urban Release Area.	WWDCP	Section 3 and 6.12
C3	Roads and pathways should generally run along the contours of the land and generally perpendicular to the contour where the land is steeper.	WWDCP	Section 3; Figure 3-3
C4	Development Applications shall include management and mitigation information for land identified in the LEP as environmentally sensitive.	WWDCP	Not an environmentally sensitive area
C5	Development with large building footprints should be sited on flatter land to avoid excess cut and fill. 3D modelling including view corridors will be required for development applications for sloping land with a gradient of over 10 %.	WWDCP	Site is reusing an existing evaporation pond. Footprint required for hardstand is small and will contain site office.
Bomen: environmental conservation, biodiversity and natural resource management			
C1	A development application for: • Land containing the Yellow Box Woodland remnant along the Trahairs Road reserve west of Byrnes Road as identified in Figure 14 of the "Biodiversity Certification Report" • The larger areas of low conservation value treed native vegetation as identified in Figure 14 of the "Biodiversity Certification Report" • Any low conservation value treed native vegetation within the mapped (biodiversity) sensitive area shown on the Natural Resources Sensitivity Map – Biodiversity Shall be accompanied by a draft management plan which will not only provide for protection but also for revegetation of the perimeter areas of the Bomen industrial zones with the multiple objectives of management for visual impact mitigations, assistance in the management of surface water runoff, acoustic protection, and biodiversity offsetting and enhancement.	WWDCP	The development application does not refer to land containing Yellow Box remnant woodland as identified in C1.
C2	Trees within the area referred to in C1 are to be protected in accordance with a conservation management plan, prepared by a qualified ecologist and approved by Council.	WWDCP	The development application does not refer to land containing Yellow Box remnant woodland as identified in C1.
C3	Revegetation of the area referred to in C1 is to be undertaken in accordance with a management plan approved by Council.	WWDCP	The development application does not refer to land containing Yellow Box remnant woodland as identified in C1.
Stormwater and drainage			

Reference	Requirement	Summary of compliance	Addressed
C1	Provide stormwater detention facilities to capture rainwater and surface runoff to ensure post-development flows do not exceed pre-development flows, for storm events up to and including the 1-in-100-year storm event.	WWDCP	Existing effluent evaporation ponds and 2 farm dams will provide stormwater detention facilities to capture rainwater and surface runoff.
C2	All new and existing roads will be required to have collector pits and an underground pipe system to carry water to the discharge point for each lot. Inter-allotment drainage will also be required to collect drainage from higher lots and avoid uncontrolled discharge onto lower lying properties.	WWDCP	All water will be retained internally.
C4	Developers will be required to manage stormwater resulting from the development. Preferred solutions for managing stormwater include: • Developers shall provide details of their stormwater management plan at the time of submitting a DA. • Collection of stormwater by rainwater tanks for re-use onsite is preferred. • Surface water runoff may be required to be collected and treated onsite. • Broadacre development is suitable for swale stormwater management. Small, intense development will require kerb and gutter stormwater management.	WWDCP	Stormwater and leachate management are detailed on the design drawings and will be managed internally.
C5	Each lot is to incorporate a range of water sensitive urban design measures to achieve the nominated water quality targets.	WWDCP	All stormwater runoff on-site will be captured and tested for future use. Section 6.2.4.
C6	Stormwater runoff from communal areas is to be treated through communal water sensitive urban design measures to achieve the nominated water quality targets.	WWDCP	All stormwater runoff on-site will be captured and tested for future use. Section 6.2.4.
Bomen: water conservation			
C1	Development should include the provision of rainwater collection measures for reuse onsite.	WWDCP	Stormwater management is detailed on the design drawings and will be managed internally. Internal water needs will be met from internal water sources

Reference	Requirement	Summary of compliance	Addressed
			and not rely on reticulated water.
Bomen heritage conservation			
East Bomen IF1: one stone artefact in exposed paddock in Riverina Wool Combing Property (AHIMS 56-1-0044).			
C1	Proponents are to comply with the provisions of the NPW Act with respect to Aboriginal cultural heritage.	WWDCP	Section 6.5.
C2	Prior to the commencement of development within the Bomen Urban Release Area, further investigations of Potential Archaeological Deposits (PADS) and areas of high or moderate sensitivity as shown on the Heritage Plan, are required at the development assessment stage, to identify whether or not Aboriginal objects are present. Such investigations must comply with the provisions of the NPW Act.	WWDCP	Section 6.5.
C3	Proposals must be designed to avoid harm to Aboriginal objects and/or Aboriginal places by designating the areas where they are located and appropriate buffers as open space and documenting proposed management practices to ensure the conservation of those objects and/or places.	WWDCP	Section 6.5.
C4	Satisfactory consultation is to be carried out with Council and Aboriginal stakeholders to confirm the proposed method of management for areas containing Aboriginal objects and/or Aboriginal places.	WWDCP	Section 5.3. Section 6.5.
C5	Council must be provided with documented justification where proposals cannot avoid harm to Aboriginal objects and/or Aboriginal places.	WWDCP	Section 6.5.
C6	Where harm to Aboriginal objects and/or Aboriginal places is proposed, the development will be 'Integrated Development' under section 91 of the EP&A Act, and necessary approvals must be obtained from DECCW in accordance with the NPW Act prior to Council determining the development application.	WWDCP	Section 6.5.
C7	A member of the Wagga Wagga Local Aboriginal Land Council or other Aboriginal stakeholder group must be invited to supervise works carried out in proximity to an Aboriginal object, Aboriginal place, or other site with Aboriginal cultural heritage values.	WWDCP	Section 6.5.
Bomen: odour			
C1	Uses located within 400 m of residential land are to be limited to those emitting minimal or no odour compatible with adjoining residential/rural residential land uses.	WWDCP	Proposed site is greater than 400 m from residential property.
C2	Developments that have processes, inputs, and outputs that are likely to generate significant or offensive odour will be required to undertake an odour modelling and assessment process to ascertain the impact of such odours on sensitive receptors and to outline measures to minimise and mitigate against such odours.	WWDCP	Section 6.4.
Bomen: contamination			
C1	Development Applications shall include an assessment of the potential contamination of the development site, and details of measures to address any contamination identified.	WWDCP	Section 6.2.

Reference	Requirement	Summary of compliance	Addressed
Bomen: industrial: vehicle access and parking			
C1	All car parking and vehicle access must be contained on site and be set back from the street.	WWDCP	Section 3.3.6.
C2	Service vehicles are to be separated from visitor and staff parking areas, screened from the street and located at the rear or sides of the buildings behind the building line.	WWDCP	Section 6.8.6.
C3	Provide clear paths for pedestrian movement separate from areas of frequent vehicular movement.	WWDCP	Section 6.8.6.
C4	Parking areas are to be provided with suitable species of shade tree at a ratio of 1 per 4 car bays, evenly throughout the parking areas.	WWDCP	Section 6.8.6.
C5	Parking areas must be designed to channel water into the vegetated allotment swale.	WWDCP	Section 6.2.
C6	Parking areas and access driveways must be paved or sealed with asphalt or other Council approved seal.	WWDCP	Section 6.8.6.
Vehicle access and movements			
C2	A Traffic Impact Study may be required where adverse local traffic impacts may result from the development. The traffic impact study is to include the suitability of the proposal in terms of the design and location of the proposed access, and the likely nature, volume, or frequency of traffic to be generated by the development.	WWDCP	Section 6.8.
C3	Vehicles are to enter and leave in a forward direction unless it can be demonstrated that site conditions prevent it.	WWDCP	Section 6.8.6
C4	Provide adequate areas for loading and unloading of goods on site. The loading space and facilities are to be appropriate to the scale of development.	WWDCP	Section 6.8.6
C5	Access driveways are to be located in accordance with the relevant Australian Standard at the time of lodgement of an application.	WWDCP	Section 6.8.6.
C6	Ensure adequate sight lines for proposed driveways.	WWDCP	Section 6.8.6.
Off-street parking			
C1	Parking is to be provided in accordance with the table of land uses.	WWDCP	Section 6.8.6.
C2	The design and layout of parking is to be in accordance with the relevant Australian Standard at the time of lodgement of an application.	WWDCP	Section 6.8.6.
C3	Parking spaces are to be provided for disabled persons. Accessible parking spaces to comply with the relevant Australian Standard at the time of lodgement of an application.	WWDCP	Section 6.8.6
C9	Provide trees within the parking area at a rate of 1 tree per 5 spaces in a row. Each tree to have a minimum mature spread of 5 m and to be located in a planting bed with minimum width of 1.5 m (between back of kerbs) and minimum area of 3.5 m^2.	WWDCP	Section 6.8.6.
C10	Planting beds located within a car park are to have a subsoil drainage system connected into the stormwater system of the site.	WWDCP	Section 6.8.6.

Reference	Requirement	Summary of compliance	Addressed
C11	To ensure sightlines are maintained for drivers and pedestrians, trees used within or adjacent to car parking areas shall have a minimum clear trunk height of 2.5 m, with shrubs and ground covers not to exceed 500 mm in height.	WWDCP	Section 6.8.6.
Landscape design			
C1	A landscape plan is required for applications for: • Commercial and industrial developments • Residential development (other than dwelling houses)	WWDCP	Allowing for natural regeneration on-site for landscaping. Vegetative cover for rehabilitation will be perennial grasses (planted).
C2	Natural features at the site, such as trees, rock outcrops, cliffs, ledges, and indigenous species and vegetation communities are to be retained and incorporated into the design of the development.	WWDCP	Section 6.3.
C3	Use native and indigenous plants, especially low water consumption plants, in preference to exotic species.	WWDCP	Section 6.3.
C4	Trees should be planted at the front and rear of properties to provide tree canopy.	WWDCP	Section 6.3.
C5	Provide landscaping in the front and side setback areas, and on other parts of the site to improve the streetscape, soften the appearance of buildings and paved areas, and to provide visual screening.	WWDCP	Section 6.3.
C6	Landscaping should provide shade in summer without reducing solar access in winter. Limited use of deciduous species is acceptable where used to achieve passive solar design.	WWDCP	Section 6.3.
Erosion and sediment control			
C1	An Erosion and Sediment Control Plan is to be submitted with the development application.	WWDCP	All dirty water resulting from construction will be contained within the existing effluent pond during construction and the leachate management pond during operation. Safeguards and mitigation measures are contained in Table 6-15.
C2	Water diversion or filtration measures including sand bags, silt fencing, or straw bale sediment filter fencing are to be implemented on the downslope property boundary, including, where appropriate, the rear of the lot.	WWDCP	Section 6.2.

Reference	Requirement	Summary of compliance	Addressed
C3	All sediment control measures are to be installed prior to commencement of work on the site. The measures are also to be maintained in a sound and workable condition until completion and must not be removed from the site until permanent rehabilitation/stabilisation measures have been completed.	WWDCP	Section 6.2.
C4	Vehicle admittance onto the site shall be restricted during wet or muddy conditions.	WWDCP	Section 6.2.
C5	The placement of blue metal, gravel, or similar materials is required on the identified single access point if access is necessary under wet or muddy conditions. This will prevent erosion by concentrated run-off and minimise tracking of mud from the site on the road.	WWDCP	Section 6.2.
C6	Temporary fencing is to be installed along the boundary adjoining roadways to prevent vehicles by-passing the designated driveway access.	WWDCP	Section 6.2.
C7	Locate stockpiles so that the material is wholly within the property boundary and not in a position where it can be washed into the gutter or roadway.	WWDCP	Section 3.3.3. Section 6.2.
C8	Coverage of stockpiles should be provided to prevent loss by wind erosion, unless the material is too coarse to be wind-blown (e.g. coarse sand).	WWDCP	Section 3.3.3. Section 6.2.
C9	Sediment fencing must be provided down slope of all stockpiles. Where the catchment exceeds 2 ha, a diversion bank/fence must be constructed immediately upslope of all stockpiles.	WWDCP	Section 3.3.3. Section 6.2.
C10	Disturbed areas are to be stabilised with seeded topsoil or turf as quickly as possible or by no later than 14 days after completion of construction works. Use of turfed terraces or turf strips along embankments may facilitate quick stabilisation of those areas.	WWDCP	Section 6.2.
C11	All erosion and sediment control devices should be kept in place until the site is fully stabilised and/or landscaped.	WWDCP	Section 6.2.

4.5 NSW PLANNING APPROVAL PATHWAY

The proposal is permissible with development consent under the Wagga Wagga LEP and therefore assessed under Part 4 of the EP&A Act. The proposed is prescribed as Designated Development under the EP&A Regulation and is further prescribed as Regionally Significant Development under the State Environmental Planning Policy (State and Regional Development) 2011. Pursuant to clause 4.4 of the EP&A Act, the consent authority for regionally significant development is the Southern Joint Regional Planning Panel (SJRPP). Wagga Wagga City Council must receive the development application and carry out certain preparatory and assessment functions on behalf of the Panel, as prescribed by Clause 4.7(2) of the EP&A Act.

5 CONSULTATION

SECRETARY'S ENVIRONMENTAL ASSESSMENT REQUIREMENTS

As works are designated development, a request was made for a Secretary's Environmental Assessment Requirements (SEARS) to DPE in June 2017. The issued SEARS detailed the following:

During the preparation of the EIS, you must consult the relevant local, State and Commonwealth government authorities, service providers, and community groups, and address any issues they may raise in the EIS. In particular, you should consult with the:

- *Environment Protection Authority;*
- *Office of Environment and Heritage;*
- *Department of Primary Industries;*
- *Roads and Maritime Services;*
- *Riverina Local Land Services;*
- *Wagga Wagga City Council; and*
- *The surrounding landowners and occupiers that are likely to be impacted by the proposal.*

Details of the consultation carried out and issues raised must be included in the EIS.

5.1 AGENCY CONSULTATION

Secretary's Environmental Assessment Requirements (SEARs)

A preliminary environmental assessment was prepared, and SEARs were requested. These were provided by DPE on 26 July 2016 (refer **Error! Reference source not found.**). The SEARs are intended to guide the structure and content of the EIS and reflect the responsibilities and concerns of NSW government agencies in relation to the environmental assessment of the proposal.

The following sections provide a summary of the SEARs from the various agencies and cross reference where specific issues are addressed within this EIS. Additional consultation was undertaken with several of the agencies to clarify some of the issues raised in the SEARs or seek further advice. This additional consultation with agencies is also summarised below.

Department of Planning and Environment

Issue summary	Addressed in EIS
The Environmental Impact Statement (EIS) must meet the minimum form and content requirements in Clauses 6 and 7 of Schedule 2 of the *Environmental Planning and Assessment Regulation 2000*.	Section 7.
In particular, the EIS must include: • An assessment of all potential impacts of the proposed development on the existing environment (including cumulative impacts if necessary) and develop appropriate measures to avoid, minimise, mitigate and/or manage these potential impacts	Section 6 and Section 9.
• The EIS must assess the proposal against the relevant environmental planning instruments, including but not limited to: - State Environmental Planning Policy (Infrastructure) 2007. - State Environmental Planning Policy No.33 Hazardous and Offensive Development	Section 4 and Section 6.

- State Environmental Planning Policy No. 55 Remediation of Land - Wagga Wagga Local Environmental Plan. - Relevant DCPs and section 94 plans. As part of the EIS assessment, the following matters must also be addressed: Strategic context – • A detailed justification for the proposal and suitability of the site for the development • A demonstration that the proposal is consistent with all relevant planning strategies, environmental planning instruments, development control plans (DCPs), or justification for any inconsistencies • A list of any approvals that must be obtained under any other Act or law before the development may lawfully be carried out	Section 2. Section 4 and Section 6. Section 8.
Waste management – • The Environmental Impact Statement must include a preliminary risk screening completed in accordance with SEPP No.33 – Hazardous and Offensive Development and applying SEPP No. 33 (DOP, 2011), with a clear indication of class, quantity and location of all dangerous goods and hazardous materials associated with the development. • Should preliminary screening indicate the project is "potentially hazardous", a Preliminary Hazard Analysis (PHA) must be prepared in accordance with the Hazardous Industry Planning Advisory Paper No.6 – Guidelines for Hazard Analysis (DoP, 2011) and Multi-Level Risk Assessment (DoP, 2011).	Section 6.9.
Air quality and odour – • A description of all potential sources of air emissions. • An air quality assessment in accordance with relevant EPA Guidelines. • A description and appraisal of air quality and impact mitigation and monitoring measures.	Section 6.4.
Noise and vibration – • A description of all potential noise and vibration sources during construction and operation, including road and rail noise. • A noise and vibration assessment in accordance with the relevant EPA Guidelines. • A description and appraisal of noise and vibration mitigation and monitoring measures.	Section 6.7.
Soil and water – • Existing and proposed water licensing requirements in accordance with the Water Act 1912 and/or the Water Management Act 2000. • A description of the measures proposed to ensure the development can operate in accordance with the requirements of any relevant Water Sharing Plan, Floodplain Management Plan or water source embargo. • A description of local soils, topography, drainage and landscapes. • Details of sediment and erosion controls. • A detailed site water balance. • An assessment of potential impacts on the quality and quantity of surface and groundwater resources. • An assessment of flooding impacts including potential impacts to and resulting from the development. • Details of the proposed stormwater and wastewater management systems (including sewage), water monitoring program and other measures to mitigate surface and groundwater impacts. • Details of leachate collection and management.	Section 4.3.7. Section 4.3.7 Section 6.2. Section 3.2.3 Section 6.2. Section 6.2. Section 3.2 and Section 6.2.5. .

• Characterisation of the nature and extent of any contamination on the site and surrounding area. • A description and appraisal of impact mitigation and monitoring measures.	Section 6.2.6. Section 6.2.5 and Section 6.2.6. Table 6-15
Transport – • Details of road transport routes and access to the site. • Road traffic predictions for the development during construction and operation. • An assessment of impacts to the safety and function of the road network, and the details of any road upgrades required for the development.	Section 0. Section 6.8.2. Section 6.8.3.
Biodiversity – • Accurate predictions of any vegetation clearing on site or for any road upgrades. • A detailed assessment of the potential impacts on any threatened species, populations, endangered ecological communities (EEC) or their habitats, groundwater dependent ecosystems and any potential for offset requirements. • A detailed description of the measures to avoid, minimise, mitigate and offset biodiversity impacts.	Section 6.3.8. Section 6.3.3, Section 6.3.4, Section 6.3.5, Section 6.3.6. Section 6.3.10.
Visual – Including an impact assessment at private receptors and public vantage points.	Section 6.12 and Appendix P.
Heritage – Including Aboriginal and non-Aboriginal cultural heritage.	Section 6.5 and Section 0.
During the preparation of the EIS you should consult the Department's Register of Development Assessment Guidelines, which is available on the Department's website at planning.nsw.gov.au under Development Proposals/Register of Development Assessment Guidelines. Whilst not exhaustive, this Register contains some of the guidelines, policies, and plans that must be taken into account in the environmental assessment of the proposed development. During the preparation of the EIS, you must consult the relevant local, State and Commonwealth government authorities, service provides and community groups, and address any issues they may raise in the EIS. In particular, you should consult with the: • Environment Protection Authority • Office of Environment and Heritage. • Department of Primary Industries. • Roads and Maritime Services. • Riverina Local Land Services. • WWCC. • The surrounding landowners and occupiers that are likely to be impacted by the proposal. Details of the consultation carried out and issues raised must be included in the EIS. If you do not lodge an application under Section 78A (8) of the EP&A Act within 2 years of the issue date of these SEARs, you must consult with the Secretary in relation to any further requirements for lodgement.	Consultation with WWCC and the local community is discussed in Section 5.1, Section 0 and Section 5.4. Consultation with the other groups is discussed in the following sections.

Details of additional correspondence between NGH Environmental and the DPE is detailed below (Appendix C):

- A phone call was made to the DPE office in June 2018 regarding an extension to SEAR 1062. The call was placed to Patrick Copas. He was able to provide advice on the requirements of SEAR extension. This included an email to him regarding any changes made to the proposal.
- Final response was received on 21 August 2018 from Patrick Copas. SEAR 1062 had been granted a two year extension and with limited amendments to the original SEAR by other organisations.

NSW Environmental Protection Agency

Issue summary	Addressed in this EIS
The key guidance documents for the assessment, establishment, and operation of a landfill in NSW is the Environmental Guidelines: Solid Waste Landfills (EPA, 2016, Second Edition) ("Landfill Guideline"). The EIS should detail how the proposed landfill will meet all the applicable benchmark performance criteria as detailed in Part B of the Landfill Guideline.	
The EIS must include (but is not limited to) the following information on the proposed landfill design and operation:	
a) Fully describe the proposed landfill and the ongoing operational management for the life of the landfill, including details of all development stages and site rehabilitation.	Section 3.
b) Describe and assess the existing environment with particular reference to surface and ground water quality.	Section 6 and Section 6.2.3.
c) Details of the engineered features of the proposed landfill works and cell construction, including the leachate barrier, leachate storage and disposal system, stormwater management works, water quality monitoring installations, landfill gas management and monitoring infrastructure (if required), and final capping. This must include plans, specifications and engineering drawings.	Section 3.2 and **Error! Reference source not found.**.
d) Maps of the site configuration and a scaled plan diagram of the premises, depicting the boundary of the premises and footprint of landfill cells, the locations of all residences and other sensitive receptors, and the locations of other relevant infrastructure such as sewer connections, utilities, and urban stormwater systems.	**Error! Reference source not found.**, Figure 3-1, Figure 3-2, and Figure 3-3.
e) Projections of the types and quantities of wastes to be received, the characterisation and classification of the wastes, the design capacity of the landfill or cell, and the expected life of the landfill/cell.	No services, utilities or stormwater systems transect the development footprint.
f) Details of any waste reprocessing to take place at the landfill, the nature of any resources to be recovered from wastes received at the landfill, and the locations and sizes of any proposed stockpiles.	Section 3.2.1 and Section 6.10.
g) Enough information to demonstrate that the proposal will meet the required outcomes in the Landfill Guidelines, with justification for any proposed alternatives to the acceptable measures described in these guidelines. The application should be supported by a hydrogeological risk assessment, noise impact assessment, water balance calculations for leachate management, and proposed environmental monitoring programs.	Section 3.2.1 and Section 6.10. Section 6.2.3, Appendix K, Section 3.2.7, Section 6.2.5 and Section 7.2.
h) Detail the mitigation and management options that will be used to prevent, control, abate, or mitigate the identified potential environmental impacts associated with the project. This should include an assessment of the effectiveness and reliability of the measures and any residual impacts after these measures are implemented.	Section 7.2.
i) Confirmation that the application has been prepared by a suitability qualified and experienced person(s).	

The environmental objectives for water quality are as follows: • No pollution of, or discharge to waters (including surface and groundwater), except to the extent authorised by EPA (i.e. in accordance with an Environment Protection Licence); and • All polluted water (including leachate, wash down waters, polluted stormwater, or onsite amenities effluent) is captured on the site and collected, treated and beneficially reused, where this is safe and practicable to do so.	Certification. Section 6.2. Section 6.2.
The EIS should document the measures that will be implemented to achieve these objectives and include (but not be limited to) the following specific aspects. • Leachate barrier system: clearly describe and detail the proposed leachate barrier system, including proposed materials and details of the cell development; • Leachate collection and management system: general details of the drainage layers, pipework and risers, pump, leachate ponds, intended method of disposal or reuse, and leachate monitoring. This must include a leachate balance undertaken in accordance with the Landfill Guideline and account for the water contained in the waste as received at the proposed facility; • Surface water controls: details of the proposed surface water controls that will be installed. These controls should be designed in accordance with the guideline Managing Urban Stormwater: Soils and Construction – Volume 2B Waste Landfills (DECC, 2008); • Groundwater assessment: a comprehensive hydrogeological investigation and impact assessment for the site and the surrounding groundwater to identify with a high degree of certainty the groundwater quality, flow pathways and vulnerability to contamination for all aquifers; and • Groundwater monitoring network: with the potential risk to groundwater resources, the groundwater assessment should provide details of the proposed groundwater monitoring network, including locations and depth of all hydraulically up-gradient and down-gradient monitoring bores; and • Groundwater and surface water monitoring program: the proposal must also include details of the proposed groundwater and surface water monitoring program, which must include upstream/up-gradient monitoring and downstream/down-gradient monitoring, and background monitoring.	Section 3.2.5. Section 3.2. Section 6.2.6. Section 6.2.3. Section 6.2.3. Section 6.2.5.
The environmental objective for landfill development is for the minimisation of amenity impacts associated with the development of the landfill. The EIS should document the measures that will be implemented to achieve this objective and include but not be limited to the following specific aspects. • Construction impacts: assess the impacts and detail the mitigation controls to minimise offsite dust, noise, and vibration and water quality impacts in accordance with EPA guidelines. This should include details of any off-site work such as winning and importing clay liner material or graded rock for drainage layers; and • Landfill development: include details and anticipated timing of any stages in the development of the landfill, and details of the proposed final extent of the landfill. This must include plans and cross section diagrams which clearly detail the extent of the proposed development. As the proposed site has been previously used for evaporation of wool scour wastewater, the EIS must also detail how the residues from previous activity will be managed and potential impacts mitigated, including potential impacts on landfill liners.	Section 6.4 and Section 6.7. Section 7. Section 3.3.4. **Error! Reference source not found.** and Section 3. Section 6.2.2 and Appendix R.
The environmental objective of landfill operation in relation to local amenity is the prevention of impacts, and where not possible the mitigation of impacts on	Section 6.4 and Appendix J.

sensitive receptors in accordance with the EPA's guideline criteria for odour, dust, noise, and facility management and operation.	Section 6.7 and Appendix K. Section 0. Section 6.11. Section 6.12 and Appendix P.
All potentially impacted residential or sensitive locations likely to be impacted by the development must be identified and included in the assessment. The EIS should assess the impact and document the measures that will be implemented to achieve the amenity objectives and should include but not be limited to the following specific aspects.	
• Odour: an odour assessment should be prepared based on the potential emissions from the waste management facility. The EIS should also detail the appropriate waste acceptance and screening steps and waste management steps that will be implemented to prevent the generation of odour;	Section 6.4 and Appendix J.
• Dust: the air quality impact assessment should include an assessment of dust impacts from the proposed construction and operation of the landfill and details of all mitigation measures;	Section 6.4.
• Noise: a noise impact assessment for the development and operation of the landfill should be prepared in accordance with the NSW Industrial Noise Policy (DECC, 2000), including determining the project specific noise criteria and details of all proposed noise mitigation measures;	Section 6.7 and Appendix K.
• Road traffic noise: the proposed development will result in an increase in traffic movements, particularly during the development phase. The number of traffic movements associated with all phases of the development should be quantified and the potential noise impacts associated with these traffic movements need to be assessed in accordance with the NSW Road Noise Policy (DECCW, 2011);	Section 6.7 and Appendix K.
• Litter: detail the control measures that will be implemented to minimise the generation or movement off-site of litter from the exposed tipping face or associated with waste transport on site;	Section 6.10.
• Covering and compaction of waste: details of the proposed waste covering and compaction regime consistent with the objectives of the Landfill Guidelines, including all details for the proposed use of the evaporated pond sludge; and	Section 3.2 and Section 6.2.2.
• Cleaning of vehicles: detail the proposed controls to prevent contaminated mud and waste material from being tracked off site by vehicles.	Section 6.10.4.
The EIS should provide details on the following specific aspects of waste:	
• Waste classification: the waste classification under the Waste Classification Guidelines, Part 1: Classifying Waste (DECCW, 2009) for all wastes proposed to be received and landfilled at the proposed facility;	Section **Error! Reference source not found.**.
• Measurement and recording the quantity, type, and sources of waste to be received: provide details of how the proposed activity will comply with the EPA measuring and reporting requirements;	Section 3.2.1 and Section 6.10.
• Screening of waste received: details of the proposed waste acceptance and screening procedures to ensure the site does not accept wastes that are prohibited from receipt and disposal; and	Section 6.4.5.
• Maximise recycling: detail the proposed management actions to deal with waste delivered to site that could be improved for material recycling or reuse.	Section 6.10.
The environmental objectives in relation to landfill gas emission is to reduce the emission of greenhouse gases, lower the emission of other environmentally impacting compounds, and reduce the risk of fire and explosion.	

Although emission rate and quantity of land fill gases emitted from a non-putrescible landfill are typically low, the EIS should address the following: • Determine the likely composition and risk of landfill gas emissions based on the predicted waste streams and proposed landfill management regime, and detail the proposed controls if required; and • Estimate the emission of greenhouse gases that will be generated, and accurately account for the greenhouse gas emissions from the project. The full life-cycle greenhouse gas emissions should be calculated and must demonstrate how greenhouse gas emissions will be minimised over the life cycle.	Section **Error! Reference source not found.**. Section **Error! Reference source not found.**. Appendix S.
The environmental objective of the landfill closure and associated works is to ensure appropriate and effective controls are installed and continue to be operated effectively and prevent any offsite environmental impacts. The EIS should document the measures that will be implemented to achieve this environmental objective and should include but not be limited to the following specific aspects. • Capping and revegetation: detail the proposed capping and revegetation of the landfill site after closure. • Landfill closure and post-closure monitoring and maintenance: the EIS should detail the ongoing monitoring and maintenance in accordance with the Landfill Guideline that the operator will undertake until it is assessed that the landfill does not pose a threat to the environment.	Section 3.2 and Section 7.2. Section 3.2.11.

Office of Environment and Heritage (OEH)

Issue summary	Addressed in this EIS
Impacts related to the following environmental issues need to be assessed, quantified and reported on: • Aboriginal cultural heritage • Biodiversity • Cumulative The Environmental Impact Statement (EIS) should address the specific requirements outlined under each heading below and assess impacts in accordance with the relevant guidelines mentioned.	Section 6.5. Section 6.3. Section 6.14
OEH requires that the proponent undertaken a cultural heritage assessment of the potential impacts of the proposed development. The EIS must contain: • A description of the Aboriginal objects and declared Aboriginal places located within the area of the proposed development; • A description of the cultural heritage values, including the significance of the Aboriginal objects and any declared Aboriginal places, which exist across the whole area that will be affected by the proposed development, and the significance of these values for the Aboriginal people who have a cultural associated with the land; • A description of how the requirements for consultation with Aboriginal people as specified in clause 80C of the National Parks and Wildlife Regulation 2009 have been met; • The views of those Aboriginal people regarding the likely impact of the proposed development on their cultural heritage. If any submissions have been received as a part of the consultation requirements, then the report must include a copy of each submission and your response; • A description of the actual or likely harm posed to the Aboriginal objects or declared Aboriginal places from the proposed activity, with reference to the cultural heritage values identified; • A description of any practical measures that may be taken to protect and conserve those Aboriginal objects or declared Aboriginal places; • A description of any practical measures that may be taken to avoid or mitigate any actual or likely harm, alternatives to harm or, if this is not possible, to manage (minimise) harm;	Section 6.5. Section 6.5. Section **Error! Reference source not found.**. Section **Error! Reference source not found.**.

• In the event that harm to Aboriginal objects cannot be avoided, then an application for an Aboriginal Heritage Impact Permit (AHIP) will be required to be submitted to OEH for consideration. In addressing the above requirements, the proponent must comply with the processes described in the following documents: • Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010 (DECCW, 2010) – www.environment.nsw.gov.au/licences/consultation.htm. This document further explains the consultation requirements that are set out in clause 80C of the National parks and Wildlife Regulation 2009. The process set out in this document must be followed and documented in the Environmental Assessment Report. • Code of Practice for the Archaeological Investigation of Aboriginal Objects in New South Wales (DECCW, 2010) – www.environment.nsw.gov.au/licences/archinvestigations.htm. The process described in this Code should be followed and documented where the assessment of Aboriginal cultural heritage requires an archaeological investigation to be undertaken. • Guide to investigation, assessing and reporting on Aboriginal Cultural heritage in NSW (OEH, April 2011) – www.environment.nsw.gov.au/licences/investassessreport.htm. This document provides guidance on the process for investigating and assessing Aboriginal cultural heritage in NSW and OEH's requirements for an assessment report. • Applying for an Aboriginal Heritage Impact Permit: Guide for applicants (OEH, May 2011) – www.environment.nsw.gov.au/licences/applyforahip.htm. The aim of this guide is to assist in the preparation of an AHIP application. It should be read in conjunction with the National Parks and Wildlife Act 1974 and the National Parks and Wildlife Regulation 2009. An Aboriginal Site Recording Form must be completed and submitted to the Aboriginal Heritage Information Management System (AHIMS) Registrar, for each Aboriginal site that is recorded during archaeological investigations completed for these environmental assessment requirements. The forms can be downloaded at www.environment.nsw.gov.au/licences/DECCAHIMSSiteRecordingForm.htm.	Section 6.5. Section 6.5. Section **Error! Reference source not found.**. Section **Error! Reference source not found.**.
OEH notes that the site for this proposed development is zoned Industrial and is within the Wagga Wagga biodiversity certification area. This means that for the purposes of Part 4 of the *Environment Planning and Assessment Act 1979*, any development within this area is taken to not be likely to have a significant effect on any threatened species, population, or ecological community, or its habitat. However, the Wagga Wagga biodiversity certification also relies on the Wagga Wagga DCP. Section 13 of the DCP requires the retention of low conservation value remnant patches in Bomen, which includes the strip of White Box – Yellow Box – Blakely's Red Gum Woodland along Byrnes Road on the western side of Lots 1 and 2 DP 771340. Specifically, the DCP requires the preparation of a management plan to protect and enhance this vegetation with any development application within the Bomen area. Although the information provided is not clear as to the extent of works required on these lots, OEH considers that it should be possible to construct and operate this proposed waste management facility without adversely impacting on this native vegetation.	Section **Error! Reference source not found.**. Section 6.3.
With regard to the *Commonwealth Environment Protection and Biodiversity Conservation Act 1999*, the assessment should identify any relevant Matters of National Environmental Significance and whether the proposal has been referred to the Commonwealth or already determined to be a controlled action. Please note that the biodiversity certification of the *Wagga Wagga Local Environmental Plan 2010* does not address matters under Commonwealth legislation.	Section 0.
The cumulative impacts from all clearing activities and operations, associated edge effects and other indirect impacts on cultural heritage, biodiversity, and OEH Estate need to be comprehensively assessed in accordance with the *Environmental Planning and Assessment Act 1979*). This should include the cumulative impact of the proponent's existing and proposed development and associated infrastructure (such as access tracks etc.), as well as the cumulative impact of other developments located in the vicinity. This assessment should include consideration of both construction and operational impacts.	Section 6.14.

Details of additional correspondence between NGH Environmental and the DPE is detailed below (Appendix C):

- A phone call was made to Miranda Kerr at OEH Albury on 24th August 2018 regarding confirmation that this assessment remains in the transition phase under the BC Act.
- Final response was received on 24th August 2018 from Andrew Fisher, OEH Albury, confirming that this assessment would remain in the transitional arrangement if submitted by February 2019.

Roads and Maritime Services

Issue summary	Addressed in this EIS
Roads and Maritime is interested in the characteristics of the traffic generated by the development and the potential impact of the development on the safety and efficiency of the road network, particularly the interaction of the development with the Snowy Mountains Highway and the Sturt Highway.	
Given the scale of the development proposal, a Traffic Impact Assessment (TIA) shall be prepared and submitted with the Development Application. In particular, the TIA shall address, and provide any appropriate mitigation measures for, the impacts of the traffic generated by this development upon the surrounding road network, particularly intersections, during the lifetime of the project. For guidance in the preparation of the TIA, the applicant is referred to the Austroads publications, particularly the Austroads Guide to Traffic Management Part 12: Traffic Impacts of Development and the "Guide to Traffic Generating Developments" prepared by the RTA and similar documentation. As a minimum, the TIA is to address the existing and anticipated additional traffic generation on the surrounding road network, vehicle types and volumes, peak traffic volumes, travel routes for vehicles accessing the development site, and provide recommendations for any mitigation measures, such as intersection upgrades, considered necessary to address traffic related impacts. Consideration of the cumulative impacts of the potential traffic generation when added to existing traffic volumes upon the surrounding road network shall be undertaken.	Section **Error! Reference source not found.**.

NSW Department of Industry - Water

Issue summary	Addressed in this EIS
Access to surface and groundwater resources: • Annual volumes of surface water and groundwater proposed to be taken by the activity (including through inflow and seepage) from each surface and groundwater source as defined by the relevant water sharing plan. • Assessment of any volumetric water licensing requirements (including those for ongoing water take following completion of the project). • Assessment of the impact and approvals (Works and Use Approvals under the WMA 2000) required for the taking or storage of water. • The identification of an adequate and secure water supply for the life of the project. Confirmation that water can be sourced from an appropriately authorised and reliable supply. This is to include an	Section 6.2.4. Section 6.2.4. Section 4.3.7. Section 6.2.4.

assessment of the current market depth where water entitlement is required to be purchased. • A detailed and consolidated site water balance.	Section 3.2.3.
Impact on surface and groundwater resources • Assessment of impacts on surface and ground water sources (both quality and quantity), related infrastructure, adjacent licensed water users, basic landholder rights, watercourses, riparian land, and groundwater dependent ecosystems, and measures proposed to reduce and mitigate these impacts. • Full technical details and data of all surface and groundwater modelling. • Proposed surface and groundwater monitoring activities and methodologies. • Proposed management and disposal of produced or incidental water.	Section 6.2.4. Section 6.2.3. Section **Error! Reference source not found.**. Section 3.2 and Section 6.2.4.
Flooding • DPI-W is responsible for the management and licensing of flood work approvals. • If the proposal is for an earthwork, embankment or levee, wherever situated or proposed to be constructed that is reasonably likely to affect the flow of water to or from a river or lake then the assessment is required to address potential impacts detailed further.	Section 6.2.3. Section 6.2.3.
Impact on waterfront land and water resource dependents • Clear identification of "waterfront land" (as defined in the WMA 2000) and an assessment of impacts of works and activities on waterfront land. (Works on waterfront land may be subject to Controlled Activity Approval (CAA) under the Water Management Act 2000.) • Details of the final landform of the site, including final void management (where relevant) and rehabilitation measures. • Assessment of any potential cumulative impacts on water resources, and any proposed options to manage the cumulative impacts. • Consideration of relevant policies and guidelines. • A statement of where each element of the SEARs is addressed in the EIS (i.e. in the form of a table).	Section 3.2.11 and Section 3.2.13. Section 6.14. Section 4. Section **Error! Reference source not found.**.
Water sharing plans The EIS is required to: • Demonstrate how the proposal is consistent with the relevant rules of the Water Sharing Plan, including rules for access licences, distance restrictions for water supply works and rules for the management of local impacts in respect of surface water and groundwater sources, ecosystem protection (including groundwater dependent ecosystems), water quality and surface-groundwater connectivity. • Provide a description of any site water use (amount of water to be taken from each water source) and management, including all sediment dams, clear water diversion structures with detail of the location, design specifications, and storage capacities for all the existing and proposed water management structures. • Provide an analysis of the proposed water supply arrangements against the rules for access licences and other applicable requirements of any WSP, including: o Sufficient marker depth to acquire the necessary entitlements for each water source	Section 6.2.3. Section 6.2.4. Not applicable.

○ Ability to carry out a "dealing" to transfer the water to relevant location under the rules of the EWSP ○ Daily and long-term access rules ○ Account management and carryover provisions • Provide a detailed and consolidated site water balance. • Further detail on licensing requirements is provided. • The EIS should take into account the following policies: ○ NSW Guidelines for Controlled Activities on Waterfront Land (NOW, 2012) ○ NSW Aquifer Interference Policy (NOW, 2012) ○ Risk Assessment Guidelines for Groundwater Dependent Ecosystems (NOW, 2012) ○ Australian Groundwater Modelling Guidelines (NWC, 2012) ○ NSW State Rivers and Estuary Policy (1993) ○ NSW Wetlands Policy (2010) ○ NSW State Groundwater Policy Framework Document (1997) ○ NSW State Groundwater Quality Protection Policy (1998) ○ NSW State Groundwater Dependent Ecosystems Policy (2002) ○ NSW Water Extraction Monitoring Policy (2007)	Section 3.2.3. Section 8. Section 4.
Licensing Considerations The EIS is required to provide: • Identification of water requirements for the life of the project in terms of both volume and timing (including predictions of potential ongoing groundwater taken following the cessation of operations at the site – such as evaporative loss from open voids or inflows). • Details of the water supply source(s) for the proposal, including any proposed surface water and groundwater extraction from each water source as defined in the relevant Water Sharing Plan/s and all water supply works to take water. • Explanation of how the required water entitlements will be obtained (i.e. through new or existing licence/s, trading on the water market, controlled allocations, etc.). • Information on the purpose, location, construction, and expected annual extraction volumes, including details on all existing and proposed water supply works which take surface water (pumps, dams, diversions, etc.). • Details on all bores and excavations for the purpose of investigation, extraction, dewatering, testing, and monitoring. All predicted groundwater take must be accounted for through adequate licencing. • Details on existing dams/storages (including the date of construction, location, purpose, size, and capacity) and any proposal to change the purpose of existing dams/storages. • Details on the location, purpose, size, and capacity of any new proposed dams/storages. • Applicability of any exemptions under the Water Management (General) Regulation 2011 to the project. Water allocation account management rules, total daily extraction limits, and rules governing environmental protection and access licence dealings also need to be considered.	Section 6.2.4. Section 6.2.4. Section 6.2.4. Not applicable. Section 6.2.3. Section 6.2.3. Not applicable. Not applicable.
Dam Safety Where new or modified dams are proposed, or where new development will occur below an existing dam, the NSW Dams Safety Committee should be consulted in relation to any safety issues that may arise. Conditions of approval may be recommended to ensure safety in relation to any new or existing dams.	Not applicable.

Surface Water Assessment The predictive assessment of the impact of the proposed project on surface water sources should include the following: • Identification of all surface water features including watercourses, wetlands, and floodplains transected by or adjacent to the proposed project. • Identification of all surface water sources as described by the relevant water sharing plan. • Detailed description of dependent ecosystems and existing surface water users within the area, including basic landholder rights to water and adjacent/downstream licensed water users. • Description of all works and surface infrastructure that will intercept, store, convey, or otherwise interact with surface water resources. • Assessment of predicted impacts on the following: o Flow of surface water, sediment movement, channel stability, and hydraulic regime, o Water quality, o Flood regime, o Dependent ecosystems, o Existing surface water users, and o Planned environmental water and water sharing arrangements prescribed in the relevant water sharing plans.	Section 6.2.3. Not applicable. Section 6.2.3. Section 3.2.4 and Section 6.2.4. Section 6.2.4.
Flooding If the proposal is for an earthwork, embankment, or levee, wherever situated or proposed to be constructed that is reasonably likely to affect the flow of water to or from a river or lake, then the assessment is required to address potential impacts detailed below: • The contents of any relevant floodplain management plan or any other relevant Government policy, • The need to maintain the natural flood regimes in wetlands and related ecosystems and the preservation of any habitat, animals (including fish) or plants that benefit from periodic flooding, • The effect or likely effect on water flows in downstream river sections, • Any geographical features, or other matters, of Aboriginal interest that may be affected by a controlled work; • The effect or likely effect of a controlled work on the passage, flow, and distribution of any flood waters, • The effect or likely effect of a controlled work on existing dominant flood ways or exits from flood ways, rates of flow, flood water levels and the duration of inundation, the protection of the environment.	Section 6.2.3, Section 6.2.4 and Section 6.2.6. Not applicable. Not applicable. Not applicable. Not applicable.
Groundwater Assessment To ensure the sustainable and integrated management of groundwater sources, the EIS needs to include adequate details to assess the impact of the project on all groundwater sources including: • Works likely to intercept, connect with, or infiltrate the groundwater sources. • Any proposed groundwater extraction, including purpose, location, and construction details of all proposed bores and expected annual extraction volumes. • Bore construction information is to be supplied to DPI Water by submitting a "Form A" template. DPI Water will supply "GW" registration numbers (and licence/approval numbers if required) which must be used as consistent and unique bore identifiers for all future reporting.	Section 3.2.4. Section 3.2.4. Not applicable. Section 6.2.3.

• A description of the water table and groundwater pressure configuration, flow directions and rates, and physical and chemical characteristics of the groundwater source (including connectivity with other groundwater and surface water sources).	Section 6.2.3.
• Sufficient baseline monitoring for groundwater quantity and quality for all aquifers and GDEs to establish a baseline incorporating typical temporal and spatial variations.	Not applicable.
• The predicted impacts of any final landform on the groundwater regime.	Section 6.2.3, Section 6.2.4 and Section 6.2.6.
• The existing groundwater users within the area (including the environment), any potential impacts on these users and safeguard measures to mitigate impacts.	Section 6.2.4 and Section 6.9.
• An assessment of groundwater quality, its beneficial use classification and prediction of any impacts on groundwater quality.	Section 6.2.6.
• An assessment of the potential for groundwater contamination (considering both the impacts of the proposal on groundwater contamination and the impacts of contamination on the proposal).	Section 6.2.6. Section 3.
• Measures proposed to protect groundwater quality, both in the short and long term.	Section 3. Section 3.2.7.
• Measures for preventing groundwater pollution so that remediation is not required.	
• Protective measures for any groundwater-dependent ecosystems.	Not applicable.
• Proposed methods of the disposal of waste water and approval from the relevant authority.	Not applicable.
• The results of any models or predictive tools used.	
Where potential impact/s are identified, the assessment will need to identify limits to the level of impact and contingency measures that would remediate, reduce, or manage potential impacts to the existing groundwater resource and any dependent groundwater environment or water users, including information on:	Section **Error! Reference source not found.**.
• Any proposed monitoring programs, including water levels and quality data. Reporting procedures for any monitoring program, including mechanism for transfer of information.	Section **Error! Reference source not found.**.
• An assessment of any groundwater source/aquifer that may be sterilised from future use as a water supply as a consequence of the proposal.	Section 6.2.3.
• Identification of any nominal thresholds as to the level of impact beyond which remedial measures or contingency plans would be initiated (this may entail water level triggers or a beneficial use category).	Section 6.2.6.
• Description of the remedial measures or contingency plans proposed.	Section 3.2.6 and Section 6.2.6.
• Any funding assurances covering the anticipated post-development maintenance cost, for example on-going groundwater monitoring for the nominated period.	Section 3.2.12.
Groundwater Dependent Ecosystems The EIS must consider the potential impacts on any Groundwater Dependent Ecosystems (GDEs) at the site and in the vicinity of the site, and:	
• Identify and potential impacts on GDEs as a result of the proposal, including: o The effect of the proposal on the recharge to groundwater systems, o The potential to adversely affect the water quality of the underlying groundwater system and adjoining groundwater systems in hydraulic connections, and o The effect on the function of GDEs (habitat, groundwater levels, connectivity).	Section 6.2.3 and Section 6.2.4 and Section 6.3.
• Provide safeguard measures for any GDEs.	Section 3.2.6.
Watercourses, Wetlands and Riparian Land	

The EIS should address the potential impacts of the project on all watercourses likely to be affected by the project, existing riparian vegetation and the rehabilitation of riparian land. It is recommended the EIS provides details on all watercourses potentially affected by the proposal, including:	
• Scaled plans showing the location of:	Not applicable.
○ Wetlands/swamps, watercourses, and top of bank	Not applicable.
○ Riparian corridor widths to be established along the creeks,	Not applicable.
○ Existing riparian vegetation surrounding the watercourses (identify any areas to be protected and any riparian vegetation proposed to be removed),	Figure 3-3
○ The site boundary, the footprint of the proposal in relation to the watercourses and riparian areas, and	Section 6.9.1.
○ Proposed location of any asset protection zones.	Not applicable.
• Photographs of the watercourses/wetlands and a map showing the point from which the photos were taken.	Section 6.2 and Section 6.3.
• A detailed description of all potential impacts on the wetlands, including potential impacts to the wetlands hydrologic regime, groundwater recharge, habitat, and any species that depend on the wetlands.	Section 3.2 and 6.2.6.
• A description of the design features and measures to be incorporated to mitigate potential impacts.	Not applicable.
• Geomorphic and hydrological assessment of water courses including details of stream order (Strahler System), river style and energy regimes both in channel and on adjacent floodplains.	Not applicable.
• Works on waterfront land may be subject to Controlled Activity Approval (CAA) under the Water Management Act 2000. Further information can be obtained from the Office of Water's website.	
Drill pad, well, and access road construction • Any construction activity within 40 m of a watercourse should be designed by a suitably qualified person, consistent with the NSW Guidelines for Controlled Activities on Waterfront Land (July 2012). • Construction of all wells must be undertaken in accordance with the Minimum Construction Requirements for Water Bores in Australia (3rd edition 2012) by a driller holding a bore drillers' licence valid in New South Wales. • The length of time that a core hole is maintained as an open hole should be minimised.	Not applicable.
Landform rehabilitation (including final void management) Where significant modification to landform is proposed, the EIS must include:	
• Justification of the proposed final landform with regard to its impact on local and regional surface and groundwater systems.	Minimal impact. A void will be removed and replaced with a capped landfill.
• A detailed description of how the site would be progressively rehabilitated and integrated into the surrounding landscape;	Section 3.2.11 and Section 3.2.13.
• Outline of proposed construction and restoration of topography and surface drainage features if affected by the project.	Not applicable
• Detailed modelling of potential groundwater volume, flow, and quality impacts of the presence of an inundated final void (where relevant) on identified receptors, specifically considering those environmental systems that are likely to be groundwater dependent.	Not applicable – no additional impact to groundwater movement
• An outline of the measures to be put in place to ensure that sufficient resources are available to implement the proposed rehabilitation.	Section 3.2.11.
• The measures that would be established for the long-term protection of local and regional aquifer systems and for the ongoing management of the site following the cessation of the project.	Section 3.2.12 and Section 3.2.13.

Details of additional correspondence with DPI-W and WaterNSW is detailed below (Appendix C):

- Email to Customer Helpdesk at WaterNSW on 12th November 2018 requiring clarification of the licence that is required under the Water Management Act 2000 for aquifer interference activities. A reply from Angela Lepper (WaterNSW Leeton) on 13th November 2018 requested more information on the location of the facility and the client. Angela also attached a document with a background into Water Management Agencies in NSW.
- Email received from Angela Lepper on 16th November 2018 that she was still seeking an answer.
- Email received from Angela Lepper on 20th November 2018 to pass me on to Prem Kumar at DPI-W as the aquifer interference isn't yet 'switched on'.
- Email to Prem Kumar on 21st November 2018 detailing advice received from WaterNSW
- Email from Ann Smithson (DPI-W) detailing a Water Management Act part 5 licence should be used to put conditions on aquifer interference activities in lieu of aquifer interference approvals having been commenced. Under the Water Management Act 2000 the take of water via the groundwater interception scheme will require an access licence unless an exemption applies. It included a request for client information. A reply from NGH Environmental on 4th December 2018 to Ann Smithson detailed that the client was private, not a local government. Ann Smithson replied on 4th December 2018 that it is WaterNSW's role to provide further assistance as the landfill would be privately owned and operated.
- Email sent to Angela Lepper (WaterNSW) on 4th December detailing the advice she had provided and that NGH Environmental should contact WaterNSW for further assistance.
- Email sent to Simone Tonkin (WaterNSW) on 6th December 2018 requesting confirmation of site water balance requirement and the level of detail required. Simone replied the same day confirming it was required. An additional email to Simone on 11th December requesting confirmation of the detail required for the site water balance was responded to by Simone on the same day.

5.2 LOCAL GOVERNMENT CONSULTATON

WWCC was consulted at an early stage to seek their perspective on the proposal and its assessment.

North Ridge Materials Management Pty Ltd initiated discussion with WWCC staff during 2017 with the first meeting held on 24 October 2017. A copy of the presentation from this meeting is provided in **Error! Reference source not found.**.

WWCC Planning and Heritage officers provided information regarding traffic and heritage which has been used in the preparation of this EIS. The Council did not have any environmental assessment requirements.

A pre-lodgement meeting was held at Wagga Wagga City Council on 17th September 2018 where the project was discussed and the timeline for submission.

5.3 ABORIGINAL COMMUNITY CONSULTATION

An Aboriginal Heritage Due Diligence Assessment was completed for the proposal in accordance with the guidelines as set out in the NSW OEH's *Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales* (DECCW 2010) (refer Section 6.5).

Consultation was not conducted and is not required as the Due Diligence Assessment assessed the site as having a low likelihood of impacting on Aboriginal heritage objects. The low archaeological potential would be due to the extensive disturbance of the existing evaporation ponds. Should there be any unexpected

finds of suspected Aboriginal origin, all work in the immediate vicinity must stop and OEH be notified. In this instance, consultation would occur with the Local Aboriginal Lands Council (LALC) in line with clause 80C of the *National Parks and Wildlife Regulation 2009*.

5.4 COMMUNITY CONSULTATION

Community consultation was undertaken as part of the preparation of this EIS, as required by the SEARs. The following section describes the consultation undertaken.

Effective engagement requires an understanding of community stakeholders and prioritisation of potential impacts. It also relies on the community understanding the project and specific issues of interest to them, in order to contribute effectively. The focus of the consultation process for North Ridge Materials Facility has been on providing this understanding and engagement.

5.4.1 Community consultation activities to date

A range of community engagement tools have been used with regards to the proposal. These include:

- A community information session was held at the Wagga Wagga City Council on 24 October 2017. The session was used to provide proposal information and to answer questions. The session was announced through advertisements and stories in the Wagga Wagga Daily Advertiser on 14 October 2017, 16 October 2017 and 21 October 2017. The concept plan was used as information to discuss the proposed development. These advertisements also provided the contact details for interested parties seeking information.
- A second community information session was held at the Wagga Wagga City Council on 4th October 2018. The session was used to provide updated proposal information and to answer questions. The session was announced through advertisements in the Wagga Wagga Daily Advertiser on 22nd October 2018 and 29th October 2018, and a letterbox drop (including feedback form) to 32 homes within a 2.5 km radius (**Error! Reference source not found.**). The concept plan was used as information to discuss the proposed development. These advertisements also provided contact details for interested parties seeking information. The minutes of this session are included in Appendix C.
- One-on-one consultation was made available to all interested parties.

5.4.2 Results of community consultation

The first (2017) community information session attracted around 28 people and the second session attracted around 21 people. A community attendance register was provided. Those in attendance represented a number of organisations including Salvestro Planning, the Eunony Valley Association, Carbon Mate, Gundagai Community Environmental Impact Group (GCEIG), Wagga Wagga City Council, Recycled Organics Unit and a number of farmers and residents surrounding the proposed development site.

Emailed feedback and three feedback forms were returned after the first community information session.

Feedback from one concerned resident, more than 2 km from the proposed development, was very detailed. Feedback from this resident was primarily a request for further information around the specifics of landfill size, traffic numbers, stage 1 cell size, water management, waste collection from the local area, the use of crushed glass and questions around the key reasons for the facility. The concerned resident also attended the second community information session and following, provided an additional letter.

The second community information session, on 4th October 2018, was to provide updated information, project progress and reply to concerns raised by residents after the first information session in October 2017.

Issues raised have been addressed throughout this EIS:

- Potential impacts to water quality and water users (section 6.2).
- The proponent (section 1.2.1).
- Proposal details (section 3.2).
- Project purpose (section 2).
- Traffic (section 6.8).
- Details about the volume, design and materials of the waste cell (section 3.2 and section 3.3).
- Sensitive receivers for noise, vibration and odour (Figure 3-2, section 6.4 and section 0).

An extensive question and answer session followed the presentation at the second community information session. Questions from attendees and the answers provided by NGH Environmental were minuted and circulated, with the SEAR, to those in attendance who provided email addresses (Appendix C).

Included in the minutes, one resident who lives around 4 km to the east of the proposal invited NGH Environmental staff to his property to understand the effect of noise and odour in the valley. Another resident offered to find photos of the 1990 flood that occurred when the Riverina Wool Combing facility was operational. Another resident who lives beyond 5 km from the proposal but near Schiller's Creek, offered to show NGH Environmental Staff the landscape where he lived and that the properties would experience sheet wash in a flood and not channelised flow to the Murrumbidgee River.

One resident was contacted regarding the flood photos and these were made available to NGH Environmental in November 2018. NGH Environmental has attempted to contact the resident who invited us to their property, more than 4 km from the proposal, to gain an understanding of the noise and odour issues already faced. NGH Environmental will continue to try to contact this resident. NGH Environmental was not contacted by the resident who lives more than 5 km from the site.

5.4.3 Continued engagement

Engagement activities will continue throughout the determination period, particularly in relation to submissions received during the EIS exhibition period. Adjacent landholders and registered parties will be notified of the intention to lodge and of the exhibition period.

Consultation requirements will be reviewed regularly. Consultation will be a focus at key transition phases between different stages of project development (e.g. prior to construction or operation).

The local community would be advised of construction work by way of a "pre-notification" issued to residents by letterbox drop at least two weeks prior to the construction of the proposal. The pre-notification would advise of the timing, hours of work, noise and extra vehicle movements associated with the proposal, as well as contact details of relevant construction staff.

5.5 PUBLIC EXHIBITION AND NOTIFICATION

Section 79(1) of the EP&A Act outlines public participation procedures for designated development which requires that the determining authority must, as soon as practicable after the application is made for consent:

- Place the application and accompanying information on public exhibition for a minimum of 30 days.
- Provide written notice of the application to people as required by the EP&A Act and EP&A Regulation, including adjoining owners and people potentially affected by the proposal.
- Exhibit notice of the application on the land to which the application refers.
- Publish a notice of the application in a locally circulating newspaper on not less than two occasions.
- Invite submissions by any person to the consent authority with respect to the application.

Under the Wagga Wagga DCP, waste disposal facilities proposed for areas zoned IN1 are required to be advertised for a period of 14 days.

5.6 ISEPP CONSULTATION

Is consultation with other agencies required under clause 16 of the Infrastructure SEPP?		
Are the works adjacent to a national park, nature reserve or other area reserved under the *National Parks and Wildlife Act 1974*?	☐ Yes	☒ No
Are the works adjacent to a declared aquatic reserve under the *Fisheries Management Act 1994*?	☐ Yes	☒ No
Are the works adjacent to a declared marine park under the *Marine Parks Act 1997*?	☐ Yes	☒ No
Are the works in the Sydney Harbour Foreshore Area as defined by the *Sydney Harbour Foreshore Authority Act 1998*?	☐ Yes	☒ No
Do the works involve the installation of a fixed or floating structure in or over navigable waters?	☐ Yes	☒ No
Are the works for the purpose of residential development, an educational establishment, a health services facility, a correctional facility or group home in bush fire prone land?	☐ Yes	☒ No
Is it a traffic generating development to be referred to RMS?	☒ Yes	☐ No

6 ENVIRONMENTAL ASSESSMENT

6.1 IMPACT ASSESSMENT APPROACH

A risk assessment was undertaken to characterise the likely adverse environmental risks associated with the construction and operation of the landfill. The aim of the risk assessment was to ensure that all relevant risks were identified, investigated and mitigated as part of the EIS submission, relative to the degree of environmental risk they represented.

The environmental impact assessment below addresses all impacts likely to be attributed to the proposal. This includes consideration of:

- Direct impacts - impacts directly attributable to the construction and operational phases such as:
    - Disturbances to native vegetation, soil, water and air quality.
    - Potential to impact on cultural features and values.
    - Noise generated by equipment and traffic movements.
    - Public safety, pollution risks and hazards.
- Indirect impacts – follow-on or cascading impacts such as:
    - Impacts on the local economy.
    - Potential to impact existing and future land uses.
- Cumulative impacts - the combined potential effects of different impact types as well as the potential interaction with other proposals. For example:
    - The combined impact of traffic and visual impacts for nearby receivers.
    - The combined impact of leachate producing landfill for an undetermined length of time.

The risk rating is a factor of the **consequence** of an impact occurring and the **likelihood** of the impact occurring. Depending on the combination of consequence and likelihood, the overall risk rating could be low to extreme (Table 6-1 Risk assessment matrix

). High to extreme risks (termed 'key risks') have warranted a higher level of investigation. Risks identified as low to medium are discussed in less detail.

Table 6-1 Risk assessment matrix

Likelihood	Consequence				
	Negligible	**Minor**	**Moderate**	**Major**	**Catastrophic**
Remote	Low	Low	Low	Medium	Medium
Unlikely	Low	Low	Medium	High	High
Possible	Low	Medium	High	Very High	Very High
Likely	Medium	High	Very High	Very High	Extreme
Almost certain/ inevitable	Medium	High	Very High	Extreme	Extreme

Measures to minimise and mitigate risks of impacts for each of the high risk aspects have been developed so as to reduce the resultant risk ('residual risk') to an acceptable level. Medium and low risks are considered manageable and are investigated by site inspection and desktop review.

Table 6-2 Risk assessment rating matrix

Aspect	Likelihood	Consequence	Risk rating	Residual risk rating*
Soils and water	Unlikely	Moderate	Medium	Low
Biodiversity	Unlikely	Minor	Low	Low
Climate and air quality	Likely	Minor	High	Low
Aboriginal heritage	Unlikely	Moderate	Medium	Low
Non-indigenous heritage	Remote	Minor	Low	Low
Noise and vibration	Likely	Minor	High	Medium
Hazards and risks	Possible	Minor	Medium	Low
Traffic	Likely	Minor	High	Low
Waste and resource management	Likely	Minor	High	Low
Social and economic	Remote	Minor	Low	Low
Visual Amenity	Unlikely	Minor	Low	Low

*Residual risk after implementation of management measures.

6.2 SOILS AND WATER

SECRETARY'S ENVIRONMENTAL ASSESSMENT REQUIREMENTS

Soil and water, including:

- *Existing and proposed water licensing requirements in accordance with the Water Act 1912 and/or the Water Management Act 2000;*
- *A description of the measures proposed to ensure the development can operate in accordance with the requirements of any relevant Water Sharing Plan, Floodplain Management Plan, or water source embargo;*
- *A description of local soils, topography, drainage, and landscapes;*
- *Details of sediment and erosion controls;*
- *A detailed site water balance;*
- *An assessment of potential impacts on the quality and quantity of surface and groundwater resources;*
- *An assessment of flooding impacts, including potential impacts to and resulting from the development;*
- *Details of the proposed stormwater and wastewater management systems (including sewage), water monitoring program, and other measures to mitigate surface and groundwater impacts;*
- *Details of leachate collection and management;*
- *Characterisation of the nature and extent of any contamination on the site and surrounding area; and*
- *A description and appraisal of impact mitigation and monitoring measures.*

EPA'S REQUIREMENTS

The environmental objectives for water quality are as follows:

- *No pollution of, or discharge to waters (including surface and groundwater), except to the extent authorised by EPA (i.e. In accordance with an Environment Protection Licence); and*
- *All polluted water (including leachate, wash down waters, polluted stormwater, or onsite amenities effluent) is captured on the site and collected, treated, and beneficially reused where this is safe and practicable to do so.*

The EIA should document the measures that will be implemented to achieve these objectives, and include (but not be limited to) the following specific aspects:

- *Leachate barrier system: clearly describe and detail the proposed leachate barrier system, including proposed materials and details of the cell development;*
- *Leachate collection and management system: general details of the drainage layers, pipework and risers, pump, leachate ponds, intended method of disposal or reuse, and leachate monitoring. This must include a leachate balance undertaken in accordance with the Landfill Guidelines and account for the water contained in the waste as received at the proposed facility;*
- *Surface water controls: details of the proposed surface water controls that will be installed. These controls should be designed in accordance with the guideline* Managing Urban Stormwater: Soils and Construction – Volume 2B Waste Landfills *(DECC, 2008);*
- *Groundwater assessment: a comprehensive hydrogeological investigation and impact assessment for the site and the surrounding groundwater to identify with a high degree of*

certainty the groundwater quality, flow pathways, and vulnerability to contamination for all aquifers; and

- *Groundwater monitoring network: with the potential risk to groundwater resources, the groundwater assessment should provide details of the proposed groundwater monitoring network, including locations and depth of all hydraulically up-gradient and down-gradient monitoring bores; and*
- *Groundwater and surface water monitoring program: the proposal must also include details of the proposed groundwater and surface water monitoring program, which must include upstream/up-gradient monitoring and downstream/down-gradient monitoring, and background monitoring.*

WATER NSW'S REQUIREMENTS

Access to surface and groundwater resources:

- *Annual volumes of surface water and groundwater proposed to be taken by the activity (including through inflow and seepage) from each surface and groundwater source as defined by the relevant water sharing plan;*
- *Assessment of any volumetric water licensing requirements (including those for ongoing water take following completion of the project;*
- *Assessment of the impact and approvals (Works and Use Approvals under the WMA 2000) required for the taking or storage of water;*
- *The identification of an adequate and secure water supply for the life of the project. Confirmation that water can be sourced from an appropriately authorised and reliable supply. This is to include an assessment of the current market depth where water entitlement is required to be purchased;*
- *A detailed and consolidated site water balance;*

Impact on surface and groundwater resources:

- *Assessment of impacts on surface and ground water sources (both quality and quantity), related infrastructure, adjacent licensed water users, basic landholder rights, watercourses, riparian land, and groundwater dependent ecosystems, and measures proposed to reduce and mitigate these impacts;*
- *Full technical details and data of all surface and groundwater modelling;*
- *Proposed surface and groundwater monitoring activities and methodologies;*
- *Proposed management and disposal of produced or incidental water.*

WAGGA DCP REQUIREMENTS

Developments applications shall include an assessment of the potential contamination of the development site, and details of measures to address any contamination identified.

6.2.1 Relevant Guidelines

The following guidelines are relevant to the development of water quality objectives for the proposal:

- NSW EPA's *Environmental Guidelines: Solid Waste Landfills* (2016).
- Landcom (2004), *Managing Urban Stormwater- Soils and Construction*, Volume 1, 4th Edition (The Blue Book).
- ANZG 2018 guidelines for water quality management for aquatic ecosystems and primary industries – irrigation.

- NSW DECCW (2008), *Managing Urban Stormwater-Volume 2E Mines and Quarries*, NSW Department of Environment, Climate Change and Water.
- Approved Methods for the Sampling and Analysis of Water Pollutants in NSW – March 2004.
- Environmental Best Management Practice Guideline for Concreting Contractors, DEC 2004.
- ARTA's Guidelines for the Control of Erosion and Sedimentation in Roadworks.

6.2.2 Existing environment

Topography

The topography of the SWS bioregion is dominated by the foothills and ranges of the inland slopes of the Great Dividing Range to the edge of the Riverina Bioregion. The topography of the locality is comprised of undulating rises and low hills with slope gradients between 3 % and 10 %. The landform comprises of crests and ridges, long waning slopes, and shallow drainage lines. The development site is generally flat to gently undulating, sloping down to the east.

Geology

The 1:250000 Surface Geology of Australia Map from Geoscience Australia (2017) indicates that the locality is underlain by Silurian granites, described as mainly felsic intrusive rocks ranging in composition from alkali feldspar granite to tonalite, and including associated migmatite, gabbro, and diorite. The main stratigraphic units are Wantabadgery Granite, with lithology of massive biotite granite and granodiorite, and Collingullie Granite, with occasional Burrandana Granite.

Soil

The pattern of soils in the SWS bioregion includes shallow, stony soils on the tops of ridges and hills, and texture-contrast soils with subsoils derived from weathered bedrock and topsoils from coarse, weathered material from the upper slopes on the lower slopes. Dryland salinity is widespread across the bioregion.

A search of CSIRO's Australian Soil Resource Information System showed that the bedrock in the development site is overlain by dermosol and kandosol soils (ASRIS, 2014). The soil landscape in the area is classified as East Bomen, which extends from north of the Murrumbidgee Floodplain to around Yarragundry-Collingullie with a small area south of Uranquinty and is formed by aeolian processes. This soil landscape is prone to soil erosion. The *Soil Landscapes of Wagga Wagga 1:100, 000 Sheet* (DLWC, 1997) describe the East Bomen soils as shallow to moderately deep (40-150 cm) Eutrophic Red Dermosols on crests and ridges, deep (80 – 200 cm) Eutrophic Red Dermosols on slopes, and moderately deep (80-150 cm) Eutrophic Brown Dermosols in drainage lines. Dermosols are typically well-structured with a moderate to high erosion hazard depending on slope and groundcover. The East Bomen soil landscape is typically composed of the following stratigraphy (Table 6-3):

Table 6-3 Typical stratigraphy of East Bomen soil landscape

Code	Soil Type	Description	Limitations
eb1	Dull loam (topsoil-A1 horizon)	Dark to dull, sandy loam to clay loam, massive; field pH 5.0-5.5.	Moderately acid, low wet bearing strength (localised), salinity (localised), low fertility, sodicity (localised), hardsetting (localised).
eb2	Reddish light clay (b1 horizon)	Reddish brown, light clay, massive; field pH 6.0-6.5.	Low wet bearing strength (localised), salinity (localised), low fertility, sodicity (localised).

Code	Soil Type	Description	Limitations
eb3	Reddish brown light clay (subsoil-B21 horizon)	Bright reddish brown to reddish brown, light clay to medium clay, massive to strong pedal; field pH 6.0-7.5.	Low fertility, sodicity.
eb4	Yellowish light medium clay (subsoil-B22 horizon)	Dull yellow orange to yellowish brown, light medium clay, moderate to strong pedal; field pH 6.0-7.0.	Low fertility, low wet bearing strength.
eb5	bright sandy light clay (subsoil-BC horizon)	Orange to bright yellowish, brown coarse sandy light clay, moderate pedal; field pH 6.0-8.0.	Low fertility, low wet bearing strength.

There are four soil profiles listed on the OEH eSPADE database (OEH, 2017) in the vicinity of the development site (Figure 6-1, Appendix D.2).

The first of these, shown as profile 1 Figure 6-1, was taken on a hillslope used for improved pasture under dry sclerophyll forest. The profile is described as imperfectly drained, with hard set surface condition, slight erosion hazard, and no evident salting. The soil type was classified as Red Earth, with fine loamy sand to fine sandy clay loam in the upper profile and sandy to medium clay in the lower profile.

Profile 2 was taken in an area used for cropping, with low slope and a southerly aspect. The soil type was classified as Mottled Eutrophic Brown Dermosol, with coarse sandy clay loam in the upper horizon and light clay in lower horizons.

Profile 3 was also taken in a cropping area with low slope and southerly aspect. The profile is described as moderately well drained, and no evident salting. The soil type was also classified as Mottled Eutrophic Brown Dermosol, with loam in the upper horizon and light to light-medium clay in the lower horizons.

Profile 4 was taken to the north of the subject lots, on a low slope with a southerly aspect. The soil type was also classified as Mottled Eutrophic Brown Dermosol, with loam in the upper horizon and light to light-medium clay in the lower horizons.

McMahon Earth Science determined the soil types in six test pits along the western edge of the proposed waste cell, within the development footprint, on 21 February 2017. On 24 March 2017, McMahon Earth Science determined the soil types in four test pits down gradient of the middle evaporation pond within the development site.

Pit depths along the western ridge of the proposed waste cell ranged from around 1.25 m to 3.0 m where refusal occurred at rigid clay. All pits contained a yellow to reddish yellow silt layer at the top approximately 0.1 – 0.25 m. Pits 1, 2, 3 and 5 had a black lanolin oil residue layer, approximately 0.1 m below the surface layer. Pits 1, 2 and 3 contained sandy clay layers below the lanolin. These pits were the closest to the southern end of the proposed waste cell. Full details are available in Appendix O.

Geotechnical assessment of the Yellowish Brown medium clay of the proposed waste cell was undertaken by McMahon Earth Sciences on 21 February 2017 (Appendix M). The sample was taken from a depth between 2.5 to 3 m. This material would be reused in the construction of the waste cell with treatment. Table 6-4 describes the test report for pavement materials, fills, subgrade and soils.

Table 6-4 Test report results for sample number 4125/2.1 for pavement materials, fills, subgrade and soils

Tests	Pre-treatment	Result
T107	Pass 425 µm sieve	92.3 %
	Pass 75 µm sieve	63.7 %

Tests	Pre-treatment	Result
	Less than 13.5 µm sieve	21.9 %
AS1289.3.1.2	Liquid limit	46 %
AS1289.3.2.1	Plastic limit	33 %
AS1289.3.3.1	Plasticity index	13 %
T113	Linear shrinkage	8.5 %
T111	Maximum dry density (MDD)	1.614 t/m^3
	Optimum moisture content (OMC)	21.7 %
T120	Field moisture content	20.2 %

Table 6-5 describes the test report results for falling head permeability. The permeability results indicate that with a gypsum or cement treatment to reach a permeability of no greater than 1x10^{-09} m/s, the soil can be reused on site for landfill clay lining and capping.

Table 6-5 Test report results for sample number 4125/2.1 for falling head permeability

MDD (t/m^3)	OMC (%)	Dry density of specimen (%)	Moisture moulding (%)	% of OMC	% of MDD	Permeability (m/s)
1.614	21.7	1.676	21.3	98.2	103.8	2.23x10^{-08}

The descriptions of the sample pits down-gradient of the middle pond show the black lanolin oil residue layer is not present. However, there was lanolin found throughout the profile in bore hole 1 and 2. Lanolin oils were present on all ped and aggregate faces and throughout profile in bore hole 1, to a depth of 2.75 m (Appendix O).

Contamination

A search of NSW EPA's Contaminated Lands Register on 26 April 2018 found three listings in Wagga Wagga LGA. Two of these are in the township of Wagga Wagga, and one in the village of Tarcutta. No known contaminated sites were found in or near the development site.

On the list of *NSW Contaminated Sites Notified to EPA* as of 16 April 2018 there are 15 sites in Wagga Wagga listed as contaminated sites. None of these sites are found in or near the development site.

As above, there is a black waxy residue present throughout many of the soil profiles of the proposed waste cell, tested by McMahon Earth Sciences (Appendix M and Appendix O). Results of a Preliminary Site Investigation of the development footprint show high concentrations of long-chain hydrocarbons, which are reflected in the results of the Ecological Screening Limits (ESLs) and Management Limits for fractions F3 and F4.

Some ESLs and Management Limits have been exceeded, particularly for Fractions 3 and 4. However, as the waxy residue is naturally derived from sheep's wool, the associated risk to human and environmental health is low.

Therefore, the ongoing use of the site for commercial/industrial land use is appropriate. Immediate intervention is not necessary, and the environmental risks are considered to be manageable. Levels of pesticides were below the method detection limit in the samples tested.

Full results are available in the Preliminary Site Investigation (Appendix R).

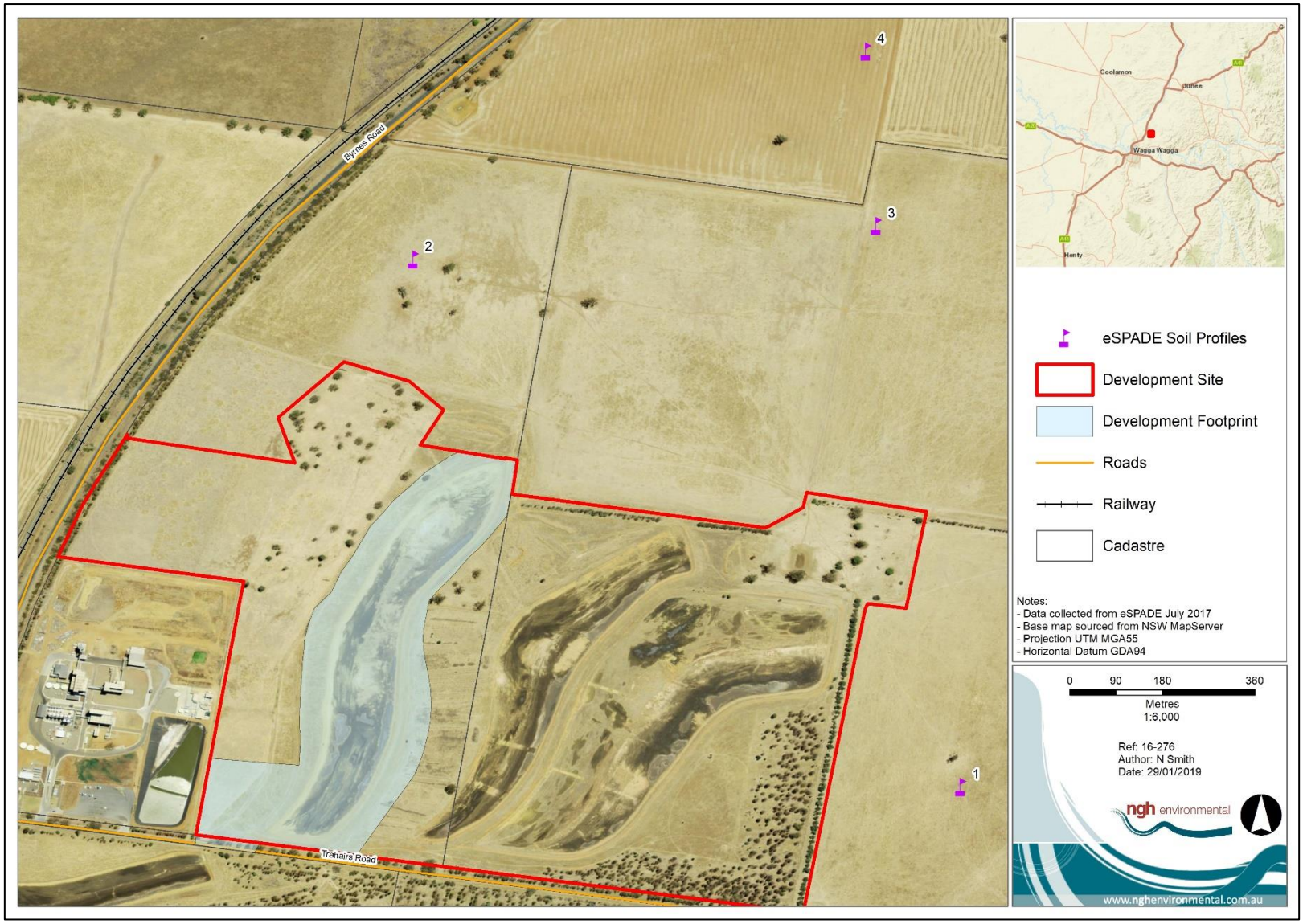

Figure 6-1 Location of eSPADE soil profiles in proximity to the development site

6.2.3 Hydrology and water quality

Existing environment - Surface water

The development site is in the upper catchment of the Murrumbidgee River, which is around 6 km south of the development site, and within the Murrumbidgee Catchment Management Area. The Murrumbidgee River is the primary water supply for a number of different users, including major population centres such as Wagga Wagga, large irrigated agricultural and pastoral areas, aquaculture, and industry. Water is also allocated for environmental flows. The Murrumbidgee River is a regulated system, and water supply to users is the responsibility of WaterNSW. Surface water quality in Murrumbidgee CMA has been affected by extensive clearing and other land management practices in the catchment, leading to increased turbidity, nutrient levels, bacterial pollution, and pesticide levels (EPA, 1995).

Drainage of the site is primarily through sheet flow and ephemeral, poorly-defined drainage lines. There are no streams that run through the development site. There are minor drainage lines around 100 m south of the development site boundary, about 1 km east of the development site (Schillers Creek), and Dukes Creek around 2 km west of the development site. Drainage in the locality generally flows from north to south towards the Murrumbidgee River (Figure 6-2).

Adjacent water users to the development site are included in Table 6-6.

Table 6-6 Adjacent water users to the proposed North Ridge Materials Facility

Water User	Licence and issue date	Location
DP 751405 Lot 110	40BL186402 19/02/1997	South of site, adjacent to middle and eastern evaporation ponds.
DP 771340 Lot 1	40BL186402 19/02/1997	South of the site along Byrnes Road, the former Wool Combing facility.
DP 1130519 Lot 12	40BL192539 19/11/2010 40BL192622 30/04/2014	ROBE facility, immediately west of the proposed site.

The development site is not listed as flood prone land in the Wagga Wagga LEP (2010). The development site is beyond the North Wagga Hydraulic Extent of the Wagga Wagga Major Overland Flow Flood Study (WMA Water 2011). The existing evaporation ponds would act as flood storage zones.

The impacts associated with overland flooding are discussed in section 6.2.4. The proposed development will account for overland rainfall by implementing mitigation measures and safeguards, discussed in section 6.2.6.

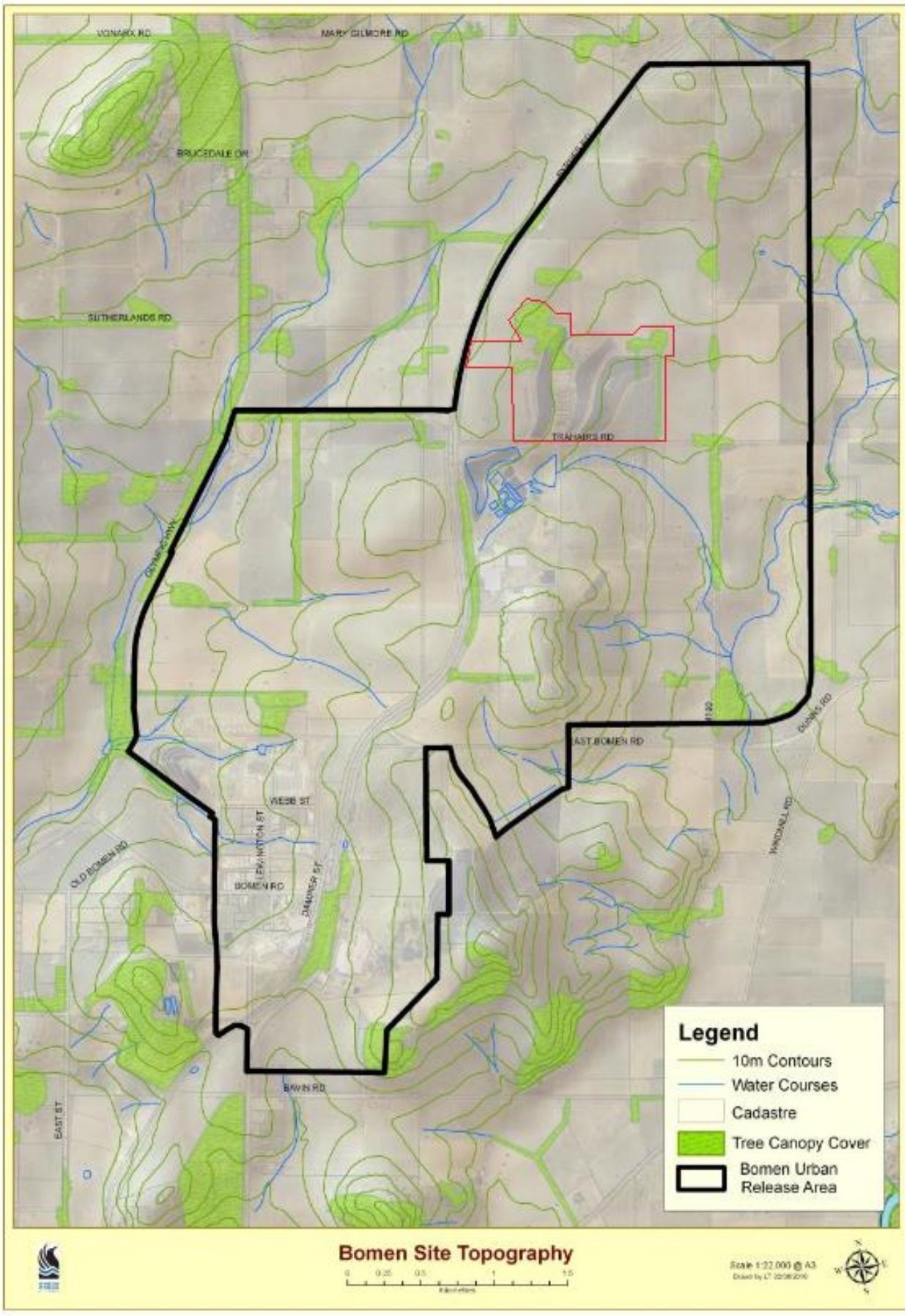

Figure 6-2 Drainage of Bomen industrial area, including development site (outlined in red).

The proposal would be situated on and around the historic effluent evaporation ponds of Riverina Wool Combing, a decommissioned wool scouring facility. These ponds were used to store and evaporate saline effluent and have not been in use for around 15 years. The ponds are predominantly dry. However, after rainfall, water pools in depressions (Figure 6-3). The ponds were constructed in the early 1980s.

Figure 6-3 Existing western effluent evaporation pond with pooled water following rainfall

There are two farm dams located on-site (Figure 3-3) that were constructed prior to 2013. The northern dam will be receiving the stormwater runoff that will be diverted from the west of the proposed facility. This dam has an approximate capacity of 3 518 m^3. The southern farm dam has an approximate capacity of 794 m^2.

Existing environment - Hydrogeology

Surface water and groundwater interactions range in connectivity throughout the catchment. Connectivity is high in some areas, seasonal in other areas to longer variations in connectivity or totally disconnected (Green et al. 2011). Upland streams around the development site and throughout the catchment are hydraulically connected, where flow is received from fractured rock aquifers. In addition to groundwater within the weathered granite zone, groundwater is likely to flow through fractures within the underlying granite bedrock, with variable flow rates depending on the local interconnectivity of fractures (DPI-W 2018).

There are three groundwater units in the Wagga Wagga region. These are Ordovician metasediments, Silurian granites and Tertiary and Quaternary alluvium (Paul et al. 1996). The Ordovician metasediments are mostly comprised of phyllite and shale and are generally well fractured (Paul et al. 1996).

The major aquifer of the proposed development site is fractured rock (Figure 6-4) and part of the Lachlan Fold Belt (Green *et al.* 2011), which covers 16,722,000 ha in the NSW Murray-Darling Basin (MDB) (NSW Government 2011). However, the source of most of the water for town water supply, and stock and domestic on the Murrumbidgee floodplain is from the two alluvial aquifers, the Tertiary Lachlan formation (deep) and the Quaternary Cowra Formation (shallow) (Mitchell 2009).

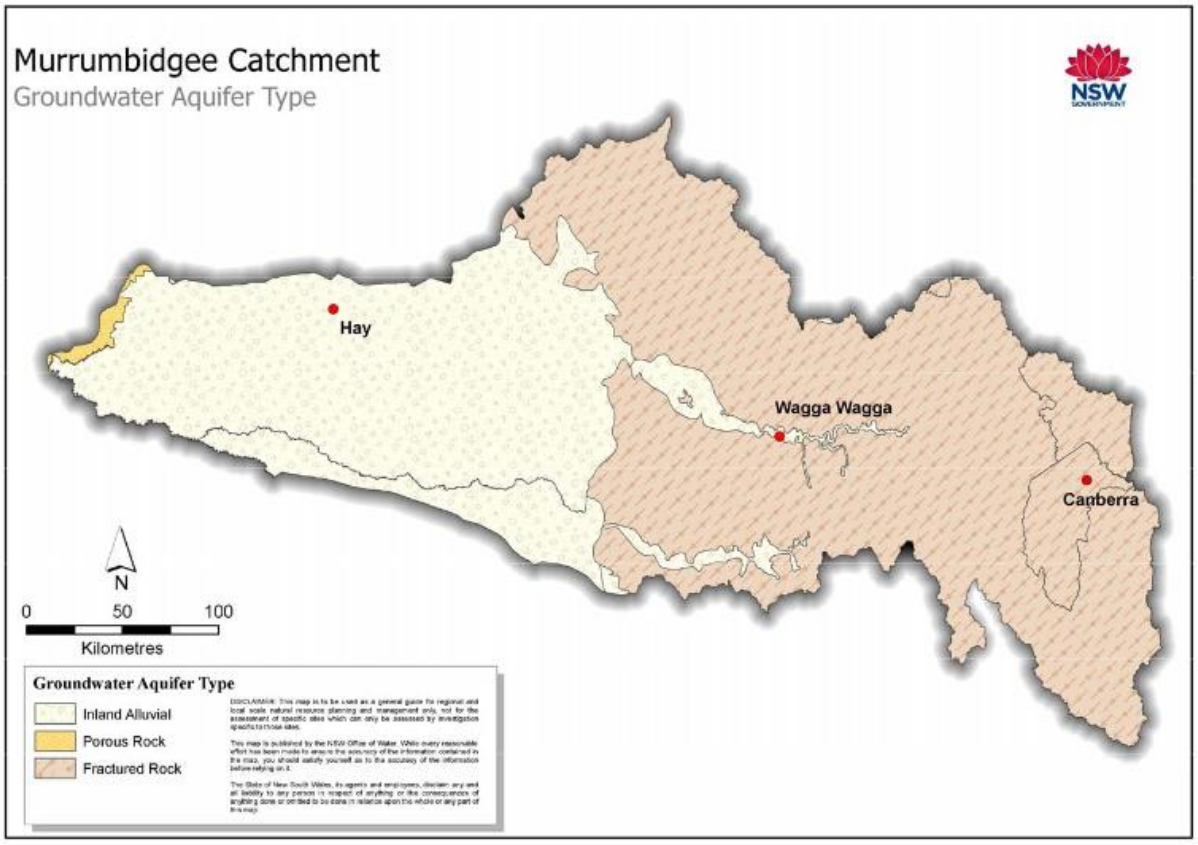

Figure 6-4 Major aquifer types of the Murrumbidgee Catchment (Green *et al.* 2011)

Historical records identified two aquifers beneath the development site. There is a shallow aquifer at approximately two metres depth and a deeper aquifer between four to 13 m depth. Both are a product of the Silurian granites below the site. The general characteristics of groundwater associated with these types of aquifers include low rates of supply and are generally moderate to brackish (Green et al. 2011). Therefore, in some circumstances it is not suitable for domestic use (Figure 6-5).

The connectivity between the groundwater of the Lachlan Fold Belt fractured rock aquifer beneath the proposed site and surface waters is low to moderate with a low level of impact on instream values (NSW Government 2011). The estimated travel time between groundwater and surface water of this aquifer system is of years to decades (NSW Government 2011a).

The average annual rainfall for the Lachlan Fold Belt MDB aquifer is approximately 519.43 mm/yr, with an infiltration rate of 4 % and a total estimated average annual rainfall recharge of 3,474,364 ML/yr for the 16,721,908 ha (NSW Government 2011).

Minimal data exists on the flow paths of groundwater prior to the excavation of the evaporation ponds. However, shallow sources of groundwater are expected to flow west-north-west to east-south-east from elevated land to lower elevations and along watercourses (McMahon 2010).

The groundwater recharge rate in Wagga Wagga has been modified as a result of land clearing for agriculture and urban development. The rates of groundwater recharge under different scenarios are shown in Table 6-7. For a catchment area of approximately 27 km^2, the volumetric catchment recharge rate is estimated to be 1,215 ML yr^{-1} (Cook et al. 2001).

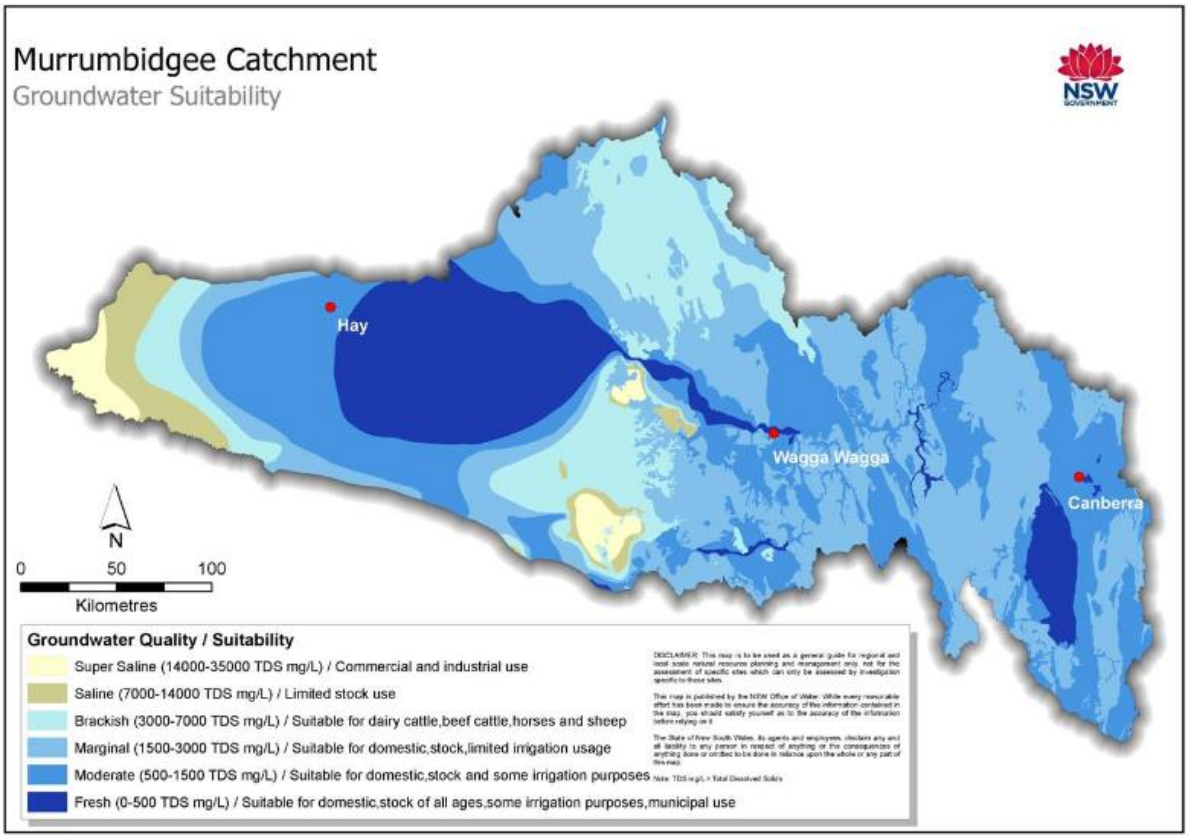

Figure 6-5 Major aquifer types of the Murrumbidgee Catchment (Green et al. 2011)

Table 6-7 Groundwater recharge rates for Wagga Wagga (Cook et al. 2001)

Scenario	Recharge rate (mm yr^{-1})
Native vegetation	1.3
Agricultural land	15
Urban areas	55

Low permeability clays in the northern part of the Murrumbidgee Catchment result in waterlogging, preventing groundwater from easily moving away from the area (Cook et al. 2001). In areas of Wagga Wagga affected by salinity, the depth of the water table has been recorded at less than 2 m (Cook et al. 2001).

Wagga Wagga LEP (2010) indicates that the development site does not occur in an area of groundwater vulnerability.

EXISTING GROUNDWATER MONITORING NETWORK

The NSW DPI-Water database of groundwater lists 12 bores in the development site Figure 6-6). The details for the 12 bores are shown in Table 6-8. There are a further 40 licensed bores within 2 km of the development site (DPI-W 2018). Two of these are for stock (west) and stock and domestic (south-west) supply. Both bores are more than one kilometre from the site. Thirteen of these are monitoring bores contained within the ROBE facility site to the west. Of the remaining monitoring bores, 21 are located to the south of the site and four to the south-east.

Falling head permeability tests conducted in the vicinity of the development site showed lateral infiltration rates of around 0.15 m/d in sandy clay and 0.0012 m/d to 0.0018 m/d in clay with minor sand content (ROBE 2008).

Figure 6-6 Licensed bores within 2 km of the development site (DPI-W 2018)

Table 6-8 Monitoring bores within the development site (DPI-W 2018)

Bore ID	Authorised purpose	Drilled depth (m)
GW400114	Monitoring bore	7.80
GW400093	Monitoring bore	7.40
GW403039	Monitoring bore	2.75
GW403042	Monitoring bore	7.88
GW403038	Monitoring bore	10.55
GW403040	Monitoring bore	2.80
GW403041	Monitoring bore	2.80
GW400122	Monitoring bore	2.00
GW400123	Monitoring bore	4.00
GW400092	Monitoring bore	4.80
GW400120	Monitoring bore	2.80
GW400121	Monitoring bore	5.50

A total of 16 paired groundwater monitoring wells are located in and around the development site. These wells are in addition to the bores mentioned above (ROBE 2008). Monitoring wells 1 to 12 and 14 to 20 are

nested, with the first intercepting the shallow aquifer (around 2 m) and the second intercepting the deeper aquifer (ranging from 4 to 13 m).

Monitoring wells P1 - P10 are within the development site and P11 is adjacent to the proposed development footprint. Monitoring wells P1 – P7 and P11 are closest to the development footprint and are proposed for use (Figure 6-8). The details associated with monitoring wells P1 – P11 are shown in Table 6-9, including the wet/dry characteristics for P1A to P6B (McMahon 2010).

Table 6-9 Monitoring well descriptions for P1 - P11, which are located in and adjacent to the development site

Monitoring well ID	Australian height datum	Location description	Position to development footprint	Well depth (m)	Characteristic
P1a (shallow)	227.85	Evaporation Basin 3	Down-gradient	1.80	Dry
P1b (deep)	227.875	Evaporation Basin 3	Down-gradient	11.00	Wet
P2a	228.17	Evaporation Basin 3	Down-gradient	1.80	Dry
P2b	228.17	Evaporation Basin 3	Down-gradient	6.90	Dry
P3a	228.16	Evaporation Basin 3	Down-gradient	1.85	Dry
P3b	228.16	Evaporation Basin 3	Down-gradient	4.90	Dry
P4a	228.52	Evaporation Basin 3	Down-gradient	1.70	Dry
P4b	228.52	Evaporation Basin 3	Down-gradient	11.05	Sporadically wet
P5a	222.27	Evaporation Basin 4	Down-gradient	1.80	Dry
P5b	222.27	Evaporation Basin 4	Down-gradient	4.40	Wet
P6a	222.58	Evaporation Basin 4	Down-gradient	1.80	Dry
P6b	222.58	Evaporation Basin 4	Down-gradient	5.40	Wet
P7a	222.47	Evaporation Basin 4	Down-gradient	1.80	-
P7b	222.47	Evaporation Basin 4	Down-gradient	4.90	-
P8a	218.03	Evaporation Basin 5	Down-gradient	1.80	-
P8b	218.03	Evaporation Basin 5	Down-gradient	5.50	-
P9a	218.31	Evaporation Basin 5	Down-gradient	1.80	-
P9b	218.31	Evaporation Basin 5	Down-gradient	3.80	-
P10a	218.28	Evaporation Basin 5	Down-gradient	1.80	-
P10b	218.28	Evaporation Basin 5	Down-gradient	8.35	-
P11a	228.79	South of western pond	Up-gradient	1.70	-
P11b	228.79	South of western pond	Up-gradient	11.05	-

As groundwater flows in an east-south-easterly (ESE) direction, groundwater resources to the ESE would be most at risk. The four bores to the south-east of the proposed development footprint are between 1.3 and 1.55 km from the southern end of the proposal and described in Table 6-10. There is currently no water quality data available for these monitoring bores. However, it would be a recommendation to utilise these monitoring bores before, during and post closure of the proposal.

Table 6-10 Bores ESE of the proposed development footprint

Bore ID	Authorised purpose	Drilled depth (m)	Approximate distance from proposal (km)
GW415965	Monitoring bore	12.00	1.35
GW415966	Monitoring bore	2.00	1.35
GW415964	Monitoring bore	9.00	1.50
GW415968	Monitoring bore	2.00	1.50

Groundwater levels have been routinely monitored since 1997. Results across the monitoring bores at the site indicate an overall decline in groundwater levels. This could be associated with the drought conditions experienced during this period. Trends in the groundwater monitoring data show there is minimal connectivity between the two aquifers, with the difference in the levels of paired wells greater than 7 m (McMahon 2010).

In 2008, all monitoring wells located within the shallow aquifer were dry, excluding monitoring wells P19a and P20a (ROBE 2008). The presence of water in this shallow aquifer east of the development site could be the result of the irrigation undertaken within and adjacent to the paddock where the wells are located, or different geology (ROBE 2008).

The annual average standing water levels for the monitoring wells in and around the development site were recorded (ROBE 2008). Some wells displayed higher standing water levels during years of increased rainfall. However, the majority of reported standing water levels for the shallow water aquifer were erratic, indicating the shallow aquifer could be influenced by surface activities and the use of the evaporation ponds, rather than rainfall events.

Within the deeper aquifer, standing water levels typically followed trends in regional rainfall patterns. This indicates that the deeper aquifer is influenced more by rainfall and not the use of the evaporation ponds (ROBE 2008).

Contour plots were produced for the groundwater data within the development site for the years the ponds were and were not in use (ROBE 2008). The plots show little change in the direction of groundwater flow between seasons and pond use and non-use. The deep aquifer groundwater generally flows in a southeast direction. Overall, climatic conditions seem to have a greater influence on groundwater levels at the development site than the evaporation ponds (ROBE 2008).

All shallow bores have been dry since 2007 (Table 6-9), indicating that higher rainfall events during the period of 2008 to 2010 did not have an impact on recharging the shallow aquifer (McMahon 2010). During 28 October 2009 to 16 November 2010, groundwater depths were measured monthly for bores 1A to 6B. Between 1 January 2007 and 6 May 2009, weekly groundwater depths were taken (McMahon 2010). A hydrograph for bores 1B, 5B and 6B was produced. It includes bore 13, which is not required for this study (Figure 6-7).

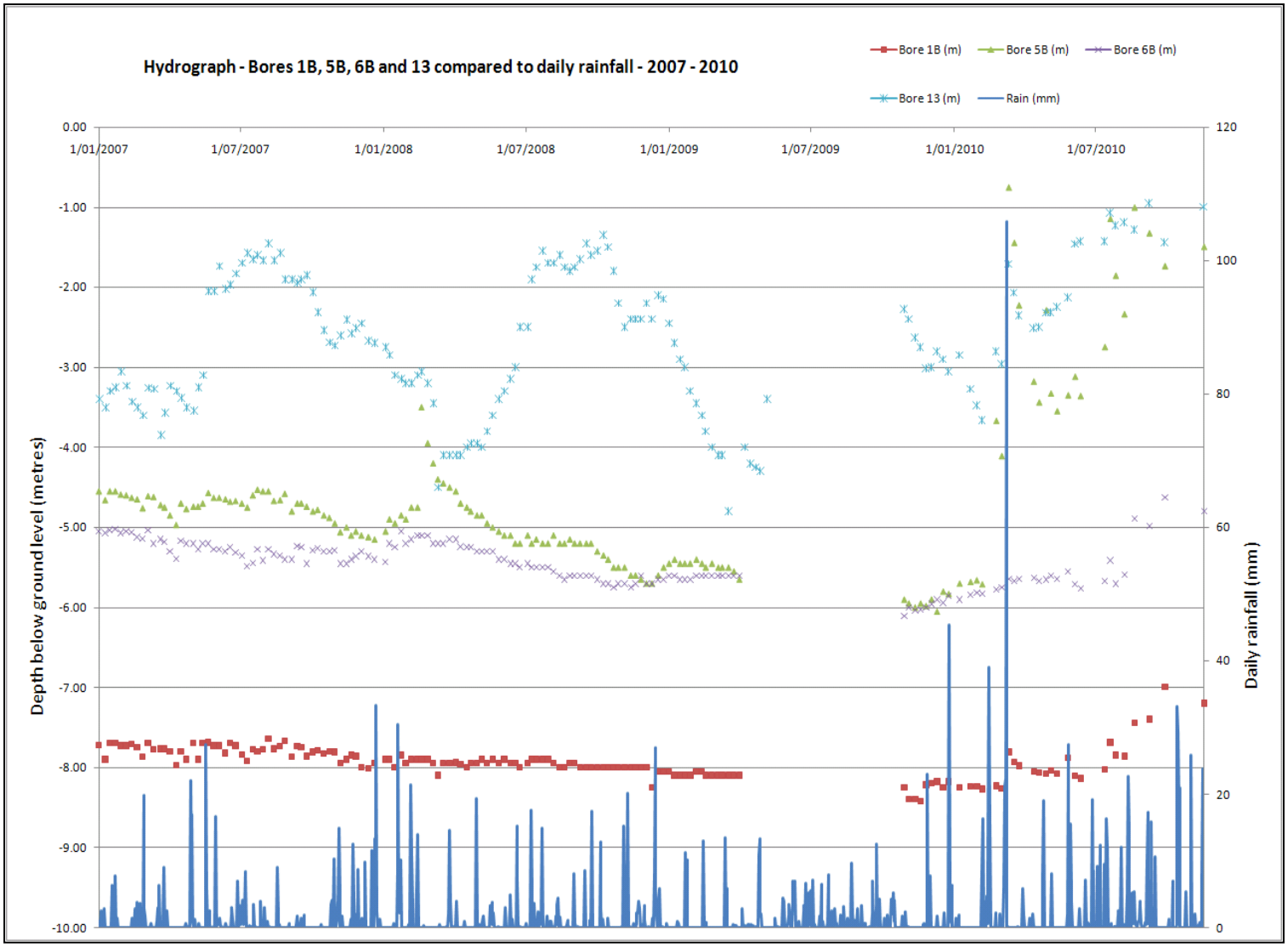

Figure 6-7 Existing bore groundwater heights and daily rainfall (McMahon 2010)

The water depth in bores 1B, 5B and 6B have remained steady since 2007 and show a slight increase in water depth in 2010, coinciding with increased rainfall throughout the year (McMahon 2010).

Groundwater analytic results were reported in the annual environmental reports for the Riverina Wool Combing facility and assessed against the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZG 2018) for Primary Industries (irrigation) Water. The results of the groundwater quality assessment found that the groundwater is generally neutral to alkaline and considered to be brackish. Concentrations of calcium carbonate were reported in excess of the assessment criteria, and therefore indicates the water is very hard. There were minimal variations in reported results between 2004 when the ponds were in use and 2006 when the ponds were no longer in use (ROBE 2008). Analysis of bores P5B and P6B for groundwater quality are presented in **Error! Reference source not found.** below. It includes analysis results by Riverina Wool Combing 2003 – 2006 (ROBE 2008) and analysis results from December 2008 (McMahon 2010).

RECENT GROUNDWATER MONITORING

On Wednesday 20th June 2018, two consultants from NGH Environmental purged the monitoring bores (Figure 6-8) down-gradient of the proposed waste cell (P1A to P10B). All bores were dry except for P1B. The well depth of bore P1B was 11.35 m below the soil surface with a standing water level of 7.63 m.

On Friday 22 June 2018, one consultant from NGH Environmental took a bore sample from P1B for analysis at Charles Sturt University's Environmental and Analytical Lab (EAL) in Wagga Wagga and ALS Scoresby (sample ID 5714090) (Appendix N). The well depth of bore P1B was 11.35 m below the soil surface with a standing water level of 8.22 m. Table 6-11 presents the results of the P1B sample compared to the groundwater quality results of monitoring wells P1B, P5B and P6B from 2003 to 2008. The monitoring well data has been compared to the ANZG (2018) irrigation criteria and GILs for freshwater ecosystems.

NEPM (2013) Groundwater Health Screening Level D (GHSL D) is part of a Tier 1 risk based generic assessment criteria. The assessment criteria assess the potential risks to human health from exposure to inhalation of vapours from contaminants in the groundwater. Other GHSLs are Residential (A/B) and Open Space/ Recreational (C). Therefore, the groundwater assessment is based on the criteria for GHSL D.

NEPM Groundwater Investigation Levels (GILs) for drinking water quality and fresh water ecosystems were adopted from the Australian Drinking Water Guidelines and the ANZG 2018 guidelines for Fresh and Marine Water Quality. They were used to determine if further investigation was required into groundwater contamination when the GIL thresholds are exceeded. The full report is available in the Preliminary Site Investigation (Appendix R).

Although potential drinking water wells east and southeast of the site are beyond attenuation zones (dilution of contaminants over distance), GILs were considered because:

- Potential contamination of groundwater on site from on-site contamination associated with the effluent ponds and windrowed material.
- There are 40 licensed bores within 2 km of the site, which are primarily used for irrigation and two for stock/ stock and domestic. However, these two wells are west and north-west of the site and as such unlikely to be impacted.

ALS Water analysed the P1B bore sample for BTEXN (Benzene, Toluene, Ethyl Benzene, Xylene, Naphthalene), total recoverable hydrocarbons (TRH), total petroleum hydrocarbons (TPH), organochlorine pesticides (OC) and organophosphorus pesticides (OP). Results indicate that all analytes tested in the sample are at or less than the standard limit of reporting (Appendix N). Charles Sturt University's

Environmental and Analytical Laboratory analysed the samples for total metals and other analytes. Full results are available in Appendix N.

The results indicate that the groundwater from bore P1B remains uncontaminated by BTEX hydrocarbons, heavy metals and pesticides (Appendix R). The groundwater results are below the groundwater HSL for 8 m+.

The groundwater testing results for bore P1B indicate that the majority of the analytes tested are below the thresholds for commercial and industrial land use. The results also indicate that levels of the majority of analytes tested are below threshold levels for the groundwater investigation levels for drinking water and for freshwater ecosystems or below the limit of reporting.

No bores for stock and/or domestic use have been identified within close proximity to the site that are within the direction of the identified groundwater flow path. Therefore, the attenuation zone between the site and abstraction zones would be great enough that groundwater quality objectives are not exceeded. Results indicate that there are no exceedances of the GILs for drinking water, which have remained in the assessment.

The analytes that are elevated against threshold values include chromium, copper, lead and zinc. These are elevated against the groundwater investigation levels for freshwater ecosystems. Elevated background levels of these trace elements are expected to be the result of the fractured granite aquifer source (Kumar 2013). Levels of chloride are slightly more elevated than the results of prior groundwater testing for the same bore in 2003 – 2006 (Appendix R).

The area is classified as an 'upland area' under the ANZG (2018) guidelines as the site is greater than 150 m in altitude. The site is in the transition zone between an upland river system and lowland river system. When classified as an upland area, the maximum criteria for electrical conductivity (EC) (salinity) is 350 µS/cm, whereas for lowland rivers the salinity guidelines are 125 – 2200 µS/cm. The groundwater results indicate that the EC (salinity) is greater that the criteria for an upland freshwater aquifer. This is expected to be the result of the granite Lachlan Fold Belt GWMA. The EC has not varied greatly in P1B or P6B over the years of sampling (Appendix R). The groundwater hardness ($CaCO_3$) is classed as very-hard to extremely hard with values between 291 and 397 mg/L.

The groundwater investigation levels (GILs) reported for freshwater ecosystems are from the 95% species protection values of the *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZG 2018).

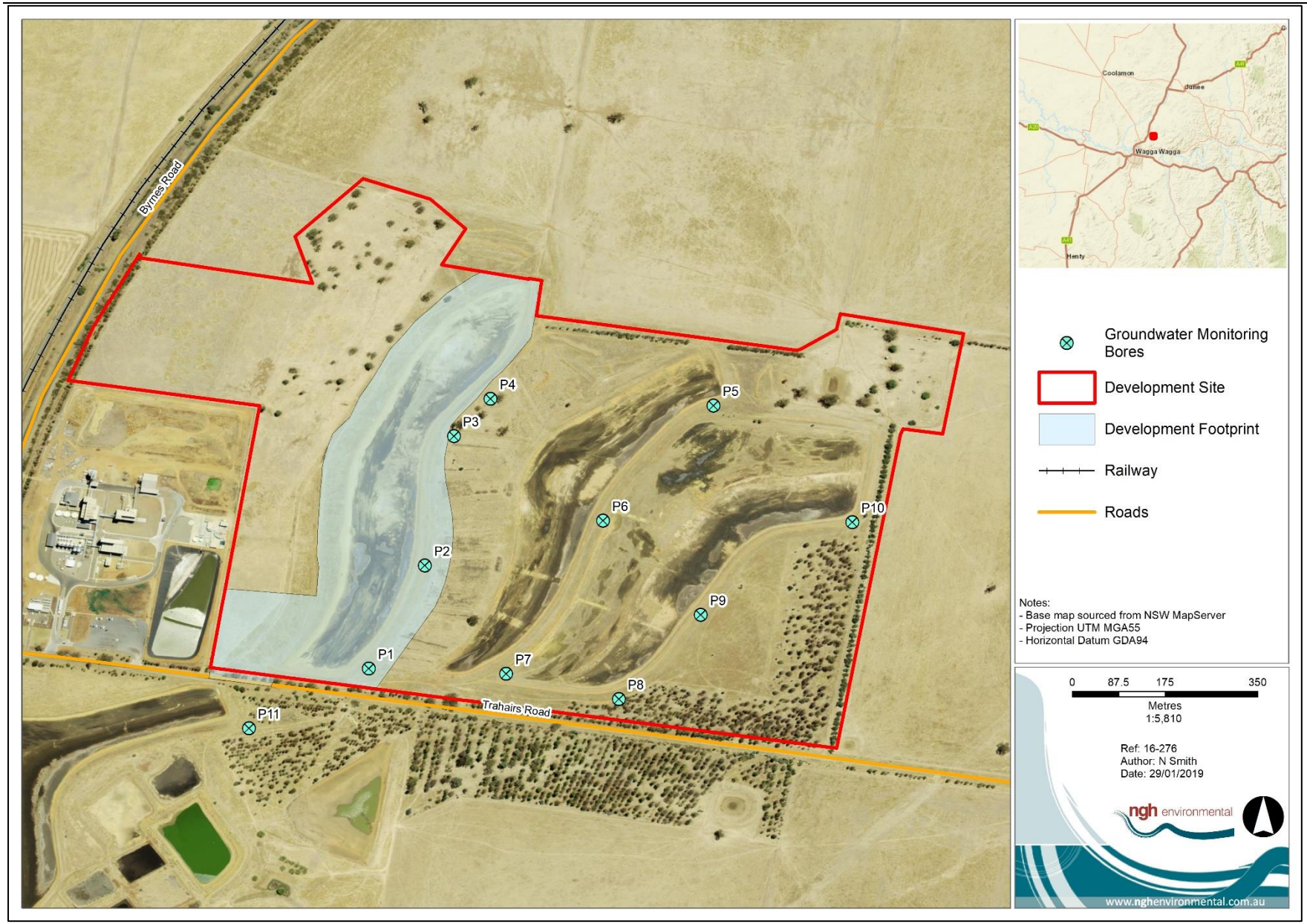

Figure 6-8 Groundwater monitoring bores in proximity to the development site

Table 6-11 Groundwater quality results for sample analysis of bores P1B, P5B and P6B of the years 2003-2006, 2008 and 2018 (NGH Environmental sample) against the ANZG irrigation criteria (IC) and groundwater investigation levels (GIL) for freshwater ecosystems trigger values for typical *slightly – moderately disturbed systems* of the ANZG (2018) guidelines.

Indicator	LOR	Units	P1B						P5B					P6B					IC	GIL[1]
			2003	2004	2005	2006	2008	2018	2003	2004	2005	2006	2008	2003	2004	2005	2006	2008		
pH	1	pH units	7.2	7.1	7.3	7.4	7.3	7.5	7.4	7.4	7.3	7.5	7.6	7.5	7.5	7.4	7.6	7.7	>6.5 - <8.5	6.5 - 7.5[3]
EC	1	µS/cm	1253	1325	1328	1358	1380	1290	914	693	1029	964	1000	1263	1280	1298	1355	1360	-	<350
Total Dissolved Solids (TDS)	2	mg/L	-	-	-	-	-	715	-	-	-	-	-	-	-	-	-	-	<13000	-
Sodium (Na)	0.05	mg/L	106.5	401	128	121	123	83.8	63	76.4	80.9	73.7	85.2	90.4	114	106	114.6	113	<460	-
Potassium (K)	0.2	mg/L	2.85	2.85	2.8	3.03	3.7	2.5	1.23	1.7	1.7	1.45	1.7	4.1	4.9	5.1	5.1	5.1	-	-
Calcium (Ca)	0.03	mg/L	98	106	96	104	99.7	84.5	74.2	73.6	70.3	71.2	74.3	75.9	81.6	75.9	84.1	76.4	<1000	-
Magnesium (Mg)	0.02	mg/L	38	36.7	40.3	42.5	38.8	27.7	37.9	37.9	39.3	38.7	39.5	47.5	50.9	52.3	55.8	49.1	-	-
Chloride (Cl)	0.5	mg/L	179	210	215	195	200	234	57.4	60	65.1	56.7	36.6	217	218	234	234	226	<700	-
Nitrate (NO_3) as N	0.1	mg/L	10.6	9.75	7.2	9.0	10	6.8	22.4	29	28	31	I/S	1	<2	4	7	I/S	<400	0.7
Sulphate (SO_4)	0.5	mg/L	-	-	-	-	-	19.7	-	-	-	-	-	-	-	-	-	-	<1000	-

Indicator	LOR	Units	P1B						P5B					P6B					IC	GIL[1]
			2003	2004	2005	2006	2008	2018	2003	2004	2005	2006	2008	2003	2004	2005	2006	2008		
Total Hardness as $CaCO_3$	2	mg/L	-	-	-	-	-	325	-	-	-	-	-	-	-	-	-	-	<350	-
Alkalinity, Total as $CaCO_3$	2	mg/L	359	373	376	379	397	378	327	340	341	291	357	333	348	353	352	303	-	Very hard - extreme

(1) Investigation level for fresh water
(2) ID = Insufficient Data to derive an investigation level
(3) Upland river environments (>150 m elevation)

6.2.4 Potential impacts

There are no natural surface water bodies located on the development site. Potential impacts to surface waters would likely be associated with runoff or sediment leaving the site and affecting the surface water bodies located down catchment.

Construction

SOILS, SURFACE WATER AND GROUNDWATER

The proposal would require some earthworks and vegetation removal. As the soil type at the development site is prone to erosion, these factors have the potential to lead to increased soil erosion, particularly during high-intensity rainfall events or as a result of overland flooding. Minor soil disturbance is also likely to occur around vehicle and plant access points. Increased soil erosion may lead to increased sedimentation and turbidity of site runoff, which could have a negative impact on surface and groundwater.

Potential impacts during construction associated with earthworks and stockpiling may include:

- Increased turbidity of surface water resulting from erosion and sediment laden runoff from earthworks and traffic areas.
- Increased turbidity of surface water resulting from water and wind erosion of stockpiles and site access roads.
- Contamination of surface waters resulting from fuel spillage from vehicles, machinery, or storage.

Construction of the proposal would not involve any extraction of groundwater.

Overall, these impacts are likely to be minimal, contained to the local environment, and readily manageable. Whilst there is some potential for soil and liquid materials entering the local environment, this can be readily managed such that any potential impact would be small.

Detention ponds, if required to manage surface water during construction, will be detailed in the design phase of the waste cell. Erosion and sediment control measures would be implemented to mitigate any impacts in accordance with the *Managing Urban Stormwater: Soils and Construction Guidelines Volume 2B Waste Landfills* (DECC 2008).

WATER USE

Water use during the construction phase would be minimal and mainly for dust suppression during earth moving within the proposed cell, on unsealed roads and for the construction of site access. This water requirement is likely to vary depending on weather conditions such as rainfall and wind and is estimated to be up to 1 – 2 ML in total. Potable water requirements for around 10 workers would be about 21.9 kL (Table 6-12).

Table 6-12 Water requirements during construction.

Water quality	Annual construction water requirements	Potential sources	Availability
Potable (drinking)	21.9 kL (for 12-24 weeks)	Pre-packaged water	Available as required – commercial supply
Non-potable	1-2 ML (for 12-24 weeks)	Water storages on-site, truck delivery when required	Available as required

A volumetric water licence would not be required. Water would be sourced from a commercial supplier or captured water on-site would be reused. Currently there is around 35.46 ML within the middle and eastern evaporation ponds.

One water tank would be used on site for groundwater relief layer water storage. Water will be trucked in when required.

The development is unlikely to impact on the rights of adjacent licensed water users or landholders.

Operation

SOILS

The proposal would require stockpiling of materials to be used to cover the active waste cells. Materials would include clay for capping and other materials brought on site as part of the non-putrescible waste collection. High-intensity rainfall events and overland flooding could result in increased erosion. Minor soil disturbance is also likely to occur around vehicle and plant access points. Increased soil erosion may lead to increased sedimentation and turbidity of site runoff, which could have a negative impact on surface and groundwater.

Stormwater diversion berms and drains would require monitoring during and after high-intensity rainfall and overland flooding to ensure that these structures are not eroded, compromising stormwater diversion away from the active waste cells and to reduce any potential increases in sedimentation of surface waters.

Overall, these impacts are likely to be minimal, contained to the local environment, and readily manageable. Whilst there is some potential for soil to enter the local environment, this can be readily managed such that any potential impact would be small.

Erosion and sediment control measures would be implemented to mitigate any impacts in accordance with the *Managing Urban Stormwater: Soils and Construction Guidelines Volume 2B Waste Landfills* (DECC 2008).

SURFACE WATER QUALITY

Potential impacts during operation may include:

- Contamination of surface water caused by off-site release of wastewater, stormwater, or runoff.
- Contamination of surface water caused by fuel spills from vehicles, machinery, or storage.

WWCC's mapping of flood-prone land identified that the development site is not within an area prone to flooding. The development of the proposal is unlikely to impact the likelihood and severity of flooding in the catchment due to the limited size of the proposal, localised nature of the development and the location of the proposal in the catchment. Overland flow captured uphill of the proposal would be diverted around the proposal. Stormwater captured onsite would generally be retained in existing evaporation ponds and tested for future use.

The use of fuels and other chemicals on site poses a risk of surface water contamination in the event of a spill. Chemicals used onsite would include fuels, lubricants and herbicides, none of which are considered difficult to manage.

Stormwater collected on site would be retained and tested in accordance with the NSW EPA's *Environmental Guidelines: Solid Waste Landfills* (2016).

GROUNDWATER QUALITY

Potential impacts during operation may include:

- Contamination of groundwater caused by infiltration of leachate due to landfill liner failure.
- Contamination of surface water caused by fuel spills from vehicles, machinery, or storage.

The use of fuels and other chemicals on site pose a risk of groundwater contamination in the event of a spill. Chemicals used onsite would include fuels, lubricants and herbicides, none of which are considered difficult to manage.

Infiltration of leachate – changes in groundwater level, flow direction and groundwater quality

The use of the existing proposed waste cell as a waste cell and leachate management pond is unlikely to result in changes to the groundwater level and flow direction of the aquifers. The details of the waste cell and leachate management pond lining is included in section 3.3.4. At capacity, the waste sub-cells would be capped and revegetated to the specifications outlined in the NSW EPA's *Environmental Guidelines: Solid Waste Landfills* (2016).

Leachate production rates are expected to be highest as each sub-cell is commenced and depths of waste within the sub-cell are shallow. As the depth of waste increases, the absorptive capacity of the sub-cell increases. When the sub-cell is domed, capped with clay, topsoiled, and vegetation established, leachate production rates are the lowest.

There is a small risk for defects to occur during the construction of the landfill liner, resulting in potential leaks of leachate to groundwater. During operation, a well-designed and installed liner may be expected to experience some degradation or aging with time that would eventually lead to localised failure, including swelling, ultraviolet degradation, temperature, environmental stress cracking, and biological and oxidative degradation. Potential impacts to underlying groundwater may result from leachate infiltration through liner material where it has become compromised.

In the event of liner failure where minor infiltration may occur, historical data has indicated that the effect on groundwater levels and flow direction would be restricted to the immediate area and not significantly affect the surrounding environment.

The collection of water by the groundwater relief layer management system would be transported by pipework via an inspection port (3.2.4). The water would be tested at a monthly frequency at these ports to ensure there is no leakage from the waste cell or the leachate pond and diverted to a water storage tank. This water would be reused for activities on site such as dust suppression.

The proposal could impact water quality if leachate infiltration was to occur due to liner failure. Regular monitoring of groundwater quality is recommended so that adverse impacts to water quality are immediately identified and managed accordingly.

Overall, these impacts are likely to be minimal, contained to the local environment, and readily manageable.

Aquifer connectivity

It is unlikely that the proposal would impact the connectivity between the shallow and deep aquifers in and around the development site.

Trends in the groundwater level and quality monitoring indicate there is low connectivity between the shallow and deep aquifers. Data from 2006 indicated that there was around 4 m difference in water levels between the shallow and deeper aquifers within the area of the ponds and a 7 m difference in the irrigation paddock (ROBE 2008). Sampling of the shallow and deep bores during the period of 2009 to 2010 by McMahon Earth Science (2010) indicated all shallow bores dry and unresponsive to increased rainfall during the 2008 to 2010 period.

Overall, these impacts are likely to be minimal, contained to the local environment, and readily manageable.

Adjacent licensed water users

There are no wells within one kilometre of the proposed development site that are used for irrigation, stock or domestic uses. Therefore, it is unlikely that these would be affected by operations of the proposal activities.

Overall, these impacts are likely to be minimal, contained to the local environment, and readily manageable.

WATER USE

Water use during the operation phase would be minimal and include non-potable water for dust suppression on unsealed roads and on the waste cell, and potable water for the staff office / amenity space. Leachate would be used for dust suppression in the active waste cell. The demountable building would contain a pump out toilet facility. Sewerage would be pumped out by a commercial operator.

The non-potable water requirement is likely to vary depending on weather conditions such as rainfall and wind and is estimated to be up to 1 ML annually. Potable water requirements for about two staff and workers would be about 21.9 kL annually (Table 6-13).

Table 6-13 Approximate water requirements during operation.

Water quality	Annual water requirement	Potential sources	Availability
Potable (drinking)	21.9 kL	Pre-packaged water.	Available as required – commercial supply
Non-potable	1 ML	Captured leachate for dust suppression in the waste cell. Captured surface and ground water relief layer water and water storages on-site, truck delivery when required.	Available as required

One water tank would be used to capture stormwater from the demountable building and used for on-site amenities. All surface water runoff would be captured on-site and retained for re-use. The additional two effluent evaporation ponds within the development site have capacities of approximately 125 400 m^3 (middle - 125.4 ML) and approximately 229 200 m^3 (eastern – 229.2 ML).

Water would be trucked in when required, if these water storages are dry and if there has not been any water captured from the groundwater interception scheme.

The development is unlikely to impact on the rights of adjacent licensed water users or landholders.

6.2.5 Water monitoring

Monitoring programs for ambient surface water, groundwater and leachate at the site would be guided by the NSW EPA's *Environmental Guidelines: Solid Waste Landfills* (2016). The details for the programs are described in Table 6-14.

Appropriate sampling and analysis methods would be used in accordance with *Approved Methods for the Sampling and Analysis of Water Pollutants in NSW* (NSW DEC 2004a) and other recognised guidelines.

Monitoring records would be kept by the occupier and notified to the EPA if there are any irregular leachate discharges or overflows from the site. A groundwater assessment report should be prepared at least once

every five years or if the groundwater monitoring detects a failure of the leachate management system. The report must be done by a suitably qualified person and prepared to meet the report outline in the NSW EPA's *Environmental Guidelines: Solid Waste Landfills* (2016).

Table 6-14 Monitoring programs for ambient surface water, groundwater and leachate as per the NSW EPA's *Environmental Guidelines: Solid Waste Landfills* (2016)

<table>
<tr><th></th><th>Monitoring and Management Program</th></tr>
<tr><td>Surface Water and Ambient Surface water</td><td>
Surface water would be routinely tested in the middle and eastern evaporation ponds, which are down-gradient of the proposed waste cell. Surface runoff up-gradient of the waste cell would be diverted around the cell and to a farm dam down-gradient, which is incorporated in the ambient surface water monitoring. Pond water would be tested to ensure it remains unpolluted by the leachate and can be reused on site for dust suppression and environmental control.
The surface water monitoring program would be guided by the NSW EPA's Environmental Guidelines: Solid Waste Landfills (2016).
An ambient surface water monitoring program would be established to detect potential off-site surface water pollution. There are no water courses on site. Stormwater drainage has been directed into two farm dams. Both dams are down-gradient (east) of the proposal (Figure 3-3). These dams would be routinely monitored for pollution. There are no dams or watercourses up-gradient of the proposal. Water sources in the vicinity of the development site include the effluent pond of ROBE and effluent ponds of the old Riverina Wool Combing facility. A water sample from the closest channel, Dukes Creek, could be sampled for background water quality in the locality, as Schiller's Creek, to the east, is ephemeral.
The ambient surface water monitoring program would be guided by the NSW EPA's Environmental Guidelines: Solid Waste Landfills (2016) as follows:
Ambient water quality monitoring can be restricted to a reduced suite of typical indicators of landfill leachate and environmental impact. Monitoring should be undertaken at a regular frequency, dependent on the proximity and sensitivity of the surface water body. The following parameters for ambient surface water monitoring for a general solid waste landfill should be sampled for and sampling method:
<table>
<tr><th>Pollutant</th><th>Unit of measure</th><th>Sampling method</th></tr>
<tr><td>pH</td><td></td><td>Probe</td></tr>
<tr><td>Dissolved oxygen</td><td>mg/L</td><td>Probe</td></tr>
<tr><td>Electrical conductivity</td><td>µS/cm</td><td>Probe</td></tr>
<tr><td>Nitrogen – ammonia</td><td>mg/L</td><td>Grab sample</td></tr>
<tr><td>Total suspended solids</td><td>mg/L</td><td>Grab sample</td></tr>
<tr><td>Thermotolerant coliforms</td><td>cfu/100 mL</td><td>Grab sample</td></tr>
<tr><td>Total dissolved solids</td><td>mg/L</td><td>Grab sample</td></tr>
<tr><td>Potassium</td><td>mg/L</td><td>Grab sample</td></tr>
<tr><td>Total organic carbon</td><td>mg/L</td><td>Grab sample</td></tr>
</table>
</td></tr>
</table>

	Monitoring and Management Program
Groundwater	Groundwater monitoring would occur regularly to detect potential pollution by the leachate. There are 10 nested bores down-gradient of the proposed materials facility. These bores and two bores further down-gradient would be sufficient to determine leachate pollution in the groundwater (Figure 6-6). The closest sensitive receivers down-gradient and south-east (direction of groundwater movement) are 2.5 to 3 km from the proposal. The waste cell would occur within the footprint of an existing effluent evaporation pond, where the base has already undergone compaction. The waste cell would be lined with compacted clay and an HDPE liner to the specifications of the NSW EPA's *Environmental Guidelines: Solid Waste Landfills* (2016). There are many licensed bores up-gradient that could be utilised to determine the background groundwater quality (Figure 6-6). The groundwater monitoring network would be maintained and repaired as necessary. Maintenance and installation of the bores would be in accordance with *Minimum Construction Requirements for Water Bores in Australia Third Edition 2012* (National Uniform Drillers Licensing Committee 2012) or other recognised guidelines. The groundwater monitoring program would be guided by the NSW EPA's *Environmental Guidelines: Solid Waste Landfills* (2016) as follows: • Sampling would be in accordance with published guidelines. • Standing water level would be measured to an accuracy of ± 5 mm. • Monitoring bores would be purged prior to sampling. • Monitoring should be quarterly or as otherwise specified in the environment protection licence. The following analytes should be assessed. These can vary depending on the waste landfilled at the site.

Pollutant	Unit of measure	Frequency	Sampling method
pH, redox potential and temperature		Quarterly	Probe, field analysis
Standing water level	m AHD	Quarterly	In situ
Total dissolved solids	mg/L	Quarterly	Grab sample
Major cations and anions (calcium, magnesium, potassium, sodium, chloride, fluoride and sulfate)	mg/L	Quarterly	Grab sample
Alkalinity (bicarbonate and carbonate)	mg/L	Quarterly	Grab sample
Total organic carbon	mg/L	Quarterly	Grab sample
Ammonia and nutrients (nitrate, nitrite and phosphorus)	mg/L	Quarterly	Grab sample
Selenium	mg/L	Quarterly	Grab sample
Metals and metalloids (aluminium, arsenic, barium, cadmium, chromium, cobalt, copper, lead, manganese, mercury, nickel, zinc)	mg/L	Annually	Grab sample
Organic contaminants: • **Phenols**	mg/L	Annually	Grab sample

<table>
<tr><th></th><th colspan="4">Monitoring and Management Program</th></tr>
<tr><td></td><td colspan="4">

Petroleum hydrocarbons
Monoaromatic hydrocarbons (benzene, toluene, ethylbenzene, xylene, naphthalene)
Organochlorine and organophosphate pesticides
Polycyclic aromatic hydrocarbons

</td></tr>
<tr><td>Leachate</td><td colspan="4">
A leachate monitoring program should be established to provide data on the composition, height levels and volumes of leachate produced by the waste cell. Details would be recorded about any irregular discharges or overflows of the leachate from site. The surface water monitoring program would be guided by the NSW EPA's Environmental Guidelines: Solid Waste Landfills (2016) and would address the following requirements:

Routine composition monitoring.
Leachate level monitoring.
Leachate discharges or overflows.
Requirements of off-site disposal or irrigation of leachate.

The height of leachate within the pond would be monitored daily.
The following table indicates the parameters for leachate monitoring:
<table>
<tr><th>Pollutant</th><th>Unit of measure</th><th>Frequency</th><th>Sampling method</th></tr>
<tr><td>pH</td><td>pH units</td><td>Quarterly</td><td>Probe</td></tr>
<tr><td>Electrical conductivity</td><td>µS/cm</td><td>Quarterly</td><td>Probe</td></tr>
<tr><td>Standing water level in all leachate risers</td><td>m AHD</td><td>Quarterly</td><td>In situ and when not depressed by leachate extraction</td></tr>
<tr><td>Volume</td><td>m^3</td><td>Continuous</td><td>From flow meters or pumping records of the amount of leachate transferred from cell</td></tr>
<tr><td>Total dissolved solids</td><td>mg/L</td><td>Annually</td><td>Grab sample</td></tr>
<tr><td>Total suspended solids</td><td>Mg/L</td><td>Annually</td><td>Grab sample</td></tr>
<tr><td>Major cations and anions (calcium, magnesium, potassium, sodium, chloride, fluoride and sulfate)</td><td>mg/L</td><td>Annually</td><td>Grab sample</td></tr>
<tr><td>Alkalinity (bicarbonate and carbonate)</td><td>mg/L</td><td>Annually</td><td>Grab sample</td></tr>
<tr><td>Dissolved organic matter (total organic carbon, biochemical oxygen demand, chemical oxygen demand)</td><td>mg/L</td><td>Annually</td><td>Grab sample</td></tr>
<tr><td>Ammonia and nutrients (nitrate, nitrite and phosphorus)</td><td>mg/L</td><td>Annually</td><td>Grab sample</td></tr>
</table>
</td></tr>
</table>

	Monitoring and Management Program			
	Metals and metalloids (aluminium, arsenic, barium, cadmium, chromium, cobalt, copper, lead, manganese, mercury, nickel, zinc, selenium)	mg/L	Annually	Grab sample
	Organic contaminants: • **Phenols** • **Petroleum hydrocarbons** • **Monoaromatic hydrocarbons (benzene, toluene, ethylbenzene, xylene, naphthalene)** • **Organochlorine and organophosphate pesticides** • **Polycyclic aromatic hydrocarbons**	mg/L	Annually	Grab sample

6.2.6 Safeguards and mitigation measures

Leachate barrier systems:

- *The landfill must have a leachate barrier system to contain leachate and prevent the contamination of surface water and groundwater over the life of the landfill.*
- *Pollutants with the potential to degrade the quality of groundwater must not migrate through the strata to any point beyond the boundary of the premises or beyond 150 m from the landfill footprint, whichever is smaller. If this occurs, additional engineered controls may be required to prevent further pollutant migration. It may also be necessary to remediate the existing pollution.*

The following safeguards are recommended within the soil, landform and water assessment to minimise impacts:

Table 6-15 Soil and water mitigation measures.

No.	Impact	Environmental safeguard	Timing
S1	Soil and water quality impacts	Prior to construction commencing, a Construction Environmental Management Plan (CEMP) and Operational Environmental Management Plan (OEMP) should be developed for the proposal, which includes these mitigation measures as part of a Soil and Water Management Plan (SWMP).	Pre-construction
S2	Groundwater impacts	A Groundwater Monitoring Plan (GMP) would be developed and implemented prior to the operation of the proposed development. The GMP would include: • Recommendations for the installation of additional monitoring wells including construction details. • Development of a groundwater monitoring strategy including sampling methodology and timetable. • Preparation of a consolidated GMP to be implemented during operation of the proposed development. Quarterly monitoring of groundwater quality is recommended so that adverse impacts to water quality can be identified and managed accordingly. The water quality monitoring program would be carried out in accordance with NSW EPA's *Environmental Guidelines: Solid Waste Landfills* (2016).	Pre-construction Construction Operation

No.	Impact	Environmental safeguard	Timing
		The GMP would include the addition of monitoring wells at the western boundary to indicate baseline groundwater quality, and in the far eastern and south-eastern boundary to ensure that groundwater leaving the site remains uncontaminated. Quarterly monitoring would occur up-gradient and down-gradient of the proposed waste cell. All groundwater quality data would be measured against Australia Standards, ANZG guidelines for aquatic ecosystems and primary industries – irrigation, EPA guidelines and baseline/ background data.	
S3	Erosion and sedimentation	An Erosion and Sediment Control Plan (ESCP) should be developed and implemented for the proposal, detailing erosion and sediment control measures to be implemented and maintained to: • Prevent sediment moving off-site and sediment laden water entering any water course, drainage lines, or drain inlets. • Reduce water velocity and capture sediment on site. • Minimise the amount of material transported from site to surrounding pavement surfaces. • Divert clean water around the site. (in accordance with the DECC *Managing Urban Stormwater, Soils and Construction Guidelines Volume 2B Waste Landfills)*	Pre-construction
S4	Erosion and sedimentation	Haul routes around the proposed landfill should be designed and clearly identified to minimise surface and vegetation disturbance.	Pre-construction
S5	Erosion and sedimentation	Consistent with any specific requirements of the ESCP, control measures should be implemented and maintained to minimise risks associated with erosion and sedimentation and entry of materials to drainage lines and waterways. That would include, but not necessarily be limited to: • Sediment management devices, such as fencing or sand bags. • Measures to divert or capture and filter water prior to discharge, such as drainage channels and first flush and sediment basins. • Scour protection and energy dissipaters at locations of high erosion risk. • Installation of measures at work entry and exit points to minimise movement of material onto adjoining roads, such as rumble grids or wheel wash bays. • Appropriate location and storage of construction materials, fuels and chemicals, including bunding where appropriate.	Pre-construction During construction
S6	Erosion and sedimentation	Standard erosion and sediment controls include: • Appropriately stockpile and reuse all topsoil and ensure that temporary stockpiles are protected from erosion • Ensure that stockpiles are not placed in the flow path of upstream runoff • Divert clean runoff water from the upstream drainage system around the site • Monitor and maintain all sediment and erosion control measures • Minimise additional soil disturbance activities during wet weather • Stabilise rehabilitated surfaces at the earliest possible time • Provide adequately designed sediment fences, barrier fences,	

No.	Impact	Environmental safeguard	Timing
		and other required structures • Restrict vehicular access to stabilised entry and exit point with controls to reduce transport of soil on vehicles and machinery exiting the site • Restrict access to areas that do not require land disturbance	
S7	Erosion and sedimentation	Vegetation clearance and soil disturbance would be confined to those areas required for construction. Vegetation clearance would be limited to the minimum required for construction.	Construction
S8	Erosion and sedimentation	Soil disturbance should be minimised wherever possible, and heavy vehicles should not be used in wet conditions.	Construction
S9	Erosion and sedimentation	Progressively stabilise disturbed areas through construction and minimise surface disturbance/maximise ground cover.	Construction
S10	Erosion and sedimentation	Work practices would be implemented during construction to support efficient water use and minimise waste. This would include, but not necessarily be limited to, measures to reuse and recycle water where practicable for use in road construction (such as dust suppression and concreting) and irrigation of revegetated areas.	Construction
S11	Soil contamination	All fuels, chemicals and other hazardous materials must be stored in a roofed, fire-protected and impervious bunded area at least 20 m from waterways, drainage lines, basins, flood-affected areas or slopes above 10%. Bunding design must comply with relevant Australian Standards and should generally be in accordance with guidelines provided in the EPA Authorised Officers Manual. Appropriate on-site signage must be provided to identify the materials stored.	Construction
S12	Soil contamination	Spill kits would be available on-site and all staff would be aware of their location and trained in their use.	Construction
S13	Erosion and sedimentation	All areas disturbed during construction, including areas for stockpiles, compound sites, temporary access roads and temporary work areas, should be stabilised and rehabilitated on completion of work to prevent future erosion.	Construction
S14	Stormwater impacts	Standard stormwater controls include: • Construction of a perimeter bund around the entire active landfill area to prevent surface water from entering the landfill area • Total area of exposed and/or uncapped active waste cell areas would be kept to a minimum and bunded with diversion drains to prevent runoff from entering these areas. Progressively filled areas would be covered daily to minimise contact between surface waters and waste, and therefore minimise the production of leachate. • Construction of a diversion drain around the entire landfill area to collect all runoff from disturbed areas (outside active waste cell areas) which would drain to a sedimentation basin.	Construction

No.	Impact	Environmental safeguard	Timing
		• Construction of a dry basin downstream of the sedimentation basin and leachate pond that would capture any overflow from the sediment basin and/or leachate pond.	
S15	Leachate	The leachate barrier system would limit the quantity of leachate being generated by minimising the inflow of groundwater to the landfill and maximising the diversion of groundwater around the area, and contain all leachate within the landfill area. The leachate collection system would be designed to ensure collection of all leachate generated from the landfill and prevent the transmission of leachate to the external environment including underlying groundwater. The leachate pond would be sized to ensure that sufficient holding capacity would be provided for the safe storage of all collected leachate.	Construction
S16	Leachate	In order to effectively manage leachate water, the proposal includes the construction of a permanent leachate pond where all leachate would be collected, stored, and treated. This includes all waters that are potentially contaminated due to contact with waste or any areas of land that have been contaminated with waste. The volume of leachate water produced would be regulated and would be required to undergo regular monitoring in accordance with the site EPL under the POEO Act. In the event that the leachate pond overflows, all overflow waters would be diverted to the permanent sedimentation basin for emergency storage and treatment.	Construction, operation
S17	Leachate	If the leachate storage and evaporation pond is in danger of overflowing, leachate would be injected back into the cells and leachate extraction from the cells would cease immediately.	Operation
S18	Overflow	A bund downstream of the landfill is proposed to divert overflow to the existing pond directly to the east as an emergency containment system in the event that the leachate pond overflows during a storm event (1 in 100-year event). The existing pond immediately east of the existing landfill has the capacity to act as an immediate containment system in the unlikely event of overflow. There is no need to line it as it would be acted upon straight away.	Operation
S19	Erosion and sedimentation	Cleared and disturbed areas should be monitored for erosion throughout construction and operation of the proposal, and, if required, remediation actions taken.	Construction, operation
S20	Soil contamination	In the event of discovery of previously unidentified area(s) of potentially contaminated material, the following procedures would be implemented to mitigate potential impacts: • If required, DECCW would be promptly notified of any suspected contaminated ground that is exposed during construction activities • Advice would be immediately sought from a suitably qualified and experienced contaminated site consultant • Any suspected contaminated materials excavated during construction works would be stockpiled on a sealed surface or plastic sheeting and covered to prevent wind or rain erosion. The stockpile would not be placed near sensitive environmental receivers such as vegetated areas. A spoon drain would be excavated on the down gradient side of the stockpile, and any runoff appropriately treated prior to release	Construction, operation

No.	Impact	Environmental safeguard	Timing
		• Stockpile would be adequately secured to prevent unauthorised access • Stockpiled material would be sampled for testing. Reuse or disposal options would be based on the results of laboratory analysis in accordance with relevant legislation • All confirmed contaminated material would be excavated and disposed of offsite in a suitably licensed facility in accordance with relevant regulations • Any workers who come into contact with suspected contaminated material would report the exposure and take appropriate precautions in accordance with the proposal's WHS requirements • Any contaminated waste identified or generated during the works would only be disposed of in accordance with EPA guidelines	
S21	Stormwater impacts	Potentially contaminated stormwater should be diverted appropriately and treated on site prior to release.	Construction, operation
S22	Erosion and sedimentation	Capped landfill areas should be progressively stabilised and revegetated to minimise disturbance of soils on capped sub-cells.	Operation
S23	Erosion and sedimentation	The landscaped area around the landfill area should be maintained and revegetated to ensure a consistent groundcover. At all times, exposure of surfaces should be minimised to ensure that soils are bonded on site via groundcover.	Operation
S24	Erosion and sedimentation	Access roads should be appropriately maintained to ensure that there are no potholes and that road surface edges do not degrade over time.	Operation
S25	Surface water quality impacts	Quarterly monitoring of surface water quality is recommended so that adverse impacts to water quality can be identified and managed accordingly. The water quality monitoring program would be carried out in accordance with *NSW EPA's Environmental Guidelines: Solid Waste Landfills* (1996) and include: • Leachate monitoring • Stormwater monitoring • Ambient surface water monitoring	Operation
S26	Groundwater impacts	A network of groundwater bores would be used to monitor groundwater quality and trends in the development site.	Operation
S27	Groundwater impacts	If significant changes in groundwater levels or quality are recorded during routine monitoring, corrective action should be taken including an inspection of the lining of the waste cell and leachate pond.	Operation
S28	Water quality impacts	Prior to operation, an Operations Contingency Plan would be developed and implemented if water quality monitoring programs: • Show elevated levels of analytes, above ANZG trigger values, of surface and groundwater. • Discharge or overflow from the leachate pond. All water quality data would be measured against Australia Standards, ANZG guidelines for aquatic ecosystems and primary industries – irrigation, EPA guidelines and baseline/ background data.	Operation Closure

No.	Impact	Environmental safeguard	Timing
P2	Design and construction should be in accordance with best practice catchment management principles		WWDCP
C3	Roads and pathways should generally run along the contours of the land and generally perpendicular to the contour where the land is steeper.		WWDCP
C1	Provide stormwater detention facilities to capture rainwater and surface runoff to ensure post-development flows do not exceed pre-development flows, for storm events up to and including the 1 in 100-year storm event.		WWDCP
C4	Developers would be required to manage stormwater resulting from the development. Preferred solutions for managing stormwater include: • Developers shall provide details of their stormwater management plan at the time of submitting a Development Application. • Collection of stormwater by rainwater tanks for re-use onsite is preferred. • Surface water runoff may be required to be collected and treated onsite. • Broadacre development is suitable for swale stormwater management. Small, intense development would require kerb and gutter stormwater management.		WWDCP
C5	Each lot is to incorporate a range of water sensitive urban design measures to achieve the nominated water quality targets.		WWDCP
C6	Stormwater runoff from communal areas is to be treated through communal water sensitive urban design measures to achieve the nominated water quality targets.		WWDCP
C1	An Erosion and Sediment Control Plan is to be submitted with the development application.		WWDCP
C2	Water diversion or filtration measures including sand bags, silt fencing, or straw bale sediment filter fencing are to be implemented on the downslope property boundary, including, where appropriate, the rear of the lot.		WWDCP
C3	All sediment control measures are to be installed prior to commencement of work on the site. The measures are also to be maintained in a sound and workable condition until completion and must not be removed from the site until permanent rehabilitation/stabilisation measures have been completed.		WWDCP
C4	Vehicle admittance onto the site shall be restricted during wet or muddy conditions.		WWDCP
C5	The placement of blue metal, gravel, or similar materials is required on the identified single access point if access is necessary under wet or muddy conditions. This would prevent erosion by concentrated run-off and minimise tracking of mud from the site on the road.		WWDCP
C6	Temporary fencing is to be installed along the boundary adjoining roadways to prevent vehicles by-passing the designated driveway access.		WWDCP
C7	Locate stockpiles so that the material is wholly within the property boundary and not in a position where it can be washed into the gutter or roadway.		WWDCP
C8	Coverage of stockpiles should be provided to prevent loss by wind erosion, unless the material is too coarse to be wind-blown (e.g. coarse sand).		WWDCP

No.	Impact	Environmental safeguard	Timing
C9		Sediment fencing must be provided down slope of all stockpiles. Where the catchment exceeds 2 ha, a diversion bank/fence must be constructed immediately upslope of all stockpiles.	WWDCP
C10		Disturbed areas are to be stabilised with seeded topsoil or turf as quickly as possible or by no later than 14 days after completion of construction works. Use of turfed terraces or turf strips along embankments may facilitate quick stabilisation of those areas.	WWDCP
C11		All erosion and sediment control devices should be kept in place until the site is fully stabilised and/or landscaped.	WWDCP

6.3 BIODIVERSITY

SECRETARY'S ENVIRONMENTAL ASSESSMENT REQUIREMENTS

Biodiversity, including:

- *Accurate predictions of any vegetation clearing on site or for any road upgrades;*
- *A detailed assessment of the potential impacts on any threatened species, populations, endangered ecological communities, or their habitats, groundwater dependent ecosystems and any potential for offset requirements; and*
- *A detailed description of the measures to avoid, minimise, mitigate, and offset biodiversity impacts.*

6.3.1 Existing environment

Site context

The SWS bioregion is an important agricultural region in Australia and is the most cleared bioregion in NSW, with around 80 % of the native vegetation cleared since European settlement. Remaining vegetation primarily exists as small, scattered patches within a matrix of agricultural landscape.

The study area is located within the upper slopes of the Murrumbidgee Catchment Management Area (CMA). The development site is 50 m higher than the Murrumbidgee River floodplain 5.5 km to the south and 30 m higher than the closest prescribed waterway, Schiller's Creek.

The study area consists of flat to undulating terrain, which has been largely cleared of native vegetation for cropping and grazing. There are three evaporation ponds that were previously used to manage effluent from a wool scouring facility. The ponds have not been used for about 12 years, but they can contain water after periods of rainfall and can provide some habitat for opportunistic fauna.

The development site is around 208 ha, of which 72 % is cleared agricultural land, around 24 % accounts for the heavily disturbed evaporation ponds and around 4 % accounts for areas of remnant or planted native trees.

6.3.2 Approach

This biodiversity assessment was completed with reference to the following information sources and guidelines:

- Specific requirements for the project issued with the SEARs and in consultation with the NSW Office of Environment and Heritage (OEH).
- Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities (DEC 2004).
- Threatened Species Assessment Guidelines (DECC 2007).
- Threatened species survey and assessment guidelines: field survey methods for fauna, Amphibians (DECC 2009).

The general approach for the biodiversity assessment included a background search, field survey, and assessment of background and field data, which are discussed in more detail below.

Background search

A background search was conducted to determine regional and local biodiversity values with the potential to occur in the study area, including threatened species, populations, and ecological communities. These results were then used in field survey design. The following information sources were consulted:

- NSW OEH BioNet records within 10 km of the study area.
- EPBC Protected Matters Search Tool records within 10 km of the study area.
- OEH and EPBC Threatened Species Profiles.
- Aerial photographs (SIX Maps/Google Earth).

The results of the background search are included in Appendix D.

Field survey

The study area includes the development site and any additional areas likely to be affected by the proposal, either directly or indirectly (Figure 6-9), including areas outside the site boundary within 50 m buffer of the development site that may be subject to impacts such as increased noise and dust as a consequence of the proposal.

A field survey was completed by two ecologists on 2nd December 2016. A flora assessment was conducted over a total of 4.5 person hours, and included:

- Random meander over the development site.
- Biometric plot (incorporating condition assessment according to the BioBanking Assessment Methodology (DECC 2008).
- Targeted searches for threatened flora species.

The aims of the flora assessment were to:

- Identify vegetation communities in the development site, including their condition and extent, with reference to the OEH Biometric Vegetation Types Database.
- Identify potential Endangered Ecological Communities (EECs) within the development site, including their condition and extent.
- Identify any threatened flora species or potential habitat in the development site.
- Identify areas of weed infestation.

A fauna assessment was conducted over a total of 2.5 person hours, and included:

- General habitat assessment.
- Hollow-bearing tree survey.
- Diurnal bird survey.
- Frog survey over two nights.

The aims of the fauna assessment were to:

- Identify the location, extent and condition of fauna habitat, including important features for threatened species such as hollow-bearing trees, wildlife corridors and food resources.
- Record opportunistic sightings or signs of terrestrial fauna.

Assessment of background and field data

Assessment of the desktop and field data was used to:

- Establish the conservation values of the study area.

- Determine the significance of potential ecological impacts in relation to relevant environmental legislation.
- Identify measures to reduce the risks of these impacts, focusing on avoidance and mitigation where possible and consideration of offsets where not possible.

Preliminary advice based on this assessment was provided to the proponent early in the planning phase. This ensured that designs could be modified if necessary to avoid or mitigate impacts to threatened species, populations and ecological communities.

6.3.3 Flora

Vegetation communities

The study area was found to be dominated by highly modified, exotic-dominated vegetation, with a small proportion of native plantings, a few scattered remnant eucalypt trees, and highly modified riparian vegetation around the evaporation ponds (Figure 6-9).

Habitat types within the study area include:

- Highly modified exotic-dominated vegetation – most dominant habitat type throughout the study area, due to the previous use of the site for agriculture. Species are only likely to use this habitat type opportunistically.
- Patches of remnant box woodland –Yellow Box *Eucalyptus melliodora* and Grey Box *Eucalyptus microcarpa* mature trees remaining as small stands or lone paddock trees. Remnant patches of native vegetation to the west of the proposed footprint have been mapped by OEH as plant community type (PCT) 277 – Blakely's Red Gum – Yellow Box grassy woodland of the NSW South Western Slopes Bioregion. Threatened Ecological Communities (TEC) associated with PCT 277 are White Box Yellow Box Blakely's Red Gum Woodland under the BC Act and the EPBC Act.
- Several are hollow bearing, providing nesting and foraging habitat for hollow-dependent fauna.
- Native plantings – Narrow linear plantings of native species along the northern, eastern and southern boundaries of the site which are about 20 years old. Planting in the south eastern corner is around 100 m wide by 400 m long. Area has retained native grasses and provides habitat to a number of fauna species.
- Exotic planting – row of olive trees *Olive europaea* ssp. *europaea* of around 600 m in length along the western fence line in the far eastern paddock. It is likely that these were once harvested for fruit. A number of weed olive plants also recorded on site.
- Cereal crop – far eastern paddock planted with wheat during the site survey, providing temporary habitat for grassland fauna species.
- Degraded riparian and aquatic habitat – Weed-dominated riparian vegetation along edges of ponds, with exotic annual grasses and agricultural weeds and low abundance of native vegetation. Used by common fauna species including large numbers of Black-winged Stilt *Himantopus himantopus* in shallow mud flats of the three ponds and provides potential habitat for a range of threatened fauna species.

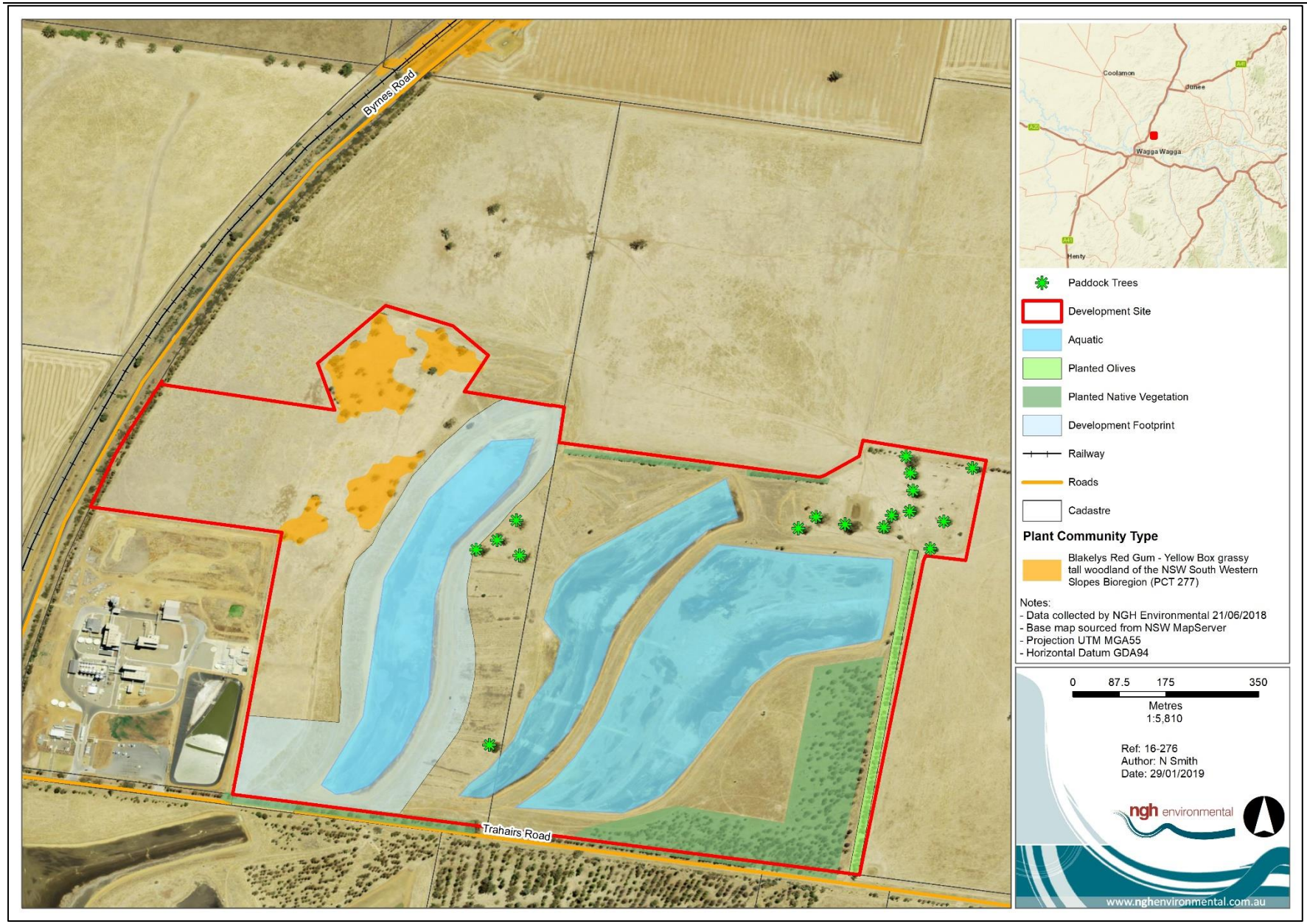

Figure 6-9 Vegetation mapping for the development site based on site inspection in December 2016 and OEH mapping

Threatened flora

The field survey identified 40 flora species (D.5), including six trees (one exotic) and 15 grasses (nine exotic). None of these are listed as threatened under the BC Act or the EPBC Act.

The background search identified 11 flora species of conservation significance as potentially occurring in the study area. None of these have been recorded in the study area. Based on consideration of species habitat requirements and distribution, it is considered possible that three of these species may occur in the study area – Dwarf Bush Pea *Pultenaea humilis*, Yass Daisy *Ammodium craspedioides*, and Hoary Sunray *Leucochrysum albicans var. tricolor* (Table 6-16). The potential impact of the proposal on these species has been assessed using the Assessment of Significance in Appendix G. The remaining eight species are not likely to occur in the study area and are therefore not considered further in this report.

Table 6-16 Threatened flora species from background search with potential to occur in study area.

Common Name	Species Name	Legal Status
Plants		
Dwarf Bush-pea	*Pultenaea humilis*	Vulnerable - BC
Yass Daisy	*Ammobium craspediodes*	Vulnerable – BC Vulnerable - EPBC
Hoary Sunray	*Leucochrysum albicans var. tricolor*	Endangered – BC Endangered - EPBC

6.3.4 Endangered Ecological Communities

The background search identified four EECs as potentially occurring in the study area. The field surveys identified that species indicative of two of these EECs were present in the study area in small, low-quality patches (Table 6-17). The potential impact of the proposal on these EECs has been assessed using the Assessments of Significance in Appendix G. The remaining two EECs are not likely to occur in the study area and are therefore not considered further in this report.

Table 6-17 Threatened species records from background search.

Endangered Ecological Community	Legal Status
White Box – Yellow Box – Blakely's Red Gum woodland	EEC – BC Critically endangered - EPBC
Grey Box woodland	EEC – BC Endangered - EPBC

6.3.5 Groundwater dependent ecosystems

Wagga Wagga LEP indicates that the development site does not occur in an area of groundwater vulnerability. Potential groundwater dependent ecosystems within the vicinity of the development site are mapped in the *Groundwater Dependent Ecosystems Atlas* (BOM 2018). There are not listed aquatic GDE sites within the development site (Figure 6-10).

There are small areas of unclassified potential terrestrial groundwater dependent ecosystems mapped directly to the west of the northern end of the proposed waste cell and areas mapped along Byrnes Road to the north and south of the proposal (Figure 6-11).

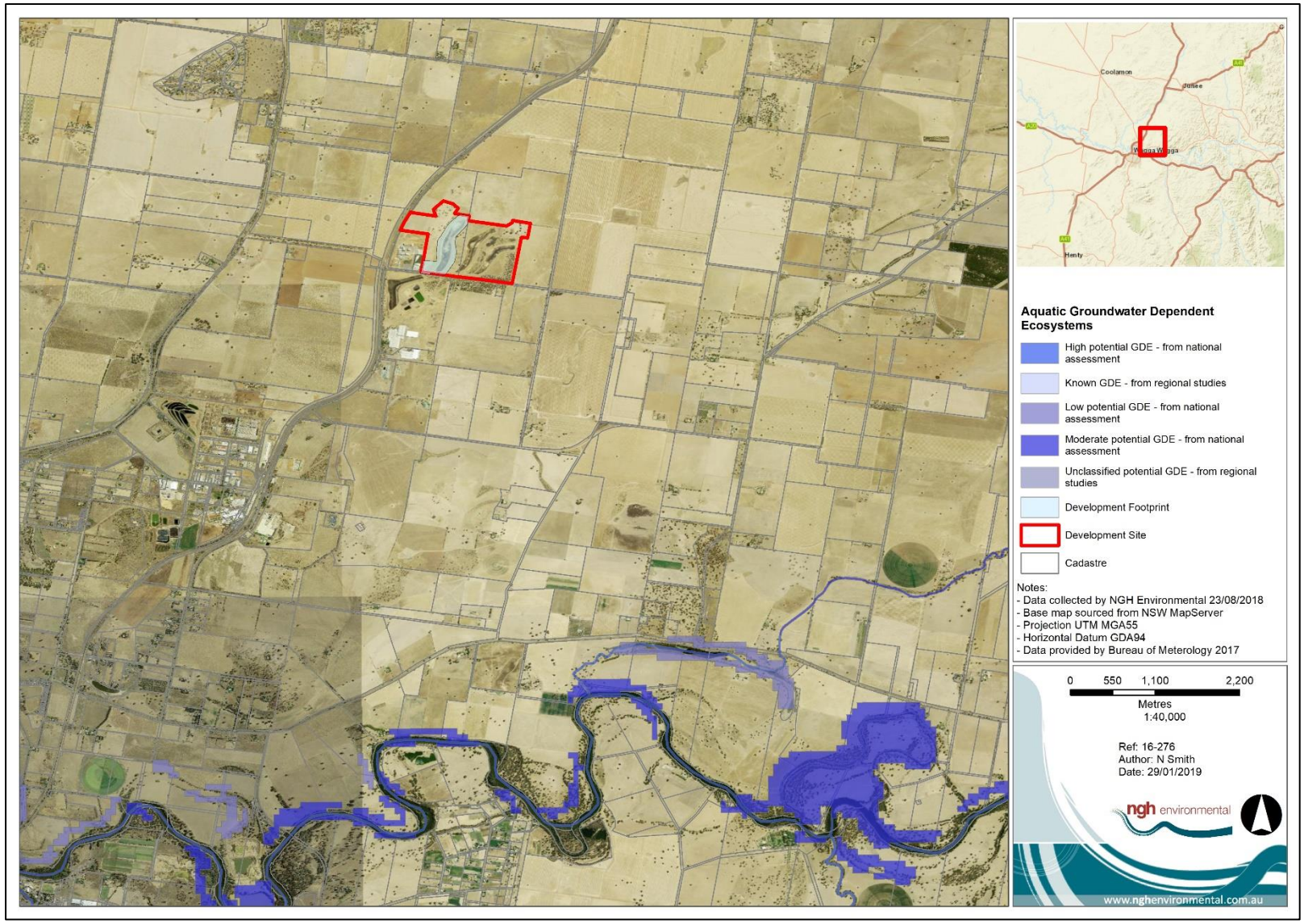

Figure 6-10 Aquatic groundwater dependent ecosystems in proximity to the development site, indicated by the red boundary

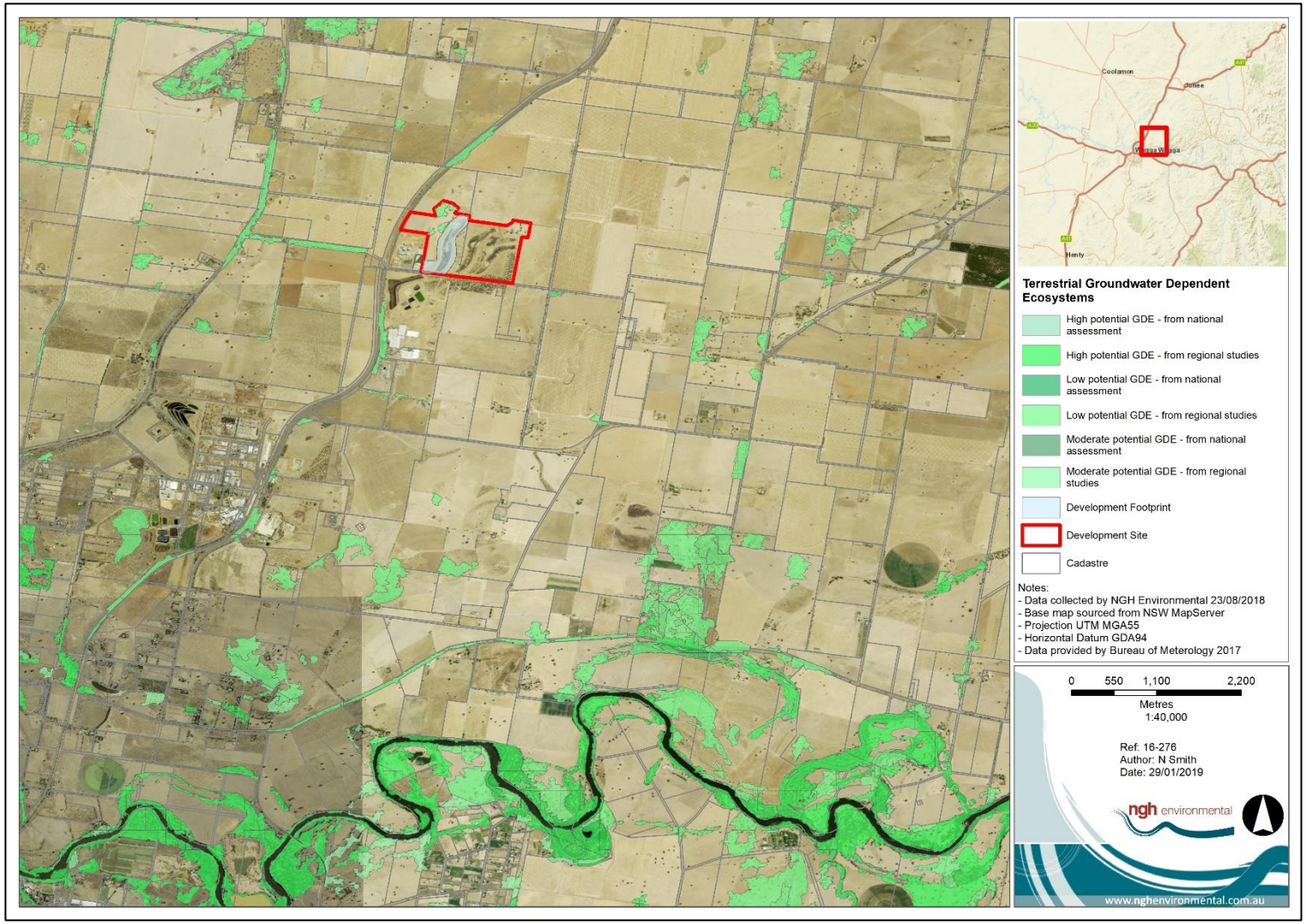

Figure 6-11 Terrestrial groundwater dependent ecosystems in proximity to the development site, indicated by the red boundary

6.3.6 Threatened fauna

The field survey identified 18 fauna species (D.5), including 12 birds, 3 mammals (including one exotic), and 3 amphibians. None of these are listed as threatened under the BC Act or the EPBC Act.

The background search identified 53 fauna species of conservation significance as potentially occurring in the study area. None of these have been recorded in the study area, but Grey-crowned Babbler *Pomatostomus temporalis* has been recorded around 2 km from the development site and Superb Parrot *Polytelis swainsonii* around 3 km from the development site (Figure 6-12). Based on consideration of species habitat requirements and distribution, it is considered possible that 28 of these species may occur in the study area (Table 6-18), including 22 birds and 6 mammals. The potential impact of the proposal on these species has been assessed using the Assessments of Significance in Appendix G. The remaining 25 species are not likely to occur in the study area and are therefore not considered further in this report.

Table 6-18 Threatened fauna species from background search with potential to occur in study area.

Common Name	Species Name	Legal Status
Birds		
Regent Honeyeater	*Anthochaera phrygia*	Critically endangered – TSC Critically endangered - EPBC
Painted Honeyeater	*Grantiella picta*	Vulnerable - TSC Vulnerable - EPBC
Black-chinned Honeyeater (eastern subspecies)	*Melithreptus gularis gularis*	Vulnerable – TSC
Curlew Sandpiper	*Callidris ferruginea*	Endangered – TSC Critically endangered - EPBC
Swift Parrot	*Lathamus discolor*	Endangered – TSC Critically endangered - EPBC
Superb Parrot	*Polytelis swainsonii*	Vulnerable – TSC Vulnerable – EPBC
Gang-Gang Cockatoo	*Callocephalon fimbriatum*	Vulnerable - TSC
Turquoise Parrot	*Neophema pulchella*	Vulnerable - TSC
Little Lorikeet	*Glossopsita pusilla*	Vulnerable - TSC
Square-tailed Kite	*Lophoictinia isura*	Vulnerable - TSC
Little Eagle	*Hieraaetus morphnoides*	Vulnerable - TSC
Barking Owl	*Ninox connivens*	Vulnerable - TSC
Flame Robin	*Petrocia phoenica*	Vulnerable – TSC
Brown Treecreeper	*Climacteris picumnus victoriae*	Vulnerable - TSC
Varied Sittella	*Daphoenositta chrysoptera*	Vulnerable - TSC
Hooded Robin (south-eastern form)	*Melanodryas cucullata cucullata*	Vulnerable - TSC
Diamond Firetail	*Stagonopleura guttata*	Vulnerable - TSC
White-fronted Chat	*Epthianura albifrons*	Vulnerable - TSC
Grey-crowned Babbler (eastern subspecies)	*Pomatostomus temporalis temporalis*	Vulnerable - TSC
Fork-tailed Swift	*Apus pacificus*	Migratory - EPBC
White-throated Needletail	*Hirundapus caudacutus*	Migratory - EPBC
Yellow Wagtail	*Motacilla flava*	Migratory - EPBC
Satin Flycatcher	*Myiagra cyanoleuca*	Migratory - EPBC
Mammals		
Koala	*Phascolarctos cinereus*	Vulnerable – TSC Vulnerable – EPBC
Squirrel Glider	*Petaurus norfolcensis*	Vulnerable - TSC
Eastern Pygmy-possum	*Cercartetus nanus*	Vulnerable - TSC
Corben's Long-eared Bat	*Nyctophilus corbeni*	Vulnerable – TSC Vulnerable - EPBC

Common Name	Species Name	Legal Status
Eastern Bentwing-bat	*Miniopterus schreibersii oceanensis*	Vulnerable - TSC
Grey-headed Flying-fox	*Pteropus poliocephalus*	Vulnerable – BC Vulnerable - EPBC
Yellow-bellied Sheathtail-bat	*Saccolaimus flaviventris*	Vulnerable - TSC

Wagga Wagga LGA is listed in Schedule 1 of SEPP 44, which requires that prior to granting consent to a development on land subject to the policy, Council must consider whether the land constitutes potential or core koala habitat. Under the definitions of this policy, potential koala habitat means areas of native vegetation where the trees of types listed in Schedule 2 constitute at least 15 % of the total number of trees in the upper or lower strata of the tree component.

There are no tree species identified on site which are listed in Schedule 2 of the SEPP as a koala food tree. However, there are three species which have been identified as secondary food species in the Murrumbidgee region: Inland Grey Box, Yellow Box, and Blakely's Red Gum (OEH 2016). Each constitutes 5 – 25 % of vegetation cover in the wooded areas of the site, but less than 15 % of the trees occurring on the land overall, therefore, under the SEPP, there is no need to proceed to Step 2 to determine whether the land is core koala habitat. Further, no evidence of koalas was found on site during the field survey, and there are no recorded sightings within around 10 km of the study area. The proposal is therefore eligible to proceed without a Plan of Management being prepared for the koala.

6.3.7 Aquatic Biodiversity

Species that could potentially be impacted under the *Fisheries Management Act 1994* were assessed within the results in Appendix F. It was determined that there would be minimal impact to aquatic biodiversity as a result of the proposed works. There are no water courses that transect the development site, the evaporation ponds remain dry for the majority of the year and the existing farm dams that retain stormwater would be retained on-site. The closest prescribed stream is unnamed and ephemeral approximately 500 m to the south of the development site.

6.3.8 Disturbance, weeds, and pests

Native woodland vegetation has been previously cleared within the study area for cropping and pasture, characteristic of the surrounding landscape. Pasture weed species are common across the majority of the study area. Two noxious weeds declared for the Wagga Wagga Local Council under the *Biosecurity Act 2015* were recorded within the study area, St. John's Wort *Hypericum perforatum* and Scotch Thistle *Onopordum acanthium*. A large patch of Scotch Thistle was located above the central evaporation pond.

Feral animals recorded within the study area during the survey included the Red Fox *Vulpes vulpes*, which was identified from a scat. It is likely that Feral Cat *Felis catus* and European Rabbit *Oryctolagus cuniculus* are also present at the site.

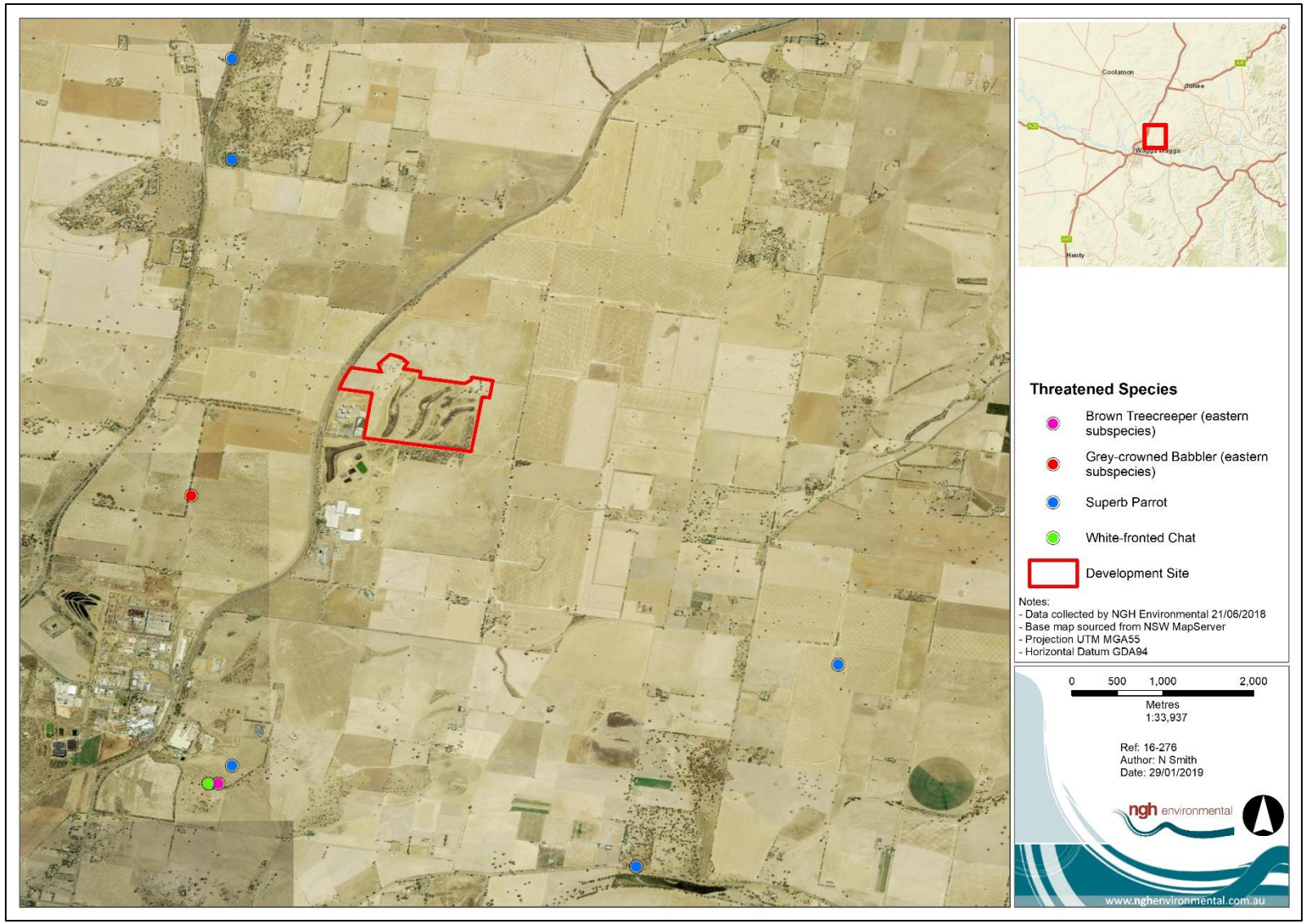

Figure 6-12 Threatened species records from NSW BioNet (2016)

Several key threatening processes listed under the TSC and EPBC Acts are or were relevant to the study area, including:

- Clearing of native vegetation (TSC) / Land clearance (EPBC).
- Loss of hollow-bearing trees (TSC).
- Removal of dead wood and dead trees (TSC).
- Predation by the European Red Fox *Vulpes vulpes* (Linnaeus, 1758) (TSC& EPBC).
- Predation by the Feral Cat *Felis catus* (Linnaeus, 1758) (TSC & EPBC).
- Anthropogenic climate change (TSC).

6.3.9 Potential impacts

Potential impacts of the proposal on biodiversity were considered, including both direct and indirect impacts, and taking into account the nature, extent, frequency, duration, and timing of impacts.

Loss of vegetation/habitat

It is estimated that around 17 ha of land would be disturbed during construction of the development footprint, including the site access and hard stand. This would require the removal of around 0.8 ha of existing exotic groundcover and up to two mature trees for site access and the hard stand. Additional exotic groundcover removal could occur as a result of the excavation and earthworks in and around the proposed waste cell. However, the proposed waste cell is already heavily modified and most of the construction and operation activity would occur within the existing footprint of the pond. The area of disturbance would be minimised, including by not using or parking any heavy machinery or other vehicles in any areas outside the current development footprint. No impact to aquatic biodiversity is expected as a result of the construction or operation of the proposed project.

Erosion and sedimentation

Earthworks and topsoil disturbance in the construction phase may result in increased soil erosion and sedimentation. This would be exacerbated by any heavy rainfall during the construction period. Erosion and sedimentation would affect both terrestrial and aquatic ecosystems, with loss of topsoil impacting terrestrial vegetation, and increased turbidity and sedimentation impacting on water quality and thus aquatic organisms. The risk of erosion and sedimentation would be minimised with the use of appropriate mitigation measures.

Loss of habitat features

The proposal would have minimal impact on habitat features such as hollow-bearing trees and fallen timber. No hollow-bearing trees are within the proposed development footprint. No paddock trees would be impacted as a result of the proposal.

Traffic

Construction and operation of the proposal is likely to result in an increase in traffic levels on site access roads. This could increase the risk of collisions with wildlife and contribute to increased dust and noise levels. Given the lack of suitable habitats, this is likely to be very minor.

Noise

Excessive or increased noise may disturb nearby native fauna. This can disrupt feeding and breeding of disturbance-sensitive species. This is unlikely to be of substantial impact given the lack of native fauna habitat in the development area.

Indirect impacts on adjacent habitats

Runoff from waste receiving, processing, and disposal areas could potentially contain high concentrations of pollutants, including gross pollutants, oils and grease, heavy metals, nutrients, pathogens, and oxygen-demanding substances. All runoff from waste areas should be collected and reused in the process and/or discharged to the leachate management system.

Night-time security or operational lighting can potentially discourage habitat use where diffuse light penetrates adjoining areas of vegetation. Nocturnal foraging regimes could be disrupted, and predators such as foxes and cats may be advantaged, which are not strictly nocturnal hunters. The eyesight of nocturnal species is limited by strong lighting and leaves them more vulnerable to predation. In general, the use of large floodlights should be avoided. Where required for emergencies, maintenance, or security, lighting should be designed not to spill light outside the development site.

Noise and dust generated during construction activities could impact on resident flora and fauna in close proximity to the development site. Further, the proposed waste cell is likely to contain contaminants, including lanolin oil, and any discharge of water or mobilisation of sediment into the natural drainage system could impact on the aquatic habitat of this system. However, given the relatively small scale of the proposal and the largely disturbed and low-quality habitat value in the development site, and with the implementation of the recommended mitigation measures the impact is expected to be minimal. No significant indirect impacts on species of conservation significance are likely to be generated by the proposal.

Weeds and pests

Weeds and pathogens may be established and spread via seeds, plant parts, and dirt on construction equipment and machinery during construction, and on trucks, light vehicles, and waste during operation. The potential risk of introduction and spread of weeds from the proposal could contribute to a loss of biodiversity through competition from aggressive weed species, and provision of food resources and shelter for pest species. The risk of spread of weeds from the landfill site could be associated with soil disturbance and earthworks during construction of the proposal. Mitigation measures have been recommended to minimise the risk of this impact.

The potential for the spread of pest species such as rabbits, foxes, cats, rodents, starlings, flies, and cockroaches could also contribute to the loss of biodiversity through competition for resources and direct predation on native fauna.

Increase in key threatening processes

Several key threatening processes listed under the TSC and EPBC Acts have been identified as relevant to the proposal, including:

- Clearing of native vegetation (TSC) / Land clearance (EPBC).
- Loss of hollow-bearing trees (TSC).
- Removal of dead wood and dead trees (TSC).

With the implementation of the recommended mitigation measures, the proposal is not likely to significantly contribute to these key threatening processes.

Groundwater dependent ecosystems

The terrestrial vegetation within the study area is generally not dependant on shallow groundwater. The relatively minor drainage lines within the study area are unlikely to provide river base flows through groundwater discharge. There are no aquifer or cave ecosystems or estuarine or near shore marine systems within the study area. As groundwater does not rise to the surface within the study area, terrestrial fauna would not depend on it for drinking water.

No GDEs occur within the study area, therefore there is not likely to be any impacts on GDEs as a result of the proposal.

Cumulative impacts

The proposal is not considered to significantly add to cumulative adverse biodiversity impacts in the locality, because the majority of the vegetation to be removed or impacted is exotic understorey with limited habitat value.

6.3.10 Safeguards and mitigation measures

The following safeguards are recommended within the biodiversity assessment to minimise impacts:

No.	Impact	Environmental safeguard	Timing
B1	Erosion and sedimentation	Final design should include appropriate soil erosion and sedimentation mitigation measures.	Design
B2	Avoid, minimise, mitigate and offset biodiversity impacts	Construction should take place in already disturbed areas, particularly, the proposed waste cell. Stockpiling and materials management should all occur within the existing footprint of the proposed waste cell. Construction of site access should occur in an area where vegetation is sparser to minimise the extent of clearing for site access. Tree planting as a mitigation measure should occur along parts of the western boundary.	
B3	Habitat loss	Proposal should be designed to minimise the extent of clearing required.	Design
B4	Habitat loss / bushfire	Any Asset Protection Zone (APZ) would need to be included within the footprint of the design and should not be justification for additional clearing.	Design
B5	Biodiversity impacts	A Construction Environmental Management Plan (CEMP) and	Pre-construction

No.	Impact	Environmental safeguard	Timing
		Operational Environmental Management Plan (OEMP) should be developed for the proposal, including these mitigation measures. These plans should be prepared in consultation with an appropriately qualified ecologist.	
B6	Habitat loss	Areas of native vegetation within the development site which are not being cleared should be fenced off prior to construction commencing, to limit access and prevent disturbance.	Pre-construction
B7	Weeds	The noxious weeds St. John's Wort and Scotch Thistle should be controlled prior to the commencement of works according to Noxious and Environmental Weed Control Handbook (DPI (2015)). The site should be monitored on an annual basis. and weed control undertaken as required during the life of the facility.	Pre-construction
B8	Weeds	Establish a plan to ensure vehicle and machinery are cleaned before entering and leaving the site to minimise risk of weed invasion	Pre-construction
B9	Aquatic impacts	A spill control plan would be established prior to the commencement of works to prevent chemicals or pollutants from having an adverse effect on the environment.	Pre-construction
B10	Biodiversity offset package	An offset package should be prepared to mitigate the effects of the proposal on biodiversity. Actions implemented as part of this package would include: • Revegetation to fill gaps • Ground preparation activities including deep ripping to increase water infiltration and allow greater root penetration • Appropriate wildlife-friendly fencing • Relocation of logs • Weed and pest control • Ongoing maintenance and monitoring	Pre-construction
B11	Biodiversity offset package	The proposal would result in around 0.8 ha of vegetation being cleared. This would	Pre-construction

No.	Impact	Environmental safeguard	Timing
		consist predominantly of exotic groundcover.	
B12	Weeds	Control existing weed infestations in the development site prior to commencement of the construction phase.	Pre-construction
B1.	Habitat loss	Limit clearing to within the development site.	Construction
B13	Direct fauna impacts	In the case of any unexpected finds of injured or less mobile fauna during construction, work should stop immediately until WIRES or an ecologist has been contacted.	Construction
B14	Weeds	Stockpile local topsoil and mulch during construction in previously cleared areas for use in landscaping and rehabilitation works.	Construction
B15	Weeds	Minimise the volume of imported topsoil to reduce the risk of introducing weed propagules.	Construction
B16	Pests	Install appropriate fencing around landfill site to discourage pests.	Construction
B17	Rehabilitation	Undertake planting for landscaping and vegetated buffers. All flora planted at the site should be indigenous to the study area.	Construction
B18	Bushfire	Prepare and implement a fire management plan for the landfill site and surrounding vegetation. This plan would provide for: • Monitoring of fuel loads • Fuel reduction such as slashing, controlled grazing, and hazard reduction burning where appropriate • No hazard reduction burning in offset areas in compliance with OEH's requirements for offset areas	Operation
B19	Weeds	Monitor cleared areas for weed growth, and, if required, implement control and remediation actions.	Operation

No.	Impact	Environmental safeguard	Timing
B20	Weeds	Do targeted monitoring and control of weeds that are harmful to threatened species and ecological communities.	Operation
B21	Pests	Monitor and implement follow-up control of pests (including rabbits, foxes, and cats) as necessary throughout operation of the proposal.	Operation
B22	Direct fauna impacts	Appropriate speed limits would be applied to the internal access roads, with speed control signage installed, to reduce the risk of vehicle collisions with fauna.	Construction, operation
B23	Groundcover	Maintain adequate groundcover on all parts of the landfill site not required for day-to-day operations.	Operation
B24	Rehabilitation	Progressive rehabilitation and revegetation of spent landfill areas to stabilise soils.	Operation
B25	Rehabilitation	Following closure of the landfill, the site would be rehabilitated and revegetated with plant species consistent with the site's pre-existing condition. Revegetation works would include a two-year maintenance period and weed control for at least five years following closure of the landfill.	Post-operation
P3	Design and construction should be in accordance with biodiversity and riparian lands conservation management principles.		WWDCP
C1	Retain existing vegetation along the Olympic Highway and Byrnes Road and along creek lines and all other treed locations indicated on the Bomen Site Topography and landscape character plan.		WWDCP
C3	Revegetation of the area referred to in C1 is to be undertaken in accordance with a management plan approved by Council.		WWDCP
C1	A landscape plan is required for applications for: • Commercial and industrial developments Residential development (other than dwelling houses)		WWDCP
C2	Natural features at the site, such as trees, rock outcrops, cliffs, ledges, and indigenous species and vegetation communities are to be retained and incorporated into the design of the development.		WWDCP
C3	Use native and indigenous plants, especially low water consumption plants, in preference to exotic species.		WWDCP

No.	Impact	Environmental safeguard	Timing
C4	Trees should be planted at the front and rear of properties to provide tree canopy.		WWDCP
C5	Provide landscaping in the front and side setback areas, and on other parts of the site to improve the streetscape, soften the appearance of buildings and paved areas, and to provide visual screening.		WWDCP
C6	Landscaping should provide shade in summer without reducing solar access in winter. Limited use of deciduous species is acceptable where used to achieve passive solar design.		WWDCP
C7	Trees should be planted at the front and rear of properties to provide tree canopy.		WWDCP

6.4 CLIMATE AND AIR QUALITY

SECRETARY'S ENVIRONMENTAL ASSESSMENT REQUIREMENTS

Air quality and odour, including:

- *A description of all potential sources of air emissions;*
- *An air quality impact assessment in accordance with relevant Environment Protection Authority Guidelines; and*
- *A description and appraisal of air quality impact mitigation and monitoring measures.*

EPA'S REQUIREMENTS

An odour assessment should be prepared based on the potential emissions from the management facility. The EIS should also detail the appropriate waste acceptance and screening steps and waste management steps that will be implemented to prevent the generation of odour;

The air quality impact assessment should include an assessment of dust impacts from the proposed construction and operation of the landfill and details of all mitigation measures.

WW DCP REQUIREMENTS

Developments that have processes, inputs, and outputs that are likely to generate significant or offensive odour will be required to undertake an odour modelling and assessment process to ascertain the impact of such odours on sensitive receptors and to outline measures to minimise and mitigate against such odours.

An operational odour assessment was conducted by the JACOBS Group (Australia) Pty Ltd for the proposed North Ridge Materials Facility. The findings of the report are summarised in section 6.4.2 and the full report is available in Appendix J.

A construction and operational air quality assessment was conducted by the JACOBS Group (Australia) Pty Ltd for the proposed North Ridge Materials Facility. The findings of the report are summarised in section 6.4.3 and the full report is available in Appendix T.

6.4.1 Existing environment

Climate

The rate at which pollutants are dispersed is dependent on meteorological conditions, including wind speed, wind direction, atmospheric stability class and mixed-layer height.

The development site is located in the SWS bioregion, which is characterised by a sub-humid climate with hot summers and no dry season. The Bureau of Meteorology (BOM) climate records available from the climate station at Wagga Wagga AMO (station number 072150, -35.016°S, 147.46°E) indicate a mean summer maximum of 31.8 °C (January) and a mean winter minimum of 2.8 °C (July) for the period 1942 to 2018. The BOM rainfall records from the same station for the period 1941 to 2018 show a mean annual rainfall of 575.3 mm. Rainfall is generally greatest over winter and spring with the average monthly maximum occurring in October (56.9 mm). The monthly climate data is summarised in Table 6-19.

Table 6-19 Summary monthly climate statistics for Wagga Wagga AMO (072150)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann.
Mean max. temp. (°C)	31.8	30.9	27.7	22.6	17.4	13.9	12.7	14.5	17.7	21.6	25.9	29.5	22.2
Mean min. temp. (°C)	16.3	16.4	13.4	9.2	5.9	3.7	2.8	3.5	5.1	7.8	10.9	13.9	9.1
Mean rainfall (mm)	40.5	40.5	44.6	39.7	50.6	50.5	54.9	51.0	49.4	56.9	45.7	45.7	575.3

BOM wind data collected at Wagga Wagga AMO climate station (station number 072150, -35.16°S, 147.46°E) show that the prevailing winds easterly at 9.00 am and westerly at 3.00 pm. The average annual wind speed ranges from 10.1 kph at 9:00 am to 14.2 kph at 3:00 pm, with an average monthly maximum of 17.7 kph (December, 3:00 pm) and minimum of 6.5 kph (June, 9:00 am).

Air quality

Air quality in the South West Slopes region is considered in the fair to very good categories (OEH 2016). The development site is located within an industrial area and next to rural areas used for agriculture. Sources of pollution in the locality are likely to include:

- Emissions from industrial activities.
- Emissions from light vehicles and trucks on local roads and highways.
- Emissions from trains on the railway.
- Dust from vehicles travelling on unsealed roads.
- Dust from agricultural activities and saleyard use.
- Smoke from paddock stubble burn-off in agricultural areas and from wood fires.

Search results from the National Pollutant Inventory (NPI) (DEE 2018) identified 13 polluting industrial facilities in the Wagga Wagga/Bomen area. The industrial facilities in Bomen mainly emit the following substances to the atmosphere:

- Sulphur dioxide
- Total volatile organic compounds (VOCs)
- Chromium (III) compounds
- Nickel and compounds
- Carbon monoxide
- Benzene
- Ethylbenzene
- Toluene (methylbenzene)
- Cyclohexane
- N-Hexane
- Xylenes
- Polycyclic aromatic hydrocarbons
- Nitrogen oxides
- Particulate matter 10.0 µm
- Lead and compounds
- Mercury and compounds

One of these facilities is within the study area (Riverina Oils and Bio Energy Pty Ltd). The total pollution emissions for 2016-2017 are presented in Table 6-20.

Table 6-20 Pollution emissions for Riverina Oils and Bio Energy Pty Ltd, 2016-2017

Pollutant	Total (kg)
Arsenic and compounds	0.02
Cadmium and compounds	0.12
Carbon monoxide	3000.00
Chromium (III) compounds	0.15
Copper and compounds	0.09
n-Hexane	3800.00
Lead and compounds	0.05
Mercury and compounds	0.03
Nickel and compounds	0.22
Nitrogen oxides	6300.00
Particulate matter 10.0 µm	1700.00
Particulate matter 2.5 µm	860.00
Polycyclic aromatic hydrocarbons	0.11
Sulphur dioxide	120.00
Total Volatile Organic Compounds	4900.00

Episodic events such as bushfire, dust storms and drought during dry times may produce short term adverse effects on local air quality through the generation of dust. Agricultural activities can also temporarily affect air quality during activities such as cultivation, fertiliser application, harvesting or slashing. Impacts are generally worsened during windy periods with greater dispersion of air pollutants. For the development site, highest winds are experienced during the months of October to February.

Sensitive receivers

There are no residential sensitive receivers within a 1 km radius of the development site. There are three residential sensitive receivers located approximately 1.5 km of the development site (Figure 3-2). The closest residential receiver is located approximately 1.25 km from the western boundary of the proposal. Receivers R01 to R21 were used in this report and were representative of the 66 residential sensitive receivers in a 3 km radius.

6.4.2 Operational odour assessment

The AUSPLUME dispersion model was used to assess the operational odour experienced by sensitive receivers situated around the proposal. Meteorological conditions were estimated for the site using the Bureau of Meteorology's (BOM) automatic weather station (AWS) Wagga Wagga Airport.

The annual and seasonal wind roses were developed from the 2014, 2015 and 2016 annual wind data for the AWS Wagga Wagga Airport. Annual and seasonal trends were consistent for the three years and the following trends were observed:

- Summer – Easterly and east north-easterly winds were most common. Calm conditions of less than 3 %.

- Autumn – Easterly winds most common with east north-easterly and east south-easterly winds occurring frequently. Calm conditions of 5-7 %.
- Winter – Easterly winds with occasional strong winds from the west of greater than 7.5 m per second. East north-easterly and east south-easterly also common. Calm conditions of 10 %.
- Spring – Easterly and north-easterly winds most common. Strong winds occasionally occurring from the west-northwest, west and west-southwest. Calm conditions of 5-6 %.

There was more consistency between the spring conditions of the 2014 and 2015 datasets than with 2016. Therefore, 2015 conditions were used for the analysis.

Operational odour risks are primarily associated with, and were calculated for, the following:

- The active filling area or tipping face of the waste cell.
- Residual odour from immediately or permanently covered areas.
- The leachate pond.

The methods for the modelling and assessment of air pollutants for the North Ridge site follow the Approved Methods for the Modelling and Assessment of Air Pollutants in NSW (EPA 2016). All methods are detailed in the full Operational Odour Assessment report (Appendix J).

Impact assessment criteria for complex mixtures of odorous pollutants is described in Table 6-21 and measured in odour units (OU). One OU represents the threshold of detection. Therefore, values less than 1 OU are below detection.

Table 6-21 Impact assessment criteria for complex mixtures of odorous pollutants (Appendix J)

Population of affected community	Impact assessment criteria for complex mixtures of odorous air pollutants (OU)
Urban (greater than or equal to 2000 persons including schools and hospitals)	2.0
Approximately 500	3.0
Approximately 125	4.0
Approximately 30	5.0
Approximately 10	6.0
Single rural residence (less than or equal to 2 persons)	7.0

Assessment scenarios

Specific odour emission rates (SOER) were identified through a literature review for three common landfill phases. The data was compared and reviewed (Appendix J). The common phases include:

- The active tipping face, which refers to the operational area with exposed waste.
- The daily cover area, which refers to an intermediate cover applied to the exposed waste each day until capacity is reached.
- The final filled and capped area, which refers to the section that has reached capacity and is capped with the final cover layer.

The SOERs are notably higher for putrescible wastes than for non-putrescible wastes. As the proposal is a non-putrescible waste facility, the values measured for non-putrescible waste were used for the assessment. Conservative measurements were used for the leachate pond, filled and capped areas and daily cover. The measurements from the Wetherill Park site were used for the active tipping face as the material disposed of onsite best represents the material to be received by the proposal.

Four scenarios were developed using the adopted SOERs (Appendix J):

- Scenario 1 – Early operations includes one active sub-cell and the leachate pond.
- Scenario 2 – Medium term operations includes an active sub-cell, the leachate pond and residual odours from the filled and capped cells.
- Scenario 3 – Final operations includes the final active sub-cell, the leachate pond and the residual odours from the filled and capped sub-cells.
- Scenario 4 – Closure includes the residual odours generated from the filled and capped waste cell and the leachate pond.

Predicted results

A conservative approach was undertaken in the odour assessment. A stringent criterion of 2 OU was used, instead of 7 OU, which would meet the criteria of the area surrounding the proposal (Table 6-21).

The predicted results from the modelling indicate that odours from the proposal are not likely to exceed the 99th percentile one hour peak-to mean (i.e. corrected to the nose response time average) criterion of 2 OU at the identified sensitive receivers for Scenario 1 (Figure 6-13), Scenario 2 (Figure 6-14), Scenario 3 (Figure 6-15) and Scenario 4 (Figure 6-16). This is line with the *Environmental Guidelines: Solid Waste Landfills* (EPA 2016).

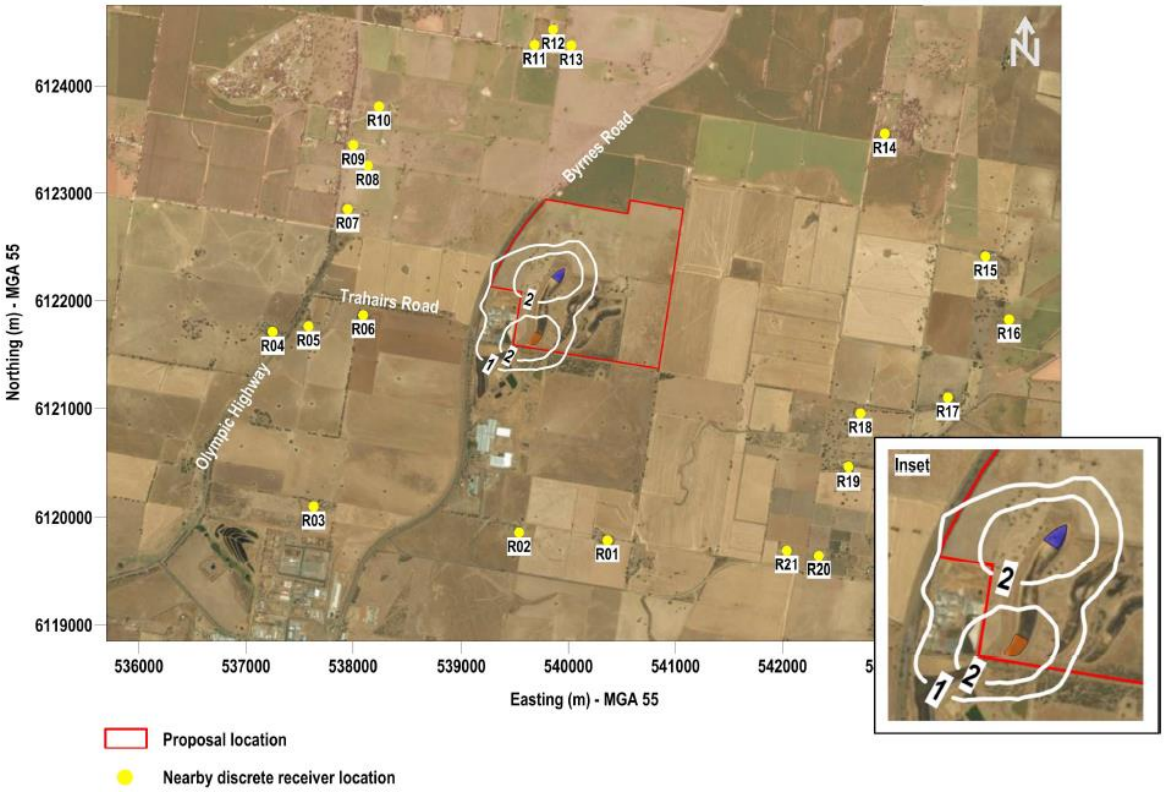

Figure 6-13 Predicted 1-hour peak-to-mean corrected 99th percentile ground level odour concentration results - Scenario 1 (early operations) (Appendix J)

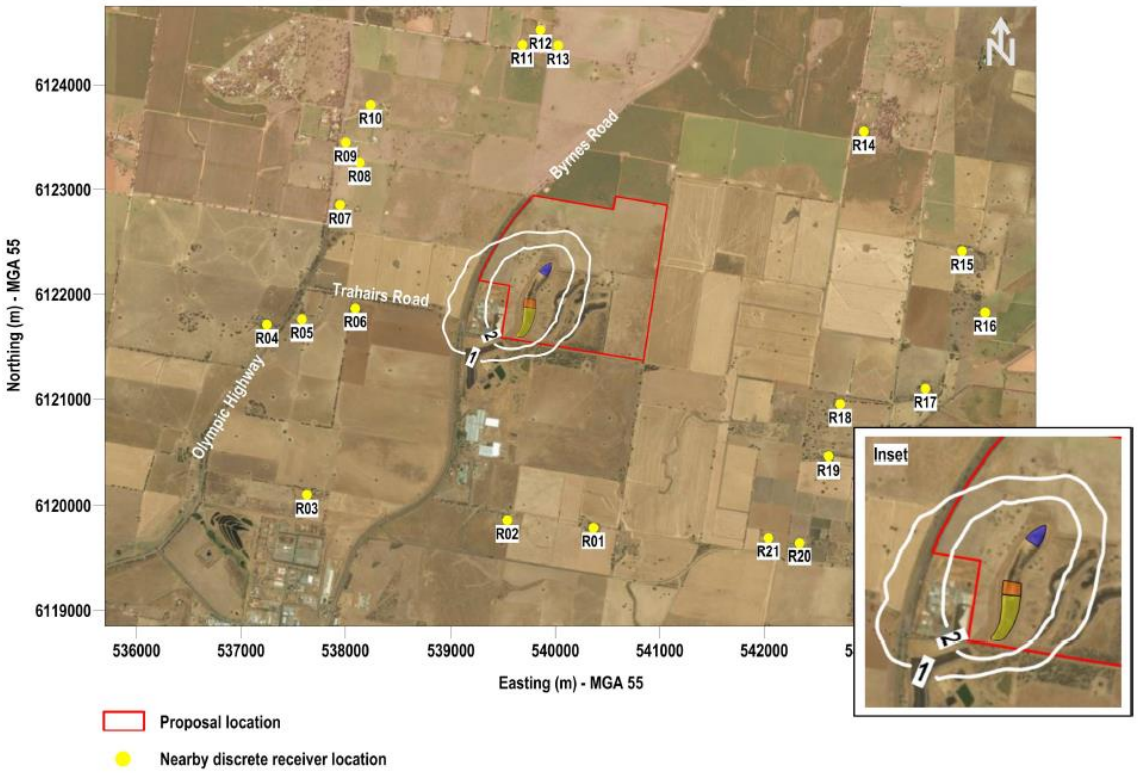

Figure 6-14 Predicted 1-hour peak-to-mean corrected 99th percentile ground level odour concentration results - Scenario 2 (medium-term operations) (Appendix J)

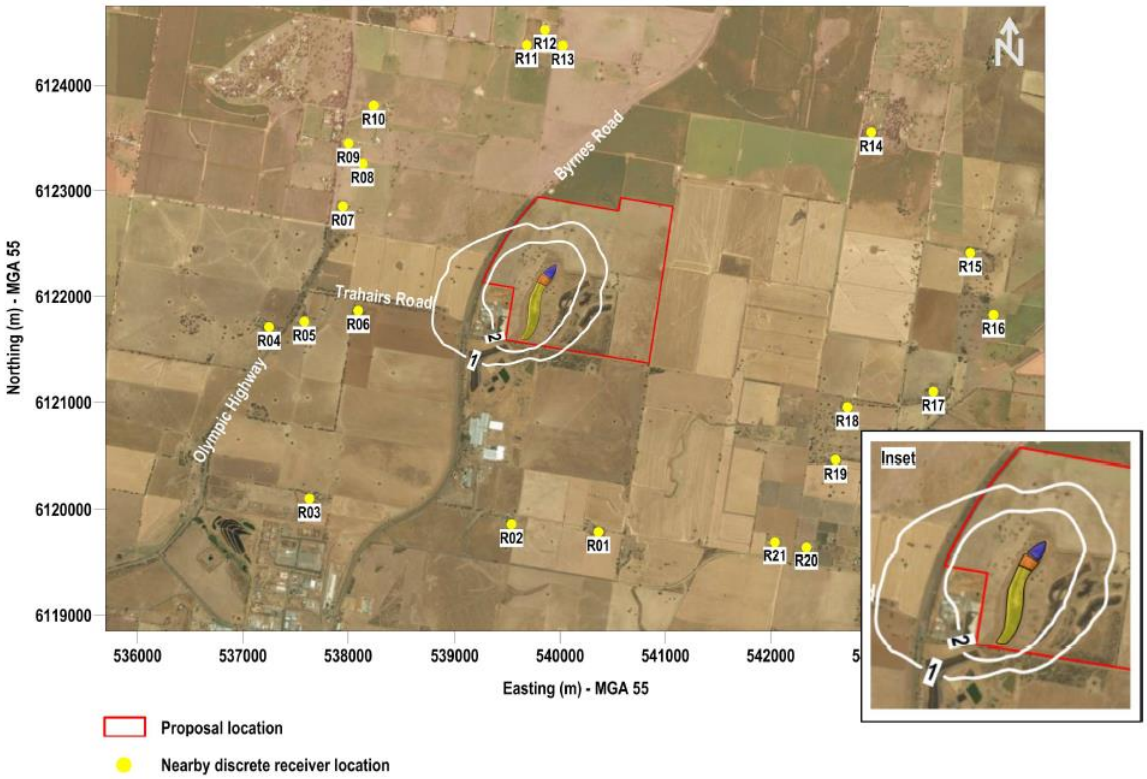

Figure 6-15 Predicted 1-hour peak-to-mean corrected 99th percentile ground level odour concentration results - Scenario 3 (final operations) (Appendix J)

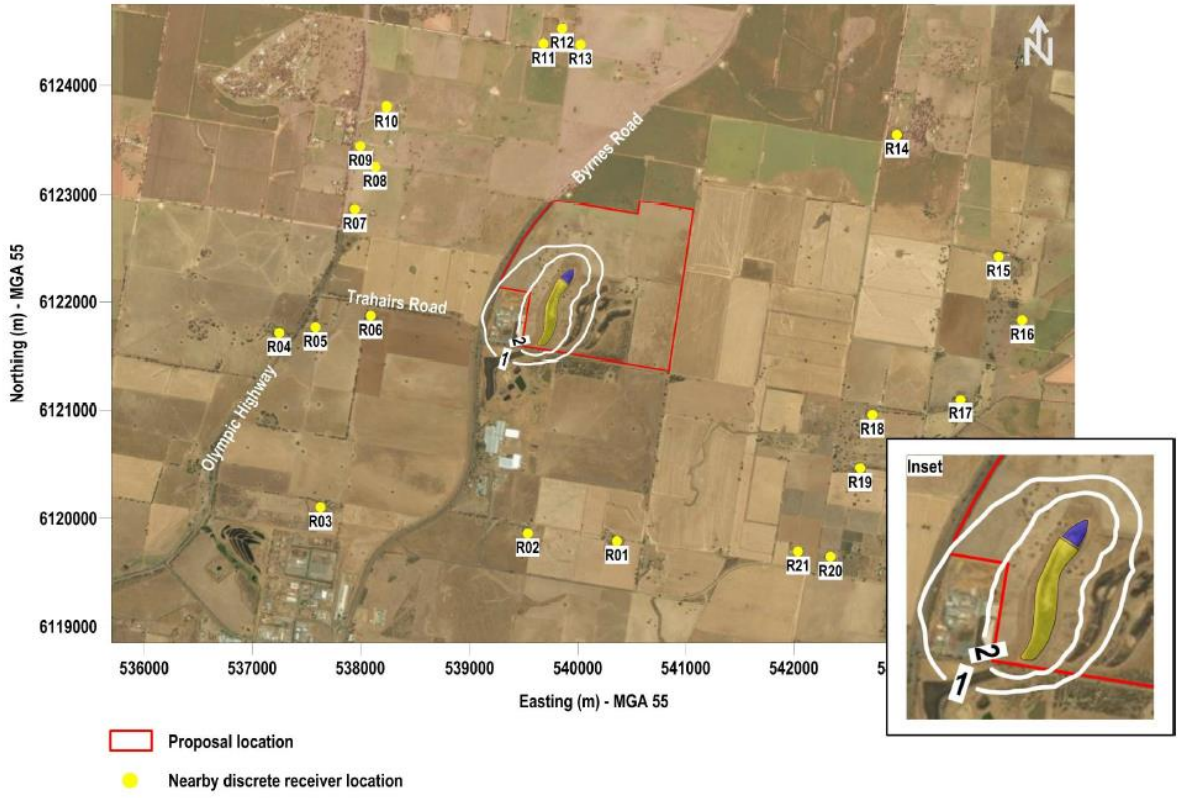

Figure 6-16 Predicted 1-hour peak-to-mean corrected 99th percentile ground level odour results - Scenario 4 (closure) (Appendix J)

The findings indicate that the North Ridge Materials Facility is unlikely to cause adverse odour impacts.

Recommended safeguards and mitigation measures are included in section 6.4.5 (Appendix J).

6.4.3 Construction and operational air quality assessment

Operational odour from the proposal has been assessed in section 6.4.2. Another primary air quality risk during construction and operation of the proposal is the generation of dust and includes total suspended particulates (TSP) and fine particles (PM_{10} and $PM_{2.5}$). Secondary air quality risk includes exhaust emissions (i.e. particulate matter, sulfur dioxide (SO_2), nitrogen dioxide (NO_2), carbon monoxide (CO) and volatile compounds e.g. benzene) from the combustion of fossil fuels in vehicles, plant and equipment used at the site.

The AUSPLUME dispersion model was used to assess air quality impacts experienced by sensitive receivers, including dust and exhaust emissions, from the construction and operation of the proposal.

Emissions to air during construction and operation were estimated using guidance from *Emission Estimation Technique Manual for Mining Version 3.1* (Commonwealth DSEWPaC 2012). Predicted levels were evaluated against criteria established from the *Approved Methods for Modelling and Assessment of Air Pollutants in NSW* (Approved Methods) (NSW EPA 2016).

Table 6-22 provides the criteria relevant to the pollutants assessed in the report (Appendix T). The criteria for deposited dust, TSP, SO_2, NO_2 and CO relate to the 100th percentile or maximum predicted concentration from the activity and existing background levels. The assessment criteria for benzene applies to the site boundary as it is classified as an 'air toxic'. Therefore, the 99.9th percentile of 1-hour averaged incremental concentration impact assessment criterion applies.

Table 6-22 Impact assessment criteria

Pollutant	Averaging time	Impact assessment criteria	Criteria applies at
Total suspended particles (TSP)	Annual	90 µg/m^3 (100th percentile)	Nearest existing or likely future off-site sensitive receptors
Airborne particulate matter (as PM_{10})	24-hour	50 µg/m^3 (100th percentile)	
	Annual	25 µg/m^3 (100th percentile)	
Airborne particulate matter (as $PM_{2.5}$)	24-hour	25 µg/m^3 (100th percentile)	
	Annual	8 µg/m^3 (100th percentile)	
Sulfur dioxide (SO_2)	10-minutes	712 µg/m^3 (100th percentile)	
	1-hour	570 µg/m^3 (100th percentile)	
	24-hour	228 µg/m^3 (100th percentile)	
	Annual	60 µg/m^3 (100th percentile)	
Nitrogen dioxide (NO_2)	1-hour	246 µg/m^3 (100th percentile)	
	Annual	62 µg/m^3 (100th percentile)	
Carbon monoxide (CO)	15-minutes	100 mg/m^3 (100th percentile)	
	1-hour	30 mg/m^3 (100th percentile)	
	8-hour	10 mg/m^3 (100th percentile)	
Benzene	1-hour	29 µg/m^3 (99.9th percentile)	At and beyond the site boundary

Meteorological conditions were estimated for the site using the Bureau of Meteorology's (BOM) automatic weather station (AWS) Wagga Wagga Airport. The climate data in section 6.4.1 indicate that the potential for dust generation is at its highest during the summer months when conditions are warmest, and rainfall is low. Refer to section 6.4.2 for the annual and seasonal wind rose data.

PM_{10} and $PM_{2.5}$ background data was taken from an OEH operated ambient air quality monitoring station at Wagga Wagga north, which has been operating since 2011. Albion Park is the closest OEH station monitoring SO_2 and NO_2. The OEH station in Wollongong is the closest station monitoring CO. It has been noted that neither the Albion Park station nor the station in Wollongong are representative of conditions in Wagga Wagga. However, in the absence of data from closer locations or more representative locations, this data has been included.

Adopted background concentrations of the key air quality risks were established for the proposal and presented in Table 6-23.

Table 6-23 Adopted background concentrations

Pollutant	Averaging time	Adopted background concentration	Justification
TSP	Annual	53 µg/m^3	No known monitoring of TSP is conducted near the proposal. The NSW Minerals Council estimated that, for rural environments in NSW, the average PM_{10} concentrations are typically 40 per cent of the TSP concentrations (Minerals Council 2000).

Pollutant	Averaging time	Adopted background concentration	Justification
PM_{10}	24-hour	48 µg/m³	Highest 2014 to 2017 95th percentile value recorded at OEH's Wagga Wagga station
	Annual	21 µg/m³	Highest 2014 to 2017 value recorded at OEH's Wagga Wagga station
$PM_{2.5}$	24-hour	18 µg/m³	Highest 2014 to 2017 95th percentile value recorded at OEH's Wagga Wagga station
	Annual	7.7 µg/m³	Average of 2014 to 2017 value recorded at OEH's Wagga Wagga station
NO_2	1-hour	96 µg/m³	Highest 2014 to 2017 value recorded at OEH's Albion Park station
	Annual	8 µg/m³	Highest 2014 to 2017 value recorded at OEH's Albion Park station
SO_2	1-hour	109 µg/m³	Highest 2014 to 2017 value recorded at OEH's Albion Park station
	24-hour	23 µg/m³	Highest 2014 to 2017 value recorded at OEH's Albion Park station
	Annual	3 µg/m³	Highest 2014 to 2017 value recorded at OEH's Albion Park station
CO	1-hour	3 mg/m³	Highest 2014 to 2017 value recorded at OEH's Wollongong station
	8-hour	1.1 mg/m³	Highest 2014 to 2017 value recorded at OEH's Wollongong station

Adopted background concentrations for SO_2, NO_2 and CO surrounding the proposal are expected to be well below the relevant impact assessment criteria from the Approved Methods. The scale of plant expected to be in use during the construction and operation of the proposal is minor, and it was determined that exhaust-emissions would not present an issue and were not considered further in the assessment.

Emissions to air

Handling, loading and unloading, transport and storage of bulk materials are all activities that are expected to generate dust. Dust generation is also expected from erosion of exposed surfaces. These sources present the primary air quality risk during construction. Table 6-24 presents the estimated dust emissions during full-scale construction.

Table 6-24 Estimated dust emissions during full-scale construction

Phase	Activity	Annual emissions (kg/y)		
		TSP	PM_{10}	$PM_{2.5}$
Overall excavation	Scrapers removing soils	468	118	23
	Scrapers traveling across cell	555	142	28
	Wind erosion	8,676	4,338	434
Subsoil drainage	Excavators trenching	3	1	0
	Trucks hauling material	98	26	3
Leachate pond and collection system	Excavators handling material	4	2	0
	Trucks hauling material	780	211	21
	Wind erosion	1,542	771	77
Cell 1 earthworks	Excavators handling material	20	9	2
	Trucks hauling material	717	194	19

Phase	Activity	Annual emissions (kg/y)		
		TSP	PM_{10}	$PM_{2.5}$
	Trucks dumping material	296	106	15
	Graders spreading material	137	61	7
	Wind erosion	2,186	1,093	109
Hardstand earthworks	Excavators handling material	8	4	1
	Trucks hauling material	108	29	3
	Trucks dumping material	122	44	6
	Graders spreading material	137	61	7
	Wind erosion	1,226	613	61
Access road	Excavators handling material	<1	<1	<1
	Trucks hauling material	1	<1	<1
	Trucks dumping material	4	1	<1
	Graders spreading material	137	61	7
	Wind erosion	88	44	4
Earth bank	Trucks hauling material	94	25	3
	Trucks dumping material	14	5	1
	Excavators handling material	1	<1	0
	Wind erosion	526	263	26
Total (kg/y)		**17,949**	**8,224**	**858**

Emissions to air for the operation of the proposal are presented in Table 6-25. The scenario considered active filling, daily cover, capping of cell 1 and the construction of cell 2.

Table 6-25 Estimated dust emissions during operation

Phase	Activity	Annual emissions (kg/y)		
		TSP	PM_{10}	$PM_{2.5}$
Cell 2 earthworks	Excavators handling material	20	9	2
	Trucks hauling material	717	194	19
	Trucks dumping material	296	106	15
	Graders spreading material	137	61	7
	Wind erosion	2,186	1,093	109

Phase	Activity	Annual emissions (kg/y)		
		TSP	PM_{10}	$PM_{2.5}$
Cell 1 daily cover	Excavators handling material	7	3	0
Cell 1 capping layer	Excavators handling material	20	9	2
	Trucks hauling material	701	189	19
	Trucks dumping material	290	104	15
	Graders spreading material	137	61	7
	Wind erosion	2,186	1,093	109
Exposed remaining cell areas	Wind erosion	6,482	3,241	324
Total (kg/y)		**13,181**	**6,165**	**628**

Assessment of impacts

The predicted results at the surrounding sensitive receivers for the construction and operational assessment scenarios described above are presented in Table 6-26 and Table 6-27. Only the 24-hour averaged PM_{10} impact assessment criteria was predicted to be exceeded during construction at the nearest residential receivers to the west (R06) and north (R11) of the facility. No exceedances were predicted during operations.

Table 6-26 Predicted results for construction

Receiver	Annually averaged TSP (µg/m³) vs 90 µg/m³ criterion			PM_{10}						$PM_{2.5}$					
				24-hour averaged (µg/m³) vs 50 µg/m³ criterion			Annually averaged (µg/m³) vs 25 µg/m³ criterion			24-hour averaged (µg/m³) vs 25 µg/m³ criterion			Annually averaged (µg/m³) vs 8 µg/m³ criterion		
	Background	Increment	Cumulative	Background	Increment	Cumulative	Background	Increment	Cumulative	Background	Increment	Cumulative	Background	Increment	Cumulative
R01	53	<1	<54	48	2	50	21	<0.5	<22	18	0.2	<19	7.7	<0.05	<7.8
R02	53	<1	<54	48	2	50	21	<0.5	<22	18	0.1	<19	7.7	<0.05	<7.8
R03	53	<1	<54	48	2	50	21	<0.5	<22	18	0.2	<19	7.7	<0.05	<7.8
R04	53	<1	<54	48	2	50	21	<0.5	<22	18	0.2	<19	7.7	<0.05	<7.8
R05	53	<1	<54	48	2	50	21	<0.5	<22	18	0.2	<19	7.7	<0.05	<7.8
R06	53	<1	<54	48	3	**51**	21	<0.5	<22	18	0.3	<19	7.7	<0.05	<7.8
R07	53	<1	<54	48	1	49	21	<0.5	<22	18	0.1	<19	7.7	<0.05	<7.8

Receiver	Annually averaged TSP (µg/m³) vs 90 µg/m³ criterion			PM_{10}						$PM_{2.5}$					
				24-hour averaged (µg/m³) vs 50 µg/m³ criterion			Annually averaged (µg/m³) vs 25 µg/m³ criterion			24-hour averaged (µg/m³) vs 25 µg/m³ criterion			Annually averaged (µg/m³) vs 8 µg/m³ criterion		
	Background	Increment	Cumulative	Background	Increment	Cumulative	Background	Increment	Cumulative	Background	Increment	Cumulative	Background	Increment	Cumulative
R08	53	<1	<54	48	1	49	21	<0.5	<22	18	0.1	<19	7.7	<0.05	<7.8
R09	53	<1	<54	48	1	49	21	<0.5	<22	18	0.1	<19	7.7	<0.05	<7.8
R10	53	<1	<54	48	1	49	21	<0.5	<22	18	0.1	<19	7.7	<0.05	<7.8
R11	53	<1	<54	48	3	**51**	21	<0.5	<22	18	0.2	<19	7.7	<0.05	<7.8
R12	53	<1	<54	48	2	50	21	<0.5	<22	18	0.2	<19	7.7	<0.05	<7.8
R13	53	<1	<54	48	1	49	21	<0.5	<22	18	0.1	<19	7.7	<0.05	<7.8
R14	53	<1	<54	48	1	49	21	<0.5	<22	18	0.1	<19	7.7	<0.05	<7.8
R15	53	<1	<54	48	1	49	21	<0.5	<22	18	0.1	<19	7.7	<0.05	<7.8
R16	53	<1	<54	48	1	49	21	<0.5	<22	18	0.1	<19	7.7	<0.05	<7.8
R17	53	<1	<54	48	1	49	21	<0.5	<22	18	0.1	<19	7.7	<0.05	<7.8
R18	53	<1	<54	48	1	49	21	<0.5	<22	18	0.1	<19	7.7	<0.05	<7.8
R19	53	<1	<54	48	1	49	21	<0.5	<22	18	0.1	<19	7.7	<0.05	<7.8
R20	53	<1	<54	48	1	49	21	<0.5	<22	18	0.1	<19	7.7	<0.05	<7.8
R21	53	<1	<54	48	1	49	21	<0.5	<22	18	0.1	<19	7.7	<0.05	<7.8

Table 6-27 Predicted results for operation

Receiver	Annually averaged TSP (µg/m³)			PM_{10}						$PM_{2.5}$					
				24-hour averaged (µg/m³)			Annually averaged (µg/m³)			24-hour averaged (µg/m³)			Annually averaged (µg/m³)		
	Background	Increment	Cumulative	Background	Increment	Cumulative	Background	Increment	Cumulative	Background	Increment	Cumulative	Background	Increment	Cumulative
R01	53	<1	<54	48	1	49	21	<0.5	<22	18	0.1	<19	7.7	<0.05	<7.8
R02	53	<1	<54	48	1	49	21	<0.5	<22	18	0.1	<19	7.7	<0.05	<7.8
R03	53	<1	<54	48	2	50	21	<0.5	<22	18	0.2	<19	7.7	<0.05	<7.8
R04	53	<1	<54	48	1	49	21	<0.5	<22	18	0.1	<19	7.7	<0.05	<7.8
R05	53	<1	<54	48	1	49	21	<0.5	<22	18	0.1	<19	7.7	<0.05	<7.8
R06	53	<1	<54	48	2	50	21	<0.5	<22	18	0.2	<19	7.7	<0.05	<7.8
R07	53	<1	<54	48	1	49	21	<0.5	<22	18	0.1	<19	7.7	<0.05	<7.8
R08	53	<1	<54	48	1	49	21	<0.5	<22	18	0.1	<19	7.7	<0.05	<7.8
R09	53	<1	<54	48	1	49	21	<0.5	<22	18	0.1	<19	7.7	<0.05	<7.8
R10	53	<1	<54	48	1	49	21	<0.5	<22	18	0.1	<19	7.7	<0.05	<7.8
R11	53	<1	<54	48	2	50	21	<0.5	<22	18	0.2	<19	7.7	<0.05	<7.8
R12	53	<1	<54	48	2	50	21	<0.5	<22	18	0.2	<19	7.7	<0.05	<7.8
R13	53	<1	<54	48	1	49	21	<0.5	<22	18	0.1	<19	7.7	<0.05	<7.8
R14	53	<1	<54	48	1	49	21	<0.5	<22	18	0.1	<19	7.7	<0.05	<7.8
R15	53	<1	<54	48	1	49	21	<0.5	<22	18	0.1	<19	7.7	<0.05	<7.8
R16	53	<1	<54	48	<1	<49	21	<0.5	<22	18	0.0	<19	7.7	<0.05	<7.8
R17	53	<1	<54	48	1	49	21	<0.5	<22	18	0.1	<19	7.7	<0.05	<7.8
R18	53	<1	<54	48	1	49	21	<0.5	<22	18	0.1	<19	7.7	<0.05	<7.8
R19	53	<1	<54	48	1	49	21	<0.5	<22	18	0.1	<19	7.7	<0.05	<7.8

Receiver	Annually averaged TSP (µg/m³)			PM_{10}						$PM_{2.5}$					
				24-hour averaged (µg/m³)			Annually averaged (µg/m³)			24-hour averaged (µg/m³)			Annually averaged (µg/m³)		
	Background	Increment	Cumulative	Background	Increment	Cumulative	Background	Increment	Cumulative	Background	Increment	Cumulative	Background	Increment	Cumulative
R20	53	<1	<54	48	1	49	21	<0.5	<22	18	0.1	<19	7.7	<0.05	<7.8
R21	53	<1	<54	48	1	49	21	<0.5	<22	18	0.1	<19	7.7	<0.05	<7.8

The predicted exceedances of the 24-hour averaged PM_{10} at residential receivers R06 and R11 during construction (Table 6-26) are primarily a result of the elevated local background level adopted for the assessment (48 µg/m³). As a result, further analysis was conducted to confirm whether construction activities of the proposal would cause any additional exceedances of the impact criteria for R06 and R11. No additional exceedances were predicted at R06 or R11, indicating that the project would not be the cause of an exceedance.

6.4.4 Potential impacts

Construction

During construction, the following activities would potentially result in air quality impacts:

- Clearing of vegetation.
- Stripping and stockpiling topsoil.
- Earthworks.
- Transport and handling of soils and other materials.
- Road construction.
- Use of construction vehicles and equipment, generating exhaust fumes.
- Construction of sub-cell.

Potential air quality impacts during construction would mainly be from the generation of dust and impacts to nearby sensitive receivers.

Sensitive receivers include residents (Figure 3-2) and workers within Bomen Business Park.

Operation

During operation, the following activities would potentially result in air quality impacts in addition to those outlined in the odour assessment section 6.4.2:

- Dozers working in landfill.
- Hauling waste on road.
- Dumping waste.
- Scraping and transporting cover material.
- Shaping covered area.
- Wind erosion from exposed landfill excavation areas.
- Wind erosion from stockpiles.

- Use of vehicles and equipment, generating exhaust fumes.

The proposal landfill would contain some level of biodegradable organic matter, including paper, cardboard and/or wood/timber products. When biodegradable material is deposited in a landfill site, landfill gas is produced due to the microbial activity that facilitates the organic breakdown process. Landfill gas produced at the proposed landfill would consist primarily of carbon dioxide and methane. These are both odourless gases, however landfill can also contain a variety of corrosive, toxic, or odorous components.

6.4.5 Safeguards and mitigation measures

The following safeguards are recommended to minimise air quality impacts:

No.	Impact	Environmental safeguard	Timing
AQ1	General air quality impacts	Construction activities are to be managed to minimise dust and fuel emissions.	During construction
AQ2	Dust generation	Dust minimisation measures (including watering or covering exposed areas) are to be used to minimise or prevent air pollution from disturbed areas, if required, and especially during hot and windy conditions	During construction
AQ3	Dust generation	Visual surveillance for visible dust generation is to occur at all times. Work must cease when high levels of air-borne dust cannot be controlled	During construction
AQ4	Dust generation	Disturbed areas are to be stabilised progressively during the work	During construction
AQ5	Dust generation	Water carts may be used on stockpile sites or access roads to reduce dust.	During construction
AQ6	Vehicle and other equipment emissions	Plant and machinery are to be maintained in accordance with manufacturer's specifications.	During construction
AQ7	Vehicle and other equipment emissions	Vehicles will not be left running when idle.	During construction
AQ8	Vehicle and other equipment emissions	Vehicles transporting waste or other materials that may produce dust are to be covered during transportation.	During construction
AQ9	Odour	Gas monitoring program to be implemented, including subsurface and surface gas emission monitoring devices.	During operation
AQ10	Odour	Apply daily and intermediate cover to waste each day before the close of business. A minimum cover depth of 150 mm is required.	Operation

No.	Impact	Environmental safeguard	Timing
		Any waste-filled areas that have not been landfilled for more than 90 days should have an intermediate soil cover meeting the following requirements: • The cover layer should be a minimum 300 mm layer of virgin excavated natural material in the form of fine-grained, largely cohesive soil. • Soil should have a saturated hydraulic conductivity of less than 1 x 10-5 m/s.	
AQ11	Odour	Keep the active tipping face as small as practicable.	Operation
AQ12	Odour	Waste screening of all waste delivered. Loads will be inspected on receival. Contaminated or odorous loads will be rejected. Materials will be taken from the screening area and placed in the programmed areas in discrete layers. Each new layer will be covered on a daily basis. Unsuitable materials recovered during construction will be stockpiled within the existing cell footprint for use as daily cover during operation.	Operation
AQ13	Odour	Attend to the delivery of highly biodegradable and odorous wastes. The occupier should require such wastes to be delivered in a covered, enclosed or treated form and should ensure that they are immediately buried with adequate cover.	Operation
AQ14	Odour	Control odour from leachate sources by: • Using tight fittings on leachate risers and pipework. • Reducing leachate seeps into the landfill.	Operation Closure
AQ15	Odour	Modify activities appropriately when the wind is blowing towards sensitive receivers.	Operation
AQ16	Handling odour and dust complaints	Develop and maintain an odour and dust complaints system. At a minimum, the following details of a complaint should be recorded: • Date and time. • Contact details of complainant. • Nature of complaint, including odour characteristics, perceived duration and frequency, and perceived source or conditions giving rise to the complaint. • Activities happening at the site at the time of the complaint. • Weather conditions (i.e. wind, rainfall and temperature) at the time of the complaint. • Names of staff on duty. • Actions taken to investigate and resolve the complaint, including any remedial control measures to reduce odour and/or dust emissions. Where several odour or dust complaints are received over time, investigations should include measurement of surface emission rates by using the methods described in the *Approved Methods for Sampling and*	Operation Closure

No.	Impact	Environmental safeguard	Timing
		Analysis of Air Pollutants in NSW (DEC 2005). This data should be compared with the emission factors used in the initial impact assessment modelling and any published emission rates for the type and location of the landfill.	
AQ17	Handling odour complaints	The occupier should implement a program of regular field odour surveys around the site boundary. These surveys should be undertaken during worst-case weather conditions. Personnel conducting field odour surveys should be trained for odour assessment in accordance with the requirements for olfactory testing in *Australian Standard AS 4323.3:2001 Stationary Source Emissions – Determination of odour concentrations by dynamic olfactometry* (Standards Australia 2001).	Operation Closure
AQ18	Handling odour complaints	To assist with the management of odour complaints and to inform future expansions at the site, meteorological equipment should be sited and operated in accordance with the requirements in *Australian Standard AS 3580.14-2001 Methods for Sampling and Analysis of Ambient Air – Part 14: Meteorological monitoring for ambient air quality monitoring applications* (Standards Australia 2001).	Operation Closure
AQ19	Dust amenity impacts	Impose speed limits on all internal haul roads.	Construction Operation
AQ20	Dust amenity impacts	Regularly water all internal haul roads, stockpiles, exposed and disturbed areas.	Construction Operation
AQ21	Dust amenity impacts	Review and adjust the intensity of dusty activities during inclement weather conditions.	Construction Operation
AQ22	Dust amenity impacts	Limit the extent of disturbed and exposed areas to the extent practical.	Construction Operation
AQ23	Dust amenity impacts	To the extent practical, minimise volumes of imported and excavated soil stockpiles. Locate stockpiles away from the site boundary.	Construction Operation
AQ24	Dust amenity impacts	Direct internal traffic along sealed, established roads wherever possible.	Operation
AQ25	Dust amenity impacts	Regularly inspect and remove any loose debris inadvertently spilt onto hardstand areas and access roads.	Operation

No.	Impact	Environmental safeguard	Timing
AQ26	Dust amenity impacts	Rehabilitate capped cell as soon as practical to stabilise and reduce wind erosion from these areas.	Operation Closure

6.5 ABORIGINAL HERITAGE

SECRETARY'S ENVIRONMENTAL ASSESSMENT REQUIREMENTS

Heritage, including Aboriginal and non-Aboriginal cultural heritage.

OEH'S REQUIREMENTS

OEH requires that the proponent undertake a cultural heritage assessment of the potential impacts of the proposed development. The EIS must contain:

- *A description of the Aboriginal objects and declared Aboriginal places located within the area of the proposed development;*
- *A description of the cultural heritage values, including the significance of the Aboriginal objects and any declared Aboriginal places, which exist across the whole area that will be affected by the proposed development, and the significance of these values for the Aboriginal people who have a cultural association with the land;*
- *A description of how the requirements for consultation with Aboriginal people as specified in clause 80C of the* National Parks and Wildlife Regulation 2009 *have been met;*
- *The views of those Aboriginal people regarding the likely impact of the proposed development on their cultural heritage. If any submissions have been received as part of the consultation requirements, then the report must include a copy of each submission and your response;*
- *A description of the actual or likely harm posed to the Aboriginal objects or declared Aboriginal places from the proposed activity, with reference to the cultural heritage values identified;*
- *A description of any practical measures that may be taken to protect and conserve those Aboriginal objects or declared Aboriginal places;*
- *A description of any practical measures that may be taken ta void or mitigate any actual or likely harm, alternatives to harm or, if this is not possible, to manage (minimise) harm;*
- *In the event that harm to Aboriginal objects cannot be avoided, then an application for an Aboriginal Heritage Impact Permit (AHIP) will be required to be submitted to OEH for consideration.*

Development can impact on Aboriginal heritage, through direct physical damage to sites as well as indirect impacts on places of significance. OEH identified issues relating to Aboriginal Cultural Heritage as important during development of the SEARs for this proposal.

An Aboriginal Heritage Due Diligence Assessment was completed by NGH Environmental and is summarised in this section. The Aboriginal Heritage Due Diligence Assessment Report is provided in full in Appendix L.

Consultation was not conducted and is not required as the Due Diligence Assessment assessed the site as having a low likelihood of impacting on Aboriginal heritage objects. The low archaeological potential would be due to the extensive disturbance of the existing evaporation ponds. Should there be any unexpected finds of suspected Aboriginal origin, all work in the immediate vicinity must stop and OEH be notified. In this instance, consultation would occur with the Local Aboriginal Lands Council (LALC) in line with in clause 80C of the *National Parks and Wildlife Regulation 2009*.

6.5.1 Approach

The methodology for the assessment followed the OEH 2010 guide: *Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales* ('Code of Practice'). The Code of Practice provides a five-step approach to determining whether an activity is likely to cause harm to an Aboriginal object, as defined by the NSW *National Parks and Wildlife Act 1974*.

The progress through the steps in the Code of Practice is aimed at providing an assessment of the potential for an activity to impact a known Aboriginal object, or whether it is likely that unrecorded Aboriginal objects are present that may be impacted. The result of the process is aimed at providing the proponent with information about the likelihood that their activity would impact an Aboriginal object and whether an Aboriginal Heritage Impact Permit may be required.

The Due Diligence process does not formally require consultation with Aboriginal community groups, therefore no Aboriginal groups were contacted for the assessment. The development site occurs within the boundaries of the Wagga Wagga Local Aboriginal Land Council (LALC).

The Due Diligence assessment was carried out by qualified archaeologist Matt Barber of NGH Environmental, in line with the following five major steps in the process:

Step 1: Register Search

Step 2: Desktop Assessment of Landscape

Step 3: Visual Inspection

Step 4: Complete Report

Step 5: Further Investigation and Impact Assessment

A search of relevant heritage registers for Aboriginal sites and places provides an indication of the presence of previously recorded sites. A register search is not conclusive, as it requires that an area has been inspected and any sites are provided to the relevant body to add to the register. However, as a starting point, the search indicates whether any sites are known within or adjacent to the investigation area.

The Aboriginal Heritage Information Management System (AHIMS) is maintained by OEH and provides a database of previously recorded Aboriginal heritage sites. A search provides basic information about any sites previously identified within a search area. The results of the search can be relied on for 12 months for the purposes of a due diligence level assessment.

An AHIMS search was performed on 6th November 2018 with a 1 km buffer around the development site using the Lot and DP number (Appendix D.8). Three Aboriginal sites are recorded near the location. An extensive search of an area approximately 30 kms east-west by 30 kms north-south surrounding the development site was undertaken on 3rd July 2017. There were 120 Aboriginal sites recorded within this search area with five declared Aboriginal Places (Appendix L). No Aboriginal Sites or Aboriginal Places are located within the development site.

A visual inspection of the development site was undertaken on 5 July 2017. The inspection was carried out by qualified archaeologists Matt Barber and Emily Dillon. The field inspection assessed an area of the site that includes the development footprint, and the land between the development footprint and Byrnes Road. The assessment area was assessed as having negligible potential to contain Aboriginal objects and no Aboriginal artefacts were identified. No mature trees adjacent to the development site were found to be culturally modified.

6.5.2 Existing environment

A search of the AHIMS database, of an area approximately 30 km east-west by 30 km north-south with a buffer of 50 m centred on the development site, was undertaken on 3 July 2017. The AHIMS client service ID was 289335. There were 120 Aboriginal sites recorded within this search area and five declared Aboriginal Places. The Bomen Urban Release Area Development Control Plan identified three Aboriginal heritage sites in the Bomen area listed on AHIMS, which include:

- East Bomen IF1: Isolated find consisting of one stone artefact within an exposed paddock in the Riverina Wool Combing property (AHIMS #56-1-0045)
- East Bomen IF2: Isolated find (AHIMS #56-1-0044)
- East Bomen 1: Aboriginal surficial hardstone basalt quarry (AHIMS #56-1-0043)

6.5.3 Potential impacts

The proposal is not anticipated to impact on any Aboriginal heritage given the previous disturbances within the development site. Ground disturbance as a result of the proposal work would generally be confined to existing disturbed areas.

6.5.4 Safeguards and mitigation measures

The following safeguards are recommended to minimise the risk of impacts:

No.	Impact	Environmental safeguard	Timing
AH1	Damage to heritage items	Proposed works should remain limited to the impact footprint as assessed in the current report in order to limit the possibility of encountering Aboriginal objects in unassessed areas	During construction
AH2	Damage to heritage items	Any activity proposed outside of the current assessment area should also be subject to an Aboriginal heritage assessment	Pre-construction
AH3	Unexpected finds	If any items suspected of being Aboriginal in origin are discovered during the work, all work in the immediate vicinity must stop and OEH notified. The find will need to be assessed and if found to be an Aboriginal object an AHIP may be required. In this instance, consultation with the LALC would occur.	During construction
C1	Proponents are to comply with the provisions of the NPW Act with respect to Aboriginal cultural heritage.		WWDCP
C3	Proposals must be designed to avoid harm to Aboriginal objects and/or Aboriginal places by designating the areas where they are		WWDCP

No.	Impact	Environmental safeguard	Timing
	located and appropriate buffers as open space and documenting proposed management practices to ensure the conservation of those objects and/or places.		
C4	Satisfactory consultation is to be carried out with Council and Aboriginal stakeholders to confirm the proposed method of management for areas containing Aboriginal objects and/or Aboriginal places.		WWDCP
C5	Council must be provided with documented justification where proposals cannot avoid harm to Aboriginal objects and/or Aboriginal places.		WWDCP
C6	Where harm to Aboriginal objects and/or Aboriginal places is proposed, the development will be 'Integrated Development' under section 91 of the EP&A Act, and necessary approvals must be obtained from DECCW in accordance with the NPW Act prior to Council determining the development application.		WWDCP
C7	A member of the Wagga Wagga Local Aboriginal Land Council or other Aboriginal stakeholder group must be invited to supervise works carried out in proximity to an Aboriginal object, Aboriginal place, or other site with Aboriginal cultural heritage values.		WWDCP

6.6 HISTORIC HERITAGE

SECRETARY'S ENVIRONMENTAL ASSESSMENT REQUIREMENTS

Heritage, including Aboriginal and non-Aboriginal cultural heritage.

6.6.1 Approach

A desktop study was undertaken to identify any historic heritage (non-indigenous) items or places in proximity to the development site, with a particular focus on the site. Heritage databases searched as part of this assessment included:

- The NSW State Heritage Inventory (SHI) (includes items on the State Heritage Register and items listed by state agencies and local government) to identify any items currently listed within or adjacent to the development site. The area searched was the City of Wagga Wagga LGA.
- The Australian Heritage Database (includes items on the National and Commonwealth Heritage Lists) to identify any items that are currently listed within or adjacent to the development site.
- The Environmental heritage (schedule 5) of the Wagga Wagga LEP (NSW Government 2010) for locally listed heritage items that are within or adjacent to the development site.

6.6.2 Results

A search of listed items (under the *NSW Heritage Act 1977*, the Australian Heritage Database and those listed by local Councils and State Government agencies) was completed for the City of Wagga Wagga LGA on 4th April 2017. None of the items listed are located within the development site.

The results of the heritage searches listed above indicate that no known historic items or places occur within the development site. Details of listed items are provided below.

State Heritage Register

The search of the NSW State Heritage Register indicated there were no listed items located within or adjacent to the development site.

Australian Heritage Database

The search of the Australian Heritage Database found no listed items located within or adjacent to the development site.

Local Heritage Schedule Listings

A search of the Wagga Wagga LEP found no listed items located within or adjacent to the development site. The nearest items were recorded in the Bomen area, 2 km southwest of the development site:

- Bomen Railway Station located at 46 Dampier Street, Bomen NSW.
- Bomen Stationmaster's Residence located at 58 Dampier Street, Bomen NSW.

6.6.3 Potential impacts

Two heritage items were identified from the desktop study, outlined above. None of the listed items are located in the development site. There are two general items located in close proximity to the development site, as outlined above.

No heritage approvals would be required.

The proposal is not considered likely to have a significant impact on heritage values in accordance with the NSW *Heritage Act 1977*, the EP&A Act, and the EPBC Act.

6.6.4 Safeguards and mitigation measures

While impacts to historic heritage items are considered unlikely, the following safeguards are recommended to minimise the risk of impacts:

No.	Impact	Environmental safeguard	Timing
H1	Damage to heritage items	Proposed works should remain limited to the impact footprint as assessed in the current report in order to limit the possibility of encountering heritage items in unassessed areas.	During construction
H2	Unexpected finds	Should an item of historic heritage be identified, the Heritage Division (Office of Environment and Heritage) would be contacted prior to further work being carried out in the vicinity.	During construction

6.7 NOISE AND VIBRATION

SECRETARY'S ENVIRONMENTAL ASSESSMENT REQUIREMENTS

Noise and vibration, including:

- *A description of all potential noise and vibration sources during construction and operation, including road traffic noise;*
- *A noise and vibration assessment in accordance with the relevant Environment Protection Authority Guidelines; and*
- *A description and appraisal of noise and vibration mitigation and monitoring measures.*

EPA'S REQUIREMENTS

A noise impact assessment for the development and operation of the landfill should be prepared in accordance with the NSW Industrial Noise Policy (DECC, 2000), including determining the project specific noise criteria and details of all proposed noise mitigation measures.

The potential noise and vibration impacts of the proposal associated with both construction and operational activities were assessed in accordance with the SEARs and the requirements of the EPA.

The potential noise impacts associated with these traffic movements need to be assessed in accordance with the NSW Road Noise Policy (DECCW 2011).

6.7.1 Noise and Vibration Assessment

A construction and operational noise and vibration assessment was conducted by the Jacobs Group (Australia) Pty Ltd for the proposed North Ridge Materials Facility. The full report is available in Appendix K.

6.7.2 Policy setting

Construction noise

The NSW Interim Construction Noise Guideline DECC 2009 (ICNG) provides direction for the assessment and management of construction noise impacts. The guideline indicates that a quantitative assessment of noise impacts is warranted where works would impact an individual or sensitive land use for more than three weeks in total.

The ICNG provides direction on the calculation of 'noise management levels (NML)' for noise sensitive receivers. The NMLs are relative to the time of day. During standard construction hours construction noise levels measured at a receiver should comply with Table 6-28. Receivers are 'highly noise affected' when measured construction noise is above 75dB(A) at the receiver. Adhering to the levels described in the guidelines will minimise the impact of construction noise on adjacent receivers. The **rating background noise level** (RBL) is a single figure that represents background noise levels for noise assessment purposes. The noise descriptor L_{AF90} is the noise level that is exceeded for 90 % of the time and is used to measure the RBL. Measurements of the RBL are made at likely noise receivers over seven days without rain, strong wind or extraneous noise.

Table 6-28 Construction Noise Levels

Recommended Construction Hours	Noise Levels
Monday to Friday 7.00 am to 6.00 pm **Saturday 8.00 am to 1.00 pm** **No work on Sundays or public holidays**	RBL + 10 dB
Justified work outside standard construction hours	RBL + 5 dB
Highly noise affected, likely strong community reaction	=75 dB(A)

As no work outside standard working hours is proposed, only the daytime noise management levels have been assessed.

Operational noise

The purpose of NSW Noise Policy for Industry (NPI) (EPA 2017) is to ensure noise impacts associated with the operation of an industrial development are evaluated and managed consistently and transparently. The NPI specifies noise criteria to protect the community from excessive intrusive noise. The NPI provides guidance on the calculation of project noise trigger levels. Those trigger levels include:

- Intrusive noise levels.
- Amenity noise level.

The **L_{Aeq} descriptor** is used for measuring and describing both intrusive noise levels and amenity noise levels. The NPI describes a process for determining the intrusive noise levels for an industrial noise source. The NPI describes intrusiveness of a mechanical noise source. Generally, the noise level is acceptable if the equivalent continuous (energy-average) A-weighted level of noise from the source (L_{Aeq} descriptor), measured over a 15-minute period, does not exceed the RBL by more than 5dB(A). The level for intrusive noise is described in Table 6-29.

Table 6-29 NSW Noise Policy for Industry intrusiveness goals

Time of day	RBL dB(A) L_{A90}	Intrusive noise = RBL + allowance	NML dB(A) $L_{A90\ (15min)}$
Day	35	= RBL + 5	40
Evening	30	= RBL + 5	35
Night	30	= RBL + 5	35

The acceptable intrusive noise level from an industrial noise source is the RBL + 5dB.

The NPI describes a process for determining the project amenity noise levels. This aims to limit continuing increases in noise levels from industrial development. The recommended amenity noise levels aim to protect against noise impacts such as speech interference, community annoyance and some sleep disturbance. The project amenity noise level represents the objective for noise from a single industrial development at a receiver. The industrial noise during operation should not normally exceed the acceptable noise levels for rural residential properties as detailed in Table 6-30. The NPI calculates the

project amenity noise level for industrial developments as the recommended amenity noise level minus 5 dB(A) plus 3 dB(A) (Table 6-30.

Table 6-30 NSW Industrial Noise Policy amenity goals

Receiver type	Indicative noise amenity area	Time of day	Recommended $L_{Aeq\ 15\ minute}$ Noise Level dB(A)	
			Recommended	Acceptable
Residence	Rural	Day	50	48
		Evening	45	43
		Night	40	38

Road traffic noise

The Road Noise Policy (EPA) policy sets out the noise criteria for the purpose of defining road traffic noise impacts. As outlined in the policy, increases in total traffic noise levels as a result of the development should be limited to 2 dB above the noise level without the development.

Construction and operation vibration

Vibration criteria for development exists to ensure human comfort is maintained. Vibration from construction activities should comply with the EPA (2006) *Assessing Vibration: a technical guideline* and AS2670.2 (DEC 2006). Application of these criteria considers the level as well as the duration of exposure and the time of day. There are separate values for residential and non-residential receivers (Appendix K).

Intermittent vibration impact could occur when continuous vibration sources operate occasionally during the assessment period. Intermittent vibration impact is assessed using vibration dose values (VDVs). The VDV is calculated using the overall RMS acceleration of the vibrating source and for the duration of the vibration (Appendix K).

The Australian Standard AS2187.2-2006 *Explosives – Storage, Transport and Use* provides the guidance for the assessment of structural damage to buildings caused by vibration (Appendix K).

6.7.3 Existing environment

The development site is located in a mixed rural and industrial environment with low to moderate ambient background noise levels. The surrounding land use is comprised of the ROBE facility and other industrial sites, major and secondary roads including the Olympic Highway and Byrnes Road, agricultural production including grazing, and some rural residences. These land uses would not create substantial background noise in the area.

Residential sensitive receivers are sparsely located in all directions around the development site. The nearest residential sensitive receiver to the development site (Figure 3-2) is a rural residence at 46 Trahairs Road (R06), around 1.25 km from the western boundary of the development site, and 1.5 km from the nearest effluent evaporation pond. There are two more residential receivers within 1.5 km from the development site boundary (Figure 3-2). Receivers R01 to R21 were used in this report and were representative of the 66 residential sensitive receivers in a 3 km radius.

Background noise at the development site is considered to be low-moderate, with most noise originating from local industry, vehicles using local roads and agricultural activities. A noise survey was conducted by SLR Consulting (2016) and has been used for the baseline noise data (Table 6-31). The survey was conducted for an industrial development approximately 720 m south-west of the proposal less than 2 years

ago. Therefore, the data is considered to be valid. The monitoring locations are considered to be representative of noise conditions at surrounding residential receivers within the vicinity of the proposal.

Table 6-31 Summary of baseline noise monitoring results (SLR 2016)

Monitoring location	NPI assessment period	Rating background level $L_{A90(15mins)}$ – dB(A)	Ambient noise level $L_{Aeq(period)}$ – dB(A)
45 Trahairs Road (Receiver R06)	Day (7.00 am–6.00 pm)	32	53
	Evening (6.00 –10.00 pm)	31	55
	Night (10.00 pm – 6.00 am)	29	48
1206 Olympic Highway (Receiver R04)	Day (7.00 am – 6.00 pm)	37	56
	Evening (6.00 –10.00 pm)	32	56
	Night (10.00 pm – 6.00 am)	30	56
1365 Olympic Highway (Receiver R03)	Day (7.00 am – 6.00 pm)	36	52
	Evening (6.00 –10.00 pm)	36	50
	Night (10.00 pm – 6.00 am)	34	50

6.7.4 Construction noise results

Construction of the site is estimated to take approximately 3 months. Construction would take place during the ICNG recommended standard hours.

The sound power levels of major noise generating plant and equipment expected to be used during the construction period is presented in section 7.1 of Appendix K. A 5 dB penalty has been applied to activities that may include tones, impulses, low frequency or intermittent noise.

SoundPLAN (Version 7.4) noise modelling software, based on the CONCAWE prediction algorithm, was used to model and predict the construction noise levels at sensitive receivers. The full methodology is available in Appendix K. Two construction scenarios were used:

- Scenario 1 – construction of access road and hard stand area.
- Scenario 2 – construction of landfill footprint and leachate pond.

There are no predicted exceedances of construction noise levels at any of the 21 residential sensitive receivers or the two industrial sensitive receivers, for Scenario 1 or Scenario 2 (Appendix K).

6.7.5 Operational noise results

The sound power levels of individual plant expected to be used during the operational period is presented in section 7.2 of Appendix K. A 5 dB penalty has been applied to activities that may include tones, impulses, low frequency or intermittent noise.

SoundPLAN (Version 7.4) noise modelling software, based on the CONCAWE prediction algorithm, was used to model and predict the construction noise levels at sensitive receivers. The full methodology is available in Appendix K. Three construction scenarios were used:

- Scenario 1 – trucks in hard stand area, front end loader (FEL) along the track at the western boundary of the landfill footprint and FEL, compactor, water cart and grader operating in the first sub-cell of the waste cell.
- Scenario 2 – trucks in hard stand area, front end loader (FEL) along the track at the western boundary of the landfill footprint and FEL, compactor, water cart and grader operating in the middle sub-cells of the waste cell.
- Scenario 3 - trucks in hard stand area, front end loader (FEL) along the track at the western boundary of the landfill footprint and FEL, compactor, water cart and grader operating in the final sub-cells of the waste cell.

Operational noise was assessed against the NPI criteria. There are no predicted exceedances of operational noise levels at any of the 21 residential sensitive receivers or the two industrial sensitive receivers, for Scenario 1, Scenario 2 or Scenario 3 (Appendix K). Operational noise emission levels are predicted to be well within the project specific noise criteria at all assessed receiver locations for the three scenarios.

6.7.6 Road traffic noise results

The report used the traffic figures in a traffic management study by GHD (2008) conducted for Wagga Wagga City Council. The road traffic figures for Byrnes Road, north of Bavin Road, includes (GHD 2008):

- 2 750 vehicles per day.
- 1 980 light vehicles for both ways – daytime 15 hours (7.00 am to 10.00 pm).
- 220 heavy vehicles for both ways – daytime 15 hours (7.00 am to 10.00 pm).

Construction

The *Construction Road Traffic Noise Estimator* (RMS) was used to assess the potential impacts arising from construction traffic. Construction traffic is estimated to include 40 heavy vehicle and 20 light vehicle movements per day during standard daytime construction hours. Existing traffic and the estimated construction traffic figures were input into the Estimator. Based on these inputs, additional construction traffic noise is unlikely to result in changes of more than 2 dB(A) above existing noise levels. Therefore, road traffic noise during construction of the proposal would comply with the road traffic noise criteria (Appendix K).

Operation

It is estimated that there would be 20 light vehicle and 20 heavy vehicle movements per day during the operation of the proposal. The operational noise would not be more than the predicted construction traffic noise level of 41.7 dB(A) at the nearest residential receiver (RO3 Figure 3-2Figure 3-2 Sensitive receivers (residences) to the proposed development site). Therefore, it is unlikely that the operational traffic noise level would exceed 2 dB(A) above the existing noise levels (Appendix K).

6.7.7 Vibration impact assessment

Vibration-intensive equipment that could be used during the construction of the project may include compaction equipment, such as a vibratory roller and pneumatic hammer. Recommended safe setback distances to maintain building cosmetic and human comfort criteria for various plant are included in section 8 of Appendix K.

A worst-case separation distance of more than 500 m was used between the proposal boundary and the nearest residential receiver. Construction vibration was assessed to not adversely impact the building structure or human comfort of surrounding residential receivers.

There could be vibration impacts, resulting in structural damage and reduction of human comfort, of the industrial premise located 10 m from the western boundary of the proposal. Management measures to mitigate these impacts are addressed in section 6.7.9and section 6.7.10.

6.7.8 Blasting

Blasting may be required if granite intrusions exist within the construction zone of the proposal and interfere with cell compaction, drainage and lining. Blasting the granite on site would quickly and efficiently break up the rock. This would allow excavators to remove the rock and prepare a foundation for infrastructure required at the base of the cell. This option lessens the time frame of noise impact on landholders adjacent to the site.

Blasting would be covered in the EPL that would be issued.

The blasting would generally be in accordance with:

- *Blasting activities must comply with the Australian and New Zealand Environment Council Technical Basis for Guidelines to Minimise Annoyance Due to the Blasting Overpressure and Ground Vibration (1990). This guideline includes monitoring overpressure and vibration from each blast to comply with the criteria at the nearest sensitive receiver.*
- *Before blasting, a blast impact assessment must occur. The Australian Standard 2187.2 Explosives – Storage, transport and use Part 2: Use of explosives gives some guidance on how to calculate blast overpressure and vibration, and manage blast impacts, but does not replace licence conditions or the criteria in the technical basis document.*

The local community would be advised of blasting work by way of a “pre-notification” issued to adjacent local residences by letterbox drop at least one week prior to the blasting. Additional traffic controls and advisories would be used to manage traffic immediately before and during the blast. Consultation with the department would occur to amend the EPL for the premises and to schedule blasting.

6.7.9 Potential impacts

Construction Noise

Predicted (L_{Aeq}) noise levels at the residential sensitive receivers resulting from construction activities ranges from 15.1 dB(A) at R16 to 32.7 dB(A) at R06 for Scenario 1. For Scenario 2, the range is 18.0 dB(A) at R16 to 33.7 dB(A) at R06. These noise levels are well within the daytime criteria of 45 – 47 dB(A). It is expected that noise levels during most of the construction work would be lower than these predicted levels. Small variations in noise levels would be expected at the receivers based on the variation in the location of construction equipment and wind conditions over time. However, this variation is not considered likely to cause any significant difference in the assessed construction noise level for the residential sensitive receivers.

Predicted (L_{Aeq}) noise levels at the industrial sensitive receivers resulting from construction activities ranges from 40.9 dB(A) at I01 to 59.8 dB(A) at I02 for Scenario 1. For Scenario 2, the range is 42.3 dB(A) at I01 and 53.3 dB(A) at I02. These noise levels are well within the daytime criteria of 75 dB(A).

It is also expected that all construction activities would be conducted within standard daytime construction hours (7.00 am to 6.00 pm Monday to Friday, and 8.00 am to 4.00 pm on Saturdays) with no work on Sundays or public holidays.

Construction vibration

It was determined that, given the substantial distances to surrounding residential receivers, any ground vibrations arising due to construction activities would be unnoticeable at these locations and significantly below the relevant guideline criteria for human comfort and structural damage. However, the 10 m separation distance between the western boundary of the proposal and the nearest industrial receiver, could result in adverse impacts to building structure and human comfort. Section 6.7.10 outlines the management measures required to mitigate against the potential vibration impacts.

Expected blast impacts

Airblast overpressure can cause discomfort to people and, at high levels, damage to structures and architectural elements, and at very high levels, injury to persons. The impacts transmitted through the ground may cause damage to structures and architectural elements or discomfort to their occupants. The vibration levels at which people become annoyed are well below vibration levels at which damage occurs. Damage or discomfort may be ascertained by measuring the vibration from a blast close to the location of concern such as a building or other structure. In addition, the impact can be estimated based on the size of the blast.

The impacts of the blasting include overpressure (noise) and vibration impacts from the blast at sensitive receivers. In this case the sensitive receivers include:

- The ROBE facility 300 m to the west
- R06 residential receiver 1.25 km to the west

Written details of the blasting including the quantity of explosive to be detonated and the blasting pattern to be used would be contained within a blasting plan. Mitigation measures proposed to limit noise and to ensure that vibration from blasting does not adversely affect nearby structures are listed in section 6.7.10.

Blasting overpressure (noise) and vibration criteria

The Australian and New Zealand Environment Council *Technical Basis for Guidelines to Minimise Annoyance Due to the Blasting Overpressure and Ground Vibration* (1990) describes a range of criteria that can be used to reduce annoyance associated with basting. The guide lists four criteria:

- Airblast overpressure level
- Ground vibration peak particle velocity
- Time of blasting
- Frequency of blasting

Blasts would be timed to occur during daylight hours outside of peak travel times most likely within the window of 10 am to 2 pm. As such, ongoing disturbance from blasting activities would not occur. Also, potential sleep disturbance would be avoided.

The guidelines recommended airblast overpressure level maximum when measured at a sensitive receiver of 115 dBL (Linear Peak). This level can be exceeded 5% of the time over a twelve-month period but should not exceed 120 dBL at any time.

The guideline also recommends that a maximum level of 5 mm/s for peak particle velocity (PPV) be adopted to reduce annoyance. This level can be exceeded 5% of the time over a twelve-month period but should not exceed 10 mm/s PPV.

Annoyance levels due to vibration are much lower than the vibration levels recommended for minimising damage to structures and buildings. The *Australian Standard 2187.2 Explosives – Storage, transport and use Part 2: Use of explosives* refers to the British Standard BS 7385-2 for a range of vibration limits to avoid structural damage. Table 6-32 provides the recommended limits for cosmetic damage.

Table 6-32 Vibration Limits for cosmetic damage

Type of building	Peak component particle velocity in the frequency range of predominant pulse	
	4 Hz to 15 Hz	15 Hz and above
Reinforced or framed structures. Industrial and heavy commercial buildings	50 mm/s at 4 Hz and above	—
Unreinforced or light framed structure. Residential or light commercial type buildings	15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz	20 mm/s at 15 Hz increasing to 50 mm/s at 40 Hz and above

Should blasting be required, it would occur within the existing pond. The pond surface is currently around 2 m below ground level and would provide a level of shielding from blast impacts.

Operational Noise

Predicted (L_{Aeq}) noise levels at the residential sensitive receivers resulting from operation activities ranges from 13.3 dB(A) at R16 to 29.4 dB(A) at R06 for Scenario 1. For Scenario 2, the range is 13.6 dB(A) at R16 to 29.4 dB(A) at R06. For Scenario 3, the range is 14.2 dB(A) at R16 to 29.4 dB(A) at R06. These noise levels are well within the daytime criteria of 45 – 47 dB(A). Small variations in noise levels would be expected at the receivers based on the variation in the location of operational equipment and wind conditions over time. However, this variation is not considered likely to cause any significant difference in the assessed operational noise level for the residential sensitive receivers.

Predicted (L_{Aeq}) noise levels at the industrial sensitive receivers resulting from construction activities ranges from 40.9 dB(A) at I01 to 59.8 dB(A) at I02 for Scenario 1. For Scenario 2, the range is 42.3 dB(A) at I01 and 53.3 dB(A) at I02. These noise levels are well within the daytime criteria of 75 dB(A).

It is also expected that all operation activities would be conducted within standard daytime operation hours (7.00 am to 6.00 pm Monday to Friday, and 8.00 am to 1.00 pm on Saturdays) with no work on Sundays or public holidays.

6.7.10 Safeguards and mitigation measures

No.	Impact	Environmental safeguard	Timing
NV1	Construction noise and vibration	Prepare a Construction Noise and Vibration Management Plan to identify all reasonable and feasible mitigation measures. This would also detail the best practice construction methods to be used, noise monitoring program, a	Pre-construction

No.	Impact	Environmental safeguard	Timing
		complaint management strategy, and contingency plans, if noise exceedance or justified complaints were to occur.	
NV2	Noise from plant and equipment	All mechanical plant should be silenced by best practical means using current technology wherever possible. Noise suppression devices should be maintained to the manufacturer's specifications. Internal combustion engines would be fitted with a suitable muffler in good working order.	During construction
NV3	Noise from plant and equipment	The offset distance between noisy plant/equipment and nearby noise sensitive receivers should be maximised, particularly for fixed equipment such as pumps, generators, or compressors.	During construction
NV4	Noise from plant and equipment	Simultaneous operation of noisy plant/equipment should be managed, such as different operating times or increasing the distance between plant/equipment.	During construction
NV5	Noise from plant and equipment	Equipment known to emit noise strongly in one direction, such as the exhaust outlet of an attenuated generator set, should be oriented away from sensitive areas.	During construction
NV6	Noise from plant and equipment	Broadband reversing alarms should be used instead of tonal reversing alarms. Alternatives to reversing beepers include the use of spotters or site design to reduce the need to reverse.	During construction and operation
NV7	Noise from plant and equipment	All plant on site should be operated in accordance with the manufacturer's instructions and, where necessary, have current Roads & Traffic Authority (RTA) registration licences.	During construction

No.	Impact	Environmental safeguard	Timing
NV8	Noise from plant and equipment	All engine covers should be kept closed while equipment is operating.	During construction
NV9	Construction noise and vibration	Vehicles, plant and equipment which are used intermittently should be shut down when not in use or throttled down to a minimum.	During construction
NV10	Noise from plant and equipment	All vehicular movements to and from the site should comply with site entry controls.	During construction
NV11	Construction noise and vibration	All site workers (including subcontractors and temporary workforce) should be sensitised to the potential for noise and vibration impacts upon local residents and encouraged to take all practical and reasonable measures to minimise noise during the course of their activities. This could be included in site inductions and daily tool-box talks.	During construction
NV12	Community contact	Contact with local community should be maintained and scheduled work communicated via letter drops and/or local media announcements, particularly when unusual noise or vibration generating activities are planned.	During construction
NV13	Community information	The constructor or site developer (as appropriate) should provide a community liaison phone number and permanent site contact so that noise and/or vibration related complaints can be received and addressed in a timely manner.	During construction
NV14	Noise/vibration complaints	Noise and vibration monitoring should be undertaken by a qualified professional and with consideration of relevant standards and guidelines on receipt of a complaint to identify and quantify the issue and determine options to minimise impacts.	During construction

No.	Impact	Environmental safeguard	Timing
NV15	Noise/vibration complaints	Noise and vibration monitoring should be undertaken and reported within five working days of receiving the complaint. If exceedances are detected, the situation should be reviewed in order to identify means to reduce the impact to acceptable levels.	During construction
NV16	Operational noise	Prepare an Operational Noise Management Plan that identifies reasonable and feasible measures to manage operational noise levels from the proposal.	Pre-operation
NV17	Noise from plant and equipment	All permanent equipment used on site should be silenced by best practical means using current technology wherever possible. Noise suppression devices should be maintained to the manufacturer's specifications. Internal combustion engines would be fitted with a suitable muffler in good working order.	During operation
NV18	Noise from plant and equipment	An equipment and plant monitoring regime should be implemented, with routine inspections to determine if the equipment or plant is noisier than comparable machines, and rectifying or replacing as required. Inspections will check that any silencers and enclosures are intact, rotating parts are balanced, loose bolts are tightened, frictional noise reduced with lubrication, and cutting noise reduced by keeping equipment sharp.	During operation
NV19	Blasting	Ensure that the design of the blast has been prepared in accordance with the ANZEC Guideline (1990).	During construction
NV20	Blasting	A Vibration and Air Blast Management Plan (VABMP) would be prepared prior to blasting occurring.	Pre-construction

No.	Impact	Environmental safeguard	Timing
NV21	Blasting	Adjoining land owners should be notified of the blast 7 days prior to the blast. Livestock should be relocated to adjacent paddocks outside of the exclusion zone.	During construction
NV22	Blasting	Apply a blasting exclusion zone compliant with AS*2187.2 Explosives – Storage, transport and use Part 2: Use of explosives.*	During construction
NV23	Blasting	Blast monitoring will be undertaken in accordance with the monitoring requirements for blasting activities in the Australian and New Zealand Environment Council Technical Basis for Guidelines to Minimise Annoyance Due to the Blasting Overpressure and Ground Vibration (1990).	During construction

6.8 TRAFFIC, TRANSPORT AND ROAD SAFETY

SECRETARY'S ENVIRONMENTAL ASSESSMENT REQUIREMENTS

Traffic and transport, including:

- *Details of road transport routes and access to the site;*
- *Road traffic predictions for the development during construction and operation;*
- *An assessment of impacts to the safety and function of the road network, and the details of any road upgrades required for the development.*

EPA'S REQUIREMENTS

The proposed development will result in an increase in traffic movements, particularly during the development phase. The number of traffic movements associated with all phases of the development should be quantified and the potential noise impacts associated with these traffic movements need to be assessed in accordance with the NSW Road Noise Policy *(DECCW, 2011).*

RMS'S REQUIREMENTS

As a minimum, the Traffic Impact Assessment (TIA) is to address the existing and anticipated additional traffic generation on the surrounding road network, vehicle types and volumes, peak traffic volumes, travel routes for vehicles accessing the development site and provide recommendations for any mitigation measures, such as intersection upgrades, considered necessary to address traffic related impacts. Consideration of the cumulative of the potential traffic generation when added to existing traffic volumes upon the surrounding road network shall be undertaken.

WAGGA WAGGA DCP REQUIREMENTS

A Traffic Impact Study may be required where adverse local traffic impacts may result from the development. The traffic impact study is to include the suitability of the proposal in terms of the design and location of the proposed access, and the likely nature, volume, or frequency of traffic to be generated by the development.

6.8.1 Approach

This Traffic Impact Assessment for the proposal is based on traffic information supplied by Wagga Wagga City Council (WWCC), the Roads and Maritime Service (RMS), and from the WWCC *Report for Wagga Planning Studies- Traffic Management Bomen*, prepared by GHD 2008 and *ROBE Environmental Assessment: Integrated Oilseed Processing and Biodiesel Plant Volume 1 – Environmental Assessment* prepared by ENSR/AECOM 2008. Relevant information included is referenced. The following sections describe the existing and proposed traffic conditions and potential impacts.

6.8.2 Existing environment

Existing site access

Currently, access to the development site is via Trahairs Road immediately south of the site, connected to Byrnes Road, which crosses the south-eastern corner of the neighbouring property (ROBE). The proposal includes construction of a new sealed access road from Trahairs Road, further east of the current access road, in order to provide direct access to the development site.

Table 6-33 Traffic access at Trahairs Road for the North Ridge site (Source: SIX Maps 2017)

Existing transport network

The development site is on Trahairs Road, east of the intersection with Byrnes Road in Wagga Wagga, around 10 km north of the city centre. Both Trahairs and Byrnes Road are Council roads. Major transport routes near the development site include the Olympic Highway, running parallel to Byrnes Road to the west, and the Sturt Highway, located to the south of the development site.

Byrnes Road is a sealed two-lane single carriageway which is B-double accessible and is a designated B-double route between Wagga Wagga and the boundary of Wagga Wagga LGA. It runs roughly north-east/south-west between Wagga Wagga and Junee.

Around the project area, it is a two-lane rural road with a wide shoulder of over 2 m and a speed limit of 100 kph, which is reduced to 80 kph between Oura Road and East Bomen Road. At its intersection with Trahairs Road, Byrnes Road has turning lanes from either direction. Vehicles turning onto Byrnes Road from Trahairs Road enter a single lane. Road traffic includes local traffic and trucks going to Bomen Industrial Area. The NSW Department of Transport Centre for Road Safety website records accidents and fatalities. A search of the website based on the Wagga Wagga LGA was conducted. The search revealed two accidents along Byrnes Road around 2.5 km and 4.5 km north of the development site in 2013 and 2014 respectively, both of which resulted in moderate injuries but no fatalities.

Trahairs Road is a two-lane single carriageway which provides local access to adjoining properties. It runs east from the intersection with Byrnes Road, with the first 400 m sealed and B-double accessible, and the remaining 1300 m an unsealed farm access road. Road traffic is minimal, with the sealed part of the road used for access to the ROBE facility, and the remaining part used primarily by agricultural vehicles.

Existing traffic volumes

The RMS publishes data on average daily flows on major roads, which provides an indication of typical traffic conditions surrounding the development site. Annual Average Daily Traffic (AADT) counts collected from RMS count stations, as well as daily traffic counts conducted by WWCC for the surrounding road network are presented in Table 6-34.

Table 6-34 Annual average daily traffic counts for the surrounding road network

Count Station	Road	Count Location	2000	2001	2003	2005	2006	2007	2010	2011	2013
WWCC1	Byrnes Road	Bavin Street	-	-	-	3058	-	-	-	-	3065
WWCC2	Byrnes Road	North of Dampier Street	-	2022	-	-	-	-	-	-	-
WWCC3	Byrnes Road	North of Trahairs Road	-	1630	-	-	-	-	-	-	-
95137 (RMS)	Olympic Highway	130 m north Mary Gilmore Road	3456	-	3308	-	2529	2505	1392*	2780	-

*south-bound only

The most recent daily traffic data was recorded in 2013 and obtained from WWCC for the traffic count station on Byrnes Road (Table 6-34). The station is located south of the development site and is the route

many heavy vehicles would take to access the Bomen Industrial Area. Seventeen percent of the vehicles recorded were heavy vehicles.

The most recent daily traffic data obtained from WWCC (2005) is for the traffic count station located at Byrnes Road at Bavin Street (WWCC1). This station is located south of the development site in the area of Bomen Industrial Estate, which has numerous industrial activities and traffic volumes recorded are thus likely to be higher than actual and predicted traffic volumes at the development site.

In the week of 11 – 18 October 2005 a traffic count was undertaken at the intersection of Byrnes Road and Bavin Street (Table 6-35), which is the closest count station to the proposed development site. The traffic count at this location is likely to be higher than at the development site and has been used to provide a conservative estimate of peak hour traffic near the site.

Table 6-35 Traffic data for Bavin Street in the week of 11- 18 October 2005 (ROBE 2005)

Calculated peak hour	Traffic count
8.00 am to 9.00 am	256
4.00 pm to 5.00 pm	288

Traffic data obtained by WWCC (WWCC 2008) for surrounding roads included data on the Olympic Way, which carries around 3 700 vehicles per day (vpd) with estimate of 25 % of those heavy or commercial vehicles. Byrnes Road carries around 2 750 vpd between Bavins Road and Dampier Street. WWCC expects the traffic to grow on Byrnes Road by around 8 % per annum (WWCC 2008).

Existing level of service

An assessment of the existing level of service (LOS) for Byrnes Road in Bomen was undertaken using RMS's *Guide to Traffic Generating Developments* (2013). The LOS provides an indication of the traffic efficiency. The objective is for the development to maintain the existing LOS of roads with the LOS as a performance standard. It is an assessment of factors such as speed, geometric features, traffic volume, interruptions and delays, and freedom to manoeuvre. The six LOS described in AUSTROADS *Guide to Traffic Engineering Practice – Part 2: Roadway Capacity* (1988) are:

- LOS A: a condition of free flow in which individual drivers are virtually unaffected by the presence of others in the traffic stream. Freedom to select desired speeds and to manoeuvre within the traffic stream is very high, and the general level of comfort and convenience provided is excellent.
- LOS B: this level is in the zone of stable flow and drivers still have reasonable freedom to select their desired speed and to manoeuvre within the traffic stream, although the general level of comfort and convenience is little less than that of the level of LOS A.
- LOS C: this service level is also in the zone of stable flow, but most drivers are restricted in their freedom to select their desired speed and to manoeuvre within the traffic stream. The general level of comfort and convenience declines noticeably at this level.
- LOS D: This level is close to the limit of stable flow but is approaching unstable flow. All drivers are severely restricted in their freedom to select their desired speed and to manoeuvre within the traffic stream. The general level of comfort and convenience is poor, and small increases in traffic flow would generally cause operational problems.

- LOS E: This occurs when traffic volumes are at or close to capacity and there is virtually no freedom to select desired speeds or to manoeuvre within the traffic stream. Flow is unstable and minor disturbances within the traffic stream will cause a traffic jam.
- LOS F: This service level is in the zone of forced flow. With it, the amount of traffic approaching the point under construction exceed that which can pass it. Flow break-down occurs, and queuing and delays result.

These descriptions characterise LOS for uninterrupted flow conditions, in which no interruption to traffic occurs because of factors external to the traffic stream, such as intersection controls.

Section 4.2.4 of the *Guide to Traffic Generating Developments* (2002) suggests that intersection capacity is less important than overtaking opportunity on two lane roads. Table 4.5 of the guide provides a range of peak flows for rural roads and the desired level of service. For the Bomen area we have assumed that 7.30 am to 9.00 am and 4.00 pm to 6:00 pm are the peak hours, the terrain is rolling, and the percentage of heavy vehicles is around 15 % (RMS have identified 15-16 % of vehicles travelling along the Olympic Highway ID 95137 are heavy vehicles). Peak hour flows in these circumstances would have a B LOS if vehicles per hour are less than 310, and a C LOS if less than 570. The desirable level of service is C as a minimum.

The LOS for Byrnes Road (between Bavin Street and Dampier Street) has been estimated using the most recent traffic count data available (WWCC 2008) and applying a growth rate of 8 %. The estimated daily traffic count, average peak hour traffic count, and estimated LOS are shown below. For conservative assessment purposes, the peak traffic volume per hour was estimated to be 10 % of the daily traffic count (Table 6-36). In addition, the growth rate of 8 % has been used since 2008 (WWCC 2008).

Table 6-36 Daily traffic count and average peak hour traffic for Byrnes Road between Bavin Street and Dampier Street

Daily traffic (WWCC 2013)	Daily traffic count and an 8 % / annum growth rate	Average peak hour traffic (vehicles/hour) (10 % of AADT)	Heavy vehicles (%)	Estimated LOS
3065	4 291	429	17	B

As shown above, a peak hour traffic volume of 429 vehicles/hour has been assumed for this assessment. Based on the estimated AADT, percentage of heavy vehicle traffic and average peak hour traffic, Byrnes Road is designed to be operating at a current LOS B with an estimated capacity of 530 vehicles/hour. Byrnes Road is therefore considered to be operating with spare capacity.

Site access

Currently, access to the development site is via Trahairs Road, which crosses the neighbouring property (ROBE). The proposal includes construction of a new sealed access road from Trahairs Road, further east of the current access road, in order to provide direct access to the development site.

There are a number of unsealed internal access roads throughout the development site. This internal road network would be upgraded and gravelled to provide access to site facilities for construction machinery, trucks, and light vehicles.

Transport routes likely to be used by vehicles travelling to and from the site have been determined based on the existing local road network:

- From north and south: via Olympic Highway and Dorset Drive. Dorset Drive is B-double enabled.
- From north and south: via Olympic Highway and Bomen Road. B-double access is via Bomen Road.
- From east and west: via Sturt Highway and Olympic Highway, and site access via Bomen Road. A secondary B-double route for vehicles travelling along Sturt Highway from the east: Eunony Bridge Road and Oura Road.

For the purposes of this assessment, a 50 % split of traffic travelling north and south along the Olympic Highway to and from the site has been assumed. Additional traffic generation along the Olympic Highway is not expected to be significant, given the proximity to Bomen Industrial Estate and the proportion of heavy vehicle traffic currently utilising Olympic Highway.

6.8.3 Road traffic potential impacts

For the purposes of this assessment, traffic generation has been estimated assuming a worst-case scenario of both daily vehicle movements and vehicle movements per hour, which can be applied to all operating hours of the proposal.

Construction

It is expected that construction would take about 12-24 weeks to complete. Site work would begin during 2019. Construction would be undertaken between the hours of 7.00 am and 6.00 pm Monday to Friday and 8.00 am to 4.00 pm on Saturday. No work would be undertaken on Sundays or public holidays. There would be a maximum of 20 construction personnel on the site at any one time during the peak construction period when the majority of construction activities would take place.

The proposal would generate vehicle movements during construction, mainly associated with:

- Removal of excavated material.
- Clearance of vegetation, earthworks and grading of the site.
- Plastic liner deliveries by heavy vehicle.
- Geotextile liner deliveries by heavy vehicle.
- Gravel and sand for drainage and pipe bedding materials.
- Construction of sub-cells, leachate pond, and internal access roads.
- Delivery and removal of construction equipment and machinery.
- Daily movement of construction personnel.
- Delivery and removal of temporary construction site amenities.

Construction vehicle movements may comprise of, on average, about 20 heavy vehicles accessing the development site per day or 40 movements per day. For a short period of time during construction there would be traffic impacts on Trahairs and Byrnes Roads, primarily involving truck movements for delivery of materials to the development site. Construction vehicles have the potential to cause some damage to or congestion of local roads. Plant and equipment used during construction would be delivered at the commencement of construction works and remain on site for the duration of the construction period.

Light vehicles would be required to transport staff to and from the development site, and in various activities on site. Site personnel would travel to the site in the hour preceding and immediately following their shifts. It is expected that up to 20 light vehicle movements per day would be generated during peak construction times. The local road network has adequate carrying capacity for this temporary increase in vehicle numbers.

Construction of the proposal would temporarily affect the arrangement of property access. Continued access would be maintained throughout construction.

The peak hour average estimated traffic flows for Byrnes Road is 429 vehicles per day. If there are an additional 60 vehicle movements a day during peak construction period, there would be up to 4 351 vehicles per day. If it is assumed that half of those vehicles travel during the peak hours (two peak hours) there would be approximately 444 vehicles per hour during peak hours. This corresponds to a LOS of B, and thus meets the required minimum service level (Table 6-37).

Table 6-37 Byrnes Road peak hour traffic generation - construction

Existing LOS	Existing peak hourly volume	Proposed peak hourly traffic generation	Predicted peak hourly volume	Predicted LOS
B	429	15	444	**B**

Operation

The proposed landfill facility would operate from 7.00 am to 6.00 pm Monday to Friday, and 8.00 am to 1.00 pm Saturday. There would be a maximum of five permanent staff associated with the proposed facility.

It is anticipated that the proposal would generate traffic during operation, with heavy vehicle movements for waste deliveries, light vehicle movements associated with staff travelling to and from site, and a weekly fuel delivery for vehicles and equipment.

Estimated facility receivals for 60 000 t of waste per year would generate approximately 10 loads or 20 heavy vehicle movements per day. This number can change and is dependent on variables such as weather, waste availability, work load and site conditions. It is estimated that light vehicle movements could be in the order of 20 per day.

It is expected that half of the heavy vehicle movements would be by B-doubles and the other half semi-trailers or truck and dog combinations.

Light vehicles would be required to transport staff to and from the development site, and in various activities on site. Site personnel would travel to the site in the hour preceding and immediately following their shifts. It is expected that 20 additional light vehicle movements per day would be generated during operation. The local road network has adequate carrying capacity for this increase in vehicle numbers and remains at a predicted LOS of B (Table 6-38).

Table 6-38 Byrnes Road peak hour traffic generation - operation

Existing LOS	Existing peak hourly volume	Proposed peak hourly traffic generation	Predicted peak hourly volume	Predicted LOS
B	429	10	439	**B**

6.8.4 Safety and function potential impacts

An assessment of the impacts to the safety and function of the road network during the construction and operation stages.

Construction

The potential traffic, transport and road safety impacts associated with construction of the proposal relate primarily to the increased numbers of large vehicles on the road network which may lead to:

- Increased collision risks (other vehicles, pedestrians, stock and wildlife).
- Damage to road infrastructure.
- Associated noise and dust (particularly where traffic is on unsealed roads) which may adversely affect nearby receivers.
- Reduction of the level of service on the road network caused by 'platooning' of construction traffic.

DAMAGE TO ROAD INFRASTRUCTURE

The increase in traffic and heavy vehicle movements could impact the condition of roads on the haulage network. Along major highways, the impact is expected to be negligible due to the existing capacity of the road network. The use of the local road network by larger vehicles accessing the proposed development site is not dissimilar to the existing use of the road by trucks associated with surrounding land uses, particularly for the Bomen Industrial Area and agriculture.

However, the strength of the pavement of Trahairs Road east of the sealed section to access the ROBE facility should undergo a pavement assessment to determine if it can support the proposed volume of construction traffic.

ROAD AND INTERSECTION UPGRADES

The intersection of Trahairs Road with Byrnes Road already supports heavy vehicle turning and access for the ROBE facility. It is unlikely that additional upgrades would be required for this intersection.

Trahairs Road would be sealed up to the access point for the proposed development. The road access into the site to access the hardstand area would be sealed and around 7.5 m in width.

Prior to the commencement of road construction, geotechnical assessments would be undertaken before any construction works. This information would be used to ensure the road design and construction meets the requirements of Wagga Wagga City Council and Austroad design guidelines. The proponent would manage construction impacts on local roads with a Traffic Management Plan. This may require periodic road improvements and lane closures to preserve traffic flow.

ASSOCIATED NOISE AND DUST

The increase in traffic during construction and decommissioning may increase noise and dust in the local area, particularly on the portion of Trahairs Road if it were to remain unsealed. Due to the access of the site being located about 500 m from the intersection with Byrnes Road, it is unlikely that traffic would be travelling at high speeds along this unsealed road. Impacts from dust generated from the proposed activity, including that associated with increased traffic are considered in Section 0.

The increase in traffic and heavy vehicle movement during construction would result in a minor increase in noise as a result of the proposed works. Byrnes Road is located directly to the west of the development site and forms part of the intersection where the concentration of traffic is expected.

Byrnes Road is a well-used local road for local traffic between Junee and Wagga Wagga, and for light and heavy vehicle access to the Bomen Industrial Area. The closest residential sensitive receiver to the intersection of Byrnes Road and Trahairs Road is about 1.25 km. The same residential sensitive receiver is the closest to the access point on Trahairs Road, located about 1.5 km from the access point to the western

side of Byrnes Road. The traffic noise during construction and decommissioning could be noticeable at the nearest sensitive receiver. The noise associated with the additional traffic during construction is considered in Section 0.

DISRUPTION TO EXISTING SERVICES

Local traffic and traffic commuting between Junee and Wagga Wagga would be minimally affected. There would be an increase in vehicles from staff during construction and conducting commercial activities relating to the materials facility.

SUMMARY OF CONSTRUCTION IMPACTS

Overall, the additional traffic associated with the construction of the materials facility would be a small component of the existing traffic loads on local and state roads. The suggested access route to the proposed North Ridge Materials Facility is suitable to accommodate the expected construction vehicle types and traffic volumes. No substantive increased collision risk, damage to road infrastructure, noise or dust impacts, disruption to existing services or reduced level of service is expected to accompany construction of the proposal.

Operation

During operation there would be heavy vehicles delivering material and several light vehicles accessing the site daily. Vehicles would use the designated road network to access the site and travel within the site during the operational phase (about a nine-year period). Activities undertaken during the operation phase would include travelling to the site office or maintenance building and carrying out daily maintenance activities on the waste cell infrastructure. Operational staff would be confined to designated parking areas and access roads/tracks within the development site.

It is considered unlikely that the low levels of operational traffic would obstruct public or private local access or be above the background noise levels, which includes light and heavy vehicle access to the adjacent ROBE facility and agricultural vehicles.

Additional risks to road safety from operational traffic would be minimal.

PARKING AND INTERNAL LAYOUT

Internal road design and layout would incorporate:

- Turn around bays for heavy vehicles on the hard stand area.
- A road width of 7.5 m.
- Internal speed limit of 10 kph.
- Parking for four light vehicles and two heavy vehicles.

6.8.5 Cumulative impacts

An effect of the proposed development of the North Ridge Materials Facility is a likely increase of traffic movements along Byrnes Road and the existing road network. However, the existing LOS is not expected to be negatively affected. The current road network supports the heavy and light vehicle movements associated with the Bomen Industrial Area, which is in proximity to the proposed development site.

It is not anticipated that the increase in vehicle movements during the construction and operation of the proposed facility would result in adverse cumulative impacts for other road users or infrastructure.

6.8.6 Safeguards and mitigation measures

The following measures would minimise the impacts on traffic and transport associated with the proposal:

No.	Impact	Environmental safeguard	Timing
T1	Impacts to traffic	Traffic Management Plan A Traffic Management Plan (TMP) would be prepared in accordance with the Australia Standard 1742.3-2002: *Manual of Uniform Traffic Control Devices* and the NSW Roads and Maritime Services QA Specification *G10 "Traffic Control at Worksites", Versions 4* and would be approved by WWCC before implementation. The TMP would include: a) Confirmation of haulage routes b) Measures to maintain access to local roads and properties c) Site specific traffic control measures (including signage) to manage and regulate traffic movement d) Measures to maintain pedestrian and cyclist access e) Requirements and methods to consult and inform the local community of impacts on the local road network f) Access to construction sites including entry and exit locations and measures to prevent construction vehicles queuing on public roads. g) A response plan for any construction traffic incident h) Consideration of other developments that may be under construction to minimise traffic conflict and congestion that may occur due to the cumulative increase in construction vehicle traffic i) Monitoring, review and amendment mechanisms.	Pre-construction
T2	Local road dilapidation	Dilapidation reports Pre-construction and post construction road dilapidation reports for local roads likely to be used for construction will be prepared. Any damage resulting from construction (not normal wear and tear) will be repaired unless alternative arrangements are made with the relevant road authority. Copies of road dilapidation reports will be provided to the local roads authority.	Pre-construction
T3	Impacts to traffic	Signage should be placed at the entrances to the sites in advance of the works commencing notifying road users of the proposed works.	Pre-construction

No.	Impact	Environmental safeguard	Timing
T4	Access	Consultation with RMS regarding the treatment of accesses to and from the site.	Pre-construction
T5	Reduced speeds, traffic delays and disruptions during construction	Road users and local communities should be provided with timely, accurate, relevant and accessible information about changed traffic arrangements and delays owing to construction activities.	Pre-construction, During construction
T6	Impacts to traffic	Construction traffic would enter/exit the construction zone in the area designated for this purpose by the Traffic Management Plan.	During construction
T7	Impacts to traffic	Traffic flow would be monitored along routes used by construction vehicles. If construction vehicles cause traffic congestion at any location, measures would be implemented to minimise traffic impacts.	During construction
T8	Impacts to traffic	Prior to the commencement of work the local community will be notified by way of a Notice to Residents and businesses, with information regarding timing of additional traffic movements.	During construction
T9	Impacts to traffic	Provide "Truck Turning" warning signs in accordance with Australian Standard AS1742.3 to reduce the impact associated with slow turning speed of heavy vehicles to and from the silos and any high speed of vehicles on Byrnes Road.	During construction
T10	Access	Repair and seal the road shoulders leading into the development site.	During construction
C1	All car parking and vehicle access must be contained on site and be set back from the street.		WWDCP
C2	Service vehicles are to be separated from visitor and staff parking areas, screened from the street and located at the rear or sides of the buildings behind the building line.		WWDCP
C3	Provide clear paths for pedestrian movement separate from areas of frequent vehicular movement.		WWDCP
C4	Parking areas are to be provided with suitable species of shade tree at a ratio of 1 per 4 car bays, evenly throughout the parking areas.		WWDCP
C5	Parking areas must be designed to channel water into the vegetated allotment swale.		WWDCP
C6	Parking areas and access driveways must be paved or sealed with asphalt or other Council approved seal.		WWDCP

No.	Impact	Environmental safeguard	Timing
C3	Vehicles are to enter and leave in a forward direction unless it can be demonstrated that site conditions prevent it.		WWDCP
C4	Provide adequate areas for loading and unloading of goods on site. The loading space and facilities are to be appropriate to the scale of development.		WWDCP
C5	Access driveways are to be located in accordance with the relevant Australian Standard at the time of lodgement of an application.		WWDCP
C6	Ensure adequate sight lines for proposed driveways.		WWDCP
C1	Parking is to be provided in accordance with the table of land uses.		WWDCP
C2	The design and layout of parking is to be in accordance with the relevant Australian Standard at the time of lodgement of an application.		WWDCP
C3	Parking spaces are to be provided for disabled persons. Accessible parking spaces to comply with the relevant Australian Standard at the time of lodgement of an application.		WWDCP
C9	Provide trees within the parking area at a rate of 1 tree per 5 spaces in a row. Each tree to have a minimum mature spread of 5 m and to be located in a planting bed with minimum width of 1.5 m (between back of kerbs) and minimum area of 3.5 m^2.		WWDCP
C10	Planting beds located within a car park are to have a subsoil drainage system connected into the stormwater system of the site.		WWDCP
C11	To ensure sightlines are maintained for drivers and pedestrians, trees used within or adjacent to car parking areas shall have a minimum clear trunk height of 2.5 m, with shrubs and ground covers not to exceed 500 mm in height.		WWDCP

6.9 HAZARDS AND RISKS

SECRETARY'S ENVIRONMENTAL ASSSESSMENT REQUIREMENTS

Hazards and risk, including:

- *The Environmental Impact Statement must include a preliminary risk screening completed in accordance with State Environmental Planning Policy No. 33 – Hazardous and Offensive Development and Applying SEPP 33 (DoP 2011), with a clear indication of class, quantity, and location of all dangerous goods and hazardous materials associated with the development.*
- *Should preliminary screening indicate that the project is "potentially hazardous", a Preliminary Hazard Analysis (PHA) must be prepared in accordance with Hazardous Industry Planning Advisory Paper No. 6 – Guidelines for Hazard Analysis (DoP 2011) and Multi-Level Risk Assessment (DoP 2011).*

An environmental hazard is a thing or situation which can threaten the environment or human health. Hazards may be natural or artificial or result from the interaction between human activity and the natural environment. Hazards relevant to the proposal and development site include risks associated with hazardous goods, leachate, fire and flooding.

This section addresses the use, storage and transportation of chemicals and hazardous materials associated with the proposal and documents the preliminary risk screening which was completed in line with SEPP 33 and the SEARs.

For the purpose of identification and assessment of relevant hazards, receivers are considered to be residential dwellings and their occupants that are located within a 2 km radius of the development site. The locations of these receivers are shown in Figure 3-2. Other receivers that may be impacted by hazards include construction personnel, landfill operators, waste delivery truck drivers and any other site management personnel and non-routine visitors.

6.9.1 Hazardous materials and development

SEPP 33 Hazardous and Offensive Development requires a Preliminary Hazard Assessment (PHA) to be prepared for potentially hazardous or offensive development. Appendix 3 of the Applying Sepp 33 Guidelines lists industries that may fall within SEPP 33, waste (landfilling/processing) is listed under 'Industries that may be potentially offensive'. Appendix 2 of the guidelines provides a risk screening procedure and a checklist to identify Hazardous and Offensive Development in instances where the applicability of SEPP 33 is not immediately apparent.

Risk Screening

SEPP 33 screening procedure is based on the quantity of dangerous goods stored or transported, the frequency of transportation movements, and in some cases the distance of the materials from the site boundary. The guidelines require goods to be classified according to the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG Code).

A development which exceeds screening thresholds in the guidelines would be considered potentially hazardous and a PHA would be required. For quantities below the given threshold, the SEPP indicates that there is unlikely to be a significant off-site risk, in the absence of other risk factors.

In determining whether a proposal is potentially hazardous or offensive, the guideline document *Applying SEPP 33 – Hazardous and Offensive Development Application Guidelines* (2011) is applied. The risk screening methodology for potentially hazardous industry is based on five main factors:

- The properties of the substance(s) being handled or stored.
- The conditions of storage or use.
- The quantity involved.
- The location with respect to the site boundary.
- The surrounding land uses.

Fuel would be delivered to site by a commercial fuel supplier when required for the plant. No fuel would be stored on site. All plant would be kept off-site and therefore, there is no requirement for any hazardous substances to be transported or kept on-site. Transportation and storage of dangerous goods would not exceed SEPP 33 thresholds, therefore would not be considered potentially hazardous and would not require a PHA.

The proposed facility would receive solid waste only originating from commercial and industrial sources. All loads of waste would be inspected before being dumped in the waste cell.

Fire

The development site is undulating. Local native vegetation remains in and around the site as remnant patches and planted corridors. Remnant roadside native vegetation remains to the west of the site along Byrnes Road and south of the site along Trahairs Road. Native tree plantings occur within the site, along the eastern boundary, and in the south-eastern and north-eastern corners of the site. Patches of remnant vegetation are located in surrounding paddocks to the east and south of the development site. The majority of the development site has been cleared and cultivated in the past. The site is not identified as bush fire prone land (WWCC 2018).

The existing bushfire hazards within the development site are as follows:

- Narrow strips of planted native woodland north of the ponds.
- Remnant patches of vegetation located to the north west.
- Large patch of planted native vegetation in the south-eastern corner of the site.

The local bush fire danger period occurs between October and March. The harvest period of November to mid-December is considered a prime risk period due to machinery in crops and generally high activity in the rural sector. January and February present the highest temperatures, coupled with low humidity and dry crop stubble over extensive areas.

In terms of resources to fight fire, two historic effluent evaporation ponds would remain, and two farm dams exist on site. Additionally, historic evaporation ponds exist on the southern side of Trahairs Road. Water from these resources would be used to fight fires. There are scattered farm dams on properties surrounding the site. The Murrumbidgee River is about 6 km to the south. The nearest rural fire service is located about 2.5 km from the development site on Brucedale Road (adjacent to Olympic Highway).

Internal access tracks would be 5 m wide to ensure safe operational access and egress for emergency service personnel.

In terms of receptors and assets at risk from bush fire, no residential dwellings are located within 1 km of the development site. However, there is one industry located on the 1 km radius boundary to the south. Additionally, farm sheds, watering points, silos and equipment are common in the local area. As stated

above, November to mid-December represents a period of high activity when many people may be active in harvest and other farm activities onsite and in the local area.

Planning for Bushfire Protection Guidelines (RFS 2006)

According to the Planning for Bushfire Protection (PBP) guidelines (RFS 2006), an acceptable level of protection from bushfires is achieved for developments through a combination of strategies which:

- *Control the types of development permissible in bush fire prone areas.*
- *Minimise the impact of radiant heat and direct flame contact by separating the development from the bush fire hazard.*
- *Reduce the rate of heat output (intensity) of a bush fire close to a development through control of fuel levels.*
- *Minimise the vulnerability of buildings to ignition from radiation and ember attack.*
- *Enable relatively safe access for the public and facilitate fire-fighting operations.*
- *Provide adequate water supplies for bush fire suppression operations.*
- *Implement community education programs, focusing on property preparedness, including emergency planning and property maintenance requirements.*
- *Facilitate the maintenance of APZs, fire trails, access for firefighting and on-site equipment for fire suppression.*

The PBP guidelines provide six key Bush Fire Protection Measures for developments:

a) The provision of clear separation of buildings and bush fire hazards in the form of fuel reduced APZ (comprising inner and outer protection areas and defendable space).
b) Construction standards and design.
c) Appropriate access standards for residents, fire fighters, emergency service workers and those involved in evacuation.
d) Adequate water supply and pressure.
e) Emergency management arrangements for fire protection and/or evacuation.
f) Suitable landscaping to limit fire spreading to a building.

Standards for Asset Protection Zones (RFS n.d.)

Bushfire Fuel Reduction

According to the Standard, not all vegetation must be removed, as it can be a cause of environmental damage. The following methods can be adopted to reduce fuel loads:

- *Raking or manual removal of fine fuels.*
- *Mowing or grazing of grass.*
- *Removal or pruning of trees, shrubs and understorey.*
- *Slashing.*
- *Ploughing and grading.*
- *Hazard reduction burning.*
- *Pile burning.*

Fire Prevention (NSW EPA 2016)

According to the Environmental Guidelines for Solid Waste Landfills (NSW EPA 2016), the following fire-prevention and fire-fighting practices should be followed:

- *Signs should clearly inform the general public that flammable liquids are not permitted on the site and there should be an emergency contacts list at the site entrance.*

- *Stockpiles of approved amounts of combustibles for recycling and composting (such as tyres, wood or vegetation) should be divided into small piles or windrows so that any burning material can be isolated from additional fuel. Tyre stockpiles should not exceed 50 tonnes at any one time and should be located in a clearly defined area away from the tipping face.*
- *All sealed or contaminated drums should be banned from the landfill unless they are delivered as a specific consignment, the contents of which are clearly identified and suitable for acceptance.*
- *All fuels or flammable solvents for operational use should be stored in an appropriately ventilated and secure store located on unfilled land. All flammable liquids should be stored within a bund that has a capacity of 110% of the volume of the flammable liquids so that any release of raw or burning fuel will not cause a fire in the filled waste or affect stormwater.*
- *Flammable solid wastes must not be stockpiled at the premises in excess of the quantity limits imposed on the licence.*
- *Fire breaks should be constructed and maintained around all filled areas, stockpiles of combustibles, gas extraction equipment and site buildings.*
- *Fire-fighting equipment should be installed at the site, including at flammable waste storage areas.*
- *All fire-fighting equipment should be clearly signposted and access to it must be available at all times.*
- *All fire-fighting equipment should be maintained according to a regular schedule (at a minimum, weekly visual checks for damage and 3-monthly test operation of the equipment).*
- *Landfill staff should be trained in all of the above fire-prevention and fire-fighting techniques.*

6.9.2 Potential impacts

Potential hazards may be expected to arise from operation of the proposal and from incidents around the landfill that may create a hazard. A hazard is usually an uncontrolled event, and it is assumed that additional hazards exist that have not yet been identified. For the purposes of this assessment, the following are considered to be potential hazards at the proposed development:

- Bushfire on the site (with the operational parts of the proposed development considered to be a potential fuel source during a bushfire).
- Hazardous materials on site – including the leachate produced from the materials facility.
- Vandalism of the site (including deliberate lighting of fires at the landfill or destruction of fences or other property).
- Explosions on site, through methane or other flammable gas accumulation or ignition of fuels.
- Natural hazards such as flooding or geological subsidence.

The potential impacts from the above hazards include:

- Damage to residential properties (and life/health) around the proposed landfill facility.
- Increased risk of spread of fire from the landfill.
- Damage to vegetation, habitats, and fauna.
- Potential impacts to soils and surface water in the project area through hazardous materials or leaking fuels.
- Structural integrity of the landfill.

Bushfire-prone land has been mapped by WWCC. No bushfire-prone areas currently exist within 5 km of the development site, and the site of the proposed landfill is generally clear of vegetation as a result of the

dominance of agricultural land use in the area. However, given the potential for bushfires (including grassfires) to occur, bushfire impacts have been assessed and management measures have been identified.

Leachate management

The proposed materials facility is comprised of open cells collecting non-putrescible solid waste materials from the construction and demolition industry and from other sources. Materials from other sources include glass from a recycler.

Rainfall infiltration into the waste cell produces leachate. The waste cells would be lined in compliance with the NSW EPA's *Environmental Guidelines: Solid Waste Landfills* (2016) to prevent leachate infiltration into the subsoil. Leachate would be captured by a leachate management system and directed to a designated lined leachate pond. The specifications of the leachate management system and pond are in section 3.2.

The proposed development is not potentially hazardous or offensive, according to the requirements of SEPP 33 and a PHA is not required. However, the proposed landfill facility would require an EPL as it is a scheduled activity under the POEO Act.

6.9.3 Safeguards and mitigation measures

The following safeguards are recommended to minimise impacts:

No.	Impact	Environmental safeguard	Timing
HR1	Hazardous materials	Relevant Materials Safety Data Sheets (MSDS), spill containment, and other safety equipment should be installed and maintained. This includes bunds around storage tanks, fire extinguishers, and drains.	Construction, Operation
HR2	Hazardous materials	All wastes arriving at the proposed landfill facility would be screened for hazardous materials prior to entering the landfill facility.	Operation
HR3	Vandalism	The proposed landfill facility should be securely fenced to protect from vandalism.	Construction
HR4	Explosions and fires	Fire prevention practices should be implemented around the landfill facility, including: ○ Regular mowing of grassed areas surrounding site buildings ○ Frequent covering of material delivered to the landfill ○ Removal of escaped litter and rubbish ○ Installation of firefighting equipment on site	Operation
HR5	Explosions	A gas accumulation monitoring program should be established.	Operation
HR6	Explosions	Accumulation of landfill gases should be managed to avoid uncontrolled gas emissions.	Operation

No.	Impact	Environmental safeguard	Timing
HR7	Fires	Controlled burning at the site boundary should be used regularly to minimise fire risk.	Operation

HR8	Fires	A Fire Management Plan would be developed and implemented during construction, operation and decommissioning, with input from the RFS, and include but not be limited to:
		• Management of activities with a risk of fire ignition.
		• Management of fuel loads onsite.
		• Storage and maintenance of firefighting equipment, including siting and provision of adequate water supplies for fire suppression.
		• The below requirements of Planning for Bush Fire Protection 2006:
		  ○ Identifying asset protection zones.
		  ○ Providing adequate egress/access to the site.
		  ○ Emergency evacuation measures.
		Operational procedures relating to mitigation and suppression of bush fire relevant to the materials facility.
			Construction
			Operation
			Closure

HR9	Leachate	All leachate should be managed in the leachate management system. The leachate management system would be designed and constructed to meet the specifications in the NSW EPA's *Environmental Guidelines: Solid Waste Landfills* (2016). A leachate monitoring program would be established to provide data on the composition, height levels and volumes of leachate produced by the landfill cell. Any irregular discharges or overflows would also be recorded. Leachate composition would be monitored annually as per the NSW EPA's *Environmental Guidelines: Solid Waste Landfills* (2016).	Operation Closure
P1	The design and construction of development should recognise and be designed within the environmental hazards and constraints of the site.		WWDCP
C1	Applications are to satisfy the relevant provisions of *Planning for Bush Fire Protection 2006* (or any later versions) and Australian Standard: 3959 Construction of Buildings in Bush Fire Prone Areas.		WWDCP
C2	Where required, a clear separation is to be provided between buildings and bushfire hazards in the form of a fuel-reduced Asset Protection Zone (APZ). In all cases, the APZ is to be located wholly within the land zoned Residential. Refer to the requirements of Planning for Bush Fire Protection 2006.		WWDCP

6.10 RESOURCE USE AND WASTE GENERATION

SECRETARY'S ENVIRONMENTAL ASSESSMENT REQUIREMENTS

Waste management, including:

- *Details of the type, quantity and classification of waste to be received at the site;*
- *Details of the resource outputs and any additional processes for residual waste;*
- *Details of waste handling including transport, identification, receipt, stockpiling, and quality control; and*
- *The measures that would be implemented to ensure that the proposed development is consistent with the aims, objectives, and guidelines in the NSW Waste Avoidance and Resource Recovery Strategy 2014-21.*

EPA'S REQUIREMENTS

Detail the control measures that will be implemented to minimise the generation or movement off-site of litter from the exposed tipping face or associated with waste transport on site;

Details of the proposed waste covering and compaction regime consistent with the objectives of the Landfill Guidelines, including all details for the proposed use of the excavated evaporation pond sludge.

6.10.1 Policy

Waste management shall be undertaken in accordance with the *Waste Avoidance and Resource Recovery Act 2001*. The objectives of this Act are:

(a) to encourage the most efficient use of resources and to reduce environmental harm in accordance with the principles of ecologically sustainable development,

(b) to ensure that resource management options are considered against a hierarchy of the following order:

(i) avoidance of unnecessary resource consumption,

(ii) resource recovery (including reuse, reprocessing, recycling and energy recovery),

(iii) disposal,

(c) to provide for the continual reduction in waste generation,

(d) to minimise the consumption of natural resources and the final disposal of waste by encouraging the avoidance of waste and the reuse and recycling of waste,

(e) to ensure that industry shares with the community the responsibility for reducing and dealing with waste,

(f) to ensure the efficient funding of waste and resource management planning, programs and service delivery,

(g) to achieve integrated waste and resource management planning, programs and service delivery on a State-wide basis,

(h) to assist in the achievement of the objectives of the Protection of the Environment Operations Act 1997.

6.10.2 Existing environment

The main waste facility for the Wagga Wagga area is Gregadoo Waste Management Facility. Waste streams accepted by this facility include:

- General and commercial solid waste – putrescible and non-putrescible.
    - Green waste.
    - Construction and demolition waste.
    - Contaminated waste.
- Asbestos.
- Clinical and related waste.
- Waste tyres.

The next closest waste facility is the Albury Waste Management Centre. This facility accepts the same waste streams detailed above.

Existing contaminated soil within the Riverina Wool Combing evaporation pond would be excavated and composted within the existing pond footprint. The contamination is characterised as long chain hydrocarbons from the wool wax (lanolin) from the wool combing process (section 6.2).

6.10.3 Potential impacts

Construction

The main waste streams from the proposal would include:

- General construction waste.
- Grass and shrubs from vegetation clearing.
- Noxious weeds.
- Excavated material not needed for reuse on site.
- Packaging waste from materials brought on site.
- General waste.

It is expected that the largest component of waste material on site (surplus soil) would be reused on site and stockpiled within the existing pond footprint. All waste would be disposed of at appropriately licensed waste facilities. Materials would be recycled wherever possible.

Operation

The development is primarily intended to service the waste management needs of Wagga Wagga LGA and surrounding LGAs. Wagga Wagga has a population of over 63 000 people (ABS 2017). The population has an ongoing need for the management and disposal of solid waste for building and demolition, light industry and other activities. Waste streams would include solid non-putrescible waste from companies in the Wagga Wagga LGA and surrounding LGAs. Table 6-39 outlines the waste stream, location of the waste, potential supply and the type of waste.

Additional waste production would include the production of leachate from the waste cells and collection of water from the groundwater relief layer. Waste management for these items has been addressed in section 6.10.4.

Table 6-39 Potential annual general solid waste (non-putrescible) streams from Wagga Wagga and surrounding areas

Waste Stream	Location	Potential Supply (t)	Volume (m^3)	Type of Waste
Construction & demolition waste*	Wagga Wagga LGA	29 000	37 700	• Broken concrete, brick and other rubble. • Soil (uncontaminated). • Road millings. • Timber. • Plaster board. • Compressed cement sheet.
	Albury LGA	16 000	20 800	
Visy Pulp and Paper Mill, Tumut	Tumut	15 000	7 500	• Compactor plastics – light mixed plastics. • Grapple Materials – heavy plastics, some metals, rubber and fibre. • Glass material – glass, ceramics and stone chips. • Fines/sand – with a small amount of fibre. • Flotsam – wire, rope, plastics, metal and some fibre. • Carbonates – mix of sodium and calcium carbonates, lime and a small amount of unburnt organics. • Power boiler fly ash – boiler wood ash, inorganics. • Power boiler sand – with some metals and small rocks.
Kurrajong Recyclers	Wagga Wagga	1 000	2 800	• Crushed glass. • Some limited electrical wire contamination.
Other undefined non-putrescible waste		2 000		• Undefined

Table 6-40 shows the referenced conversion factors used for determining material volume from the supplied material weight.

Table 6-40 Conversion factors for waste type

Waste type	Conversion factor (tonnes to m^3)	Reference
Construction and demolition waste	1.3	www.zerowaste.sa.gov.au
Pulp and paper mill waste	0.5	www.zerowaste.sa.gov.au
Glass waste (crushed)	0.34	www.zerowaste.sa.gov.au

6.10.4 Safeguards and mitigation measures

The following safeguards are recommended to minimise impacts:

No.	Impact	Environmental safeguard	Timing

WR1	Avoid, minimise and sustainably manage waste	Waste Management
		Waste Management will be considered and identified as part of the CEMP and will include:
		• Resource management hierarchy principles must be followed:
		  • Avoid unnecessary resource consumption as a priority
		  • Avoidance is followed by resource recovery (including reuse of materials, reprocessing, recycling and energy recovery)
		  • Disposal is carried out as a last resort (in accordance with the *Waste Avoidance & Resource Recovery Act 2014*).
			During construction and operation

WR2	Avoid, minimise and sustainably manage waste	All waste generated by the proposal would be classified in accordance with the *NSW Waste Classification Guidelines Part 1: Classifying Waste* (EPA 2014).	During construction
WR3	Avoid, minimise and sustainably manage waste	Waste materials (such as soils and aggregates) obtained from the project to be exported offsite for reuse will be sampled and classified as per WR2.	During construction
WR4	Avoid, minimise and sustainably manage waste	Waste material is not to be left on site once the works have been completed and working areas are to be maintained, kept free of rubbish and cleaned up at the end of each working day.	During construction
WR5	Waste generation	All waste generated on site is to be transported off site and disposed of at a landfill site approved to accept General Solid Waste (non-putrescible).	During construction

No.	Impact	Environmental safeguard	Timing
WR6	Avoid, minimise and sustainably manage waste	All waste delivered to the site will be checked that it meets the criteria of the landfill. Waste screening will occur at the waste sorting area on receival. Contaminated loads will be rejected.	During operation
WR7	Avoid, minimise and sustainably manage waste	Contaminated soil in the existing Riverina Wool Combing facility evaporation ponds will be composted. The contamination is wool wax (lanolin) as a result of the wool combing process.	During operation
WR8	Avoid, minimise and sustainably manage waste	<u>Stockpiling</u> Unsuitable material recovered during construction would be stockpiled within the existing cell footprint for use as daily cover. Soil, rubble and glass received as waste will be stockpiled within the existing cell footprint for use as daily cover.	During operation
WR9	Avoid, minimise and sustainably manage waste	<u>Waste cover and compaction</u> Waste in the active cell would be covered at close of business daily. The cover material would be to a depth of 150 mm and of an approved material type, such as soil or crushed glass. The amount of exposed waste will be kept to a minimum at all times. An intermediate cover will be used if the litter face is to be exposed but not used for more than 90 days. Final capping requirements and rehabilitation would be undertaken directly as the sub-cell reaches capacity and follow the *Environmental Guidelines: Solid Waste Landfills* (NSW EPA 2016). Compaction of the waste would occur after each load / daily in the active cell and would occur to minimise litter from the landfill. Methods as per the *Environmental Guidelines: Solid Waste Landfills* (NSW EPA 2016).	During operation
WR10	Avoid, minimise and sustainably manage waste	The general solid waste sorting area is located on the hard stand. The sorting area will be contained by walls. Thick grasses and shrubs will be planted along the transport route, and fencing erected around the hardstand area, to trap litter. Litter collection traps would be installed on inlet pits located near the hardstand area.	During operation

No.	Impact	Environmental safeguard	Timing
		All litter leaving the site would be retrieved as soon as practicable. Vehicles leaving the site must not distribute mud or litter that has been collected on tyres. Cleaning equipment would be available for removing these items from vehicles before leaving the site. Signage will be installed at the access point alerting customers to their responsibility to ensure that no remnants of waste materials contaminate public roads. Methods as per the *Environmental Guidelines: Solid Waste Landfills* (NSW EPA 2016).	
WR11	Avoid, minimise and sustainably manage waste	Leachate production will be managed in the leachate collection and management system, which would meet the design specifications in the NSW EPA's *Environmental Guidelines: Solid Waste Landfills* (2016).	During operation
WR12	Avoid, minimise and sustainably manage waste	A groundwater relief layer will intercept and manage the groundwater that comes into contact with the base of the waste cell. The groundwater will be collected, tested and discharged to a tank. The water will be used for dust suppression.	During operation

6.11 SOCIOECONOMIC AND COMMUNITY

New types of developments can produce social and economic impacts on local communities. These can be positive, such as the provision of employment and increased retail trade. They can also produce unintended or adverse impacts, such as creating strains on existing infrastructure (such as public transport or accommodation facilities during construction, or social infrastructure such as volunteer services, social ties and networks). This section investigates the socio-economic profile of the region to understand the impact of the proposal on socioeconomics and the community.

6.11.1 Background

Socio-economic profile

The City of Wagga Wagga LGA has a population of 62 385 people (ABS 2016). In the 2011 census, the population was 59 458 people, which represents an increase of 5.6 % in population over five years. The percentage of people of Indigenous origin in 2016 was 5.6 %, which is high in comparison to the Australian average of 2.8 %. The overseas immigrant population is small, with 84.1 % of the population born in Australia compared to the Australian average of 66.7 % (ABS 2016).

Agriculture contributes to the local economy, with 3.6 % of the population employed in agriculture, forestry and fishing (economy.id2 2018), and a total value of agricultural output of $105 million in 2015-16 (economy.id2 2018). This includes cereal crops (such as wheat, oats and barley), broadacre crops (such as soybeans, cotton and hops), wool, milk, livestock, and hay crops (ABS 2016). Other sectors that support the economy include health and social care, education and training, public administration and safety, retail and construction (economy.id2 2018). The unemployment rate for the City of Wagga Wagga is 4.77 % in September 2017, which is less than the national rate of 5.5 % (economy.id 2018).

Wagga Wagga is a service centre for the area and includes:

- Location along Olympic and Sturt Highways.
- Abundant tourist accommodation in Wagga Wagga township including 30 motels/hotels/serviced apartments as of 2016 (ABS 2018) and five caravan parks (Visit Wagga Wagga 2018).
- Educational facilities including over 20 primary schools and 8 high schools (Wagga Wagga 2019).
- Medical facilities including rural referral hospital.
- Aged care facilities.
- Shopping precincts with banks, post office, supermarkets, and retail outlets.
- Recreational and sporting facilities including a public swimming pool, golf courses, recreation grounds for football and cricket, netball courts and tennis courts.

The development site is within Bomen Industrial Area to the north of the Wagga Wagga central business district. Site access is via Trahairs Road off Byrnes Road, which is a route between Wagga Wagga and Junee.

Community feedback on the proposal

Riverina Warehousing Solutions Pty Ltd. and NGH Environmental have undertaken preliminary consultation with surrounding neighbours and the general community. A community information session and contact details are an example of the methods that have been made available to surrounding landholders and community members for communication and feedback of the proposed development.

FACE-TO-FACE MEETINGS

Face-to-face meetings were offered to any interested party by the advertisements in Wagga Wagga's Daily Advertiser.

COMMUNITY INFORMATION SESSIONS

One community information session was held in Wagga Wagga on 24 October 2017. Feedback forms were provided to those who attended the information session and provided their email address on the community attendance register. Two feedback forms were completed and returned. The feedback from one concerned resident, more than 2 km from the proposed development, was very detailed. Feedback from this resident was primarily a request for further information around the specifics of landfill size, traffic numbers, stage 1 cell size, water management, waste collection from the local area, the use of crushed glass and questions around the key driver for the facility. NGH Environmental replied to the concerns raised by this resident in the second community consultation session on Thursday 4 October 2018 and addressed all the concerns. Issues raised have been addressed throughout this EIS:

- Potential impacts to water quality and water users (section 6.2).
- The proponent (section 1.2.1).
- Proposal details (section 3.2).
- Project purpose (section 2).
- Traffic (section 6.8).
- Details about the volume, design and materials of the waste cell (section 3.2 and section 3.3).
- Sensitive receivers for noise, vibration and odour (Figure 3-2, section 6.4 and section 0).

6.11.2 Potential impacts

The proposal would help meet the waste management needs of Wagga Wagga LGA and surrounding LGAs, including the management and disposal of solid waste for building and demolition, light industry, and other activities. The proposal makes use of the existing wool scouring effluent evaporation ponds on a disturbed site with generally low environmental values. This would minimise the environmental impacts of the development and avoid the need to locate a landfill facility in an area of higher environmental, socio-economic, or agricultural values.

Social

Community consultation has been undertaken during the preparation of this EIS to identify the issues that are of concern to the local community (section 5).

Five residential receivers have been identified in close proximity to the development site, who could potentially be affected by impacts on local amenity during construction and operation of the proposed facility. The nearest sensitive receiver to the development site is a rural residence at 46 Trahairs Road, around 1.25 km from the western boundary of the development site and 1.6 km from the nearest effluent evaporation pond.

Potential social impacts during the construction period are likely to be associated with amenity impacts resulting from noise and traffic, which were addressed in section 0 and section 0.

Other potential socio-economic impacts during construction have been addressed elsewhere in this EIS, including visual impacts for the local residents (section 6.12) and air quality impacts (section 6.4). These impacts would not be likely to impact on the local community. Mitigation measures would be implemented during construction and operation to manage these potential impacts.

Riverina Warehousing Solutions Pty Ltd would continue to consult with the private landholders about issues such as construction timeframes.

Economic

The capital investment value of the project is estimated to be around $3 million. Costs to develop the proposed landfill include the construction costs associated with the development of an engineered landfill and associated facilities, including all nominated environmental controls.

The location of the waste cell within the footprint of the existing effluent evaporation pond would reduce the economic costs of the proposal. Excavation and earthworks are a significant cost in construction. The sub-cell in stage 1 would have a footprint of around 12 481 m^2 and a completed depth of 8 m. This would result in an excavated volume of 99 848 m^3.

The construction and operation of the proposed landfill facility is likely to have a beneficial impact on the local and regional economy, primarily as a result of employment generation and provision of another waste management option for the construction and demolition industry of the Wagga Wagga LGA.

The construction phase of the proposed landfill would employ up to 10 workers, which would benefit the local economy. The proposal would employ two full-time equivalent (FTE) staff on site during operation. There may also be other indirect employment opportunities associated with the proposal, including environmental monitoring work and supply of goods and services.

The capping, rehabilitation, and closure of the proposed landfill would allow the land to be re-used in the future. The project area would be returned to its pre-existing land use condition. Rehabilitation of the site would be progressive through the stages of the proposed landfill. The ongoing use of the site would be determined in consultation with relevant stakeholders and agencies.

There are potential environmental impacts if the landfill operator does not have the financial means to carry out remediation after closure of the landfill. Financial assurance of the landfill operators is an important aspect relating to the ongoing viability of landfill operations.

6.11.3 Safeguards and mitigation measures

The following safeguards are recommended to minimise impacts:

No.	Impact	Environmental safeguard	Timing
SE1	General impacts to the local community and stakeholders	Complaints would be communicated to the construction / landfill facility manager and recorded in the Safeguard Reporting System per complaints handling procedure.	Construction
SE2	General impacts to the local community and stakeholders	The proponent would undertake community consultation, as identified in this EIS.	Pre-construction
SE3	General impacts to the local community	Potentially affected residences and businesses would be contacted before the commencement of works. Residents and businesses would be notified via door knocks, newsletters or letter box drops	Pre-construction Construction

No.	Impact	Environmental safeguard	Timing
		providing information on the proposed work, working hours and a contact name and number should any complaints wish to be registered	
SE4	Impacts to residents and general community	Road users and local communities will be provided with timely, accurate, relevant and accessible information about changed traffic arrangements and delays owing to construction activities.	Pre-construction Construction

6.12 VISUAL AMENITY

SECRETARY'S ENVIRONMENTAL ASSESSMENT REQUIREMENTS

Visual, including an impact assessment at private receptors and public vantage points.

A Visual Impact Assessment (VIA) was prepared by NGH Environmental for the proposed development site. The full report is provided in Appendix P and summarised below.

6.12.1 Existing environment

The visual character of the locality is typical of the bioregion, with a flat, undulating terrain of low hills, which is largely cleared and remaining vegetation existing primarily as small, scattered patches. It also contains industrial sites, primarily the ROBE facility on the adjacent property, as well as the railway corridor, roads and residences. Public vistas occur from residences and the nearby local and regional road network.

Residential sensitive receivers are sparsely located in all directions around the development site. The nearest residential sensitive receiver to the development site (Figure 3-2) is a rural residence at 46 Trahairs Road (R06), around 1.25 km from the western boundary and 1.5 km from the nearest effluent evaporation pond. There are two more residential receivers within 1.5 km from the development site boundary (Figure 3-2).

Local land uses in the visual assessment study area include agriculture (grazing and cropping) and industry. There are no look outs or promoted scenic vistas located within proximity to the proposal. However, features that contribute to the scenic character of the area include:

- Byrnes Road between the townships of Wagga Wagga and Junee.
- Pastoral views.

6.12.2 Approach

Views to the site

The following viewpoints were considered in the assessment of the visual impacts of the proposal on the local landscape:

- Nearest sensitive receiver – 46 Trahairs Road (R06 Figure 3-2).
- Residential sensitive receivers to the west, north, south and east.
- Along Byrnes Road, north of the ROBE facility, along the western boundary of the development site.

Landscape character units (LCU) and representative viewpoints

Four LCUs were identified within the suburb of Bomen and surrounding suburbs:

- Industrial (roads, electrical, waste management and other built infrastructure).
- Rural (including agricultural lands and rural residential blocks).
- Residential (retail and residential areas).
- Recreational (reserves, parks and other recreational areas).

The scenic quality was rated in each LCU as follows:

- A high scenic quality rating describes areas with outstanding, unusual or diverse features.

- A moderate scenic quality rating applies to areas with the features and variety normally present in the character type.
- A low scenic quality rating is given to areas lacking features and variety.

The Bureau of Land Management (BLM) methodology requires identification of representative viewpoints in the development site. These may be travel routes such as roads, waterways and recreational tracks, residential areas, tourist facilities, houses and farmland.

Eleven representative viewpoints were identified using the BLM methodology and the landscape topography.

Evaluation criteria

- High contrast: the proposed activity would be dominant within the landscape and generally not overlooked by the observer; the visual change would not be absorbed.
- Medium contrast: the proposed activity would be moderately dominant and noticed; the visual change would be partially absorbed.
- Low contrast: the proposed activity would be seen but would not attract attention; the visual change would be well absorbed.
- Indistinct: contrast would not be seen or would not attract attention; the visual change would be imperceptible.

To determine if the objectives for the VLM zone are met, the contrast rating for the viewpoint is compared with the relevant management objectives to give a visual impact level. The visual impact level is consequently defined as:

- High impact: contrast is greater than what is acceptable.
- Medium impact: contrast is acceptable.
- Low impact: visual contrast is little or not perceived and is acceptable.

For high impact viewpoints, mitigation must be considered.

6.12.3 Results

Visual impact assessment at representative viewpoints

Visual impacts at each representative viewpoint are summarised below in Figure 6-17 and Table 6-41.

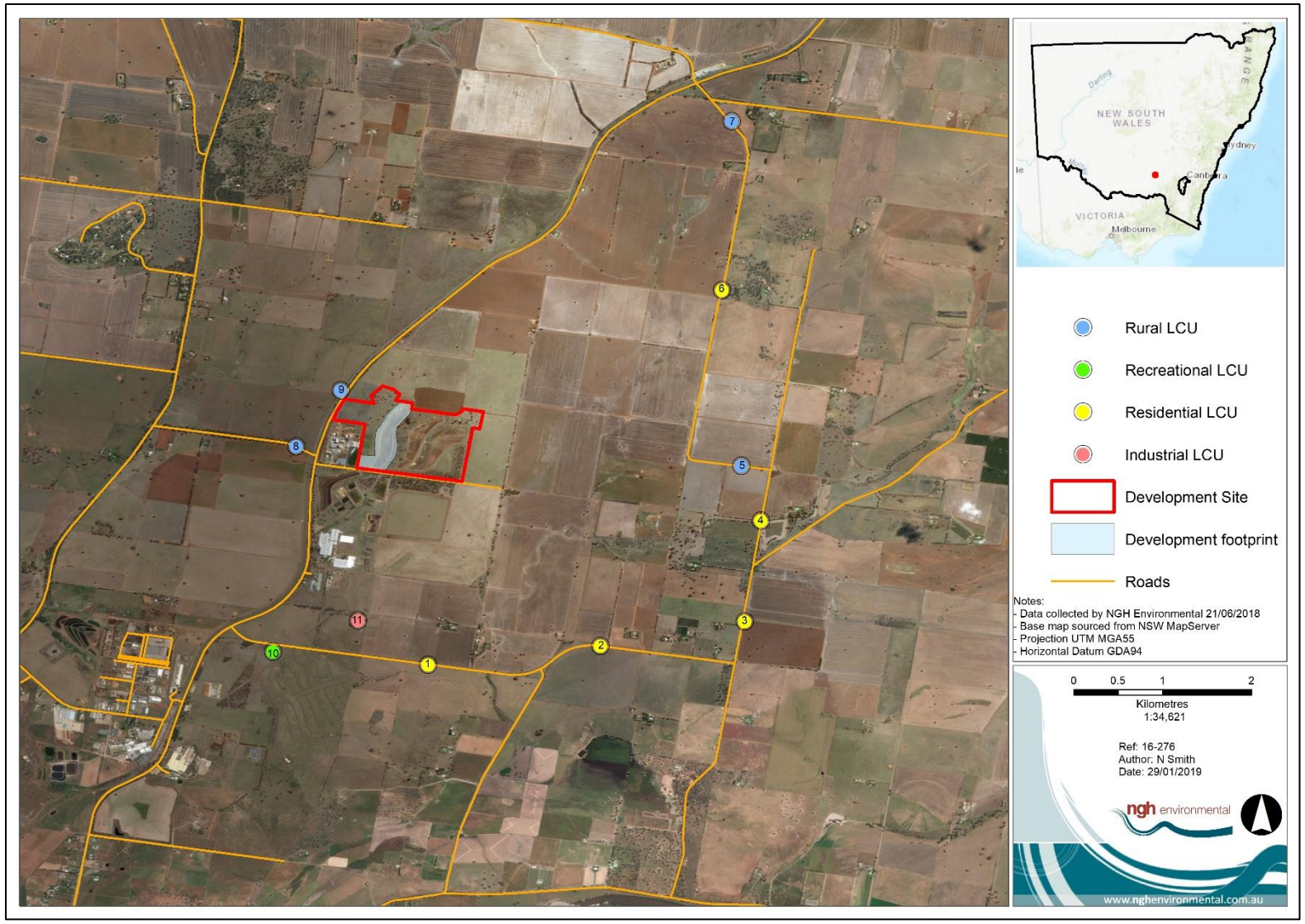

Figure 6-17 Viewpoint locations

Table 6-41 Visual impact at each representative viewpoint

Viewpoint ID	LCU	Viewpoint	Contrast	Inherent Visual Impact	Comment
1	Residential	Road (middle ground)	Indistinct	**LOW**	No mitigation is required.
2	Residential	Road (middle ground)	Indistinct	**LOW**	No mitigation is required.
3	Residential	Road (middle ground)	Low	**LOW**	No mitigation is required.
4	Residential	Road (middle ground)	Low	**LOW**	No mitigation is required.
5	Rural	Road (middle ground)	Low	**LOW**	No mitigation is required.
6	Residential	Road (middle ground)	Indistinct	**LOW**	No mitigation is required.
7	Rural	Road (background)	Indistinct	**LOW**	No mitigation is required.
8	Rural	Road (foreground)	Indistinct	**LOW**	No mitigation is required.
9	Rural	Road (foreground)	Indistinct	**LOW**	No mitigation is required.
10	Recreational	Road (middle ground)	Indistinct	**LOW**	No mitigation is required.
11	Industrial	Industrial (middle ground)	Indistinct	**LOW**	No mitigation is required.

High Impact – not applicable

No viewpoints were assessed to have a high impact.

There are no nearby residences that would have significant, direct views of the materials facility. The ROBE facility is the dominant feature in the landscape. Once the waste sub-cells are capped and revegetated they would blend into the landscape.

Medium impact – mitigation could be considered

No viewpoints were assessed to have a medium impact.

There are no nearby residences that would have significant, direct views of the materials facility. The ROBE facility is the dominant feature in the landscape. Once the waste sub-cells are capped and revegetated they would blend into the landscape.

Low impact – no mitigation

Low impacts are likely for roads and residences, where views of the materials facility infrastructure would be difficult to perceive or indistinct. Low impacts are expected for the majority of the study area and representative viewpoints due to existing vegetative screening around residences, retained on-site vegetation, existing industry and the overall undulating nature of the area. No mitigation is required for these locations.

The extent of view from representative viewpoints are shown in Table 6-42.

Table 6-42 Extent of view from representative viewpoints.

Viewpoint 2 – extent of view indicated by the white square

Viewpoint 3 – extent of view indicated by the white square

Viewpoint 5 – extent of view indicated by the white square

Viewpoint 6 – extent of view indicated by the white square

Viewpoint 8 – western side of Byrnes Road. Site is obscured from all western receivers by the topography and ROBE.

6.12.4 Potential impacts

Construction

Visual impacts associated with construction would result from vegetation clearing and construction activities.

As the footprint of the proposed facility is largely situated in the footprint of the existing effluent evaporation ponds, only a minimal amount of vegetation would be cleared to facilitate site access. It is not considered that the limited amount of vegetation clearing proposed would significantly alter the visual quality of the overall landscape.

Construction works would include excavation, sub-cell construction, road construction, installation of the site office and amenities, and movement of construction plant such as bulldozers and excavators. Exposed work areas and heavy vehicle movements would impact on the visual character of the development site and local landscape.

Dust and vehicle movement cumulative impacts could occur if earthworks during construction were to coincide with harvest activities or the construction phase of the proposed Bomen Solar Farm.

Operation

Visual impacts associated with operation would result from landfilling activities and rehabilitation of the project area.

The proposed landfill operations would require work areas and waste materials at the landfill face, stockpiling of cover materials, and movement of heavy vehicles around the site. These impacts would occur progressively throughout the life of the landfill facility. Existing mature vegetation would provide some level of visual screening from some vantage points, including along Trahairs Road, and the ROBE facility screens views from some vantage points along Byrnes Road.

The proposed footprint of the landfill would be progressively rehabilitated as each sub-cell Is filled, capped, and revegetated over the life of the proposal. There would also be rehabilitation and revegetation of the areas surrounding the proposal footprint, which would provide additional screening of the proposed facility once vegetation was mature.

Cumulative visual traffic impacts are considered negligible as most vehicle movements would be confined to the hard stand and sorting area close to the site access from Trahairs Road and surrounded by existing vegetative screening to the east and south.

Generally, adverse cumulative visual impacts are anticipated to be manageable due to the existing and retained vegetative screening and undulating nature of the site that blocks out most views almost entirely.

6.12.5 Safeguards and mitigation measures

In order to minimise the impact of the proposal on visual amenity, the following mitigation measures are recommended:

No.	Impact	Environmental safeguard	Timing
VA1	Loss of visual amenity	Appropriate sizing and placement of stockpiles should be ensured.	Construction, operation
VA2	Loss of visual amenity	Construction and maintenance areas should be maintained in an orderly and tidy state.	Construction, operation
VA3	Loss of visual amenity	Existing groundcover on future cells should be retained for as long as possible until removal is required.	Construction, operation
VA4	Loss of visual amenity	Waste delivered to the landfill should be frequently covered.	Operation
VA5	Loss of visual amenity	Revegetation of the area surrounding the proposal footprint should be used to provide a biodiversity offset for the existing vegetation to be cleared, and to improve the habitat values of the project area. Some areas of revegetation	Construction

No.	Impact	Environmental safeguard	Timing
		should be strategically located to provide some visual screening.	
VA6	Loss of visual amenity	All existing vegetation within the development site but outside the proposal footprint should be maintained throughout the life of the proposal.	Operation
VA7	Rubbish around development site	Escaped litter and landfill waste should be removed regularly.	Operation
P1	Visual impacts on surrounding area	Development should not interrupt the hills and visually prominent ridges throughout the local government area of Wagga Wagga.	Design
C1	Visual impacts on surrounding area	Protect ridgelines as visual features of Bomen. Ridgelines at all times are to remain visible above the topmost ridge of all new buildings, when viewed from any point along the eastern boundary of the Bomen Urban Release Area.	Design
C2	Loss of visual amenity	Natural features at the site, such as trees, rock outcrops, cliffs, ledges, and indigenous species and vegetation communities are to be retained and incorporated into the design of the development.	Design
C4	Loss of visual amenity	Trees should be planted at the front and rear of properties to provide tree canopy.	Construction
C5	Loss of visual amenity	Provide landscaping in the front and side setback areas, and on other parts of the site to improve the streetscape, soften the appearance of buildings and paved areas, and to provide visual screening.	WWDCP

6.13 MATTERS OF NATIONAL ENVIRONMENTAL SIGNIFICANCE

6.13.1 Summary of MNES searches

Matters of National Environmental Significance (MNES) are assessed in section 6.3 and Appendix I. Below is a summary of the MNES:

Table 6-43 Summary the EPBC protected matters relevant to the proposed action

Matters of National Environmental Significance	Records	Occurrence within study area
World Heritage Properties	None	N/A
National Heritage Places	None	N/A
Wetlands of International Importance:	Four	The closest Wetland of International Importance is located 400-500 km upstream of the study area.
Great Barrier Reef Marine Park:	None	N/A
Commonwealth Marine Area	None	N/A
Listed Threatened Ecological Communities	Three	Two EECs were recorded within the study area during the survey.
Listed Threatened Species	Nineteen	Seven of these species have been recorded or could potentially occur in the development site, including: • Regent Honeyeater • Painted Honeyeater • Curlew Sandpiper • Swift Parrot • Corben's Long-eared Bat • Grey-headed Flying-fox
Listed Migratory Species **(excludes marine species)**	Seven	Four listed migratory species are considered to have the potential to occur in the development site, including: • Fork-tailed Swift • White-throated Needletail • Yellow Wagtail • Satin Flycatcher

There is a low likelihood of significant impact to MNES with the implementation of the safeguards developed in this EIS. Referral to the Commonwealth is not considered to be required.

6.14 CUMULATIVE IMPACTS

OEH'S REQUIREMENTS

The cumulative impacts from all clearing activities and operations, associated edge effects, and other indirect impacts on cultural heritage, biodiversity, and OEH Estate need to be comprehensively assessed in accordance with the Environmental Planning and Assessment Act 1979.

This should include the cumulative impact of the proponent's existing and proposed development and associated infrastructure (such as access tracks, etc.) as well as the cumulative impact of other developments in the vicinity. This assessment should include consideration of both construction and operational impacts.

Cumulative impacts can result from a number of different elements within a project as well as from numerous different projects with interacting impacts in the same locality. Cumulative impacts of the proposal may occur as a result of another existing or future project within the locality.

6.14.1 Existing environment

Potential cumulative impacts of the proposal

The existing site comprises partly excavated evaporation ponds and internal access roads. The proposed development site would include site access, further excavation, leachate production, a leachate management system, upgrades to the internal roads and a site office.

The potential cumulative impacts during the construction and operation of the proposed facility have been identified in the relevant chapters of this EIS, including:

- Impacts on local air quality, primarily dust, exhaust emissions, and odour (section 6.4).
- Impacts on noise levels (section 0).
- Traffic impacts on local road network (section 0).
- Impacts on surface and groundwater quality (section 6.2).
- Impacts on local biodiversity values, including habitat values, and species and ecological communities of conservation significance (section 6.3).

These potential impacts would be mitigated with the recommended safeguards and measures. Therefore, the proposal would be unlikely to cause a significant cumulative impact.

Potential for cumulative impacts with other projects

The proposal would be situated within an industrial and rural landscape. ROBE is an industrial facility adjacent to the proposal. Cumulative impacts that could occur as a result of these two adjacent businesses include effects on soil and water quality, erosion and sediment control hazards, cumulative impacts of noise, vibration, increased traffic movements, visual amenity, dust and odour. These have been dealt with in this EIS in section 6, including recommended mitigation measures (section **Error! Reference source not found.**). Any significant cumulative impacts are considered unlikely.

A search was conducted of the major projects listed for Bomen on the NSW Department of Planning portal on 14 May 2018. There are three listed projects for Bomen Industrial Area. These include:

- Renewed Metal Technologies (RMT) Bomen, expansion of battery resource recovery facility (Enirgi Power Storage).
- Relocation of retail ready meat production facility (Teys Australia).

- Bomen solar project (Bomen Solar).

The expansion of the RMT facility would occur at its existing site on Byrnes Road, around 2 km south of the proposed development site. The Teys Australia relocation would be to a site adjoining the existing facility.

The location of the Bomen Solar Project is adjoining the proposed development site for the materials facility. The footprint of the Bomen Solar Project surrounds the proposed development site to the north, south and east. Cumulative visual and noise impacts could occur.

A search was conducted of WWCC's Development Application Tracking database of proposed developments within proximity to the development site on 14 May 2018. There are 23 undetermined industrial developments for the Bomen Industrial Area and one development currently on exhibition (Bomen Solar Project). There are around 70 development applications in Bomen for commercial developments. The Bomen Solar Project remains the only development in proximity to the proposed materials facility.

6.14.2 Potential impacts

The proposed development may cause cumulative impacts during construction and operation with any of the developments being undertaken in the Bomen area.

Table 6-44 lists environmental factors and the potential cumulative impacts that could occur during the construction and operation phase with other developments.

Table 6-44 Potential cumulative impacts for Bomen, NSW

Environmental factor	Potential cumulative impacts
Soil erosion and sedimentation	There could be cumulative impacts regarding soil erosion and sedimentation with the proposed Bomen Solar Project, which is adjacent to the development site. Vegetation loss at the development site would be low and therefore, the cumulative impacts are unlikely to be significant.
Biodiversity	The proposed development and other developments in the Bomen Industrial Area could result in cumulative impacts to loss of biodiversity. The removal of vegetation, particularly paddock trees, could result in the cumulative loss of habitat. These cumulative impacts are unlikely to be significant as the removal of vegetation on the proposed site is low.
Traffic volumes	Increases in traffic volumes during the construction and operation stages is a potential cumulative impact with the adjacent proposed solar farm and other developments in the Bomen Industrial Area. Byrnes Road can account for the increased capacity of vehicles required during the construction phase if the proposed developments were occurring at the same time. The construction phase is anticipated to be short term for the proposed development. The operational phase of the proposal would increase traffic volumes within the capacity available on Byrnes Road. There are turning lanes at the intersection of Trahairs Road and Byrnes Road. This would reduce potential congestion at the intersection of Byrnes Road and Trahairs Road from turning vehicles. Overall, these cumulative impacts are unlikely to be significant as the construction phase is short term and potentially not aligned with the construction phase of other developments.

Environmental factor	Potential cumulative impacts
Air quality (dust and odour)	Odour and dust generation during the construction and operation phases of the proposal could cause cumulative impacts on air quality with the developments and existing business in the Bomen Industrial Area. The safeguards and mitigation measures provided in section 6.4.5would be implemented to minimise any cumulative impacts on air quality during construction and operation of the proposed project.
Visual amenity	Cumulative visual impacts could occur as a result of the construction and operation of the proposal and the proposed solar farm. Existing vegetative screening would remain along the southern boundary and the eastern boundary. The ROBE facility would act as a barrier along the western boundary. The waste cell would be divided into discrete sub-cells. Once the sub-cell is full, it would be capped and vegetated, increasing visual amenity. The land slope is to the east and therefore, visual impacts from Byrnes Road should be minimal. The visual impacts would be consistent with the land use zoning of the Bomen Industrial Area. Overall, potential cumulative visual impacts should be minimal.
Noise and vibration	Cumulative noise impacts could occur as a result of the construction and operation of the proposal and the proposed solar farm. Other potential cumulative impacts for noise include the operation of the adjacent ROBE facility. Overall, the cumulative impacts are unlikely to be significant and the safeguards and mitigation measures provided in section 6.7.10 would be implemented to minimise any cumulative impacts on noise and vibration during construction and operation of the project.

6.15 PRINCIPLES OF ECOLOGICALLY SUSTAINABLE DEVELOPMENT

The *Protection of the Environment Administration Act 1991* outlines a number of principles of ecologically sustainable development (ESD). These are presented and discussed in relation to the proposal below.

6.15.1 The precautionary principle

According to the precautionary principle, if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be seen as a reason not to protect the environment. The use of the precautionary principle implies that proposals should be carefully evaluated to identify possible impacts and assess the risk of potential consequences.

The assessment of conservation values and environmental threats and impacts throughout this EIS have been prepared in accordance with the precautionary principle. If potential impacts are considered as possibly leading to serious or irreversible environmental damage, then either the development would not proceed, or it would be modified to remove the threats. The development of mitigation measures and safeguards to manage impacts (listed in section 7) aims to reduce the risk of serious and irreversible impacts on the environment. Generally, throughout this assessment, there has been found to be a low level of uncertainty in regard to all factors assessed.

A cautious approach has been used in the assessment of potential habitat use by threatened species. Intensive, targeted surveys were not undertaken for threatened species, and survey timing was not appropriate for all species. To account for the potential for these species to be overlooked, a habitat evaluation was used to determine the likelihood of occurrence and potential to be impacted for each threatened species (Appendix F). The approach assumed that threatened species could occur within the development site if the species is known or predicted to occur in the area, and if habitat and site conditions are suitable, even if the species was not detected in the site survey.

6.15.2 Inter-generational equity

The principle of inter-generational equity requires the present generation to ensure that the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations.

The proposal would not impact on natural or cultural features to a level that would compromise the health, diversity, or productivity of the environment such that it would impact future generations.

The proposal has been designed in accordance with NSW EPA's *Environmental Guidelines: Solid Waste Landfills* (April 2016). These environmental guidelines focus on the environmental management of landfills and describe how the landfill should be constructed, operated, closed, and rehabilitated to minimise environmental impacts. The guidelines are based on benchmarks, which are aimed at achieving the most environmentally beneficial outcomes for the effective treatment and disposal of waste. These guidelines have been used to ensure that the landfill operates effectively throughout its lifetime (around 30 years), and that its construction and operation do not give rise to any significant environmental effects.

6.15.3 Conservation of biological diversity and ecological integrity

The proposed location of the landfill facility on the already disturbed and contaminated footprint of existing effluent evaporation ponds will result in lower biodiversity impacts than on a less disturbed site with higher biodiversity values.

The impacts of the proposal on local populations of threatened species and ecological communities and their habitats have been assessed in detail in Section 6.3. The activity is not likely to have a significant impact on long term biological or ecological diversity, subject to the recommended mitigation measures.

6.15.4 Appropriate valuation of environmental factors

This principle requires that costs to the environment be factored into the economic costs of a project. This EIS has examined the environmental consequences of the proposal and identified mitigation measures for factors which have the potential to experience adverse impacts. Requirements imposed in terms of implementation of these mitigation measures would increase both the capital and operating costs of the proposal. This signifies that environmental resources have been given appropriate valuation.

7 ENVIRONMENTAL MANAGEMENT

7.1 ENVIRONMENTAL FRAMEWORK

The environmental risks associated with the proposed North Ridge Materials Facility would be managed by implementing a project-specific suite of mitigation measures detailed in Section 6 and summarised below.

All commitments and environmental safeguards would be managed through the implementation of a Project Environmental Management Plan, consisting of a CEMP, an Operation Environmental Management Plan and a Soil and Water Management Plan. These plans would be prepared sequentially, prior to each stage of works.

These plans would detail the environmental management responsibilities of specific staff roles, reporting requirements, monitoring requirements, environmental targets and objectives, auditing and review timetables, emergency responses, induction and training, complaint response procedures and adaptive management mechanisms to encourage continuous improvement.

7.2 MITIGATION MEASURES

Table 7-1 below summarises the safeguards and mitigation measures outlined in the individual sections of this report. It provides an easy reference to inform the appropriate environmental management of the proposed works.

Table 7-1 Summary of key environmental safeguards and mitigation measures

No.	Impact	Environmental safeguard	Timing
S1	Soil and water quality impacts	Prior to construction commencing, a Construction Environmental Management Plan (CEMP) and Operational Environmental Management Plan (OEMP) should be developed for the proposal, which includes these mitigation measures as part of a Soil and Water Management Plan (SWMP).	Pre-construction
S2	Groundwater impacts	A Groundwater Monitoring Plan (GMP) would be developed and implemented prior to the operation of the proposed development. The GMP would include: • Recommendations for the installation of additional monitoring wells including construction details. • Development of a groundwater monitoring strategy including sampling methodology and timetable. • Preparation of a consolidated GMP to be implemented during operation of the proposed development. Quarterly monitoring of groundwater quality is recommended so that adverse impacts to water quality can be identified and managed accordingly. The water quality monitoring program would be carried out in accordance with NSW EPA's *Environmental Guidelines: Solid Waste Landfills* (2016). The GMP would include the addition of monitoring wells at the western boundary to indicate baseline groundwater quality, and in the far eastern and south-eastern boundary to ensure that groundwater leaving the site remains uncontaminated. Quarterly monitoring would occur up-gradient and down-gradient of the	Pre-construction Construction Operation

No.	Impact	Environmental safeguard	Timing
		proposed waste cell. All groundwater quality data would be measured against Australian Standards, ANZG guidelines for aquatic ecosystems and primary industries – irrigation, EPA guidelines and baseline/ background data.	
S3	Erosion and sedimentation	An Erosion and Sediment Control Plan (ESCP) should be developed and implemented for the proposal, detailing erosion and sediment control measures to be implemented and maintained to: • Prevent sediment moving off-site and sediment laden water entering any water course, drainage lines, or drain inlets. • Reduce water velocity and capture sediment on site. • Minimise the amount of material transported from site to surrounding pavement surfaces. • Divert clean water around the site. (in accordance with the DECC *Managing Urban Stormwater, Soils and Construction Guidelines Volume 2B Waste Landfills)*	Pre-construction
S4	Erosion and sedimentation	Haul routes around the proposed landfill should be designed and clearly identified to minimise surface and vegetation disturbance.	Pre-construction
S5	Erosion and sedimentation	Consistent with any specific requirements of the ESCP, control measures should be implemented and maintained to minimise risks associated with erosion and sedimentation and entry of materials to drainage lines and waterways. That would include, but not necessarily be limited to: • Sediment management devices, such as fencing or sand bags. • Measures to divert or capture and filter water prior to discharge, such as drainage channels and first flush and sediment basins. • Scour protection and energy dissipaters at locations of high erosion risk. • Installation of measures at work entry and exit points to minimise movement of material onto adjoining roads, such as rumble grids or wheel wash bays. Appropriate location and storage of construction materials, fuels and chemicals, including bunding where appropriate.	Pre-construction During construction
S6	Erosion and sedimentation	Standard erosion and sediment controls include: • Appropriately stockpile and reuse all topsoil and ensure that temporary stockpiles are protected from erosion • Ensure that stockpiles are not placed in the flow path of upstream runoff • Divert clean runoff water from the upstream drainage system around the site • Monitor and maintain all sediment and erosion control measures • Minimise additional soil disturbance activities during wet weather • Stabilise rehabilitated surfaces at the earliest possible time • Provide adequately designed sediment fences, barrier fences, and other required structures • Restrict vehicular access to stabilised entry and exit point with controls to reduce transport of soil on	

No.	Impact	Environmental safeguard	Timing
		vehicles and machinery exiting the site Restrict access to areas that do not require land disturbance	
S7	Erosion and sedimentation	Vegetation clearance and soil disturbance would be confined to those areas required for construction. Vegetation clearance would be limited to the minimum required for construction.	Construction
S8	Erosion and sedimentation	Soil disturbance should be minimised wherever possible, and heavy vehicles should not be used in wet conditions.	Construction
S9	Erosion and sedimentation	Progressively stabilise disturbed areas through construction and minimise surface disturbance/maximise ground cover.	Construction
S10	Erosion and sedimentation	Work practices would be implemented during construction to support efficient water use and minimise waste. This would include, but not necessarily be limited to, measures to reuse and recycle water where practicable for use in road construction (such as dust suppression and concreting) and irrigation of revegetated areas.	Construction
S11	Soil contamination	All fuels, chemicals and other hazardous materials must be stored in a roofed, fire-protected and impervious bunded area at least 20 m from waterways, drainage lines, basins, flood-affected areas or slopes above 10 %. Bunding design must comply with relevant Australian Standards and should generally be in accordance with guidelines provided in the EPA Authorised Officers Manual. Appropriate on-site signage must be provided to identify the materials stored.	Construction
S12	Soil contamination	Spill kits would be available on-site and all staff would be aware of their location and trained in their use.	Construction
S13	Erosion and sedimentation	All areas disturbed during construction, including areas for stockpiles, compound sites, temporary access roads and temporary work areas, should be stabilised and rehabilitated on completion of work to prevent future erosion.	Construction
S14	Stormwater impacts	Standard stormwater controls include: • Construction of a perimeter bund around the entire active landfill area to prevent surface water from entering the landfill area • Total area of exposed and/or uncapped active waste cell areas would be kept to a minimum and bunded with diversion drains to prevent runoff from entering these areas. Progressively filled areas would be covered daily to minimise contact between surface waters and waste, and therefore minimise the production of leachate. • Construction of a diversion drain around the entire landfill area to collect all runoff from disturbed areas (outside active waste cell areas) which would drain to a sedimentation basin. Construction of a dry basin downstream of the sedimentation basin and leachate pond that would capture any overflow from the sediment basin and/or leachate pond.	Construction
S15	Leachate	The leachate barrier system would limit the quantity of leachate being generated by minimising the inflow of groundwater to the landfill and maximising the diversion of groundwater around the area, and contain all leachate within the landfill area. The leachate collection system would be designed to ensure collection of all leachate generated from the landfill and prevent the	Construction

No.	Impact	Environmental safeguard	Timing
		transmission of leachate to the external environment including underlying groundwater. The leachate pond would be sized to ensure that sufficient holding capacity would be provided for the safe storage of all collected leachate.	
S16	Leachate	In order to effectively manage leachate water, the proposal includes the construction of a permanent leachate pond where all leachate would be collected, stored, and treated. This includes all waters that are potentially contaminated due to contact with waste or any areas of land that have been contaminated with waste. The volume of leachate water produced would be regulated and would be required to undergo regular monitoring in accordance with the site EPL under the POEO Act. In the event that the leachate pond overflows, all overflow waters would be diverted to the permanent sedimentation basin for emergency storage and treatment.	Construction, operation
S17	Leachate	If the leachate storage and evaporation pond is in danger of overflowing, leachate would be injected back into the cells and leachate extraction from the cells would cease immediately.	Operation
S18	Overflow	A bund downstream of the landfill is proposed to divert overflow to the existing pond directly to the east as an emergency containment system in the event that the leachate pond overflows during a storm event (1 in 100-year event). The existing pond immediately east of the existing landfill has the capacity to act as an immediate containment system in the unlikely event of overflow. There is no need to line it as it would be acted upon straight away.	Operation
S19	Erosion and sedimentation	Cleared and disturbed areas should be monitored for erosion throughout construction and operation of the proposal, and, if required, remediation actions taken.	Construction, operation
S20	Soil contamination	In the event of discovery of previously unidentified area(s) of potentially contaminated material, the following procedures would be implemented to mitigate potential impacts: • If required, DECCW would be promptly notified of any suspected contaminated ground that is exposed during construction activities • Advice would be immediately sought from a suitably qualified and experienced contaminated site consultant • Any suspected contaminated materials excavated during construction works would be stockpiled on a sealed surface or plastic sheeting and covered to prevent wind or rain erosion. The stockpile would not be placed near sensitive environmental receivers such as vegetated areas. A spoon drain would be excavated on the down gradient side of the stockpile, and any runoff appropriately treated prior to release • Stockpile would be adequately secured to prevent unauthorised access • Stockpiled material would be sampled for testing. Reuse or disposal options would be based on the results of laboratory analysis in accordance with relevant legislation • All confirmed contaminated material would be excavated and disposed of offsite in a suitably licensed facility in accordance with relevant regulations	Construction, operation

No.	Impact	Environmental safeguard	Timing
		• Any workers who come into contact with suspected contaminated material would report the exposure and take appropriate precautions in accordance with the proposal's WHS requirements Any contaminated waste identified or generated during the works would only be disposed of in accordance with EPA guidelines	
S21	Stormwater impacts	Potentially contaminated stormwater should be diverted appropriately and treated on site prior to release.	Construction, operation
S22	Erosion and sedimentation	Capped landfill areas should be progressively stabilised and revegetated to minimise disturbance of soils on capped sub-cells.	Operation
S23	Erosion and sedimentation	The landscaped area around the landfill area should be maintained and revegetated to ensure a consistent groundcover. At all times, exposure of surfaces should be minimised to ensure that soils are bonded on site via groundcover.	Operation
S24	Erosion and sedimentation	Access roads should be appropriately maintained to ensure that there are no potholes and that road surface edges do not degrade over time.	Operation
S25	Surface water quality impacts	Quarterly monitoring of surface water quality is recommended so that adverse impacts to water quality can be identified and managed accordingly. The water quality monitoring program would be carried out in accordance with *NSW EPA's Environmental Guidelines: Solid Waste Landfills* (1996) and include: • Leachate monitoring • Stormwater monitoring • Ambient surface water monitoring	Operation
S26	Groundwater impacts	A network of groundwater bores would be used to monitor groundwater quality and trends in the development site.	Operation
S27	Groundwater impacts	If significant changes in groundwater levels or quality are recorded during routine monitoring, corrective action should be taken including an inspection of the lining of the waste cell and leachate pond.	Operation
S28	Water quality impacts	Prior to operation, an Operations Contingency Plan would be developed and implemented if water quality monitoring programs: • Show elevated levels of analytes, above ANZG trigger values, of surface and groundwater. • Discharge or overflow from the leachate pond. All water quality data would be measured against Australia Standards, ANZG guidelines for aquatic ecosystems and primary industries – irrigation, EPA guidelines and baseline/ background data.	Operation Closure
B1	Erosion and sedimentation	Final design should include appropriate soil erosion and sedimentation mitigation measures.	Design
B2	Avoid, minimise, mitigate and offset biodiversity impacts	Construction should take place in already disturbed areas, particularly, the proposed waste cell. Stockpiling and materials management should all occur within the existing footprint of the proposed waste cell. Construction of site access should occur in an area where vegetation is sparser to minimise the extent of clearing for site access. Tree planting as a mitigation measure should occur along parts of the western boundary.	

No.	Impact	Environmental safeguard	Timing
B3	Habitat loss	Proposal should be designed to minimise the extent of clearing required.	Design
B4	Habitat loss / bushfire	Any Asset Protection Zone (APZ) would need to be included within the footprint of the design and should not be justification for additional clearing.	Design
B5	Biodiversity impacts	A Construction Environmental Management Plan (CEMP) and Operational Environmental Management Plan (OEMP) should be developed for the proposal, including these mitigation measures. These plans should be prepared in consultation with an appropriately qualified ecologist.	Pre-construction
B6	Habitat loss	Areas of native vegetation within the development site which are not being cleared should be fenced off prior to construction commencing, to limit access and prevent disturbance.	Pre-construction
B7	Weeds	The noxious weeds St. John's Wort and Scotch Thistle should be controlled prior to the commencement of works according to Noxious and Environmental Weed Control Handbook (DPI (2015)). The site should be monitored on an annual basis. and weed control undertaken as required during the life of the facility.	Pre-construction
B8	Weeds	Establish a plan to ensure vehicles and machinery are cleaned before entering and leaving the site to minimise risk of weed invasion	Pre-construction
B9	Aquatic impacts	A spill control plan would be established prior to the commencement of works to prevent chemicals or pollutants from having an adverse effect on the environment.	Pre-construction
B10	Biodiversity offset package	An offset package should be prepared to mitigate the effects of the proposal on biodiversity. Actions implemented as part of this package would include: • Revegetation to fill gaps • Ground preparation activities including deep ripping to increase water infiltration and allow greater root penetration • Appropriate wildlife-friendly fencing • Relocation of logs • Weed and pest control Ongoing maintenance and monitoring	Pre-construction
B11	Biodiversity offset package	The proposal would result in around 0.8 ha of vegetation being cleared. This would consist predominantly of exotic groundcover.	Pre-construction
B12	Weeds	Control existing weed infestations in the development site prior to commencement of the construction phase.	Pre-construction
	Habitat loss	Limit clearing to within the development site.	Construction
B13	Direct fauna impacts	In the case of any unexpected finds of injured or less mobile fauna during construction, work should stop immediately until WIRES or an ecologist has been contacted.	Construction
B14	Weeds	Stockpile local topsoil and mulch during construction in previously cleared areas for use in landscaping and rehabilitation works.	Construction
B15	Weeds	Minimise the volume of imported topsoil to reduce the risk of introducing weed propagules.	Construction
B16	Pests	Install appropriate fencing around landfill site to discourage pests.	Construction
B17	Rehabilitation	Undertake planting for landscaping and vegetated buffers. All flora planted at the site should be indigenous to the study area.	Construction

No.	Impact	Environmental safeguard	Timing
B18	Bushfire	Prepare and implement a fire management plan for the landfill site and surrounding vegetation. This plan would provide for: • Monitoring of fuel loads • Fuel reduction such as slashing, controlled grazing, and hazard reduction burning where appropriate No hazard reduction burning in offset areas in compliance with OEH's requirements for offset areas	Operation
B19	Weeds	Monitor cleared areas for weed growth, and, if required, implement control and remediation actions.	Operation
B20	Weeds	Do targeted monitoring and control of weeds that are harmful to threatened species and ecological communities.	Operation
B21	Pests	Monitor and implement follow-up control of pests (including rabbits, foxes, and cats) as necessary throughout operation of the proposal.	Operation
B22	Direct fauna impacts	Appropriate speed limits would be applied to the internal access roads, with speed control signage installed, to reduce the risk of vehicle collisions with fauna.	Construction, operation
B23	Groundcover	Maintain adequate groundcover on all parts of the landfill site not required for day-to-day operations.	Operation
B24	Rehabilitation	Progressive rehabilitation and revegetation of spent landfill areas to stabilise soils.	Operation
B25	Rehabilitation	Following closure of the landfill, the site would be rehabilitated and revegetated with plant species consistent with the site's pre-existing condition. Revegetation works would include a two-year maintenance period and weed control for at least five years following closure of the landfill.	Post-operation
AQ1	General air quality impacts	Construction activities are to be managed to minimise dust and fuel emissions.	During construction
AQ2	Dust generation	Dust minimisation measures (including watering or covering exposed areas) are to be used to minimise or prevent air pollution from disturbed areas, if required, and especially during hot and windy conditions	During construction
AQ3	Dust generation	Visual surveillance for visible dust generation is to occur at all times. Work must cease when high levels of air-borne dust cannot be controlled	During construction
AQ4	Dust generation	Disturbed areas are to be stabilised progressively during the work	During construction
AQ5	Dust generation	Water carts may be used on stockpile sites or access roads to reduce dust.	During construction
AQ6	Vehicle and other equipment emissions	Plant and machinery are to be maintained in accordance with manufacturer's specifications.	During construction
AQ7	Vehicle and other equipment emissions	Vehicles will not be left running when idle.	During construction
AQ8	Vehicle and other equipment emissions	Vehicles transporting waste or other materials that may produce dust are to be covered during transportation.	During construction
AQ9	Odour	Gas monitoring program to be implemented, including subsurface and surface gas emission monitoring devices.	During operation

No.	Impact	Environmental safeguard	Timing
AQ10	Odour	Apply daily and intermediate cover to waste each day before the close of business. A minimum cover depth of 150 mm is required. Any waste-filled areas that have not been landfilled for more than 90 days should have an intermediate soil cover meeting the following requirements: • The cover layer should be a minimum 300 mm layer of virgin excavated natural material in the form of fine-grained, largely cohesive soil. Soil should have a saturated hydraulic conductivity of less than 1 x 10-5 m/s.	Operation
AQ11	Odour	Keep the active tipping face as small as practicable.	Operation
AQ12	Odour	Waste screening of all waste delivered. Loads will be inspected on receival. Contaminated or odorous loads will be rejected. Materials will be taken from the screening area and placed in the programmed areas in discrete layers. Each new layer will be covered on a daily basis. Unsuitable materials recovered during construction will be stockpiled within the existing cell footprint for use as daily cover during operation.	Operation
AQ13	Odour	Attend to the delivery of highly biodegradable and odorous wastes. The occupier should require such wastes to be delivered in a covered, enclosed or treated form and should ensure that they are immediately buried with adequate cover.	Operation
AQ14	Odour	Control odour from leachate sources by: • Using tight fittings on leachate risers and pipework. Reducing leachate seeps into the landfill.	Operation Closure
AQ15	Odour	Modify activities appropriately when the wind is blowing towards sensitive receivers.	Operation
AQ16	Handling odour and dust complaints	Develop and maintain an odour and dust complaints system. At a minimum, the following details of a complaint should be recorded: • Date and time. • Contact details of complainant. • Nature of complaint, including odour characteristics, perceived duration and frequency, and perceived source or conditions giving rise to the complaint. • Activities happening at the site at the time of the complaint. • Weather conditions (i.e. wind, rainfall and temperature) at the time of the complaint. • Names of staff on duty. Actions taken to investigate and resolve the complaint, including any remedial control measures to reduce odour and/or dust emissions. Where several odour or dust complaints are received over time, investigations should include measurement of surface emission rates by using the methods described in the *Approved Methods for Sampling and Analysis of Air Pollutants in NSW* (DEC 2005). This data should be compared with the emission factors used	Operation Closure

No.	Impact	Environmental safeguard	Timing
		in the initial impact assessment modelling and any published emission rates for the type and location of the landfill.	
AQ17	Handling odour complaints	The occupier should implement a program of regular field odour surveys around the site boundary. These surveys should be undertaken during worst-case weather conditions. Personnel conducting field odour surveys should be trained for odour assessment in accordance with the requirements for olfactory testing in *Australian Standard AS 4323.3:2001 Stationary Source Emissions – Determination of odour concentrations by dynamic olfactometry* (Standards Australia 2001).	Operation Closure
AQ18	Handling odour complaints	To assist with the management of odour complaints and to inform future expansions at the site, meteorological equipment should be sited and operated in accordance with the requirements in *Australian Standard AS 3580.14-2001 Methods for Sampling and Analysis of Ambient Air – Part 14: Meteorological monitoring for ambient air quality monitoring applications* (Standards Australia 2001).	Operation Closure
AQ19	Dust amenity impacts	Impose speed limits on all internal haul roads.	Construction Operation
AQ20	Dust amenity impacts	Regularly water all internal haul roads, stockpiles, exposed and disturbed areas.	Construction Operation
AQ21	Dust amenity impacts	Review and adjust the intensity of dusty activities during inclement weather conditions.	Construction Operation
AQ22	Dust amenity impacts	Limit the extent of disturbed and exposed areas to the extent practical.	Construction Operation
AQ23	Dust amenity impacts	To the extent practical, minimise volumes of imported and excavated soil stockpiles. Locate stockpiles away from the site boundary.	Construction Operation
AQ24	Dust amenity impacts	Direct internal traffic along sealed, established roads wherever possible.	Operation
AQ25	Dust amenity impacts	Regularly inspect and remove any loose debris inadvertently spilt onto hardstand areas and access roads.	Operation
AQ26	Dust amenity impacts	Rehabilitate capped cell as soon as practical to stabilise and reduce wind erosion from these areas.	Operation Closure
AH1	Damage to heritage items	Proposed works should remain limited to the impact footprint as assessed in the current report in order to limit the possibility of encountering Aboriginal objects in unassessed areas	During construction
AH2	Damage to heritage items	Any activity proposed outside of the current assessment area should also be subject to an Aboriginal heritage assessment	Pre-construction
AH3	Unexpected finds	If any items suspected of being Aboriginal in origin are discovered during the work, all work in the immediate vicinity must stop and OEH notified. The find will need to be assessed and if found to be an Aboriginal object an AHIP may be required. In this instance, consultation with the LALC would occur.	During construction
H1	Damage to heritage items	Proposed works should remain limited to the impact footprint as assessed in the current report in order to limit the possibility of encountering heritage items in unassessed areas.	During construction

No.	Impact	Environmental safeguard	Timing
H2	Unexpected finds	Should an item of historic heritage be identified, the Heritage Division (Office of Environment and Heritage) would be contacted prior to further work being carried out in the vicinity.	During construction
NV1	Construction noise and vibration	Prepare a Construction Noise and Vibration Management Plan to identify all reasonable and feasible mitigation measures. This would also detail the best practice construction methods to be used, noise monitoring program, a complaint management strategy, and contingency plans, if noise exceedance or justified complaints were to occur.	Pre-construction
NV2	Noise from plant and equipment	All mechanical plant should be silenced by best practical means using current technology wherever possible. Noise suppression devices should be maintained to the manufacturer's specifications. Internal combustion engines would be fitted with a suitable muffler in good working order.	During construction
NV3	Noise from plant and equipment	The offset distance between noisy plant/equipment and nearby noise sensitive receivers should be maximised, particularly for fixed equipment such as pumps, generators, or compressors.	During construction
NV4	Noise from plant and equipment	Simultaneous operation of noisy plant/equipment should be managed, such as different operating times or increasing the distance between plant/equipment.	During construction
NV5	Noise from plant and equipment	Equipment known to emit noise strongly in one direction, such as the exhaust outlet of an attenuated generator set, should be oriented away from sensitive areas.	During construction
NV6	Noise from plant and equipment	Broadband reversing alarms should be used instead of tonal reversing alarms. Alternatives to reversing beepers include the use of spotters or site design to reduce the need to reverse.	During construction and operation
NV7	Noise from plant and equipment	All plant on site should be operated in accordance with the manufacturer's instructions and, where necessary, have current Roads & Traffic Authority (RTA) registration licences.	During construction
NV8	Noise from plant and equipment	All engine covers should be kept closed while equipment is operating.	During construction
NV9	Construction noise and vibration	Vehicles, plant and equipment which are used intermittently should be shut down when not in use or throttled down to a minimum.	During construction
NV10	Noise from plant and equipment	All vehicular movements to and from the site should comply with site entry controls.	During construction
NV11	Construction noise and vibration	All site workers (including subcontractors and temporary workforce) should be sensitised to the potential for noise and vibration impacts upon local residents and encouraged to take all practical and reasonable measures to minimise noise during the course of their activities. This could be included in site inductions and daily tool-box talks.	During construction
NV12	Community contact	Contact with local community should be maintained and scheduled work communicated via letter drops and/or local media announcements, particularly when unusual noisy or vibration generating activities are planned.	During construction
NV13	Community information	The constructor or site developer (as appropriate) should provide a community liaison phone number and permanent site contact so that noise and/or vibration related complaints can be received and addressed in a timely manner.	During construction
NV14	Noise/vibration complaints	Noise and vibration monitoring should be undertaken by a qualified professional and with consideration of relevant standards and guidelines on receipt of a complaint to identify and quantify the issue and determine options to minimise impacts.	During construction

No.	Impact	Environmental safeguard	Timing
NV15	Noise/vibration complaints	Noise and vibration monitoring should be undertaken and reported within five working days of receiving the complaint. If exceedances are detected, the situation should be reviewed in order to identify means to reduce the impact to acceptable levels.	During construction
NV16	Operational noise	Prepare an Operational Noise Management Plan that identifies reasonable and feasible measures to manage operational noise levels from the proposal.	Pre-operation
NV17	Noise from plant and equipment	All permanent equipment used on site should be silenced by best practical means using current technology wherever possible. Noise suppression devices should be maintained to the manufacturer's specifications. Internal combustion engines would be fitted with a suitable muffler in good working order.	During operation
NV18	Noise from plant and equipment	An equipment and plant monitoring regime should be implemented, with routine inspections to determine if the equipment or plant is noisier than comparable machines, and rectifying or replacing as required. Inspections will check that any silencers and enclosures are intact, rotating parts are balanced, loose bolts are tightened, frictional noise reduced with lubrication, and cutting noise reduced by keeping equipment sharp.	During operation
NV19	Blasting	Ensure that the design of the blast has been prepared in accordance with the ANZEC Guideline (1990).	During construction
NV20	Blasting	A Vibration and Air Blast Management Plan (VABMP) would be prepared prior to blasting occurring.	Pre-construction
NV21	Blasting	Adjoining land owners should be notified of the blast 7 days prior to the blast. Livestock should be relocated to adjacent paddocks outside of the exclusion zone.	During construction
NV22	Blasting	Apply a blasting exclusion zone compliant with AS*2187.2 Explosives – Storage, transport and use Part 2: Use of explosives.*	During construction
NV23	Blasting	Blast monitoring will be undertaken in accordance with the monitoring requirements for blasting activities in the Australian and New Zealand Environment Council Technical Basis for Guidelines to Minimise Annoyance Due to the Blasting Overpressure and Ground Vibration (1990).	During construction
T1	Impacts to traffic	<u>Traffic Management Plan</u> A Traffic Management Plan (TMP) will be prepared in accordance with the Australia Standard 1742.3-2002: *Manual of Uniform Traffic Control Devices* and the NSW Roads and Maritime Services QA Specification *G10 "Traffic Control at Worksites", Versions 4* and would be approved by WWCC before implementation. The TMP will include: j) Confirmation of haulage routes k) Measures to maintain access to local roads and properties l) Site specific traffic control measures (including signage) to manage and regulate traffic movement m) Measures to maintain pedestrian and cyclist access n) Requirements and methods to consult and inform the local community of impacts on the local road network o) Access to construction sites including entry and exit locations and measures to prevent construction vehicles queuing on public roads. p) A response plan for any construction traffic incident	Pre-construction

No.	Impact	Environmental safeguard	Timing
		q) Consideration of other developments that may be under construction to minimise traffic conflict and congestion that may occur due to the cumulative increase in construction vehicle traffic Monitoring, review and amendment mechanisms.	
T2	Local road dilapidation	<u>Dilapidation reports</u> Pre-construction and post construction road dilapidation reports for local roads likely to be used for construction will be prepared. Any damage resulting from construction (not normal wear and tear) will be repaired unless alternative arrangements are made with the relevant road authority. Copies of road dilapidation reports will be provided to the local roads authority.	Pre-construction
T3	Impacts to traffic	Signage should be placed at the entrances to the sites in advance of the works commencing notifying road users of the proposed works.	Pre-construction
T4	Access	Consultation with RMS regarding the treatment of accesses to and from the site.	Pre-construction
T5	Reduced speeds, traffic delays and disruptions during construction	Road users and local communities should be provided with timely, accurate, relevant and accessible information about changed traffic arrangements and delays owing to construction activities.	Pre-construction, During construction
T6	Impacts to traffic	Construction traffic would enter/exit the construction zone in the area designated for this purpose by the Traffic Management Plan.	During construction
T7	Impacts to traffic	Traffic flow would be monitored along routes used by construction vehicles. If construction vehicles cause traffic congestion at any location, measures would be implemented to minimise traffic impacts.	During construction
T8	Impacts to traffic	Prior to the commencement of work the local community will be notified by way of a Notice to Residents and businesses, with information regarding timing of additional traffic movements.	During construction
T9	Impacts to traffic	Provide "Truck Turning" warning signs in accordance with Australian Standard AS1742.3 to reduce the impact associated with slow turning speed of heavy vehicles to and from the silos and any high speed of vehicles on Byrnes Road.	During construction
T10	Access	Repair and seal the road shoulders leading into the development site.	During construction
HR1	Hazardous materials	Relevant Materials Safety Data Sheets (MSDS), spill containment, and other safety equipment should be installed and maintained. This includes bunds around storage tanks, fire extinguishers, and drains.	Construction, Operation
HR2	Hazardous materials	All wastes arriving at the proposed landfill facility would be screened for hazardous materials prior to entering the landfill facility.	Operation
HR3	Vandalism	The proposed landfill facility should be securely fenced to protect from vandalism.	Construction
HR4	Explosions and fires	Fire prevention practices should be implemented around the landfill facility, including: ○ Regular mowing of grassed areas surrounding site buildings ○ Frequent covering of material delivered to the landfill ○ Removal of escaped litter and rubbish Installation of firefighting equipment on site	Operation
HR5	Explosions	A gas accumulation monitoring program should be established.	Operation

No.	Impact	Environmental safeguard	Timing
HR6	Explosions	Accumulation of landfill gases should be managed to avoid uncontrolled gas emissions.	Operation
HR7	Fires	Controlled burning at the site boundary should be used regularly to minimise fire risk.	Operation
HR8	Fires	A Fire Management Plan would be developed and implemented during construction, operation and decommissioning, with input from the RFS, and include but not be limited to: • Management of activities with a risk of fire ignition. • Management of fuel loads onsite. • Storage and maintenance of firefighting equipment, including siting and provision of adequate water supplies for fire suppression. • The below requirements of Planning for Bush Fire Protection 2006: ○ Identifying asset protection zones. ○ Providing adequate egress/access to the site. ○ Emergency evacuation measures. Operational procedures relating to mitigation and suppression of fire relevant to the materials facility.	Construction Operation Closure
HR9	Leachate	All leachate should be managed in the leachate management system. The leachate management system would be designed and constructed to meet the specifications in the NSW EPA's *Environmental Guidelines: Solid Waste Landfills* (2016). A leachate monitoring program would be established to provide data on the composition, height levels and volumes of leachate produced by the landfill cell. Any irregular discharges or overflows would also be recorded. Leachate composition would be monitored annually as per the NSW EPA's *Environmental Guidelines: Solid Waste Landfills* (2016). This includes monitoring for Pb, As and Se.	Operation Closure
WR1	Avoid, minimise and sustainably manage waste	<u>Waste Management</u> Waste Management will be considered and identified as part of the CEMP and will include: • Resource management hierarchy principles must be followed: • Avoid unnecessary resource consumption as a priority • Avoidance is followed by resource recovery (including reuse of materials, reprocessing, recycling and energy recovery) • Disposal is carried out as a last resort (in accordance with the *Waste Avoidance & Resource Recovery Act 2014*).	During construction and operation
WR2	Avoid, minimise and sustainably manage waste	All waste generated by the proposal would be classified in accordance with the *NSW Waste Classification Guidelines Part 1: Classifying Waste* (EPA 2014).	During construction
WR3	Avoid, minimise and sustainably manage waste	Waste materials (such as soils and aggregates) obtained from the project to be exported offsite for reuse will be sampled and classified as per WR2.	During construction
WR4	Avoid, minimise and sustainably manage waste	Waste material is not to be left on site once the works have been completed and working areas are to be maintained, kept free of rubbish and cleaned up at the end of each working day.	During construction
WR5	Waste generation	All waste generated on site is to be transported off site and disposed of at landfill sites approved to accept General Solid Waste (non-putrescible).	During construction

No.	Impact	Environmental safeguard	Timing
WR6	Avoid, minimise and sustainably manage waste	All waste delivered to the site will be checked that it meets the criteria of the landfill. Waste screening will occur at the waste sorting area on receival. Contaminated loads will be rejected.	During operation
WR7	Avoid, minimise and sustainably manage waste	Contaminated soil in the existing Riverina Wool Combing facility evaporation ponds will be composted. The contamination is wool wax (lanolin) as a result of the wool combing process.	During operation
WR8	Avoid, minimise and sustainably manage waste	<u>Stockpiling</u> Unsuitable material recovered during construction would be stockpiled within the existing cell footprint for use as daily cover. Soil, rubble and glass received as waste will be stockpiled within the existing cell footprint for use as daily cover.	During operation
WR9	Avoid, minimise and sustainably manage waste	<u>Waste cover and compaction</u> Waste in the active cell would be covered at close of business daily. The cover material would be to a depth of 150 mm and of an approved material type, such as soil or crushed glass. The amount of exposed waste will be kept to a minimum at all times. An intermediate cover will be used if the litter face is to be exposed but not used for more than 90 days. Final capping requirements and rehabilitation would be undertaken directly as the sub-cell reaches capacity and follow the *Environmental Guidelines: Solid Waste Landfills* (NSW EPA 2016). Compaction of the waste would occur after each load / daily in the active cell and would occur to minimise litter from the landfill. Methods as per the *Environmental Guidelines: Solid Waste Landfills* (NSW EPA 2016).	During operation
WR10	Avoid, minimise and sustainably manage waste	The general solid waste sorting area is located on the hard stand. The sorting area will be contained by walls. Thick grasses and shrubs will be planted along the transport route, and fencing erected around the hardstand area, to trap litter. Litter collection traps would be installed on inlet pits located near the hardstand area. All litter leaving the site would be retrieved as soon as practicable. Vehicles leaving the site must not distribute mud or litter that has been collected on tyres. Cleaning equipment would be available for removing these items from vehicles before leaving the site. Signage will be installed at the access point alerting customers to their responsibility to ensure that no remnants of waste material contaminates public roads. Methods as per the *Environmental Guidelines: Solid Waste Landfills* (NSW EPA 2016).	During operation
WR11	Avoid, minimise and sustainably manage waste	Leachate production will be managed in the leachate collection and management system, which would meet the design specifications in the NSW EPA's *Environmental Guidelines: Solid Waste Landfills* (2016).	During operation

No.	Impact	Environmental safeguard	Timing
WR12	Avoid, minimise and sustainably manage waste	A groundwater relief layer will intercept and manage the groundwater that comes into contact with the base of the waste cell. The groundwater will be collected, tested and discharged to a tank. The water will be used for dust suppression.	During operation
SE1	General impacts to the local community and stakeholders	Complaints would be communicated to the construction / landfill facility manager and recorded in the Safeguard Reporting System per complaints handling procedure.	Construction
SE2	General impacts to the local community and stakeholders	The proponent would undertake community consultation, as identified in this EIS.	Pre-construction
SE3	General impacts to the local community	Potentially affected residences and businesses would be contacted before the commencement of works. Residents and businesses would be notified via door knocks, newsletters or letter box drops providing information on the proposed work, working hours and a contact name and number should any complaints wish to be registered	Pre-construction Construction
SE4	Impacts to residents and general community	Road users and local communities will be provided with timely, accurate, relevant and accessible information about changed traffic arrangements and delays owing to construction activities.	Pre-construction Construction
VA1	Loss of visual amenity	Appropriate sizing and placement of stockpiles should be ensured.	Construction, operation
VA2	Loss of visual amenity	Construction and maintenance areas should be maintained in an orderly and tidy state.	Construction, operation
VA3	Loss of visual amenity	Existing groundcover on future cells should be retained for as long as possible until removal is required.	Construction, operation
VA4	Loss of visual amenity	Waste delivered to the landfill should be frequently covered.	Operation
VA5	Loss of visual amenity	Revegetation of the area surrounding the proposal footprint should be used to provide a biodiversity offset for the existing vegetation to be cleared, and to improve the habitat values of the project area. Some areas of revegetation should be strategically located to provide some visual screening.	Construction
VA6	Loss of visual amenity	All existing vegetation within the development site but outside the proposal footprint should be maintained throughout the life of the proposal.	Operation
VA7	Rubbish around development site	Escaped litter and landfill waste should be removed regularly.	Operation

8 LIST OF APPROVALS AND LICENCES

The following licences and approvals would be required to carry out the proposed works:

- Development consent from WWCC.
- A Water Management Act part 5 licence for conditions on aquifer interference activities.
- Section 138 approval from WWCC for works on a public road.
- Environmental Protection Licence from EPA for waste disposal (scheduled activity).

9 CONCLUSION AND JUSTIFICATION

North Ridge Materials Management Pty Ltd proposes to convert the existing effluent evaporation ponds at the North Ridge site, in the Bomen Industrial Area, into a non-putrescible landfill facility. The landfill facility would cater to commercial and industrial waste to service the waste management needs of Wagga Wagga LGA and surrounding LGAs.

This proposal is subject to assessment under Part 4 of the EP&A Act. The objective of this EIS is to fulfil the requirements of Schedule 2 of the *Environmental Planning and Assessment Regulation 2000* (EP&A Regulation) and Section 79C of the EP&A Act. The EIS also addresses the assessment requirements of the BC Act and the EPBC Act.

The development site is on land previously used to manage and dispose of effluent from the historic Riverina Wool Combing facility at Bomen. The site is dominated by highly modified, largely exotic vegetation, with some scattered remnant box woodland, native and exotic plantings, cereal crops, and degraded wetland habitat. It is considered likely that 3 flora species, 2 endangered ecological communities, and 28 fauna species of conservation significance may occur in the study area. The Assessments of Significance in Appendix G showed that the proposal may impact on some of these species and communities or their habitats, but that the impact is not likely to be significant. The potential impacts can be mitigated with the recommended measures in section 7. The proposal is also unlikely to significantly affect Commonwealth land or have a significant impact on any matters of national environmental significance. The proposal would therefore not trigger the requirement for a Species Impact Statement or referral to the Commonwealth Environment Minister.

The proposal has the potential to impact on a number of environmental factors, including soil, surface and ground water, air quality, noise and vibration, traffic, waste, socio-economic, and visual. However, these impacts are relatively minor, localised, and short in duration. The potential environmental impact of the proposal has been avoided or reduced during options assessment and development of the concept design and can be further mitigated with the recommended measures in section 7

The preferred option best meets the proposal objectives. The proposal has the benefit of achieving this objective while also making use of the existing wool scouring effluent evaporation ponds on a disturbed site that has generally low environmental values, which would minimise the environmental impacts of the development.

9.1 EVALUATION OF THE DEVELOPMENT

Under Section 4.15 of the EP&A Act, the consent authority is required to consider a number of matters when determining a DA under Part 4. These matters are listed in Table 9-1and assessed in terms of their relevance to the proposal.

Table 9-1 Matters of consideration under Section 79C of the EP&A Act.

Provision	Relevance to the proposal
Any environmental planning instrument;	Relevant environmental planning instruments are discussed in Section 4.2.
Any proposed instrument that is or has been the subject of public consultation under the EP&A Act and that has been notified to the consent authority;	There are no draft instruments relevant to the proposal.

Provision	Relevance to the proposal
Any development control plan;	Relevant requirements of Wagga Wagga DCP are considered in section 4.4.2, and have been incorporated into the recommended mitigation measures.
Any planning agreement that has been entered into under section 93F, or any draft planning agreement that a developer has offered to enter into under section 93F;	There are no planning agreements that have been entered into, nor are any planning agreements proposed, that relate to the proposal.
The regulations (to the extent that they prescribe matters for consideration);	Relevant provisions are discussed in Section 4.2.2.
Any coastal zone management plan (within the meaning of the *Coastal Protection Act 1979*), that apply to the land to which the development application relates;	Coastal zone management is not applicable to the proposal.
The likely impacts of that development, including environmental impacts on both the natural and built environments, and social and economic impacts in the locality;	The likely impacts of the proposal, including environmental impacts on both the natural and built environments, and the social and economic impacts in the locality, are detailed in Section 6.11 of this EIS. This EIS demonstrates that the environmental impacts of the proposal have been avoided or minimised through careful project design. Overall impacts are considered manageable and justifiable.
The suitability of the site for the development;	The development site is within existing effluent evaporation ponds from the Riverina Wool Combing facility. The proposal involves making use of a disturbed site that has generally low environmental values. The site is suitable for the development.
Any submissions made in accordance with this Act or the regulations; and	Public submissions would be sought and responded to as part of the EIS determination process. The proponent would consider and respond to any submissions, subsequent to the public exhibition period.
The public interest.	This project is in the public interest as it complies with local policies and plans. A number of public benefits are relevant to the proposal as discussed in Section 2.2. Specifically, these relate to: Provide a state-of-the-art waste management option for the commercial and industrial sector in the Wagga Wagga area. The facility would be constructed and operated while minimising the potential environmental impacts of the development on a site with low environmental value.

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APPENDIX A SECRETARY'S ENVIRONMENTAL ASSESSMENT REQUIREMENTS

Industry Assessments
Contact: Bianca Thornton
Phone: (02) 9228 2040
Fax: (02) 9228 6555
Email: bianca.thornton@planning.nsw.gov.au

Mr Charles Bannatyne
Riverina Warehousing Solutions
PO Box 1082
WAGGA WAGGA NSW 2650

16/09157
SEAR 1062

Dear Mr Bannatyne

Waste Management Facility (Landfill)
Byrnes Road, Bomen, Wagga Wagga Local Government Area
Secretary's Environmental Assessment Requirements (SEAR) No. 1062

Thank you for your request for the Secretary's Environmental Assessment Requirements (SEARs) for the preparation of an Environmental Impact Statement (EIS) for the above development proposal. I have attached a copy of these requirements.

In support of your application, you indicated that your proposal is both designated and integrated development under Part 4 of the *Environmental Planning and Assessment Act 1979* and requires an approval under the *Protection of the Environment Operations Act 1997*.

In preparing the SEARs, the Department has consulted with the Environment Protection Authority, the Office of Environment and Heritage and the Department of Primary Industries. A copy of their requirements for the EIS are attached. The Department has also consulted with the Roads and Maritime Services as required under *State Environmental Planning Policy (Infrastructure) 2007* and attaches its requirements for the EIS.

If other integrated approvals are identified before the Development Application (DA) is lodged, you must undertake direct consultation with the relevant agencies, and address their requirements in the EIS.

If your proposal contains any actions that could have a significant impact on matters of National Environmental Significance, then it will require an additional approval under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). This approval is in addition to any approvals required under NSW legislation. If you have any questions about the application of the EPBC Act to your proposal, you should contact the Commonwealth Department of the Environment on (02) 6274 1111.

Should you have any further enquiries, please contact Bianca Thornton, Industry Assessments, at the Department on (02) 9228 2040.

Yours sincerely

C. Ritchie 26/7/16.

Chris Ritchie
Director
Industry Assessments
as delegate of the Secretary

Environmental Assessment Requirements

Section 78A (8) of the *Environmental Planning and Assessment Act 1979.*

Designated Development

SEAR Number	1062
Proposal	Construction and operation of a landfill with a capacity of 865,000 tonnes of non-putrescible waste.
Location	560 Byrnes Road, 223 Trahairs Road and 299 Trahairs Road, Bomen, Wagga Wagga Local Government Area (Lot 1 DP 771340, Lot 2 DP 590756 and Lot 11 DP 1130519)
Applicant	Riverina Warehousing Solutions
Date of Issue	July 2016
General Requirements	The Environmental Impact Statement (EIS) must meet the minimum form and content requirements in clauses 6 and 7 of Schedule 2 of the *Environmental Planning and Assessment Regulation 2000.*
Key Issues	The EIS must include an assessment of all potential impacts of the proposed development on the existing environment (including cumulative impacts if necessary) and develop appropriate measures to avoid, minimise, mitigate and/or manage these potential impacts. As part of the EIS assessment, the following matters must also be addressed: • **strategic context** – including: – a detailed justification for the proposal and suitability of the site for the development; – a demonstration that the proposal is consistent with all relevant planning strategies, environmental planning instruments, development control plans (DCPs), or justification for any inconsistencies; and – a list of any approvals that must be obtained under any other Act or law before the development may lawfully be carried out. • **waste management** – including: – details of the type, quantity and classification of waste to be received at the site; – details of the resource outputs and any additional processes for residual waste; – details of waste handling including, transport, identification, receipt, stockpiling and quality control; and – the measures that would be implemented to ensure that the proposed development is consistent with the aims, objectives and guidelines in the *NSW Waste Avoidance and Resource Recovery Strategy 2014-21*. • **hazards and risk** – including: – the Environmental Impact Statement must include a preliminary risk screening completed in accordance with State Environmental Planning Policy No. 33 – Hazardous and Offensive Development and Applying SEPP 33 (DoP, 2011), with a clear indication of class, quantity and location of all dangerous goods and hazardous materials associated with the development. – should preliminary screening indicate that the project is "potentially hazardous" a Preliminary Hazard Analysis (PHA) must be prepared in accordance with Hazardous Industry Planning Advisory Paper No. 6 - Guidelines for Hazard Analysis (DoP, 2011) and Multi-Level Risk Assessment (DoP, 2011). • **air quality and odour** – including:

	- a description of all potential sources of air emissions; - an air quality impact assessment in accordance with relevant Environment Protection Authority Guidelines; and - a description and appraisal of air quality impact mitigation and monitoring measures. • **noise and vibration** – including: - a description of all potential noise and vibration sources during construction and operation, including road traffic noise; - a noise and vibration assessment in accordance with the relevant Environment Protection Authority Guidelines; and - a description and appraisal of noise and vibration mitigation and monitoring measures. • **soil and water** – including: - existing and proposed water licensing requirements in accordance with the Water Act 1912 and/or the Water Management Act 2000; - a description of the measures proposed to ensure the development can operate in accordance with the requirements of any relevant Water Sharing Plan, Floodplain Management Plan or water source embargo; - a description of local soils, topography, drainage and landscapes; - details of sediment and erosion controls; - a detailed site water balance; - an assessment of potential impacts on the quality and quantity of surface and groundwater resources; - an assessment of flooding impacts including potential impacts to and resulting from the development; - details of the proposed stormwater and wastewater management systems (including sewage), water monitoring program and other measures to mitigate surface and groundwater impacts; - details of leachate collection and management; - characterisation of the nature and extent of any contamination on the site and surrounding area; and - a description and appraisal of impact mitigation and monitoring measures. • **traffic and transport** – including: - details of road transport routes and access to the site; - road traffic predictions for the development during construction and operation; and - an assessment of impacts to the safety and function of the road network; and the details of any road upgrades required for the development. • **biodiversity** – including: - accurate predictions of any vegetation clearing on site or for any road upgrades; - a detailed assessment of the potential impacts on any threatened species, populations, endangered ecological communities or their habitats, groundwater dependent ecosystems and any potential for offset requirements; and - a detailed description of the measures to avoid, minimise, mitigate and offset biodiversity impacts. • **visual** – including an impact assessment at private receptors and public vantage points. • **heritage** – including Aboriginal and non-Aboriginal cultural heritage.
Environmental Planning Instruments and other policies	The EIS must assess the proposal against the relevant environmental planning instruments, including but not limited to: • *State Environmental Planning Policy (Infrastructure) 2007*; • *State Environmental Planning Policy No. 33 Hazardous and Offensive Development*; • *State Environmental Planning Policy No. 55 Remediation of Land*; • *Wagga Wagga Local Environmental Plan*; and • Relevant development control plans and section 94 plans.

Guidelines	During the preparation of the EIS you should consult the Department's Register of Development Assessment Guidelines which is available on the Department's website at planning.nsw.gov.au under Development Proposals/Register of Development Assessment Guidelines. Whilst not exhaustive, this Register contains some of the guidelines, policies, and plans that must be taken into account in the environmental assessment of the proposed development.
Consultation	During the preparation of the EIS, you must consult the relevant local, State and Commonwealth government authorities, service providers and community groups, and address any issues they may raise in the EIS. In particular, you should consult with the: • Environment Protection Authority; • Office of Environment and Heritage; • Department of Primary Industries; • Roads and Maritime Services; • Riverina Local Land Services; • Wagga Wagga City Council; and • The surrounding landowners and occupiers that are likely to be impacted by the proposal. Details of the consultation carried out and issues raised must be included in the EIS.
Further consultation after 2 years	If you do not lodge an application under Section 78A (8) of the *Environmental Planning and Assessment Act 1979* within 2 years of the issue date of these SEARs, you must consult with the Secretary in relation to any further requirements for lodgement.

NSW EPA

Your reference: SEAR No. 1062
Our reference: EF13/5681 DOC16/342586-01
Contact: Amanda Baldwin 02 6932 9123

The Director
Industry Assessment
Department of Planning and Infrastructure
GPO Box 39
SYDNEY NSW 2001

Attention: Bianca Thornton

Dear Mr Ritchie

Re Proposal for waste management facility at 560 Byrnes Road, Bomen – SEAR ID No. 1062

I refer to your electronic mail dated 8 July 2016 to the Environment Protection Authority (EPA) requesting our requirements for the preparation of an Environmental Impact Statement (EIS) for the proposed waste management facility at Lot 11 DP 1130519, Lot 2 DP 590759, Lot 1 DP 771340, Bomen.

We have considered the details of the proposal as described in the documentation provided with your electronic mail and have identified the information required for the environmental impact assessment as outlined at Attachment A. The EPA's key information requirements for the project are as follows.

- A detailed environmental impact assessment of the proposal on the existing local ground and surface waters and details about the measures proposed to protect and monitor surface and ground waters.
- Concept designs of the landfill cells, stormwater management and diversions and the surface water and groundwater monitoring regime.
- Details of the proposed leachate management including concept design of the leachate barrier system and details of the leachate collection, storage and disposal system.
- Details of the proposed operational management and mitigation measures that will be implemented to control all potential off site impacts from the activity including potential amenity issues such as odour, dust, noise, litter and fire control.
- Details about the source, volumes, characterisation and classification of all the waste proposed to be received and landfilled.
- Details of all proposed construction activity and an assessment of the impacts. This is to include an assessment of noise, vibration and dust emissions for the establishment of landfill cells.

PO Box 544 Albury NSW 2640
Second Floor, Government Offices
512 Dean Street Albury NSW 2640
Tel: (02) 6022 0600 Fax: (02) 6022 0610
ABN 30 841 387 271
www.epa.nsw.gov.au

Details of our specific requirements and guidance documents are provided at Attachments A and B respectively. We recommend that during the preparation of the EIS the proponent consults with the EPA to ensure the specific issues identified in the attachments are adequately addressed.

It should be noted that the key guidance document for the assessment, establishment and operation of a landfill in NSW is the *Environmental Guidelines: Solid Waste Landfills (EPA, 2016, Second Edition)* ("Landfill Guideline"). The EIS should detail how the proposed landfill will meet all the applicable standards detailed in Part B of the Landfill Guideline. Where alternative approaches are proposed to achieve required outcomes they will need to be fully justified and substantiated with evidence demonstrating the proposed alternative will achieve the required standard or specification.

If you have any further enquiries about this matter please contact Amanda Baldwin by telephoning 02 6932 9123.

Yours sincerely

BRIAN WILD 21 July 2016
Head, Albury Unit
Environment Protection Authority

Enclosure

ATTACHMENT A

General Comment

1. The key guidance document for the assessment, establishment and operation of a landfill in NSW is the *Environmental Guidelines: Solid Waste Landfills (EPA, 2016, Second Edition)* ("Landfill Guideline"). The EIS should detail how the proposed landfill will meet all the applicable benchmark performance criteria as detailed in Part B of the Landfill Guideline.

2. The environmental impact statement (EIS) must include (but is not limited to) the following information on the proposed landfill design and operation:

    a) Fully describe the proposed landfill and the ongoing operational management for the life of the landfill, including details of all development stages and site rehabilitation.

    b) Describe and assess the existing environment with particular reference to surface and ground water quality;

    c) Details of the engineered features of the proposed landfill works and cell construction, including the leachate barrier, leachate storage and disposal system, stormwater management works, water quality monitoring installations, landfill gas management and monitoring infrastructure (if required), and final capping. This must include plans, specifications and engineering drawings.

    d) Maps of the site configuration and a scaled plan diagram of the premises, depicting the boundary of the premises and footprint of landfill cells, the locations of all residences and other sensitive receptors, and the locations of other relevant infrastructure such as sewer connections, utilities and urban stormwater systems.

    e) Projections of the types and quantities of wastes to be received, the characterisation and classification of the wastes, the design capacity of the landfill or cell, and the expected life of the landfill/cell.

    f) Details of any waste reprocessing to take place at the landfill, the nature of any resources to be recovered from wastes received at the landfill, and the locations and sizes of any proposed stockpiles.

    g) Enough information to demonstrate that the proposal will meet the required outcomes in the Landfill Guidelines, with justification for any proposed alternatives to the acceptable measures described in these guidelines. The application should be supported by a hydrogeological risk assessment, landfill gas risk assessment, air quality impact assessment, odour impact assessment, noise impact assessment, water balance calculations for leachate management, and proposed environmental monitoring programs.

    h) Detail the mitigation and management options that will be used to prevent, control, abate or mitigate the identified potential environmental impacts associated with the project. This should include an assessment of the effectiveness and reliability of the measures and any residual impacts after these measures are implemented.

    i) Confirmation that the application has been prepared by a suitably qualified and experienced person(s).

Potential impacts on water (surface water and groundwater)

The environmental objectives for water quality are as follows.

- No pollution of, or discharge to waters (including surface and groundwater), except to the extent authorised by EPA (ie in accordance with an Environment Protection Licence); and

- All polluted water (including leachate, wash down waters, polluted stormwater or onsite amenities effluent) is captured on the site and collected, treated and beneficially reused, where this is safe and practicable to do so.

The EIS should document the measures that will be implemented to achieve these objectives, and include (but not be limited to) the following specific aspects.

- Leachate barrier system - Clearly describe and detail the proposed leachate barrier system, including proposed materials and details of the cell development;

- Leachate collection and management system - General details of the drainage layers, pipework and risers, pump, leachate ponds, intended method of disposal or reuse, and leachate monitoring. This must include a leachate balance undertaken in accordance with the Landfill Guideline and account for the water contained in the waste as received at the proposed facility;

- Surface water controls - Details of the proposed surface water controls that will be installed. These controls should be designed in accordance with the guideline *Managing Urban Stormwater: Soils and Construction – Volume 2B Waste Landfills (DECC 2008)*;

- Groundwater assessment - A comprehensive hydrogeological investigation and impact assessment for the site and the surrounding groundwater to identify with a high degree of certainty the groundwater quality, flow pathways and vulnerability to contamination for all aquifers; and

- Groundwater monitoring network - With the potential risk to groundwater resources, the groundwater assessment should provide details of the proposed groundwater monitoring network, including locations and depth of all hydraulically up-gradient and down-gradient monitoring bores; and

- Groundwater and surface water monitoring program: The proposal must also include details of the proposed groundwater and surface water monitoring program, which must include upstream/up-gradient monitoring and downstream/down-gradient monitoring, and background monitoring.

Landfill Development

The environmental objective is for the minimisation of amenity impacts associated with the development of the landfill. The EIS should document the measures that will be implemented to achieve this objective, and include but not be limited to the following specific aspects.

- Construction impacts - Assess the impacts and detail the mitigation controls to minimise offsite dust, noise, and vibration and water quality impacts in accordance with EPA guidelines. This should include details of any off site work such as winning and importing clay liner material or graded rock for drainage layers; and

- Landfill development - Include details and anticipated timing of any stages in the development of the landfill, and details of the proposed final extent of the landfill. This must include plans and cross section diagrams which clearly detail the extent of the proposed development. As the h proposed site has been previously used for evaporation of wool scour wastewater, the EIS must also detail how the residues from previous activity will be managed and potential impacts mitigated, including potential impacts on landfill liners.

Landfill Operation - Prevent degradation of local amenity

The environmental objective in relation to local amenity is the prevention of impacts, and where not possible the mitigation of impacts on sensitive receptors in accordance with the EPA's guideline criteria for odour, dust, noise and facility management and operation.

All potentially impacted residential or sensitive locations likely to be impacted by the development must be identified and included in the assessment. The EIS should assess the impact and document the measures that will be implemented to achieve the amenity objectives, and should include but not be limited to the following specific aspects.

- Odour - An odour assessment should be prepared based on the potential emissions from the waste management facility. The EIS should also detail the appropriate waste acceptance and screening steps and waste management steps that will be implemented to prevent the generation of odour;

- Dust – The air quality impact assessment should include an assessment of dust impacts from the proposed construction and operation of the landfill and details of all mitigation measures.

- Noise – A noise impact assessment for the development and operation of the landfill should be prepared in accordance with the NSW Industrial Noise Policy (DECC, 2000), including determining the project specific noise criteria and details of all proposed noise mitigation measures.

- Road traffic noise - The proposed development will result in an increase in traffic movements, particularly during the development phase. The number of traffic movements associated with all phases of the development should be quantified and the potential noise impacts associated with these traffic movements need to be assessed in accordance with the *NSW Road Noise Policy* (DECCW, 2011);

- Litter - Detail the control measures that will be implemented to minimise the generation or movement off-site of litter from the exposed tipping face or associated with waste transport on site;

- Covering and compaction of waste - Details of the proposed waste covering and compaction regime consistent with the objectives of the Landfill Guidelines, including all details for the proposed use of the excavated evaporation pond sludge; and

- Cleaning of vehicles - Detail the proposed controls to prevent contaminated mud and waste material from being tracked off site by vehicles.

Waste

The EIS should provide details on the following specific aspects.

- Waste classification - The waste classification under the *Waste Classification Guidelines, Part 1: Classifying Waste* (DECCW, 2009) for all wastes proposed to be received and landfilled at the proposed facility;
- Measurement and recording the quantity, type and sources of waste to be received - Provide details of how the proposed activity will comply with the EPA measuring and reporting requirements;
- Screening of waste received - Details of the proposed waste acceptance and screening procedures to ensure the site does not accept wastes that are prohibited from receipt and disposal; and
- Maximise recycling - Detail the proposed management actions to deal with waste delivered to site that could be approved for material recycling or reuse.

Potential impacts of landfill gas emissions

The environmental objectives in relation to landfill gas emission is to reduce the emission of greenhouse gases, lower the emission of other environmentally impacting compounds, and reduce the risk of fire and explosion.

Although emission rate and quantity of land fill gases emitted from a non-putrescible landfill are typically low, the EIS should address the following.

- Determine the likely composition and risk of landfill gas emissions based on the predicted waste streams and proposed landfill management regime, and detail the proposed controls if required; and

- Estimate the emission of greenhouse gases that will be generated, and accurately account for the greenhouse gas emissions from the project. The full life-cycle greenhouse gas emissions should be calculated, and must demonstrate how greenhouse gas emissions will be minimised over the life-cycle.

Landfill Closure

The environmental objective of the landfill closure and associated works is to ensure appropriate and effective controls are installed and continue to be operated effectively and prevent any offsite environmental impacts. The EIS should document the measures that will implemented to achieve this environmental objective, and should include but not be limited to the following specific aspects.

- Capping and revegetation - Detail the proposed capping and revegetation of the landfill site after closure.

- Landfill closure and post-closure monitoring and maintenance – The EIS should detail the ongoing monitoring and maintenance in accordance with the Landfill Guideline that the operator will undertake until it is assessed that the landfill does not pose a threat to the environment.

ATTACHMENT B

Guidance Material for Assessing Environmental Impacts

Waste

- Environmental Guidelines: Solid Waste Landfills (EPA, 2016, 2nd Edition). Available online: http://www.epa.nsw.gov.au/resources/waste/solid-waste-landfill-guidelines-160259.pdf
- Waste Classification Guidelines, Part 1: Classifying Waste, November 2014. Available online http://www.epa.nsw.gov.au/resources/wasteregulation/140796-classify-waste.pdf

Air quality and odour

- Protection of the Environment Operations (Clean Air) Regulation 2010
- Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales (DECC, 2005). Available online http://www.epa.nsw.gov.au/resources/legislation/07001amsaap.pdf
- Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales (DECC, 2005). Available online http://www.epa.nsw.gov.au/resources/air/ammodelling05361.pdf
- Technical framework: Assessment and Management of Odour from Stationary Sources in NSW (DECC, 2006). Available online http://www.epa.nsw.gov.au/air/odour.htm

Landfill Gas and Greenhouse gases

- Draft Guidelines: Energy and Greenhouse in EIA (DoP, 2002)
- Factors and Methods Workbook (AGO, 2006)
- Guidance on the management of Landfill Gas (UK Environment Agency, 2004) www.gov.uk/government/publications/management-of-landfill-gas-lftgn-03

Greenhouse Gas	
The Greenhouse Gas Protocol: Corporate Standard, World Council for Sustainable Business Development & World Resources Institute	http://www.ghgprotocol.org/standards/corporate-standard
National Greenhouse Accounts (NGA) Factors, Australian Department of Climate Change (Latest release),	http://www.environment.gov.au/climate-change/greenhouse-gas-measurement/publications/national-greenhouse-accounts-factors-dec-2014
National Greenhouse and Energy Reporting System, Technical Guidelines (latest release)	http://www.environment.gov.au/climate-change/greenhouse-gas-measurement/nger/technical-guidelines
Australian Greenhouse Emissions Information System (AGEIS)	http://ageis.climatechange.gov.au/

Noise and vibration

- NSW Industrial Noise Policy (DECC, 2000). Available online http://epa.nsw.gov.au/noise/industrial.htm
- NSW Road Noise Policy (DECCW, 2011) Available online http://www.epa.nsw.gov.au/resources/noise/2011236nswroadnoisepolicy.pdf
- Assessing Vibration: A Technical Guide (DEC, 2006) www.epa.nsw.gov.au/noise/index.htm
- Interim Noise Construction Guideline (DECCW, 2009). Available online http://www.epa.nsw.gov.au/noise/constructnoise.htm

Water quality

- Approved Methods for the Sampling and Analysis of Water Pollutants in NSW (DEC, 2004) www.environment.nsw.gov.au/resources/water/approvedmethods-water.pdf
- Australian and New Zealand Guidelines for Fresh and Marine Water Quality 2000 (ANZECC 2000) Australia and New Zealand Environment and Conservation Council (Canberra) and Agriculture and Resource Management Council of Australia and New Zealand. www.environment.gov.au/water/publications/quality/australian-and-new-zealand-guidelines-fresh-marine-water-quality-volume-1
- National Water Quality Management Strategy: Australian Guidelines for Water Quality Monitoring and Reporting (ANZECC/ARMCANZ, 2000)
- Using the ANZECC Guidelines and Water Quality Objectives in NSW (DECC, 2006) www.environment.nsw.gov.au/water/usinganzeccandwqos.htm

Groundwater

- The NSW State Groundwater Policy Framework Document (DLWC, 1997)
- The NSW State Groundwater Quality Protection Policy (DLWC, 1998)
- The NSW State Groundwater Dependent Ecosystems Policy (DLWC, 2002)
- National Water Quality Management Strategy Guidelines for Groundwater Protection in Australia (ARMCANZ/ANZECC, 1995)
- Guidelines for the Assessment and Management of Groundwater Contamination (DEC 2007) www.epa.nsw.gov.au/resources/clm/groundwaterguidelines07144.pdf

Stormwater

- Managing Urban Stormwater: Soils and Construction Volume 1 (4th Edition, Landcom, 2004) http://www.environment.nsw.gov.au/stormwater/publications.htm
- Managing Urban Stormwater: Soils and Construction Volume 2B Waste Landfills (DECC 2008) http://www.environment.nsw.gov.au/stormwater/publications.htm
- Managing Urban Stormwater: Soils and Construction Volume 2C Unsealed Roads (DECC 2008) www.environment.nsw.gov.au/resources/stormwater/0802soilsconststorm2c.pdf

NSW GOVERNMENT | Office of Environment & Heritage

Your reference: EAR No. 1062
Our reference: DOC16/341990
Contact: Andrew Fisher
Ph: 6022 0623

Ms Bianca Thornton
Student Planner
Industry Assessments
Department of Planning & Environment
GPO Box 39
SYDNEY NSW 2001

Dear Ms Thornton

RE: Waste Management Facility, 560 Byrnes Road, 223 Trahairs Road and 299 Trahairs Road, Bomen – EARs ID No. 1062

I refer to your email dated 8 July 2016 seeking the requirements of the Office of Environment and Heritage (OEH) for the preparation of an Environmental Impact Statement (EIS) for the above proposal. This response is in regard to statutory matters relating to application of the *National Parks and Wildlife Act 1974* and the *Threatened Species Conservation Act 1995.*

We have reviewed the information and offer the following comments. Details are provided in **Attachment A**. In summary, OEH's key information requirements for the proposal include adequate assessment of:

1. **Impacts to Aboriginal cultural heritage objects**
2. **Impacts on native vegetation identified in the Wagga Wagga Biodiversity Certification and Development Control Plan**
3. **Cumulative impacts**

The EIS should fully describe the proposal, the existing environment and impacts of the proposal including the location and extent of all proposed works that may impact Aboriginal cultural heritage values. The scale and intensity of the proposed development should dictate the level of investigation. It is important that all conclusions are supported by adequate data.

The assessment should also include details about the location, extent and activities undertaken for any infrastructure associated with the proposal. This assessment should also include consideration of direct and indirect impacts as a result of both construction and operation of the project. The EIS should also assess the cumulative impacts of this and other developments in the area.

Potential exists for proposed development activities to impact Aboriginal cultural heritage especially where soil disturbance and native vegetation removal is proposed. OEH recommends that the proponent conduct a cultural heritage assessment of the potential impacts of the proposed development as detailed in **Attachment A**. In addressing these requirements, the proponent must comply with the processes described in those documents identified within the Aboriginal Cultural Heritage section of **Attachment A**.

The development is proposed to occur within one kilometre of known sites and the declared Aboriginal Place, Bomen Axe Quarry (Aboriginal Place I.D. 124), while also being in close proximity to landscape features considered indicative for the presence of Aboriginal cultural heritage (ACH) including a ridge line and within 200 metres of a natural watercourse occurring on Lot 1 DP 771340. OEH considers there is potential for ACH to occur anywhere across the proposed activity area given the proximity to the basalt quarry and indicative landscape features. While it is evident that some landscape modification has occurred across sections of the subject area, according to the Wagga Wagga Local Environmental Study: Aboriginal Cultural Heritage Assessment (2008), sections of the proposed activity area are still identified as having moderate and high archaeological sensitivity. It is recommended that the impacts on these areas should be considered in relation to the detailed design of any development.

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OEH notes that the site for this proposed development is within the Wagga Wagga Biodiversity Certification area. This means that this development is taken to not be likely to have a significant impact on any threatened species, population, or ecological community or its habitat. However the Wagga Wagga Biodiversity Certification also relies on the Wagga Wagga Development Control Plan (DCP) which requires the retention of low conservation value remnant patches in Bomen, including the strip of White Box - Yellow Box - Blakely's Red Gum Woodland along Byrnes Road. Consideration of this native vegetation along with a draft management plan to protect and enhance this vegetation is required to be submitted with the development application, as identified in the DCP.

If you require further information about this matter please contact Andrew Fisher on 6022 0623 or at andrew.fisher@environment.nsw.gov.au.

Yours sincerely

P.E 22/7/16

PETER EWIN
Senior Team Leader Planning
South West Region
Regional Operations
Office of Environment and Heritage

Enclosure: ATTACHMENT A – Detailed SEARs for Waste Management Facility, Bomen – EARs ID No. 1062

ATTACHMENT A – Detailed SEARs for Waste Management Facility, Bomen – EARs ID No. 1062

Impacts related to the following environmental issues need to be assessed, quantified and reported on:

- **Aboriginal cultural heritage**
- **Biodiversity**
- **Cumulative impact**

The Environmental Impact Statement (EIS) should address the specific requirements outlined under each heading below and assess impacts in accordance with the relevant guidelines mentioned.

Aboriginal cultural heritage

OEH requires that the proponent undertake a cultural heritage assessment of the potential impacts of the proposed development. The EIS must contain:

- A description of the Aboriginal objects and declared Aboriginal places located within the area of the proposed development.
- A description of the cultural heritage values, including the significance of the Aboriginal objects and any declared Aboriginal places, which exist across the whole area that will be affected by the proposed development, and the significance of these values for the Aboriginal people who have a cultural association with the land.
- A description of how the requirements for consultation with Aboriginal people as specified in clause 80C of the *National Parks and Wildlife Regulation 2009* have been met.
- The views of those Aboriginal people regarding the likely impact of the proposed development on their cultural heritage. If any submissions have been received as a part of the consultation requirements, then the report must include a copy of each submission and your response.
- A description of the actual or likely harm posed to the Aboriginal objects or declared Aboriginal places from the proposed activity, with reference to the cultural heritage values identified.
- A description of any practical measures that may be taken to protect and conserve those Aboriginal objects or declared Aboriginal places.
- A description of any practical measures that may be taken to avoid or mitigate any actual or likely harm, alternatives to harm or, if this is not possible, to manage (minimise) harm.
- In the event that harm to Aboriginal objects cannot be avoided then an application for an Aboriginal Heritage Impact Permit (AHIP) will be required to be submitted to OEH for consideration.

In addressing the above requirements, the proponent must comply with the processes described in the following documents:

- *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010* (DECCW 2010) – www.environment.nsw.gov.au/licences/consultation.htm. This document further explains the consultation requirements that are set out in clause 80C of the *National Parks and Wildlife Regulation 2009*. The process set out in this document must be followed and documented in the Environmental Assessment Report.
- *Code of Practice for the Archaeological Investigation of Aboriginal Objects in New South Wales* (DECCW 2010) – www.environment.nsw.gov.au/licences/archinvestigations.htm. The process described in this Code should be followed and documented where the assessment of Aboriginal cultural heritage requires an archaeological investigation to be undertaken.
- *Guide to investigation, assessing and reporting on Aboriginal Cultural heritage in NSW* (OEH April 2011) – www.environment.nsw.gov.au/licences/investassessreport.htm. This document provides guidance on the process for investigating and assessing Aboriginal cultural heritage in NSW and OEH's requirements for an assessment report.

- *Applying for an Aboriginal Heritage Impact Permit: Guide for applicants* (OEH May 2011) – www.environment.nsw.gov.au/licences/applyforahip.htm. The aim of this guide is to assist in the preparation of an AHIP application. It should be read in conjunction with the *National Parks and Wildlife Act 1974* (NPW Act) and the *National Parks and Wildlife Regulation 2009*.

An Aboriginal Site Recording Form must be completed and submitted to the Aboriginal Heritage Information Management System (AHIMS) Registrar, for each Aboriginal site that is recorded during archaeological investigations completed for these environmental assessment requirements. The forms can be downloaded at www.environment.nsw.gov.au/licences/DECCAHIMSSiteRecordingForm.htm.

Biodiversity

OEH notes that the site for this proposed development is zoned Industrial and is within the Wagga Wagga biodiversity certification area. This means that for the purposes of Part 4 of the *Environment Planning and Assessment Act 1979* any development within this area is taken to not be likely to have a significant effect on any threatened species, population, or ecological community or its habitat. However the Wagga Wagga biodiversity certification also relies on the Wagga Wagga DCP. Section 13 of the DCP requires the retention of low conservation value remnant patches in Bomen, which includes the strip of White Box - Yellow Box - Blakely's Red Gum Woodland along Byrnes Road on the western side of Lots 1 and 2 DP 771340. Specifically the DCP requires the preparation of a management plan to protect and enhance this vegetation with any development application within the Bomen area. Although the information provided is not clear as to the extent of works required on these lots, OEH considers that it should be possible to construct and operate this proposed waste management facility without adversely impacting on this native vegetation.

Matters of National Environmental Significance

With regard to the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*, the assessment should identify any relevant Matters of National Environmental Significance and whether the proposal has been referred to the Commonwealth or already determined to be a controlled action. Please note that the biodiversity certification of the *Wagga Wagga Local Environmental Plan 2010* does not address matters under Commonwealth legislation.

Cumulative Impact

The cumulative impacts from all clearing activities and operations, associated edge effects and other indirect impacts on cultural heritage, biodiversity and OEH Estate need to be comprehensively assessed in accordance with the *Environmental Planning and Assessment Act 1979*.

This should include the cumulative impact of the proponent's existing and proposed development and associated infrastructure (such as access tracks etc.) as well as the cumulative impact of other developments located in the vicinity. This assessment should include consideration of both construction and operational impacts.

22 July 2016

SWT16/00084
SF2016/155683
MM

The Manager
Department of Planning & Environment
GPO Box 39
SYDNEY NSW 2001

Attention: Bianca Thornton

SEAR-920 – PROPOSED WASTE MANAGEMENT FACILITY, LOT 11 DP1130519, LOT 2 DP590756 & LOT 1 DP771340, 560 BYRNES ROAD & 223 & 299 TRAHAIRS ROAD, BOMEN.

I refer to your correspondence requesting provision of the Secretary's Environmental Assessment Requirements to be addressed in the supporting documentation to be submitted for the subject development.

From review of the information provided it is understood that the proposal is for the establishment of a waste management facility with an intended capacity for landfilling up to 2.6 million cubic metres of waste. The subject site has frontage to both Byrnes Road and Trahairs Road, which are both classed as local roads.

The information supplied does not provide any preliminary detail in relation to potential traffic generation or regarding the proposed access arrangements from the public road network to the proposed development.

It is noted that the landfill is primarily intended to service the waste management needs of the Visy Paper Mill in Tumut. This will result in the regular transportation of waste by road transport means from the Paper Mill site in Tumut to this proposed landfill site north of Wagga Wagga. In addition to the transportation of waste assessment of the transportation of material for the lining of the proposed landfill cells may also be required.

Roads and Maritime is interested in the characteristics of the traffic generated by the development and the potential impact of the development on the safety and efficiency of the road network, particularly the interaction of the development with the Snowy Mountains Highway and the Sturt Highway.

Given the scale of the development proposal a Traffic Impact Assessment (TIA) shall be prepared and submitted with the Development Application. In particular the TIA shall address, and provide any appropriate mitigation measures for, the impacts of the traffic generated by this development upon the surrounding road network, particularly intersections, during the lifetime of the project.

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For guidance in the preparation of the TIA the applicant is referred to the Austroads publications, particularly the Austroads Guide to Traffic Management Part 12: Traffic Impacts of Development and the “Guide to Traffic Generating Developments” prepared by the RTA and similar documentation.

As a minimum the TIA is to address the existing and anticipated additional traffic generation on the surrounding road network, vehicle types and volumes, peak traffic volumes, travel routes for vehicles accessing the development site and provide recommendations for any mitigation measures, such as intersection upgrades, considered necessary to address traffic related impacts. Consideration of the cumulative impacts of the potential traffic generation when added to existing traffic volumes upon the surrounding road network shall be undertaken.

Roads and Maritime emphasises the need to appropriately consider and minimise the impacts of the total traffic generation due to the development on the existing road infrastructure and maintain the safety, efficiency and standard of maintenance along the existing road network through the design, construction and operation of the development and any road works required to support the operation of the development.

Any enquiries regarding this correspondence may be referred to the Manager, Land Use for Roads and Maritime Services (South West Region), Maurice Morgan, phone (02) 69231611.

Yours faithfully

Per:
Mr Lindsay Tanner
Regional Manager
South West Region

PO Box 156, Leeton NSW 2705
2198 Irrigation Way
Yanco NSW 2703
www.waternsw.com.au
ABN 21 147 934 787

The General Manager
Department of Planning
PO Box 39
Sydney NSW 2000

Attention: Adam Oehlman

Contact: Tracie Scarfone
Phone: 0269 512510
Email:tracie.scarfone@waternsw.com.au
Our ref: 40CA403430

19th July 2016

Dear Adam ,

Re: Request for Secretary's Environmental Assessment Requirements for Waste Management Facility - Bomen - SEAR 1062

WaterNSW has reviewed the supporting documentation accompanying the request for Secretary's Environmental Assessment Requirements (SEARs) and provides the following comments below, and further detail in **Attachment A**.

It is recommended that the EIS be required to include:

Access to surface and groundwater resources

- Annual volumes of surface water and groundwater proposed to be taken by the activity (including through inflow and seepage) from each surface and groundwater source as defined by the relevant water sharing plan.
- Assessment of any volumetric water licensing requirements (including those for ongoing water take following completion of the project).
- Assessment of the impact and approvals (Works and Use Approvals under the WMA 2000) required for the taking or storage of water.
- The identification of an adequate and secure water supply for the life of the project. Confirmation that water can be sourced from an appropriately authorised and reliable supply. This is to include an assessment of the current market depth where water entitlement is required to be purchased.
- A detailed and consolidated site water balance.
- A detailed assessment against the NSW Aquifer Interference Policy (2012) using DPI Water's assessment framework.

Impact on surface and groundwater resources

- Assessment of impacts on surface and ground water sources (both quality and quantity), related infrastructure, adjacent licensed water users, basic landholder rights, watercourses, riparian land, and groundwater dependent ecosystems, and measures proposed to reduce and mitigate these impacts.
- Full technical details and data of all surface and groundwater modelling, and an independent peer review.

- Proposed surface and groundwater monitoring activities and methodologies.
- Proposed management and disposal of produced or incidental water

Flooding
WaterNSW is responsible for the management and licensing of flood work approvals.

If the proposal is for an earthwork, embankment or levee, wherever situated or proposed to be constructed that is reasonably likely to affect the flow of water to or from a river or lake then the assessment is required to address potential impacts detailed further in attachment A.

Impact on waterfront land and water resource dependents

- Clear identification of "waterfront land" (as defined in the WMA 2000) and an assessment of impacts of works and activities on waterfront land. (Works on waterfront land may be subject to Controlled Activity Approval (CAA) under the *Water Management Act 2000.)*
- Details of the final landform of the site, including final void management (where relevant) and rehabilitation measures.
- Assessment of any potential cumulative impacts on water resources, and any proposed options to manage the cumulative impacts.
- Consideration of relevant policies and guidelines.
- A statement of where each element of the SEARs is addressed in the EIS (i.e. in the form of a table).

Please direct any questions or correspondence to **Tracie Scarfone, tracie.scarfone@waternsw.com.au**.

Yours sincerely

Tracie Scarfone
Senior Water Regulation Officer
Water Regulatory Operations, Water Regulatory Operations South
WaterNSW

ATTACHMENT A

WaterNSW General Assessment Requirements

The following detailed assessment requirements are provided to assist in adequately addressing the assessment requirements for this proposal.

For further information visit the website, www.water.nsw.gov.au

Key Relevant Legislative Instruments

This section provides a basic summary to aid proponents in the development of an Environmental Impact Statement (EIS), and should not be considered a complete list or comprehensive summary of relevant legislative instruments that may apply to the regulation of water resources for a project.

The EIS should take into account the objects and regulatory requirements of the *Water Act 1912* (WA 1912) and *Water Management Act 2000* (WMA 2000), and associated regulations and instruments, as applicable.

Water Management Act 2000 (WMA 2000)
Key points:

- Volumetric licensing in areas covered by water sharing plans
- Works within 40m of waterfront land
- SSD & SSI projects are exempt from requiring water supply work approvals and controlled activity approvals as a result of the *Environmental Planning & Assessment Act 1979 (EP&A Act)*.
- No exemptions for volumetric licensing apply as a result of the *EP&A Act*.
- Basic landholder rights, including harvestable rights dams
- Aquifer interference activity approval and flood management work approval provisions have not yet commenced and are regulated by the *Water Act 1912*
- Maximum penalties of $2.2 million plus $264,000 for each day an offence continues apply under the *WMA 2000*

Water Act 1912 (WA 1912)
Key points:

- Volumetric licensing in areas where no water sharing plan applies
- Monitoring bores
- Aquifer interference activities that are not regulated as a water supply work under the *WMA 2000*.
- Flood management works
- No exemptions apply to licences or permits under the *WA 1912* as a result of the *EP&A Act*.
- Regulation of water bore driller licensing.

Water Management (General) Regulation 2011
Key points:

- Provides various exemptions for volumetric licensing and activity approvals
- Provides further detail on requirements for dealings and applications.

Water Sharing Plans – these are considered regulations under the *WMA 2000*

Access Licence Dealing Principles Order 2004

Harvestable Rights Orders

Water Sharing Plans

It is important that the proponent understands and describes the ground and surface water sharing plans, water sources, and management zones that apply to the project. The relevant water sharing plans can be determined spatially at www.ourwater.nsw.gov.au. Multiple water sharing plans may apply and these must all be described.

The *Water Act 1912* applies to all water sources not yet covered by a commenced water sharing plan.

The EIS is required to:

- Demonstrate how the proposal is consistent with the relevant rules of the Water Sharing Plan including rules for access licences, distance restrictions for water supply works and rules for the management of local impacts in respect of surface water and groundwater sources, ecosystem protection (including groundwater dependent ecosystems), water quality and surface-groundwater connectivity.
- Provide a description of any site water use (amount of water to be taken from each water source) and management including all sediment dams, clear water diversion structures with detail on the location, design specifications and storage capacities for all the existing and proposed water management structures.
- Provide an analysis of the proposed water supply arrangements against the rules for access licences and other applicable requirements of any relevant WSP, including:
    - Sufficient market depth to acquire the necessary entitlements for each water source.
    - Ability to carry out a "dealing" to transfer the water to relevant location under the rules of the WSP.
    - Daily and long-term access rules.
    - Account management and carryover provisions.
- Provide a detailed and consolidated site water balance.
- Further detail on licensing requirements is provided below.

Relevant Policies and Guidelines

The EIS should take into account the following policies (as applicable):

- NSW Guidelines for Controlled Activities on Waterfront Land (NOW, 2012)
- NSW Aquifer Interference Policy (NOW, 2012)
- Risk Assessment Guidelines for Groundwater Dependent Ecosystems (NOW, 2012)
- Australian Groundwater Modelling Guidelines (NWC, 2012)
- NSW State Rivers and Estuary Policy (1993)
- NSW Wetlands Policy (2010)
- NSW State Groundwater Policy Framework Document (1997)
- NSW State Groundwater Quality Protection Policy (1998)
- NSW State Groundwater Dependent Ecosystems Policy (2002)
- NSW Water Extraction Monitoring Policy (2007)

DPI Water policies can be accessed at the following links:
http://www.water.nsw.gov.au/Water-management/Law-and-policy/Key-policies/default.aspx
http://www.water.nsw.gov.au/Water-licensing/Approvals/Controlled-activities/default.aspx

An assessment framework for the NSW Aquifer Interference Policy can be found online at: http://www.water.nsw.gov.au/Water-management/Law-and-policy/Key-policies/Aquifer-interference.

Licensing Considerations

The EIS is required to provide:

- Identification of water requirements for the life of the project in terms of both volume and timing (including predictions of potential ongoing groundwater take following the cessation of operations at the site – such as evaporative loss from open voids or inflows).
- Details of the water supply source(s) for the proposal including any proposed surface water and groundwater extraction from each water source as defined in the relevant Water Sharing Plan/s and all water supply works to take water.
- Explanation of how the required water entitlements will be obtained (i.e. through a new or existing licence/s, trading on the water market, controlled allocations etc.).
- Information on the purpose, location, construction and expected annual extraction volumes including details on all existing and proposed water supply works which take surface water, (pumps, dams, diversions, etc).
- Details on all bores and excavations for the purpose of investigation, extraction, dewatering, testing and monitoring. All predicted groundwater take must be accounted for through adequate licensing.
- Details on existing dams/storages (including the date of construction, location, purpose, size and capacity) and any proposal to change the purpose of existing dams/storages
- Details on the location, purpose, size and capacity of any new proposed dams/storages.
- Applicability of any exemptions under the *Water Management (General) Regulation 2011* to the project.

Water allocation account management rules, total daily extraction limits and rules governing environmental protection and access licence dealings also need to be considered.

The Harvestable Right gives landholders the right to capture and use for any purpose 10 % of the average annual runoff from their property. The Harvestable Right has been defined in terms of an equivalent dam capacity called the Maximum Harvestable Right Dam Capacity (MHRDC). The MHRDC is determined by the area of the property (in hectares) and a site-specific run-off factor. The MHRDC includes the capacity of all existing dams on the property that do not have a current water licence. Storages capturing up to the harvestable right capacity are not required to be licensed but any capacity of the total of all storages/dams on the property greater than the MHRDC may require a licence.

For more information on Harvestable Right dams, including a calculator, visit: http://www.water.nsw.gov.au/Water-licensing/Basic-water-rights/Harvesting-runoff/Harvesting-runoff

Dam Safety

Where new or modified dams are proposed, or where new development will occur below an existing dam, the NSW Dams Safety Committee should be consulted in relation to any safety issues that may arise. Conditions of approval may be recommended to ensure safety in relation to any new or existing dams.

See www.damsafety.nsw.gov.au for further information.

Surface Water Assessment

The predictive assessment of the impact of the proposed project on surface water sources should include the following:

- Identification of all surface water features including watercourses, wetlands and floodplains transected by or adjacent to the proposed project.
- Identification of all surface water sources as described by the relevant water sharing plan.
- Detailed description of dependent ecosystems and existing surface water users within the area, including basic landholder rights to water and adjacent/downstream licensed water users.
- Description of all works and surface infrastructure that will intercept, store, convey, or otherwise interact with surface water resources.
- Assessment of predicted impacts on the following:
    - flow of surface water, sediment movement, channel stability, and hydraulic regime,
    - water quality,
    - flood regime,
    - dependent ecosystems,
    - existing surface water users, and
    - planned environmental water and water sharing arrangements prescribed in the relevant water sharing plans.

Flooding

If the proposal is for an earthwork, embankment or levee, wherever situated or proposed to be constructed that is reasonably likely to affect the flow of water to or from a river or lake then the assessment is required to address potential impacts detailed below;

- the contents of any relevant floodplain management plan or any other relevant Government policy,
- the need to maintain the natural flood regimes in wetlands and related ecosystems and the preservation of any habitat, animals (including fish) or plants that benefit from periodic flooding,
- the effect or likely effect on water flows in downstream river sections,
- any geographical features, or other matters, of Aboriginal interest that may be affected by a controlled work,
- the effect or likely effect of a controlled work on the passage, flow and distribution of any flood waters,
- the effect or likely effect of a controlled work on existing dominant flood ways or exits from flood ways, rates of flow, flood water levels and the duration of inundation,

the protection of the environment

Groundwater Assessment

To ensure the sustainable and integrated management of groundwater sources, the EIS needs to include adequate details to assess the impact of the project on all groundwater sources including:

- Works likely to intercept, connect with or infiltrate the groundwater sources.
- Any proposed groundwater extraction, including purpose, location and construction details of all proposed bores and expected annual extraction volumes.
- Bore construction information is to be supplied to DPI Water by submitting a “Form A” template. DPI Water will supply “GW” registration numbers (and licence/approval numbers if required) which must be used as consistent and unique bore identifiers for all future reporting.
- A description of the watertable and groundwater pressure configuration, flow directions and rates and physical and chemical characteristics of the groundwater source (including connectivity with other groundwater and surface water sources).
- Sufficient baseline monitoring for groundwater quantity and quality for all aquifers and GDEs to establish a baseline incorporating typical temporal and spatial variations.
- The predicted impacts of any final landform on the groundwater regime.
- The existing groundwater users within the area (including the environment), any potential impacts on these users and safeguard measures to mitigate impacts.
- An assessment of groundwater quality, its beneficial use classification and prediction of any impacts on groundwater quality.
- An assessment of the potential for groundwater contamination (considering both the impacts of the proposal on groundwater contamination and the impacts of contamination on the proposal).
- Measures proposed to protect groundwater quality, both in the short and long term.
- Measures for preventing groundwater pollution so that remediation is not required.
- Protective measures for any groundwater dependent ecosystems (GDEs).
- Proposed methods of the disposal of waste water and approval from the relevant authority.
- The results of any models or predictive tools used.

Where potential impact/s are identified the assessment will need to identify limits to the level of impact and contingency measures that would remediate, reduce or manage potential impacts to the existing groundwater resource and any dependent groundwater environment or water users, including information on:

- Any proposed monitoring programs, including water levels and quality data.
- Reporting procedures for any monitoring program including mechanism for transfer of information.
- An assessment of any groundwater source/aquifer that may be sterilised from future use as a water supply as a consequence of the proposal.
- Identification of any nominal thresholds as to the level of impact beyond which remedial measures or contingency plans would be initiated (this may entail water level triggers or a beneficial use category).
- Description of the remedial measures or contingency plans proposed.
- Any funding assurances covering the anticipated post development maintenance cost, for example on-going groundwater monitoring for the nominated period.

Groundwater Dependent Ecosystems

The EIS must consider the potential impacts on any Groundwater Dependent Ecosystems (GDEs) at the site and in the vicinity of the site and:

- Identify any potential impacts on GDEs as a result of the proposal including:
  - the effect of the proposal on the recharge to groundwater systems;
  - the potential to adversely affect the water quality of the underlying groundwater system and adjoining groundwater systems in hydraulic connections; and
  - the effect on the function of GDEs (habitat, groundwater levels, connectivity).
- Provide safeguard measures for any GDEs.

Watercourses, Wetlands and Riparian Land

The EIS should address the potential impacts of the project on all watercourses likely to be affected by the project, existing riparian vegetation and the rehabilitation of riparian land. It is recommended the EIS provides details on all watercourses potentially affected by the proposal, including:

- Scaled plans showing the location of:
  - wetlands/swamps, watercourses and top of bank;
  - riparian corridor widths to be established along the creeks;
  - existing riparian vegetation surrounding the watercourses (identify any areas to be protected and any riparian vegetation proposed to be removed);
  - the site boundary, the footprint of the proposal in relation to the watercourses and riparian areas; and
  - proposed location of any asset protection zones.
- Photographs of the watercourses/wetlands and a map showing the point from which the photos were taken.
- A detailed description of all potential impacts on the watercourses/riparian land.
- A detailed description of all potential impacts on the wetlands, including potential impacts to the wetlands hydrologic regime; groundwater recharge; habitat and any species that depend on the wetlands.
- A description of the design features and measures to be incorporated to mitigate potential impacts.
- Geomorphic and hydrological assessment of water courses including details of stream order (Strahler System), river style and energy regimes both in channel and on adjacent floodplains.
- Works on waterfront land may be subject to Controlled Activity Approval (CAA) under the *Water Management Act 2000.* Further information can be obtained from the Office of Water's website:
  www.water.nsw.gov.au Water licensing › Approvals › Controlled activities

Drill Pad, Well and Access Road Construction

- Any construction activity within 40m of a watercourse, should be designed by a suitably qualified person, consistent with the NSW *Guidelines for Controlled Activities on Waterfront Land* (July 2012).
- Construction of all wells must be undertaken in accordance with the *Minimum Construction Requirements for Water Bores in Australia* (3rd edition 2012) by a driller holding a bore drillers' licence valid in New South Wales.
- The length of time that a core hole is maintained as an open hole should be minimised.

Landform rehabilitation (including final void management)

Where significant modification to landform is proposed, the EIS must include:

- Justification of the proposed final landform with regard to its impact on local and regional surface and groundwater systems;
- A detailed description of how the site would be progressively rehabilitated and integrated into the surrounding landscape;
- Outline of proposed construction and restoration of topography and surface drainage features if affected by the project;
- Detailed modelling of potential groundwater volume, flow and quality impacts of the presence of an inundated final void (where relevant) on identified receptors specifically considering those environmental systems that are likely to be groundwater dependent;
- An outline of the measures to be put in place to ensure that sufficient resources are available to implement the proposed rehabilitation; and
- The measures that would be established for the long-term protection of local and regional aquifer systems and for the ongoing management of the site following the cessation of the project.

Consultation and general enquiries

General licensing enquiries can be made to Advisory Services:
water.enquiries@waternsw.com.au, 1800 353 104.

Assessment or state significant development enquiries, or requests for review or consultation should be directed to the Strategic Stakeholder Liaison Unit, water.referrals@dpi.nsw.gov.au.

A consultation guideline and further information is available online at:
www.water.nsw.gov.au/water-management/law-and-policy/planning-and-assessment

End Attachment A

Industry Assessments
Contact: Patrick Copas
Phone: (02) 9274 6273
Email: patrick.copas@planning.nsw.gov.au

Ms Nicola Smith
Environmental Consultant Graduate
NGH Environmental
PO Box 5464
WAGGA WAGGA NSW 2650

OBJ16/09157
SEAR 1062

Dear Ms Smith

Request for Updated Requirements
Waste Management Facility (Landfill) – Byrnes Road, Bomen – Wagga Wagga LGA
Planning Secretary's Environmental Assessment Requirements (SEAR) 1062

I refer to your email of 26 June 2018, seeking updated Planning Secretary's Environmental Assessment Requirements (SEARs) for the preparation of an Environmental Impact Statement (EIS) for the above development proposal.

The Department notes SEAR 1062, issued on 26 July 2016, was for the construction and operation of a landfill with a capacity of 865,000 tonnes of non-putrescible waste, within the Wagga Wagga local government area (LGA).

In its consideration of the request, the Department has re-consulted with all relevant local and State government authorities in relation to the proposal, including the Environment Protection Authority, WaterNSW, the Roads and Maritime Services, the Office of Environment and Heritage and the Department's Southern Regional Office. Their additional comments/requirements for the EIS have been attached for your reference.

Based on the responses received from the relevant local and State government authorities, the Department considers that the SEARs previously issued would continue to remain relevant to the proposal. Notwithstanding, you must ensure you address both the original SEARs and the authorities' additional comments/requirements as part of your EIS.

If you do not lodge an application under section 4.12(8) of the *Environmental Planning and Assessment Act 1979* within 2 years of the date of this letter, you must consult with the Planning Secretary in relation to any further requirements for lodgement.

Should you have any further enquiries, please contact Patrick Copas, Planning Services, at the Department on (02) 9274 6273.

Yours sincerely

C. Ritchie 21/8/18.

Chris Ritchie
Director
Industry Assessments
as delegate of the Planning Secretary

PO Box 453, Deniliquin NSW 2710
8-20 Edwardes Street
Deniliquin, NSW 2710
www.waternsw.com.au
ABN 21 147 934 787

28 June 2018

Executive Director
Planning Services
Department of Planning and Environment
PO Box 39
Sydney NSW 2000

Contact: Simone Tonkin
Phone: 03 5898 3936
Email :simone.tonkin@waternsw.com.au
Our ref: F2018/284

Attn: Patrick Copas

Dear Mr Copas,

Re:SEARs ID No.1062 – Proposed Waste Management Facility,
Lot 11 DP 1130519, Lot 2 DP590756, Lot 1 DP771340,
Byrnes Road/Trahairs Road, BOMEN, Wagga Wagga.

WaterNSW has reviewed the supporting documentation accompanying the request for Secretary's Environmental Assessment Requirements (SEARs) and provides the following comments below, and further detail in **Attachment A**.

It is recommended that the EIS be required to include:

Access to surface and groundwater resources

- Annual volumes of surface water and groundwater proposed to be taken by the activity (including through inflow and seepage) from each surface and groundwater source as defined by the relevant water sharing plan.
- Assessment of any volumetric water licensing requirements (including those for ongoing water take following completion of the project).
- Assessment of the impact and approvals (Works and Use Approvals under the WMA 2000) required for the taking or storage of water.
- The identification of an adequate and secure water supply for the life of the project. Confirmation that water can be sourced from an appropriately authorised and reliable supply. This is to include an assessment of the current market depth where water entitlement is required to be purchased.
- A detailed and consolidated site water balance.

Impact on surface and groundwater resources

- Assessment of impacts on surface and ground water sources (both quality and quantity), related infrastructure, adjacent licensed water users, basic landholder rights, watercourses, riparian land, and groundwater dependent ecosystems, and measures proposed to reduce and mitigate these impacts.
- Full technical details and data of all surface and groundwater modelling.
- Proposed surface and groundwater monitoring activities and methodologies.
- Proposed management and disposal of produced or incidental water

Flooding

WaterNSW is responsible for the management and licensing of flood work approvals.

If the proposal is for an earthwork, embankment or levee, wherever situated or proposed to be constructed that is reasonably likely to affect the flow of water to or from a river or lake then the assessment is required to address potential impacts detailed further in attachment A.

NOTE:

Please note there are some minor changes to advice that was provided in 2016. These changes are reflective of Water Regulation transferring from DPI to WaterNSW.

WaterNSW is now the leading agency responsible for regulating surface and groundwater in NSW since 1 July 2016. WaterNSW administers approvals under the Water Management Act 2000 *that are subject to integrated development provisions of the* Environmental Planning & Assessment Act 1979 (EP&A Act)*.*

The following works require water supply work approvals from WaterNSW:

- *Water pump or water bore contracted for taking water from a water source, including temporary dewatering purposes.*
- *A tank, dam or weir constructed for capturing, impounding or storing water.*
- *Water pipe or irrigation channel constructed for conveying water.*
- *Bank or levee that could divert water flowing to or from a water source.*

The following works require flood work approvals from WaterNSW:

- *Barrage, causeway, cutting or embankment that is situated in or near a river, estuary, lake or within floodplain and is likely to influence the flow of water to or from a river, estuary or lake or the distribution or flow of floodwater in times of flood.*

All other works (e.g. controlled activities) remain the responsibility of Department of Industry.

Please direct any questions or correspondence to **Simone Tonkin at simone.tonkin@waternsw.com.au**.

Yours sincerely

Simone Tonkin
Water Regulation Officer
Customer and Community
WaterNSW

ATTACHMENT A

WaterNSW General Assessment Requirements

The following detailed assessment requirements are provided to assist in adequately addressing the assessment requirements for this proposal.

For further information visit the website, www.water.nsw.gov.au

Key Relevant Legislative Instruments

This section provides a basic summary to aid proponents in the development of an Environmental Impact Statement (EIS), and should not be considered a complete list or comprehensive summary of relevant legislative instruments that may apply to the regulation of water resources for a project.

The EIS should take into account the objects and regulatory requirements of the *Water Management Act 2000* (WMA 2000), and associated regulations and instruments, as applicable.

Water Management Act 2000 (WMA 2000)
Key points:

- Volumetric licensing in areas covered by water sharing plans
- Works within 40m of waterfront land
- SSD & SSI projects are exempt from requiring water supply work approvals and controlled activity approvals as a result of the *Environmental Planning & Assessment Act 1979 (EP&A Act)*.
- No exemptions for volumetric licensing apply as a result of the *EP&A Act*.
- Basic landholder rights, including harvestable rights dams
- Aquifer interference activity approval and flood management work approval provisions have not yet commenced and are regulated by the *Water Act 1912*
- Maximum penalties of $2.2 million plus $264,000 for each day an offence continues apply under the *WMA 2000*

Water Management (General) Regulation 2011
Key points:

- Provides various exemptions for volumetric licensing and activity approvals
- Provides further detail on requirements for dealings and applications.

Water Sharing Plans – these are considered regulations under the *WMA 2000*

Access Licence Dealing Principles Order 2004

Harvestable Rights Orders

Water Sharing Plans

It is important that the proponent understands and describes the ground and surface water sharing plans, water sources, and management zones that apply to the project. The relevant water sharing plans can be determined spatially at www.ourwater.nsw.gov.au. Multiple water sharing plans may apply and these must all be described.

The EIS is required to:

- Demonstrate how the proposal is consistent with the relevant rules of the Water Sharing Plan including rules for access licences, distance restrictions for water supply works and rules for the management of local impacts in respect of surface water and groundwater sources, ecosystem protection (including groundwater dependent ecosystems), water quality and surface-groundwater connectivity.

- Provide a description of any site water use (amount of water to be taken from each water source) and management including all sediment dams, clear water diversion structures with detail on the location, design specifications and storage capacities for all the existing and proposed water management structures.
- Provide an analysis of the proposed water supply arrangements against the rules for access licences and other applicable requirements of any relevant WSP, including:
    - Sufficient market depth to acquire the necessary entitlements for each water source.
    - Ability to carry out a "dealing" to transfer the water to relevant location under the rules of the WSP.
    - Daily and long-term access rules.
    - Account management and carryover provisions.
- Provide a detailed and consolidated site water balance.
- Further detail on licensing requirements is provided below.

Relevant Policies and Guidelines

The EIS should take into account the following policies (as applicable):

- NSW Guidelines for Controlled Activities on Waterfront Land (NOW, 2012)
- NSW Aquifer Interference Policy (NOW, 2012)
- Risk Assessment Guidelines for Groundwater Dependent Ecosystems (NOW, 2012)
- Australian Groundwater Modelling Guidelines (NWC, 2012)
- NSW State Rivers and Estuary Policy (1993)
- NSW Wetlands Policy (2010)
- NSW State Groundwater Policy Framework Document (1997)
- NSW State Groundwater Quality Protection Policy (1998)
- NSW State Groundwater Dependent Ecosystems Policy (2002)
- NSW Water Extraction Monitoring Policy (2007)

Policies can be accessed at the following links:
http://www.water.nsw.gov.au/Water-management/Law-and-policy/Key-policies/default.aspx
http://www.water.nsw.gov.au/Water-licensing/Approvals/Controlled-activities/default.aspx

An assessment framework for the NSW Aquifer Interference Policy can be found online at: http://www.water.nsw.gov.au/Water-management/Law-and-policy/Key-policies/Aquifer-interference.

Licensing Considerations

The EIS is required to provide:

- Identification of water requirements for the life of the project in terms of both volume and timing (including predictions of potential ongoing groundwater take following the cessation of operations at the site – such as evaporative loss from open voids or inflows).
- Details of the water supply source(s) for the proposal including any proposed surface water and groundwater extraction from each water source as defined in the relevant Water Sharing Plan/s and all water supply works to take water.
- Explanation of how the required water entitlements will be obtained (i.e. through a new or existing licence/s, trading on the water market, controlled allocations etc.).

- Information on the purpose, location, construction and expected annual extraction volumes including details on all existing and proposed water supply works which take surface water, (pumps, dams, diversions, etc).
- Details on all bores and excavations for the purpose of investigation, extraction, dewatering, testing and monitoring. All predicted groundwater take must be accounted for through adequate licensing.
- Details on existing dams/storages (including the date of construction, location, purpose, size and capacity) and any proposal to change the purpose of existing dams/storages
- Details on the location, purpose, size and capacity of any new proposed dams/storages.
- Applicability of any exemptions under the *Water Management (General) Regulation 2011* to the project.

Water allocation account management rules, total daily extraction limits and rules governing environmental protection and access licence dealings also need to be considered.

The Harvestable Right gives landholders the right to capture and use for any purpose 10 % of the average annual runoff from their property. The Harvestable Right has been defined in terms of an equivalent dam capacity called the Maximum Harvestable Right Dam Capacity (MHRDC). The MHRDC is determined by the area of the property (in hectares) and a site-specific run-off factor. The MHRDC includes the capacity of all existing dams on the property that do not have a current water licence. Storages capturing up to the harvestable right capacity are not required to be licensed but any capacity of the total of all storages/dams on the property greater than the MHRDC may require a licence.

For more information on Harvestable Right dams, including a calculator, visit: http://www.water.nsw.gov.au/Water-licensing/Basic-water-rights/Harvesting-runoff/Harvesting-runoff

Dam Safety

Where new or modified dams are proposed, or where new development will occur below an existing dam, the NSW Dams Safety Committee should be consulted in relation to any safety issues that may arise. Conditions of approval may be recommended to ensure safety in relation to any new or existing dams.

See www.damsafety.nsw.gov.au for further information.

Surface Water Assessment

The predictive assessment of the impact of the proposed project on surface water sources should include the following:

- Identification of all surface water features including watercourses, wetlands and floodplains transected by or adjacent to the proposed project.
- Identification of all surface water sources as described by the relevant water sharing plan.
- Detailed description of dependent ecosystems and existing surface water users within the area, including basic landholder rights to water and adjacent/downstream licensed water users.
- Description of all works and surface infrastructure that will intercept, store, convey, or otherwise interact with surface water resources.
- Assessment of predicted impacts on the following:
    - flow of surface water, sediment movement, channel stability, and hydraulic regime,

- water quality,
- flood regime,
- dependent ecosystems,
- existing surface water users, and
- planned environmental water and water sharing arrangements prescribed in the relevant water sharing plans.

Flooding

If the proposal is for an earthwork, embankment or levee, wherever situated or proposed to be constructed that is reasonably likely to affect the flow of water to or from a river or lake then the assessment is required to address potential impacts detailed below;

- the contents of any relevant floodplain management plan or any other relevant Government policy,
- the need to maintain the natural flood regimes in wetlands and related ecosystems and the preservation of any habitat, animals (including fish) or plants that benefit from periodic flooding,
- the effect or likely effect on water flows in downstream river sections,
- any geographical features, or other matters, of Aboriginal interest that may be affected by a controlled work,
- the effect or likely effect of a controlled work on the passage, flow and distribution of any flood waters,
- the effect or likely effect of a controlled work on existing dominant flood ways or exits from flood ways, rates of flow, flood water levels and the duration of inundation,
  the protection of the environment

Groundwater Assessment

To ensure the sustainable and integrated management of groundwater sources, the EIS needs to include adequate details to assess the impact of the project on all groundwater sources including:

- Works likely to intercept, connect with or infiltrate the groundwater sources.
- Any proposed groundwater extraction, including purpose, location and construction details of all proposed bores and expected annual extraction volumes.
- Bore construction information is to be supplied to DPI Water by submitting a “Form A” template. DPI Water will supply “GW” registration numbers (and licence/approval numbers if required) which must be used as consistent and unique bore identifiers for all future reporting.
- A description of the water table and groundwater pressure configuration, flow directions and rates and physical and chemical characteristics of the groundwater source (including connectivity with other groundwater and surface water sources).
- Sufficient baseline monitoring for groundwater quantity and quality for all aquifers and GDEs to establish a baseline incorporating typical temporal and spatial variations.
- The predicted impacts of any final landform on the groundwater regime.
- The existing groundwater users within the area (including the environment), any potential impacts on these users and safeguard measures to mitigate impacts.
- An assessment of groundwater quality, its beneficial use classification and prediction of any impacts on groundwater quality.

- An assessment of the potential for groundwater contamination (considering both the impacts of the proposal on groundwater contamination and the impacts of contamination on the proposal).
- Measures proposed to protect groundwater quality, both in the short and long term.
- Measures for preventing groundwater pollution so that remediation is not required.
- Protective measures for any groundwater dependent ecosystems (GDEs).
- Proposed methods of the disposal of waste water and approval from the relevant authority.
- The results of any models or predictive tools used.

Where potential impact/s are identified the assessment will need to identify limits to the level of impact and contingency measures that would remediate, reduce or manage potential impacts to the existing groundwater resource and any dependent groundwater environment or water users, including information on:

- Any proposed monitoring programs, including water levels and quality data.
- Reporting procedures for any monitoring program including mechanism for transfer of information.
- An assessment of any groundwater source/aquifer that may be sterilised from future use as a water supply as a consequence of the proposal.
- Identification of any nominal thresholds as to the level of impact beyond which remedial measures or contingency plans would be initiated (this may entail water level triggers or a beneficial use category).
- Description of the remedial measures or contingency plans proposed.
- Any funding assurances covering the anticipated post development maintenance cost, for example on-going groundwater monitoring for the nominated period.

Groundwater Dependent Ecosystems

The EIS must consider the potential impacts on any Groundwater Dependent Ecosystems (GDEs) at the site and in the vicinity of the site and:

- Identify any potential impacts on GDEs as a result of the proposal including:
  - the effect of the proposal on the recharge to groundwater systems;
  - the potential to adversely affect the water quality of the underlying groundwater system and adjoining groundwater systems in hydraulic connections; and
  - the effect on the function of GDEs (habitat, groundwater levels, connectivity).
- Provide safeguard measures for any GDEs.

Watercourses, Wetlands and Riparian Land

The EIS should address the potential impacts of the project on all watercourses likely to be affected by the project, existing riparian vegetation and the rehabilitation of riparian land. It is recommended the EIS provides details on all watercourses potentially affected by the proposal, including:

- Scaled plans showing the location of:
  - wetlands/swamps, watercourses and top of bank;
  - riparian corridor widths to be established along the creeks;
  - existing riparian vegetation surrounding the watercourses (identify any areas to be protected and any riparian vegetation proposed to be removed);

  - the site boundary, the footprint of the proposal in relation to the watercourses and riparian areas; and
  - proposed location of any asset protection zones.
- Photographs of the watercourses/wetlands and a map showing the point from which the photos were taken.
- A detailed description of all potential impacts on the watercourses/riparian land.
- A detailed description of all potential impacts on the wetlands, including potential impacts to the wetlands hydrologic regime; groundwater recharge; habitat and any species that depend on the wetlands.
- A description of the design features and measures to be incorporated to mitigate potential impacts.
- Geomorphic and hydrological assessment of water courses including details of stream order (Strahler System), river style and energy regimes both in channel and on adjacent floodplains.
- Works on waterfront land may be subject to Controlled Activity Approval (CAA) under the *Water Management Act 2000. This is managed by DPI Water.* Further information can be obtained from the DPI Water's website:
  www.water.nsw.gov.au Water licensing › Approvals › Controlled activities

Drill Pad, Well and Access Road Construction

- Any construction activity within 40m of a watercourse, should be designed by a suitably qualified person, consistent with the NSW *Guidelines for Controlled Activities on Waterfront Land* (July 2012).
- Construction of all wells must be undertaken in accordance with the *Minimum Construction Requirements for Water Bores in Australia* (3rd edition 2012) by a driller holding a bore drillers' licence valid in New South Wales.
- The length of time that a core hole is maintained as an open hole should be minimised.

Landform rehabilitation (including final void management)

Where significant modification to landform is proposed, the EIS must include:

- Justification of the proposed final landform with regard to its impact on local and regional surface and groundwater systems;
- A detailed description of how the site would be progressively rehabilitated and integrated into the surrounding landscape;
- Outline of proposed construction and restoration of topography and surface drainage features if affected by the project;
- Detailed modelling of potential groundwater volume, flow and quality impacts of the presence of an inundated final void (where relevant) on identified receptors specifically considering those environmental systems that are likely to be groundwater dependent;
- An outline of the measures to be put in place to ensure that sufficient resources are available to implement the proposed rehabilitation; and
- The measures that would be established for the long-term protection of local and regional aquifer systems and for the ongoing management of the site following the cessation of the project.

Consultation and general enquiries
General licensing enquiries can be made to Advisory Services:
water.enquiries@waternsw.com.au, 1800 353 104.

Assessment or state significant development enquiries, or requests for review or consultation should be directed to the Strategic Stakeholder Liaison Unit, water.referrals@dpi.nsw.gov.au.

A consultation guideline and further information is available online at:
www.water.nsw.gov.au/water-management/law-and-policy/planning-and-assessment

End Attachment A

Patrick Copas

From: Craig Bretherton
Sent: Thursday, 28 June 2018 8:01 PM
To: Patrick Copas
Subject: HPE CM: FW: SEAR 1062 - Waste Management Facility (Landfill) - Byrnes Road, Bomen - Wagga Wagga LGA - SEAR Review
Attachments: FORM A SEAR 1062.pdf; SEARs 1062 Signed - Combined.pdf

Categories: No Comment, SEAR Response

Hi Patrick

I confirm the EPA's comments remain applicable to the current proposal, and we have no additional requirements.

Thanks

Craig Bretherton
Manager Regional Operations
Riverina Far West Region
South & West Branch, NSW Environment Protection Authority
☎ 02 6969 0700 Mobile ☎ 0427 223 516
craig.bretherton@epa.nsw.gov.au www.epa.nsw.gov.au @EPA_NSW
Report pollution and environmental incidents 131 555 (NSW only) or +61 2 9995 5555
Please send all official electronic correspondence to riverina.farwest@epa.nsw.gov.au

Patrick Copas

From: MORGAN Maurice W <Maurice.MORGAN@rms.nsw.gov.au>
Sent: Friday, 6 July 2018 9:36 AM
To: Patrick Copas
Cc: Development South West
Subject: HPE CM: RE: SEAR 1062 - Waste Management Facility (Landfill) - Byrnes Road, Bomen - Wagga Wagga LGA - SEAR Review

Categories: No Comment, SEAR Response

Patrick

Roads and Maritime Services has reviewed this request and advises that as the circumstances for the development, the subject site or surrounding road network have not changed that the previous comments submitted in respect to the request for Environmental Assessment Requirements remain applicable.

If you have questions regarding this response please contact the me on the detail below

Regards

Maurice Morgan
Manager Land Use
Regional & Freight
T 02 6923 6611 **M** 0428 471 824
www.rms.nsw.gov.au

Every journey matters

Roads and Maritime Services
193-195 Morgan Street, Wagga Wagga NSW 2650

Patrick Copas

From: Miranda Kerr
Sent: Monday, 9 July 2018 1:35 PM
To: Patrick Copas
Cc: Andrew Fisher
Subject: HPE CM: SEAR 1062 - Bomen Waste facility - reissue of SEARs

Categories: Agency Response, SEAR Response

Hi Patrick

Our CM9 record of the request for OEH comments about re-issue of the Bomen waste facility (SEAR 1062) has been compromised, so I'm guessing that the response is to you. Please let me know if I need to contact someone else.

The OEH response letter to DPE dated 22 July 2016 still applies and we have nothing to add. While transitional arrangements apply to biodiversity certification of the Wagga Wagga LEP from the *Threatened Species Conservation Act 1995* to the *Biodiversity Conservation Act 2016*, our previous advice about biodiversity assessment is still relevant.

Regards
Miranda

NSW GOVERNMENT Office of Environment & Heritage

Miranda Kerr
A/ Senior Team Leader
Planning, South West Branch
Regional Operations Division

Level 2, 512 Dean St, Albury
PO Box 1040, Albury NSW 2640
T 02 6022 0607 **M** 0407 752 822

Contact the Office of Environment and Heritage (OEH) South West Planning Team about biodiversity and Aboriginal cultural heritage planning and regulation matters by emailing rog.southwest@environment.nsw.gov.au.

Patrick Copas

From: Will Mayes
Sent: Tuesday, 21 August 2018 12:22 PM
To: Patrick Copas
Subject: RE: SEAR 1062 - Waste Management Facility (Landfill) - Byrnes Road, Bomen - Wagga Wagga LGA - SEAR Review - DPE Southern Office

Hi Patrick,

Apologies for the delayed response. It would be appreciated if the SEARs can be updated to require that the EIS have regard to the Riverina Murray Regional Plan 2036, Wagga Wagga Spatial Plan 2013-43 and the Bomen Strategic Master Plan 2009.

Thanks again for the opportunity to comment.

Will

Will Mayes
Planning Officer
Queanbeyan
Southern Region
02 8275 1050
will.mayes@planning.nsw.gov.au

APPENDIX B PLANS OF THE PROPOSAL

APPENDIX C CONSULTATION

NEWS

Landfill talks intensifying near Bomen

COMMUNITY leaders in the Eunony Valley have amped up their campaign against ongoing proposals for a waste facility and entertainment complex in Bomen, saying developers will be at liberty to dump "almost anything".

Eunony Valley Association president Mr Schulz believes developers cannot deliver their promise of a non-odorous landfill.

"They've got a licence for non-putrescible waste but that includes bricks, lead paint, metal and basically anything other than asbestos and food-based waste," Mr Schulz said.

"That beautiful warm fuzzy non-odorous and no dust scenario just isn't possible when you're putting in stuff like that."

Mr Schulz also rubbished plans for the entertainment facility, arguing the allocated space would be ill-suited to large crowds, and acussed developers of not communicating. However, site developer Chris Egan strongly refuted the claim.

"We received positive feedback from our community consultations and anyone is at liberty to provide feedback in writing," Mr Egan said.

"We have made an offer to Bill Schulz to meet with our team and we want people to understand that project will be done in accordance with the EPA."

Mr Egan rubbished claims the Eunony Valley would be affected by runoff water, saying the development plans were "entirely safe".

"For starters, our plans incorporate a complete sub-landfill drainage system and water is captured on-site and dealt with there. The cost is extraordinary and this project will be done at a world class standard."

– LACHLAN GREY

LONG ROAD: Wagga mother Lisa Saffery - pictured with the late Sarah Williams and their son Yarrul Saffery - s Australia's response to the same-sex marriage postal survey was a step in the right direction.

Lisa's hope: 'It is what Australia want

LISA Saffery was shaking when she heard the news; Australia had voted "yes".

For the mother-of-two, the result of the same-sex marriage postal survey was a "two-sided coin" and a long time coming.

Ms Saffery's late partner, Sarah, had died before she could wed the love of her life.

The Wagga woman said she hoped somewhere, Sarah was watching.

"As an Aboriginal woman, she wanted to see same-sex marriage legalised in her home country but she had to watch privileged, predominantly white males make decisions," Ms Saffery said.

"On the other side of the coin, for the first time in a long time, I've met a very with a beautiful woman, who there may be potential (to wed) in future."

After a gruelling few months of lobbying – "bringing out the best and worst in people" – Ms Saff there was still a lo ahead.

However, she ho survey's result wou step in the right direc

"This is what A wants," she said.

"This is our life, o ners, our security."

Public Notices

Wagga Wagga City Council

Looking for Wagga Wagga City Council information?

Refer to the Council News feature located in the news section of this newspaper to find Wagga Wagga City Council public notices, job ads and community information in the one place - every week.

Council News

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RM2244385

Public Notices

Community Consultation

North Ridge Materials Facility, Trahairs Road, Bomen, Via Wagga Wagga

NGH Environmental are preparing an Environmental Impact Statement (EIS) for the proposed North Ridge Materials Facility. The proposed facility will transform and reuse a past wool scour effluent evaporation pond on Trahairs Road. If approved the pond would be converted to a solid waste landfill. As part of the EIS NGH Environmental are consulting with agencies and the Bomen Community including residents. The facility's proponents want to understand the thoughts of surrounding landowners and occupiers.

A meeting will be held at the Wagga Wagga City Council chambers at 6pm Tuesday 24 October 2017.

A brief presentation will commence at 6pm and finish at 6.30pm. One-on-one consultation will be available to interested parties between 6.30pm and 7pm.

For more information contact

michial.s@nghenvironmental.com.au or 02 6923 1532.

Tenders

LAND FOR SALE
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Divided into three paddocks,two dams with good holding.
New feral fence on Forest Boundary 1.1km.
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Mailing GA Purcell
4200 Canola Way Ganmain 2702

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Tender No. 02-17/18: Villages Sewerage Scheme – Installation of Reticulation and On Property Works
- Contact: Bernard Maxwell on 02 6962 8100
- Closing: 09/11/17 2.00pm NSW

Unless otherwise stated, tender documents are available for download free of charge. Contractors wishing to respond to this tender will find the full details including contacts at the URL below.

www.tenderlink.com/griffith

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NEWS

Eunony resident fears for region's 'livelihood'

BY LACHLAN GREY

A WINEMAKER in the Eunony Valley region has expressed serious concerns over the impact of tainted water from dump sites leaking into waterways and properties north-east of Wagga Wagga.

It comes as the wider Eunony Valley community continues to discuss ongoing development proposals for a Bomen waste management facility.

Some residents, including Eunonyhareenya Wines proprietor Jan Pollard, believe proposed developments at the old Wool Combing Facility, including the conversion of effluent evaporation ponds into a dumping ground for recycled and non-odorous materials, will have serious implications for the surrounding region.

Mrs Pollard attended a community meeting on Monday alongside roughly 40 other Eunony locals and said people were "concerned about their livelihoods".

"We're all concerned about what we're growing out here and what will happen in the future," she said.

It's nice of the developers to say the waste is non-toxic but we still don't really know what's going into the area and how it will affect us."

Site owner Chris Egan has previously flagged the proposed dump as non-odorous and told *The Daily Advertiser* it was in an ideal location far away from residential properties.

However Mrs Pollard believes the real problems are the ones less easily spotted.

"My major concerns are for what you can't see," she said.

POINT OF VIEW: Eunony Valley winemaker Jan Pollard points towards the gentle rise where a proposed landfill for non-odorous materials may be placed. Mrs Pollard believes the runoff water could affect the entire valley.

"In storms, those ponds they're planning on using will get flooded and all the water could run down and affect the whole valley.

"Those ponds have been sitting there toxic for 20 years, so who knows what's in them or what's been leeching out into the ground?"

Ms Pollard said she would support the initiative if it was further away and didn't impact on people's waterways and properties.

"Sure, this kind of thing would be fine if it were in a disused dam in the middle of nowhere," she said,

"But to my understanding, water runs down off that ridge through the valley so I can see why people are up in arms about it."

"That runoff water is only going one way and that's a direct route into the river."

Water isn't the only concern with the Pollard residence conscious of noise pollution from any on-site machinery at the proposed landfill.

"Quite often on a Thursday, I can hear the agents taking bids at the saleyards (roughly seven kilometres away," Mrs Pollard said.

"Imagine the sounds of trash compactors out there 5 days a week in our own backyard.

"That'll impact everyone's ears."

James Lamerton

LifeSpan launch likely in February

A GROUND-BREAKING suicide prevention program is on track to be introduced into the Wagga region in February.

The first meeting of the LifeSpan collective, the body which is overseeing the introduction into the Murrumbidgee Primary Health Network's area, was held last week.

LifeSpan, which has already been introduced in three other regions, is being described as a new, evidence-based approach to suicide prevention and combines nine strategies distinct into one community-led approach and aims to prevent 20 per cent of suicide deaths and 30 per cent of suicide attempts.

"The strength of the LifeSpan model is that it can be individually tailored to meet the needs in any local community," James Lamerton, chief executive officer of Murrumbidgee Primary Health Network said.

If you need help, you can call beyondblue on 1300 224 636; Lifeline on 13 11 14; or the Kids Help Line on 1800 551 800.

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Community Consultation

North Ridge Materials Facility, Trahairs Road, Bomen, Via Wagga Wagga

NGH Environmental are preparing an Environmental Impac Statement (EIS) for the proposed North Ridge Materials Facility The proposed facility will transform and reuse a past wool scou effluent evaporation pond on Trahairs Road. If approved the pon would be converted to a solid waste landfill. As part of the EI NGH Environmental are consulting with agencies and the Bome Community including residents. The facility's proponents want t understand the thoughts of surrounding landowners an occupiers.

A meeting will be held at the Wagga Wagga City Counci chambers at 6pm Tuesday 24 October 2017.

A brief presentation will commence at 6pm and finish at 6.30pm One-on-one consultation will be available to interested partie between 6.30pm and 7pm.

For more information contact

✉ michial.s@nghenvironmental.com.au or ☎ 02 6923 1532.

26 September 2018

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(po box 5464)
wagga wagga nsw 2650
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f 02 6971 9693

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newcastle west nsw 2302
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sydney
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21 mary st
surry hills nsw 2010
t 02 8202 8333

ngh@nghenvironmental.com.au
www.nghenvironmental.com.au

Dear Resident,

RE – Proposed North Ridge Materials Facility

As a near neighbour, we are writing to invite you to attend a community consultation session for the proposed North Ridge Materials Facility on Trahairs Road, Bomen.

NGH Environmental has been engaged to prepare the Environmental Impact Statement (EIS) for the proposed development to assess and address the potential environmental impacts.

The session will provide the community with updated details of the proposal and address issues raised at the previous meeting. There will also be the opportunity to raise any new matters for NGH to consider in the Environmental Impact Statement (EIS).

The session will be held at the Wagga Wagga City Council Chambers on Thursday 4 October 2018 commencing at 6pm. A presentation by NGH will extend for approximately 30 minutes, followed by the opportunity for one-on-one discussions with any interested parties. The session will conclude at 7.15pm.

Key elements of the proposed activity include:

- The use of an existing effluent evaporation pond for a General Solid Waste facility (non-putrescible waste).
- The majority of all works would remain within the existing pond footprint,
- A hardstand area for screening of waste and the office (transportable building).
- Reshaping of existing upslope earthen drains to prevent surface runoff reaching the waste cells.
- Lining of the proposed waste cell, sub-surface drainage systems and a leachate evaporation and management pond designed, constructed and operated to the NSW EPA's *Environmental Guidelines - Solid Waste Landfills* (2016).
- Progressive rehabilitation of the site with annual grasses once sub-cells are capped.
- Management and reuse of all surface water captured on-site.

A map of the proposed layout is included as an attachment to this letter.

If you are unable to attend but would like to opportunity to provide written comment, please refer to the attached form. Should you require any further information please contact me on 02 6923 1532 or via email at michial.s@nghenvironmental.com.au.

Yours sincerely,
NGH Environmental

Michial Sutherland
Manager, Riverina and Western NSW
Ph 02 6923 1532

Figure 1: Proposed layout

NORTH RIDGE MATERIALS FACILITY
COMMUNITY CONSULTATION FEEDBACK FORM

Your opinion is important to the design and environmental assessment of the proposed general solid 'non-putrescible' waste facility. Voicing your opinion will ensure:

- local concerns are understood by the proponent and the assessment team;
- all relevant matters that may have an impact are identified, investigated and mitigated if required.

The feedback will be compiled and used in the project assessment. Contact details will be withheld and your identity kept anonymous. Only nominated organisations and geographic information will be used in collating the feedback.

Please provide your completed form to NGH.

For further information about the project, contact Michial Sutherland michial.s@nghenvironmental.com.au.

Name:

Organisation (if relevant):

Contact details:

Telephone:

Email Address:

Address:

Tick which box best describes where you live (please refer to map on page 3):

☐ Less than 2 km from the proposed waste facility

☐ 2-3 km from the proposed waste facility

☐ More than 3 km from the proposed waste facility

☐ Not a local member of the community

What do you value most about the local area? Circle one or more.

a) Views

b) Community / family ties

c) Historic values

d) Work opportunities

e) Recreation opportunities, including sporting, nature based etc.

f) Other

Comment:

……

……

……

How do you feel about solid waste facilities generally? Circle one.

1. Very Positive 2. Positive 3. Neutral 4. Negative 5. Very Negative

What concerns do you have about solid waste facilities generally? Circle one or more.

a) Community impacts b) Visual impact

c) Noise, during construction or operation d) Traffic, during construction or operation

e) Effects on land use or land values f) Effects on recreation opportunities

g) Effects on natural areas and habitats h) Air quality

i) Other

How do you feel about this proposal, a solid waste facility, located in a historic evaporation pond? Circle one.

1. Very Positive 2. Positive 3. Neutral 4. Negative 5. Very Negative

What specific concerns do you have about this proposal?

……

……

……

……

What do you feel is positive about this proposal?

.....

.....

.....

.....

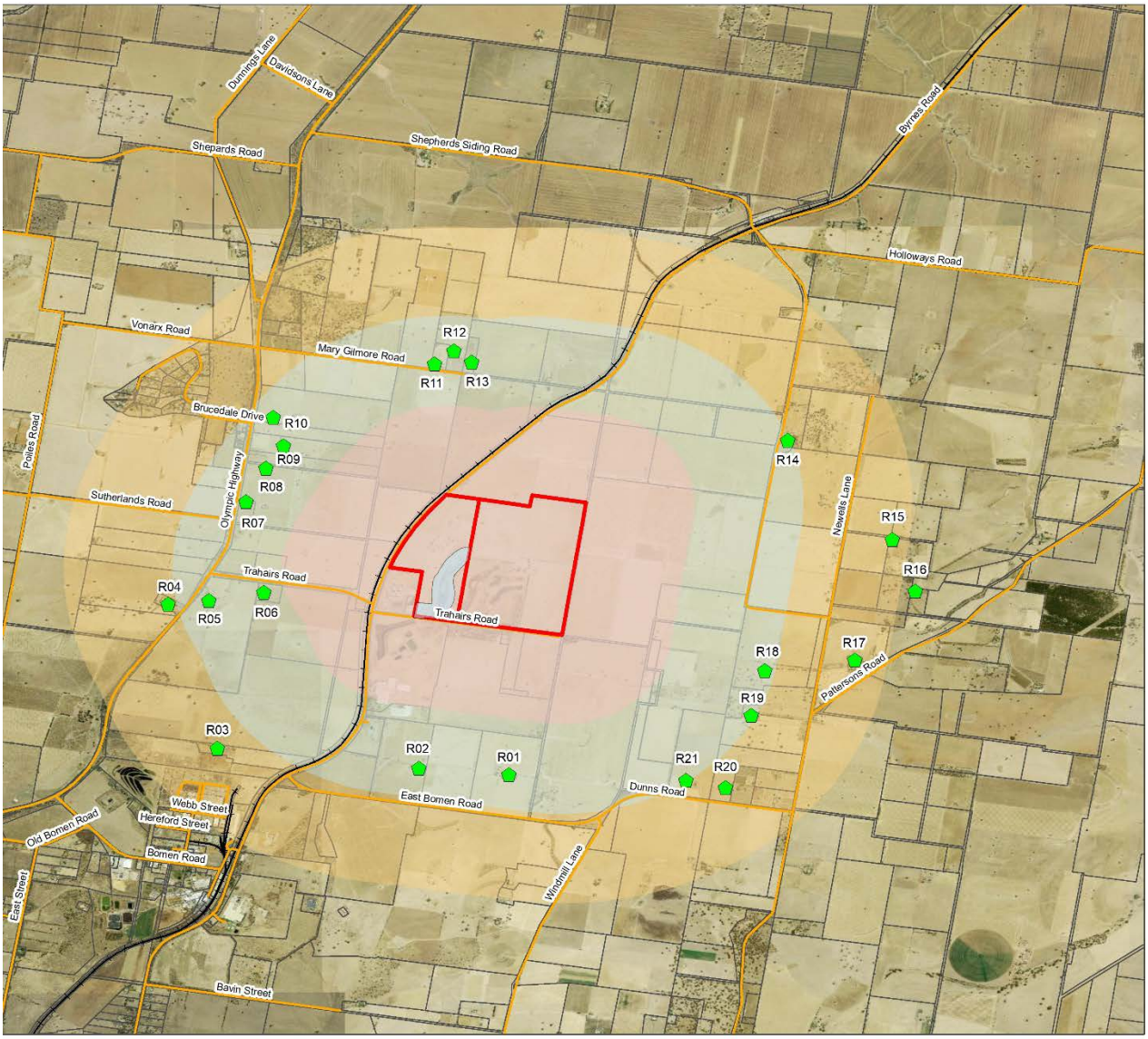
Do you have any other comments?

.....

.....

.....

.....



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KOORINGAL, 174 Lake Albert Rd. Downsizing. Tools, camping, furniture, Fuphy

☐ VISIT ☐ VISITED

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COMMUNITY CONSULTATIO
NORTH RIDGE MATERIAL FACI
TRAHAIRS ROAD BOMEN,
VIA WAGGA WAGGA

NGH Environmental are prepar Environmental Impact Statement (EIS proposed North Ridge Materials Faci proposed facility will transform and past wool scour effluent evaporation Trahairs Road. If approved, the pond be converted to a solid waste landfill.

As part of the EIS, NGH Environmer consulting with agencies and the Community. This will be the community consultation meeting f proposed facility. The meeting will a issues raised from the initial consultati updated details of the facility.

The meeting will be held at the Wagga City Council chambers at 6 pm Thurs October 2018.

A brief presentation will commence at and finish at 6.30 pm. One on consultation will be available to inter parties between 6.30 pm and 7.15 pm.

For more information contact michial.S@nghenvironmental.com.a or phone 02 6923 1532

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COMMUNITY CONSULTATION
NORTH RIDGE MATERIAL FACILITY
TRAHAIRS ROAD BOMEN,
VIA WAGGA WAGGA

NGH Environmental are preparing an Environmental Impact Statement (EIS) for the proposed North Ridge Materials Facility. The proposed facility will transform and reuse a past wool scour effluent evaporation pond on Trahairs Road. If approved, the pond would be converted to a solid waste landfill.

As part of the EIS, NGH Environmental are consulting with agencies and the Bomen Community. This will be the second community consultation meeting for the proposed facility. The meeting will address issues raised from the initial consultation and updated details of the facility.

The meeting will be held at the Wagga Wagga City Council chambers at 6 pm Thursday 4 October 2018.

A brief presentation will commence at 6 pm and finish at 6.30 pm. One on one consultation will be available to interested parties between 6.30 pm and 7.15 pm.

For more information contact
michial.S@nghenvironmental.com.au
or phone 02 6923 1532

RM6452957
22/09/2018 - PUBLIC NOTICES

Quit Cigarettes

ngh environmental

8 January 2019

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21 mary st
surry hills nsw 2010
t 02 8202 8333

ngh@nghenvironmental.com.au
www.nghenvironmental.com.au

Dear Resident,

RE – Response to Feedback following the community meeting for the proposed North Ridge Materials Facility

Thank you to those who provided feedback regarding the proposed North Ridge Materials Facility. NGH received four responses after the 2017 information session and three responses after the 2018 information session.

The community feedback received to date is summarised in the table below. A response is provided or for more detailed information the section of the Environmental Impact Statement (EIS) that will soon be on display.

Feedback	Response / where addressed
No objections if the operators are acting within legislative requirements.	The facility has been designed and planned in accordance with the relevant NSW legislation and guidelines. The proposed operation of the facility will also meet the same.
Noise from extended hours of operation and trucks arriving throughout the night.	At this point in time the proposed development does not involve operation outside normal hours, 7am to 6pm Monday to Friday and 8.30am to 1.30pm Saturdays. No work is proposed for Sundays or Public Holidays. Any extension of operating hours would require approval by the Consent authority.
Location in the Murrumbidgee River catchment.	The facility is located within the Murrumbidgee River catchment but not within the flood plain or above the Murrumbidgee River aquifer. See section 6.2.3 of the EIS.
Potential impacts on down-gradient drainage lines, groundwater resources and the Murrumbidgee River.	The facility has been designed in accordance with the NSW EPA Guidelines for solid waste facilities. Clean water from upslope will be diverted around the facility (refer to section 3.2.3 of the EIS). Leachate generated on-site will be drained and held in designated leachate evaporation pond. Water from the waste handling areas will be directed to the leachate pond (refer to section 3.2.7 of the EIS). For information regarding the design components of the waste cell, rehabilitation and post-closure monitoring, refer to section 3.2 of the EIS. Also refer to Soils and Water section 6.2 of the EIS.
Registered bores in proximity to the proposal.	There are 12 bores in the development site and a further 40 licensed bores within 2 km of the proposal. Two are for stock, and stock and domestic, and located to the west and south-west respectively. Thirteen of these are monitoring bores within the ROBE facility. Twenty-one bores are located to the south of the proposal and four to the southeast.

Feedback	Response / where addressed
	The water management systems designed in accordance with the NSW EPA Guidelines for solid waste facilities will minimise or eliminate contamination of local groundwater. The groundwater interception scheme and ground water monitoring bores will allow groundwater quality to be monitored over the life of the project and beyond. Refer to Preliminary Site Investigation results (Appendix R of the EIS) and section 6.2.3 of the EIS.
Proposal location above aquifer.	The facility is located above a weathered and fractured granite aquifer. This aquifer has low flow rates slightly brackish water relative to the aquifer associated with the Murrumbidgee River Flood Plain. Water from the granite aquifer is generally suitable for stock water and limited garden watering due to its salinity, iron content and low supply rates. See Section 6.2.3 of the EIS.
Odour, noise and additional traffic.	The proposal is for a non-putrescible waste facility. Wastes classed as 'non-putrescible' by the NSW EPA should not emit offensive odours. Odour and noise modelling for the proposed facility indicate that emissions from the facility would not adversely impact the amenity of adjacent residences. Refer to sections 3.2.1 and 6.4 of the EIS. Noise modelling is in section 6.7 of the EIS. Traffic details are in section 6.8 of the EIS.
Fire risk.	A Fire Management Plan (FMP) would be prepared as part of the Operational Environmental Management Plan. The FMP would address the management of fire risk from on-site and offsite fires, the suppression of fires and the interaction of the facility with the Rural Fire Service. Fire impacts and mitigation measures are detailed in section 6.9 of the EIS.
Air quality if waste is dumped following refusal at facility.	The facility would only accept waste under contract by appointment. The facility would not be open to the general public.
The distance to the closest residential sensitive receiver.	Nearest residential sensitive receiver is around 1.25 km west of the western boundary. The facility would be screen from the residential property by the North South ridgeline adjacent Byrnes Road.
Availability of presentation material.	Please see minutes of the second community information session and SEARs made available in October 2018. Please forward a request if you would like this information.
Existing site environmental status.	In summary, the subject land contains three effluent evaporation ponds. Those ponds have a clay liner on the base and walls. The clay liner has a covering of greasy wool wax a long chain complex hydrocarbon, lanolin. Below the proposed facility is stockpiled soil and woodchip that also shows evidence of greasy wool wax content. Ground water below the site did not show evidence of contamination. A Preliminary Site

Feedback	Response / where addressed
	Investigation has been completed as a requirement of the SEARs and is Appendix R of the EIS.
Volume of daily cover required.	Estimated to be 4.5 m^3 per day at 150 mm thick. Unsuitable soil materials from construction would be stockpiled within the existing cell footprint for use as daily cover. Soil, rubble and glass received as waste will be stockpiled within the existing cell footprint for use as daily cover.
Clay liner support.	The leachate barrier has been designed in accordance with the NSW EPA Guidelines. See section 3.2.5 and 3.2.6 for details of the leachate barrier system and leachate collection system.
Current contaminants – soil and water.	The current upper effluent evaporation pond to be used as part of the proposal is currently dry. The current contaminants at the site are described in the Preliminary Site Investigation (Appendix R) and section 6.2 of the EIS.
Landfill final capacity.	The site is designed to have the capacity of around 630 000 m^3, see Section 3.2.2 of the EIS.
Landfill waste composition.	The facility is prosed to accept non-putrescible waste only including: • Building and demolition waste such as soil, sand, concrete, timber and plasterboard etc (not asbestos). • Plastic, wire, paper fibre, glass, lime and ash. • Crushed glass Section 3.2.1 of the EIS.
Traffic and landfill volume.	Traffic volumes are expected to be about 20 heavy vehicles and 20 light vehicles per day during construction and about 20 heavy vehicles and 20 light vehicles per day during operation. Traffic, transport and road safety is discussed in section 6.8 of the EIS. Proposed landfill volume is discussed in section 3.2.2 of the EIS.
Project purpose.	Section 2.1 of the EIS.
Proponent details.	Riverina Warehousing Solutions Pty Ltd. Further details available in section 1.2.1 of the EIS.

Please do not hesitate to contact me to further discuss the proposal.

Yours sincerely,

Michial Sutherland
Manager

02 6923 1532

NGH Environmental

APPENDIX D BACKGROUND SEARCH RESULTS

D.1 AUSTRALIAN SOIL RESOURCE INFORMATION SYSTEM

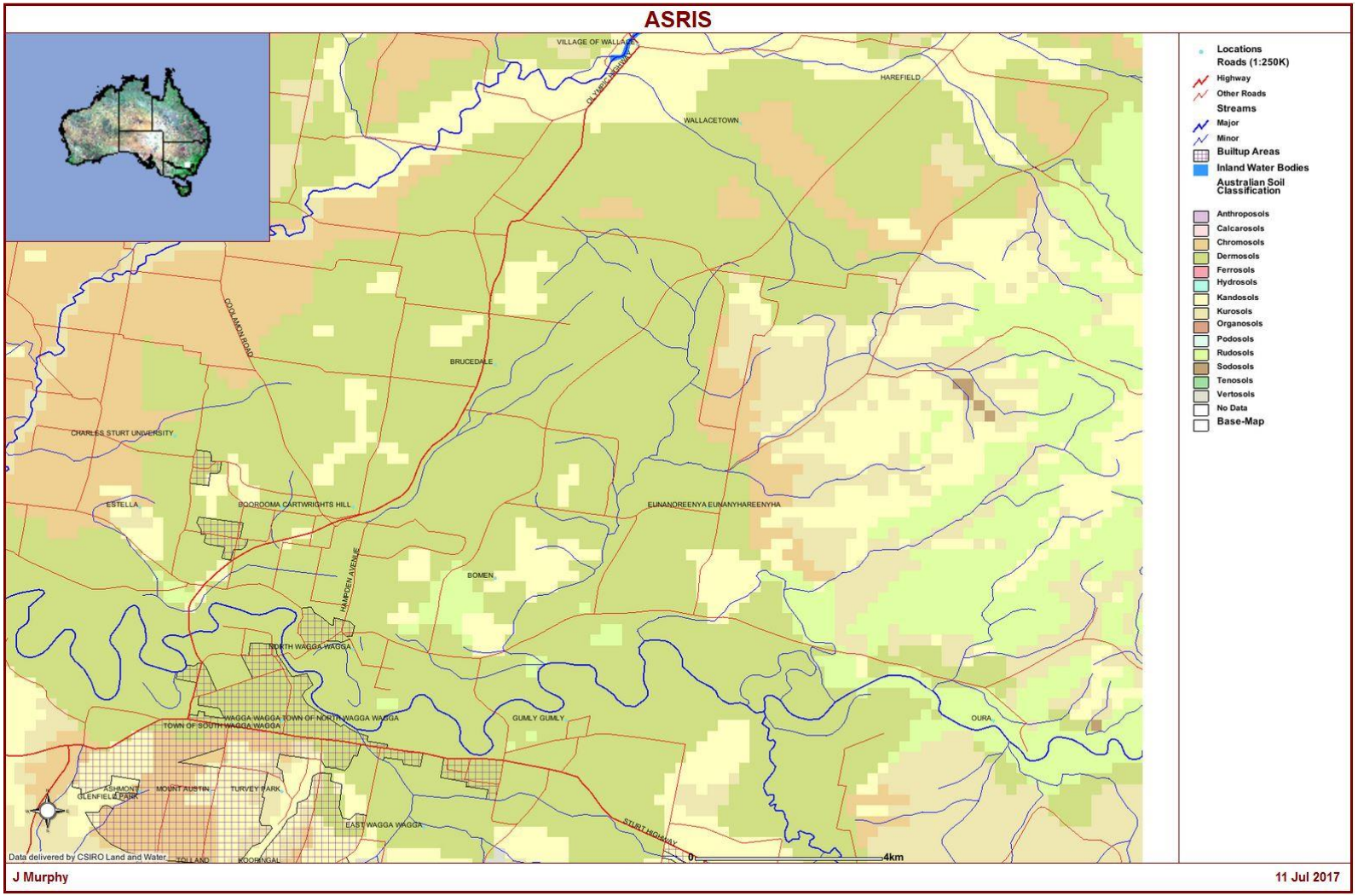

Figure 10-1 Soil classifications in locality from ASRIS.

D.2 OEH ESPADE

NSW SOIL AND LAND INFORMATION SYSTEM

Soil Essentials Report

SITE DETAILS

Site Location:	Site1
Map Reference:	MGA Grid Reference: Zone 55, 540713E, 6121685N. 8327 WAGGA WAGGA (1:100000) map sheet.
Profile Details:	Soils and vegetation of the Natural Gas pipeline, Section 5 Survey (1000121), Profile 1, collected by Mr Peter Barker on December 18, 1980
Physiography:	hillslope under dry sclerophyll forest on aeolian, fine-acidic lithology and used for improved pasture. Slope 1% (measured), elevation 212.0 m. Surface condition is hard set, profile drainage is imperfectly drained, erosion hazard is slight, and no salting evident
Soil Type:	Red Earth (GSG), Gn2.15 (PPF)
Base of observation:	
Profile Field Notes:	

SOIL DESCRIPTION

Layer 0

Layer 1

0.00 - 0.15 m A1 Horizon	brown (7.5YR 4/4) [moist] fine loamy sand with massive structure (earthy), abundant (>100/10x10cm) (Root size unknown), field pH is 6.0. Coarse fragments are sedimentary, pans are not evident, segregations are not evident; smooth clear (20-50 mm) boundary to ...

Layer 2

0.15 - 0.30 m A2 Horizon	(dark reddish brown) (5YR 3/6) [moist] fine sandy clay loam with massive structure (earthy), many (25-100/10x10cm) (Root size unknown), field pH is 6.0. Coarse fragments are few (2-10%), sedimentary, fine gravel (2-6 mm), pans are not evident, segregations are none, medium (2-6 mm), ferruginous; smooth clear (20-50 mm) boundary to ...

Layer 3

0.30 - 0.40 m B1 Horizon	(reddish brown) (5YR 4/8) [moist] fine sandy clay loam with massive structure (earthy), none (Root size unknown), field pH is 6.5. Coarse fragments are common (10-20%), quartz, gravel (6-20 mm), fine gravel (2-6 mm)common (10-20%), sedimentary, gravel (6-20 mm), fine gravel (2-6 mm), pans are not evident, segregations are very few (< 2%), fine (< 2 mm), ferruginous; smooth gradual (50-100 mm) boundary to ...

Layer 4

0.40 - 0.55 m B21 Horizon	(reddish brown) (5YR 4/8) [moist] sandy clay with moderate pedality (sub-angular blocky), none (Root size unknown), field pH is 6.5. Coarse fragments are few (2-10%), quartz, gravel (6-20 mm)few (2-10%), sedimentary, gravel (6-20 mm), pans are not evident, segregations are none, fine (< 2 mm), ferruginous; gradual (50-100 mm) boundary to ...

Layer 5

0.55 - 0.80 m B22 Horizon	strong brown (bright brown) (7.5YR 5/6) [moist] medium clay with moderate pedality (sub-angular blocky, smooth-faced peds), none (Root size unknown), field pH is 6.5. Coarse fragments are very few (< 2%), sedimentary, gravel (6-20 mm), pans are not evident, segregations are none, fine (< 2 mm), ferruginous; clear (20-50 mm) boundary to ...

Layer 6

0.80 - 1.30 m B23 Horizon	brownish yellow (bright yellowish brown) (10YR 6/6) [moist] , none (Root size unknown). Coarse fragments are very few (< 2%), quartz, gravel (6-20 mm)very few (< 2%), sedimentary, gravel (6-20 mm), pans are not evident, segregations are very few (< 2%), fine (< 2 mm), manganiferous

Figure 10-2 eSpade report for profile southeast of site (#1 in Figure 7.1).

NSW SOIL AND LAND INFORMATION SYSTEM

Soil Essentials Report

SITE DETAILS

Site Location:	Profile 10
Map Reference:	MGA Grid Reference: Zone 55, 539843E, 6122715N. 8327 WAGGA WAGGA (1:100000) map sheet.
Profile Details:	WAGGA/BRUCEDALE D.T.M Survey (1000577), Profile 10, collected by Mr Dermot McKane on July 15, 1994
Physiography:	granite lithology and used for cropping. Slope 3% (measured), elevation 246.0 m, aspect south.
Soil Type:	Mottled Eutrophic Brown Dermosol (ASC)
Base of observation:	

Profile Field Notes:

SOIL DESCRIPTION

Layer 0

Layer 1

0.00 - 0.08 m A1 Horizon	brown (7.5YR 4/4) [moist] coarse sandy clay loam with massive structure (earthy), few (1-10/10x10cm) roots (<1mm). Coarse fragments are very few (< 2%), ironstone, fine gravel (2-6 mm); clear (20-50 mm) boundary to ...

Layer 2

0.08 - 0.67 m B1 Horizon	red (reddish brown) (2.5YR 4/8) [moist] light clay with massive structure (earthy), few (1-10/10x10cm) roots (<1mm), few (1-10/10x10cm) roots (1-2mm). Coarse fragments are very few (< 2%), quartz, fine gravel (2-6 mm); clear (20-50 mm) boundary to ...

Layer 3

0.67 - 1.00 m B2 Horizon	yellowish brown (10YR 5/8) [moist] light clay with moderate pedality (sub-angular blocky, < 2 mm, smooth-faced peds). Coarse fragments are very few (< 2%), ironstone, fine gravel (2-6 mm)very few (< 2%), quartz, fine gravel (2-6 mm), segregations are common (10% - 20%), manganiferous

Figure 10-3 eSpade report for profile northwest of site (#2 in Figure 7.1).

NSW SOIL AND LAND INFORMATION SYSTEM

Soil Essentials Report

SITE DETAILS

Site Location:	DOWNSLOPE FROM 1
Map Reference:	MGA Grid Reference: Zone 55, 540583E, 6122775N. 8327 WAGGA WAGGA (1:100000) map sheet.
Profile Details:	WAGGA/BRUCEDALE D.T.M Survey (1000577), Profile 38, collected by Mr Dermot McKane on July 15, 1994
Physiography:	granite lithology and used for cropping. Slope 3% (measured), elevation 236.0 m, aspect south. profile drainage is mod. well drained, and no salting evident
Soil Type:	Mottled Eutrophic Brown Dermosol (ASC)
Base of observation:	
Profile Field Notes:	

SOIL DESCRIPTION

Layer 0

Layer 1

0.00 - 0.13 m A1 Horizon	brown (7.5YR 4/4) [moist] loam with massive structure (earthy), few (1-10/10x10cm) roots (<1mm); smooth clear (20-50 mm) boundary to ...

Layer 2

0.13 - 0.37 m B1 Horizon	yellowish red (bright reddish brown) (5YR 5/8) [moist] light clay with massive structure (earthy), few (1-10/10x10cm) roots (<1mm). Coarse fragments are very few (< 2%), quartz, fine gravel (2-6 mm)very few (< 2%), ironstone, gravel (6-20 mm); smooth gradual (50-100 mm) boundary to ...

Layer 3

0.37 - 0.70 m B21 Horizon	reddish yellow (orange) (7.5YR 6/8) [moist] light clay with weak pedality (sub-angular blocky, 2 - 5 mm, smooth-faced peds), none roots (<1mm). Coarse fragments are very few (< 2%), ironstone, gravel (6-20 mm); smooth clear (20-50 mm) boundary to ...

Layer 4

0.70 - 1.65 m B22 Horizon	brownish yellow (bright yellowish brown) (10YR 6/6) [moist] light medium clay with moderate pedality (sub-angular blocky, 5 - 10 mm, smooth-faced peds), none roots (<1mm). Coarse fragments are few (2-10%), ironstone, fine gravel (2-6 mm); smooth gradual (50-100 mm) boundary to ...

Layer 5

1.65 - 1.85 m B23 Horizon	brownish yellow (bright yellowish brown) (10YR 6/8) [moist] light clay with moderate pedality (sub-angular blocky, 5 - 10 mm, smooth-faced peds). Coarse fragments are very few (< 2%), ironstone, coarse gravel (20-60 mm)

Figure 10-4 eSpade report for profile north of site (#3 in Figure 7.1).

NSW SOIL AND LAND INFORMATION SYSTEM

Soil Essentials Report

SITE DETAILS

Site Location:	Profile 27
Map Reference:	MGA Grid Reference: Zone 55, 540568E, 6123116N. 8327 WAGGA WAGGA (1:100000) map sheet.
Profile Details:	WAGGA/BRUCEDALE D.T.M Survey (1000577), Profile 27, collected by Mr Dermot McKane on June 24, 1994
Physiography:	granite lithology. Slope 5% (measured), elevation 269.0 m, aspect south.
Soil Type:	Mottled Eutrophic Brown Dermosol (ASC)
Base of observation:	
Profile Field Notes:	

SOIL DESCRIPTION

Layer 0

Layer 1

0.00 - 0.20 m A1 Horizon	dark reddish brown (5YR 3/3) [moist] loam with massive structure (earthy), many (25-100/10x10cm) roots (<1mm), few (1-10/10x10cm) roots (1-2mm). Coarse fragments are very few (< 2%), quartz, fine gravel (2-6 mm); clear (20-50 mm) boundary to ...

Layer 2

0.20 - 0.58 m B1 Horizon	colour not recorded light clay with massive structure (earthy), common (10-25/10x10cm) roots (<1mm). Coarse fragments are very few (< 2%), quartz, fine gravel (2-6 mm). Layer notes are: Moist Munsell should be 2.5YR 3/8; gradual (50-100 mm) boundary to ...

Layer 3

0.58 - 1.00 m B21 Horizon	yellowish brown (10YR 5/8) [moist] light medium clay with moderate pedality (sub-angular blocky, 5 - 10 mm, smooth-faced peds). Coarse fragments are very few (< 2%), ironstone, fine gravel (2-6 mm)

Figure 10-5 eSpade report for profile north of site (#4 in Figure 7.1).

D.3 CONTAMINATED LAND RECORD

DECCW | Search results Page 1 of 1

NSW EPA

Healthy Environment, Healthy Community, Healthy Business

Home Contaminated land Record of notices

Search results

Your search for:LGA: Wagga Wagga City Council

Matched 8 notices relating to 3 sites.
Search Again
Refine Search

Suburb	Address	Site Name	Notices related to this site
TARCUTTA	(Hume Highway) 32 Sydney STREET	Mobil Service Station	3 former
WAGGA WAGGA	54 Chaston STREET	Former Gasworks	1 current and 2 former
WAGGA WAGGA	Cnr Tarcutta Street and Cross STREET	Former Gasworks	2 current

Page 1 of 1

30 November 2016

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Public consultation

Contact
Contact us
Offices
Report pollution

Government
NSW Government
jobs.nsw

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Figure 10-6 Search results in Wagga Wagga LGA from contaminated land record database

D.4 BIONET

Data from the BioNet Atlas of NSW Wildlife website, which holds records from a number of custodians. The data are only indicative and cannot be considered a comprehensive inventory, and may contain errors and omissions. Species listed under the Sensitive Species Data Policy may have their locations denatured (^ rounded to 0.1Â°; ^^ rounded to 0.01Â°). Copyright the State of NSW through the Office of Environment and Heritage. Search criteria : Public Report of all Valid Records of Threatened (listed on TSC Act 1995) or Commonwealth listed Entities in selected area [North: -34.99 West: Report generated on 1/12/2016 11:09 AM

Kingdom	Class	Family	Species Code	Scientific Name	Exotic	Common Name	NSW status	Comm. status	Records	Info
Animalia	Aves	Psittacidae	0277	^^*Polytelis swainsonii*		Superb Parrot	V,P,3	V	7	
Animalia	Aves	Climacteridae	8127	*Climacteris picumnus victoriae*		Brown Treecreeper (eastern subspecies)	V,P		1	
Animalia	Aves	Meliphagidae	0448	*Epthianura albifrons*		White-fronted Chat	V,P		1	
Animalia	Aves	Pomatostomidae	8388	*Pomatostomus temporalis temporalis*		Grey-crowned Babbler (eastern subspecies)	V,P		1	

Figure 10-7 Search results for locality from BioNet (NSW Wildlife Atlas).

D.5 PROTECTED MATTERS SEARCH TOOL

Australian Government
Department of the Environment and Energy

EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

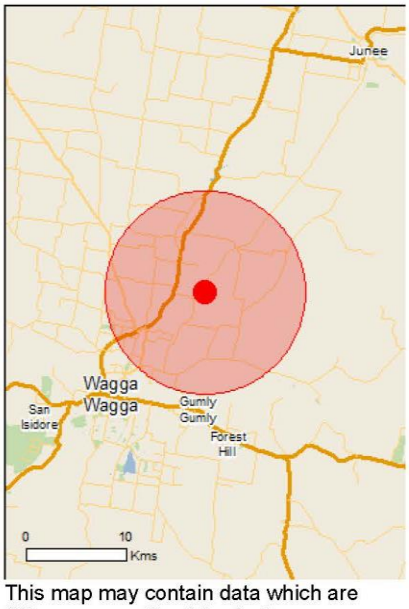
Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

Report created: 29/11/16 09:48:45

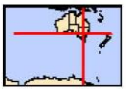
Summary
Details
- Matters of NES
- Other Matters Protected by the EPBC Act
- Extra Information

Caveat
Acknowledgements



This map may contain data which are ©Commonwealth of Australia (Geoscience Australia), ©PSMA 2010

Coordinates
Buffer: 10.0Km



Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	4
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	3
Listed Threatened Species:	19
Listed Migratory Species:	7

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at http://www.environment.gov.au/heritage

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Land:	2
Commonwealth Heritage Places:	None
Listed Marine Species:	13
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Commonwealth Reserves Marine:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

State and Territory Reserves:	None
Regional Forest Agreements:	None
Invasive Species:	34
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Wetlands of International Importance (Ramsar)	[Resource Information]
Name	Proximity
Banrock station wetland complex	600 - 700km upstream
Hattah-kulkyne lakes	400 - 500km upstream
Riverland	500 - 600km upstream
The coorong, and lakes alexandrina and albert wetland	600 - 700km upstream

Listed Threatened Ecological Communities		[Resource Information]
For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.		
Name	Status	Type of Presence
Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia	Endangered	Community likely to occur within area
Weeping Myall Woodlands	Endangered	Community may occur within area
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	Critically Endangered	Community likely to occur within area

Listed Threatened Species		[Resource Information]
Name	Status	Type of Presence
Birds		
Anthochaera phrygia Regent Honeyeater [82338]	Critically Endangered	Foraging, feeding or related behaviour may occur within area
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat likely to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat likely to occur within area
Grantiella picta Painted Honeyeater [470]	Vulnerable	Species or species habitat likely to occur within area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat likely to occur within area
Leipoa ocellata Malleefowl [934]	Vulnerable	Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Polytelis swainsonii Superb Parrot [738]	Vulnerable	Breeding known to occur within area

Name	Status	Type of Presence
Rostratula australis		
Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area
Fish		
Galaxias rostratus		
Flathead Galaxias, Beaked Minnow, Flat-headed Galaxias, Flat-headed Jollytail, Flat-headed Minnow [84745]	Critically Endangered	Species or species habitat may occur within area
Maccullochella peelii		
Murray Cod [66633]	Vulnerable	Species or species habitat may occur within area
Macquaria australasica		
Macquarie Perch [66632]	Endangered	Species or species habitat may occur within area
Frogs		
Litoria raniformis		
Growling Grass Frog, Southern Bell Frog, Green and Golden Frog, Warty Swamp Frog [1828]	Vulnerable	Species or species habitat likely to occur within area
Mammals		
Nyctophilus corbeni		
Corben's Long-eared Bat, South-eastern Long-eared Bat [83395]	Vulnerable	Species or species habitat may occur within area
Phascolarctos cinereus (combined populations of Qld, NSW and the ACT)		
Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Vulnerable	Species or species habitat known to occur within area
Pteropus poliocephalus		
Grey-headed Flying-fox [186]	Vulnerable	Roosting known to occur within area
Plants		
Caladenia tensa		
Greencomb Spider-orchid, Rigid Spider-orchid [24390]	Endangered	Species or species habitat may occur within area
Reptiles		
Aprasia parapulchella		
Pink-tailed Worm-lizard, Pink-tailed Legless Lizard [1665]	Vulnerable	Species or species habitat likely to occur within area
Delma impar		
Striped Legless Lizard [1649]	Vulnerable	Species or species habitat may occur within area

Listed Migratory Species		[Resource Information]
* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.		
Name	Threatened	Type of Presence
Migratory Marine Birds		
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Migratory Terrestrial Species		
Hirundapus caudacutus		
White-throated Needletail [682]		Species or species habitat may occur within area
Motacilla flava		
Yellow Wagtail [644]		Species or species habitat may occur within area
Myiagra cyanoleuca		
Satin Flycatcher [612]		Species or species habitat known to occur within area
Migratory Wetlands Species		

Name	Threatened	Type of Presence
Calidris ferruginea		
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat likely to occur within area
Gallinago hardwickii		
Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
Numenius madagascariensis		
Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Commonwealth Land [Resource Information]

The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.

Name
Commonwealth Land - Australian Telecommunications Commission
Commonwealth Land - Defence Housing Authority

Listed Marine Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Birds		
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba		
Great Egret, White Egret [59541]		Species or species habitat likely to occur within area
Ardea ibis		
Cattle Egret [59542]		Species or species habitat may occur within area
Calidris ferruginea		
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat likely to occur within area
Gallinago hardwickii		
Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
Haliaeetus leucogaster		
White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area
Hirundapus caudacutus		
White-throated Needletail [682]		Species or species habitat may occur within area
Lathamus discolor		
Swift Parrot [744]	Critically Endangered	Species or species habitat likely to occur within area
Merops ornatus		
Rainbow Bee-eater [670]		Species or species

Name	Threatened	Type of Presence
		habitat may occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat known to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat likely to occur within area

Extra Information

Invasive Species [Resource Information]

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resouces Audit, 2001.

Name	Status	Type of Presence
Birds		
Alauda arvensis Skylark [656]		Species or species habitat likely to occur within area
Anas platyrhynchos Mallard [974]		Species or species habitat likely to occur within area
Carduelis carduelis European Goldfinch [403]		Species or species habitat likely to occur within area
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Passer domesticus House Sparrow [405]		Species or species habitat likely to occur within area
Passer montanus Eurasian Tree Sparrow [406]		Species or species habitat likely to occur within area
Streptopelia chinensis Spotted Turtle-Dove [780]		Species or species habitat likely to occur within area
Sturnus vulgaris Common Starling [389]		Species or species habitat likely to occur

Name	Status	Type of Presence
		within area
Turdus merula Common Blackbird, Eurasian Blackbird [596]		Species or species habitat likely to occur within area
Mammals		
Bos taurus Domestic Cattle [16]		Species or species habitat likely to occur within area
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Capra hircus Goat [2]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Feral deer Feral deer species in Australia [85733]		Species or species habitat likely to occur within area
Lepus capensis Brown Hare [127]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Rattus rattus Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area
Sus scrofa Pig [6]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Asparagus asparagoides Bridal Creeper, Bridal Veil Creeper, Smilax, Florist's Smilax, Smilax Asparagus [22473]		Species or species habitat likely to occur within area
Eichhornia crassipes Water Hyacinth, Water Orchid, Nile Lily [13466]		Species or species habitat likely to occur within area
Genista monspessulana Montpellier Broom, Cape Broom, Canary Broom, Common Broom, French Broom, Soft Broom [20126]		Species or species habitat likely to occur within area
Lycium ferocissimum African Boxthorn, Boxthorn [19235]		Species or species habitat likely to occur within area
Nassella neesiana Chilean Needle grass [67699]		Species or species habitat likely to occur within area
Nassella trichotoma Serrated Tussock, Yass River Tussock, Yass		Species or species

Name	Status	Type of Presence
Tussock, Nassella Tussock (NZ) [18884]		habitat likely to occur within area
Opuntia spp. Prickly Pears [82753]		Species or species habitat likely to occur within area
Pinus radiata Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780]		Species or species habitat may occur within area
Rubus fruticosus aggregate Blackberry, European Blackberry [68406]		Species or species habitat likely to occur within area
Salix spp. except S.babylonica, S.x calodendron & S.x reichardtii Willows except Weeping Willow, Pussy Willow and Sterile Pussy Willow [68497]		Species or species habitat likely to occur within area
Salvinia molesta Salvinia, Giant Salvinia, Aquarium Watermoss, Kariba Weed [13665]		Species or species habitat likely to occur within area
Senecio madagascariensis Fireweed, Madagascar Ragwort, Madagascar Groundsel [2624]		Species or species habitat likely to occur within area
Solanum elaeagnifolium Silver Nightshade, Silver-leaved Nightshade, White Horse Nettle, Silver-leaf Nightshade, Tomato Weed, White Nightshade, Bull-nettle, Prairie-berry, Satansbos, Silver-leaf Bitter-apple, Silverleaf-nettle, Trompillo [12323]		Species or species habitat likely to occur within area
Ulex europaeus Gorse, Furze [7693]		Species or species habitat likely to occur within area

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World and National Heritage properties, Wetlands of International and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species distributions have been derived through a variety of methods. Where distributions are well known and if time permits, maps are derived using either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc) together with point locations and described habitat; or environmental modelling (MAXENT or BIOCLIM habitat modelling) using point locations and environmental data layers.

Where very little information is available for species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc). In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More reliable distribution mapping methods are used to update these distributions as time permits.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Coordinates

-35.04178 147.44004

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Department of Land and Resource Management, Northern Territory
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Australian Tropical Herbarium, Cairns
-eBird Australia
-Australian Government – Australian Antarctic Data Centre
-Museum and Art Gallery of the Northern Territory
-Australian Government National Environmental Science Program
-Australian Institute of Marine Science
-Reef Life Survey Australia
-American Museum of Natural History
-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania
-Tasmanian Museum and Art Gallery, Hobart, Tasmania
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact Us page.

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D.6 GROUNDWATER-DEPENDENT ECOSYSTEMS

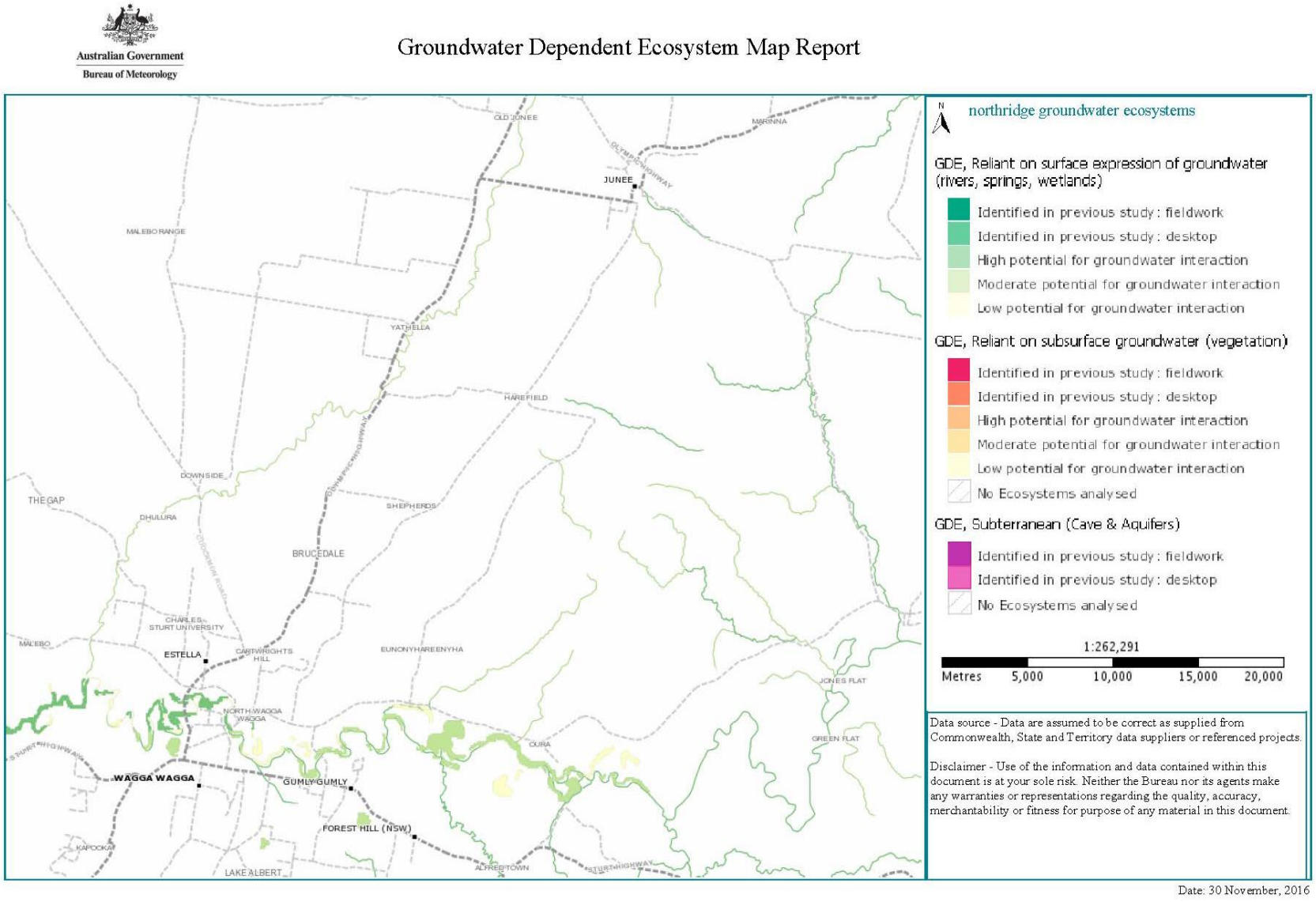


Figure 10-8 Map of groundwater-dependent ecosystems in locality from BOM.

D.7 WEEDWISE

Priority weeds for the Riverina

Note: this region includes the local council areas of Bland, Carrathool (lower), Coolamon, Cootamundra-Gundagai, Griffith, Hay (lower), Hilltops (western), Junee, Leeton, Murrumbidgee (upper), Narrandera, Snowy Valleys (upper), Temora, Wagga Wagga, Young

Weed	Duty
All plants	**General Biosecurity Duty** *All plants are regulated with a general biosecurity duty to prevent, eliminate or minimise any biosecurity risk they may pose. Any person who deals with any plant, who knows (or ought to know) of any biosecurity risk, has a duty to ensure the risk is prevented, eliminated or minimised, so far as is reasonably practicable.*
African boxthorn *Lycium ferocissimum*	**Mandatory Measure** *Must not be imported into the State or sold*
Alligator weed *Alternanthera philoxeroides*	**Mandatory Measure** *Must not be imported into the State or sold*
Alligator weed *Alternanthera philoxeroides*	**Biosecurity Zone** The Alligator Weed Biosecurity Zone is established for all land within the state except land in the following regions: Greater Sydney; Hunter (but only in the local government areas of City of Lake Macquarie, City of Maitland, City of Newcastle or Port Stephens). *Within the Biosecurity Zone this weed must be eradicated where practicable, or as much of the weed destroyed as practicable, and any remaining weed suppressed. The local control authority must be notified of any new infestations of this weed within the Biosecurity Zone*
Alligator weed *Alternanthera philoxeroides*	**Regional Recommended Measure** *Land managers should mitigate the risk of new weeds being introduced to their land. The plant should be eradicated from the land and the land kept free of the plant. The plant should not be bought, sold, grown, carried or released into the environment. Notify local control authority if found.*
Anchored water hyacinth *Eichhornia azurea*	**Prohibited Matter** *A person who deals with prohibited matter or a carrier of prohibited matter is guilty of an offence. A person who becomes aware of or suspects the presence of prohibited matter must immediately notify the Department of Primary Industries*
Athel pine *Tamarix aphylla*	**Mandatory Measure** *Must not be imported into the State or sold*

Bellyache bush *Jatropha gossypiifolia*	**Mandatory Measure** *Must not be imported into the State or sold*
Bitou bush *Chrysanthemoides monilifera* subsp. *rotundata*	**Mandatory Measure** *Must not be imported into the State or sold*
Bitou bush *Chrysanthemoides monilifera* subsp. *rotundata*	**Biosecurity Zone** The Bitou Bush Biosecurity Zone is established for all land within the State except land within 10 kilometres of the mean high water mark of the Pacific Ocean between Cape Byron in the north and Point Perpendicular in the south. *Within the Biosecurity Zone this weed must be eradicated where practicable, or as much of the weed destroyed as practicable, and any remaining weed suppressed. The local control authority must be notified of any new infestations of this weed within the Biosecurity Zone*
Bitou bush *Chrysanthemoides monilifera* subsp. *rotundata*	**Regional Recommended Measure** *Land managers should mitigate the risk of new weeds being introduced to their land. The plant should be eradicated from the land and the land kept free of the plant. The plant should not be bought, sold, grown, carried or released into the environment. Notify local control authority if found.*
Black knapweed *Centaurea X moncktonii*	**Prohibited Matter** *A person who deals with prohibited matter or a carrier of prohibited matter is guilty of an offence. A person who becomes aware of or suspects the presence of prohibited matter must immediately notify the Department of Primary Industries*
Black willow *Salix nigra*	**Mandatory Measure** *Must not be imported into the State or sold*
Black willow *Salix nigra*	**Regional Recommended Measure** *Land managers should mitigate the risk of new weeds being introduced to their land. The plant should be eradicated from the land and the land kept free of the plant. Notify local control authority if found.*
Blackberry *Rubus fruticosus* species aggregate	**Mandatory Measure** *Must not be imported into the State or sold* All species in the *Rubus fruiticosus* species aggregate have this requirement, except for the varietals Black Satin, Chehalem, Chester Thornless, Dirksen Thornless, Loch Ness, Murrindindi, Silvan, Smooth Stem, and Thornfree
Boneseed *Chrysanthemoides monilifera* subsp. *monilifera*	**Mandatory Measure** *Must not be imported into the State or sold*

Boneseed *Chrysanthemoides monilifera* subsp. *monilifera*	**Biosecurity Control Order** Bonseed Control Zone: Whole of NSW *Boneseed Control Zone (Whole of NSW): Owners and occupiers of land on which there is boneseed must notify the local control authority of new infestations; immediately destroy the plants; ensure subsequent generations are destroyed; and ensure the land is kept free of the plant. A person who deals with a carrier of boneseed must ensure the plant (and any seed and propagules) is not moved from the land; and immediately notify the local control authority of the presence of the plant.*
Boxing glove cactus *Cylindropuntia fulgida* var. *mamillata*	**Mandatory Measure** *Must not be imported into the State or sold*
Bridal creeper *Asparagus asparagoides*	**Mandatory Measure** *Must not be imported into the State or sold* *this requirement also applies to the Western Cape form of bridal creeper
Bridal veil creeper *Asparagus declinatus*	**Prohibited Matter** *A person who deals with prohibited matter or a carrier of prohibited matter is guilty of an offence. A person who becomes aware of or suspects the presence of prohibited matter must immediately notify the Department of Primary Industries*
Broomrapes *Orobanche* species	**Prohibited Matter** *A person who deals with prohibited matter or a carrier of prohibited matter is guilty of an offence. A person who becomes aware of or suspects the presence of prohibited matter must immediately notify the Department of Primary Industries* All species of *Orobanche* are Prohibited Matter in NSW, except the natives *Orobanche cernua* var. *australiana* and *Orobanche minor*
Cabomba *Cabomba caroliniana*	**Mandatory Measure** *Must not be imported into the State or sold*
Cane cactus *Austrocylindropuntia cylindrica*	**Mandatory Measure** *Must not be imported into the State or sold* All species in the *Austrocylindropuntia* genus have this requirement
Cane needle grass *Nassella hyalina*	**Regional Recommended Measure** Whole region except Wagga Wagga City Council *Land managers should mitigate the risk of new weeds being introduced to their land. The plant should be eradicated from the land and the land kept free of the plant. The plant should not be bought, sold, grown, carried or released into the environment. Notify local control authority if found.*

Cape broom *Genista monspessulana*	**Mandatory Measure** *Must not be imported into the State or sold*
Cape broom *Genista monspessulana*	**Regional Recommended Measure** Whole region excluding Snowy Valleys Council *Land managers should mitigate the risk of new weeds being introduced to their land. The plant should be eradicated from the land and the land kept free of the plant. Notify local control authority if found.*
Cape broom *Genista monspessulana*	**Regional Recommended Measure** Snowy Valleys Council *Land managers should mitigate the risk of new weeds being introduced to their land. Land managers should mitigate spread from their land.*
Cat's claw creeper *Dolichandra unguis-cati*	**Mandatory Measure** *Must not be imported into the State or sold*
Chilean needle grass *Nassella neesiana*	**Mandatory Measure** *Must not be imported into the State or sold*
Chilean needle grass *Nassella neesiana*	**Regional Recommended Measure** *Land managers should mitigate the risk of new weeds being introduced to their land. The plant should be eradicated from the land and the land kept free of the plant. Notify local control authority if found.*
Chinese violet *Asystasia gangetica* subsp. *micrantha*	**Regional Recommended Measure** *Land managers should mitigate the risk of new weeds being introduced to their land. The plant should be eradicated from the land and the land kept free of the plant. The plant should not be bought, sold, grown, carried or released into the environment. Notify local control authority if found.*
Climbing asparagus *Asparagus africanus*	**Mandatory Measure** *Must not be imported into the State or sold*
Climbing asparagus fern *Asparagus plumosus*	**Mandatory Measure** *Must not be imported into the State or sold*
Common pear *Opuntia stricta*	**Mandatory Measure** *Must not be imported into the State or sold*
Coolatai grass *Hyparrhenia hirta*	**Regional Recommended Measure** *Land managers should mitigate the risk of new weeds being introduced to their land. The plant should be eradicated from the land and the land kept free of the plant. The plant should not be bought, sold, grown, carried or released into the environment. Notify local control authority if found.*
Eurasian water milfoil *Myriophyllum spicatum*	**Prohibited Matter** *A person who deals with prohibited matter or a carrier of prohibited matter is guilty of an offence. A person who becomes aware of or suspects the*

	presence of prohibited matter must immediately notify the Department of Primary Industries
Fireweed *Senecio madagascariensis*	**Mandatory Measure** *Must not be imported into the State or sold*
Fireweed *Senecio madagascariensis*	**Regional Recommended Measure** *Land managers should mitigate the risk of new weeds being introduced to their land. The plant should be eradicated from the land and the land kept free of the plant. Notify local control authority if found.*
Flax-leaf broom *Genista linifolia*	**Mandatory Measure** *Must not be imported into the State or sold*
Frogbit *Limnobium laevigatum*	**Prohibited Matter** *A person who deals with prohibited matter or a carrier of prohibited matter is guilty of an offence. A person who becomes aware of or suspects the presence of prohibited matter must immediately notify the Department of Primary Industries* All species of *Limnobium* are Prohibited Matter
Gamba grass *Andropogon gayanus*	**Prohibited Matter** *A person who deals with prohibited matter or a carrier of prohibited matter is guilty of an offence. A person who becomes aware of or suspects the presence of prohibited matter must immediately notify the Department of Primary Industries*
Gorse *Ulex europaeus*	**Mandatory Measure** *Must not be imported into the State or sold*
Gorse *Ulex europaeus*	**Regional Recommended Measure** *Land managers should mitigate the risk of new weeds being introduced to their land. The plant should be eradicated from the land and the land kept free of the plant. Notify local control authority if found.*
Grey sallow *Salix cinerea*	**Mandatory Measure** *Must not be imported into the State or sold*
Grey sallow *Salix cinerea*	**Regional Recommended Measure** *Land managers should mitigate the risk of new weeds being introduced to their land. The plant should be eradicated from the land and the land kept free of the plant. Notify local control authority if found.*
Ground asparagus *Asparagus aethiopicus*	**Mandatory Measure** *Must not be imported into the State or sold*
Hawkweeds *Hieracium* species	**Prohibited Matter** *A person who deals with prohibited matter or a carrier of prohibited matter is guilty of an offence. A person who becomes aware of or suspects the presence of prohibited matter must immediately notify the Department of Primary Industries*

	All species in the genus *Hieracium* are Prohibited Matter
Hudson pear *Cylindropuntia rosea*	**Mandatory Measure** *Must not be imported into the State or sold*
Hydrocotyl *Hydrocotyle ranunculoides*	**Prohibited Matter** *A person who deals with prohibited matter or a carrier of prohibited matter is guilty of an offence. A person who becomes aware of or suspects the presence of prohibited matter must immediately notify the Department of Primary Industries*
Hymenachne *Hymenachne amplexicaulis* and hybrids	**Mandatory Measure** *Must not be imported into the State or sold*
Karroo thorn *Vachellia karroo*	**Prohibited Matter** *A person who deals with prohibited matter or a carrier of prohibited matter is guilty of an offence. A person who becomes aware of or suspects the presence of prohibited matter must immediately notify the Department of Primary Industries*
Kidney-leaf mud plantain *Heteranthera reniformis*	**Regional Recommended Measure** *Land managers should mitigate the risk of new weeds being introduced to their land. The plant should be eradicated from the land and the land kept free of the plant. The plant should not be bought, sold, grown, carried or released into the environment. Notify local control authority if found.*
Kochia *Bassia scoparia*	**Prohibited Matter** *A person who deals with prohibited matter or a carrier of prohibited matter is guilty of an offence. A person who becomes aware of or suspects the presence of prohibited matter must immediately notify the Department of Primary Industries* Excluding the subspecies *trichophylla*
Koster's curse *Clidemia hirta*	**Prohibited Matter** *A person who deals with prohibited matter or a carrier of prohibited matter is guilty of an offence. A person who becomes aware of or suspects the presence of prohibited matter must immediately notify the Department of Primary Industries*
Lagarosiphon *Lagarosiphon major*	**Prohibited Matter** *A person who deals with prohibited matter or a carrier of prohibited matter is guilty of an offence. A person who becomes aware of or suspects the presence of prohibited matter must immediately notify the Department of Primary Industries*
Lantana *Lantana camara*	**Mandatory Measure** *Must not be imported into the State or sold*
Madeira vine *Anredera cordifolia*	**Mandatory Measure** *Must not be imported into the State or sold*

Mesquite *Prosopis* species	**Mandatory Measure** *Must not be imported into the State or sold* All species in the genus *Prosopis* have this requirement
Mesquite *Prosopis* species	**Regional Recommended Measure** *Land managers should mitigate the risk of new weeds being introduced to their land. The plant should be eradicated from the land and the land kept free of the plant. Notify local control authority if found.*
Mexican feather grass *Nassella tenuissima*	**Prohibited Matter** *A person who deals with prohibited matter or a carrier of prohibited matter is guilty of an offence. A person who becomes aware of or suspects the presence of prohibited matter must immediately notify the Department of Primary Industries*
Miconia *Miconia* species	**Prohibited Matter** *A person who deals with prohibited matter or a carrier of prohibited matter is guilty of an offence. A person who becomes aware of or suspects the presence of prohibited matter must immediately notify the Department of Primary Industries* All species of *Miconia* are Prohibited Matter in NSW
Mikania vine *Mikania micrantha*	**Prohibited Matter** *A person who deals with prohibited matter or a carrier of prohibited matter is guilty of an offence. A person who becomes aware of or suspects the presence of prohibited matter must immediately notify the Department of Primary Industries* *all species in the genus *Mikania* are Prohibited Matter in NSW
Mimosa *Mimosa pigra*	**Prohibited Matter** *A person who deals with prohibited matter or a carrier of prohibited matter is guilty of an offence. A person who becomes aware of or suspects the presence of prohibited matter must immediately notify the Department of Primary Industries*
Mother-of-millions *Bryophyllum* species	**Regional Recommended Measure** *Land managers should mitigate the risk of new weeds being introduced to their land. The plant should be eradicated from the land and the land kept free of the plant. The plant should not be bought, sold, grown, carried or released into the environment. Notify local control authority if found.*
Ox-eye daisy *Leucanthemum vulgare*	**Regional Recommended Measure** *Land managers should mitigate the risk of the plant being introduced to their land. Land*

	managers should mitigate spread from their land. Notify local control authority if found.
Parkinsonia *Parkinsonia aculeata*	**Mandatory Measure** *Must not be imported into the State or sold*
Parkinsonia *Parkinsonia aculeata*	**Biosecurity Control Order** Parkinsonia Control Zone: Whole of NSW *Parkinsonia Control Zone (Whole of NSW): Owners and occupiers of land on which there is parkinsonia must notify the local control authority of new infestations; immediately destroy the plants; ensure subsequent generations are destroyed; and ensure the land is kept free of the plant. A person who deals with a carrier of parkinsonia must ensure the plant (and any seed and propagules) is not moved from the land; and immediately notify the local control authority of the presence of the plant.*
Parthenium weed *Parthenium hysterophorus*	**Prohibited Matter** *A person who deals with prohibited matter or a carrier of prohibited matter is guilty of an offence. A person who becomes aware of or suspects the presence of prohibited matter must immediately notify the Department of Primary Industries*
Parthenium weed *Parthenium hysterophorus*	**Mandatory Measure** *The following equipment must not be imported into NSW from Queensland: grain harvesters (including the comb or front), comb trailers (including the comb or front), bins used for holding grain during harvest operations, augers or similar for moving grain, vehicles used to transport grain harvesters, support vehicles driven in paddocks during harvest operations, mineral exploration drilling rigs and vehicles used to transport those rigs, unless set out as an exception in Division 5, Part 2 of the Biosecurity Order (Permitted Activities) 2017*
Perennial ground cherry *Physalis longifolia*	**Regional Recommended Measure** *Land managers should mitigate the risk of new weeds being introduced to their land. The plant should be eradicated from the land and the land kept free of the plant. The plant should not be bought, sold, grown, carried or released into the environment. Notify local control authority if found.*
Pond apple *Annona glabra*	**Prohibited Matter** *A person who deals with prohibited matter or a carrier of prohibited matter is guilty of an offence. A person who becomes aware of or suspects the presence of prohibited matter must immediately notify the Department of Primary Industries*

Prairie ground cherry *Physalis hederifolia*	**Regional Recommended Measure** *Land managers should mitigate the risk of new weeds being introduced to their land. The plant should be eradicated from the land and the land kept free of the plant. The plant should not be bought, sold, grown, carried or released into the environment. Notify local control authority if found.*
Prickly acacia *Vachellia nilotica*	**Prohibited Matter** *A person who deals with prohibited matter or a carrier of prohibited matter is guilty of an offence. A person who becomes aware of or suspects the presence of prohibited matter must immediately notify the Department of Primary Industries*
Prickly pears - Austrocylindropuntias *Austrocylindropuntia* species	**Mandatory Measure** *Must not be imported into the State or sold* All species in the *Austrocylindropuntia* genus have this requirement
Prickly pears - Cylindropuntias *Cylindropuntia species*	**Mandatory Measure** *Must not be imported into the State or sold* All species in the *Cylindropuntia* genus have this requirement
Prickly pears - Opuntias *Opuntia* species	**Mandatory Measure** *Must not be imported into the State or sold* Except for *Opuntia ficus-indica* (Indian fig)
Ragwort *Senecio jacobaea*	**Regional Recommended Measure** *Land managers should mitigate the risk of new weeds being introduced to their land. The plant should be eradicated from the land and the land kept free of the plant. The plant should not be bought, sold, grown, carried or released into the environment. Notify local control authority if found.*
Rope pear *Cylindropuntia imbricata*	**Mandatory Measure** *Must not be imported into the State or sold* All species in the *Cylindropuntia* genus have this requirement
Rubber vine *Cryptostegia grandiflora*	**Prohibited Matter** *A person who deals with prohibited matter or a carrier of prohibited matter is guilty of an offence. A person who becomes aware of or suspects the presence of prohibited matter must immediately notify the Department of Primary Industries*
Sagittaria *Sagittaria platyphylla*	**Mandatory Measure** *Must not be imported into the State or sold*
Sagittaria *Sagittaria platyphylla*	**Regional Recommended Measure** *Land managers should mitigate the risk of new weeds being introduced to their land. The plant should be eradicated from the land and the land*

	kept free of the plant. Notify local control authority if found.
Salvinia *Salvinia molesta*	**Mandatory Measure** *Must not be imported into the State or sold*
Salvinia *Salvinia molesta*	**Regional Recommended Measure** *Land managers should mitigate the risk of new weeds being introduced to their land. The plant should be eradicated from the land and the land kept free of the plant. Notify local control authority if found.*
Scotch broom *Cytisus scoparius* subsp. *scoparius*	**Mandatory Measure** *Must not be imported into the State or sold*
Scotch broom *Cytisus scoparius* subsp. *scoparius*	**Regional Recommended Measure** Whole region excluding Snowy Valleys Council *Land managers should mitigate the risk of new weeds being introduced to their land. The plant should be eradicated from the land and the land kept free of the plant. Notify local control authority if found.*
Scotch broom *Cytisus scoparius* subsp. *scoparius*	**Regional Recommended Measure** Snowy Valleys Council. *Land managers should mitigate the risk of new weeds being introduced to their land. Land managers should mitigate spread from their land.*
Senegal tea plant *Gymnocoronis spilanthoides*	**Regional Recommended Measure** *Land managers should mitigate the risk of new weeds being introduced to their land. The plant should be eradicated from the land and the land kept free of the plant. The plant should not be bought, sold, grown, carried or released into the environment. Notify local control authority if found.*
Serrated tussock *Nassella trichotoma*	**Mandatory Measure** *Must not be imported into the State or sold*
Serrated tussock *Nassella trichotoma*	**Regional Recommended Measure** *Land managers should mitigate the risk of new weeds being introduced to their land. The plant should be eradicated from the land and the land kept free of the plant. Notify local control authority if found.*
Siam weed *Chromolaena odorata*	**Prohibited Matter** *A person who deals with prohibited matter or a carrier of prohibited matter is guilty of an offence. A person who becomes aware of or suspects the presence of prohibited matter must immediately notify the Department of Primary Industries*
Silverleaf nightshade *Solanum elaeagnifolium*	**Mandatory Measure** *Must not be imported into the State or sold*

Smooth tree pear *Opuntia monacantha*	**Mandatory Measure** *Must not be imported into the State or sold*
Snakefeather *Asparagus scandens*	**Mandatory Measure** *Must not be imported into the State or sold*
Spongeplant *Limnobium spongia*	**Prohibited Matter** *A person who deals with prohibited matter or a carrier of prohibited matter is guilty of an offence. A person who becomes aware of or suspects the presence of prohibited matter must immediately notify the Department of Primary Industries* All species of *Limnobium* are Prohibited Matter
Spotted knapweed *Centaurea stoebe* subsp. *micranthos*	**Prohibited Matter** *A person who deals with prohibited matter or a carrier of prohibited matter is guilty of an offence. A person who becomes aware of or suspects the presence of prohibited matter must immediately notify the Department of Primary Industries*
Tiger pear *Opuntia aurantiaca*	**Mandatory Measure** *Must not be imported into the State or sold*
Tropical soda apple *Solanum viarum*	**Biosecurity Control Order** Tropical Soda Apple Control Zone: Whole of NSW *Tropical Soda Apple Control Zone (Whole of NSW): Owners and occupiers of land on which there is tropical soda apple must notify the local control authority of new infestations; destroy the plants including the fruit; ensure subsequent generations are destroyed; and ensure the land is kept free of the plant. A person who deals with a carrier of tropical soda apple must ensure the plant (and any seed and propagules) is not moved from the land; and immediately notify the local control authority of the presence of the plant on the land, or on or in a carrier.*
Velvety tree pear *Opuntia tomentosa*	**Mandatory Measure** *Must not be imported into the State or sold*
Water caltrop *Trapa* species	**Prohibited Matter** *A person who deals with prohibited matter or a carrier of prohibited matter is guilty of an offence. A person who becomes aware of or suspects the presence of prohibited matter must immediately notify the Department of Primary Industries* All species in the *Trapa* genus are Prohibited Matter in NSW
Water hyacinth *Eichhornia crassipes*	**Mandatory Measure** *Must not be imported into the State or sold*
Water hyacinth *Eichhornia crassipes*	**Biosecurity Zone** The Water Hyacinth Biosecurity Zone applies to all land within the State, except for the following regions: Greater Sydney or North Coast, North

	West (but only the local government area of Moree Plains), Hunter (but only in the local government areas of City of Cessnock, City of Lake Macquarie, MidCoast, City of Maitland, City of Newcastle or Port Stephens), South East (but only in the local government areas of Eurobodalla, Kiama, City of Shellharbour, City of Shoalhaven or City of Wollongong). *Within the Biosecurity Zone this weed must be eradicated where practicable, or as much of the weed destroyed as practicable, and any remaining weed suppressed. The local control authority must be notified of any new infestations of this weed within the Biosecurity Zone*
Water hyacinth *Eichhornia crassipes*	**Regional Recommended Measure** *Land managers should mitigate the risk of new weeds being introduced to their land. The plant should be eradicated from the land and the land kept free of the plant. Notify local control authority if found.*
Water lettuce *Pistia stratiotes*	**Regional Recommended Measure** *Land managers should mitigate the risk of new weeds being introduced to their land. The plant should be eradicated from the land and the land kept free of the plant. The plant should not be bought, sold, grown, carried or released into the environment. Notify local control authority if found.*
Water lilies *Nymphaea* species	**Regional Recommended Measure** *Land managers should mitigate the risk of new weeds being introduced to their land. The plant should not be bought, sold, grown, carried or released into the environment. Notify local control authority if found.* This Regional Recommended Measure applies to *Nymphaea mexicana* (Mexican water lily)
Water poppy *Hydrocleys nymphoides*	**Regional Recommended Measure** *Land managers should mitigate the risk of the plant being introduced to their land. Land managers should mitigate spread from their land. Notify local control authority if found.*
Water soldier *Stratiotes aloides*	**Prohibited Matter** *A person who deals with prohibited matter or a carrier of prohibited matter is guilty of an offence. A person who becomes aware of or suspects the presence of prohibited matter must immediately notify the Department of Primary Industries*
Willows *Salix* species	**Mandatory Measure** *Must not be imported into the State or sold* All species in the *Salix* genus have this

	requirement, except *Salix babylonica* (weeping willows), *Salix x calodendron* (pussy willow) and *Salix x reichardtii* (sterile pussy willow)
Witchweeds *Striga* species	**Prohibited Matter** *A person who deals with prohibited matter or a carrier of prohibited matter is guilty of an offence. A person who becomes aware of or suspects the presence of prohibited matter must immediately notify the Department of Primary Industries* All species in the *Striga* genus are Prohibited Matter in NSW, except the native *Striga parviflora*
Yellow burrhead *Limnocharis flava*	**Prohibited Matter** *A person who deals with prohibited matter or a carrier of prohibited matter is guilty of an offence. A person who becomes aware of or suspects the presence of prohibited matter must immediately notify the Department of Primary Industries*

The content provided here is for information purposes only and is taken from the *Biosecurity Act 2015* and its subordinate legislation, and the Regional Strategic Weed Management Plans (published by each Local Land Services region in NSW). It describes the state and regional priorities for weeds in New South Wales, Australia.

D.8 ABORIGINAL HERITAGE INFORMATION MANAGEMENT SYSTEM (AHIMS)

Office of Environment & Heritage
NSW GOVERNMENT

AHIMS Web Services (AWS)
Search Result

Purchase Order/Reference : North Ridge
Client Service ID : 381015

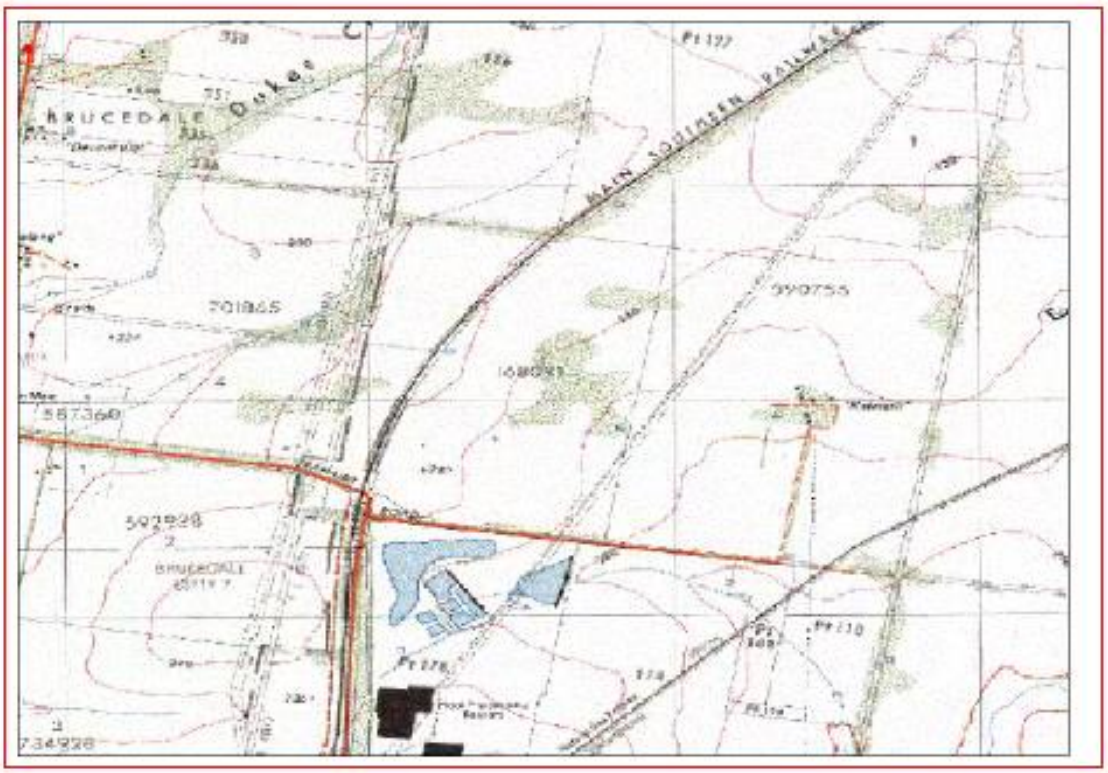
NGH Heritage - Fyshwick
17/27 Yallourn St
Fyshwick Australian Capital Territory 2609
Attention: Amy Ziesing
Email: amy.z@nghenvironmental.com.au

Date: 06 November 2018

Dear Sir or Madam:

AHIMS Web Service search for the following area at Lot : 11, DP:DP1130519 with a Buffer of 1000 meters, conducted by Amy Ziesing on 06 November 2018.

The context area of your search is shown in the map below. Please note that the map does not accurately display the exact boundaries of the search as defined in the paragraph above. The map is to be used for general reference purposes only.



A search of the Office of the Environment and Heritage AHIMS Web Services (Aboriginal Heritage Information Management System) has shown that:

3	Aboriginal sites are recorded in or near the above location.
0	Aboriginal places have been declared in or near the above location. *

If your search shows Aboriginal sites or places what should you do?

- You must do an extensive search if AHIMS has shown that there are Aboriginal sites or places recorded in the search area.
- If you are checking AHIMS as a part of your due diligence, refer to the next steps of the Due Diligence Code of practice.
- You can get further information about Aboriginal places by looking at the gazettal notice that declared it. Aboriginal places gazetted after 2001 are available on the NSW Government Gazette (http://www.nsw.gov.au/gazette) website. Gazettal notices published prior to 2001 can be obtained from Office of Environment and Heritage's Aboriginal Heritage Information Unit upon request

Important information about your AHIMS search

- The information derived from the AHIMS search is only to be used for the purpose for which it was requested. It is not be made available to the public.
- AHIMS records information about Aboriginal sites that have been provided to Office of Environment and Heritage and Aboriginal places that have been declared by the Minister;
- Information recorded on AHIMS may vary in its accuracy and may not be up to date .Location details are recorded as grid references and it is important to note that there may be errors or omissions in these recordings,
- Some parts of New South Wales have not been investigated in detail and there may be fewer records of Aboriginal sites in those areas. These areas may contain Aboriginal sites which are not recorded on AHIMS.
- Aboriginal objects are protected under the National Parks and Wildlife Act 1974 even if they are not recorded as a site on AHIMS.
- This search can form part of your due diligence and remains valid for 12 months.

3 Marist Place, Parramatta NSW 2150
Locked Bag 5020 Parramatta NSW 2220
Tel: (02) 9585 6380 Fax: (02) 9873 8599

ABN 30 841 387 271
Email: ahims@environment.nsw.gov.au
Web: www.environment.nsw.gov.au

D.9 REGISTER OF NATIVE TITLE CLAIMS

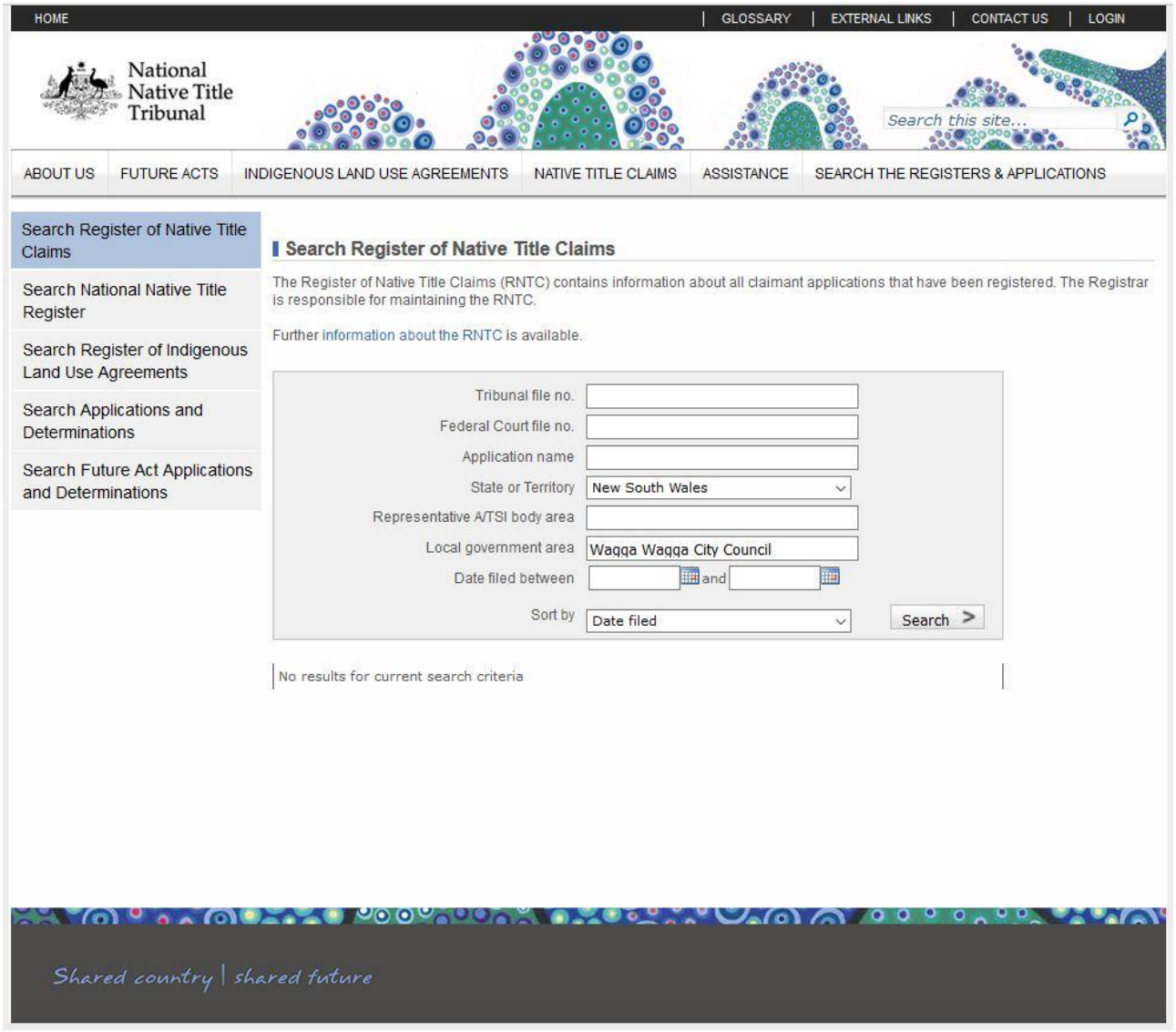


Figure 10-9 Search results for LGA from Register of Native Title Claims.

D.10 SEARCH FOR NSW HERITAGE

Home > Topics > Heritage places and items > Search for heritage

Search for NSW heritage

Return to search page where you can refine/broaden your search.

Statutory listed items

Information and items listed in the State Heritage Inventory come from a number of sources. This means that there may be several entries for the same heritage item in the database. For clarity, the search results have been divided into three sections.

- **Section 1** - contains Aboriginal Places declared by the **Minister for the Environment** under the National Parks and Wildlife Act. This information is provided by the Heritage Division.
- **Section 2** - contains heritage items listed by the **Heritage Council of NSW** under the NSW Heritage Act. This includes listing on the State Heritage Register, an Interim Heritage Order or protected under section 136 of the NSW Heritage Act. This information is provided by the Heritage Division.
- **Section 3** - contains items listed by **local councils** on Local Environmental Plans under the Environmental Planning and Assessment Act, 1979 and **State government agencies** under s.170 of the Heritage Act. This information is provided by local councils and State government agencies.

Section 1. Aboriginal Places listed under the National Parks and Wildlife Act.

Your search returned 1 record.

Aboriginal place name	Local government area	Local Aboriginal Land Council	Latitude	Longitude	Gazettal date and page numbers	Comments
Bomen Axe Quarry	Wagga Wagga	Wagga Wagga	-35.069813	147.424007	03/23/2012 p. 781	

Section 2. Items listed under the NSW Heritage Act.

Your search returned 1 record.

Item name	Address	Suburb	LGA	SHR
Bomen Railway Station	Main Southern railway	Bomen	Wagga Wagga	01093

Section 3. Items listed by Local Government and State Agencies.

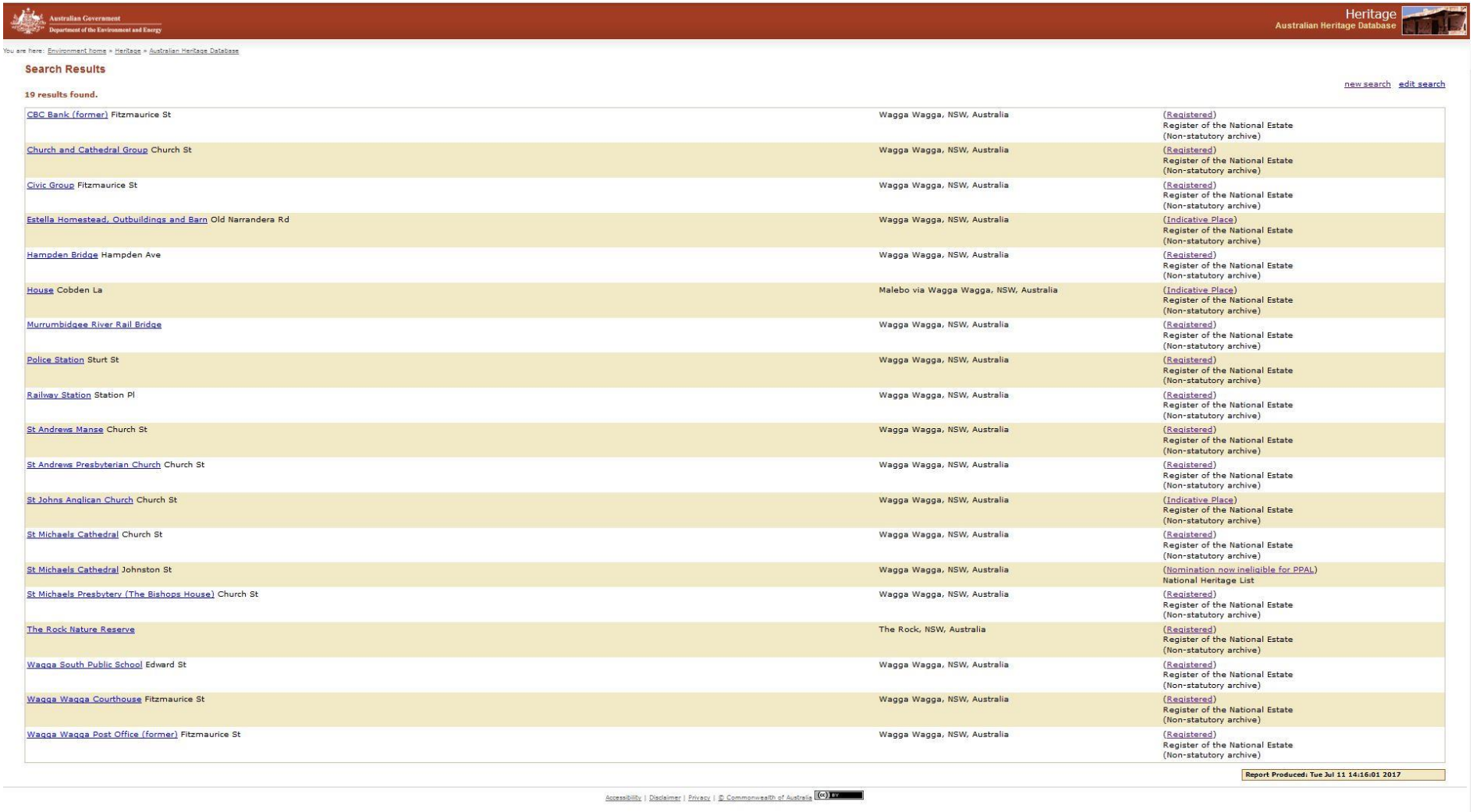
Your search returned 3 records.

Item name	Address	Suburb	LGA	Information source
Bomen Railway Station	46 Dampier Street	Bomen	Wagga Wagga	LGOV
Bomen Railway Station	Dampier Street	Bomen	Wagga Wagga	SGOV
Bomen Stationmaster's Residence	58 Dampier Street	Bomen	Wagga Wagga	LGOV

There was a total of 5 records matching your search criteria.

Figure 10-10 Search results for Bomen suburb in Wagga Wagga LGA from Search for NSW Heritage database.

D.11 AUSTRALIAN HERITAGE DATABASE



Australian Government
Department of the Environment and Energy

Heritage
Australian Heritage Database

You are here: Environment home » Heritage » Australian Heritage Database

Search Results

new search edit search

19 results found.

CBC Bank (former) Fitzmaurice St	Wagga Wagga, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
Church and Cathedral Group Church St	Wagga Wagga, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
Civic Group Fitzmaurice St	Wagga Wagga, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
Estella Homestead, Outbuildings and Barn Old Narrandera Rd	Wagga Wagga, NSW, Australia	(Indicative Place) Register of the National Estate (Non-statutory archive)
Hampden Bridge Hampden Ave	Wagga Wagga, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
House Cobden La	Malebo via Wagga Wagga, NSW, Australia	(Indicative Place) Register of the National Estate (Non-statutory archive)
Murrumbidgee River Rail Bridge	Wagga Wagga, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
Police Station Sturt St	Wagga Wagga, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
Railway Station Station Pl	Wagga Wagga, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
St Andrews Manse Church St	Wagga Wagga, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
St Andrews Presbyterian Church Church St	Wagga Wagga, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
St Johns Anglican Church Church St	Wagga Wagga, NSW, Australia	(Indicative Place) Register of the National Estate (Non-statutory archive)
St Michaels Cathedral Church St	Wagga Wagga, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
St Michaels Cathedral Johnston St	Wagga Wagga, NSW, Australia	(Nomination now ineligible for PPAL) National Heritage List
St Michaels Presbytery (The Bishops House) Church St	Wagga Wagga, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
The Rock Nature Reserve	The Rock, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
Wagga South Public School Edward St	Wagga Wagga, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
Wagga Wagga Courthouse Fitzmaurice St	Wagga Wagga, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
Wagga Wagga Post Office (former) Fitzmaurice St	Wagga Wagga, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)

Report Produced: Tue Jul 11 14:16:01 2017

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Figure 10-11 Search results for Wagga Wagga from Australian Heritage Database.

APPENDIX E SPECIES LIST

A list of all flora and fauna species identified within the study area is provided in Table E-1. The flora and fauna surveys were carried out within the study area at Bomen, approximately 10 km north east of central Wagga Wagga in New South Wales (Figure 1-1). The initial survey was carried out on the 2nd December 2016, followed by a night survey on 8th February 2017.

Noxious Class 4 △ Denotes a species listed as a Priority Weed within the local control authority of WWCC.

- Class 4 Plants pose a threat to primary production, the environment or human health, are widely distributed in an area to which the order applies and are likely to spread in the area or to another area. The growth of the plant must be managed in a manner that continuously inhibits the ability of the plant to spread and the plant must not be sold, propagated or knowingly distributed.

***** Denotes introduced species

^ Methodology for cover abundance scores are Braun-Blanquet, J. (1932).

Table E-1 Braun-Blanquet density scores

Score	Cover
0	Taxa absent from quadrat
0.1	Taxa represented by a solitary shoot, <5 % cover
0.5	Taxa represented by a few (<5) shoots, <5 % cover
1	Taxa represented by many (>5) shoots, <5 % cover
2	Taxa represented by many (>5) shoots, 5 – 25 % cover
3	Taxa represented by many (>5) shoots, 25 – 50 % cover
4	Taxa represented by many (>5) shoots, 50 – 75 % cover
5	Taxa represented by many (>5) shoots, 75 – 100 % cover

Table E-2 List of flora species recorded during the survey.

Family	Scientific name	Common name	Cover Abundance^ Pond 1	Cover Abundance^ Pond 2	Cover Abundance^ Pond 3	Cover Abundance^ Tree lot	Cover Abundance^ Bottom paddock
Asteraceae							
	**Conyza* sp.	Fleabane	0.5	0.5	0.5	0	0.5
	**Hypochaeris* sp.	Cat's Ears	1	1	1	1	0.5
	**Latuca serriola*	Prickly Lettuce	1	1	1	1	0.5
	⊿ **Onopordum acanthium*	Scotch Thistle	1	2	2	1	1
	**Sonchus oleraceus*	Milk Thistle	1	1	1	1	0.5
	**Vittadinia cuneata*	Fuzzweed	0.1	0.1	0.1	0	0
Boraginaceae							
	**Echium plantaginuem*	Patterson's Curse	1	1	1	1	1
Chenopodiaceae							
	Sclerolaena birchii	Galvanised Burr	0.5	0.5	0.5	0	0
	Scleroleana muricata	Black Roly-poly	0.5	0.5	0	0	0
Clusiaceae							
	⊿ **Hypericum perforatum*	St. John's Wort	1	1	1	0.5	0.5
Fabaceae							
	**Acacia leucoclada*	Northern Silver Wattle	0	0	0	2	0
	**Trifolium arvense*	Haresfoot Clover	1	1	1	1	1
Juncaceae							
	Juncus sp.	Rush	0.5	0.5	0.5	0	0.1
Lamiaceae							
	**Salvia verbenaca*	Wild Sage	1	1	1	0.1	0
	**Marrubium vulgare*	Horehound	0.5	0.5	0.5	0.1	0
Malvaceae							

Family	Scientific name	Common name	Cover Abundance^ Pond 1	Cover Abundance^ Pond 2	Cover Abundance^ Pond 3	Cover Abundance^ Tree lot	Cover Abundance^ Bottom paddock
	**Malva* sp.	Mallow	0.1	0.1	0.1	0.5	1
Myrtaceae							
	Eucalytpus polyanthemos	Red Box	0	0	0	2	0
	Eucalyptus microcarpa	Grey Box	0	0.5	0	2	0
	Eucalyptus melliodora	Yellow Box	0.5	0.5	0	2	0
	Eucalyptus blakelyi	Blakely's Red Gum	0	0	0.5	2	0
	Melaleuca stypheloides	Prickly-leaf Tea-tree (Planted)	0	0	0	1	0
Oleaceae							
	**Olive eropeae* ssp. *europaea*	Olive (Planted)	0	0	0	0.5	2
Poaceae							
	**Avena* sp.	Wild Oats	3	3	3	3	2
	**Bromus diandrus*	Great Brome	1	1	1	1	1
	**Bromus molliformis*	Soft Brome	1	1	1	1	1
	**Dactylis glomerata*	Cocksfoot Grass	1	1	1	1	1
	**Hordeum leporinum*	Barley Grass	1	1	1	1	1
	**Lolium* sp.	Rye Grass	1	1	1	1	1
	**Pennisetum clandestinum*	Kikuyu	1	0	0	0	0
	**Phalaris aquatica*	Phalaris	2	2	2	2	2
	**Vulpia myuros*	Rat's Tail Grass	1	1	1	1	1
	Austrostipa sp.	Spear Grass (scabra?)	1	1	1	2	1
	Austrostipa sp.	Spear Grass (aristiglumis?)	1	1	1	2	1
	Cynodon dactylon	Couch	0	0	0	0	0.5

Family	Scientific name	Common name	Cover Abundance^ Pond 1	Cover Abundance^ Pond 2	Cover Abundance^ Pond 3	Cover Abundance^ Tree lot	Cover Abundance^ Bottom paddock
	Austrodanthonia sp.	Wallaby Grass (tenuior?)	2	2	3	3	1
	Austrodanthonia sp.	Wallaby Grass	2	2	3	3	1
	Triticum sp.	Wheat (Planted crop)	0	0	0	0	5
Polygonaceae							
	**Polygonum aviculare*	Wireweed	0.5	0.5	0.5	0	0.5
	**Rumex crispus*	Curled Dock	1	1	1	1	1
	Persicaria prostrata	Knotweed	0.5	0.5	0.5	0	0.5
Residaceae							
	**Reseda luteola*	Wild Mignonette	0	0	0	0.5	0

Table E-3 List of fauna species recorded during the surveys

Key

* Denotes exotic species

O Observed

H Heard

S Scat

T Track

Scientific name	Common name	Observation Type
Birds		
Corvus coronoides	Australian Raven	O
Egretta novaehollandiae	White-faced Heron	O
Himantopus himantopus	Black-winged Stilt	O
Lalage sueurii	White-winged Triller	H
Malurus cyaneus	Superb Blue Wren	H
Ocyphaps lophotes	Crested Pigeon	O
Platycercus eximius	Eastern Rosella	O
Psephotus haematonotus	Red-rumped Parrot	O
Rhipidura leucophrys	Willy Wagtail	O
Vanellus miles	Masked Lapwing	O
Mammals		
Macropus giganteus	Eastern Grey Kangaroo	O
Tachyglossus aculeatus	Echidna	T (Diggings)
****Vulpes vulpes***	Fox	O
Amphibians		
Limnodynastes tasmaniensis	Spotted Marsh Frog	O
Limnodynastes dumerilii	Southern Banjo Frog	O
Litoria peronii	Peron's Tree Frog	O + H
Reptiles		
-	Legless Lizard sp.	O
During site inspection		
Peewee	Black-shouldered Kite	BFCS
Black Swan (across road)		

APPENDIX F THREATENED SPECIES EVALUATIONS

The tables in this Appendix present the habitat evaluation for threatened species, ecological communities and endangered populations listed for Wagga Wagga in the *Atlas of NSW Wildlife*[1] and those identified as potentially occurring in the area according to the Commonwealth EPBC *Protected Matters Search Tool*[2].

The likelihood of occurrence is based on presence of habitat, proximity of nearest records and mobility of the species (where relevant). The assessment of potential impact is based on the nature of the proposal, the ecology of the species and its likelihood of occurrence. The following classifications are used:

Presence of habitat:

Present: Potential or known habitat is present within the study area

Absent: No potential or known habitat is present within the study area

Likelihood of occurrence

Unlikely: Species known or predicted within the locality but unlikely to occur in the study area

Possible: Species could occur in the study area

Present: Species was recorded during the field investigations

Possible to be impacted

No: The proposal would not impact this species or its habitats. No assessment of significance is necessary for this species

Yes: The proposal could impact this species or its habitats. An assessment of significance has been applied to these entities.

[1] The *Atlas of NSW Wildlife* is administered by the NSW Department of Environment, Climate Change and Water (OEH) and is an online database of fauna and flora records that contains over four million recorded sightings.

[2] This online tool is designed for the public to search for matters protected under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). It is managed by the Commonwealth Department of the Environment, Water, Heritage and the Arts.

Species	Description	Presence of habitat	Likelihood of occurrence	Possible impact?
FLORA				
Pultenaea humilis Dwarf Bush-pea V BC (BN)	Dwarf Bush-pea is found in isolated remnants of native woodland and forest communities that occur in extensively cleared agricultural landscapes, on a variety of soils ranging from sandy loams to clays.	**Present** Study area includes remnant native woodland in cleared agricultural landscape.	**Possible** Species could occur in study area.	**Yes** Assessment of significance completed.
Ammobium craspedioides Yass Daisy V BC V EPBC (BN)	Yass Daisies are found in moist of dry forest communities, Box-Gum woodland, and secondary grassland derived from clearing of these communities. They grow in association with a large range of eucalypts, including Blakely's Red Gum and Yellow Box. Populations can persist in some lightly grazed sites.	**Present** Study area includes remnant woodland communities including Blakely's Red Gum and Yellow Box.	**Possible** Species has been recorded in Wagga Wagga area.	**Yes** Assessment of significance completed.
Leucochrysum albicans var. tricolor Hoary Sunray E EPBC (BN)	Hoary Sunray occurs in a wide variety of grassland, woodland and forest habitats, generally on relatively heavy soils, and can also occur on modified habitats and roadsides. They are highly dependent on the presence of bare ground for germination, and in some areas disturbance is required for successful establishment.	**Present** Study area includes modified remnant woodland habitat which has been previously disturbed.	**Possible** Species could occur in study area.	**Yes** Assessment of significance completed.
Caladenia tensa Greencomb Spider-orchid E EPBC (PMST)	Greencomb Spider-orchids grow on red-brown sandy loams on higher areas generally with rocky outcrops in open woodland, most commonly dominated by Yellow Gum and Rottnest Island Pine.	**Absent** No open woodland on higher areas in study area.	**Unlikely** Species unlikely to occur as there is no suitable habitat in study area.	**No** No suitable habitat would be impacted by the proposal, so unlikely to have any impact on this species.

Species	Description	Presence of habitat	Likelihood of occurrence	Possible impact?
Caesia parviflora var. minor Small Pale Grass-lily E BC (BN)	Small Pale Grass-lilies are found in damp places in open forest on sandstone.	**Absent** No open forest on sandstone in study area.	**Unlikely** Species unlikely to occur as there is no suitable habitat in study area.	**No** No suitable habitat would be impacted by the proposal, so unlikely to have any impact on this species.
Caladenia concolor Crimson Spider-orchid E BC V EPBC (BN)	Crimson Spider-orchids are found in regrowth woodland on granite ridge country that has retained a high diversity of plant species, including other orchids. Dominant trees are Blakely's Red Gum, Red Stringybark, Red Box, and White Box.	**Absent** No regrowth woodland on granite ridge with high plant diversity in study area.	**Unlikely** Species unlikely to occur as there is no suitable habitat in study area.	**No** No suitable habitat would be impacted by the proposal, so unlikely to have any impact on this species.
Caladenia rosella Rosella Spider-orchid PE BC E EPBC (BN)	Rosella Spider-orchid is found in Victoria in woodlands and low forests of Red Box, Long-leafed Box, and Red Stringybark in well-drained, skeletal soils.	**Absent** No woodland or low forest of habitat species in study area.	**Unlikely** Species unlikely to occur as there is no suitable habitat and study area is outside known species distribution.	**No** No suitable habitat would be impacted by the proposal, so unlikely to have any impact on this species.
Euphrasia collina muelleri Mueller's Eyebright E BC E EPBC (BN)	Mueller's Eyebright is found in Victoria in damp areas of heathy woodland.	**Absent** No heathy woodland in study area.	**Unlikely** Species unlikely to occur as there is no suitable habitat in study area.	**No** No suitable habitat would be impacted by the proposal, so unlikely to have any impact on this species.

Species	Description	Presence of habitat	Likelihood of occurrence	Possible impact?
Swainsona recta Small Purple-pea E BC E EPBC (BN)	Small Purple-pea occurs predominantly in grassy woodlands, but sometimes extends into grassy open forest, usually with tree cover including Blakely's Red Gum, Yellow Box, and White Box.	**Present** Study area includes remnant native woodland with tree cover including Blakely's Red Gum and Yellow Box.	**Unlikely** Species was recorded historically in the Wagga Wagga area, but is now considered locally extinct.	**No** Species not likely to occur in study area, so unlikely to be any impact.
Grevillea wilkinsonii Tumut Grevillea E BC E EPBC (BN)	Tumut Grevillea is associated with native vegetation includes remnant riverine shrub communities adjacent to open-forest, with the most common tree species being Blakely's Red Gum, Apple Box, Yellow Box, and Red Stringybark, with Kurrajongs growing in nearby paddocks.	**Absent** No riverine vegetation in study area.	**Unlikely** Species unlikely to occur as there is no suitable habitat in study area.	**No** No suitable habitat would be impacted by the proposal, so unlikely to have any impact on this species.
Senecio garlandii Woolly Ragwort V BC (BN)	Woolly Ragwort occurs on sheltered slopes of rocky outcrops.	**Absent** No rocky outcrops in study area.	**Unlikely** Species unlikely to occur as there is no suitable habitat in study area.	**No** No suitable habitat would be impacted by the proposal, so unlikely to have any impact on this species.
THREATENED ECOLOGICAL COMMUNITIES				
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland EEC BC CE EPBC (PMST)	White Box – Yellow Box – Blakely's Red Gum EEC occurs in areas with moderate to highly fertile soils, on the tablelands and western slopes of NSW from the Queensland border to the Victorian border.	**Present** Study area includes moderate to highly fertile soil on western slopes of NSW.	**Possible** Study area is highly disturbed, but species characteristic of the community occur in the study area, including Yellow Box and Blakely's Red Gum.	**Yes** Assessment of significance completed.

Species	Description	Presence of habitat	Likelihood of occurrence	Possible impact?
Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native grasslands of South-eastern Australia EEC BC E EPBC (PMST)	Grey Box woodlands EEC generally occurs in low relief landscapes in drier areas on productive alluvial and colluvial soils.	**Present** Study area includes low relief landscape on productive soil.	**Possible** Study area is highly disturbed, but species characteristic of the community occur in the study area, including Grey Box and Yellow Box.	**Yes** Assessment of significance completed.
Myall Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain, Murray-Darling Depression, Riverina and NSW South Western Slopes bioregions EEC BC E EPBC (PMST)	Myall Woodland EEC occurs across the eastern parts of the alluvial plains of the Murray-Darling river system. Typically, it occurs on red-brown earths and heavy textured grey and brown alluvial soils within a climatic belt receiving between 375 and 500 mm mean annual rainfall.	**Absent** No red-brown or heavy textured grey and brown alluvial soils in study area.	**Unlikely** Ecological community unlikely to occur as there is no suitable habitat in study area.	**No** No suitable habitat would be impacted by the proposal, so unlikely to have any impact on this ecological community.
Tablelands Snow Gum, Black Sallee, Candlebark and Ribbon Gum grassy woodland in the south-eastern highlands, Sydney basin, south-east corner and NSW south-western slopes bioregions EEC BC (BN)	This EEC commonly occurs on valley floors, margins of frost hollows, and on footslopes and undulating hills, between around 600 and 1400 m in altitude on a variety of substrates including basalt, sediments, granite, colluvium, and alluvium.	**Absent** The study area does not contain any land between 600 and 1400 m in altitude.	**Unlikely** Ecological community unlikely to occur as there is no suitable habitat in study area, and species characteristic of the community were not recorded in study area.	**No** No suitable habitat would be impacted by the proposal, so unlikely to have any impact on this ecological community.
FAUNA				
Birds				

Species	Description	Presence of habitat	Likelihood of occurrence	Possible impact?
Anthochaera phrygia Regent Honeyeater CE BC CE EPBC (PMST)	Regent Honeyeaters mainly inhabit temperate woodlands and open forests of the inland slopes of south-east Australia, in particular dry open forest, woodland, Box-Ironbark woodland, and riparian forests of River Sheoak.	**Present** Study area includes remnant mature trees from temperate woodland.	**Possible** Species could occur in study area.	**Yes** Assessment of significance completed.
Grantiella picta Painted Honeyeater V EPBC V BC (PMST)	Painted Honeyeaters occur in Boree/Weeping Myall, Brigalow, and Box-Gum Woodlands and Box-Ironbark Forests.	**Present** Study area includes remnant mature trees from woodland.	**Possible** Species could occur in study area.	**Yes** Assessment of significance completed.
Melithreptus gularis gularis Black-chinned Honeyeater (eastern subspecies) V BC (BN)	Black-chinned Honeyeaters occupy mostly the upper levels of drier open forests or woodlands dominated by box and ironbark eucalypts, especially Mugga Ironbark, White Box, Grey Box, Yellow Box, Blakely's Red Gum, and Forest Red Gum. They also inhabit open forests of smooth-barked gums, stringybarks, ironbarks, tea trees, and river she-oaks.	**Present** Study area includes open eucalypt woodland with Grey Box, Yellow Box, and Blakely's Red Gum.	**Possible** Species could occur in study area.	**Yes** Assessment of significance completed.
Calidris ferruginea Curlew Sandpiper E BC CE EPBC (PMST)	Curlew Sandpipers mainly occur on intertidal mudflats in both fresh and brackish waters in sheltered coastal areas, such as estuaries, bays, inlets, and lagoons. They are also recorded inland, including around ephemeral and permanent lakes, dams, and waterholes, usually with bare edges of mud or sand.	**Present** Study area includes three evaporation ponds with bare mud edges.	**Possible** Species could occur in study area.	**Yes** Assessment of significance completed.

Species	Description	Presence of habitat	Likelihood of occurrence	Possible impact?
Lathamus discolor Swift Parrot E BC CE EPBC (PMST)	In NSW, Swift Parrots mostly occur on the coast and southwest slopes in areas with abundant flowering eucalypts or lerp. Feed trees include winter flowering species such as Swamp Mahogany, Spotted Gum, Red Bloodwood, Mugga Ironbark, and White Box.	**Present** Study area includes mature food trees such as Grey Box.	**Possible** Species could occur in study area.	**Yes** Assessment of significance completed.
Polytelis swainsonii Superb Parrot V BC V EPBC (PMST)	Superb Parrots inhabit Box-Gum, Box-Cypress, and Boree Woodlands and River Red Gum Forests. They nest in hollows of large trees in tall open forest or woodland.	**Present** Study area includes open remnant woodland with mature hollow-bearing trees.	**Possible** Species has been recorded in locality and could occur in study area.	**Yes** Assessment of significance completed.
Callocephalon fimbriatum Gang-Gang Cockatoo V BC (BN)	In New South Wales, Gang-gang Cockatoos occur from the south-east coast to the Hunter region, and inland to the Central Tablelands and south-west slopes. In spring and summer, they are generally found in tall mountain forests and woodlands, particularly in heavily timbered and mature wet sclerophyll forests. In autumn and winter, they often move to lower altitudes in drier, more open eucalypt forests and woodlands, particularly box-gum and box-ironbark assemblages.	**Present** Study area includes open remnant Box-Gum woodland.	**Possible** Species could occur in study area.	**Yes** Assessment of significance completed.
Neophema pulchella Turquoise Parrot V BC (BN)	Turquoise Parrots live on the edges of eucalypt woodland adjoining clearings, timbered ridges and creeks in farmland. They nest in tree hollows, logs, or posts.	**Present** Study area includes edges of eucalypt woodland in farmland and mature hollow-bearing trees.	**Possible** Species could occur in study area.	**Yes** Assessment of significance completed.

Species	Description	Presence of habitat	Likelihood of occurrence	Possible impact?
Glossopsitta pusilla Little Lorikeet V BC (BN)	Little Lorikeets forage primarily in the canopy of open *Eucalyptus* forest and woodland, and finds food in *Angophora, Melaleuca* and other tree species. Riparian habitats are particularly used due to higher soil fertility and resulting greater productivity. Isolated flowering trees in open country, including paddocks, roadside remnants, and urban trees are also used. They typically select nesting hollows in the limbs and trunks of smooth-barked eucalypts, often in riparian areas, which are known to be used repeatedly for decades.	**Present** Study area includes isolated flowering trees in open country, and mature smooth-barked eucalypts.	**Possible** Species could occur in study area.	**Yes** Assessment of significance completed.
Lophoictinia isura Square-tailed Kite V BC (BN)	Square-tailed Kites occur along coastal and subcoastal areas from south-western to northern Australia, Queensland, NSW and Victoria. They are found in a variety of timbered habitats including dry woodlands and open forests, particularly timbered watercourses.	**Present** Study area includes open dry woodland.	**Possible** Species could occur in study area.	**Yes** Assessment of significance completed.
Hieraaetus morphnoides Little Eagle V BC (BN)	Little Eagles occupy open eucalypt forest, woodland, or open woodland, and Sheoak or Acacia woodlands and riparian woodlands in interior NSW, where they nest in tall living trees within a remnant patch.	**Present** Study area includes open eucalypt woodland.	**Possible** Species could occur in study area.	**Yes** Assessment of significance completed.
Ninox connivens Barking Owl V BC (BN)	Barking Owls typically inhabit woodland and open forest, including fragmented remnants and partly cleared farmland, but can be flexible in habitat use and hunting can extend into closed forest and more open areas. They are sometimes able to breed along timbered watercourses in heavily cleared habitats. They require large permanent territories, usually around 2000 ha, and nest in hollows of large old trees, preferably living eucalypts.	**Present** Study area includes fragmented remnants of woodland in farmland and mature hollow-bearing trees.	**Possible** Species could occur in study area.	**Yes** Assessment of significance completed.

Species	Description	Presence of habitat	Likelihood of occurrence	Possible impact?
Petrocia phoenica Flame Robin V BC (BN)	Flame Robins breed in upland tall moist eucalypt forests and woodlands, often on ridges and slopes, where they prefer clearings or areas with open understoreys. In winter, they migrate to drier and more open habitats in the lowlands, including dry forests, open woodlands, and pastures and native grasslands with or without scattered trees.	**Present** Study area includes open woodland and agricultural land with scattered trees.	**Possible** Species could occur in study area.	**Yes** Assessment of significance completed.
Climacteris picumnus victoriae Brown Treecreeper (eastern subspecies) V BC (WA)	Brown Treecreepers are found in eucalypt woodlands (including Box-Gum woodland) and dry open forest of the inland slopes and plains west of the Great Dividing Range, mainly in woodlands dominated by Stringybarks or other rough-barked eucalypts, usually with an open grassy understorey and sometimes with one or more shrub species. They are also found in Mallee and River Red Gum forest bordering wetlands with an open understorey of acacias, saltbush, lignum, cumbungi and grasses. They are not usually found in woodlands with a dense shrub layer. Fallen timber is an important habitat component for foraging, and hollows in standing dead or live trees and tree stumps are essential for nesting.	**Present** Study area includes remnant Box-Gum woodland with mature hollow-bearing trees.	**Possible** Species has been recorded in locality and could occur in study area.	**Yes** Assessment of significance completed.
Daphoenositta chrysoptera Varied Sittella V BC (BN)	Varied Sittellas inhabit eucalypt forests and woodlands, especially those containing rough-barked species and mature smooth-barked gums with dead branches, Mallee and Acacia woodland.	**Present** Study area includes remnant eucalypt woodland with mature smooth-barked gums.	**Possible** Species could occur in study area.	**Yes** Assessment of significance completed.
Melanodryas cucullata cucullata Hooded Robin (south-eastern form) V BC (BN)	Hooded Robins prefer lightly wooded country, usually open eucalypt woodland, Acacia scrub and Mallee, often in or near clearings or open areas. They require structurally diverse habitats featuring mature eucalypts, saplings, some small shrubs, and a ground layer of moderately tall native grasses.	**Present** Study area includes open eucalypt woodland in open farmland.	**Possible** Species could occur in study area.	**Yes** Assessment of significance completed.

Species	Description	Presence of habitat	Likelihood of occurrence	Possible impact?
Stagonopleura guttata Diamond Firetail V BC (BN)	Diamond Firetails are found in grassy eucalypt woodlands, including Box-Gum woodlands, as well as open forest, Mallee, natural temperate grassland, secondary grassland derived from other communities, and lightly wooded farmland.	**Present** Study area includes lightly wooded farmland with eucalypts.	**Possible** Species could occur in study area.	**Yes** Assessment of significance completed.
Epthianura albifrons White-fronted Chat V BC (WA)	White-fronted Chats are found mostly in temperate to arid climates and very rarely sub-tropical areas, it occupies foothills and lowlands up to 1000 m above sea level. In NSW, it occurs mostly in the southern half of the state, in damp open habitats along the coast, and near waterways in the western part of the state.	**Present** Study area includes open habitat within 2 km of a major waterway.	**Possible** Species could occur in study area and has been recorded around 4 km from the study area.	**Yes** Assessment of significance completed.
Pomatostomus temporalis temporalis Grey-crowned Babbler (eastern subspecies) V BC (WA)	Grey-crowned Babbler Inhabits open Box-Gum Woodlands on the slopes, and Box-Cypress-pine and open Box Woodlands on alluvial plains. They feed on invertebrates, either by foraging on the trunks and branches of eucalypts and other woodland trees or on the ground, digging and probing amongst litter and tussock grasses. Nests are usually located in shrubs or sapling eucalypts, although they may be built in the outermost leaves of low branches of large eucalypts.	**Present** Study area includes open woodlands with mature Grey Box, Yellow Box, Red Gum, and Blakely's Red Gum.	**Possible** Species could occur in study area and has been recorded around 2 km from the study area.	**Yes** Assessment of significance completed.
Apus pacificus Fork-tailed Swift MM EPBC (PMST)	Fork-tailed Swifts mostly occur over dry or open habitats, including riparian woodland and tea-tree swamps, low scrub, heathland or saltmarsh. They are also found at treeless grassland and sandplains covered with spinifex, open farmland and inland and coastal sand-dunes, as well as over settled areas, including towns, urban areas and cities.	**Present** Study area includes open farmland habitat.	**Possible** Species may fly over study area or use as occasional foraging habitat.	**Yes** Assessment of significance completed.
Hirundapus caudacutus White-throated Needletail MT EPBC (PMST)	White-throated Needletails are most commonly recorded above wooded areas including open forest and rainforest, and less commonly above woodland.	**Present** Study area includes open woodland habitat.	**Possible** Species may fly over study area or use as occasional foraging habitat.	**Yes** Assessment of significance completed.

Species	Description	Presence of habitat	Likelihood of occurrence	Possible impact?
Motacilla flava Yellow Wagtail MT EPBC (PMST)	Yellow Wagtails occur in variable habitat, but typically flat, open, grassy area near water, which may include grasslands, air strips, pastures, sports fields, and edges of wetlands, rivers, and dams.	**Present** Study area includes flat grassy areas near evaporation ponds.	**Possible** Species could occur in study area.	**Yes** Assessment of significance completed.
Myiagra cyanoleuca Satin Flycatcher MT EPBC (PMST)	Satin Flycatchers are found in eucalypt forest and woodland, especially tall, wet sclerophyll forests along gullies and water courses, and open, grassy areas of woodland.	**Present** Study area includes open, grassy areas of woodland.	**Possible** Species could occur in study area.	**Yes** Assessment of significance completed.
Botaurus poiciloptilus Australasian Bittern E EPBC E BC (PMST)	Australasian Bitterns favour permanent freshwater wetlands with tall, dense vegetation, particularly bulrushes and spikerushes.	**Absent** No dense wetland vegetation in study area.	**Unlikely** Species unlikely to occur as there is no suitable habitat in study area.	**No** No suitable habitat would be impacted by the proposal, so unlikely to have any impact on this species.
Numenius madagascariensis Eastern Curlew CE EPBC (PMST)	Eastern Curlews are mostly commonly found on large intertidal mudflats often with seagrass beds along sheltered coasts including in estuaries, bays, harbours, inlets, lagoons, and among saltmarshes and mangroves.	**Absent** No coastal habitat in study area.	**Unlikely** Species unlikely to occur as there is no suitable habitat in study area.	**No** No suitable habitat would be impacted by the proposal, so unlikely to have any impact on this species.
Rostratula australis Australian Painted Snipe E EPBC E BC (PMST)	Australian Painted Snipes generally inhabit shallow terrestrial freshwater or occasionally brackish wetlands, including temporary and permanent lakes, swamps, and claypans. They also use inundated or waterlogged grassland or saltmarsh, dams, rice crops, sewage farms, and bore drains. They prefer the fringes of swamps, dams, and nearby marshy areas where there is a cover of grasses, lignum, low scrub, or open timber.	**Absent** No vegetation cover on waterbody fringes in study area.	**Unlikely** Species unlikely to occur as there is no suitable habitat in study area.	**No** No suitable habitat would be impacted by the proposal, so unlikely to have any impact on this species.

Species	Description	Presence of habitat	Likelihood of occurrence	Possible impact?
Gallinago hardwickii Latham's Snipe MW EPBC (PMST)	Latham's Snipe occurs in permanent and ephemeral wetlands, usually open freshwater wetlands with low, dense vegetation such as swamps, flooded grasslands or heathlands, and bogs, but also in saline or brackish water bodies, and in both modified and artificial habitats.	**Absent** No water bodies with low, dense vegetation in study area.	**Unlikely** Species unlikely to occur as there is no suitable habitat in study area.	**No** No suitable habitat would be impacted by the proposal, so unlikely to have any impact on this species.
Burhinus grallarius Bush Stone-curlew E BC (BN)	Bush Stone-curlews inhabit open forests and woodlands with a sparse, grassy ground layer and fallen timber.	**Absent** No open forests or woodlands with fallen timber in study area.	**Unlikely** Species unlikely to occur as there is no suitable habitat in study area.	**No** No suitable habitat would be impacted by the proposal, so unlikely to have any impact on this species.
Leipoa ocellata Malleefowl E BC V EPBC (PMST)	Malleefowl are found in semi-arid to arid shrublands and low woodlands, especially those dominated by Mallee and/or Acacia which are tall, dense, and floristically rich. A sandy to sandy-loam substrate and abundance of leaf litter are required for breeding.	**Absent** No habitat dominated by Mallee or Acacia in study area.	**Unlikely** Species unlikely to occur as there is no suitable habitat in study area.	**No** No suitable habitat would be impacted by the proposal, so unlikely to have any impact on this species.
Calyptorhynchus lathami Glossy Black-cockatoo V BC (BN)	Glossy Black-cockatoos inhabit open forest and woodland of the coast and Great Dividing Range where stands of Sheoak occur. Inland populations feed on a wide range of she-oaks. In the Riverina, birds are associated with hills and rocky rises supporting Drooping Sheoak, and in open woodlands dominated by Belah. They are dependent on large hollow-bearing eucalypts for nesting.	**Absent** No rocky rises with she-oak or Belah in study area.	**Unlikely** Species unlikely to occur as there is no suitable habitat in study area.	**No** No suitable habitat would be impacted by the proposal, so unlikely to have any impact on this species.

Species	Description	Presence of habitat	Likelihood of occurrence	Possible impact?
Glossopsitta porphyrocephala Purple-crowned Lorikeet V BC (BN)	Purple-crowned Lorikeets are found in open forests and woodlands, particularly where there are large flowering eucalypts, and in Mallee habitats. They feed primarily on the nectar and pollen of flowering eucalypts, including planted trees in urban areas.	**Present** Study area includes remnant open woodlands with large flowering eucalypts.	**Unlikely** Species unlikely to occur as study area is outside known species distribution.	**No** Species not likely to occur in study area, so unlikely to be any impact.
Petrocia boodang Scarlet Robin V BC (BN)	Scarlet Robins live in dry eucalypt forests and woodlands. The understorey is usually open and grassy with a few scattered shrubs. They live in both mature and regrowth vegetation, and usually in habitat which contains abundant logs and fallen timber. In autumn and winter, many Scarlet Robins live in open grassy woodlands, and grasslands or grazed paddocks with scattered trees.	**Absent** No dry eucalypt forest or woodland with fallen timber in study area.	**Unlikely** Species unlikely to occur as there is no suitable habitat in study area.	**No** No suitable habitat would be impacted by the proposal, so unlikely to have any impact on this species.
Chthonicola sagittata Speckled Warbler V BC (BN)	Speckled Warblers live in a wide range of eucalypt dominated communities that have a grassy understorey, often on rocky ridges or in gullies. Typical habitat would include scattered native tussock grasses, a sparse shrub layer, some eucalypt regrowth, and an open canopy. Large, relatively undisturbed remnants are required for the species to persist in an area.	**Absent** No large, relatively undisturbed vegetation remnants in study area.	**Unlikely** Species unlikely to occur as there is no suitable habitat in study area.	**No** No suitable habitat would be impacted by the proposal, so unlikely to have any impact on this species.
Ninox strenua Powerful Owl V BC (BN)	Powerful Owls occur in a range of vegetation types, including woodland and open sclerophyll forest. They need large tracts of habitat but can occur in fragmented landscapes as well. Breeding and hunting occurs in open or closed sclerophyll forest or woodland, and hunting may also occur in open habitat. They perch during the day in dense vegetation that includes species such as Turpentine, Black She-oak, Blackwood, Rough-barked Apple, Cherry Ballart, and a number of eucalypt species.	**Absent** No large tracts of habitat in locality.	**Unlikely** Species unlikely to occur as there is no suitable habitat in study area.	**No** No suitable habitat would be impacted by the proposal, so unlikely to have any impact on this species.
Tyto novaehollandiae Masked Owl V BC (BN)	Masked Owls live in dry eucalypt forests and woodlands from sea level to 1100 m. They are a forest species but often hunt on forest edges, including roadsides.	**Absent** No large tracts of habitat in locality.	**Unlikely** Species unlikely to occur as there is no suitable habitat and study area is outside known species distribution.	**No** No suitable habitat would be impacted by the proposal, so unlikely to have any impact on this species.

Species	Description	Presence of habitat	Likelihood of occurrence	Possible impact?
Mammals				
Phascolarctos cinereus Koala V BC V EPBC (PMST)	Koalas inhabit a range of temperate, subtropical and tropical eucalypt woodlands and forests where suitable food trees grow, of which there are more than 70 eucalypt species and 30 non-eucalypt species that are particularly abundant on fertile clay soils.	**Present** Study area includes mature secondary feed tree species Yellow Box and Blakely's Red Gum.	**Possible** Species could occur in study area and has been recorded around 10 km from the study area.	**Yes** Assessment of significance completed.
Petaurus norfolcensis Squirrel Glider V BC (BN)	Squirrel Gliders inhabit mature or old-growth Box, Box-Ironbark woodlands, and River Red Gum forests west of the Great Dividing Range. They prefer mixed species stands with a shrub or Acacia mid-storey, and require abundant tree hollows.	**Present** Study area includes mature Grey Box and Yellow Box.	**Possible** Species could occur in study area.	**Yes** Assessment of significance completed.
Cercartetus nanus Eastern Pygmy-possum V BC (BN)	Eastern Pygmy-possums are found in a broad range of habitats, including sclerophyll forest and woodland. They feed largely on nectar and pollen collected from banksias, eucalypts, and bottlebrushes, and shelter in tree hollows, rotten stumps, holes in the ground, abandoned nests, and vegetation thickets.	**Present** Study area includes some sclerophyll woodland.	**Possible** Species could occur in study area.	**Yes** Assessment of significance completed.
Nyctophilus corbeni Corben's Long-eared bat V BC V EPBC (PMST)	Corben's Long-eared Bats inhabit a variety of vegetation types, most commonly Mallee, Bulloke, and Box-dominated communities, but are most common in vegetation which has a distinct canopy and dense understorey. They roost in tree hollows, crevices, and under loose bark.	**Present** Study area includes communities dominated by eucalypt species such as Grey Box and Yellow Box, with mature hollow-bearing trees.	**Possible** Species could occur in study area.	**Yes** Assessment of significance completed.

Species	Description	Presence of habitat	Likelihood of occurrence	Possible impact?
Miniopterus schreibersii oceanensis Eastern Bentwing-bat V BC (BN)	Eastern Bent-wing Bats roost primarily in caves, but also use derelict mines, storm-water tunnels, buildings and other man-made structures. They form discrete populations centered on a maternity cave which have very specific temperature and humidity regimes. Cold caves are used for hibernation in southern Australia. They hunt in forested areas, catching moths and other flying insects above the tree tops.	**Present** Study area includes lightly forested area which may provide some foraging habitat.	**Possible** Species could occur in study area and has been recorded around 6 km from the study area.	**Yes** Assessment of significance completed.
Pteropus poliocephalus Grey-headed Flying-fox V BC V EPBC (PMST)	Grey-headed Flying-foxes roost and forage in a range of vegetation communities including rainforest, open forest, and closed and open woodland. Roost sites are usually near water, including lakes, rivers, and coastlines.	**Present** Locality includes tall sclerophyll forests around 2 km from major watercourse.	**Possible** Species could occur in study area.	**Yes** Assessment of significance completed.
Saccolaimus flaviventris Yellow-bellied Sheathtail-bat V BC (BN)	Yellow-bellied Sheathtail-bats have a broad distribution, foraging in most forested and clear habitats, and roost in tree hollows and buildings, or in mammal burrows in cleared areas.	**Present** Study area includes forested and cleared habitats, with mature hollow bearing trees.	**Possible** Species could occur in study area.	**Yes** Assessment of significance completed.
Dasyurus maculatus Spotted-tailed Quoll V BC E EPBC (BN)	Spotted-tailed Quolls have been recorded in a range of habitat types, including open forest, woodland, and inland riparian forest, where they use hollow-bearing trees, fallen logs, small caves, rock outcrops, and rocky cliff faces as den sites. Females occupy home ranges of up to about 750 ha and males up to 3500 ha.	**Absent** No large tracts of habitat in locality.	**Unlikely** Species unlikely to occur as there is no suitable habitat in study area.	**No** No suitable habitat would be impacted by the proposal, so unlikely to have any impact on this species.
Falsistrellus tasmaniensis Eastern False Pipistrelle V BC (BN)	Eastern False Pipistrelles prefer moist habitats, with trees taller than 20 m. They generally roost in eucalypt hollows, but has also been found under loose bark on trees or in buildings.	**Absent** No moist habitat with trees taller than 20 m in study area.	**Unlikely** Species unlikely to occur as there is no suitable habitat in study area.	**No** No suitable habitat would be impacted by the proposal, so unlikely to have any impact on this species.

Species	Description	Presence of habitat	Likelihood of occurrence	Possible impact?
Phascogale tapoatafa Brush-tailed Phascogale V BC (BN)	Brush-tailed Phascogales prefer dry sclerophyll open forest with sparse groundcover of herbs, grasses, shrubs, or leaf litter. Females have exclusive territories of around 20 – 40 ha, while males have overlapping territories often greater than 100 ha.	**Absent** No large tracts of habitat in locality.	**Unlikely** Species unlikely to occur as there is no suitable habitat in study area.	**No** No suitable habitat would be impacted by the proposal, so unlikely to have any impact on this species.
Amphibians				
Litoria raniformis Southern Bell Frog E BC V EPBC (PMST)	Southern Bell Frogs are only known to exist in isolated populations in the Coleambally Irrigation Area, the Lowbidgee floodplain, and around Lake Victoria. The species is usually found in or around permanent or ephemeral Black Box/Lignum/Nitre Goosefoot swamps or billabongs along floodplains and river valleys, and where there is no available natural habitat they may occur in irrigated rice crops.	**Absent** No Black Box/Lignum/Nitre Goosefoot swamps, billabongs, or irrigated rice crops in study area.	**Unlikely** Species unlikely to occur as there is no suitable habitat in study area.	**No** No suitable habitat would be impacted by the proposal, so unlikely to have any impact on this species.
Litoria booroolongensis Booroolong Frog E BC E EPBC (BN)	Booroolong Frog lives along permanent streams with some fringing vegetation cover such as ferns, sedges or grasses. They shelter under rocks or amongst vegetation near the ground on the stream edge.	**Absent** No permanent streams in study area.	**Unlikely** Species unlikely to occur as there is no suitable habitat in study area.	**No** No suitable habitat would be impacted by the proposal, so unlikely to have any impact on this species.
Crinia sloanei Sloane's Froglet V BC (BN)	Sloane's Froglet is typically associated with periodically inundated areas in grassland, woodland and disturbed habitats. Typically breeds in ephemeral wetlands, or periodically inundated areas of permanent wetlands, in grasslands, woodlands, and disturbed environments.	**Present** Study area includes disturbed inundated evaporation ponds.	**Unlikely** Species is considered likely to be locally extinct.	**No** Species not likely to occur in study area, so unlikely to be any impact.
Reptiles				

Species	Description	Presence of habitat	Likelihood of occurrence	Possible impact?
Aprasia parapulchella Pink-tailed Legless Lizard V BC V EPBC (BN)	Pink-tailed Legless Lizards inhabit sloping open woodland areas with groundcover dominated by native grasses, typically those which are well-drained with rocky outcrops or scattered, partly-buried rocks.	**Present** Marginal open woodland habitat in study area.	**Possible** Legless Lizard species recorded on site. It is possible that this was *A. parapulchella* as there is some habitat in study area.	**Yes** Assessment of Significance completed.
Varanus rosenbergi Rosenberg's Goanna V BC (BN)	Rosenberg's Goannas are found in heath, open forest, and woodland. Individuals require large areas of habitat. Termite mounds, where they nest, are a critical habitat component. They shelter in hollow logs, rock crevices, and in burrows.	**Absent** No large areas of habitat or termite mounds in study area.	**Unlikely** Species unlikely to occur as there is no suitable habitat in study area.	**No** No suitable habitat would be impacted by the proposal, so unlikely to have any impact on this species.
Fish				
Galaxias rostratus Flathead Galaxias CE FM CE EPBC (PMST)	Flathead Galaxias are found in still or slow moving water bodies such as wetlands and lowland streams. The species has been recorded forming shoals. They have been associated with a range of habitats including rock and sandy bottoms and aquatic vegetation.	**Absent** No water bodies with rocky or sandy substrate in study area.	**Unlikely** Species unlikely to occur as there is no suitable habitat in study area.	**No** No suitable habitat would be impacted by the proposal, so unlikely to have any impact on this species.
Macquaria australasica Macquarie Perch E FM E EPBC (PMST)	Macquarie perch are found in both river and lake habitats; especially the upper reaches of rivers and their tributaries. They are found in rivers, clear, deep, rocky holes with plenty of cover including aquatic vegetation, large boulders, large woody debris, and overhanging banks.	**Absent** No aquatic habitat with clear, deep, rocky holes, aquatic vegetation, large bounders or woody debris, or overhanging banks in study area.	**Unlikely** Species unlikely to occur as there is no suitable habitat in study area.	**No** No suitable habitat would be impacted by the proposal, so unlikely to have any impact on this species.

Species	Description	Presence of habitat	Likelihood of occurrence	Possible impact?
Maccullochella peelii peelii Murray Cod V EPBC (PMST)	Murray Cod occur in a wide range of warm water habitat including clear rocky streams, slow flowing turbid rivers, and billabongs. The upper reaches of the Murray and Murrumbidgee Rivers are considered too cold to be suitable habitat. They are usually found near complex structural cover such as large rocks, woody debris, and overhanging vegetation, and is most frequently found in the main river channel and larger tributaries but can occasionally occur in floodplain channels during floods.	**Absent** No streams, rivers or billabongs with complex structural cover in study area.	**Unlikely** Species unlikely to occur as there is no suitable habitat in study area.	**No** No suitable habitat would be impacted by the proposal, so unlikely to have any impact on this species.

Species and Status	Description of habitat[3]	Presence of habitat	Likelihood of occurrence	Potential for impact?
Fish				
Flathead Galaxias *Galaxius rostratus* CE EPBC CE FM	Below 150 m in altitude. Billabongs, lakes, swamps, and rivers, with preference for still or slow-flowing waters.	**No** No suitable permanent water below 150 m in altitude.	**Unlikely** Within species distribution.	**No** No suitable habitat in study area.
Murray Hardyhead *Craterocephalus fluviatilis* CE FM	Mostly recorded in saline lakes that are moderately acidic to highly alkaline and have relatively low turbidity. Margins of lakes, wetlands, backwaters, and billabongs. Open water, shallow, slow-flowing or still habitats, with sand or silt substrates. Also, deeper habitats with dense aquatic vegetation.	**No** No lakes, backwaters, billabongs with deep water.	**Unlikely** Within historic species distribution.	**No** No suitable habitat in study area.
Stocky Galaxias *Galaxias tantangara* CE FM	Small, cold, clear and fast-flowing alpine creek, flowing through open forest of eucalypts, low shrubs and tussock grass.	**No** No alpine creeks.	**Unlikely** Outside species distribution.	**No** No suitable habitat in study area.

[3] Information sourced from species profiles on NSW DPI species list or the Australian Government's *Species Profiles and Threats* database (SPRAT) unless otherwise stated.

OEH threatened species database: https://www.dpi.nsw.gov.au/fishing/species-protection/conservation/what-current

SPRAT: http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl

Species and Status	Description of habitat[3]	Presence of habitat	Likelihood of occurrence	Potential for impact?
Australian Grayling *Prototrocetes marena* E FM	Migrates between rivers, estuaries and coastal seas. Mostly in freshwater rivers and streams, usually in cool, clear waters with gravel substrate and alternating pool and riffle zones.	**No** No coastal habitat.	**Unlikely** Outside species distribution.	**No** No suitable habitat in study area.
Eastern Freshwater Cod *Maccullochella ikei* E FM	Clear flowing rivers with rocky substrate and large amounts of in-stream cover.	**No** No flowing rivers.	**Unlikely** Outside species distribution.	**No** No suitable habitat in study area.
Oxleyan Pygmy Perch *Nannoperca oxleyana* E FM	Coastal lowlands, mostly coastal floodplains in swamps, creeks and lakes of coastal Banksia heath.	**No** No coastal habitat.	**Unlikely** Outside species distribution.	**No** No suitable habitat in study area.
Southern Pygmy Perch *Nannoperca australis* E FM	Slow-flowing waters and still, vegetated habitats in small streams, lakes, billabongs and wetlands.	**No** No flowing or suitable permanent water.	**Unlikely** Outside species distribution.	**No** No suitable habitat in study area.
Southern Purple Spotted Gudgeon *Mogurnda adspersa* E FM	Rivers, creeks, and billabongs with slow-flowing or still waters or in streams with low turbidity. Cover in the form of aquatic or overhanging vegetation, leaf litter, rocks or snags.	**No** No suitable slow-flowing or still permanent water.	**Unlikely** Outside current known species distribution.	**No** No suitable habitat in study area.
Troud Cod *Maccullochella macquariensis* E FM	Areas with large in-stream woody debris.	**No** No suitable permanent water with large woody debris.	**Unlikely** Outside species distribution.	**No** No suitable habitat in study area.
Murray Cod *Maccullochella peelii* V EPBC	Slow flowing, turbid water in streams and rivers, favouring deeper water around boulders, undercut banks, overhanging vegetation and logs.	**No** No deep, slow-flowing streams or rivers.	**Unlikely** Within species distribution.	**No** No suitable habitat in study area.
Macquarie Perch *Macquaria australasica* E EPBC E FM	Rivers, in clear, deep, rocky holes with plenty of cover including aquatic vegetation, large boulders, large woody debris, and overhanging banks.	**No** No deep water with plenty of cover.	**Unlikely** Within species distribution.	**No** No suitable habitat in study area.

Species and Status	Description of habitat[3]	Presence of habitat	Likelihood of occurrence	Potential for impact?
Silver Perch *Bidyanus bidyanus* V FM	Faster-flowing water, including rapids and races, and more open sections of river, throughout the Murray-Darling Basin.	**No** No fast-flowing water.	**Unlikely** Within species distribution.	**No** No suitable habitat in study area.
Darling River Hardyhead population in the Hunter River catchment *Craterocephalus amniculus* EP FM	North-east part of the Murray-Darling Basin, especially MacIntyre, Namoi and other border rivers. The Hunter River population is the only known occurrence in an eastward flowing river.	**No** Outside Hunter River catchment.	**No** Outside population distribution.	**No** Population not in study area.
Murray-Darling Basin population of Eel-tailed Catfish *Tandanus tandanus* EP FM	Diverse range of freshwater environments including rivers, creeks, lakes, billabongs and lagoons. Clear, sluggish or still waters, but also found in flowing streams with turbid waters. Substrates range from mud to gravel and rock.	**Possible** Small freshwater dams with sand/mud substrate.	**Unlikely** Not recorded in locality.	**No** Species not recorded in locality.
Snowy River population of River Blackfish *Gadopsis marmoratus* EP FM	Clear flowing streams with good instream cover such as woody debris, aquatic vegetation and undercut banks.	**No** Outside Snowy River catchment.	**No** Outside population distribution.	**No** Population not in study area.
Western population of Olive Perchlet *Ambassis agassizii* EP FM	Western (Murray-Darling) population is limited to a few localities in Darling drainage upstream from Bourke.	**No** Outside Darling drainage system upstream from Bourke.	**No** Outside population distribution.	**No** Population not in study area.
Grey Nurse Shark *Carcharias taurus* CE FM	Inshore coastal waters along coast of NSW and southern Queensland.	**No** No coastal habitat.	**No** Outside species distribution.	**No** No suitable habitat in study area.
Scalloped Hammerhead Shark *Sphyrna lewini* E FM	Tropical and warm temperate seas between 45°N and 34°S, inshore and over continental shelf and in adjacent deep water from surface to at least 275 m depth.	**No** No marine habitat.	**No** Outside species distribution.	**No** No suitable habitat in study area.

Species and Status	Description of habitat[3]	Presence of habitat	Likelihood of occurrence	Potential for impact?
Great Hammerhead Shark *Sphyrna mokarran* V FM	Occurs along coastlines, continental shelves and adjacent drop-offs to about 80 m depth.	**No** No marine habitat.	**No** Outside species distribution.	**No** No suitable habitat in study area.
White Shark *Carcharodon carcharias* V FM	Inshore habitats to outer continental shelf and slope areas.	**No** No marine habitat.	**No** Outside species distribution.	**No** No suitable habitat in study area.
Southern Bluefin Tuna *Thunnus maccoyii* E FM	Oceanic waters on seaward side of continental shelf.	**No** No marine habitat.	**No** Outside species distribution.	**No** No suitable habitat in study area.
Black Rockcod *Epinephelus daemelii* V FM	Caves, gutters and beneath bommies on rocky reefs, from near shore environments to depths of at least 50 m.	**No** No marine habitat.	**No** Outside species distribution.	**No** No suitable habitat in study area.
Invertebrates				
Darling River Snail *Notopala sublineata* CE FM	Darling River and its tributaries. Artificially introduced hard surfaces including irrigation pipelines.	**No** No artificial surfaces in waterways.	**Unlikely** Outside species distribution.	**No** No suitable habitat in study area.
Hanley's River Snail *Notopala hanleyi* CE FM	Artificially introduced hard surfaces including irrigation pipelines.	**No** No artificial surfaces in waterways.	**Unlikely** Outside species distribution.	**No** No suitable habitat in study area.
Fitzroy Falls Spiny Crayfish *Euastachus dharawalus* CE FM	Creates burrows in soft stream bed below waterline.	**No** No suitable permanent streams.	**Unlikely** Outside species distribution.	**No** No suitable habitat in study area.
Murray Crayfish *Euastachus armatus* V FM	Lotic waters of southern Murray-Darling Basin. Habitats ranging from pasture to sclerophyll forest, large and small streams. Deep flowing water proximal to clay banks, wood or rock cover.	**No** No permanent lotic habitat.	**Possible** Within species distribution.	**No** No suitable habitat in study area.

Species and Status	Description of habitat[3]	Presence of habitat	Likelihood of occurrence	Potential for impact?
Marine Slug *Smeagol hilaris* CE FM	Small isolated location at Merry Beach, south of Ulladulla, NSW.	**No** No marine habitat.	**No** Outside species distribution.	**No** No suitable habitat in study area.
Adams Emerald Dragonfly *Archaeophya adamsi* E FM	Narrow, shaded riffle zones with moss and abundant riparian vegetation in small to moderate sized creeks with gravel or sandy bottoms.	**No** No suitable narrow, shaded riffle zones.	**No** Outside species distribution.	**No** No suitable habitat in study area.
Sydney Hawk Dragonfly *Austrocordulia leonardi* E FM	Deep river pools with cooler water and permanent flow.	**No** No deep water or permanent flow.	**No** Outside species distribution.	**No** No suitable habitat in study area.
Alpine Redspot Dragonfly *Austropetalia tonyana* V FM	Amongst rocks, logs and moss within the splash zone of waterfalls or in the nearby stream edge.	**No** No waterfalls or rocky streams.	**No** Outside species distribution.	**No** No suitable habitat in study area.
Bousfield Marsh Hopper *Microrchestia bousfieldi* V FM	Mangrove swamps and salt marshes in eastern Australia.	**No** No coastal habitat.	**No** Outside species distribution.	**No** No suitable habitat in study area.
Buchanans Fairy Shrimp *Branchinella buchananensis* V FM	Lake Buchanan in southwest Queensland, and Gidgee and Burkanoko Lakes in northwest NSW.	**No** No lake habitat.	**No** Outside species distribution.	**No** No suitable habitat in study area.
Plants				
Marine Brown Alga *Nereia lophocladia* CE FM	Port Phillip Heads in Victoria and Muttonbird Island, Coffs Harbour in NSW.	**No** No coastal habitat.	**No** Outside species distribution.	**No** No suitable habitat in study area.

Species and Status	Description of habitat[3]	Presence of habitat	Likelihood of occurrence	Potential for impact?
Posidonia australis seagrass, Port Hacking, Botany Bay, Sydney Harbour, Pittwater, Brisbane Waters and Lake Macquarie populations EP FM	Coarse sandy to fine silty sediments between the low tide and approximately 10 m in depth.	**No** No marine habitat.	**No** Outside species distribution.	**No** No suitable habitat in study area.
Endangered Ecological Community				
Lowland Darling River aquatic ecological community EEC FM	Natural creeks, rivers, streams and associated lagoons, billabongs, lakes, flow diversions to anabranches, the anabranches, and the floodplains of the Darling River within NSW, including Menindee Lakes and Barwon River.	**No** Not in Darling River catchment.	**No** Outside community distribution.	**No** No suitable habitat in study area.
Lowland Lachlan River aquatic ecological community EEC FM	Natural rivers, creeks, streams and associated lagoons, billabongs, lakes, wetlands, paleochannels, floodrunners, effluent streams (those that flow away from the river) and the floodplains of the Lachlan River within NSW, including Lake Brewster, Lake Cargelligo and Lake Cowal.	**No** Not in Lachlan River catchment.	**No** Outside community distribution.	**No** No suitable habitat in study area.
Lowland Murray River aquatic ecological community EEC FM	Natural creeks, rivers, and associated lagoons, billabongs and lakes of the regulated portions of the Murray River (also known as the River Murray) downstream of Hume Weir, the Murrumbidgee River downstream of Burrinjuck Dam, the Tumut River downstream of Blowering Dam and all their tributaries anabranches and effluents including Billabong Creek, Yanco Creek, Colombo Creek, and their tributaries, the Edward River and the Wakool River and their tributaries, anabranches and effluents, Frenchmans Creek, the Rufus River and Lake Victoria.	**Yes** Ephemeral stream is tributary of Murrumbidgee River.	**Unlikely** Within community distribution.	**No** No riparian vegetation impacted.
Snowy River aquatic ecological community EEC FM	Rivers, creeks and streams of the Snowy River catchment. This includes Snowy, Eucumbene, Thredbo (or Crackenback), Gungarlin Mowamba, Bombala, McLaughlin, Delegate, Pinch and Jacobs Rivers and their tributaries.	**No** Not in Snowy River catchment.	**No** Outside community distribution.	**No** No suitable habitat in study area.

Species and Status	Description of habitat[3]	Presence of habitat	Likelihood of occurrence	Potential for impact?

CE FM = listed as Critically Endangered under Schedule 4A of the NSW *Fisheries Management Act 1994.*

E FM = listed as Endangered under Schedule 4 of the NSW *Fisheries Management Act 1994.*

V FM = listed as Vulnerable under Schedule 5 of the NSW *Fisheries Management Act 1994.*

EP = listed as an Endangered Population under Schedule 4 of the NSW *Fisheries Management Act 1994.*

EEC = listed as an Endangered Ecological Community under Schedule 4 of the NSW *Fisheries Management Act 1994.*

APPENDIX G THREATENED SPECIES ASSESSMENTS OF SIGNIFICANCE

G.1 BIODIVERSITY CONSERVATION ACT

As the transitional arrangements under the Biodiversity Conservation (Savings and Transition) Regulation apply, Section 5A of the *Environment Planning and Assessment Act 1979* (EP&A Act) is to be used in deciding whether a development is likely to significantly affect threatened species, populations or ecological communities, or their habitats, listed at the state level under the *Biodiversity Conservation Act 2016*.

This *Seven-part Test* characterises the significance of likely impacts associated with the proposal on the following species and ecological communities:

- Threatened Flora
    - Dwarf Bush-pea
    - Yass Daisy
    - Hoary Sunray
- Endangered Ecological Communities
    - White Box Yellow Box Blakely's Red Gum woodland
    - Inland Grey Box woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South bioregions
- Threatened Ground/Understorey Birds
    - Flame Robin
    - Hooded Robin
    - Brown Treecreeper
    - Diamond Firetail
    - White-fronted Chat
    - Grey-crowned Babbler
- Threatened Aquatic Bird
    - Curlew Sandpiper
- Threatened Canopy Birds
    - Regent Honeyeater
    - Painted Honeyeater
    - Black-chinned Honeyeater
    - Swift Parrot
    - Superb Parrot
    - Turquoise Parrot
    - Gang-Gang Cockatoo
    - Little Lorikeet
    - Little Eagle
    - Square-tailed Kite
    - Barking Owl
    - Varied Sittella
- Threatened Arboreal Mammals
    - Koala
    - Squirrel Glider

- Eastern Pygmy-possum
- Threatened Bats
  - Corben's Long-eared Bat
  - Eastern Bentwing-bat
  - Grey-headed Flying-fox
  - Yellow-bellied Sheathtail-bat
- Threatened Reptile
  - Pink-tailed Legless Lizard

a) In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.
Threatened Flora (Dwarf Bush-pea, Yass Daisy, Hoary Sunray)
These species are known or considered likely to occur in the locality and could potentially occur within the study area. However, the quality of potential habitat is low, being largely cleared, dominated by exotic grasses, and disturbed as a result of the previous industrial activity on the site. Native woodland vegetation is limited to the southeast of the site outside the proposal footprint. Some vegetation clearing is required to facilitate site access, including around 3 mature trees and 7668 m^2 of exotic groundcover, and there may be some disturbance associated with construction and operation of the proposal. However, the impact on habitat would be minor, with the majority of the proposal footprint being located within the footprint of the existing effluent evaporation ponds. With the recommended mitigation measures, the likelihood of the proposal having an adverse effect on the life cycle of these species such that a viable local population would be placed at risk of extinction is minimal.
Endangered Ecological Communities (White Box – Yellow Box – Blakely's Red Gum Woodland, Grey Box Woodland)
Not Applicable
Threatened Ground/Understorey Birds (Flame Robin, Hooded Robin, Brown Treecreeper, Diamond Firetail, White-fronted Chat, Grey-crowned Babbler)
All of these species are known or considered likely to occur in the locality and could potentially occur within the study area. However, the quality of potential habitat is low, being largely cleared, dominated by exotic grasses, lacking structural complexity, and disturbed as a result of the previous industrial activity on the site. Native woodland vegetation is limited to the southeast of the site outside the proposal footprint. Some vegetation clearing is required to facilitate site access, including around 3 mature trees and 7668 m^2 of exotic groundcover, and there may be some disturbance associated with construction and operation of the proposal. However, the impact on habitat would be minor, with the majority of the proposal footprint being located within the footprint of the existing effluent evaporation ponds. With the recommended mitigation measures, the likelihood of the proposal having an adverse effect on the life cycle of these species such that a viable local population would be placed at risk of extinction is minimal.
Threatened Aquatic Bird (Curlew Sandpiper)
This species could potentially occur within the study area. The proposal involves converting the existing effluent evaporation ponds, containing some intermittent wetland habitat, into waste cells. However, the quality of potential wetland habitat in these evaporation ponds is low, with contamination from wool carding effluent, minimal riparian or aquatic vegetation, and most of the water already drained. The species does not use the habitat for nesting, as it migrates to Siberia to breed. The likelihood of the proposal having an adverse effect on the life cycle of these species such that a viable local population would be placed at risk of extinction is therefore minimal.

Threatened Canopy Birds (Regent Honeyeater, Painted Honeyeater, Black-chinned Honeyeater, Swift Parrot, Superb Parrot, Turquoise Parrot, Gang-Gang Cockatoo, Little Lorikeet, Little Eagle, Square-tailed Kite, Barking Owl, Varied Sittella)

All of these species are known or considered likely to occur in the locality and could potentially occur within the study area. However, the quality of potential habitat is low, being largely cleared, dominated by exotic grasses, lacking structural complexity, and disturbed as a result of the previous industrial activity on the site. Native woodland vegetation is limited to the southeast of the site outside the proposal footprint. Some vegetation clearing is required to facilitate site access, including around 3 mature trees and 7668 m^2 of exotic groundcover, and there may be some disturbance associated with construction and operation of the proposal. However, the impact on habitat would be minor, with the majority of the proposal footprint being located within the footprint of the existing effluent evaporation ponds. With the recommended mitigation measures, the likelihood of the proposal having an adverse effect on the life cycle of these species such that a viable local population would be placed at risk of extinction is minimal.

Threatened Arboreal Mammals (Koala, Squirrel Glider)

These species have been recorded in the locality, and could potentially occur within the study area. However, the quality of potential habitat is low, being largely cleared, and disturbed as a result of the previous industrial activity on the site. Native woodland vegetation is limited to the southeast of the site outside the proposal footprint. Some vegetation clearing is required to facilitate site access, and there may be some disturbance associated with construction and operation of the proposal. However, the impact on habitat would be minor, with the majority of the proposal footprint being located within the footprint of the existing effluent evaporation ponds, and only around 3 mature trees proposed to be removed. With the recommended mitigation measures, the likelihood of the proposal having an adverse effect on the life cycle of these species such that a viable local population would be placed at risk of extinction is minimal.

Threatened Bats (Corben's Long-eared Bat, Eastern Bentwing-bat, Grey-headed Flying-fox, Yellow-bellied Sheathtail-bat)

All of these species are known or considered likely to occur in the locality and could potentially occur within the study area. However, the quality of potential habitat is low, being largely cleared, dominated by exotic grasses, and disturbed as a result of the previous industrial activity on the site. Native woodland vegetation is limited to the southeast of the site outside the proposal footprint. Some vegetation clearing is required to facilitate site access, including around 3 mature trees which could provide foraging and roosting habitat, and there may be some disturbance associated with construction and operation of the proposal. However, the impact on habitat would be minor, with the majority of the proposal footprint being located within the footprint of the existing effluent evaporation ponds. With the recommended mitigation measures, the likelihood of the proposal having an adverse effect on the life cycle of these species such that a viable local population would be placed at risk of extinction is minimal.

Threatened Reptile (Pink-tailed Legless Lizard)

This species could occur in the study area, where open woodland with a grassy understorey is present, and an unidentified legless lizard was recorded on an ant nest. However, the quality of potential habitat is low, being largely cleared, dominated by exotic grasses, and disturbed as a result of the previous industrial activity on the site. Native woodland vegetation is limited to the southeast of the site outside the proposal footprint. Some vegetation clearing is required to facilitate site access, including around 3 mature trees and 7668 m^2 of exotic groundcover, and there may be some disturbance associated with construction and operation of the proposal. However, the impact on habitat would be minor, with the majority of the proposal footprint being located within the footprint of the existing effluent evaporation ponds. With the recommended mitigation measures, the likelihood of the proposal having an adverse effect on the life cycle of this species such that a viable local population would be placed at risk of extinction is minimal.

b) **In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction.**
Threatened Flora (Dwarf Bush-pea, Yass Daisy, Hoary Sunray)
Not Applicable
Endangered Ecological Communities (White Box – Yellow Box – Blakely's Red Gum Woodland, Grey Box Woodland)
Not Applicable
Threatened Ground/Understorey Birds (Flame Robin, Hooded Robin, Brown Treecreeper, Diamond Firetail, White-fronted Chat, Grey-crowned Babbler)
Not Applicable
Threatened Aquatic Bird (Curlew Sandpiper)
Not Applicable
Threatened Canopy Birds (Regent Honeyeater, Painted Honeyeater, Black-chinned Honeyeater, Swift Parrot, Superb Parrot, Turquoise Parrot, Gang-Gang Cockatoo, Little Lorikeet, Little Eagle, Square-tailed Kite, Barking Owl, Varied Sittella)
Not Applicable
Threatened Arboreal Mammals (Koala, Squirrel Glider)
Not Applicable
Threatened Bats (Corben's Long-eared Bat, Eastern Bentwing-bat, Grey-headed Flying-fox, Yellow-bellied Sheathtail-bat)
Not Applicable
Threatened Reptile (Pink-tailed Legless Lizard)
Not Applicable
c) In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed: i. is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or ii. is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.
Threatened Flora (Dwarf Bush-pea, Yass Daisy, Hoary Sunray)
Not Applicable
Endangered Ecological Communities (White Box – Yellow Box – Blakely's Red Gum Woodland, Grey Box Woodland)
The proposal involves the removal of a minimal amount of vegetation, including 3 mature trees and around 7668 m^2 of exotic groundcover. Some of vegetation removed may be classified as this EEC, however the quality of the community Is low, being largely cleared, dominated by exotic grasses, and disturbed as a result of the previous industrial activity of the site. Native woodland vegetation is limited to the southeast of the site outside the proposal footprint. The impact on the EEC would be minimised with the majority of the proposal footprint located within the footprint of the existing effluent evaporation ponds. With the recommended mitigation measures, the likelihood of the proposal having an adverse effect on the extent of

the EEC or substantially and adversely modifying the composition of the EEC such that its local occurrence is likely to be placed at risk of extinction is minimal.
Threatened Ground/Understorey Birds (Flame Robin, Hooded Robin, Brown Treecreeper, Diamond Firetail, White-fronted Chat, Grey-crowned Babbler)
Not Applicable
Threatened Aquatic Bird (Curlew Sandpiper)
Not Applicable
Threatened Canopy Birds (Regent Honeyeater, Painted Honeyeater, Black-chinned Honeyeater, Swift Parrot, Superb Parrot, Turquoise Parrot, Gang-Gang Cockatoo, Little Lorikeet, Little Eagle, Square-tailed Kite, Barking Owl, Varied Sittella)
Not Applicable
Threatened Arboreal Mammals (Koala, Squirrel Glider)
Not Applicable
Threatened Bats (Corben's Long-eared Bat, Eastern Bentwing-bat, Grey-headed Flying-fox, Yellow-bellied Sheathtail-bat)
Not Applicable
Threatened Reptile (Pink-tailed Legless Lizard)
Not Applicable
d) In relation to the habitat of a threatened species, population or ecological community: i. the extent to which habitat is likely to be removed or modified as a result of the action proposed, and ii. whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and iii. the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.
Threatened Flora (Dwarf Bush-pea, Yass Daisy, Hoary Sunray)
The quality of potential habitat in the proposal area is low, being largely cleared, dominated by exotic grasses, and disturbed as a result of the previous industrial activity on the site. Native woodland vegetation is limited to the southeast of the site outside the proposal footprint. Some vegetation clearing is required to facilitate site access, including around 3 mature trees and 7668 m^2 of exotic groundcover, and there may be some disturbance associated with construction and operation of the proposal. However, the impact on habitat would be minor, with the majority of the proposal footprint being located within the footprint of the existing effluent evaporation ponds. The vegetation to be cleared is not within the core area of existing woodland in the southeast of the study area and would not fragment or isolate any areas of habitat. With the recommended mitigation measures, the likelihood of significant habitat loss, modification, or fragmentation in an important area of habitat is minimal.
Endangered Ecological Communities (White Box – Yellow Box – Blakely's Red Gum Woodland, Grey Box Woodland)
The proposal involves the removal of a minimal amount of vegetation, including 3 mature trees and around 7668 m^2 of exotic groundcover. Some of vegetation removed may be classified as this EEC, however the quality of the community Is low, being largely cleared, dominated by exotic grasses, and disturbed as a result of the previous industrial activity of the site. Native woodland vegetation is limited to the southeast of the site outside the proposal footprint. The impact on the EEC would be minimal, with the majority of the proposal footprint located within the footprint of the existing effluent evaporation ponds. The vegetation to be cleared is not within the core area of existing woodland in the southeast of the study area and would not

fragment or isolate any areas of this EEC. With the recommended mitigation measures, the likelihood of significant habitat loss, modification, or fragmentation in an important area of habitat is minimal.

Threatened Ground/Understorey Birds (Flame Robin, Hooded Robin, Brown Treecreeper, Diamond Firetail, White-fronted Chat, Grey-crowned Babbler)

The quality of potential habitat in the proposal area is low, being largely cleared, dominated by exotic grasses, lacking structural complexity, and disturbed as a result of the previous industrial activity on the site. Native woodland vegetation is limited to the southeast of the site outside the proposal footprint. Some vegetation clearing is required to facilitate site access, including around 3 mature trees and 7668 m^2 of exotic groundcover, and there may be some disturbance associated with construction and operation of the proposal. However, the impact on habitat would be minor, with the majority of the proposal footprint being located within the footprint of the existing effluent evaporation ponds. The vegetation to be cleared is not within the core area of existing woodland in the southeast of the study area and would not fragment or isolate any areas of habitat. With the recommended mitigation measures, the likelihood of significant habitat loss, modification, or fragmentation in an important area of habitat is minimal.

Threatened Aquatic Bird (Curlew Sandpiper)

The proposal involves converting the existing effluent evaporation ponds, containing some wetland habitat, into waste cells. However, the quality of potential wetland habitat in these evaporation ponds is low, with contamination from wool carding effluent, minimal riparian or aquatic vegetation, and most of the water already drained. The species does not use the habitat for nesting, as it migrates to Siberia to breed. The likelihood of significant habitat loss, modification, or fragmentation in an important area of habitat for this species is therefore minimal.

Threatened Canopy Birds (Regent Honeyeater, Painted Honeyeater, Black-chinned Honeyeater, Swift Parrot, Superb Parrot, Turquoise Parrot, Gang-Gang Cockatoo, Little Lorikeet, Little Eagle, Square-tailed Kite, Barking Owl, Varied Sittella)

The quality of potential habitat in the proposal area is low, being largely cleared, dominated by exotic grasses, lacking structural complexity, and disturbed as a result of the previous industrial activity on the site. Native woodland vegetation is limited to the southeast of the site outside the proposal footprint. Some vegetation clearing is required to facilitate site access, including around x mature trees and 7668 m^2 of exotic groundcover, and there may be some disturbance associated with construction and operation of the proposal. However, the impact on habitat would be minor, with the majority of the proposal footprint being located within the footprint of the existing effluent evaporation ponds. The vegetation to be cleared is not within the core area of existing woodland in the southeast of the study area and would not fragment or isolate any areas of habitat. With the recommended mitigation measures, the likelihood of significant habitat loss, modification, or fragmentation in an important area of habitat is minimal.

Threatened Arboreal Mammals (Koala, Squirrel Glider)

The quality of potential habitat in the proposal area is low, being largely cleared, and disturbed as a result of the previous industrial activity on the site. Native woodland vegetation is limited to the southeast of the site outside the proposal footprint. Some vegetation clearing is required to facilitate site access, and there may be some disturbance associated with construction and operation of the proposal. However, the impact on habitat would be minor, with the majority of the proposal footprint being located within the footprint of the existing effluent evaporation ponds, and only around 3 mature trees proposed to be removed. The vegetation to be cleared is not within the core area of existing woodland in the southeast of the study area and would not fragment or isolate any areas of habitat. With the recommended mitigation measures, the likelihood of significant habitat loss, modification, or fragmentation in an important area of habitat is minimal.

Threatened Bats (Corben's Long-eared Bat, Eastern Bentwing-bat, Grey-headed Flying-fox, Yellow-bellied Sheathtail-bat)

The quality of potential habitat in the proposal area is low, being largely cleared, dominated by exotic grasses, and disturbed as a result of the previous industrial activity on the site. Native woodland vegetation is limited to the southeast of the site outside the proposal footprint. Some vegetation clearing is required to facilitate site access, including around 3 mature trees which could provide foraging and roosting habitat, and there may be some disturbance associated with construction and operation of the proposal. However, the impact

on habitat would be minor, with the majority of the proposal footprint being located within the footprint of the existing effluent evaporation ponds. The vegetation to be cleared is not within the core area of existing woodland in the southeast of the study area and would not fragment or isolate any areas of habitat. With the recommended mitigation measures, the likelihood of significant habitat loss, modification, or fragmentation in an important area of habitat is minimal.
Threatened Reptile (Pink-tailed Legless Lizard)
The quality of potential habitat is low, and native woodland vegetation is limited to outside the proposal footprint. Some vegetation clearing is required to facilitate site access, including around 3 mature trees and 7668 m^2 of exotic groundcover, and there may be some disturbance associated with construction and operation of the proposal. However, the impact on habitat would be minor, with the majority of the proposal footprint being located within the footprint of the existing effluent evaporation ponds. The vegetation to be cleared is not within the core area of existing woodland in the southeast of the study area and would not fragment or isolate any areas of habitat. With the recommended mitigation measures, the likelihood of significant habitat loss, modification, or fragmentation in an important area of habitat is minimal.
e) Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly).
Threatened Flora (Dwarf Bush-pea, Yass Daisy, Hoary Sunray)
No areas of critical habitat have been declared in or near the study area.
Endangered Ecological Communities (White Box – Yellow Box – Blakely's Red Gum Woodland, Grey Box Woodland)
No areas of critical habitat have been declared in or near the study area.
Threatened Ground/Understorey Birds (Flame Robin, Hooded Robin, Brown Treecreeper, Diamond Firetail, White-fronted Chat, Grey-crowned Babbler)
No areas of critical habitat have been declared in or near the study area.
Threatened Aquatic Bird (Curlew Sandpiper)
No areas of critical habitat have been declared in or near the study area.
Threatened Canopy Birds (Regent Honeyeater, Painted Honeyeater, Black-chinned Honeyeater, Swift Parrot, Superb Parrot, Turquoise Parrot, Gang-Gang Cockatoo, Little Lorikeet, Little Eagle, Square-tailed Kite, Barking Owl, Varied Sittella)
No areas of critical habitat have been declared in or near the study area.
Threatened Arboreal Mammals (Koala, Squirrel Glider)
No areas of critical habitat have been declared in or near the study area.
Threatened Bats (Corben's Long-eared Bat, Eastern Bentwing-bat, Grey-headed Flying-fox, Yellow-bellied Sheathtail-bat)
No areas of critical habitat have been declared in or near the study area.
Threatened Reptile (Pink-tailed Legless Lizard)
No areas of critical habitat have been declared in or near the study area.
f) Whether the action proposed is consistent with the objectives or actions of a Recovery Plan or Threat Abatement Plan.
Threatened Flora (Dwarf Bush-pea, Yass Daisy, Hoary Sunray)

No Recovery Plan has been prepared for these species. The proposed work is consistent with general recovery plan principles.

Endangered Ecological Communities (White Box – Yellow Box – Blakely's Red Gum Woodland, Grey Box Woodland)

The proposal is consistent with the National Recovery Plan for this EEC, and with general recovery plan principles, including avoiding removal of significant habitat features.

Threatened Ground/Understorey Birds (Flame Robin, Hooded Robin, Brown Treecreeper, Diamond Firetail, White-fronted Chat, Grey-crowned Babbler)

No Recovery Plan has been prepared for these species. The proposed work is consistent with general recovery plan principles.

Threatened Aquatic Bird (Curlew Sandpiper)

No Recovery Plan has been prepared for this species, but the proposed work is consistent with the conservation objectives listed in the approved conservation advice and with general recovery plan principles.

Threatened Canopy Birds (Regent Honeyeater, Painted Honeyeater, Black-chinned Honeyeater, Swift Parrot, Superb Parrot, Turquoise Parrot, Gang-Gang Cockatoo, Little Lorikeet, Little Eagle, Square-tailed Kite, Barking Owl, Varied Sittella)

The proposed work is consistent with the National Recovery Plan for the Swift Parrot, and with general recovery plan principles. No Recovery Plan has been prepared for the other species.

Threatened Arboreal Mammals (Koala, Squirrel Glider)

The proposed work is consistent with the Recovery Plan for the Koala, and with general recovery plan principles. No Recovery Plan has been prepared for the Squirrel Glider.

Threatened Bats (Corben's Long-eared Bat, Eastern Bentwing-bat, Grey-headed Flying-fox, Yellow-bellied Sheathtail-bat)

No Recovery Plan has been prepared for these species. The proposed work is consistent with general recovery plan principles.

Threatened Reptile (Pink-tailed Legless Lizard)

No Recovery Plan has been prepared for these species. The proposed work is consistent with general recovery plan principles.

g) Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

Threatened Flora (Dwarf Bush-pea, Yass Daisy, Hoary Sunray)

Clearing of native vegetation, loss of hollow-bearing trees, removal of dead wood and dead trees, and invasion by various weeds, pests, and pathogens are all listed as key threatening processes under the TSC Act. These processes are potential impacts of the construction and operation of the proposal and may impact on these species. However, the degree of impact would be minor, with the majority of the proposal footprint being located within the footprint of the existing effluent evaporation ponds, and only around x mature trees and x m^2 of exotic groundcover to be removed. With the recommended mitigation measures, the likelihood of the proposal increasing the impact of a key threatening process on these species is minimal.

Endangered Ecological Communities (White Box – Yellow Box – Blakely's Red Gum Woodland, Grey Box Woodland)

Clearing of native vegetation, loss of hollow-bearing trees, removal of dead wood and dead trees, and invasion by various weeds, pests, and pathogens are all listed as key threatening processes under the TSC Act. These processes are potential impacts of the construction and operation of the proposal and may impact on this EEC. However, the degree of impact would be minor, with the majority of the proposal footprint being located within the footprint of the existing effluent evaporation ponds, and only around 3 mature trees and

7668 m^2 of exotic groundcover to be removed. With the recommended mitigation measures, the likelihood of the proposal increasing the impact of a key threatening process on this EEC is minimal.
Threatened Ground/Understorey Birds (Flame Robin, Hooded Robin, Brown Treecreeper, Diamond Firetail, White-fronted Chat, Grey-crowned Babbler)
Clearing of native vegetation, loss of hollow-bearing trees, removal of dead wood and dead trees, and invasion by various weeds, pests, and pathogens are all listed as key threatening processes under the TSC Act. These processes are potential impacts of the construction and operation of the proposal and may impact on these species. However, the degree of impact would be minor, with the majority of the proposal footprint being located within the footprint of the existing effluent evaporation ponds, and only around 3 mature trees and 7668 m^2 of exotic groundcover to be removed. With the recommended mitigation measures, the likelihood of the proposal increasing the impact of a key threatening process on these species is minimal.
Threatened Aquatic Bird (Curlew Sandpiper)
There are no key threatening processes specifically relating to this species, but invasion by various weeds, pests, and pathogens are listed as key threatening processes and may impact on the species as a result of the proposal. However, the quality of potential wetland habitat in these evaporation ponds is low, with contamination from wool carding effluent, minimal riparian or aquatic vegetation, and most of the water already drained. With the recommended mitigation measures, the likelihood of the proposal increasing the impact of a key threatening process on this species is minimal.
Threatened Canopy Birds (Regent Honeyeater, Painted Honeyeater, Black-chinned Honeyeater, Swift Parrot, Superb Parrot, Turquoise Parrot, Gang-Gang Cockatoo, Little Lorikeet, Little Eagle, Square-tailed Kite, Barking Owl, Varied Sittella)
Clearing of native vegetation, loss of hollow-bearing trees, removal of dead wood and dead trees, and invasion by various weeds, pests, and pathogens are all listed as key threatening processes under the TSC Act. These processes are potential impacts of the construction and operation of the proposal and may impact on these species. However, the degree of impact would be minor, with the majority of the proposal footprint being located within the footprint of the existing effluent evaporation ponds, and only around 3 mature trees to be removed. With the recommended mitigation measures, the likelihood of the proposal increasing the impact of a key threatening process on these species is minimal.
Threatened Arboreal Mammals (Koala, Squirrel Glider)
Clearing of native vegetation, loss of hollow-bearing trees, removal of dead wood and dead trees, and invasion by various weeds, pests, and pathogens are all listed as key threatening processes under the TSC Act. These processes are potential impacts of the construction and operation of the proposal and may impact on these species. Specifically, the loss of hollow-bearing trees could impact on the hollow-dependent Squirrel Glider, and removal of food trees such as Yellow Box, Grey Box, and Blakely's Red Gum could impact on food availability for the koala. However, the degree of impact would be minor, with the majority of the proposal footprint being located within the footprint of the existing effluent evaporation ponds, and only around 3 mature trees to be removed. With the recommended mitigation measures, the likelihood of the proposal increasing the impact of a key threatening process on either of these species is minimal.
Threatened Bats (Corben's Long-eared Bat, Eastern Bentwing-bat, Grey-headed Flying-fox, Yellow-bellied Sheathtail-bat)
Clearing of native vegetation, loss of hollow-bearing trees, removal of dead wood and dead trees, and invasion by various weeds, pests, and pathogens are all listed as key threatening processes under the TSC Act. These processes are potential impacts of the construction and operation of the proposal and may impact on these species. In particular, hollow-roosting bats such as Corben's Long-eared Bat would be impacted by the removal of roost trees. However, the degree of impact would be minor, with the majority of the proposal footprint being located within the footprint of the existing effluent evaporation ponds, and only around 3 mature trees to be removed. With the recommended mitigation measures, the likelihood of the proposal increasing the impact of a key threatening process on these species is minimal.
Threatened Reptile (Pink-tailed Legless Lizard)

Clearing of native vegetation, loss of hollow-bearing trees, removal of dead wood and dead trees, and invasion by various weeds, pests, and pathogens are all listed as key threatening processes under the TSC Act. These processes are potential impacts of the construction and operation of the proposal and may impact on these species. However, the degree of impact would be minor, with the majority of the proposal footprint being located within the footprint of the existing effluent evaporation ponds, and only around 3 mature trees and 7668 m^2 of exotic groundcover to be removed. With the recommended mitigation measures, the likelihood of the proposal increasing the impact of a key threatening process on this species is minimal.

Conclusion

The assessment has concluded that with the implementation of the recommended mitigation measures, the proposal is not likely to significantly affect the threatened species or ecological communities that occur or are likely to occur in the study area, either directly or indirectly. A Species Impact Statement is therefore not required for the proposal.

G.2 ENVIRONMENT PROTECTION AND BIODIVERSITY CONSERVATION ACT PRINCIPAL SIGNIFICANT IMPACT ASSESSMENT

The *Environment Protection and Biodiversity Conservation Act* 1999 specifies factors to be taken into account in deciding whether a development is likely to significantly affect Endangered Ecological Communities and threatened species listed at the Commonwealth level. The following assessment assesses the significance of the likely impacts associated with the proposal on the critically endangered or endangered species:

- Threatened Plant
  - Hoary Sunray
- Threatened Birds
  - Regent Honeyeater
  - Swift Parrot
  - Curlew Sandpiper

a) Will the action lead to a long-term decrease in the size of a population of a species?

Hoary Sunray

This species has been recorded in the locality and could potentially occur within the study area. However, the quality of potential habitat is low, being largely cleared, dominated by exotic grasses, and disturbed as a result of the previous industrial activity on the site. Native woodland vegetation is limited to the southeast of the site outside the proposal footprint. Some vegetation clearing is required to facilitate site access, including around 7668 m^2 of exotic groundcover and 3 mature trees to facilitate site access. There may be some disturbance associated with construction and operation of the proposal. However, the impact on habitat would be minor, with the majority of the proposal footprint being located within the footprint of the existing effluent evaporation ponds. With the recommended mitigation measures, the likelihood of the proposal leading to a long-term decrease in the size of a population of this species is minimal.

Regent Honeyeater

This species could potentially occur within the study area, where feed trees including Yellow Box are present. However, the quality of potential habitat is low, being largely cleared, and disturbed as a result of the previous industrial activity on the site. Native woodland vegetation is limited to the southeast of the site outside the proposal footprint. Some vegetation clearing is required to facilitate site access, however 3 mature trees will be impacted. There may be some disturbance associated with construction and operation of the proposal. However, the impact on habitat would be minor, with the majority of the proposal footprint being located within the footprint of the existing effluent evaporation ponds. With the

recommended mitigation measures, the likelihood of the proposal leading to a long-term decrease in the size of a population of this species is minimal.

Swift Parrot

This species could potentially occur within the study area, where both hollow-bearing trees suitable for nesting and feed trees including Grey Box are present. However, the quality of potential habitat is low, being largely cleared, and disturbed as a result of the previous industrial activity on the site. Native woodland vegetation is limited to the southeast of the site outside the proposal footprint. Some vegetation clearing is required to facilitate site access, 3 mature trees to facilitate site access and around 7668 m^2 exotic groundcover. There may be some disturbance associated with construction and operation of the proposal. However, the impact on habitat would be minor, with the majority of the proposal footprint being located within the footprint of the existing effluent evaporation ponds. The likelihood of the proposal leading to a long-term decrease in the size of a population of this species is therefore minimal.

Curlew Sandpiper

This species could potentially occur within the study area. The proposal involves converting the existing effluent evaporation ponds, containing some intermittent wetland habitat, into waste cells. However, the quality of potential wetland habitat in these evaporation ponds is low, with contamination from wool carding effluent, minimal riparian or aquatic vegetation, and most of the water already drained. The species does not use the habitat for nesting, as it migrates to Siberia to breed. The likelihood of the proposal leading to a long-term decrease in the size of a population of this species is therefore minimal.

b) Will the action reduce the area of occupancy of the species?

Hoary Sunray

The quality of potential habitat in the development site is low, being largely cleared, dominated by exotic grasses, and disturbed as a result of the previous industrial activity on the site. Native woodland vegetation is limited to the southeast of the site outside the proposal footprint. There may be some disturbance associated with construction and operation of the proposal, including some vegetation clearing. However, the impact on habitat would be minor, with the majority of the proposal footprint being located within the footprint of the existing effluent evaporation ponds. The vegetation to be cleared is not within the core area of existing woodland in the southeast of the study area. With the recommended mitigation measures, the likelihood of the action reducing the area of occupancy of the species is minimal.

Regent Honeyeater

The quality of potential habitat in the development site is low, being largely cleared, and disturbed as a result of the previous industrial activity on the site. Native woodland vegetation is limited to the southeast of the site outside the proposal footprint. There may be some disturbance associated with construction and operation of the proposal, including some vegetation clearing. However, the impact on habitat would be minor, with the majority of the proposal footprint being located within the footprint of the existing effluent evaporation ponds. The vegetation to be cleared is not within the core area of existing woodland in the southeast of the study area. With the recommended mitigation measures, the likelihood of the action reducing the area of occupancy of the species is minimal.

Swift Parrot

The quality of potential habitat in the development site is low, being largely cleared, and disturbed as a result of the previous industrial activity on the site. Native woodland vegetation is limited to the southeast of the site outside the proposal footprint. There may be some disturbance associated with construction and operation of the proposal, including some vegetation clearing. However, the impact on habitat would be minor, with the majority of the proposal footprint being located within the footprint of the existing effluent evaporation ponds. The vegetation to be cleared is not within the core area of existing woodland

in the southeast of the study area. With the recommended mitigation measures, the likelihood of the action reducing the area of occupancy of the species is minimal.

Curlew Sandpiper

The proposal involves converting the existing effluent evaporation ponds, containing some wetland habitat, into waste cells. However, the quality of potential wetland habitat in these evaporation ponds is low, with contamination from wool carding effluent, minimal riparian or aquatic vegetation, and most of the water already drained. The species does not use the habitat for nesting, as it migrates to Siberia to breed. The likelihood of the action reducing the area of occupancy of the species is minimal.

c) Will the action fragment an existing population into two or more populations?

Hoary Sunray

The quality of potential habitat in the development site is low, being largely cleared, dominated by exotic grasses, and disturbed as a result of the previous industrial activity on the site. Native woodland vegetation is limited to the southeast of the site outside the proposal footprint. There may be some disturbance associated with construction and operation of the proposal, including some vegetation clearing. However, the impact on habitat would be minor, with the majority of the proposal footprint being located within the footprint of the existing effluent evaporation ponds. The vegetation to be cleared is not within the core area of existing woodland in the southeast of the study area and would not fragment or isolate any areas of habitat. With the recommended mitigation measures, the likelihood of the action fragmenting an existing population of the species into two or more populations is minimal.

Regent Honeyeater

The quality of potential habitat in the development site is low, being largely cleared, and disturbed as a result of the previous industrial activity on the site. Native woodland vegetation is limited to the southeast of the site outside the proposal footprint. There may be some disturbance associated with construction and operation of the proposal, including some vegetation clearing. However, the impact on habitat would be minor, with the majority of the proposal footprint being located within the footprint of the existing effluent evaporation ponds. The vegetation to be cleared is not within the core area of existing woodland in the southeast of the study area and would not fragment or isolate any areas of habitat. With the recommended mitigation measures, the likelihood of the action fragmenting an existing population of the species into two or more populations is minimal.

Swift Parrot

The quality of potential habitat in the development site is low, being largely cleared, and disturbed as a result of the previous industrial activity on the site. Native woodland vegetation is limited to the southeast of the site outside the proposal footprint. There may be some disturbance associated with construction and operation of the proposal, including some vegetation clearing. However, the impact on habitat would be minor, with the majority of the proposal footprint being located within the footprint of the existing effluent evaporation ponds. The vegetation to be cleared is not within the core area of existing woodland in the southeast of the study area and would not fragment or isolate any areas of habitat. With the recommended mitigation measures, the likelihood of the action fragmenting an existing population of the species into two or more populations is minimal.

Curlew Sandpiper

The proposal involves converting the existing effluent evaporation ponds, containing some wetland habitat, into waste cells. However, the quality of potential wetland habitat in these evaporation ponds is low, with contamination from wool carding effluent, minimal riparian or aquatic vegetation, and most of the water already drained. The species does not use the habitat for nesting, as it migrates to Siberia to

breed. The likelihood of the action fragmenting an existing population of the species into two or more populations is minimal.

d) Will the action adversely affect habitat critical to the survival of the species?

Hoary Sunray

No areas of critical habitat have been declared for this species. The quality of potential habitat in the development site is low, being largely cleared, dominated by exotic grasses, and disturbed as a result of the previous industrial activity on the site, and is therefore not likely to be critical to the survival of the species. Native woodland vegetation is limited to the southeast of the site outside the proposal footprint. The likelihood of the action adversely affecting habitat critical to the survival of the species is minimal.

Regent Honeyeater

No areas of critical habitat have been declared for this species. The quality of potential habitat in the development site is low, being largely cleared, and disturbed as a result of the previous industrial activity on the site and is therefore not likely to be critical to the survival of the species. Native woodland vegetation is limited to the southeast of the site outside the proposal footprint. The likelihood of the action adversely affecting habitat critical to the survival of the species is minimal.

Swift Parrot

No areas of critical habitat have been declared for this species. The quality of potential habitat in the development site is low, being largely cleared, and disturbed as a result of the previous industrial activity on the site and is therefore not likely to be critical to the survival of the species. Native woodland vegetation is limited to the southeast of the site outside the proposal footprint. The likelihood of the action adversely affecting habitat critical to the survival of the species is minimal.

Curlew Sandpiper

No areas of critical habitat have been declared for this species. The quality of potential wetland habitat in these evaporation ponds is low, with contamination from wool carding effluent, minimal riparian or aquatic vegetation, and most of the water already drained, and is therefore not likely to be critical to the survival of the species. The likelihood of the action adversely affecting habitat critical to the survival of the species is minimal.

e) Will the action disrupt the breeding cycle of a population?

Hoary Sunray

Hoary Sunray flowers from spring to summer. Given that the quality of habitat in the development site is low, being largely cleared, dominated by exotic grasses, and disturbed, and that native woodland vegetation is limited to the southeast of the site outside the proposal footprint, it is not likely that the action would disrupt the breeding cycle of a population of this species.

Regent Honeyeater

Regent Honeyeaters breed between July and January in temperate woodlands including Box-Ironbark, and in riparian forest dominated by River She-oak. Given that the development site is not within woodlands of this type, it is not likely that the action would disrupt the breeding cycle of a population of this species.

Swift Parrot

Swift Parrots breed in Tasmania during spring and summer. Given that the development site is not in Tasmania, it is not likely that the action would disrupt the breeding cycle of a population of this species.

Curlew Sandpiper

Curlew Sandpipers migrate to Siberia to breed during June and July. Given that the development site is not in Siberia, it is not likely that the action would disrupt the breeding cycle of a population of this species.

f) Will the action modify, destroy, remove, isolate, or decrease the availability or quality of habitat to the extent that the species is likely to decline?

Hoary Sunray

The availability and quality of potential habitat in the development site is low, being largely cleared, dominated by exotic grasses, and disturbed as a result of the previous industrial activity on the site. Native woodland vegetation is limited to the southeast of the site outside the proposal footprint. There may be some disturbance associated with construction and operation of the proposal, including some vegetation clearing. However, the impact on habitat would be minor, with the majority of the proposal footprint being located within the footprint of the existing effluent evaporation ponds. The vegetation to be cleared is not within the core area of existing woodland in the southeast of the study area and would not fragment or isolate any areas of habitat. With the recommended mitigation measures, the likelihood of the action modifying, destroying, removing, isolating, or decreasing the availability of quality of habitat to the extent that the species is likely to decline is minimal.

Regent Honeyeater

The availability and quality of potential habitat in the development site is low, being largely cleared, and disturbed as a result of the previous industrial activity on the site. Native woodland vegetation is limited to the southeast of the site outside the proposal footprint. There may be some disturbance associated with construction and operation of the proposal, including some vegetation clearing. However, the impact on habitat would be minor, with the majority of the proposal footprint being located within the footprint of the existing effluent evaporation ponds. The vegetation to be cleared is not within the core area of existing woodland in the southeast of the study area and would not fragment or isolate any areas of habitat. With the recommended mitigation measures, the likelihood of the action modifying, destroying, removing, isolating, or decreasing the availability of quality of habitat to the extent that the species is likely to decline is minimal.

Swift Parrot

The availability and quality of potential habitat in the development site is low, being largely cleared, and disturbed as a result of the previous industrial activity on the site. Native woodland vegetation is limited to the southeast of the site outside the proposal footprint. There may be some disturbance associated with construction and operation of the proposal, including some vegetation clearing. However, the impact on habitat would be minor, with the majority of the proposal footprint being located within the footprint of the existing effluent evaporation ponds. The vegetation to be cleared is not within the core area of existing woodland in the southeast of the study area and would not fragment or isolate any areas of habitat. With the recommended mitigation measures, the likelihood of the action modifying, destroying, removing, isolating, or decreasing the availability of quality of habitat to the extent that the species is likely to decline is minimal.

Curlew Sandpiper

The proposal involves converting the existing effluent evaporation ponds, containing some wetland habitat, into waste cells. However, the quality of potential wetland habitat in these evaporation ponds is low, with contamination from wool carding effluent, minimal riparian or aquatic vegetation, and most of

the water already drained. The species does not use the habitat for nesting, as it migrates to Siberia to breed. The likelihood of the action modifying, destroying, removing, isolating, or decreasing the availability of quality of habitat to the extent that the species is likely to decline is minimal.

g) Will the action result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat?

Hoary Sunray

There is a risk that invasive weed or pest species could be introduced to the development site via machinery, vehicles, and landfill during construction and operation. However, the quality of potential habitat in the development site is low, being largely cleared, dominated by exotic grasses, and disturbed, and native woodland vegetation is limited to the southeast of the site outside the proposal footprint. With the recommended mitigation measures, including cleaning machinery and vehicles prior to entering the site, the likelihood of the action resulting in harmful invasive species becoming established in the species' habitat is minimal.

Regent Honeyeater

There is a risk that invasive weed or pest species could be introduced to the development site via machinery, vehicles, and landfill during construction and operation. However, the quality of potential habitat in the development site is low, being largely cleared and disturbed, and native woodland vegetation is limited to the southeast of the site outside the proposal footprint. With the recommended mitigation measures, including cleaning machinery and vehicles prior to entering the site, the likelihood of the action resulting in harmful invasive species becoming established in the species' habitat is minimal.

Swift Parrot

There is a risk that invasive weed or pest species could be introduced to the development site via machinery, vehicles, and landfill during construction and operation. However, the quality of potential habitat in the development site is low, being largely cleared and disturbed, and native woodland vegetation is limited to the southeast of the site outside the proposal footprint. With the recommended mitigation measures, including cleaning machinery and vehicles prior to entering the site, the likelihood of the action resulting in harmful invasive species becoming established in the species' habitat is minimal.

Curlew Sandpiper

There is a risk that invasive weed or pest species could be introduced to the development site via machinery, vehicles, and landfill during construction and operation. However, the quality of potential wetland habitat in these evaporation ponds is low, with contamination from wool carding effluent, minimal riparian or aquatic vegetation, and most of the water already drained. Further, with the recommended mitigation measures, including cleaning machinery and vehicles prior to entering the site, the likelihood of the action resulting in harmful invasive species becoming established in the species' habitat is minimal.

h) Will the action introduce disease that may cause the species to decline?

Hoary Sunray

There is a risk that disease could be introduced to the development site via machinery, vehicles, and landfill during construction and operation. However, the quality of potential habitat in the development site is low, being largely cleared, dominated by exotic grasses, and disturbed, and native woodland vegetation is limited to the southeast of the site outside the proposal footprint. With the recommended mitigation

measures, including cleaning machinery and vehicles prior to entering the site, the likelihood of the action introducing disease that may cause the species to decline is minimal.

Regent Honeyeater

There is a risk that disease could be introduced to the development site via machinery, vehicles, and landfill during construction and operation. However, the quality of potential habitat in the development site is low, being largely cleared and disturbed, and native woodland vegetation is limited to the southeast of the site outside the proposal footprint. With the recommended mitigation measures, including cleaning machinery and vehicles prior to entering the site, the likelihood of the action introducing disease that may cause the species to decline is minimal.

Swift Parrot

There is a risk that disease could be introduced to the development site via machinery, vehicles, and landfill during construction and operation. However, the quality of potential habitat in the development site is low, being largely cleared and disturbed, and native woodland vegetation is limited to the southeast of the site outside the proposal footprint. With the recommended mitigation measures, including cleaning machinery and vehicles prior to entering the site, the likelihood of the action introducing disease that may cause the species to decline is minimal.

Curlew Sandpiper

There is a risk that disease could be introduced to the development site via machinery, vehicles, and landfill during construction and operation. However, the quality of potential wetland habitat in these evaporation ponds is low, with contamination from wool carding effluent, minimal riparian or aquatic vegetation, and most of the water already drained. Further, with the recommended mitigation measures, including cleaning machinery and vehicles prior to entering the site, the likelihood of the action introducing disease that may cause the species to decline is minimal.

i) Will the action interfere with the recovery of the species?

Hoary Sunray

There is nothing in the proposal that would interfere with the recovery objectives in the National Recovery Plan for this species. The proposal is also consistent with general recovery plan principles. The likelihood that the action would interfere with the recovery of the species is minimal.

Regent Honeyeater

There is nothing in the proposal that would interfere with the recovery objectives in the National Recovery Plan for this species. The proposal is also consistent with general recovery plan principles. The likelihood that the action would interfere with the recovery of the species is minimal.

Swift Parrot

There is nothing in the proposal that would interfere with the recovery objectives in the National Recovery Plan for this species. The proposal is also consistent with general recovery plan principles. The likelihood that the action would interfere with the recovery of the species is minimal.

Curlew Sandpiper

There is nothing in the proposal that would interfere with the recovery objectives in the National Recovery Plan for this species. The proposal is also consistent with general recovery plan principles. The likelihood that the action would interfere with the recovery of the species is minimal.

The following assessment assesses the significance of the likely impacts associated with the proposal on the critically endangered White Box – Yellow Box – Blakely's Red Gum grassy woodland and derived native grassland endangered ecological community and the endangered Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native grasslands of South-eastern Australia endangered ecological community.

a) Will the action reduce the extent of an ecological community?
White Box – Yellow Box – Blakely's Red Gum grassy woodland and derived native grassland
Some species characteristic of this EEC, including Yellow Box and Blakely's Red Gum, occur in the study area. The proposal involves the removal of a minimal amount of vegetation, including 3 mature trees and around 7668 m^2 of exotic groundcover. Some of vegetation removed may be classified as this EEC, however the quality of the community in the development site Is low, being largely cleared, dominated by exotic grasses, and disturbed as a result of the previous industrial activity of the site. Native woodland vegetation is limited to the southeast of the site outside the proposal footprint. The impact on the EEC would be minimal, with the majority of the proposal footprint located within the footprint of the existing effluent evaporation ponds. With the recommended mitigation measures, the likelihood of the proposal significantly reducing the extent of this EEC is minimal.
Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and derived native grasslands of South-eastern Australia
Some species characteristic of this EEC, including Grey Box and Yellow Box, occur in the study area. The proposal involves the removal of a minimal amount of vegetation, including around 7668 m^2 of exotic groundcover. Some of vegetation removed may be classified as this EEC, however the quality of the community in the development site Is low, being largely cleared, dominated by exotic grasses, and disturbed as a result of the previous industrial activity of the site. Native woodland vegetation is limited to the southeast of the site outside the proposal footprint. The impact on the EEC would be minimal, with the majority of the proposal footprint located within the footprint of the existing effluent evaporation ponds. With the recommended mitigation measures, the likelihood of the proposal significantly reducing the extent of this EEC is minimal.
b) Will the action fragment or increase fragmentation of an ecological community, for example by clearing vegetation for roads or transmission lines?
White Box – Yellow Box – Blakely's Red Gum grassy woodland and derived native grassland and Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and derived native grasslands of South-eastern Australia
The proposal involves the removal of a minimal amount of vegetation, some of which may be classified as these EECs. However, the quality of the community in the development site is low, being largely cleared, dominated by exotic grasses, and disturbed as a result of the previous industrial activity of the site. Native woodland vegetation is limited to the southeast of the site outside the proposal footprint. The impact on the EECs would be minimal, with the majority of the proposal footprint located within the footprint of the existing effluent evaporation ponds. The vegetation to be cleared is not within the core area of existing woodland in the southeast of the study area, and would not fragment or isolate any areas of these EECs. With the recommended mitigation measures, the likelihood of the action fragmenting or increasing fragmentation of an EEC is minimal.
c) Will the action adversely affect habitat critical to the survival of an ecological community?
White Box – Yellow Box – Blakely's Red Gum grassy woodland and derived native grassland and Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and derived native grasslands of South-eastern Australia
No areas of critical habitat have been declared for these EECs. The quality of potential habitat in the development site is low, being largely cleared, dominated by exotic grasses, and disturbed as a result of the previous industrial activity on the site, and is therefore not likely to be critical to the survival of these EECs. Native woodland vegetation is limited to the southeast of the site outside the proposal footprint. The likelihood of the action adversely affecting habitat critical to the survival of these EECs is minimal.

d) Will the action modify or destroy abiotic (non-living) factors (such as water, nutrients, or soil) necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns?
White Box – Yellow Box – Blakely's Red Gum grassy woodland and derived native grassland and Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and derived native grasslands of South-eastern Australia
The proposal may cause minor changes in abiotic factors of the habitat of these EECs, including increased soil erosion, localised soil compaction, and decreased air quality. Groundwater levels and surface water drainage patterns may also be impacted, but are not likely to be significantly different to the existing conditions at the site. With the recommended mitigation measures, the likelihood of the action modifying or destroying abiotic factors necessary for these EECs' survival is minimal.
e) Will the action cause a substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionally important species, for example through regular burning or flora or fauna harvesting?
White Box – Yellow Box – Blakely's Red Gum grassy woodland and derived native grassland and Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and derived native grasslands of South-eastern Australia
The proposal involves the removal of a minimal amount of vegetation, including 3 mature trees and around 7668 m^2 of exotic groundcover, and does not involve any activities that would modify community composition, such as burning or harvesting. The likelihood of the action causing a substantial change in the species composition of an occurrence of an EEC, including causing a decline or loss of functionally important species, is minimal.
f) Will the action cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to assisting invasive species that are harmful to the listed ecological community to become established, or causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community?
White Box – Yellow Box – Blakely's Red Gum grassy woodland and derived native grassland and Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and derived native grasslands of South-eastern Australia
The proposal involves some use of fuels and chemicals and the production of some leachate on site. There is also a risk that invasive weeds could be introduced to the development site via seeds or plant parts on machinery, vehicles, and landfill. However, the quality of the community in the development site is low, being largely cleared, dominated by exotic grasses, and disturbed as a result of the previous industrial activity of the site. Native woodland vegetation is limited to the southeast of the site outside the proposal footprint. The impact on the EECs would be minimal, with the majority of the proposal footprint located within the footprint of the existing effluent evaporation ponds. With the recommended mitigation measures, the action is unlikely to result in a substantial reduction in the quality or integrity of an occurrence of an EEC.
g) Will the action interfere with the recovery of an ecological community?
White Box – Yellow Box – Blakely's Red Gum grassy woodland and derived native grassland and Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and derived native grasslands of South-eastern Australia
There is nothing in the proposal which would interfere with the recovery objectives in the National Recovery Plan for the White Box – Yellow Box – Blakely's Red Gum EEC. No Recovery Plan has been prepared for the Grey Box grassy woodlands EEC. The proposal is consistent with general recovery plan principles. The likelihood that the action would interfere with the recovery of these EECs is minimal.

The following assessment assesses the significance of the likely impacts associated with the proposal on vulnerable species:

- Threatened Plant
    - Yass Daisy

- Threatened Birds
    - Painted Honeyeater
    - Superb Parrot
- Threatened Arboreal Mammals
    - Koala
    - Squirrel Glider
- Threatened Bats
    - Corben's Long-eared Bat
    - Grey-headed Flying-fox
- Threatened Reptile
    - Pink-tailed Legless Lizard

a) Will the action lead to a long-term decrease in the size of an important population of a species?
Threatened Plant (Yass Daisy)
This species has been recorded in the Wagga Wagga area and could potentially occur within the study area. However, the quality of potential habitat is low, being largely cleared, dominated by exotic grasses, and disturbed as a result of the previous industrial activity on the site. Native woodland vegetation is limited to the southeast of the site outside the proposal footprint. Some vegetation clearing is required to facilitate site access, including 3 mature trees and around 7668 m^2 of exotic groundcover and 3 mature trees. There may be some disturbance associated with construction and operation of the proposal. However, the impact on habitat would be minor, with the majority of the proposal footprint being located within the footprint of the existing effluent evaporation ponds. With the recommended mitigation measures and given that the proposal would not take place within a known important population of this species, the likelihood of the proposal leading to a long-term decrease in the size of an important population of this species is minimal.
Threatened Birds (Painted Honeyeater, Superb Parrot)
Superb Parrot is known and Painted Honeyeater considered likely to occur in the locality, and both could potentially occur within the study area. However, the quality of potential habitat is low, being largely cleared, dominated by exotic grasses, lacking structural complexity, and disturbed as a result of the previous industrial activity on the site. Native woodland vegetation is limited to the southeast of the site outside the proposal footprint. Some vegetation clearing is required to facilitate site access. Three mature trees will be removed as part of the proposal. There may be some disturbance associated with construction and operation of the proposal. However, the impact on habitat would be minor, with the majority of the proposal footprint being located within the footprint of the existing effluent evaporation ponds. With the recommended mitigation measures and given that the proposal would not take place within a known important population of these species, the likelihood of the proposal leading to a long-term decrease in the size of an important population of these species is minimal.
Threatened Arboreal Mammals (Koala, Squirrel Glider)
These species have been recorded in the locality, and could potentially occur within the study area, where mature and feed trees are present. However, the quality of potential habitat is low, being largely cleared and disturbed as a result of the previous industrial activity on the site. Native woodland vegetation is limited to the southeast of the site outside the proposal footprint. Some vegetation clearing is required to facilitate site access, and there may be some disturbance associated with construction and operation of the proposal. However, the impact on habitat would be minor, with the majority of the proposal footprint being located within the footprint of the existing effluent evaporation ponds. Three mature trees are proposed to be removed to facilitate site access. With the recommended mitigation measures and given that the proposal would not take place within a known important population of these species, the likelihood of the proposal leading to a long-term decrease in the size of an important population of these species is minimal.
Threatened Hollow-roosting Bat (Corben's Long-eared Bat)
This species could potentially occur within the study area, where mature hollow-bearing trees are present. However, the quality of potential habitat is low, being largely cleared, lacking in structural complexity,

dominated by exotic grasses, and disturbed as a result of the previous industrial activity on the site. Native woodland vegetation is limited to the southeast of the site outside the proposal footprint. Some vegetation clearing is required to facilitate site access. Three mature trees are proposed to be removed, which could provide foraging and roosting habitat. There may be some disturbance associated with construction and operation of the proposal. However, the impact on habitat would be minor, with the majority of the proposal footprint being located within the footprint of the existing effluent evaporation ponds. With the recommended mitigation measures and given that the proposal would not take place within a known important population of this species, the likelihood of the proposal leading to a long-term decrease in the size of an important population of this species is minimal.

Threatened Canopy-roosting Bat (Grey-headed Flying-fox)

This species could potentially occur in the study area, where mature and feed trees are present in proximity to a major river. However, the quality of potential habitat is low, being largely cleared, dominated by exotic grasses, and disturbed as a result of the previous industrial activity on the site. Native woodland vegetation is limited to the southeast of the site outside the proposal footprint. Some vegetation clearing is required to facilitate site access. Three mature trees are proposed to be removed, which could provide foraging and roosting habitat. There may be some disturbance associated with construction and operation of the proposal. However, the impact on habitat would be minor, with the majority of the proposal footprint being located within the footprint of the existing effluent evaporation ponds. With the recommended mitigation measures and given that the proposal would not take place within a known important population of this species, the likelihood of the proposal leading to a long-term decrease in the size of an important population of this species is minimal.

Threatened Reptile (Pink-tailed Legless Lizard)

This species could occur in the study area, where open woodland with a grassy understorey is present, and an unidentified legless lizard was recorded on an ant nest. However, the quality of potential habitat is low, being largely cleared, dominated by exotic grasses, and disturbed as a result of the previous industrial activity on the site. Native woodland vegetation is limited to the southeast of the site outside the proposal footprint. Some vegetation clearing is required to facilitate site access, including around 7668 m^2 of exotic groundcover and three mature trees. There may be some disturbance associated with construction and operation of the proposal. However, the impact on habitat would be minor, with the majority of the proposal footprint being located within the footprint of the existing effluent evaporation ponds. With the recommended mitigation measures and given that the proposal would not take place within a known important population of this species, the likelihood of the proposal leading to a long-term decrease in the size of an important population of this species is minimal.

b) Will the action reduce the area of occupancy of an important population?

Threatened Plant (Yass Daisy)

The quality of potential habitat in the development site is low, and native woodland vegetation is limited to outside the proposal footprint. There may be some disturbance associated with construction and operation of the proposal, including some vegetation clearing. However, the impact on habitat would be minor. The vegetation to be cleared is not within the core area of existing woodland in the southeast of the study area. With the recommended mitigation measures and given that the proposal would not take place within a known important population of this species, the likelihood of the action reducing the area of occupancy of the species is minimal.

Threatened Birds (Painted Honeyeater, Superb Parrot)

The quality of potential habitat in the development site is low, and native woodland vegetation is limited to outside the proposal footprint. There may be some disturbance associated with construction and operation of the proposal, including some vegetation clearing. However, the impact on habitat would be minor. The vegetation to be cleared is not within the core area of existing woodland in the southeast of the study area. With the recommended mitigation measures and given that the proposal would not take place within a known important population of these species, the likelihood of the action reducing the area of occupancy of an important population of these species is minimal.

Threatened Arboreal Mammals (Koala, Squirrel Glider)

The quality of potential habitat is low, and native woodland vegetation is limited to outside the proposal footprint. Some vegetation clearing is required to facilitate site access. Three mature trees are proposed to be removed, which could provide foraging and roosting habitat. There may be some disturbance associated with construction and operation of the proposal. However, the impact on habitat would be minor. The vegetation to be cleared is not within the core area of existing woodland in the southeast of the study area. With the recommended mitigation measures and given that the proposal would not take place within a known important population of these species, the likelihood of the proposal reducing the area of occupancy of an important population of these species is minimal.

Threatened Bat (Corben's Long-eared Bat)

The quality of potential habitat is low, and native woodland vegetation is limited to outside the proposal footprint. Some vegetation clearing is required to facilitate site access. Three mature trees are proposed to be removed, which could provide foraging and roosting habitat. There may be some disturbance associated with construction and operation of the proposal. However, the impact on habitat would be minor. The vegetation to be cleared is not within the core area of existing woodland in the southeast of the study area. With the recommended mitigation measures and given that the proposal would not take place within a known important population of this species, the likelihood of the proposal reducing the area of occupancy of an important population of this species is minimal.

Threatened Canopy-roosting Bat (Grey-headed Flying-fox)

The quality of potential habitat is low, and native woodland vegetation is limited to outside the proposal footprint. Some vegetation clearing is required to facilitate site access. Three mature trees are proposed to be removed, which could provide foraging and roosting habitat. There may be some disturbance associated with construction and operation of the proposal. However, the impact on habitat would be minor. With the recommended mitigation measures and given that the proposal would not take place within a known important population of this species, the likelihood of the proposal reducing the area of occupancy of an important population of this species is minimal.

Threatened Reptile (Pink-tailed Legless Lizard)

The quality of potential habitat is low, and native woodland vegetation is limited to outside the proposal footprint. Some vegetation clearing is required to facilitate site access, including around 7668 m^2 of exotic groundcover and 3 mature trees. There may be some disturbance associated with construction and operation of the proposal. However, the impact on habitat would be minor. With the recommended mitigation measures and given that the proposal would not take place within a known important population of this species, the likelihood of the proposal reducing the area of occupancy of an important population of this species is minimal.

c) Will the action fragment an existing important population into two or more populations?

Threatened Plant (Yass Daisy)

The quality of potential habitat in the development site is low, and native woodland vegetation is limited to outside the proposal footprint. There may be some disturbance associated with construction and operation of the proposal, including some vegetation clearing. However, the impact on habitat would be minor. The vegetation to be cleared is not within the core area of existing woodland in the southeast of the study area and would not fragment or isolate any areas of habitat. With the recommended mitigation measures and given that the proposal would not take place within a known important population of the species, the likelihood of the action fragmenting an existing important population of the species into two or more populations is minimal.

Threatened Birds (Painted Honeyeater, Superb Parrot)

The quality of potential habitat in the development site is low, and native woodland vegetation is limited to outside the proposal footprint. There may be some disturbance associated with construction and operation of the proposal, including some vegetation clearing. However, the impact on habitat would be minor. The vegetation to be cleared is not within the core area of existing woodland in the southeast of the study area and would not fragment or isolate any areas of habitat. With the recommended mitigation measures and given that the proposal would not take place within a known important population of these species, the

likelihood of the action fragmenting an existing important population of these species into two or more populations is minimal.

Threatened Arboreal Mammals (Koala, Squirrel Glider)

The quality of potential habitat in the development site is low, and native woodland vegetation is limited to the southeast of the site outside the proposal footprint. There may be some disturbance associated with construction and operation of the proposal, including some vegetation clearing. However, the impact on habitat would be minor, with the majority of the proposal footprint being located within the footprint of the existing effluent evaporation ponds. The vegetation to be cleared is not within the core area of existing woodland in the southeast of the study area and would not fragment or isolate any areas of habitat. With the recommended mitigation measures and given that the proposal would not take place within a known important population of these species, the likelihood of the action fragmenting an existing important population of these species into two or more populations is minimal.

Threatened Bat (Corben's Long-eared Bat)

The quality of potential habitat in the development site is low, and native woodland vegetation is limited to outside the proposal footprint. Some vegetation clearing is required to facilitate site access. Three mature trees are proposed to be removed, which could provide foraging and roosting habitat. There may be some disturbance associated with construction and operation of the proposal. However, the impact on habitat would be minor. The vegetation to be cleared is not within the core area of existing woodland in the southeast of the study area and would not fragment or isolate any areas of habitat. With the recommended mitigation measures and given that the proposal would not take place within a known important population of these species, the likelihood of the action fragmenting an existing important population of this species into two or more populations is minimal.

Threatened Canopy-roosting Bat (Grey-headed Flying-fox)

The quality of potential habitat is low, and native woodland vegetation is limited to outside the proposal footprint. Some vegetation clearing is required to facilitate site access, including three mature trees. These could provide foraging and roosting habitat. There may be some disturbance associated with construction and operation of the proposal. However, the impact on habitat would be minor. With the recommended mitigation measures and given that the proposal would not take place within a known important population of this species, the likelihood of the proposal reducing the area of occupancy of an important population of this species is minimal.

Threatened Reptile (Pink-tailed Legless Lizard)

The quality of potential habitat is low, and native woodland vegetation is limited to outside the proposal footprint. Some vegetation clearing is required to facilitate site access, including around 7668 m^2 of exotic groundcover and three mature trees. There may be some disturbance associated with construction and operation of the proposal. However, the impact on habitat would be minor. With the recommended mitigation measures and given that the proposal would not take place within a known important population of this species, the likelihood of the action fragmenting an existing important population of this species into two or more populations is minimal.

d) Will the action adversely affect habitat critical to the survival of a species?

Threatened Plant (Yass Daisy)

No areas of critical habitat have been declared for this species. The quality of potential habitat in the development site is low and is therefore not likely to be critical to the survival of the species. Native woodland vegetation is limited to outside the proposal footprint. The likelihood of the action adversely affecting habitat critical to the survival of the species is minimal.

Threatened Birds (Painted Honeyeater, Superb Parrot)

No areas of critical habitat have been declared for these species. The quality of potential habitat in the development site is low and is therefore not likely to be critical to the survival of the species. Native woodland vegetation is limited to outside the proposal footprint. The likelihood of the action adversely affecting habitat critical to the survival of these species is minimal.

Threatened Arboreal Mammals (Koala, Squirrel Glider)

No areas of critical habitat have been declared for these species. The quality of potential habitat in the development site is low and is therefore not likely to be critical to the survival of the species. Native woodland vegetation is limited to outside the proposal footprint. The likelihood of the action adversely affecting habitat critical to the survival of these species is minimal.

Threatened Bat (Corben's Long-eared Bat)

No areas of critical habitat have been declared for this species. The quality of potential habitat in the development site is low and is therefore not likely to be critical to the survival of the species. Native woodland vegetation is limited to outside the proposal footprint. The likelihood of the action adversely affecting habitat critical to the survival of this species is minimal.

Threatened Canopy-roosting Bat (Grey-headed Flying-fox)

No areas of critical habitat have been declared for this species. The quality of potential habitat in the development site is low and is therefore not likely to be critical to the survival of the species. Native woodland vegetation is limited to outside the proposal footprint. The likelihood of the action adversely affecting habitat critical to the survival of this species is minimal.

Threatened Reptile (Pink-tailed Legless Lizard)

No areas of critical habitat have been declared for this species. The quality of potential habitat in the development site is low and is therefore not likely to be critical to the survival of the species. Native woodland vegetation is limited to outside the proposal footprint. The likelihood of the action adversely affecting habitat critical to the survival of this species is minimal.

e) Will the action disrupt the breeding cycle of an important population?

Threatened Plant (Yass Daisy)

Flowering occurs from October to November; the leaves shrivel in summer after fruiting and re-sprout in autumn. The quality of habitat in the development site is low, and native woodland vegetation is limited to outside the proposal footprint. The proposal would not take place in a known important population of the species. The likelihood of the action disrupting the breeding cycle of an important population of this species is therefore minimal.

Threatened Birds (Painted Honeyeater, Superb Parrot)

Painted Honeyeaters nest from spring to autumn in a small nest hanging in the canopy of drooping eucalypts, she-oak, paperbark, or mistletoe branches. Superb Parrots breed between September and January in a core area in the South-west Slopes bioregion bounded by Cowra and Yass in the east, and Grenfell, Cootamundra, and Coolac in the west, nesting in small colonies in tree hollows. The quality of habitat in the development site is low. No hollow-bearing trees would be removed. However, the impact on habitat would be minimal, with the majority of the proposal footprint located within the footprint of the existing effluent evaporation ponds. Native woodland vegetation is limited to the southeast of the site outside the proposal footprint. The proposal would not take place in a known important population of the species. The likelihood of the action disrupting the breeding cycle of an important population of these species is therefore minimal.

Threatened Arboreal Mammals (Koala, Squirrel Glider)

The quality of habitat in the development site is low. Three mature trees would be removed. However, the impact on habitat would be minimal, with the majority of the proposal footprint located within the footprint of the existing effluent evaporation ponds. Native woodland vegetation is limited to outside the proposal footprint. The proposal would not take place in a known important population of these species. The likelihood of the action disrupting the breeding cycle of an important population of these species is therefore minimal.

Threatened Bat (Corben's Long-eared Bat)

The quality of habitat in the development site is low. Three mature trees would be removed. However, the impact on habitat would be minimal, with the majority of the proposal footprint located within the footprint of the existing effluent evaporation ponds. Native woodland vegetation is limited to outside the proposal

footprint. The proposal would not take place in a known important population of this species. The likelihood of the action disrupting the breeding cycle of an important population of this species is therefore minimal.

Threatened Canopy-roosting Bat (Grey-headed Flying-fox)

Grey-headed Flying-foxes mate annually in January and conception occurs in April or May. A single offspring is born in October or November. The quality of habitat in the development site is low. No feed trees would be removed. The impact on habitat would be minimal, with the majority of the proposal footprint located within the footprint of the existing effluent evaporation ponds. Native woodland vegetation is limited to outside the proposal footprint. The proposal would not take place in a known important population of this species. The likelihood of the action disrupting the breeding cycle of an important population of this species is therefore minimal.

Threatened Reptile (Pink-tailed Legless Lizard)

It is thought that this species lays 2 eggs inside ant nest during summer, and that the young first emerge in March. The quality of habitat in the development site is low, and native woodland vegetation is limited to outside the proposal footprint. The proposal would not take place in a known important population of the species. The likelihood of the action disrupting the breeding cycle of an important population of this species is therefore minimal.

f) Will the action modify, destroy, remove or isolate of decrease the availability or quality of habitat to the extent that the species is likely to decline?

Threatened Plant (Yass Daisy)

The availability and quality of potential habitat in the development site is low. Native woodland vegetation is limited to outside the proposal footprint. There may be some disturbance associated with construction and operation of the proposal, including some vegetation clearing. However, the impact on habitat would be minor, with the majority of the proposal footprint being located within the footprint of the existing effluent evaporation ponds. The vegetation to be cleared is not within the core area of existing woodland and would not fragment or isolate any areas of habitat. With the recommended mitigation measures, the likelihood of the action modifying, destroying, removing, isolating, or decreasing the availability of quality of habitat to the extent that the species is likely to decline is minimal.

Threatened Birds (Painted Honeyeater, Superb Parrot)

The availability and quality of potential habitat in the development site is low. Native woodland vegetation is limited to outside the proposal footprint. There may be some disturbance associated with construction and operation of the proposal. Three mature trees will be removed, which could decrease the availability and quality of some habitat. However, the impact on habitat would be minor, as the majority of the proposal footprint is located within the footprint of the existing effluent evaporation ponds, and the vegetation to be cleared is not within the core area of existing woodland and would not fragment or isolate any areas of habitat. With the recommended mitigation measures, the likelihood of the action modifying, destroying, removing, isolating, or decreasing the availability or quality of habitat to the extent that the species are likely to decline is minimal.

Threatened Arboreal Mammals (Koala, Squirrel Glider)

The availability and quality of potential habitat in the development site is low. Native woodland vegetation is limited to the southeast of the site outside the proposal footprint. There may be some disturbance associated with construction and operation of the proposal. Three mature trees will be removed, which could decrease the availability and quality of some habitat. However, the impact on habitat would be minor, as the majority of the proposal footprint is located within the footprint of the existing effluent evaporation ponds, and the vegetation to be cleared is not within the core area of existing woodland and would not fragment or isolate any areas of habitat. With the recommended mitigation measures, the likelihood of the action modifying, destroying, removing, isolating, or decreasing the availability or quality of habitat to the extent that the species are likely to decline is minimal.

Threatened Bat (Corben's Long-eared Bat)

The availability and quality of potential habitat in the development site is low. Native woodland vegetation is limited to outside the proposal footprint. There may be some disturbance associated with construction

and operation of the proposal. Three mature trees will be removed. However, the impact on habitat would be minor, as the majority of the proposal footprint is located within the footprint of the existing effluent evaporation ponds, and the vegetation to be cleared is not within the core area of existing woodland and would not fragment or isolate any areas of habitat. With the recommended mitigation measures, the likelihood of the action modifying, destroying, removing, isolating, or decreasing the availability or quality of habitat to the extent that the species are likely to decline is minimal.

Threatened Canopy-roosting Bat (Grey-headed Flying-fox)

The availability and quality of potential habitat in the development site is low. There may be some disturbance associated with construction and operation of the proposal, including clearing of around 7668 m^2 of exotic groundcover and 3 mature trees, which could decrease the availability and quality of some habitat. However, the impact on habitat would be minor, as the majority of the proposal footprint is located within the footprint of the existing effluent evaporation ponds, and the vegetation to be cleared is not within the core area of existing woodland and would not fragment or isolate any areas of habitat. With the recommended mitigation measures, the likelihood of the action modifying, destroying, removing, isolating, or decreasing the availability or quality of habitat to the extent that the species are likely to decline is minimal.

Threatened Reptile (Pink-tailed Legless Lizard)

The availability and quality of potential habitat in the development site is low. Native woodland vegetation is limited to outside the proposal footprint. There may be some disturbance associated with construction and operation of the proposal, including clearing of around 7668 m^2 of exotic groundcover and 3 mature trees, which could decrease the availability and quality of some habitat. However, the impact on habitat would be minor, as the majority of the proposal footprint is located within the footprint of the existing effluent evaporation ponds, and the vegetation to be cleared is not within the core area of existing woodland and would not fragment or isolate any areas of habitat. With the recommended mitigation measures, the likelihood of the action modifying, destroying, removing, isolating, or decreasing the availability or quality of habitat to the extent that the species are likely to decline is minimal.

g) Will the action result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat?

Threatened Plant (Yass Daisy)

There is a risk that invasive weed or pest species could be introduced to the development site via machinery, vehicles, and landfill during construction and operation. However, the quality of potential habitat in the development site is low, and native woodland vegetation is limited to outside the proposal footprint. With the recommended mitigation measures, including cleaning machinery and vehicles prior to entering the site, the likelihood of the action resulting in harmful invasive species becoming established in the species' habitat is minimal.

Threatened Birds (Painted Honeyeater, Superb Parrot)

There is a risk that invasive weed or pest species could be introduced to the development site via machinery, vehicles, and landfill during construction and operation. However, the quality of potential habitat in the development site is low, and native woodland vegetation is limited to outside the proposal footprint. With the recommended mitigation measures, including cleaning machinery and vehicles prior to entering the site, the likelihood of the action resulting in harmful invasive species becoming established in the habitat of these species is minimal.

Threatened Arboreal Mammals (Koala, Squirrel Glider)

There is a risk that invasive weed or pest species could be introduced to the development site via machinery, vehicles, and landfill during construction and operation. However, the quality of potential habitat in the development site is low, and native woodland vegetation is limited to outside the proposal footprint. With the recommended mitigation measures, including cleaning machinery and vehicles prior to entering the site, the likelihood of the action resulting in harmful invasive species becoming established in the habitat of these species is minimal.

Threatened Bat (Corben's Long-eared Bat)

There is a risk that invasive weed or pest species could be introduced to the development site via machinery, vehicles, and landfill during construction and operation. However, the quality of potential habitat in the development site is low, and native woodland vegetation is limited to outside the proposal footprint. With the recommended mitigation measures, including cleaning machinery and vehicles prior to entering the site, the likelihood of the action resulting in harmful invasive species becoming established in the species' habitat is minimal.

Threatened Canopy-roosting Bat (Grey-headed Flying-fox)

There is a risk that invasive weed or pest species could be introduced to the development site via machinery, vehicles, and landfill during construction and operation. However, the quality of potential habitat in the development site is low, and native woodland vegetation is limited to outside the proposal footprint. With the recommended mitigation measures, including cleaning machinery and vehicles prior to entering the site, the likelihood of the action resulting in harmful invasive species becoming established in the species' habitat is minimal.

Threatened Reptile (Pink-tailed Legless Lizard)

There is a risk that invasive weed or pest species could be introduced to the development site via machinery, vehicles, and landfill during construction and operation. However, the quality of potential habitat in the development site is low, and native woodland vegetation is limited to outside the proposal footprint. With the recommended mitigation measures, including cleaning machinery and vehicles prior to entering the site, the likelihood of the action resulting in harmful invasive species becoming established in the species' habitat is minimal.

h) Will the action introduce disease that may cause the species to decline?

Threatened Plant (Yass Daisy)

There is a risk that disease could be introduced to the development site via machinery, vehicles, and landfill during construction and operation. However, the quality of potential habitat in the development site is low, and native woodland vegetation is limited to outside the proposal footprint. With the recommended mitigation measures, including cleaning machinery and vehicles prior to entering the site, the likelihood of the action introducing disease that may cause the species to decline is minimal.

Threatened Birds (Painted Honeyeater, Superb Parrot)

There is a risk that disease could be introduced to the development site via machinery, vehicles, and landfill during construction and operation. However, the quality of potential habitat in the development site is low, and native woodland vegetation limited to outside the proposal footprint. With the recommended mitigation measures, including cleaning machinery and vehicles prior to entering the site, the likelihood of the action introducing disease that may cause these species to decline is minimal.

Threatened Arboreal Mammals (Koala, Squirrel Glider)

There is a risk that disease could be introduced to the development site via machinery, vehicles, and landfill during construction and operation. However, the quality of potential habitat in the development site is low, and native woodland vegetation limited to outside the proposal footprint. With the recommended mitigation measures, including cleaning machinery and vehicles prior to entering the site, the likelihood of the action introducing disease that may cause these species to decline is minimal.

Threatened Bat (Corben's Long-eared Bat)

There is a risk that disease could be introduced to the development site via machinery, vehicles, and landfill during construction and operation. However, the quality of potential habitat in the development site is low, and native woodland vegetation limited to outside the proposal footprint. With the recommended mitigation measures, including cleaning machinery and vehicles prior to entering the site, the likelihood of the action introducing disease that may cause the species to decline is minimal.

Threatened Canopy-roosting Bat (Grey-headed Flying-fox)

There is a risk that disease could be introduced to the development site via machinery, vehicles, and landfill during construction and operation. However, the quality of potential habitat in the development site is low,

and native woodland vegetation limited to outside the proposal footprint. With the recommended mitigation measures, including cleaning machinery and vehicles prior to entering the site, the likelihood of the action introducing disease that may cause the species to decline is minimal.
Threatened Reptile (Pink-tailed Legless Lizard)
There is a risk that disease could be introduced to the development site via machinery, vehicles, and landfill during construction and operation. However, the quality of potential habitat in the development site is low, and native woodland vegetation limited to outside the proposal footprint. With the recommended mitigation measures, including cleaning machinery and vehicles prior to entering the site, the likelihood of the action introducing disease that may cause the species to decline is minimal.
i) Will the action interfere substantially with the recovery of the species?
Threatened Plant (Yass Daisy)
No Recovery Plan has been prepared for this species. The proposal is consistent with general recovery plan principles. The likelihood that the action would interfere with the recovery of the species is minimal.
Threatened Birds (Painted Honeyeater, Superb Parrot)
No Recovery Plan has been prepared for the Painted Honeyeater. There is nothing in the proposal that would interfere with the recovery objectives in the National Recovery Plan for the Superb Parrot. The proposal is consistent with general recovery plan principles. The likelihood that the action would interfere with the recovery of these species is minimal.
Threatened Arboreal Mammals (Koala, Squirrel Glider)
No Recovery Plan has been prepared for the Squirrel Glider. The proposed work is consistent with the NSW Recovery Plan for the Koala, and with general recovery plan principles. The likelihood that the action would interfere with the recovery of these species is minimal.
Threatened Bat (Corben's Long-eared Bat)
No Recovery Plan has been prepared for this species. The proposal is consistent with general recovery plan principles. The likelihood that the action would interfere with the recovery of this species is minimal.
Threatened Canopy-roosting Bat (Grey-headed Flying-fox)
The proposed work is consistent with the draft Commonwealth Recovery Plan for this species, and with general recovery plan principles. The likelihood that the action would interfere with the recovery of this species is minimal.
Threatened Reptile (Pink-tailed Legless Lizard)
No Recovery Plan has been prepared for this species. The proposal is consistent with general recovery plan principles. The likelihood that the action would interfere with the recovery of this species is minimal.

The *Environment Protection and Biodiversity Conservation Act* 1999 specifies factors to be taken into account in deciding whether a development is likely to significantly affect migratory species, listed at the Commonwealth level. The following assessment assesses the significance of the likely impacts associated with the proposal on:

- Fork-tailed Swift
- White-throated Needletail
- Yellow Wagtail
- Satin Flycatcher

a) Will the action substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles, or altering hydrological cycles), destroy, or isolate an area of important habitat for a migratory species?
Migratory Birds (Fork-tailed Swift, White-throated Needletail, Yellow Wagtail, Satin Flycatcher)

The availability and quality of potential habitat in the development site is low, being largely cleared, dominated by exotic grasses, and disturbed as a result of the previous industrial activity on the site. Native woodland vegetation is limited to the southeast of the site, outside the proposal footprint. The proposal may involve some disturbance associated with construction and operation. Three mature trees will be removed, which form part of the canopy and provide potential habitat or foraging habitat for these species. However, the impact on habitat would be minor, with the majority of the proposal footprint being located within the footprint of the existing effluent evaporation ponds. The vegetation to be cleared is not within the core area of existing woodland in the southeast of the study area and would not fragment or isolate any areas of habitat. The likelihood that the proposal would substantially modify, destroy or isolate an area of important habitat for these migratory species is minimal.

b) Will the action result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species?

Migratory Birds (Fork-tailed Swift, White-throated Needletail, Yellow Wagtail, Satin Flycatcher)

There is a risk that invasive weed, pest, or pathogen species could be introduced to the development site via machinery, vehicles, and landfill during construction and operation. However, the quality of potential habitat in the development site is low, being largely cleared, dominated by exotic grasses, and disturbed, and native woodland vegetation limited to the southeast of the site outside the proposal footprint. With the recommended mitigation measures, including cleaning machinery and vehicles prior to entering the site, the likelihood of the action resulting in invasive species that is harmful to the migratory species becoming established in an area of important habitat for these migratory species is minimal.

c) Will the action seriously disrupt the lifecycle (breeding, feeding, migration, or resting behaviour) of an ecologically significant proportion of the population of a migratory species?

Migratory Birds (Fork-tailed Swift, White-throated Needletail, Yellow Wagtail, Satin Flycatcher)

These species have all been recorded or are considered likely to occur in the locality and could potentially occur in the study area. The proposal may involve some disturbance associated with construction and operation. However, the quality of potential habitat in the development site is low, being largely cleared, dominated by exotic grasses, and disturbed, the majority of the proposal would be located within the existing effluent evaporation ponds, and the footprint of the proposal is limited to around 17 ha, which largely consists of the heavily disturbed excavated evaporation ponds and exotic groundcover. It is unlikely to be an ecologically significant area of habitat for these wide-ranging species. With the recommended mitigation measures, the likelihood of the action seriously disrupting the lifecycle of an ecologically significant proportion of the population of these migratory species is minimal.

Conclusion

The assessment has concluded that with the implementation of the recommended mitigation measures, the proposal is not likely to significantly affect any of the flora, fauna, or EECs listed under the EPBC Act that occur or are likely to occur in the study area, either directly or indirectly. A Species Impact Statement is therefore not required for the proposal.

APPENDIX H CLAUSE 228 CHECKLIST

A checklist of factors that should be considered in the assessment of impacts prior to its determination is included within Clause 228 of the *Environmental Planning and Assessment Regulation 2000*. This clause identifies sixteen issues that need to be addressed. The following text provides summary details of each of the issues, the majority of which have been addressed within the body of this document.

Factor	Impact
a. **Any environmental impact on a community?** The proposal would have minor impacts on the community during its construction; this includes temporary traffic, noise and air quality issues. These impacts are manageable with the recommended safeguards and management measures recommended in Section 7.2.	Short term negative
b. **Any transformation of a locality?** The proposal would be unlikely to transform the locality as the area is an existing effluent evaporation pond.	None
c. **Any environmental impact on the ecosystems of the locality?** No impact to the ecosystem is predicted to occur as an impact from the proposal.	None
d. **Any reduction of the aesthetic, recreational, scientific or other environmental quality or value of a locality?** The proposal would improve the value of the locality by utilising existing effluent evaporation ponds and remediating the site. The materials facility will be progressively capped and revegetated, improving the habitat of the locality.	Long term positive
e. **Any effect on a locality, place or building having aesthetic, anthropological, archaeological, architectural, cultural, historical, scientific or social significance or other special value for present or future generations?** No items of cultural, social or scientific significance are to be impacted by the proposal	None
f. **Any impact on the habitat of protected fauna (within the meaning of the *National Parks and Wildlife Act 1974*)?** No habitat of protected fauna would be impacted by the proposal.	None
g. **Any endangering of any species of animal, plant or other form of life, whether living on land, in water or in the air?** No impact or endangering of any species of animal, plant or other form of life, whether living on land, in water or in the air would result from the proposal.	None
h. **Any long-term effects on the environment?** No likely long term effects on the environment is predicted to occur as an impact from the proposal.	None
i. **Any degradation of the quality of the environment?** Potential degradation of the quality of the environment is unlikely but has the potential to occur as an impact from the proposal. These impacts are manageable with the recommended safeguards and management measures recommended in Section 7.2.	Potential short term negative
j. **Any risk to the safety of the environment?** Contamination of surface water and groundwater resources has the potential to occur as an impact from the proposal. These impacts are manageable with the recommended safeguards and management measures recommended in Section 7.2.	Potential short term negative

Factor	Impact
k. **Any reduction in the range of beneficial uses of the environment?** No likely reduction in the range of beneficial uses of the environment is predicted to occur as an impact from the proposal.	None
l. **Any pollution of the environment?** Pollution of the environment is likely to be restricted to litter escaping from the sorting area and potential surface water and groundwater contamination from the leachate. These impacts are manageable with the recommended safeguards and management measures recommended in Section 7.2.	Potential short term negative
m. **Any environmental problems associated with the disposal of waste?** Waste from the proposal would be minimal and disposed of at the facility if it meets the General Solid Waste non-putrescible criteria. There are no foreseeable problems with the disposal of this waste. Timber and steel would be readily recycled where possible.	Potential short term negative
n. **Any increased demands on resources (natural or otherwise) that are, or are likely to become, in short supply?** No likely increase of demand on resources (natural or otherwise) that are, or are likely to become, in short supply.	None
o. **Any cumulative environmental effect with other existing or likely future activities?** Potential surface water and groundwater contamination with adjacent landholders. These impacts are manageable with the recommended safeguards and management measures recommended in Section 7.2.	Potential short term negative
p. **Any impact on coastal processes and coastal hazards, including those under projected climate change conditions?** No coastal processes and coastal hazards would be impacted as a result of the proposal.	None

APPENDIX I MATTERS OF NATIONAL ENVIRONMENTAL SIGNIFICANCE

Under the environmental assessment provisions of the *Environment Protection and Biodiversity Conservation Act 1999*, the following Matters of National Environmental Significance are required to be considered to assist in determining whether the proposal should be referred to Australian Government Department of Environment and Energy.

Factor	Impact
a. Any impact on a World Heritage property? There are no world heritage listed items located near the study area that would be affected as part of the proposal.	Nil
b. Any impact on a National Heritage place? There are no national heritage listed places located near the study area that would be affected as part of the proposal.	Nil
c. Any impact on a wetland of international importance? No wetlands of international importance would be directly or indirectly affected by the proposal.	Nil
d. Any impact on a listed threatened species or communities? Although a number of threatened species have been recorded within a 10 km radius of the study area, the works are of a minor nature and would not significantly affect any of these species.	Nil
e. Any impacts on listed migratory species? Although a number of migratory species have been recorded within a 10 km radius of the study area, the works are of a minor nature and would not affect any of these species.	Nil
d. Any impact on a Commonwealth marine area? There are no marine areas located near the study area.	Nil
g. Does the proposal involve a nuclear action (including uranium mining)? No.	Nil
Additionally, any impact (direct or indirect) on Commonwealth land? No.	Nil

APPENDIX J OPERATIONAL ODOUR ASSESSMENT

Northridge waste disposal facility

Riverina Warehousing Solutions at the Northridge Unit Trust

Operational odour assessment

F0 | v0

4 June 2018

Northridge waste disposal facility

Project No:	IA155100.1
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Document No.:	F0
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Client Name:	Riverina Warehousing Solutions at the Northridge Unit Trust
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D0v1	08/08/2017	Draft issued for client review	LS		
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F0v0	04/06/2018	Final following EIS author review	LS		

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Executive Summary

As part of satisfying the *Secretary's Environmental Assessment Requirements* (SEARs) (No. 1062 issued July 2016), Jacobs was engaged to review potential operational odour issues associated with the proposed Northridge waste disposal facility. This assessment was undertaken to satisfy these requirements, as well as relevant guidance from applicable statutes and policies.

The assessment was completed using the AUSPLUME dispersion model. Meteorological conditions at the site were approximated using data available from the nearby Bureau of Meteorology's weather station at Wagga Wagga Airport. Odour emission rates from different stages of filling and capping of the site, as well as the leachate pond were estimated from a literature review of measurements collected at other similar facilities. Emissions were developed for four different assessment scenarios; early, mid-term, final and closure operations. The dispersion used the meteorological data in combination with the estimates of odour emissions to predict the off-site odour levels. These predictions were then compared to the assessment criteria noted by the Environment Protection Authority (EPA).

The results from modelling were that ground level odour concentrations were predicted to be well below the adopted 2 OU assessment criterion at nearby receiver locations for all of the four assessment scenarios considered. It was therefore concluded the proposed facility would not cause any adverse odour impacts. Nevertheless, mitigation and management measures were recommended as detailed in the *Environmental Guidelines Solid waste landfills Second Edition,* (EPA, 2016).

1. Introduction

Riverina Warehousing Solutions at The Northridge Unit Trust (RWS) is planning to develop a solid waste disposal facility at 223 and 299 Trahairs Road in Bomen, NSW. NGH Environmental has been engaged to prepare an Environmental Impact Statement (EIS) for the development application. The *Secretary's Environmental Assessment Requirements* (SEARs) (No. 1062 issued July 2016) issued for the proposal require the assessment of key environmental matters associated with the proposal. Odour associated with operations is identified as a key issue, and is the subject of this report.

The relevant requirements for assessment for operational odour from the SEARs have been reproduced below.

Air quality and odour – including:

- *A description of all potential sources of emissions;*
- *An air quality impact assessment in accordance with relevant Environmental Protection Authority Guidelines; and*
- *A description and appraisal of air quality impact mitigation and monitoring measures.*

In meeting these requirements, the objectives of this assessment were to:

- Provide a brief overview of the proposal, including any aspects particularly relevant to operational air quality (**Section 2.1**).
- Identify key odour risks during operations (**Section 2.2**).
- Detail the method used to evaluate potential operational odour impacts associated with the proposal (**Section 3**).
- Determine criteria for assessing potential impacts associated with the proposal based on guidance presented in the relevant statues and guidelines (**Section 4**).
- Characterise key features of the environment surrounding the proposal including nearby sensitive receivers, land uses, terrain features and prevailing climate and meteorological conditions (**Section 5**).
- Quantitatively evaluate potential odours associated with the operational phase of the proposal (**Section 6**).
- Develop suitable mitigation measures as identified to be necessary, including an evaluation of how they would achieve any required levels of reduction (**Section 7**).

2. Proposal overview

2.1 Key features

RWS is planning the construction of a solid waste disposal facility off Trahairs Road, Bomen NSW. The facility would be around 16.5 hectares in size and located across two individual titles (Lot 2 DP 590756 and Lot 11 DP 1130519). A schematic of the proposal is displayed below in **Figure 2-1**.

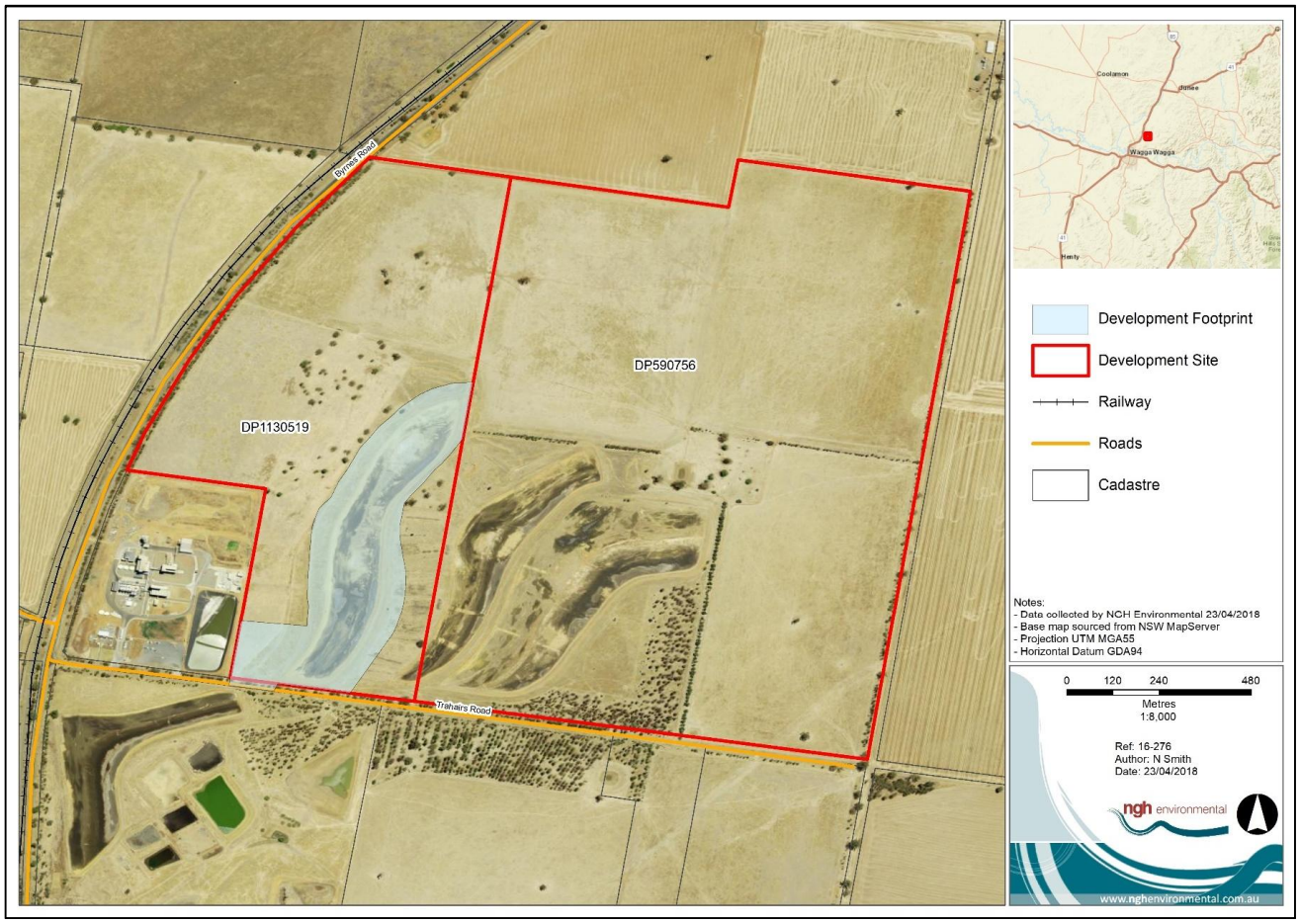


Figure 2-1 Schematic of Proposal area (NGH Environmental, 2017)

It is envisaged that most waste received on site would be from the Visy paper mill located at Tumut. Waste streams from Visy would include:

- Compactor plastics – light mixed plastics.
- Grapple Materials – heavy plastics, some metals, rubber and fibre.
- Glass material – glass, ceramics and stone chips.
- Fines/sand – with a small amount of fibre.
- Flotsam – wire, rope, plastics, metal and some fibre.
- Carbonates – mix of sodium and calcium carbonates, lime and a small amount of unburnt organics.
- Power boiler fly ash – boiler wood ash, inorganics.
- Power boiler sand – with some metals and small rocks.

The dregs and grits and power boiler sand would be used as landfill cover material.

Glass waste from Kurrajong Recyclers at Wagga Wagga would also be disposed of at the site, and would include:

- Crushed glass.
- Some limited electrical wire contamination.

Screened building and demolition waste including:

- Broken concrete, brick and other rubble.
- Soil (uncontaminated).
- Road millings.
- Timber.
- Plaster board.
- Compressed cement sheet.

It is planned that the facility would have capacity for approximately 630,000 m^3 of waste materials, which would be filled over a design life of approximately nine years. It is estimated that the facility would receive about 60,000 tonnes or 67,000 m^3 in its first year and grow at about 1.5 % annually. Approximate predicted annual receivables would be:

- 67,514 m^3 in year one.
- 68,054 m^3 in year two.
- 69,075 m^3 in year three.
- 70,111 m^3 in year four.
- 71,162 m^3 in year five.
- 72,230 m^3 in year six.
- 73,313 m^3 in year seven.
- 74,413 m^3 in year eight.
- 75,529 m^3 in year nine.

The overall disposal area is expected to be constructed in a staged approach, with the area divided into seven to eight cells (each with an approximate total area of up to around 10,000 m^2). The first cell to receive waste would be located at the southern end of the disposal area, with the cells progressively filled from south to north over the life of the facility. In the northern end of the footprint of the pond being converted to construct the facility, a leachate pond would be constructed to receive leachate generated from the facility. As filling is completed in each cell, the area would be sealed with a low-permeability capping layer (and revegetated) to contain the waste materials and limit the generation of leachate.

Materials would be received at the site from a formed access point off Trahairs Road and would be delivered to a hard-stand area from where they would be promptly emplaced following inspection. It is expected that the site would operate during standard business hours, namely 7am to 6pm Monday to Friday, and 8am to 1pm Saturdays, with no work Sundays.

2.2 Primary operational odour risks

The primary odour risk during operations will be associated with the emplacement of the waste materials into the landfill. Most odours will arise from the active filling area or tipping face, with residual odour also arising from intermediately and permanently covered areas, as well as the leachate pond. As such, these are the odours which have been assessed in this report.

3. Method of assessment

The methodology followed in assessing and evaluating potential odour impacts during the operational phase of the proposal is outlined in the following bullet points:

- **Recognise key odour risks:** Details of the proposal were reviewed to determine the key risks with regard to the generation of odours during the operational phase. This stage of the assessment is described above in **Section 2.2**.
- **Determine assessment criteria:** Criteria for assessing potential odour impacts associated with the proposal were developed based on guidance presented in relevant statutes and guidelines. The policy setting and the criteria adopted for the assessment are presented in **Section 4**.
- **Identify surrounding receivers and land uses:** Nearby receivers which may be sensitive to odour arising from the development were identified using aerial imagery. Designated land uses around the proposal were determined from the Local Environment Plan (LEP) accessed using the Planning Portal provided by the NSW Department of Planning and Environment. Identified surrounding receivers and land uses are described in **Section 5.1**.
- **Determine local physical environment characteristics and prevailing climate and meteorological conditions:** A digital terrain model (DTM) was developed for the area around the site using 90 m resolution elevation data obtained from the NASA Shuttle Radar Tomography Mission (SRTM3). Terrain around the proposal is described in **Section 5.2**.

  Prevailing climate and meteorological conditions around the proposal were determined using data collected at the automatic weather station (AWS) operated by the Bureau of Meteorology (BoM) at Wagga Wagga Airport (Station number 072150). Annual and seasonal wind roses were developed using meteorological data collected in 2014, 2015 and 2016. These wind roses were reviewed to select a representative year to be used as the meteorological input file for the AUSPLUME v6.0 dispersion model. This step in the assessment is presented in **Section 5.3**.
- **Model selection and setup:** Guidance presented in Section 6.2 of the *Approved Methods for the Modelling and Assessment of Air Pollutants in NSW* (Approved Methods), (EPA, 2016) was used to confirm the applicability of the AUSPLUME v6.0 dispersion model for the proposal situation. The model was set up based on guidance presented in Section 6.4 of the Approved Methods. *The Technical framework - Assessment and management of odour from stationary sources in NSW*, (DEC 2006) were also adopted for this assessment. These aspects of the assessment are detailed in **Section 6.1**.
- **Prepare an emissions inventory:** A literature review was performed to identify suitable odour emission parameters for the different operating circumstances and situations. **Section 6.2** describes this step in the assessment.
- **Quantitative evaluation of potential impacts**: The model was run for each of the identified representative operating situations and resulting odour concentrations were predicted at the surrounding sensitive receivers. Concentrations were evaluated by comparing the results against the criteria established in **Section 4.2**. This stage of the assessment is presented in **Section 6.3**.
- **Development of monitoring and management measures:** Based on the outcomes of modelling, mitigation and monitoring measures were developed as determined to necessary. Measures were reviewed to evaluate their ability to achieve any required levels of reduction. This step is detailed in **Section 7**.

4. Policy setting and criteria

Odours emitted during the operation of the facility are subject to requirements listed in a number of statutes, policies and guidelines. These include:

- *NSW Protection of the Environment Operations Act 1997 (POEO Act).*
- *Protection of the Environment Operations (Clean Air) Regulation 2010 (POEO Clean Air Regulation).*
- *Approved Methods for the Modelling and Assessment of Air Pollutants in NSW,* (EPA, 2016).
- *Approved Methods for Sampling and Analysis of Air Pollutants in NSW,* (DEC, 2005).
- *Technical Framework – Assessment and Management of Odour from Stationary Sources in NSW,* (DEC, 2006).
- *Environmental Guidelines Solid waste landfills Second Edition,* (EPA, 2016).

Relevant requirements from each of these documents are outlined below in **Section 4.1**, with specific criteria and assessment requirements adopted for the project presented in **Section 4.2**.

4.1 Statutory operational odour requirements

NSW Protection of the Environment Operations Act 1997

The *NSW Protection of the Environment Operations Act 1997 (POEO Act)* is the primary piece of legislation for the regulation of potential pollution impacts associated with operations or activities in NSW. Sections 126, 127, 128 and 129 relate to the generation of odours and would be applicable to the proposal. These requirements have been reproduced below.

Table 4-1 Relevant requirements from the POEO Act 1997

POEO Act 1997 Section reference	Requirement
Section 126	The occupier of any premises who deals with materials in or on those premises in such a manner as to cause air pollution from those premises is guilty of an offence if the air pollution so caused, or any part of the air pollution so caused, is caused by the occupier's failure to deal with those materials in a proper and efficient manner.
Section 127	To prove that air pollution was caused from premises, within the meaning of sections 124-126, it is sufficient to prove that air pollution was caused on the premises, unless the defendant satisfies the court that the air pollution did not cause air pollution outside the premises.
Section 128 Condition 2 (b)	The occupier of any premises must carry on any activity, or operate any plant, in or on the premises by such practicable means as may be necessary to prevent or minimise air pollution if the emissions are not point source emissions
Section 129	The occupier of any premises at which scheduled activities are carried on under the authority conferred by a licence must not cause or permit the emission of any offensive odour from the premises to which the licence applies

In summary, the POEO Act 1997 requires an activity does not result in odours considered to be 'offensive' beyond the boundary of the premises.

NSW Protection of the Environment Operations (Clean Air) Regulation 2010

Emissions from wood heaters, open burning, motor vehicles and fuels and industry are regulated by the *Protection of the Environment Operations (Clean Air) Regulation 2010 (POEO Clean Air Regulation)*.

Approved Methods for the Modelling and Assessment of Air Pollutants in NSW

The *Approved Methods for the Modelling and Assessment of Air Pollutants in NSW* (Approved Methods), (EPA, 2016) outline the approaches to be applied for the modelling and assessment of air pollutants in NSW.

Section 6.2 describes the model selection process and suggested settings for dispersion modelling assessments in NSW. Section 7.5 of the Approved Methods provides impact assessment criteria for complex mixtures of odorous air pollutants. These have been reproduced below in Table 4-2.

These criteria are expressed in the units, 'odour units' (OU). The Approved Methods describes the number of odour units as 'the concentration of a sample divided by the odour threshold or the number of dilutions required for the sample to reach the threshold'. The numerical value expressed is the threshold value equivalent to when 50% of a testing panel correctly detect an odour. A value of 1 OU represents the threshold of detection, and as such values less than 1 OU are considered to be below detection.

Table 4-2 Impact assessment criteria for complex mixtures of odorous pollutants (nose-response-time average, 99th percentile), Approved Methods

Population of affected community	Impact assessment criteria for complex mixtures of odorous air pollutants (OU)
Urban (greater than or equal to 2000 persons including schools and hospitals)	2.0
Approximately 500	3.0
Approximately 125	4.0
Approximately 30	5.0
Approximately 10	6.0
Single rural residence (less than or equal to 2 persons)	7.0

Section 7.5.2 of the Approved Methods describes how these criteria apply at 'the nearest existing or likely future off-site sensitive receptor'. Where site-specific meteorological data is available, these criteria relate to the 99th percentile of peak concentrations.

As described in Section 6.6 of the Approved Methods, the evaluation of odour impacts requires the 'estimation of short or peak concentrations on the time scale of less than one second'. Noting that the temporal resolution of dispersion modelling is generally one hour or more, an emission rate correction is applied in NSW to 'accurately simulate atmospheric dispersion of odours and the instantaneous perception of odours by the human nose'. This correction is known as a peak-to-mean ratio. Values for the peak-to-mean ratio are dependent on the nature of the source, atmospheric stability and the distance downwind. Reference peak-to-mean values from the Approved Methods have been reproduced below.

Table 4-3 Reference peak-to-mean values (Approved Methods)

Source	Pasquill-Gifford stability class	Near-field P/M60*	Far-field P/M60*
Area	A, B, C, D	2.5	2.3
	E, F	2.3	1.9
Line	A to F	6	6
Surface wake-free point	A, B, C	12	4
	D, E, F	25	7
Tall wake-free point	A, B, C	17	3
	D, E, F	35	6
Wake-affected point	A to F	2.3	2.3

Source	Pasquill-Gifford stability class	Near-field P/M60*	Far-field P/M60*
Volume	A to F	2.3	2.3

Approved Methods for Sampling and Analysis of Air Pollutants in NSW

The *Approved Methods for Sampling and Analysis of Air Pollutants in NSW,* (DEC, 2005) provides guidance for the monitoring and analysis of odours in NSW. Relevant information from this document was adopted during the consideration of operational odour monitoring requirements for the project.

Technical Framework – Assessment and Management of Odour from Stationary Sources in NSW

The *Technical Framework – Assessment and Management of Odour from Stationary Sources in NSW,* (DEC, 2006) provides information on how odour matters should be assessed, managed, regulated and enforced. The impact assessment criteria above in **Table 4-2** from the Approved Methods are adopted from the Technical Framework.

This study uses site-specific input data including local terrain, meteorology, and land use information; as well as literature-derived emission estimates based on the nature of the materials expected to be received at the facility. Potential impacts were evaluated using the AUSPLUME v6 dispersion model. As such, the review is considered to constitute a Level 3 assessment, in the context of Section 4 of the Technical Framework. This level of assessment is identified as being suitable for assessing 'site suitability and odour mitigation measures'.

Guidance for avoiding and mitigating odour from Section 5 of the Technical Framework was also considered as applicable to the proposal.

Environmental Guidelines Solid waste landfills Second Edition

The *Environmental Guidelines Solid waste landfills Second Edition,* (EPA, 2016) provides guidance for the management of environmental issues during all phases of solid waste landfill projects in NSW, from design, through construction, during operations and finally during post-closure.

Regarding operational odour, the required outcome specified in Section 6 of the guideline is that 'offensive odour impacts must not occur at off-site locations'.

The requirements for assessment of odour impacts detailed in Section 6.1 of the guideline were adhered to as part of this assessment. This method refers to the approaches detailed in the Approved Methods and Technical Framework which have applied as part of this assessment.

In establishing operational odour emission rates, the presented 'minimum standards' for management of odour issues associated with the active tipping face, leachate system, daily and intermediate covering, and final capping were also considered.

4.2 Adopted criteria and requirements for assessment

Considering the guidance presented above, a 99th percentile one-hour peak-to-mean corrected (i.e. nose-response-time average) ground level concentration (GCL) impact assessment criterion of 2 OU was conservatively adopted for this assessment. In achieving this criterion, it is expected that the requirement to avoid offensive odours beyond the boundary of the premises from the POEO Act 1997 and the *Environmental Guidelines Solid waste landfills Second Edition,* (EPA, 2016) would also be met.

5. Existing environment

This section of the report describes the existing environment around the proposal location including surrounding receivers, land use, terrain and prevailing climate and meteorological conditions.

5.1 Surrounding receivers and designated land uses

The proposal is set within a semi-rural location on the outskirts of the township of Bomen, NSW. There are several residential receivers located within the vicinity of the proposal with the nearest located approximately 1.4 kilometres from the perimeter of the proposed site. Nearby residential receivers are generally located in all directions from the proposal with the nearest receivers to the south set along East Bomen Road; to the west off Trahairs Road and the Olympic Highway; to the north along Mary Gilmore Road; and to the east off Pattersons Road and Shepherds Siding Road. The nearest receivers in relation to the proposal are displayed below in **Figure 5-1**, with their approximate coordinates and distance from the perimeter of the site listed in **Table 5-1**.

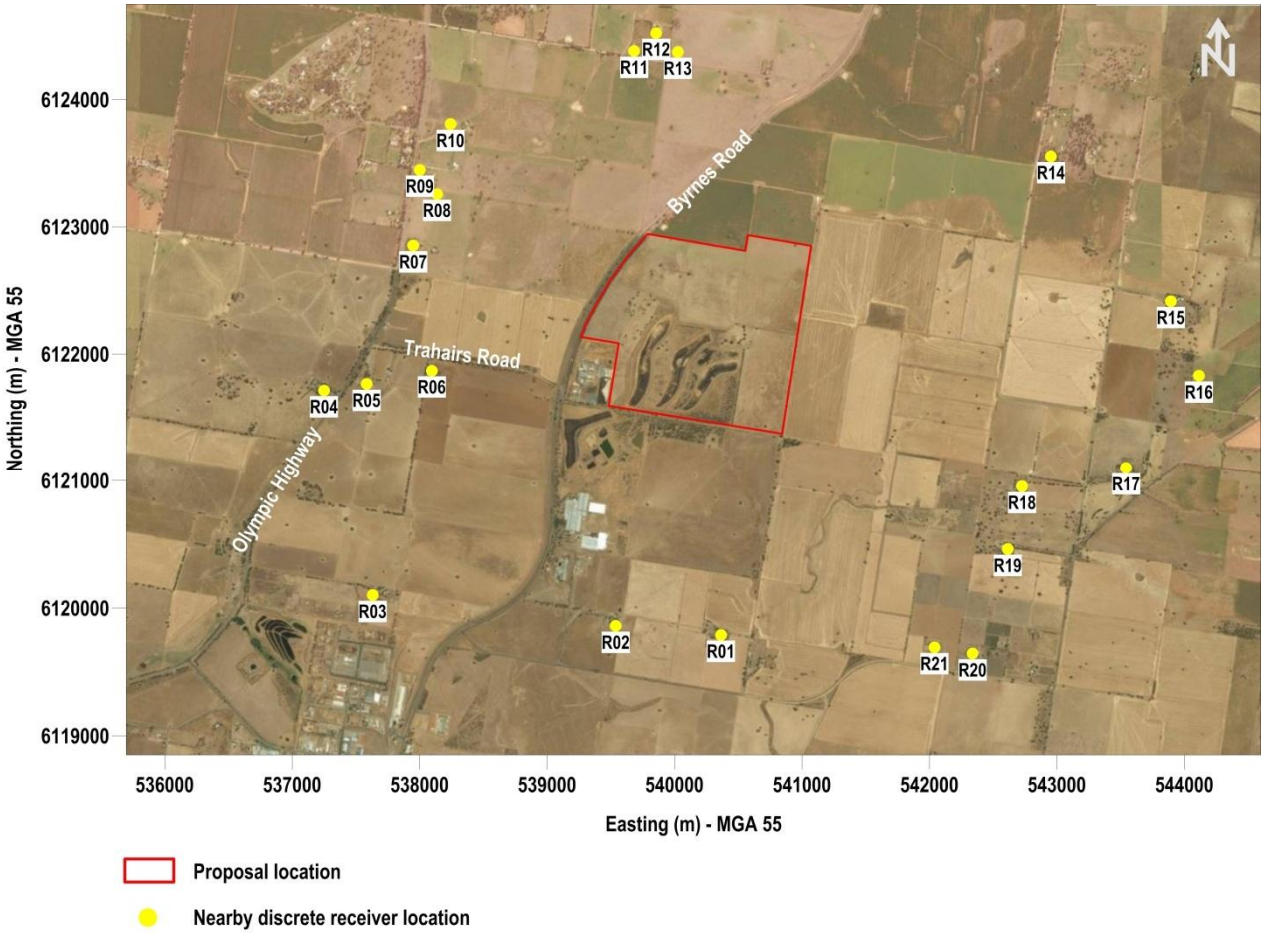
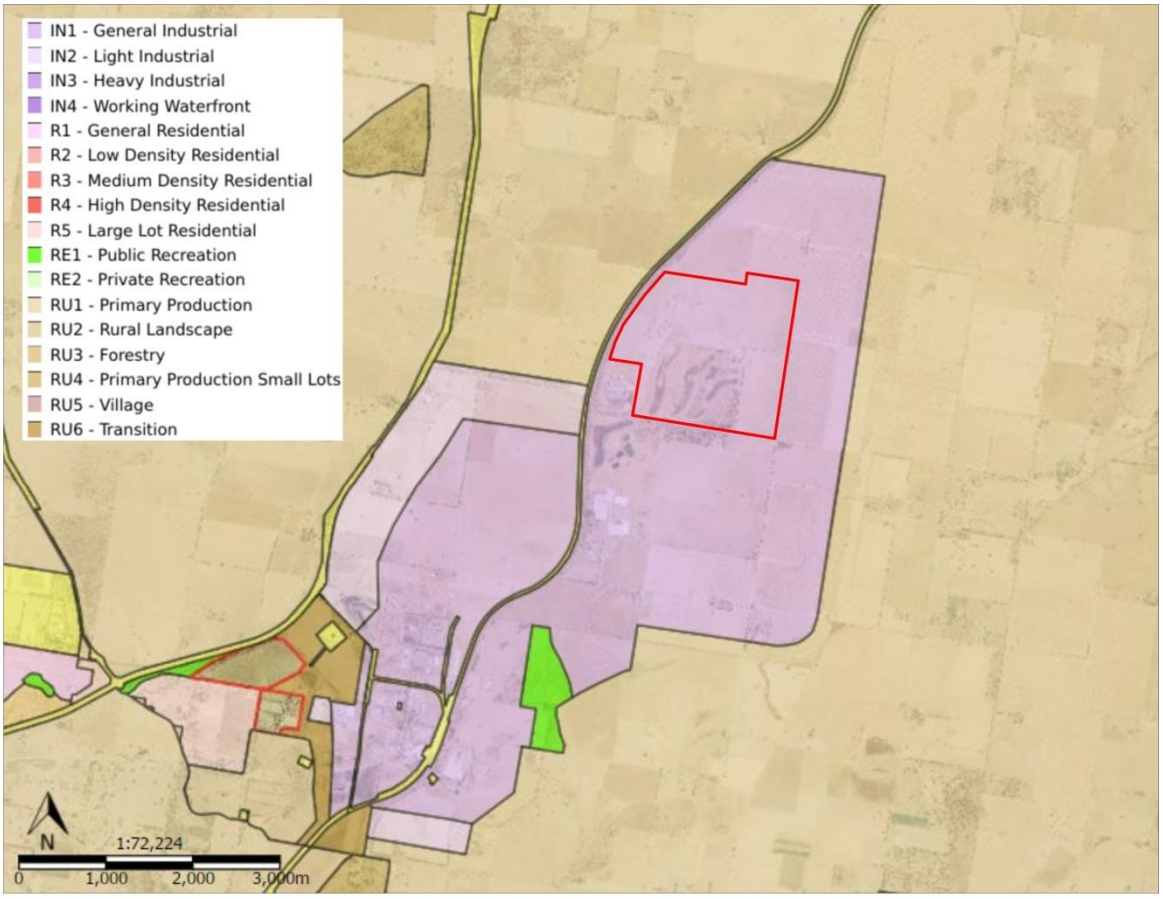


Figure 5-1 Surrounding receivers and local terrain (Imagery source: Esri)

Table 5-1 Details of nearby receivers

Receiver ID	X coordinate (metres UTM – MGA 56)	Y coordinate (m UTM – MGA 56)	Receiver type	Approximate distance from proposal (metres)
R01	540363.4	6119791	Residential	1600 metres
R02	539537.9	6119861	Residential	1600 metres
R03	537630.5	6120102	Residential	2300 metres
R04	537248.4	6121714	Residential	2250 metres
R05	537583.3	6121765	Residential	1900 metres
R06	538095.2	6121871	Residential	1400 metres
R07	537949	6122854	Residential	1500 metres
R08	538135.7	6123258	Residential	1500 metres
R09	538001.6	6123449	Residential	1700 metres
R10	538241.4	6123808	Residential	1700 metres
R11	539683.3	6124382	Residential	1400 metres
R12	539855.5	6124524	Residential	1600 metres
R13	540025.1	6124375	Residential	1400 metres
R14	542953.5	6123555	Residential	2300 metres
R15	543893.5	6122416	Residential	2900 metres
R16	544113.4	6121830	Residential	3100 metres
R17	543543.1	6121103	Residential	2700 metres
R18	542726.6	6120956	Residential	1900 metres
R19	542614.2	6120463	Residential	1950 metres
R20	542338.6	6119645	Residential	2250 metres
R21	542038.7	6119694	Residential	2000 metres

Designated land uses around the proposal were identified based zoning specified in the Local Environmental Plan. This was accessed using the Planning Portal provided by the NSW Department of Planning and Environment (available at https://www.planningportal.nsw.gov.au/find-a-property/property/). As displayed below, the land immediately surrounding the proposal site is zoned for industrial purposes, with lands designated for rural uses further from the site.



5.2 Terrain

As displayed below in **Figure 5-2**, the terrain within approximately 3 kilometres of the proposal site is generally flat, with elevations up to around 300 metres above sea level to the northeast of the site, to approximately 220 metres just to the east and west of the site.

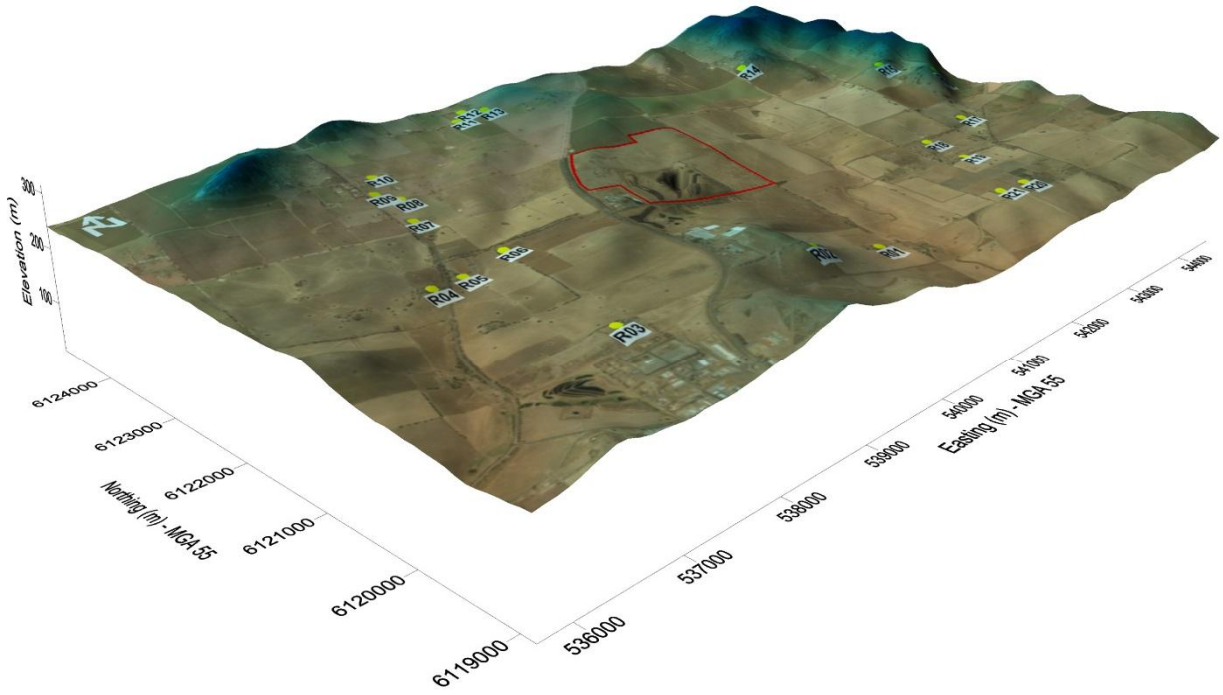


Figure 5-2 Three dimensional schematic of existing terrain around the proposal (Source: NASA Shuttle Radar Tomography Mission [SRTM3])

5.3 Climate and meteorology

Climate

The nearest weather station with long-term historical records operated by the BoM is the Wagga Wagga Airport automatic weather station (AWS) (Station number 072150). As displayed below in **Figure 5-3**, this station is located close to the proposal site, approximately located approximately 12 kilometres to the southeast.

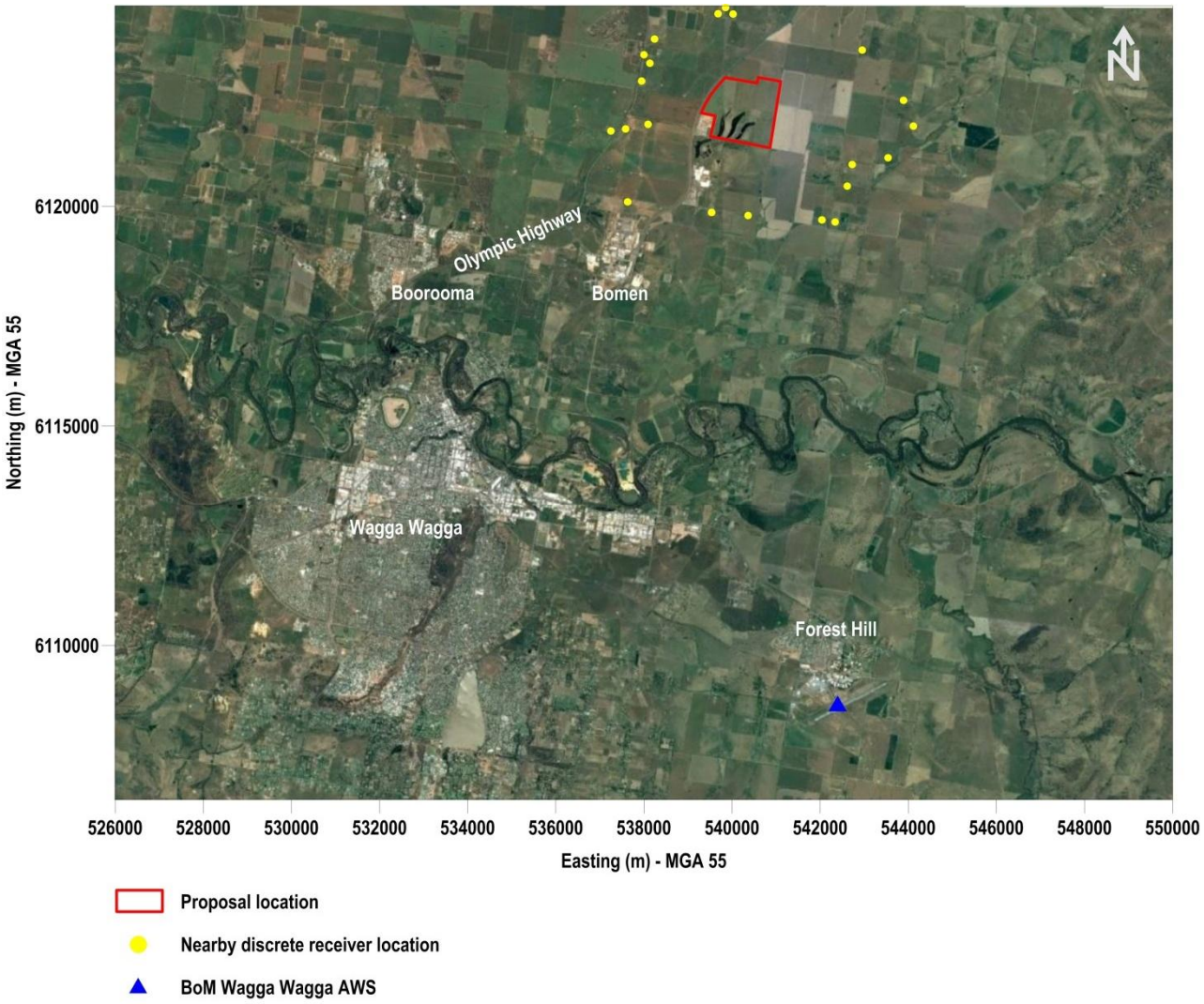


Figure 5-3 Wider locality and location of the BoM Wagga Wagga AWS in relation to the proposal site

Table 5-2 displays long-term temperature and rainfall averages recorded at this station from its date of commission in 1942 to 8 June 2017.

Table 5-2 Long-term temperature and rainfall data from the BoM Sunshine Coast Airport AWS from 1994 to 2016 (BoM, 2017)

Month	Mean maximum temperature (°C)	Mean minimum temperature (°C)	Mean rainfall (mm)	Mean number of rain days (> 1 mm)
January	31.7	16.3	40.6	3.9
February	30.9	16.4	40.7	4
March	27.7	13.4	45.1	4.1
April	22.5	9.2	40.3	4.9
May	17.4	5.9	50.8	6.3
June	13.8	3.7	51.2	7.5
July	12.7	2.8	54.9	9.1
August	14.5	3.6	51	8.8
September	17.7	5.1	50	7.3
October	21.6	7.8	56.8	6.9
November	25.9	10.9	45.8	5.4
December	29.5	13.9	45.6	4.6

Month	Mean maximum temperature (°C)	Mean minimum temperature (°C)	Mean rainfall (mm)	Mean number of rain days (> 1 mm)
Annual	**22.2**	**9.1**	**572.6**	**72.8**

These data indicate the following climate trends:

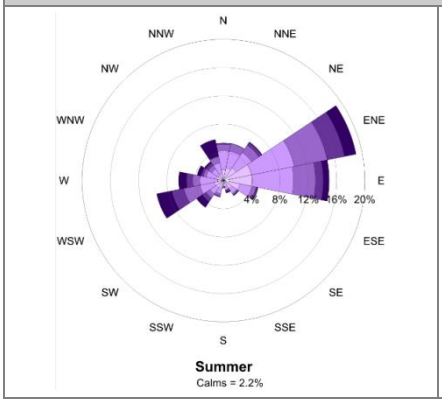
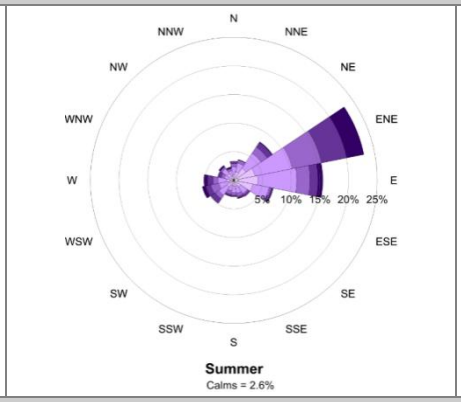
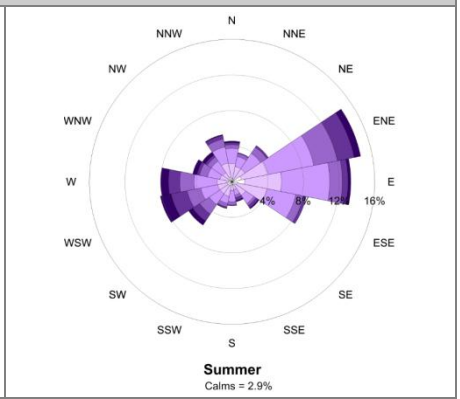
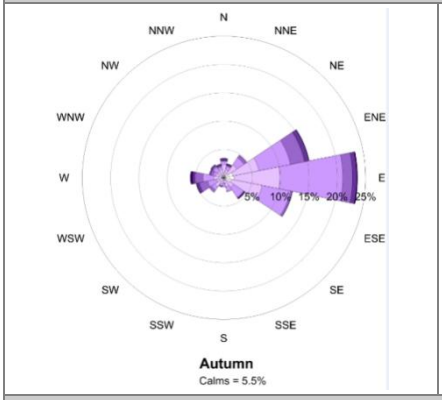
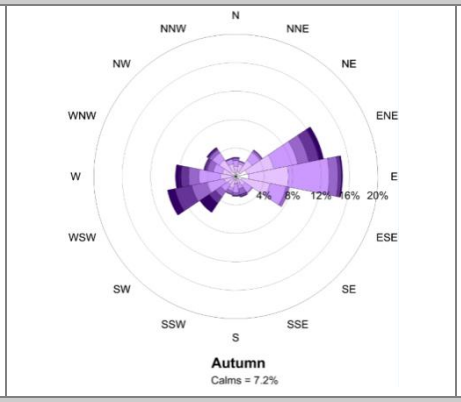
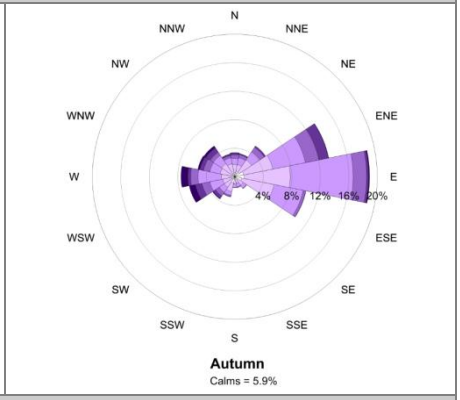
- Average maximum temperatures range from around 32 to 30 degrees Celsius in summer to around 13 to 15 degrees Celsius in winter. Minimum temperatures in summer varied between 14 and 16 degrees Celsius, and 3 and 4 degrees Celsius in winter.
- Precipitation is relatively consistent across all months throughout the year with a highest average of 57 millimetres in October and a minimum of 40 millimetres in April. July historically has the highest number of days with more than 1 millimetre of rain (9), whereas the month with the lowest number of rain days each year is January (4).

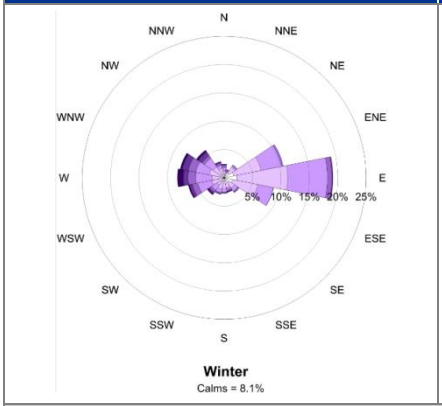
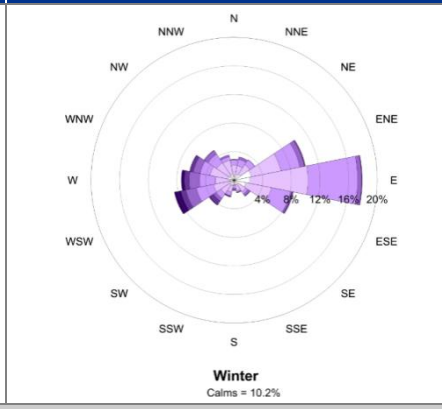
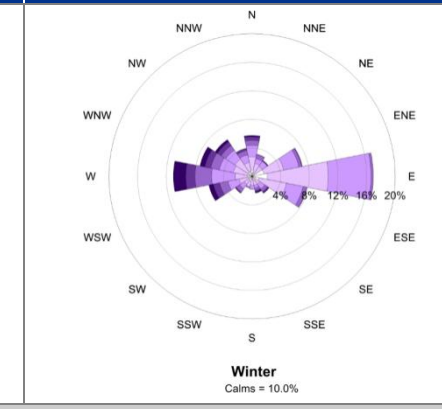
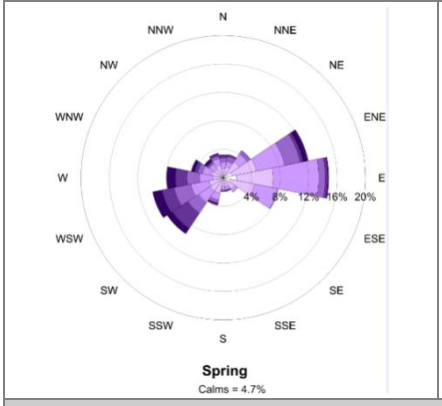
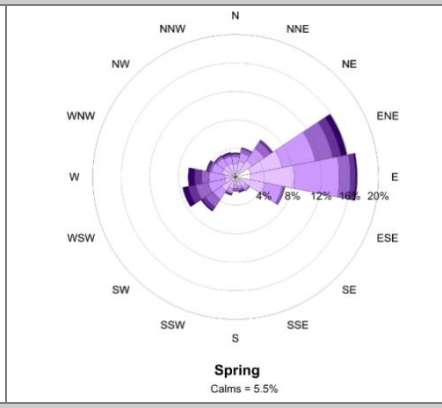
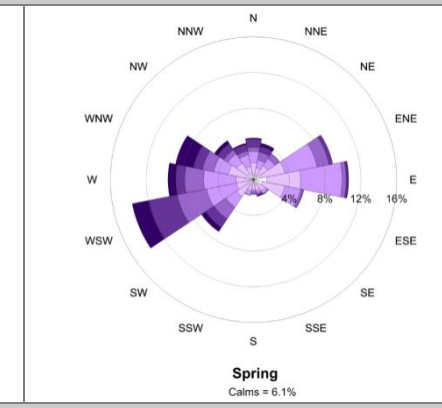
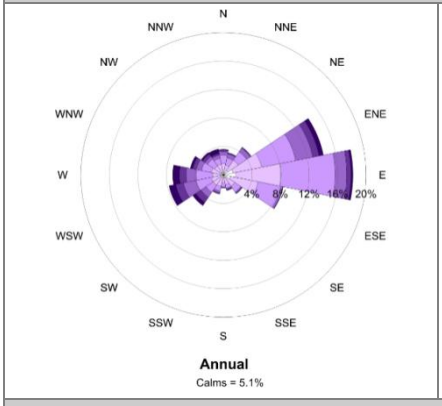
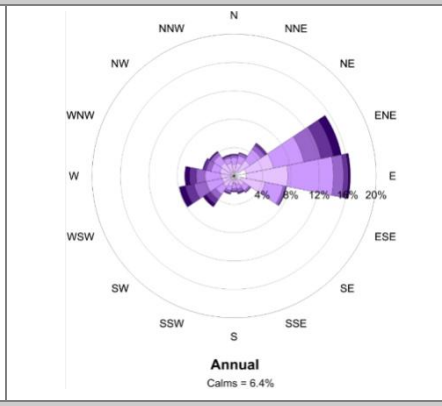
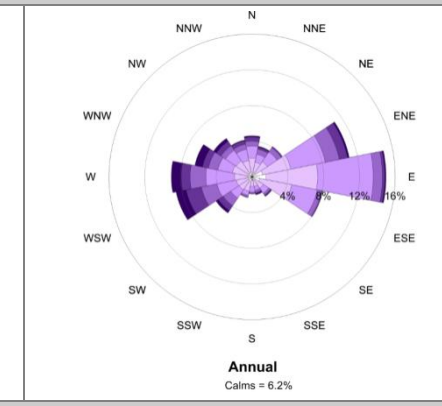
Meteorology

Meteorological conditions are important for determining the direction and rate at which emissions from a source will disperse. The key meteorological requirements for an air dispersion model typically include hourly records of wind speed, wind direction, temperature, atmospheric stability class and mixing layer height. For air quality assessments, a minimum one year of hourly data is usually required, which means that almost all possible meteorological conditions, including seasonal variations, are considered in the simulations.

Meteorological data were considered from the BoM Wagga Wagga Airport AWS. Data collected in 2014, 2015 and 2016 were developed into annual and seasonal wind roses. These are displayed below in **Table 5-3**.

Table 5-3 Annual and seasonal wind roses for 2014, 2015 and 2016 from data measured at BoM Wagga Wagga Airport AWS

2014	2015	2016
Summer		
		
Autumn		
		
Winter		

2014	2015	2016
		
Spring		
		
Annual		
		
Legend		
Wind speed (m/s) >0.5 - 1.5 >1.5 - 3 >3 - 4.5 >4.5 - 6 >6 - 7.5 >7.5		

The annual and seasonal wind roses for these three years are generally consistent, with the following typical trends observed for each season:

- Summer – Winds blowing from the east and east northeast most common, with a low percentage of calm conditions (less than 3%).
- Autumn – Winds from the east most common, with winds from the east northeast and east southeast also occurring frequently. Calm periods occurring 5 to 7% of the time.
- Winter – Prevailing winds from the east, with occasional strong winds (greater than 7.5 metres per second) from the west with winds blowing from the east northeast and east southeast also common. Calm periods taking place up to around 10% of the time.
- Spring – Winds blowing from the east and east northeast most common, with strong winds occasionally occurring from the west northwest, west, and west southwest. Calm conditions were uncommon, occurring around 5 to 6% of the time.

Though these was a high level of consistency between the trends observed over each of the three years, 2015 was selected to be used as the representative meteorological input year for dispersion modelling. 2015 was selected instead of the more recent 2016 dataset as there was more consistency between spring observations in 2014 and 2015, compared with 2016 where there were a higher proportion of winds blowing from the west southwest.

6. Quantitative assessment

6.1 Model selection and setup

Selection

The AUSPLUME v 6.0 dispersion model was selected for the evaluation of potential odour impacts associated with the operational phase of the proposal. The model was selected on the basis that the requirements for application listed in Section 6.2 of the Approved Methods were satisfied for the proposal scenario.

Table 6-1 Checklist for application of AUSPLUME v6.0 dispersion model Source: Approved Methods)

Modelling aspect	Requirement satisfied for AUSPLUME to be used during assessment
Simple terrain, steady-state conditions	ü
No buoyant line plumes	ü
No coastal fumigation effects	ü
Low frequency of stable, calm night time conditions	ü

General compliance with the fourth condition for use being a low frequency of stable, calm night time conditions was evaluated by post-analysing the annual, one-hour time step meteorological input files generated for use in the AUSPLUME v6 dispersion model. These review identified the occurrence of calm and stable night time conditions 9.3%, 11.4% and 11.5% in 2014, 2015 and 2016 respectively. As such it was considered that this condition was satisfied and that it was appropriate for AUSPLUME v6 to be used for assessing operational odour impacts associated with the proposal.

Setup

The AUSPLUME v6 dispersion model was used to assess potential odour impacts during the operational phase of the proposal. Key setup details applied in the model are summarised below in **Table 6-2**.

Table 6-2 Model setup details

Parameter	Details
Model version	AUSPLUME version 6.0
Terrain effects	NASA Shuttle Radar Topography Mission (SRTM3) data were used to generate terrain across the study area. Terrain effects were accounted for in the model using the Egan half-height approach.
Horizontal and vertical dispersion curves	Pasquill-Gifford method
Meteorology	Processed data collected in 2015 from the BoM Wagga Wagga Airport AWS (Station number 072150) processed into a format suitable for use.
Wind profile exponent	Irwin rural wind profile exponents for rural areas.
Plume rise parameters and wind speed categories	AUSPLUME default values.
Prediction area	100 metre spaced area approximately 8 kilometres (east to west) by around 5 kilometres (north to south) to cover the extent of nearby receivers in relation to the proposal
Land use	‘Flat rural’ (surface roughness height = 0.1 metres)

6.2 Emissions inventory and assessment scenarios

The *Environmental Guidelines Solid waste landfills Second Edition,* (EPA, 2016) describes how 'odour production rates from landfills are highly variable, depending on the type of the waste, its moisture content, the extent of its decomposition, the type and extent of the cover material, whether or not landfill gas collection is installed, the terrain, the temperature and the wind conditions'.

A literature review of available odour emission data was conducted to derive suitable inputs for this modelling assessment. The literature review included compliance and license odour reports from NATA accredited facilities such as The Odour Unit and SLR, as well as published odour impact assessments for new or proposed landfills, conducted by consultancies such as Golder Associates and Pacific Environment Limited.

The specific odour emission rates (SOER) from the reviewed literature during three (3) common landfill phases were extracted for comparison and review. These common phases include the active tip face, daily cover area and final filled and capped area. The active tip face is where a landfill face is operational and has exposed waste. Daily cover refers to the intermediate covering of the active filling area each day until the area has reached the final design level. Filled and capped areas refer to sections of the emplacement facility are those which have been filled to capacity and sealed with a final cover layer.

Table 6-3 presents SOERs derived from this literature review, from the aforementioned phases, as well as odours arising from leachate ponds. These data were collected with the use of flux chamber hoods, or calculated to an equivalent flux hood value. It is noted that not all literature classifies the type of waste that was measured on the day, and not all phases were measured in each assessment.

Table 6-3 Range of literature SOERs at waste facilities during different emplacement activities

SOER (ou.m^3/m^2/s) without peak-to-mean adjustments				Waste type/notes	Source
Active tipping face	Daily cover	Filled and capped area	Leachate pond (aerated)		
3.3	0.2	0	NM	- Non-recyclable, solid putrescible waste.	*Melbourne regional Landfill Air Quality Assessment,* (Pacific Environment Limited [PEL], 2016)
0.4	NM	NM	NM	- Municipal non-putrescible waste (construction, industrial, demolition, garden waste). - PEL used its own previous monitoring assessments to derive an average SOER from non-putrescible waste.	*Wetherill Park Resource Recovery Facility Upgrade – Odour Assessment*, (PEL, 2016)
9.2 to 11.8	NM	0.2 to 0.4	0.03	- Putrescible waste from Sydney. - Biofilter cap resulting in higher SOER).	*Woodlawn Bioreactor Expansion Project: Independent Odour Audit #4*, (The Odour Unit, 2015)
4.1 to 4.7	NM	0-0.6	0.02 to 0.03	- Putrescible waste from Sydney. - Biofilter cap resulting in higher SOER).	*Woodlawn Bioreactor Expansion Project: Independent Odour Audit #3*, (The Odour Unit, 2014)
0.3	NM	NM	0.2	- Non-putrescible, mixed waste.	*Energy from waste facility – Odour Assessment*, (PEL, 2015)
1.5	0.03	0.02	0.03	- General waste, specifications not provided.	*Mugga Stage 5 Air quality Impact Assessment*, (AECOM, 2012)
2.6	1.0	0.04	0.6	- Odour values based on Golder's in house odour database. - Putrescible waste only.	*Hanson Landfill and Quarry Risk Assessment*, (Golder Associates, 2012)

SOER (ou.m^3/m^2/s) without peak-to-mean adjustments				Waste type/notes	Source
Active tipping face	Daily cover	Filled and capped area	Leachate pond (aerated)		
2.1	0.1	NM	NM	- Non-putrescible waste.	*Melbourne regional Landfill Air Quality Assessment,* (PEL, 2016)
2.0	0.04	0.04	NM	- Non-putrescible waste.	*Melbourne regional Landfill Air Quality Assessment,* (PEL, 2016)
0.1 to 1.5	0.6 to 0.9	0.01 to 0.02	NM	- Non-putrescible waste.	*Air Quality Assessment – Odour and Dust: Proposed Modification to the Northern Extension Landfill at Eastern Creek,* (PAE Holmes, 2010)
0.2	0.2	0.05	NM	- Baled waste mixture (construction and demolition, food and garden, bio solids).	*Orange resource Recovery and Waste Management Project – Environmental Assessment,* (GHD, 2009)

NM = Not Measured

As discussed in **Section 2.2**, the nature of the waste expected to be received at the site would generally comprise of non-putrescible waste mainly consisting of building and demolition wastes, and by products from the nearby Visy Paper Mill.

Expectedly and as displayed in **Table 6-3**, SOERs are considerably higher for putrescible wastes. Considering the nature of the materials to be received, literature values measured for non-putrescible waste are expected to be more appropriate for the facility. The general waste from building and demolition wastes generally should not produce offensive odours; however organic acids and sulphur compounds present in paper mill waste can generate unpleasant odours over time. As such, the most conservative SOERs for non-putrescible waste presented above were applied in this assessment for the leachate pond, filled and capped areas and daily cover; with the SOER value for the active tipping face documented in the study at Wetherill Park used, noting that the material in this study was generally most similar to what is intended to be disposed at the site. These adopted values are summarised below in **Table 6-4**.

Table 6-4 Adopted SOER values

Peak-to-mean multiplier	SOER (ou.m^3/m^2/s)			
	Active Tip Face	Daily Cover	Filled and Capped area	Leachate Pond
None	0.4	0.1	0.04	0.2
2.3	0.92	0.23	0.092	0.46
2.5	1.0	0.25	0.1	0.5

In combination with the planned operational schedule, these adopted SOERs were developed into an emissions inventory. The inventory considered four scenarios for assessment at the site. Each of these is described below:

- Scenario 1 (Early operations) – The overall waste emplacement area is to be constructed in staged manner, with the first cell to receive waste located at the southern end. This scenario considers odours arising from the in-filling of this southernmost cell, including adjustments for night cover and odours arising from the leachate pond.
- Scenario 2 (Medium-term operations) – Midway through the life of the facility, the first waste cells in the south of the emplacement area would be filled, with active filling occurring in a cell located at the middle of the overall emplacement area (nominally Cell 4). In this scenario, odours would be considered from the

active filling cell (including adjustments made for night cover), the leachate pond, and residual emissions arising from the filled and capped cells to the south.

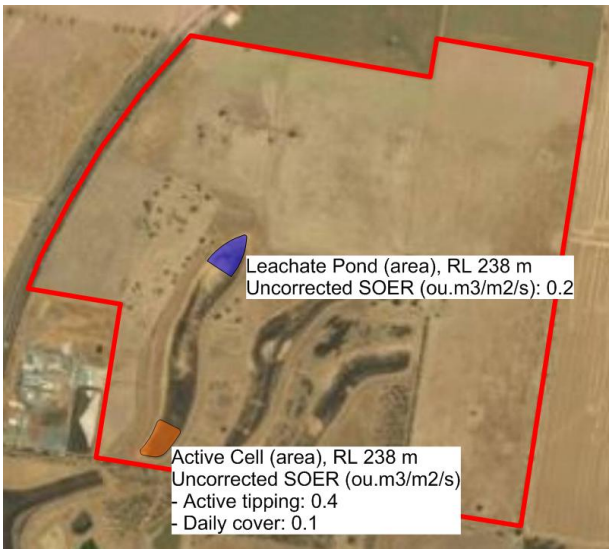
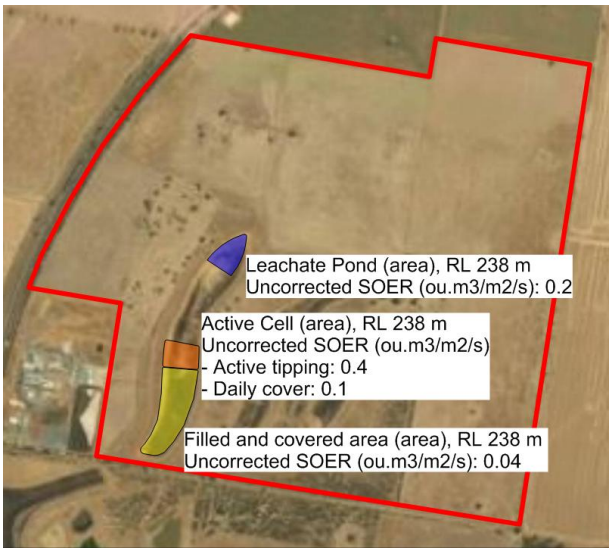
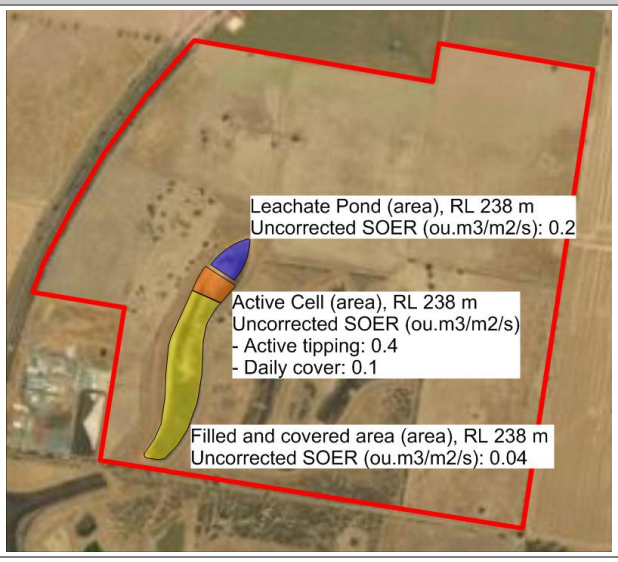
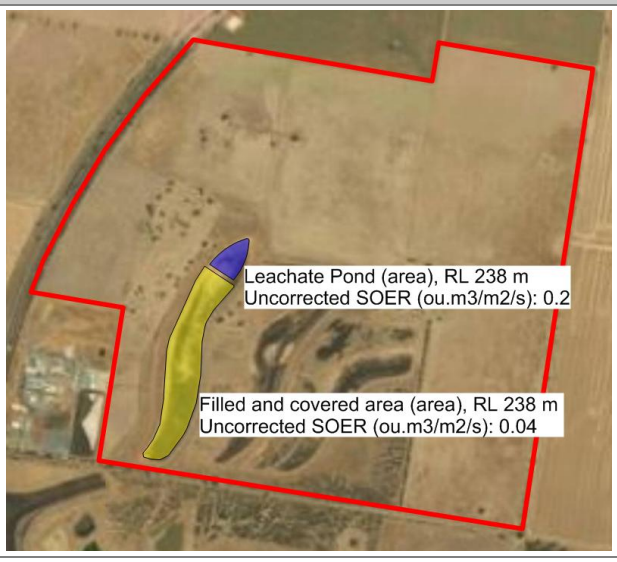
- Scenario 3 (Final operations) – The final cell to be filled would be the northernmost portion of the emplacement area, below the leachate pond. This third assessment scenario considers odours arising from active filling of the northernmost cell, the leachate pond and residual odours arising from the filled and capped emplacement area.
- Scenario 4 (Closure) – Once the entire emplacement area has been filled and capped, there may still be some residual odour arising from the facility. This assessment scenario evaluates these odours which may result from the filled and capped area, and leachate pond.

The emissions modelled for each scenario are summarised in **Table 6-5**. Peak-to-mean corrections were applied to the emission rates as per the values presented in **Table 4-3** depending on the stability conditions present for each hour of the meteorological observation file. The emission rate was also varied by hour of the day for the active cell area to account for the application of the daily cover layer. The sources as represented in the model for the four assessment scenarios are shown in **Table 6-6**.

Table 6-5 Modelled odour emissions

Source	Source type	Area (m^2)	Elevation (m AHD)	SOER ($Ou.m^3/m^2/s$)	TOER (OU/s)
Scenario 1 (Early operations)					
Leachate pond	Area	8760	229.5	0.2	1,752
Active filling area (Cell 1)	Area	8,663	238	0.4 – active tipping 0.1 – daily cover	3,465 866
Scenario 2 (Medium-term operations)					
Leachate pond	Area	8760	229.5	0.2	1,752
Active filling area (Cell 4)	Area	9,282	238	0.4 – active tipping 0.1 – daily cover	3,713 928
Filled and covered area (Cells 1 to 3)	Area	27,067	238	0.04	1,083
Scenario 3 (Final operations)					
Leachate pond	Area	8760	229.5	0.2	1,752
Active filling area (Cell 7)	Area	8,740	238	0.4 – active tipping 0.1 – daily cover	3,496 874
Filled and covered area (Cells 1 to 6)	Area	53,051	238	0.04	2122
Scenario 4 (Closure)					
Leachate pond	Area	8760	229.5	0.2	1,752
Filled and covered area (Cells 1 to 7)	Area	62,290	238	0.04	2,479

Table 6-6 Emissions setup for each assessment scenario

Modelling emission details for assessment scenarios	
Scenario 1 (Early operations)	**Scenario 2 (Medium-term operations)**
	
Scenario 3 (Final operations)	**Scenario 4 (Closure)**
	

6.3 Predicted results

99th percentile one-hour peak-to-mean corrected (i.e. nose-response-time average) GLC odour contours are presented below for assessment scenarios 1, 2, 3 and 4 in **Figure 6-1**, **Figure 6-2**, **Figure 6-3** and **Figure 6-4** respectively.

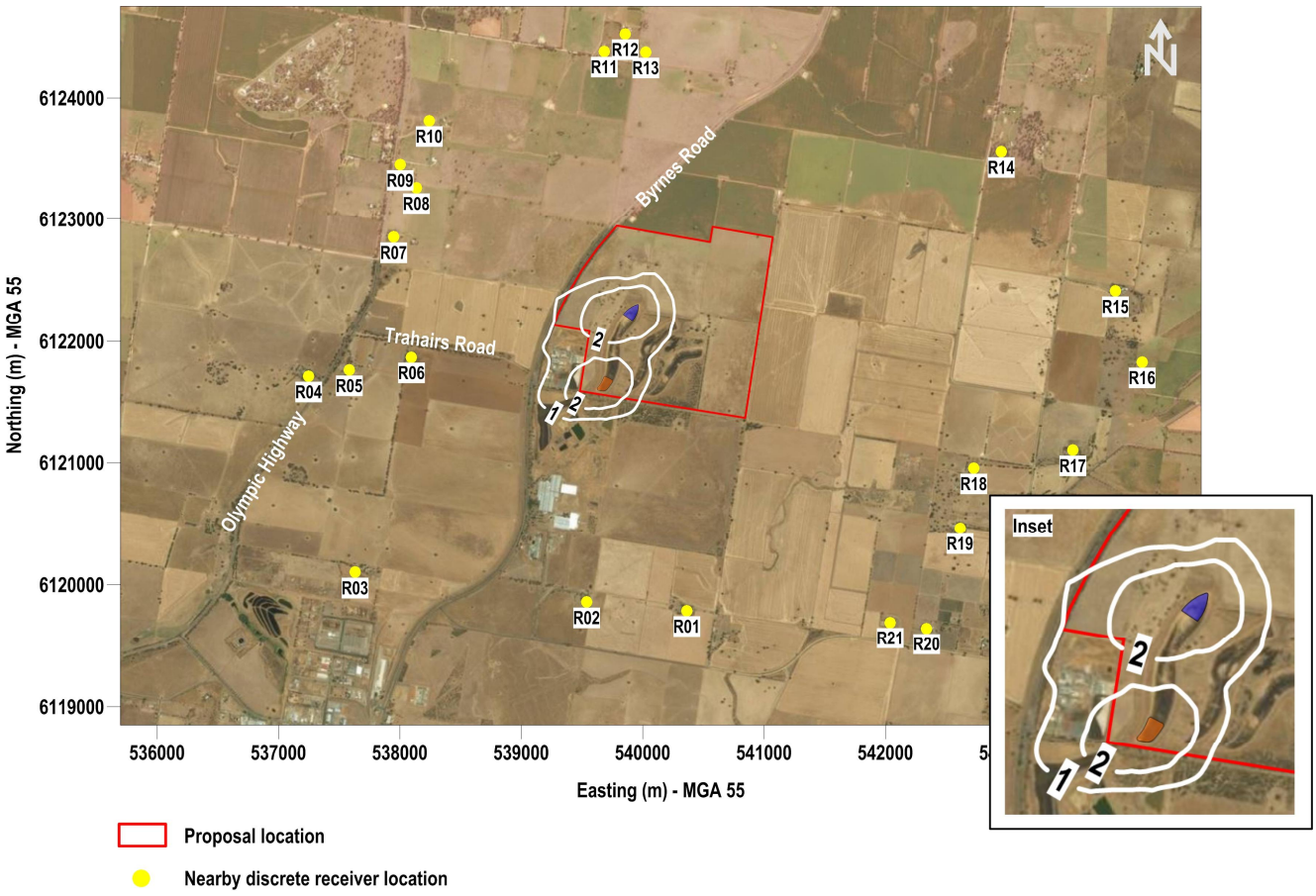


Figure 6-1 Predicted 1-hour peak-to-mean corrected 99th percentile ground level odour concentration results - Scenario 1 (early operations)

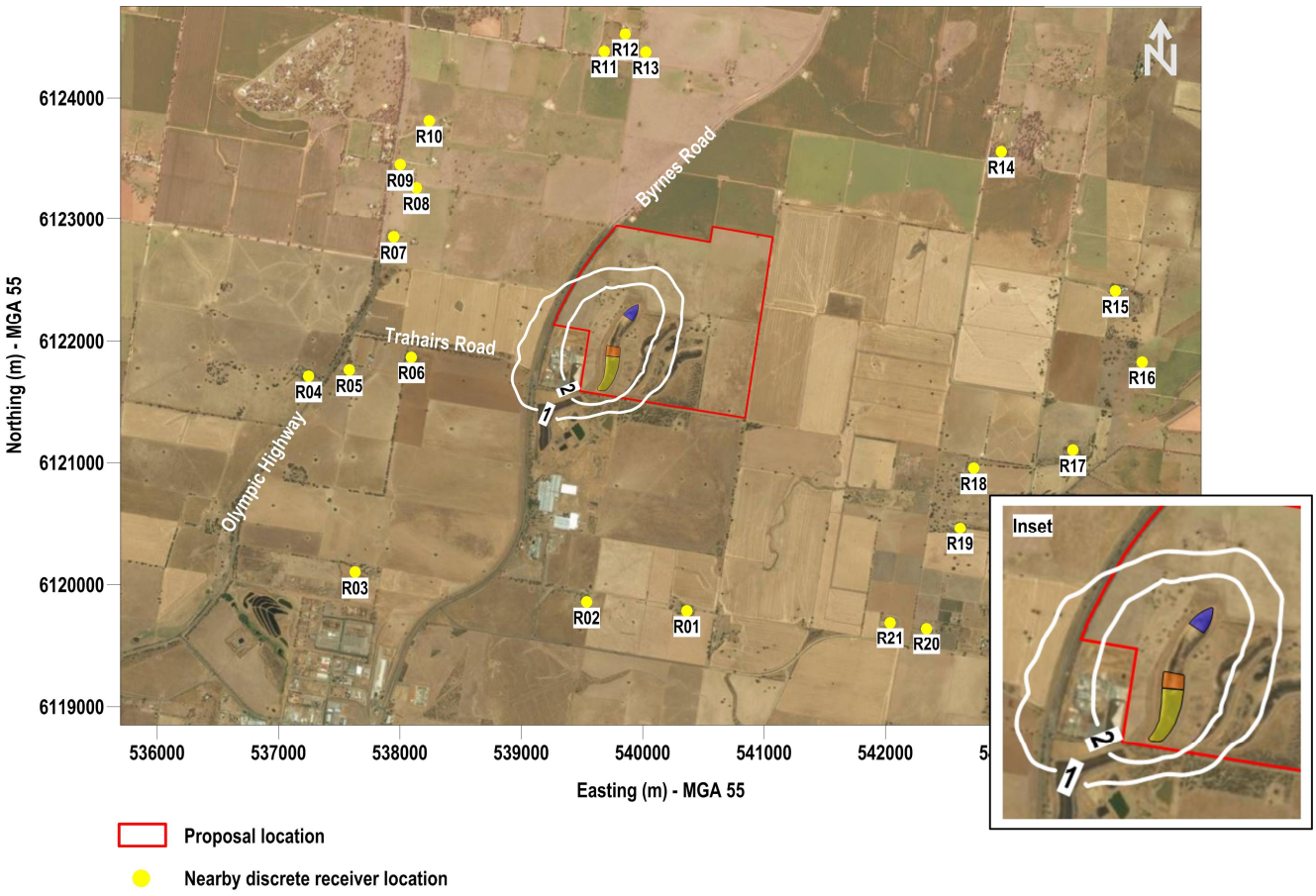


Figure 6-2 Predicted 1-hour peak-to-mean corrected 99th percentile ground level odour concentration results - Scenario 2 (medium-term operations)

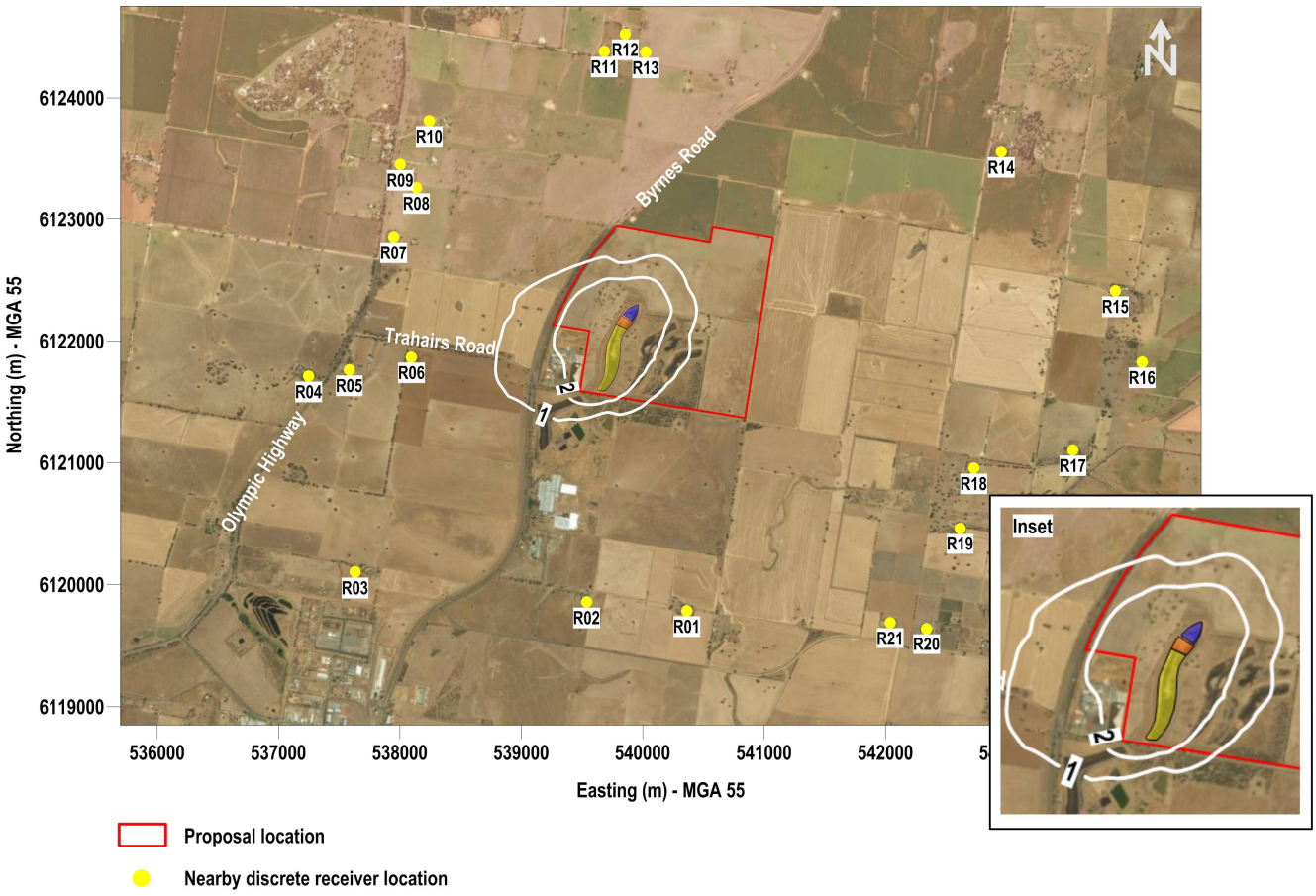


Figure 6-3 Predicted 1-hour peak-to-mean corrected 99th percentile ground level odour concentration results - Scenario 3 (final operations)

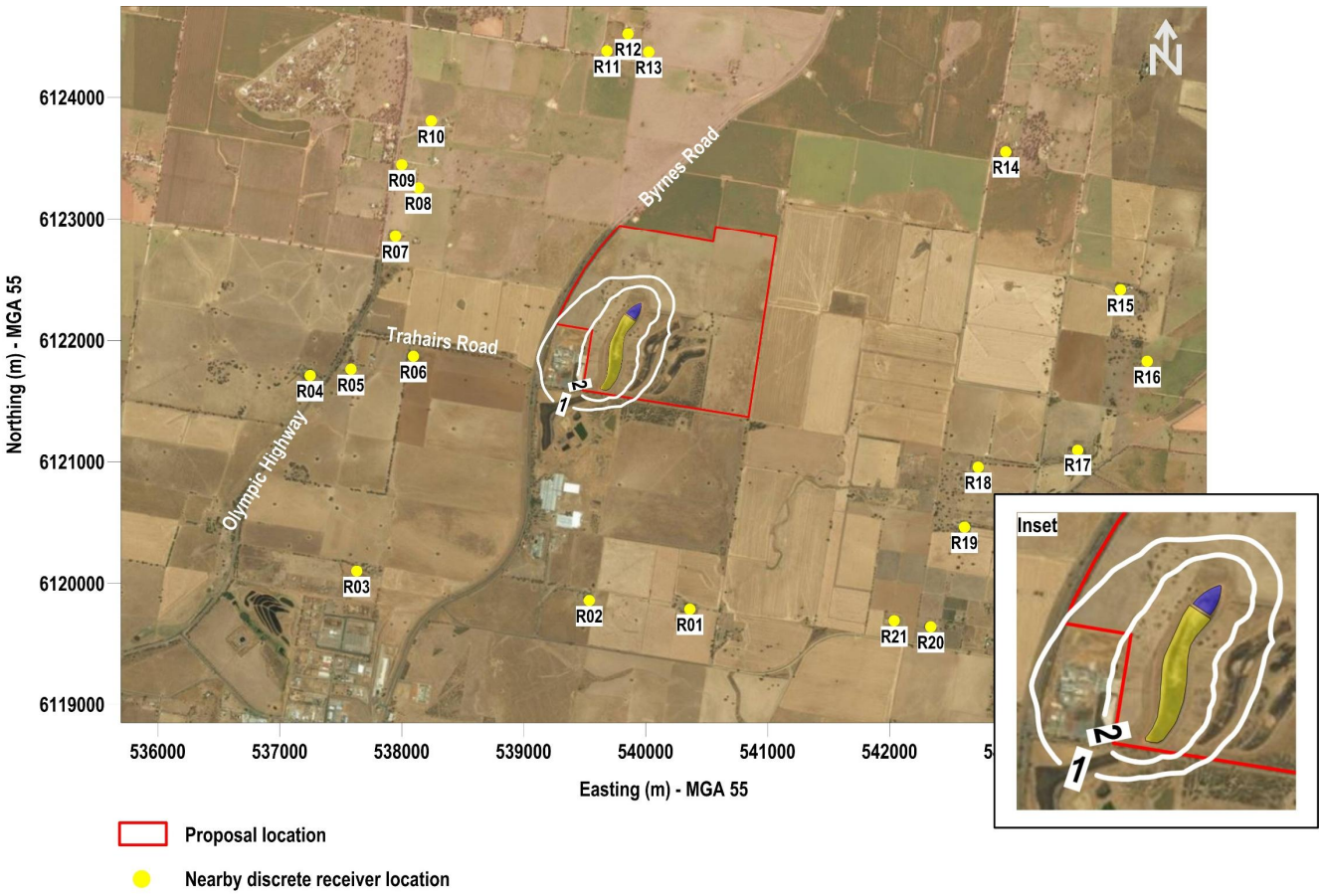


Figure 6-4 Predicted 1-hour peak-to-mean corrected 99th percentile ground level odour concentration results - Scenario 4 (closure)

As displayed, predictions from modelling indicate that odours arising from the proposed facility are not likely to exceed the 99th percentile one-hour peak-to-mean corrected criterion of 2 OU at any of the nearby sensitive receiver locations identified. As such it has been determined that facility is unlikely to cause adverse odour impacts.

7. Monitoring and management

The emissions considered in this assessment are based on the assumption that the 'minimum standards' for management of odour issues associated with the active tipping face, leachate system, daily and intermediate covering, and final capping layer would be applied as detailed in *Environmental Guidelines Solid waste landfills Second Edition,* (EPA, 2016). These requirement, as well as other relevant management and monitoring requirements have been reproduced below.

Table 7-1 Recommended monitoring and management measures (EPA, 2016)

Potential issue	Mitigation or management measures
Potential odours during operations	· Apply daily and intermediate cover to waste each day before the close of business. The daily cover material should be virgin excavated natural material in the form of soil. A minimum cover depth of 150 mm is required. · Any waste-filled areas that have not been landfilled for more than 90 days should have an intermediate soil cover meeting the following requirements: - The cover layer should be a minimum 300 mm layer of virgin excavated natural material in the form of a fine-grained, largely cohesive soil. - Soil should have a saturated hydraulic conductivity of less than 1 x 10-5 m/s. · Keep the active tipping face as small as practicable. · Attend to the delivery of highly biodegradable and odorous wastes. The occupier should require such wastes to be delivered in a covered, enclosed or treated form and should ensure that they are immediately buried with adequate cover. · Control odour from leachate sources by: - Using tight fittings on leachate risers and pipework. - Reducing leachate seeps into the landfill. · Modify activities appropriately when the wind is blowing towards sensitive receptors.
Handling odour complaints	· Develop an odour complaints system. At a minimum, the following details of a complaint should be recorded: - Date and time. - Contact details of complainant. - Nature of the complaint, including odour characteristics, perceived duration and frequency, and perceived source or conditions giving rise to the complaint. - Activities happening at the site at the time of the complaint. - Weather conditions (i.e. wind, rainfall and temperature) at the time of the complaint. - Names of staff on-duty - Actions taken to investigate and resolve the complaint, including any remedial control measures to reduce odour emissions. Where several odour complaints are over time, investigations should include measurement of surface emission rates by using the methods described in the *Approved Methods for Sampling and Analysis of Air Pollutants in NSW,* (DEC, 2005). This data should be compared with the emission factors used in the initial impact assessment modelling and with any published emission rates for the type and location of the landfill. · In addition to these reactive measures, the occupier should implement a program of regular field odour surveys around the site boundary. These surveys should be undertaken during worst-case weather conditions. Personnel conducting field odour surveys should be trained and calibrated for odour assessment in accordance with the requirements for olfactory testing in *Australian Standard AS 4323.3:2001 Stationary Source Emissions – Determination of odour concentrations by dynamic*

Potential issue	Mitigation or management measures
	olfactometry, (Standards, Australia, 2001). · To assist with the management of odour complaints and to inform future expansions at the site, meteorological equipment should be sited and operated in accordance with the requirements in *Australian Standard AS 3580.14-2001 Methods for Sampling and Analysis of Ambient Air – Part 14: Meteorological monitoring for ambient air quality monitoring applications,* (Standards Australia, 2001).

8. Conclusion

An assessment was completed to evaluate potential impacts arising from operational activities at the new solid waste disposal facility proposed at Lots 223 and 299 Trahairs Road in Bomen, NSW. This assessment was undertaken to meet the relevant requirements for assessment listed in the SEARs, as well as relevant guidance from applicable statutes and policies. Using this guidance, a 99th percentile one-hour peak-to-mean corrected (i.e. nose-response-time average) GCL impact assessment criterion of 2 OU was conservatively adopted.

The assessment was undertaken using the AUSPLUME dispersion model. Meteorological conditions at the site were approximated using data available from the nearby BoM AWS at Wagga Wagga Airport. Odour emission rates from different stages of filling and capping of the site, as well as the leachate pond were estimated using data collected from a literature review of measurements collected at similar facilities. Emissions were developed for three different assessment scenarios; early, mid-term and final operations.

Modelling predicted that the resulting ground level odour concentrations were well below the adopted 2 OU assessment criterion at nearby receiver locations for all of the four assessment scenarios considered. It was therefore concluded the proposed facility would not cause any adverse odour impacts. In-line with guidance presented in *Environmental Guidelines Solid waste landfills Second Edition,* (EPA, 2016), measures for monitoring and controlling odour emissions arising from the site during operations were recommended.

9. References

- *Secretary's Environmental Assessment Requirements* (SEARs) (No. 1062 issued July 2016).
- *Approved Methods for the Modelling and Assessment of Air Pollutants in NSW* (Approved Methods), (EPA, 2016).
- *Approved Methods for Sampling and Analysis of Air Pollutants in NSW,* (DEC, 2005).
- *Technical Framework – Assessment and Management of Odour from Stationary Sources in NSW,* (DEC, 2006).
- *Environmental Guidelines Solid waste landfills Second Edition,* (EPA, 2016).
- NSW Department of Planning and Environment Planning Portal available at https://www.planningportal.nsw.gov.au/find-a-property/property/
- *Melbourne regional Landfill Air Quality Assessment*, (Pacific Environment Limited [PEL], 2016)
- *Wetherill Park Resource Recovery Facility Upgrade – Odour Assessment*, (PEL, 2016)
- *Woodlawn Bioreactor Expansion Project: Independent Odour Audit #4*, (The Odour Unit, 2015)
- *Woodlawn Bioreactor Expansion Project: Independent Odour Audit #3*, (The Odour Unit, 2014)
- *Energy from waste facility – Odour Assessment*, (PEL, 2015)
- *Mugga Stage 5 Air quality Impact Assessment*, (AECOM, 2012)
- *Hanson Landfill and Quarry Risk Assessment*, (Golder Associates, 2012)
- *Air Quality Assessment – Odour and Dust: Proposed Modification to the Northern Extension Landfill at Eastern Creek*, (PAE Holmes, 2010)
- *Orange resource Recovery and Waste Management Project – Environmental Assessment*, (GHD, 2009)

APPENDIX L ABORIGINAL HERITAGE DUE DILIGENCE REPORT

Aboriginal Heritage Due Diligence Assessment

NORTHRIDGE MATERIALS FACILITY DD

AUGUST 2017

ngh environmental

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ACRONYMS AND ABBREVIATIONS

AHIMS	Aboriginal heritage information management system
AHIP	Aboriginal Heritage Impact Permit
Km	kilometres
LALC	Local Aboriginal Land Council
M	Metres
NPW Act	*National Parks And Wildlife Act 1974* (NSW)
NSW	New South Wales
OEH	(NSW) Office of Environment and Heritage, formerly Department of Environment, Climate Change and Water
PAD	Potential Archaeological Deposit

EXECUTIVE SUMMARY

NGH Environmental was commissioned by Riverina Warehousing Solutions to undertake a Due Diligence assessment for Aboriginal heritage sites for the proposed construction of the Northridge Materials Facility at 223 and 299 Trahairs Road, Bomen. The proposal area is described as Lot 11 DP 1130519 and Lot 2 DP 590756, 223 and 299 Trahairs Road. It is about 200 hectares in area and is approximately 9.5km north east of central Wagga Wagga.

BACKGROUND ASSESSMENT

No AHIMS sites have been currently recorded within the proposed Northridge Materials Facility assessment area. There are however, 120 sites and 5 Aboriginal Places recorded in the wider region. The northern section of the assessment area has previously been identified as having moderate archaeological sensitivity by Kelleher Nightingale (2008) and this area should be investigated to confirm this desktop assessment. Due to the significant disturbance associated with the evaporation ponds the eastern part of the assessment area is expected to have negligible archaeological potential.

FIELD ASSESSMENT

The field inspection of the assessment area identified no Aboriginal cultural material despite good visibility. This investigation revised the Kelleher Nightingale (2008) assessment of the upper ridgeline to an archaeological sensitivity of low to moderate as the landform within the assessment area is unlikely to have any focused or repeatedly occupied areas of human occupation. Therefore, archaeological material, while present, would likely present as a low density background scatter across the landscape. The remainder of the assessment area is designated as having low archaeological potential due to the extensive disturbance of the evaporation ponds.

IMPACT ASSESSMENT CONCLUSION

The upper ridge line crest is assessed as having low to moderate archaeological potential, the lower ridge line and mid-slope areas are considered to have low archaeological potential and the area surrounding the evaporation ponds is thought to have negligible archaeological potential. The project in its current form is assessed as having a low likelihood of impacting on Aboriginal heritage objects.

RECOMMENDATIONS

1. Any activity proposed outside of the current assessment area should also be subject to an Aboriginal heritage assessment.
2. All significant ground disturbance and excavation work must be constrained to the existing areas of disturbance associated with the existing evaporation ponds (see Figure 3) and may proceed with caution.
3. The property access point, laydown area and carpark are not expected to impact on Aboriginal cultural material and may proceed with caution.
4. If any ground disturbance is to occur along the upper ridge line crest (see Figure 3) further archaeological investigation in the form of survey and or test pitting would be required.
5. If any items suspected of being Aboriginal in origin are discovered during the work, without a valid AHIP, all work in the immediate vicinity must stop and OEH notified. The

find will need to be assessed and if found to be an Aboriginal object an AHIP may be required.

6. Riverina Warehousing Solutions are reminded that it is an offence under the *NSW National Parks and Wildlife Act 1974* to disturb, damage or destroy and Aboriginal object without a valid Aboriginal Heritage Impact Permit.

1 INTRODUCTION

NGH Environmental was commissioned by Riverina Warehousing Solutions to undertake a Due Diligence assessment for Aboriginal heritage sites for the proposed construction of the Northridge Materials Facility at 223 and 299 Trahairs Road, Bomen. The proposal area is described as Lot 11 DP 1130519 and Lot 2 DP 590756, 223 and 299 Trahairs Road. It is about 200 hectares in area and is approximately 9.5km north east of central Wagga Wagga.

The site was previously used as a wool scouring effluent disposal facility and evaporation ponds. Currently the site is not in use, though the land adjacent to the site is currently used for cropping and grazing.

The proposal is classified as designated development based on the volume of waste to be disposed. The proposal is classified as integrated development given the requirement for a section 138 approval from Council under the *Roads Act 1993* and an Environmental Protection Licence under the *Protection of the Environment Operations Act 1997.* Given the capital investment value is likely to be less than $5 million, the proposal is not considered to be state significant or regional development.

The Secretary's Environmental Assessment Requirements (SEARs) have been obtained for the proposal.

This assessment forms part of a Review of Environmental Factors prepared by NGH Environmental for the proposed concept alignment.

1.1 PROJECT PARTICIPANTS

The Due Diligence assessment was carried out by qualified archaeologists Matthew Barber and Emily Dillon of NGH Environmental. This included background research, field inspection and the completion of this report.

The due diligence process does not formally require consultation with Aboriginal community groups. No Aboriginal groups were contacted for this due diligence level assessment. The area is within the boundaries of the Wagga Wagga Local Aboriginal Land Council.

This report was sent to the Wagga Wagga LALC on the 16th of August for their information and comment.

1.2 FORMAT OF THIS REPORT

This report has been drafted in keeping with the sequence of steps identified in the NSW Office of Environment and Heritage's *Due Diligence Code of Practice for the Protection of Aboriginal Objects in NSW* (OEH 2010). The Code of Practice provides a five step approach to determine if an activity is likely to cause harm to an Aboriginal object, as defined by the *NSW National Parks and Wildlife Act* (1974). The steps follow a logical sequence of questions, the answer to each question determines the need for the next step in the process.

The progress through the steps in the Code of Practice is aimed at providing an assessment of the potential for an activity to impact either a known Aboriginal object, or whether it is likely that unrecorded Aboriginal objects are present that may be impacted. The result of the process is aimed at providing the proponent with information about the likelihood that their activity will impact an Aboriginal object and whether an Aboriginal Heritage Impact Permit may be required.

Each section below follows the relevant step outlined in the Code of Practice.

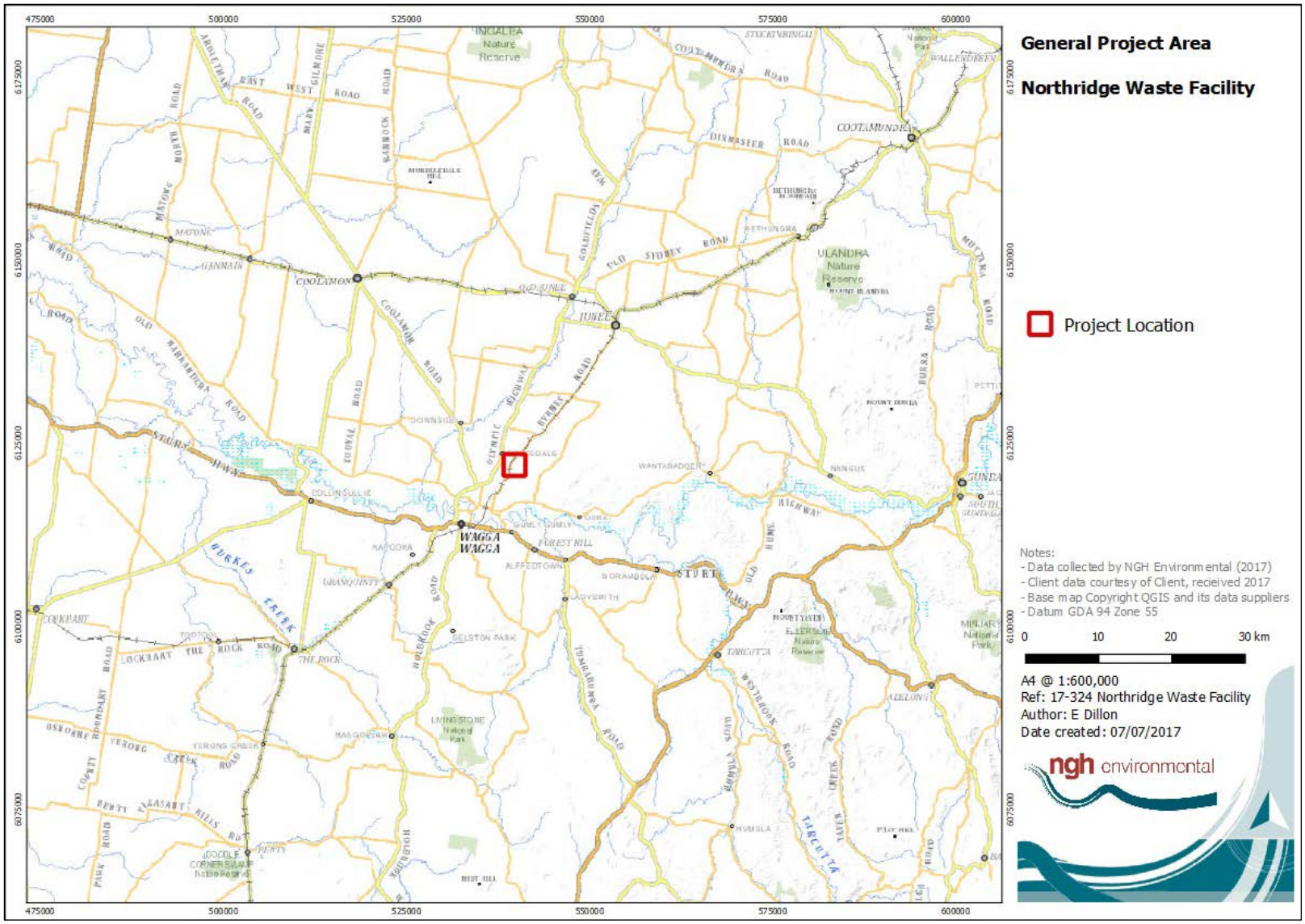

Figure 1 General project location.

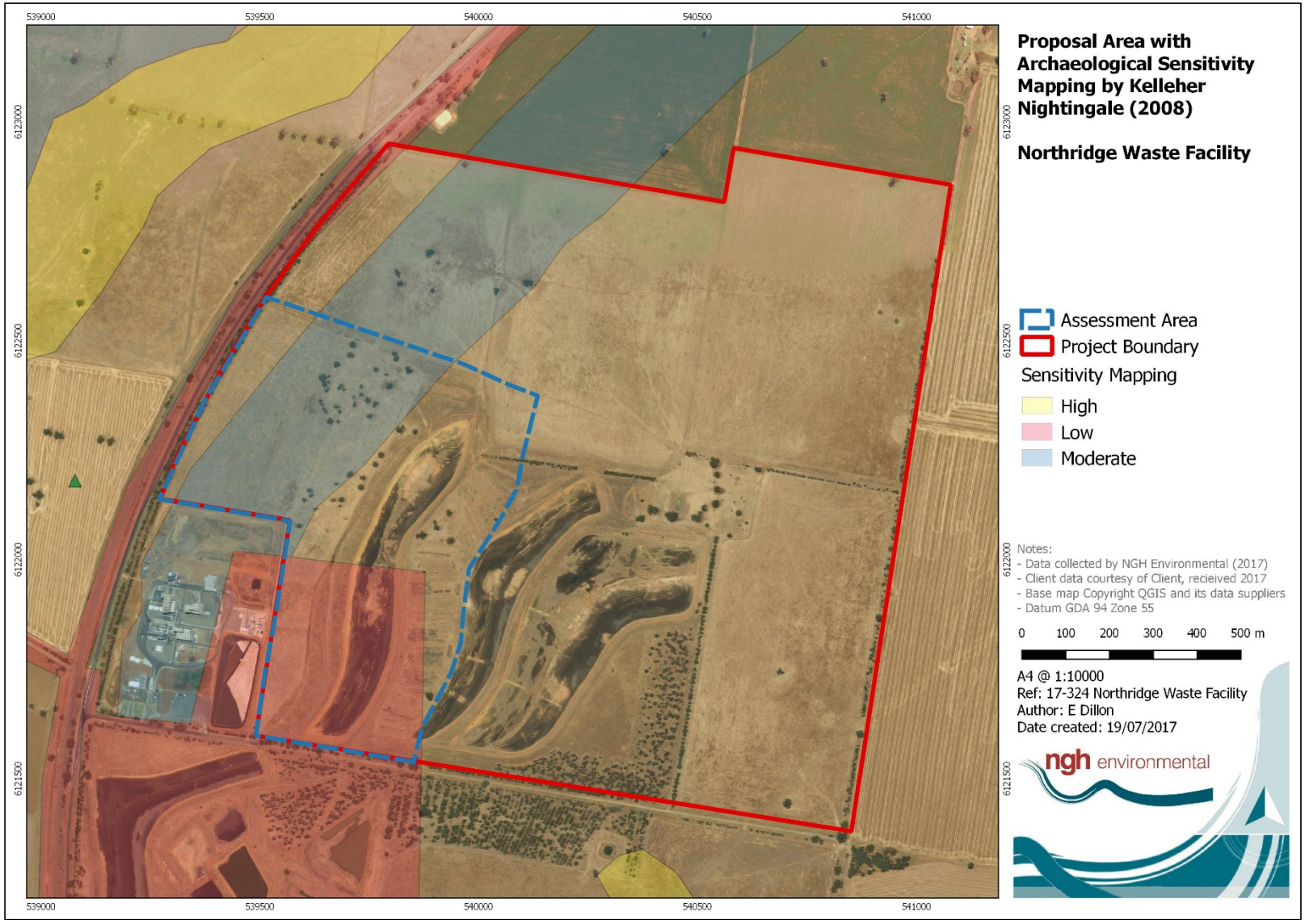

Figure 2 Project boundary and assessment area of this report with Kelleher Nightingale (2008) archaeological sensitivity mapping overlay

2 GROUND DISTURBANCE

Step 1. Will the activity disturb the ground surface or any culturally modified trees?

The proposed work to be undertaken by Riverina Warehousing Solutions involves using the upper existing effluent disposal pond for disposal of non-putrescible solid waste. The construction of the facility would involve:

- Transportable office placed on site for construction.
- Construction of internal access roads.
- Reshaping of existing upslope earthen drain to prevent overland stormwater flows reaching the waste cells.
- The creation of a series of discreet cells within the existing upper evaporation pond. Lining the waste disposal cells with an impermeable clay liner, HDPE liner and free draining aggregate layer.
- Construction of a piped drainage system to collect and drain leachate from the waste cells.
- Construction of a lined leachate storage and evaporation pond.
- Possible weighbridge installation in the future. Initially a weighbridge located at ROBE would be used.
- Placement of a transportable office and amenities block for operation.

These activities, limited to within the project area, require significant ground disturbance, the use of heavy machinery and laydown areas. Any Aboriginal sites within the disturbance footprint would therefore be subject to harm.

The affirmation that ground disturbance will occur requires the next step in the due diligence process.

3 REGISTER SEARCH AND LANDSCAPE ASSESSMENT

Step 2a. Search the AHIMS Database and other information sources

A search of relevant heritage registers for Aboriginal sites and places provides an indication of the presence of previously recorded sites. A register search is not conclusive however, as it requires that an area has been inspected and any sites are provided to the relevant body to add to the register. However, as a starting point, the search will indicate whether any sites are known within or adjacent to the investigation area. The Aboriginal Heritage Information Management System (AHIMS) is maintained by OEH and provides a database of previously recorded Aboriginal heritage sites. A search provides basic information about any sites previously identified within a search area. The results of the search are able to be relied upon for 12 months for the purposes of a due diligence level assessment.

A search of the AHIMS database of an area approximately 30kms east-west by 30kms north-south, centred on the proposed Northridge Materials Facility was undertaken on 3rd of July 2017. The coordinates for the search area were from Lat, Long -35.1352, 147.3049 to Lat, Long -34.9773, 147.5553 with a buffer of 50 meters. The AHIMS Client Service Number was: 289335. There were 120 Aboriginal sites recorded within this search area with five declared Aboriginal Places. Table 1 shows the breakdown of site types, Table 2 is a list of known aboriginal places and Figure 3 shows the location of the AHIMS sites and Aboriginal places in relation to the project area.

Table 1 Breakdown of previously recorded Aboriginal sites in the region.

Site Type	Number
Modified Tree	74
Artefact	41
Stone Quarry and Artefact	2
Modified Tree and Artefact	1
Artefact and Shell	1
Stone Quarry	1
TOTAL	**120**

Table 2 List of known Aboriginal Places in the region.

Aboriginal Place	ID Number
Bomen Axe Quarry	77
Wiradjuri Reserve & Gobba Beach	85
Bomen Lagoon	99
Wollundry Lagoon & Tony Ireland Reserve	103
Flowerdale Lagoon	105

No currently recorded archaeological sites are present within or directly adjacent to the Northridge Materials Facility proposal area however, several sites occur within close proximity of the project area. AHIMS #56-1-0457 is an isolated artefact located approximately 700m north west of the proposal area and AHIMS# 56-1-0459, a modified tree is located 1.3km to the south west. In addition to this, 1.5km to the south east of the project area there are two recorded sites, AHIMS # 56-1-0437 an isolated find and AHIMS # 56-1-0109 an artefact and stone quarry site.

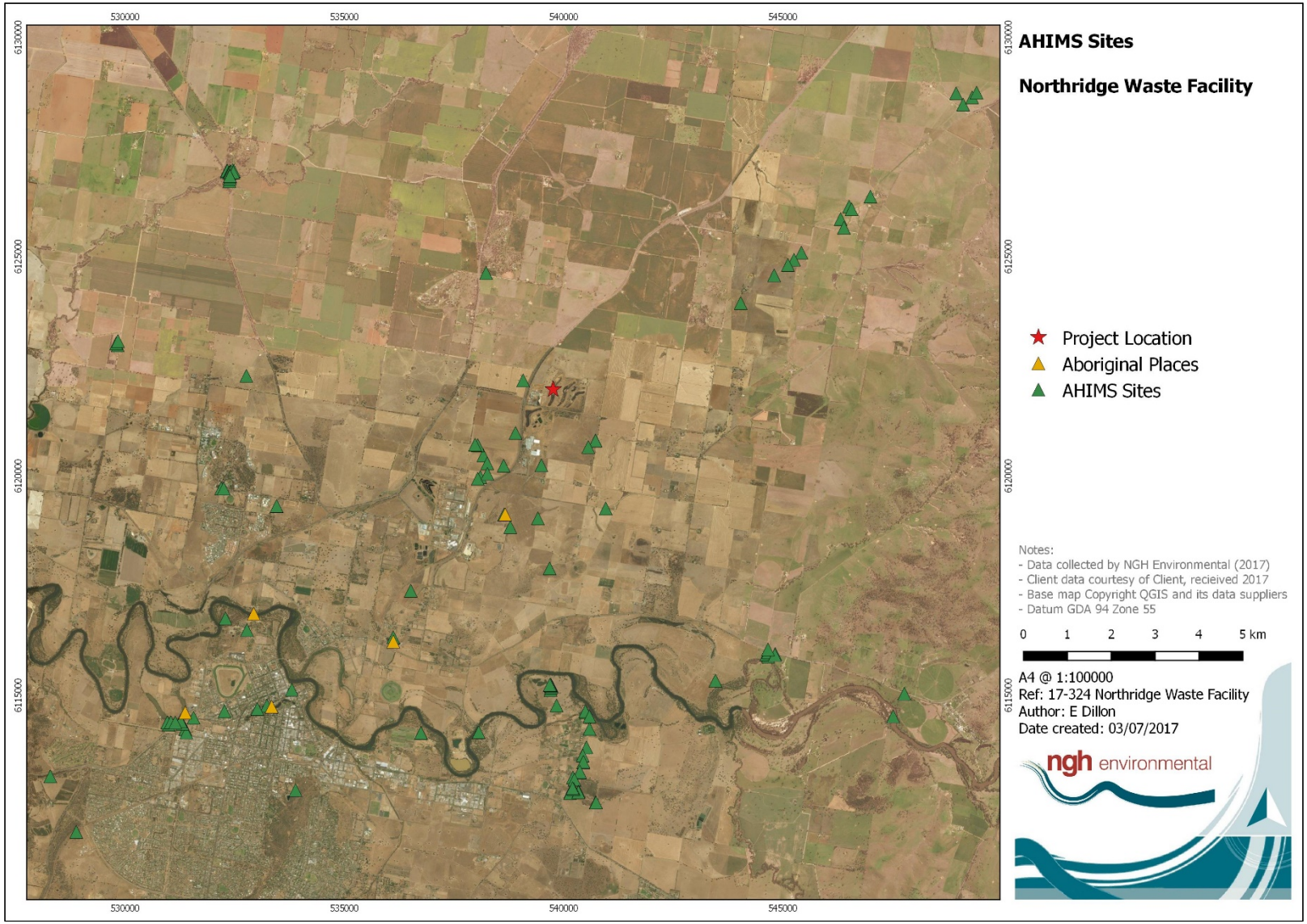

Figure 3 AHIMS sites and Aboriginal Places near the project area

3.1 LOCAL ARCHAEOLOGICAL STUDIES

Aboriginal people have occupied what we now know as the Australian continent for at least 40,000 years and perhaps 60,000 years and beyond. There have been no known dated excavations in the Wagga Wagga area, although the archaeological evidence from Lake Mungo, approximately 400 km to the north-west provides ample evidence of Aboriginal occupation dating back 40,00 years (Bowler et al. 2003; Hiscock 2007; Mulvaney & Kamminga 1999). No regional synthesis of the archaeology has been completed for the Bomen or Wagga Wagga area. The following are summaries of those archaeological survey reports that have been completed in the Bomen and Wagga Wagga areas primarily driven by development and infrastructure requirements.

Witter carried out a survey for a gas pipeline between Wagga Wagga and Young in 1980. He recorded 14 artefact scatters, 21 isolated finds, a possible rock well and a modified tree. Most of the sites identified by Witter occurred in association with creeks or water courses within a range of landforms including flats, slopes and spurs. Witter recommended the excavation of some of these sites if they were unable to be avoided. One of these sites, artefact scatter BY/4, was salvaged by Kelly later that same year collecting 319 surface artefacts and excavating an additional 48 artefacts (Kelleher Nightingale Consulting 2008, p.4).

A number of transmission line surveys where undertaken in 1983 including Witter and Hughes who surveyed Stage 1 of the Murrumburrah to Yass and Murrumburrah to Wagga Wagga transmission lines during which they identified four artefact scatters, 13 isolated artefacts and a possible modified tree. The artefact scatters were large open camp sites with the dominate lithology quartz. In 1983 Hiscock also identified 13 isolated artefacts and nine modified trees during another transmission line survey from Wagga Wagga to Darlington Point. During the survey of Stage 2 of the Murrumburrah to Yass Transmission line in 1983 Packard and Hughes identified another 11 isolated finds, five artefact scatters and two modified trees (OzArk 2012, pp.16–17).

In 1987 Silcox conducted a series of test excavations using a backhoe on the northern side of the Murrumbidgee River at Gumly Gumly (approximately 10 km east of Wagga Wagga) based on the results of a survey for a water augmentation project. The PAD named GG1 was proposed for test excavation due to its proximity to a reliable water source, its elevated, well-drained flat surface suitable for camping and the absence of previous ground disturbance activities. Seventeen test pits at seven locations were excavated and 52 artefacts were recovered. All artefacts were of quartz and were mainly found in the upper 25cm of the deposits. He also identified the presence of a thin layer of mussel shell within one trench. The results indicated to Silcox (1987) that there is a low density scatter of artefacts across the lower Murrumbidgee floodplain.

AASC (1995) conducted a study about 16km east of Wagga for a proposed upgrade of the Sturt Highway. The majority of the survey area had been highly disturbed by activities associated with the previous construction of the highway. Despite good visibility, no sites were located and AASC (1995) concluded this was an accurate reflection of the Aboriginal use of this steep hill slope area with limited water availability in the area.

Central West Archaeological and Heritage Services (2007) notes that Navin Officer Heritage Consultants (NOHC) identified 65 Aboriginal sites while conducting surveys from 1996 to 1998 for the Wodonga-Wagga Wagga Natural Gas Pipe line. This consisted of 39 artefact scatters, 19 isolated artefacts and eight PADS. Based on these survey results it was suggested that artefact scatters are likely to be located in well drained contexts adjacent to water sources.

HLA Envirosciences (1997) undertook an assessment for a proposed expansion of effluent irrigation system for the Bomen Abattoir (HLA-Envirosciences Pty Ltd 1997). They examined the alignment of a proposed pipeline, the location of a proposed holding dam and the proposed irrigated paddocks. They located a single isolated artefact (ISF BOM1), a piece of coarse silcrete that had evidence of grinding on one surface in an upper floodplain area of a paddock that was devoid and any source material.

In 1998 NOHC surveyed an area for a proposed power plant site at Bomen identifying three Aboriginal sites, including the axe manufacturing and quarry site East Bomen 1 (#56-1-0043), also known as the Bomen Axe Quarry, and two isolated finds (Green 2011). The axe quarry itself is situated on the crest of the ridge line that consists of exposures of granite and basalt. The basalt material was utilised for the manufacture of axe blanks, which were most likely carried off-site for final production. There were distinct working areas, with primary flaking areas close to the basalt outcrop and secondary working areas located a little further away (NOHC map in Green 2011). The site has been identified as highly significant to the local Aboriginal community and of high archaeological significance. The area has now been declared an Aboriginal Place under the *National Parks and Wildlife Act* (Green 2011). The Bomen Axe Quarry Aboriginal Place is approximately 2.5 km south west of the proposed Northridge Materials Facility works area and will not be disturbed by the proposed activities.

In 2002 Green compiled a comprehensive study of Wiradjuri heritage for the Wagga Wagga area. The study focused on Wiradjuri and non-indigenous heritage, oral histories, insight into pre-European Wiradjuri culture, a timeline of Wiradjuri history and highlighted potential tourism, education and employment opportunities. Green also identified a number of plant and animal resources in the Wagga Wagga area that the Wiradjuri people past and present utilise. During the study Green identified three scarred trees and an artefact scatter in association with either the Bomen Lagoon or Wollundry Lagoon (Green 2002).

In 2005 Kelton conducted a primarily desktop study and brief field assessment of approximately 600ha within the Henwood property, between Coolamon Road the Olympic Highway and Sutherlands Road, Wagga Wagga (as cited in Central West Archaeological and Heritage Services 2007, p.15). While the survey visibility of the area was poor a number of areas of archaeological sensitivity and PADs were identified. The PADs were primarily located along the western banks and adjacent terraces of Dukes Creek and its surrounding low hillslopes. Hill crests and ridges in the area were also identified as archaeologically sensitive landforms. This is similar to the areas of archaeological sensitivity mapped by Kelleher Nightingale (2008) and NGH Environmental (2015) in the Bomen area.

In 2007 Central West Archaeological and Heritage Services (CWAS) surveyed approximately 40ha for the proposed extension to the Wagga Quarry on Roach Road, Wagga Wagga. The quarry is on an alluvial floodplain on the southern side of the Murrumbidgee River and while noted as an archaeologically sensitive area no sites or PADs were identified. The area was extensively disturbed and CWAS (2007) concluded that the flood prone nature of the survey area would have not been ideal for Aboriginal occupation on a regular basis.

Kelleher Nightingale (2008) conducted an Aboriginal heritage assessment for particular areas around Wagga Wagga as part of the Local Environmental Study (LES). They examined eight areas which included Bomen, and undertook some limited field work to identify Aboriginal heritage values and develop a predictive model of site location and distribution based on landscape features. They concluded that different landscapes had slightly different archaeological sensitivity but in general spur and ridge crests had moderate sensitivity. Lower, mid and upper hillslopes had low to moderate sensitivity and areas of undulating/flat colluvial deposits and drainage lines associated with alluvial/colluvial deposits had moderate to high sensitivity. The main contributing factors to site distribution and complexity were

identified as being related to the availability of raw source materials, the availability of plant and animal resources and the landforms that were associated with these materials and sources.

Kelleher Nightingale (2008) found a single isolated artefact (Bomen IF1), a mudstone flake, in their limited survey of the Bomen area. The artefact was found on a gentle slope of a small rise between a first and second order drainage line. Kelleher and Nightingale also developed a model of archaeological sensitivity for the Bomen district (see Table 2) based on topography and the results of previous surveys. They also produced a map showing areas of archaeological sensitivity which identifies the Northridge Materials Facility as having moderate archaeological sensitivity.

Table 3. Bomen Archaeological sensitivity (Kelleher Nightingale Consulting 2008, p.16)

Landform Type	Archaeological sensitivity	Description
Ridgeline crest	Moderate	Less exposed to prevailing winds, increased sensitivity with proximity to drainage lines/terraces
Granite outcrop along upper slope/crest	High	Increased sensitivity where potential artefact raw material present such as quartz
Upper/Mid hillslope	Low	Less possibility of intact archaeological deposits increased sensitivity with gentler slopes and proximity to open drainage lines/terraces
Lower hillslope	Low to Moderate	Increased sensitivity in association with alluvial/colluvial deposits associated with drainage lines
Undulating/Flat colluvial deposits	Moderate to High	Increased sensitivity in association with proximity to drainage lines/terraces
Drainage line and associated alluvial/colluvial deposits	Moderate to High	Increased sensitivity where gentle slopes or raised ground above regular floods

AECOM Australia (2010) conducted the Aboriginal and historic heritage study for Stage 1 of a 61 km pipeline project from Bethungra to Wagga Wagga. The survey methodology was designed to only target specific portions of landscapes where archaeological evidence was most likely to be found, resulting in 18 transects being surveyed. A total of 36 Aboriginal sites (30 artefact scatters and 6 isolated artefacts) were recorded along the propose pipeline route, including 24 previously unrecorded sites. The majority of sites identified during the survey were associated with, or in close proximity to an ephemeral water source with over two thirds of sites located within 50 m of a water source.

OzArk (2014) carried out a desktop due diligence assessment for a proposed telecommunications tower as part of the National Broadband Network (NBN) in Bomen. While the exact location for the tower was not known at the time OzArk undertook the assessment, the general locality was Lot 22, on the southern side of East Bomen Road, near the access corridor for the Bomen Axe Quarry Aboriginal Place. Their assessment did not include a field component but they assessed the location as having low archaeological potential due to the landform and previous disturbance from agricultural and road construction activities (OzArk 2014).

Umwelt (2014) undertook excavations of the Wagga Wagga Courthouse as part of the courthouse upgrades during which 23 artefacts were recovered from 18 test pits. Following the subsurface testing program, the

location was recorded as site Wiradjuri 1 (W1) and consisted of flakes, broken flakes and flaked pieces all manufactured from quartz. During the consultation process it was noted that the local Aboriginal community associated the location with a burial ground, although no human remains where identified during excavations.

NGH Environmental (2016a) conducted a due diligence assessment for Stage 1 of the proposed Riverina Intermodal Freight and Logistics (RIFL) Hub at Bomen Park identifying three isolated artefacts (# 56-1-0432, # 56-1-0433 and # 56-1-0434) within disturbed contexts. They also identified two PADs and areas of archaeological sensitivity that were recommended for subsurface testing to establish the archaeological potential and extent of sites in the areas. A further survey and subsurface testing program was subsequently undertaken by NGH (2016b).

During the 2016 survey, NGH recorded an additional isolated surface find, a subsurface isolated find, four artefact scatters with subsurface deposits and a scarred tree. The scarred tree was identified as having high cultural significance to the local Aboriginal community. An additional two areas of archaeological sensitivity previously identified by Kelleher and Nightingale (2008) were located and included in the subsurface test excavation program. Of the 73 test pits excavated 14 contained stone artefacts with a total of 28 artefacts recovered. Typical of other assemblages in the area, the artefacts were predominantly quartz and no retouched items were found. Fewer artefacts than expected were located during excavation with only discreet low density artefact scatters and isolated finds recovered. NGH suggests that artefacts and site distribution are not restricted to a single or dominate landscape as artefacts were both absent and present across similar landforms tested within the project area.

Additionally, NGH suggested that the predictive modelling undertaken by Kelleher Nightingale (2008) should be revised and ground truthed as several drainage lines that do not hold water, even after considerable rain, were designated as having high to moderate archaeological sensitivity. This level of sensitivity was based on the presence of water but in the current landscape, water was not readily available in these depressions and the testing program indicated a lack of sites (NGH Environmental 2016b, p.36).

NGH Environmental (2016c) investigated an area for the extension of Brunslea Park estate, 9.5 km south-east of Wagga Wagga. Nineteen stone artefacts, a single piece of mussel shell, pieces of burnt clay and eight lithic fragments were recovered from 40 test pits with an additional 17 surface artefacts recorded across the area. The majority of the subsurface artefacts were recovered from spit 2 (5-15cm) below the surface. Flakes or portions of flakes were the dominate artefact typology for both the surface and subsurface finds with only a single core recovered. Quartz was the common lithology with the exception being a lithic fragment of a volcanic material. A single surface find flake was also recorded as having retouch but it was not assigned a formal tool type, though it was noted to be similar in shape to a tula adze. Following the subsurface testing program the location was recorded as sites Brunslea Park AS7 and Brunslea Park AS8, characterised by low density artefact scatters on low gradient slopes and along the crest of a broad ridgeline. The average density was 1.9 artefacts/m^2 with a peak of 28/m^2 in one test pit. The sites were deemed to have low scientific value however it was considered likely that the development area as a whole was likely to contain Aboriginal heritage objects and an AHIP was recommended for the entire proposed development area. The excavation results in this area supported Kelleher Nightingale (2008) predictive model of areas of archaeological sensitivity in the Wagga Wagga area and that archaeological sensitivity in the area will increase in areas with a gentle slope or raised above regular flood levels.

NGH Environmental (2016d) conducted a due diligence assessment for the Bomen Solar Energy development north of Wagga Wagga identifying a single site, Bomen Solar ISO1, consisting of two quartz flakes. The site was located in an agricultural field approximately 90m from a water source in an area identified by Kelleher and Nightingale (2008) as having high archaeological sensitivity. The area of

archaeological sensitivity within the proposed works area was recommended for subsurface testing to establish the archaeological potential and extent of sites in the area.

Step 2b. Are there undisturbed landscape features likely to contain Aboriginal objects?

The Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales outlines a range of landscape features that have higher potential to contain Aboriginal objects. It is also necessary to consider whether there are landscape features of undisturbed land that may contain Aboriginal objects. These include land that is:

- within 200m of water,
- located within a sand dune system,
- located on a ridge top, ridge line or headland,
- located within 200m below or above a cliff face, or
- within 20m of a cave, rock shelter or cave mouth.

As outlined above, Aboriginal heritage sites have been recorded in the district, although not within the current assessment area. The sensitivity mapping of local landforms would indicate that there is some archaeological potential for Aboriginal artefacts, possibly isolated finds or small artefact scatters to occur. Sensitivity mapping of the southern section of the proposal area suggests low potential for archaeological material due to disturbance. The landscapes within this area have been heavily disturbed by agricultural practices and the historic effluent disposal and evaporation ponds. The construction and use of these ponds has caused extensive and significant ground disturbance and modification. This area therefore does not require any further assessment for Aboriginal sites. The remainder of the site however, includes an area of moderate archaeological sensitivity as identified by Kelleher Nightingale (2008) (see Figure 2). Despite disturbance by historic land use practices there is some potential for archaeological material to be present. The nature of works being undertaken at the site particularly the grading for access tracks and movement of topsoil means that it is important that these areas are investigated further.

The desktop and landscape assessment indicates that there are landscapes present within the project area that have the potential to contain Aboriginal sites. The next step in the OEH due diligence process is therefore required.

4 IMPACT AVOIDANCE

Step 3. Can any AHIMS listed objects, or landscape features be avoided?

The most extensive work being proposed for this project is the construction of discrete cells within the existing evaporation ponds. These features are constrained by the location of the existing evaporation ponds and cannot be moved. These ponds are however, extensively disturbed and are unlikely to contain any cultural material. There is some flexibility however, in the placement of access tracks, buildings etc and consequently a visual inspection to establish the archaeological potential of the landscape is required. The desktop assessment alone is not sufficient to conclusively appraise the archaeological potential of the landscape or the location of any sites, the next step in the process, a visual inspection, must be conducted to properly appraise the presence and potential for Aboriginal sites to occur.

5 DESKTOP ASSESSMENT AND VISUAL INSPECTION

Step 4. Does the desktop assessment and visual inspection confirm that there are likely to be Aboriginal objects present or below the ground surface?

The assessment process is primarily a desktop exercise, using available information such as the AHIMS search results and relevant archaeological reports that have been previously completed in the area. Visual inspection is also required where undisturbed landscape features are present that may contain sites.

A visual inspection of the project area was undertaken on the 5th of July 2017. The inspection was carried out by qualified archaeologists, Matthew Barber and Emily Dillon. The following provides a summary of the landscape and project area in relation to the archaeological potential for Aboriginal objects to occur.

A total distance of approximately 6km was walked as part of the visual survey of the proposed Northridge Materials Facility. The survey area is characterised by a large existing evaporation pond running north to south through the project area; a low ridgeline that runs parallel with the evaporation ponds and an upper ridge line that extends along the western property boundary, identified by Kelleher Nightingale (2008) as having moderate archaeological sensitivity (see Figure 2). The majority of the remaining property in the north east is characterised by a relatively low gradient mid-slope (See Figure 3)

The current access point to the property is located in the south west corner of the project area adjacent to the private Riverine Oils and Bioenergy facility (ROBE). The proposed access point will remain on the southern property boundary adjacent to Trahairs Road. This boundary had some remnant vegetation including trees that were inspected for any Aboriginal scarring or modification. No trees were identified as being of sufficient age for such features to be present. A vehicle track running parallel with this property boundary was also inspected however, no archaeological material was identified (see Plate 1).

The first transect section was walked south to north along a gently sloping lower slope rising gradually to the west which was approximately 600m long and 150m wide, running parallel with the evaporation ponds (see Figure 3). This area has been ploughed and cropped and consisted of a reddy brown clayey soil with large >10cm inclusions of volcanic rocks. Visibility was high throughout this area (>30%) however, no archaeological material was identified (see Plate 1).

This section was considered to have low archaeological potential. Despite there being theoretical archaeological potential along this section of the lower ridgeline, there is no discernible area where evidence of human occupation would be concentrated through repetitive or prolonged occupation such as level ground. It is consequently unlikely that any archaeological material would be found in sufficient densities to warrant test pitting and the surface visibility was sufficient to be confident there were no surface artefacts present.

The second survey section encompasses the western most area of the property to the north of the ROBE facility. This section is an undulating upper ridgeline crest that runs north south through the project area and had been identified by Kelleher and Nightingale as having moderate archaeological sensitivity (see Figure 2 and Figure 3). The area has been ploughed and cropped and visibility ranges from ~60% in limited exposed areas to ~30% for the normally ploughed areas (See Plate 5 and 6).

The pedestrian survey of this area confirmed that there is potential for archaeological material to be present however, like the lower ridge it is believed that this would only be a background scatter of artefacts and no areas are expected to be focuses of occupation.

Recent test pitting of the Bomen area by NGH (2016b) has confirmed that similar areas have very low potential for identifying archaeological material. Therefore, while acknowledging that the area is of

theoretical archaeological potential it is unlikely that the proposed works will impact upon any archaeological material as there are no plans to utilise this crest area as part of the development.

The third survey area consisted of the mid slope section which had been ploughed and cropped with a visibility between 40 and 60% (see Plate 7 and 8). Most of the remnant paddock trees occurred in this section however, most were identified to be too young to have Aboriginal scarring or modification. A small number of older trees were assessed however, no modification was identified on any trees within this area.

Survey area four followed the edge of the first evaporation pond and the land directly adjacent (see Plate 9). The area had low visibility (<10%) as no ploughing had recently occurred. Significant earth works including a contour bank and table drains were visible and significant land disturbance has occurred. The area was consequently considered to have negligible archaeological potential.

The fifth survey section followed the edge of the evaporation pond around to the eastern margin along an existing vehicle track (see Plate 10 and 11). Visibility was 100% on the track and <20% otherwise and no archaeological material was identified. This area has been extensively disturbed through earth works and construction associated with the existing evaporation ponds. The remainder of the section along the eastern edge of the pond between ponds 1 and 2 was driven as the area was deemed to be too extensively disturbed to warrant pedestrian survey (see Plate 12). This area is considered to also have negligible archaeological potential.

Sections of the proposal area within the evaporation ponds have been extensively disturbed and have nil archaeological potential (see Figure 3). The relatively undisturbed sections of the proposal area consist of the lower ridge, upper ridge and the associated mid-slope sections. The lower ridge and mid slope sections are considered to have low archaeological potential and the upper ridge is identified as having low to moderate archaeological potential. Due to the subtle and broad extent of these landscape features and a lack of areas where prolonged or regular human occupation would have likely occurred it is unlikely that any of the proposed works for the Northridge Materials Facility will impact upon archaeological material.

Plate 1. View west along track associated with proposed vehicle access point

Plate 2. View south towards property boundary and access point over ploughed upper slope of low ridge

Plate 3. View north over ploughed upper slope of low ridge towards remanent paddock trees.

Plate 4. View west over proposed laydown area

Plate 5. View west over ploughed crest of main ridge

Plate 6. View north along undulating main ridge line

Plate 7. View south over mid-slope towards ROBE facility

Plate 8. View south east from mid-slope towards evaporation pond

Plate 9. View south along drain at edge of evaporation pond

Plate 10. View west over evaporation pond towards ROBE facility

Plate 11. View north west over length of evaporation pond

Plate 12. View north east over second evaporation pond illustrating extensive site disturbance

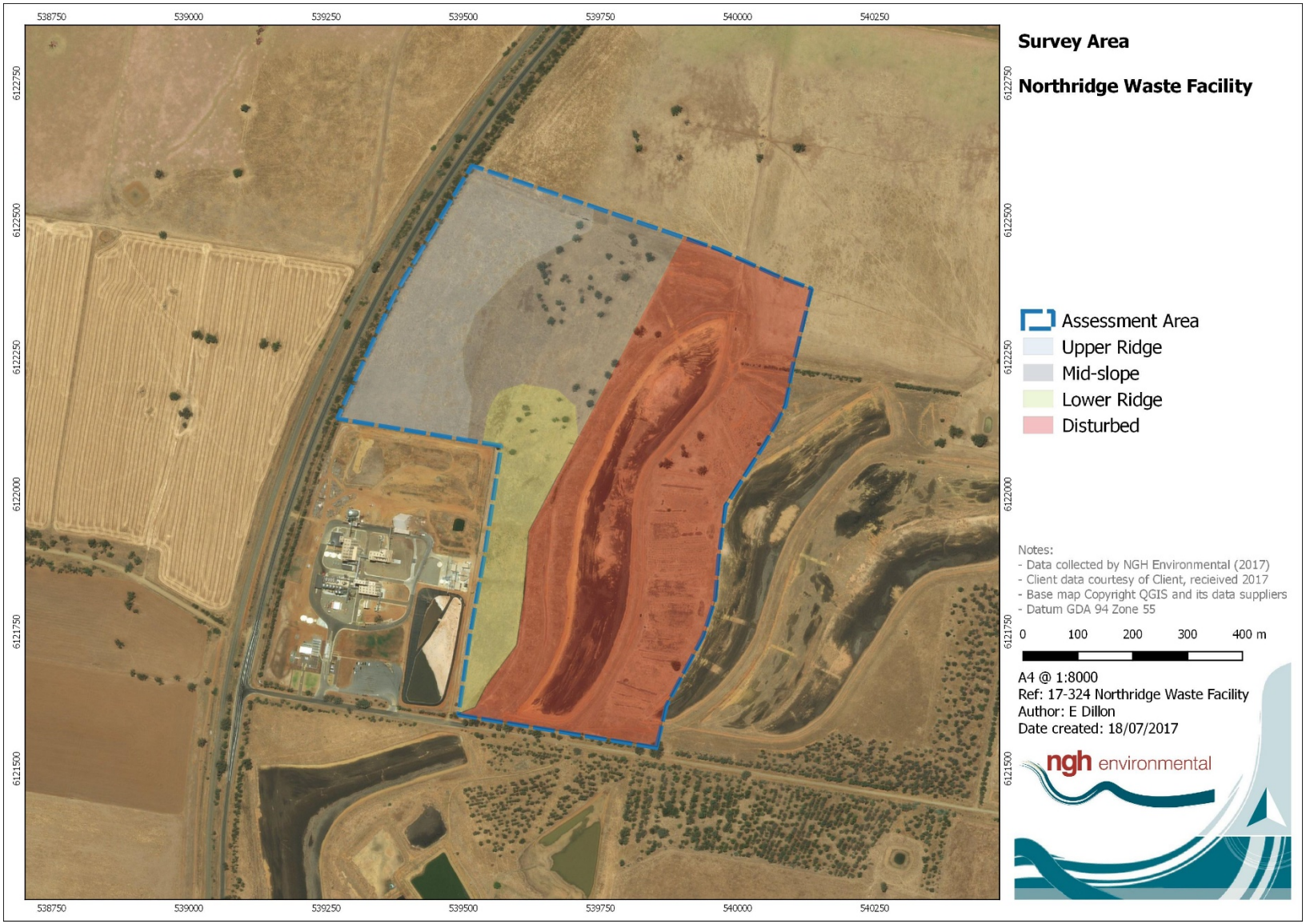

Figure 4 Division of proposal area into landforms

6 FURTHER ASSESSMENT

Step 5. Is further investigation or impact assessment required?

The Due Diligence Code of Practice states that if, after the desktop research and visual inspection is completed, it is evident that harm will occur to Aboriginal objects or heritage places then further and more detailed assessment is required.

The field assessment of this site confirmed the desktop assessment observations that the area has been extensively disturbed as a result of historic land use practices. The previous mapping undertaken by Kelleher Nightingale (2008) suggesting that the upper ridge area has moderate archaeological sensitivity has been revised by NGH and designated as having a low to moderate archaeological potential. Due to the limited works footprint and the very extensive nature of the identified landform with archaeological potential it is unlikely that any Aboriginal cultural sites will be directly impacted by the works. The main area of archaeological potential is the ridge crest. Any proposed development on the crest would warrant further assessment in the form of subsurface testing.

If however, archaeological material is identified during construction, works must cease and an AHIP will be required.

7 RECOMMENDATIONS

The following recommendations are based on the results of this Due Diligence assessment. The proposed work for the Northridge Materials Facility may proceed with caution, provided the following recommendations are followed.

1. Any activity proposed outside of the current assessment area should also be subject to an Aboriginal heritage assessment.
2. All significant ground disturbance and excavation work must be constrained to the existing areas of disturbance associated with the existing evaporation ponds (see Figure 3) and may proceed with caution.
3. The property access point, laydown area and carpark are not expected to impact on Aboriginal cultural material and may proceed with caution.
4. If any ground disturbance is to occur along the upper ridge line crest (see Figure 3) further archaeological investigation in the form of survey and or test pitting would be required.
5. If any items suspected of being Aboriginal in origin are discovered during the work, without a valid AHIP, all work in the immediate vicinity must stop and OEH notified. The find will need to be assessed and if found to be an Aboriginal object an AHIP may be required.
6. Riverina Warehousing Solutions are reminded that it is an offence under the *NSW National Parks and Wildlife Act 1974* to disturb, damage or destroy and Aboriginal object without a valid Aboriginal Heritage Impact Permit.

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APPENDIX M GEOTECHNICAL REPORT

Test Pit 6
Test Pit 5
Test Pit 4
Test Pit 3
Test Pit 2
Test Pit 1
N
Gate
Trahairs Rd

McMahon EARTH SCIENCE

Job No:	4125	Sheet:	1 of 6
Hole No:	TP01	Date:	21.02.2017
Drilled by:	JP	Conditions:	Fine, Sunny
Logged by:	AR	Position: (MGA94 GDA z 55)	539669 E
Drill Method:	AS1289.1.2.1 cl. 6.5.4		6121686 N
Location:	Trahairs Rd, Woolcombing - Western Pond		

Depth (RL) metres	Sample No.	Description	USCS	Moisture Condition	Consistency	Test (DCP/SPT)	Remarks
0.00		Yellow Silt	ML	D	0		
0.25		Black Lanolin oil residue	*	*	*		Cannot be classified by USCS classification system
0.50		Grey Light to Medium CLAY	CL	T	1		Grey colour due to contamination of clay with lanolin oil residue
0.75							
1.00		Greyish Brown Fine sandy CLAY with trace coarse sands and accretions of Mn and/or Fe, moderately mottled with red and grey	CL	M	4		
1.25							
1.50							
1.75	4125/1.1	Yellowish Brown Fine Sandy CLAY with some coarse sands and accretiond of Mn and/or Fe, mottling continued	CL	M	4		
2.00							
2.25							
2.50							
2.75	4125/1.2	Reddish Yellow Fine Sandy CLAY, accretions and mottling as above	CL	M	5		End of Pit @ 3.0m.
3.00							

General comments: *Oily Sheen present on all excavated material to excavated depth.

McMahon EARTH SCIENCE			Job No:	4125	Sheet:	2 of 6	
			Hole No:	TP02	Date:	21.02.2017	
			Drilled by:	JP	Conditions:	Fine, Sunny	
			Logged by:	AR	Position: (MGA94 GDA z 55)	539698 E	
			Drill Method:	AS1289.1.2.1 cl. 6.5.4		6121778 N	
			Location:	Trahairs Rd, Woolcombing - Western Pond			

Depth (RL) metres	Sample No.	Description	USCS	Moisture Condition	Consistency	Test (DCP/SPT)	Remarks
		Yellow Silt	ML	D	0		
0.25		Black Lanolin oil residue	*	*	*		Cannot be classified by USCS classification system
0.50		Grey Fine Sandy CLAY, moderately mottled with red and yellow	CL	T	3		Grey colour due to contamination of clay with lanolin oil residue
0.75							
1.00							
1.25		Greyish Brown Fine Sandy CLAY with some coarse sand	CL	T	5		
1.50							
1.75							
2.00							
2.25		Greyish Brown Light to Medium CLAY with some coarse sand and mottling of red and black	CL	M	6		
2.50	4125/2.2 (2.4m)						
2.75	4125/2.1 & 4125/2.3 (2.8m)						
3.00		Yellowish Brown Medium CLAY with some coarse sands and mottling of red and black, accretions present as above	CL	M	7		End of Pit at 3.0m. Refusal on rigid Clay

General comments: *Oily Sheen present on all excavated material to excavated depth.

Job No:	4125	Sheet:	3 of 6		
Hole No:	TP03	Date:	21.02.2017		
Drilled by:	JP	Conditions:	Fine, Sunny		
Logged by:	AR	Position: (MGA94 GDA z 55)	539707 E		
Drill Method:	AS1289.1.2.1 cl. 6.5.4		6121875 N		
Location:	Trahairs Rd, Woolcombing - Western Pond				

Depth (RL) metres	Sample No.	Description	USCS	Moisture Condition	Consistency	Test (DCP/SPT)	Remarks
0.25		Yellow Silt	ML	D	0		
0.50		Black Lanolin oil residue	*	*	*		Cannot be classified by USCS classification system
0.75		Grey Fine Sandy CLAY	CL	T	3		Grey colour due to contamination of clay with lanolin oil residue
1.00		Red Coarse Sandy CLAY	SC	T	3		
1.25							
1.50	4125/3.1 & 4125/3.3	Yellowish Red Coarse Sands with saprolite present throughout, dominated by highly decomposed Granites. Biotite mica present	SP	T	4		
1.75							
2.00							
2.25	4125/3.2						
2.50							
2.75		End of Pit @ 2.5m Refusal on Rigid Clay					
3.00							

General comments: *Oily Sheen present on all excavated material to excavated depth.

McMahon EARTH SCIENCE	Job No:	4125	Sheet:	4 of 6		
	Hole No:	TP04	Date:	21.02.2017		
	Drilled by:	JP	Conditions:	Fine, Sunny		
	Logged by:	AR	Position: (MGA94 GDA z 55)	539717 E		
	Drill Method:	AS1289.1.2.1 cl. 6.5.4		6121975 N		
	Location:	Trahairs Rd, Woolcombing - Western Pond				

Depth (RL) metres	Sample No.	Description	USCS	Moisture Condition	Consistency	Test (DCP/SPT)	Remarks
0.25		Reddish Yellow Silt	ML	D	0		
0.50		Reddish Brown Light to Medium CLAY	CL	T	3		
0.75		Reddish Yellow Medium CLAY	CL	T	4		
1.00		Greyish Brown Medium CLAY, mottled with red and black	CL	T	5		
1.25	4125/4.1 & 4125/4.2(1.2m)						
1.50		Brownish Yellow Light to Medium CLAY, heavy mottling and black staining from Mn or Fe, large (>5mm) concretions of Fe and/or Mn present	CL	T	7		
1.75							
2.00	4125/4.3 (2.0m)						
2.25		End of Pit @ 2.0m. Refusal on Rigid Clay.					
2.50							
2.75							
3.00							

General comments: *Oily Sheen present on all excavated material to excavated depth.

McMahon EARTH SCIENCE

Job No:	4125	Sheet:	5 of 6
Hole No:	TP05	Date:	21.02.2017
Drilled by:	JP	Conditions:	Fine, Sunny
Logged by:	AR	Position: (MGA94 GDA z 55)	539756 E
Drill Method:	AS1289.1.2.1 cl. 6.5.4		6122064 N
Location:	Trahairs Rd, Woolcombing - Western Pond		

Depth (RL) metres	Sample No.	Description	USCS	Moisture Condition	Consistency	Test (DCP/SPT)	Remarks
		Reddish Yellow Silt	ML	D	0		
0.25		Black Lanolin oil residue	*	*	*		Cannot be classified by USCS classification system
0.50		Dark Grey Medium CLAY	CL	T	4		Grey colour due to contamination of clay with lanolin oil residue
0.75							
1.00	4125/5.3 (1.0m)						
1.25		Brownish Yellow Medium CLAY with moderate mottling of red and black and accretions of Mn and/or Fe	CL	T	5		
1.50							
1.75	4125/5.1 & 4125/5.4 (2.0m)						
2.00							
2.25							
2.50	4125/5.5						
2.75							
3.00	4125/5.2						End of Pit @ 3.1m. Refusal on Rigid Clay.

General comments: *Oily Sheen present on all excavated material to excavated depth.

McMahon EARTH SCIENCE	Job No:	4125	Sheet:	6 of 6		
	Hole No:	TP06	Date:	21.02.2017		
	Drilled by:	JP	Conditions:	Fine, Sunny		
	Logged by:	AR	Position: (MGA94 GDA z 55)	539798 E		
	Drill Method:	AS1289.1.2.1 cl. 6.5.4		6122155 N		
	Location:	Trahairs Rd, Woolcombing - Western Pond				

Depth (RL) metres	Sample No.	Description	USCS	Moisture Condition	Consistency	Test (DCP/SPT)	Remarks
0.00		Yellow Silt	ML	D	0		
0.25		Reddish Yellow Light Clay, (Spongy)	CL	W	1		
0.50	4125/6.2	Grey Light to Medium Clay	CL	T	6		Grey colour due to contamination of clay with lanolin oil residue
0.75							
1.00					6		
1.25	4125/6.1 & 4125/6.3 (1.1m)	Dark Reddish Brown Light Clay	CL	T			
1.50					7		
1.75		End of Pit @ 1.25m Refusal on Rigid Clay					
2.00							
2.25							
2.50							
2.75							
3.00							

General comments: *Oily Sheen present on all excavated material to excavated depth.

Figure 1:Test Pit 1

Figure 2:Test Pit 2.1

Figure 3:Test Pit 2.2

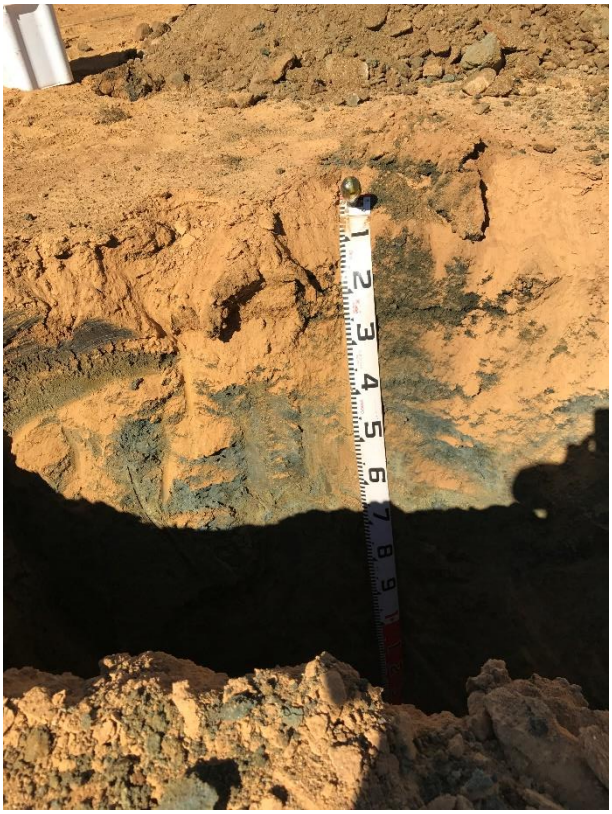

Figure 4:Test Pit 3.1

Figure 5:Test Pit 3.2

Figure 6:Test Pit 4.1

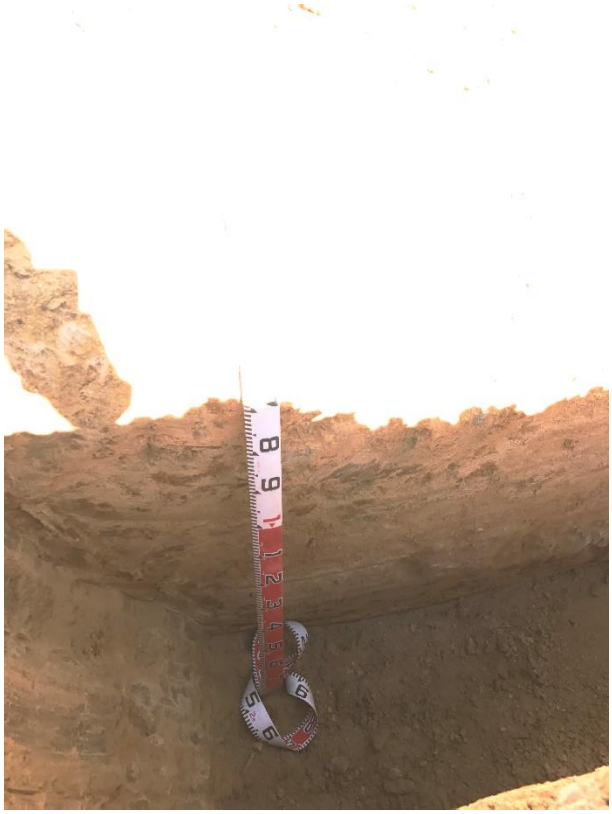

Figure 7:Test Pit 4.2

Figure 8::Test Pit 5.1

Figure 9:Test Pit 5.2

Figure10:Test Pit 6.1

Figure 11:Test Pit 6.2

DM McMahon Pty Ltd
PO Box 6118
WAGGAWAGGA NSW 2650
Ph: 0269 310 510

TEST REPORT
FALLING HEAD PERMEABILITY
AS TEST METHOD AS 1289.6.7.2

CLIENT: Riverina Warehousing Solutions
JOB DESCRIPTION: Woolcombing - Western Pond
LOCATION: Trahairs Rd, Bomen NSW 2650

PAGE: 1
OF: 1
SUBMITTED BY: AR
DATE SUBMITTED: 21/02/17
NO OF SAMPLES: 1
TEST METHODS: AS 1289.6.7.2
RMS T111
RMS T120
JOB NUMBER: 4125

MATERIAL TYPE: Yellowish Brown medium CLAY
SURCHARGES ADDED: 2.65kg (1.0L mould)
PRESSURE APPLIED: 3kPa
NOMINAL SIEVE SIZE: 9.5mm
% RETAINED SIEVE: Nil
COMPACTION METHOD: STANDARD

Sample No.	Maximum Dry Density - MDD (t/m3)	Optimum Moisture - OMC (%)	Dry Density of Specimen (%)	Moisture Moulding (%)	% of OMC	% of MDD	Permeability m/sec
4125/2.1	1.614	21.7	1.676	21.3	98.2	103.8	$2.23x10^{-08}$
*	*	*	*	*	*	*	*
*	*	*	*	*	*	*	*
*	*	*	*	*	*	*	*
*	*	*	*	*	*	*	*
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*	*	*	*	*	*	*	*
*	*	*	*	*	*	*	*

ACCREDITED FOR TECHNICAL COMPETENCE
Number: 3349

Accredited for compliance with ISO/IEC 17025. The results of these tests, calibrations and/or measurement included in this document are traceable to Australian/National Standards. This document shall not be reproduced except in full.

REMARKS:

APPROVED SIGNATORY: DM McMahon

DATE: 13/03/2017

APPENDIX N GROUNDWATER ANALYSIS RESULTS

1806-0104

Charles Sturt University

| | | |

Charles Sturt University

ENVIRONMENTAL AND ANALYTICAL LABORATORIES

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Wagga Wagga NSW 2678

Tel: +61 2 6933 2849
Fax: +61 2 6933 2477
Email: eal@csu.edu.au
www.csu.edu.au/faculty/science/eal

NGH Environmental
Suite 1/39 Fitzmaurice Strret
Wagga Wagga NSW 2650
Attention: Nicole Isles

Tuesday, July 17, 2018

NATA Accredited Laboratory Number: 9597

Accredited for compliance with ISO/IEC 17025 - Testing

LABORATORY ANALYSIS REPORT

Report Number:1806-0104
Page 1 of 2
For all enquiries related to this report please quote document number: 1806-0104

Facility: **Order #**

Sample Type **Collected By** **Date Received**
Water N. Smith 22-June-2018

EAL ID	Client ID. / Date/Time sample taken	Test	Result (units)		Method Reference	Limit of Reporting
18Jun-0514	**P1b220618NS** 22.06.18 11.06am					
		Alkalinity, Total as CaCO3	**378**	mg/L	APHA 2320 B	2
		Arsenic (acid extractable)	**<0.02**	mg/L	APHA 3030 E/3120 B	0.02
		Cadmium (acid extractable)	**<0.002**	mg/L	APHA 3030 E/3120 B	0.002
		Calcium (acid extractable)	**84.5**	mg/L	APHA 3030 E/3120 B	0.03
		Chloride	**234**	mg/L	APHA 4110 B	0.5
		Chromium (acid extractable)	**0.007**	mg/L	APHA 3030 E/3120 B	0.002
		Copper (acid extractable)	**0.046**	mg/L	APHA 3030 E/3120 B	0.002
		Conductivity	**1290**	µS/cm	APHA 2510 B	1
		Total Hardness as CaCO3	**325**	mg/L	APHA 2340 B	2
		Lead (acid extractable)	**0.01**	mg/L	APHA 3030 E/3120 B	0.01
		Magnesium (acid extractable)	**27.7**	mg/L	APHA 3030 E/3120 B	0.02
		Mercury (acid extractable)	**<0.03**	mg/L	* APHA 3030 E/3120 B	0.03
		Nickel (acid extractable)	**<0.01**	mg/L	APHA 3030 E/3120 B	0.01
		Nitrate as N	**6.8**	mg/L	APHA 4110 B	0.1
		pH	**7.5**	pH units	APHA 4500-H+ B	
		Potassium (acid extractable)	**2.5**	mg/L	APHA 3030 E/3120 B	0.2
		Selenium (acid extractable)	**<0.02**	mg/L	APHA 3030 E/3120 B	0.02
		Sodium (acid extractable)	**83.8**	mg/L	APHA 3030 E/3120 B	0.05
		Refer to ALS Report Number:	**18-30270**		Analysis by ALS, Melbourne (acc no. 992)	
		Sulphate	**19.7**	mg/L	APHA 4110 B	0.5
		Total Dissolved Solids	**715**	mg/L	APHA 2540 C	2
		Zinc (acid extractable)	**0.109**	mg/L	APHA 3030 E/3120 B	0.002

ENVIRONMENTAL AND ANALYTICAL LABORATORIES

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Fax: +61 2 6933 2477
Email: eal@csu.edu.au
www.csu.edu.au/faculty/science/eal

NGH Environmental
Suite 1/39 Fitzmaurice Strret
Wagga Wagga NSW 2650
Attention: Nicole Isles

Tuesday, July 17, 2018

NATA Accredited Laboratory Number: 9597

Accredited for compliance with ISO/IEC 17025 - Testing

LABORATORY ANALYSIS REPORT

Report Number:1806-0104
Page 2 of 2
For all enquiries related to this report please quote document number: 1806-0104

Facility:	**Order #**	
Sample Type	**Collected By**	**Date Received**
Water	N. Smith	22-June-2018

EAL ID	Client ID. Date/Time sample taken	Test	Result (units)	Method Reference	Limit of Reporting

Note:

**** NATA Accreditation does not cover the performance of this service.***

Signed ..... David Wade, Laboratory Manager.

All samples analysed as received.
All soil results are reported on a dry basis.
The EAL takes no responsibility for the end use of results within this report.
This report shall not be reproduced except in full.
This report replaces any previously issued report

CERTIFICATE OF ANALYSIS

Batch No:	**18-30270**	*Page*	**Page 1 of 4**
Interim Report	**697458**	*Laboratory*	Scoresby Laboratory
Client:	**Environmental and Analytical Laboratories**	*Address*	Caribbean Business Park, 22 Dalmore Drive, Scoresby, VIC 3179
Contact:	**David Wade**	*Phone*	03 8756 8000
Address:	Charles Sturt University Locked Bag 588 WAGGA WAGGA NSW 2678	*Fax*	03 9763 1862
		Contact:	
PO No:	**P0197464**	Date Sampled:	**28-Jun-2018**
Sampler Name:		Date Samples Received:	**29-Jun-2018**
ALS Program Ref:	**EAL**	*Date Issued:*	**05-Jul-2018**
Program Description:	**Analysis for EAL**		
Client Ref:	**Analysis**		

The sample(s) referred to in this report were analysed by the following method(s) under NATA Accreditation No. 992. The hash (#) below indicates methods not covered by NATA accreditation in the performance of this service.

Analysis	*Method*	*Laboratory*	*Analysis*		*Method*	*Laboratory*
BTEXN	WP074	Scoresby	OCP		WP068A	Scoresby
OPP	WP130	Scoresby	TRH F2	#	WP071	Scoresby
TRH & TPH (>C10)	WP071	Scoresby	TRH (C6-C10) & F1		WP071 (F1 not NATA)	Scoresby
VFA / VOA	WP045B	Scoresby	TOC		EP003	ALS Brisbane

Signatories

These results have been electronically signed by the authorised signatories indicated below. Electronic signing has been carried out in compliance with procedures specified in 21 CFR Part 11

Name	*Title*	*Name*	*Title*
Chatura Perera	**Team Leader Nutrients**	**Hao Zhang**	**Team Leader Organics**
Kosta Christopoulos	**Deputy Team Leader Organics**	**Kosta Christopoulos**	**Chemist/Analyst**

Accreditation No. 992
Accredited for compliance with ISO/IEC 17025 - Testing

Samples not collected by ALS and are tested as received.

Soil results expressed in mg/kg dry weight unless specified otherwise. Soil microbiological testing was commenced within 48 hours from the day received unless otherwise stated. Water microbiological testing was commenced on the day received and within 24 hours of sampling unless otherwise stated.

MM524: Plate count results <10 per mL and >300 per mL are deemed as approximate.

MM526: Plate count results <2,500 per mL and >250,000 per mL are deemed as approximate.

Calculated results are based on raw data.

Legionella species refers to Legionella species other than Legionella pneumophila

Measurement Uncertainties values for your compliance results are available at this link

Sample No	Site Code	Site Description	Sample Type	Sampled Date/Time
5714076		18Jun-0452	S-SLUDGE	28/06/18
5714077		18Jun-0453	S-SLUDGE	28/06/18
5714078		18Jun-0454	S-SLUDGE	28/06/18
5714079		18Jun-0455	S-SLUDGE	28/06/18

Analysis - Analyte	*Sample No. Site Code Units*	5714076	5714077	5714078	5714079
TOC - Total Organic Carbon, as C	mg/kg	Pending	Pending	Pending	Pending

Sample No	Site Code	Site Description	Sample Type	Sampled Date/Time
5714080		18Jun-0456	S-SLUDGE	28/06/18
5714081		18Jun-0457	S-SLUDGE	28/06/18
5714082		18Jun-0458	S-SLUDGE	28/06/18
5714083		18Jun-0459	S-SLUDGE	28/06/18

Analysis - Analyte	*Sample No. Site Code Units*	5714080	5714081	5714082	5714083
TOC - Total Organic Carbon, as C	mg/kg	Pending	Pending	Pending	Pending

Sample No	Site Code	Site Description	Sample Type	Sampled Date/Time
5714084		18Jun-0460	S-SLUDGE	28/06/18
5714085		18Jun-0461	S-SLUDGE	28/06/18
5714086		18Jun-0428	WATER	28/06/18
5714087		18Jun-0429	WATER	28/06/18

Analysis - Analyte	*Sample No. Site Code Units*	5714084	5714085	5714086	5714087
VFA / VOA - Volatile Fatty Acids / Volatile Organic Acids	mg/L			44	35
TOC - Total Organic Carbon, as C	mg/kg	Pending	Pending		

Batch No: **18-30270**
Report Number: **697458**
Client: **Environmental and Analytical Laboratories**
ALS Program Ref: **EAL**
Program Description: **Analysis for EAL**

Sample No	Site Code	Site Description	Sample Type	Sampled Date/Time
5714088		18Jun-0562	WATER	28/06/18
5714089		18Jun-0563	WATER	28/06/18
5714090		18Jun-0514	WATER	28/06/18

Analysis - Analyte	*Sample No. Site Code Units*	5714088	5714089	5714090
VFA / VOA - Volatile Fatty Acids / Volatile Organic Acids	mg/L	42	41	
BTEXN - Benzene	mg/L			<0.001
BTEXN - Toluene	mg/L			<0.001
BTEXN - Ethyl Benzene	mg/L			<0.001
BTEXN - Xylene - m & p	mg/L			<0.002
BTEXN - Xylene - o	mg/L			<0.001
BTEXN - Naphthalene	mg/L			<0.001
BTEXN - Total Xylenes	mg/L			<0.002
BTEXN - BTEX (Sum)	mg/L			<0.002
TRH (C6-C10) & F1 - TPH C6-C9	mg/L			<0.1
TRH (C6-C10) & F1 - TRH C6-C10	mg/L			<0.1
TRH (C6-C10) & F1 - TRH C6-C10 minus BTEX	mg/L			<0.1
TRH F2 - TRH>C10-C16 minus Naphthalene	mg/L			<0.1
TRH & TPH (>C10) - TPH C10-C14	mg/L			<0.1
TRH & TPH (>C10) - TPH C15-C28	mg/L			<0.1
TRH & TPH (>C10) - TPH C29-C36	mg/L			<0.1
TRH & TPH (>C10) - TRH>C10-C16	mg/L			<0.1
TRH & TPH (>C10) - TRH>C16-C34	mg/L			<0.1
TRH & TPH (>C10) - TRH>C34-C40	mg/L			<0.1
TRH & TPH (>C10) - Sum of TRH>C10-C40	mg/L			<0.1
OCP - BHC (alpha Isomer)	mg/L			<0.001
OCP - Aldrin	mg/L			<0.001
OCP - BHC (beta Isomer)	mg/L			<0.001
OCP - Chlordane	mg/L			<0.001
OCP - cis-Chlordane	mg/L			<0.001
OCP - trans-Chlordane	mg/L			<0.001
OCP - BHC (delta Isomer)	mg/L			<0.001
OCP - 4,4-DDD	mg/L			<0.001
OCP - 4,4-DDE	mg/L			<0.001
OCP - 4,4-DDT	mg/L			<0.001
OCP - Dieldrin	mg/L			<0.001
OCP - Endosulfan I	mg/L			<0.001
OCP - Endosulfan II	mg/L			<0.001
OCP - Sum of alpha-, beta- and Endosulphan Sulphate	mg/L			<0.001
OCP - Endosulfan Sulfate	mg/L			<0.001
OCP - Endrin Aldehyde	mg/L			<0.001
OCP - Endrin	mg/L			<0.001
OCP - Endrin Ketone	mg/L			<0.001
OCP - Hexachlorobenzene	mg/L			<0.001
OCP - Heptachlor Epoxide	mg/L			<0.001
OCP - Heptachlor	mg/L			<0.001
OCP - Lindane (BHC gamma Isomer)	mg/L			<0.001
OCP - Methoxychlor	mg/L			<0.001
OCP - Oxychlordane	mg/L			<0.001
OCP - Sum of DDD, DDE and DDT	mg/L			<0.001
OCP - Sum of Aldrin and Dieldrin	mg/L			<0.001
OPP - Chlorpyrifos	mg/L			<0.001
OPP - Diazinon	mg/L			<0.001
OPP - Dichlorvos	mg/L			<0.001
OPP - Ethion	mg/L			<0.001

Sample No	Site Code	Site Description	Sample Type	Sampled Date/Time
5714088		18Jun-0562	WATER	28/06/18
5714089		18Jun-0563	WATER	28/06/18
5714090		18Jun-0514	WATER	28/06/18

		5714088	5714089	5714090
OPP - Fenthion	mg/L			<0.001
OPP - Malathion	mg/L			<0.001
OPP - Mevinphos	mg/L			<0.001
OPP - Parathion	mg/L			<0.001
OPP - Ronnel (Fenchlorfos)	mg/L			<0.001
OPP - Stirofos	mg/L			<0.001

A blank space indicates no test performed.

APPENDIX O ENVIRONMENTAL SOIL INVESTIGATION

CHAIN OF CUSTODY - Client

ENVIROLAB GROUP - National phone number 1300 424 344

Sydney Lab - Envirolab Services
12 Ashley St, Chatswood, NSW 2067
Ph: 02 9910 6200 / sydney@envirolab.com.au

Perth Lab - MPL Laboratories
16-18 Hayden Crt Myaree, WA 6154
Ph: 08 9317 2505 / lab@mpl.com.au

Melbourne Lab - Envirolab Services
1A Dalmore Drive Scoresby VIC 3179
Ph: 03 9763 2500 / melbourne@envirolab.com.au

Adelaide Office - Envirolab Services
7a The Parade, Norwood, SA 5067
Ph: 08 7087 6800 / adelaide@envirolab.com.au

Brisbane Office - Envirolab Services
20a, 10-20 Depot St, Banyo, QLD 4014
Ph: 07 3266 9532 / brisbane@envirolab.com.au

Darwin Office - Envirolab Services
Unit 7, 17 Willes Rd, Berrimah, NT 0820
Ph: 08 8967 1201 / darwin@envirolab.com.au

Client: NGH ENVIRONMENTAL	**Client Project Name / Number / Site etc (ie report title):** 16-276 NORTH RIDGE MATERIALS FACILITY
Contact Person: NICOLA SMITH	
Project Mgr: MICHIAL SUTHERLAND	**PO No.:**
Sampler: M SUTHERLAND / N SMITH	**Envirolab Quote No. :**
Address: SUITE 1, 39 FITZMAURICE STREET WAGGA WAGGA NSW 2650	**Date results required:** Or choose: standard / same day / 1 day / 2 day / 3 day *Note: Inform lab in advance if urgent turnaround is required - surcharges apply*
Phone: 02 6923 1537 **Mob:**	**Additional report format:** esdat / equis /
Email: NICOLA.S@NGHENVIRONMENTAL.COM.AU	**Lab Comments:**

Sample information					Tests Required	Comments
Envirolab Sample ID	Client Sample ID or information	Depth	Date sampled	Type of sample	COMBINATION 6	Provide as much information about the sample as you can
1	Soil 1 - north	0-0.15	19-09-18	Soil		Effluent Pond
2	Soil 2 - north	0.3-0.4	19-09-18	Soil		Effluent Pond
3	Soil 3 - centre north	0-0.15	19-09-18	Soil		Effluent Pond
4	Soil 7 - centre south	0-0.15	19-09-18	Soil		Effluent Pond
5	Soil 8 - surface sediment	surface	19-09-18	Sediment		Effluent Pond
6	Soil 9 - south	0-0.15	19-09-18	Soil		Effluent Pond
7	Soil 10 - south	0.3-0.4	19-09-18	Soil		Effluent Pond
8	Soil 11 - windrow	0-0.10	19-09-18	Soil		Windrow

ENVIROLAB GROUP
Envirolab Services
12 Ashley St
Chatswood NSW 2067
Ph: (02) 9910 6200

Job No: 291217
Date Received: 20/9/18
Time Received: 13:00
Received By: KG
Temp: Cool/Ambient
Cooling: Ice/Icepack
Security: Intact/Broken/None

Relinquished by (Company): NGH Environmental	**Received by (Company):** ELS	***Lab Use Only***	
Print Name: NICOLA SMITH	**Print Name:** Kate Gore	**Job number:**	**Cooling: Ice / Ice pack / None**
Date & Time: 19/09/18 5.50 pm.	**Date & Time:** 20/9/18 13:00	**Temperature:** 17.6	**Security seal: Intact / Broken / None**
Signature:	**Signature:**	**TAT Req - SAME day / 1 / 2 / 3 / 4 / STD**	

NEPM TRH Fractions (F1 & F2), Naphthalene reporting and Benzo(a)Pyrene TEQ

Envirolab has made the move to standardise on the reporting of the draft NEPM fractions as described below. The likely release in 2013 of the 'Schedule B (1) – Guideline on Investigation Levels for Soil and Groundwater' document requires the proposed fractions* to be reported. However, the Envirolab Group will continue to report the historical fractions for purposes of comparison, until further notice.

Therefore the fractions in the tables below will be reported as standard, this includes the F1 and F2 calculated fractions as discussed in Schedule B (1):-

Date extracted	--	21/11/2012 (Water)	--	21/11/2012 (Soil)
Date analysed	--	21/11/2012 (Water)	--	21/11/2012 (Soil)
$TRHC_6$-C_9	µg/L	<10	mg/kg	<25
$TRHC_6$-C_{10}*	µg/L	<10	mg/kg	<25
$TRHC_6$-C_{10} less BTEX (F1)*	µg/L	<10	mg/kg	<25
Surrogate Dibromofluoromethane	%	100	%	100
Surrogate toluene-d8	%	100	%	100
Surrogate 4-BFB	%	100	%	100

Date extracted	--	21/11/2012 (Water)	--	21/11/2012 (Soil)
Date analysed	--	21/11/2012 (Water)	--	21/11/2012 (Soil)
$TRHC_{10}$ - C_{14}	µg/L	<50	mg/kg	<50
$TRHC_{15}$ - C_{28}	µg/L	<100	mg/kg	<100
$TRHC_{29}$ - C_{36}	µg/L	<100	mg/kg	<100
Surrogate o-Terphenyl	%	100	%	100
$TRH{>}C_{10}$ - C_{16}*	µg/L	<50	mg/kg	<50
$TRH{>}C_{10}$ - C_{16} less Naphthalene (F2)*	µg/L	<50	mg/kg	<50
$TRH{>}C_{16}$ - C_{34}*	µg/L	<100	mg/kg	<100
$TRH{>}C_{34}$ - C_{40}*	µg/L	<100	mg/kg	<100

*NEPM draft fractions

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-Waste

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-Surface
-Drinking
-Trade Waste
-Saline

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-Workplace
-Emissions
-Ambient
-Soil gas
-Dust / DPM

Asbestos
-Building
-Soil
-Brake pads

SPOCAS
-Acid Sulphate Soil
-AMD

Sydney	Perth	Melbourne	Adelaide	Brisbane
Envirolab Services	**MPL Laboratories**	**Envirolab Services**	Envirolab Services	Envirolab Services
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Chatswood NSW 2067	Myaree WA 6154	Scoresby VIC 3179	Windsor Gardens SA 5087	Banyo QLD 4014
T 02 9910 6200	**T** 08 9317 2505	**T** 03 9763 2500	**T** 0406 350 706	**T** 07 3266 9532
F 02 9910 6299	**F** 08 9317 4163	**F** 03 9763 2633	**F** 08 8369 0722	**F** 07 3256 9411
sydney@envirolab.com.au	lab@mpl.com.au	melbourne@envirolab.com.au	adelaide@envirolab.com.au	brisbane@envirolab.com.au

The Naphthalene value used for the F2 determination is taken from the VOC analysis due to availability (determined with BTEX/vTRH using Purge and Trap GC-MS techniques), hence Naphthalene will be reported with the BTEX data at no extra cost (assuming vTRH and/or BTEX is already requested).

Variability between VOC and SVOC Naphthalene data

There is the potential for discrepancy in the Naphthalene results for a particular sample where the result from a VOC analysis (typically Purge and Trap – GC-MS) differs from a result from a SVOC analysis (direct injection – GC-MS). While both results are valid, there are several parameters that may cause poor precision between the VOC and SVOC results. These are detailed below:-

i. Extraction efficiency for soils – VOC extraction with methanol vs SVOC DCM-Acetone extraction can cause discrepancy in the Naphthalene results.

ii. Preservation for water samples – VOC containers are typically preserved, whereas SVOC containers may not be, discrepancy in the Naphthalene results may occur.

iii. Non-homogeneity with soils and water aliquots from bottle to vial may cause discrepancy in the Naphthalene results.

iv. VOC is typically a Purge & Trap system connected to GC-MS, SVOC is a liquid injection directly onto a GC-MS, these are two distinct methods of delivery to the GC-MS which can cause a degree of variability in the Naphthalene results.

Benzo(a)Pyrene TEQ

The draft 'Schedule B (1) – Guideline on Investigation Levels for Soil and Groundwater' document also includes HILs for Benzo(a)pyrene as Toxic Equivalents (TEQ) i.e. the comparison of 8 carcinogenic PAHs relative to Benzo(a)pyrene. Therefore Envirolab will include this calculated value in all reports where PAHs are analysed.

FOR FURTHER INFORMATION AND TECHNICAL ASSISTANCE CONTACT YOUR LOCAL LABORATORY OR OFFICE ON

1300 42 43 44 or www.envirolab.com.au OR www.mpl.com.au

Issued:- 7th December 2012

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SPOCAS
-Acid Sulphate Soil
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F 02 9910 6299	**F** 08 9317 4163	**F** 03 9763 2633	**F** 08 8369 0722	**F** 07 3256 9411
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CERTIFICATE OF ANALYSIS 201217

Client Details

Client	NGH Environmental
Attention	Nicola Smith
Address	Suite 1, 39 Fitzmaurice street, Wagga Wagga, NSW, 2650

Sample Details

Your Reference	**16-276 North Ridge Materials Facility**
Number of Samples	7 Soil, 1 Sediment
Date samples received	20/09/2018
Date completed instructions received	20/09/2018

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Please refer to the last page of this report for any comments relating to the results.

Report Details

Date results requested by	27/09/2018
Date of Issue	27/09/2018

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Results Approved By
Jeremy Faircloth, Organics Supervisor
Long Pham, Team Leader, Metals
Nancy Zhang, Assistant Lab Manager
Steven Luong, Senior Chemist

Authorised By

Jacinta Hurst, Laboratory Manager

vTRH(C6-C10)/BTEXN in Soil						
Our Reference		201217-1	201217-2	201217-3	201217-4	201217-5
Your Reference	UNITS	Soil 1 - north	Soil 2 - north	Soil 3 - centre north	Soil 7 - centre north	Soil 8 - surface sediment
Depth		0.0-0.15	0.3-0.4	0.0-0.15	0.0-0.15	surface
Date Sampled		19/09/2018	19/09/2018	19/09/2018	19/09/2018	19/09/2018
Type of sample		Soil	Soil	Soil	Soil	Sediment
Date extracted	-	21/09/2018	21/09/2018	21/09/2018	21/09/2018	21/09/2018
Date analysed	-	24/09/2018	24/09/2018	24/09/2018	24/09/2018	24/09/2018
TRH C_6 - C_9	mg/kg	<25	<25	<25	<25	<25
TRH C_6 - C_{10}	mg/kg	<25	<25	<25	<25	<25
vTPH C_6 - C_{10} less BTEX (F1)	mg/kg	<25	<25	<25	<25	<25
Benzene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1	<1	<1	<1
m+p-xylene	mg/kg	<2	<2	<2	<2	<2
o-Xylene	mg/kg	<1	<1	<1	<1	<1
naphthalene	mg/kg	<1	<1	<1	<1	<1
Total +ve Xylenes	mg/kg	<1	<1	<1	<1	<1
Surrogate aaa-Trifluorotoluene	%	78	92	94	83	80

vTRH(C6-C10)/BTEXN in Soil				
Our Reference		201217-6	201217-7	201217-8
Your Reference	UNITS	Soil 9 - south	Soil 10 - south	Soil 11 - windrow
Depth		0.0-0.15	0.3-0.4	0.0-0.1
Date Sampled		19/09/2018	19/09/2018	19/09/2018
Type of sample		Soil	Soil	Soil
Date extracted	-	21/09/2018	21/09/2018	21/09/2018
Date analysed	-	24/09/2018	24/09/2018	24/09/2018
TRH C_6 - C_9	mg/kg	<25	<25	<25
TRH C_6 - C_{10}	mg/kg	<25	<25	<25
vTPH C_6 - C_{10} less BTEX (F1)	mg/kg	<25	<25	<25
Benzene	mg/kg	<0.2	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1	<1
m+p-xylene	mg/kg	<2	<2	<2
o-Xylene	mg/kg	<1	<1	<1
naphthalene	mg/kg	<1	<1	<1
Total +ve Xylenes	mg/kg	<1	<1	<1
Surrogate aaa-Trifluorotoluene	%	79	80	102

svTRH (C10-C40) in Soil						
Our Reference		201217-1	201217-2	201217-3	201217-4	201217-5
Your Reference	UNITS	Soil 1 - north	Soil 2 - north	Soil 3 - centre north	Soil 7 - centre north	Soil 8 - surface sediment
Depth		0.0-0.15	0.3-0.4	0.0-0.15	0.0-0.15	surface
Date Sampled		19/09/2018	19/09/2018	19/09/2018	19/09/2018	19/09/2018
Type of sample		Soil	Soil	Soil	Soil	Sediment
Date extracted	-	21/09/2018	21/09/2018	21/09/2018	21/09/2018	21/09/2018
Date analysed	-	22/09/2018	22/09/2018	22/09/2018	22/09/2018	22/09/2018
TRH C_{10} - C_{14}	mg/kg	<50	<50	<50	<50	410
TRH C_{15} - C_{28}	mg/kg	500	<100	1,800	2,400	19,000
TRH C_{29} - C_{36}	mg/kg	1,600	<100	5,500	6,500	62,000
TRH >C_{10} -C_{16}	mg/kg	<50	<50	53	88	600
TRH >C_{10} - C_{16} less Naphthalene (F2)	mg/kg	<50	<50	53	88	600
TRH >C_{16} -C_{34}	mg/kg	1,900	<100	6,400	8,000	69,000
TRH >C_{34} -C_{40}	mg/kg	450	<100	1,700	2,400	20,000
Total +ve TRH (>C10-C40)	mg/kg	2,300	<50	8,200	10,000	90,000
Surrogate o-Terphenyl	%	121	100	#	#	#

svTRH (C10-C40) in Soil				
Our Reference		201217-6	201217-7	201217-8
Your Reference	UNITS	Soil 9 - south	Soil 10 - south	Soil 11 - windrow
Depth		0.0-0.15	0.3-0.4	0.0-0.1
Date Sampled		19/09/2018	19/09/2018	19/09/2018
Type of sample		Soil	Soil	Soil
Date extracted	-	21/09/2018	21/09/2018	21/09/2018
Date analysed	-	22/09/2018	22/09/2018	22/09/2018
TRH C_{10} - C_{14}	mg/kg	170	<50	550
TRH C_{15} - C_{28}	mg/kg	5,800	<100	9,200
TRH C_{29} - C_{36}	mg/kg	18,000	170	23,000
TRH >C_{10} -C_{16}	mg/kg	260	<50	700
TRH >C_{10} - C_{16} less Naphthalene (F2)	mg/kg	260	<50	700
TRH >C_{16} -C_{34}	mg/kg	22,000	190	28,000
TRH >C_{34} -C_{40}	mg/kg	5,300	<100	8,700
Total +ve TRH (>C10-C40)	mg/kg	28,000	190	37,000
Surrogate o-Terphenyl	%	#	114	#

PAHs in Soil						
Our Reference		201217-1	201217-2	201217-3	201217-4	201217-5
Your Reference	UNITS	Soil 1 - north	Soil 2 - north	Soil 3 - centre north	Soil 7 - centre north	Soil 8 - surface sediment
Depth		0.0-0.15	0.3-0.4	0.0-0.15	0.0-0.15	surface
Date Sampled		19/09/2018	19/09/2018	19/09/2018	19/09/2018	19/09/2018
Type of sample		Soil	Soil	Soil	Soil	Sediment
Date extracted	-	21/09/2018	21/09/2018	21/09/2018	21/09/2018	21/09/2018
Date analysed	-	24/09/2018	24/09/2018	24/09/2018	24/09/2018	24/09/2018
Naphthalene	mg/kg	<1	<0.1	<1	<1	<1
Acenaphthylene	mg/kg	<1	<0.1	<1	<1	<1
Acenaphthene	mg/kg	<1	<0.1	<1	<1	<1
Fluorene	mg/kg	<1	<0.1	<1	<1	<1
Phenanthrene	mg/kg	<1	<0.1	<1	<1	<1
Anthracene	mg/kg	<1	<0.1	<1	<1	<1
Fluoranthene	mg/kg	<1	<0.1	<1	<1	<1
Pyrene	mg/kg	<1	<0.1	<1	<1	<1
Benzo(a)anthracene	mg/kg	<1	<0.1	<1	<1	<1
Chrysene	mg/kg	<1	<0.1	<1	<1	<1
Benzo(b,j+k)fluoranthene	mg/kg	<2	<0.2	<2	<2	<2
Benzo(a)pyrene	mg/kg	<0.5	<0.05	<0.5	<0.5	<0.5
Indeno(1,2,3-c,d)pyrene	mg/kg	<1	<0.1	<1	<1	<1
Dibenzo(a,h)anthracene	mg/kg	<1	<0.1	<1	<1	<1
Benzo(g,h,i)perylene	mg/kg	<1	<0.1	<1	<1	<1
Total +ve PAH's	mg/kg	<0.5	<0.05	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<5	<0.5	<5	<5	<5
Benzo(a)pyrene TEQ calc(half)	mg/kg	<5	<0.5	<5	<5	<5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<5	<0.5	<5	<5	<5
Surrogate p-Terphenyl-d14	%	94	92	88	91	92

PAHs in Soil				
Our Reference		201217-6	201217-7	201217-8
Your Reference	UNITS	Soil 9 - south	Soil 10 - south	Soil 11 - windrow
Depth		0.0-0.15	0.3-0.4	0.0-0.1
Date Sampled		19/09/2018	19/09/2018	19/09/2018
Type of sample		Soil	Soil	Soil
Date extracted	-	21/09/2018	21/09/2018	21/09/2018
Date analysed	-	24/09/2018	24/09/2018	24/09/2018
Naphthalene	mg/kg	<1	<1	<1
Acenaphthylene	mg/kg	<1	<1	<1
Acenaphthene	mg/kg	<1	<1	<1
Fluorene	mg/kg	<1	<1	<1
Phenanthrene	mg/kg	<1	<1	<1
Anthracene	mg/kg	<1	<1	<1
Fluoranthene	mg/kg	<1	<1	<1
Pyrene	mg/kg	<1	<1	<1
Benzo(a)anthracene	mg/kg	<1	<1	<1
Chrysene	mg/kg	<1	<1	<1
Benzo(b,j+k)fluoranthene	mg/kg	<2	<2	<2
Benzo(a)pyrene	mg/kg	<0.5	<0.5	<0.5
Indeno(1,2,3-c,d)pyrene	mg/kg	<1	<1	<1
Dibenzo(a,h)anthracene	mg/kg	<1	<1	<1
Benzo(g,h,i)perylene	mg/kg	<1	<1	<1
Total +ve PAH's	mg/kg	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<5	<5	<5
Benzo(a)pyrene TEQ calc(half)	mg/kg	<5	<5	<5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<5	<5	<5
Surrogate p-Terphenyl-d14	%	99	98	96

Organochlorine Pesticides in soil						
Our Reference		201217-1	201217-2	201217-3	201217-4	201217-5
Your Reference	UNITS	Soil 1 - north	Soil 2 - north	Soil 3 - centre north	Soil 7 - centre north	Soil 8 - surface sediment
Depth		0.0-0.15	0.3-0.4	0.0-0.15	0.0-0.15	surface
Date Sampled		19/09/2018	19/09/2018	19/09/2018	19/09/2018	19/09/2018
Type of sample		Soil	Soil	Soil	Soil	Sediment
Date extracted	-	21/09/2018	21/09/2018	21/09/2018	21/09/2018	21/09/2018
Date analysed	-	27/09/2018	27/09/2018	27/09/2018	27/09/2018	27/09/2018
HCB	mg/kg	<0.1	<0.1	<0.1	<0.1	<1
alpha-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<1
gamma-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<1
beta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<1
Heptachlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<1
delta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<1
Aldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<1
Heptachlor Epoxide	mg/kg	<0.1	<0.1	<0.1	<0.1	<1
gamma-Chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1	<1
alpha-chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1	<1
Endosulfan I	mg/kg	<0.1	<0.1	<0.1	<0.1	<1
pp-DDE	mg/kg	<0.1	<0.1	<0.1	<0.1	<1
Dieldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<1
Endrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<1
pp-DDD	mg/kg	<0.1	<0.1	<0.1	<0.1	<1
Endosulfan II	mg/kg	<0.1	<0.1	<0.1	<0.1	<1
pp-DDT	mg/kg	<0.1	<0.1	<0.1	<0.1	<1
Endrin Aldehyde	mg/kg	<0.1	<0.1	<0.1	<0.1	<1
Endosulfan Sulphate	mg/kg	<0.1	<0.1	<0.1	<0.1	<1
Methoxychlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<1
Total +ve DDT+DDD+DDE	mg/kg	<0.1	<0.1	<0.1	<0.1	<1
Surrogate TCMX	%	104	97	97	83	72

Organochlorine Pesticides in soil				
Our Reference		201217-6	201217-7	201217-8
Your Reference	UNITS	Soil 9 - south	Soil 10 - south	Soil 11 - windrow
Depth		0.0-0.15	0.3-0.4	0.0-0.1
Date Sampled		19/09/2018	19/09/2018	19/09/2018
Type of sample		Soil	Soil	Soil
Date extracted	-	21/09/2018	21/09/2018	21/09/2018
Date analysed	-	27/09/2018	27/09/2018	27/09/2018
HCB	mg/kg	<1	<0.1	<1
alpha-BHC	mg/kg	<1	<0.1	<1
gamma-BHC	mg/kg	<1	<0.1	<1
beta-BHC	mg/kg	<1	<0.1	<1
Heptachlor	mg/kg	<1	<0.1	<1
delta-BHC	mg/kg	<1	<0.1	<1
Aldrin	mg/kg	<1	<0.1	<1
Heptachlor Epoxide	mg/kg	<1	<0.1	<1
gamma-Chlordane	mg/kg	<1	<0.1	<1
alpha-chlordane	mg/kg	<1	<0.1	<1
Endosulfan I	mg/kg	<1	<0.1	<1
pp-DDE	mg/kg	<1	<0.1	<1
Dieldrin	mg/kg	<1	<0.1	<1
Endrin	mg/kg	<1	<0.1	<1
pp-DDD	mg/kg	<1	<0.1	<1
Endosulfan II	mg/kg	<1	<0.1	<1
pp-DDT	mg/kg	<1	<0.1	<1
Endrin Aldehyde	mg/kg	<1	<0.1	<1
Endosulfan Sulphate	mg/kg	<1	<0.1	<1
Methoxychlor	mg/kg	<1	<0.1	<1
Total +ve DDT+DDD+DDE	mg/kg	<1	<0.1	<1
Surrogate TCMX	%	85	90	105

Organophosphorus Pesticides						
Our Reference		201217-1	201217-2	201217-3	201217-4	201217-5
Your Reference	UNITS	Soil 1 - north	Soil 2 - north	Soil 3 - centre north	Soil 7 - centre north	Soil 8 - surface sediment
Depth		0.0-0.15	0.3-0.4	0.0-0.15	0.0-0.15	surface
Date Sampled		19/09/2018	19/09/2018	19/09/2018	19/09/2018	19/09/2018
Type of sample		Soil	Soil	Soil	Soil	Sediment
Date extracted	-	21/09/2018	21/09/2018	21/09/2018	21/09/2018	21/09/2018
Date analysed	-	27/09/2018	27/09/2018	27/09/2018	27/09/2018	27/09/2018
Azinphos-methyl (Guthion)	mg/kg	<0.1	<0.1	<0.1	<0.1	<1
Bromophos-ethyl	mg/kg	<0.1	<0.1	<0.1	<0.1	<1
Chlorpyriphos	mg/kg	<0.1	<0.1	<0.1	<0.1	<1
Chlorpyriphos-methyl	mg/kg	<0.1	<0.1	<0.1	<0.1	<1
Diazinon	mg/kg	<0.1	<0.1	<0.1	<0.1	<1
Dichlorvos	mg/kg	<0.1	<0.1	<0.1	<0.1	<1
Dimethoate	mg/kg	<0.1	<0.1	<0.1	<0.1	<1
Ethion	mg/kg	<0.1	<0.1	<0.1	<0.1	<1
Fenitrothion	mg/kg	<0.1	<0.1	<0.1	<0.1	<1
Malathion	mg/kg	<0.1	<0.1	<0.1	<0.1	<1
Parathion	mg/kg	<0.1	<0.1	<0.1	<0.1	<1
Ronnel	mg/kg	<0.1	<0.1	<0.1	<0.1	<1
Surrogate TCMX	%	104	97	97	83	72

Organophosphorus Pesticides				
Our Reference		201217-6	201217-7	201217-8
Your Reference	UNITS	Soil 9 - south	Soil 10 - south	Soil 11 - windrow
Depth		0.0-0.15	0.3-0.4	0.0-0.1
Date Sampled		19/09/2018	19/09/2018	19/09/2018
Type of sample		Soil	Soil	Soil
Date extracted	-	21/09/2018	21/09/2018	21/09/2018
Date analysed	-	27/09/2018	27/09/2018	27/09/2018
Azinphos-methyl (Guthion)	mg/kg	<1	<0.1	<1
Bromophos-ethyl	mg/kg	<1	<0.1	<1
Chlorpyriphos	mg/kg	<1	<0.1	<1
Chlorpyriphos-methyl	mg/kg	<1	<0.1	<1
Diazinon	mg/kg	<1	<0.1	<1
Dichlorvos	mg/kg	<1	<0.1	<1
Dimethoate	mg/kg	<1	<0.1	<1
Ethion	mg/kg	<1	<0.1	<1
Fenitrothion	mg/kg	<1	<0.1	<1
Malathion	mg/kg	<1	<0.1	<1
Parathion	mg/kg	<1	<0.1	<1
Ronnel	mg/kg	<1	<0.1	<1
Surrogate TCMX	%	85	90	105

PCBs in Soil						
Our Reference		201217-1	201217-2	201217-3	201217-4	201217-5
Your Reference	UNITS	Soil 1 - north	Soil 2 - north	Soil 3 - centre north	Soil 7 - centre north	Soil 8 - surface sediment
Depth		0.0-0.15	0.3-0.4	0.0-0.15	0.0-0.15	surface
Date Sampled		19/09/2018	19/09/2018	19/09/2018	19/09/2018	19/09/2018
Type of sample		Soil	Soil	Soil	Soil	Sediment
Date extracted	-	21/09/2018	21/09/2018	21/09/2018	21/09/2018	21/09/2018
Date analysed	-	27/09/2018	27/09/2018	27/09/2018	27/09/2018	27/09/2018
Aroclor 1016	mg/kg	<0.1	<0.1	<0.1	<0.1	<1
Aroclor 1221	mg/kg	<0.1	<0.1	<0.1	<0.1	<1
Aroclor 1232	mg/kg	<0.1	<0.1	<0.1	<0.1	<1
Aroclor 1242	mg/kg	<0.1	<0.1	<0.1	<0.1	<1
Aroclor 1248	mg/kg	<0.1	<0.1	<0.1	<0.1	<1
Aroclor 1254	mg/kg	<0.1	<0.1	<0.1	<0.1	<1
Aroclor 1260	mg/kg	<0.1	<0.1	<0.1	<0.1	<1
Total +ve PCBs (1016-1260)	mg/kg	<0.1	<0.1	<0.1	<0.1	<1
Surrogate TCLMX	%	104	97	97	83	72

PCBs in Soil				
Our Reference		201217-6	201217-7	201217-8
Your Reference	UNITS	Soil 9 - south	Soil 10 - south	Soil 11 - windrow
Depth		0.0-0.15	0.3-0.4	0.0-0.1
Date Sampled		19/09/2018	19/09/2018	19/09/2018
Type of sample		Soil	Soil	Soil
Date extracted	-	21/09/2018	21/09/2018	21/09/2018
Date analysed	-	27/09/2018	27/09/2018	27/09/2018
Aroclor 1016	mg/kg	<1	<0.1	<1
Aroclor 1221	mg/kg	<1	<0.1	<1
Aroclor 1232	mg/kg	<1	<0.1	<1
Aroclor 1242	mg/kg	<1	<0.1	<1
Aroclor 1248	mg/kg	<1	<0.1	<1
Aroclor 1254	mg/kg	<1	<0.1	<1
Aroclor 1260	mg/kg	<1	<0.1	<1
Total +ve PCBs (1016-1260)	mg/kg	<1	<0.1	<1
Surrogate TCLMX	%	85	90	105

Acid Extractable metals in soil						
Our Reference		201217-1	201217-2	201217-3	201217-4	201217-5
Your Reference	UNITS	Soil 1 - north	Soil 2 - north	Soil 3 - centre north	Soil 7 - centre north	Soil 8 - surface sediment
Depth		0.0-0.15	0.3-0.4	0.0-0.15	0.0-0.15	surface
Date Sampled		19/09/2018	19/09/2018	19/09/2018	19/09/2018	19/09/2018
Type of sample		Soil	Soil	Soil	Soil	Sediment
Date prepared	-	21/09/2018	21/09/2018	21/09/2018	21/09/2018	21/09/2018
Date analysed	-	21/09/2018	21/09/2018	21/09/2018	21/09/2018	21/09/2018
Arsenic	mg/kg	<4	<4	<4	<4	<4
Cadmium	mg/kg	<0.4	<0.4	<0.4	<0.4	<0.4
Chromium	mg/kg	37	48	37	38	8
Copper	mg/kg	16	20	17	15	4
Lead	mg/kg	12	11	11	11	3
Mercury	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Nickel	mg/kg	10	13	15	15	4
Zinc	mg/kg	19	22	42	63	49

Acid Extractable metals in soil				
Our Reference		201217-6	201217-7	201217-8
Your Reference	UNITS	Soil 9 - south	Soil 10 - south	Soil 11 - windrow
Depth		0.0-0.15	0.3-0.4	0.0-0.1
Date Sampled		19/09/2018	19/09/2018	19/09/2018
Type of sample		Soil	Soil	Soil
Date prepared	-	21/09/2018	21/09/2018	21/09/2018
Date analysed	-	21/09/2018	21/09/2018	21/09/2018
Arsenic	mg/kg	<4	<4	8
Cadmium	mg/kg	<0.4	<0.4	<0.4
Chromium	mg/kg	37	58	40
Copper	mg/kg	12	18	27
Lead	mg/kg	8	11	13
Mercury	mg/kg	<0.1	<0.1	<0.1
Nickel	mg/kg	10	12	15
Zinc	mg/kg	29	19	220

Moisture						
Our Reference		201217-1	201217-2	201217-3	201217-4	201217-5
Your Reference	UNITS	Soil 1 - north	Soil 2 - north	Soil 3 - centre north	Soil 7 - centre north	Soil 8 - surface sediment
Depth		0.0-0.15	0.3-0.4	0.0-0.15	0.0-0.15	surface
Date Sampled		19/09/2018	19/09/2018	19/09/2018	19/09/2018	19/09/2018
Type of sample		Soil	Soil	Soil	Soil	Sediment
Date prepared	-	21/09/2018	21/09/2018	21/09/2018	21/09/2018	21/09/2018
Date analysed	-	24/09/2018	24/09/2018	24/09/2018	24/09/2018	24/09/2018
Moisture	%	17	15	19	14	7.0

Moisture				
Our Reference		201217-6	201217-7	201217-8
Your Reference	UNITS	Soil 9 - south	Soil 10 - south	Soil 11 - windrow
Depth		0.0-0.15	0.3-0.4	0.0-0.1
Date Sampled		19/09/2018	19/09/2018	19/09/2018
Type of sample		Soil	Soil	Soil
Date prepared	-	21/09/2018	21/09/2018	21/09/2018
Date analysed	-	24/09/2018	24/09/2018	24/09/2018
Moisture	%	19	16	6.5

Method ID	Methodology Summary
Inorg-008	Moisture content determined by heating at 105+/-5 °C for a minimum of 12 hours.
Metals-020	Determination of various metals by ICP-AES.
Metals-021	Determination of Mercury by Cold Vapour AAS.
Org-003	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis.
Org-003	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis. Note, the Total +ve TRH PQL is reflective of the lowest individual PQL and is therefore "Total +ve TRH" is simply a sum of the positive individual TRH fractions (>C10-C40).
Org-005	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC with dual ECD's.
Org-005	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC with dual ECD's. Note, the Total +ve reported DDD+DDE+DDT PQL is reflective of the lowest individual PQL and is therefore simply a sum of the positive individually report DDD+DDE+DDT.
Org-006	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-ECD.
Org-006	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-ECD. Note, the Total +ve PCBs PQL is reflective of the lowest individual PQL and is therefore" Total +ve PCBs" is simply a sum of the positive individual PCBs.
Org-008	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC with dual ECD's.

Method ID	Methodology Summary
Org-012	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS. Benzo(a)pyrene TEQ as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater - 2013. For soil results:- 1. 'EQ PQL'values are assuming all contributing PAHs reported as <PQL are actually at the PQL. This is the most conservative approach and can give false positive TEQs given that PAHs that contribute to the TEQ calculation may not be present. 2. 'EQ zero'values are assuming all contributing PAHs reported as <PQL are zero. This is the least conservative approach and is more susceptible to false negative TEQs when PAHs that contribute to the TEQ calculation are present but below PQL. 3. 'EQ half PQL'values are assuming all contributing PAHs reported as <PQL are half the stipulated PQL. Hence a mid-point between the most and least conservative approaches above. Note, the Total +ve PAHs PQL is reflective of the lowest individual PQL and is therefore "Total +ve PAHs" is simply a sum of the positive individual PAHs.
Org-014	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS.
Org-016	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater.
Org-016	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater. Note, the Total +ve Xylene PQL is reflective of the lowest individual PQL and is therefore "Total +ve Xylenes" is simply a sum of the positive individual Xylenes.

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	201217-2
Date extracted	-			21/09/2018	1	21/09/2018	21/09/2018		21/09/2018	21/09/2018
Date analysed	-			24/09/2018	1	24/09/2018	24/09/2018		24/09/2018	24/09/2018
TRH C_6 - C_9	mg/kg	25	Org-016	<25	1	<25	<25	0	101	85
TRH C_6 - C_{10}	mg/kg	25	Org-016	<25	1	<25	<25	0	101	85
Benzene	mg/kg	0.2	Org-016	<0.2	1	<0.2	<0.2	0	100	90
Toluene	mg/kg	0.5	Org-016	<0.5	1	<0.5	<0.5	0	134	83
Ethylbenzene	mg/kg	1	Org-016	<1	1	<1	<1	0	85	82
m+p-xylene	mg/kg	2	Org-016	<2	1	<2	<2	0	92	84
o-Xylene	mg/kg	1	Org-016	<1	1	<1	<1	0	99	95
naphthalene	mg/kg	1	Org-014	<1	1	<1	<1	0	[NT]	[NT]
Surrogate aaa-Trifluorotoluene	%		Org-016	94	1	78	81	4	100	85

QUALITY CONTROL: svTRH (C10-C40) in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	201217-2
Date extracted	-			21/09/2018	1	21/09/2018	21/09/2018		21/09/2018	21/09/2018
Date analysed	-			22/09/2018	1	22/09/2018	22/09/2018		22/09/2018	22/09/2018
TRH C_{10} - C_{14}	mg/kg	50	Org-003	<50	1	<50	<50	0	112	106
TRH C_{15} - C_{28}	mg/kg	100	Org-003	<100	1	500	1500	100	102	95
TRH C_{29} - C_{36}	mg/kg	100	Org-003	<100	1	1600	4800	100	109	104
TRH >C_{10} -C_{16}	mg/kg	50	Org-003	<50	1	<50	<50	0	112	106
TRH >C_{16} -C_{34}	mg/kg	100	Org-003	<100	1	1900	5500	97	102	95
TRH >C_{34} -C_{40}	mg/kg	100	Org-003	<100	1	450	1400	103	109	104
Surrogate o-Terphenyl	%		Org-003	84	1	121	#		79	100

QUALITY CONTROL: PAHs in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	201217-2
Date extracted	-			21/09/2018	1	21/09/2018	21/09/2018		21/09/2018	21/09/2018
Date analysed	-			24/09/2018	1	24/09/2018	24/09/2018		24/09/2018	24/09/2018
Naphthalene	mg/kg	0.1	Org-012	<0.1	1	<1	<1	0	103	92
Acenaphthylene	mg/kg	0.1	Org-012	<0.1	1	<1	<1	0	[NT]	[NT]
Acenaphthene	mg/kg	0.1	Org-012	<0.1	1	<1	<1	0	[NT]	[NT]
Fluorene	mg/kg	0.1	Org-012	<0.1	1	<1	<1	0	104	87
Phenanthrene	mg/kg	0.1	Org-012	<0.1	1	<1	<1	0	112	105
Anthracene	mg/kg	0.1	Org-012	<0.1	1	<1	<1	0	[NT]	[NT]
Fluoranthene	mg/kg	0.1	Org-012	<0.1	1	<1	<1	0	109	102
Pyrene	mg/kg	0.1	Org-012	<0.1	1	<1	<1	0	100	95
Benzo(a)anthracene	mg/kg	0.1	Org-012	<0.1	1	<1	<1	0	[NT]	[NT]
Chrysene	mg/kg	0.1	Org-012	<0.1	1	<1	<1	0	103	97
Benzo(b,j+k)fluoranthene	mg/kg	0.2	Org-012	<0.2	1	<2	<2	0	[NT]	[NT]
Benzo(a)pyrene	mg/kg	0.05	Org-012	<0.05	1	<0.5	<0.5	0	108	105
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	Org-012	<0.1	1	<1	<1	0	[NT]	[NT]
Dibenzo(a,h)anthracene	mg/kg	0.1	Org-012	<0.1	1	<1	<1	0	[NT]	[NT]
Benzo(g,h,i)perylene	mg/kg	0.1	Org-012	<0.1	1	<1	<1	0	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-012	89	1	94	88	7	89	88

QUALITY CONTROL: Organochlorine Pesticides in soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	201217-2
Date extracted	-			21/09/2018	1	21/09/2018	21/09/2018		21/09/2018	21/09/2018
Date analysed	-			27/09/2018	1	27/09/2018	27/09/2018		27/09/2018	27/09/2018
HCB	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
alpha-BHC	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	81	92
gamma-BHC	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
beta-BHC	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	85	85
Heptachlor	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	90	90
delta-BHC	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Aldrin	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	87	73
Heptachlor Epoxide	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	90	95
gamma-Chlordane	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
alpha-chlordane	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Endosulfan I	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
pp-DDE	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	88	91
Dieldrin	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	96	100
Endrin	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	103	104
pp-DDD	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	91	88
Endosulfan II	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
pp-DDT	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Endrin Aldehyde	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Endosulfan Sulphate	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	87	79
Methoxychlor	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Surrogate TCMX	%		Org-005	122	1	104	93	11	106	112

QUALITY CONTROL: Organophosphorus Pesticides						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	201217-2
Date extracted	-			21/09/2018	1	21/09/2018	21/09/2018		21/09/2018	21/09/2018
Date analysed	-			27/09/2018	1	27/09/2018	27/09/2018		27/09/2018	27/09/2018
Azinphos-methyl (Guthion)	mg/kg	0.1	Org-008	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Bromophos-ethyl	mg/kg	0.1	Org-008	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Chlorpyriphos	mg/kg	0.1	Org-008	<0.1	1	<0.1	<0.1	0	109	91
Chlorpyriphos-methyl	mg/kg	0.1	Org-008	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Diazinon	mg/kg	0.1	Org-008	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Dichlorvos	mg/kg	0.1	Org-008	<0.1	1	<0.1	<0.1	0	105	102
Dimethoate	mg/kg	0.1	Org-008	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Ethion	mg/kg	0.1	Org-008	<0.1	1	<0.1	<0.1	0	128	110
Fenitrothion	mg/kg	0.1	Org-008	<0.1	1	<0.1	<0.1	0	124	106
Malathion	mg/kg	0.1	Org-008	<0.1	1	<0.1	<0.1	0	82	107
Parathion	mg/kg	0.1	Org-008	<0.1	1	<0.1	<0.1	0	107	91
Ronnel	mg/kg	0.1	Org-008	<0.1	1	<0.1	<0.1	0	120	101
Surrogate TCMX	%		Org-008	122	1	104	93	11	113	99

QUALITY CONTROL: PCBs in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	201217-2
Date extracted	-			21/09/2018	1	21/09/2018	21/09/2018		21/09/2018	21/09/2018
Date analysed	-			27/09/2018	1	27/09/2018	27/09/2018		27/09/2018	27/09/2018
Aroclor 1016	mg/kg	0.1	Org-006	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1221	mg/kg	0.1	Org-006	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1232	mg/kg	0.1	Org-006	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1242	mg/kg	0.1	Org-006	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1248	mg/kg	0.1	Org-006	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1254	mg/kg	0.1	Org-006	<0.1	1	<0.1	<0.1	0	108	88
Aroclor 1260	mg/kg	0.1	Org-006	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Surrogate TCLMX	%		Org-006	122	1	104	93	11	113	99

QUALITY CONTROL: Acid Extractable metals in soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	201217-2
Date prepared	-			21/09/2018	1	21/09/2018	21/09/2018		21/09/2018	21/09/2018
Date analysed	-			21/09/2018	1	21/09/2018	21/09/2018		21/09/2018	21/09/2018
Arsenic	mg/kg	4	Metals-020	<4	1	<4	<4	0	98	75
Cadmium	mg/kg	0.4	Metals-020	<0.4	1	<0.4	<0.4	0	96	101
Chromium	mg/kg	1	Metals-020	<1	1	37	44	17	90	90
Copper	mg/kg	1	Metals-020	<1	1	16	15	6	99	95
Lead	mg/kg	1	Metals-020	<1	1	12	11	9	100	93
Mercury	mg/kg	0.1	Metals-021	<0.1	1	<0.1	<0.1	0	97	81
Nickel	mg/kg	1	Metals-020	<1	1	10	11	10	98	100
Zinc	mg/kg	1	Metals-020	<1	1	19	21	10	99	103

Result Definitions

NT	Not tested
NA	Test not required
INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
<	Less than
>	Greater than
RPD	Relative Percent Difference
LCS	Laboratory Control Sample
NS	Not specified
NEPM	National Environmental Protection Measure
NR	Not Reported

Quality Control Definitions

Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011.

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% – see ELN-P05 QA/QC tables for details; <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals; 60-140% for organics (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Measurement Uncertainty estimates are available for most tests upon request.

Report Comments

TRH Soil C10-C40 NEPM - (1D,3,4,5,6,8 SURROGATE)# Percent recovery is not possible to report as the high concentration of analytes in the sample/s have caused interference.

PAHs in Soil - PQL has been raised due to interference from analytes(other than those being tested) in samples 1, 3-8.

TRH Soil C10-C40 NEPM -(1,1d rocky clay sample) The RPD for duplicate results is accepted due to the non homogenous nature of the sample/s.

OC's/OPs and PCBs in Soil - PQL has been raised due to interference from analytes(other than those being tested) in samples 5,6 and 8.

APPENDIX P VISUAL IMPACT ASSESSMENT

Visual Impact Assessment

NORTH RIDGE MATERIALS FACILITY

JANUARY 2019

ngh environmental

Document Verification

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1 INTRODUCTION

NGH Environmental has prepared this Visual Impact Assessment (VIA) for the proposed North Ridge Materials Facility. The proposal site is located to the east of Byrnes Road with proposed site access from Trahairs Road in Bomen, New South Wales. The proposed site is approximately 10 km north-east of central Wagga Wagga.

This report has been prepared on behalf of the proponent, Riverina Warehousing Solutions Pty Ltd, to assess the potential visual impacts of the proposed facility.

As visual amenity values and visual impacts can be subjective, the assessment includes a transparent, systematic evaluation with reference to existing guidelines, to address subjectivity as much as possible.

1.1 PROJECT OVERVIEW

The proposal would involve the conversion of a liquid effluent evaporation pond into an operating materials facility. The facility would accept general solid non-putrescible waste from the Wagga Wagga LGA and surrounding LGAs.

Waste streams would include:

- Construction and demolition waste.
- Visy Pulp and Paper Mill waste.
- Crushed glass from Kurrajong Recyclers.
- Other undefined non-putrescible waste

The construction period would take 12-24 weeks. The visual character of the site would include a hardstand, demountable office building, wire-mesh security fence closed and capped waste cells, an open lined cell to accept waste materials and a leachate pond.

The lifespan of the facility is estimated to be approximately nine years. The proposed waste cell would have a footprint of approximately 77 600 m^2, made up of 6 discrete sub-cells. The finished waste depth would be about eight metres below the existing pond surface and a height of about six metres above the existing pond surface. Once the sub-cell reaches capacity, it will be capped and revegetated with annual grasses (Figure 1-1). The proposed materials facility would involve both construction and operational visual impacts.

Figure 1-1 An example of phytocapping with annual grasses of a capped waste cell (Source: BEN 2011)

1.2 SITE CONTEXT

The proposed development site is located at 223 and 299 Trahairs Roads. It is near the Sturt and Olympic Highways (Figure 1-2). The development site is around 16.5 ha in size and is located on two individual titles (Figure 1-3):

- Lot 2 DP1249028 299 Trahairs Road 40.67 ha
- Lot 4 DP1249028 223 Trahairs Road 45.27 ha

The majority of the development site has been previously cleared of native vegetation from historic agricultural use. For more than 30 years the site was used for effluent disposal and evaporation ponds for industry, and for cropping and grazing. There are scattered paddock trees throughout the subject land. Rows and patches of planted native vegetation exist along Trahairs Road, the south eastern corner of the eastern pond and to the north of the middle pond. There is a row of planted olives to the east of the eastern pond.

The visual character of the land surrounding the development site is a mixture of agricultural and industrial. Primary production land surrounds the proposal to the north and east. The Riverina Oils and Bio Energy facility is located to the west of the proposal and other industry to the south.

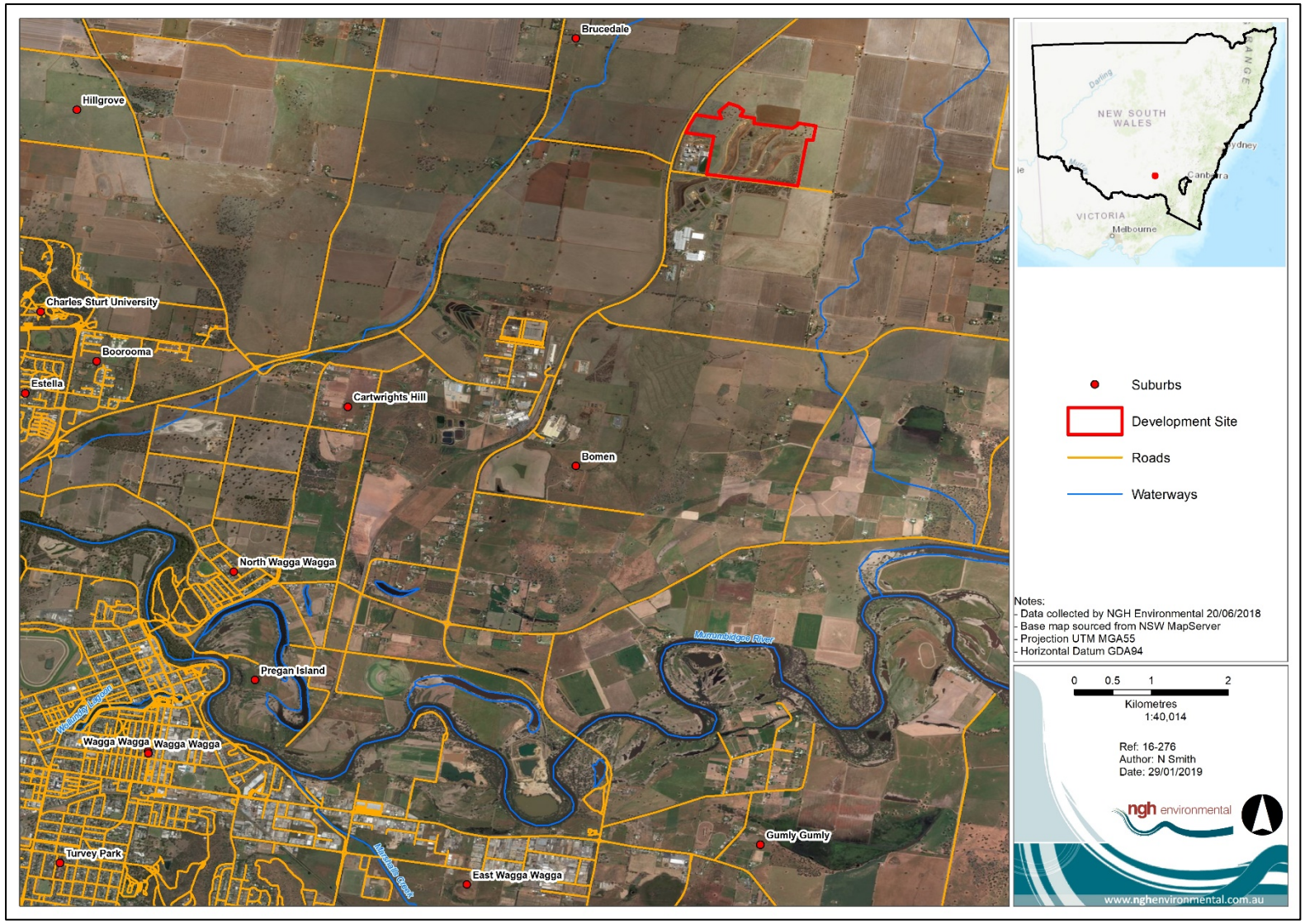


Figure 1-2 Location of the proposed North Ridge Materials Facility

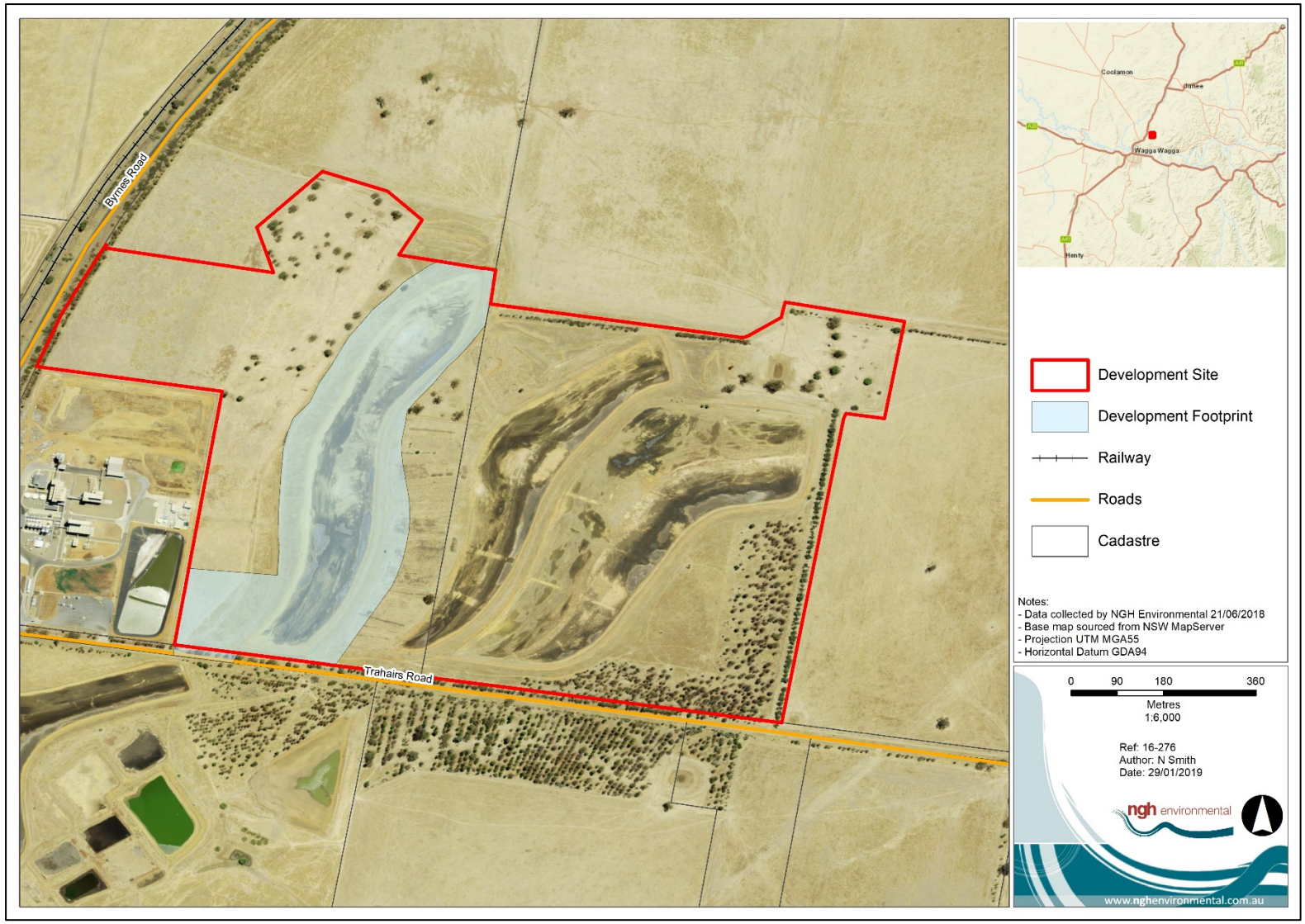


Figure 1-3 Proposed development site and footprint

1.3 OBJECTIVES OF THIS REPORT

This VIA includes a full assessment of the potential visual impacts associated with the proposed facility infrastructure and activities to address the agency consultation as outlined in the Secretary's Environmental Assessment Requirements (SEARs). Specifically, it includes an assessment of:

- Landscape character and scenic vistas (including significant or sensitive vistas).
- Stakeholder values regarding visual amenity.
- Potential impacts on representative viewpoints, including residences and road users.

1.4 TERMINOLOGY

Terminology used in this report includes:

Study area	Defined as land within 3 km of the proposed activity site.
Proposed development site	Defined as the lot boundaries in Figure 1-3.
Development footprint	Defined as the area where construction and operation activities will be undertaken (Figure 1-3).
Proposed activity	All infrastructure and activities required for the construction and operation of the facility.
Landscape Character Unit (LCU)	LCUs take into account topography, vegetation, land use, and other distinct landscape features. They are a way to categorise the existing scenic quality of the scenic environment and consider the ability of the environment to absorb visual change at the landscape scale.
Viewer sensitivity	Viewer sensitivity is subjective but can be assessed in terms of factors such as whether the view relates to recreational or work environments, or whether the view is experienced continuously or intermittently.
Landscape Management Zone (LMZ)	LMZs are derived by combining scenic quality with viewer sensitivity and proximity to the proposed infrastructure at the landscape scale. A three- tiered management hierarchy sets out appropriate management objectives for each zone.

2 METHODOLOGY

2.1 OVERVIEW

The VIA has been completed in the following stages:

1. Background investigations and mapping.
2. Field survey including reconnaissance, ground truthing and photography.
3. Impact assessment.
4. Development of a visual impact mitigation strategy.

These methods are detailed below.

2.2 BACKGROUND INVESTIGATIONS, MAPPING AND MODELLING

Background investigations included identifying key landscape features that may be affected by the visual impacts of the proposed materials facility. This was done using existing literature and aerial photos.

Mapping and modelling were undertaken to:

- Identify and classify LCUs within Bomen and surrounds. LCUs are a way to summarise differences in landscape amenity and the sensitivity of different areas within the landscape to visual impacts.
- Define areas in which the infrastructure of the proposed materials facility may be visible, using the topography of the area. This method uses topographic information to determine areas in which views of infrastructure may be visible from sensitive receivers (e.g. Google Earth Viewshed).
- Identify key viewpoints such as major travel routes, potential receivers (dwellings and other structures), and built up areas.
- Understand the feasibility of screening to mitigate visual impacts along the northern boundary.

The results were used to inform the field survey.

2.3 FIELD SURVEY

With reference to the mapping and modelling, field reconnaissance and ground truthing was undertaken to:

- Verify and document the existing LCUs in the study area.
- Identify the nearest, most affected sensitive receivers.
- Identify representative viewpoints within the LCUs.
- Understand the likely sensitivity of the LCUs to views of the proposed materials facility.

The fieldwork was undertaken by NGH Environmental and involved driving along major roads and publicly accessible minor roads, investigating and documenting dominant visual character elements and potential views to the proposed infrastructure. Photographs were taken at representative locations. Some roadside viewpoints have also been identified as ‘residential’ where they occur near a residence.

2.4 IMPACT ASSESSMENT

The potential impact of the proposed activity on visual amenity during construction has been assessed qualitatively given the construction period would be short in duration.

The impact assessment methodology used in this VIA for operational impacts is based on the Bureau of Land Management (BLM) Visual Resource Management System, developed by the BLM, US Department of the Interior (n.d.). The BLM developed a systematic process to analyse the visual impact of proposed developments. The basic philosophy states that the degree to which a development affects the visual landscape depends on the visual contrast imposed by the project.

Key steps undertaken to assess the visual impact are as follows:

- Define LMZs for the representative viewpoints, based on:
    - The scenic quality of the study area's LCUs.
    - The expected sensitivity at representative viewpoints.
    - The proximity of each representative viewpoint.
- Evaluate the degree of contrast the materials facility would generate at representative viewpoints in consideration of the management objectives of the relevant LMZ.
- Determine the acceptability of the contrast with the management objectives of the relevant LMZ; this is the resultant visual impact, rated as high, medium or low.

Criteria for scenic quality, sensitivity, proximity, contrast and visual impact are included in the assessment in Section 3.

Mitigation measures are considered to be required for high impact receivers, where unmitigated impacts are deemed greater than what is acceptable. For medium impact receivers, the contrast is considered acceptable and mitigation may be recommended. For low impact receivers, the contrast is deemed unlikely to be perceived and therefore acceptable with no mitigation required.

2.5 VISUAL IMPACT MITIGATION STRATEGY

The Visual Impact Mitigation Strategy was developed after consideration of the above methods. The mitigation strategy is outlined in Section 6.

3 EXISTING ENVIRONMENT

3.1 WAGGA WAGGA

Wagga Wagga is located within the study area for this Visual Impact Assessment. Wagga Wagga is a major regional city located in southern inland New South Wales on the Murrumbidgee River.

The residences within the study area are generally located within Wagga Wagga. There are also several residences on rural properties on the outskirts of the city. Residential sensitive receivers are sparsely located around the development site. The notable exception is to the north-west, where the large lot residential suburb of Brucedale is located (Figure 3-1). The nearest residential sensitive receiver to the development site (Figure 3-1) is a rural residence at 46 Trahairs Road (R06), around 1.25 km from the western boundary and 1.5 km from the nearest effluent evaporation pond. There are two more residential receivers within 1.5 km from the development site boundary (Figure 3-1).

Local land uses in the study area include agriculture (grazing), rural residential, industrial, and electrical infrastructure.

Wagga Wagga has a strong economy with the city's Gross Regional Product valued at $3.7 billion for the 2015-2016 financial year (idcommunity, 2017). Wagga had a mean population of 62,385 in 2016, with Australian Bureau of Statistics data indicating 31,563 people worked in Wagga Wagga with the main local industry for employment being Defence (4.6%), hospitals and health (4.5%), higher education (3.1%) social assistance services (2.4%) and secondary education (2.4%) (ABS 2016).

Wagga Wagga is the largest retail, commercial, administrative and population centre in the Riverina. It is a central hub of services to a catchment of over 185,000 people. The city is a key educational centre, providing education and training across the full spectrum of learning. This includes Charles Sturt University's largest campus and the Riverina TAFE Campus. A strategically beneficial location enables multiple transport options and connectivity to Australia's major cities by road, rail or air. As a result of the wide-reaching population catchment, the city exhibits a strong retail sector, with significant investment and expansion in a number of shopping centres.

The proposed materials facility would provide a use for the defunct historic effluent evaporation pond. Further it would provide a facility for general solid non-putrescible waste for the Wagga Wagga Local Government Area and surrounds.

Local land uses in the visual assessment study area include agriculture (grazing and cropping) and industry.

3.2 SIGNIFICANT VISTAS

There are no look outs or promoted scenic vistas located within 3 km of the proposed activity site. Features that contribute to the scenic character of the area include (Figure 3-2):

- Byrnes Road between the townships of Wagga Wagga and Junee.
- Pastoral views.

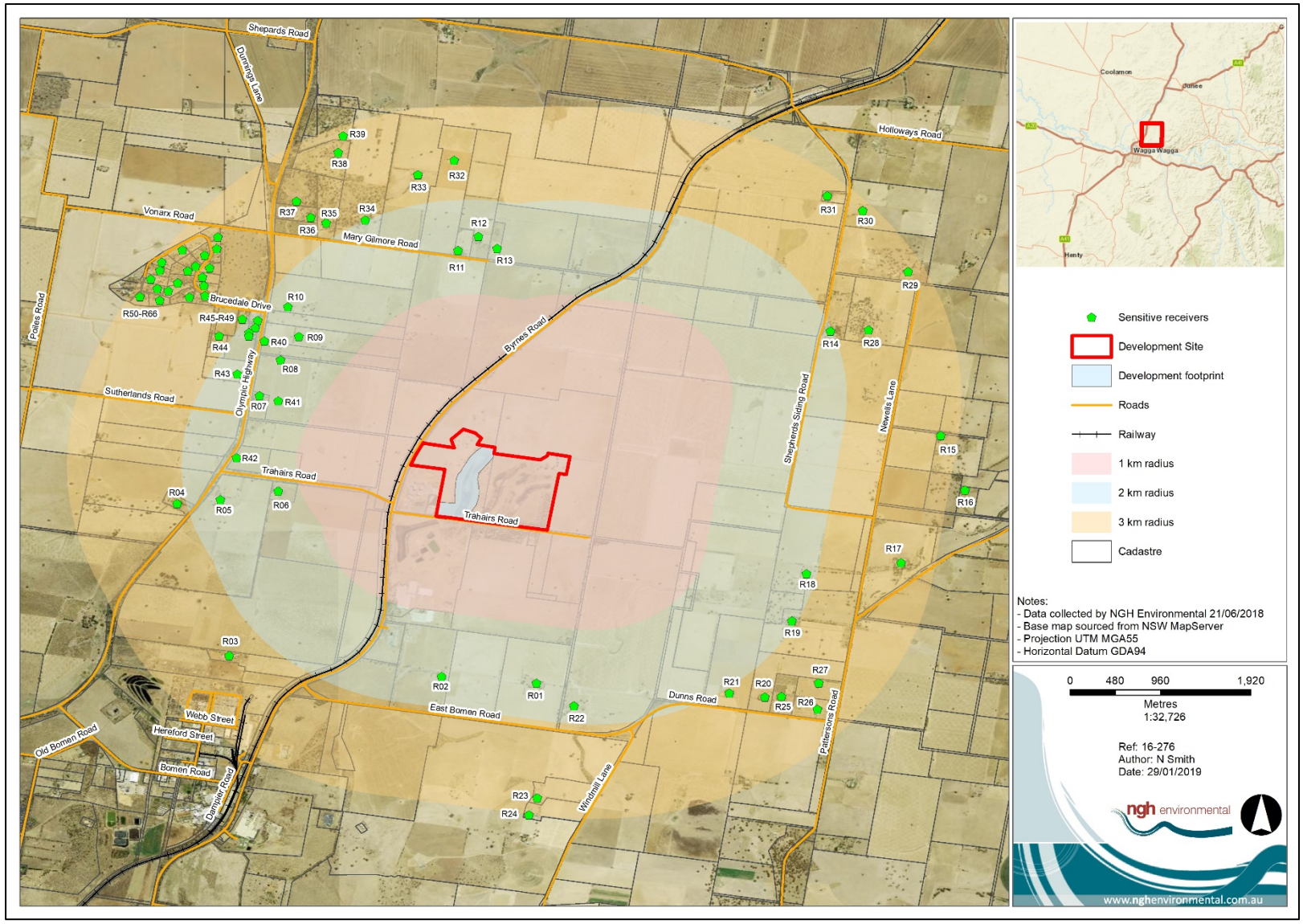


Figure 3-1 Representative sensitive receivers surrounding the proposed development site

Byrnes Road

Cropping and pastoral views

Figure 3-2 Examples of local vistas

3.3 COMMUNITY VALUES

Research indicates that the level of concern for different types of potential impacts of living near waste management facilities is high (McCrea *et al*. 2016). The perceived impact score of visual appearance by impacted residents (those affected by waste management facilities) is 3.8, where a score of 5 is 'very concerned' (McCrea *et al*. 2016).

Attitudes of respondents towards living near a waste management facility are focused around three main attitudes: 23% 'ok with it'; 31% 'tolerate it'; and 34% 'reject it' (McCrea *et al*. 2016). Potential drivers of social acceptance in the waste and resource recovery sector included: open and honest communication and responsiveness of the operator to community concerns and feedback; trust that the operator is acting responsibly and, in the community's, best interests; and the operator is working within designated guidelines and regulations associated with waste management facilities (McCrea *et al*. 2016).

Results of community consultation for the proposal showed that community concerns were based particularly around potential impacts to surface and groundwater. A quote from one resident in The Daily Advertiser (November 14, 2017) was "This is a really nice part of the world and we're just trying to protect our community".

Visual issues that have been addressed in this report include:

- The potential visibility from surrounding areas; consideration of the site in the context of land zoning and landscapes.
- Potential visual impacts from strategic viewpoints; these include from adjacent residences, industry and roadsides.
- Proposed mitigation and management measures to reduce visual impacts.

3.4 LANDSCAPE CHARACTER UNITS (LCU)

LCUs take into account topography, vegetation, land use, and other distinct landscape features. They summarise differences in the receiving environment that may affect the visual impact of the proposed materials facility at different locations.

Four LCUs were identified within the suburb of Bomen and surrounding areas:

- Industrial (roads, fencing, electrical, warehouses, waste management and other built infrastructure).
- Rural (including agricultural lands and rural residential blocks).
- Residential (retail and residential areas).
- Recreational (reserves, parks and other recreational areas).

The scenic quality was rated in each LCU as follows:

- A high scenic quality rating describes areas with outstanding, unusual or diverse features.
- A moderate scenic quality rating applies to areas with the features and variety normally present in the character type.
- A low scenic quality rating is given to areas lacking features and variety.

The four LCUs identified are characterised in Table 3-1 in terms of their scenic quality and illustrated in the following plates.

Table 3-1 Key features and photographs of Landscape Characteristic Units (LCUs) within Bomen and surrounding suburbs

Rural LCU

Rural and agricultural lands within the study area are used predominantly for grazing and rotational cropping and are relatively flat to undulating. Expansive views within this LCU are generally limited given the moderate relief and screening provided by vegetation.

Sealed roads such as Byrnes Road, Dorsett Drive and Olympic Highway, and minor unsealed roads such as Trahairs Road, Dunns Road and Shepherds Siding Road, are the main vantage points from which to view agricultural areas. From the road corridors, grazing land can be viewed openly. Occasional patches of native and planted vegetation screen views of agricultural land from roadways.

In addition to sections of road, large overhead transmission lines are visible that reinforce rectilinear shapes and are common in rural landscapes. The southern railway, Sydney to Melbourne, runs parallel with Byrnes Road.

Surrounding land is made up of primary production, small rural holdings and large lot residential. Residences within this landscape are relatively closely distributed and commonly associated with some additional vegetation plantings. Other infrastructure includes sheds and low open fences.

Also located within the LCU:

- Brucedale Bush Fire Brigade on Brucedale Drive.
- Wollundry Grove Olives on Olympic Highway.

Scenic quality is moderate. Built elements are production related and include linear fences, powerlines, roads, agricultural buildings and rural houses. Forms are generally uniform, of moderate elevation and linear. This LCU is common in the study area. The proposed materials facility is located adjacent to this LCU.

Residential LCU

The urban area of Wagga Wagga consists of residential, commercial and mixed-use areas, which contain commercial and residential uses, schools, and recreation areas.

The North Wagga Wagga area generally has street trees and reasonably maintained residences. The buildings are generally modest, single story and located side by side. Gardens and lawns are well manicured and grassed, with moderate to large feature trees. The roads are predominantly sealed.

The Estella / Boorooma areas are a mix of new and established dwellings. The older areas generally have street trees and reasonably maintained residences. The buildings are generally modest, single story and located side by side. Gardens and lawns are well manicured and grassed, with moderate to large feature trees. The roads are predominantly sealed with kerb and guttering.

Outlooks are generally limited to other residences or low relief rural views.

Scenic quality is considered moderate. These areas have variety in colour and form normal in this character type. Elements include tree lined streets, small businesses and residential homes. This LCU is not common in the study area.

Recreational LCU

The recreational area of Bomen Axe Quarry is located approximately 2.2 km south of the development site. It is an Aboriginal Place where stone axes were manufactured. It provides insight into Wiradjuri stone tool technology and Aboriginal trade routes and land management practices.

Scenic quality is considered high. The development site is located over 2 km from this LCU.

Celebrating the declaration of an Aboriginal Place, Bomen Axe Quarry (Source: NSW Office of Environment and Heritage 2012).

Industrial LCU

The industrial area within the suburb of Bomen is extensive and includes the Riverina Oils and Bio Energy Facility, Enirgi Group, Teys Australia abattoir, Southern Oil Re-refinery and many other industries. Most industry is located to the south and west of the development site. Common features in the LCU are attributed to both and include fencing, buildings, powerlines and regular large vehicles.

Scenic quality is considered low, with elements being battery waste management, oil re-refinery, abattoir, sale yards and production related. The structures match the land use. Screening is present in some areas however, it is an industrial estate. This LCU is common in the study area and where the development site is located.

3.5 VIEWPOINT SENSITIVITY

3.5.1 Identifying viewpoints

The BLM methodology requires identification of representative viewpoints in the study area. These may be travel routes such as roads, waterways and recreational tracks, residential areas, tourist facilities, houses and farmland.

Eleven representative viewpoints were identified using the BLM methodology and topography and are mapped in Figure 3-3.

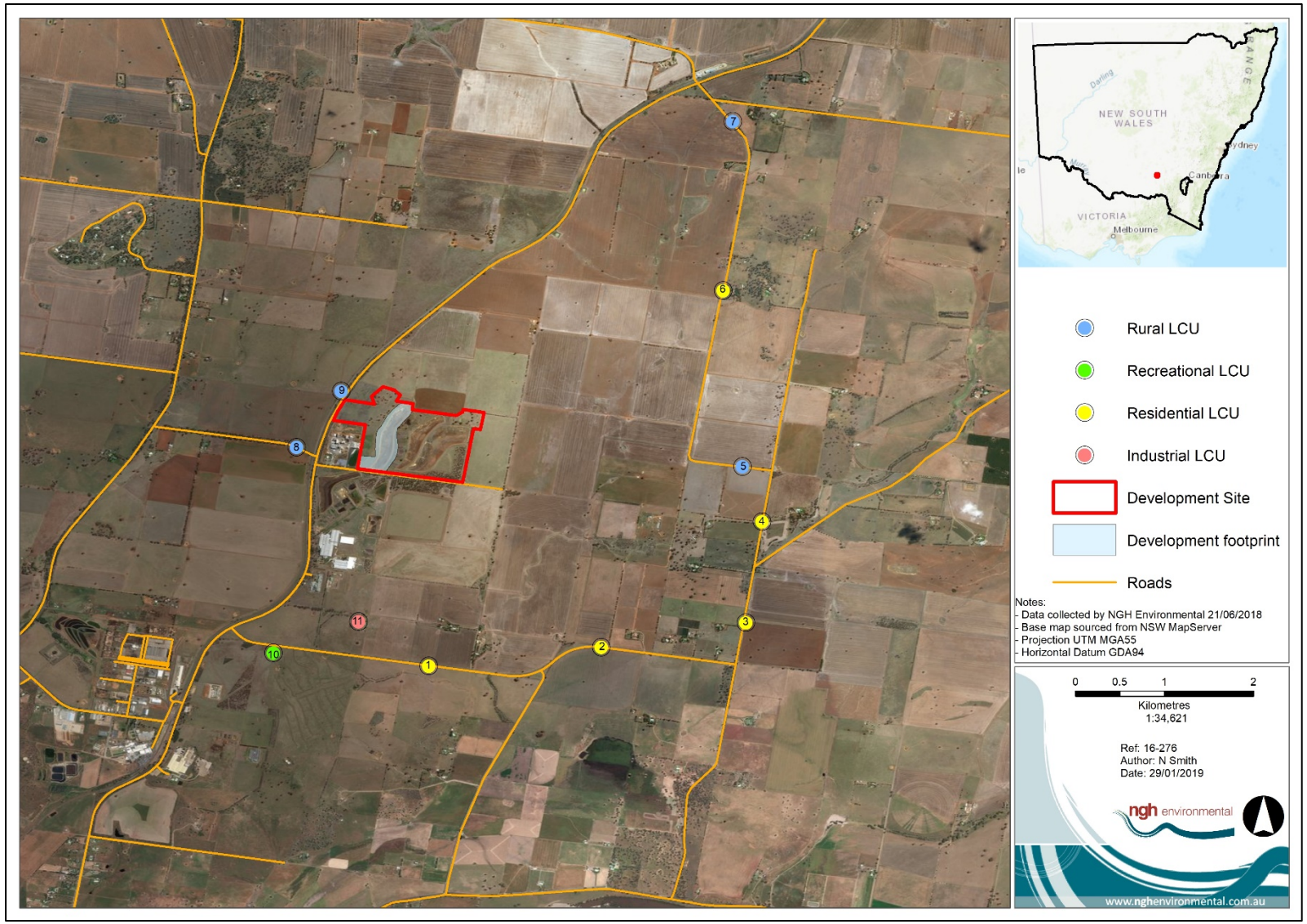


Figure 3-3 Representative viewpoints and corresponding Landscape Character Units

3.5.2 Rating proximity and assessing sensitivity of viewpoints

The predicted sensitivity of each viewpoint can be determined, considering its proximity to the proposed activity site and factors such as use, scenic quality and regional significance.

Criteria for proximity are as follows:

- Foreground 0 – 1 kilometres.
- Middle ground 1 – 3 kilometres.
- Background More than 3km.

Criteria for sensitivity are as follows:

- High sensitivity:
  - high use routes or areas
  - routes or areas of national or state significance
  - areas with high scenic quality
- Moderate sensitivity:
  - moderate use routes or areas
  - routes or areas of regional or local significance
  - areas with moderate scenic quality
- Low sensitivity:
  - low use routes or areas
  - routes or areas of low local significance
  - areas with low scenic quality

Considering the sensitivity of local viewpoints, the following assessments were made:

- **Residential viewpoints** were assessed as generally having high sensitivity. If there was a view to the materials facility, the view duration could be expected to be high for a receiver.
- **Recreational viewpoints.** Viewpoints from recreational areas were assessed as generally having high sensitivity. However, given the distance to the development site, existing buildings and vegetation within the study area, it is considered the materials facility would not be visible from these viewpoints.
- **Road viewpoints** were assessed as having moderate to low sensitivity and include Byrnes Road, Trahairs Road, East Bomen Road, Dunns Road, Pattersons Road and Shepherds Siding Road. Viewpoints along these roads are considered to have moderate to low sensitivity given the surrounding industrial activities. Any views from these areas would be fleeting due to landscape topography, vehicle speed, hard to discern and fragmented by existing roadside and paddock vegetation. Built structure is more commonly functional than aesthetic in these settings.
- **Industrial viewpoints** were assessed as having low sensitivity. In these locations, receivers would be more likely to be focused on work activities than view durations. If there is a view to the materials facility, it would be limited due to this focus. Sites are sometimes untidy, with limited effort expended on visual amenity such as screening or garden plantings.
- **Rural viewpoints** were assessed as having moderate sensitivity as representative viewpoints were roadside. However, given the distance to the development site,

existing buildings and vegetation within the study area, it is considered the materials facility would not be visible from these viewpoints.

The sensitivity of each viewpoint is provided in Table 3-2. Eleven representative viewpoints were identified and are mapped in Figure 3-3 (above).

Table 3-2 Representative viewpoints and assessed proximity, scenic quality and sensitivity.

Viewpoint ID	LCU	View location	Representative	Distance to site	Scenic quality	Sensitivity
1	Rural	Road	Residence	Middle ground	Moderate	Low
2	Residential	Road	Residence	Middle ground	High	Moderate
3	Residential	Road	Residence	Middle ground	High	Moderate
4	Residential	Road	Residence	Middle ground	High	Moderate
5	Rural	Road	Road	Middle ground	Moderate	Low
6	Residential	Road	Residence	Middle ground	High	Moderate
7	Rural	Road	Road	Background	Moderate	Low
8	Rural	Road	Road	Foreground	Moderate	Low
9	Rural	Road	Industrial	Foreground	Moderate	Low
10	Recreational	Road	Recreational	Middle ground	High	Low
11	Industrial	Industry	Industrial	Middle ground	High	Low

4 VISUAL CHARACTERISTICS OF KEY INFRASTRUCTURE COMPONENTS

The key infrastructure components of the proposed North Ridge Materials Facility, with reference to the stage of the project and the potential visual amenity impacts they may generate, are discussed below.

4.1 INFRASTRUCTURE COMPONENTS

The following construction ancillary facilities would be located within the development site:

- Hard stand and waste receival area.
- Staff amenities building.
- Site access.
- Parking for staff and visitors.
- Waste cell and leachate management pond within an existing effluent disposal and evaporation pond.

These facilities would be designed in line with the relevant Australian standards.

Staff amenities would be designed to accommodate workers during the construction and operation period, and would include:

- Car park.
- Sanitary modules with pump-out tank.
- Changing rooms.
- Administrative office.
- Undercover storage area.

- Muster point in case of emergency.

4.2 CONSTRUCTION COMPONENTS

Construction impacts would be temporary, confined to approximately 12-24 weeks. Visual impacts could be generated during this time by:

- Development of site compound areas, site facilities and stockpiles located within the site boundaries. Material stockpiles may detract from visual amenity, particularly if dispersed across broad areas. These may be visible from Byrnes Road and dwellings to the south and east (down gradient) and may detract from the visual amenity of the area.
- Construction traffic will increase visual impacts and add to dust generation on the entry to Trahairs Road. Onsite parking areas, the hard stand area and site amenity block would likely be visible from Trahairs Road East.
- Areas of bare soil created through excavation, grading or trenching could contribute to dust and detract from visual amenity until they are rehabilitated. These areas may be visible from Byrnes Road and dwellings to the south and east.

4.3 OPERATION COMPONENTS

Operational impacts centre on the look and operation of the materials facility, once construction is complete:

- One waste sub-cell will be in operation. A short period of overlap would exist between capping and revegetation of one waste sub-cell and the start of the next waste sub-cell. The finished waste height above ground level will be around 6 m, capped and revegetated.
- Waste receival area will be located in the hard stand area. The trucks will unload the waste into this area for inspection.
- The site office and amenity building could add visual impact, mostly to views up-gradient from the east.
- The main access to the site would be from Trahairs Road. This would provide minimal visual impact to local traffic along Byrnes Road.
- An area for parking would be included on the hardstand within the site boundaries.
- Fencing would be up to 1.8 m high security fencing along the perimeter of the facility. It is expected to be wire-mesh fencing as per the EPA (2016) *Environmental Guidelines: Solid Waste Landfills*.

Within the development site, ground disturbance would be limited to:

- The on-going creation of sub-cells. This work would be confined inside the existing footprint of the effluent evaporation pond. It would include excavation for and installation of the drainage piping for the groundwater relief layer, compacted clay liners, HDPE liner, drainage layers, and the leachate management system.

Activities would predominantly occur within the waste cell at the proposed facility. Excavation and stockpiling of materials for the operation of each sub-cell will occur within the waste cell.

Operational components that could be visible is the proposed hard stand, approximately 25 m from the property boundary at the access site and is approximately 0.66 ha. Within this area will be car parking, the site office and the waste receival area. The waste receival area will have a retaining wall on the eastern

(down gradient) side (Appendix A) to enable the front-end loader to effectively collect and move the waste. The concrete pad for the waste receival area will be around 174 m^2 and the height of the retaining wall will be around 1.5 m. The waste receival area would be obscured from the west by the fist sub-cell when it is capped and revegetated.

The perimeter fencing is an operational component that may cause glare depending on the sun angle. This infrastructure would be unlikely to present a glare hazard to residents or motorists.

As the proposal is for a materials facility, there is potential for waste to escape as litter from the receival area and from the sub-cell and therefore, detract from the visual amenity until the litter is retrieved.

5 IMPACT ASSESSMENT

5.1 CONSTRUCTION IMPACT ASSESSMENT

Visual impacts during the construction period would be generated by the following construction activities and elements:

- Temporary site office and amenities buildings.
- Earthworks.
- Delivery and stockpiling of materials.
- Stockpiling of excavated soil.
- Construction and installation of proposed materials facility infrastructure.

The use of excavation machinery would contribute to the visual impact of the proposed activity.

Visual receptors for the proposed activity during the construction period would include some residents in the immediate vicinity to the east and south-east, road users travelling along Trahairs Road.

Given the relatively short duration of the construction period compared to the lifetime of the proposal, low use of local roads and very few residents with any view of the proposal, it is considered that the potential visual impact during construction would be minimal. A general mitigation measure for the management of the development site during construction has been included in Section 6.

5.2 OPERATIONAL IMPACT ASSESSMENT

5.2.1 Methodology

An operational visual impact assessment has been conducted considering:

- The proposed materials facility components described in Section 4.
- The potential for the proposed materials facility to be viewed from representative viewpoints.
- The degree of contrast the proposed materials facility would have within the identified LMZ. LMZs were assigned to viewpoints based on the results of the field work, and the contrast at that viewpoint was evaluated, as described below.

5.2.2 Definition of landscape management zones

Visual LMZs were assigned to each representative viewpoint. The zones were derived by combining scenic quality (from the LCUs described in Section 3.4), viewer sensitivity and the distance to the proposed material facility (from Section 3.5.2). Combined they produce a three-tiered management hierarchy: A – C, as shown in Table 5-1.

Table 5-1 Visual Landscape Management Zone decision matrix

		Proximity / sensitivity						
		Foreground High	**Middle ground High**	**Background High**	**Foreground Moderate**	**Middle ground Moderate**	**Background Moderate**	**Foreground Low**
Scenic quality	**High**	A	A	A	A	B	B	B
	Moderate	A	B	B	B	B	C	C
	Low	B	B	B	B	C	C	C

Each zone has associated objectives to guide management of visual change and to help evaluate proposed project impacts. These are shown in Table 5-2.

Table 5-2 Visual Landscape Management Zone management objectives

Management priority	Management objectives
A	Maximise retention of existing visual amenity. Landscapes are least able to absorb change. Developments may lead to a major change.
B	Maintain existing visual amenity, where possible. Protect dominant visual features. Developments may be allowed to be visually apparent.
C	Less importance for retaining existing visual amenity. Landscapes are able to absorb change. Developments may be allowed to dominate but should reflect existing forms and colours where possible.

5.2.3 Visual impact assessment at representative viewpoints

Evaluation criteria

The ratings for the degree of contrast created by the proposed materials facility at each viewpoint have the following definitions (BLM n.d.):

- High contrast: the proposed activity would be dominant within the landscape and generally not overlooked by the observer; the visual change would not be absorbed.
- Medium contrast: the proposed activity would be moderately dominant and noticed; the visual change would be partially absorbed.
- Low contrast: the proposed activity would be seen but would not attract attention; the visual change would be well absorbed.
- Indistinct: contrast would not be seen or would not attract attention; the visual change would be imperceptible.

To determine if the objectives for the VLM zone are met, the contrast rating for the viewpoint is compared with the relevant management objectives to give a visual impact level. The visual impact level is consequently defined as:

- High impact: contrast is greater than what is acceptable.
- Medium impact: contrast is acceptable.
- Low impact: visual contrast is little or not perceived and is acceptable.

For high impact viewpoints, mitigation must be considered.

Evaluation Results

Table 5-3 evaluates the expected level of visual impact from 1 to 11 representative viewpoints. No residential receivers would have a visual impact from the materials facility on the western side of Byrnes Road. The topography of the study area limits views on the eastern side of Byrnes Road (Viewpoint 8). The topography also limits the impact to visual amenity to those receivers to the far north and south of the proposal. Views are obscured by topography and vegetation.

Visual amenity of residential sensitive receivers to the east and south east may be impacted. However, the dominant feature at each representative viewpoint is the Riverina Oils and Bio Energy (ROBE) facility due to the height of infrastructure and prominence in the landscape. It is adjacent to the west of the proposal. ROBE and the proposal fit within the Industrial LCU.

Note, no high or medium impact viewpoints were identified. A summary of the operational visual impact assessment is presented in Section 5.2.5. The 'extent of view' is indicated by a white square where the proposed facility could be visible.

Table 5-3 Visual impact at representative viewpoints with reference to the proposed materials facility at Bomen

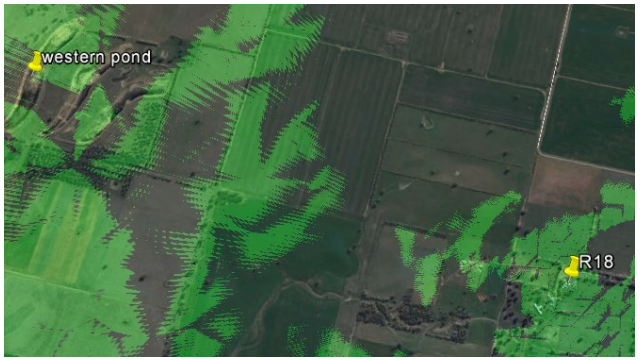
VIEWPOINT 1			
Summary of Viewpoint		Viewpoint Description / Impact	
LCU	Rural	Taken from East Bomen Road facing north towards the proposed materials facility. The Viewpoint is representative of residential sensitive receiver R01. Dominant features include the sealed East Bomen Road, grazing and cropping paddocks, fencing, vegetation and overhead powerlines to the south. Proposed infrastructure is unlikely to be discernible by residents or motorists due to distance, vegetative screening and undulating nature of the area. **No mitigation is required**	Google Earth viewshed (accessed October 2018). The green shading indicates 'line of sight' from R01 (indicated) to the western pond (indicated) from 2 m above ground level and based on local topography.
Scenic Quality	High		
Proximity	Middle ground (>3 km)		
Sensitivity	High		
LMZ Objective	A		
Contrast	Low		
Inherent Visual Impact	LOW		

VIEWPOINT 2			
Summary of Viewpoint		Viewpoint Description / Impact	
LCU	Rural	Taken from Dunns Road facing north-west towards the proposed materials facility. The Viewpoint is representative of Receiver 21, located on the northern side of Dunns Road. Dominant features include the unsealed Dunns Road, grazing and cropping paddocks, fencing, vegetation and industrial buildings in the far distance. The ROBE facility is the dominant infrastructure in the landscape. The land is predominately cleared and undulating to flat. Proposed infrastructure may be discernible by residents and motorists. However, views will be fragmented through existing vegetative screening and difficult to discern due to distance. Materials facility infrastructure would not be the dominant feature at this Viewpoint and would not alter the current rural outlook. **No mitigation is required**	 Google Earth viewshed (accessed October 2018). The green shading indicates 'line of sight' from R21 (indicated) to the western pond (indicated) from 2 m above ground level and based on local topography.
Scenic Quality	High		
Proximity	Middle Ground (1-3 km)		
Sensitivity	High		
LMZ Objective	A		
Contrast	Indistinct		
Inherent Visual Impact	LOW		

VIEWPOINT 3			
Summary of Viewpoint		Viewpoint Description / Impact	
LCU	Residential	Taken from Pattersons Road facing west towards the proposed materials facility. The Viewpoint is representative of Receivers 19, located on western side of Pattersons Road. Dominate features include the tree lined, sealed Pattersons Road, grazing and cropping paddocks, fencing, industry and vegetation. The land is predominately cleared and undulating to flat. Broken views of the proposed infrastructure through vegetative screening could be noticeable by residents. However, materials facility infrastructure would not be the dominant feature at this Viewpoint and would not alter the current rural outlook. Views would be fleeting and hard to discern by motorists due to speed of travel and distance. **No mitigation is required**	 Google Earth viewshed (accessed October 2018). The green shading indicates 'line of sight' from R19 (indicated) to the western pond (indicated) from 2 m above ground level and based on local topography.
Scenic Quality	High		
Proximity	Middle Ground (1-3 km)		
Sensitivity	High		
LMZ Objective	A		
Contrast	Low		
Inherent Visual Impact	LOW		

VIEWPOINT 4

Summary of Viewpoint		Viewpoint Description / Impact
LCU	Residential	Taken from a point on Shepherds Siding Road facing west towards the proposed materials facility. The Viewpoint is representative of Receivers 18 and 17. R18 is located on western side and R17 is located on the eastern side of Shepherds Siding Road. Dominant features include the tree lined, unsealed Shepherds Siding Road, grazing and cropping paddocks, fencing, vegetation and industry in the far distance. The land is predominately cleared and flat to elevated. Broken views of the proposed infrastructure through vegetative screening could be noticeable by residents. However, materials facility infrastructure would not be the dominant feature at this Viewpoint and would not alter the current rural outlook. Views would be fleeting and hard to discern by motorists due to speed of travel and distance. The form of the finished waste sub-cells, low (< 6 m capped and vegetated height) and following the contour of the land, is not incongruous with the existing forms in this agricultural area. **No mitigation is required**
Scenic Quality	High	
Proximity	Middle Ground (1-3 km)	
Sensitivity	High	
LMZ Objective	A	
Contrast	Low	
Inherent Visual Impact	LOW	



Google Earth viewshed (accessed October 2018). The green shading indicates 'line of sight' from R18 (indicated) to the western pond (indicated) from 2 m above ground level and based on local topography.

VIEWPOINT 5		
Summary of Viewpoint		Viewpoint Description / Impact
LCU	Rural	Taken from Shepherds Siding Road facing west towards the proposal. Dominant features include the unsealed Shepherds Siding Road, grazing and cropping paddocks, fencing, vegetation and industry in the far distance. The land is predominately cleared and undulating to flat. Views of the proposed infrastructure through vegetative screening could be noticeable by residents. However, materials facility infrastructure would not be the dominant feature at this Viewpoint and would not alter the current rural outlook. The form of the finished waste sub-cells, low (< 6 m capped and vegetated height) and following the contour of the land, is not incongruous with the existing forms in this agricultural area. **No mitigation is required**
Scenic Quality	Moderate	
Proximity	Middle Ground (1-3 km)	
Sensitivity	Moderate	
LMZ Objective	B	
Contrast	Low	
Inherent Visual Impact	LOW	

VIEWPOINT 6			
Summary of Viewpoint		Viewpoint Description / Impact	
LCU	Residential	Taken from Shepherds Siding Road facing south-west towards the proposal. The Viewpoint is representative of Receiver 14, located on western side of eastern side of Shepherds Siding Road. Dominant features include the unsealed Shepherds Siding Road, grazing and cropping paddocks, fencing, industry and vegetation. The land is predominately cleared and undulating. Proposed infrastructure is unlikely to be discernible by residents or motorists due to distance, vegetative screening and speed of travel. **No mitigation is required**	 Google Earth viewshed (accessed October 2018). The green shading indicates 'line of sight' from R14 (indicated) to the western pond (indicated) from 2 m above ground level and based on local topography.
Scenic Quality	High		
Proximity	Middle Ground (1-3 km)		
Sensitivity	High		
LMZ Objective	A		
Contrast	Indistinct		
Inherent Visual Impact	LOW		

VIEWPOINT 7		
Summary of Viewpoint		Viewpoint Description / Impact
LCU	Rural	Taken from Shepherds Siding Road facing south-west towards the proposal. Dominant features include the unsealed Shepherds Siding Road, grazing and cropping paddocks, fencing, industry and vegetation. The land is predominately cleared and undulating. Proposed infrastructure is unlikely to be discernible by residents or motorists due to distance, vegetative screening and speed of travel. **No mitigation is required**
Scenic Quality	Moderate	
Proximity	Background (> 3 km)	
Sensitivity	Low	
LMZ Objective	C	
Contrast	Indistinct	
Inherent Visual Impact	LOW	

VIEWPOINT 8			
Summary of Viewpoint		Viewpoint Description / Impact	
LCU	Rural	Taken from Trahairs Road west, facing east towards the proposal, located behind (down gradient) of the ROBE facility (foreground). Dominant features include the unsealed Trahairs Road, Southern Railway, industry, sealed Byrnes Road with roadside vegetation, grazing and cropping paddocks, fencing, vegetation and road signage. The land is predominately cleared and slightly undulating. Proposed infrastructure is unlikely to be discernible by residents or motorists due to distance, the ROBE facility, the undulating nature of the area, vegetative screening and speed of travel. **No mitigation is required**	 Google Earth viewshed (accessed October 2018). The green shading indicates 'line of sight' from the closest receiver, R06 (indicated), to the western pond (indicated) from 2 m above ground level and based on local topography.
Scenic Quality	Moderate		
Proximity	Foreground (<1 km)		
Sensitivity	Low		
LMZ Objective	C		
Contrast	Indistinct		
Inherent Visual Impact	LOW		

VIEWPOINT 9		
Summary of Viewpoint		Viewpoint Description / Impact
LCU	Rural	Taken from Byrnes Road facing east towards the western boundary of the proposal. The proposal is adjacent to this section of Byrnes Road. Dominant features include the sealed Byrnes Road with roadside vegetation, grazing and cropping paddocks, Southern Railway, fencing, industry, vegetation and road signage. The land is predominately cleared and undulating to flat. The Viewpoint is representative of potential views from Byrnes Road. Proposed infrastructure is unlikely to be discernible by motorists due to distance, the undulating nature of the area, vegetative screening and speed of travel. The materials facility infrastructure would not be the dominate feature at this Viewpoint and would be hard to discern. It would not alter the current industrial and rural outlook. **No mitigation is required**
Scenic Quality	Moderate	
Proximity	Foreground (<1 km)	
Sensitivity	Low	
LMZ Objective	B	
Contrast	Indistinct	
Inherent Visual Impact	LOW	

VIEWPOINT 10		
Summary of Viewpoint		Viewpoint Description / Impact
LCU	Recreational	Taken from East Bomen Road facing north towards the southern boundary of the proposal. Dominant features include the sealed East Bomen Road, grazing and cropping paddocks, fencing, industry, vegetation and road signage. The land is predominately cleared and undulating to flat. The Viewpoint is representative of potential views from East Bomen Road. Proposed infrastructure is unlikely to be discernible by those using the recreational space or motorists due to distance, the undulating nature of the area, vegetative screening and speed of travel. The materials facility infrastructure would not be the dominate feature at this Viewpoint and would be hard to discern. It would not alter the current industrial and rural outlook. **No mitigation is required**
Scenic Quality	High	
Proximity	Middle ground (1 - 3 km)	
Sensitivity	High	
LMZ Objective	A	
Contrast	Indistinct	
Inherent Visual Impact	LOW	

VIEWPOINT 11

Summary of Viewpoint		Viewpoint Description / Impact
LCU	Industrial	Taken from Enirgi Group carpark facing north towards the southern boundary of the proposal. Dominant features include the company buildings, sealed driveway and carpark, driveway vegetation, grazing and cropping paddocks, fencing, ROBE and other industry, vegetation and road signage. The land is predominately cleared and undulating to flat. The Viewpoint is representative of potential views from East Bomen Road. Proposed infrastructure is unlikely to be discernible by employees of the Enirgi Group due to distance, the undulating nature of the area and vegetative screening. The materials facility infrastructure would not be the dominate feature at this Viewpoint and would be hard to discern. It would not alter the current industrial and rural outlook. **No mitigation is required**
Scenic Quality	Moderate	
Proximity	Middle Ground (1 -3 km)	
Sensitivity	Low	
LMZ Objective	B	
Contrast	Indistinct	
Inherent Visual Impact	LOW	

5.2.4 Results summary

High Impact – not applicable

No viewpoints were assessed to have a high impact.

There are no nearby residences that would have significant, direct views on the materials facility. The ROBE facility is the dominant feature in the landscape. Once the waste sub-cells are capped and revegetated they will blend into the landscape.

Medium impact – mitigation could be considered

No viewpoints were assessed to have a medium impact.

There are no nearby residences that would have significant, direct views on the materials facility. The ROBE facility is the dominant feature in the landscape. Once the waste sub-cells are capped and revegetated they will blend into the landscape.

Low impact – no mitigation

Low impacts are likely for roads and residences, where views of the materials facility infrastructure would be difficult to perceive or indistinct. Low impacts are expected for the majority of the study area and representative viewpoints due to existing vegetative screening around residences, retained on-site vegetation, existing industry and the overall undulating nature of the area. No mitigation is required for these locations.

5.3 CUMULATIVE IMPACTS

Adverse cumulative impacts occur when the infrastructure or activities at the materials facility site exacerbate the negative impacts of other infrastructure or activities occurring nearby.

5.3.1 Construction

During construction, the additional traffic and dust generation impacts are probably the greatest potential for cumulative visual impacts. The visual impact of increased traffic movements to the site would be predominantly limited to construction. Dust cumulative impacts could occur if earthworks during construction were to coincide with harvest activities or the construction phase of the proposed Bomen Solar Farm.

5.3.2 Operation

The operational view of the materials facility may generate a cumulative impact being directly adjacent to the agricultural views. There is a proposed solar farm for the land surrounding the development site to the north, east and south. The materials facility could contribute to the cumulative impact of the loss of visual amenity. However, it would not be the dominant feature. The site requires security fencing.

During operation, excepting unusual maintenance operations and preparations of subsequent waste sub-cells, a small team using standard vehicles and plant all that will be required. Heavy vehicles delivering the waste will likely access the site daily, around 20 movements per day. Cumulative visual traffic impacts are considered negligible as most vehicle movements will be confined to the hard stand and sorting area close

to the site access from Trahairs Road and surrounded by existing vegetative screening to the east and south.

Generally, adverse cumulative visual impacts are anticipated to be manageable due to the existing and retained vegetative screening and undulating nature of the site that blocks out most views almost entirely.

6 MITIGATION STRATEGY

6.1 GENERAL MEASURES

The following measures are recommended to reduce the general visual impact of the development for all other receivers:

6.1.1 Design

The materials and colour of onsite infrastructure will, where practical, be non-reflective and in keeping with the materials and colouring of existing infrastructure or of a colour that will blend with the landscape. Where practical:

- Development should not interrupt the hills and visually prominent ridges throughout the Wagga Wagga LGA.
- Ridgelines at all times, are to remain visible above the topmost ridge of all new buildings, when viewed from any point along the eastern boundary of the Bomen Urban Release Area.
- Buildings will be non-reflective and in eucalypt green, beige or muted brown.
- Avoidance of unnecessary lighting, signage and logos.
- Retain and protect existing boundary landscaping.
- Natural features at the site, such as trees, rock outcrops, cliffs, ledges, and native flora and fauna communities are to be retained and incorporated into the design of the development.

6.1.2 Construction

- During construction, dust would be controlled in response to visual cues.
- Areas of soil disturbed by the project would be rehabilitated progressively or immediately post-construction, reducing views of bare soil.
- Existing groundcover on future cells should be retained for as long as possible until removal is required.
- Appropriate sizing and placement of stockpiles should be ensured.
- Construction and maintenance areas should be maintained in an orderly and tidy state.

6.1.3 Operation

- During operation, dust will be controlled in response to visual cues.
- Areas around the waste cell will be managed to reduce bare soil and maintain existing vegetation.
- Waste delivered to the landfill would be covered daily.
- Escaped litter and landfill waste would be removed weekly from perimeter fencing.

- Plantings may be required along the perimeter fencing to break up the view in areas where there is not existing vegetation.
- Once a sub-cell has reached capacity, it will be capped and revegetated. The finished height of the cell above ground level will be limited to 6 m.

7 CONCLUSION

This report has been prepared to assess the potential visual impacts of the proposed North Ridge Materials Facility in Bomen, a suburb of Wagga Wagga. A systematic evaluation has been undertaken to address subjectivity as much as possible. The report was informed by background investigations including mapping and field survey. This included reconnaissance, ground truthing and photography.

The proposed materials facility would be located in an industrial area of generally low scenic quality. The industrial area is surrounded by agricultural land with moderate to high scenic quality. No viewpoints were considered to be highly or moderately impacted by the proposal.

General measures to reduce impacts for all receivers have also been recommended. These centre on use of design elements to reduce visual contrast, mitigation of construction impacts such as dust and traffic that may reduce visual amenity, and mitigation of operational impacts such as maintaining ground cover around the facility to break up side-on and front views of the proposal and soften the appearance of the facility.

The visual impacts of the proposal are considered acceptable and manageable.

8 REFERENCES

Australian Bureau of Statistics (ABS) (2016) *2016 Census QuickStats Wagga Wagga LGA*. http://www.censusdata.abs.gov.au/census_services/getproduct/census/2016/quickstat/LGA17750?opendocument [accessed June 2018]

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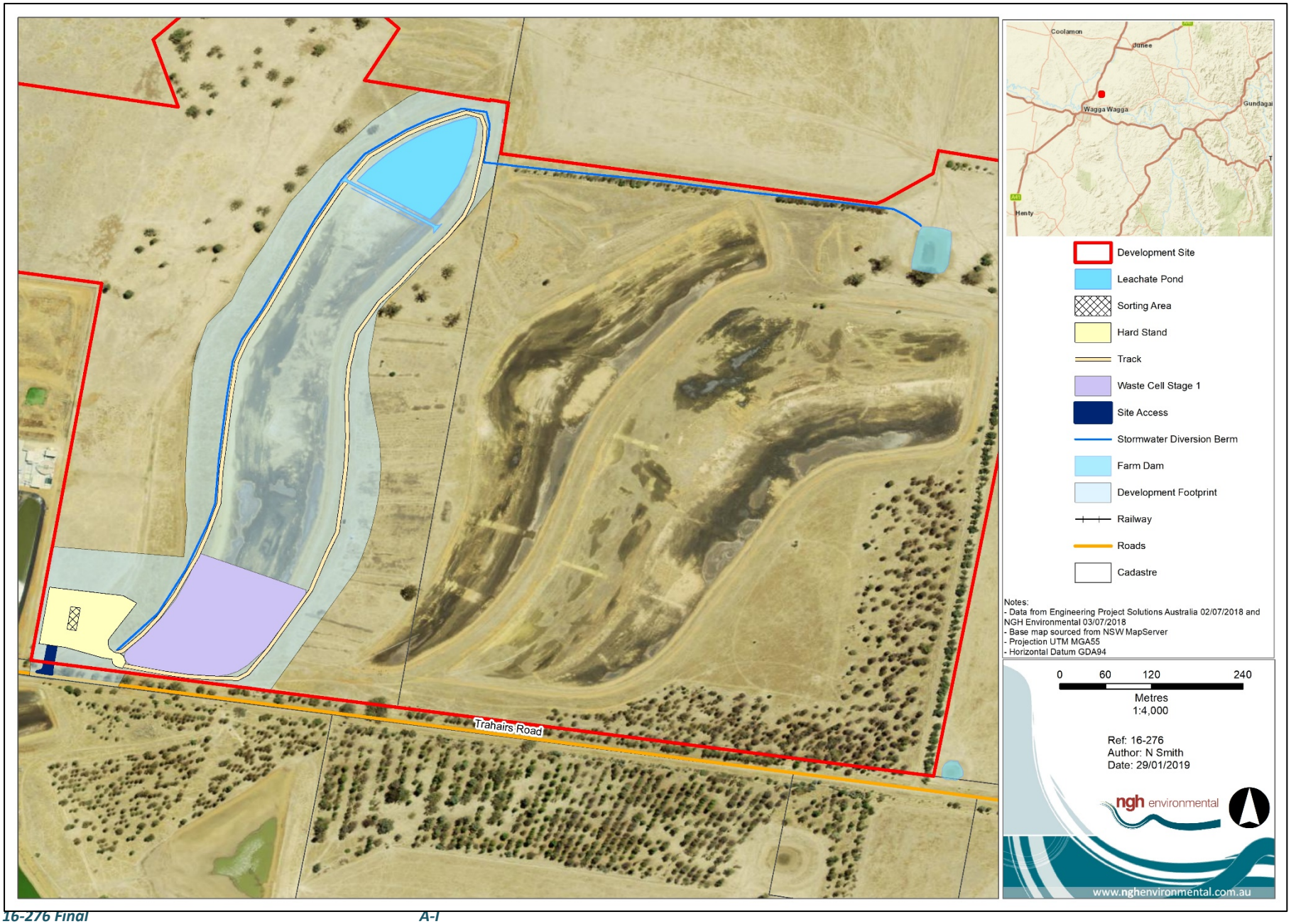
BLM, n.d., *BLM Visual Resource Management System. Available online from the Bureau of Land Management*, US Department of the Interior. (www.blm.gov)

Daily Advertiser, The (2017) *Eunony Valley Association Slam 'Impossible' Landfill Plan as Developers Hit Back at Accusations.* November 14 2017, Fairfax Media.

Idcommunity (2017) *Gross Domestic product | Wagga Wagga City | economy.id.* http://economy.id.com.au/wagga-wagga/gross-product [accessed June 2018]

McCrea, R., Walton, A., Jeanneret, T., Lacey, J. and Moffat, K. (2016) *Attitudes and social acceptance in the waste and resource recovery sector*. CSIRO, Australia.

Appendix A LOCATION AND PROPOSED INFRASTRUCTURE LAYOUT


Trahairs Road
Coolamon
Junee
Wagga Wagga
Gundagai
Henty
Development Site
Leachate Pond
Sorting Area
Hard Stand
Track
Waste Cell Stage 1
Site Access
Stormwater Diversion Berm
Farm Dam
Development Footprint
Railway
Roads
Cadastre
Notes:
- Data from Engineering Project Solutions Australia 02/07/2018 and NGH Environmental 03/07/2018
- Base map sourced from NSW MapServer
- Projection UTM MGA55
- Horizontal Datum GDA94
0 60 120 240
Metres
1:4,000
Ref: 16-276
Author: N Smith
Date: 29/01/2019
ngh environmental
www.nghenvironmental.com.au

APPENDIX Q DIAL BEFORE YOU DIG

Dial Before You Dig (DBYD)
Location Information

91 Hammond Avenue
Wagga Wagga, NSW, 2650
Ph: (02) 6922 0608 Fax: (02) 6921 2241
www.rwcc.nsw.gov.au

To:
NGH Environmental - Ms Nicola Smith
Suite 1 39 Fitzmaurice Street
Wagga Wagga NSW 2650

Enquiry Details	
Utility ID	90329
Sequence Number	73157251
Enquiry Date	05/07/2018 12:09
Response	**NOT AFFECTED**
Address	223 Trahairs Road Bomen
Location in Road	Nature Strip
Activity	Planning & Design

Enquirer Details			
Customer ID	1863656		
Contact	Ms Nicola Smith		
Company	NGH Environmental		
Email	nicola.s@nghenvironmental.com.au		
Phone	0269231537	**Mobile**	Not Supplied

Disclaimer

Plans issued by RWCC are valid for 60 days unless otherwise stated. If this timeframe has elapsed, you will be required to reapply via Dial Before You Dig. RWCC plans are provided for the use of the applicant only and must not be distributed to any third parties. Please contact RWCC if assets are identified that are not shown on the plans. RWCC shall not be liable for any loss or damage caused by the use of its plans and/or information supplied to the applicant. Please ensure RWCC plans and information provided remains on-site at all times during construction

Powered by dbyd

Your Enquiry falls more than 25m from one or more of RWCC's assets

IMPORTANT:

- The attached plan/s shows RWCC assets within the specified search area.
- Schematic plans supplied depict locations of RWCC's assets in the general vicinity of the search area. Exact depths and alignments are not supplied.
- Plans have been prepared for RWCC's own use. RWCC supplies them at no cost with the objective of reducing the risk of accidental damage occurring to its network. **Riverina Water County Council does not accept any liability for inaccuracies or any lack of information on the plans, or any damage to Riverina Water County Council assets resulting from, or in connection with the information provided.**

CONCERNING RWCC PLANS:

- Plans issued by RWCC are valid for 60 days unless otherwise stated. If this timeframe has elapsed, you will be advised to reapply via Dial Before You Dig.
- RWCC plans are provided for the use of the applicant only and must not be distributed to any third parties.
- Please contact RWCC if assets are identified that are not shown on the plans.
- RWCC shall not be liable for any loss or damage caused by the use of its plans and/or information supplied to the applicant.
- Please ensure RWCC plans and information provided remains on-site at all times during construction.

DUTY OF CARE:

When working in the vicinity of RWCC assets, the applicant has a duty of care to:

- Request plans of RWCC assets in the affected work area before commencing work.
- Visually locate RWCC assets prior to commencing excavation.
- Maintain safe clearances when constructing in the vicinity of RWCC assets.
- Ensure that any construction does not have a negative impact on any RWCC asset. **Where there is a potential for conflict with RWCC assets, please contact RWCC before construction or excavation commences to discuss options before approval is granted**.

DAMAGE:

IN CASE OF EMERGENCY OR TO REPORT DAMAGE

PHONE (02) 6922 0608

IMMEDIATELY

- The contractor, or other agency, is liable for all damage to RWCC assets when works commence prior to obtaining plans, or failure to follow agreed instructions.
- All damage, regardless of severity, must be reported to RWCC immediately.
- RWCC reserves the right to recover compensation for costs associated with repairing damage due to careless or negligent practices carried out by the applicant.
- **Riverina Water County Council does not accept any liability for loss or damage occurring due to inaccuracy or lack of information on the plans provided.**

FURTHER ASSISTANCE:

RWCC offers further assistance where more information is required as detailed below:

- **Work as Executed Plans** - RWCC can supply WAE plans if they are available to assist in locating any assets in our network. Not all assets have WAE plans available. For further assistance please contact RWCC on (02) 6922 0608.
- **On-site Assistance** - RWCC offers on-site assistance to help identify the location of its assets. On-site location/detection is a free service which will help identify our asset to the best of our knowledge. If potholing/excavation of the site is required, it will be costed out at the required rate and applicant billed accordingly. To arrange an on-site location contact RWCC on (02) 6922 0608. **Please note that a minimum of 24 hours notice is required in advance for on-site assistance.**

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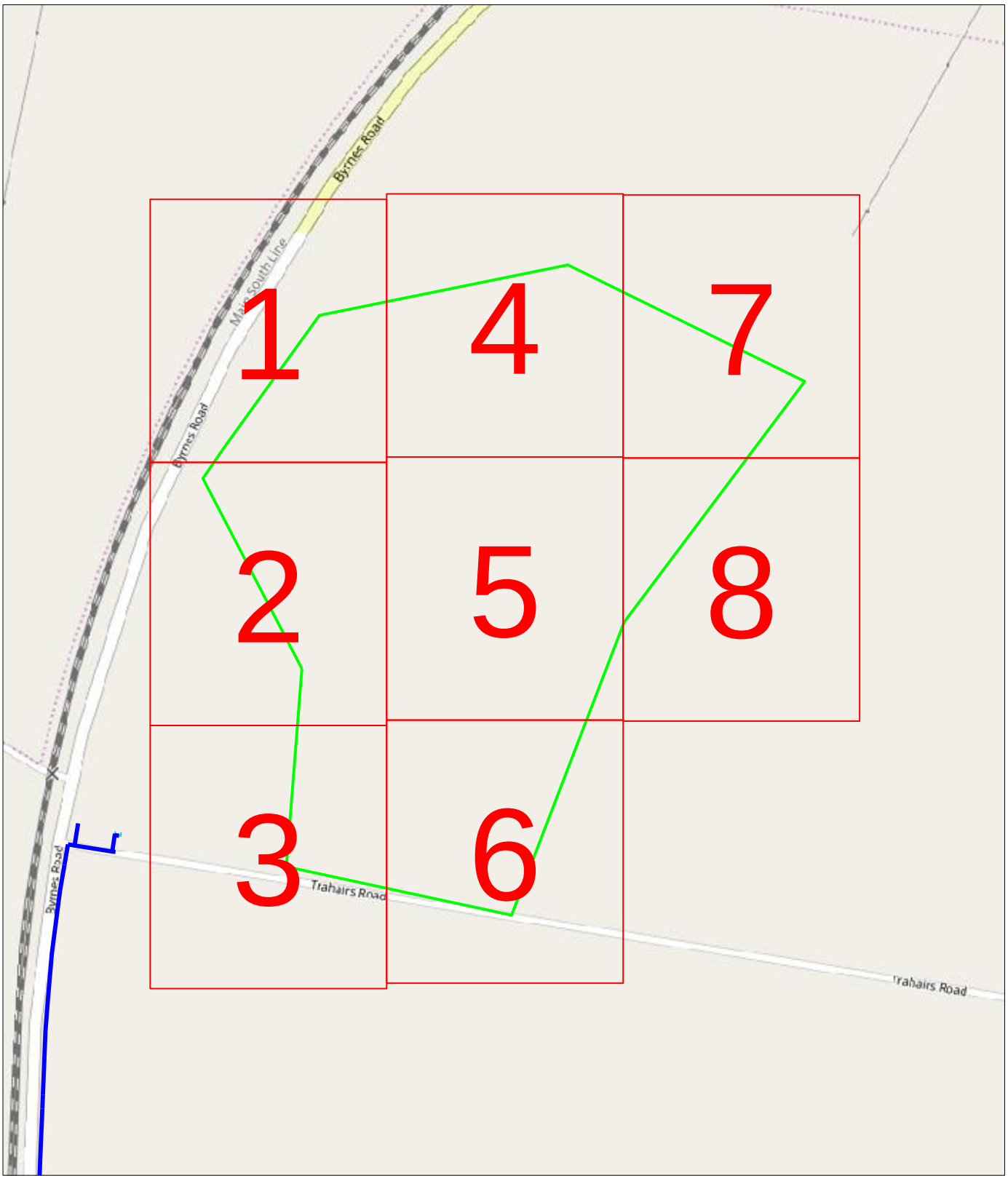
Date: 15/07/2018

Overview Map

Sequence No: 73157251

223 Trahairs Road Bomen



LEGEND:

1 Detail Map

Water Main

Service Connection Pipe

Proposed Construction Area

Not Affected DBYD Work Area

N

0 0.07km

Imagery sourced from Open StreetMaps

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Powered by dbyd

Date: 05/07/2018

Map 1

Sequence No: 73157251

223 Trahairs Road Bomen

N

0 0.01km

LEGEND:

- Property Boundary
- Proposed Construction Area
- Not Affected DBYD Work Area

- Nodes - Air_Release_Valve
- Nodes - Borehole
- Nodes - Butterfly_Valve
- Nodes - Check_Valve
- Nodes - Cleaning_Port
- Nodes - Closed_Valve
- Nodes - Endcap
- Nodes - Gate_Valve
- Nodes - Hydrant_Single
- Nodes - Junction
- Nodes - Meter
- Nodes - Pres_Reducing_Valve
- Nodes - Pres_Sustain_Valve
- Nodes - Pump
- Nodes - Reducer
- Nodes - Reservoir
- Nodes - Scour_Valve
- Nodes - Standpipe
- Nodes - Tower
- Nodes - Treatment_Plant
- Pipes - Raw
- Pipes - Abandoned
- Pipes
- Services - Service Connection Pipe

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Imagery sourced from Open StreetMaps

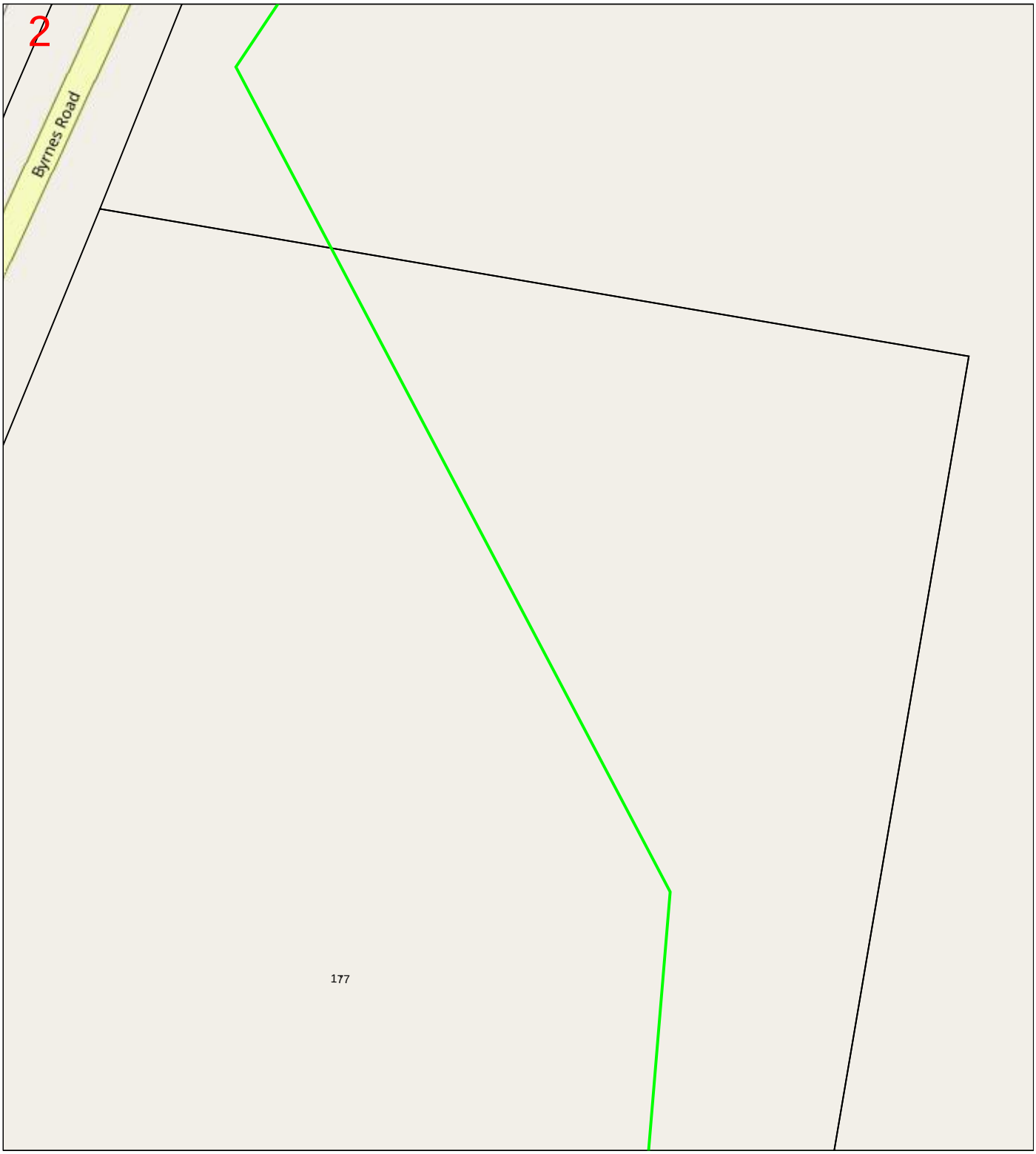
Powered by dbyd

Date: 05/07/2018

Map 2

Sequence No: 73157251

223 Trahairs Road Bomen



N

0 0.01km

LEGEND:

- Property Boundary
- Proposed Construction Area
- Not Affected DBYD Work Area

- Nodes - Air_Release_Valve
- Nodes - Borehole
- Nodes - Butterfly_Valve
- Nodes - Check_Valve
- Nodes - Cleaning_Port
- Nodes - Closed_Valve
- Nodes - Endcap
- Nodes - Gate_Valve
- Nodes - Hydrant_Single
- Nodes - Junction
- Nodes - Meter
- Nodes - Pres_Reducing_Valve
- Nodes - Pres_Sustain_Valve
- Nodes - Pump
- Nodes - Reducer
- Nodes - Reservoir
- Nodes - Scour_Valve
- Nodes - Standpipe
- Nodes - Tower
- Nodes - Treatment_Plant
- Pipes - Raw
- Pipes - Abandoned
- Pipes
- Services - Service Connection Pipe

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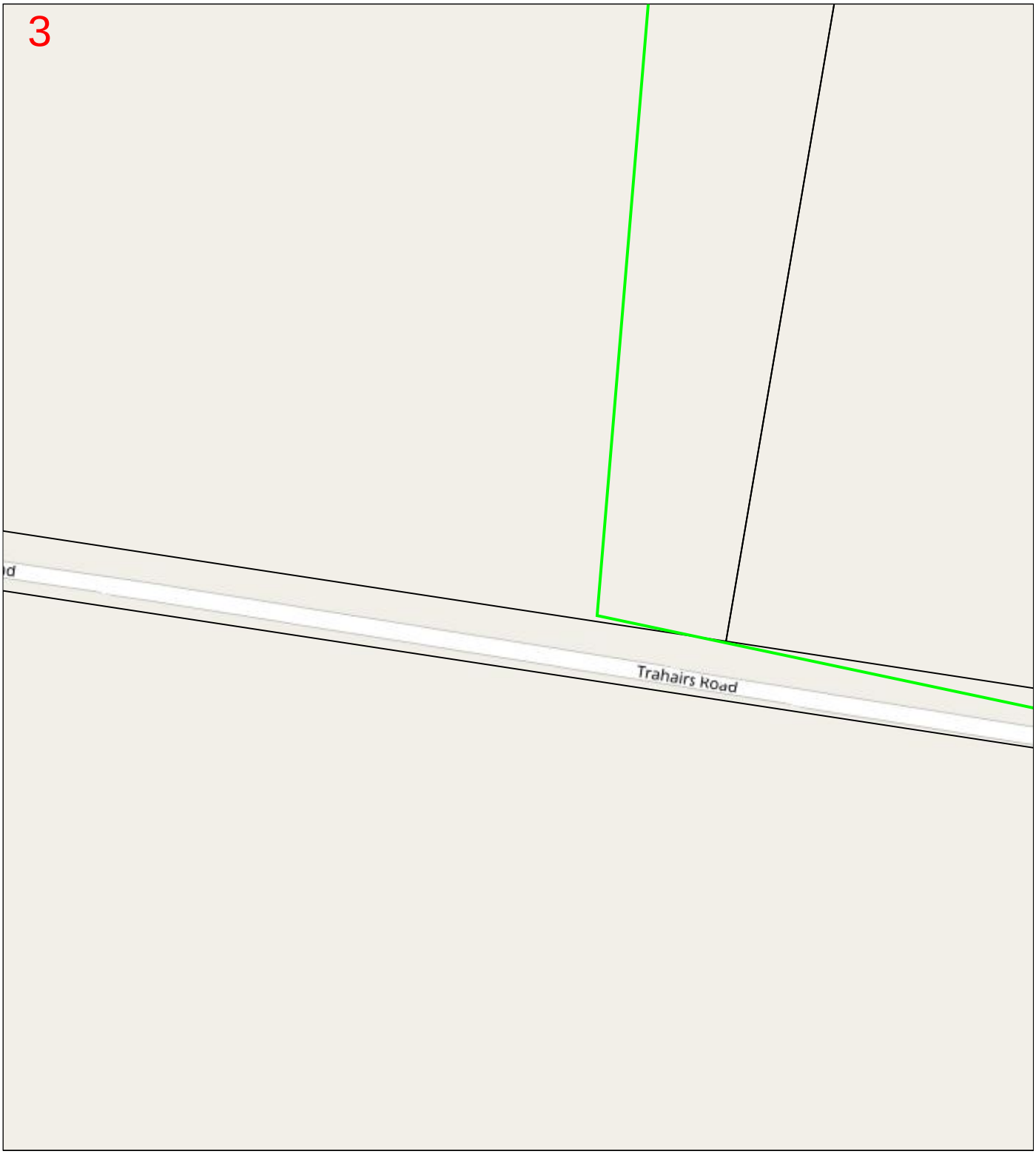
Imagery sourced from Open StreetMaps

Powered by dbyd

Map 3

Sequence No: 73157251

223 Trahairs Road Bomen



N

0 0.01km

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Imagery sourced from Open StreetMaps

LEGEND:

- Property Boundary
- Proposed Construction Area
- Not Affected DBYD Work Area

- Nodes - Air_Release_Valve
- Nodes - Borehole
- Nodes - Butterfly_Valve
- Nodes - Check_Valve
- Nodes - Cleaning_Port
- Nodes - Closed_Valve
- Nodes - Endcap
- Nodes - Gate_Valve
- Nodes - Hydrant_Single
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- Nodes - Pres_Reducing_Valve
- Nodes - Pres_Sustain_Valve
- Nodes - Pump
- Nodes - Reducer
- Nodes - Reservoir
- Nodes - Scour_Valve
- Nodes - Standpipe
- Nodes - Tower
- Nodes - Treatment_Plant
- Pipes - Raw
- Pipes - Abandoned
- Pipes
- Services - Service Connection Pipe

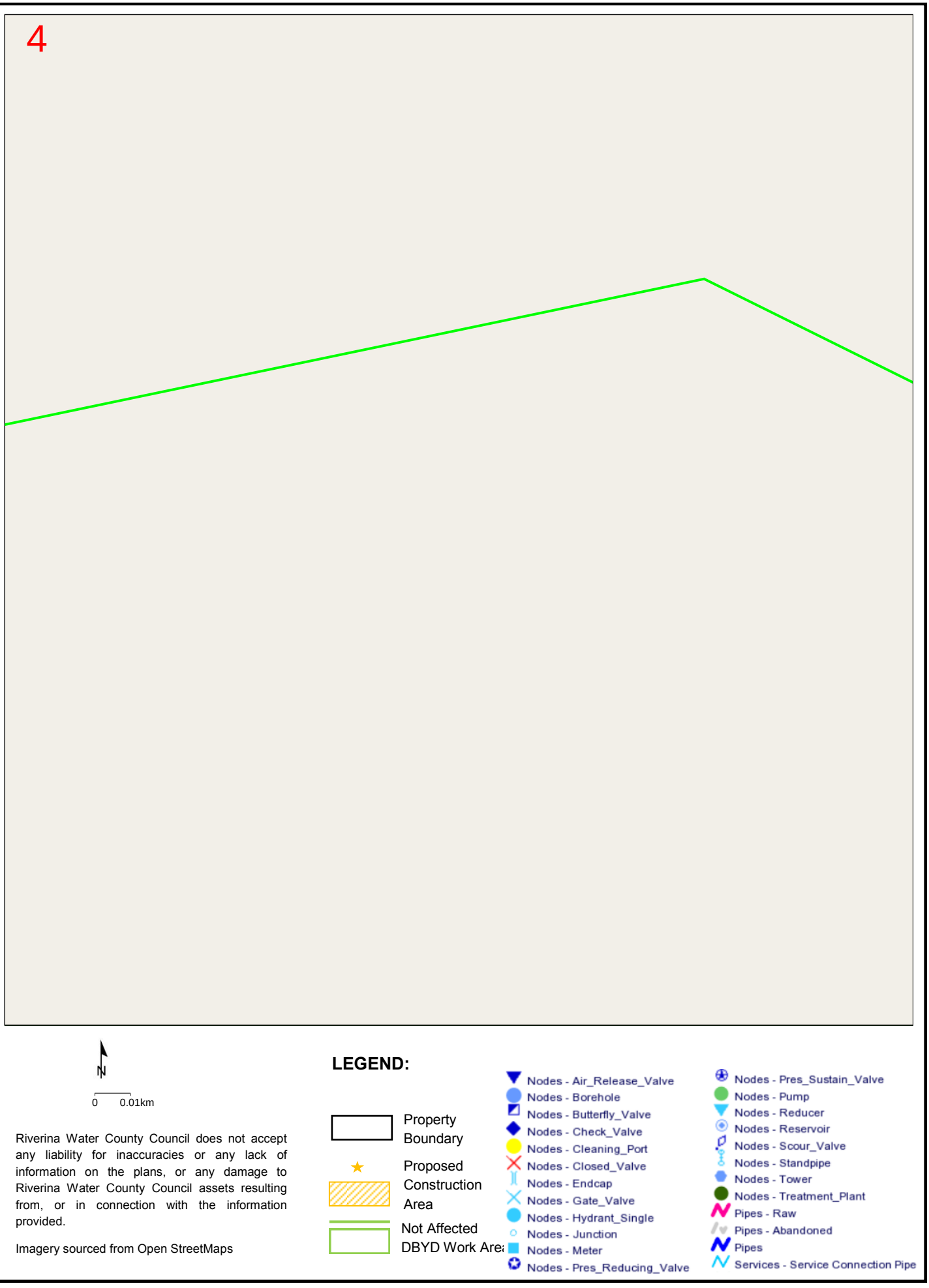
Powered by dbyd

Date: 05/07/2018

Map 4

Sequence No: 73157251

223 Trahairs Road Bomen



Riverina Water County Council does not accept any liability for inaccuracies or any lack of information on the plans, or any damage to Riverina Water County Council assets resulting from, or in connection with the information provided.

Imagery sourced from Open StreetMaps

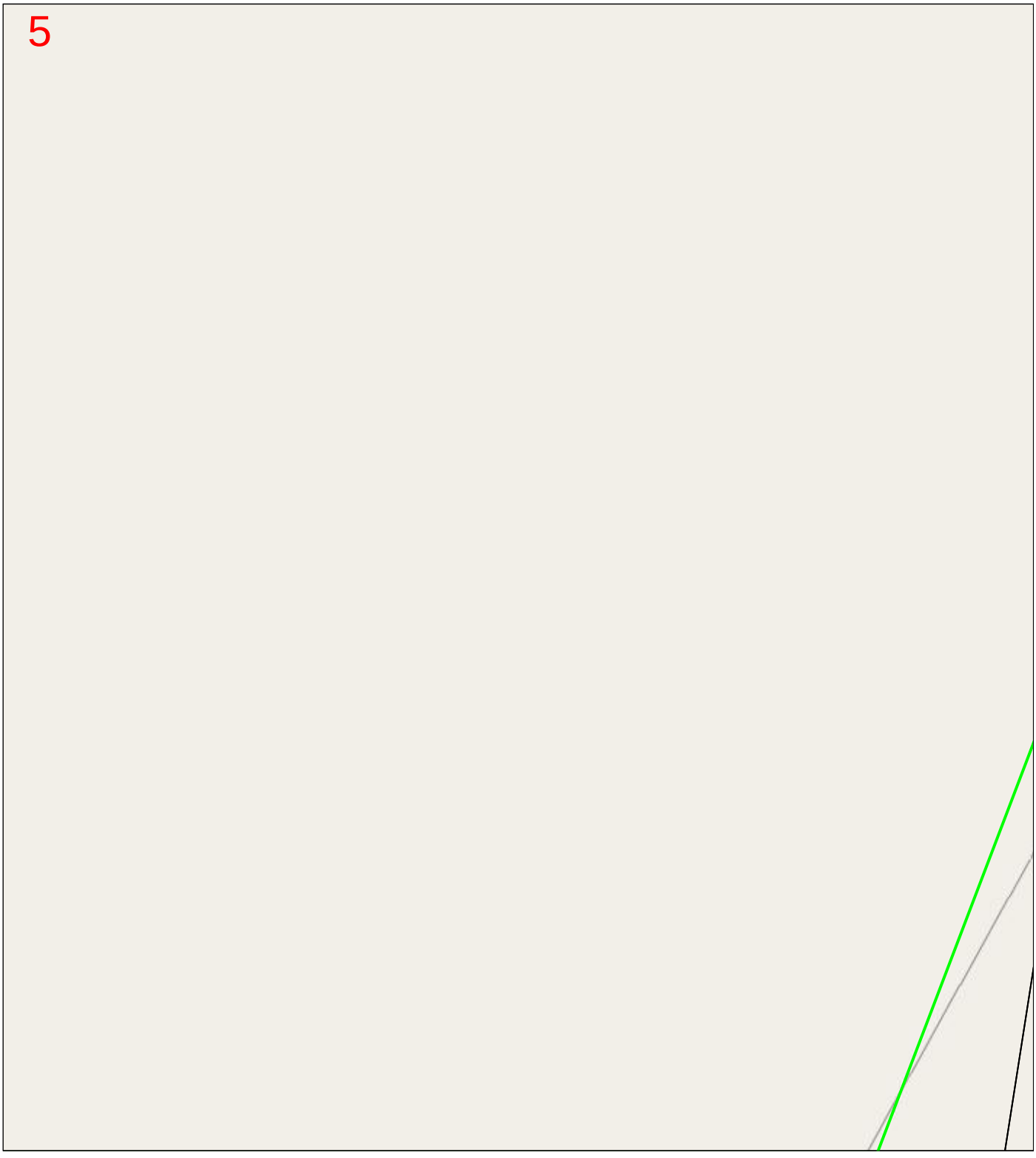
Powered by dbyd

Date: 05/07/2018

Map 5

Sequence No: 73157251

223 Trahairs Road Bomen



N

0 0.01km

Riverina Water County Council does not accept any liability for inaccuracies or any lack of information on the plans, or any damage to Riverina Water County Council assets resulting from, or in connection with the information provided.

Imagery sourced from Open StreetMaps

LEGEND:

- Property Boundary
- Proposed Construction Area
- Not Affected DBYD Work Area

- Nodes - Air_Release_Valve
- Nodes - Borehole
- Nodes - Butterfly_Valve
- Nodes - Check_Valve
- Nodes - Cleaning_Port
- Nodes - Closed_Valve
- Nodes - Endcap
- Nodes - Gate_Valve
- Nodes - Hydrant_Single
- Nodes - Junction
- Nodes - Meter
- Nodes - Pres_Reducing_Valve
- Nodes - Pres_Sustain_Valve
- Nodes - Pump
- Nodes - Reducer
- Nodes - Reservoir
- Nodes - Scour_Valve
- Nodes - Standpipe
- Nodes - Tower
- Nodes - Treatment_Plant
- Pipes - Raw
- Pipes - Abandoned
- Pipes
- Services - Service Connection Pipe

Powered by dbyd

Date: 05/07/2018

Map 6

Sequence No: 73157251

223 Trahairs Road Bomen

N

0 0.01km

LEGEND:

- Property Boundary
- Proposed Construction Area
- Not Affected DBYD Work Area

- Nodes - Air_Release_Valve
- Nodes - Borehole
- Nodes - Butterfly_Valve
- Nodes - Check_Valve
- Nodes - Cleaning_Port
- Nodes - Closed_Valve
- Nodes - Endcap
- Nodes - Gate_Valve
- Nodes - Hydrant_Single
- Nodes - Junction
- Nodes - Meter
- Nodes - Pres_Reducing_Valve
- Nodes - Pres_Sustain_Valve
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- Nodes - Standpipe
- Nodes - Tower
- Nodes - Treatment_Plant
- Pipes - Raw
- Pipes - Abandoned
- Pipes
- Services - Service Connection Pipe

Riverina Water County Council does not accept any liability for inaccuracies or any lack of information on the plans, or any damage to Riverina Water County Council assets resulting from, or in connection with the information provided.

Imagery sourced from Open StreetMaps

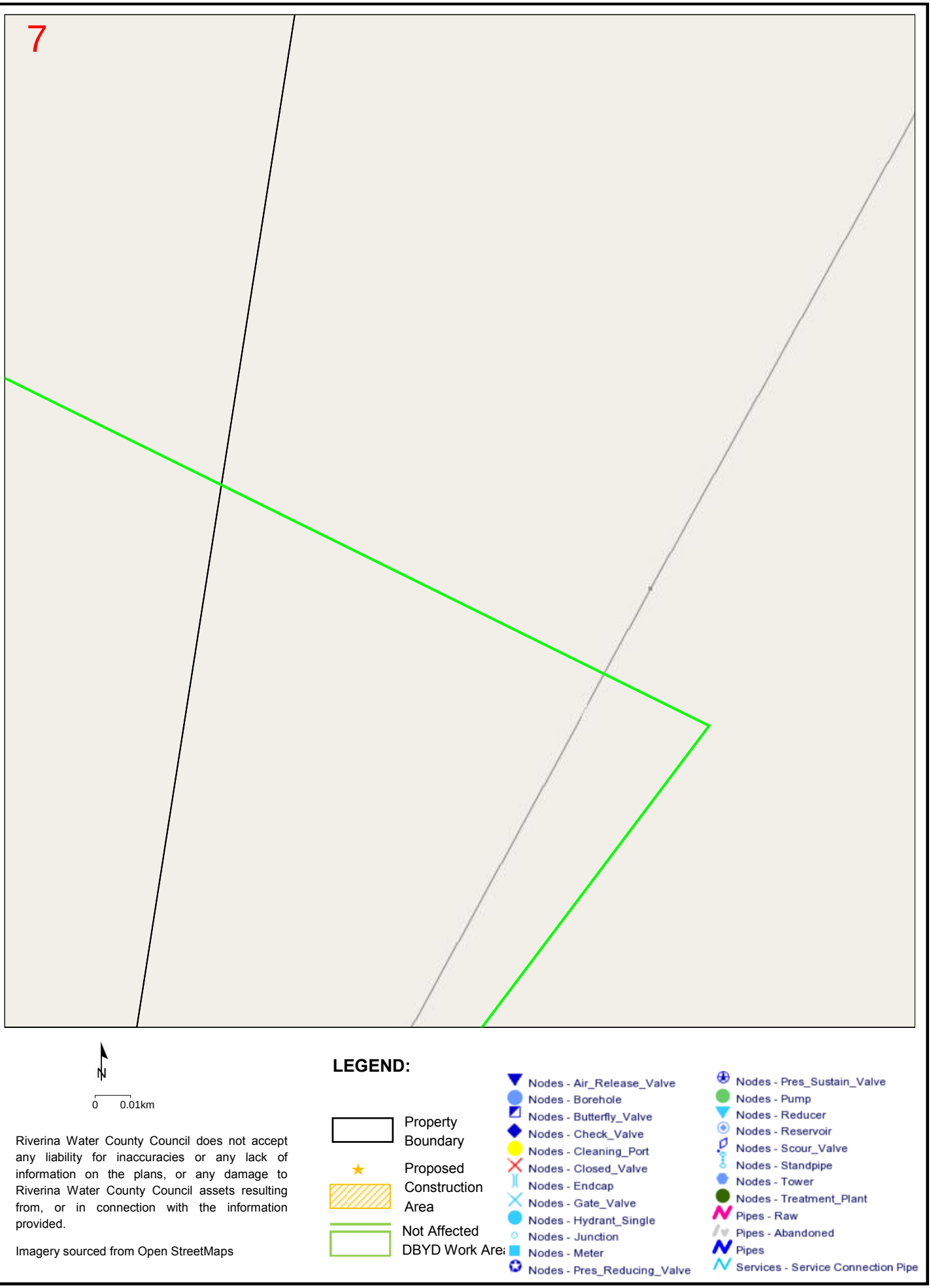
Powered by dbyd

Date: 05/07/2018

Map 7

Sequence No: 73157251

223 Trahairs Road Bomen



Riverina Water County Council does not accept any liability for inaccuracies or any lack of information on the plans, or any damage to Riverina Water County Council assets resulting from, or in connection with the information provided.

Imagery sourced from Open StreetMaps

Powered by dbyd

Date: 05/07/2018

Map 8

Sequence No: 73157251

223 Trahairs Road Bomen

N

0 0.01km

Riverina Water County Council does not accept any liability for inaccuracies or any lack of information on the plans, or any damage to Riverina Water County Council assets resulting from, or in connection with the information provided.

Imagery sourced from Open StreetMaps

LEGEND:

- Property Boundary
- Proposed Construction Area
- Not Affected DBYD Work Area

- Nodes - Air_Release_Valve
- Nodes - Borehole
- Nodes - Butterfly_Valve
- Nodes - Check_Valve
- Nodes - Cleaning_Port
- Nodes - Closed_Valve
- Nodes - Endcap
- Nodes - Gate_Valve
- Nodes - Hydrant_Single
- Nodes - Junction
- Nodes - Meter
- Nodes - Pres_Reducing_Valve
- Nodes - Pres_Sustain_Valve
- Nodes - Pump
- Nodes - Reducer
- Nodes - Reservoir
- Nodes - Scour_Valve
- Nodes - Standpipe
- Nodes - Tower
- Nodes - Treatment_Plant
- Pipes - Raw
- Pipes - Abandoned
- Pipes
- Services - Service Connection Pipe

Powered by dbyd

APA Group
PO Box 6014 Halifax Street
South Australia 5023

05/07/2018

Company: NGH Environmental
Ms Nicola Smith
Suite 1 39 Fitzmaurice Street
Wagga Wagga
NSW 2650

nicola.s@nghenvironmental.com.au

Dear Ms Nicola Smith

Sequence Number: 73157250
Worksite Address: 223 Trahairs Road
Bomen
NSW 2650

Thank you for your Dial Before You Dig enquiry regarding the location of Gas Assets, we can confirm that the APA Group Network's Division has **no** underground Gas Assets in the vicinity of the above location.

You are hereby notified that the attached Duty of Care requirements apply to any activity in the vicinity of Gas Assets operated by APA, please ensure you read and comply with all the relevant requirements.

Should you have any questions with regards to the attached information please contact our Dial Before You Dig officer - (08) 8115 4500.

Caution - Damage to gas assets could result in possible explosion and fire with the risk of personal injury
For Gas Emergencies please call 1800 427 532.

Please find enclosed the following information: -

- APA's Duty of Care, if you are unclear of your obligations under these requirements please contact the APA Representative listed above immediately
- An overview map with your requested area highlighted to assist in identifying the location of APA's Gas Assets
- A map(s) showing APA's Gas Assets in the requested area, this information is valid for 30 days from the date of this response, **please check this represents the area you requested**, if it does not, please contact the APA Representative listed above immediately

Please Note: For some DBYD enquiries, you might receive 2 responses from the APA Group. Please read both responses carefully as they will relate to different assets. It is your responsibility to action all requirements set out in APA Group responses.

Please take some time to review the entire response document and check the information supplied and please let us have any feedback by sending an email to DBYDNetworksAPA@apa.com.au or contacting us direct on (08) 8115 4500.

Yours Faithfully,

Dial Before You Dig Officer
APA Group
Email: DBYDNetworksAPA@apa.com.au

Duty of Care - Working Around Gas Assets

General Conditions

- This location enquiry is valid for 30 days from the enquiry date
- Expired locations, i.e., over 30 days from the date of this response, require a new Dial Before You Dig request to validate location information
- The location information supplied in this document shall be used as a guide only. APA Group shall not be liable or responsible for the accuracy of any such information supplied pursuant to this request
- It is the responsibility of the excavator to expose all Gas Assets, including Gas Services pipelines (see below), **by hand** (Please Note: Do not use vacuum excavation systems as damage to Gas Assets may occur). Gas Asset depths may vary according to ground conditions
- Gas Service pipelines (inlet service) connecting Gas Assets in the street to the gas meter on the property are typically **not** marked on the map
- Some Gas Assets are installed inside of a casing. The locations where a Gas Asset changes from inserted to direct burial are not marked on the map
- This information has been generated by an automated system based on the area highlighted in your DBYD request and has not been independently verified. It is your responsibility to ensure that the information supplied in this response matches the dig site you defined when submitting your Dial Before You Dig enquiry. If the information does not match the dig site or you have any question, please contact APA immediately using the details listed on the first page and / or please resubmit your enquiry
- For Gas Emergencies please call 1800 427 532

Site Address	223 Trahairs Road Bomen 2650	**Sequence No**	73157250
Name	Ms Nicola Smith		
Email	nicola.s@nghenvironmental.com.au		

Scale 1: 6500	NORTH	Enquiry Area Map Key Area

Enquiry Summary Manual Print

Your request has been submitted

Your Responsibilities and Duty of Care

If plans are not received within two working days, contact the asset owners directly and quotes the their sequence number
ALWAYS perform an onsite inspection for the presence of assets. Should you require an onsite location, contact the asset owners directly.
Please remember, plans do not detail the exact location of assets.
Pothole to establish the exact location of all underground assets using a hand shovel, before using heavy machinery.
Ensure you adhere to any state legislative requirements regarding Duty of Care and Safe Digging Requirements.
If you damage an underground asset you MUST advise the asset owner immediately.
By using this service, you agree to the privacy policy and terms and disclaimers set out at the 1100 website
For more information on safe excavation practices, visit the 1100 website

Asset Owner Details

The assets owners listed below have been requested to contact you with information about their asset locations within 2 working days.
Additional time should be allowed for information issued by post. It is **your responsibility** to identify the presence of any underground assets in and around your proposed dig site. Please be aware, that not all asset owners are registered with the Dial Before You Dig service, so it is **your responsibility** to identify and contact any asset owners not listed here directly.
** Asset owners highlighted by asterisks ** require that you visit their offices to collect plans.
# Asset owners highlighted with a hash require that you call them to discuss your enquiry or to obtain plans.
^^ Permit Request Sent. Some DBYD Local Government are now using the Permit Manager system to run their permit application process. If your enquiry is in the area of one of those councils, the council takes the enquiry you have lodged with DBYD and converts it to a permit application. In such cases, a status of "Permit Request Sent" will be shown in the table below.

Enquiry Lodging Details	
Job No	**14519467**
Job lodged on	05/07/2018 - 12:09:10 pm
Priority	Normal
Job was lodged by	Web
Delivery Method	Email - nicola.s@nghenvironmental.com.au

Enquiry Details	
Address	223 Trahairs Road Bomen NSW 2650
Job Purpose	Design
Activity	Planning & Design
Job Start	01/01/2019
Job Completion	31/08/2019

User Reference	North Ridge
Working on Behalf of	Private
Location of Workplace	Both
Location In Road Reserve	Nature strip

Notes/Description of Works

Some earthworks for site access off Trahairs Road, a hard stand and further excavation within the existing footprint of the evaporation pond.

Utility List

The following authorities are affected by this enquiry

Type	Sequence No	Authority	Phone	Status
Gas & Petroleum	73157250	APA Group Networks (APT Management Services P/L)	0881154500	Notification Sent
Electricity	73157246	Essential Energy	132391	Notification Sent
Water	73157251	Riverina Water County Council	0269220661	Notification Sent
Communications	73157248	Telstra NSW, South	1800653935	Notification Sent

Job No 14519467

Phone: 1100
www.1100.com.au

Caller Details

Contact:	Ms Nicola Smith	**Caller Id:**	1863656	**Phone:**	0269231537
Company:	NGH Environmental	**Mobile:**	Not Supplied	**Fax:**	Not Supplied
Address:	Suite 1 39 Fitzmaurice Street Wagga Wagga NSW 2650	**Email:**	nicola.s@nghenvironmental.com.au		

Dig Site and Enquiry Details

WARNING: The map below only displays the location of the proposed dig site and does not display any asset owners' pipe or cables. The area highlighted has been used only to identify the participating asset owners, who will send information to you directly.

User Reference: North Ridge
Working on Behalf of: Private

Enquiry Date:	Start Date:	End Date:
05/07/2018	01/01/2019	31/08/2019

Address:
223 Trahairs Road
Bomen NSW 2650

Job Purpose:	Onsite Activity:
Design	Planning & Design
Location of Workplace:	**Location in Road:**
Both	Nature Strip

- Check the location of the dig site is correct. If not submit a new enquiry.
- If the scope of works change, or plan validity dates expire, resubmit your enquiry.
- Do NOT dig without plans. Safe excavation is your responsibility. If you do not understand the plans or how to proceed safely, please contact the relevant asset owners.

Notes/Description of Works:
Some earthworks for site access off Trahairs Road, a hard stand and further excavation within the existing footprint of the evaporation pond.

Your Responsibilities and Duty of Care

- If plans are not received within 2 working days, contact the asset owners directly & quote their Sequence No.
- ALWAYS perform an onsite inspection for the presence of assets. Should you require an onsite location, contact the asset owners directly. Please remember, plans do not detail the exact location of assets.
- Pothole to establish the exact location of all underground assets using a hand shovel, before using heavy machinery.
- Ensure you adhere to any State legislative requirements regarding Duty of Care and safe digging requirements.
- If you damage an underground asset you MUST advise the asset owner immediately.
- By using this service, you agree to Privacy Policy and the terms and disclaimers set out at **www.1100.com.au**
- **For more information on safe excavation practices, visit www.1100.com.au**

Asset Owner Details

The assets owners listed below have been requested to contact you with information about their asset locations within 2 working days.
Additional time should be allowed for information issued by post. It is **your responsibility** to identify the presence of any underground assets in and around your proposed dig site. Please be aware, that not all asset owners are registered with the Dial Before You Dig service, so it is **your responsibility** to identify and contact any asset owners not listed here directly.
** Asset owners highlighted by asterisks ** require that you visit their offices to collect plans.
# Asset owners highlighted with a hash require that you call them to discuss your enquiry or to obtain plans.

Seq. No.	Authority Name	Phone	Status
73157250	APA Group Networks (APT Management Services P/L)	0881154500	NOTIFIED
73157246	Essential Energy	132391	NOTIFIED
73157251	Riverina Water County Council	0269220661	NOTIFIED
73157248	Telstra NSW, South	1800653935	NOTIFIED

END OF UTILITIES LIST

CABLE/PIPE LOCATION

No assets were found in the search area

COMPANY NAME:	NGH Environmental
ATTENTION:	Ms Nicola Smith
EMAIL:	nicola.s@nghenvironmental.com.au
SEARCH LOCATION:	223 Trahairs Road Bomen NSW 2650
SEQUENCE NO:	73157246
DATE:	Thursday, 5 July 2018

Provision of Plans:
Please find enclosed plans depicting approximate locations of **Essential Energy** assets in the search location***. The excavator must not assume that there may not be assets owned by other network operators in the search location.***

Underground assets searched for	Underground assets found
Essential Energy Electrical	☐
Essential Energy Water & Sewerage	☐

Plans are updated from time to time to record changes to underground assets and may be updated by Essential Energy without notice. In the event that excavation does not commence within 28 days of receipt of a plan, a new plan should be obtained.

The excavator must retain the plans on site for the duration of the works.

The excavator shall report all damage made to Essential Energy assets immediately. Note that damage includes gouges, dents, holes and gas escapes.

IN CASE OF EMERGENCY OR TO REPORT DAMAGE:
PHONE 13 20 80

DISCLAIMER

Please be aware that plans may **not** reflect alterations to surface levels or the position of roads, buildings, fences etc. **Cable and pipe locations are approximate** and the plans are **not** suitable for scaling purposes. *Essential Energy does not retain plans for privately-owned underground electrical or water & sewerage assets located on private property.* ***Privately-owned underground electrical assets located on private property are the responsibility of the owner.***

The plans have been prepared for Essential Energy's sole use and benefit. **Essential Energy cannot and does not warrant the accuracy or completeness of the plans**. Essential Energy supplies them at no cost with the object of reducing the serious risk of unintentional damage being caused to its cables and pipes. **Essential Energy does not accept any responsibility for any omissions, inaccuracies or errors in the plans, or any reliance place on the material. Any reliance placed on any plan provided in response to your request is at your own risk.**

www.essentialenergy.com.au
ABN 37 428 185 226
PO Box 5730 Port Macquarie NSW 2444
Telephone: 13 23 91 Facsimile: 1800 354 636

Essential Energy retains all intellectual and industrial property rights which exists or may exist in or with respect to the plan(s). The material provided is not to be copies or distributed beyond you.

You release Essential Energy from and against all claims, demands, actions and proceedings arising out of or in any way related to the use of the provided material.

Location of Assets on Site:
The plans indicate only that cables and pipes may exist in the general vicinity – they do not pinpoint the exact location of the cables and pipes.

If it is found that the location of cables or pipes on the plans can be improved, please notify Essential Energy on 13 23 91 (or fax 1800 354 636).

All individuals have a duty of care they must observe when working in the vicinity of underground cables and pipes. It is the **excavator's responsibility to visually expose the underground cables and pipes manually**, **ie. by using hand-held tools and non-destructive pot-holing techniques prior to any mechanical excavation.** The excavator will be held responsible for all damage caused to the Essential Energy network or cables and pipes, and for the costs associated with the repair of any such damage. The excavator will also be held responsible for all damage caused to any persons.

When digging in the vicinity of underground assets, persons should observe the requirements of the applicable Codes of Practice published by the NSW Work Cover Authority or Safe Work Australia, and any amendments from time to time by the Authorities, including although not limited to:

- Excavation Work
- Managing Electrical Risks in the workplace
- How to manage and control asbestos in the workplace

(Please refer to https://www.workcover.nsw.gov.au/law-and-policy/legislation-and-codes/codes-of-practice).

When digging in the vicinity of **electrical assets** persons should observe the requirements of the **Electricity Supply Act 1995.**
Persons excavating near live underground electrical reticulation and/or earthing cables **must exercise extreme caution at all times and adhere to the requirements of Essential Energy's Electrical Safety Rules.** (These are available on our website: http://www.essentialenergy.com.au/content/safety-community and include

- **Work near Essential Energy's Underground Assets:**
  http://www.essentialenergy.com.au/asset/cms/pdf/contestableWorks/CEOP8041.pdf , and
- **Asbestos Fact Sheet**:
  http://www.essentialenergy.com.au/asset/cms/pdf/safety/AsbestosFactSheet.pdf

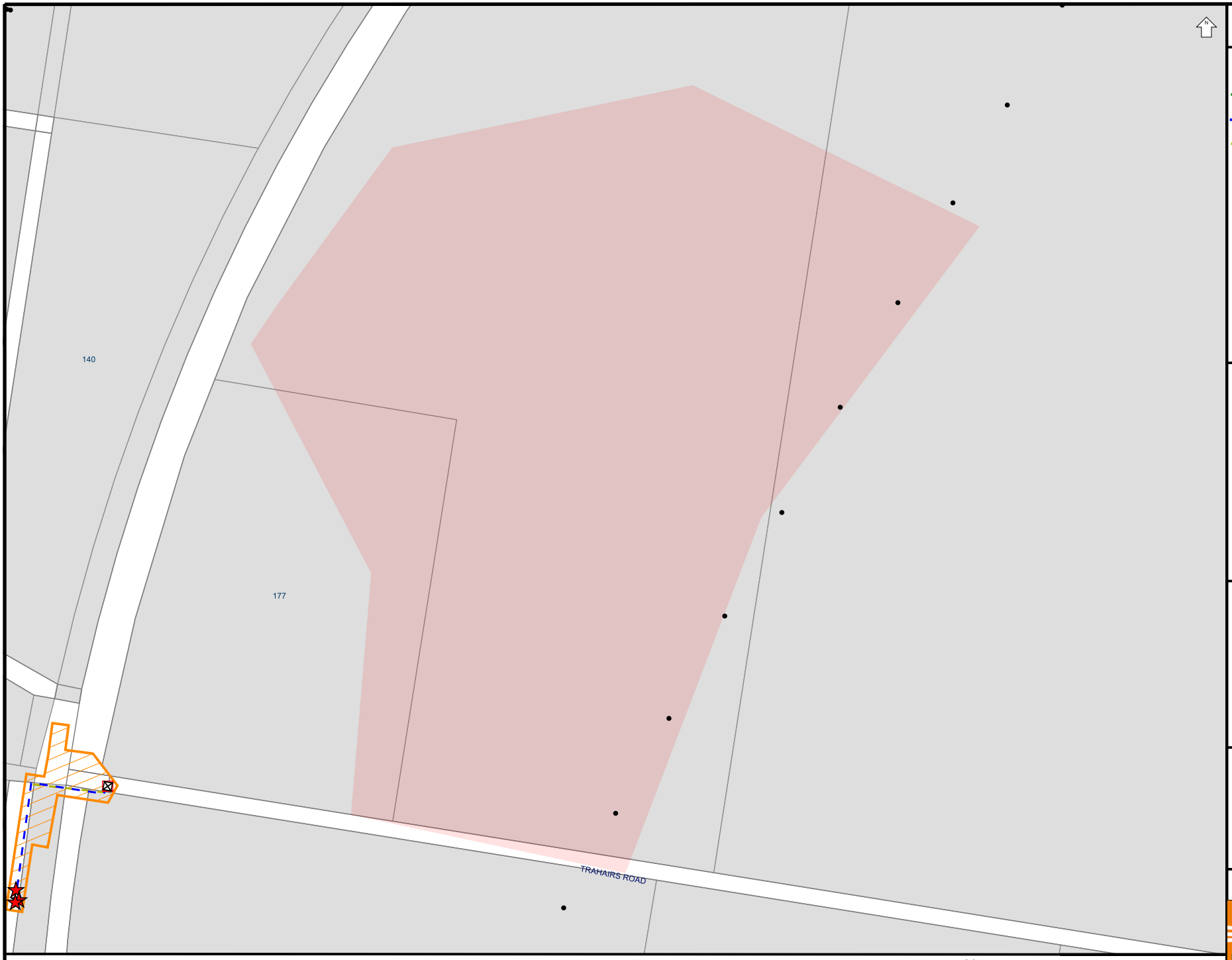
In some situations these procedures call for work to be performed by authorised staff.
Should there be any doubt as to the exact location of any underground electrical assets, and the potential for conflict with live underground cables caused by excavation at your work site, you should contact **13 23 91** to arrange for an on-site visit by an Essential Energy representative**.** No construction or mechanical excavation work is to commence prior to this on-site visit and approval being obtained.

When digging in the vicinity of **water or sewer assets** persons should observe the requirements of the **Water Management Act 2000.**
Should there be any doubt as to the exact location of any underground water and sewer assets, and the potential for conflict with underground water and sewer pipes caused by excavation at your work site, you should contact **13 23 91** to arrange for an on-site visit**.** No construction or excavation work is to commence prior to this on-site visit and approval being obtained.

Prior Notification:
Please note that for excavation depths greater than 250mm near power poles and stays you should allow for **advance notice** in your construction program to permit Essential Energy time to allocate the necessary field resources to carry out the inspection at the site a **minimum of fourteen (14) working days prior to work commencing**. This service may incur a fee and this can be negotiated with the local Area Coordinator at the time of making the appointment. Failure to give reasonable notice to the local Area Coordinator may result in disruption to Essential Energy's planned works program in the district and could incur an extra charge over and above the normal rate for this service.

For further information please call 13 23 91.

www.essentialenergy.com.au
ABN 37 428 185 226
PO Box 5730 Port Macquarie NSW 2444
Telephone: 13 23 91 Facsimile: 1800 354 636



Overhead wires not shown
LOOK UP & LIVE!

LEGEND

- LV Underground Cable
- HV Underground Cable
- Underground Pipe
- Underground Earth or Wires
- Ground Substation
- Pole
- Cubicle
- Pit
- Area of Interest

Critical Assets

Contact Essential Energy on 13 23 91

- Zone Substation
- Underground Cable
- Underground Fibre

Proposed Works

- Area of proposed works

Proposed assets are shown as orange symbols

THE INFORMATION ON THIS MAP MAY NOT BE ACCURATE.
If details are incorrect, please notify Essential Energy on 13 23 91 (or fax 1800 354 636)

ISSUE DATE: 05/07/2018

You must resubmit your request if you have not started work within 4 weeks of the 'Issue Date' above

A4 | SCALE: 1:6143

essential energy

Job Number: 14519467 Sequence number: 73157246 Job location: 223 Trahairs Road, Bomen Map Centre: 147° 26' 9.5", -35° 2' 37.5"

APPENDIX R CONTAMINATION ASSESSMENT

CONSULTING EARTH SCIENTISTS

10 January 2019

CES Document Reference:
CES181110-NGH-AA

NGH Environmental Pty Ltd
Suite 1, 39 Fitzmaurice Street
Wagga Wagga, NSW 2650

RE: North Ridge Materials Facility,
CEnvP: SC Review of Preliminary Site Investigation

For the Attention of Nicola Smith

Dear Sirs,

1 INTRODUCTION

NGH Environmental Pty Ltd (NGH) was engaged to prepare a Preliminary Site Investigation (PSI) for the proposed North Ridge Materials Facility site, located at 223 and 299 Trahairs Road, Bomen, NSW.

Consulting Earth Scientists Pty Ltd (CES) was commissioned by NGH, to carry out a review of the PSI by a Certified Environmental Practitioner: Site Contamination Specialist (CEnvP:SC) in order to provide an independent assessment of the report. As a result, Mark Challoner – Principal Environmental Scientist, CEnvP: SC (No. SC40106), has reviewed the *Preliminary Site Investigation Report, North Ridge Materials Facility* (project No. 16-276, Draft v1.3, prepared by NGH (dated 23 November 2018).

The objective of the PSI is to characterise potential soil and groundwater contamination at the site, identify the contamination sources, possible exposure pathways, and the likely on-site and off-site receptors and to determine whether the site is suitable for the proposed use.

Upon my review of the PSI, and following e-mail correspondence (dated 16 November 2018), I am satisfied with the PSI and that it has been prepared in general accordance with the relevant standards, legislation and guidelines, namely:

CONSULTING EARTH SCIENTISTS
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5 Brunker Road
Broadmeadow NSW 2292
Australia
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W www.consultingearth.com.au

- NSW EPA, *Contaminated Sites Guidelines for Consultants Reporting on Contaminated Sites* (2011);
- *State Environmental Planning Policy 55 – Remediation of Land (SEPP 55)* NSW EPA (2014); and
- *National Environment Protection (Assessment of Site Contamination) Measure* (NEPM), (2013).

2 CLOSURE

Should you require further information or clarification of any details, please do not hesitate to contact the undersigned on 02 4940 7230.

For and on behalf of Consulting Earth Scientists Pty Ltd.

Certified Environmental Practitioner: Site Contamination Specialist
Principal Environmental Scientist

Preliminary Site Investigation Report

NORTH RIDGE MATERIALS FACILITY

JANUARY 2019

ngh environmental

Document Verification

Project Title: North Ridge Materials Facility

Project Number: 16-276

Project File Name: Preliminary Site Investigation North Ridge

Revision	Date	Prepared by (name)	Reviewed by (name)	Approved by (name)
Final	29/01/19	Nicola Smith	Michial Sutherland Mark Challoner	Erwin Budde

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ACRONYMS AND ABBREVIATIONS

CSM	Conceptual Site Model
DMM	D McMahon Pty Ltd
DPE	NSW Department of Planning and Environment
EPA	New South Wales Environmental Protection Authority
ha	Hectares
km	Kilometres
LEP	Local Environment Plan
m	Metres
NATA	National Association of Testing Authorities
NEPM	National Environmental Protection Measures
NSW	New South Wales
PSI	Preliminary Site Investigation
ROBE	Riverina Oils and Bio Energy Pty Ltd
RWC	Riverina Wool Combing Pty Ltd
SEAR	Secretary's Environmental Assessment Requirements

EXECUTIVE SUMMARY

Three historic effluent evaporation ponds exist on the proposed development site at 223 and 299 Trahairs Road, Bomen. The ponds were once used for effluent evaporation, generated from the Riverina Wool Combing facility. The wool combing facility operated for approximately 30 years. Prior to the effluent ponds the site was used for mixed farming, cropping and grazing.

Liquid effluent was the by-product of wool scouring. The scouring effluent contains components removed from greasy wool and the detergents used in scouring. Results of liquid effluent testing indicate traces of heavy metals and concentrations of nitrogen, chlorine, potassium, sodium, oil and grease. The ponds have not been used for effluent evaporation for eight years. A black waxy residue (wool wax) remains on the surface of the pond base.

The proposed development would utilise the historic effluent disposal and evaporation pond of the wool combing facility, located in part of Lot 2 DP1249028, which has been delineated for this assessment. The proposal involves the construction and operation of a non-putrescible solid waste landfill and associated infrastructure. The landfill would be situated within the footprint of the historic effluent evaporation pond. The evaporation pond has been selected as the preferred site to establish the landfill. The proposal would repurpose the effluent pond to a non-putrescible landfill. This would use contaminated land in a beneficial way and allow for more reuse options of the land in the future.

The objectives of the investigation are to characterise potential soil and groundwater contamination at the site, identify the contamination sources, possible exposure pathways, and the likely on-site and off-site receptors. This investigation is a preliminary assessment of the potential risk to human health and/or the environment. The scope of work included groundwater and soil sampling of the development footprint and adjacent windrowed material and laboratory analysis. Subsequent data analysis was undertaken in this preliminary site investigation and analysed against the guidelines in the *National Environment Protection (Assessment of Site Contamination) Measure (NEPM) 2013* to determine if further investigation is required and if the site is suitable for commercial/industrial land use.

Potential contamination identified on the site include the black waxy residue that remains on the pond surface and in the clay liner of the pond base, and windrowed material adjacent to the eastern side of the pond.

ESLs and management limits were exceeded for Soil 8, Soil 9 and Soil 11 for Fractions 3 and 4. The ESL for Fraction 2 was exceeded for Soil 8 and Soil 11. The exceedances are from the samples that contain only or a high volume of the wool combing waxy residue. As the contaminant is known from a naturally derived source, sheep's wool, there is no risk to human or environmental health. The exceedances of trace elements in the groundwater sample include chromium, copper, lead and zinc. Elevated background levels of these trace elements are expected to be the result of the fractured granite aquifer source.

Soil contaminated with the black waxy residue and the windrowed material should be remediated for reuse on-site after undergoing appropriate soil engineering assessment, disposed of at an EPA licenced facility or for other appropriate applications.

Based on the data collected in this preliminary site investigation, there is no requirement for further investigation for soil or groundwater contamination and the site remains suitable for commercial/industrial land use.

1 INTRODUCTION

1.1 SCOPE OF WORK

This report presents the findings of a preliminary site investigation (PSI) of the Riverina Wool Combing (RWC) site north of Trahairs Road. The assessment provides a baseline report for contamination on site and assesses the need for further testing of soils, material or groundwater that may pose a threat to human health or the environment. It addresses the DPE's requirement of the SEARs, *characterisation of the nature and extent of any contamination on the site and surrounding area*.

All works were completed in accordance with the relevant NSW EPA guidelines and standards (1994, 1995 and 1997), and laboratory results were compared to the National Environment Protection Measure (NEPM) 2013 measure for the assessment of site contamination for commercial and industrial sites.

This report was developed with guidance from the *Guidelines for Consultants Reporting on Contaminated Sites* (NSW Government 2011), *Environmental Planning and Assessment Act 1979*, *Contaminated Land Management Act 1997*, *State Environmental Planning Policy No 55 – Remediation of Land*, the *Contaminated Land Management Policy* (RAMROC and REROC n.d.) and the *National Environment Protection (Assessment of Site Contamination) Measure (NEPM) 2013*.

1.2 SITE IDENTIFICATION

The development site is located at 223 and 299 Trahairs Road, Bomen. It is around 10 km north-east of central Wagga Wagga about 2 km east of the Olympic Highway. Wagga Wagga is around 400 km southwest of Sydney in the South West Slopes (SWS) Interim Biogeographic Regionalisation for Australia (IBRA) Bioregion of southern NSW. This bioregion covers an extensive area of foothills and isolated ranges comprising the lower inland slopes of the Great Dividing Range, and includes parts of the Murray, Murrumbidgee, Lachlan, and Macquarie River catchments.

The size of the development site is 85.94 ha. However, this assessment is for the development footprint and adjacent windrowed land only and includes part of Lot 2 DP1249028. The land size of the assessment is 16.48 ha. The central geographic coordinate of the site is -35.044215, 147.436474.

A maximum land size of 5 ha is referred to in Table A of the NSW EPA (1995) *Contaminated Site Sampling Guidelines*. Land sizes of 5 ha require 55 sampling points with an equivalent sampling density of 11 points per hectare. However, the contaminating sources are limited and known for the 16.48 ha proposal, therefore eight samples were collected as part of the investigation. It should be noted that McMahon (2014) collected eight composite samples from the RWC facility south of Trahairs Road where four to ten samples made up each composite sample. In line with McMahon (2014), seven soil samples were taken from the western pond. One sample was taken from the windrowed material within the proposed development footprint as the windrows are known deposits of soil, bark chip and waxy residue material (McMahon 2014).

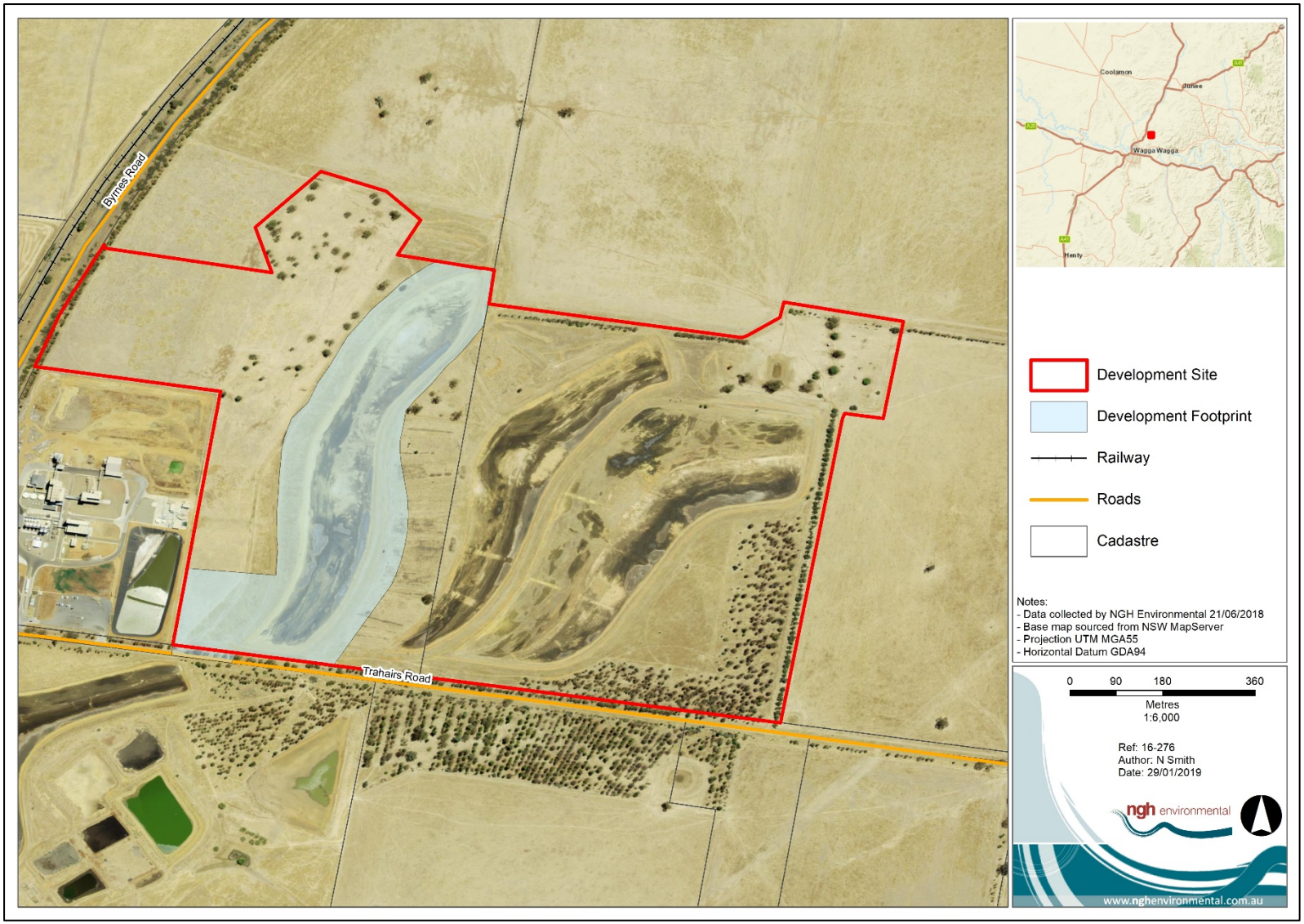

Figure 1-1 The proposed development site, development footprint, evaporation ponds and the ROBE facility (corner of Byrnes Road and Trahairs Road)

2 SITE HISTORY

2.1 LAND USE

2.1.1 Past land use

"Bomen" is thought to be derived from "Bowmin", which is an Aboriginal word from the Wiradjuri language meaning "Deep" (Green 2011). This name is thought to have represented the deep lagoon on the northern side of the Murrumbidgee River (Green 2011).

In 1878, Bomen became the southern terminus of the railway from Sydney. In 1879, the railway was further extended south after the construction of the bridge and viaduct across the Murrumbidgee River (Green 2011). It is now a suburb of Wagga Wagga and an industrial area surrounded by rural landscape.

Riverina Wool Combing Pty Ltd (RWC) began operations on a site on Byrnes Road, Bomen in 1980/1981, with a production capacity of 6,000 tonnes of wool (Figure 2-1). In 1992, Wagga Wagga City Council approved an upgrade to the Riverina Wool Combing facility, which saw staff numbers rise from around 240 to around 321 (The Leader 2017). In 2010 the company closed and moved offshore.

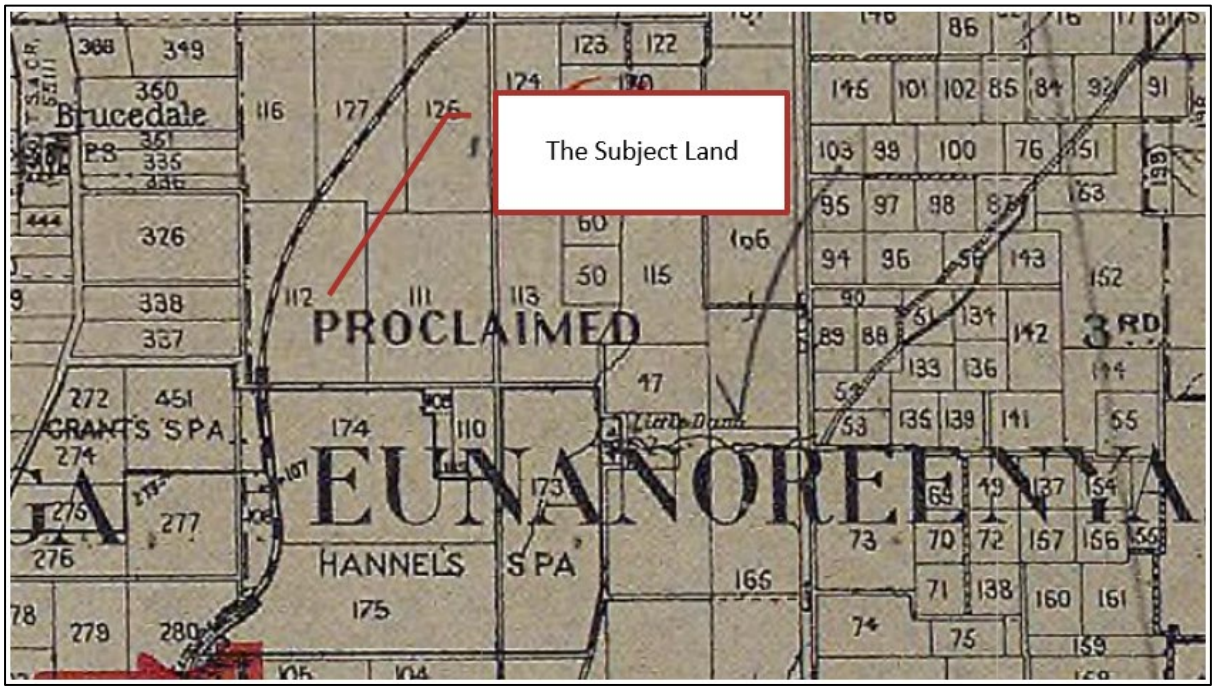

Figure 2-1 County of Clarendon Branch Charting Map, 3rd March 1896 (http://hlrv.nswlrs.com.au/pixel.htm#)

The wool combing process takes raw wool fibre and prepares it for processing into a useable textile (UNE 2009). Processes include raw wool scouring, dying, carding, and backwashing (UNE 2012). Wool scouring is essentially the washing and drying of the raw fibre to remove contaminants (UNE 2009) and is the most polluting stage of wool processing (Stivens *et al*. n.d.). Wool wax (grease), sweat salts (suint, water soluble), dirt, dust, dung and vegetative matter need to be removed from the wool (Pearson *et al*. 2004; UNE 2009).

Hot water is used to dissolve the sweat salts and melt the wool wax. A detergent is used to remove the dirt from the wool and emulsify the wool wax to prevent it from re-depositing on the wool (UNE 2009). The wool is rinsed to remove the detergent and washing away remaining solids. In addition, the scouring

process provides the opportunity for different chemical applications to treat other issues, for example, a bleach to reduce the yellowness of some wool (UNE 2009).

Liquid effluent is the by-product of wool scouring and contains the contaminants removed from the wool and the treatments used in scouring. The saline by-product at RWC was released into a series of effluent disposal and evaporation ponds at the site. Liquid effluent samples were taken whilst the RWC was in operation. Results of liquid effluent testing indicate traces of heavy metals and concentrations of nitrogen, chlorine, potassium, sodium, oil and grease. The pH is heavily alkaline. The breakdown of this data is available in Appendix B.

Waste treatment and evaporation ponds were constructed to the north and south of Trahairs Road. Three ponds were constructed on the northern side of Trahairs Road and were fed by those to the south. It is at the western most of the three evaporation ponds where the proposed development site is located (Figure 2-2).

EPA scheduled activities ceased at the RWC facility in 2010 and new industry has since developed on the land. Riverina Oils and Bio Energy Pty Ltd (ROBE) facility opened in 2013, adjacent to the proposed development site (Figure 2-3,). The ROBE facility is an oilseed crushing and refining plant.

2.1.2 Current land use

Three evaporation ponds are located within the development site. The evaporation ponds occupy about 12% of these lots and have not been used for the last 12 years. The remainder of the lots are currently being used for primary production, including cropping and grazing. Cropping and grazing would continue adjacent to the proposal during construction and operation.

An assessment by DM McMahon Pty Ltd (DMM) in September 2014 (Appendix A) characterised on-site contamination. The RWC site north of Trahairs Road is the location of the proposed North Ridge Materials Facility.

The McMahon (2014) report assessed and discussed issues from a NSW EPA “Notice of Clean-up Action” issued on 29 March 2011. Concerns were raised around the potential contamination from the release of effluent from the wool combing process. The waste contained wool wax residues and the presence of hydrocarbons, pesticides and heavy metals. However, soil and wax samples were not collected or analysed from the evaporation ponds north of Trahairs Road.

Groundwater has been monitored on the site routinely by Riverina Wool Combing Pty Ltd. since 1997 and reported annually. Recent groundwater monitoring was undertaken by NGH Environmental on 20th June 2018, where one of ten bore locations around the northern effluent evaporation ponds had a standing water level. The deep bore (P1B) had a standing water level of 8.22 m. The remaining piezometers were dry.

2.1.3 Proposed land use

The proposed development would utilise the western historic effluent disposal and evaporation pond from RWC. The proposal involves the construction and operation of a non-putrescible solid waste landfill and associated infrastructure. The landfill would be situated within the footprint of the historic effluent evaporation pond. The evaporation pond has been selected as the preferred site to establish the landfill. The proposal would repurpose the western effluent pond to a non-putrescible landfill. This would use contaminated land in a beneficial way and allow for more reuse options of the land in the future.

The proposal would include:

- Creation of a series of 6 staged sub-cells within the existing proposed waste cell.
- Construction of a piped drainage system to intercept and collect groundwater from underneath the sub-cells.
- Lining the sub-cells with an impermeable clay liner, HDPE liner, and free-draining aggregate layer.
- Construction of a piped drainage system to collect and drain leachate from the waste cell.
- Construction of a lined leachate storage and evaporation pond with aerator.
- Repair of existing upslope earthen drain to direct overland stormwater flows away from the waste cells.
- Construction of ingress, egress and internal access road of sufficient size to allow storage and turning of semi-trailers.
- Construction of designated waste inspection area and transfer station.
- Transportable office and amenities block.
- Possible weighbridge installation in the future.

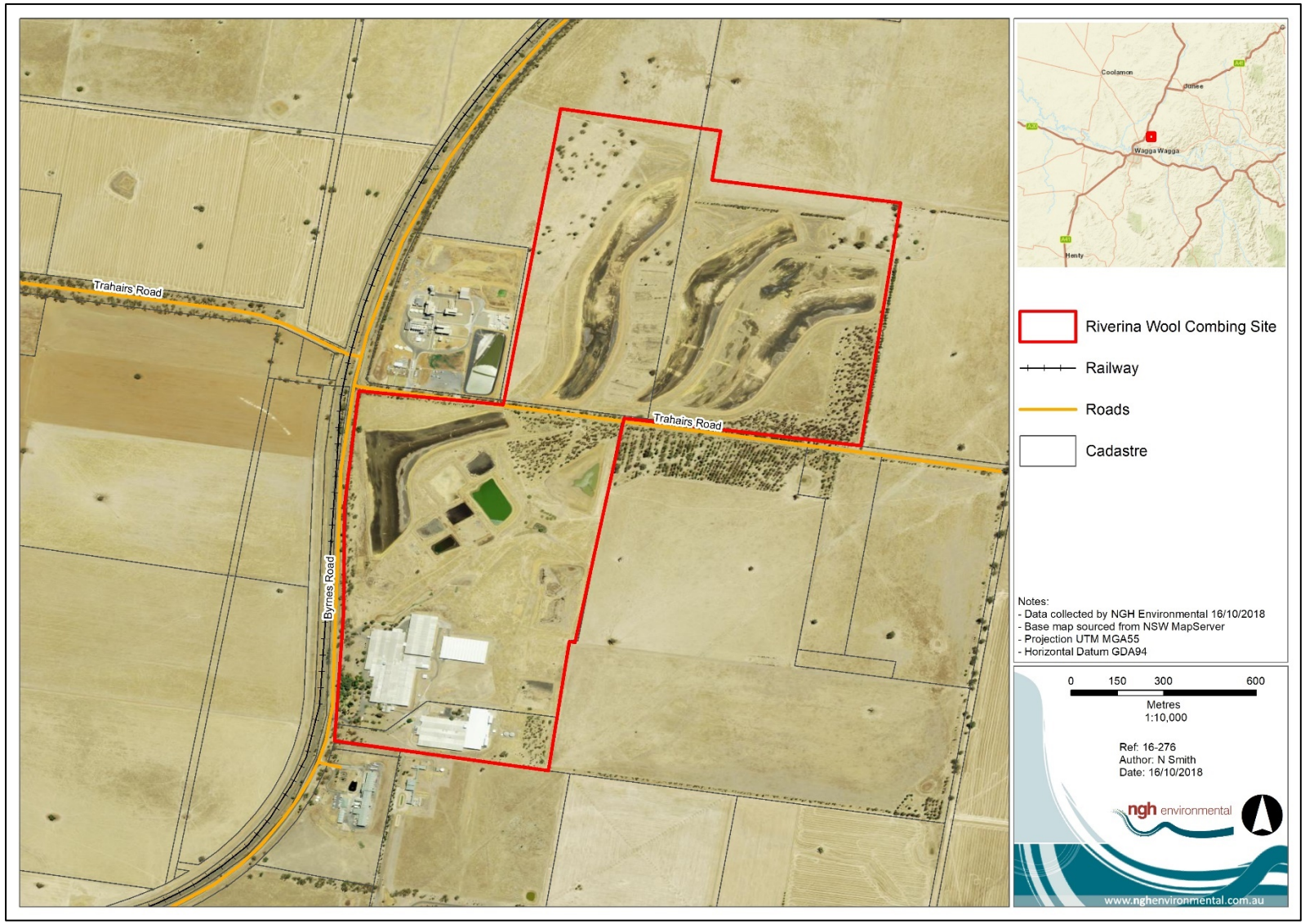

Figure 2-2 Location of the Riverina Wool Combing site

Figure 2-3 Western pond looking south. The ROBE facility is to the west.

2.1.4 Historical use of adjacent land

Historical use of adjacent land was for agricultural activities, including grazing and cropping. Adjacent land remains used for these activities.

2.2 LAND ZONING

The RWC site was on land zoned as 'Rural' until 2010, when new zoning was finalised in the Wagga Wagga LEP (2010). The RWC site is located on land currently zoned IN1 General Industrial.

In 2008, Lot 11 DP1130519 was subdivided for the ROBE facility (Figure 2-2), which is now Lot 12 DP1130519. Figure 2-4 is an aerial image of the site in 2003, before it was zoned IN1 in 2010 and prior to the subdivision for the ROBE facility in 2008.

In 2019, Lot 11 DP 1130519 and Lot 2 DP 590756 became Lot 2 and Lot 4 DP1249028. The new requisition was lodged by the approved solar farm development on adjacent land. It remains zoned IN1.

Figure 2-4 Aerial image of the RWC site in 2003 (Source: Google Earth 2018)

2.3 CONTAMINATING LAND USE

As identified above, the development site was used for effluent disposal and evaporation for around 30 years. The effluent was largely confined to the constructed evaporation ponds. Cropping and grazing activities occurred on the surrounding land. Limited irrigation of effluent occurred on land to the west of the evaporation ponds. The irrigation occurred when the ponds were reaching their capacity. This land is now largely occupied by the ROBE facility.

Historical wool combing activities of RWC had the potential to cause contamination. Fuel and oil-based contaminants have not been considered for analysis. There is no evidence of underground or above-ground storage tanks and no fuels or oils were kept on-site. Refuelling of vehicles and plant maintenance would have occurred adjacent to storage buildings located in the southern part of the RWC site. Therefore, BTEX and hydrocarbons to C_{16} can be ruled out.

Additionally, herbicides and pesticides could have been contaminants on the wool and introduced into the environment. However, McMahon (2014) analysed the samples for organochlorides (OC) and organophosphates (OP) analytes. Results showed no pesticides were persistent in the samples from the southern site of the RWC facility (McMahon 2010).

The likely contaminants may be assessed through analysis of related analytes (Table 2-1).

Table 2-1: Potential Contaminants and analytes

Industry	Contaminant	Analyte
	Wool wax (grease), suint (sweat salts), dirt	Total Recoverable Hydrocarbons

Industry	Contaminant	Analyte
Wool combing effluent	and vegetative matter.	
	Pesticides	Organochlorides (OC) and organophosphates (OP)

Most activity occurred south of Trahairs Road, close to the buildings where the wool combing activity took place. The proposed site, north of Trahairs Road, was used only for effluent evaporation and grazing. No storage of chemicals occurred at the site and no sewer exists.

2.3.1 Contaminated lands

NSW EPA Database search

A search of NSW EPA's *Contaminated Lands Register* on 26 April 2018 found three listings in Wagga Wagga LGA. Two of these are in the township of Wagga Wagga, and one in the village of Tarcutta. No known contaminated sites were found in or near the development site.

On the list of *NSW Contaminated Sites Notified to EPA* as of 16 April 2018 there are 15 sites in Wagga Wagga listed as contaminated sites. None of these sites are found in or near the development site.

LGA Database search

A search of the Wagga Wagga Shire Council Local Environmental Plan did not identify any contaminated land for the development site.

2.4 GROUND AND SURFACE WATERS

Monitoring Bores

The NSW DPI-Water database of groundwater works lists 12 bores in the development site. The details for the 12 bores are shown in Table 2-3. The depth of the seasonal high-water table within the site varies between 4 m and 100 m below ground level.

Table 2-2 Monitoring bores within the development site

Bore ID	Authorised purpose	Drilled depth (m)
GW400114	Monitoring bore	7.80
GW400093	Monitoring bore	7.40
GW403039	Monitoring bore	2.75
GW403042	Monitoring bore	7.88
GW403038	Monitoring bore	10.55
GW403040	Monitoring bore	2.80
GW403041	Monitoring bore	2.80
GW400122	Monitoring bore	2.00

GW400123	Monitoring bore	4.00
GW400092	Monitoring bore	4.80
GW400120	Monitoring bore	2.80
GW400121	Monitoring bore	5.50

There are a further 40 licensed bores within two kilometres of the development site (DPI-W 2018). Two of these are for stock (west) and stock and domestic (south-west) supply. These bores are more than one kilometre from the site. Thirteen of these are monitoring bores and are up gradient within the ROBE facility west of the site. Of the remaining monitoring bores, 21 are located to the south of the site and four to the south-east (Figure 2-4).

Figure 2-5 Recorded bores within 2 km of the proposed development site (DPI-W 2018)

A total of 16 paired groundwater monitoring wells are located in and around the development site. These wells are in addition to the bores mentioned above (ROBE 2008). Monitoring wells 1 to 12 and 14 to 20 are nested, with the first installed to a depth of around 2 m and the second installed to a depth ranging from 4 to 13 m.

Monitoring wells P1 - P10 are within the development site. Monitoring well P11 is on land to the south of the proposed development footprint (Figure 2-5). Monitoring wells P1 to P7 are closest to the development footprint.

Groundwater flows in an east-south-easterly (ESE) direction (refer to section 4.3) and therefore, groundwater to the ESE would be most at risk. The four bores to the south-east of the proposed development footprint are between 1.3 and 1.55 km from the southern end of the proposal and described in Table 2-3. There is currently no water quality data available for these monitoring bores. However, it would be a recommendation to utilise these monitoring bores before, during and post closure of the proposal.

Table 2-3 Bores ESE of the proposed development footprint

Bore ID	Authorised purpose	Drilled depth (m)	Approximate distance from proposal (km)
GW415965	Monitoring bore	12.00	1.35
GW415966	Monitoring bore	2.00	1.35
GW415964	Monitoring bore	9.00	1.50
GW415968	Monitoring bore	2.00	1.50

Figure 2-6 Groundwater monitoring bores down-gradient of the evaporation ponds

3 SITE CONDITION AND SURROUNDING ENVIRONMENT

3.1 LANDFORM

The development site is located within the Murrumbidgee River catchment. The locality is comprised of undulating rises and low hills with slope gradients largely between 3% and 10%. The landform comprises of crests and ridges, long waning slopes, and shallow drainage lines. The development site is generally flat to gently undulating, sloping down to the east. The ROBE facility occupies the crest while the western evaporation pond occupies the mid slopes.

3.2 SITE CONDITION

The boundary fences of the site are in good condition to accommodate grazing stock. The fencing used is standard ring-lock rural fencing. There is no evidence of erosion at the site. Planted native vegetation occupies about seven hectares of land down gradient and south east of the ponds. Similarly, to the south of the site 12 hectares of planted native vegetation exists. To the west and north of the ponds scattered vegetation and tree lines exist.

There are visible signs of a waxy residue within the effluent ponds. A black waxy residue on the base and within the clay liner to around 1 m depth (Figure 3-1) exists. When inside the pond and oily odour is evident. The ponds can contain water after periods of rainfall. Fauna were observed on the ponds during the site inspection.

There are no buildings on the site. There are unsealed tracks around the perimeter of each pond and along the southern perimeter. The tracks are now used primarily for moving stock through the site.

Surface water falling within the historic effluent ponds evaporate with the increasing temperatures of summer. Water from the ponds north of Trahairs Road do not receive off site water. Water in the ponds cannot escape the ponds due to the depth and free board of the ponds. There is an existing stormwater diversion berm that directs stormwater from the west, around the ponds, to a farm dam to the east of the eastern pond.

The site is not listed as flood prone land (NSW Government 2010).

Figure 3-1 Black waxy residue on the surface of the western evaporation pond

3.3 ENVIRONMENTAL CHARACTERISTICS OF THE SITE AND SURROUNDS

The development site is in the upper catchment of the Murrumbidgee River. The Murrumbidgee river is around 6 km south of the development site and part of the Murrumbidgee Catchment Management Area. Drainage off the site is primarily through sheet flow to the east leads to ephemeral, poorly-defined drainage lines. There are no streams that run through the development site. There are minor drainage lines around 100 m south of the development site boundary. About 1 km east of the development site is Schiller's Creek, an ephemeral drainage line. Around 2 km west of the development site is Duke's Creek. Drainage in the locality generally flows from north to south towards the Murrumbidgee River (Figure 3-2).

Patches of remnant box woodland –Yellow Box *Eucalyptus melliodora* and Grey Box *Eucalyptus microcarpa* mature trees remaining as small stands or lone paddock trees. Remnant patches of native vegetation to the west of the proposed footprint have been mapped by OEH as plant community type (PCT) 277 – Blakely's Red Gum – Yellow Box grassy woodland of the NSW South Western Slopes Bioregion. Threatened Ecological Communities (TEC) associated with PCT 277 are White Box Yellow Box Blakely's Red Gum Woodland under the BC Act and the EPBC Act. These are located to the north-west of the western pond.

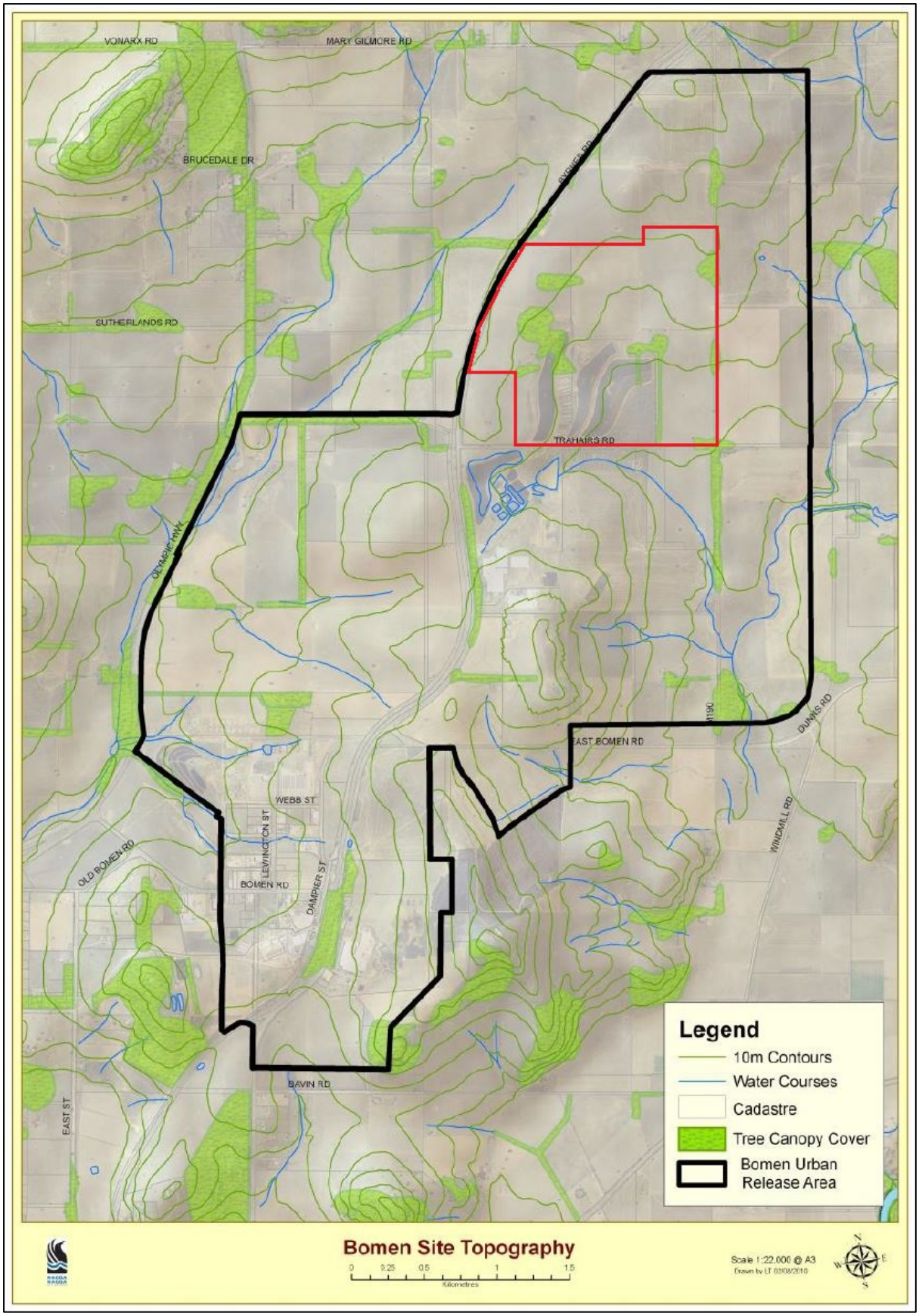

Figure 3-2 Drainage of Bomen Industrial Area, including the development site (outlined in red)

The background search identified 11 flora species of conservation significance and four endangered ecological communities as potentially occurring in the study area. None of these have been recorded in the study area. Based on consideration of species habitat requirements and distribution, it is considered possible that three of these species may occur in the study area – Dwarf Bush Pea *Pultenaea humilis*, Yass Daisy *Ammodium craspedioides*, and Hoary Sunray *Leucochrysum albicans var. tricolor.*

Wagga Wagga LEP (2010) indicates that the development site does not occur in an area of groundwater vulnerability. Potential groundwater dependent ecosystems within the vicinity of the development site are mapped in the *Groundwater Dependent Ecosystems Atlas* (BOM 2018). There are no listed aquatic GDE sites within the development site (Figure 3-3).

There are small areas of unclassified potential terrestrial groundwater dependent ecosystems mapped directly to the west of the northern end of the proposed waste cell and areas mapped along Byrnes Road to the north and south of the proposal (Figure 3-4).

The background search identified 53 fauna species of conservation significance as potentially occurring in the study area. None of these have been recorded in the study area, but Grey-crowned Babbler *Pomatostomus temporalis* has been recorded around 2 km from the development site and Superb Parrot *Polytelis swainsonii* around 3 km from the development site. Based on consideration of species habitat requirements and distribution, it is considered possible that 28 of these species may occur in the study area, including 22 birds and 6 mammals.

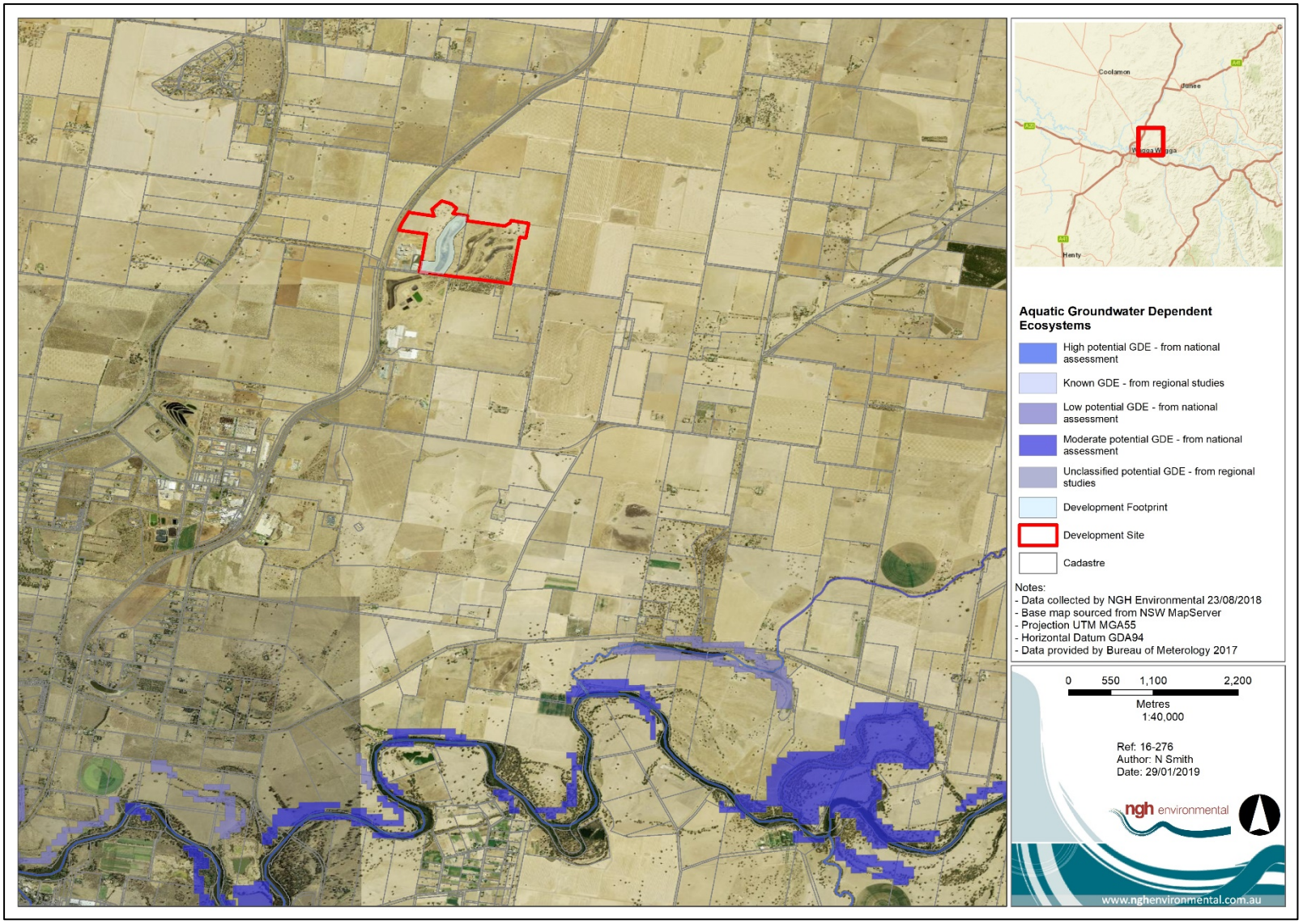

Figure 3-3 Aquatic groundwater dependent ecosystems in proximity to the development site, indicated by the red boundary

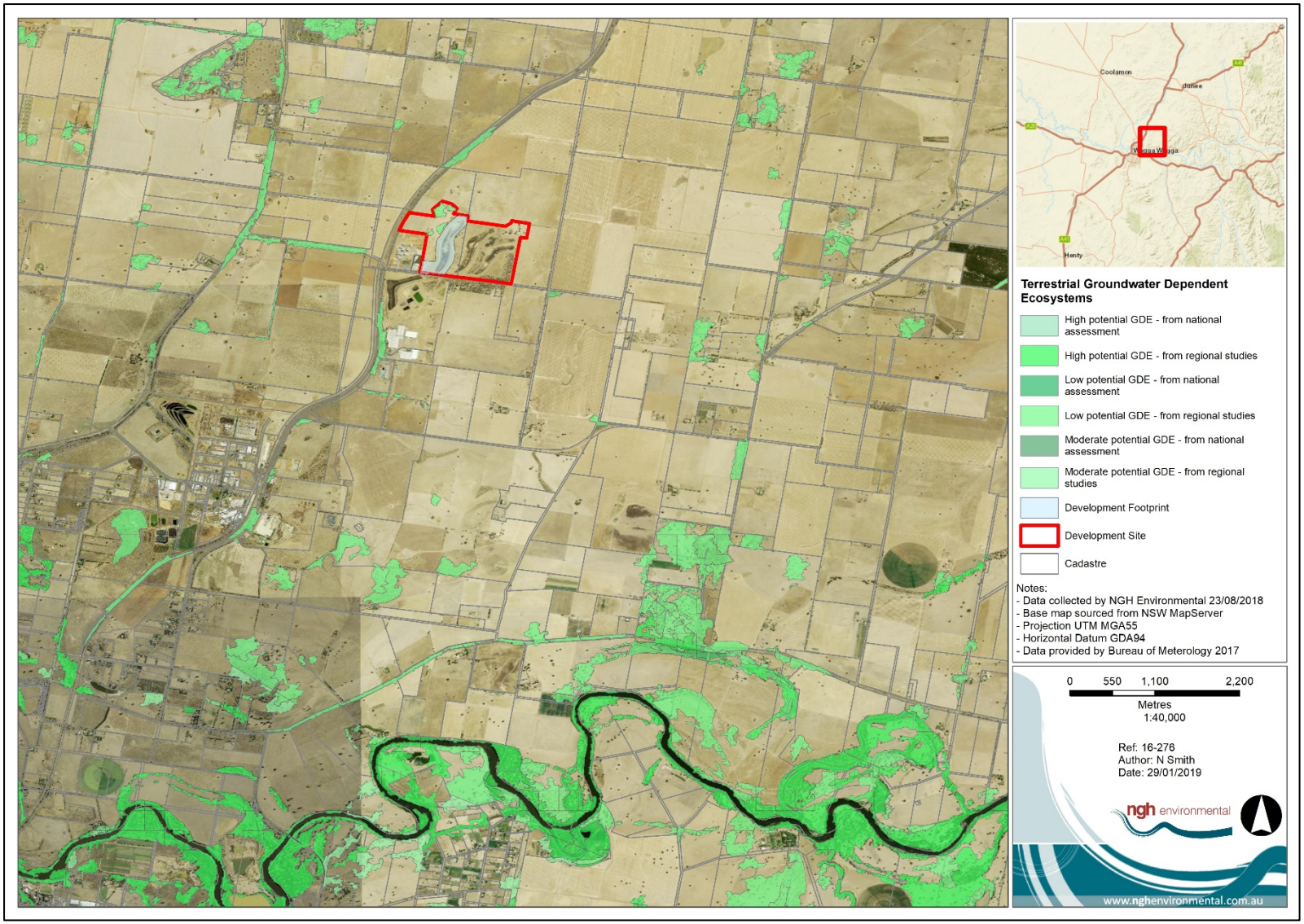

Figure 3-4 Terrestrial groundwater dependent ecosystems in proximity to the development site, indicated by the red boundary

4 GEOLOGY AND HYDROGEOLOGY

4.1 CLIMATE

The site is located in the South West Slopes bioregion, which is characterised by a sub-humid climate with hot summers and no dry season. The Bureau of Meteorology (BOM) climate records available from the climate station at Wagga Wagga AMO (station number 072150, -35.016°S, 147.46°E) indicate a mean summer maximum of 31.8 °C (January) and a mean winter minimum of 2.8 °C (July) for the period 1942 to 2018. The BOM rainfall records from the same station for the period 1941 to 2018 show a mean annual rainfall of 575.3 mm. Rainfall is generally greatest over winter and spring with the average monthly maximum occurring in October (56.9 mm). The monthly climate data is summarised in Table 6-18.

Table 4-1 Summary monthly climate statistics for Wagga Wagga AMO (072150)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann.
Mean max. temp. (°C)	31.8	30.9	27.7	22.6	17.4	13.9	12.7	14.5	17.7	21.6	25.9	29.5	22.2
Mean min. temp. (°C)	16.3	16.4	13.4	9.2	5.9	3.7	2.8	3.5	5.1	7.8	10.9	13.9	9.1
Mean rainfall (mm)	40.5	40.5	44.6	39.7	50.6	50.5	54.9	51.0	49.4	56.9	45.7	45.7	575.3

BOM wind data collected at Wagga Wagga AMO climate station (station number 072150, -35.16°S, 147.46°E) show that the prevailing winds easterly at 9.00 am and westerly at 3.00 pm. The average annual wind speed ranges from 10.1 kph at 9:00 am to 14.2 kph at 3:00 pm, with an average monthly maximum of 17.7 kph (December, 3:00 pm) and minimum of 6.5 kph (June, 9:00 am).

4.2 GEOLOGY AND SOILS

The 1:250000 Surface Geology of Australia Map from Geoscience Australia (2017) indicates that the locality is underlain by Silurian granites, described as mainly felsic intrusive rocks ranging in composition from alkali feldspar granite to tonalite, and including associated migmatite, gabbro, and diorite. The main stratigraphic units are Wantabadgery Granite, with lithology of massive biotite granite and granodiorite, and Collingullie Granite, with occasional Burrandana Granite.

The Wagga Batholith forms part of the Lachlan Fold Belt and is comprised of around 5% I-type granites and around 95% S-type granites (Chappell *et al*. 1990). The average composition of S-Type granites includes trace elements in greater amounts than I-type granites (Chappell *et al*. 1990).

The soil landscape in the area is classified as East Bomen, which extends from north of the Murrumbidgee Floodplain. Its distribution is from Bomen to around Yarragundry-Collingullie with a small area south of Uranquinty and is formed by aeolian processes. This soil landscape is prone to soil erosion. The *Soil Landscapes of Wagga Wagga 1:100, 000 Sheet* (DLWC 1997) describe the East Bomen soils as shallow to moderately deep (40-150 cm) Eutrophic Red Dermosols on crests and ridges, deep (80 – 200 cm) Eutrophic

Red Dermosols on slopes, and moderately deep (80-150 cm) Eutrophic Brown Dermosols in drainage lines. The East Bomen soil landscape is typically composed of the following stratigraphy (Table 4-1):

Table 4-2 Typical stratigraphy of East Bomen soil landscape

Code	Soil Type	Description	Limitations
eb1	Dull loam (topsoil-A1 horizon)	Dark to dull, sandy loam to clay loam, massive; field pH 5.0-5.5.	Moderately acid, low wet bearing strength (localised), salinity (localised), low fertility, sodicity (localised), hardsetting (localised).
eb2	Reddish light clay (b1 horizon)	Reddish brown, light clay, massive; field pH 6.0-6.5.	Low wet bearing strength (localised), salinity (localised), low fertility, sodicity (localised).
eb3	Reddish brown light clay (subsoil-B21 horizon)	Bright reddish brown to reddish brown, light clay to medium clay, massive to strong pedal; field pH 6.0-7.5.	Low fertility, sodicity.
eb4	Yellowish light medium clay (subsoil-B22 horizon)	Dull yellow orange to yellowish brown, light medium clay, moderate to strong pedal; field pH 6.0-7.0.	Low fertility, low wet bearing strength.
eb5	bright sandy light clay (subsoil-BC horizon)	Orange to bright yellowish, brown coarse sandy light clay, moderately pedal; field pH 6.0-8.0.	Low fertility, low wet bearing strength.

There are four soil profiles listed on the OEH eSPADE database (OEH, 2017) in the vicinity of the development site (Figure 4-1).

The first of these, shown as profile 1, was taken on a hillslope used for improved pasture under dry sclerophyll forest. The profile is described as imperfectly drained, with hard set surface condition, slight erosion hazard, and no evident salting. The soil type was classified as Red Earth, with fine loamy sand to fine sandy clay loam in the upper profile and sandy to medium clay in the lower profile.

Profile 2 was taken in an area used for cropping, with low slope and a southerly aspect. The soil type was classified as Mottled Eutrophic Brown Dermosol, with coarse sandy clay loam in the upper horizon and light clay in lower horizons.

Profile 3 was also taken in a cropping area with low slope and southerly aspect. The profile is described as moderately well drained, and no evident salting. The soil type was also classified as Mottled Eutrophic Brown Dermosol, with loam in the upper horizon and light to light medium clay in the lower horizons.

Profile 4 was taken to the north of the subject lots, on a low slope with a southerly aspect. The soil type was also classified as Mottled Eutrophic Brown Dermosol, with loam in the upper horizon and light to light medium clay in the lower horizons.

McMahon Earth Science determined the soil types in six test pits along the western edge of the proposed waste cell, within the development footprint, on 21 February 2017. On 24 March 2017, McMahon Earth Science determined the soil types in four test pits down gradient of the middle evaporation pond within the development site.

Pit depths along the western ridge of the proposed waste cell ranged from around 1.25 m to 3.0 m where refusal occurred at rigid clay. All pits contained a yellow to reddish yellow silt layer at the top approximate 0.1 – 0.25 m. Pits 1, 2, 3 and 5 had a black lanolin oil residue layer, approximately 0.1 m below the surface layer. Pits 1, 2 and 3 contained sandy clay layers below the lanolin. These pits were the closest to the southern end of the proposed waste cell. Full details are available in Appendix C.

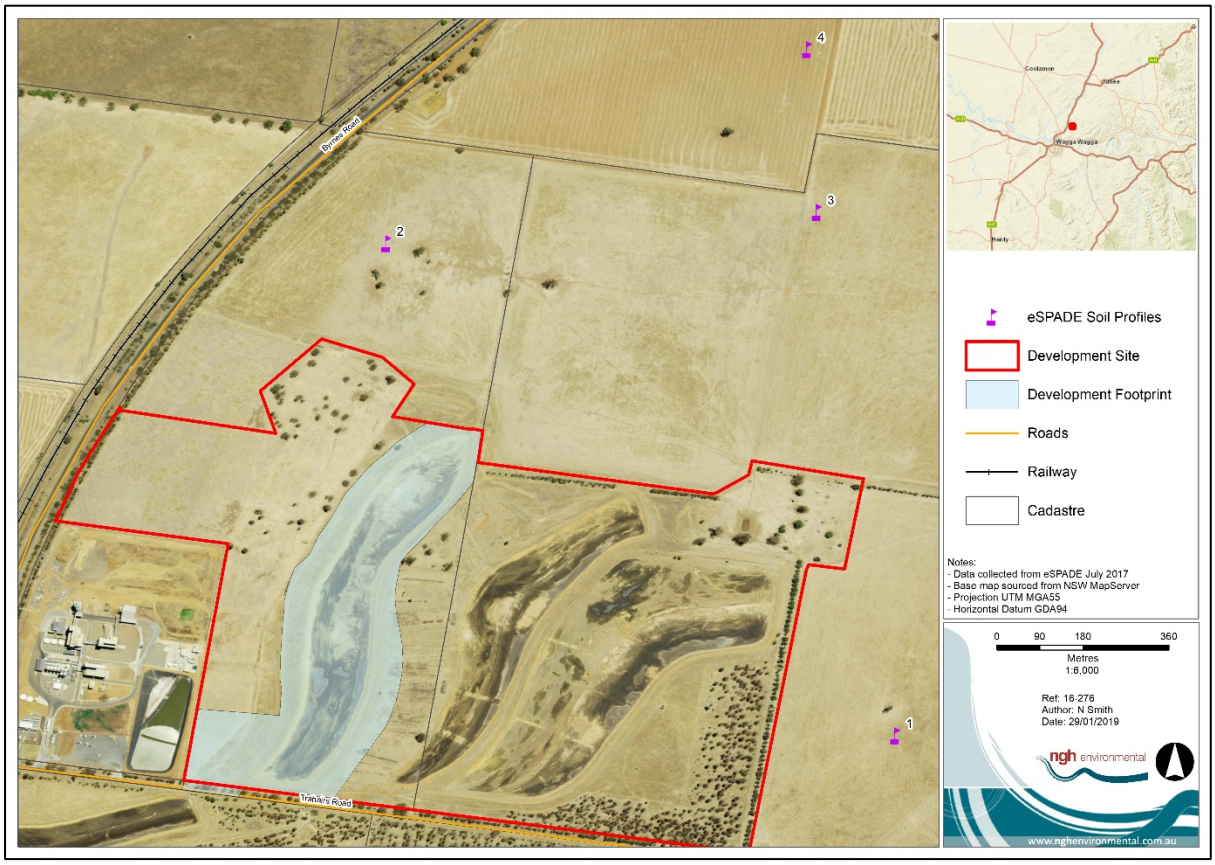

Figure 4-1 Location of eSPADE soil profiles in proximity to the development site

4.3 HYDROGEOLOGY

Surface water and groundwater interactions range in connectivity throughout the catchment. Connectivity is high in some areas, seasonal in other areas to longer variations in connectivity or totally disconnected (Green et al. 2011). Upland streams around the development site and throughout the catchment are hydraulically connected, where flow is received from fractured rock aquifers. In addition to groundwater within the weathered granite zone, groundwater is likely to flow through fractures within the underlying granite bedrock, with variable flow rates depending on the local interconnectivity of fractures (DPI-W 2018).

There are three groundwater units in the Wagga Wagga region. These are Ordovician metasediments, Silurian granites and Tertiary and Quaternary alluvium (Paul et al. 1996). The Ordovician metasediments are mostly comprised of phyllite and shale and are generally well fractured (Paul et al. 1996).

The major aquifer of the proposed development site is fractured rock (Figure 4-2) and part of the Lachlan Fold Belt (Green *et al.* 2011), which covers 16,1722,000 ha in the NSW Murray-Darling Basin (MDB) (NSW Government 2011a). However, the source of most of the water for town water supply, and stock and domestic on the Murrumbidgee floodplain is from the two alluvial aquifers, the Tertiary Lachlan formation (deep) and the Quaternary Cowra Formation (shallow) (Mitchell 2009).

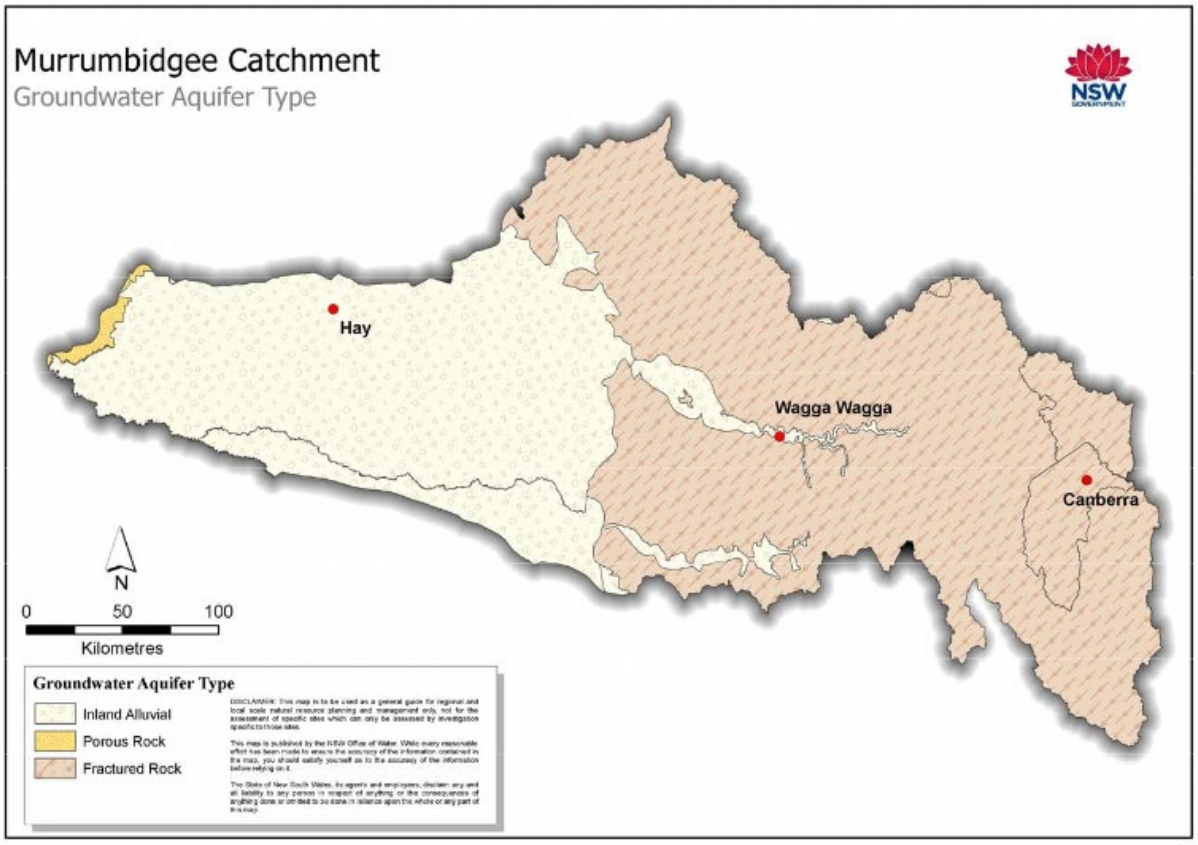

Figure 4-2 Major aquifer types of the Murrumbidgee Catchment (Green *et al.* 2011).

Historical records identified two aquifers beneath the development site. There is a shallow aquifer at approximately two metres depth and a deeper aquifer between four to 13 m depth. Both are a product of the Silurian granites below the site. The general characteristics of groundwater associated with these types of aquifers include low rates of supply and are generally moderate to brackish (Green et al. 2011). Therefore, in some circumstances it is not suitable for domestic use (Figure 4-3).

The Young Batholith is comprised of 99% S-type granites (Chappell *et al*. 1990). WaterNSW monitoring bores indicate that the groundwater quality within the source has electrical conductivity values ranging from 470-3,200 µS/cm and that sodium and chloride are the dominant ions (Kumar 2013). Elevated levels of some trace elements were indicated in the groundwater chemistry data and include lead and zinc (Kumar 2013).

The connectivity between the groundwater of the Lachlan Fold Belt fractured rock aquifer beneath the proposed site and surface waters is low to moderate with a low level of impact on instream values (NSW Government 2011a). The estimated travel time between groundwater and surface water of this aquifer system is of years to decades (NSW Government 2011a).

The average annual rainfall for the Lachlan Fold Belt MDB aquifer is approximately 519.43 mm/yr, with an infiltration rate of 4 % and a total estimated average annual rainfall recharge of 3,474,364 ML/yr for the 16,721,908 ha (NSW Government 2011a).

Minimal data exists on the flow paths of groundwater prior to the excavation of the evaporation ponds. However, shallow sources of groundwater are expected to flow west-north-west to east-south-east from elevated land to lower elevations and along watercourses (McMahon 2010).

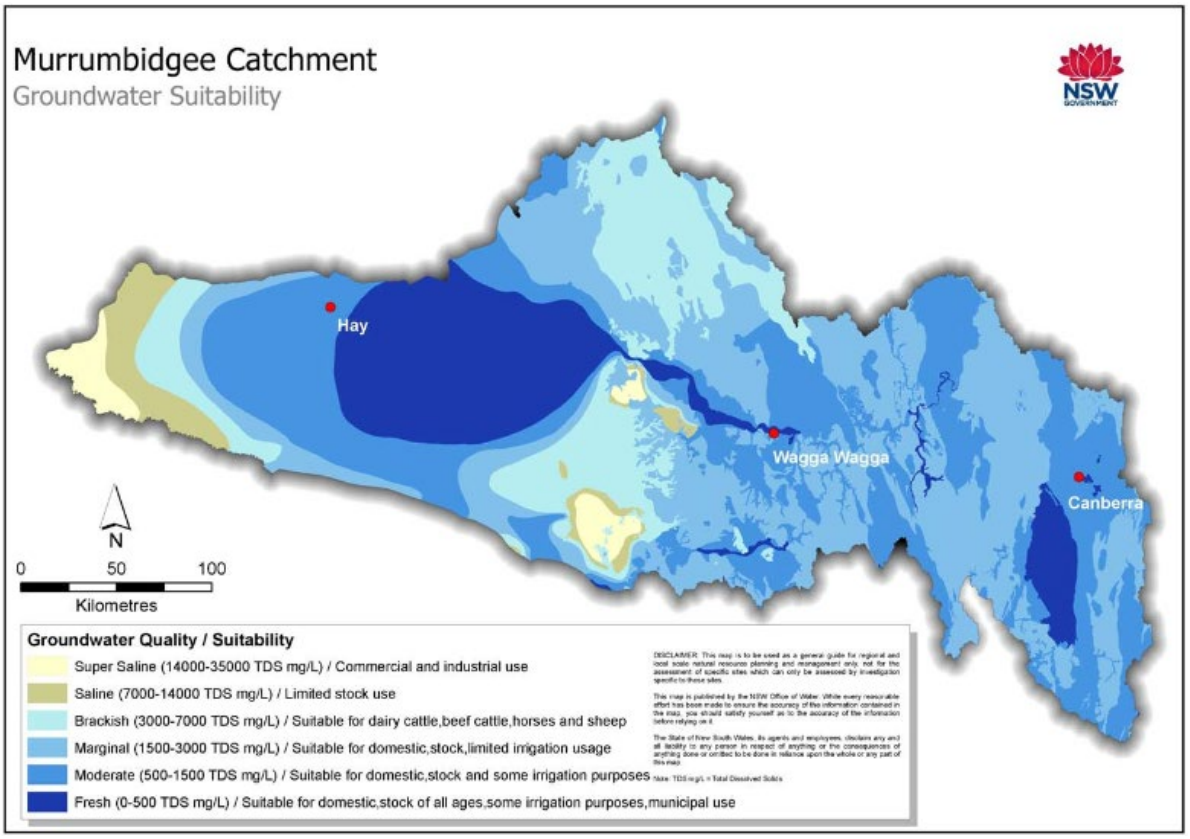

Figure 4-3 Groundwater quality of the Murrumbidgee Catchment (Green et al. 2011)

The groundwater recharge rate in Wagga Wagga has been modified as a result of land clearing for agriculture and urban development. The rates of groundwater recharge under different scenarios is shown in Table 4-2. For a catchment area of approximately 27 km^2, the volumetric catchment recharge rate is estimated to be 1,215 ML yr^{-1} (Cook et al. 2001).

Table 4-3 Groundwater recharge rates for Wagga Wagga (Cook et al. 2001)

Scenario	Recharge rate (mm/yr)
Native vegetation	1.3
Agricultural lands	15
Urban areas	55

Low permeability clays in the northern part of the Murrumbidgee Catchment results in waterlogging, preventing groundwater from easily moving away from the area (Cook et al. 2001). The 0.5m thick clay liner of the historic pond was compacted during their development to reduce the surface water infiltration.

Wagga Wagga LEP (2010) indicates that the development site does not occur in an area of groundwater vulnerability.

4.3.1 Groundwater Monitoring

Groundwater levels have been routinely monitored since 1997. Results across the monitoring bores at the site indicate an overall decline in groundwater levels. This could be associated with the drought conditions experienced during this period.

In 2008, all on-site monitoring wells located within the shallow aquifer were dry (ROBE 2008). The presence of water in this shallow aquifer east of the development site could be the result of the irrigation undertaken within and adjacent to the paddock where the wells are located, or different geology (ROBE 2008).

The annual average standing water levels for the monitoring wells in and around the development site were recorded (ROBE 2008). Some wells displayed higher standing water levels during years of increased rainfall. However, the majority of reported standing water levels for the shallow water aquifer were erratic, indicating the shallow aquifer could be influenced by surface activities and the use of the evaporation ponds, rather than rainfall events.

Within the deeper aquifer, standing water levels typically followed trends in regional rainfall patterns. This indicates that the deeper aquifer is influenced more by rainfall and not the use of the evaporation ponds (ROBE 2008).

Contour plots were produced for the groundwater data within the development site for the years the ponds were and were not in use (ROBE 2008). The plots show little change in the direction of groundwater flow between seasons and pond use and non-use. The deep aquifer groundwater flow generally flows in a southeast direction. Overall, climatic conditions seem to have a greater influence on groundwater levels at the development site than the evaporation ponds (ROBE 2008).

All shallow bores have been dry since 2007, indicating that higher rainfall events during the period of 2008 to 2010 did not have an impact on recharging the shallow aquifer (McMahon 2010). During 28 October 2009 to 16 November 2010, groundwater depths were measured monthly for bores 1A to 6B. Between 1 January 2007 and 6 May 2009, weekly groundwater depths were taken (McMahon 2010). A hydrograph for bores 1B, 5B and 6B was produced. It includes bore 13, which is not required for this study (Figure 4-4).

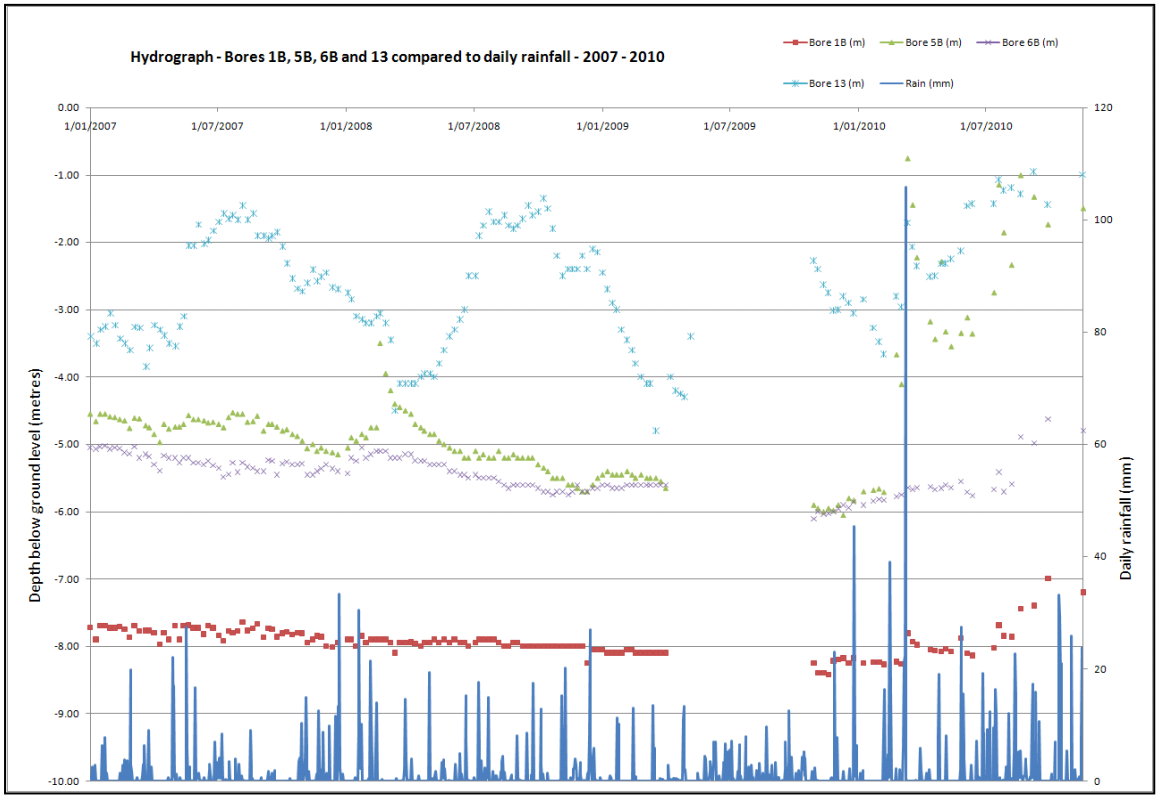

Figure 4-4 Existing bore groundwater heights and daily rainfall (McMahon 2010)

Groundwater analytic results were reported in the annual environmental reports for the Riverina Wool Combing facility and assessed against the Australian and New Zealand Guidelines for Fresh and Marine

Water Quality (ANZG 2018) for Primary Industries (irrigation) Water. The results of the groundwater quality assessment found that the groundwater is generally neutral to alkaline and considered to be brackish. Concentrations of calcium carbonate were reported in excess of the assessment criteria, and therefore indicates the water is very hard. There were minimal variations in reported results between 2004 when the ponds were in use and 2006 when the ponds were no longer in use (ROBE 2008).

5 CONCEPTUAL SITE MODEL

The conceptual site model (CSM) has been developed in accordance with Section 4 of *Schedule B2 Guideline on Site Characterisation* of the NEPM (2013) and the Guidelines for Consultants Reporting on Contaminated Sites (NSW Government 2011).

5.1.1 Known and potential sources of contamination

Known and potential sources of contamination at the site are described in Table 5-1. OC and OP were found to be non-persistent in the evaporation ponds within the main hub of the RWC facility, south of Trahairs Road (McMahon 2010). However, analysis was included in the combination chosen for sample analysis.

Table 5-1 Known and potential sources of contamination

Industry	Type of chemical/ contamination	Associated chemicals/ contaminant	Mechanism for contamination
Wool combing effluent	Wool wax Heavy metals	Hydrocarbons Arsenic, Cadmium, Chromium, Copper, Lead, Mercury, Nickel, Zinc)	Top down

5.1.2 Potentially affected media

Potentially affected media that has been considered as part of this CSM from the known and potential contaminating sources include:

- Site soils by potential vertical and horizontal leaching of contaminants.
- Groundwater contamination from vertical leaching of contaminants through the soil profile to the aquifers.

5.1.3 Areas of concern

Contamination sources are primarily the effluent from the wool combing process. The effluent evaporation pond and the windrowed material down gradient (east) of the western pond are the likely sources of contamination (Figure 2-4).

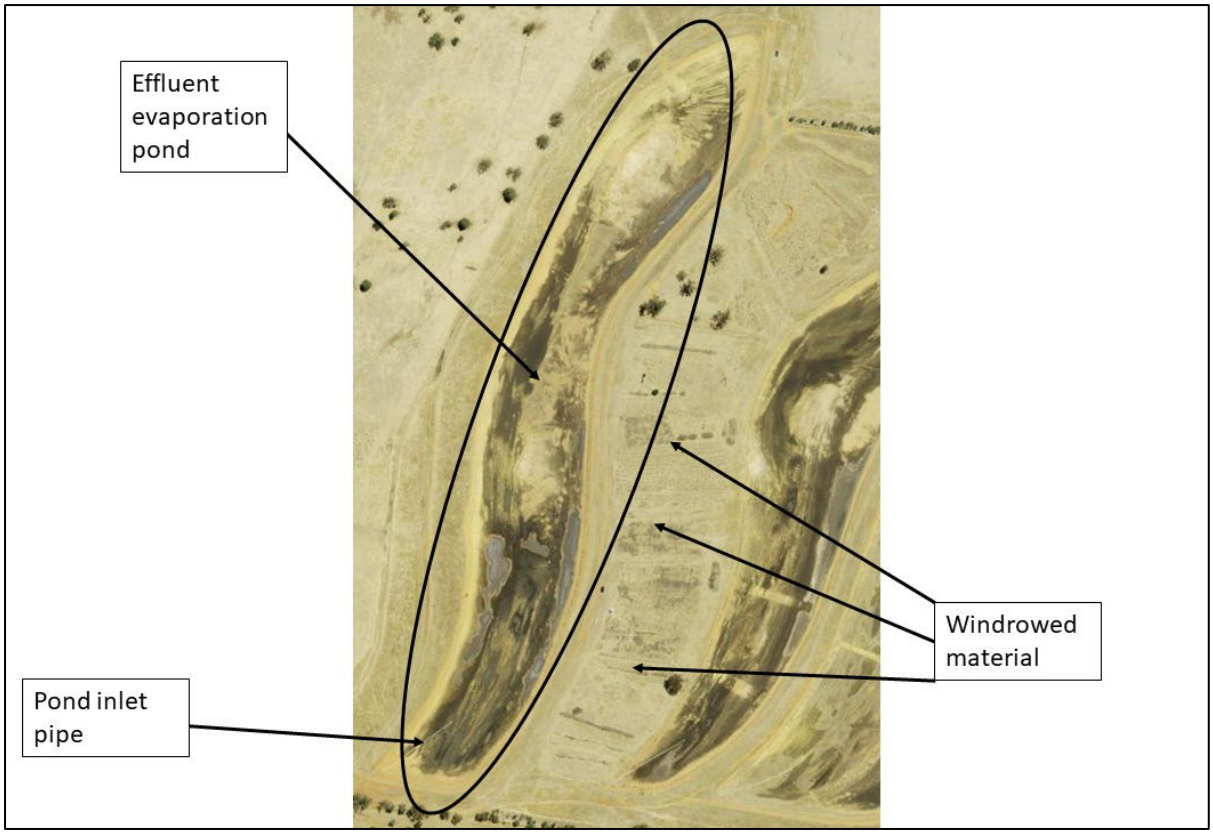

Figure 5-1 Areas of likely contamination sources

5.1.4 Potential receptors and exposure pathways

Exposure pathways for users of the proposed development include:

- Dermal contact (dermal or incidental ingestion) during agricultural activities and earthworks.
- Groundwater discharge to surface water.

On-site receptors include:

- Currently, persons managing livestock on the land around the ponds.
- Proposed employees during construction and operation of the materials facility.
- Site visitors – currently the owners and consultants etc. and proposed delivery personnel.
- Proposed maintenance workers.
- Livestock.

Off-site receptors include:

- Rural land owners surrounding the proposal, particularly down-gradient to the east and south-east. Many whom use operating bores for water resources.
- Livestock.
- ROBE facility up-gradient.
- Biodiversity surrounding the site, including down-gradient aquatic ecosystems.
- Maintenance workers.

5.1.5 Summary of the CSM

Based on the previous land uses of the site, observations and environmental characteristics, it is concluded that there is a risk of soil and groundwater contamination from the identified areas of concern (section 2.3.3). The areas of concern include:

- Historic wool-combing effluent remaining in the effluent evaporation pond.
- Historic windrowed wool-combing material down-gradient of the pond.

During redevelopment and occupation of the site, there is a risk to site users from contamination. The topsoil, subsoil and groundwater in the areas of concern require analysis at a certified laboratory to confirm if there is any contamination that would lead to risk in human health and/or environment for the current and proposed land use. The CSM is described in Table 3-4 and visually in Figure 5-2.

Table 5-2 Conceptual site model for the proposed North Ridge Materials Facility

Known and potential contamination sources	Impacted media	Contaminants of concern[1]	Existing and potential exposure routes	Human and ecological receptors		Comments
				Current	Future	
Effluent in the historic evaporation pond	Groundwater	• TRH • Heavy metals	Ingestion (drinking)	Agricultural personnel Livestock Aquatic ecosystems Residents	Site users – workers, customers, agricultural personnel Residents Aquatic ecosystems Livestock	No drinking water wells on-site. Low standing water level (~ 8 m) in one bore, all others dry. Low risk.
	Soil		Ingestion Dermal absorption	Agricultural personnel Livestock Adjacent industry personnel	Site users – workers, customers, agricultural personnel Adjacent industry personnel Livestock	Most likely risk of contamination.
Windrowed material	Groundwater	• TRH • Heavy metals	Ingestion (drinking)	Residents Agricultural personnel Livestock Aquatic ecosystem	Site users – workers, customers, agricultural personnel Residents Aquatic ecosystems Livestock	No drinking water wells on-site. Low standing water level (~ 8 m) in one bore, all others dry. Low risk.

Known and potential contamination sources	Impacted media	Contaminants of concern[1]	Existing and potential exposure routes	Human and ecological receptors		Comments
				Current	Future	
	Soil		Ingestion Dermal absorption	Residents Agricultural personnel Livestock	Site users – workers, customers, agricultural personnel Residents Livestock	Most likely risk of contamination.

1. Should correlate with DQOs.

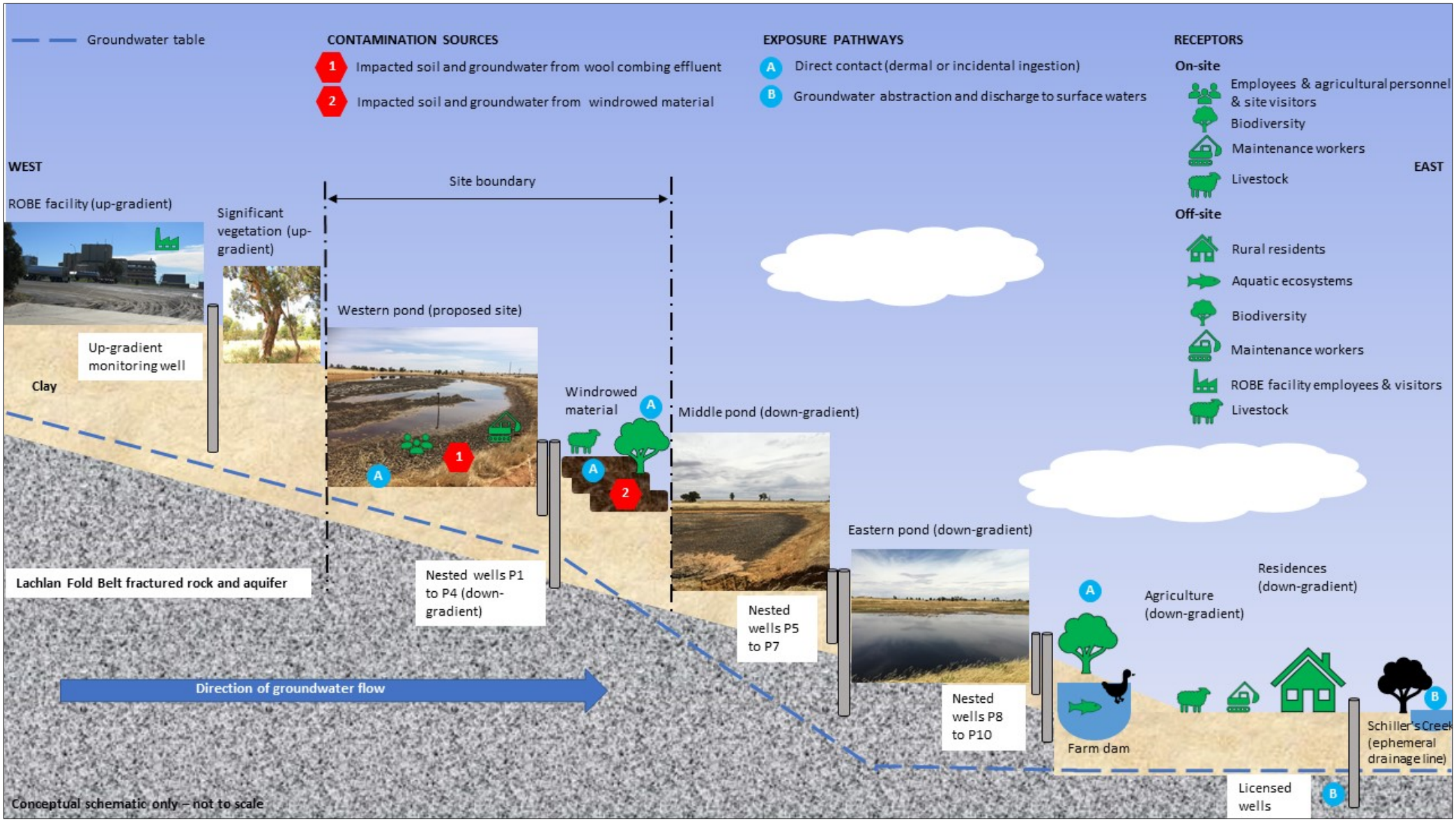

Figure 5-2 Visual schematic of the CSM

6 SAMPLING AND ANALYSIS PLAN AND SAMPLING METHODOLOGY

6.1 SAMPLING OBJECTIVE

The objective of the Preliminary Site Investigation (PSI) is to identify and characterise potential on-site contamination. The PSI is used to determine if remediation of the site is required or if further investigation is required. The following sampling objectives are used to assess the areas of concern within the site (Table 6-1).

Table 6-1 Sampling objectives

Sampling objective	Comments
Assess contamination in soil	Soils will be tested as per the sampling pattern and strategy. If the results are above the HSL D criteria for soil, further investigation may be required.
Assess contamination in groundwater	An assessment of groundwater will be undertaken and assessed against the GHSL D criteria and the GILs for drinking water and fresh water ecosystems.

6.2 SITE INSPECTION

Sampling pattern and strategy was determined using the *Sampling Design Guidelines for Contaminated Sites* (EPA 1995), *Schedule B2 Guideline on Site Characterisation* (NEPM 2013) and McMahon (2014).

Soil

A site visit was conducted on 19th September 2018. Potential contaminating sources on site included (Appendix D):

- Effluent evaporation pond containing black waxy residue, variously 20 mm to 150 mm thick contaminated with hydrocarbons (wool wax) (Figure 3-1).
- Windrowed material to the east of the western pond.

Eight soil/wax samples were collected on 19th September 2018. Sample depths were between 0.0 m to 0.15 m for surface soil/wax samples and 0.3 – 0.4 m for subsoil samples. Sample locations are identified in Figure 6-1. McMahon (2014) used four to ten samples within one evaporation pond for composite samples and analysed a total of eight composite samples for the southern section of the RWC facility. In total, 16 samples have been analysed for soil contaminants for the old Riverina Wool Combing facility.

Samples were collected using a FISKAR Quick Drill auger, bucket and pre-labelled zip-lock plastic bags. The auger and bucket were washed and rinsed with clean water and dried after each sample. This sampling method was deemed appropriate as site contamination is consistent with evaporation pond contamination results in McMahon (2014).

Groundwater

Groundwater sampling occurred on Wednesday 20 June 2018. All monitoring bores down-gradient of the western pond were purged (P1A to P10B). All bores were dry except for P1B (Figure 2-5). The well depth of bore P1B was 11.35 m below the soil surface with a standing water level of 7.63 m.

Containers used for sampling were prelabelled bottles from the Charles Sturt University EAL, provided to specifically for the analytes to be tested.

6.3 SAMPLE ANALYSIS

6.3.1 Soil

Eight samples were sent to Envirolab laboratories for analysis in Chatswood NSW, a NATA accredited laboratory. The samples were received by Envirolab on 20 September 2018 and the results were issued on 27 September 2018 (Appendix D).

The certificate of analysis contains general comments, report comments, analytical results and surrogate control limits. Combination 6a was used for the soil samples tested at Envirolab. The analytes required for soil testing of the likely contaminants of the proposed development footprint include total recoverable hydrocarbons (TRH) and metals (Arsenic, Cadmium, Chromium, Copper, Iron, Lead, Mercury, Nickel, Zinc). Also included in Envirolab's Combination 6a were organochlorine pesticides, organophosphorus pesticides, BTEX (Benzene, Toluene, Ethylbenzene, Xylenes), polycyclic aromatic hydrocarbons and polychlorinated biphenyls, however, these are not of concern as described in section 2.3.

Results of the effluent pond soil samples and windrowed material were compared against the *National Environment Protection (Assessment of Site Contamination) Measure* (NEPM 2013). The Health Investigation Level (HIL) 'D', the Heath Screening Levels (HSLs) and 'D' and petroleum management limits and the Ecological Screening Levels (ESLs) were used from the NEPM (2013), which accounts for human exposure based on: *D. Commercial/Industrial: includes premises such as shops and offices as well as factories and industrial sites*, reflecting this industrial site.

The results for soil testing and the comparison to the guidelines listed above are described in section 9.1.

6.3.2 Groundwater

Charles Sturt University's (CSU) Environmental and Analytical Laboratory (EAL), a NATA registered laboratory, was used to analyse the groundwater sample. CSU EAL sent some samples to the ALS Water laboratory, a NATA registered laboratory. ALS Water analysed the P1B bore sample for BTEX (Benzene, Toluene, Ethyl Benzene, Xylene), total recoverable hydrocarbons (TRH), total petroleum hydrocarbons (TPH), organochlorine pesticides (OC) and organophosphorus pesticides (OP). CSU's EAL analysed the sample for total metals and other analytes. Full results are available in Appendix E.

Results of the groundwater sample was compared against the *National Environment Protection (Assessment of Site Contamination) Measure* (NEPM 2013). The Groundwater Health Screening Level (HSL) 'D' for clay soils was used from the NEPM (2013), which accounts for human exposure based on: *D. Commercial/Industrial: includes premises such as shops and offices as well as factories and industrial sites*, reflecting this industrial site.

Groundwater Investigation Levels (GILs) were adopted from the *Australian Drinking Water Guidelines* and ANZG (2018) *Guidelines for Fresh and Marine Water Quality*.

The results of the groundwater testing and the comparison to the guidelines listed above are described in 9.2.

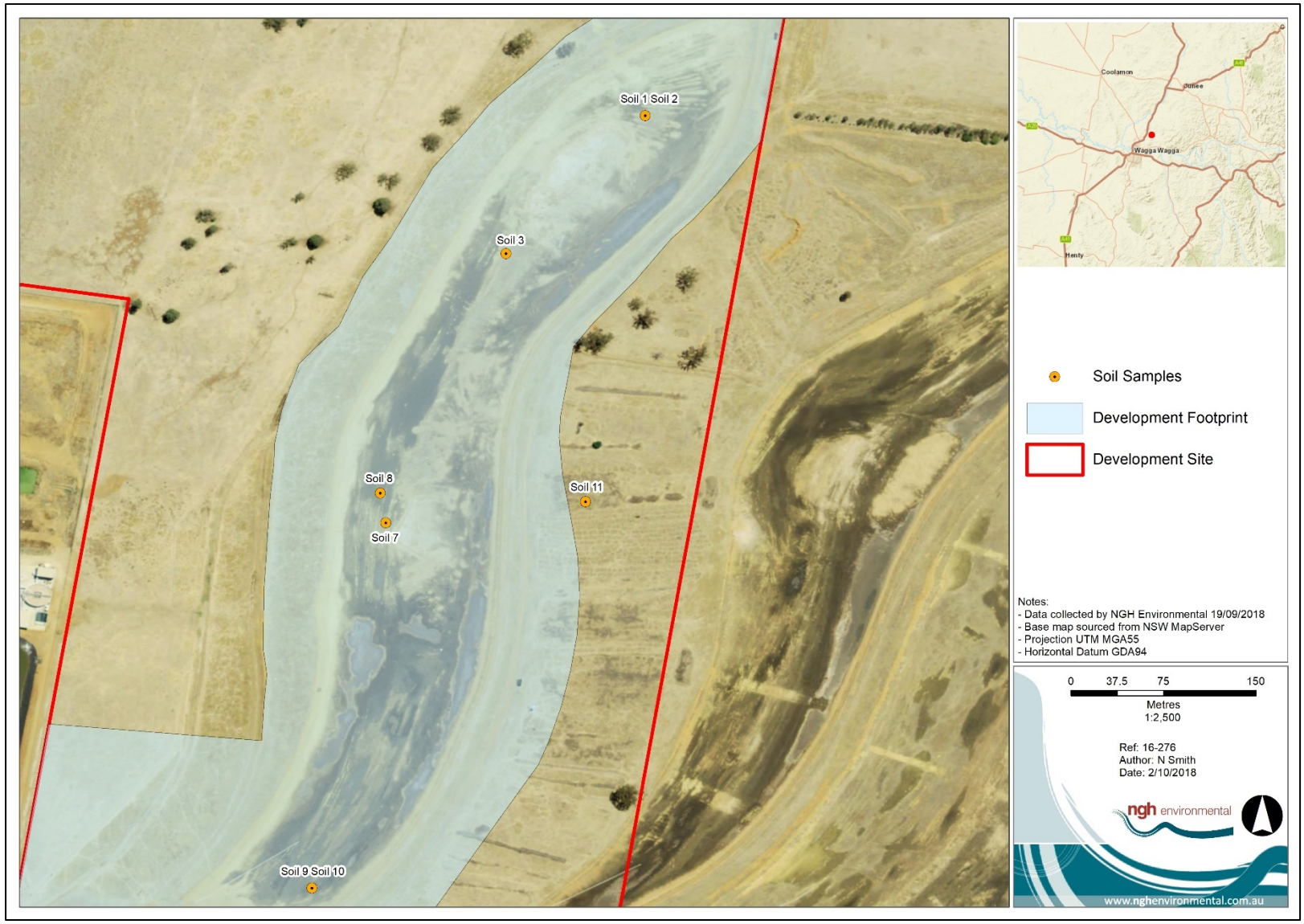

Figure 6-1 Soil sample locations

7 QUALITY ASSURANCE AND QUALITY CONTROL

7.1 FIELD

Details of the sampling team for groundwater and soil sampling are described in Table 7-1.

Table 7-1 Details of samplers

Person	Role
Michial Sutherland	Principal Environmental Consultant (NGH Environmental)
Nicola Smith	Environmental Consultant (NGH Environmental)

The Chain of Custody forms are contained within Appendix D for soil and Appendix E for groundwater.

The clean Bailer used for groundwater sampling was first rinsed with the groundwater to be sampled. After sampling, the Bailer was cleaned with deionised water. This was deemed an appropriate method of sample collection as volatile compounds are not considered to be an issue from previous land uses.

The auger and bucket used to collect soil samples were decontaminated after each use with clean water and then dried with a single-use cloth.

Replicate and triplicate samples were not necessary for groundwater sampling as only one sample was taken. The soil samples taken for this preliminary characterisation of the soils of the site, and previous work by McMahon (2010), eliminated the requirement for replicate and triplicate samples. If a detailed site investigation was required, further analysis including replicate and triplicate samples, would be required.

7.2 LABORATORY

All laboratory QA/QC, including the Chain of Custody forms, are contained within Appendix D for soil and Appendix E for groundwater.

7.3 DATA QUALITY INDICATORS

The soil and groundwater analytes that exceed the HSLs, ESLs, Management Limits and GILs for freshwater ecosystems are from naturally derived sources and therefore do not pose a risk to human or environmental health. The site is suitable for continued commercial/ industrial land use and no further investigation is required.

As such, the acceptance of the analytical data is made on the basis of the data quality indicators in the context of the precision, accuracy, representativeness, comparability and completeness (PARCC). PARCC assessment is based on the following parameters as outlined in *Schedule B2 of the National Environment Protection (Assessment of Site Contamination) Measure 1999*:

- Precision: A quantitative measure of the variability (or reproducibility) of data.
- Accuracy: A quantitative measure of the closeness of reported data to the “true” value.
- Representativeness: The confidence (expressed qualitatively) that data are representative of each media present on site.
- Comparability: The confidence (expressed qualitatively) that data may be considered to be equivalent for each sampling and analytical event.

- Completeness: A measure of the amount of useable data from a data collection activity.

Table 7-2 provides a summary statement for each parameter of the PARCC assessment.

Table 7-2 DQOs assessment

DQO parameter	Comment
Precision	The precision was high when considering: • Standard sampling procedures were used by trained professionals. • Laboratory duplicates were analysed and are available in Appendix D and Appendix E. • Field replicates and triplicates were not required for groundwater or soil as discussed in section 7.1.
Accuracy	The accuracy was high when considering: • The standard sampling procedure was sufficient for this preliminary site investigation. • All actions and tools used ensured no cross contamination between samples. • Groundwater receptacles were provided by the laboratory. • The laboratories that analysed the data presented the data to the "true" value (Appendix D and Appendix E).
Representativeness	Confidence of the data collected is representative of each medium. The samples are representative of the development footprint and adjacent windrowed material. This is evidenced by the McMahon (2010) report. The groundwater sample is representative of the ongoing groundwater chemistry around the site as compared to past data.
Comparability	Confidence of the data collected is equivalent for each sampling and analytical event. The same standard sampling procedure was used for each soils sample collection. All soil samples were collected on the same day in the same weather conditions and handled in the same way. Evidence of the laboratory sample analysis is available in Appendix D and Appendix E.
Completeness	100% of the data collected was able to be used. Groundwater data was restricted to one monitoring well as all other monitoring wells were dry. Soil sampling was extensive in its coverage and representative of the site. Envirolab has noted that due to interference from analytes, the Practical Quantitation Limit (PQL) in some samples was raised (Appendix D).

8 SCREENING CRITERIA AND MANAGEMENT LIMITS

The following screening criteria and management limits were used in this assessment as per the Tier 1 Assessment Criteria. Health Investigation Level (HIL) D is applied to this site for past, present and proposed uses and is defined as: *Commercial/ Industrial, includes premises such as shops, offices, factories and industrial sites*. The site was used for effluent evaporation from a wool combing facility. The proposed future use is for a materials facility to use the void of the western pond and suits the definition for HIL D. Agricultural activities continue around the ponds.

8.1 SOIL

NEPM (2013) Health Based Investigation Level D (HIL D), as described above, is part of a Tier 1 risk based generic assessment criteria. The assessment criteria assess the potential risks to human health from exposure to contaminants in the soil. Other HILs are Residential (A/B) and Recreational (C). Therefore, the soil assessment is based on the criteria for HIL D.

NEPM (2013) Management of limits for TPH fractions F1-F4 in soil are relevant for operating sites where there is potential for significant sub-surface leakage of petroleum compounds. These are required as screening levels after the evaluation of human health and ecological risks and risks to groundwater resources. The management limits D for commercial/ industrial sites has been adopted for the current and proposed land use.

8.2 VAPOUR

NEPM (2013) Health Based Screening Level D (HSL D), as described above, is part of a Tier 1 risk based generic assessment criteria. The assessment criteria assess the potential risks to human health from exposure to vapours caused by contaminants in the soil. Other HILs are Residential (A/B) and Recreational (C).

Assessment of potential volatile contamination would occur where soil or groundwater contamination with volatile hydrocarbons were above the HSL D and GHSL D respectively. Volatile contamination is not a known or expected contaminant of previous land uses within the proposed development site and has therefore, not been assessed.

8.3 ECOLOGICAL

NEPM (2013) Ecological Screening Level D (ESL D) is part of a Tier 1 assessment for TPH fractions and specific compounds. ESLs apply to the root and habitation zone for plants and animals, which is within 2 m of the surface.

Samples were taken in heavily disturbed environments that were used for the previous wool combing industry. Areas of ecological significance occur to the west (up-gradient) of the western pond.

The landscape characteristic to the east of the site is predominantly rural agricultural land with remnant vegetation and farm dams. There is an area of planted native vegetation down-gradient in the south-eastern corner of the proposed development site. Schiller's Creek is an ephemeral draining line around 1.3 km east of the site.

8.4 GROUNDWATER

NEPM (2013) Groundwater Health Screening Level D (GHSL D) is part of a Tier 1 risk based generic assessment criteria. The assessment criteria assess the potential risks to human health from exposure to inhalation of vapours from contaminants in the groundwater. Other GHSLs are Residential (A/B) and Open Space/ Recreational (C). Therefore, the groundwater assessment is based on the criteria for GHSL D.

NEPM Groundwater Investigation Levels (GILs) for drinking water quality and fresh water ecosystems were adopted from the Australian Drinking Water Guidelines and the ANZG 2018 guidelines for Fresh and Marine Water Quality. They were used to determine if further investigation was required into groundwater contamination when the GIL thresholds are exceeded.

Although potential drinking water wells east and southeast of the site are beyond attenuation zones (dilution of contaminants over distance), GILs were considered because:

- Potential contamination of groundwater on site from on-site contamination associated with the effluent ponds and windrowed material.
- There are 40 licensed bores within 2 km of the site, which are primarily used for irrigation and two for stock/ stock and domestic. However, these two wells are west and north-west of the site and as such unlikely to be impacted.

9 SITE CHARACTERISATION

9.1 SOIL

The results are provided in full in Appendix D and summarised in Table 9-1.

The analytes tested for in the eight soil samples for metals and inorganics, and OC and OP, are below the HILs for soil contaminants based on the *National Environment Protection (Assessment of Site Contamination) Measure* (NEPM 2013).

To determine whether the TRHs are above the HSLs and a threat to human health, according to NEPM (2013) *Guidelines on Investigation levels for Soil and Groundwater*, Benzene, Toluene, Ethylbenzene and Xylenes should be subtracted from the TRH $C_6 – C_{10}$ analytical results to compare them with the health-based screening levels (HSL) for fraction 1 (carbon range $C_6 – C_{10}$). Naphthalene should be subtracted from C10 – C16 to compare with the HSL for fraction 2.

The F1 and F2 fractions (Table 3-2) are well below the thresholds listed for commercial and industrial use in *Table 1B(6) Management Limits for TPH fractions F1 – F4* (NEPM 2013). The Commercial and Industrial Management Limit threshold for F1 $C_6 – C_{10}$ is 800 mg/kg and for F2 $>C_{10} – C_{16}$ is 1000 mg/kg (NEPM 2013). The Management Limit for F3 is exceeded for Soil 8 (waxy residue), Soil 9 (high volume waxy residue near pipe outlet) and Soil 11 (windrowed soil, bark chip and waxy residue). The Management Limit for F4 is exceeded by Soil 8 (waxy residue).

Fractions 3 ($>C_{16}$-C_{34}) and 4 ($>C_{34}$-C_{40}) refer to longer chain hydrocarbons that are non-volatile and therefore not a concern for vapour intrusion. Affects from exposure to these can be via direct contact (Friebel and Nadebaum 2011).

The ESL for F2 are exceeded for Soil 8 (waxy residue) and Soil 11 (windrowed material), both soil samples are of the wool combing waxy residue. The ESL for F3 is exceeded by Soil 8 (waxy residue), Soil 9 (high volume waxy residue near pipe outlet) and Soil 11 (windrowed material). The ESL for F4 is exceeded by Soil 8 (waxy residue and Soil 11 (windrowed material). The samples containing hydrocarbons that exceed the ESLs for fractions 2, 3 and 4 are those that contain only or a high volume of the naturally derived wool combing waxy residue.

The results for $>C_{16}$-C_{34} and $>C_{34}$-C_{40} are below those described in *Table B4 Soil Health Screening Levels for Direct Contact (mg/kg)* for an intrusive maintenance worker (Friebel and Nadebaum 2011), where the worker is assumed to be exposed 20 days per year, over 30 consecutive years. An intrusive maintenance worker covers activities within the first 1 m of soil. Test pit results for the western pond (Appendix C) show wool wax residue is found at maximum depths between 0.75 m and 1.25 m.

Envirolab has noted that due to interference from analytes, the Practical Quantitation Limit (PQL) in some samples was raised (Appendix D).

As the results indicate, some ESLs and Management Limits have been exceeded, particularly for Fractions 3 and 4. However, as the waxy residue is naturally derived from sheep's wool, the associated risk to human and environmental health is low.

Therefore, the ongoing use of the site for commercial/industrial land use is appropriate. Immediate intervention is not necessary, and the environmental risks are considered to be manageable. Levels of pesticides were below the method detection limit in the samples tested.

Table 9-1 Analytical results for soil samples from the proposed development footprint

Analyte	Units	Pond north		Pond centre north (Soil 3) 0.0-0.15m	Pond centre south (Soil 7) 0.0-0.15m	Waxy residue (Soil 8) 0.0m	Pond south		Windrow (Soil 11) 0.0-0.1m	HILs Column D (mg/kg)	HSLs Column D (mg/kg)				ESLs Column D (mg/kg)	Management limits for TPH fractions F1-F4 in soil (mg/kg)
		Soil 1 0.0-0.15m	Soil 2 0.3-0.4m				Soil 9 0.0-0.15m	Soil 10 0.3-0.4m			0 m to <1 m	1 m to <2 m	2 m to <3 m	4 m +		
Arsenic	mg/kg	<4	<4	<4	<4	<4	<4	<4	8	3000	-	-	-	-	-	-
Cadmium	mg/kg	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	900	-	-	-	-	-	-
Chromium	mg/kg	37	48	37	38	8	37	58	40	3600	-	-	-	-	-	-
Copper	mg/kg	16	20	17	15	4	12	18	27	240000	-	-	-	-	-	-
Lead	mg/kg	12	11	11	11	3	8	11	13	1500	-	-	-	-	-	-
Mercury	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	730	-	-	-	-	-	-
Nickel	mg/kg	10	13	15	15	4	10	12	15	6000	-	-	-	-	-	-
Zinc	mg/kg	19	22	42	63	49	29	19	220	400000	-	-	-	-	-	-
Total +ve DDT+DDE+DDD	mg/kg	<0.1	<0.1	<0.1	<0.1	<1	<1	<0.1	<1	3600	-	-	-	-	-	-
Aldrin & Dieldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<1	<1	<0.1	<1	45	-	-	-	-	-	-
Chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1	<1	<1	<0.1	<1	530	-	-	-	-	-	-
Endosulfan	mg/kg	<0.1	<0.1	<0.1	<0.1	<1	<1	<0.1	<1	2000	-	-	-	-	-	-
Endrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<1	<1	<0.1	<1	100	-	-	-	-	-	-
Heptachlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<1	<1	<0.1	<1	50	-	-	-	-	-	-
HCB	mg/kg	<0.1	<0.1	<0.1	<0.1	<1	<1	<0.1	<1	80	-	-	-	-	-	-
Methoxychlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<1	<1	<0.1	<1	2500	-	-	-	-	-	-
Chlorpyrifos	mg/kg	<0.1	<0.1	<0.1	<0.1	<1	<1	<0.1	<1	2000	-	-	-	-	-	-
PCBs	mg/kg	<0.1	<0.1	<0.1	<0.1	<1	<1	<0.1	<1	7	-	-	-	-	-	-

Analyte	Units	Pond north		Pond centre north (Soil 3) 0.0-0.15m	Pond centre south (Soil 7) 0.0-0.15m	Waxy residue (Soil 8) 0.0m	Pond south		Windrow (Soil 11) 0.0-0.1m	HILs Column D (mg/kg)	HSLs Column D (mg/kg)				ESLs Column D (mg/kg)	Management limits for TPH fractions F1-F4 in soil (mg/kg)
		Soil 1 0.0-0.15m	Soil 2 0.3-0.4m				Soil 9 0.0-0.15m	Soil 10 0.3-0.4m			0 m to <1 m	1 m to <2 m	2 m to <3 m	4 m +		
PAHs (total)	mg/kg	<5	<0.5	<5	<5	<5	<0.5	<0.5	<0.5	4000	-	-	-	-	-	-
Moisture Content	%	17	15	19	14	7.0	19	16	6.5	-	-	-	-	-	-	-
TRH $C_8 – C_9$	mg/kg	<25	<25	<25	<25	<25	<25	<25	<25	-	-	-	-	-	-	-
TRH $C_6 – C_{10}$	mg/kg	<25	<25	<25	<25	<25	<25	<25	<25	-	-	-	-	-	-	800
TPH $C_6 – C_{10}$ less BTEX (F1)	mg/kg	<25	<25	<25	<25	<25	<25	<25	<25	-	310	480	NL	NL	215	-
TRH $C_{10} – C_{14}$	mg/kg	<50	<50	<50	<50	410	170	<50	550	-	-	-	-	-	-	-
TRH $C_{15} – C_{28}$	mg/kg	500	<100	1800	2400	19000	5800	<100	9200	-	-	-	-	-	-	-
TRH $C_{29} – C_{36}$	mg/kg	1600	<100	5500	6500	62000	18000	170	23000	-	-	-	-	-	-	-
TRH $>C_{10} – C_{16}$	mg/kg	<50	<50	53	88	600	260	<50	700	-	-	-	-	-	-	1000
TRH $>C_{10} – C_{16}$ less Naphthalene (F2)	mg/kg	<50	<50	53	88	**600**	**260**	<50	**700**	-	NL	NL	NL	NL	170	-
TRH $>C_{16} – C_{34}$ (F3)	mg/kg	1900	<100	1700	2400	**20000**	**22000**	190	**28000**	-	-	-	-	-	2500	5000
TRH $>C_{34} – C_{40}$ (F4)	mg/kg	450	<100	1700	2400	**20000**	5300	<100	**8700**	-	-	-	-	-	6600	10000
Total TRH ($C_{10} – C_{40}$)	mg/kg	2300	<50	8200	10000	90000	28000	190	37000	-	-	-	-	-	-	-
Benzene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	-	4	6	9	20	95	-
Toluene	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	NL	NL	NL	NL	135	-
Ethylbenzene	mg/kg	<1	<1	<1	<1	<1	<1	<1	<1	-	NL	NL	NL	NL	185	-
Xylenes (total)	mg/kg	<1	<1	<1	<1	<1	<1	<1	<1	-	NL	NL	NL	NL	95	-
Naphthalene	mg/kg	<1	<0.1	<1	<1	<1	<1	<1	<1	-	NL	NL	NL	NL	-	-

9.2 GROUNDWATER

The results indicate that the groundwater from bore P1B remains uncontaminated by BTEX hydrocarbons, heavy metals and pesticides (Table 9-2). The groundwater results are below the groundwater HSL for 8 m+.

The groundwater testing results for bore P1B indicate that the majority of the analytes tested are below the thresholds for commercial and industrial land use. The results also indicate that levels of the majority of analytes tested are below threshold levels for the groundwater investigation levels for drinking water and for freshwater ecosystems or below the limit of reporting.

No bores for stock and/or domestic use have been identified within close proximity to the site that are within the direction of the identified groundwater flow path. Therefore, the attenuation zone between the site and abstraction zones would be great enough that groundwater quality objectives are not exceeded. Results indicate that there are no exceedances of the GILs for drinking water, which have remained in the assessment.

The analytes that are elevated against threshold values include chromium, copper, lead and zinc. These are elevated against the groundwater investigation levels for freshwater ecosystems. Elevated background levels of these trace elements are expected to be the result of the fractured granite aquifer source (Kumar 2013). Levels of chloride are slightly elevated than the results of prior groundwater testing for the same bore in 2003 – 2006 (Appendix F).

The groundwater investigation levels (GILs) reported for freshwater ecosystems are from the 95% species protection values of the *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZG 2018).

Table 9-2 Groundwater results and comparison to GILs for drinking water and freshwater ecosystems

Indicator	LOR	Units	P1B 2018	GIL[1]	GIL[2]	NEPM HSLs Column D (mg/L)		
						2 to <4 m	4 m to <8 m	8 m +
pH	1	pH units	7.5	-	-	-	-	-
EC	1	µs/cm	1290	-	-	-	-	-
Total Dissolved Solids (TDS)	2	mg/L	715	-	-	-	-	-
Sodium (Na)	0.05	mg/L	83.8	-	-	-	-	-
Potassium (K)	0.2	mg/L	2.5	-	-	-	-	-
Calcium (Ca)	0.03	mg/L	84.5	-	-	-	-	-
Magnesium (Mg)	0.02	mg/L	27.7	-	-	-	-	-
Chloride (Cl)	0.5	mg/L	234	-	-	-	-	-
Nitrate (NO_3) as N	0.1	mg/L	6.8	50	0.7	-	-	-
Sulphate (SO_4)	0.5	mg/L	19.7	500	-	-	-	-
Total Hardness as $CaCO_3$	2	mg/L	325	-	-	-		
Alkalinity, Total as $CaCO_3$	2	mg/L	378	-	-	-		
Arsenic	0.02	mg/L	<0.02	0.01	0.024 as As(III) 0.013 as As(V)	-		
Cadmium	0.002	mg/L	<0.002	0.002	0.002	-	-	-
Chromium	0.002	mg/L	0.007	0.050	0.001	-	-	-
Copper	0.002	mg/L	0.046	2	0.0014	-	-	-
Lead	0.01	mg/L	0.01	0.01	0.0034	-	-	-
Mercury	0.03	mg/L	<0.03	0.001	0.0006	-	-	-
Nickel	0.01	mg/L	<0.01	0.02	0.011	-	-	-

Indicator	LOR	Units	P1B 2018	GIL[1]	GIL[2]	NEPM HSLs Column D (mg/L)		
						2 to <4 m	4 m to <8 m	8 m +
Selenium	0.02	mg/L	<0.02	0.01	0.005	-	-	-
Zinc	0.02	mg/L	0.109	-	0.008	-	-	-
Benzene	<0.001	mg/L	<0.001	0.001	0.95	30	30	35
Toluene	<0.001	mg/L	<0.001	0.8	-	NL	NL	NL
Ethyl Benzene	<0.001	mg/L	<0.001	0.3	-	NL	NL	NL
o-Xylene	<0.001	mg/L	<0.001	0.6	0.35	NL	NL	NL
p-Xylene	<0.002	mg/L	<0.002	0.6	0.2	NL	NL	NL
Naphthalene	<0.001	mg/L	<0.001	-	0.016	NL	NL	NL
TRH (C_6-C_{10}) & F1 – TRH C_6-C_{10} minus BTEX	<0.1	mg/L	<0.1	-	-	NL	NL	NL
TRH (>C_{10}-C_{16}) & F1 – TRH >C_{10}-C_{16} minus Naphthalene	<0.1	mg/L	<0.1	-	-	NL	NL	NL
TRH >C_{16}-C_{34}	<0.1	mg/L	<0.1	-	-	-	-	-
TRH >C_{34}-C_{40}	<0.1	mg/L	<0.1	-	-	-	-	-
Aldrin	<0.001	mg/L	<0.001	0.0003	-	-	-	-
Chlordane	<0.001	mg/L	<0.001	0.002	0.00003	-	-	-
DDT	<0.001	mg/L	<0.001	0.09	0.00006	-	-	-
Dieldrin	<0.001	mg/L	<0.001	0.0003	-	-	-	-
Endosulfan	<0.001	mg/L	<0.001	0.02	0.0003	-	-	-
Endrin	<0.001	mg/L	<0.001	-	0.00001	-	-	-
Heptochlor	<0.001	mg/L	<0.001	-	0.00001	-	-	-
Lindane	<0.001	mg/L	<0.001	0.01	0.0002	-	-	-
Chlor-pyrifos	<0.001	mg/L	<0.001	0.01	0.00001	-	-	-
Diazinon	<0.001	mg/L	<0.001	0.004	0.00001	-	-	-
Malathion	<0.001	mg/L	<0.001	0.07	0.00005	-	-	-

Indicator	LOR	Units	P1B 2018	GIL[1]	GIL[2]	NEPM HSLs Column D (mg/L)		
						2 to <4 m	4 m to <8 m	8 m +
Parathion	<0.001	mg/L	<0.001	0.02	$4x10^{-6}$	-	-	-

1. Groundwater investigation level for drinking water

2. Groundwater investigation level for fresh water ecosystems

NL – No HSL presented for this chemical

10 CONCLUSION AND RECOMMENDATIONS

NGH Environmental completed a Preliminary Site Investigation of the proposed development footprint and adjacent land, with windrowed material, to the east.

As part of the assessment, a sampling and analysis program was completed. Eight soil samples were collected that are representative of the effluent disposal and evaporation ponds at the site. The eight samples were analysed at the Envirolab laboratories for total metals and Total Recoverable Hydrocarbons (TRH).

BTEX and hydrocarbons to C_{16} were ruled out (refer to section 2.3). However, the TRH results show that there are hydrocarbons and fractions that exceed the ESLs and management limits. However, the waxy residue material is from a known natural source, sheep. As the material exceeding these screening levels and management limits are naturally derived from sheep's wool, the exceedances do not pose a risk to human or environmental health. Therefore, the site is considered to be suitable for continued for commercial/industrial land use without risk to human health or the environment.

The groundwater results for the majority of analytes tested are below the Groundwater Investigation Levels for drinking water and for fresh water ecosystems (ANZG 2018). The trace elements that are elevated against trigger levels of the GILs for freshwater ecosystems are copper, chromium, lead and zinc. Elevated background levels of these trace elements are expected to be the result of the fractured granite aquifer source (Kumar 2013) and do not pose a risk to human or environmental health. Therefore, the site is considered to be suitable for continued for commercial/industrial land use.

This assessment has indicated that there is contamination on-site, which is identified as the waxy residue from the wool combing process. Characterisation of the waxy residue, through this assessment and the assessment by McMahon (2010), indicates that although immediate intervention is not necessary, remediation of the soil would be required before reuse or alternatively disposed of at an EPA licenced facility. Recommendations on the management of this waxy residue is available in section 10.2. Using appropriate remediation methods, it can be reused on-site. Therefore, no further investigation required.

10.1 MITIGATION MEASURES

Mitigation measures should be taken to ensure the contaminants do not mobilise and leach further throughout the landscape and include:

- If during excavation any potentially contaminated soils are encountered, it is recommended that testing and classification of the material be arranged.
- Any stockpiles of materials suspected to contain contamination should be bunded on an impervious surface to minimise the risk of contaminated materials mobilising on site.

10.2 RECOMMENDATIONS

Wool scouring, the most polluting part of the wool combing process (Stivens *et al*. n.d.), involves the cleaning of the wool fibre and the subsequent removal of wool wax, suint, dirt and vegetative matter. The waxy residue that remains, after the scouring effluent has evaporated, contains levels of biogenic long-chain hydrocarbons above NEPM (2013) trigger levels. Although not a risk to human or environmental health, the contaminated soil requires remediation to become a material fit for other applications. The

composting and land application of wool scour waste has been the topic of research into the economical remediation and reuse of soils contaminated with the waxy residue (Kroening 2003; Pearson *et al*. 2004).

Landfarming is a method of passive remediation that uses bacteria and fungi to convert polluting and contaminating substances in soil into a material that no longer presents a risk to human or environmental health (EPA 2014). Landfarming is generally suited to soils contaminated with benzene, toluene, ethylbenzene and xylenes (BTEX), total petroleum hydrocarbons, polycyclic aromatic hydrocarbons and phenolic compounds. Long-chain hydrocarbons and those with a higher molecular weight are more resistant to biodegradation but will still biodegrade (EPA 2014).

Landfarming may be a suitable method of remediation for the proposal and could occur on-site. The clay soils at the proposal site would require amelioration with gypsum, and bulking agents such as sawdust or green waste (Maheswaran *et al*. 1999; Stivens *et al*. n.d.: EPA 2014). This will enable greater aeration of the soil, which is required for this method of remediation. If remediation on-site is not appropriate, alternative soil recycling facilities could be considered, such as the EPA licenced Cootamundra Soil Recycling Facility.

Once appropriate remediation measures have eliminated or converted the contaminating substances from the soil, it could be reused on-site. Reuse of soils on site once the soil has been subject to appropriate soil engineering assessment. If the soil does not meet the required engineering properties it can be reused on-site as non-structural fill material or used as an agricultural material for crop fertilisation with reference to the NSW EPA's *Environmental Guidelines on Use and Disposal of Biosolid Products* (2000).

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APPENDIX A CONTAMINATION ASSESSMENT REPORT RIVERINA WOOL COMBING FACILITY

Appendix H – Riverina Wool Combing effluent ponds contamination assessment

RIVERINA WOOL COMBING
SITE ASSESSMENT & "NOTICE OF CLEAN-UP ACTION" REQUIREMENTS

Riverina Wool Combing
Byrnes Road
Bomen, NSW 2650
29 September 2014

Project brief
On 4 September 2014, a site visit to Riverina Wool Combing (RWC), an industrially zoned site, at Byrnes Road, Bomen was conducted to assess and discuss issues which were outstanding from a NSW EPA "Notice of Clean-Up Action" issued on the 29 March 2011 and any other environmental issues which were of concern to the EPA regarding the site. Present for the site visit were Damian Moloney of Knight Frank Real Estate, Christopher Burton and Amanda Baldwin of NSW EPA and James Maloney of DM McMahon Pty Ltd (DMM).

The main area of concern surrounds the former wool scour waste landfill area which contains waste from the former processing of wool. Within this waste is a large amount of lanolin residues which leads to the presence of Hydrocarbons. Presently it is thought that there are 2 wool scour waste encapsulation cells on site and it is proposed to construct a third encapsulation cell from wool scour waste in the landfill area.

The waste water and sludge treatment areas raised concerns regarding the presence of persistent pesticides, heavy metals and hydrocarbons. Sludge from each of the evaporation ponds, anaerobic and aerobic ponds and terminal ponds was sampled and analysed for the above contaminants. Recommendations are contained within this report regarding disposal and/or usage of this sludge.

Samples were collected by hand auger on 8 September 2014. A number of samples were taken from each pond to form a composite sample for the respective pond. Samples were taken to a maximum depth of 1 metre where greater than 1 metre of sludge was present.

Site identification
Address: 560 Byrnes Road, Bomen, NSW 2650
Real property description: Lot 1 DP 771340
Centre co-ordinate: E539322 N6121031 - MGA 55 GDA 94
Property size:

North of Trahairs Road	Area – 184 Hectares
	Perimeter – 6.02 km
South of Trahairs Road	Area – 188 Hectares
	Perimeter – 5.63 km

Present use: Industrial land
Environment Protection Licence Number: 3914 (Surrendered)

DM McMahon Pty Ltd 4A Norton Street (PO BOX 6118) Wagga Wagga NSW 2650 t (02) 6931 0510 m 0427 214 453 f (02) 6931 0511
e david@dmmcmahon.com.au w www.dmmcmahon.com.au

Methodology
Work was carried out generally by reference to NSW EPA (1994, 1995 and 1997). Contamination analysis and threshold comparision was done in accordance with NEPM (2013).

Contamination assessment
The investigation area consists of the former waste water and sludge treatment area and former Wool Scour Waste landfill to the south of Trahairs road on the Riverina Wool Combing site. Sampling was carried out at the following locations:

1) Wool Scour waste landfill dam
2) Terminal Pond (3A)
3) Terminal Pond (3B)
4) Aerobic pond (2A)
5) Aerobic Pond (2B)
6) Anaerobic Pond (single sample representing 1A & 1B)
7) Sludge storage pit
8) Evaporation Basin (4A)

Sampling where possible was taken from the centre of each pond/pit, however a number of ponds still contain a large amount of water which meant sampling was carried out along the edge. Anaerobic Pond, 1B, was at capacity which meant a sample could not be obtained; as a result sample no. 6, anaerobic pond sample, is representative of sludge contained in both anaerobic ponds.

Samples were collected by hand auger on 8 September 2014. A number of samples were taken from each pond to form a composite sample for the respective pond. Samples were taken to a maximum depth of 1 metre where greater than 1 metre of sludge was present.

The samples were sent for analysis at a NATA accredited laboratory and results are compared against relevant guidelines within this report.

Characteristics of the site
A desktop review and investigation of the topography, hydrology, soil, lithology, geology and hydrogeology of the site has been undertaken and are as follows:

Topography
The Wagga Wagga 1:100 000 Topographic Map (Sheet 8327-1-N) indicates that the site is located at an elevation of approximately 225m to 235 AHD. The site landform is classed as flat with a level slope.

Location and Significance
Soil & Landform
The site lies within the soil mapping unit coded as UB39 from the Digital Atlas of Australian Soil (BRS, 1991). The map unit key UB39 is described as:
The site lies within the soil mapping unit coded as eb, East Bomen, and is found over 26.6 km^2 of undulating rises and long lower slopes, within the Northcote-Coolamon physiographic region. This landscape occurs more extensively on the Wagga Wagga 1:100 000 sheet from which this description is derived (Chen & McKane 1996).

eb	EAST BOMEN	Aeolian (Associated)

Landscape—26.6 km², undulating rises comprising broad crests and ridges, long waning slopes, and shallow drainage depressions underlain by Silurian Wantabadgery granodiorite. Local relief 15–40 m, slopes 3–10%. Almost completely cleared tall woodland.

Soils—shallow to moderately deep (40–100 cm) Haplic Red Chromosols and Kandosols (Red Earths) on crests and ridges. Moderately deep (80–150 cm) Haplic Red Kandosols (Red Earths), Chromosols and Dermosols on slopes. Moderately deep (80–150 cm) Haplic Brown Kandosols (Yellow Earths) in drainage lines.

Qualities and Limitations—moderate erosion hazard. Moderate acidity, shallow soils (localised).

Landscape

Geology
Silurian granites, mainly Wantabadgery granodiorite and Collingullie granite. Thick (>2 m) clay sequences with significant windblown (aeolian) clay additions (parna) occur on most sideslopes and in drainage depressions.

Landform/Topography
Undulating rises and minor low hills. Slope gradients are mostly 3–10%. Local relief is 15–40 m within an elevation range of 200–280 m. Landform elements include broad (<500 m) crest and ridges, long (>400 m) waning slopes and shallow drainage lines.

Climate and Hydrology
Climatic zones 2A and 2C. Annual rainfall is 500-550mm. During winter and spring, soil is moderately moist to moist but dry during summer and early autumn. Run on is low to moderate for most slopes but moderate to high near drainage depressions.

Stormwater from the RWC site runs into an unnamed creek 1.7 km southeast from the site. This creek flows to the Kurrajong lagoon approximately 5.1 km south east of the RWC site. Dukes Creek is located approximately 0.9 km to the east and north east of the RWC site.

Vegetation
Almost completely cleared. Isolated very small areas of extensively cleared tall woodland remain in crown reserve and along a few roads. Most common tree species include *Callitris glaucophylla* (white cypress Pine), *Eucalyptus albens* (white box), *E. microcarpa* (grey box) and *E. melliodora* (yellow box). Understorey species

include *Themeda australis* (kangaroo grass), *Poa labillardierei* (tussock grass), *Austrostipa aristiglumis* (plains grass), *Austrostipa* spp. (speargrass) and *Austrodanthonia* spp. (wallaby grass).

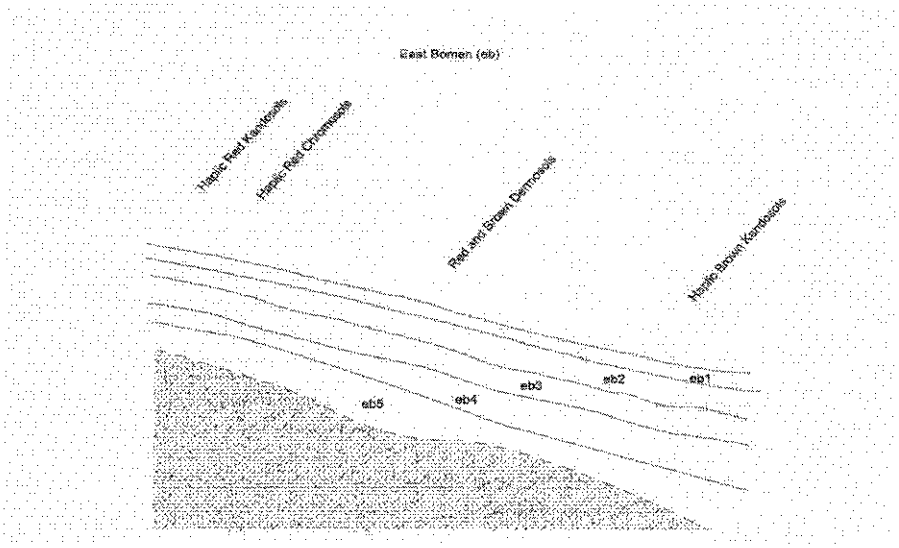
Land Use
Predominantly cropping for wheat with minor barley and cereal rye. Minor improved pasture for dryland lucerne. Significant areas of grazing, both on stubble and improved pastures.

Land Degradation
As much as 15 cm soil can be lost to sheet erosion in intensively cultivated regions where soil structure decline also occurs, resulting in hardsetting surfaces. Minor gully erosion (usually <1 m deep, locally <2 m) occurs along a few drainage lines. Isolated salinisation in one or two drainage flats has been observed in the north-east of the Wagga soil landscape map sheet.

Urban Capability
Slight to locally moderate limitations where shallow soil (<100 cm on crests and ridges) causes difficulties for excavation and underground services.

Rural Capability and Sustainable Land Use Recommendations
Slight limitations for cultivation tending to moderate on crests and major drainage depressions. Slight limitations for grazing. Areas of sheet erosion and soil structure decline restrict productivity. Eroded drainage lines should be fenced off and revegetated.

Dominant Soil Materials
eb1: acidic brown massive sandy loam to sandy clay loam (topsoil—A_1 horizon).
eb2: reddish-brown massive light clay (subsoil—B_1 horizon).
eb3: sodic reddish-brown massive to strongly structured light to light medium clay (subsoil—B_2 horizon).
eb4: yellowish-brown moderate to strongly structured light medium clay (subsoil—B_2).
eb5: orange moderate structured coarse sandy light clay to light clay (subsoil—BC horizon).



Distribution diagram of East Bomen soil landscape illustrating the occurrence and relationship of dominant soil materials.

Weather
The average rainfall is approximately 571.7 mm per annum, with the wettest months being July, August and October. Annual mean evaporation is 1861.5 mm with mean daily evaporation ranges from 1.2mm in July to 10.2mm in January. Wagga is characterised by cold wet winters and hot dry summers with mean maximum temperatures ranging from 12.7 °C in July to 31.6 °C in January and mean minimum temperatures ranging from 2.7 °C in July to 16.4 °C in February, Wagga Wagga AMO 072150 (www.bom.gov.au).

Lithology and Geology
Silurian Granites, mainly Wantabadgery Granodiorite and Collingullie Granite, with small parts of Burrandana Granite. Thick (>2m) clay sequences with significant windblown (aeolian) clay additions ("parna"), deposited on most sideslopes and in drainage depressions.

Hydrogeology
From the Geoscience Australia hydrogeology dataset the groundwater beneath the site is described as: fractured or fissured extensive aquifers of low to moderate productivity.

Physical characteristics of the site
The site forms part of the former Riverina Wool Combing facility formerly owned and managed by Chargeurs Wool who operated the site under EPL number 3914. The site consists of a mixture of agricultural pasture land, Offices, car park facilities and industrial sheds. Part of the site is currently under lease and in use to third party businesses. It should be noted that an underground Natural Gas Pipeline runs through the site, west of the Wool Processing area through lot numbers:

a) 174 DP 751405
b) 108 DP 751405
c) 110 DP 751405
d) 2 DP 590756

The site runs along Byrnes Road, to its left, and is dissected by Trahairs Road which splits the site into 2 sections.

1) North of Trahairs Road
2) South of Trahairs Road

North of Trahairs Road consists mainly of agricultural land, however it formerly accommodated three water storage and evaporation ponds which were fed by the waste water treatment ponds to the south of Trahairs road. Within this section also lies an area formerly used for stockpiling / wind rowing sludge material. To the north and west of the evaporation ponds there is approximately 110 hectares of agricultural land.

The areas of concern involve the former waste water and sludge treatment area and former Wool Scour Waste landfill to the south of Trahairs Road. There is also thought to be 2 wool scour waste encapsulation cells located to the south of the wool scour waste landfill area. Also within this section are the former offices of RWC, the processing facilities and storage sheds/warehouses for RWC and the former employee car parking facilities. There are 2 main entrances from Byrnes Road used to enter these facilities, with 3 entrances along Trahairs Road. To the rear of the

former wool processing facility there is approximately 100 hectares of agricultural land.

There are approximately 34 groundwater monitoring wells scattered around the RWC site on both sides of Trahairs road.

Site Environmental History
Riverina Wool Combing was formerly owned and operated by Chargeurs Wool. RWC was established in the 1980's and operated under EPL number 3914 since May 2000. Chargeurs then sold the RWC site in 2006/07 to RIVCO Group Pty Ltd (RIVCO), who leased the site back to RWC for a number of years until 2010. In February 2010 RWC advised the EPA that the scheduled activity would cease to be carried out at RWC premises from 31 March 2010.

On 29 March 2011 the EPA issued RWC with a "Notice of Clean-Up Action" requiring an Environmental management Plan to be put together. As RWC no longer operate the facility and RIVCO are no longer in existence, it is unclear if these issues have been addressed.

The EPA have approved the surrender of Environment Protection Licence number 3914 on 23 January 2014, notice number 1506172.

The outstanding issues remaining regarding the site are from the "Notice of Clean-Up action" discussed above, the following site assessment will also make recommendations on how to address any outstanding issues which may assist in the formulation of an Environmental Management Plan.

Potential contaminating activities
There are a number of potential contamination sources on site, such as the following:

1) Wool Scour Waste Landfill area which visibly leaches hydrocarbon contaminated (lanolin) to a dam at the lowest point in the landfill area.
2) Waste water treatment ponds which contain a large amount of sludge contaminated with hydrocarbons from lanolin.
3) Above ground fuel storage tank located in the waste water treatment area, contents are unknown.
4) Underground Natural Gas pipeline running through the site
5) Overhead Electricity power lines run through the site.

Further site investigation may be required surrounding the former process area, offices and the warehouses to establish if chemicals or other substances remain in storage on site. If the fuel storage tank within the waste water treatment area is to be maintained consideration should be given to installing a concrete bund for compliance with work cover and NSW EPA regulations.

Procedure of Work
By reference to Contaminated Sites, sampling design guidelines, NSW EPA (1995), a total of 8 samples were taken from between zero and one metre below ground level at various pre determined sampling points around the site where possible to investigate the extent of contamination. Sludge samples from all ponds on site were sampled and depth of sludge where possible was recorded. It was found that there was greater than one metre of sludge at the following sample locations; Anaerobic pond (*2), Sludge storage pit, and both Aerobic ponds. A minimum of 4 samples up to a maximum of 10 samples were taken at each sampling location which were composited and formed a representative sample for each sample point which was analysed by a NATA accredited laboratory.

Each sample was analysed for moisture content, Potassium, Lead, Arsenic, Zinc, Copper, Aluminium, Iron, Organochlorine pesticides, Organophosphorus pesticides, TPH/TRH and BTEXN. Results are compared against National Environment Protection Measures (NEPM) 2013.

Developing a Decision Rule

As part of the review the analytical data was assessed against *National Environment Protection (Assessment of Site Contamination) Measure,* NEPM (2013); and the Health Investigation (HIL) level 'D' was used from the Measure which is a human exposure setting based on land that has been established as follows:

D. Commercial/Industrial: includes premises such as shops and offices as well as factories and industrial sites.

The HIL was chosen to reflect the current use of the site which is an industrial/commercial.

Specify Limits of Decision Error

This step is to establish the decision maker's tolerable limits on decision errors, which are used to establish performance goals for limiting uncertainty in the data. Data generated during this project must be appropriate to allow decisions to be made with confidence. Specific limits for this project have been adopted in accordance with the appropriate guidance from the NSW EPA (1994), NEPM (2013), ANZECC/ARMCANZ (2000), DEC (2007), appropriate indicators of data quality (DQIs used to assess quality assurance / quality control) and standard procedures for field sampling and handling.

AS4482.1-20054 nominates two types of errors that require assessment:
a) Deciding that the site is acceptable when it actually is not; and
b) Deciding that the site is unacceptable when actually it is.

As a result the above decision rules have been assessed using the relevant guidelines.

Contamination Assessment

As can be seen from the following tables the samples analysed are below the relevant threshold levels for commercial/industrial sites based on National Environment Protection (Assessment of Site Contamination) Measure (NEPM) 2013.

Analyte	Wool Scour Waste landfill dam	*Terminal Pond 3A*	*Terminal Pond 3B*	*Threshold*
Metals/Metalloids (mg/kg)	mg/kg	mg/kg	mg/kg	*mg/kg*
Arsenic	6	6	7	*3000*
Copper	19	19	20	*240,000*
Lead	12	12	14	*1500*[1]
Zinc	29	29	22	*400,000*
Iron	22100	22700	23700	*no data*
Aluminium	18700	17000	16800	*no data*
Major Cations (mg/kg)	mg/kg	mg/kg	mg/kg	*mg/kg*
Potassium	920	1610	1620	*no data*
Organochlorine Pesticides (mg/kg)	mg/kg	mg/kg	mg/kg	*mg/kg*
DDT+DDE+DDD	<0.05	<0.25	<0.05	*3600*
Aldrin & Dieldrin	<0.05	<0.25	<0.05	*45*

Chlordane	<0.05	<0.25	<0.05	*530*
Endosulfan	<0.05	<0.25	<0.05	*2000*
Endrin	<0.05	<0.25	<0.05	*100*
Heptachlor	<0.05	<0.25	<0.05	*50*
HCB	<0.05	<0.25	<0.05	*80*
Methoxychlor	<0.2	<1.0	<0.2	*2500*
Other Pesticides (mg/kg)	mg/kg	mg/kg	mg/kg	*mg/kg*
Chlorpyrifos	<0.05	<0.25	<0.05	*2000*
Organics (mg/kg)	mg/kg	mg/kg	mg/kg	*mg/kg*
TPH $C_6 - C_9$	<10	<10	<10	*no data*
TPH $C_{10} - C_{16}$	<50	<50	<50	*no data*
TPH $C_{16} - C_{34}$	<100	2380	160	*no data*
TPH $C_{34} - C_{40}$	<100	2930	<100	*no data*
TPH $C_{10} - C_{40}$	<50	5310	160	*no data*
BTEXN (mg/kg)	mg/kg	mg/kg	mg/kg	*mg/kg*
Benzene	<0.2	<0.2	<0.2	*no data*
Toluene	<0.5	<0.5	<0.5	*no data*
Ethylbenzene	<0.5	<0.5	<0.5	*no data*
Xylenes (Total)	<0.5	<0.5	<0.5	*no data*
Napthalene	<1	<1	<1	*no data*
Other	%	%	%	%
Moisture Content (%)	23.9	30.8	9.4	*no data*

1. *NEPM (2013)*

Analyte	Aerobic Pond 2A	*Aerobic Pond 2B*	*Anaerobic Pond 1A & 1B*	*Threshold*
Metals/Metalloids (mg/kg)	mg/kg	mg/kg	mg/kg	*mg/kg*
Arsenic	<5	<5	<5	*3000*
Copper	16	22	19	*240,000*
Lead	10	12	12	*1500*[1]
Zinc	94	211	220	*400,000*
Iron	13300	13200	12000	*no data*
Aluminium	15200	16300	12600	*no data*
Major Cations (mg/kg)	mg/kg	mg/kg	mg/kg	*mg/kg*
Potassium	3400	4070	2310	*no data*
Organochlorine Pesticides (mg/kg)	mg/kg	mg/kg	mg/kg	*mg/kg*
DDT+DDE+DDD	<0.25	<0.5	<2.5	*3600*
Aldrin & Dieldrin	<0.25	<0.5	<2.5	*45*
Chlordane	<0.25	<0.5	<2.5	*530*
Endosulfan	<0.25	<0.5	<2.5	*2000*
Endrin	<0.25	<0.5	<2.5	*100*
Heptachlor	<0.25	<0.5	<2.5	*50*
HCB	<0.25	<0.5	<2.5	*80*
Methoxychlor	<1.0	<2.0	<10	*2500*
Other Pesticides (mg/kg)	mg/kg	mg/kg	mg/kg	*mg/kg*
Chlorpyrifos	<0.25	<0.5	<2.5	*2000*
Organics (mg/kg)	mg/kg	mg/kg	mg/kg	*mg/kg*
TRH $C_6 - C_{10}$	<10	28	<10	*no data*
TRH $C_{10} - C_{16}$	<170	80	<50	*no data*
TRH $C_{16} - C_{34}$	25200	19600	13700	*no data*
TRH $C_{34} - C_{40}$	31100	27600	16300	*no data*

TRH $C_{10} - C_{40}$	56500	47300	30000	*no data*
BTEXN (mg/kg)	mg/kg	mg/kg	mg/kg	*mg/kg*
Benzene	<0.2	<0.2	<0.2	*no data*
Toluene	<0.5	<0.5	<0.5	*no data*
Ethylbenzene	<0.5	<0.5	<0.5	*no data*
Xylenes (Total)	<0.5	<0.5	<0.5	*no data*
Napthalene	<1	<1	<1	*no data*
Other	%			%
Moisture Content (%)	49.8	56.4	47.1	*no data*

1. *NEPM (2013)*

Analyte	Sludge Storage pit	*Evaporation Basin*	*Threshold*
Metals/Metalloids (mg/kg)	mg/kg	mg/kg	*mg/kg*
Arsenic	<5	6	*3000*
Copper	25	14	*240,000*
Lead	17	8	*1500*[1]
Zinc	202	76	*400,000*
Iron	19700	11400	*no data*
Aluminium	21500	10800	*no data*
Major Cations (mg/kg)	mg/kg	mg/kg	*mg/kg*
Potassium	3400	8800	*no data*
Organochlorine Pesticides (mg/kg)	mg/kg	mg/kg	*mg/kg*
DDT+DDE+DDD	<5.0	<2.5	*3600*
Aldrin & Dieldrin	<5.0	<2.5	*45*
Chlordane	<5.0	<2.5	*530*
Endosulfan	<5.0	<2.5	*2000*
Endrin	<5.0	<2.5	*100*
Heptachlor	<5.0	<2.5	*50*
HCB	<5.0	<2.5	*80*
Methoxychlor	<20	<10	*2500*
Other Pesticides (mg/kg)	mg/kg	mg/kg	*mg/kg*
Chlorpyrifos	<0.25	<0.5	*2000*
Organics (mg/kg)	mg/kg	mg/kg	*mg/kg*
TRH $C_6 - C_{10}$	<10	<10	*no data*
TRH $C_{10} - C_{16}$	90	90	*no data*
TRH $C_{16} - C_{34}$	16400	17100	*no data*
TRH $C_{34} - C_{40}$	24600	22400	*no data*
TRH $C_{10} - C_{40}$	41100	39600	*no data*
BTEXN (mg/kg)	mg/kg	mg/kg	*mg/kg*
Benzene	<0.2	<0.2	*no data*
Toluene	<0.5	<0.5	*no data*
Ethylbenzene	<0.5	<0.5	*no data*
Xylenes (Total)	<0.5	<0.5	*no data*
Napthalene	<1	<1	*no data*
Other	%	%	%
Moisture Content (%)	55.1	47.1	*no data*

1. *NEPM (2013)*

The soil testing and analysis demonstrates that the soils tested were below soil threshold levels for commercial/industrial land use. The levels of contamination reported do not warrant immediate intervention and are considered acceptable for

the site's existing use as a commercial/industrial premises. Environmental risks are considered manageable at the present levels.

Health Screening Levels (HSL) fractions and corresponding equivalent carbon range

Fraction Number	Equivalent carbon number range
F1	$C_6 - C_{10}$
F2	$C_{10} - C_{16}$
F3	$C_{16} - C_{34}$
F4	$C_{34} - C_{40}$

According to NEPM Guidelines on Investigation levels for Soil and Groundwater 2013, BTEX results should be subtracted from the TRH $C_6 - C_{10}$ analytical results for comparison with the HSL for F1. Likewise, naphthalene should be subtracted from $C_{10} - C_{16}$ for comparison with the HSL for F2.

Chemicals in the **C_{16}-C_{34} and C_{34}-C_{40} fractions are non-volatile** and therefore not of concern for vapour intrusion, however, exposure can be via direct contact pathways (dermal contact and incidental ingestion and inhalation of soil particles). Direct contact HSLs for these fractions can be found in Friebel and Nadebaum (2011a).

It is noted by the NATA accredited laboratory who conducted the analysis that due to matrix interferences in each sample the Limits of Reporting (LoR) for pesticides in each sample required adjusting. This is stated in the attached Certificate of Analysis (CoA).

Estimated Volume of sludge
Pond size has been estimated from SIX maps for the following calculations. Where sludge depth was greater than 1 metre the minimum estimate is shown.

Pond	Area	Perimeter	Depth Sludge	Volume sludge
Terminal Pond (3A)	13350	450	0.4	5340
Anaerobic Pond (1A)	2745	218	>1	>2745
Anaerobic Pond (1B)	2745	218	>1	>2745
Sludge storage	4737	260	>1	>4737
Terminal Pond (3B)	8789	384	<0.1	<879
Aerobic pond (2A)	3924	246	>1	>3924
Aerobic pond (2B)	3924	246	>1	>3924
Evaporation Basin	6400	1470	0.4	2560
Estimated Total Sludge Volume				>26854

From the calculations shown above, there is at least 26,854 m^3 of sludge material within the ponds on site. Samples from the wool scour waste landfill dam and the terminal pond 3B, consisted mainly of clay. Disregarding these samples the minimum moisture content of the sludge was >30%. A more detailed investigation regarding

depth of sludge to establish sludge volumes should be carried out once each pond has been emptied of water and dried out.

Wool Scour Waste Landfill Area

The wool scour waste landfill area covers approximately 2.5 hectares with wool scour waste mounds approximately 1 to 1.5 metres in height scattered throughout the landfill area. An approximate estimation for wool scour waste within the area is 13,500m^3 of waste which requires encapsulation within a landfill cell. It should be noted this is a ballpark estimation. The waste requires encapsulation on site to prevent any hydrocarbon contamination from lanolin derivatives potentially leaching from the waste.

Recommendations

The following are assumptions based on the site remaining as industrially zoned land.

As the material tested is within threshold limit for NEPM commercial/industrial land use (HIL D) it is recommended to leave it in-situ. As the EPA have raised concerns regarding the wool scour waste present in the landfill area it is proposed that this should be encapsulated within a landfill cell similar to existing encapsulation cells present on site to prevent further hydrocarbon contamination on site.

In regard to the volume of sludge material present on site a number of options exist:

1) Combining the sludge with existing clay on site or VENM material for earthworks which may be required on site may be considered once further geotechnical testing on soil/sludge blends have undergone soil engineering analysis for the following at a minimum, Gradings, MDD/OMC, and PI.
2) Landspreading throughout the site should be considered as the sludge is likely to be rich in nutrients valuable to crops. The elevated Potassium results are an indication of this. Further analysis may be required and a detailed biosolids application strategy should be implemented. Contaminant threshold levels for biosolids application are discussed below.
3) The sludge material may be suitable for composting at a facility such as "Carbon Mate", which is an EPA licenced facility at Gregadoo landfill facility. Carbon Mate accept green waste and "build soil carbon" to produce a high value compost product.

It is also advised that a detailed services location be carried out prior to any earthworks beginning. Issues such as the existence of an underground gas pipeline and overhead electricity power lines should be clearly marked and identified.

Suitability for Biosolids Disposal

As the sludge material sampled is within NEPM guideline values for a Commercial / Industrial site and there are no proposals as yet to modify this, a logical recommendation for the sludge disposal is use as a biosolid and consideration toward land spreading throughout the site is a viable option. Table 3.1 from the NSW EPA Environmental Guidelines on "Use and Disposal of Biosolids Products" demonstrates the contamination acceptance concentration thresholds as shown below.

TABLE 3-1

Contaminant Acceptance Concentration Thresholds*

Contaminant	Grade A[1] (mg/kg)[3]	Grade B[2] (mg/kg)[3]	Grade C (mg/kg)[3]	Grade D (mg/kg)[3]
Arsenic	20	20	20	30
Cadmium	3	5	20	32
Chromium (total)	100	250	500	600
Copper	100	375	2,000	2,000
Lead	150	150	420	500
Mercury	1	4	15	19
Nickel	60	125	270	300
Selenium	5	8	50	90
Zinc	200	700	2,500	3,500
DDT/DDD/DDE	0.5	0.5	1.00	1.00
Aldrin	0.02	0.2	0.5	1.00
Dieldrin	0.02	0.2	0.5	1.00
Chlordane	0.02	0.2	0.5	1.00
Heptachlor	0.02	0.2	0.5	1.00
HCB	0.02	0.2	0.5	1.00
Lindane	0.02	0.2	0.5	1.00
BHC	0.02	0.2	0.5	1.00
PCBs	0.3	0.3	1.00	1.00

* Contaminant acceptance concentrations are not mean values. Refer to Schedule 2

Notes:
1. The Grade A threshold for cadmium is under review and will be revised in 2 years. Subject to the outcome of this review, the standard for cadmium would be revised and then may become the same as the maximum allowable soil concentration for agricultural land, namely 1 mg/kg.
2. The Grade B threshold levels are under review and will be revised in 2 years.
3. Values are expressed on dry weight basis.

From results shown above in the contamination assessment it has been established that there are no persistent pesticides present in any of the samples. Samples from aerobic pond 2B, anaerobic ponds, and sludge storage pond have breached the grade A concentration thresholds for Zinc slightly and sludge from these ponds should be classified as Grade B. A detailed plan should be formulated if this option is to be pursued.

Disclaimer

The information contained in this report has been extracted from field and laboratory sources believed to be reliable and accurate. DM McMahon Pty Ltd will not assume any responsibility for the misinterpretation of information supplied in this report. The accuracy and reliability of recommendations identified in this report need to be evaluated with due care according to individual circumstances.

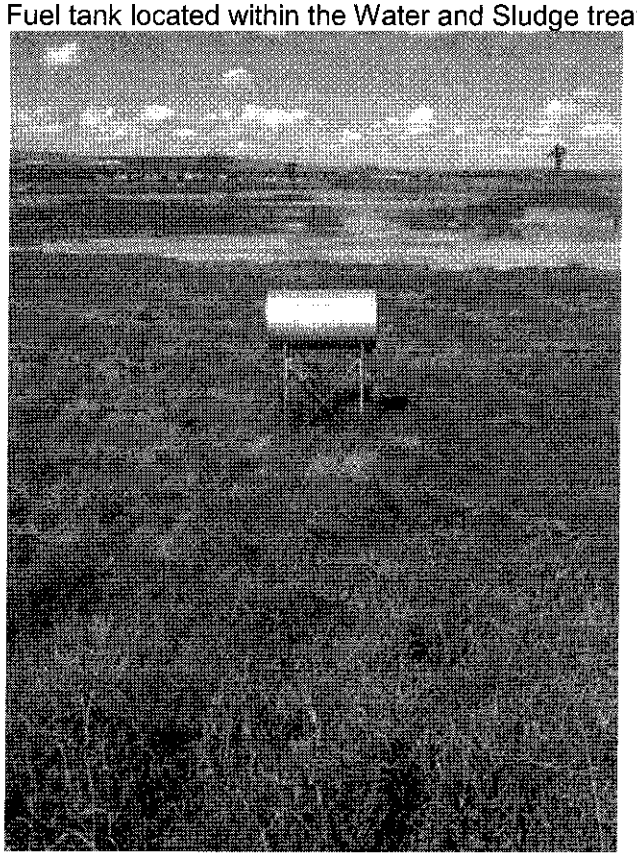
It should be noted that findings in this report are based solely upon the said site conditions at the time of testing. The results of the said investigations undertaken are an overall representation of the conditions encountered. The properties of the soil within the location may change due to variations in ground conditions outside the tested area.

The site assessment and report has been compiled by;

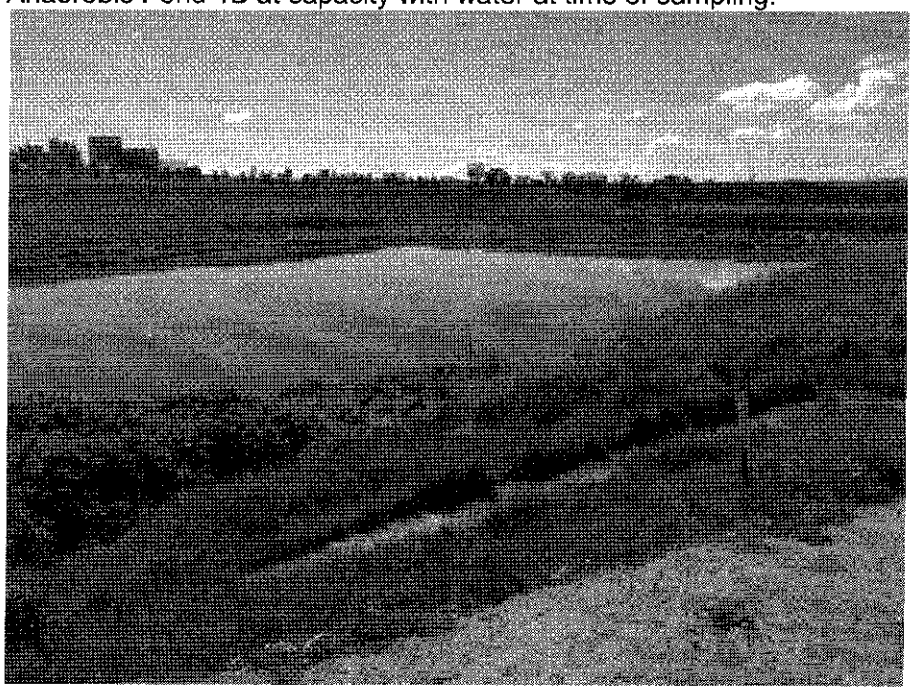
James Maloney
BSc (Hons), Pg Dip Chem Eng
DM McMahon Pty Ltd
PO Box 6118
Wagga Wagga NSW, 2650

Photos

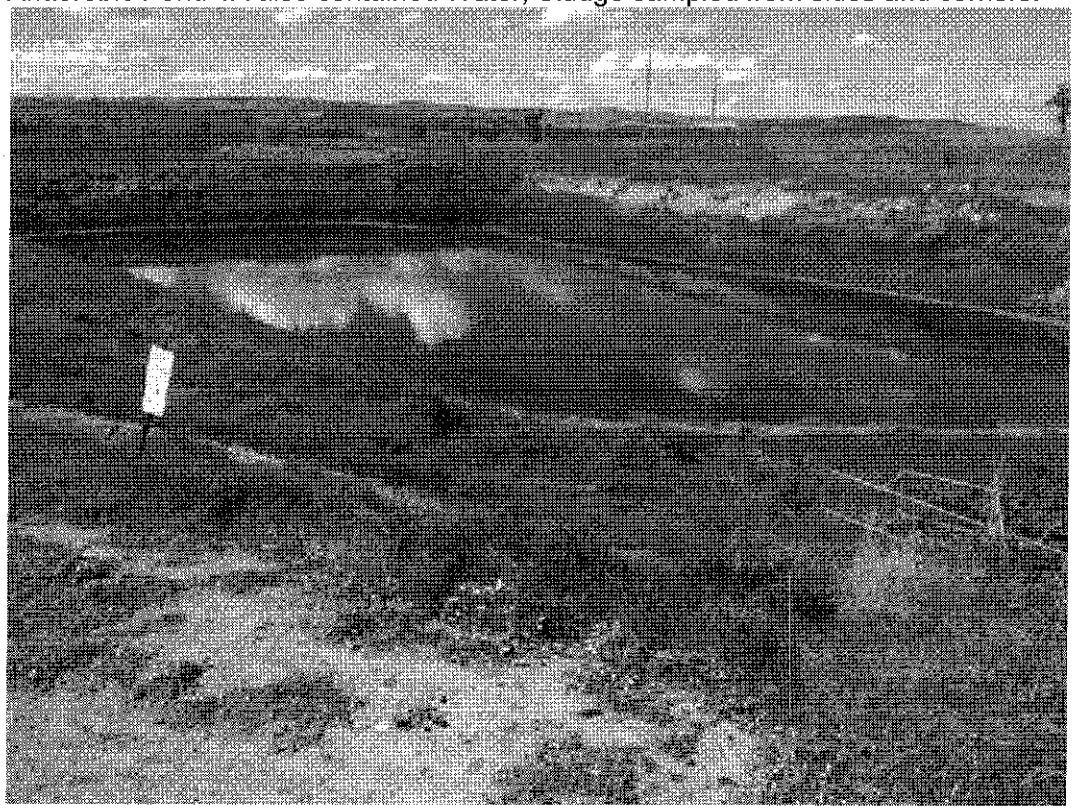
Fuel tank located within the Water and Sludge treatment area.



Anaerobic Pond 1B at capacity with water at time of sampling.



Anaerobic Pond 1A also contained Water, Sludge sampled from sides and corners.



References

Australian and New Zealand Environment and Conservation Council (ANZECC) and the National Health and Medical Research Council (NHMRC) Guidelines for the Assessment and Management of Contaminated Sites 1992

Chen, X.Y., and McKane, D.J. (1997) *Soil Landscapes of the Wagga Wagga 1:100 000 Sheet*, Department of Land and water Conservation, Sydney.

National Environment Protection (Assessment of Site Contamination) Measure (NEPM), 2013

NSW EPA *Contaminated Site Sampling Design Guidelines* 1995

NSW EPA *Guidelines for Consultants Reporting on Contaminated Sites* 1997

NSW EPA (DEC) *Guidelines for the NSW Site Auditor Scheme*, 2nd Edition, 2006

NSW EPA, Environmental Guidelines, Use and Disposal of Biosolids Products

Attachments

Certificate of Analysis from Analytical laboratory

Aerial Photo detailing section investigated

Investigation Logs

Notice of Licence surrender

Notice of Clean up action

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **ES1420693**	Page	: 1 of 9
Client	: **DM MCMAHON PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: MR JAMES MALONEY	Contact	: Client Services
Address	:	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: james@dmmcmahon.com.au	E-mail	: sydney@alsglobal.com
Telephone	: ----	Telephone	: +61-2-8784 8555
Facsimile	: ----	Facsimile	: +61-2-8784 8500
Project	: RIVERINA WOOL COMBING	QC Level	: NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Order number	: ----		
C-O-C number	: ----	Date Samples Received	: 15-SEP-2014
Sampler	: ----	Issue Date	: 22-SEP-2014
Site	: ----		
		No. of samples received	: 8
Quote number	: ----	No. of samples analysed	: 8

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

NATA Accredited Laboratory 825

Accredited for compliance with ISO/IEC 17025.

WORLD RECOGNISED ACCREDITATION

Signatories

This document has been electronically signed by the authorized signatories indicated below. Electronic signing has been carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Pabi Subba	Senior Organic Chemist	Sydney Organics
Phalak Inthakesone	Laboratory Manager - Organics	Sydney Organics
Shobhna Chandra	Metals Coordinator	Sydney Inorganics

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting

- **EP068 : Particular samples required dilution due to matrix interferences. LOR values have been adjusted accordingly. Surrogates could not be determined due to samples matrix.**

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)

Compound	CAS Number	LOR	Unit	Client sample ID	TERMINAL POND	L SHAPE EVAP BASIN	NORTH POND (ABOVE TERMINAL)	ANAEROBIC POND (REP1&2)	EVAPORATION BASIN
				Client sampling date / time	08-SEP-2014 15:00	08-SEP-2014 15:00	08-SEP-2014 15:00	08-SEP-2014 15:00	08-SEP-2014 15:00
					ES1420693-001	ES1420693-002	ES1420693-003	ES1420693-004	ES1420693-005
EA055: Moisture Content									
Moisture Content (dried @ 103°C)	----	1.0	%		30.8	9.4	55.1	47.1	28.0
ED093S: Soluble Major Cations									
Potassium	7440-09-7	10	mg/kg		1610	1620	3400	2310	8800
EG005T: Total Metals by ICP-AES									
Aluminium	7429-90-5	50	mg/kg		17000	16800	21500	12600	10800
Arsenic	7440-38-2	5	mg/kg		6	7	<5	<5	6
Copper	7440-50-8	5	mg/kg		19	20	25	19	14
Iron	7439-89-6	50	mg/kg		22700	23700	19700	12000	11400
Lead	7439-92-1	5	mg/kg		12	14	17	12	8
Zinc	7440-66-6	5	mg/kg		29	22	202	220	76
EP068A: Organochlorine Pesticides (OC)									
alpha-BHC	319-84-6	0.05	mg/kg		<0.25	<0.05	<5.00	<2.50	<2.50
Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg		<0.25	<0.05	<5.00	<2.50	<2.50
beta-BHC	319-85-7	0.05	mg/kg		<0.25	<0.05	<5.00	<2.50	<2.50
gamma-BHC	58-89-9	0.05	mg/kg		<0.25	<0.05	<5.00	<2.50	<2.50
delta-BHC	319-86-8	0.05	mg/kg		<0.25	<0.05	<5.00	<2.50	<2.50
Heptachlor	76-44-8	0.05	mg/kg		<0.25	<0.05	<5.00	<2.50	<2.50
Aldrin	309-00-2	0.05	mg/kg		<0.25	<0.05	<5.00	<2.50	<2.50
Heptachlor epoxide	1024-57-3	0.05	mg/kg		<0.25	<0.05	<5.00	<2.50	<2.50
^ Total Chlordane (sum)	----	0.05	mg/kg		<0.25	<0.05	<5.00	<2.50	<2.50
trans-Chlordane	5103-74-2	0.05	mg/kg		<0.25	<0.05	<5.00	<2.50	<2.50
alpha-Endosulfan	959-98-8	0.05	mg/kg		<0.25	<0.05	<5.00	<2.50	<2.50
cis-Chlordane	5103-71-9	0.05	mg/kg		<0.25	<0.05	<5.00	<2.50	<2.50
Dieldrin	60-57-1	0.05	mg/kg		<0.25	<0.05	<5.00	<2.50	<2.50
4.4`-DDE	72-55-9	0.05	mg/kg		<0.25	<0.05	<5.00	<2.50	<2.50
Endrin	72-20-8	0.05	mg/kg		<0.25	<0.05	<5.00	<2.50	<2.50
beta-Endosulfan	33213-65-9	0.05	mg/kg		<0.25	<0.05	<5.00	<2.50	<2.50
^ Endosulfan (sum)	115-29-7	0.05	mg/kg		<0.25	<0.05	<5.00	<2.50	<2.50
4.4`-DDD	72-54-8	0.05	mg/kg		<0.25	<0.05	<5.00	<2.50	<2.50
Endrin aldehyde	7421-93-4	0.05	mg/kg		<0.25	<0.05	<5.00	<2.50	<2.50
Endosulfan sulfate	1031-07-8	0.05	mg/kg		<0.25	<0.05	<5.00	<2.50	<2.50
4.4`-DDT	50-29-3	0.2	mg/kg		<1.0	<0.2	<20.0	<10.0	<10.0
Endrin ketone	53494-70-5	0.05	mg/kg		<0.25	<0.05	<5.00	<2.50	<2.50

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)	Client sample ID	TERMINAL POND	L SHAPE EVAP BASIN	NORTH POND (ABOVE TERMINAL)	ANAEROBIC POND (REP1&2)	EVAPORATION BASIN
	Client sampling date / time	08-SEP-2014 15:00	08-SEP-2014 15:00	08-SEP-2014 15:00	08-SEP-2014 15:00	08-SEP-2014 15:00
					ES1420	ES1420693-005

APPENDIX B RIVERINA WOOL COMBING PTY LTD LIQUID EFFLUENT DATA

Appendix F

Riverina Wool Combing Liquid Effluent Data

Summarised Liquid Effluent Data (20 samples)
Sample Location: Terminal Pond

Parameter	Units	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	MEAN	St DEV	
Antimony	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	**<0.05**	**0**	
Arsenic	mg/L	0.02	0.02	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	**0.02**	**0**	
Beryllium	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	**<0.001**	**0**	
Boron	mg/L	<0.02	<0.02	0.07	<0.02	<0.02	0.05	<0.02	<0.02	0.13	<0.02	0.06	<0.02	0.03	0.04	<0.02	<0.02	<0.02	<0.02	<0.02	0.06	**0.06**	**0.03**	#
Cadmium	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	**<0.001**	**0**	
Chromium	mg/L	0.039	0.029	0.039	0.039	0.038	0.044	0.036	0.035	0.048	0.035	0.044	0.039	0.039	0.04	0.038	0.034	0.035	0.035	0.035	0.036	**0.038**	**0.004**	
Cobalt	mg/L	0.023	0.018	0.023	0.026	0.023	0.023	0.023	0.023	0.029	0.024	0.025	0.023	0.024	0.025	0.023	0.023	0.022	0.022	0.023	0.023	**0.02**	**0.002**	
Copper	mg/L	0.017	0.11	0.018	0.016	0.015	0.016	0.014	0.013	0.02	0.013	0.014	0.015	0.014	0.015	0.014	0.013	0.012	0.01	0.011	0.013	**0.02**	**0.02**	
Lead	mg/L	<0.01	<0.01	<0.01	0.010	0.01	0.01	<0.01	0.01	0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	**0.01**	**0.00**	#
Manganese	mg/L	2.94	2.81	3.22	3.26	3.08	3.16	2.88	2.83	2.87	2.92	2.90	2.84	2.9	2.96	2.82	2.99	2.99	2.76	2.96	3.04	**2.96**	**0.14**	
Mercury	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	**<0.1**	**0**	
Moisture Content	%	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	**99**	**0**	
Molybdenum	mg/L	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	**0.01**	**0**	#
Nickel	mg/L	0.02	0.02	0.02	0.020	0.02	0.02	0.02	0.02	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	**0.02**	**0.002**	
Selenium	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	**<0.1**	**0**	
Tin	mg/L	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	**<0.03**	**0**	
TOC	mg/L	2400	2300	2400	2300	2400	2600	2300	2200	2200	2400	2500	2400	2400	2100	2100	2200	2500	2300	2300	2200	**2325**	**133**	
Vanadium	mg/L	0.101	0.113	0.11	0.098	0.112	0.094	0.105	0.101	0.104	0.100	0.098	0.088	0.104	0.098	0.101	0.104	0.097	0.099	0.106	0.106	**0.10**	**0.01**	
Zinc	mg/L	0.124	0.098	0.132	0.135	0.126	0.135	0.127	0.124	0.173	0.129	0.144	0.129	0.136	0.145	0.171	0.125	0.132	0.124	0.122	0.129	**0.13**	**0.02**	
Total Nitrogen	mg/L	384	269	387	393	208	334	308	370	398	370	110	484	349	442	398	557	545	462	411	559	**386.9**	**111**	
Total Chlorine	mg/L	263	310	302	275	305	270	296	298	310	285	306	274	310	329	286	249	269	284	297	303	**291.1**	**20**	
Total Flourine	mg/L	2	1.2	2.1	1.9	2.1	1.9	1.9	1.9	2	1.9	2	4.2	3.7	4.6	1.9	4.2	1.8	1.9	6.3	7.1	**2.8**	**1.6**	
Total Sulphur	mg/L	28	14.6	46	53	62.4	76.2	64	60.9	24.8	24	21	25.9	36.2	23	16.7	103	35.4	43	43.2	29.3	**41.5**	**22.7**	
Total Phosphorus	mg/L	15.9	12.4	15.8	14.9	43.3	55.5	5.3	22.6	13.5	14.7	14.3	18.4	20.2	20.5	26.6	35.1	37.9	34	23.4	22.2	**23.3**	**12.2**	
Potassium	mg/L	829	1440	1080	1560	4890	8260	5080	7250	1130	1440	1500	1980	1660	2030	2300	2660	2820	2310	1360	2400	**2699.0**	**2062.8**	
Sodium	mg/L	202	154	231	271	1030	1660	1360	1480	276	199	256	328	249	341	364	381	584	473	347	390	**528.8**	**461.0**	
Calcium	mg/L	47.7	49.3	51	56.6	60.6	104	93.1	77.3	66	59.2	68.1	25.9	65.3	84	97.5	91	91.3	89.2	69	83.7	**71.5**	**20.2**	
BOD	mg/L	700	525	618	896	665	1130	1240	1840	694	1030	1060	1160	924	608	880	861	1220	882	649	1450	**951.6**	**326.3**	
Oil & Grease	mg/L	348	86	1760	289	150	541	1120	466	476	652	721	739	928	504	714	1420	1560	517	1040	540	**728.6**	**453.9**	
pH	pH units	7.6	8.5	8.0	8.0	9.5	9.4	9.1	9	9	8.5	8	8.1	8.3	8.2	8.3	8.3	8.4	8.4	8.2	8.2	**8.5**	**0.5**	
Total Susp. Solids	mg/L	1130	533	1720	900	2250	4100	5570	1350	1450	2320	1530	3250	3300	2340	3110	5330	6940	3910	3060	2900	**2849.7**	**1681.2**	

#Calculated on measurable values

APPENDIX C TEST PITS WESTERN EVAPORATION POND

Test Pit 6
Test Pit 5
Test Pit 4
Test Pit 3
Test Pit 2
Test Pit 1
N
Gate
Trahairs Rd

McMahon EARTH SCIENCE

Job No:	4125	Sheet:	1 of 6
Hole No:	TP01	Date:	21.02.2017
Drilled by:	JP	Conditions:	Fine, Sunny
Logged by:	AR	Position: (MGA94 GDA z 55)	539669 E
Drill Method:	AS1289.1.2.1 cl. 6.5.4		6121686 N
Location:	Trahairs Rd, Woolcombing - Western Pond		

Depth (RL) metres	Sample No.	Description	USCS	Moisture Condition	Consistency	Test (DCP/SPT)	Remarks
0.00		Yellow Silt	ML	D	0		
0.25		Black Lanolin oil residue	*	*	*		Cannot be classified by USCS classification system
0.50		Grey Light to Medium CLAY	CL	T	1		Grey colour due to contamination of clay with lanolin oil residue
0.75							
1.00		Greyish Brown Fine sandy CLAY with trace coarse sands and accretions of Mn and/or Fe, moderately mottled with red and grey	CL	M	4		
1.25							
1.50							
1.75	4125/1.1	Yellowish Brown Fine Sandy CLAY with some coarse sands and accretiond of Mn and/or Fe, mottling continued	CL	M	4		
2.00							
2.25							
2.50							
2.75	4125/1.2	Reddish Yellow Fine Sandy CLAY, accretions and mottling as above	CL	M	5		End of Pit @ 3.0m.
3.00							

General comments: *Oily Sheen present on all excavated material to excavated depth.

McMahon EARTH SCIENCE			Job No:	4125	Sheet:	2 of 6	
			Hole No:	TP02	Date:	21.02.2017	
			Drilled by:	JP	Conditions:	Fine, Sunny	
			Logged by:	AR	Position: (MGA94 GDA z 55)	539698 E	
			Drill Method:	AS1289.1.2.1 cl. 6.5.4		6121778 N	
			Location:	Trahairs Rd, Woolcombing - Western Pond			

Depth (RL) metres	Sample No.	Description	USCS	Moisture Condition	Consistency	Test (DCP/SPT)	Remarks
		Yellow Silt	ML	D	0		
0.25		Black Lanolin oil residue	*	*	*		Cannot be classified by USCS classification system
0.50		Grey Fine Sandy CLAY, moderately mottled with red and yellow	CL	T	3		Grey colour due to contamination of clay with lanolin oil residue
0.75							
1.00							
1.25		Greyish Brown Fine Sandy CLAY with some coarse sand	CL	T	5		
1.50							
1.75							
2.00							
2.25		Greyish Brown Light to Medium CLAY with some coarse sand and mottling of red and black	CL	M	6		
2.50	4125/2.2 (2.4m)						
2.75	4125/2.1 & 4125/2.3 (2.8m)						
3.00		Yellowish Brown Medium CLAY with some coarse sands and mottling of red and black, accretions present as above	CL	M	7		End of Pit at 3.0m. Refusal on rigid Clay

General comments: *Oily Sheen present on all excavated material to excavated depth.

Job No:	4125	Sheet:	3 of 6		
Hole No:	TP03	Date:	21.02.2017		
Drilled by:	JP	Conditions:	Fine, Sunny		
Logged by:	AR	Position: (MGA94 GDA z 55)	539707 E		
Drill Method:	AS1289.1.2.1 cl. 6.5.4		6121875 N		
Location:	Trahairs Rd, Woolcombing - Western Pond				

Depth (RL) metres	Sample No.	Description	USCS	Moisture Condition	Consistency	Test (DCP/SPT)	Remarks
0.25		Yellow Silt	ML	D	0		
0.50		Black Lanolin oil residue	*	*	*		Cannot be classified by USCS classification system
0.75		Grey Fine Sandy CLAY	CL	T	3		Grey colour due to contamination of clay with lanolin oil residue
1.00		Red Coarse Sandy CLAY	SC	T	3		
1.25							
1.50	4125/3.1 & 4125/3.3	Yellowish Red Coarse Sands with saprolite present throughout, dominated by highly decomposed Granites. Biotite mica present	SP	T	4		
1.75							
2.00							
2.25	4125/3.2						
2.50							
2.75		End of Pit @ 2.5m Refusal on Rigid Clay					
3.00							

General comments: *Oily Sheen present on all excavated material to excavated depth.

McMahon EARTH SCIENCE	Job No:	4125	Sheet:	4 of 6		
	Hole No:	TP04	Date:	21.02.2017		
	Drilled by:	JP	Conditions:	Fine, Sunny		
	Logged by:	AR	Position: (MGA94 GDA z 55)	539717 E		
	Drill Method:	AS1289.1.2.1 cl. 6.5.4		6121975 N		
	Location:	Trahairs Rd, Woolcombing - Western Pond				

Depth (RL) metres	Sample No.	Description	USCS	Moisture Condition	Consistency	Test (DCP/SPT)	Remarks
0.25		Reddish Yellow Silt	ML	D	0		
0.50		Reddish Brown Light to Medium CLAY	CL	T	3		
0.75		Reddish Yellow Medium CLAY	CL	T	4		
1.00		Greyish Brown Medium CLAY, mottled with red and black	CL	T	5		
1.25	4125/4.1 & 4125/4.2(1.2m)						
1.50		Brownish Yellow Light to Medium CLAY, heavy mottling and black staining from Mn or Fe, large (>5mm) concretions of Fe and/or Mn present	CL	T	7		
1.75							
2.00	4125/4.3 (2.0m)						
2.25		End of Pit @ 2.0m. Refusal on Rigid Clay.					
2.50							
2.75							
3.00							

General comments: *Oily Sheen present on all excavated material to excavated depth.

McMahon EARTH SCIENCE

Job No:	4125	Sheet:	5 of 6
Hole No:	TP05	Date:	21.02.2017
Drilled by:	JP	Conditions:	Fine, Sunny
Logged by:	AR	Position: (MGA94 GDA z 55)	539756 E
Drill Method:	AS1289.1.2.1 cl. 6.5.4		6122064 N
Location:	Trahairs Rd, Woolcombing - Western Pond		

Depth (RL) metres	Sample No.	Description	USCS	Moisture Condition	Consistency	Test (DCP/SPT)	Remarks
		Reddish Yellow Silt	ML	D	0		
0.25		Black Lanolin oil residue	*	*	*		Cannot be classified by USCS classification system
0.50		Dark Grey Medium CLAY	CL	T	4		Grey colour due to contamination of clay with lanolin oil residue
0.75							
1.00	4125/5.3 (1.0m)						
1.25		Brownish Yellow Medium CLAY with moderate mottling of red and black and accretions of Mn and/or Fe	CL	T	5		
1.50							
1.75	4125/5.1 & 4125/5.4 (2.0m)						
2.00							
2.25							
2.50	4125/5.5						
2.75							
3.00	4125/5.2						End of Pit @ 3.1m. Refusal on Rigid Clay.

General comments: *Oily Sheen present on all excavated material to excavated depth.

McMahon EARTH SCIENCE	Job No:	4125	Sheet:	6 of 6		
	Hole No:	TP06	Date:	21.02.2017		
	Drilled by:	JP	Conditions:	Fine, Sunny		
	Logged by:	AR	Position: (MGA94 GDA z 55)	539798 E		
	Drill Method:	AS1289.1.2.1 cl. 6.5.4		6122155 N		
	Location:	Trahairs Rd, Woolcombing - Western Pond				

Depth (RL) metres	Sample No.	Description	USCS	Moisture Condition	Consistency	Test (DCP/SPT)	Remarks
0.00		Yellow Silt	ML	D	0		
0.25		Reddish Yellow Light Clay, (Spongy)	CL	W	1		
0.50	4125/6.2	Grey Light to Medium Clay	CL	T	6		Grey colour due to contamination of clay with lanolin oil residue
0.75							
1.00					6		
1.25	4125/6.1 & 4125/6.3 (1.1m)	Dark Reddish Brown Light Clay	CL	T			
1.50					7		
1.75		End of Pit @ 1.25m Refusal on Rigid Clay					
2.00							
2.25							
2.50							
2.75							
3.00							

General comments: *Oily Sheen present on all excavated material to excavated depth.

Figure 1:Test Pit 1

Figure 2:Test Pit 2.1

Figure 3:Test Pit 2.2

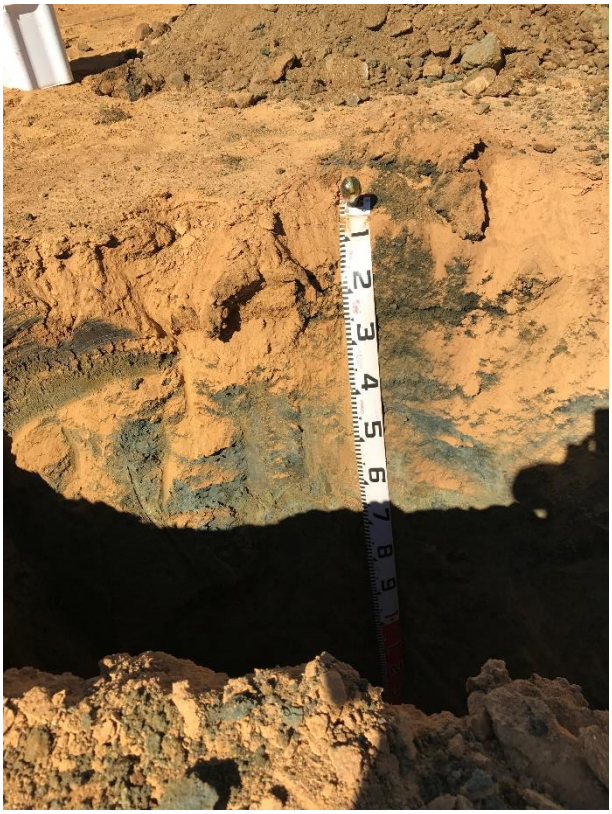


Figure 4:Test Pit 3.1

Figure 5:Test Pit 3.2

Figure 6:Test Pit 4.1

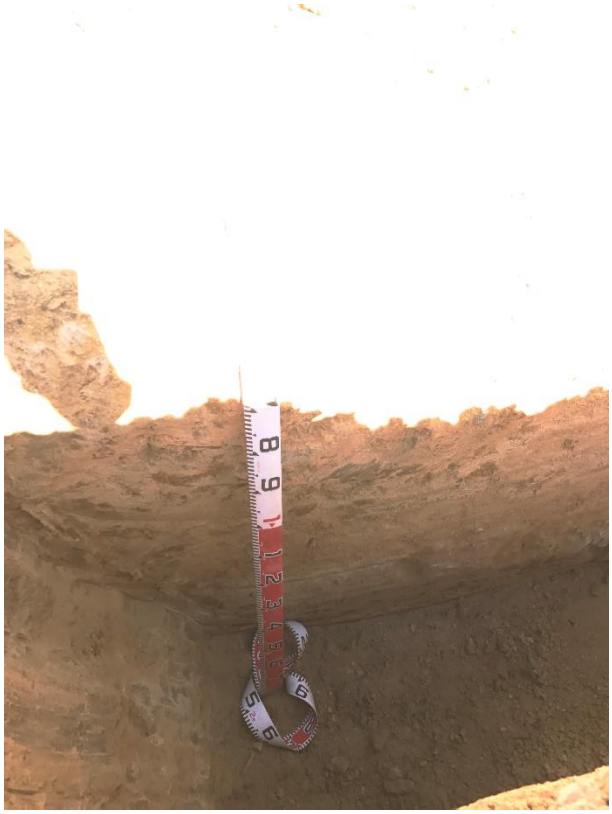


Figure 7:Test Pit 4.2

Figure 8::Test Pit 5.1

Figure 9:Test Pit 5.2

Figure10:Test Pit 6.1

Figure 11:Test Pit 6.2

APPENDIX D SOIL ANALYSIS RESULTS

Envirolab Services Pty Ltd
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CERTIFICATE OF ANALYSIS 201217

Client Details

Client	NGH Environmental
Attention	Nicola Smith
Address	Suite 1, 39 Fitzmaurice street, Wagga Wagga, NSW, 2650

Sample Details

Your Reference	**16-276 North Ridge Materials Facility**
Number of Samples	7 Soil, 1 Sediment
Date samples received	20/09/2018
Date completed instructions received	20/09/2018

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Please refer to the last page of this report for any comments relating to the results.

Report Details

Date results requested by	27/09/2018
Date of Issue	27/09/2018

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Results Approved By
Jeremy Faircloth, Organics Supervisor
Long Pham, Team Leader, Metals
Nancy Zhang, Assistant Lab Manager
Steven Luong, Senior Chemist

Authorised By

Jacinta Hurst, Laboratory Manager

vTRH(C6-C10)/BTEXN in Soil						
Our Reference		201217-1	201217-2	201217-3	201217-4	201217-5
Your Reference	UNITS	Soil 1 - north	Soil 2 - north	Soil 3 - centre north	Soil 7 - centre north	Soil 8 - surface sediment
Depth		0.0-0.15	0.3-0.4	0.0-0.15	0.0-0.15	surface
Date Sampled		19/09/2018	19/09/2018	19/09/2018	19/09/2018	19/09/2018
Type of sample		Soil	Soil	Soil	Soil	Sediment
Date extracted	-	21/09/2018	21/09/2018	21/09/2018	21/09/2018	21/09/2018
Date analysed	-	24/09/2018	24/09/2018	24/09/2018	24/09/2018	24/09/2018
TRH C_6 - C_9	mg/kg	<25	<25	<25	<25	<25
TRH C_6 - C_{10}	mg/kg	<25	<25	<25	<25	<25
vTPH C_6 - C_{10} less BTEX (F1)	mg/kg	<25	<25	<25	<25	<25
Benzene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1	<1	<1	<1
m+p-xylene	mg/kg	<2	<2	<2	<2	<2
o-Xylene	mg/kg	<1	<1	<1	<1	<1
naphthalene	mg/kg	<1	<1	<1	<1	<1
Total +ve Xylenes	mg/kg	<1	<1	<1	<1	<1
Surrogate aaa-Trifluorotoluene	%	78	92	94	83	80

vTRH(C6-C10)/BTEXN in Soil				
Our Reference		201217-6	201217-7	201217-8
Your Reference	UNITS	Soil 9 - south	Soil 10 - south	Soil 11 - windrow
Depth		0.0-0.15	0.3-0.4	0.0-0.1
Date Sampled		19/09/2018	19/09/2018	19/09/2018
Type of sample		Soil	Soil	Soil
Date extracted	-	21/09/2018	21/09/2018	21/09/2018
Date analysed	-	24/09/2018	24/09/2018	24/09/2018
TRH C_6 - C_9	mg/kg	<25	<25	<25
TRH C_6 - C_{10}	mg/kg	<25	<25	<25
vTPH C_6 - C_{10} less BTEX (F1)	mg/kg	<25	<25	<25
Benzene	mg/kg	<0.2	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1	<1
m+p-xylene	mg/kg	<2	<2	<2
o-Xylene	mg/kg	<1	<1	<1
naphthalene	mg/kg	<1	<1	<1
Total +ve Xylenes	mg/kg	<1	<1	<1
Surrogate aaa-Trifluorotoluene	%	79	80	102

svTRH (C10-C40) in Soil						
Our Reference		201217-1	201217-2	201217-3	201217-4	201217-5
Your Reference	UNITS	Soil 1 - north	Soil 2 - north	Soil 3 - centre north	Soil 7 - centre north	Soil 8 - surface sediment
Depth		0.0-0.15	0.3-0.4	0.0-0.15	0.0-0.15	surface
Date Sampled		19/09/2018	19/09/2018	19/09/2018	19/09/2018	19/09/2018
Type of sample		Soil	Soil	Soil	Soil	Sediment
Date extracted	-	21/09/2018	21/09/2018	21/09/2018	21/09/2018	21/09/2018
Date analysed	-	22/09/2018	22/09/2018	22/09/2018	22/09/2018	22/09/2018
TRH C_{10} - C_{14}	mg/kg	<50	<50	<50	<50	410
TRH C_{15} - C_{28}	mg/kg	500	<100	1,800	2,400	19,000
TRH C_{29} - C_{36}	mg/kg	1,600	<100	5,500	6,500	62,000
TRH >C_{10} -C_{16}	mg/kg	<50	<50	53	88	600
TRH >C_{10} - C_{16} less Naphthalene (F2)	mg/kg	<50	<50	53	88	600
TRH >C_{16} -C_{34}	mg/kg	1,900	<100	6,400	8,000	69,000
TRH >C_{34} -C_{40}	mg/kg	450	<100	1,700	2,400	20,000
Total +ve TRH (>C10-C40)	mg/kg	2,300	<50	8,200	10,000	90,000
Surrogate o-Terphenyl	%	121	100	#	#	#

svTRH (C10-C40) in Soil				
Our Reference		201217-6	201217-7	201217-8
Your Reference	UNITS	Soil 9 - south	Soil 10 - south	Soil 11 - windrow
Depth		0.0-0.15	0.3-0.4	0.0-0.1
Date Sampled		19/09/2018	19/09/2018	19/09/2018
Type of sample		Soil	Soil	Soil
Date extracted	-	21/09/2018	21/09/2018	21/09/2018
Date analysed	-	22/09/2018	22/09/2018	22/09/2018
TRH C_{10} - C_{14}	mg/kg	170	<50	550
TRH C_{15} - C_{28}	mg/kg	5,800	<100	9,200
TRH C_{29} - C_{36}	mg/kg	18,000	170	23,000
TRH >C_{10} -C_{16}	mg/kg	260	<50	700
TRH >C_{10} - C_{16} less Naphthalene (F2)	mg/kg	260	<50	700
TRH >C_{16} -C_{34}	mg/kg	22,000	190	28,000
TRH >C_{34} -C_{40}	mg/kg	5,300	<100	8,700
Total +ve TRH (>C10-C40)	mg/kg	28,000	190	37,000
Surrogate o-Terphenyl	%	#	114	#

PAHs in Soil						
Our Reference		201217-1	201217-2	201217-3	201217-4	201217-5
Your Reference	UNITS	Soil 1 - north	Soil 2 - north	Soil 3 - centre north	Soil 7 - centre north	Soil 8 - surface sediment
Depth		0.0-0.15	0.3-0.4	0.0-0.15	0.0-0.15	surface
Date Sampled		19/09/2018	19/09/2018	19/09/2018	19/09/2018	19/09/2018
Type of sample		Soil	Soil	Soil	Soil	Sediment
Date extracted	-	21/09/2018	21/09/2018	21/09/2018	21/09/2018	21/09/2018
Date analysed	-	24/09/2018	24/09/2018	24/09/2018	24/09/2018	24/09/2018
Naphthalene	mg/kg	<1	<0.1	<1	<1	<1
Acenaphthylene	mg/kg	<1	<0.1	<1	<1	<1
Acenaphthene	mg/kg	<1	<0.1	<1	<1	<1
Fluorene	mg/kg	<1	<0.1	<1	<1	<1
Phenanthrene	mg/kg	<1	<0.1	<1	<1	<1
Anthracene	mg/kg	<1	<0.1	<1	<1	<1
Fluoranthene	mg/kg	<1	<0.1	<1	<1	<1
Pyrene	mg/kg	<1	<0.1	<1	<1	<1
Benzo(a)anthracene	mg/kg	<1	<0.1	<1	<1	<1
Chrysene	mg/kg	<1	<0.1	<1	<1	<1
Benzo(b,j+k)fluoranthene	mg/kg	<2	<0.2	<2	<2	<2
Benzo(a)pyrene	mg/kg	<0.5	<0.05	<0.5	<0.5	<0.5
Indeno(1,2,3-c,d)pyrene	mg/kg	<1	<0.1	<1	<1	<1
Dibenzo(a,h)anthracene	mg/kg	<1	<0.1	<1	<1	<1
Benzo(g,h,i)perylene	mg/kg	<1	<0.1	<1	<1	<1
Total +ve PAH's	mg/kg	<0.5	<0.05	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<5	<0.5	<5	<5	<5
Benzo(a)pyrene TEQ calc(half)	mg/kg	<5	<0.5	<5	<5	<5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<5	<0.5	<5	<5	<5
Surrogate p-Terphenyl-d14	%	94	92	88	91	92

PAHs in Soil				
Our Reference		201217-6	201217-7	201217-8
Your Reference	UNITS	Soil 9 - south	Soil 10 - south	Soil 11 - windrow
Depth		0.0-0.15	0.3-0.4	0.0-0.1
Date Sampled		19/09/2018	19/09/2018	19/09/2018
Type of sample		Soil	Soil	Soil
Date extracted	-	21/09/2018	21/09/2018	21/09/2018
Date analysed	-	24/09/2018	24/09/2018	24/09/2018
Naphthalene	mg/kg	<1	<1	<1
Acenaphthylene	mg/kg	<1	<1	<1
Acenaphthene	mg/kg	<1	<1	<1
Fluorene	mg/kg	<1	<1	<1
Phenanthrene	mg/kg	<1	<1	<1
Anthracene	mg/kg	<1	<1	<1
Fluoranthene	mg/kg	<1	<1	<1
Pyrene	mg/kg	<1	<1	<1
Benzo(a)anthracene	mg/kg	<1	<1	<1
Chrysene	mg/kg	<1	<1	<1
Benzo(b,j+k)fluoranthene	mg/kg	<2	<2	<2
Benzo(a)pyrene	mg/kg	<0.5	<0.5	<0.5
Indeno(1,2,3-c,d)pyrene	mg/kg	<1	<1	<1
Dibenzo(a,h)anthracene	mg/kg	<1	<1	<1
Benzo(g,h,i)perylene	mg/kg	<1	<1	<1
Total +ve PAH's	mg/kg	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<5	<5	<5
Benzo(a)pyrene TEQ calc(half)	mg/kg	<5	<5	<5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<5	<5	<5
Surrogate p-Terphenyl-d14	%	99	98	96

Organochlorine Pesticides in soil						
Our Reference		201217-1	201217-2	201217-3	201217-4	201217-5
Your Reference	UNITS	Soil 1 - north	Soil 2 - north	Soil 3 - centre north	Soil 7 - centre north	Soil 8 - surface sediment
Depth		0.0-0.15	0.3-0.4	0.0-0.15	0.0-0.15	surface
Date Sampled		19/09/2018	19/09/2018	19/09/2018	19/09/2018	19/09/2018
Type of sample		Soil	Soil	Soil	Soil	Sediment
Date extracted	-	21/09/2018	21/09/2018	21/09/2018	21/09/2018	21/09/2018
Date analysed	-	27/09/2018	27/09/2018	27/09/2018	27/09/2018	27/09/2018
HCB	mg/kg	<0.1	<0.1	<0.1	<0.1	<1
alpha-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<1
gamma-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<1
beta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<1
Heptachlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<1
delta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<1
Aldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<1
Heptachlor Epoxide	mg/kg	<0.1	<0.1	<0.1	<0.1	<1
gamma-Chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1	<1
alpha-chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1	<1
Endosulfan I	mg/kg	<0.1	<0.1	<0.1	<0.1	<1
pp-DDE	mg/kg	<0.1	<0.1	<0.1	<0.1	<1
Dieldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<1
Endrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<1
pp-DDD	mg/kg	<0.1	<0.1	<0.1	<0.1	<1
Endosulfan II	mg/kg	<0.1	<0.1	<0.1	<0.1	<1
pp-DDT	mg/kg	<0.1	<0.1	<0.1	<0.1	<1
Endrin Aldehyde	mg/kg	<0.1	<0.1	<0.1	<0.1	<1
Endosulfan Sulphate	mg/kg	<0.1	<0.1	<0.1	<0.1	<1
Methoxychlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<1
Total +ve DDT+DDD+DDE	mg/kg	<0.1	<0.1	<0.1	<0.1	<1
Surrogate TCMX	%	104	97	97	83	72

Organochlorine Pesticides in soil				
Our Reference		201217-6	201217-7	201217-8
Your Reference	UNITS	Soil 9 - south	Soil 10 - south	Soil 11 - windrow
Depth		0.0-0.15	0.3-0.4	0.0-0.1
Date Sampled		19/09/2018	19/09/2018	19/09/2018
Type of sample		Soil	Soil	Soil
Date extracted	-	21/09/2018	21/09/2018	21/09/2018
Date analysed	-	27/09/2018	27/09/2018	27/09/2018
HCB	mg/kg	<1	<0.1	<1
alpha-BHC	mg/kg	<1	<0.1	<1
gamma-BHC	mg/kg	<1	<0.1	<1
beta-BHC	mg/kg	<1	<0.1	<1
Heptachlor	mg/kg	<1	<0.1	<1
delta-BHC	mg/kg	<1	<0.1	<1
Aldrin	mg/kg	<1	<0.1	<1
Heptachlor Epoxide	mg/kg	<1	<0.1	<1
gamma-Chlordane	mg/kg	<1	<0.1	<1
alpha-chlordane	mg/kg	<1	<0.1	<1
Endosulfan I	mg/kg	<1	<0.1	<1
pp-DDE	mg/kg	<1	<0.1	<1
Dieldrin	mg/kg	<1	<0.1	<1
Endrin	mg/kg	<1	<0.1	<1
pp-DDD	mg/kg	<1	<0.1	<1
Endosulfan II	mg/kg	<1	<0.1	<1
pp-DDT	mg/kg	<1	<0.1	<1
Endrin Aldehyde	mg/kg	<1	<0.1	<1
Endosulfan Sulphate	mg/kg	<1	<0.1	<1
Methoxychlor	mg/kg	<1	<0.1	<1
Total +ve DDT+DDD+DDE	mg/kg	<1	<0.1	<1
Surrogate TCMX	%	85	90	105

Organophosphorus Pesticides						
Our Reference		201217-1	201217-2	201217-3	201217-4	201217-5
Your Reference	UNITS	Soil 1 - north	Soil 2 - north	Soil 3 - centre north	Soil 7 - centre north	Soil 8 - surface sediment
Depth		0.0-0.15	0.3-0.4	0.0-0.15	0.0-0.15	surface
Date Sampled		19/09/2018	19/09/2018	19/09/2018	19/09/2018	19/09/2018
Type of sample		Soil	Soil	Soil	Soil	Sediment
Date extracted	-	21/09/2018	21/09/2018	21/09/2018	21/09/2018	21/09/2018
Date analysed	-	27/09/2018	27/09/2018	27/09/2018	27/09/2018	27/09/2018
Azinphos-methyl (Guthion)	mg/kg	<0.1	<0.1	<0.1	<0.1	<1
Bromophos-ethyl	mg/kg	<0.1	<0.1	<0.1	<0.1	<1
Chlorpyriphos	mg/kg	<0.1	<0.1	<0.1	<0.1	<1
Chlorpyriphos-methyl	mg/kg	<0.1	<0.1	<0.1	<0.1	<1
Diazinon	mg/kg	<0.1	<0.1	<0.1	<0.1	<1
Dichlorvos	mg/kg	<0.1	<0.1	<0.1	<0.1	<1
Dimethoate	mg/kg	<0.1	<0.1	<0.1	<0.1	<1
Ethion	mg/kg	<0.1	<0.1	<0.1	<0.1	<1
Fenitrothion	mg/kg	<0.1	<0.1	<0.1	<0.1	<1
Malathion	mg/kg	<0.1	<0.1	<0.1	<0.1	<1
Parathion	mg/kg	<0.1	<0.1	<0.1	<0.1	<1
Ronnel	mg/kg	<0.1	<0.1	<0.1	<0.1	<1
Surrogate TCMX	%	104	97	97	83	72

Organophosphorus Pesticides				
Our Reference		201217-6	201217-7	201217-8
Your Reference	UNITS	Soil 9 - south	Soil 10 - south	Soil 11 - windrow
Depth		0.0-0.15	0.3-0.4	0.0-0.1
Date Sampled		19/09/2018	19/09/2018	19/09/2018
Type of sample		Soil	Soil	Soil
Date extracted	-	21/09/2018	21/09/2018	21/09/2018
Date analysed	-	27/09/2018	27/09/2018	27/09/2018
Azinphos-methyl (Guthion)	mg/kg	<1	<0.1	<1
Bromophos-ethyl	mg/kg	<1	<0.1	<1
Chlorpyriphos	mg/kg	<1	<0.1	<1
Chlorpyriphos-methyl	mg/kg	<1	<0.1	<1
Diazinon	mg/kg	<1	<0.1	<1
Dichlorvos	mg/kg	<1	<0.1	<1
Dimethoate	mg/kg	<1	<0.1	<1
Ethion	mg/kg	<1	<0.1	<1
Fenitrothion	mg/kg	<1	<0.1	<1
Malathion	mg/kg	<1	<0.1	<1
Parathion	mg/kg	<1	<0.1	<1
Ronnel	mg/kg	<1	<0.1	<1
Surrogate TCMX	%	85	90	105

PCBs in Soil						
Our Reference		201217-1	201217-2	201217-3	201217-4	201217-5
Your Reference	UNITS	Soil 1 - north	Soil 2 - north	Soil 3 - centre north	Soil 7 - centre north	Soil 8 - surface sediment
Depth		0.0-0.15	0.3-0.4	0.0-0.15	0.0-0.15	surface
Date Sampled		19/09/2018	19/09/2018	19/09/2018	19/09/2018	19/09/2018
Type of sample		Soil	Soil	Soil	Soil	Sediment
Date extracted	-	21/09/2018	21/09/2018	21/09/2018	21/09/2018	21/09/2018
Date analysed	-	27/09/2018	27/09/2018	27/09/2018	27/09/2018	27/09/2018
Aroclor 1016	mg/kg	<0.1	<0.1	<0.1	<0.1	<1
Aroclor 1221	mg/kg	<0.1	<0.1	<0.1	<0.1	<1
Aroclor 1232	mg/kg	<0.1	<0.1	<0.1	<0.1	<1
Aroclor 1242	mg/kg	<0.1	<0.1	<0.1	<0.1	<1
Aroclor 1248	mg/kg	<0.1	<0.1	<0.1	<0.1	<1
Aroclor 1254	mg/kg	<0.1	<0.1	<0.1	<0.1	<1
Aroclor 1260	mg/kg	<0.1	<0.1	<0.1	<0.1	<1
Total +ve PCBs (1016-1260)	mg/kg	<0.1	<0.1	<0.1	<0.1	<1
Surrogate TCLMX	%	104	97	97	83	72

PCBs in Soil				
Our Reference		201217-6	201217-7	201217-8
Your Reference	UNITS	Soil 9 - south	Soil 10 - south	Soil 11 - windrow
Depth		0.0-0.15	0.3-0.4	0.0-0.1
Date Sampled		19/09/2018	19/09/2018	19/09/2018
Type of sample		Soil	Soil	Soil
Date extracted	-	21/09/2018	21/09/2018	21/09/2018
Date analysed	-	27/09/2018	27/09/2018	27/09/2018
Aroclor 1016	mg/kg	<1	<0.1	<1
Aroclor 1221	mg/kg	<1	<0.1	<1
Aroclor 1232	mg/kg	<1	<0.1	<1
Aroclor 1242	mg/kg	<1	<0.1	<1
Aroclor 1248	mg/kg	<1	<0.1	<1
Aroclor 1254	mg/kg	<1	<0.1	<1
Aroclor 1260	mg/kg	<1	<0.1	<1
Total +ve PCBs (1016-1260)	mg/kg	<1	<0.1	<1
Surrogate TCLMX	%	85	90	105

Acid Extractable metals in soil						
Our Reference		201217-1	201217-2	201217-3	201217-4	201217-5
Your Reference	UNITS	Soil 1 - north	Soil 2 - north	Soil 3 - centre north	Soil 7 - centre north	Soil 8 - surface sediment
Depth		0.0-0.15	0.3-0.4	0.0-0.15	0.0-0.15	surface
Date Sampled		19/09/2018	19/09/2018	19/09/2018	19/09/2018	19/09/2018
Type of sample		Soil	Soil	Soil	Soil	Sediment
Date prepared	-	21/09/2018	21/09/2018	21/09/2018	21/09/2018	21/09/2018
Date analysed	-	21/09/2018	21/09/2018	21/09/2018	21/09/2018	21/09/2018
Arsenic	mg/kg	<4	<4	<4	<4	<4
Cadmium	mg/kg	<0.4	<0.4	<0.4	<0.4	<0.4
Chromium	mg/kg	37	48	37	38	8
Copper	mg/kg	16	20	17	15	4
Lead	mg/kg	12	11	11	11	3
Mercury	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Nickel	mg/kg	10	13	15	15	4
Zinc	mg/kg	19	22	42	63	49

Acid Extractable metals in soil				
Our Reference		201217-6	201217-7	201217-8
Your Reference	UNITS	Soil 9 - south	Soil 10 - south	Soil 11 - windrow
Depth		0.0-0.15	0.3-0.4	0.0-0.1
Date Sampled		19/09/2018	19/09/2018	19/09/2018
Type of sample		Soil	Soil	Soil
Date prepared	-	21/09/2018	21/09/2018	21/09/2018
Date analysed	-	21/09/2018	21/09/2018	21/09/2018
Arsenic	mg/kg	<4	<4	8
Cadmium	mg/kg	<0.4	<0.4	<0.4
Chromium	mg/kg	37	58	40
Copper	mg/kg	12	18	27
Lead	mg/kg	8	11	13
Mercury	mg/kg	<0.1	<0.1	<0.1
Nickel	mg/kg	10	12	15
Zinc	mg/kg	29	19	220

Moisture						
Our Reference		201217-1	201217-2	201217-3	201217-4	201217-5
Your Reference	UNITS	Soil 1 - north	Soil 2 - north	Soil 3 - centre north	Soil 7 - centre north	Soil 8 - surface sediment
Depth		0.0-0.15	0.3-0.4	0.0-0.15	0.0-0.15	surface
Date Sampled		19/09/2018	19/09/2018	19/09/2018	19/09/2018	19/09/2018
Type of sample		Soil	Soil	Soil	Soil	Sediment
Date prepared	-	21/09/2018	21/09/2018	21/09/2018	21/09/2018	21/09/2018
Date analysed	-	24/09/2018	24/09/2018	24/09/2018	24/09/2018	24/09/2018
Moisture	%	17	15	19	14	7.0

Moisture				
Our Reference		201217-6	201217-7	201217-8
Your Reference	UNITS	Soil 9 - south	Soil 10 - south	Soil 11 - windrow
Depth		0.0-0.15	0.3-0.4	0.0-0.1
Date Sampled		19/09/2018	19/09/2018	19/09/2018
Type of sample		Soil	Soil	Soil
Date prepared	-	21/09/2018	21/09/2018	21/09/2018
Date analysed	-	24/09/2018	24/09/2018	24/09/2018
Moisture	%	19	16	6.5

Method ID	Methodology Summary
Inorg-008	Moisture content determined by heating at 105+/-5 °C for a minimum of 12 hours.
Metals-020	Determination of various metals by ICP-AES.
Metals-021	Determination of Mercury by Cold Vapour AAS.
Org-003	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis.
Org-003	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis. Note, the Total +ve TRH PQL is reflective of the lowest individual PQL and is therefore "Total +ve TRH" is simply a sum of the positive individual TRH fractions (>C10-C40).
Org-005	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC with dual ECD's.
Org-005	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC with dual ECD's. Note, the Total +ve reported DDD+DDE+DDT PQL is reflective of the lowest individual PQL and is therefore simply a sum of the positive individually report DDD+DDE+DDT.
Org-006	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-ECD.
Org-006	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-ECD. Note, the Total +ve PCBs PQL is reflective of the lowest individual PQL and is therefore" Total +ve PCBs" is simply a sum of the positive individual PCBs.
Org-008	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC with dual ECD's.

Method ID	Methodology Summary
Org-012	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS. Benzo(a)pyrene TEQ as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater - 2013. For soil results:- 1. 'EQ PQL'values are assuming all contributing PAHs reported as <PQL are actually at the PQL. This is the most conservative approach and can give false positive TEQs given that PAHs that contribute to the TEQ calculation may not be present. 2. 'EQ zero'values are assuming all contributing PAHs reported as <PQL are zero. This is the least conservative approach and is more susceptible to false negative TEQs when PAHs that contribute to the TEQ calculation are present but below PQL. 3. 'EQ half PQL'values are assuming all contributing PAHs reported as <PQL are half the stipulated PQL. Hence a mid-point between the most and least conservative approaches above. Note, the Total +ve PAHs PQL is reflective of the lowest individual PQL and is therefore "Total +ve PAHs" is simply a sum of the positive individual PAHs.
Org-014	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS.
Org-016	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater.
Org-016	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater. Note, the Total +ve Xylene PQL is reflective of the lowest individual PQL and is therefore "Total +ve Xylenes" is simply a sum of the positive individual Xylenes.

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	201217-2
Date extracted	-			21/09/2018	1	21/09/2018	21/09/2018		21/09/2018	21/09/2018
Date analysed	-			24/09/2018	1	24/09/2018	24/09/2018		24/09/2018	24/09/2018
TRH C_6 - C_9	mg/kg	25	Org-016	<25	1	<25	<25	0	101	85
TRH C_6 - C_{10}	mg/kg	25	Org-016	<25	1	<25	<25	0	101	85
Benzene	mg/kg	0.2	Org-016	<0.2	1	<0.2	<0.2	0	100	90
Toluene	mg/kg	0.5	Org-016	<0.5	1	<0.5	<0.5	0	134	83
Ethylbenzene	mg/kg	1	Org-016	<1	1	<1	<1	0	85	82
m+p-xylene	mg/kg	2	Org-016	<2	1	<2	<2	0	92	84
o-Xylene	mg/kg	1	Org-016	<1	1	<1	<1	0	99	95
naphthalene	mg/kg	1	Org-014	<1	1	<1	<1	0	[NT]	[NT]
Surrogate aaa-Trifluorotoluene	%		Org-016	94	1	78	81	4	100	85

QUALITY CONTROL: svTRH (C10-C40) in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	201217-2
Date extracted	-			21/09/2018	1	21/09/2018	21/09/2018		21/09/2018	21/09/2018
Date analysed	-			22/09/2018	1	22/09/2018	22/09/2018		22/09/2018	22/09/2018
TRH C_{10} - C_{14}	mg/kg	50	Org-003	<50	1	<50	<50	0	112	106
TRH C_{15} - C_{28}	mg/kg	100	Org-003	<100	1	500	1500	100	102	95
TRH C_{29} - C_{36}	mg/kg	100	Org-003	<100	1	1600	4800	100	109	104
TRH >C_{10} -C_{16}	mg/kg	50	Org-003	<50	1	<50	<50	0	112	106
TRH >C_{16} -C_{34}	mg/kg	100	Org-003	<100	1	1900	5500	97	102	95
TRH >C_{34} -C_{40}	mg/kg	100	Org-003	<100	1	450	1400	103	109	104
Surrogate o-Terphenyl	%		Org-003	84	1	121	#		79	100

QUALITY CONTROL: PAHs in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	201217-2
Date extracted	-			21/09/2018	1	21/09/2018	21/09/2018		21/09/2018	21/09/2018
Date analysed	-			24/09/2018	1	24/09/2018	24/09/2018		24/09/2018	24/09/2018
Naphthalene	mg/kg	0.1	Org-012	<0.1	1	<1	<1	0	103	92
Acenaphthylene	mg/kg	0.1	Org-012	<0.1	1	<1	<1	0	[NT]	[NT]
Acenaphthene	mg/kg	0.1	Org-012	<0.1	1	<1	<1	0	[NT]	[NT]
Fluorene	mg/kg	0.1	Org-012	<0.1	1	<1	<1	0	104	87
Phenanthrene	mg/kg	0.1	Org-012	<0.1	1	<1	<1	0	112	105
Anthracene	mg/kg	0.1	Org-012	<0.1	1	<1	<1	0	[NT]	[NT]
Fluoranthene	mg/kg	0.1	Org-012	<0.1	1	<1	<1	0	109	102
Pyrene	mg/kg	0.1	Org-012	<0.1	1	<1	<1	0	100	95
Benzo(a)anthracene	mg/kg	0.1	Org-012	<0.1	1	<1	<1	0	[NT]	[NT]
Chrysene	mg/kg	0.1	Org-012	<0.1	1	<1	<1	0	103	97
Benzo(b,j+k)fluoranthene	mg/kg	0.2	Org-012	<0.2	1	<2	<2	0	[NT]	[NT]
Benzo(a)pyrene	mg/kg	0.05	Org-012	<0.05	1	<0.5	<0.5	0	108	105
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	Org-012	<0.1	1	<1	<1	0	[NT]	[NT]
Dibenzo(a,h)anthracene	mg/kg	0.1	Org-012	<0.1	1	<1	<1	0	[NT]	[NT]
Benzo(g,h,i)perylene	mg/kg	0.1	Org-012	<0.1	1	<1	<1	0	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-012	89	1	94	88	7	89	88

QUALITY CONTROL: Organochlorine Pesticides in soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	201217-2
Date extracted	-			21/09/2018	1	21/09/2018	21/09/2018		21/09/2018	21/09/2018
Date analysed	-			27/09/2018	1	27/09/2018	27/09/2018		27/09/2018	27/09/2018
HCB	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
alpha-BHC	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	81	92
gamma-BHC	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
beta-BHC	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	85	85
Heptachlor	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	90	90
delta-BHC	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Aldrin	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	87	73
Heptachlor Epoxide	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	90	95
gamma-Chlordane	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
alpha-chlordane	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Endosulfan I	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
pp-DDE	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	88	91
Dieldrin	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	96	100
Endrin	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	103	104
pp-DDD	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	91	88
Endosulfan II	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
pp-DDT	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Endrin Aldehyde	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Endosulfan Sulphate	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	87	79
Methoxychlor	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Surrogate TCMX	%		Org-005	122	1	104	93	11	106	112

QUALITY CONTROL: Organophosphorus Pesticides						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	201217-2
Date extracted	-			21/09/2018	1	21/09/2018	21/09/2018		21/09/2018	21/09/2018
Date analysed	-			27/09/2018	1	27/09/2018	27/09/2018		27/09/2018	27/09/2018
Azinphos-methyl (Guthion)	mg/kg	0.1	Org-008	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Bromophos-ethyl	mg/kg	0.1	Org-008	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Chlorpyriphos	mg/kg	0.1	Org-008	<0.1	1	<0.1	<0.1	0	109	91
Chlorpyriphos-methyl	mg/kg	0.1	Org-008	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Diazinon	mg/kg	0.1	Org-008	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Dichlorvos	mg/kg	0.1	Org-008	<0.1	1	<0.1	<0.1	0	105	102
Dimethoate	mg/kg	0.1	Org-008	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Ethion	mg/kg	0.1	Org-008	<0.1	1	<0.1	<0.1	0	128	110
Fenitrothion	mg/kg	0.1	Org-008	<0.1	1	<0.1	<0.1	0	124	106
Malathion	mg/kg	0.1	Org-008	<0.1	1	<0.1	<0.1	0	82	107
Parathion	mg/kg	0.1	Org-008	<0.1	1	<0.1	<0.1	0	107	91
Ronnel	mg/kg	0.1	Org-008	<0.1	1	<0.1	<0.1	0	120	101
Surrogate TCMX	%		Org-008	122	1	104	93	11	113	99

QUALITY CONTROL: PCBs in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	201217-2
Date extracted	-			21/09/2018	1	21/09/2018	21/09/2018		21/09/2018	21/09/2018
Date analysed	-			27/09/2018	1	27/09/2018	27/09/2018		27/09/2018	27/09/2018
Aroclor 1016	mg/kg	0.1	Org-006	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1221	mg/kg	0.1	Org-006	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1232	mg/kg	0.1	Org-006	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1242	mg/kg	0.1	Org-006	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1248	mg/kg	0.1	Org-006	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1254	mg/kg	0.1	Org-006	<0.1	1	<0.1	<0.1	0	108	88
Aroclor 1260	mg/kg	0.1	Org-006	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Surrogate TCLMX	%		Org-006	122	1	104	93	11	113	99

QUALITY CONTROL: Acid Extractable metals in soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	201217-2
Date prepared	-			21/09/2018	1	21/09/2018	21/09/2018		21/09/2018	21/09/2018
Date analysed	-			21/09/2018	1	21/09/2018	21/09/2018		21/09/2018	21/09/2018
Arsenic	mg/kg	4	Metals-020	<4	1	<4	<4	0	98	75
Cadmium	mg/kg	0.4	Metals-020	<0.4	1	<0.4	<0.4	0	96	101
Chromium	mg/kg	1	Metals-020	<1	1	37	44	17	90	90
Copper	mg/kg	1	Metals-020	<1	1	16	15	6	99	95
Lead	mg/kg	1	Metals-020	<1	1	12	11	9	100	93
Mercury	mg/kg	0.1	Metals-021	<0.1	1	<0.1	<0.1	0	97	81
Nickel	mg/kg	1	Metals-020	<1	1	10	11	10	98	100
Zinc	mg/kg	1	Metals-020	<1	1	19	21	10	99	103

Result Definitions

NT	Not tested
NA	Test not required
INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
<	Less than
>	Greater than
RPD	Relative Percent Difference
LCS	Laboratory Control Sample
NS	Not specified
NEPM	National Environmental Protection Measure
NR	Not Reported

Quality Control Definitions

Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011.

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% – see ELN-P05 QA/QC tables for details; <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals; 60-140% for organics (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Measurement Uncertainty estimates are available for most tests upon request.

Report Comments

TRH Soil C10-C40 NEPM - (1D,3,4,5,6,8 SURROGATE)# Percent recovery is not possible to report as the high concentration of analytes in the sample/s have caused interference.

PAHs in Soil - PQL has been raised due to interference from analytes(other than those being tested) in samples 1, 3-8.

TRH Soil C10-C40 NEPM -(1,1d rocky clay sample) The RPD for duplicate results is accepted due to the non homogenous nature of the sample/s.

OC's/OPs and PCBs in Soil - PQL has been raised due to interference from analytes(other than those being tested) in samples 5,6 and 8.

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Client: NGH ENVIRONMENTAL	**Client Project Name / Number / Site etc (ie report title):** 16-276 NORTH RIDGE MATERIALS FACILITY
Contact Person: NICOLA SMITH	
Project Mgr: MICHIAL SUTHERLAND	**PO No.:**
Sampler: M SUTHERLAND / N SMITH	**Envirolab Quote No. :**
Address: SUITE 1, 39 FITZMAURICE STREET WAGGA WAGGA NSW 2650	**Date results required:** Or choose: standard / same day / 1 day / 2 day / 3 day *Note: Inform lab in advance if urgent turnaround is required - surcharges apply*
Phone: 02 6923 1537 **Mob:**	**Additional report format:** esdat / equis /
Email: NICOLA.S@NGHENVIRONMENTAL.COM.AU	**Lab Comments:**

Sample information					Tests Required	Comments
Envirolab Sample ID	Client Sample ID or information	Depth	Date sampled	Type of sample	COMBINATION 6	Provide as much information about the sample as you can
1	Soil 1 - north	0-0.15	19-09-18	Soil		Effluent Pond
2	Soil 2 - north	0.3-0.4	19-09-18	Soil		Effluent Pond
3	Soil 3 - centre north	0-0.15	19-09-18	Soil		Effluent Pond
4	Soil 7 - centre south	0-0.15	19-09-18	Soil		Effluent Pond
5	Soil 8 - surface sediment	surface	19-09-18	Sediment		Effluent Pond
6	Soil 9 - south	0-0.15	19-09-18	Soil		Effluent Pond
7	Soil 10 - south	0.3-0.4	19-09-18	Soil		Effluent Pond
8	Soil 11 - windrow	0-0.10	19-09-18	Soil		Windrow

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Chatswood NSW 2067
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Job No: 291217
Date Received: 20/9/18
Time Received: 13:00
Received By: KG
Temp: Cool/Ambient
Cooling: Ice/Icepack
Security: Intact/Broken/None

Relinquished by (Company): NGH Environmental	**Received by (Company):** ELS	***Lab Use Only***	
Print Name: NICOLA SMITH	**Print Name:** Kate Gore	**Job number:**	**Cooling: Ice / Ice pack / None**
Date & Time: 19/09/18 5.50 pm.	**Date & Time:** 20/9/18 13:00	**Temperature:** 17.6	**Security seal: Intact / Broken / None**
Signature:	**Signature:**	**TAT Req - SAME day / 1 / 2 / 3 / 4 / STD**	

NEPM TRH Fractions (F1 & F2), Naphthalene reporting and Benzo(a)Pyrene TEQ

Envirolab has made the move to standardise on the reporting of the draft NEPM fractions as described below. The likely release in 2013 of the 'Schedule B (1) – Guideline on Investigation Levels for Soil and Groundwater' document requires the proposed fractions* to be reported. However, the Envirolab Group will continue to report the historical fractions for purposes of comparison, until further notice.

Therefore the fractions in the tables below will be reported as standard, this includes the F1 and F2 calculated fractions as discussed in Schedule B (1):-

Date extracted	--	21/11/2012 (Water)	--	21/11/2012 (Soil)
Date analysed	--	21/11/2012 (Water)	--	21/11/2012 (Soil)
$TRHC_6$-C_9	µg/L	<10	mg/kg	<25
$TRHC_6$-C_{10}*	µg/L	<10	mg/kg	<25
$TRHC_6$-C_{10} less BTEX (F1)*	µg/L	<10	mg/kg	<25
Surrogate Dibromofluoromethane	%	100	%	100
Surrogate toluene-d8	%	100	%	100
Surrogate 4-BFB	%	100	%	100

Date extracted	--	21/11/2012 (Water)	--	21/11/2012 (Soil)
Date analysed	--	21/11/2012 (Water)	--	21/11/2012 (Soil)
$TRHC_{10}$ - C_{14}	µg/L	<50	mg/kg	<50
$TRHC_{15}$ - C_{28}	µg/L	<100	mg/kg	<100
$TRHC_{29}$ - C_{36}	µg/L	<100	mg/kg	<100
Surrogate o-Terphenyl	%	100	%	100
$TRH{>}C_{10}$ - C_{16}*	µg/L	<50	mg/kg	<50
$TRH{>}C_{10}$ - C_{16} less Naphthalene (F2)*	µg/L	<50	mg/kg	<50
$TRH{>}C_{16}$ - C_{34}*	µg/L	<100	mg/kg	<100
$TRH{>}C_{34}$ - C_{40}*	µg/L	<100	mg/kg	<100

*NEPM draft fractions

ENVIROLAB GROUP SPECIALIZES IN

Soil
-Contaminated Sites
-Waste

Water
-Ground
-Surface
-Drinking
-Trade Waste
-Saline

Air
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-Workplace
-Emissions
-Ambient
-Soil gas
-Dust / DPM

Asbestos
-Building
-Soil
-Brake pads

SPOCAS
-Acid Sulphate Soil
-AMD

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F 02 9910 6299	**F** 08 9317 4163	**F** 03 9763 2633	**F** 08 8369 0722	**F** 07 3256 9411
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The Naphthalene value used for the F2 determination is taken from the VOC analysis due to availability (determined with BTEX/vTRH using Purge and Trap GC-MS techniques), hence Naphthalene will be reported with the BTEX data at no extra cost (assuming vTRH and/or BTEX is already requested).

Variability between VOC and SVOC Naphthalene data

There is the potential for discrepancy in the Naphthalene results for a particular sample where the result from a VOC analysis (typically Purge and Trap – GC-MS) differs from a result from a SVOC analysis (direct injection – GC-MS). While both results are valid, there are several parameters that may cause poor precision between the VOC and SVOC results. These are detailed below:-

i. Extraction efficiency for soils – VOC extraction with methanol vs SVOC DCM-Acetone extraction can cause discrepancy in the Naphthalene results.

ii. Preservation for water samples – VOC containers are typically preserved, whereas SVOC containers may not be, discrepancy in the Naphthalene results may occur.

iii. Non-homogeneity with soils and water aliquots from bottle to vial may cause discrepancy in the Naphthalene results.

iv. VOC is typically a Purge & Trap system connected to GC-MS, SVOC is a liquid injection directly onto a GC-MS, these are two distinct methods of delivery to the GC-MS which can cause a degree of variability in the Naphthalene results.

Benzo(a)Pyrene TEQ

The draft 'Schedule B (1) – Guideline on Investigation Levels for Soil and Groundwater' document also includes HILs for Benzo(a)pyrene as Toxic Equivalents (TEQ) i.e. the comparison of 8 carcinogenic PAHs relative to Benzo(a)pyrene. Therefore Envirolab will include this calculated value in all reports where PAHs are analysed.

FOR FURTHER INFORMATION AND TECHNICAL ASSISTANCE CONTACT YOUR LOCAL LABORATORY OR OFFICE ON

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Issued:- 7th December 2012

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APPENDIX E GROUNDWATER ANALYSIS RESULTS

CERTIFICATE OF ANALYSIS

Batch No:	**18-30270**	*Page*	**Page 1 of 4**
Interim Report	**697458**	*Laboratory*	Scoresby Laboratory
Client:	**Environmental and Analytical Laboratories**	*Address*	Caribbean Business Park, 22 Dalmore Drive, Scoresby, VIC 3179
Contact:	**David Wade**	*Phone*	03 8756 8000
Address:	Charles Sturt University Locked Bag 588 WAGGA WAGGA NSW 2678	*Fax*	03 9763 1862
		Contact:	
PO No:	**P0197464**	Date Sampled:	**28-Jun-2018**
Sampler Name:		Date Samples Received:	**29-Jun-2018**
ALS Program Ref:	**EAL**	*Date Issued:*	**05-Jul-2018**
Program Description:	**Analysis for EAL**		
Client Ref:	**Analysis**		

The sample(s) referred to in this report were analysed by the following method(s) under NATA Accreditation No. 992. The hash (#) below indicates methods not covered by NATA accreditation in the performance of this service.

Analysis	*Method*	*Laboratory*	*Analysis*		*Method*	*Laboratory*
BTEXN	WP074	Scoresby	OCP		WP068A	Scoresby
OPP	WP130	Scoresby	TRH F2	#	WP071	Scoresby
TRH & TPH (>C10)	WP071	Scoresby	TRH (C6-C10) & F1		WP071 (F1 not NATA)	Scoresby
VFA / VOA	WP045B	Scoresby	TOC		EP003	ALS Brisbane

Signatories

These results have been electronically signed by the authorised signatories indicated below. Electronic signing has been carried out in compliance with procedures specified in 21 CFR Part 11

Name	*Title*	*Name*	*Title*
Chatura Perera	**Team Leader Nutrients**	**Hao Zhang**	**Team Leader Organics**
Kosta Christopoulos	**Deputy Team Leader Organics**	**Kosta Christopoulos**	**Chemist/Analyst**

Accreditation No. 992
Accredited for compliance with ISO/IEC 17025 - Testing

Samples not collected by ALS and are tested as received.

Soil results expressed in mg/kg dry weight unless specified otherwise. Soil microbiological testing was commenced within 48 hours from the day received unless otherwise stated. Water microbiological testing was commenced on the day received and within 24 hours of sampling unless otherwise stated.

MM524: Plate count results <10 per mL and >300 per mL are deemed as approximate.

MM526: Plate count results <2,500 per mL and >250,000 per mL are deemed as approximate.

Calculated results are based on raw data.

Legionella species refers to Legionella species other than Legionella pneumophila

Measurement Uncertainties values for your compliance results are available at this link

Sample No	Site Code	Site Description	Sample Type	Sampled Date/Time
5714076		18Jun-0452	S-SLUDGE	28/06/18
5714077		18Jun-0453	S-SLUDGE	28/06/18
5714078		18Jun-0454	S-SLUDGE	28/06/18
5714079		18Jun-0455	S-SLUDGE	28/06/18

Analysis - Analyte	*Sample No. Site Code Units*	5714076	5714077	5714078	5714079
TOC - Total Organic Carbon, as C	mg/kg	Pending	Pending	Pending	Pending

Sample No	Site Code	Site Description	Sample Type	Sampled Date/Time
5714080		18Jun-0456	S-SLUDGE	28/06/18
5714081		18Jun-0457	S-SLUDGE	28/06/18
5714082		18Jun-0458	S-SLUDGE	28/06/18
5714083		18Jun-0459	S-SLUDGE	28/06/18

Analysis - Analyte	*Sample No. Site Code Units*	5714080	5714081	5714082	5714083
TOC - Total Organic Carbon, as C	mg/kg	Pending	Pending	Pending	Pending

Sample No	Site Code	Site Description	Sample Type	Sampled Date/Time
5714084		18Jun-0460	S-SLUDGE	28/06/18
5714085		18Jun-0461	S-SLUDGE	28/06/18
5714086		18Jun-0428	WATER	28/06/18
5714087		18Jun-0429	WATER	28/06/18

Analysis - Analyte	*Sample No. Site Code Units*	5714084	5714085	5714086	5714087
VFA / VOA - Volatile Fatty Acids / Volatile Organic Acids	mg/L			44	35
TOC - Total Organic Carbon, as C	mg/kg	Pending	Pending		

Batch No: **18-30270**
Report Number: **697458**
Client: **Environmental and Analytical Laboratories**
ALS Program Ref: **EAL**
Program Description: **Analysis for EAL**

Sample No	Site Code	Site Description	Sample Type	Sampled Date/Time
5714088		18Jun-0562	WATER	28/06/18
5714089		18Jun-0563	WATER	28/06/18
5714090		18Jun-0514	WATER	28/06/18

Analysis - Analyte	*Sample No. Site Code Units*	5714088	5714089	5714090
VFA / VOA - Volatile Fatty Acids / Volatile Organic Acids	mg/L	42	41	
BTEXN - Benzene	mg/L			<0.001
BTEXN - Toluene	mg/L			<0.001
BTEXN - Ethyl Benzene	mg/L			<0.001
BTEXN - Xylene - m & p	mg/L			<0.002
BTEXN - Xylene - o	mg/L			<0.001
BTEXN - Naphthalene	mg/L			<0.001
BTEXN - Total Xylenes	mg/L			<0.002
BTEXN - BTEX (Sum)	mg/L			<0.002
TRH (C6-C10) & F1 - TPH C6-C9	mg/L			<0.1
TRH (C6-C10) & F1 - TRH C6-C10	mg/L			<0.1
TRH (C6-C10) & F1 - TRH C6-C10 minus BTEX	mg/L			<0.1
TRH F2 - TRH>C10-C16 minus Naphthalene	mg/L			<0.1
TRH & TPH (>C10) - TPH C10-C14	mg/L			<0.1
TRH & TPH (>C10) - TPH C15-C28	mg/L			<0.1
TRH & TPH (>C10) - TPH C29-C36	mg/L			<0.1
TRH & TPH (>C10) - TRH>C10-C16	mg/L			<0.1
TRH & TPH (>C10) - TRH>C16-C34	mg/L			<0.1
TRH & TPH (>C10) - TRH>C34-C40	mg/L			<0.1
TRH & TPH (>C10) - Sum of TRH>C10-C40	mg/L			<0.1
OCP - BHC (alpha Isomer)	mg/L			<0.001
OCP - Aldrin	mg/L			<0.001
OCP - BHC (beta Isomer)	mg/L			<0.001
OCP - Chlordane	mg/L			<0.001
OCP - cis-Chlordane	mg/L			<0.001
OCP - trans-Chlordane	mg/L			<0.001
OCP - BHC (delta Isomer)	mg/L			<0.001
OCP - 4,4-DDD	mg/L			<0.001
OCP - 4,4-DDE	mg/L			<0.001
OCP - 4,4-DDT	mg/L			<0.001
OCP - Dieldrin	mg/L			<0.001
OCP - Endosulfan I	mg/L			<0.001
OCP - Endosulfan II	mg/L			<0.001
OCP - Sum of alpha-, beta- and Endosulphan Sulphate	mg/L			<0.001
OCP - Endosulfan Sulfate	mg/L			<0.001
OCP - Endrin Aldehyde	mg/L			<0.001
OCP - Endrin	mg/L			<0.001
OCP - Endrin Ketone	mg/L			<0.001
OCP - Hexachlorobenzene	mg/L			<0.001
OCP - Heptachlor Epoxide	mg/L			<0.001
OCP - Heptachlor	mg/L			<0.001
OCP - Lindane (BHC gamma Isomer)	mg/L			<0.001
OCP - Methoxychlor	mg/L			<0.001
OCP - Oxychlordane	mg/L			<0.001
OCP - Sum of DDD, DDE and DDT	mg/L			<0.001
OCP - Sum of Aldrin and Dieldrin	mg/L			<0.001
OPP - Chlorpyrifos	mg/L			<0.001
OPP - Diazinon	mg/L			<0.001
OPP - Dichlorvos	mg/L			<0.001
OPP - Ethion	mg/L			<0.001

Sample No	Site Code	Site Description	Sample Type	Sampled Date/Time
5714088		18Jun-0562	WATER	28/06/18
5714089		18Jun-0563	WATER	28/06/18
5714090		18Jun-0514	WATER	28/06/18

		5714088	5714089	5714090
OPP - Fenthion	mg/L			<0.001
OPP - Malathion	mg/L			<0.001
OPP - Mevinphos	mg/L			<0.001
OPP - Parathion	mg/L			<0.001
OPP - Ronnel (Fenchlorfos)	mg/L			<0.001
OPP - Stirofos	mg/L			<0.001

A blank space indicates no test performed.

1806-0104

Charles Sturt University

| | | |

Charles Sturt University

ENVIRONMENTAL AND ANALYTICAL LABORATORIES

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NGH Environmental
Suite 1/39 Fitzmaurice Strret
Wagga Wagga NSW 2650
Attention: Nicole Isles

Tuesday, July 17, 2018

NATA Accredited Laboratory Number: 9597

Accredited for compliance with ISO/IEC 17025 - Testing

LABORATORY ANALYSIS REPORT

Report Number:1806-0104
Page 1 of 2
For all enquiries related to this report please quote document number: 1806-0104

Facility: **Order #**

Sample Type **Collected By** **Date Received**
Water N. Smith 22-June-2018

EAL ID	Client ID. / Date/Time sample taken	Test	Result (units)		Method Reference	Limit of Reporting
18Jun-0514	**P1b220618NS** 22.06.18 11.06am					
		Alkalinity, Total as CaCO3	**378**	mg/L	APHA 2320 B	2
		Arsenic (acid extractable)	**<0.02**	mg/L	APHA 3030 E/3120 B	0.02
		Cadmium (acid extractable)	**<0.002**	mg/L	APHA 3030 E/3120 B	0.002
		Calcium (acid extractable)	**84.5**	mg/L	APHA 3030 E/3120 B	0.03
		Chloride	**234**	mg/L	APHA 4110 B	0.5
		Chromium (acid extractable)	**0.007**	mg/L	APHA 3030 E/3120 B	0.002
		Copper (acid extractable)	**0.046**	mg/L	APHA 3030 E/3120 B	0.002
		Conductivity	**1290**	µS/cm	APHA 2510 B	1
		Total Hardness as CaCO3	**325**	mg/L	APHA 2340 B	2
		Lead (acid extractable)	**0.01**	mg/L	APHA 3030 E/3120 B	0.01
		Magnesium (acid extractable)	**27.7**	mg/L	APHA 3030 E/3120 B	0.02
		Mercury (acid extractable)	**<0.03**	mg/L	* APHA 3030 E/3120 B	0.03
		Nickel (acid extractable)	**<0.01**	mg/L	APHA 3030 E/3120 B	0.01
		Nitrate as N	**6.8**	mg/L	APHA 4110 B	0.1
		pH	**7.5**	pH units	APHA 4500-H+ B	
		Potassium (acid extractable)	**2.5**	mg/L	APHA 3030 E/3120 B	0.2
		Selenium (acid extractable)	**<0.02**	mg/L	APHA 3030 E/3120 B	0.02
		Sodium (acid extractable)	**83.8**	mg/L	APHA 3030 E/3120 B	0.05
		Refer to ALS Report Number:	**18-30270**		Analysis by ALS, Melbourne (acc no. 992)	
		Sulphate	**19.7**	mg/L	APHA 4110 B	0.5
		Total Dissolved Solids	**715**	mg/L	APHA 2540 C	2
		Zinc (acid extractable)	**0.109**	mg/L	APHA 3030 E/3120 B	0.002

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NGH Environmental
Suite 1/39 Fitzmaurice Strret
Wagga Wagga NSW 2650
Attention: Nicole Isles

Tuesday, July 17, 2018

NATA Accredited Laboratory Number: 9597

Accredited for compliance with ISO/IEC 17025 - Testing

LABORATORY ANALYSIS REPORT

Report Number:1806-0104
Page 2 of 2
For all enquiries related to this report please quote document number: 1806-0104

Facility:	**Order #**	
Sample Type	**Collected By**	**Date Received**
Water	N. Smith	22-June-2018

EAL ID	Client ID. Date/Time sample taken	Test	Result (units)	Method Reference	Limit of Reporting

Note:

**** NATA Accreditation does not cover the performance of this service.***

Signed ..... David Wade, Laboratory Manager.

All samples analysed as received.
All soil results are reported on a dry basis.
The EAL takes no responsibility for the end use of results within this report.
This report shall not be reproduced except in full.
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APPENDIX F RWC GROUNDWATER QUALITY RESULTS

		Average Concentration								
Monitoring Well ID	Year	Nitrogen mg/L	Potassium mg/L	Sodium mg/L	pH	EC uS/cm	Bicarbonate mg/L	Calcium mg/L	Magnesium mg/L	Chloride mg/L
P1b	2003	10.6	2.85	106.5	7.2	1253	359	98	38	179
	2004	9.75	2.85	401	7.1	1325	373	106	36.7	210
	2005	7.2	2.8	128	7.3	1328	376	96	40.3	215
	2006	9	3.03	121	7.4	1358	379	104	42.5	195
P4b	2004	DRY								
	2005	18	4.2	220	8.1	1170	543	15	16.8	27.5
	2006	16	4.4	231	8.2	1200	524	23.6	22.1	28.6
P5b	2003	22.4	1.23	63	7.4	941	327	74.2	37.9	57.4
	2004	29	1.7	76.4	7.4	963	340	73.6	37.9	60
	2005	28	1.7	80.9	7.3	1029	341	70.3	39.3	65.1
	2006	31	1.45	73.7	7.5	964	291	71.2	38.7	56.7
P6b	2003	1	4.1	90.4	7.5	1263	333	75.9	47.5	217
	2004	<2	4.9	114	7.5	1280	348	81.6	50.9	218
	2005	4	5.1	106	7.4	1298	353	75.9	52.3	234
	2006	7	5.1	114.6	7.6	1355	352	84.1	55.8	234
P9b	2003	2.3	7.2	287	7.4	2556	860	117	119	447
	2004	5	9.9	327	7.6	2430	2900	33.8	108	476
	2005	DRY								
	2006	DRY								
P13	2003	6.8	4	123.2	7.3	896	194	24	14	102
	2004	4.7	5.85	127	7.2	689	164	16.2	9.8	89.8
	2005	8	4	116	7.1	688	151	13.7	9	89
	2006	5	4.3	131	7.1	730	218	16.1	10.3	79.1

Riverina Wool Combing groundwater analysis results (ROBE 2008).

APPENDIX S GREENHOUSE GAS EMISSION ESTIMATE

Australian Government Clean Energy Regulator | CLEAN ENERGY REGULATOR

Back | Enter subfacility 2 data | Enter biological treatment | View output

North Ridge Materials Facility

References: NGER Determ.	NGER Determ. Section 5.5 INPUT	NGER Determ. Section 5.4, Section 5.22B									NGER Determ. Section 5.10 (3), (4)
		Input Parameters: Qcap, Qflared and Qtr			**Calculator Outputs**						**Select from list to reflect licensing restrictions**
Please enter total waste entering landfill, excluding homogenous waste streams (t) *Note: prior to first year of reporting, only report waste disposed of in landfill. On and after first year of reporting, report waste received at the landfill. Ensure opening stock of carbon is correcly estimated.*		Q_{cap} (CH_4 only) (m^3)	Q_{flared} (CH_4 only) (m^3)	Q_{tr} (CH_4 only) (m^3)	Total emissions (CO_2-e) (t)	Legacy emissions (CO_2-e) (t)	Non-legacy emissions (CO_2-e) (t)	Total captured (Q_{cap}+Q_{tr}+Q_{flared}) (CO_2-e) (t)	Legacy capture (Q_{cap}+Q_{tr}+Q_{flared}) (CO_2-e) (t)	Non-legacy capture (Q_{cap}+Q_{tr}+Q_{flared}) (CO_2-e) (t)	Waste streams permitted at landfill (leave blank for "all")
2018	**60,000**	0	0	0	0	0	0	0	0	0	C & I and C & D only
2019	**60,763**	0	0	0	1,296	0	1,296	0	0	0	C & I and C & D only
2020	**61,674**	0	0	0	2,560	0	2,560	0	0	0	C & I and C & D only
2021	**62,599**	0	0	0	3,797	0	3,797	0	0	0	C & I and C & D only
2022	**63,538**	0	0	0	5,007	0	5,007	0	0	0	C & I and C & D only
2023	**64,491**	0	0	0	6,192	0	6,192	0	0	0	C & I and C & D only
2024	**65,458**	0	0	0	7,353	0	7,353	0	0	0	C & I and C & D only
2025	**66,440**	0	0	0	8,492	0	8,492	0	0	0	C & I and C & D only
2026	**67,437**	0	0	0	9,610	0	9,610	0	0	0	C & I and C & D only
2027	**0**	0	0	0	10,708	0	10,708	0	0	0	C & I and C & D only
2028	**0**	0	0	0	10,308	0	10,308	0	0	0	C & I and C & D only
2029	**0**	0	0	0	9,924	0	9,924	0	0	0	C & I and C & D only
2030	**0**	0	0	0	9,555	0	9,555	0	0	0	C & I and C & D only
2031	**0**	0	0	0	9,200	0	9,200	0	0	0	C & I and C & D only
2032	**0**	0	0	0	8,859	0	8,859	0	0	0	C & I and C & D only
2033	**0**	0	0	0	8,531	0	8,531	0	0	0	C & I and C & D only
2034	**0**	0	0	0	8,216	0	8,216	0	0	0	C & I and C & D only
2035	**0**	0	0	0	7,913	0	7,913	0	0	0	C & I and C & D only
2036	**0**	0	0	0	7,621	0	7,621	0	0	0	C & I and C & D only
2037	**0**	0	0	0	7,341	0	7,341	0	0	0	C & I and C & D only
2038	**0**	0	0	0	7,072	0	7,072	0	0	0	C & I and C & D only
2039	**0**	0	0	0	6,813	0	6,813	0	0	0	C & I and C & D only
2040	**0**	0	0	0	6,564	0	6,564	0	0	0	C & I and C & D only
2041	**0**	0	0	0	6,325	0	6,325	0	0	0	C & I and C & D only
2042	**0**	0	0	0	6,095	0	6,095	0	0	0	C & I and C & D only
2043	**0**	0	0	0	5,873	0	5,873	0	0	0	C & I and C & D only
2044	**0**	0	0	0	5,660	0	5,660	0	0	0	C & I and C & D only
2045	**0**	0	0	0	5,456	0	5,456	0	0	0	C & I and C & D only
2046	**0**	0	0	0	5,259	0	5,259	0	0	0	C & I and C & D only
2047	**0**	0	0	0	5,069	0	5,069	0	0	0	
2048	**0**	0	0	0	4,887	0	4,887	0	0	0	
2049	**0**	0	0	0	4,712	0	4,712	0	0	0	
2050	**0**	0	0	0	4,543	0	4,543	0	0	0	
2051	**0**	0	0	0	4,381	0	4,381	0	0	0	
2052	**0**	0	0	0	4,225	0	4,225	0	0	0	
2053	**0**	0	0	0	4,074	0	4,074	0	0	0	
2054	**0**	0	0	0	3,930	0	3,930	0	0	0	
2055	**0**	0	0	0	3,791	0	3,791	0	0	0	
2056	**0**	0	0	0	3,657	0	3,657	0	0	0	
2057	**0**	0	0	0	3,528	0	3,528	0	0	0	
2058	**0**	0	0	0	3,404	0	3,404	0	0	0	
2059	**0**	0	0	0	3,285	0	3,285	0	0	0	
2060	**0**	0	0	0	3,170	0	3,170	0	0	0	
2061	**0**	0	0	0	3,059	0	3,059	0	0	0	
2062	**0**	0	0	0	2,953	0	2,953	0	0	0	
2063	**0**	0	0	0	2,850	0	2,850	0	0	0	
2064	**0**	0	0	0	2,751	0	2,751	0	0	0	
2065	**0**	0	0	0	2,656	0	2,656	0	0	0	
2066	**0**	0	0	0	2,565	0	2,565	0	0	0	
2067	**0**	0	0	0	2,476	0	2,476	0	0	0	

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NGER Determ. Section 5.10			NGER Determ. Section 5.11									NGER Determ. Section 5.11								NGER Determ. Section 5.11							
Waste streams (percentages of total) Note: defaults can be overridden in accordance with NGER Determination			**Waste mix types - Municipal solid waste (percentages of total) Note: defaults can be overridden in accordance with NGER Determination**									**Waste mix types - Commercial and Industry (percentages of total) Note: defaults can be overridden in accordance with NGER Determination**								**Waste mix types - Construction and demolition (Percentages of total) Note: defaults can be overridden in accordance with NGER Determination**							
Municipal solid waste	Commercial and industrial	Construction and demolition (calculated by deduction)	Food	Paper and paper board	Garden and park	Wood and wood waste	Textiles	Sludge	Nappies	Rubber and Leather	Inert Material	Food	Paper and paper board	Garden and park	Wood and wood waste	Textiles	Sludge	Nappies	Rubber and Leather	Inert Material	Food	Paper and paper board	Garden and park	Wood and wood waste	Textiles	Sludge	Nappies	Rubber and Leather
0%	61%	39%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	15.5%	4.0%	12.5%	4.0%	0.0%	0.0%	3.5%	60.5%	0.0%	3.0%	2.0%	6.0%	0.0%	0.0%	0.0%	0.0%

	NGER Determ. Section 5.10A			NGER Determ. Section 5.9(3)									NGER Determ. Subsection 5.11 (3)								NGER Determ. Section 5.11							
	Homogeneous Waste Stream Data. Note these can only be used in strict accordance with the NGER Determination			**Composition of Shredder Flock Note: No Defaults are available for this waste stream**									**W_{mtrmax} - waste mix type licence restrictions (Percentages of total)**								**Waste mix type proportions (adjusted for licensing restrictions if applicable) of total wa Note: these values are calculated and no input is required**							
Inert Material	Alternative Waste Treatment Residues (t)	Homogeneous Inert Waste (t)	Shredder Flock (needs to be broken down (t))	Food	Paper and paper board	Garden and park	Wood and wood waste	Textiles	Sludge	Nappies	Rubber and Leather	Inert Material	Food	Paper and paper board	Garden and park	Wood and wood waste	Textiles	Sludge	Nappies	Rubber and Leather	Inert Material	Food	Paper and paper board	Garden and park	Wood and wood waste	Textiles	Sludge	Nappies	Rubber and Leather
89.0%																						0.00%	10.63%	3.22%	9.97%	2.44%	0.00%	0.00%	2.14%

	NGER Determ. Subsection 5.11(1)(a)									NGER Determ. Subsection 5.11(1)(b)									NGER Determ. Subsection 5.11(1)(c)
aste stream.	**For years including and after the first reporting year: Waste transferred offsite for recycling or biological treatment (if any) (t)**									**For years including and after the first reporting year: Waste recycled or biologically treated on-site (if any) (t)**									**For years including and after the first reporting year: Inert waste for construction/cover (if any) (t)**
Inert Material	Food	Paper and paper board	Garden and park	Wood and wood waste	Textiles	Sludge	Nappies	Rubber and Leather	Inert Material	Food	Paper and paper board	Garden and park	Wood and wood waste	Textiles	Sludge	Nappies	Rubber and Leather	Inert Material	Inert Material
71.62%																			
71.62%																			
71.62%																			
71.62%																			
71.62%																			
71.62%																			
71.62%																			
71.62%																			
71.62%																			

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Data input to EERS

In EERS, locate or create the facility which will report the solid waste activity.
Scroll down to the bottom of the Activities & Emissions screen and click on the 'Modify Waste Mix Percentages' link.
In the Activities and Emissions screen, click on the 'Add Activity' button. Select 'Waste' as the source category, 'Solid waste disposal on land' as the source and then the appropriate activity.
Under the CH_4 Methane heading, select a Method from the drop-down menu in the 'Method' field.
A list of required Matters to be identified (MTBIs) will appear above the 'Method' field under the MTBIs heading.
Each MTBI field will require data to be entered and, where required, a unit of measurement to be selected.
Where data is available in the solid waste calculator, this can be entered in the appropriate MTBI field in EERS.
Where data is not available in the solid waste calculator, reporters will need to determine appropiate data to be entered in the MTBI fields in EERS in accordance with the relevant legislation.
Once complete, enter data in the 'Emissions released during the year (CO_2-e tonnes)' field and click the 'Save Changes' button.

Emissions summary	
Legacy (tonnes CO_2 e)	0
Non legacy (tonnes CO_2-e)	0
Total	**0**

Biological treatment emissions (tonnes CO_2 e)	0

Waste type - Method 1 MTBI (g)	Municipal waste	Commercial & industrial	Construction and demolition	Shredder flock
Food	0.0%	0.0%	0.0%	0.0%
Paper	0.0%	15.5%	3.0%	0.0%
Garden	0.0%	4.0%	2.0%	0.0%
Wood	0.0%	12.5%	6.0%	0.0%
Textiles	0.0%	4.0%	0.0%	0.0%
Sludge	0.0%	0.0%	0.0%	0.0%
Nappies	0.0%	0.0%	0.0%	0.0%
Rubber and leather	0.0%	3.5%	0.0%	0.0%
Inert waste	0.0%	60.5%	89.0%	0.0%

MTBIs entered by source (See Part 6 of Schedule 3 of the *National Greenhouse and Energy Reporting Regulations 2008*)

The location of the landfill by State or Territory or by landfill classification specified in the Determination	Temperate dry
The number of years in operation	0
The average annual amount (in tonnes) of disposal of solid waste over the lifetime of the landfill facility prior to the first year of reporting	0
The total tonnes of waste entering the landfill	60,000
The tonnes of waste entering the landfill from each of the following:	
(i) municipal sources;	0
(ii) Commercial and industrial sources;	36,600
(iii) Construction and demolition sources;	23,400
(iv) alternative waste treatment facilities;	0
(v) shredder flock;	0
(vi) inert waste	0
The tonnes of waste received at the landfill facility for each of the following:	
(i) transfer to an external recycling or biological treatment facility;	0
(ii) recycling or biological treatment onsite;	0
(iii) construction purposes, daily cover purposes, intermediate cover purposes or final capping and cover purposes(inert waste only)	0
The opening stock of degradable organic carbon, in tonnes	0
The legacy emissions from decomposition of waste;*	0
The emissions, other than legacy emissions, from decomposition of waste;*	0
The tonnes of methane (CO2 e) captured for combustion that are legacy emissions;*	0
The tonnes of methane (CO2 e) captured for combustion that are not legacy emissions;*	0
The tonnes of waste treated by each of the following:	
(i) composting;	0
(ii) anaerobic digestion	0
The tonnes of Methane (CO_2 -e) captured from each of the following:	
(i) composting (NOTE: please enter zero if appropriate)	

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CLEAN ENERGY REGULATOR

Facility name (optional)	North Ridge

Before using this calculator we recommend you read 'Solid Waste Disposal on Land User Guide' for important information on:
- the landfill facility activities that must be reported (energy/emissions)
- how to use this calculator

Techniques for calculating opening stock of degradable organic carbon for the first reporting period in accordance with S5.13 of the Determination.
Please review and select the technique used.

1) The annual amount of solid waste disposed of in landfill for all years prior to the first reporting period was evidenced by invoices; or
2) The annual amount of solid waste disposed of in landfill for all years prior to the first reporting period was measured according to state or territory legislation applying to the landfill; or
3) The annual amount of solid waste disposed of in landfill for all years prior to the first reporting period was directly measured using equipment calibrated to a measurement requirement; or
4) The annual amount of solid waste disposed of in landfill for all years prior to the first reporting period was estimated in accordance with industry estimation practices in line with the NGER principles of a) transparency, b) comparability, c) accuracy and d) completeness; or
5) The estimated average annual tonnage of solid waste disposed of in the landfill was estimated from the years for which data was available, and this average was applied to all years prior to first reporting; or
6) The estimated average annual tonnage of solid waste disposed of in the landfill was estimated by dividing the product of the landfills volume and density factor by the number of years the landfill was running prior to the first year of reporting; and this figure was applied to all years prior to first reporting.

Please select the technique used to estimate opening stock of degradable organic carbon:	6	

Please enter the number of sub facility zones are in the landfill:	Subfacility 1	Please leave Subfacility 2 blank	Please leave Subfacility 3 blank	Please leave Sub Facility 4 blank
1				
Enter Sub Facility opening year (financial year ending):	2018			
Enter the year the landfill first reported under NGERs (financial year ending):	2018			
Input state/territory from drop-down list:	NSW			
Input state/territory or climate zone from drop-down list:	Temperate dry			
Select the class of Municipal Solid Waste (MSW) received at the landfill:	MSW Class 2 only			

6 July 2020

Attention: Briohny Seaman
Riverina Far West Region
Environment Protection Agency
PO Box 397
GRIFFITH NSW 2680

riverina.farwest@epa.nsw.gov.au

Dear Mrs Seaman,

RE: ADDITIONAL INFORMATION DA19/0036 (WWCC) WASTE DISPOSAL FACILITY, 225 TRAHAIRS ROAD BOMEN

We are writing in response to EPA's request for additional information for DA19/0036 (Wagga Wagga City Council) in relation to a proposed waste disposal facility (non-putrescible landfill) at 225 Trahairs Road, Bomen.

We provide details on the following page, as requested by EPA on 13 August 2019.

We trust that this information meets EPA's requirements. If you have any questions, please do not hesitate to contact me on 02 6971 9696.

Yours sincerely,

Michial Sutherland
Manager, RWNSW
NGH

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Document Set ID: 5082421
Version: 1, Version Date: 06/07/2020

Existing waste material

EPA requested further detail about the existing residual hardened wool wax that is present within the evaporation ponds and intentions for its removal.

Request	*Response*
Proposed quantities to be removed from the cells	Based on the surface area and estimated depth of material, approximately 96 cubic metres would need to be removed progressively from each sub-cell, or approximately 672 cubic metres total.
Details of how the product will be managed on-site	The residual hardened wool wax is a spadeable material that can be traversed and handled. It has been variously wetted and baked by the local climate for the last twenty years. It is not odorous or volatile when tuner or moved. The residual hardened wool wax residue would be windrowed and then stockpiled within the existing pond area adjacent to cell to be constructed. The stockpile would then be tested to characterise the material. The hardened wool wax residue would then be loaded onto covered a trucks for disposal at an appropriately licensed facility.
If it is intended to be removed from the premises, details of where it is intended to go, including classification of the material, done in accordance with the NSW EPA Waste Classification Guidelines, to demonstrate it is going to a premises that can lawfully accept the waste	DA19/0036 only seeks DA consent for the use of the site as a waste disposal facility. Consent conditions can be levied on the development prior to the commencement of any works on the site, and the proponent is obliged to comply with any and all consent conditions. It is proposed to provide Wagga Wagga City Council and the EPA with a waste classification for the product, in accordance with the NSW EPA Waste Classification Guidelines, prior to the commencement of any works. This would also include nomination of a suitably licensed facility for the disposal of the hardened wool wax. The proponent would additionally provide disposal records to Wagga Wagga City Council and EPA. These conditions would ensure the hardened wool wax is appropriately handled, classified and disposed of, and that the legislated obligations are met by the proponent and legislated procedure is followed.
If composting on-site is proposed, further details need to be provided.	Composting is no longer proposed.

Siting restrictions

EPA requested confirmation to confirm consistency with the NSW EPA Solid Waste Landfill Guidelines siting restrictions.

Inappropriate areas according to Guideline	*Response*
Within 250 metres (or other protection zone) of an area of significant environmental or conservation value identified under relevant legislation or environmental planning instruments, including	The nearest national park to the development site is Berry Jerry National Park, approximately 29 kilometres to the west.

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national parks, historic and heritage areas, conservation areas, wilderness areas, wetlands, littoral rainforests, critical habitats, scenic areas, scientific areas and cultural areas	The nearest environmental protection area under the WWLEP 2010 is located approximately 2km to the south of the development site. The development site is not within 250 metres of conservation areas, wilderness area, wetlands or littoral rainforests, or areas zoned under the WWLEP 2010 for environmental protection purposes. The nearest historic or heritage items are Bomen Railway Station and Bomen Stationmasters Residence, located approximately 2 km southwest of the development site. The Bomen Axe Quarry is located 2.1 km to the south of the site and is an area of cultural, spiritual and historical significance to the Wiradjuri Aboriginal people. No areas of critical habitat are declared in or near the study area (Section G.1). There are no lookouts or promoted scenic vistas located within 3 km of the proposed activity site. (Section 3.2)
Within specially reserved drinking water catchments, such as special areas identified by the Sydney Catchment Authority, Sydney Water and local water supply authorities	The development site land is not located within special areas identified by Water NSW (formerly Sydney Catchment Authority), Sydney water or Riverina Water.
Within 250 metres of a residential zone or dwelling, school or hospital not associated with the facility	No dwellings, schools or hospitals are located within 250 metres of the development site. The nearest residence is located beyond the crest of a range, 1.4 km to the west of the development site. (Refer section 3.1 of EIS)
In or within 40 metres of a permanent or intermittent water body or in an area overlying an aquifer that contains drinking water quality groundwater that is vulnerable to pollution	There are no natural surface water bodies within the development site (Refer Section 6.2.4). There are no creek lines that run through the development site. There are minor drainage lines around 100 m south of the subject land, about 1 km east of the development footprint. Schillers Creek and Dukes Creek are around 2 km west of the development site. (Refer Section 3.3) The aquifer underneath the proposed development site are associated with tightly fractured granite. It is a low quality and low transmissivity aquifer unsuitable as a drinking water supply. The main source of water for Goldenfields Water, Riverina Water, and local stock and domestic supplies rely on the gravel aquifers of the Murrumbidgee River floodplain. This includes the two alluvial aquifers including, the Tertiary Lachlan formation (deep) and the Quaternary Cowra Formation (shallow) (Refer section 4.3). These aquifers are recharged by leakage from the river and contribution from adjoining tributary aquiffers. Historical drilling records identify two aquifers beneath the development site. A shallow aquifer at approximately two metres depth (weathered granite) and a deeper aquifer between four to 13 m (limit of drilling) depth (fractured granite). Both are a product of the Silurian granites below the site. The general

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	characteristics of groundwater associated with these types of aquifers include low rates of supply and generally moderate to brackish salinity. Therefore, in most circumstances it is not suitable for domestic use (Refer section 4.3).
Within a karst region or with substrata that are prone to land slip or subsidence	The development site is not located within a karst region or with substrata which are prone to land slip or subsidence (Refer section 6.9.2).
Within a floodway that may be subject to washout during a major flood event (a 1-in-100-year event)	The development site is not mapped as flood prone land and would not be subject to floodwaters during a 1-in-100-year event (Refer Section 6.2.3). The development site is more than 30m higher in elevation than the flood plain of the River.
Land identified in an environmental planning instrument as being of high Aboriginal cultural significance or high biodiversity significance.	The land is not identified as being of high aboriginal cultural significance in any EPI. The Bomen Axe Quarry, a declared Aboriginal place, is located 2.1 km to the south of the site. A Due Diligence Assessment assessed the site as having a low likelihood of impacting on Aboriginal heritage objects. (Refer Section 6.5) The land is not identified as being of high biodiversity significance or value in any EPI. It is mapped as an area of Terrestrial Biodiversity under the WWLEP 2020.

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22 April 2021

Craig Bretherton
Manager Regional Operations –
Riverina Far West Region
Environment Protection Agency
riverina.farwest@epa.nsw.gov.au

CC: Steven Cook,
Wagga Wagga City Council
cook.steven@wagga.nsw.gov.au

Dear Craig,

RE: PROPOSED NORTHRIDGE WASTE MANAGEMENT FACILITY 225 TRAHAIRS ROAD BOMEN (WWCC DA19/0036)

We refer to the EPA's request for further information in relation to proposal DA 19/0036. NGH has provided response to the requests in Table 1. Table 1 also includes the location of amendments in the Odour Assessment, Air Quality Impact Assessment and Noise and Vibration Impact Assessment where the EPA requests have been addressed.

If you have any questions, please contact me on (02) 6923 1537.

Yours sincerely,

Nicola Smith
Senior Environmental Consultant
NGH

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Table 1 Response to EPA comments.

Requirement		Response
Air Quality Assessment		
Assessment of potential odour impacts accounting for odour emissions from proposed excavation and composting historic effluent ponds has not been included.	*a) Describe the quantity and type of material proposed to be composted.*	The surface area of the proposed waste disposal area (all stages), where the black waxy residue (wool wax) remains, is approximately 6.582 hectares (65,820 m^2). The depth of the surface residue is approximately 0.03 m as a maximum depth. Therefore, the approximate volume of residue to be stockpiled and then disposed off-site would be less than 2,000 m^3. A waste classification was prepared and is provided in Appendix 1. The disposal classification for the residue is *Restricted Solid Waste (non-putrescible)*.
	b) Describe how composting would be undertaken.	It is no longer proposed to compost the residue. It will be disposed off-site at a licenced waste facility.
	c) Assess the potential odour impacts associated with the proposed excavation and stockpiling.	The wool wax material has been exposed in the historic effluent pans since the closure of the facility in 2010. The thin film of wool wax residue has undergone UV exposure and seasonal shrinking and swelling. During the drying summer months, particularly through the millennial drought, the release of volatile organic compounds (VOCs) would have occurred. Sample analysis of the material characterised it as longer chain hydrocarbons that are non-volatile. The residue is thickest at the southern end and approximately 5 cm thick when dried. Residue accumulation is patchy across the pan. The image below is from Google Earth (18/09/2018). It can be observed that there are areas of water pooling (darkest areas), areas of no / very little residue, and areas of more residue (southern end of pan and low area along the central/western side of the pan).

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Source: Google Earth (2020).

NGH has conducted numerous site visits including one recently with officers of EPA Riverina Far West Region (20th October 2020). During this site visit and all others, the odour of the residue within the historic effluent pans was not offensive. The residue has been disturbed for sampling, geotechnical investigations and trafficked by vehicles.

Disturbance associated with windrowing or stockpiling of the material as cell construction begins is unlikely to yield further odour. Any odour would be minimal and temporary. Less than 2000 m^3 of material would be stockpiled on-site. The specific odour emission rate is expected to be 1.5 – 2.6 $ou.m^3/m^2/s$ using the odour valuable of general waste and putrescible waste only, respectively. These figures are from the Mugga Stage 5 Air Quality Impact Assessment (AECOM 2012) and Hanson Landfill and Quarry Risk Assessment (Golder Associates 2012).

As per guidance from the EPA (22nd December 2020), no further odour assessment is required if the duration of the wool wax residue stockpiling is defined and not long term. The duration of stockpiling of the material before disposal at an approved landfill would be approximately 2 years.

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Requirement		Response
There are deficiencies with the assessment of potential particulate matter impacts during operation.	*a) Include explicit assessment of predicted impacts at commercial/industrial receptors.*	Industrial receptors were not included in the original assessment given they are not included in the NSW EPA's *Approved Methods for Modelling and Assessment Guidelines 2016*. Guidelines apply for residences, schools and hospitals. As requested, a revised map has been included in Appendix 2 and the results for nearby involved and not-involved industrial receivers described below. Amendment to R02 (is now I02 – the administration building of the facility located at I02 along Byrnes Road). ROBE (I01) is adjacent to the development site. The involved industrial receiver (IR01) is located approximately 800 m south of the development site. I02 is located approximately 1.4 km south of the development site. I02 administration building has been assessed as R02. As indicated in the Northridge waste disposal facility operational odour assessment (Jacobs 2018): Early Operation (1 active cell and leachate pond) - 2 odour units (OU) could be experienced at I01. The 2 OU would affect the area of the ROBE evaporation pan and would be generated from the operation of cell 1. 2 OU would also be experienced at I01 in the north-eastern tip of the lot, away from the factory. The remainder of I01 is covered by 1 OU. Medium-term Operations (2 covered cells and 1 active cell, and leachate pond) – 2 OU would extend further across I01 to the west. The 2 OU boundary would extend roughly halfway across I01. 1 OU would extend across the remainder of I01. Final Operations (filled and covered cells, and 1 remaining active cell and leachate pond) – 2 OU would extend across the northern section of I01 to the western boundary. The 2 OU boundary would remain about halfway across I01 in the central and southern portions of the site. Closure (all cells filled and covered, leachate pond) – The 2 OU boundary would affect the eastern boundary only of I01. No adverse odour impacts are likely at IR01 or I02. It is noted the Odour Impact Assessment Study for ROBE (HLA-EnviroSciences Pty Ltd 2008) indicates 6 OU covering all of I01 and includes the proposal to the east and land

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Requirement		Response
		further to the west. Therefore, making the potential 2 OU and 1 OU generated by the operation of the proposal, redundant. The AQIA report did not include industrial receivers. Jacobs have updated the assessment with modelled concentrations predicted at the nearest industrial receivers as identified in Section 4.1 presented in Section 6 of the AQIA (Appendix D).
	b) *Account for emissions that are based on the proposed capacity in which approval is sort.*	Jacobs have revised the intensities for material handling during operation of cell 1 in Appendix A of the AQIA (Appendix D) and accounted for this increase in the assessment of emissions. NGH advised Jacobs that an estimate of around 24% of waste received would comprise of dispersible materials. The remaining materials are not expected to generate any material emissions to air. Emissions from the unloading, sorting, transport, and emplacement of waste materials were included in the operational inventory (Table 5-2 and Appendix A, with the intensity of handling activities set to 24% of the annual waste volume, but transportation set to 100% noting that the transport of all waste products to the emplacement cell would generate wheel-driven emissions). The results in Section 6 were updated to account for these changes. The predicted results during construction indicate no exceedances at any residential or industrial receivers for the annually averaged TSP against the EPA's 90 µg/m^3 criterion, the annually averages PM_{10} against the 25 µg/m^3 criterion or the 24-hour averaged $PM_{2.5}$ against the 25 µg/m^3 criterion and the $PM_{2.5}$ annually averaged against the 8 µg/m^3 criterion. However, there was exceedance of the PM_{10} 24 hour averaged criterion at I01 (62 µg/m^3), R06 and R11 (both 51 µg/m^3). It is noted that the elevated levels at R06 and R11 are primarily a result of elevated background levels (48 µg/m^3). Modelling for operation indicated potential for one day where cumulative concentrations would exceed the criterion. The exceedance was at I01 for the PM_{10} 24-hour averaged result of 59 µg/m^3 (unmitigated), which exceeds the EPA's 50 µg/m^3 criterion. This result occurred on a day when background concentrations were already 48 µg/m^3. To manage the risk of potential short-term PM_{10} impacts during elevated background conditions, identification of unfavourable weather and elevated background conditions

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Requirement		Response
		would allow site activities to be scaled accordingly. Additional mitigation measures to reduce PM_{10} impacts include: • Measures to reduce emissions generated from the site including the use of water carts and site speed limits. • Reducing the extent of exposed areas to the extent practical. • Locating dust generating activities away from receivers where possible. The results in full are available in the AQIA (Appendix D).
	c) Account for potential emissions associated with proposed composting activities, including any screening or material handling.	No composting of any material, including the wool wax residue, would occur on-site. The excavation and handling of the material is included in the volume of material to be excavated and handled during cell construction (Appendix A). It is expected that minimal particulates would be attributed to the disturbance of the thin veneer of the wool wax. It is a greasy bonded material when wet, and when dry also remains bonded. Soil disturbance would be minimal when removing and stockpiling the residue material.
Construction and Operational Noise and Vibration Assessment (Clean version and tracked changes included in Appendix 3)		
1. Section 2.3 should be clarified, noting that the project is to operate during daytime hours only.		Reference to hours of operation updated with cross-reference to ICNG removed.

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Requirement	Response
2. ***Clarification whether wind roses in Table 5-1 show data for the daytime period only, or for all time periods (day/evening/night) combined.***	Updated Table 5.1 confirming that noise-enhancing wind conditions are not a feature for daytime hours when the facility would be in-use.
3. ***Table 6-1, receivers R11 and R13 represented by the noise measured at R06.***	Criteria in Section 6.1 and 6.2 updated as requested, with results assessed against updated criteria in Section 7.1.4 and 7.2.4, noting there were no changes to the outcomes as were previously assessed.
4. ***Section 7.2.1, relating to operational equipment, contains discussions of annoyance penalties under the ICNG which is not relevant. This section should be revised.***	As outlined in Section 4.5 of the ICNG, penalties are considered relevant for construction plant/equipment which exhibit particular noise effects (including vibratory rolling). Section 7.2.1 has been updated to refer to this rather than guidance from the NPI.
5. ***Table 7.4 identified incorrect noise criteria for***	Typo, updated in Table 7.4 consistent with the criteria listed in Section 6.3. No change to the outcomes of the assessment, noting that the results were previously discussed in relation to the criteria listed in Section 6.3.

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Requirement		Response
	industrial receivers I01 and I02, this should be corrected.	
6.	***Section 6.3 and 7.3, discussing road traffic noise criteria, should also refer to the applicable assessment criteria in Table 3 of the NSW Road Noise Policy as well as the 2 dB increase criterion.***	Fixed criteria listed in Section 6.3 and discussed in relation to results in Section 7.3.

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Appendix 1 Waste Classification

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WASTE CLASSIFICATION

Northridge Waste Facility

April 2021

Project Number: 16-276

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DOCUMENT VERIFICATION

Project Title:	Northridge Waste Facility
Project Number:	16-276
Project File Name:	16-276 Northridge Waste Classification V1.0

Revision	Date	Prepared by	Reviewed by	Approved by
Final Rev 1	31/03/2021	L.Gunawardana	S. McGrath	S. McGrath
Draft V1.0	1/03/2021	S. Dale	S. McGrath	S. McGrath

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1. INTRODUCTION

NGH have been engaged by Riverina Warehousing Solutions Pty Ltd (the Client) to undertake a Waste Classification of in-situ material in a disused effluent pond of a wool combing facility for the purpose of disposal. The material is detailed in section 4 of this report.

1.1. Legislation

Waste classification works have been undertaken in general accordance with;

- NSW Environmental Protection Authority (EPA) *Waste Classification Guidelines Part 1: Classifying Waste* (2014)
- NSW EPA *Contaminated Sites Sampling Design Guidelines* (1995)
- NSW EPA *Resource Recovery Order – the Excavated Natural Material Order* (the Order)

2. FIELD METHODOLOGY

A suitably qualified environmental consultant was engaged to:

- Undertake a brief history review of the site and surrounds including reviewing the NSW EPA Contaminated Land Database, freely available aerial photographs and previous environmental reports.
- Walkover the site and record visual observations of the site and material.
- Measure the approximate area and calculate volumes of the material.
- Collect samples from surface to maximum depth of material (0.03m below the ground surface) and record observations of the in-situ material.
- Transfer samples into laboratory prepared glass jars with Teflon lids using disposable nitrile gloves. Jars were capped immediately with care to minimise headspace within jar. All sample jars were labelled with unique identification, including project number, sample ID and depth (if applicable).
- Place samples into a cooled, insulated, and sealed container for transport to a National Association Testing Authority (NATA) accredited laboratory for analysis.
- Prepare laboratory chain of custody sheets and dispatching samples to the laboratory for analysis.
- Complete a Quality Assurance and Quality Control (QA/QC) Program, inclusive of duplicate samples at a rate of 5%.
- Prepare a waste classification report of the material inspected.

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3. SITE DETAILS

Details of the site are included in Table 3-1.

Table 3-1 Site Details

Item	Detail
Site Name	Proposed Northridge Waste Facility
Site Address	Trahairs Road, Bomen NSW 2650
Lot and DP	Lot 2 DP1249028
Figure	Refer to Figure 3-1 for the site layout and extent of the classification.

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Figure 3-1 Sample Locations and Classification Extent

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3.1. Site Description

The site is an historic evaporation pond used for liquid effluent between 1980 to 2010. The liquid effluent was a by-product of wool scouring and contains the contaminants removed from the wool and the treatments used in scouring. The evaporation pond is one of three located within land currently used as primary production such as cropping as grazing. The evaporation pond has not been used since 2010.

During the site visit on the 26 February 2021, NGH observed small low-lying areas containing pooled rainwater. The remaining area of the pond was significantly dried out with the wool residue coating most of the pond (Image 1).

The dried wool residue has mixed with the sandy clay of the pond bed (Image 2). An organic odour within the dry areas of the pond was minimum to un-noticeable, however the organic odour was noticeable nearby the surface water.

Refer to Image 1 and Image 2 for the site photographs.

Image 1 Evaporation pond, coated in dried wool residue material.

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Image 2 Wool residue material.

3.2. Surrounding Land Use

North: Solar farm, agricultural land

South: Industrial facility (My Chef Cuisine), solar farm and agricultural land

East: Two other evaporation ponds (same historical use), solar farm, agricultural land

West: Riverina Oils and Bio Energy, Byrnes Road, and agricultural land

3.3. Site History

3.3.1. Preliminary Site Investigation, NGH 2019

A Preliminary Site Investigation (PSI) was completed by NGH in January 2019 for the site. The site was established in 1980/1981 as Riverina Wool Combing Pty Ltd, with a production capacity of 6,000 tonnes of wool. In 2010 the company closed and moved offshore. The PSI identified a black waxy residue as potential contamination. The residue remained on the pond surface and in the clay liner of the pond base. Material is also present within windrows adjacent to the eastern side of the pond. Contaminants of potential concern associated with the wool combining residue identified within the PSI are Total Recoverable Hydrocarbons (TRH) and heavy metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel, and zinc).

Refer to the PSI (NGH 2019) attached in Appendix C for further details.

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3.3.2. Database searches

The NSW EPA Contaminated Land Record and List of Notified Sites for the suburb of Bomen was completed on the 01 March 2021, the search revealed no areas of concern within 500m of the site. The nearest listed site is outlined below:

- Enirgi Power Storage Recycling located at 509 Byrnes Road, Bomen is located 1km south of the proposal site and is currently under assessment.

4. MATERIAL AND SAMPLING DETAILS

Details of the insitu material and sampling details are included in Table 4-1.

Table 4-1 Material and Sampling Details.

Material and Sampling Details	
Sampler and Date:	Lakna Gunawardana: Environmental Consultant, inspected and sampled the material on 26/02/2021
Material Location:	Evaporation pond, refer to Figure 3-1 for the classification extent.
Material Description:	Wool combing residue: black, waxy, hard to stiff, high plasticity, coarse grained. Mixed with a sandy clay, red brown fine grained medium plasticity from the soils within the evaporation pond.
History of Material:	Wool combing residue
Suspected Asbestos:	No
Approximate Volume:	65,820m^2 x 0.03m in depth = 1,974.60m^3
Method of Collection:	Nitrile gloves
Number of Samples:	8 primary samples, 1 duplicate sample

5. NSW EPA 6-STEP CLASSIFICATION PROCESS

Step 1: Is the waste Special Waste?

The material is not considered to be special waste.

Step 2: Is the waste liquid waste?

The material is not considered to be liquid waste.

Step 3: Is the waste pre-classified?

The material is not considered to be pre-classified waste.

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Step 4: Does the waste possess hazardous characteristics?

The material is not considered to possess hazardous characteristics.

Step 5: Waste classification using chemical assessment.

Refer the following section for the chemical assessment of the material.

Step 6: Is the waste putrescible or non-putrescible?

The material is considered to be non-putrescible.

6. CHEMICAL ANALYSIS

In accordance with contaminants of potential concern outlined in the PSI (NGH 2019), the samples were analysed for:

- Heavy metals (suite of 8) plus Molybdenum*
- Total Recoverable Hydrocarbons (TRH)
- Benzene, Toluene, Ethylbenzene, and total Xylenes compounds (BTEX)
- Polycyclic Aromatic Hydrocarbons (PAH)
- Polychlorinated Biphenyls (PCB)
- Organochloride Pesticides and Organophosphate Pesticides (OCP/OPP)

*Molybdenum has been included in the suite of analysis based on the Summarised Liquid Effluent Data attached in Appendix F of the PSI (NGH 2019).

NGH consulted with the NSW EPA on the 24 February 2021 via email to confirm the suite of analysis for classification purposes. The EPA responded via phone call on the 04 March 2021 to confirm the suite of analysis is acceptable. Refer to Appendix D for written correspondence.

NGH consulted with the NSW EPA on the 18 March 2021 and again on 31 March 2021 via email to confirm the use of silica-gel clean-up on the samples for further classification purposes pursuant to footnote 7 of Table 1 in the *Waste Classification Guidelines Part 1: Classifying Waste* (2014). The EPA responded via phone call on the 31 March 2021 to confirm the process of silica gel clean-up on the samples is acceptable. Refer to Appendix D for written correspondence.

Laboratory results initially exceeded the CT1 and CT2 criteria for TRH. Subsequently, all samples were reanalysed for TRH using the silica gel clean-up methodology to remove non-petroleum hydrocarbon compounds as described in USEPA Method 1664A (USEPA 2000).

Results of laboratory analysis are summarised in Appendix A. A copy of the laboratory certificate of analysis is included in Appendix B.

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7. SUMMARY OF RESULTS

7.1. Primary Sample Results

In accordance with the NSW EPA *Waste Classification Guidelines*, the results are discussed in Table 7-1 below.

Table 7-1 Summary of Results.

Summary of Results	
Summary of material	• Sample WC02 exceeded the CT1 criteria for mercury (5 mg/kg). Detections of mercury were also observed in WC05 and WC06. • Prior to silica gel clean-up, all samples WC01-WC08 exceeded the CT2 criteria for TRH (C10-36), ranging from 94,000-143,740 mg/kg. • Subsequent silica gel clean-up results for TRH (C10-C36) on samples WC01 and WC03-WC08 exceeded the CT1 criteria for General Solid Waste (10,000 mg/kg) ranging from 16,700-33,000 mg/kg. However, are no longer classified as hazardous waste. WC02 had a result of 5430 mg/kg. Statistical analysis was not performed due to the limited size of the statistical population. • All other results were below the laboratory limit of reporting.
Chemical Assessment	Restricted Solid Waste

7.2. QA/QC Results

One intra-laboratory sample (DUP01) was undertaken for the purpose of this classification, taken at a rate of 5% per primary samples collected. The calculated Relative Percentage Difference (RPD) values in the duplicate samples were compared against the acceptable range of 30% for inorganic analytes and 40% for organic analytes to WC05 (primary sample):

- DUP01 RPD results were within an acceptable range or within 5 x the LOR.

One trip blank (TS) and one trip spike (TS) were taken at a rate of one per day for the purpose of this classification due to analysis of volatile hydrocarbons. Results of the trip blank and trip spike indicated no volatile loss during transportation.

Based on the information referenced above, it was concluded that data generated during the report is of an acceptable quality for the purpose of this report.

8. DISPOSAL CLASSIFICATION

Based on the sampling and analysis of the insitu material undertaken in accordance with the process outlined within the NSW EPA Waste Classification Guidelines, the material is classified as:

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Disposal Classification
Restricted Solid Waste (non-putrescible)

9. RECOMMENDATIONS

It is recommended that the waste be disposed as Restricted Solid Waste (non-putrescible). Alternatively, on-site remediation, such as land farming in accordance with the NSW EPA *Best Practice Note: Landfarming* (2014), may be investigated to reduce the concentration of TRH to General Solid Waste. This would also require the preparation of a Remediation Action Plan in accordance with the NSW EPA *Consultants reporting on contaminated land: Contaminated Land Guidelines* (2020).

10. LIMITATIONS

The following limitations apply to the project:

- The waste classification was undertaken on the material described above and documented in Figure 3-1 location only. This waste classification cannot be used for any other material.
- The waste classification is based upon the works undertaken on the date specified in this report. Site conditions may change over time, and NGH make no warranty on the material after this date.
- Unless otherwise stated, NGH was not present during excavation, stockpiling, load-out or disposal of this material. As such, NGH make no assurances that the material to be disposed is that material which NGH has classified within this report.

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APPENDIX A CHEMICAL ANALYSIS SUMMARY TABLE

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Analyte		Heavy Metals							PAHs		BTEX				TRH		sTPH -Silica	PCB	OCP
		Total (mg/kg)							Total (mg/kg)		Total (mg/kg)				Total (mg/kg)		Total (mg/kg)	(mg/kg)	(mg/kg)
		Arsenic	Cadmium	Chromium (VI)	Lead	Mercury	Nickel	Molybdenum	Benzo(a)Pyrene	Total PAH	Benzene	Toluene	Ethylbenzene	Xylene	C6-C9	C10-C36*	C10-C36	Total PCB	Total OCP (scheduled chemicals)
General Solid Waste (CT1)		100	20	100	100	4	40	100	0.8	200	10	288	600	1000	650	10000	10000	<50	<50
Restricted Solid Waste (CT2)		400	80	400	400	16	160	400	3.2	800	40	1152	2400	4000	2600	40000	40000	<50	<50
Hazardous Waste		>400	>80	>400	>400	>16	>160	>400	>3.2	>800	>40	>1152	>2400	>4000	>2600	>40000	>40000	>50	>50
Sample ID:	Depth (m):																		
WC01	0.03	<4	<0.4	<1	<1	<1	<0.1	<1	<0.5	<0.5	<0.2	<0.5	<1	<2	<25	143740	16700	<LOR	<LOR
WC02	0.03	<4	<0.4	7	8	5	<0.1	<1	<0.5	<0.5	<0.2	<0.5	<1	<2	<25	107890	5430	<LOR	<LOR
WC03	0.03	<4	<0.4	<1	<1	<1	<0.1	<1	<0.5	<0.5	<0.2	<0.5	<1	<2	<25	115940	25000	<LOR	<LOR
WC04	0.03	<4	<0.4	<1	<1	<1	<0.1	<1	<0.5	<0.5	<0.2	<0.5	<1	<2	<25	94000	25000	<LOR	<LOR
WC05	0.03	<4	<0.4	3	3	2	<0.1	<1	<0.5	<0.5	<0.2	<0.5	<1	<2	<25	101970	28000	<LOR	<LOR
WC06	0.03	<4	<0.4	6	6	3	<0.1	<1	<0.5	<0.5	<0.2	<0.5	<1	<2	<25	95000	33000	<LOR	<LOR
WC07	0.03	<4	<0.4	<1	<1	<1	<0.1	<1	<0.5	<0.5	<0.2	<0.5	<1	<2	<25	99700	16200	<LOR	<LOR
WC08	0.03	<4	<0.4	<1	<1	<1	<0.1	<1	<0.5	<0.5	<0.2	<0.5	<1	<2	<25	114800	27000	<LOR	<LOR
DUP01	-	<4	<0.4	<1	<1	<1	<0.1	-	-	-	-	-	-	-	-	-	-	-	-

XX	White denotes General Solid Waste
XX	Grey / bold denotes Restricted Solid Waste
XX	Red / bold denotes Hazardous Waste

Notes:	
LOR	Limit of reporting
CT	Contaminant Threshold

*TRH C10-C36 results are superseded by sTPH - Silica C10-C36 results

APPENDIX B LABORATORY CERTIFICATES

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CERTIFICATE OF ANALYSIS 263287

Client Details

Client	NGH Environmental
Attention	Nicola Smith
Address	Suite 1, 39 Fitzmaurice street, Wagga Wagga, NSW, 2650

Sample Details

Your Reference	**Northridge Waste Facility / 16-276 / Bomen**
Number of Samples	11 Soil
Date samples received	03/03/2021
Date completed instructions received	03/03/2021

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Please refer to the last page of this report for any comments relating to the results.

Report Details

Date results requested by	10/03/2021
Date of Issue	10/03/2021

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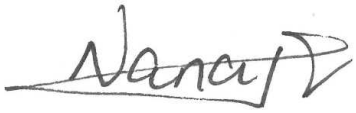
Results Approved By
Diego Bigolin, Team Leader, Inorganics
Dragana Tomas, Senior Chemist
Ken Nguyen, Reporting Supervisor
Steven Luong, Organics Supervisor

Authorised By



Nancy Zhang, Laboratory Manager

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vTRH(C6-C10)/BTEXN in Soil						
Our Reference		263287-1	263287-2	263287-3	263287-4	263287-5
Your Reference	UNITS	WC01	WC02	WC03	WC04	WC05
Depth		0.03	0.03	0.03	0.03	0.03
Date Sampled		26/02/2021	26/02/2021	26/02/2021	26/02/2021	26/02/2021
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	04/03/2021	04/03/2021	04/03/2021	04/03/2021	04/03/2021
Date analysed	-	05/03/2021	05/03/2021	05/03/2021	05/03/2021	05/03/2021
TRH C_6 - C_9	mg/kg	<25	<25	<25	<25	<25
TRH C_6 - C_{10}	mg/kg	<25	<25	<25	<25	<25
vTPH C_6 - C_{10} less BTEX (F1)	mg/kg	<25	<25	<25	<25	<25
Benzene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1	<1	<1	<1
m+p-xylene	mg/kg	<2	<2	<2	<2	<2
o-Xylene	mg/kg	<1	<1	<1	<1	<1
naphthalene	mg/kg	<1	<1	<1	<1	<1
Total +ve Xylenes	mg/kg	<3	<3	<3	<3	<3
Surrogate aaa-Trifluorotoluene	%	73	69	108	64	106

vTRH(C6-C10)/BTEXN in Soil						
Our Reference		263287-6	263287-7	263287-8	263287-10	263287-11
Your Reference	UNITS	WC06	WC07	WC08	TS	TB
Depth		0.03	0.03	0.03	-	-
Date Sampled		26/02/2021	26/02/2021	26/02/2021	26/02/2021	26/02/2021
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	04/03/2021	04/03/2021	04/03/2021	04/03/2021	04/03/2021
Date analysed	-	05/03/2021	05/03/2021	05/03/2021	05/03/2021	05/03/2021
TRH C_6 - C_9	mg/kg	<25	<25	<25	[NA]	[NA]
TRH C_6 - C_{10}	mg/kg	<25	<25	<25	[NA]	[NA]
vTPH C_6 - C_{10} less BTEX (F1)	mg/kg	<25	<25	<25	[NA]	[NA]
Benzene	mg/kg	<0.2	<0.2	<0.2	123%	<0.2
Toluene	mg/kg	<0.5	<0.5	<0.5	121%	<0.5
Ethylbenzene	mg/kg	<1	<1	<1	123%	<1
m+p-xylene	mg/kg	<2	<2	<2	127%	<2
o-Xylene	mg/kg	<1	<1	<1	123%	<1
naphthalene	mg/kg	<1	<1	<1	[NA]	<1
Total +ve Xylenes	mg/kg	<3	<3	<3	[NA]	<3
Surrogate aaa-Trifluorotoluene	%	96	89	91	127	106

svTRH (C10-C40) in Soil						
Our Reference		263287-1	263287-2	263287-3	263287-4	263287-5
Your Reference	UNITS	WC01	WC02	WC03	WC04	WC05
Depth		0.03	0.03	0.03	0.03	0.03
Date Sampled		26/02/2021	26/02/2021	26/02/2021	26/02/2021	26/02/2021
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	04/03/2021	04/03/2021	04/03/2021	04/03/2021	04/03/2021
Date analysed	-	05/03/2021	05/03/2021	05/03/2021	05/03/2021	05/03/2021
TRH C_{10} - C_{14}	mg/kg	740	890	940	<500	970
TRH C_{15} - C_{28}	mg/kg	33,000	29,000	31,000	22,000	27,000
TRH C_{29} - C_{36}	mg/kg	110,000	78,000	84,000	72,000	74,000
TRH >C_{10} -C_{16}	mg/kg	1,100	1,300	1,300	<500	1,300
TRH >C_{10} - C_{16} less Naphthalene (F2)	mg/kg	1,100	1,300	1,300	<500	1,300
TRH >C_{16} -C_{34}	mg/kg	110,000	79,000	85,000	72,000	76,000
TRH >C_{34} -C_{40}	mg/kg	43,000	41,000	46,000	37,000	38,000
Total +ve TRH (>C10-C40)	mg/kg	150,000	120,000	130,000	110,000	120,000
Surrogate o-Terphenyl	%	#	#	#	113	125

svTRH (C10-C40) in Soil				
Our Reference		263287-6	263287-7	263287-8
Your Reference	UNITS	WC06	WC07	WC08
Depth		0.03	0.03	0.03
Date Sampled		26/02/2021	26/02/2021	26/02/2021
Type of sample		Soil	Soil	Soil
Date extracted	-	04/03/2021	04/03/2021	04/03/2021
Date analysed	-	05/03/2021	05/03/2021	05/03/2021
TRH C_{10} - C_{14}	mg/kg	<500	700	800
TRH C_{15} - C_{28}	mg/kg	22,000	25,000	26,000
TRH C_{29} - C_{36}	mg/kg	73,000	74,000	88,000
TRH >C_{10} -C_{16}	mg/kg	<500	960	1,100
TRH >C_{10} - C_{16} less Naphthalene (F2)	mg/kg	<500	960	1,100
TRH >C_{16} -C_{34}	mg/kg	76,000	74,000	90,000
TRH >C_{34} -C_{40}	mg/kg	29,000	37,000	38,000
Total +ve TRH (>C10-C40)	mg/kg	100,000	110,000	130,000
Surrogate o-Terphenyl	%	108	136	130

PAHs in Soil						
Our Reference		263287-1	263287-2	263287-3	263287-4	263287-5
Your Reference	UNITS	WC01	WC02	WC03	WC04	WC05
Depth		0.03	0.03	0.03	0.03	0.03
Date Sampled		26/02/2021	26/02/2021	26/02/2021	26/02/2021	26/02/2021
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	04/03/2021	04/03/2021	04/03/2021	04/03/2021	04/03/2021
Date analysed	-	10/03/2021	10/03/2021	10/03/2021	10/03/2021	10/03/2021
Naphthalene	mg/kg	<1	<1	<1	<1	<1
Acenaphthylene	mg/kg	<1	<1	<1	<1	<1
Acenaphthene	mg/kg	<1	<1	<1	<1	<1
Fluorene	mg/kg	<1	<1	<1	<1	<1
Phenanthrene	mg/kg	<1	<1	<1	<1	<1
Anthracene	mg/kg	<1	<1	<1	<1	<1
Fluoranthene	mg/kg	<1	<1	<1	<1	<1
Pyrene	mg/kg	<1	<1	<1	<1	<1
Benzo(a)anthracene	mg/kg	<1	<1	<1	<1	<1
Chrysene	mg/kg	<1	<1	<1	<1	<1
Benzo(b,j+k)fluoranthene	mg/kg	<2	<2	<2	<2	<2
Benzo(a)pyrene	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Indeno(1,2,3-c,d)pyrene	mg/kg	<1	<1	<1	<1	<1
Dibenzo(a,h)anthracene	mg/kg	<1	<1	<1	<1	<1
Benzo(g,h,i)perylene	mg/kg	<1	<1	<1	<1	<1
Total +ve PAH's	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<5	<5	<5	<5	<5
Benzo(a)pyrene TEQ calc(half)	mg/kg	<5	<5	<5	<5	<5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<5	<5	<5	<5	<5
Surrogate p-Terphenyl-d14	%	80	82	83	86	82

PAHs in Soil				
Our Reference		263287-6	263287-7	263287-8
Your Reference	UNITS	WC06	WC07	WC08
Depth		0.03	0.03	0.03
Date Sampled		26/02/2021	26/02/2021	26/02/2021
Type of sample		Soil	Soil	Soil
Date extracted	-	04/03/2021	04/03/2021	04/03/2021
Date analysed	-	10/03/2021	10/03/2021	10/03/2021
Naphthalene	mg/kg	<1	<1	<1
Acenaphthylene	mg/kg	<1	<1	<1
Acenaphthene	mg/kg	<1	<1	<1
Fluorene	mg/kg	<1	<1	<1
Phenanthrene	mg/kg	<1	<1	<1
Anthracene	mg/kg	<1	<1	<1
Fluoranthene	mg/kg	<1	<1	<1
Pyrene	mg/kg	<1	<1	<1
Benzo(a)anthracene	mg/kg	<1	<1	<1
Chrysene	mg/kg	<1	<1	<1
Benzo(b,j+k)fluoranthene	mg/kg	<2	<2	<2
Benzo(a)pyrene	mg/kg	<0.5	<0.5	<0.5
Indeno(1,2,3-c,d)pyrene	mg/kg	<1	<1	<1
Dibenzo(a,h)anthracene	mg/kg	<1	<1	<1
Benzo(g,h,i)perylene	mg/kg	<1	<1	<1
Total +ve PAH's	mg/kg	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<5	<5	<5
Benzo(a)pyrene TEQ calc(half)	mg/kg	<5	<5	<5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<5	<5	<5
Surrogate p-Terphenyl-d14	%	80	98	82

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Organochlorine Pesticides in soil						
Our Reference		263287-1	263287-2	263287-3	263287-4	263287-5
Your Reference	UNITS	WC01	WC02	WC03	WC04	WC05
Depth		0.03	0.03	0.03	0.03	0.03
Date Sampled		26/02/2021	26/02/2021	26/02/2021	26/02/2021	26/02/2021
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	04/03/2021	04/03/2021	04/03/2021	04/03/2021	04/03/2021
Date analysed	-	10/03/2021	10/03/2021	10/03/2021	10/03/2021	10/03/2021
alpha-BHC	mg/kg	<1	<1	<1	<1	<1
HCB	mg/kg	<1	<1	<1	<1	<1
beta-BHC	mg/kg	<1	<1	<1	<1	<1
gamma-BHC	mg/kg	<1	<1	<1	<1	<1
Heptachlor	mg/kg	<1	<1	<1	<1	<1
delta-BHC	mg/kg	<1	<1	<1	<1	<1
Aldrin	mg/kg	<1	<1	<1	<1	<1
Heptachlor Epoxide	mg/kg	<1	<1	<1	<1	<1
gamma-Chlordane	mg/kg	<1	<1	<1	<1	<1
alpha-chlordane	mg/kg	<1	<1	<1	<1	<1
Endosulfan I	mg/kg	<1	<1	<1	<1	<1
pp-DDE	mg/kg	<1	<1	<1	<1	<1
Dieldrin	mg/kg	<1	<1	<1	<1	<1
Endrin	mg/kg	<1	<1	<1	<1	<1
Endosulfan II	mg/kg	<1	<1	<1	<1	<1
pp-DDD	mg/kg	<1	<1	<1	<1	<1
Endrin Aldehyde	mg/kg	<1	<1	<1	<1	<1
pp-DDT	mg/kg	<1	<1	<1	<1	<1
Endosulfan Sulphate	mg/kg	<1	<1	<1	<1	<1
Methoxychlor	mg/kg	<1	<1	<1	<1	<1
Total +ve DDT+DDD+DDE	mg/kg	<1	<1	<1	<1	<1
Surrogate TCMX	%	76	75	77	77	78

Organochlorine Pesticides in soil				
Our Reference		263287-6	263287-7	263287-8
Your Reference	UNITS	WC06	WC07	WC08
Depth		0.03	0.03	0.03
Date Sampled		26/02/2021	26/02/2021	26/02/2021
Type of sample		Soil	Soil	Soil
Date extracted	-	04/03/2021	04/03/2021	04/03/2021
Date analysed	-	10/03/2021	10/03/2021	10/03/2021
alpha-BHC	mg/kg	<1	<1	<1
HCB	mg/kg	<1	<1	<1
beta-BHC	mg/kg	<1	<1	<1
gamma-BHC	mg/kg	<1	<1	<1
Heptachlor	mg/kg	<1	<1	<1
delta-BHC	mg/kg	<1	<1	<1
Aldrin	mg/kg	<1	<1	<1
Heptachlor Epoxide	mg/kg	<1	<1	<1
gamma-Chlordane	mg/kg	<1	<1	<1
alpha-chlordane	mg/kg	<1	<1	<1
Endosulfan I	mg/kg	<1	<1	<1
pp-DDE	mg/kg	<1	<1	<1
Dieldrin	mg/kg	<1	<1	<1
Endrin	mg/kg	<1	<1	<1
Endosulfan II	mg/kg	<1	<1	<1
pp-DDD	mg/kg	<1	<1	<1
Endrin Aldehyde	mg/kg	<1	<1	<1
pp-DDT	mg/kg	<1	<1	<1
Endosulfan Sulphate	mg/kg	<1	<1	<1
Methoxychlor	mg/kg	<1	<1	<1
Total +ve DDT+DDD+DDE	mg/kg	<1	<1	<1
Surrogate TCMX	%	70	81	76

Organophosphorus Pesticides in Soil						
Our Reference		263287-1	263287-2	263287-3	263287-4	263287-5
Your Reference	UNITS	WC01	WC02	WC03	WC04	WC05
Depth		0.03	0.03	0.03	0.03	0.03
Date Sampled		26/02/2021	26/02/2021	26/02/2021	26/02/2021	26/02/2021
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	04/03/2021	04/03/2021	04/03/2021	04/03/2021	04/03/2021
Date analysed	-	10/03/2021	10/03/2021	10/03/2021	10/03/2021	10/03/2021
Dichlorvos	mg/kg	<1	<1	<1	<1	<1
Dimethoate	mg/kg	<1	<1	<1	<1	<1
Diazinon	mg/kg	<1	<1	<1	<1	<1
Chlorpyriphos-methyl	mg/kg	<1	<1	<1	<1	<1
Ronnel	mg/kg	<1	<1	<1	<1	<1
Fenitrothion	mg/kg	<1	<1	<1	<1	<1
Malathion	mg/kg	<1	<1	<1	<1	<1
Chlorpyriphos	mg/kg	<1	<1	<1	<1	<1
Parathion	mg/kg	<1	<1	<1	<1	<1
Bromophos-ethyl	mg/kg	<1	<1	<1	<1	<1
Ethion	mg/kg	<1	<1	<1	<1	<1
Azinphos-methyl (Guthion)	mg/kg	<1	<1	<1	<1	<1
Surrogate TCMX	%	76	75	77	77	78

Organophosphorus Pesticides in Soil				
Our Reference		263287-6	263287-7	263287-8
Your Reference	UNITS	WC06	WC07	WC08
Depth		0.03	0.03	0.03
Date Sampled		26/02/2021	26/02/2021	26/02/2021
Type of sample		Soil	Soil	Soil
Date extracted	-	04/03/2021	04/03/2021	04/03/2021
Date analysed	-	10/03/2021	10/03/2021	10/03/2021
Dichlorvos	mg/kg	<1	<1	<1
Dimethoate	mg/kg	<1	<1	<1
Diazinon	mg/kg	<1	<1	<1
Chlorpyriphos-methyl	mg/kg	<1	<1	<1
Ronnel	mg/kg	<1	<1	<1
Fenitrothion	mg/kg	<1	<1	<1
Malathion	mg/kg	<1	<1	<1
Chlorpyriphos	mg/kg	<1	<1	<1
Parathion	mg/kg	<1	<1	<1
Bromophos-ethyl	mg/kg	<1	<1	<1
Ethion	mg/kg	<1	<1	<1
Azinphos-methyl (Guthion)	mg/kg	<1	<1	<1
Surrogate TCMX	%	70	81	76

PCBs in Soil						
Our Reference		263287-1	263287-2	263287-3	263287-4	263287-5
Your Reference	UNITS	WC01	WC02	WC03	WC04	WC05
Depth		0.03	0.03	0.03	0.03	0.03
Date Sampled		26/02/2021	26/02/2021	26/02/2021	26/02/2021	26/02/2021
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	04/03/2021	04/03/2021	04/03/2021	04/03/2021	04/03/2021
Date analysed	-	10/03/2021	10/03/2021	10/03/2021	10/03/2021	10/03/2021
Aroclor 1016	mg/kg	<1	<1	<1	<1	<1
Aroclor 1221	mg/kg	<1	<1	<1	<1	<1
Aroclor 1232	mg/kg	<1	<1	<1	<1	<1
Aroclor 1242	mg/kg	<1	<1	<1	<1	<1
Aroclor 1248	mg/kg	<1	<1	<1	<1	<1
Aroclor 1254	mg/kg	<1	<1	<1	<1	<1
Aroclor 1260	mg/kg	<1	<1	<1	<1	<1
Total +ve PCBs (1016-1260)	mg/kg	<1	<1	<1	<1	<1
Surrogate TCMX	%	76	75	77	77	78

PCBs in Soil				
Our Reference		263287-6	263287-7	263287-8
Your Reference	UNITS	WC06	WC07	WC08
Depth		0.03	0.03	0.03
Date Sampled		26/02/2021	26/02/2021	26/02/2021
Type of sample		Soil	Soil	Soil
Date extracted	-	04/03/2021	04/03/2021	04/03/2021
Date analysed	-	10/03/2021	10/03/2021	10/03/2021
Aroclor 1016	mg/kg	<1	<1	<1
Aroclor 1221	mg/kg	<1	<1	<1
Aroclor 1232	mg/kg	<1	<1	<1
Aroclor 1242	mg/kg	<1	<1	<1
Aroclor 1248	mg/kg	<1	<1	<1
Aroclor 1254	mg/kg	<1	<1	<1
Aroclor 1260	mg/kg	<1	<1	<1
Total +ve PCBs (1016-1260)	mg/kg	<1	<1	<1
Surrogate TCMX	%	70	81	76

Acid Extractable metals in soil						
Our Reference		263287-1	263287-2	263287-3	263287-4	263287-5
Your Reference	UNITS	WC01	WC02	WC03	WC04	WC05
Depth		0.03	0.03	0.03	0.03	0.03
Date Sampled		26/02/2021	26/02/2021	26/02/2021	26/02/2021	26/02/2021
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	04/03/2021	04/03/2021	04/03/2021	04/03/2021	04/03/2021
Date analysed	-	04/03/2021	04/03/2021	04/03/2021	04/03/2021	04/03/2021
Arsenic	mg/kg	<4	<4	<4	<4	<4
Cadmium	mg/kg	<0.4	<0.4	<0.4	<0.4	<0.4
Chromium	mg/kg	<1	7	<1	<1	3
Copper	mg/kg	<1	8	<1	<1	3
Lead	mg/kg	<1	5	<1	<1	2
Mercury	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Nickel	mg/kg	<1	4	<1	<1	2
Zinc	mg/kg	5	91	9	6	25
Molybdenum	mg/kg	<1	<1	<1	<1	<1

Acid Extractable metals in soil					
Our Reference		263287-6	263287-7	263287-8	263287-9
Your Reference	UNITS	WC06	WC07	WC08	DUP01
Depth		0.03	0.03	0.03	-
Date Sampled		26/02/2021	26/02/2021	26/02/2021	26/02/2021
Type of sample		Soil	Soil	Soil	Soil
Date prepared	-	04/03/2021	04/03/2021	04/03/2021	04/03/2021
Date analysed	-	04/03/2021	04/03/2021	04/03/2021	04/03/2021
Arsenic	mg/kg	<4	<4	<4	<4
Cadmium	mg/kg	<0.4	<0.4	<0.4	<0.4
Chromium	mg/kg	6	<1	<1	<1
Copper	mg/kg	6	<1	<1	<1
Lead	mg/kg	3	<1	<1	<1
Mercury	mg/kg	<0.1	<0.1	<0.1	<0.1
Nickel	mg/kg	3	<1	<1	<1
Zinc	mg/kg	43	4	8	5
Molybdenum	mg/kg	<1	<1	<1	[NA]

Misc Soil - Inorg						
Our Reference		263287-1	263287-2	263287-3	263287-4	263287-5
Your Reference	UNITS	WC01	WC02	WC03	WC04	WC05
Depth		0.03	0.03	0.03	0.03	0.03
Date Sampled		26/02/2021	26/02/2021	26/02/2021	26/02/2021	26/02/2021
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	05/03/2021	05/03/2021	05/03/2021	05/03/2021	05/03/2021
Date analysed	-	05/03/2021	05/03/2021	05/03/2021	05/03/2021	05/03/2021
Hexavalent Chromium, Cr^{6+}	mg/kg	<1	<1	36	<1	<1

Misc Soil - Inorg					
Our Reference		263287-6	263287-7	263287-8	263287-9
Your Reference	UNITS	WC06	WC07	WC08	DUP01
Depth		0.03	0.03	0.03	-
Date Sampled		26/02/2021	26/02/2021	26/02/2021	26/02/2021
Type of sample		Soil	Soil	Soil	Soil
Date prepared	-	05/03/2021	05/03/2021	05/03/2021	05/03/2021
Date analysed	-	05/03/2021	05/03/2021	05/03/2021	05/03/2021
Hexavalent Chromium, Cr^{6+}	mg/kg	<1	<1	<1	<1

Moisture						
Our Reference		263287-1	263287-2	263287-3	263287-4	263287-5
Your Reference	UNITS	WC01	WC02	WC03	WC04	WC05
Depth		0.03	0.03	0.03	0.03	0.03
Date Sampled		26/02/2021	26/02/2021	26/02/2021	26/02/2021	26/02/2021
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	4/03/2021	4/03/2021	4/03/2021	4/03/2021	4/03/2021
Date analysed	-	5/03/2021	5/03/2021	5/03/2021	5/03/2021	5/03/2021
Moisture	%	5.6	4.1	3.6	3.7	3.7

Moisture					
Our Reference		263287-6	263287-7	263287-8	263287-9
Your Reference	UNITS	WC06	WC07	WC08	DUP01
Depth		0.03	0.03	0.03	-
Date Sampled		26/02/2021	26/02/2021	26/02/2021	26/02/2021
Type of sample		Soil	Soil	Soil	Soil
Date prepared	-	4/03/2021	4/03/2021	4/03/2021	4/03/2021
Date analysed	-	5/03/2021	5/03/2021	5/03/2021	5/03/2021
Moisture	%	12	3.4	13	3.8

Method ID	Methodology Summary
Inorg-008	Moisture content determined by heating at 105+/-5 °C for a minimum of 12 hours.
Inorg-024	Hexavalent Chromium (Cr6+) - determined colourimetrically. Waters samples are filtered on receipt prior to analysis.
Metals-020	Determination of various metals by ICP-AES.
Metals-021	Determination of Mercury by Cold Vapour AAS.
Org-020	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis.
Org-020	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis. Note, the Total +ve TRH PQL is reflective of the lowest individual PQL and is therefore "Total +ve TRH" is simply a sum of the positive individual TRH fractions (>C10-C40).
Org-021	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-ECD.
Org-021	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-ECD. Note, the Total +ve PCBs PQL is reflective of the lowest individual PQL and is therefore" Total +ve PCBs" is simply a sum of the positive individual PCBs.
Org-022	Determination of VOCs sampled onto coconut shell charcoal sorbent tubes, that can be desorbed using carbon disulphide, and analysed by GC-MS.
Org-022/025	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS/GC-MSMS.
Org-022/025	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-MS/GC-MSMS. Note, the Total +ve reported DDD+DDE+DDT PQL is reflective of the lowest individual PQL and is therefore simply a sum of the positive individually report DDD+DDE+DDT.

Method ID	Methodology Summary
Org-022/025	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS and/or GC-MS/MS. Benzo(a)pyrene TEQ as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater - 2013. For soil results:- 1. 'EQ PQL'values are assuming all contributing PAHs reported as <PQL are actually at the PQL. This is the most conservative approach and can give false positive TEQs given that PAHs that contribute to the TEQ calculation may not be present. 2. 'EQ zero'values are assuming all contributing PAHs reported as <PQL are zero. This is the least conservative approach and is more susceptible to false negative TEQs when PAHs that contribute to the TEQ calculation are present but below PQL. 3. 'EQ half PQL'values are assuming all contributing PAHs reported as <PQL are half the stipulated PQL. Hence a mid-point between the most and least conservative approaches above. Note, the Total +ve PAHs PQL is reflective of the lowest individual PQL and is therefore "Total +ve PAHs" is simply a sum of the positive individual PAHs.
Org-023	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS.
Org-023	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater.
Org-023	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater. Note, the Total +ve Xylene PQL is reflective of the lowest individual PQL and is therefore "Total +ve Xylenes" is simply a sum of the positive individual Xylenes.

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-4	263287-2
Date extracted	-			04/03/2021	1	04/03/2021	04/03/2021		04/03/2021	04/03/2021
Date analysed	-			05/03/2021	1	05/03/2021	05/03/2021		05/03/2021	05/03/2021
TRH C_6 - C_9	mg/kg	25	Org-023	<25	1	<25	<25	0	112	81
TRH C_6 - C_{10}	mg/kg	25	Org-023	<25	1	<25	<25	0	112	81
Benzene	mg/kg	0.2	Org-023	<0.2	1	<0.2	<0.2	0	110	82
Toluene	mg/kg	0.5	Org-023	<0.5	1	<0.5	<0.5	0	108	97
Ethylbenzene	mg/kg	1	Org-023	<1	1	<1	<1	0	109	76
m+p-xylene	mg/kg	2	Org-023	<2	1	<2	<2	0	117	75
o-Xylene	mg/kg	1	Org-023	<1	1	<1	<1	0	111	74
naphthalene	mg/kg	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Surrogate aaa-Trifluorotoluene	%		Org-023	97	1	73	88	19	98	97

QUALITY CONTROL: svTRH (C10-C40) in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-4	263287-2
Date extracted	-			08/03/2021	1	04/03/2021	04/03/2021		04/03/2021	04/03/2021
Date analysed	-			08/03/2021	1	05/03/2021	05/03/2021		05/03/2021	05/03/2021
TRH C_{10} - C_{14}	mg/kg	50	Org-020	<50	1	740	600	21	115	#
TRH C_{15} - C_{28}	mg/kg	100	Org-020	<100	1	33000	21000	44	105	#
TRH C_{29} - C_{36}	mg/kg	100	Org-020	<100	1	110000	64000	53	126	#
TRH >C_{10} -C_{16}	mg/kg	50	Org-020	<50	1	1100	820	29	115	#
TRH >C_{16} -C_{34}	mg/kg	100	Org-020	<100	1	110000	67000	49	105	#
TRH >C_{34} -C_{40}	mg/kg	100	Org-020	<100	1	43000	28000	42	126	#
Surrogate o-Terphenyl	%		Org-020	89	1	#	#		92	#

QUALITY CONTROL: PAHs in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-4	[NT]
Date extracted	-			04/03/2021	1	04/03/2021	04/03/2021		04/03/2021	[NT]
Date analysed	-			10/03/2021	1	10/03/2021	10/03/2021		10/03/2021	[NT]
Naphthalene	mg/kg	0.1	Org-022/025	<0.1	1	<1	<1	0	81	[NT]
Acenaphthylene	mg/kg	0.1	Org-022/025	<0.1	1	<1	<1	0	[NT]	[NT]
Acenaphthene	mg/kg	0.1	Org-022/025	<0.1	1	<1	<1	0	87	[NT]
Fluorene	mg/kg	0.1	Org-022/025	<0.1	1	<1	<1	0	100	[NT]
Phenanthrene	mg/kg	0.1	Org-022/025	<0.1	1	<1	<1	0	90	[NT]
Anthracene	mg/kg	0.1	Org-022/025	<0.1	1	<1	<1	0	[NT]	[NT]
Fluoranthene	mg/kg	0.1	Org-022/025	<0.1	1	<1	<1	0	90	[NT]
Pyrene	mg/kg	0.1	Org-022/025	<0.1	1	<1	<1	0	91	[NT]
Benzo(a)anthracene	mg/kg	0.1	Org-022/025	<0.1	1	<1	<1	0	[NT]	[NT]
Chrysene	mg/kg	0.1	Org-022/025	<0.1	1	<1	<1	0	98	[NT]
Benzo(b,j+k)fluoranthene	mg/kg	0.2	Org-022/025	<0.2	1	<2	<2	0	[NT]	[NT]
Benzo(a)pyrene	mg/kg	0.05	Org-022/025	<0.05	1	<0.5	<0.5	0	88	[NT]
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	Org-022/025	<0.1	1	<1	<1	0	[NT]	[NT]
Dibenzo(a,h)anthracene	mg/kg	0.1	Org-022/025	<0.1	1	<1	<1	0	[NT]	[NT]
Benzo(g,h,i)perylene	mg/kg	0.1	Org-022/025	<0.1	1	<1	<1	0	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-022/025	112	1	80	81	1	112	[NT]

QUALITY CONTROL: Organochlorine Pesticides in soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-4	[NT]
Date extracted	-			04/03/2021	1	04/03/2021	04/03/2021		04/03/2021	[NT]
Date analysed	-			10/03/2021	1	10/03/2021	10/03/2021		10/03/2021	[NT]
alpha-BHC	mg/kg	0.1	Org-022/025	<0.1	1	<1	<1	0	91	[NT]
HCB	mg/kg	0.1	Org-022/025	<0.1	1	<1	<1	0	[NT]	[NT]
beta-BHC	mg/kg	0.1	Org-022/025	<0.1	1	<1	<1	0	89	[NT]
gamma-BHC	mg/kg	0.1	Org-022/025	<0.1	1	<1	<1	0	[NT]	[NT]
Heptachlor	mg/kg	0.1	Org-022/025	<0.1	1	<1	<1	0	84	[NT]
delta-BHC	mg/kg	0.1	Org-022/025	<0.1	1	<1	<1	0	[NT]	[NT]
Aldrin	mg/kg	0.1	Org-022/025	<0.1	1	<1	<1	0	84	[NT]
Heptachlor Epoxide	mg/kg	0.1	Org-022/025	<0.1	1	<1	<1	0	92	[NT]
gamma-Chlordane	mg/kg	0.1	Org-022/025	<0.1	1	<1	<1	0	[NT]	[NT]
alpha-chlordane	mg/kg	0.1	Org-022/025	<0.1	1	<1	<1	0	[NT]	[NT]
Endosulfan I	mg/kg	0.1	Org-022/025	<0.1	1	<1	<1	0	[NT]	[NT]
pp-DDE	mg/kg	0.1	Org-022/025	<0.1	1	<1	<1	0	98	[NT]
Dieldrin	mg/kg	0.1	Org-022/025	<0.1	1	<1	<1	0	90	[NT]
Endrin	mg/kg	0.1	Org-022/025	<0.1	1	<1	<1	0	91	[NT]
Endosulfan II	mg/kg	0.1	Org-022/025	<0.1	1	<1	<1	0	[NT]	[NT]
pp-DDD	mg/kg	0.1	Org-022/025	<0.1	1	<1	<1	0	80	[NT]
Endrin Aldehyde	mg/kg	0.1	Org-022/025	<0.1	1	<1	<1	0	[NT]	[NT]
pp-DDT	mg/kg	0.1	Org-022/025	<0.1	1	<1	<1	0	[NT]	[NT]
Endosulfan Sulphate	mg/kg	0.1	Org-022/025	<0.1	1	<1	<1	0	90	[NT]
Methoxychlor	mg/kg	0.1	Org-022/025	<0.1	1	<1	<1	0	[NT]	[NT]
Surrogate TCMX	%		Org-022/025	101	1	76	79	4	97	[NT]

QUALITY CONTROL: Organophosphorus Pesticides in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-4	[NT]
Date extracted	-			04/03/2021	1	04/03/2021	04/03/2021		04/03/2021	[NT]
Date analysed	-			10/03/2021	1	10/03/2021	10/03/2021		10/03/2021	[NT]
Dichlorvos	mg/kg	0.1	Org-022/025	<0.1	1	<1	<1	0	92	[NT]
Dimethoate	mg/kg	0.1	Org-022/025	<0.1	1	<1	<1	0	[NT]	[NT]
Diazinon	mg/kg	0.1	Org-022/025	<0.1	1	<1	<1	0	[NT]	[NT]
Chlorpyriphos-methyl	mg/kg	0.1	Org-022/025	<0.1	1	<1	<1	0	[NT]	[NT]
Ronnel	mg/kg	0.1	Org-022/025	<0.1	1	<1	<1	0	91	[NT]
Fenitrothion	mg/kg	0.1	Org-022/025	<0.1	1	<1	<1	0	92	[NT]
Malathion	mg/kg	0.1	Org-022/025	<0.1	1	<1	<1	0	117	[NT]
Chlorpyriphos	mg/kg	0.1	Org-022/025	<0.1	1	<1	<1	0	90	[NT]
Parathion	mg/kg	0.1	Org-022/025	<0.1	1	<1	<1	0	88	[NT]
Bromophos-ethyl	mg/kg	0.1	Org-022	<0.1	1	<1	<1	0	[NT]	[NT]
Ethion	mg/kg	0.1	Org-022/025	<0.1	1	<1	<1	0	88	[NT]
Azinphos-methyl (Guthion)	mg/kg	0.1	Org-022/025	<0.1	1	<1	<1	0	[NT]	[NT]
Surrogate TCMX	%		Org-022/025	101	1	76	79	4	97	[NT]

QUALITY CONTROL: PCBs in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-4	[NT]
Date extracted	-			04/03/2021	1	04/03/2021	04/03/2021		04/03/2021	[NT]
Date analysed	-			10/03/2021	1	10/03/2021	10/03/2021		10/03/2021	[NT]
Aroclor 1016	mg/kg	0.1	Org-021	<0.1	1	<1	<1	0	[NT]	[NT]
Aroclor 1221	mg/kg	0.1	Org-021	<0.1	1	<1	<1	0	[NT]	[NT]
Aroclor 1232	mg/kg	0.1	Org-021	<0.1	1	<1	<1	0	[NT]	[NT]
Aroclor 1242	mg/kg	0.1	Org-021	<0.1	1	<1	<1	0	[NT]	[NT]
Aroclor 1248	mg/kg	0.1	Org-021	<0.1	1	<1	<1	0	[NT]	[NT]
Aroclor 1254	mg/kg	0.1	Org-021	<0.1	1	<1	<1	0	70	[NT]
Aroclor 1260	mg/kg	0.1	Org-021	<0.1	1	<1	<1	0	[NT]	[NT]
Surrogate TCMX	%		Org-021	101	1	76	79	4	97	[NT]

QUALITY CONTROL: Acid Extractable metals in soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-4	263287-2
Date prepared	-			04/03/2021	1	04/03/2021	04/03/2021		04/03/2021	04/03/2021
Date analysed	-			04/03/2021	1	04/03/2021	04/03/2021		04/03/2021	04/03/2021
Arsenic	mg/kg	4	Metals-020	<4	1	<4	<4	0	99	113
Cadmium	mg/kg	0.4	Metals-020	<0.4	1	<0.4	<0.4	0	90	98
Chromium	mg/kg	1	Metals-020	<1	1	<1	1	0	95	83
Copper	mg/kg	1	Metals-020	<1	1	<1	1	0	99	90
Lead	mg/kg	1	Metals-020	<1	1	<1	<1	0	90	103
Mercury	mg/kg	0.1	Metals-021	<0.1	1	<0.1	<0.1	0	97	###
Nickel	mg/kg	1	Metals-020	<1	1	<1	<1	0	95	111
Zinc	mg/kg	1	Metals-020	<1	1	5	7	33	89	#
Molybdenum	mg/kg	1	Metals-020	<1	1	<1	<1	0	90	##

QUALITY CONTROL: Misc Soil - Inorg						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-4	263287-2
Date prepared	-			05/03/2021	1	05/03/2021	05/03/2021		05/03/2021	05/03/2021
Date analysed	-			05/03/2021	1	05/03/2021	05/03/2021		05/03/2021	05/03/2021
Hexavalent Chromium, Cr^{6+}	mg/kg	1	Inorg-024	<1	1	<1	<1	0	103	103

Result Definitions

NT	Not tested
NA	Test not required
INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
<	Less than
>	Greater than
RPD	Relative Percent Difference
LCS	Laboratory Control Sample
NS	Not specified
NEPM	National Environmental Protection Measure
NR	Not Reported

Quality Control Definitions

Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011.

The recommended maximums for analytes in urine are taken from “2018 TLVs and BEIs”, as published by ACGIH (where available). Limit provided for Nickel is a precautionary guideline as per Position Paper prepared by AIOH Exposure Standards Committee, 2016.

Guideline limits for Rinse Water Quality reported as per analytical requirements and specifications of AS 4187, Amdt 2 2019, Table 7.2

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% – see ELN-P05 QA/QC tables for details; <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals (not SPOCAS); 60-140% for organics/SPOCAS (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC and/or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, total recoverable metals and PFAS where solids are included by default.

Samples for Microbiological analysis (not Amoeba forms) received outside of the 2-8°C temperature range do not meet the ideal cooling conditions as stated in AS2031-2012.

Report Comments

TRH Soil C10-C40 NEPM - # Percent recovery for the surrogate/matrix spike is not possible to report as the high concentration of analytes in sample/s 263287-1,1d, 2,2ms,3 have caused interference.
TRH Soil C10-C40 NEPM - The PQL for sample/s 263287-4,6 has been raised due to the high concentration of analytes in the sample/s, resulting in the sample/s requiring a dilution.

8 metals in soil:
- # Percent recovery is not possible to report due to the inhomogeneous nature of the element in the sample. However an acceptable recovery was obtained for the LCS.
-## Low spike recovery was obtained for this sample. Sample matrix interference is suspected. However, an acceptable recovery was obtained for the LCS
- ### Low spike recovery was obtained for this sample. The sample was re-digested and re-spiked and the low recovery was confirmed. This could be due to matrix interferences. However, an acceptable recovery was obtained for the LCS.

TRH Soil C10-C40 NEPM - The RPD for duplicate results is accepted due to the non homogenous nature of sample/s 263287-1,1d.

PAH_S:The PQL has been raised due to interferences from analytes (other than those being tested) in sample/s 263287-1,2,3,4,5,6,7,8.

OCP_S_MSMS:The PQL has been raised due to interferences from analytes (other than those being tested) in sample/s 263287-1,2,3,4,5,6,7,8.

OP_S_MSMS:The PQL has been raised due to interferences from analytes (other than those being tested) in sample/s 263287-1,2,3,4,5,6,7,8.

PCB_S:The PQL has been raised due to interferences from analytes (other than those being tested) in sample/s 263287-1,2,3,4,5,6,7,8.

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customerservice@envirolab.com.au
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CERTIFICATE OF ANALYSIS 263287-A

Client Details

Client	NGH Environmental
Attention	Sarah Dale
Address	Suite 1, 39 Fitzmaurice street, Wagga Wagga, NSW, 2650

Sample Details

Your Reference	**Northridge Waste Facility / 16-276 / Bomen**
Number of Samples	11 Soil
Date samples received	03/03/2021
Date completed instructions received	15/03/2021

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Please refer to the last page of this report for any comments relating to the results.

Report Details

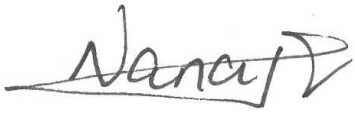
Date results requested by	18/03/2021
Date of Issue	18/03/2021

NATA Accreditation Number 2901. This document shall not be reproduced except in full.

Accredited for compliance with ISO/IEC 17025 - Testing. **Tests not covered by NATA are denoted with ***

Results Approved By
Steven Luong, Organics Supervisor

Authorised By



Nancy Zhang, Laboratory Manager

Document Set ID: 5340045
Version: 1, Version Date: 23/04/2021

sTPH in Soil (C10-C40)-Silica		
Our Reference		263287-A-1
Your Reference	UNITS	WC01
Depth		0.03
Date Sampled		26/02/2021
Type of sample		Soil
Date extracted	-	17/03/2021
Date analysed	-	17/03/2021
TPH C_{10} - C_{14}	mg/kg	<50
TPH C_{15} - C_{28}	mg/kg	6,700
TPH C_{29} - C_{36}	mg/kg	10,000
TPH >C_{10} -C_{16}	mg/kg	61
TPH >C_{16} -C_{34}	mg/kg	16,000
TPH >C_{34} -C_{40}	mg/kg	1,300
Surrogate o-Terphenyl	%	#

Method ID	Methodology Summary
Org-020	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis.

QUALITY CONTROL: sTPH in Soil (C10-C40)-Silica						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date extracted	-			17/03/2021	1	17/03/2021	17/03/2021		17/03/2021	[NT]
Date analysed	-			17/03/2021	1	17/03/2021	17/03/2021		17/03/2021	[NT]
TPH C_{10} - C_{14}	mg/kg	50	Org-020	<50	1	<50	<50	0	109	[NT]
TPH C_{15} - C_{28}	mg/kg	100	Org-020	<100	1	6700	7300	9	84	[NT]
TPH C_{29} - C_{36}	mg/kg	100	Org-020	<100	1	10000	11000	10	89	[NT]
TPH >C_{10} -C_{16}	mg/kg	50	Org-020	<50	1	61	64	5	109	[NT]
TPH >C_{16} -C_{34}	mg/kg	100	Org-020	<100	1	16000	17000	6	84	[NT]
TPH >C_{34} -C_{40}	mg/kg	100	Org-020	<100	1	1300	1500	14	89	[NT]
Surrogate o-Terphenyl	%		Org-020	107	1	#	#		102	[NT]

Result Definitions

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NA	Test not required
INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
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RPD	Relative Percent Difference
LCS	Laboratory Control Sample
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Samples for Microbiological analysis (not Amoeba forms) received outside of the 2-8°C temperature range do not meet the ideal cooling conditions as stated in AS2031-2012.

Report Comments

sTPH in Soil (C10-C40)-Silica - # Percent recovery for the surrogate/matrix spike is not possible to report as the high concentration of analytes in sample/s 263287-a-1,1d have caused interference.

Ming To

From: Nancy Zhang
Sent: Monday, 15 March 2021 10:50 AM
To: Ming To
Cc: Samplereceipt Distribution
Subject: FW: Results for Registration 263287 Northridge Waste Facility / 16-276 / Bomen

Follow Up Flag: Follow up
Flag Status: Flagged

Ref: 263287-A)
TAT: 3 days
Due: 18/03/2021
MT

A job, please.

From: Sarah Dale <sarah.m.d@nghconsulting.com.au>
Sent: Monday, 15 March 2021 9:15 AM
To: Nancy Zhang <NZhang@envirolab.com.au>
Cc: Scott McGrath <scott.mg@nghconsulting.com.au>; Nicola Smith <nicola.s@nghconsulting.com.au>
Subject: RE: Results for Registration 263287 Northridge Waste Facility / 16-276 / Bomen

CAUTION: This email originated from outside of the organisation. Do not act on instructions, click links or open attachments unless you recognise the sender and know the content is authentic and safe.

Hi Nancy,

Can I please request a silica gel clean up to be run on sample WC01? (1)

3 day TAT aswell

Thanks

SARAH DALE
ENVIRONMENTAL CONSULTANT – CONTAMINATED LAND
BSc. (Earth Science)

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From: Nancy Zhang <NZhang@envirolab.com.au>
Sent: Wednesday, 10 March 2021 5:25 PM
To: Sarah Dale <sarah.m.d@nghconsulting.com.au>; Lakna Gunawardana <lakna.g@nghconsulting.com.au>; Nicola Smith <nicola.s@nghconsulting.com.au>
Subject: Results for Registration 263287 Northridge Waste Facility / 16-276 / Bomen

Document Set ID: 5340045
Version: 1, Version Date: 23/04/2021

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www.envirolab.com.au

SAMPLE RECEIPT ADVICE

Client Details

Client	NGH Environmental
Attention	Sarah Dale

Sample Login Details

Your reference	Northridge Waste Facility / 16-276 / Bomen
Envirolab Reference	263287-A
Date Sample Received	03/03/2021
Date Instructions Received	15/03/2021
Date Results Expected to be Reported	18/03/2021

Sample Condition

Samples received in appropriate condition for analysis	Yes
No. of Samples Provided	11 Soil
Turnaround Time Requested	3 days
Temperature on Receipt (°C)	11
Cooling Method	Ice Pack
Sampling Date Provided	YES

Comments

Nil

Please direct any queries to:

Aileen Hie	Jacinta Hurst
Phone: 02 9910 6200	**Phone: 02 9910 6200**
Fax: 02 9910 6201	**Fax: 02 9910 6201**
Email: ahie@envirolab.com.au	**Email: jhurst@envirolab.com.au**

Analysis Underway, details on the following page:

Document Set ID: 5340045
Version: 1, Version Date: 23/04/2021

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

Sample ID	sTPH in Soil (C10-C40)-Silica	On Hold
WC01-0.03	✓	
WC02-0.03		✓
WC03-0.03		✓
WC04-0.03		✓
WC05-0.03		✓
WC06-0.03		✓
WC07-0.03		✓
WC08-0.03		✓
DUP01		✓
TS		✓
TB		✓

The '✓' indicates the testing you have requested. **THIS IS NOT A REPORT OF THE RESULTS.**

Additional Info

Sample storage - Waters are routinely disposed of approximately 1 month and soils approximately 2 months from receipt.
Requests for longer term sample storage must be received in writing.
Please contact the laboratory immediately if observed settled sediment present in water samples is to be included in the extraction and/or analysis (exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, Total Recoverable metals and PFAS analysis where solids are included by default.
TAT for Micro is dependent on incubation. This varies from 3 to 6 days.

Document Set ID: 5340045
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www.envirolab.com.au

CERTIFICATE OF ANALYSIS 263287-B

Client Details

Client	NGH Environmental
Attention	Sarah Dale
Address	Suite 1, 39 Fitzmaurice street, Wagga Wagga, NSW, 2650

Sample Details

Your Reference	**Northridge Waste Facility / 16-276 / Bomen**
Number of Samples	11 Soil
Date samples received	03/03/2021
Date completed instructions received	23/03/2021

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Please refer to the last page of this report for any comments relating to the results.

Report Details

Date results requested by	26/03/2021
Date of Issue	26/03/2021

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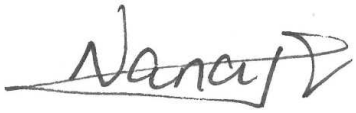
Accredited for compliance with ISO/IEC 17025 - Testing. **Tests not covered by NATA are denoted with ***

Results Approved By
Steven Luong, Organics Supervisor

Authorised By



Nancy Zhang, Laboratory Manager

Document Set ID: 5340045
Version: 1, Version Date: 23/04/2021

svTRH (C10-C40) in Soil		
Our Reference		263287-B-2
Your Reference	UNITS	WC02
Depth		0.03
Date Sampled		26/02/2021
Type of sample		Soil
Date extracted	-	24/03/2021
Date analysed	-	25/03/2021
TRH C_{10} - C_{14}	mg/kg	<50
TRH C_{15} - C_{28}	mg/kg	16,000
TRH C_{29} - C_{36}	mg/kg	42,000
TRH >C_{10} -C_{16}	mg/kg	140
TRH >C_{16} -C_{34}	mg/kg	42,000
TRH >C_{34} -C_{40}	mg/kg	25,000
Total +ve TRH (>C10-C40)	mg/kg	67,000
Surrogate o-Terphenyl	%	#

sTPH in Soil (C10-C40)-Silica						
Our Reference		263287-B-2	263287-B-3	263287-B-4	263287-B-5	263287-B-6
Your Reference	UNITS	WC02	WC03	WC04	WC05	WC06
Depth		0.03	0.03	0.03	0.03	0.03
Date Sampled		26/02/2021	26/02/2021	26/02/2021	26/02/2021	26/02/2021
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	26/03/2021	26/03/2021	26/03/2021	26/03/2021	26/03/2021
Date analysed	-	26/03/2021	26/03/2021	26/03/2021	26/03/2021	26/03/2021
TPH C_{10} - C_{14}	mg/kg	<50	<250	<250	<250	<250
TPH C_{15} - C_{28}	mg/kg	4,500	12,000	12,000	14,000	15,000
TPH C_{29} - C_{36}	mg/kg	930	13,000	13,000	14,000	18,000
TPH >C_{10} -C_{16}	mg/kg	<50	<250	<250	<250	<250
TPH >C_{16} -C_{34}	mg/kg	5,300	23,000	24,000	26,000	33,000
TPH >C_{34} -C_{40}	mg/kg	270	1,700	1,500	1,800	1,300
Surrogate o-Terphenyl	%	80	74	75	85	96

sTPH in Soil (C10-C40)-Silica			
Our Reference		263287-B-7	263287-B-8
Your Reference	UNITS	WC07	WC08
Depth		0.03	0.03
Date Sampled		26/02/2021	26/02/2021
Type of sample		Soil	Soil
Date extracted	-	26/03/2021	26/03/2021
Date analysed	-	26/03/2021	26/03/2021
TPH C_{10} - C_{14}	mg/kg	<250	<250
TPH C_{15} - C_{28}	mg/kg	7,200	11,000
TPH C_{29} - C_{36}	mg/kg	9,000	16,000
TPH >C_{10} -C_{16}	mg/kg	<250	<250
TPH >C_{16} -C_{34}	mg/kg	16,000	25,000
TPH >C_{34} -C_{40}	mg/kg	1,200	1,500
Surrogate o-Terphenyl	%	97	112

Method ID	Methodology Summary
Org-020	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis.
Org-020	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis. Note, the Total +ve TRH PQL is reflective of the lowest individual PQL and is therefore "Total +ve TRH" is simply a sum of the positive individual TRH fractions (>C10-C40).

QUALITY CONTROL: svTRH (C10-C40) in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-5	[NT]
Date extracted	-			24/03/2021	[NT]	[NT]	[NT]	[NT]	24/03/2021	[NT]
Date analysed	-			25/03/2021	[NT]	[NT]	[NT]	[NT]	25/03/2021	[NT]
TRH C_{10} - C_{14}	mg/kg	50	Org-020	<50	[NT]	[NT]	[NT]	[NT]	116	[NT]
TRH C_{15} - C_{28}	mg/kg	100	Org-020	<100	[NT]	[NT]	[NT]	[NT]	93	[NT]
TRH C_{29} - C_{36}	mg/kg	100	Org-020	<100	[NT]	[NT]	[NT]	[NT]	102	[NT]
TRH >C_{10} -C_{16}	mg/kg	50	Org-020	<50	[NT]	[NT]	[NT]	[NT]	116	[NT]
TRH >C_{16} -C_{34}	mg/kg	100	Org-020	<100	[NT]	[NT]	[NT]	[NT]	93	[NT]
TRH >C_{34} -C_{40}	mg/kg	100	Org-020	<100	[NT]	[NT]	[NT]	[NT]	102	[NT]
Surrogate o-Terphenyl	%		Org-020	105	[NT]	[NT]	[NT]	[NT]	119	[NT]

QUALITY CONTROL: sTPH in Soil (C10-C40)-Silica					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date extracted	-			26/03/2021	3	26/03/2021	26/03/2021		26/03/2021	[NT]
Date analysed	-			26/03/2021	3	26/03/2021	26/03/2021		26/03/2021	[NT]
TPH C_{10} - C_{14}	mg/kg	50	Org-020	<50	3	<250	<250	0	106	[NT]
TPH C_{15} - C_{28}	mg/kg	100	Org-020	<100	3	12000	11000	9	111	[NT]
TPH C_{29} - C_{36}	mg/kg	100	Org-020	<100	3	13000	11000	17	92	[NT]
TPH >C_{10} -C_{16}	mg/kg	50	Org-020	<50	3	<250	<250	0	106	[NT]
TPH >C_{16} -C_{34}	mg/kg	100	Org-020	<100	3	23000	21000	9	111	[NT]
TPH >C_{34} -C_{40}	mg/kg	100	Org-020	<100	3	1700	1600	6	92	[NT]
Surrogate o-Terphenyl	%		Org-020	89	3	74	77	4	88	[NT]

Result Definitions

NT	Not tested
NA	Test not required
INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
<	Less than
>	Greater than
RPD	Relative Percent Difference
LCS	Laboratory Control Sample
NS	Not specified
NEPM	National Environmental Protection Measure
NR	Not Reported

Quality Control Definitions

Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011.

The recommended maximums for analytes in urine are taken from “2018 TLVs and BEIs”, as published by ACGIH (where available). Limit provided for Nickel is a precautionary guideline as per Position Paper prepared by AIOH Exposure Standards Committee, 2016.

Guideline limits for Rinse Water Quality reported as per analytical requirements and specifications of AS 4187, Amdt 2 2019, Table 7.2

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% – see ELN-P05 QA/QC tables for details; <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals (not SPOCAS); 60-140% for organics/SPOCAS (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC and/or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, total recoverable metals and PFAS where solids are included by default.

Samples for Microbiological analysis (not Amoeba forms) received outside of the 2-8°C temperature range do not meet the ideal cooling conditions as stated in AS2031-2012.

Report Comments

TRH Soil C10-C40 NEPM - # Percent recovery for the surrogate is not possible to report as the high concentration of analytes in sample 263287-B-2 has caused interference.

sTPH in Soil (C10-C40)-Silica - The PQL for samples 263287-B-3-8 has been raised due to the high concentration of analytes in the samples, resulting in the samples requiring a dilution.

Ming To

From: Nancy Zhang
Sent: Tuesday, 23 March 2021 12:13 PM
To: Ming To
Cc: Samplereceipt Distribution
Subject: FW: Results for Registration 263287 Northridge Waste Facility / 16-276 / Bomen

Follow Up Flag: Follow up
Flag Status: Flagged

Ref: 263287-B.
TAT: 3 days.
Due: 26/03/2021 MT

A job, please.

From: Sarah Dale <sarah.m.d@nghconsulting.com.au>
Sent: Tuesday, 23 March 2021 11:12 AM
To: Nancy Zhang <NZhang@envirolab.com.au>
Cc: Scott McGrath <scott.mg@nghconsulting.com.au>; Nicola Smith <nicola.s@nghconsulting.com.au>; Enviro Lab <EnviroLab@envirolab.com.au>
Subject: RE: Results for Registration 263287 Northridge Waste Facility / 16-276 / Bomen

CAUTION: This email originated from outside of the organisation. Do not act on instructions, click links or open attachments unless you recognise the sender and know the content is authentic and safe.

Hi Nancy,

Can I please request the remainder of the primary samples (WC02-WC08) to also be analysed for silica gel clean up, 3 TAT aswell.

Many thanks

SARAH DALE
ENVIRONMENTAL CONSULTANT – CONTAMINATED LAND
BSc. (Earth Science)

M. 0420 692 608
E. sarah.m.d@nghconsulting.com.au
Unit 2, 54 Hudson St
Hamilton NSW 2303

NSW · ACT · QLD · VIC
WWW.NGHCONSULTING.COM.AU

From: Nancy Zhang <NZhang@envirolab.com.au>
Sent: Monday, 15 March 2021 10:49 AM
To: Sarah Dale <sarah.m.d@nghconsulting.com.au>
Cc: Scott McGrath <scott.mg@nghconsulting.com.au>; Nicola Smith <nicola.s@nghconsulting.com.au>
Subject: RE: Results for Registration 263287 Northridge Waste Facility / 16-276 / Bomen

Document Set ID: 5340045
Version: 1, Version Date: 23/04/2021

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

SAMPLE RECEIPT ADVICE

Client Details

Client	NGH Environmental
Attention	Sarah Dale

Sample Login Details

Your reference	Northridge Waste Facility / 16-276 / Bomen
Envirolab Reference	263287-B
Date Sample Received	03/03/2021
Date Instructions Received	23/03/2021
Date Results Expected to be Reported	26/03/2021

Sample Condition

Samples received in appropriate condition for analysis	Yes
No. of Samples Provided	11 Soil
Turnaround Time Requested	3 days
Temperature on Receipt (°C)	11
Cooling Method	Ice Pack
Sampling Date Provided	YES

Comments

Nil

Please direct any queries to:

Aileen Hie	Jacinta Hurst
Phone: 02 9910 6200	**Phone: 02 9910 6200**
Fax: 02 9910 6201	**Fax: 02 9910 6201**
Email: ahie@envirolab.com.au	**Email: jhurst@envirolab.com.au**

Analysis Underway, details on the following page:

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12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

Sample ID	sTPH in Soil (C10-C40)-Silica	On Hold
WC01-0.03		✓
WC02-0.03	✓	
WC03-0.03	✓	
WC04-0.03	✓	
WC05-0.03	✓	
WC06-0.03	✓	
WC07-0.03	✓	
WC08-0.03	✓	
DUP01		✓
TS		✓
TB		✓

The '✓' indicates the testing you have requested. **THIS IS NOT A REPORT OF THE RESULTS.**

Additional Info

Sample storage - Waters are routinely disposed of approximately 1 month and soils approximately 2 months from receipt.
Requests for longer term sample storage must be received in writing.
Please contact the laboratory immediately if observed settled sediment present in water samples is to be included in the extraction and/or analysis (exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, Total Recoverable metals and PFAS analysis where solids are included by default.
TAT for Micro is dependent on incubation. This varies from 3 to 6 days.

Document Set ID: 5340045
Version: 1, Version Date: 23/04/2021

CHAIN OF CUSTODY FORM - Client

SCC0037

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ENVIROLAB GROUP
National phone number 1300 424 344

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12 Ashley St, Chatswood, NSW 2067
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16-18 Hayden Crt, Myaree, WA 6154
✆ 08 9317 2505 | ✉ lab@mpl.com.au

Melbourne Lab - Envirolab Services
25 Research Drive, Croydon South, VIC 3136
✆ 03 9763 2500 | ✉ melbourne@envirolab.com.au

Adelaide Office - Envirolab Services
7a The Parade, Norwood, SA 5067
✆ 08 7087 6800 | ✉ adelaide@envirolab.com.au

Brisbane Office - Envirolab Services
20a, 10-20 Depot St, Banyo, QLD 4014
✆ 07 3266 9532 | ✉ brisbane@envirolab.com.au

Darwin Office - Envirolab Services
Unit 20/119 Reichardt Road, Winnellie, NT 0820

Client: NGH Pty Ltd	Client Project Name/Number/Site etc (ie report title): Northridge Waste Facility / 16-276 / Bomen
Contact Person: Nicola Smith	
Project Mgr: Nicola Smith	PO No.: 16-276
Sampler: Lakna Gunawardana	Envirolab Quote No. :
Address: 35 Kincaid St Wagga Wagga NSW 2650	Date results required: Or choose: standard *Note: Inform lab in advance if urgent turnaround is required - surcharges apply*
Phone: Mob: 0410 411 660	Additional report format: esdat / equis /
Email: nicola.s@nghconsulting.com.au lakna.g@nghconsulting.com.au sarah.m.d@nghconsulting.com.au	Lab Comments:

Sample information					Tests Required														Comments
Envirolab Sample ID	Client Sample ID or information	Depth	Date sampled	Type of sample	BTEX	Heavy Metals (8)	Combo 6	Molybdenum											Provide as much information about the sample as you can
1	WC01	0.03	26.02.2021	Solid			X	X											Please anaylse for Cr (VI) in the heavy metal suite
2	WC02	0.03	26.02.2021	Solid			X	X											
3	WC03	0.03	26.02.2021	Solid			X	X											
4	WC04	0.03	26.02.2021	Solid			X	X											
5	WC05	0.03	26.02.2021	Solid			X	X											
6	WC06	0.03	26.02.2021	Solid			X	X											
7	WC07	0.03	26.02.2021	Solid			X	X											
8	WC08	0.03	26.02.2021	Solid			X	X											
9	DUP01	-	26.02.2021	Solid		X													
10	TS	-	26.02.2021	Soil	X														
11	TB	-	26.02.2021	Soil	X														

☐ *Please tick the box if observed settled sediment present in water samples is to be included in the extraction and/or analysis*

Relinquished by (Company): Via courier	Received by (Company): ES SW	Lab Use Only
Print Name: Lakna Gunawardana	Print Name: Jason Day	Job number: 263287 / Cooling: Ice / Ice pack / None
Date & Time: 3pm 01/03/2021	Date & Time: 3/3/21 1030	Temperature: 11 / Security seal: Intact / Broken / None
Signature: LKG	Signature:	TAT Req - SAME day / 1 / 2 / 3 / 4 / STD

Document Set ID: 5340045
Version: 1, Version Date: 23/04/2021

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customerservice@envirolab.com.au
www.envirolab.com.au

SAMPLE RECEIPT ADVICE

Client Details

Client	NGH Environmental
Attention	Nicola Smith

Sample Login Details

Your reference	Northridge Waste Facility / 16-276 / Bomen
Envirolab Reference	263287
Date Sample Received	03/03/2021
Date Instructions Received	03/03/2021
Date Results Expected to be Reported	10/03/2021

Sample Condition

Samples received in appropriate condition for analysis	Yes
No. of Samples Provided	11 Soil
Turnaround Time Requested	Standard
Temperature on Receipt (°C)	11
Cooling Method	Ice Pack
Sampling Date Provided	YES

Comments

Nil

Please direct any queries to:

Aileen Hie	Jacinta Hurst
Phone: 02 9910 6200	**Phone: 02 9910 6200**
Fax: 02 9910 6201	**Fax: 02 9910 6201**
Email: ahie@envirolab.com.au	**Email: jhurst@envirolab.com.au**

Analysis Underway, details on the following page:

Document Set ID: 5340045
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customerservice@envirolab.com.au
www.envirolab.com.au

Sample ID	vTRH(C6-C10)/BTEXN in Soil	svTRH (C10-C40) in Soil	PAHs in Soil	Organochlorine Pesticides in soil	Organophosphorus Pesticides in Soil	PCBsin Soil	Acid Extractable metalsin soil	Misc Soil - Inorg
WC01-0.03	✓	✓	✓	✓	✓	✓	✓	✓
WC02-0.03	✓	✓	✓	✓	✓	✓	✓	✓
WC03-0.03	✓	✓	✓	✓	✓	✓	✓	✓
WC04-0.03	✓	✓	✓	✓	✓	✓	✓	✓
WC05-0.03	✓	✓	✓	✓	✓	✓	✓	✓
WC06-0.03	✓	✓	✓	✓	✓	✓	✓	✓
WC07-0.03	✓	✓	✓	✓	✓	✓	✓	✓
WC08-0.03	✓	✓	✓	✓	✓	✓	✓	✓
DUP01							✓	✓
TS	✓							
TB	✓							

The '✓' indicates the testing you have requested. **THIS IS NOT A REPORT OF THE RESULTS.**

Additional Info

Sample storage - Waters are routinely disposed of approximately 1 month and soils approximately 2 months from receipt.
Requests for longer term sample storage must be received in writing.
Please contact the laboratory immediately if observed settled sediment present in water samples is to be included in the extraction and/or analysis (exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, Total Recoverable metals and PFAS analysis where solids are included by default.
TAT for Micro is dependent on incubation. This varies from 3 to 6 days.

Document Set ID: 5340045
Version: 1, Version Date: 23/04/2021

APPENDIX C PSI, NGH 2019

Document Set ID: 5340045
Version: 1, Version Date: 23/04/2021

APPENDIX D EPA CORRESPONDENCE

Document Set ID: 5340045
Version: 1, Version Date: 23/04/2021

From:	Nicola Smith
To:	Briohny Seaman; Jessica.Creed@epa.nsw.gov.au
Bcc:	ec90b3a9-5017-4c9f-9522-9d8d1944f4b3.metaPublish@thehub.nghenvironmental.com.au
Subject:	16-276 - Northridge Waste Management - Residue Waste Classification Consultation
Date:	Wednesday, 24 February 2021 10:42:54 AM
Attachments:	image001.png ec90b3a9-5017-4c9f-9522-9d8d1944f4b3.png

Hi Briohny and Jessica,

I hope this finds you both well.

We have confirmation from the client to go ahead with the waste classification of the wool combing residue.

Using Appendix A of SEPP 55 and the Waste Classification Guidelines 2014, we are proposing to test for the following contaminants:

- Metals – Arsenic, Cadmium, Chromium (VI), Copper, Mercury, Nickel, Lead, Zinc and Molybdenum.
- Organochlorides (OCP).
- Organophosphates (OPP).
- Total Recoverable Hydrocarbons (TRH) (C6 – C9 and C10 – C36).
- Benzene, Toluene, Ethylbenzene, Xylene (BTEX).
- Polychlorinated Biphenyl (PCB).

As per Waste Classification Guidelines 2014, *disposal requirements for organic and inorganic chemical contaminants not listed below, contact the EPA* - could you please confirm if there are any other contaminants that should be tested?

As the waste is consistent across the base of the pond and because of previous chemical analysis, eight samples have been nominated for the assessment.

Best regards,
Nicola

NICOLA SMITH
SENIOR ENVIRONMENTAL CONSULTANT
M. Phil (Phys Geog), B. Sc.

Please note I do not work Mondays
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From:	Nicola Smith
To:	"Briohny Seaman"
Cc:	Sarah Dale
Bcc:	"fe56b56d-bca5-4528-9dec-f6f78214f44e.metaPublish@thehub.nghenvironmental.com.au"
Subject:	RE: 16-276 - Waste Classification Northridge Waste Facility - Silica Gel Clean up on samples
Date:	Wednesday, 31 March 2021 1:34:36 PM
Attachments:	image001.png fe56b56d-bca5-4528-9dec-f6f78214f44e.png

Hi Briohny,

I hope you're well.

Following up on email below – we reanalysed all samples with the silica gel clean up.

Are there any comments from the EPA regarding the below before we submit the report?

Best regards,
Nicola

NICOLA SMITH
SENIOR ENVIRONMENTAL CONSULTANT
M. Phil (Phys Geog), B. Sc.

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From: Nicola Smith
Sent: Thursday, 18 March 2021 2:35 PM
To: Briohny Seaman <Briohny.Seaman@epa.nsw.gov.au>
Cc: Sarah Dale <sarah.m.d@nghconsulting.com.au>
Subject: 16-276 - Waste Classification Northridge Waste Facility - Silica Gel Clean up on samples

Hi Briohny,

I hope this finds you well.

Touching base regarding the Northridge waste classification – As per footnote 7 for Table 1 of the Waste Classification Guidelines Part 1, a silica gel clean up was run on one of the eight samples and the reduction in TRH in the C10 to C39 is notable.

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Before running the clean up on all samples, I'm keen to seek clarification from the EPA that you are happy for us to use this methods as the material is a fat/grease and derived from animal / food source.

Could you please confirm before we proceed with the additional samples?

Thanks,
Nicola.

NICOLA SMITH
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Appendix 2 Sensitive Receivers Map

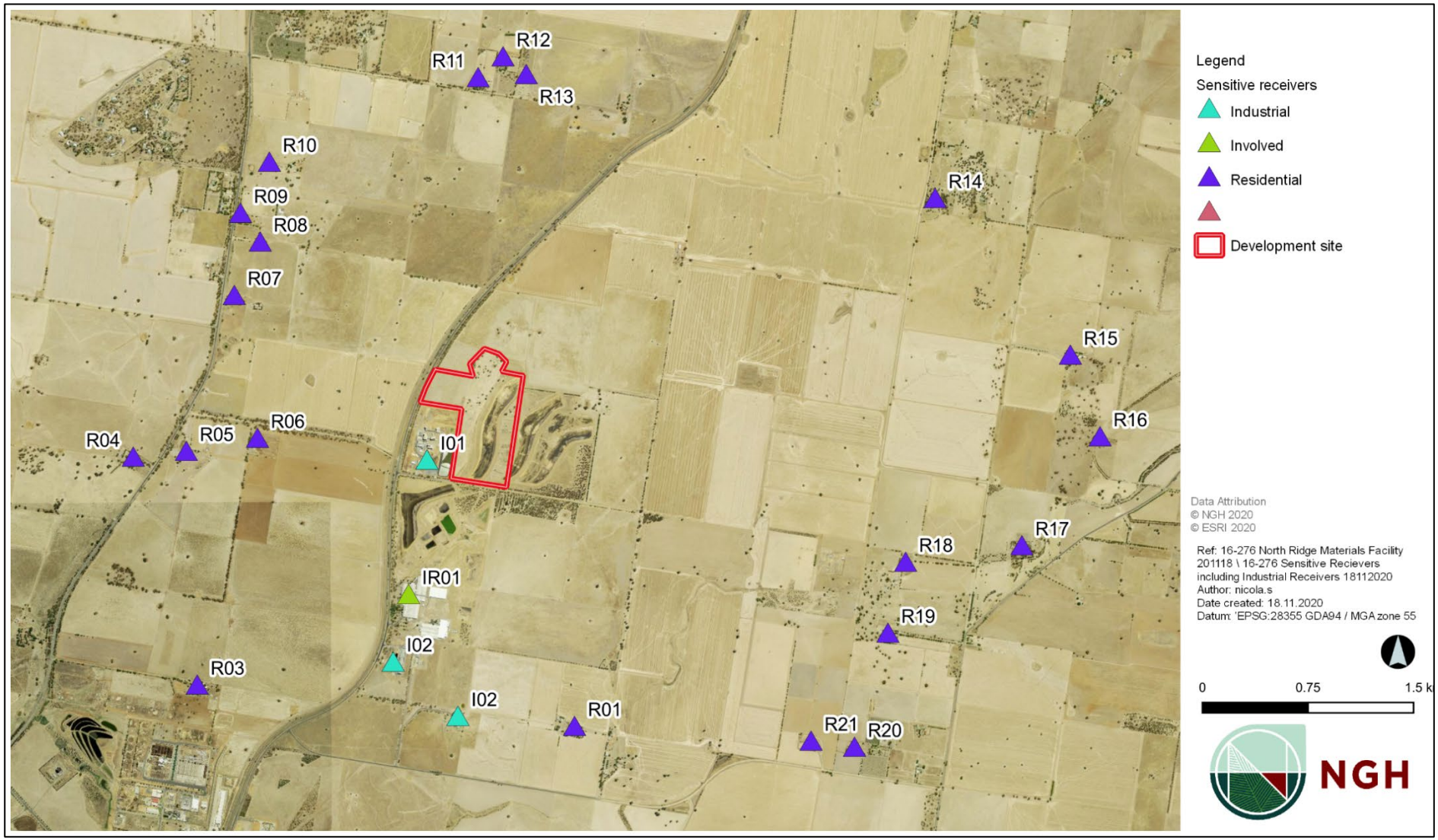

Figure 1 Sensitive receivers including residential receivers, industrial receivers (I02 includes facility and administration building (old R02) and the involved industrial receiver.

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Appendix 3 Noise and Vibration Impact Assessment

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Northridge Waste Disposal Facility

Riverina Warehousing Solutions at the Northridge Unit Trust

Construction and Operational Noise & Vibration Assessment

F0 | V1

15 March 2021

Document history and status

Revision	Date	Description	By	Review	Approved
D0v0	14/08/2017	First draft	R Sim	L Spencer	L Spencer
D0v1	12/10/2017	Address comments from PM	R Sim	L Spencer	L Spencer
F0v0	04/06/2018	Final following EIS author review	R Sim	L Spencer	L Spencer
F0v1	21/01/2021	Final to address EPA comments	L Spencer	M Baron	M Baron

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Northridge Waste Disposal Facility

Project No:	IA155100.2
Document Title:	Construction and Operational Noise & Vibration Assessment
Document No.:	F0
Revision:	V1
Date:	15 March 2021
Client Name:	Riverina Warehousing Solutions at the Northridge Unit Trust
Project Manager:	Luke Spencer
Author:	Raymond Sim
File Name:	F:\Work\LSpencer\NGH Environmental\2021_Var\Northridge WDF_NVIA Report_F0v1.docx

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Executive Summary

As part of satisfying the requirements for assessment detailed in the *Secretary's Environmental Assessment Requirements* (SEARs) (No. 1062 issued July 2016), Jacobs was engaged to review potential construction and operational noise impacts associated with the proposed Northridge waste disposal facility. This assessment was undertaken to satisfy these requirements, as well as relevant guidance from applicable statutes and policies.

Construction noise & vibration

Construction noise levels are predicted to be within allowable noise management levels at surrounding residential receivers and nearby industrial premises. Based on these findings, it was concluded that residential receivers around the facility were unlikely to be adversely affected by noise during construction. Although the construction noise impacts are predicted to comply with the noise management levels, the contractor should implement standard best practice noise management measures where feasible and reasonable. This would ensure that construction activities are below the noise management levels under all circumstances.

Road traffic noise impacts due to construction of the facility has been predicted to not increase the existing road traffic noise at surrounding residential receivers by not more than 2 dB(A) and therefore, complies with the RNP noise criteria.

Vibration arising during construction was assessed to be below structural cosmetic damage and human comfort criteria at surrounding residential receivers owing to the large separation distances between the project site and receivers. However, the adjoining industrial premises would potentially be affected by the use of large vibratory roller/compactor and hydraulic hammer. Therefore, it is recommended that smaller equipment be used to ensure vibration levels at the adjoining industrial premises are within the vibration criteria.

Operational noise

Predicted noise levels during normal operation of the facility show that that there will be minimal noise impacts on all surrounding residential receivers. Best practice noise management and mitigation measures have been recommended in this report to ensure that noise resulting from operational activities within the facility achieve the operational noise criteria.

Road traffic noise impacts due to the operations of the facility at surrounding residential receivers were predicted to be less than 2.1 dB(A) and therefore, compliant with the RNP noise criteria.

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1. Introduction

Jacobs Group (Australia) Pty Ltd (Jacobs) has been commissioned to undertake noise and vibration impact assessment for the construction and operations of the proposed waste disposal facility. Noise and vibration associated with the construction and operations have been identified as key issues, and are the subject of this report.

Riverina Warehousing Solutions at The Northridge Unit Trust (RWS) are planning to develop a solid waste disposal facility at Lots 223 and 299 Trahairs Road in Bomen, NSW. NGH Environmental has been engaged to prepare an Environmental Impact Statement (EIS) for the development application. The *Secretary's Environmental Assessment Requirements* (SEARs) (No. 1062 issued July 2016) issued for the proposal require the assessment of key environmental matters associated with the proposal.

The operational noise assessment has been prepared with reference to the Australian Standard AS 1055:197 *Description and Measurement of Environmental Noise* Parts 1, 2 and 3 and in accordance with the Environmental Protection Authority's (EPA) *Noise Policy for Industry* (NPI). The assessment of construction noise and road traffic noise is prepared with reference to EPA's *Interim Construction Noise Guideline* (ICNG) and *Road Noise Policy* (RNP).

The relevant requirements for the assessment of the construction and operational noise and vibration from the SEARs have been reproduced below.

> *Noise and vibration – including:*
>
> - *a description of all potential noise and vibration sources during construction and operation, including road traffic noise;*
> - *a noise and vibration assessment in accordance with the relevant Environment Protection Authority Guidelines; and*
> - *a description and appraisal of noise and vibration mitigation and monitoring measures.*

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2. Project setting

2.1 Project site location

The proposal area is described as Lot 11 DP 1130519 and Lot 2 DP 590756, 223 and 299 Trahairs Road, Bomen. The facility would be around 16.5 hectares in area and is approximately 9.5 km north east of central Wagga Wagga (Figure 2.1).

The land adjacent the site is currently used for cropping and grazing. There are a number of scattered dwellings in the area, with the nearest residential receivers being about 1.4 km to the west. The ROBE industrial facility is 200 metres to the west of the proposed site.

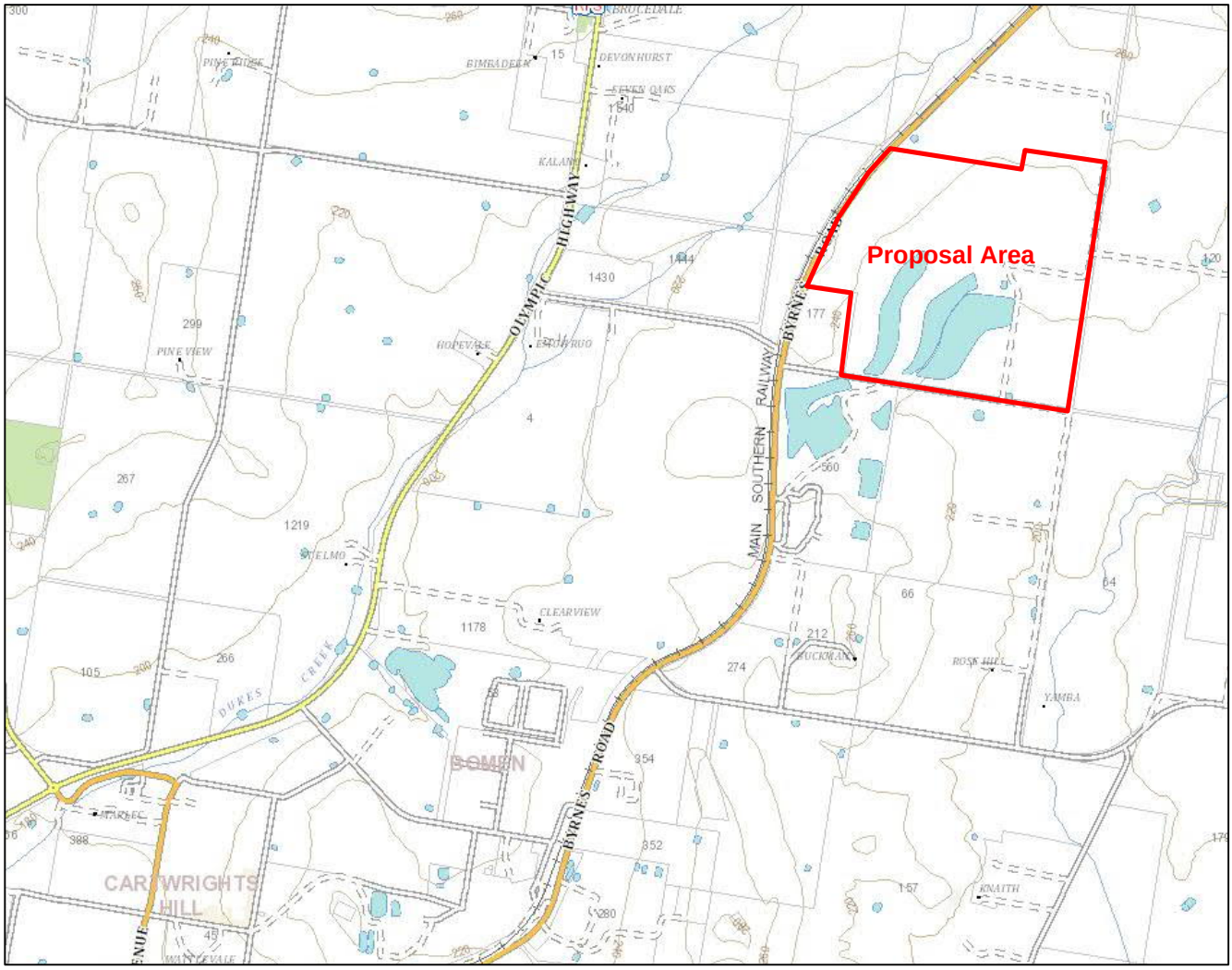

Figure 2.1 : Project site location

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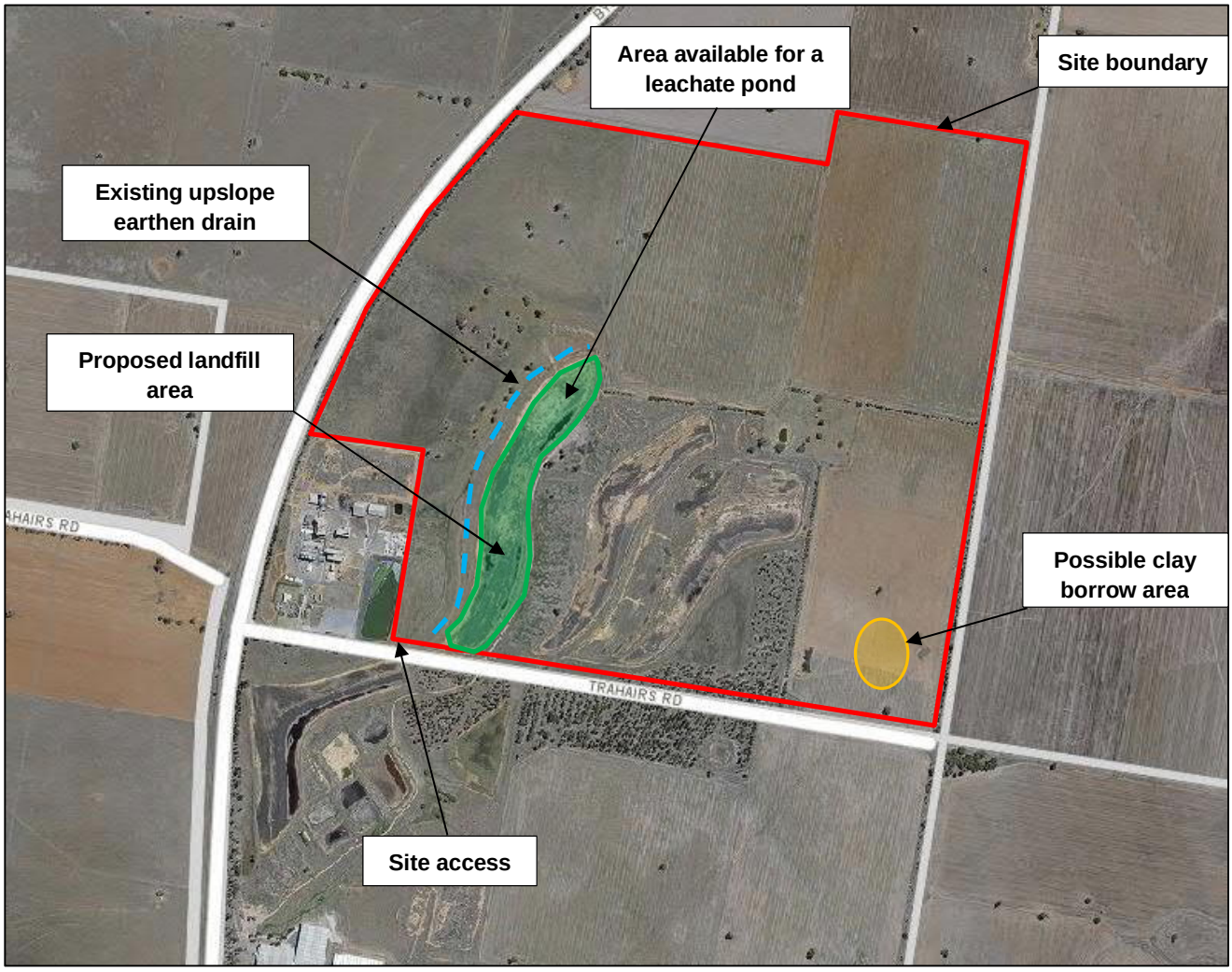

Figure 2.2 : Aerial view of the proposal area

2.2 Proposed development

2.2.1 Description

The proposed development involves using the western existing effluent evaporation pond for disposal of General Solid Waste (non-putrescible) and would include:

- Creation of a waste cell comprised of 6 discrete sub-cells within the existing western evaporation pond.
- Lining of each sub- cells with an impermeable clay liner, HDPE liner, and free-draining aggregate layer.
- Construction of a piped drainage system to collect and drain leachate from the waste cell.
- Construction of a lined leachate storage and evaporation pond.
- Construction of internal access roads.
- Placing of a transportable office and amenities block on site.
- Reshaping of existing upslope earthen drains to prevent overland stormwater flows reaching the waste cell.
- Possible installation of a weighbridge in the future.

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2.2.2 Accepted waste types and quantities

It is envisaged that most waste received on site would be from the Visy paper mill located at Tumut. Waste streams from Visy would include:

- Compactor plastics – light mixed plastics.
- Grapple Materials – heavy plastics, some metals, rubber and fibre.
- Glass material – glass, ceramics and stone chips.
- Fines/sand – with a small amount of fibre.
- Flotsam – wire, rope, plastics, metal and some fibre.
- Carbonates – mix of sodium and calcium carbonates, lime and a small amount of unburnt organics.
- Power boiler fly ash – boiler wood ash, inorganics.
- Power boiler sand – with some metals and small rocks.

The dregs and grits and power boiler sand would be used as landfill cover material.

Glass waste from Kurrajong Recyclers at Wagga Wagga would be disposed of at the site and would include:

- Crushed glass,
- Some limited electrical wire contamination

Screened building and demolition waste including:

- Broken concrete, brick and other rubble,
- Soil (uncontaminated)
- Road millings
- Timber
- Plaster board
- Compressed cement sheet.

The western pond has an existing footprint of about 86,700 square metres, and an existing depth of about two metres with a 0.5 m freeboard. The proposed waste cell would have a footprint of 77,600 square metres with a finished waste cell depth of about 8 metres and a finished height about 6 metres above the existing pond surface. The waste cell would hold approximately 630,000 cubic metres of waste. The facility would have a life span of approximately nine years.

It is estimated that the facility would receive about 60,000 tonnes or 67,000 m^3 in its first year and grow at about 1.5 % annually. Approximate predicted annual receivables would be:

- 67,514 m^3 in year one.
- 68,054 m^3 in year two.
- 69,075 m^3 in year three.
- 70,111 m^3 in year four.
- 71,162 m^3 in year five.
- 72,230 m^3 in year six.
- 73,313 m^3 in year seven.
- 74,413 m^3 in year eight.
- 75,529 m^3 in year nine.

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2.3 Operational hours

It is understood that the Northridge Waste Disposal facility will operate from Monday to Saturday during standard daytime hours (i.e. 7 am to 6 pm Monday to Friday and 8 am to 1 pm on Saturdays).

2.4 Surrounding receivers and designated land uses

The proposal is set within a semi-rural location on the outskirts of the township of Bomen, NSW. There are several residential receivers located within the vicinity of the proposal with the nearest located approximately 1.4 kilometres from the perimeter of the proposed site. Nearby residential receivers are generally located in all directions from the proposal with the nearest receivers to the south set along East Bomen Road; to the west off Trahairs Road and the Olympic Highway; to the north along Mary Gilmore Road; and to the east off Pattersons Road and Shepherds Siding Road. The nearest receivers in relation to the proposal are displayed below in Figure 2.3, with their approximate coordinates and distance from the perimeter of the site listed in Table 2.1.

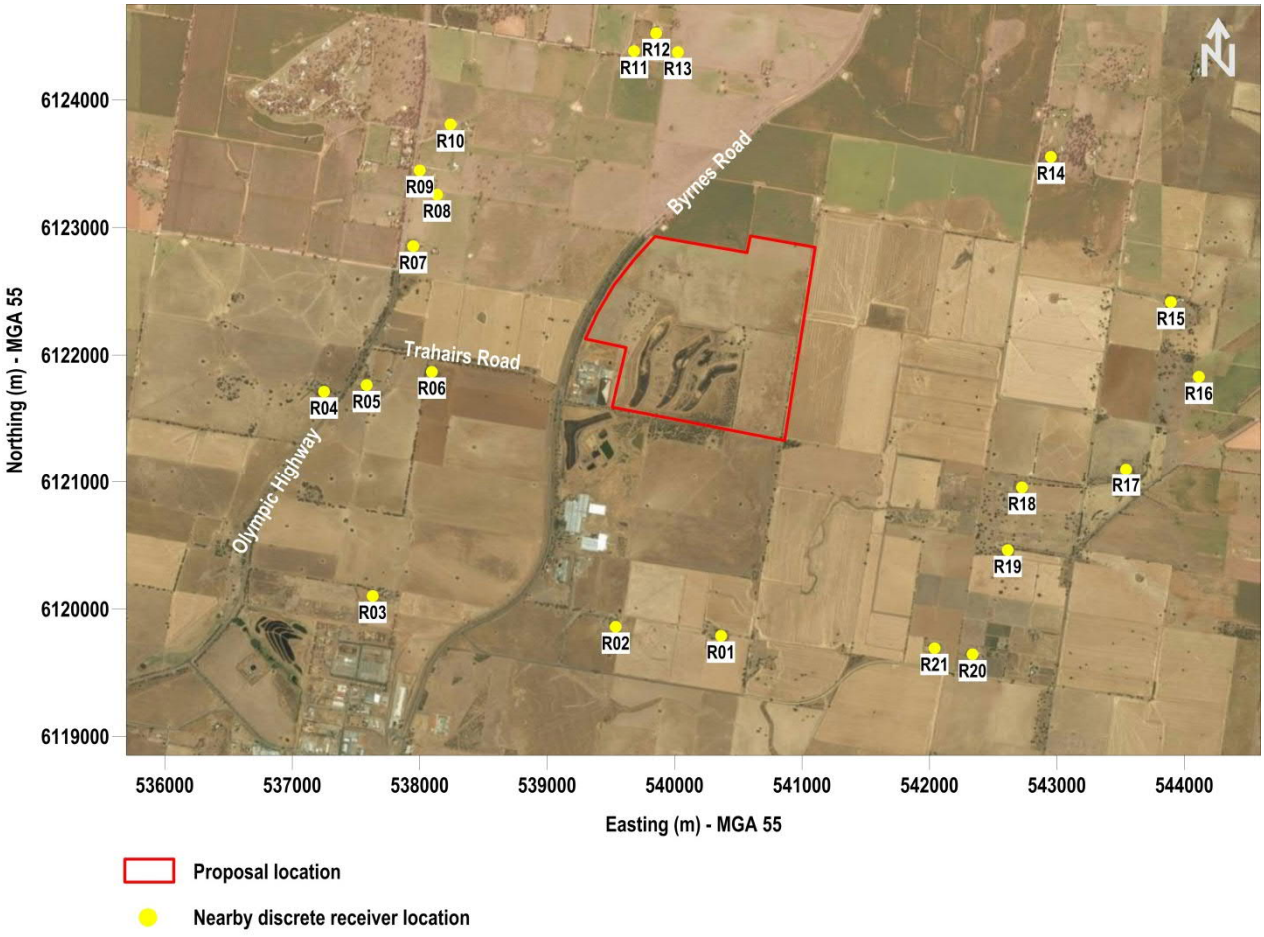

Figure 2.3 : Surrounding receivers and local terrain (Imagery source: Esri)

Table 2.1 : Details of nearby receivers

Receiver ID	X coordinate (metres UTM – MGA 56)	Y coordinate (m UTM – MGA 56)	Receiver type	Approximate distance from proposal (metres)
R01	540363.4	6119791	Residential	1600 metres
R02	539537.9	6119861	Residential	1600 metres
R03	537630.5	6120102	Residential	2300 metres
R04	537248.4	6121714	Residential	2250 metres

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Receiver ID	X coordinate (metres UTM – MGA 56)	Y coordinate (m UTM – MGA 56)	Receiver type	Approximate distance from proposal (metres)
R05	537583.3	6121765	Residential	1900 metres
R06	538095.2	6121871	Residential	1400 metres
R07	537949.0	6122854	Residential	1500 metres
R08	538135.7	6123258	Residential	1500 metres
R09	538001.6	6123449	Residential	1700 metres
R10	538241.4	6123808	Residential	1700 metres
R11	539683.3	6124382	Residential	1400 metres
R12	539855.5	6124524	Residential	1600 metres
R13	540025.1	6124375	Residential	1400 metres
R14	542953.5	6123555	Residential	2300 metres
R15	543893.5	6122416	Residential	2900 metres
R16	544113.4	6121830	Residential	3100 metres
R17	543543.1	6121103	Residential	2700 metres
R18	542726.6	6120956	Residential	1900 metres
R19	542614.2	6120463	Residential	1950 metres
R20	542338.6	6119645	Residential	2250 metres
R21	542038.7	6119694	Residential	2000 metres
I01	539507.0	6121852	Industrial	20 metres
I02	539291.8	6120895	Industrial	700 metres

Designated land uses around the proposal were identified based zoning specified in the Local Environmental Plan. This was accessed using the Planning Portal provided by the NSW Department of Planning and Environment (available at https://www.planningportal.nsw.gov.au/find-a-property/property/). As displayed below, the land immediately surrounding the proposal site is zoned for industrial purposes, with lands designated for rural uses further from the site.

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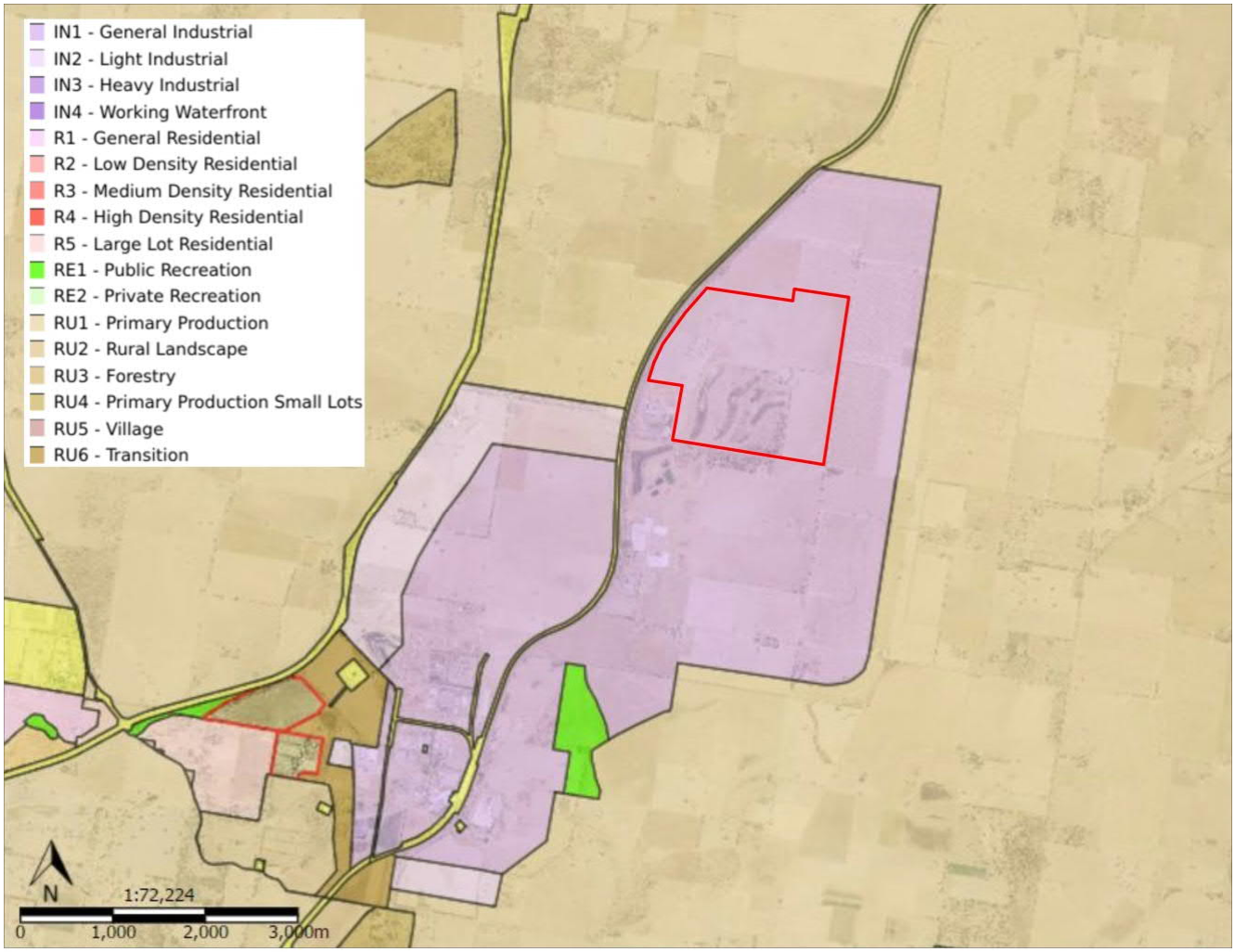

Figure 2.4 : Land use zoning

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3. Impact assessment procedures

3.1 Operational Noise

3.1.1 Noise Policy for Industry

Responsibility for the control of noise emission in New South Wales is vested in Local Government and the NSW EPA. The NPI was released in 2017 and provides a framework and process for deriving noise criteria for consents and licences that will enable the EPA to regulate premises that are scheduled under the Protection of the Environment Operations Act, 1997.

The specific policy objectives are:

- provide the noise levels that are used to assess both change in noise level and long-term noise levels
- provide a clear and consistent framework for assessing environmental noise impacts from industrial premises and industrial development proposals
- promote the use of best-practice noise mitigation measures that are feasible and reasonable where potential impacts have been identified
- support a process to guide the determination of achievable noise limits for planning approvals and/or licences, taking into account the matters that must be considered under the relevant legislation (such as the economic and social benefits and impacts of industrial development).

Implementation is achieved by ensuring that:

- Noise from any single source does not intrude greatly above the prevailing background noise level. This is known as the intrusive noise criterion.
- The background noise level does not exceed the level appropriate for the particular locality and land use. This is known as the amenity criterion.

In order to satisfy the above two requirements, Intrusive and Amenity noise criteria are determined of which the lower is adopted as the Project specific noise level.

3.1.2 Assessing Intrusiveness

For assessing intrusiveness, the background noise generally needs to be measured. The intrusiveness criterion essentially means that the equivalent continuous noise level (L_{Aeq}) over any 15-minute period, of the source should not be more than 5 dB(A) above the measured Rated Background Level (L_{A90}). It is noted that the NPI defines the following minimum RBL values for day, evening and night time periods: 35, 30 and 30 dB(A) respectively.

3.1.3 Assessing Amenity

The amenity criterion is based on land use and associated activities (and their sensitivity to noise emission). The cumulative effect of noise from industrial sources needs to be considered in assessing the impact. The criteria relate only to other industrial-type noise sources and do not include road, rail or community noise. The existing noise level from industry is measured. If it approaches the criterion, then noise levels from new industrial-type noise sources, (including air-conditioning plant) need to be designed so that the cumulative effect does not produce total noise levels that would significantly exceed the criterion. For areas of high road traffic, there are further considerations that influence the selection of the noise criterion.

An extract from the NPI that relates to the amenity criteria is presented in Table 3.1. Section 2.4 of the NPI advises that the applicable amenity criteria constitutes as the representative value from Table 3.1 less 5 dB(A).

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Table 3.1 : Amenity guidance criteria - Recommended LAeq noise levels from industrial noise sources

Type of Receiver	Indicative Amenity Area	Time of Day	Recommended L_{Aeq} Noise Level, dB(A)
Residence	Rural	Day	50
		Evening	45
		Night	40
	Suburban	Day	55
		Evening	45
		Night	40
	Urban	Day	60
		Evening	50
		Night	50
Hotels, motels, caretakers' quarters, holiday accommodation, permanent resident caravan parks	See column 4	See column 4	5 dB(A) above the recommended amenity noise level for a residence for the relevant noise amenity area and time of day
School classroom – internal	All	Noisiest 1 period	35
Hospital wards	All	Noisiest 1 period	
- internal			35
- external			50
Places of worship - internal	All	When in use	40
Area specifically reserved for passive recreation (eg National Park)	All	When in use	50
Active recreation area (eg school playground, golf course)	All	When in use	55
Commercial premises	All	When in use	65
Industrial premises	All	When in use	70
Industrial interface (applicable only to residential noise amenity areas)	All	All	Add 5 dB(A) to recommended noise amenity area

Note: Daytime 7.00 am – 6.00 pm,; Evening 6.00 pm – 10.00 pm; Night-time 10.00 pm – 7.00 am. On Sunday and Public Holidays, Daytime 8.00 am – 6.00 pm; Evening 6.00 pm – 10.00 pm; Night-time 10.00 pm – 8.00 am.

The LAeq index corresponds to the level of noise equivalent to the energy average of noise level occurring over a measurement period.

Based on the nature of the surrounding receiving environment and the guidance above, the following amenity noise levels (ANLs) were developed. A +3 dB(A) adjustment was also applied consistent with Section 2.2 of the NPI to correct for the 15-minute assessment period considered.

Table 3.2 : Modification to Acceptable Noise Level (ANL)* to account for existing levels of industrial noise

Period	Amenity noise level $L_{Aeq\ 15\ minute}$ dB(A)
Day	50 – 5 + 3 = 48
Evening	45 – 5 + 3 = 43
Night	40 – 5 + 3 = 38

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3.2 Construction noise

The EPA has prepared an interim guideline covering construction noise. The ICNG sets out noise management levels applicable to construction site noise for the purpose of defining intrusive noise impacts.

Table 3.3 sets out the noise management levels and how they are to be applied. The approach is intended to provide respite for residents exposed to excessive construction noise outside the recommended standard hours whilst allowing construction during the recommended standard hours without undue constraints.

Table 3.3 : ICNG construction noise management levels

Time of day	Management level	How to apply
Recommended standard hours: Monday to Friday 7:00 am to 6:00 pm Saturday 8:00 am to 6:00 pm No work on Sundays and public holidays	Noise affected RBL + 10 dB(A)	The noise affected level represents the point above which there may be some community reaction to noise. • Where the predicted or measured $L_{Aeq(15mins)}$ is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to minimise noise. • The proponent should also inform all potentially impacted residences of the nature of the works to be carried out, the expected noise levels and duration, as well as contact details.
	Highly noise affected 75 dB(A)	The highly affected noise level represents the point above which there may be strong community reaction to noise. • Where noise is above this level, the proponent should consider very carefully if there is any other feasible and reasonable way to reduce noise below this level. • If no quieter work method is feasible and reasonable, and the works proceed, the proponent should communicate with the impacted residents by clearly explaining the duration and noise levels of the works, and by describing any respite periods that will be provided.
Outside recommended standard hours	Noise affected RBL + 5 dB(A)	• A strong justification would typically be required for works outside the recommended standard hours. • The proponent should apply all feasible and reasonable work practices to meet the noise affected level. • Where all feasible and reasonable practices have been applied and noise is more than 5 dB(A) above the noise affected level, the proponent should negotiate with the community.

With respect to construction noise impacts at commercial and industrial premises, the ICNG states the following:

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Due to the broad range of sensitivities that commercial or industrial land can have to noise from construction, the process of defining management levels is separated into three categories. The external noise levels should be assessed at the most-affected occupied point of the premises:

- *Industrial premises: external $L_{Aeq(15,min)}$ 75 dB(A)*
- *Offices, retail outlets: external $L_{Aeq(15min)}$ 70 dB(A)*
- *Other businesses that may be very sensitive to noise, where the noise level is project specific as discussed below*

The proponent should undertake a special investigation to determine suitable noise levels on a project-by-project basis; the recommended 'maximum' internal noise levels in AS 2107 Acoustics – Recommended design sound levels and reverberation times for building interiors may assist in determining relevant noise levels.

3.3 Road traffic noise

The EPA released the *Road Noise Policy* (RNP) in March 2011, which sets out noise criteria for the purpose of defining road traffic noise impacts. The relevant road traffic noise criteria for construction and operation of the project are identified in Section 6.3 of this report.

3.4 Construction and operation vibration

German Standard DIN 4150-3 1999 "*Structure Vibration Part 3: Effects of Vibration on Structures*" provides guideline criteria for evaluating the short and long-term effects of vibration on structures. In addition, EPA has released a guideline "*Assessing vibration: a technical guideline*" dated February 206, which provides guideline for building vibration levels associated with a low probability of annoyance from occupants. Relevant vibration criteria are identified in Section 0 of this report.

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4. Existing acoustical environment

Baseline noise survey of the surrounding area was conducted by SLR Consulting in December 2015 at three nearby residential receiver locations. The noise surveys conducted by SLR Consulting were for a proposed business park development which is approximately 720 metres south-west of the project site. As the noise survey was only conducted less than 2 years ago, the surveyed data is still considered to be valid, and was subsequently used in this assessment.

The baseline noise surveys were conducted at the following three residential locations:

- 46 Trahairs Road (receiver R03);
- 1365 Olympic Highway (receiver R06); and
- 1206 Olympic Highway (receiver R04).

The noise monitoring locations relating to the residential receiver locations are indicated in Figure 2.3 above. The baseline noise survey results are presented Table 4.1 below:

Table 4.1 : Summary of baseline noise monitoring results, (SLR, 2015)

Monitoring location	NPI assessment period	Rating background level $L_{A90(15mins)}$ – dB(A)	Ambient noise level $L_{Aeq(period)}$ – dB(A)
45 Trahairs Road (Receiver R03)	Day (7:00 am – 6:00 pm)	32	53
	Evening (6:00 pm – 10:00 pm)	31	55
	Night-time (10:00 pm – 7:00 am)	29	48
1206 Olympic Highway (Receiver R04)	Day (7:00 am – 6:00 pm)	37	56
	Evening (6:00 pm – 10:00 pm)	32	56
	Night-time (10:00 pm – 7:00 am)	30	56
1365 Olympic Highway (Receiver R06)	Day (7:00 am – 6:00 pm)	36	52
	Evening (6:00 pm – 10:00 pm)	36	50
	Night-time (10:00 pm – 7:00 am)	34	50

These noise monitoring locations are considered to be representative of noise conditions at surrounding receivers within the proximity of the project site.

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5. Effects of meteorology on noise levels

5.1 Wind effects

Wind has the potential to increase noise at a receiver when it is light and stable and blows from the direction of the source of the noise. As the strength of the wind increases the noise produced by the wind will obscure noise from most industrial and transport sources.

Wind effects used to be considered when wind is a feature of the area under consideration (in accordance with the NPI). Where wind blows from the source to the receiver at speeds up to 3 m/s for more than 30% of the time during and period of the day (i.e. day, evening and night) in any season, then wind is considered to be a feature of the area and noise level predictions must be made under these conditions.

In order to determine the prevailing conditions for the subject site, 36 months of weather data between 2014 and 2016) was obtained from the Bureau of Meteorology automatic weather station at Wagga Wagga, which is approximately 12.5 kilometres south of the project site. Data collected during day time hours (i.e. when the facility would be operated) were analysed using the Noise Enhancement Wind Analysis (NEWA) program with the results presented below in **Table 5.1**.

Table 5.1 : Review of significance of noise enhancing winds during operations (day time hours)

Period	Receiver	Percentage of winds speeds < 3.0 m/s and in the direction of the receiver (plus or minus 45 degrees), day time hours											
		2014				2015				2016			
		Summer	Autumn	Winter	Spring	Summer	Autumn	Winter	Spring	Summer	Autumn	Winter	Spring
Day	R01	7.9	7.4	8.3	8.0	7.9	8.3	12.4	11.1	8.4	12.0	12.4	8.1
	R02	7.6	8.9	6.7	8.1	8.8	7.9	10.5	12.3	9.1	12.7	11.8	7.0
	R03	11.7	22.2	22.0	16.1	14.4	17.6	20.8	17.9	11.2	18.7	20.4	11.3
	R04	9.6	22.1	21.6	14.4	11.8	17.3	19.9	15.4	9.9	15.9	19.7	7.7
	R05	9.7	22.4	22.1	14.8	11.9	17.3	20.0	15.3	9.9	15.8	19.5	7.4
	R06	9.9	21.8	22.0	14.3	11.5	16.9	20.0	15.1	10.2	14.6	19.2	7.1
	R07	5.3	22.5	17.9	12.3	8.3	13.7	19.1	10.6	8.7	12.3	16.4	7.1
	R08	4.3	18.0	14.1	8.3	8.5	10.0	16.5	8.8	7.1	10.9	13.6	5.8
	R09	4.0	17.4	13.9	8.0	8.6	9.7	15.5	8.1	7.1	10.7	13.3	5.6
	R10	2.5	12.0	8.6	4.9	5.1	6.3	9.9	4.4	4.7	7.3	8.2	3.2
	R11	2.0	6.4	7.5	3.5	4.6	3.5	5.7	3.6	3.9	3.5	5.1	2.6
	R12	2.0	6.2	7.5	3.9	4.7	4.0	5.9	3.9	3.8	3.5	4.9	3.1
	R13	2.3	6.2	7.7	4.5	4.6	3.9	6.1	4.3	3.8	3.4	4.6	3.5
	R14	3.1	6.9	10.5	5.8	3.9	5.7	9.9	6.9	4.6	7.3	8.0	5.2
	R15	3.8	6.5	12.7	7.4	5.4	6.3	11.9	7.6	4.6	9.0	9.0	6.7
	R16	3.6	6.5	12.1	8.2	6.0	7.1	13.1	8.2	4.9	8.8	9.6	7.8
	R17	3.4	6.7	13.8	7.5	6.2	8.5	13.9	9.4	6.4	10.5	11.7	8.8
	R18	4.2	7.5	14.6	7.7	5.8	8.9	14.2	10.4	6.1	11.2	11.9	9.7
	R19	4.1	7.1	14.3	8.3	6.3	8.7	14.7	10.9	7.0	13.0	12.0	11.2

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Period	Receiver	Percentage of winds speeds < 3.0 m/s and in the direction of the receiver (plus or minus 45 degrees), day time hours											
		2014				2015				2016			
		Summer	Autumn	Winter	Spring	Summer	Autumn	Winter	Spring	Summer	Autumn	Winter	Spring
	R20	6.1	8.0	11.9	8.4	7.4	8.2	14.4	10.6	8.5	12.5	14.5	10.9
	R21	6.3	7.8	11.9	8.3	7.2	8.2	14.2	10.8	8.5	12.3	14.0	10.9
	I01	4.8	20.7	16.0	11.5	8.2	12.3	18.5	10.1	7.8	11.4	15.5	6.7
	I02	10.7	12.5	11.5	10.9	11.6	11.3	12.3	13.9	10.5	13.7	12.8	8.0

These results indicate that day time noise-enhancing wind conditions are not significant at any of the surrounding receivers since the frequency of occurrence of winds up to 3 m/s from the 2014, 2015 and 2016 measured data were below the 30% threshold. Hence, prevailing winds have not been considered as part of this noise assessment.

5.2 Temperature inversions

Temperature inversions, when they occur, have the ability to increase noise levels by focusing sound waves. Temperature inversions occur predominantly at night during the winter months. For a temperature inversion to be a significant characteristic of the area it needs to occur for approximately 30% of the total night-time during winter, or about two nights per week. As the facility will not operate during the night-time period the impact of noise during a temperature inversion has not been considered as part of this assessment.

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6. Project specific criteria

6.1 Construction noise management levels

It is understood that construction of the proposal will only be conducted during the ICNG standard hours of construction which is Monday to Friday between 7:00 am and 6:00 pm, and Saturdays between 8:00 am and 1:00 pm. The construction noise management levels for surrounding residential receivers, which have been determined from the measured background noise levels (with adjustments made as applicable in line with Section 2.3 of the NPI), are presented in Table 6.1.

Table 6.1 : Project specific construction noise management levels

Residence	NML for Standard hours of construction	
	Noise affected – dB(A)	Highly noise affected – dB(A)
R01 to R03, R11 to R21	45	75
R04 to R05 and R07 to R10	47	75
R06	46	75
I01 and I02	75	-

6.2 Operational noise criteria

The noise emission design criteria for the project have been established with reference to the NPI outlined in Section 3.1 of this report. In accordance with the NPI, the project specific noise levels reflect the most stringent noise level requirements from the noise levels derived from both the intrusive and amenity criteria. Applying the most stringent requirement as the project specific noise levels ensures that both intrusive noise is limited and amenity is protected.

The resulting operational project specific noise criteria for residences R01 to R21 will be based on the L_{A90} and L_{Aeq} noise levels measured at the three monitoring locations. The noise environment at R03 is assumed to be representative of the noise environments at residences R01, R02 and R11 to R21. The noise environment at R04 is assumed to be representative of the noise environments at residences R04, R05 and R07 to R10. And the noise environment at R06 is assumed to be representative of the noise environments at R06.

The resulting operational project specific noise criteria for the project are shown in Table 6.2.

Table 6.2 : Project specific operational noise criteria

Residence	Period	Measured background noise level (L_{A90}) – dB(A)	Intrusiveness criteria $L_{Aeq(15min)}$ – dB(A)	Amenity criteria $L_{Aeq(period)}$ – dB(A)	Project specific noise criteria – dB(A)
R01 to R03, R11 to R21	Day	35*	40	48	**40**
	Evening	31	36	43	**36**
	Night	30*	35	38	**35**
R04 to R05 and R07 to R10	Day	37	42	48	**42**
	Evening	32	37	43	**37**
	Night	30	35	38	**35**
R06	Day	36	41	48	**41**
	Evening	36	41	43	**41**

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Residence	Period	Measured background noise level (L_{A90}) – dB(A)	Intrusiveness criteria $L_{Aeq(15min)}$ – dB(A)	Amenity criteria $L_{Aeq(period)}$ – dB(A)	Project specific noise criteria – dB(A)
	Night	34	39	38	**38**
I01 and I02	When in use	-	-	-	**68**

*NOTE *: The rating background level has been set to 35 in the day and 30 dB(A) in the evening and night as per the minimum values in Section 2.3 of the NPI*

6.3 Road traffic noise criteria

Road traffic noise impacts due to the construction and operations of the proposal will be assessed against the EPA's *NSW Road Noise Policy* (RNP).

Application notes for the RNP state the following (http://www.epa.nsw.gov.au/noise/roadnoiseappnotes.htm):

> *'…for existing residences and other sensitive land uses affected by additional traffic on existing roads generated by land use developments, any increase in the total traffic noise level as a result of the development should be limited to 2 dB above that of the noise level without the development. This limit applies wherever the noise level without the development is within 2 dB of, or exceeds, the relevant day or night noise assessment criterion.'*

The relevant day ($L_{AEq\ 15\ hour}$) and night time ($L_{AEq\ 9\ hour}$) impact assessment criterion referred to above for residential receivers are 60 and 55 dB(A) respectively.

6.4 Vibration criteria

Vibration criteria to ensure the preservation of human comfort

Vibration from construction activities should comply with the EPA vibration guideline and AS2670.2 (DEC 2006). The NSW EPA classifies vibration as one of three types:

- Continuous – Where vibration occurs uninterrupted and can include sources such as machinery and constant road traffic;
- Impulsive – Where vibration occurs over a short duration (typically less than 2 seconds) and occurs less than three times during the assessment period, which is not defined. This may include activities such as occasional dropping of heavy equipment or loading / unloading activities;
- Intermittent – Occurs where continuous vibration activities are regularly interrupted, or where impulsive activities recur. This may include activities such as rock hammering, drilling, pile driving and heavy vehicle or train pass-bys.

Maximum and preferred values for continuous and impulsive vibration are defined in Table 6.3. Application of the criteria considers the level as well as the duration of exposure and the time of day, and similar to the noise criteria, also has separate values for residential and non-residential receivers.

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Table 6.3 : Preferred and maximum weighted Roads and Maritime values for continuous and impulsive vibration acceleration (m/s2) 1-80 Hz

Location	Assessment period	Preferred values		Maximum values	
		z-axis	x and y axis	z-axis	x and y axis
Continuous vibration					
Residences	Daytime	0.010	0.0071	0.020	0.014
	Night-time	0.007	0.005	0.014	0.010
Industrial Premises / Workshops	Day or night time	0.04	0.029	0.080	0.058
Impulsive vibration					
Residences	Daytime	0.30	0.21	0.60	0.42
	Night-time	0.10	0.071	0.20	0.14
Industrial Premises / Workshops	Day or night time	0.64	0.46	1.28	0.92

1. Daytime is 7.00am to 10.00pm and night-time is 10.00pm to 7.00am.

Intermittent vibration impact may be present when continuous vibration sources operate sporadically throughout the assessment period. This type of impact is assessed using vibration dose values (VDVs). The VDV method is more sensitive to peaks in the acceleration waveform and makes corrections to the criteria based on the duration of the source's operation. The VDV is calculated using the overall weighted Roads and Maritime acceleration of the vibrating source in each orthogonal axis and the duration which the vibration occurs. Preferred and maximum VDVs are defined in DECC (2006) and are reproduced in Table 6.4.

Table 6.4 : Acceptable vibration dose values for intermittent vibration (ms-1.75)

Locations	Daytime (7.00am – 10.00pm)		Night-time (10.00pm – 7.00am)	
	Preferred values	Maximum values	Preferred values	Maximum values
Residences	0.20	0.40	0.13	0.26
Industrial Premises / Workshops	0.80	1.60	0.80	1.60

1. Includes operating theatres, precision laboratories and other areas where vibration sensitive activities may occur.

Vibration criteria to ensure prevention of structural damage

The OEH vibration guideline does not address the potential for damage to structures. Instead, the Australian Standard AS2187.2-2006 Explosives – Storage, Transport and Use provides guidance for the assessment of structural damage to buildings caused by vibration. This section of the standard is based on the British Standard 7385: Part 2 Evaluation and measurement of vibration in buildings and is used as a guide to assess the likelihood of building damage from ground vibration including piling, compaction, construction equipment and road and rail traffic. The standard recommends levels at which 'cosmetic', 'minor' and 'major' categories of damage might occur based on the type of structure affected.

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The standard uses the peak particle velocity (PPV) parameter to quantify vibration and specifies damage criteria for frequencies within the 4 Hz to 250 Hz range for buildings. The criteria levels identified in the standard are outlined in Table 6.5.

Table 6.5 : BS 7385 Structural damage criteria

Group	Type of structure	Peak particle velocity (PPV) - mm/s		
		4Hz to 15Hz	15Hz to 40Hz	40Hz and above
1	Reinforced or framed structures Industrial and heavy commercial buildings	50		
2	Un-reinforced or light framed structures Residential or light commercial type buildings	15 to 20	20 to 50	50

The levels for structural damage outlined in the standard refer to non-continuous vibration sources and are considered ‘safe limits’ up to which no damage due to vibration effects are expected to occur for the various building types. Where vibration is continuous these levels may be reduced by up to 50 per cent and additional assessment against the standard would be necessary.

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7. Noise impact assessment

7.1 Construction noise assessment

The construction of the site is predicted to take approximately 3 months (approximately 12 weeks), and will predominantly include the preparation of the first cell, development of the new leachate pond, development of a new internal haulage circuit across the site, upgrade works to Trahairs Road and the site entry, new concrete pad for unloading and emplacement of received materials and establishment of site facilities for use during operations.

Construction will only be conducted during the ICNG recommended standard hours, i.e. Monday to Friday 7 am to 6 pm and Saturday 8 am to 1 pm. No construction work will be conducted during evening or night-time periods, or on Sundays or Public Holidays.

7.1.1 Construction equipment

The sound power levels of the major noise generating plant and equipment expected to be used during construction are presented in Table 7.1. Sound power levels of acoustically significant plant and equipment have been obtained from Jacobs database of similar plant and equipment.

Table 7.1 : Acoustically significant construction plant / equipment sound power levels

Construction scenario	Plant / equipment	Individual plant L_{Aeq} Sound Power Level – dB(A)
Scenario 1: Access road and hard stand area	Excavator (30 tonne)	108
	Scraper	105
	Front end loader	110
	Concrete trucks	105
	Dump truck	106
	Grader	100
	Vibratory roller	114
	Water cart	107
	Power tools	95
	Cars (x 20)	88
Scenario 2: Landfill footprint and leachate pond	Excavator (30 tonne)	108
	Front end loader	110
	Dozer	115
	Dump truck	106
	Rotor mill	115
	Telehandler	96
	Tipping truck	110
	Pad foot roller	86
	Grader	100
	Compactor	104
	Water cart	107

Note 1: *Annoying item of equipment as defined in the ICNG and as such includes a +5 dB penalty applied to predictions.*

Note 2: *L_{Aeq} Sound Power Levels are based on L_{Amax} noise levels published in DEFRA sound power database, Jacobs sound power database and manufacturer's equipment specifications.*

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The ICNG lists a number of construction activities which have been proven to be “annoying” and which require to have a 5 dB penalty applied to them. Annoying characteristics may include tones, impulses, low frequency noise and intermittent noise. The ICNG identifies the following proposed activities as being particularly annoying and as such, a +5 dB correction has been incorporated into the noise modelling process for the rolling/compacting activity

7.1.2 Assessment methodology

Prediction of construction noise levels at sensitive receivers was modelled using the SoundPLAN (Version 7.4) noise modelling software based on the CONCAWE prediction algorithm. This three-dimensional model accounts for noise source and receiver locations, ground and air absorption as well as any acoustic shielding provided by intervening topography and structures. Conservatively, it does not include any standard or project-specific mitigation measures. The modelling was based on the following:

- 2 metres ground contours were used in the noise model.
- Ground coverage in the study area has been assumed to be soft in the project site.
- Surrounding residential buildings have been digitised into the model.
- All noise emitting equipment have been modelled to operate simultaneously.
- The source heights of all operational equipment have been set at 2 metres.
- Receiver heights have been set at 1.5 metres.
- The noise contours height has been set at 1.5 metres.
- CONCAWE industrial standard model parameters were applied for neutral meteorological. No adverse weather condition has been applied to the noise model because construction will only take place during daytime period.

7.1.3 Construction scenarios

The construction scenarios considered for the purpose of noise predictions include in the following assumptions:

- Scenario 1 – construction of access road and hard stand area; and
- Scenario 2 – construction of Landfill footprint and leachate pond.

7.1.4 Construction noise modelling results

Construction noise from the facility has been assessed to achieve compliance with the daytime ICNG noise management levels. Table 7.2 shows the operational noise modelling results for the 2 construction scenarios which are also presented as noise contour maps in Appendix B.

Table 7.2 : Construction noise impact assessment

Receiver	Predicted L_{Aeq} noise levels – dB(A)		Project daytime criteria L_{Aeq} – dB(A)	Predicted exceedance – dB(A)	
	Scenario 1	Scenario 2		Scenario 1	Scenario 2
R01	28.7	31.3	45	0	0
R02	30.5	32.7	45	0	0
R03	25.9	27.5	45	0	0
R04	26.7	28.1	47	0	0
R05	28.9	30.1	47	0	0
R06	32.7	33.7	46	0	0
R07	28.7	29.8	47	0	0
R08	27.7	29.0	47	0	0

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Receiver	Predicted L_{Aeq} noise levels – dB(A)		Project daytime criteria L_{Aeq} – dB(A)	Predicted exceedance – dB(A)	
	Scenario 1	Scenario 2		Scenario 1	Scenario 2
R09	26.3	27.6	47	0	0
R10	25.3	26.8	47	0	0
R11	24.0	26.0	45	0	0
R12	23.2	25.3	45	0	0
R13	23.8	26.0	45	0	0
R14	18.1	21.0	45	0	0
R15	15.8	18.7	45	0	0
R16	15.1	18.0	45	0	0
R17	17.5	20.4	45	0	0
R18	21.4	24.2	45	0	0
R19	21.2	24.1	45	0	0
R20	20.5	23.3	45	0	0
R21	21.9	24.7	45	0	0
I01	59.8	53.3	75	0	0
I02	40.9	42.3	75	0	0

7.2 Operational noise assessment

7.2.1 Operational equipment

The plant and equipment to be used during the operation of the facility has been based on discussions with NGH and are presented in Table 7.3. The plant and equipment in Table 7.3 have been input into the noise model for the prediction of operational noise impacts.

Table 7.3 : Operational plant and equipment

Plant item	Location	Individual plant sound power level – dB(A)
Compactor (approx. 50 tonne)[1]	Landfill footprint cell	108
Excavator (approx. 10 tonne)		105
Grader		100
Water cart		107
Front end loader	Landfill footprint cell and road track along western boundary of landfill footprint	110
Trucks	Hardstand area	115

Note 1: Annoying item of equipment as defined in Section 4.5 of the ICNG and as such includes a +5 dB penalty applied to predictions.

Note 2: L_{Aeq} Sound Power Levels are based on L_{Amax} noise levels published in DEFRA sound power database, Jacobs sound power database and manufacturer's equipment specifications.

Section 4.5 of the ICNG lists a number of construction activities which have been proven to be "annoying" and which require to have a 5 dB penalty applied to them. Annoying characteristics may include tones, impulses, low frequency noise and intermittent noise. Compaction involving the use of vibratory rollers is identified in the ICNG as an activity that can emit noise perceived as being particularly annoying and as such, a +5 dB correction was incorporated, consistent with this guidance.

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7.2.2 Assessment methodology

Prediction of noise impacts from Northridge waste disposal facility operations has been undertaken through the use of the SoundPLAN noise propagation modelling software (Version 7.4). The modelling was based on the following:

- 2 metres ground contours were used in the noise model.
- Ground coverage in the study area has been assumed to be soft in the project site.
- Surrounding residential buildings have been digitised into the model.
- All noise emitting equipment have been modelled to operate simultaneously.
- The source heights of all operational equipment have been set at 2 metres.
- Receiver heights have been set at 1.5 metres.
- The noise contours height has been set at 1.5 metres.
- CONCAWE industrial standard model parameters were applied for neutral meteorological. No adverse weather condition has been applied to the noise model because the facility will only be operating during daytime period.

7.2.3 Operational scenarios

The operational scenarios considered for the purpose of noise predictions include in the following assumptions:

- Scenario 1 – trucks in hard stand area, front end loader (FEL) along the road track at the western boundary of the landfill footprint and FEL, compactor, water cart and grader operating in the southernmost cell of the landfill footprint;
- Scenario 2 – trucks in hard stand area, front end loader (FEL) along the road track at the western boundary of the landfill footprint and FEL, compactor, water cart and grader operating in the middle cell of the landfill footprint; and
- Scenario 3 – trucks in hard stand area, front end loader (FEL) along the road track at the western boundary of the landfill footprint and FEL, compactor, water cart and grader operating in the northernmost cell of the landfill footprint.

7.2.4 Operational noise modelling results

Operational noise from the facility has been assessed to the daytime NPI criteria. Table 7.4 shows the operational noise modelling results for the 3 operational scenarios which are also presented as noise contour maps in Appendix C.

Table 7.4 : Operational noise impact assessment

Receiver	Predicted L_{Aeq} noise levels – dB(A)			Project daytime criteria L_{Aeq} – dB(A)	Predicted exceedance – dB(A)		
	Scenario 1	Scenario 2	Scenario 3		Scenario 1	Scenario 2	Scenario 3
R01	26.1	25.3	25.3	40	0	0	0
R02	27.4	27.0	27.0	40	0	0	0
R03	22.7	22.7	22.7	40	0	0	0
R04	23.6	23.6	23.6	42	0	0	0
R05	25.7	25.7	25.7	42	0	0	0
R06	29.4	29.4	29.4	41	0	0	0
R07	25.5	25.9	25.8	42	0	0	0
R08	24.6	25.5	25.7	42	0	0	0

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Receiver	Predicted L_{Aeq} noise levels – dB(A)			Project daytime criteria L_{Aeq} – dB(A)	Predicted exceedance – dB(A)		
	Scenario 1	Scenario 2	Scenario 3		Scenario 1	Scenario 2	Scenario 3
R09	23.2	24.1	24.3	42	0	0	0
R10	22.3	23.6	24.1	42	0	0	0
R11	21.6	23.5	24.9	40	0	0	0
R12	20.8	22.6	24.0	40	0	0	0
R13	21.5	23.4	24.9	40	0	0	0
R14	16.3	17.4	18.4	40	0	0	0
R15	14.0	14.6	15.2	40	0	0	0
R16	13.3	13.6	14.2	40	0	0	0
R17	15.7	15.8	16.1	40	0	0	0
R18	19.5	19.5	19.6	40	0	0	0
R19	19.3	19.0	18.9	40	0	0	0
R20	18.4	17.8	17.4	40	0	0	0
R21	19.7	19.1	18.8	40	0	0	0
I01	52.3	52.3	52.3	68	0	0	0
I02	36.4	36.4	36.4	68	0	0	0

The operational noise emission levels are predicted to be well within the project specific noise criteria at all assessed receiver locations during the three operational scenarios.

7.3 Road traffic noise assessment

Access to the site is via Byrnes Road. A traffic management study (dated September 2008) conducted by GHD for Wagga Wagga City Council presents traffic figures along Byrnes Road.

The report provides the following data:

- Byrnes Road north of Bavins Road, ADT of 2,750 vehicles per day (vpd) both ways.

Based on the above traffic data, the assumed traffic volume breakdowns are presented in Table 7.5 below.

Table 7.5 : Assumed existing traffic volumes

Road	Vehicles per day for both ways	Daytime 15 hour (7am to 10 pm)	
		Light vehicle for both ways	Heavy vehicle for both ways
Byrnes Road	2,750	1,980	220

NOTE 1: Daily traffic volume derived from GHD's traffic management study report

NOTE 3: Daytime 15 hour traffic assumed to be 80% of daily traffic

7.3.1 Construction road traffic

Construction vehicle movements have the potential to generate temporary adverse noise impacts along access routes which use public roads as vehicles deliver materials to and from the proposal site. It is assumed that the number of vehicle movements is estimated to be an average daily total of 40 heavy vehicles and 20 light vehicles. Construction traffic is assumed to access the site using Byrnes Road. As the proposed works will only be conducted during daytime period, all construction vehicle movements would take place during standard daytime construction hours

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The *Construction Road Traffic Noise Estimator* of the RMS Construction Noise Estimator was utilised to assess potential impacts arising from construction traffic, which is also presented in below. Existing traffic inputs were added as per the assumed traffic data presented in Table 7.5, and additional traffic generated during construction was estimated based on a conservative assumption of the anticipated workforce on a per day basis; i.e. 20 light vehicles and 40 heavy vehicles. Based on these inputs it was found that additional noise arising from construction traffic is unlikely to result in changes of 2.1 dB(A) or more above existing noise levels, with road noise levels also predicted to remain below the 60 dB(A) criteria from the RNP. Therefore, road traffic noise due to the construction of the project is assessed to comply with the road traffic noise criteria set out in Section 3.3 of this report.

Transport Roads & Maritime Services

Construction Road Traffic Noise Estimator

Please input information into yellow cells
Please pick from drop-down list in orange cells

Ground type	Undeveloped green fields (rural areas with isolated dwellings)
Road surface	DGA
Road type	Freeway/arterial/sub-arterial road

Note that a road is new if a road's functional class changes during construction. For example, rerouting traffic from an arterial road temporarily to a collector road changes the functional class of the collector road for the duration of the temporary reroute.

	Day	Night
Noise criteria (residences)	60	55
Existing speed	80	80
Speed during construction	80	80

	Day (7am to 10pm)		Night (10pm to 7am)		Worst Case 1-hour Day		Worst Case 1-hour Night	
Existing traffic	Light vehicles	Heavy vehicles	Light vehicles	Heavy vehicles	Light vehicles	Heavy vehicles	Light vehicles	Heavy vehicles
Direction (1)	990	110						
Direction (2)	990	110						
Additional traffic								
Direction (1)	20	40						
Direction (2)	20	40						

	Day	Night
Change in noise levels (dBA)	0.7	#VALUE!
Mitigation level (dBA)	60	#VALUE!
Is the change in noise level greater than 2.0 dBA?	No	#VALUE!
Require consideration of additional mitigation measures?	No	#VALUE!
Mitigation distance (m)		3

Calculating noise level at the receiver

Distance to receiver (m)		
Direction (1)	500	
Direction (2)	500	
	Day	Night
Predicted noise levels (dBA) @ 1m from the façade	41.7	#VALUE!

Note that noise reports usually present noise levels rounded to the nearest integer and differences between two noise levels rounded to a single decimal

To assess noise impacts from construction traffic or a temporary reroute due to a road closure or both an initial screening test should be undertaken by evaluating whether noise levels will increase by more than 2dB(A). Where increases are 2dBA or less then no further assessment is required. Where noise levels increase by more than 2dBA (2.1dBA) and noise levels exceed the controlling criterion then the receiver qualifies for consideration of noise mitigation under the Noise Mitigation Guideline. [note: the assessment methodology is similar to minor works so in any instance the only trigger for noise mitigation under the NMG shall be due to noise level increase]

Mitigation Measures
Management of construction related traffic or traffic reroutes noise should as a minimum include the following controls:
- Scheduling and routing of vehicle movements
- Speed of vehicles
- Driver behaviour and avoidance of the use of engine compression brakes
- Ensuring vehicles are adequately silenced before allowing them to access the site

Where noise impacts are greater than one year then consideration should be given to the following measures where feasible and reasonable:
- temporary noise barriers
- at-receiver noise mitigation

Feasible and reasonable considerations should also include:
- time of day of the noise increase and exceedance of criteria
- time of use of affected receivers
- how many decibels the noise levels are to increase
- how long the mitigation will provide benefit to the receiver during the project

Figure 7.1 : Construction road traffic noise calculation

7.3.2 Operational road traffic

Based on the assumption that there will be up to 20 heavy vehicle and 20 light vehicle movements during a typical operational day of the facility, the daytime overall operational road traffic noise level (including noise from existing traffic) will not be more than the predicted construction traffic noise level of 41.7 dB(A) at the nearest residential façade which is R03 (see Table 2.1). This would also mean that additional noise arising from operational traffic is unlikely to result in changes of 2.1 dB(A) or more above existing noise levels, , with road noise levels also predicted to remain below the 60 dB(A) criteria from the RNP.

The above assessment shows that the operational road traffic noise will likely comply with the road traffic noise criteria set out in Section 3.3 of this report.

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8. Vibration impact assessment

It is understood that the vibration-intensive equipment that may be used during the construction of the project could potentially include compaction equipment such as a vibratory roller and pneumatic hammer such as a hydraulic hammer. Relevant recommended safe setback distances to maintain building cosmetic and human comfort criteria for these types of plant are reproduced below in Table 8.1.

Table 8.1 : Recommended safe setback distances for relevant vibration-generating plant

Plant	Rating / description	Safe working distance (meters)	
		Cosmetic damage (BS7385-2: 1993)	Human response (DECC, 2006)
Vibratory Roller	<50 kN (typically 1-2 t) <100 kN (typically 2-4 t) <200 kN (typically 4-6 t) <300 kN (typically 7-13 t) >300 kN (typically 13-18 t) >300 kN (> 18 t)	5 metres 6 metres 12 metres 15 metres 20 metres 25 metres	15 metres to 20 metres 20 metres 40 metres 100 metres 100 metres 100 metres
Small hydraulic hammer	300 kg – 5 to 12 t excavator	2 metres	7 metres
Medium hydraulic hammer	900 kg – 12 to 18t excavator	7 metres	23 metres
Large hydraulic hammer	1600 kg – 18 to 34 t excavator	22 metres	73 metres

Based on the worst case separation distance between the nearest residential building and the project site boundary of more than 500 metres. Construction vibration is deemed to not have any adverse structural damage or human comfort impact on surrounding residential receivers.

The nearest building at the adjoining industrial premises that is occupied by staff is approximately 10 metres from the project's western boundary. Based on the separation distance the following management measures should be implemented to ensure that the vibration criteria for both structural damage and human comfort are achieved:

- Vibratory roller or compactor should be operated at a distance of at least 10 metres from the western boundary.
- Hydraulic hammer should be operated at a distance of at least 15 metres from the western boundary.
- Vibratory roller or compactor to be used at the project site should not be more than 4 tonnes. Vibratory rollers or compactors more than 4 tonnes should not be used.
- Only a small (300 kg – 5 to 12 t excavator) or medium (900 kg – 12 to 18t excavator) hydraulic hammer should be used at the project site. Large hydraulic hammers (1600 kg – 18 to 34 t excavator) should not be used.

Where the above management measures are implemented, vibration impacts at the adjoining industrial premises would comply with the vibration criteria set out in Section 0 of this report.

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9. Noise and vibration management measures

Without mitigation, noise levels from some construction activities have been predicted to comply with the noise management levels (RBL + 10 dB(A)) nominated in the guidelines at all surrounding receivers. Noise levels at all surrounding residential receivers are also predicted to be below the highly noise affected level (< 75 dB(A)).

Operational noise impacts at all other receivers (residential and industrial) have been assessed to comply with the noise criteria.

Construction vibration levels have been assessed to achieve compliance with the vibration criteria provided small or medium equipment are used. However, if large equipment is used, construction vibration impacts will potentially exceed the vibration criteria at the adjoining industrial premises.

This section details best practice management and mitigation measures designed to assist the contractor and operator of the facility to ensure that construction and operational activities achieve the adopted noise and vibration management levels at all nearest surrounding receivers.

The management measures have been informed from guidance provided in the ICNG which promotes principles of best management practice and community notification of likely noise and vibration impacts.

It will be important for the contractor to undertake all reasonable and feasible measures to reduce noise impacts and minimise impact potential through programming works to minimise duration and liaise with affected landowners and local communities throughout the construction program.

All Contractors commissioned by RWS to undertake construction works associated with the Project are recommended to adhere to all noise and vibration management and mitigation measures recommended.

9.1 Management measures

During the planning and scheduling of construction works, the predicted noise levels should be considered in establishing work site locations, construction techniques and on site practices.

Construction works should adopt Best Management Practice (BMP) and Best Available Technology Economically Achievable (BATEA) practices as addressed in the ICNG. BMP includes factors discussed within this report and encouragement of a project objective to reduce noise emissions. BATEA practices involve incorporating the most advanced and affordable technology to minimise noise emissions. The following principles and proactive noise management measures are to be considered for implementation:

- Fixed and mobile construction plant and equipment shall be located to maximise separation distance from nearest noise and vibration sensitive and residential receivers.
- Construction plant shall be orientated away from nearest receivers and where feasible be located to take advantage of on-site buildings and structure with potential to impede noise propagation.
- Where practical, simultaneous operation of dominant noise generating plant shall be managed to reduce noise impacts, such as operating at different times or increasing the distance between the plant.
- Where possible and in compliance with occupational safety and health standards, reversing beepers on trucks would be replaced with low pitch non-tonal beepers (quackers). Alternatives to reversing beepers include the use of spotters and designing the site to reduce the need for reversing may assist in minimising the use of reversing beepers.
- Ensure that all construction and operational works comply with the start and finish times.
- As a minimum all residences within 500 metres radius of the project site should be notified of potential construction works at least 2 weeks prior to the commencement of works.
- Construction noise and vibration management practices are to be provided to all staff and contractors and be included during site inductions and daily tool-box talks. The tool-box talks should include as a minimum, the permitted hours of construction work, work site locations, site ingress/egress and the required noise management measures for each construction phase.

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9.2 Monitoring of construction works

This section details the noise and vibration monitoring strategy for construction works during standard construction hours.

Monitoring of construction noise is recommended to confirm construction noise levels at nearest receivers:

- At the commencement of construction works for the verification of predicted construction noise levels and confirm requirement for noise management and mitigation measures.
- In response to justified adverse community response or complaint to construction or operational noise and/or vibration.

All noise and vibration monitoring should be undertaken by suitably qualified practitioners with consideration to guidance provided in the ICNG and relevant regulatory and statutory guidelines.

9.2.1 Measurement of construction noise

To determine the influence of construction noise at a receiver it is important to, where practical, to record a measurement of the construction or operational noise alone or with minimal ambient influence from extraneous sources such as road traffic.

A background noise level measurement should be undertaken, where feasible, at a representative location where construction noise is not a dominant influence or during any period where construction works are not occurring. The background noise level can be applied to quantify potential construction noise influence in measured ambient noise levels.

All measurements should be undertaken for a minimum continuous period of 15 minutes and record the period L_{Aeq}, L_{A90}, L_{A10}, L_{A1} and L_{AMax} noise descriptors. Dependent upon the influence of construction noise the following correction factors may be applied to determine construction noise influence at the measurement location:

- Where the construction noise was clearly dominant over background noise during the monitoring period the meter reading is recorded without correction.
- Where construction noise was just audible above the background during the monitoring period the meter L_{Aeq} reading minus a value of 3 dB will be recorded.
- Where the construction noise was inaudible above the background during the monitoring period the meter L_{Aeq} the meter reading minus a value of 10 dB will be recorded.

Correction factors are only to be applied where construction or operational noise is a continuous influence during the measurement period.

9.2.2 Ground Vibration Monitoring

Ground borne vibration monitoring is recommended in response to adverse community response or complaint to vibration due to pile driving activities. The vibration monitoring shall be applied to recommend safe working practices to reduce vibration levels to mitigate potential for future disturbance of structural vibration issues.

The monitoring of ground vibration at nearest potentially affected receivers shall be undertaken applying site specific approaches dependent upon the external/ internal receiver environments. As a minimum ground vibration monitoring is to include and consider the following:

- Measurement of VDV and PPV vibration levels for maximum vibration values of all the axis of vibration.
- Measurements shall be recorded without the vibration source present to establish a baseline and verify that the any vibration detected is not from an extraneous source.
- Monitoring should be avoided where measurements are likely to be influenced by the presence of extraneous vibration sources such as road traffic.

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- Monitoring transducers should be located at a sufficient distance from any structure so as to avoid undue interference from vibration 'feeding back' from the structure.
- The mounting of vibration transducers to vibrating structures or substrate should where feasible comply with Australian Standard AS 2775-2004 *Mechanical vibration and shock-Mechanical mounting of accelerometers*. The measurement should be to reproduce faithfully the motion of the structure or substrate without introducing additional response.

9.3 Non-compliance / complaint response

Non-conformances for noise and vibration during construction or operational works may include:

- Exceedance of adopted receiver specific construction/operational noise management levels; triggering the requirement for noise management measures
- Exceedance of annoyance and structural vibration objectives (Section 0).
- Justified community complaints relating to noise and vibration.

The construction or operational works shall be immediately assessed to review operation of noise generating plant, required construction activity and current on and off site noise mitigation measures in place.

Any non-conformances and subsequent corrective actions shall be resolved with consideration to the RWS Community Consultation Strategy. The Environment Manager and Site Supervisor shall determine where corrective action is required and implement necessary mitigation measures.

All adopted noise mitigation measures will be updated in work method statements and identified as part of routine tool-box talks to inform staff of current construction noise and vibration issues and required mitigation measures.

Consistent with the noise mitigation measures presented in this report; examples of corrective actions to be implemented by the Environment Manager include:

- Implementing alternative construction methodologies utilising low noise or low vibration generating plant.
- Replacing excessively noisy equipment.
- Fitting additional acoustic controls, such as acoustic screens, to minimise emissions from machinery.
- Increasing separation distance between noise generating plant and nearest sensitive receivers.
- Consider respite periods where construction noise impacts include potential tonal, low frequency or impulsive annoying characteristics at nearest receivers.

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10. Conclusion

This report presents the results of the assessment of potential noise impacts associated with the construction and operation of the proposed Northridge Waste Disposal Facility.

10.1 Construction noise & vibration

Construction noise levels were predicted to be within the noise management levels at surrounding residential receivers and nearby industrial premises. Based on the predicted construction noise levels, surrounding residential receivers are expected to be unlikely to be highly noise affected.

Although the construction noise impacts are predicted to comply with the noise management levels, the contractor should implement standard best practice noise management measures where feasible and reasonable. This would ensure that construction activities are below the noise management levels under all circumstances.

Road traffic noise impacts due to construction of the facility at surrounding residential receivers were predicted to be less than 2.1 dB(A) and therefore, compliant with the RNP noise criteria.

Construction vibration has been assessed to achieve the structural damage and human comfort criteria at surrounding residential receivers due to the large separation distances between the project site and receivers. However, the adjoining industrial premises would potentially be affected by the use of large vibratory roller/compactor and hydraulic hammer. Therefore, it is recommended that smaller equipment be used to ensure vibration levels at the adjoining industrial premises are within the vibration criteria.

10.2 Operational noise

Predicted noise levels during normal operation of the facility show that that there will be minimal noise impacts on all surrounding residential receivers. Operational noise impacts are predicted to comply with the noise criteria at all surrounding industrial premises.

Noise management and mitigation measures have been recommended in this report to ensure that noise resulting from operational activities within the facility achieves the operational noise criteria.

Road traffic noise impacts due to the operations at surrounding residential receivers were also predicted to be less than 2 dB(A) and therefore, compliant with the RNP noise criteria.

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Appendix A. Acoustic terminology

A-weighted sound pressure	The human ear is not equally sensitive to sound at different frequencies. People are more sensitive to sound in the range of 1 to 4 kHz (1000 – 4000 vibrations per second) and less sensitive to lower and higher frequency sound. During noise measurement an electronic '*A-weighting*' frequency filter is applied to the measured sound level *dB(A)* to account for these sensitivities. Other frequency weightings (B, C and D) are less commonly used. Sound measured without a filter is denoted as linear weighted dB(linear).
Ambient noise	The total noise in a given situation, inclusive of all noise source contributions in the near and far field.
Community annoyance	Includes noise annoyance due to: ▪ character of the noise (e.g. sound pressure level, tonality, impulsiveness, low-frequency content) ▪ character of the environment (e.g. very quiet suburban, suburban, urban, near industry) ▪ miscellaneous circumstances (e.g. noise avoidance possibilities, cognitive noise, unpleasant associations) ▪ human activity being interrupted (e.g. sleep, communicating, reading, working, listening to radio/TV, recreation).
Compliance	The process of checking that source noise levels meet with the noise limits in a statutory context.
Cumulative noise level	The total level of noise from all sources.
Extraneous noise	Noise resulting from activities that are not typical to the area. Atypical activities may include construction, and traffic generated by holiday periods and by special events such as concerts or sporting events. Normal daily traffic is not considered to be extraneous.
Feasible and reasonable measures	Feasibility relates to engineering considerations and what is practical to build; reasonableness relates to the application of judgement in arriving at a decision, taking into account the following factors: ▪ Noise mitigation benefits (amount of noise reduction provided, number of people protected). ▪ Cost of mitigation (cost of mitigation versus benefit provided). ▪ Community views (aesthetic impacts and community wishes). ▪ Noise levels for affected land uses (existing and future levels, and changes in noise levels).

Impulsiveness	Impulsive noise is noise with a high peak of short duration or a sequence of these peaks. Impulsive noise is also considered annoying.
Low frequency	Noise containing major components in the low-frequency range (20 to 250 Hz) of the frequency spectrum.
Noise criteria	The general set of non-mandatory noise levels for protecting against intrusive noise (for example, background noise plus 5 dB) and loss of amenity (e.g. noise levels for various land use).
Noise level (goal)	A noise level that should be adopted for planning purposes as the highest acceptable noise level for the specific area, land use and time of day.
Noise limits	Enforceable noise levels that appear in conditions on consents and licences. The noise limits are based on achievable noise levels, which the proponent has predicted can be met during the environmental assessment. Exceedance of the noise limits can result in the requirement for either the development of noise management plans or legal action.
Performance-based goals	Goals specified in terms of the outcomes/performance to be achieved, but not in terms of the means of achieving them.
Rating Background Level (RBL)	The rating background level is the overall single figure background level representing each day, evening and night time period. The rating background level is the 10^{th} percentile min L_{A90} noise level measured over all day, evening and night time monitoring periods.
Receptor	The noise-sensitive land use at which noise from a development can be heard.
Sleep disturbance	Awakenings and disturbance of sleep stages.
Sound and decibels (dB)	Sound (or noise) is caused by minute changes in atmospheric pressure that are detected by the human ear. The ratio between the quietest noise audible and that which should cause permanent hearing damage is a million times the change in sound pressure. To simplify this range, the sound pressures are logarithmically converted to decibels from a reference level of 2 x 10-5 Pa. The picture below indicates typical noise levels from common noise sources.

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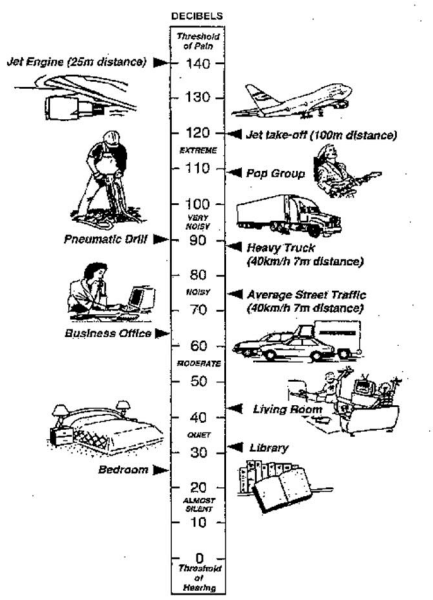


dB is the abbreviation for decibel – a unit of sound measurement. It is equivalent to 10 times the logarithm (to base 10) of the ratio of a given sound pressure to a reference pressure.

Sound power Level (SWL)

The sound power level of a noise source is the sound energy emitted by the source. Notated as SWL, sound power levels are typically presented in *dB(A)*.

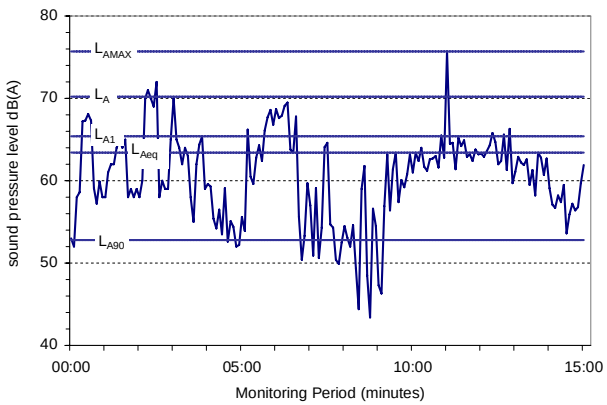
Sound Pressure Level (SPL)

The level of noise, usually expressed as SPL in *dB(A)*, as measured by a standard sound level meter with a pressure microphone. The sound pressure level in *dB(A)* gives a close indication of the subjective loudness of the noise.

Statistic noise levels

Noise levels varying over time (e.g. community noise, traffic noise, construction noise) are described in terms of the statistical exceedance level.

A hypothetical example of A weighted noise levels over a 15-minute measurement period is indicated in the following figure:



Key descriptors:

L_{Amax} Maximum recorded noise level.

L_{A1} The noise level exceeded for 1% of the 15-minute interval.

	L_{A10} Noise level present for 10% of the 15-minute interval. Commonly referred to the average maximum noise level. L_{Aeq} Equivalent continuous (energy average) A-weighted sound pressure level. It is defined as the steady sound level that contains the same amount of acoustic energy as the corresponding time-varying sound. L_{A90} Noise level exceeded for 90% of time (background level). The average minimum background sound level (in the absence of the source under consideration).
Threshold	The lowest sound pressure level that produces a detectable response (in an instrument/person).
Tonality	Tonal noise contains one or more prominent tones (and characterised by a distinct frequency components) and is considered more annoying. A 2 to 5 dB(A) penalty is typically applied to noise sources with tonal characteristics

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Appendix B. Construction noise contours

B.1 Construction of site access and hard stand area

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B.2 Construction of landfill footprint and leachate pond

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Appendix C. Operational noise contours

C.1 Operational noise contours during the operations at the southernmost cell

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C.2 Operational noise contours during the operations at the middle cell

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C.3 Operational noise contours during the operations at the northernmost cell

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Appendix D Air Quality Impact Assessment

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Northridge Waste Disposal Facility

NGH Environmental

Construction and Operational Air Quality Assessment

F0 | V1

15 April 2021

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Northridge Waste Disposal Facility

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D0vA	30/11/2018	Draft issued to client	LS	SL	SL
F0v0	18/01/2019	Final following client review	LS	SL	SL
F0v1	15/04/2021	Final addressing submissions	LS	SL	SL

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Appendix A. Emission estimation calculations

Appendix B. Proposal incremental concentration plots

B.1 Construction

B.1.1 TSP, annually averaged, 100th percentile (µg/m^3)

B.1.2 PM_{10}, 24-hour averaged, 100th percentile (µg/m^3)

B.1.3 PM_{10}, annually averaged, 100th percentile (µg/m^3)

B.1.4 $PM_{2.5}$, 24-hour averaged, 100th percentile (µg/m^3)

B.1.5 $PM_{2.5}$, annually averaged, 100th percentile (µg/m^3)

B.2 Operations

B.2.1 TSP, annually averaged, 100th percentile (µg/m^3)

B.2.2 PM_{10}, 24-hour averaged, 100th percentile (µg/m^3)

B.2.3 PM_{10}, annually averaged, 100th percentile (µg/m^3)

B.2.4 $PM_{2.5}$, 24-hour averaged, 100th percentile (µg/m^3)

B.2.5 $PM_{2.5}$, annually averaged, 100th percentile (µg/m^3)

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Executive Summary

Jacobs completed an assessment to evaluate the potential for air quality impacts including dust and exhaust emissions from the construction and operation of a new solid waste disposal facility at 223 and 299 Trahairs Road in Bomen, NSW. Emissions to air during construction and operations were estimated using guidance from "Emission Estimation Technique Manual for Mining Version 3.1", (Commonwealth DSEWPaC, 2012) and "AP-42 13.2.2 Unpaved Roads", (US EPA, 2006). Concentrations of key air pollutants at surrounding sensitive receivers were quantitatively predicted using the AUSPLUME dispersion model. Predicted levels were evaluated against criteria established from the "Approved Methods for Modelling and Assessment of Air Pollutants in NSW" (Approved Methods), (NSW Environment Protection Authority, 2016).

The assessment found that emissions associated with vehicles, plant and equipment combusting fossil fuels at the proposed disposal facility would not present a material risk to local air quality based on the limited scale of construction and operations, and low ambient concentrations relative to respective impact assessment criteria. During construction of the facility, 24-hour averaged PM_{10} concentrations were predicted to exceed the 50 µg/m^3 impact assessment criterion at the nearest residential sensitive receiver locations to the west and north, as well as the nearest industrial receiver. However, these potential exceedances were only predicted when background levels were already approaching the assessment criterion (i.e. 46 µg/m^3 and higher) In accordance with the Approved Methods, further analysis was completed which determined that PM_{10} contributions from the site would not result in any additional exceedances at residential receivers R6 and R11. The assessment indicated a risk of additional exceedances at industrial receiver I01, for which management measures were developed.

Cumulative TSP, annually averaged PM_{10}, and 24 and annually averaged $PM_{2.5}$ concentrations were otherwise not predicted to exceed relevant impact assessment criteria during construction.

None of the EPA's impact assessment criteria, except the 24-hour averaged PM_{10} criterion at I01 were predicted to be exceeded during operations. Modelling indicated the potential for one additional day where cumulative concentrations would be above the 50 µg/m^3 criterion on a day when background concentrations were already 48 µg/m^3.

To manage the risk of potential short-term PM_{10} impacts during elevated background conditions, measures were recommended. These included implementing a program to identify unfavorable weather and elevated background conditions so that on-site activities could be scaled back or suspended accordingly, as well as measures to reduce emissions generated from the site including the use of water carts and imposition of speed limits; reducing the extent of exposed areas to the extent practical; wherever possible, locating dust generating activities away from receivers wherever possible, and other management approaches.

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1. Introduction

Riverina Warehousing Solutions (RWS) is planning to develop a solid waste disposal facility at 223 and 299 Trahairs Road in Bomen, NSW. NGH Environmental has been engaged to prepare an Environmental Impact Statement (EIS) for the development application. The *Secretary's Environmental Assessment Requirements* (SEARs) (No. 1062 issued July 2016, updated August 2018) issued for the proposal require the assessment of key environmental matters associated with the proposal. Dust and other emissions to air associated with construction and operations is identified as a key issue and is the subject of this report. It is noted that potential operational odour issues for the proposal have already been assessed in the report, "Northridge Waste Disposal Facility Operational Odour Assessment F0v0", (Jacobs, 2018).

The relevant requirements for assessment for air quality impacts from the proposal from the SEARs have been reproduced below.

Table 1-1 SEARs air quality requirements and where they are addressed in this report

Condition of SEARs	Where addressed in this report
Describe all potential sources of emissions	**Section 5**
Provide an assessment of potential air quality impacts in accordance with relevant Environment Protection Authority guidelines	**Section 7**
Describe and appraise air quality mitigation and monitoring measures	**Section 8**

In meeting these requirements, the objectives of this assessment were to:

- Describe proposal and identify potential air quality issues (**Section 2**)
- Outline relevant air quality assessment criteria (**Section 3**);
- Describe the existing environment including surrounding receivers, terrain and ambient air quality conditions (**Section 4**);
- Estimate emissions to air (**Section 5**);
- Discuss the assessment approach (**Section 6**);
- Present and discuss predicted potential impacts (**Section 7**); and
- Recommend mitigation and management measures (**Section 8**).

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2. Proposal overview

2.1 Location and Key features

RWS is planning the construction of a solid waste disposal facility off Trahairs Road, Bomen NSW. The facility would be around 16.5 hectares in size and located across two individual titles (Lot 2 DP 590756 and Lot 11 DP 1130519). A schematic of the proposal is displayed below in **Figure 2-1**.

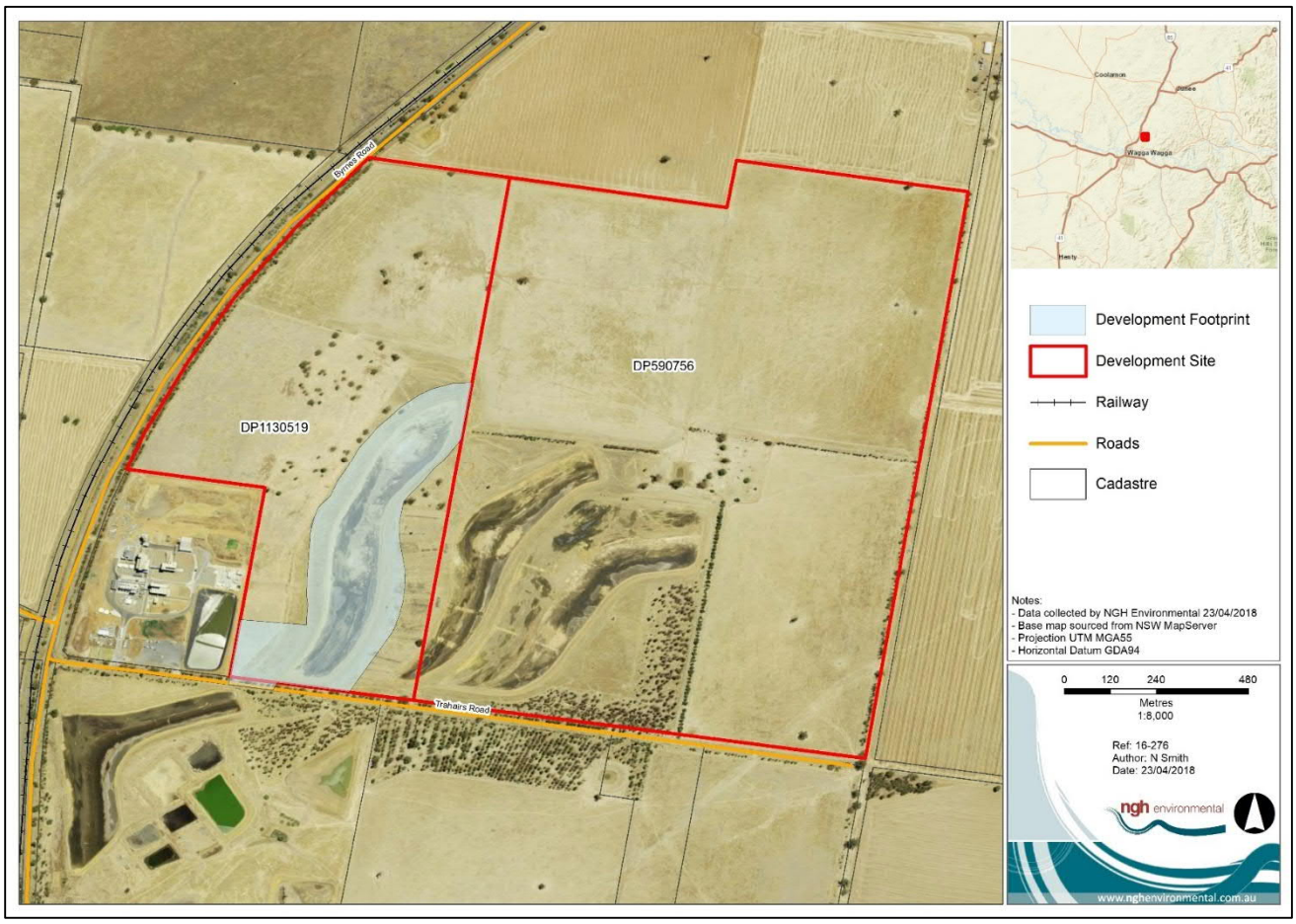

Figure 2-1 Schematic of Proposal area (NGH Environmental, 2017)

It is envisaged that most waste received on site would be from the Visy paper mill located at Tumut. Waste streams from Visy would include:

- Compactor plastics – light mixed plastics;
- Grapple Materials – heavy plastics, some metals, rubber and fibre;
- Glass material – glass, ceramics and stone chips;
- Fines/sand – with a small amount of fibre;
- Flotsam – wire, rope, plastics, metal and some fibre;
- Carbonates – mix of sodium and calcium carbonates, lime and a limited quantity of unburnt organics;

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- Power boiler fly ash – boiler wood ash, inorganics; and
- Power boiler sand – with some metals and small rocks.

The dregs and grits and power boiler sand would be used as landfill cover material.

Glass waste from Kurrajong Recyclers at Wagga Wagga would also be disposed of at the site, and would include:

- Crushed glass; and
- Some limited electrical wire contamination.

Screened building and demolition waste including the following would also be received at the site:

- Broken concrete, brick and other rubble;
- Soil (uncontaminated);
- Road millings;
- Timber;
- Plaster board; and
- Compressed cement sheet.

It is estimated that around 24% of materials received annually would comprise of soils and other emission-generating materials (e.g. fly ash, sand, road waste products) (NGH, 2021). As listed above, the remaining wastes to be disposed are a range of solid materials not expected to generate emissions to air during handling and disposal.

It is planned that the facility would have capacity for approximately 630,000 m^3 of waste materials, which would be filled over a design life of approximately nine years. It is estimated that the facility would receive about 60,000 tonnes or 67,000 m^3 in its first year and grow at about 1.5 % annually. Approximate predicted annual receivables would be:

- 67,514 m^3 in year one;
- 68,054 m^3 in year two;
- 69,075 m^3 in year three;
- 70,111 m^3 in year four;
- 71,162 m^3 in year five;
- 72,230 m^3 in year six;
- 73,313 m^3 in year seven;
- 74,413 m^3 in year eight; and
- 75,529 m^3 in year nine.

The overall disposal area is expected to be constructed in a staged approach, with the area divided into seven to eight cells (each with an approximate total area of up to around 10,000 m^2). The first cell to receive waste would be located at the southern end of the disposal area, with the cells progressively filled from south to north over the life of the facility. In the northern end of the footprint of the pond being converted to construct the facility, a leachate pond would be constructed to receive leachate generated from the facility. As filling is completed in each cell, the area would be sealed with a low-permeability capping layer (and revegetated) to contain the waste materials and limit the generation of leachate.

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Materials would be received at the site from a formed access point off Trahairs Road and would be delivered to a hard-stand area from where they would be promptly emplaced following inspection. It is expected that the site would operate during standard business hours, namely 7am to 6pm Monday to Friday, and 8am to 1pm Saturdays, with no work Sundays.

2.2 Primary air quality risks

Noting that odour generated during operations has already been assessed (Jacobs, 2018), the other key air quality risk at the site is the generation of dust including total suspended particles (TSP), and fine particles (PM_{10} and $PM_{2.5}$). Activities with the greatest potential to cause dust include excavation of the waste disposal cell, storage, management and haulage of excavated materials, management of the waste disposal cell during operations, and dust generated from the wind erosion of stockpiled materials and exposed surfaces. A secondary air quality risk for the proposal is exhaust emissions (i.e. particulate matter, sulfur dioxide [SO_2], nitrogen dioxide [NO_2], carbon monoxide [CO] and volatile organic compounds [e.g. benzene]) from the combustion of fossil fuels in vehicles, plant and equipment used at the site.

Potential impacts from dust and exhaust emissions generated at the site were considered in this assessment.

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3. Policy setting and criteria

Emissions to air from activities in NSW are regulated under the *NSW Protection of the Environment Operations Act 1997 (POEO Act)*, *Protection of the Environment Operations (Clean Air) Regulation 2010 (POEO Clean Air Regulation),* and *Protection of the Environment Operations (General) Regulation 2009, Part 5.4 Air pollution*. The "Approved Methods for Modelling and Assessment of Air Pollutants in NSW" (Approved Methods), (NSW Environment Protection Authority, 2016) outlines the approach to be applied for the modelling and assessment of air pollutants in NSW. The Approved Methods contains 'impact assessment criteria' for assessing potential air quality impacts associated with an activity. Criteria relevant to the pollutants related to the proposal have been reproduced below.

Table 3-1 Impact assessment criteria

Pollutant	Averaging time	Impact assessment criteria	Criteria applies at:
Total suspended particles (TSP)	Annual	90 µg/m^3 (100th percentile)	Nearest existing or likely future off-site sensitive receptors
Airborne particulate matter (as PM_{10})	24-hour	50 µg/m^3 (100th percentile)	
	Annual	25 µg/m^3 (100th percentile)	
Airborne particulate matter (as $PM_{2.5}$)	24-hour	25 µg/m^3 (100th percentile)	
	Annual	8 µg/m^3 (100th percentile)	
Sulfur dioxide (SO_2)	10-minutes	712 µg/m^3 (100th percentile)	
	1-hour	570 µg/m^3 (100th percentile)	
	24-hour	228 µg/m^3 (100th percentile)	
	Annual	60 µg/m^3 (100th percentile)	
Nitrogen dioxide (NO_2)	1-hour	246 µg/m^3 (100th percentile)	
	Annual	62 µg/m^3 (100th percentile)	
Carbon monoxide (CO)	15-minutes	100 mg/m^3 (100th percentile)	
	1-hour	30 mg/m^3 (100th percentile)	
	8-hour	10 mg/m^3 (100th percentile)	
Benzene	1-hour	29 µg/m^3 (99.9th percentile)	At and beyond the site boundary

The criteria for deposited dust, TSP, PM_{10}, $PM_{2.5}$, SO_2, NO_2 and CO relate to the 100th percentile or maximum predicted concentration from the activity and existing background levels (that is, cumulative). Impact assessment criteria for these pollutants apply to the nearest existing or likely future sensitive receiver areas in relation to the proposal.

Benzene is classified as an 'air toxic', and as such its assessment criteria applies at the site boundary. Given that this AQIA is a 'Level 2' (i.e. refined, using site-specific input data) assessment as defined in Section 2.1 of the Approved Methods, the 99.9th percentile (i.e. 9th highest for a year of 1-hour records) 1-hour averaged incremental concentration impact assessment criterion applies.

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4. Existing environment

This section of the report describes the existing environment around the proposal location including surrounding receivers, land use, terrain and prevailing climate, meteorological and background air quality conditions.

4.1 Surrounding receivers and designated land uses

The proposal is set within a semi-rural location on the outskirts of Wagga Wagga's industrial area, Bomen, NSW. There are several residential receivers located within the vicinity of the proposal with the nearest located approximately 1.4 kilometres from the perimeter of the proposed site. Nearby residential receivers are generally located in all directions from the proposal with the nearest receivers to the south set along East Bomen Road; to the west off Trahairs Road and the Olympic Highway; to the north along Mary Gilmore Road; and to the east off Pattersons Road and Shepherds Siding Road. The nearest receivers in relation to the proposal are displayed below in **Figure 4-1**, with their approximate coordinates and distance from the perimeter of the site listed in **Table 4-1**.

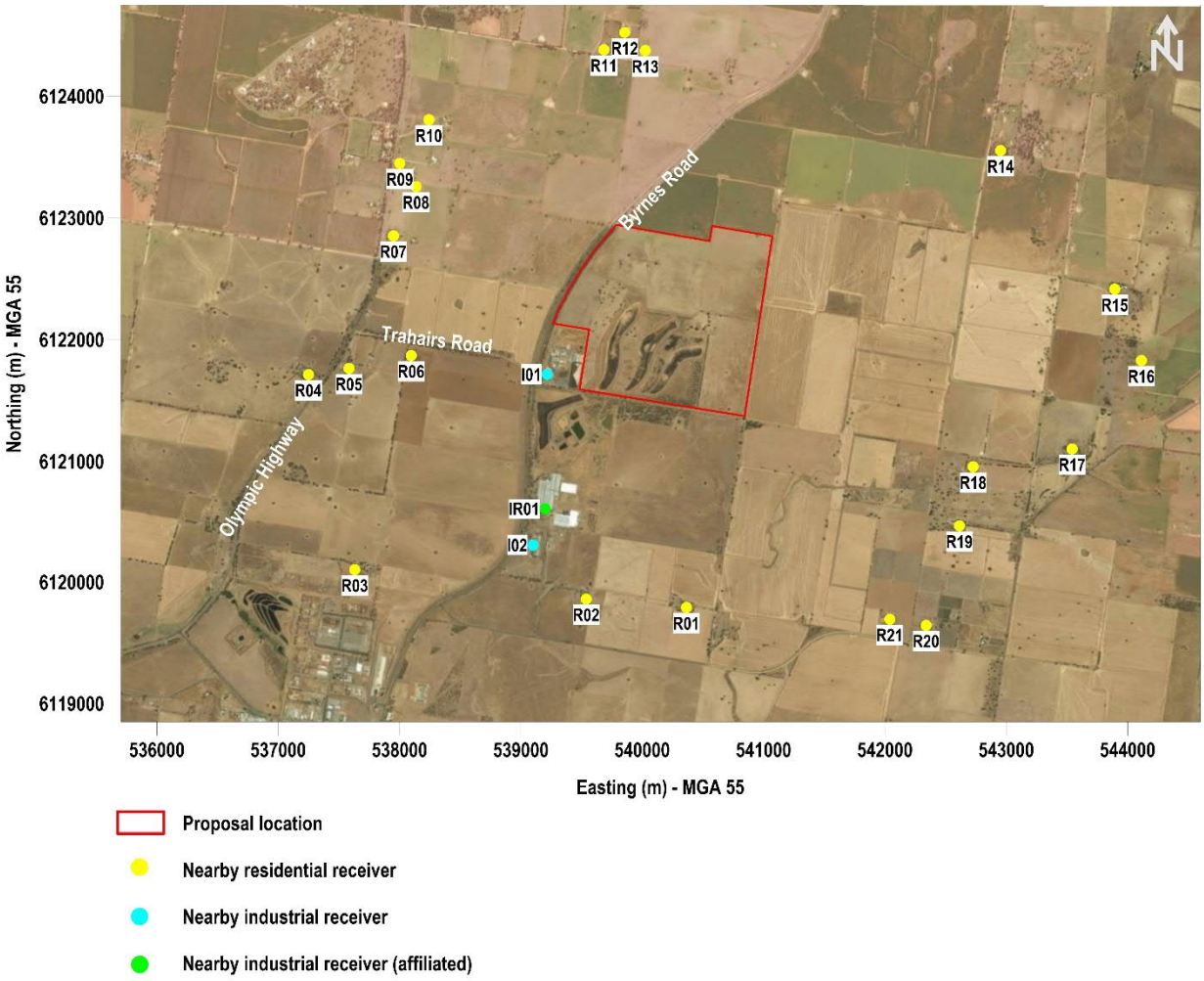

Figure 4-1 Surrounding receivers and local terrain (Imagery source: Esri)

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Table 4-1 Details of nearby receivers

Receiver ID	X coordinate (metres UTM – MGA 56)	Y coordinate (m UTM – MGA 56)	Receiver type	Approximate distance from proposal (metres)
R01	540363.4	6119791	Residential	1600 metres
R02	539537.9	6119861	Residential	1600 metres
R03	537630.5	6120102	Residential	2300 metres
R04	537248.4	6121714	Residential	2250 metres
R05	537583.3	6121765	Residential	1900 metres
R06	538095.2	6121871	Residential	1400 metres
R07	537949	6122854	Residential	1500 metres
R08	538135.7	6123258	Residential	1500 metres
R09	538001.6	6123449	Residential	1700 metres
R10	538241.4	6123808	Residential	1700 metres
R11	539683.3	6124382	Residential	1400 metres
R12	539855.5	6124524	Residential	1600 metres
R13	540025.1	6124375	Residential	1400 metres
R14	542953.5	6123555	Residential	2300 metres
R15	543893.5	6122416	Residential	2900 metres
R16	544113.4	6121830	Residential	3100 metres
R17	543543.1	6121103	Residential	2700 metres
R18	542726.6	6120956	Residential	1900 metres
R19	542614.2	6120463	Residential	1950 metres
R20	542338.6	6119645	Residential	2250 metres
R21	542038.7	6119694	Residential	2000 metres
I01	539216	6121716	Industrial	20 metres
I02	539099	6120306	Industrial	1300 metres
IR01	539199	6120605	Industrial (affiliated)	700 metres

As listed in **Table 4-1** and displayed in **Figure 4-1** there are three industrial receivers located near the proposal. Impacts have been predicted at these locations consistent with the EPA's Approved Methods which defines a sensitive receiver as a location where people work or reside (e.g. "dwelling, school, hospital, office or public recreational area").

As displayed below in **Figure 4-2**, the terrain within approximately 3 kilometres of the proposal site is generally flat. Ground elevations are up to around 300 metres above sea level to the northeast of the site, to approximately 220 metres to the east and west of the site.

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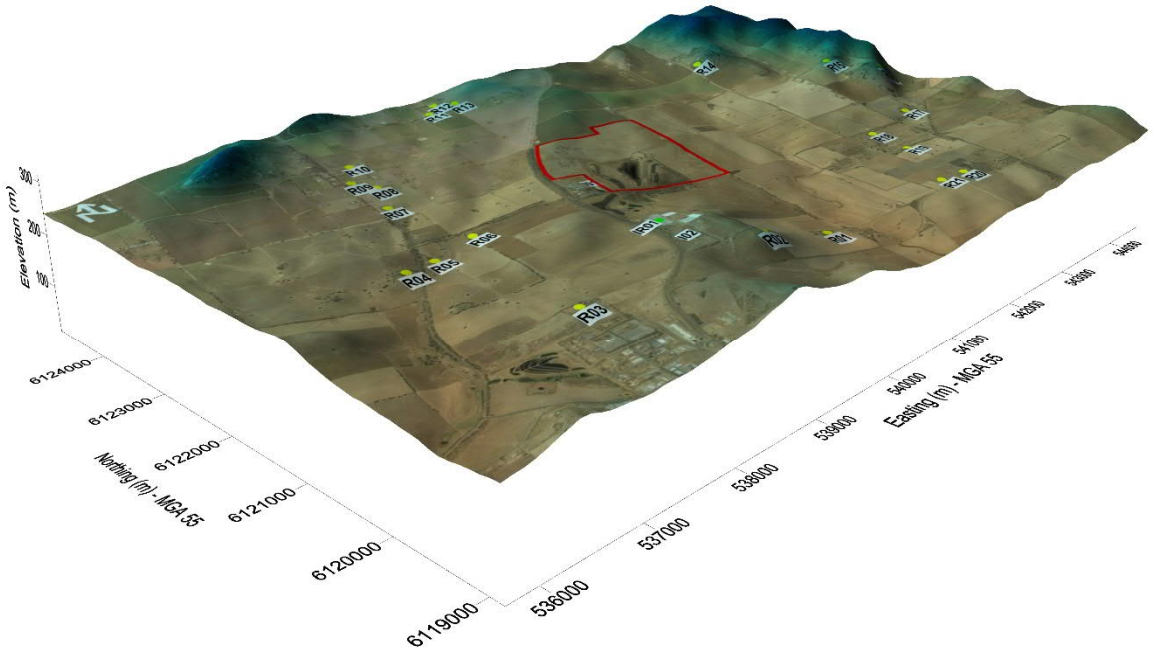

Figure 4-2 Three-dimensional schematic of existing terrain around the proposal (Source: NASA Shuttle Radar Tomography Mission [SRTM3])

4.2 Climate and meteorology

Climate

The nearest weather station with long-term historical records operated by the Bureau of Meteorology (BoM) is the Wagga Wagga Airport automatic weather station (AWS) (Station number 072150). As displayed below in **Figure 4-3**, this station is located close to the proposal site, approximately 12 kilometres to the southeast.

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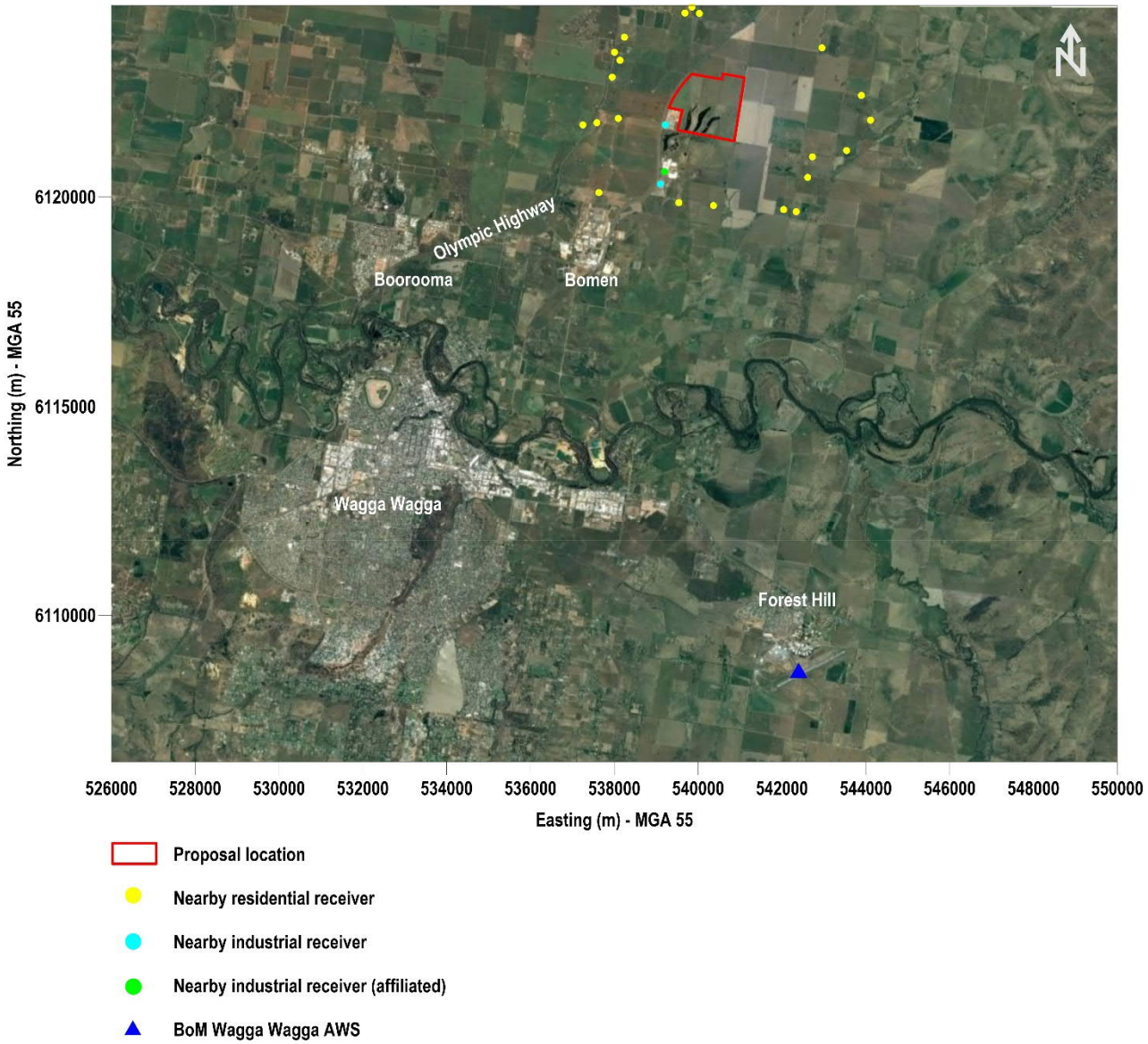

Figure 4-3 Wider locality and location of the BoM Wagga Wagga AWS in relation to the proposal site

Table 4-2 displays long-term temperature and rainfall averages recorded at the Wagga Wagga station from its date of commission in 1942 to 8 June 2017.

Table 4-2 Long-term temperature and rainfall data from the BoM Wagga Wagga AWS from 1942 to 2017 (BoM, 2017)

Month	Mean maximum temperature (°C)	Mean minimum temperature (°C)	Mean rainfall (mm)	Mean number of rain days (> 1 mm)
January	31.7	16.3	40.6	3.9
February	30.9	16.4	40.7	4
March	27.7	13.4	45.1	4.1
April	22.5	9.2	40.3	4.9
May	17.4	5.9	50.8	6.3
June	13.8	3.7	51.2	7.5

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Month	Mean maximum temperature (°C)	Mean minimum temperature (°C)	Mean rainfall (mm)	Mean number of rain days (> 1 mm)
July	12.7	2.8	54.9	9.1
August	14.5	3.6	51	8.8
September	17.7	5.1	50	7.3
October	21.6	7.8	56.8	6.9
November	25.9	10.9	45.8	5.4
December	29.5	13.9	45.6	4.6
Annual	**22.2**	**9.1**	**572.6**	**72.8**

These data above indicate the following climate trends:

- Average maximum temperatures range from around 32 to 30 degrees Celsius in summer to around 13 to 15 degrees Celsius in winter. Minimum temperatures in summer varied between 14 and 16 degrees Celsius, and 3 and 4 degrees Celsius in winter.
- Precipitation is relatively consistent across all months throughout the year with a highest average of 57 millimetres in October and a minimum of 40 millimetres in April. July historically has the highest number of days with more than 1 millimetre of rain (9), whereas the month with the lowest number of rain days each year is January (4).

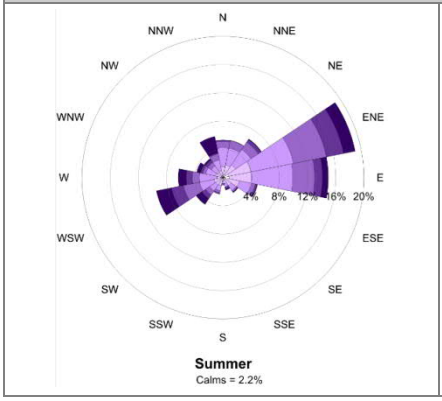
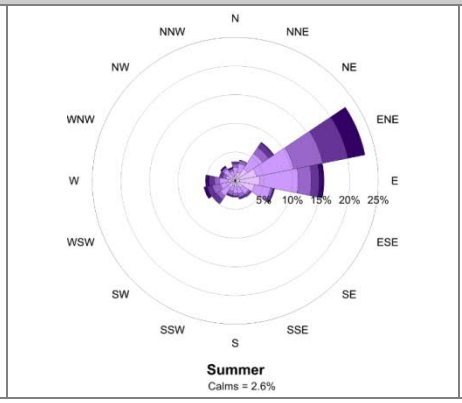
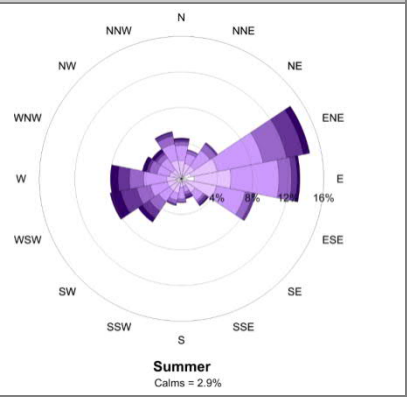
These data indicate how the potential for dust generation from the proposal is highest in summer months when conditions are warmest, and precipitation is low.

Meteorology

Meteorological conditions are important for determining the direction and rate at which emissions from a source will disperse. The key meteorological requirements for an air dispersion model typically include hourly records of wind speed, wind direction, temperature, atmospheric stability class and mixing layer height. For air quality assessments, a minimum one year of hourly data is usually required, which means that almost all possible meteorological conditions, including seasonal variations, are considered in the simulations.

Meteorological data from the BoM Wagga Wagga Airport AWS were considered for the assessment . Data collected in 2014, 2015 and 2016 were developed into annual and seasonal wind roses. These are displayed below in **Table 4-3**.

Table 4-3 Annual and seasonal wind roses for 2014, 2015 and 2016 from data measured at BoM Wagga Wagga Airport AWS

2014	2015	2016
Summer		
		

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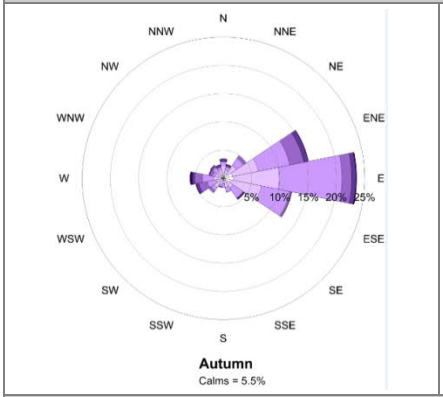
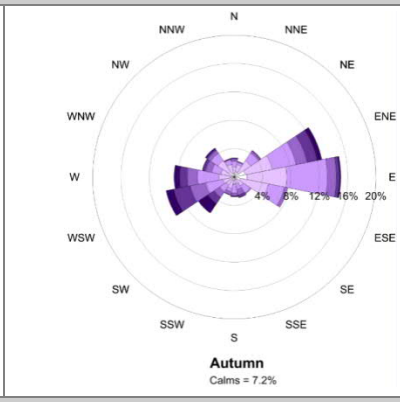
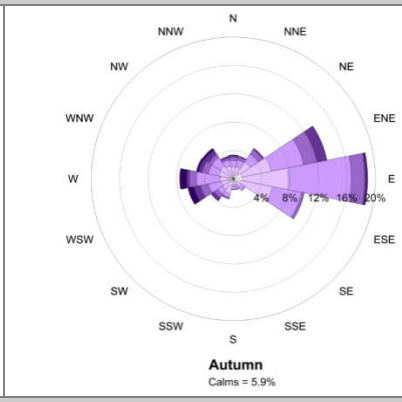
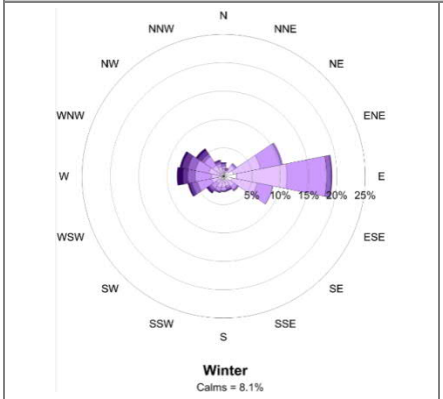
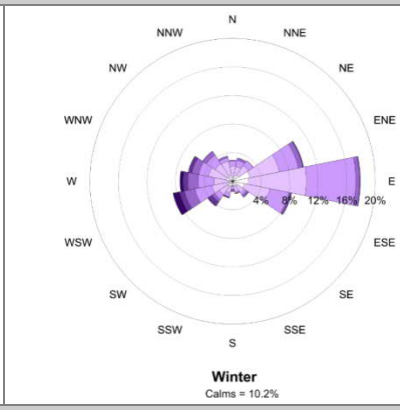
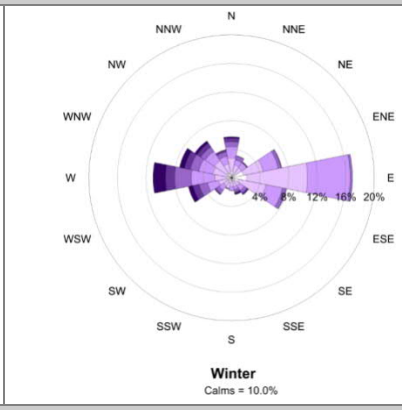
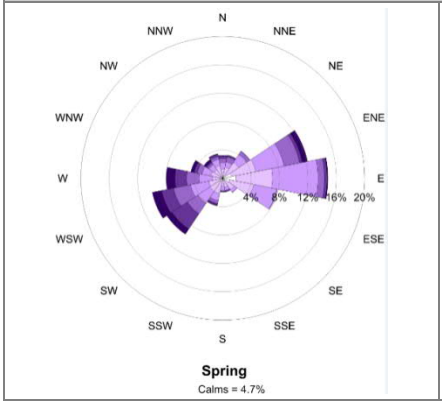
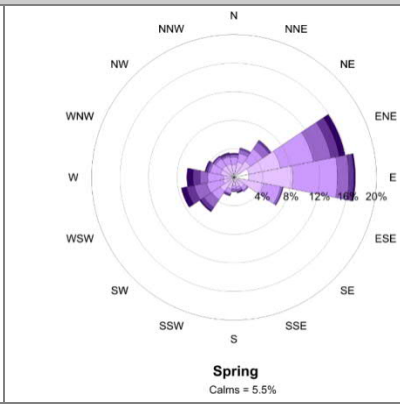
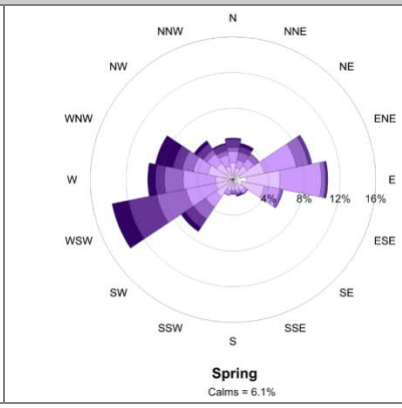
2014	2015	2016
Autumn		
		
Winter		
		
Spring		
		

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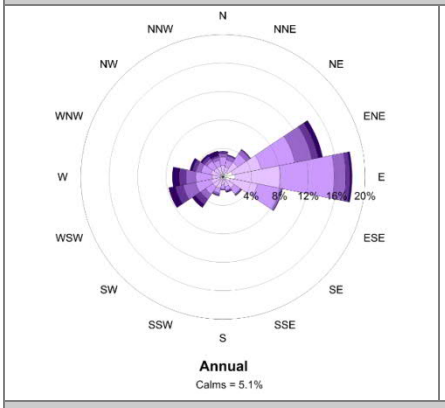
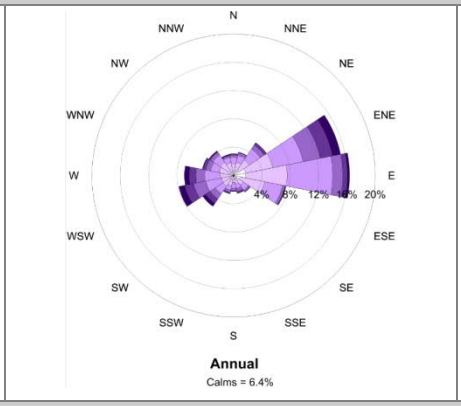
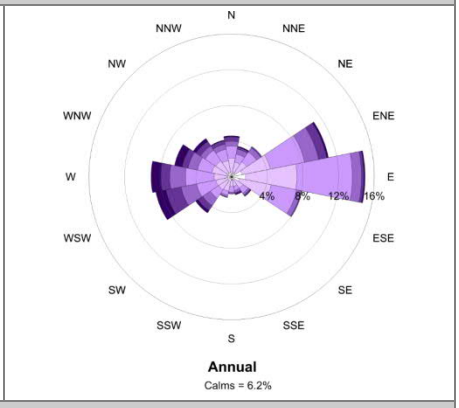
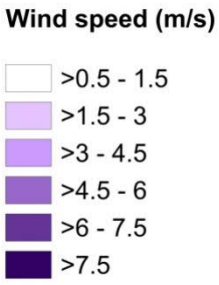
2014	2015	2016
Annual		
		
Legend		
		

The annual and seasonal wind roses for these three years are generally consistent, with the following typical trends observed for each season:

- Summer – Winds blowing from the east and east northeast most common, with a low percentage of calm conditions (less than 3%).
- Autumn – Winds from the east most common, with winds from the east northeast and east southeast also occurring frequently. Calm periods occurring 5 to 7% of the time.
- Winter – Prevailing winds from the east, with occasional strong winds (greater than 7.5 metres per second) from the west with winds blowing from the east northeast and east southeast also common. Calm periods taking place up to around 10% of the time.
- Spring – Winds blowing from the east and east northeast most common, with strong winds occasionally occurring from the west northwest, west, and west southwest. Calm conditions were uncommon, occurring around 5 to 6% of the time.

Though there was a high level of consistency between the trends observed over each of the three years, 2015 was selected to be used as the representative meteorological input year for dispersion modelling. 2015 was selected instead of the more recent 2016 dataset as there was more consistency between spring observations in 2014 and 2015. The 2016 data set had a higher proportion of winds blowing from the west southwest.

4.3 Background air quality

The NSW Office of Environment and Heritage (OEH) operate a network of ambient air quality monitoring stations throughout NSW. A station has been operated at Wagga Wagga racecourse in Wagga Wagga North approximately 9 kilometres to the southwest of the proposal since October 2011. PM_{10} and $PM_{2.5}$ are monitored

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at this station, with Albion Park South being the nearest OEH station where NO_2 and SO_2 are monitored, and the station at Wollongong being the closest where CO is measured. Neither Albion Park South or Wollongong would be considered representative of conditions in Wagga Wagga but the data have been included in the absence of data from closer or more representative locations. The most recent (2014 - 2017) publicly available data measured for these pollutants at each of these stations were used to characterise background air quality conditions around the proposal so that cumulative concentrations (i.e. contributions from the proposal as well as the contribution from existing sources) could be assessed consistent with the Approved Methods. These results are presented and discussed by pollutant below.

4.3.1 Dust and particulate matter

Table 4-4 lists ambient PM_{10} and $PM_{2.5}$ concentrations measured at the OEH's Wagga Wagga North air quality monitoring station from 2014 to 2017. As displayed the 50 µg/m^3 daily averaged PM_{10} Approved Methods impact assessment criterion was frequently exceeded over this period. These exceedances are likely to have been a result of natural and human phenomena including dust storms and bush fires, solid fuel heaters and crop residues. The 95th percentile 24-hour averaged concentrations were also considered consistent with compliance reporting against air quality criteria, according to the former Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC 2011). These values also approached the 50 µg/m^3 impact assessment criterion, with an average value of 44 µg/m^3 recorded over the four years. Annually averaged PM_{10} concentrations remained below the 50 µg/m^3 impact assessment criteria over the period reviewed.

Regarding $PM_{2.5}$, maximum daily concentrations were occasionally measured above the 25 µg/m^3 impact assessment criterion. The 95th percentile 24-hour averaged concentrations were below this criterion, with an average value of 16 recorded over the four years reviewed. Annually averaged $PM_{2.5}$ concentrations were measured below the 8 µg/m^3 impact assessment criterion, except in 2017 when a value of 8.1 µg/m^3 was recorded.

Table 4-4 Background PM_{10} and $PM_{2.5}$ concentrations measured 2014 to 2017 at Wagga Wagga North OEH station

Year	Value measured at OEH Wagga Wagga North ambient air quality monitoring station	Impact assessment criterion (µg/m^3)
Maximum 24-hour average PM_{10} in µg/m^3		
2014	88	50
2015	145	
2016	115	
2017	172	
95th percentile of 24-hour average PM_{10} in µg/m^3		
2014	44	50
2015	42	
2016	48	
2017	41	
Number of days above with average PM_{10} concentration exceeding 50 µg/m^3		
2014	13	0
2015	7	
2016	16	
2017	10	

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Year	Value measured at OEH Wagga Wagga North ambient air quality monitoring station	Impact assessment criterion (µg/m^3)
Annual average PM_{10} in µg/m^3		
2014	21	25
2015	20	
2016	21	
2017	21	
Maximum 24-hour average $PM_{2.5}$ in µg/m^3		
2014	28	25
2015	24	
2016	28	
2017	33	
95th percentile of 24-hour average $PM_{2.5}$ in µg/m^3		
2014	14	50
2015	16	
2016	16	
2017	18	
Number of days above with average $PM_{2.5}$ concentration exceeding 25 µg/m^3		
2014	2	0
2015	0	
2016	2	
2017	4	
Annual average $PM_{2.5}$ in µg/m^3		
2014	7.5	8
2015	7.6	
2016	7.4	
2017	8.1	

4.3.2 Nitrogen dioxide (NO_2)

Maximum 1-hour averaged NO_2 concentrations measured at Albion Park OEH monitoring station between 2014 and 2017 were recorded well below the 246 µg/m^3 impact assessment criterion from the Approved Methods. This was similarly the case for the annually averaged concentrations. The levels at Albion Park are likely to be higher than those around the proposal site given the lower density of traffic and industry burning fossil fuels than at Albion Park.

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Table 4-5 Background nitrogen dioxide (NO_2) concentrations measured 2014 to 2017 at Albion Park South OEH station

Year	Value measured at OEH Albion Park ambient air quality monitoring station	Impact assessment criterion (µg/m³)
Maximum 1-hour averaged NO_2 in µg/m³		
2014	78	246
2015	96	
2016	88	
2017	78	
Annual average NO_2 in µg/m³		
2014	8	62
2015	6	
2016	8	
2017	8	

4.3.3 Sulfur dioxide (SO_2)

As shown in **Table 4-6**, 1-hour, 24-hour and annually averaged SO_2 concentrations measured at OEH's Albion Park station were recorded well below the 570, 228 and 60 µg/m³ impact assessment criterion from the Approved Methods. As for NO_2, SO2 concentrations are likely to be lower at the proposal site than those measured at Albion Park given the lower density of traffic and fossil fuel-intensive industries.

Table 4-6 Background sulfur dioxide (SO_2) concentrations measured 2014 to 2017 at Albion Park South OEH station

Year	Value measured at OEH Albion Park ambient air quality monitoring station	Impact assessment criterion (µg/m³)
Maximum 1-hour averaged SO_2 in µg/m³		
2014	46	570
2015	103	
2016	63	
2017	109	
Maximum 24-hour averaged SO_2 in µg/m³		
2014	14	228
2015	20	
2016	17	
2017	23	
Annual average SO_2 in µg/m³		
2014	3	60
2015	3	
2016	3	
2017	3	

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4.3.4 Carbon monoxide (CO)

As listed in **Table 4-7**, 100th percentile, 1-hour and 8-hour carbon monoxide (CO) concentrations measured at OEH's Wollongong air quality monitoring station were both recorded well below the relevant impact assessment criteria from the Approved Methods. Compliance with CO criteria would also be anticipated for the Wagga Wagga region.

Table 4-7 Background carbon monoxide (CO) concentrations measured 2014 to 2017 at Wollongong OEH station

Year	Value measured at OEH Wollongong ambient air quality monitoring station	Impact assessment criterion (mg/m^3)
Maximum 1-hour averaged CO in mg/m^3		
2014	2	30
2015	2	
2016	2	
2017	3	
Maximum 8-hour averaged CO in mg/m^3		
2014	1.1	10
2015	1.0	
2016	1.1	
2017	0.9	

4.3.5 Adopted background concentrations

Considering the monitoring data presented above, the following background concentrations were established for the receiving environment around the proposal. **Table 4-8** includes reasoning why each value was selected.

Table 4-8 Adopted background concentrations

Pollutant	Averaging time	Adopted background concentration	Justification
TSP	Annual	53 µg/m^3	No known monitoring of TSP was conducted near the proposal site. The NSW Minerals Council estimate, for rural environments in NSW that average PM_{10} concentrations are typically 40 per cent of TSP concentrations (Minerals Council 2000).
PM_{10}	24-hour	48 µg/m^3	Highest 2014 to 2017 95th percentile value recorded at OEH's Wagga Wagga station
	Annual	21 µg/m^3	Highest 2014 to 2017 value recorded at OEH's Wagga Wagga station
$PM_{2.5}$	24-hour	18 µg/m^3	Highest 2014 to 2017 95th percentile value recorded at OEH's Wagga Wagga station
	Annual	7.7 µg/m^3	Average of 2014 to 2017 value recorded at OEH's Wagga Wagga station
NO_2	1-hour	96 µg/m^3	Highest 2014 to 2017 value recorded at OEH's Albion Park station
	Annual	8 µg/m^3	Highest 2014 to 2017 value recorded at OEH's Albion Park station
SO_2	1-hour	109 µg/m^3	Highest 2014 to 2017 value recorded at OEH's Albion Park station
	24-hour	23 µg/m^3	Highest 2014 to 2017 value recorded at OEH's Albion Park station
	Annual	3 µg/m^3	Highest 2014 to 2017 value recorded at OEH's Albion Park station
CO	1-hour	3 mg/m^3	Highest 2014 to 2017 value recorded at OEH's Wollongong station

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Pollutant	Averaging time	Adopted background concentration	Justification
	8-hour	1.1 mg/m^3	Highest 2014 to 2017 value recorded at OEH's Wollongong station

As shown in **Table 4-9**, adopted background concentrations for NO_2, SO_2 and CO around the proposal are all expected to be well below the relevant impact assessment criteria from the Approved Methods. Considering this and the expected scale of plant and equipment used during construction (1 scraper, 1 excavator, several truck and dogs, 1 grader, 1 roller and several light vehicles) and operations (1 loader, 1 grader, several truck and dogs, compactor and several light vehicles) it was determined that exhaust-emissions would not be so significant as to adversely affect local air quality. As such, these are not considered further in this assessment.

Table 4-9 Comparison of NO_2, SO_2 and CO adopted background concentrations with Approved Methods' impact assessment criteria

Pollutant	Averaging time	Adopted background concentration (µg/m^3 unless stated)	Impact assessment criteria (µg/m^3 unless stated)	Background concentration % of impact assessment criteria
NO_2	1-hour	96	246	39
	Annual	8	62	13
SO_2	1-hour	109	570	19
	24-hour	23	228	10
	Annual	3	60	5
CO	1-hour	3 mg/m^3	30	10
	8-hour	1.1 mg/m^3	10	11

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5. Emissions to air

As identified in **Section 2.2** dust generated from the handling, transport, and storage of bulk materials, as well as wind erosion from exposed surfaces present the primary air quality risk during construction. Rates of emissions to air of dust from these activities were estimated using the methods presented in "Emission Estimation Technique Manual for Mining Version 3.1", (DSEWPaC, 2012) and "AP-42 13.2.2 Unpaved Roads", (US EPA, 2006). Input information for variables within the equations included in these methods was provided by NGH Environmental, with site plans being used to determine haul road distances. **Table 5-1** shows annual TSP, PM_{10} and $PM_{2.5}$ emissions estimated for full-scale construction activities. The location(s) where these activities were assumed to take place are shown in **Figure 5-1**. **Appendix A** provides details of the dust emission calculations, including assumed emission controls. Emission sources were turned on and off based on planned hours of construction.

Table 5-1 Estimated dust emissions during full-scale construction

Phase	Activity	Annual emissions (kg/y)		
		TSP	PM_{10}	$PM_{2.5}$
Overall excavation	Scrapers removing soils	468	118	23
	Scrapers traveling across cell	555	142	28
	Wind erosion	8,676	4,338	434
Subsoil drainage	Excavators trenching	3	1	0
	Trucks hauling material	98	26	3
Leachate pond and collection system	Excavators handling material	4	2	0
	Trucks hauling material	780	211	21
	Wind erosion	1,542	771	77
Cell 1 earthworks	Excavators handling material	20	9	2
	Trucks hauling material	717	194	19
	Trucks dumping material	296	106	15
	Graders spreading material	137	61	7
	Wind erosion	2,186	1,093	109
Hardstand earthworks	Excavators handling material	8	4	1
	Trucks hauling material	108	29	3
	Trucks dumping material	122	44	6
	Graders spreading material	137	61	7
	Wind erosion	1,226	613	61
Access road	Excavators handling material	<1	<1	<1
	Trucks hauling material	1	<1	<1
	Trucks dumping material	4	1	<1
	Graders spreading material	137	61	7
	Wind erosion	88	44	4
Earth bank	Trucks hauling material	94	25	3
	Trucks dumping material	14	5	1

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Phase	Activity	Annual emissions (kg/y)		
		TSP	PM_{10}	$PM_{2.5}$
	Excavators handling material	1	<1	0
	Wind erosion	526	263	26
Total (kg/y)		**17,949**	**8,224**	**858**

Figure 5-1 Source layout full-scale construction

Emissions to air were also estimated for the operation of the facility. The scenario was considered where active waste filling (including daily covering) as well as final capping of Cell 1 was being completed, as well earthworks for the next adjacent cell (Cell 2). No information regarding the sizing of Cell 2 is available so it was assumed to be the same as Cell 1 for this assessment. This combination is conservative noting that earthworks for Cell 1 is forecast to take 12 weeks whereas emissions from this activity were programmed to take place throughout the year. **Table 5-2** lists the annual TSP, PM_{10} and $PM_{2.5}$ emissions estimated for this operational scenario. **Figure 5-2** shows where these emission sources were positioned in the model. Calculation details, including assumed

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emission controls are shown in **Appendix A**. As for construction, emissions were turned on and off based on the intended hours of operation of the facility.

Table 5-2 Estimated dust emissions during operations

Phase	Activity	Annual emissions (kg/y)		
		TSP	PM_{10}	$PM_{2.5}$
Cell 2 earthworks	Excavators handling material	20	9	2
	Trucks hauling material	717	194	19
	Trucks dumping material	296	106	15
	Graders spreading material	137	61	7
	Wind erosion	2,186	1,093	109
Waste receival and Cell 1 waste emplacement	Unloading waste materials to hardstand	196	70	10
	Sorting and loading for emplacement	13	6	1
	Transport of waste to Cell 1	1298	351	35
	Unloading waste to Cell 1	196	70	10
	Graders spreading waste	137	61	7
Cell 1 daily cover	Loaders handling material	33	17	2
Cell 1 final capping layer	Excavators handling capping material	20	9	2
	Trucks hauling capping material	701	189	19
	Trucks dumping capping material	290	104	15
	Graders spreading capping material	137	61	7
	Wind erosion	2,186	1,093	109
Exposed remaining cell areas	Wind erosion	6,482	3,241	324
Total (kg/y)		**14,816**	**6,674**	**686**

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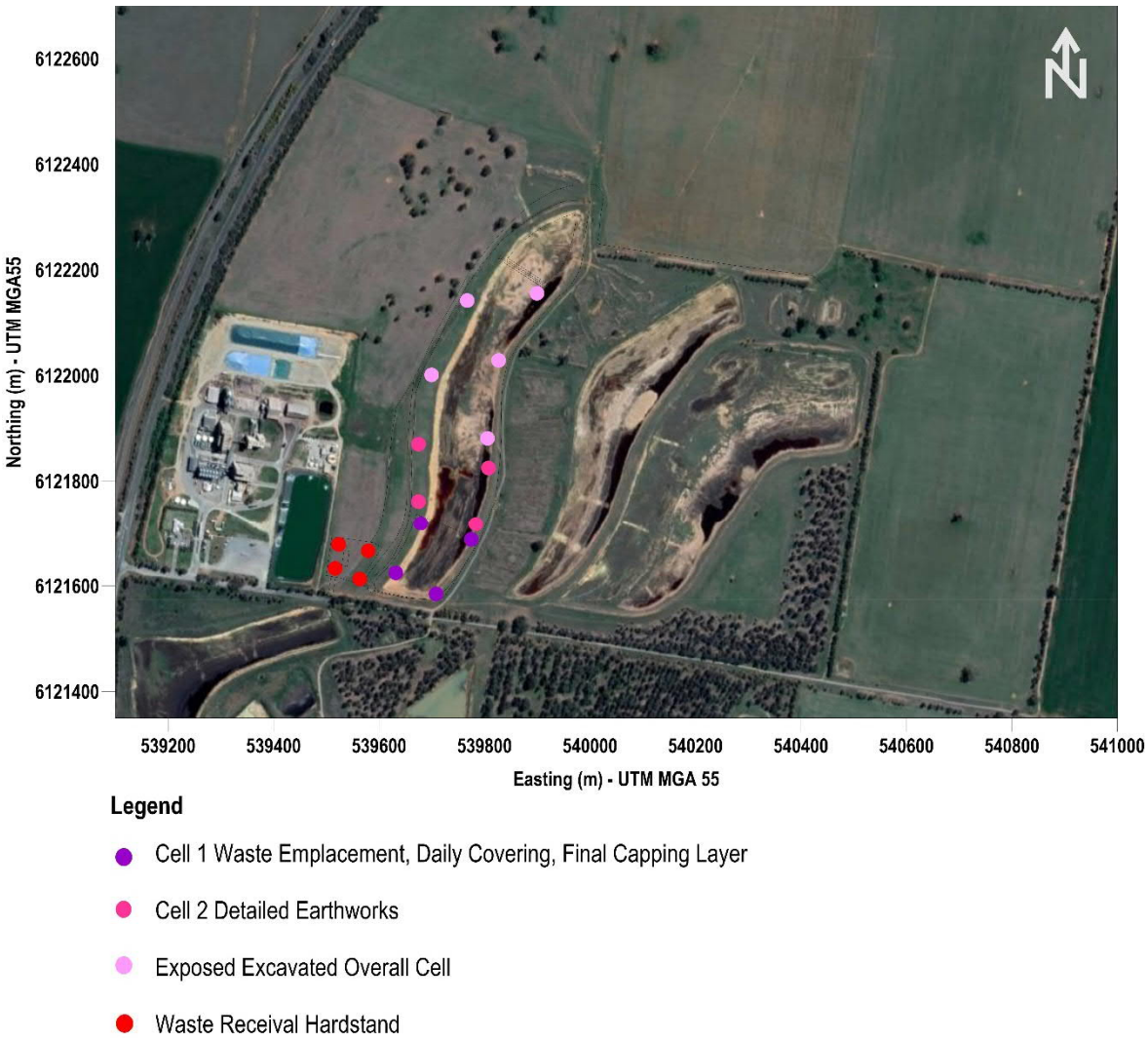

Figure 5-2 Source layout - worst-case operations

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6. Approach to assessment

This assessment has followed the EPA's Approved Methods, which specifies how assessments based on the use of air dispersion models should be undertaken. The Approved Methods include guidelines for the preparation of meteorological data, reporting requirements and air quality assessment criteria to assess the significance of dispersion model predictions.

The AUSPLUME v 6.0 dispersion model was selected for the evaluation of potential dust impacts from the proposal. The model was selected on the basis that the requirements for application listed in Section 6.2 of the Approved Methods were satisfied for the proposal scenario.

Table 6-1 Checklist for application of AUSPLUME v6.0 dispersion model (Source: Approved Methods)

Modelling aspect	Requirement satisfied for AUSPLUME to be used during assessment
Simple terrain, steady-state conditions	✓
No buoyant line plumes	✓
No coastal fumigation effects	✓
Low frequency of stable, calm night time conditions	✓

General compliance with the fourth condition for use being a low frequency of stable, calm night time conditions was evaluated by post-analysing the annual, one-hour time step meteorological input files generated for use in the AUSPLUME v6 dispersion model. These reviews identified the occurrence of calm and stable night time conditions as 9.3%, 11.4% and 11.5% in 2014, 2015 and 2016 respectively, confirming that the AUSPLUME v6 model was suitable for the assessment.

Key setup details applied in the dispersion model are summarised below in **Table 6-2**.

Table 6-2 Model setup details

Parameter	Details
Model version	AUSPLUME version 6.0
Terrain effects	NASA Shuttle Radar Topography Mission (SRTM3) data were used to generate terrain across the study area. Terrain effects were accounted for in the model using the Egan half-height approach.
Horizontal and vertical dispersion curves	Pasquill-Gifford method
Meteorology	Processed data collected in 2015 from the BoM Wagga Wagga Airport AWS (Station number 072150) processed into a format suitable for use.
Wind profile exponent	Irwin rural wind profile exponents for rural areas.
Plume rise parameters and wind speed categories	AUSPLUME default values.
Prediction area	100 metre spaced area approximately 8 kilometres (east to west) by around 5 kilometres (north to south) to cover the extent of nearby receivers in relation to the proposal
Land use	'Flat rural' (surface roughness height = 0.1 metres)

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7. Assessment of impacts

Results predicted at the surrounding sensitive receivers during construction are summarised in **Table 7-1** with contour plots displayed in **Appendix B**.

Table 7-1 Predicted results - construction

Receiver	Annually averaged TSP (µg/m³) vs 90 µg/m³ criterion			PM_{10}						$PM_{2.5}$					
				24-hour averaged (µg/m³) vs 50 µg/m³ criterion			Annually averaged (µg/m³) vs 25 µg/m³ criterion			24-hour averaged (µg/m³) vs 25 µg/m³ criterion			Annually averaged (µg/m³) vs 8 µg/m³ criterion		
	Background	Increment	Cumulative	Background	Increment	Cumulative	Background	Increment	Cumulative	Background	Increment	Cumulative	Background	Increment	Cumulative
R01	53	<1	<54	48	2	50	21	<0.5	<22	18	0.2	<19	7.7	<0.05	<7.8
R02	53	<1	<54	48	2	50	21	<0.5	<22	18	0.1	<19	7.7	<0.05	<7.8
R03	53	<1	<54	48	2	50	21	<0.5	<22	18	0.2	<19	7.7	<0.05	<7.8
R04	53	<1	<54	48	2	50	21	<0.5	<22	18	0.2	<19	7.7	<0.05	<7.8
R05	53	<1	<54	48	2	50	21	<0.5	<22	18	0.2	<19	7.7	<0.05	<7.8
R06	53	<1	<54	48	3	**51**	21	<0.5	<22	18	0.3	<19	7.7	<0.05	<7.8
R07	53	<1	<54	48	1	49	21	<0.5	<22	18	0.1	<19	7.7	<0.05	<7.8
R08	53	<1	<54	48	1	49	21	<0.5	<22	18	0.1	<19	7.7	<0.05	<7.8
R09	53	<1	<54	48	1	49	21	<0.5	<22	18	0.1	<19	7.7	<0.05	<7.8
R10	53	<1	<54	48	1	49	21	<0.5	<22	18	0.1	<19	7.7	<0.05	<7.8
R11	53	<1	<54	48	3	**51**	21	<0.5	<22	18	0.2	<19	7.7	<0.05	<7.8
R12	53	<1	<54	48	2	50	21	<0.5	<22	18	0.2	<19	7.7	<0.05	<7.8
R13	53	<1	<54	48	1	49	21	<0.5	<22	18	0.1	<19	7.7	<0.05	<7.8
R14	53	<1	<54	48	1	49	21	<0.5	<22	18	0.1	<19	7.7	<0.05	<7.8
R15	53	<1	<54	48	1	49	21	<0.5	<22	18	0.1	<19	7.7	<0.05	<7.8
R16	53	<1	<54	48	1	49	21	<0.5	<22	18	0.1	<19	7.7	<0.05	<7.8
R17	53	<1	<54	48	1	49	21	<0.5	<22	18	0.1	<19	7.7	<0.05	<7.8
R18	53	<1	<54	48	1	49	21	<0.5	<22	18	0.1	<19	7.7	<0.05	<7.8
R19	53	<1	<54	48	1	49	21	<0.5	<22	18	0.1	<19	7.7	<0.05	<7.8
R20	53	<1	<54	48	1	49	21	<0.5	<22	18	0.1	<19	7.7	<0.05	<7.8
R21	53	<1	<54	48	1	49	21	<0.5	<22	18	0.1	<19	7.7	<0.05	<7.8
I01	53	6	59	48	14	**62**	21	3	24	18	1.4	19.4	7.7	0.3	8.0
I02	53	<1	<54	48	2	50	21	<0.5	<22	18	0.2	18.2	7.7	<0.05	<7.8
IR01	53	<1	<54	48	2	50	21	<0.5	<22	18	0.2	18.3	7.7	<0.05	<7.8

During construction the 24-hour averaged PM_{10} impact assessment criteria was predicted to be exceeded during construction at the nearest residential receivers to the west (R6) and north (R11) of the facility. Modelling also

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indicated a potential risk of maximum 24-hour averaged PM_{10} concentrations being above the EPA's 50 µg/m^3 at the nearest industrial receiver (I01).

As **Table 7-1** shows the predicted exceedances of the 24-hour averaged PM_{10} impact assessment criteria at residential receivers R6 and R11 during construction are primarily a result of the elevated local background concentration value adopted for the assessment (48 µg/m^3). Noting that the sub-annual averaging time predictions from the model are conservative as they consider that all activities in **Table 5-1** take place at the same time; consistent with Section 5.1.3 of the Approved Methods further analysis was undertaken to confirm whether proposal construction activities would cause any additional exceedances of the impact assessment criteria at these two locations. Time-series plots of the contemporaneous (i.e. 2015) 24-hour averaged PM_{10} data measures at OEH Wagga Wagga North and the values predicted from the model at these locations are displayed in **Figure 7-1** and **Figure 7-2** for receivers R6 and R11 respectively.

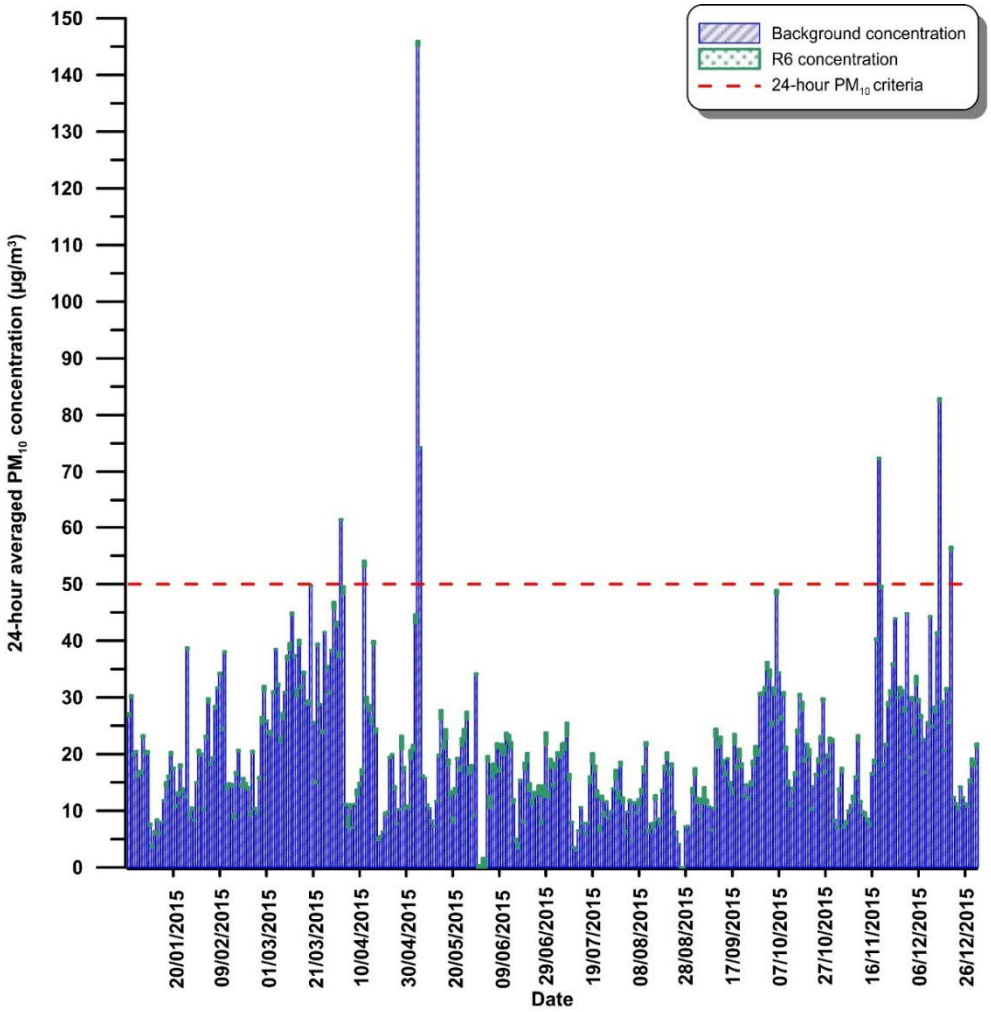

Figure 7-1 Timeseries of cumulative PM_{10} 24-hour averaged concentrations at receiver R6 during construction

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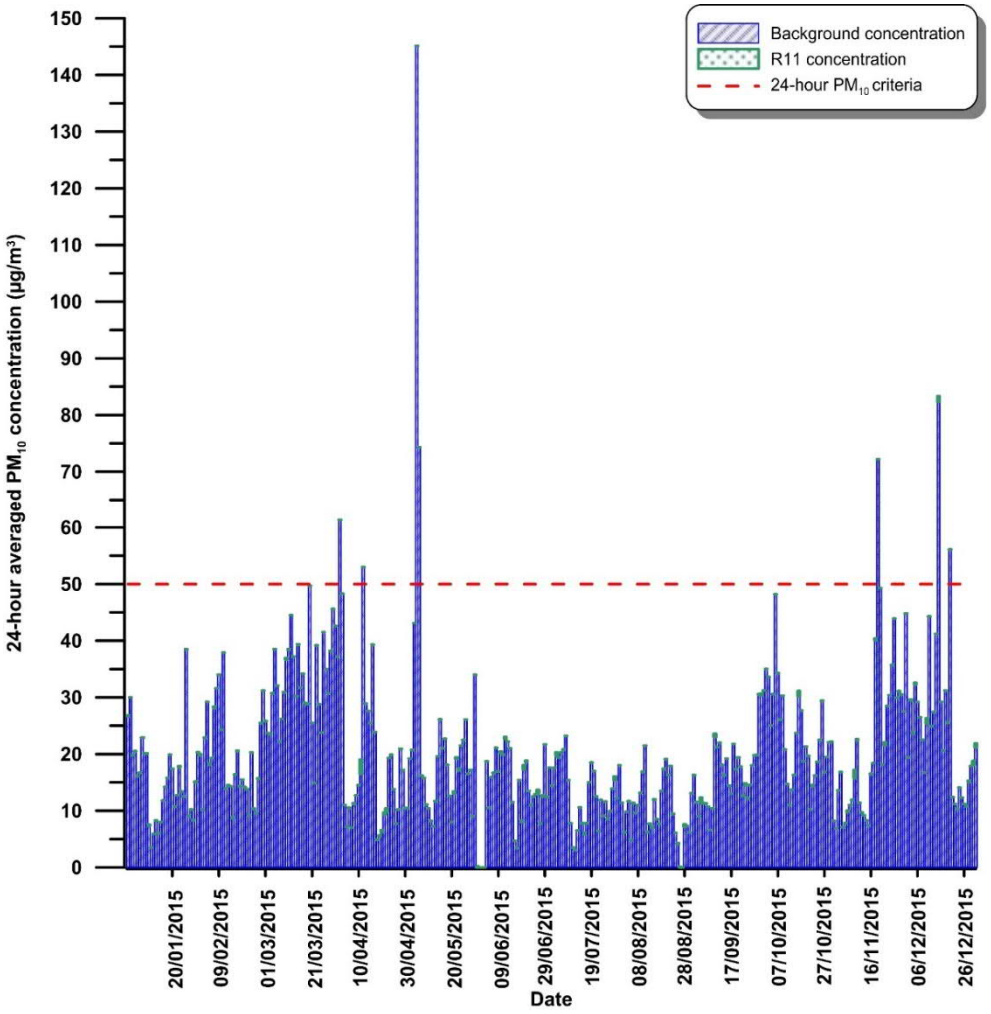

Figure 7-2 Timeseries of cumulative PM_{10} 24-hour averaged concentrations at receiver R11 during construction

As displayed, there were no additional instances when the EPA's 50 µg/m^3 criterion was predicted to be exceeded during construction at receivers R6 and R11.

Regarding industrial receiver I01, a timeseries of cumulative PM_{10} concentrations is presented below in **Figure 7-3**.

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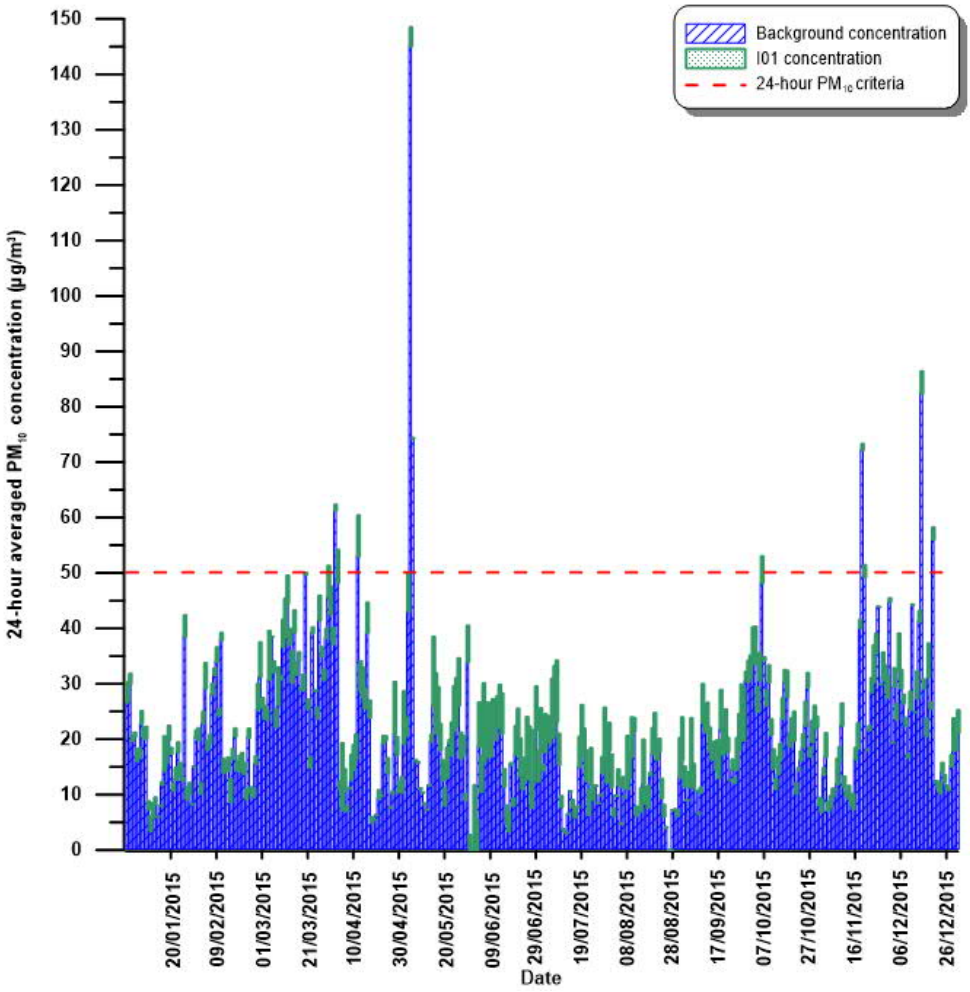

Figure 7-3 Timeseries of cumulative PM_{10} 24-hour averaged concentrations at receiver I01 during construction

The figure shows that modelling predicted the potential for three additional exceedances of the EPA's 50 µg/m^3 criterion during construction. For all three of these dates, background concentrations were elevated (46, 48 and 48 µg/m^3), and the site was predicted to contribute 11% or less of the overall cumulative concentration (highest cumulative value being 54 µg/m^3). This indicates the need to manage activities during construction to avoid potential impacts at I01.

No exceedances of the annually averaged PM_{10} and TSP, and 24-hour and annually averaged $PM_{2.5}$ criteria were predicted at the identified nearby sensitive receivers during construction.

Regarding operations, results predicted at the surrounding sensitive receivers are listed in **Table 7-2**, with contour plots displayed in **Appendix B**.

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Table 7-2 Predicted results - operations

Receiver	Annually averaged TSP (µg/m³)			PM_{10}						$PM_{2.5}$					
				24-hour averaged (µg/m³)			Annually averaged (µg/m³)			24-hour averaged (µg/m³)			Annually averaged (µg/m³)		
	Background	Increment	Cumulative	Background	Increment	Cumulative	Background	Increment	Cumulative	Background	Increment	Cumulative	Background	Increment	Cumulative
R01	53	<1	<54	48	1	49	21	<0.5	<22	18	0.1	<19	7.7	<0.05	<7.8
R02	53	<1	<54	48	1	49	21	<0.5	<22	18	0.1	<19	7.7	<0.05	<7.8
R03	53	<1	<54	48	2	50	21	<0.5	<22	18	0.2	<19	7.7	<0.05	<7.8
R04	53	<1	<54	48	1	49	21	<0.5	<22	18	0.1	<19	7.7	<0.05	<7.8
R05	53	<1	<54	48	1	49	21	<0.5	<22	18	0.1	<19	7.7	<0.05	<7.8
R06	53	<1	<54	48	2	50	21	<0.5	<22	18	0.2	<19	7.7	<0.05	<7.8
R07	53	<1	<54	48	1	49	21	<0.5	<22	18	0.1	<19	7.7	<0.05	<7.8
R08	53	<1	<54	48	1	49	21	<0.5	<22	18	0.1	<19	7.7	<0.05	<7.8
R09	53	<1	<54	48	1	49	21	<0.5	<22	18	0.1	<19	7.7	<0.05	<7.8
R10	53	<1	<54	48	1	49	21	<0.5	<22	18	0.1	<19	7.7	<0.05	<7.8
R11	53	<1	<54	48	2	50	21	<0.5	<22	18	0.2	<19	7.7	<0.05	<7.8
R12	53	<1	<54	48	2	50	21	<0.5	<22	18	0.2	<19	7.7	<0.05	<7.8
R13	53	<1	<54	48	1	49	21	<0.5	<22	18	0.1	<19	7.7	<0.05	<7.8
R14	53	<1	<54	48	1	49	21	<0.5	<22	18	0.1	<19	7.7	<0.05	<7.8
R15	53	<1	<54	48	1	49	21	<0.5	<22	18	0.1	<19	7.7	<0.05	<7.8
R16	53	<1	<54	48	1	49	21	<0.5	<22	18	0.1	<19	7.7	<0.05	<7.8
R17	53	<1	<54	48	1	49	21	<0.5	<22	18	0.1	<19	7.7	<0.05	<7.8
R18	53	<1	<54	48	1	49	21	<0.5	<22	18	0.1	<19	7.7	<0.05	<7.8
R19	53	<1	<54	48	1	49	21	<0.5	<22	18	0.1	<19	7.7	<0.05	<7.8
R20	53	<1	<54	48	1	49	21	<0.5	<22	18	0.1	<19	7.7	<0.05	<7.8
R21	53	<1	<54	48	1	49	21	<0.5	<22	18	0.1	<19	7.7	<0.05	<7.8
I01	53	5	58	48	11	**59**	21	2	23	18	1.1	19.1	7.7	0.2	7.9
I02	53	<1	<54	48	1	49	21	<0.5	<22	18	0.1	<19	7.7	<0.05	<7.8
IR01	53	<1	<54	48	2	50	21	<0.5	<22	18	0.2	<19	7.7	<0.05	<7.8

As **Table 7-2** shows, during operations, the EPA's impact assessment criteria were predicted to be met at all of the nearest surrounding residential receivers except the 24-hour averaged PM_{10} criterion at industrial receiver I01. A review of whether operations would result in additional exceedances at I01 during operations was undertaken which is presented below in **Figure 7-4**.

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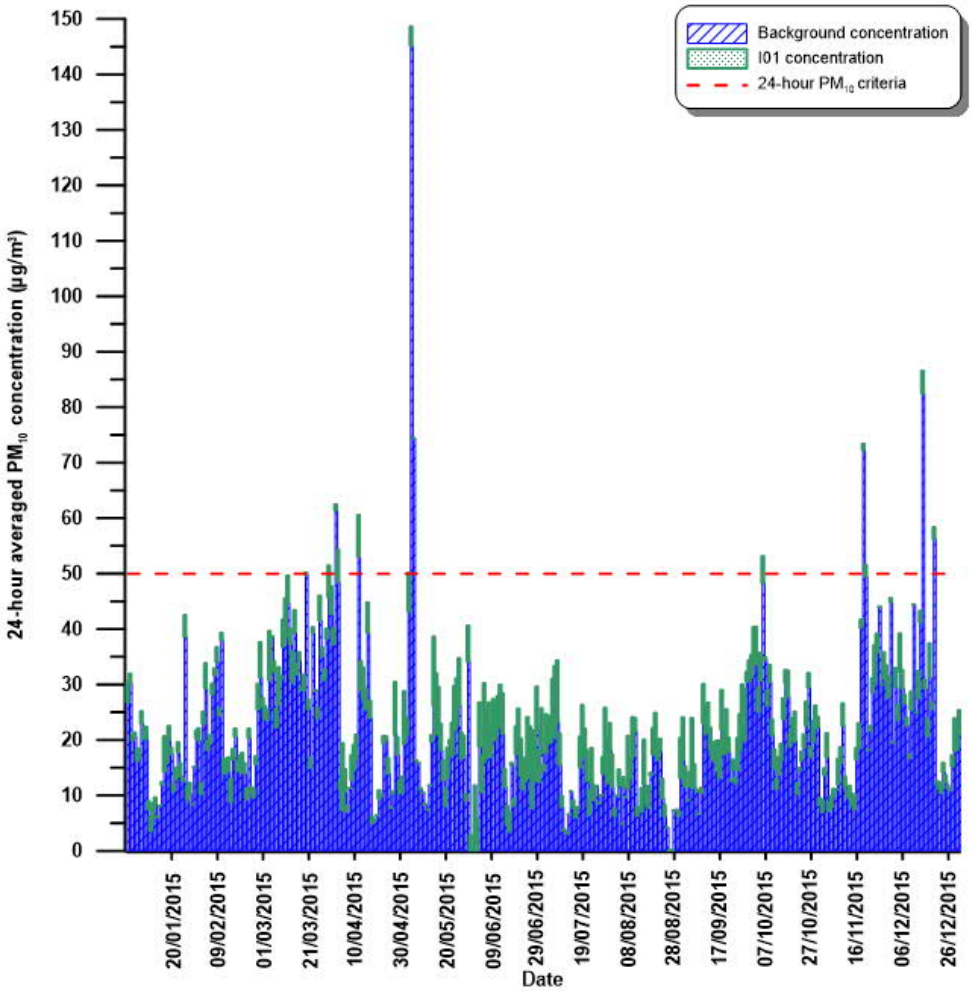

Figure 7-4 Timeseries of cumulative PM_{10} 24-hour averaged concentrations at receiver I01 during operations

As **Figure 7-4** displays, this review identified that with the inputs applied, operations could result in one additional exceedance per year at I01. This exceedance occurred on a day where the background concentration was 48 µg/m^3 and predicted contributions from the site were 4.5 µg/m^3, or approximately 8.5% of the total cumulative concentration (52.8 µg/m^3). As for construction, the assessment indicates a potential risk of short-term PM_{10} impacts at industrial receiver I01 and the need for appropriate management.

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8. Control and management measures

As presented in **Section 7**, the assessment indicated that although impacts were not predicted at of the identified surrounding sensitive receivers, the dispersion modelling indicated a risk of potential short-term impacts at industrial receiver I01. The following measures are recommended, noting that additional instances when the PM_{10} daily 50 µg/m^3 criterion at I01 was exceeded were predicted to occur when background PM10 concentrations were already elevated (46 µg/m^3 and above).

Table 8-1 Recommended safeguards

Potential issue	Mitigation or management measures
Dust amenity impacts during construction	• Impose speed limits on all internal haul roads. • Regularly water all internal haul roads, stockpiles, exposed and disturbed areas. • Review and adjust the intensity of dusty activities during inclement weather conditions. • Limit the extent of disturbed and exposed areas to the extent practical. • To the extent practical, minimise volumes of imported and excavated soil stockpiles. • Locate stockpiles away from the site boundary. • Develop a dust complaints system. At a minimum, the following details of a complaint should be recorded: - Date and time. - Contact details of complainant. - Nature of the complaint, including dust characteristics, perceived duration and frequency, and perceived source or conditions giving rise to the complaint. - Activities happening at the site at the time of the complaint. - Weather conditions (i.e. wind, rainfall and temperature) at the time of the complaint. - Names of staff on-duty. - Actions taken to investigate and resolve the complaint, including any remedial control measures to reduce dust emissions. • Design and implement a dust monitoring program which identifies when background air quality conditions are elevated so that on-site activities can be scaled back or suspended accordingly.
Dust amenity impacts during operations	• Impose speed limits on all internal haul roads. • Direct internal traffic along sealed, established roads wherever possible. • Regularly inspect and remove any loose debris inadvertently split onto hardstand areas and access roads. • Regularly water all unsealed internal haul roads, stockpiles, exposed and disturbed areas. • Scale back capping and covering activities during unfavourable weather conditions and when background air quality concentrations are elevated. • Locate covering material stockpiles away from the site boundary. • Cover any soils requiring storage at the stockpiling area. • Rehabilitate capped cells as soon as practical is stabilise and reduce wind erosion from these areas.

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Potential issue	Mitigation or management measures
	• Maintain the dust complaints system and monitoring program established during construction throughout operations.

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9. Conclusion

This investigation was completed to assess the potential for air quality issues (odour has already been assessed) during the construction and operation of a new solid waste disposal facility at 223 and 299 Trahairs Road in Bomen, NSW. The assessment was undertaken to meet the relevant guidance from the Approved Methods and other key guidelines outlined in **Section 3**.

Air quality impacts during construction and operations were quantitatively assessed using the AUSPLUME dispersion model. Meteorological conditions at the site were approximated using data available from the nearby BoM AWS at Wagga Wagga Airport. Rates of emissions to air applied in the model were estimated using guidance from "Emission Estimation Technique Manual for Mining Version 3.1", (DSEWPaC, 2012) and "AP-42 13.2.2 Unpaved Roads", (US EPA, 2006), using details provided by the NGH Environmental. Concentrations at surrounding sensitive receivers were evaluated using impact assessment criteria from the NSW EPA's Approved Methods. Existing background concentrations used to determine cumulative dust concentrations from the proposal were adopted from NSW OEH's nearby air quality monitoring station at Wagga Wagga North.

The assessment found that exhaust emissions from vehicles, plant and equipment combusting fossil fuels at the facility did not present a material to risk local air quality.

Regarding dust generated from activities at the site, during construction of the facility, 24-hour averaged PM_{10} concentrations were predicted to exceed the 50 µg/m^3 impact assessment criterion at the nearest residential sensitive receiver locations (R6 and R11) to the west and north, as well as at industrial receiver I01. Contributions from the site at R6 and R11 were predicted to be less than 3 µg/m^3, with background levels contributing 48 µg/m^3. As per the Approved Methods, further assessment was completed which determined that PM_{10} contributions from the site would not result in any additional exceedances at these two locations. At industrial receiver I01, modelling indicated the potential for three additional exceedances, although all were on days where background concentrations were 46 µg/m^3 or higher. Cumulative TSP, annually averaged PM_{10} and 24 and annually averaged $PM_{2.5}$ concentrations were otherwise not predicted to exceed relevant impact assessment criteria during construction.

None of the EPA's impact assessment criteria, except the 24-hour averaged PM_{10} criterion at I01 were predicted to be exceeded during the most intensive phase of operations. Modelling indicated the potential for one additional day where cumulative concentrations would be above the 50 µg/m^3 criterion on a day when background concentrations were already 48 µg/m^3.

To manage the risk of potential short-term PM_{10} impacts during elevated background conditions, measures were recommended to identify unfavorable weather and elevated background conditions so that site activities could be scaled accordingly, as well as measures to reduce emissions generated from the site including the use of water carts and site speed limits; reducing the extent of exposed areas to the extent practical; wherever possible, locating dust generating activities away from receivers wherever possible, and other management approaches.

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10. References

Commonwealth Department of Sustainability, Environment, Water, Population and Communities. (2012). *Emission Estimation Technique Manual for Mining Version 3.1*

Jacobs. (2018). *Northridge waste disposal facility Operational odour assessment F0v0*

NSW Department of Environment and Planning. (2016). *Secretary's Environmental Assessment Requirements* (No. 1062)

NSW Environment Protection Authority. (2016). *Approved Methods for Modelling and Assessment of Air Pollutants in NSW*

United States Environmental Protection Agency. (2006). *AP-42 13.2.2 Unpaved Roads*

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Appendix A. Emission estimation calculations

Construction: Intensities and emission rates

		Annual emissions (kg/y)									
Stage	Activity	TSP	PM10	PM2.5	Control (%)	Intensity	Units	Density	Units	Intensity	Units
Excavation overall	Scrapers removing soil	468	118	23	0	10000	m3/y	1.614	t/m3	16140	t/y
	Scraper traversing soils	555	142	28	0	267	km/y			267	km/y
	Wind erosion	8676	4338	434	50					4.952	ha
Subsoil drainage	Excavators trenching	3	1	0	50	2085	m3/y	1.614	t/m3	3365.19	t/y
	Trucks hauling material	98	26	3	50					3365.19	t/y
Leachate pond and system	Excavators handling material	4	2	0	50	2939	m3/y	1.614	t/m3	4743.546	t/y
	Trucks hauling material	780	211	21	50					4743.546	t/y
	Wind erosion	1542	771	77	50					0.88	ha
Earthworks - Cell 1	Excavators handling material	20	9	2	50	15308	m3/y	1.614	t/m3	24707.112	t/y
	Trucks hauling material	717	194	19	50					24707.112	t/y
	Trucks dumping material	296	106	15	0					24707.112	t/y
	Graders spreading material	137	61	7	0	720	km/y			720	km/y
	Wind erosion	2186	1093	109	50					1.248	ha
Earthworks - Hardstand	Excavators handling material	8	4	1	50	6317	m3/y	1.614	t/m3	10195.638	t/y
	Trucks hauling material	108	29	3	50					10195.638	t/y
	Trucks dumping material	122	44	6	0					10195.638	t/y
	Graders spreading material	137	61	7	0	720	km/y			720	km/y
	Wind erosion	1226	613	61	50					0.7	ha
Access road	Excavators handling material	0	0	0	50	206	m3/y	1.614	t/m3	332.484	t/yr
	Trucks hauling material	1	0	0	50					332.484	t/yr
	Trucks dumping material	4	1	0	0					332.484	t/yr
	Graders spreading material	137	61	7	0	720	m3/y			720	km/y
	Wind erosion	88	44	4	50					0.05	ha
Earth bank	Trucks hauling material	94	25	3	50					1145.94	t/yr
	Trucks dumping material	14	5	1	0					1145.94	t/yr
	Excavators placing material	1	0	0	50	710	m3/y	1.614	t/m3	1145.94	t/yr
	Wind erosion	526	263	26	50					0.3	ha

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Construction: Emission factors

		TSP		PM10		PM2.5	
Stage	Activity	Factor	Units	Factor	Units	Factor	Units
Excavation overall	Scrapers removing soil	0.029	kg/t	0.0073	kg/t	0.00145	kg/t
	Scraper traversing soils	2.08	kg/VKT	0.53	kg/VKT	0.104	kg/VKT
	Wind erosion	0.4	kg/ha/h	0.2	kg/ha/h	0.02	kg/ha/h
Subsoil drainage	Excavators trenching	0.0016154	kg/t	0.000764	kg/t	8.077E-05	kg/t
	Trucks hauling material	2.2246579	kg/VKT	0.6005624	kg/VKT	0.0600562	kg/VKT
Leachate pond and system	Excavators handling material	0.0016154	kg/t	0.000764	kg/t	8.077E-05	kg/t
	Trucks hauling material	2.2246579	kg/VKT	0.6005624	kg/VKT	0.0600562	kg/VKT
	Wind erosion	0.4	kg/ha/h	0.2	kg/ha/h	0.02	kg/ha/h
Earthworks - Cell 1	Excavators handling material	0.0016154	kg/t	0.000764	kg/t	8.077E-05	kg/t
	Trucks hauling material	2.2246579	kg/VKT	0.6005624	kg/VKT	0.0600562	kg/VKT
	Trucks dumping material	0.012	kg/t	0.0043	kg/t	0.0006	kg/t
	Graders spreading material	0.1900658	kg/VKT	0.085	kg/VKT	0.0095033	kg/VKT
	Wind erosion	0.4	kg/ha/h	0.2	kg/ha/h	0.02	kg/ha/h
Earthworks - Hardstand	Excavators handling material	0.0016154	kg/t	0.000764	kg/t	8.077E-05	kg/t
	Trucks hauling material	2.2246579	kg/VKT	0.6005624	kg/VKT	0.0600562	kg/VKT
	Trucks dumping material	0.012	kg/t	0.0043	kg/t	0.0006	kg/t
	Graders spreading material	0.1900658	kg/VKT	0.085	kg/VKT	0.0095033	kg/VKT
	Wind erosion	0.4	kg/ha/h	0.2	kg/ha/h	0.02	kg/ha/h
Access road	Excavators handling material	0.0016154	kg/t	0.000764	kg/t	8.077E-05	kg/t
	Trucks hauling material	2.2246579	kg/VKT	0.6005624	kg/VKT	0.0600562	
	Trucks dumping material	0.012	kg/t	0.0043	kg/t	0.0006	kg/t
	Graders spreading material	0.1900658	kg/VKT	0.085	kg/VKT	0.0095033	kg/VKT
	Wind erosion	0.4	kg/ha/h	0.2	kg/ha/h	0.02	kg/ha/h
Earth bank	Trucks hauling material	2.2246579	kg/VKT	0.6005624	kg/VKT	0.0600562	kg/VKT
	Trucks dumping material	0.012	kg/t	0.0043	kg/t	0.0006	kg/t
	Excavators placing material	0.0016154	kg/t	0.000764	kg/t	8.077E-05	kg/t
	Wind erosion	0.4	kg/ha/h	0.2	kg/ha/h	0.02	kg/ha/h

Construction: Variables and calculation method reference

		Variables												Reference
Stage	Activity	Area (m2)	U (m/s)	(Ws/2.2)^1.3	Moisture (%)	(M/2)^1.4	kg/VKT	t/truck	km/trip	No. trips	VKT	Silt (%)	km/h	
Excavation overall	Scrapers removing soil													NPI, 2012 (1.1.12)
	Scraper traversing soils								0.24	37.083333	8.9			NPI, 2012 (1.1.13)
	Wind erosion	49520												NPI, 2012 (1.1.18)
Subsoil drainage	Excavators trenching		3.4	1.76105576	2.4	1.2907845								NPI, 2012 (1.1.2)
	Trucks hauling material							23	0.6	146.31261	87.787565	6.4		AP42 (13.2.2)
Leachate pond and system	Excavators handling material		3.4	1.76105576	2.4	1.2907845								NPI, 2012 (1.1.2)
	Trucks hauling material							23	1.7	206.24113	350.60992	6.4		AP42 (13.2.2)
	Wind erosion	8800												NPI, 2012 (1.1.18)
Earthworks - Cell 1	Excavators handling material		3.4	1.76105576	2.4	1.2907845								NPI, 2012 (1.1.2)
	Trucks hauling material							23	0.6	1074.2223	644.53336	6.4		AP42 (13.2.2)
	Trucks dumping material													NPI, 2012 (1.1.6)
	Graders spreading material								0.24	41.666667	10		5	NPI, 2012 (1.1.14)
	Wind erosion	12480												NPI, 2012 (1.1.18)
Earthworks - Hardstand	Excavators handling material		3.4	1.76105576	2.4	1.2907845								NPI, 2012 (1.1.2)
	Trucks hauling material							23	0.22	443.28861	97.523494	6.4		AP42 (13.2.2)
	Trucks dumping material													NPI, 2012 (1.1.6)
	Graders spreading material								0.22	45.454545	10		5	NPI, 2012 (1.1.14)
	Wind erosion	7000												NPI, 2012 (1.1.18)
Access road	Excavators handling material		3.4	1.76105576	2.4	1.2907845								NPI, 2012 (1.1.2)
	Trucks hauling material							23	0.08	14.455826	1.1564661	6.4		AP42 (13.2.2)
	Trucks dumping material													NPI, 2012 (1.1.6)
	Graders spreading material								0.08	125	10		5	NPI, 2012 (1.1.14)
	Wind erosion	500												NPI, 2012 (1.1.18)
Earth bank	Trucks hauling material							23	1.7	49.823478	84.699913	6.4		AP42 (13.2.2)
	Trucks dumping material													NPI, 2012 (1.1.6)
	Excavators placing material		3.4	1.76105576	2.4	1.2907845								NPI, 2012 (1.1.2)
	Wind erosion	3000												NPI, 2012 (1.1.18)

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Operations: Intensities and emission rates

Stage	Activity	TSP	PM10	PM2.5	Control (%)	Intensity	Units	Density	Units	Intensity	Units
Earthworks - Cell 2	Excavators handling material	20	9	2	50	15308	m3/y	1.614	t/m3	24707.112	t/y
	Trucks hauling material	717	194	19	50					24707.112	t/y
	Trucks dumping material	296	106	15	0					24707.112	t/y
	Graders spreading material	137	61	7	0	720	km/y			720	km/y
	Wind erosion	2186	1093	109	50					1.248	ha
Daily cover Cell 1	Excavators handling material	36	17	2		44	m3/day	1.614	t/m3	22217.8629	t/y
Capping layer Cell 1	Excavators handling material	20	9	2	50	14976	m3/y	1.614	t/m3	24171.264	t/y
	Trucks hauling material	468	126	13	50	14976	m3/y	1.614	t/m3	24171.264	t/y
	Trucks dumping material	290	104	15	0	14976	m3/y	1.614	t/m3	24171.264	t/y
	Graders spreading material	137	61	7	0	720	km/y			720	km/y
	Wind erosion	2186	1093	109	50					1.248	ha
Exposed Overall Cell	Wind erosion	6482	3241	324	50					3.7	ha
Management of waste materials	Unloading to hardstand	196	70	10	0	18363.808	m3/y	0.888704565	t/m3	16320	t/y
	Sorting and loading for emplac	13	6	1	50	18363.808	m3/y	0.888704565	t/m3	16320	t/y
	Transport to Cell 1	1298	351	35	50	75529	m3/y	0.888704565	t/m3	67122.9671	t/y
	Unloading to Cell 1	196	70	10	0	18363.808	m3/y	0.888704565	t/m3	16320	t/y
	Graders spreading waste mate	137	61	7	0	720	km/y			720	km/y

Operations: Emission factors

		TSP		PM10		PM2.5	
Stage	Activity	Factor	Units	Factor	Units	Factor	Units
Earthworks - Cell 2	Excavators handling material	0.001615366	kg/t	0.000764025	kg/t	8.08E-05	kg/t
	Trucks hauling material	2.224657853	kg/VKT	0.600562418	kg/VKT	0.060056	kg/VKT
	Trucks dumping material	0.012	kg/t	0.0043	kg/t	0.0006	kg/t
	Graders spreading material	0.190065778	kg/VKT	0.085	kg/VKT	0.009503	kg/VKT
	Wind erosion	0.4	kg/ha/h	0.2	kg/ha/h	0.02	kg/ha/h
Daily cover Cell 1	Excavators handling material	0.001615366	kg/t	0.000764025	kg/t	8.08E-05	kg/t
Capping layer Cell 1	Excavators handling material	0.001615366	kg/t	0.000764025	kg/t	8.08E-05	kg/t
	Trucks hauling material	2.224657853	kg/VKT	0.600562418	kg/VKT	0.060056	kg/VKT
	Trucks dumping material	0.012	kg/t	0.0043	kg/t	0.0006	kg/t
	Graders spreading material	0.190065778	kg/VKT	0.085	kg/VKT	0.009503	kg/VKT
	Wind erosion	0.4	kg/ha/h	0.2	kg/ha/h	0.02	kg/ha/hr
Exposed Overall Cell	Wind erosion	0.4	kg/ha/h	0.2	kg/ha/h	0.02	kg/ha/hr
Management of waste materials	Unloading to hardstand	0.012	kg/t	0.0043	kg/t	0.0006	kg/t
	Sorting and loading for emplac	0.001615366	kg/t	0.000764025	kg/t	8.08E-05	kg/t
	Transport to Cell 1	2.224657853	kg/VKT	0.600562418	kg/VKT	0.060056	kg/VKT
	Unloading to Cell 1	0.012	kg/t	0.0043	kg/t	0.0006	kg/t
	Graders spreading waste mate	0.190065778	kg/VKT	0.085	kg/VKT	0.009503	kg/VKT

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Operations: Variables and calculation method reference

		Variables												Reference
Stage	Activity	Area (m2)	U (m/s)	(Ws/2.2)^1.3	Moisture (%	(M/2)^1.4	kg/VKT	t/truck	km/trip	No. trips	VKT	Silt (%)	km/h	
Earthworks - Cell 2	Excavators handling material		3.4	1.7610558	2.4	1.290785								NPI, 2012 (1.1.2)
	Trucks hauling material							23	0.6	1074.222	644.5334	6.4		AP42 (13.2.2)
	Trucks dumping material													NPI, 2012 (1.1.6)
	Graders spreading material								0.24	41.66667	10		5	NPI, 2012 (1.1.14)
	Wind erosion	12480												NPI, 2012 (1.1.18)
Daily cover Cell 1	Excavators handling material		3.4	1.7610558	2.4	1.290785								NPI, 2012 (1.1.2)
Capping layer Cell 1	Excavators handling material		3.4	1.7610558	2.4	1.290785								NPI, 2012 (1.1.2)
	Trucks hauling material							23	0.4	1050.925	420.3698	6.4		AP42 (13.2.2)
	Trucks dumping material													NPI, 2012 (1.1.6)
	Graders spreading material								0.24	41.66667	10		5	NPI, 2012 (1.1.14)
	Wind erosion	12480												NPI, 2012 (1.1.18)
Exposed Overall Cell	Wind erosion	37000												NPI, 2012 (1.1.18)
Management of waste materials	Unloading to hardstand													NPI, 2012 (1.1.6)
	Sorting and loading for emplacement		3.4	1.7610558	2.4	1.290785								NPI, 2012 (1.1.2)
	Transport to Cell 1							23	0.4	2918.39	1167.356	6.4		AP42 (13.2.2)
	Unloading to Cell 1													NPI, 2012 (1.1.6)
	Graders spreading waste material								0.24	41.66667	10		5	NPI, 2012 (1.1.14)

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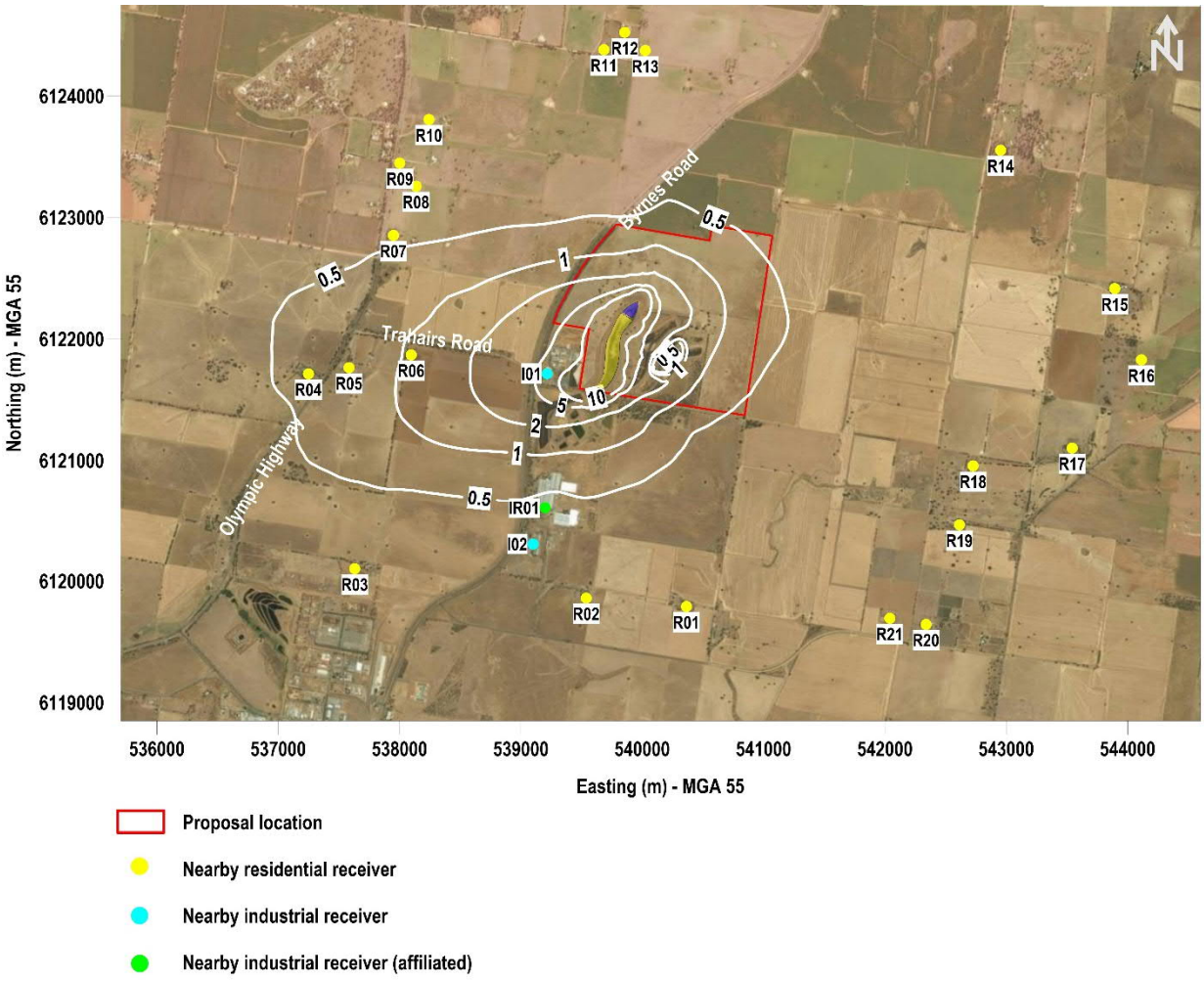
Appendix B. Proposal incremental concentration plots

B.1 Construction

B.1.1 TSP, annually averaged, 100th percentile (µg/m3)



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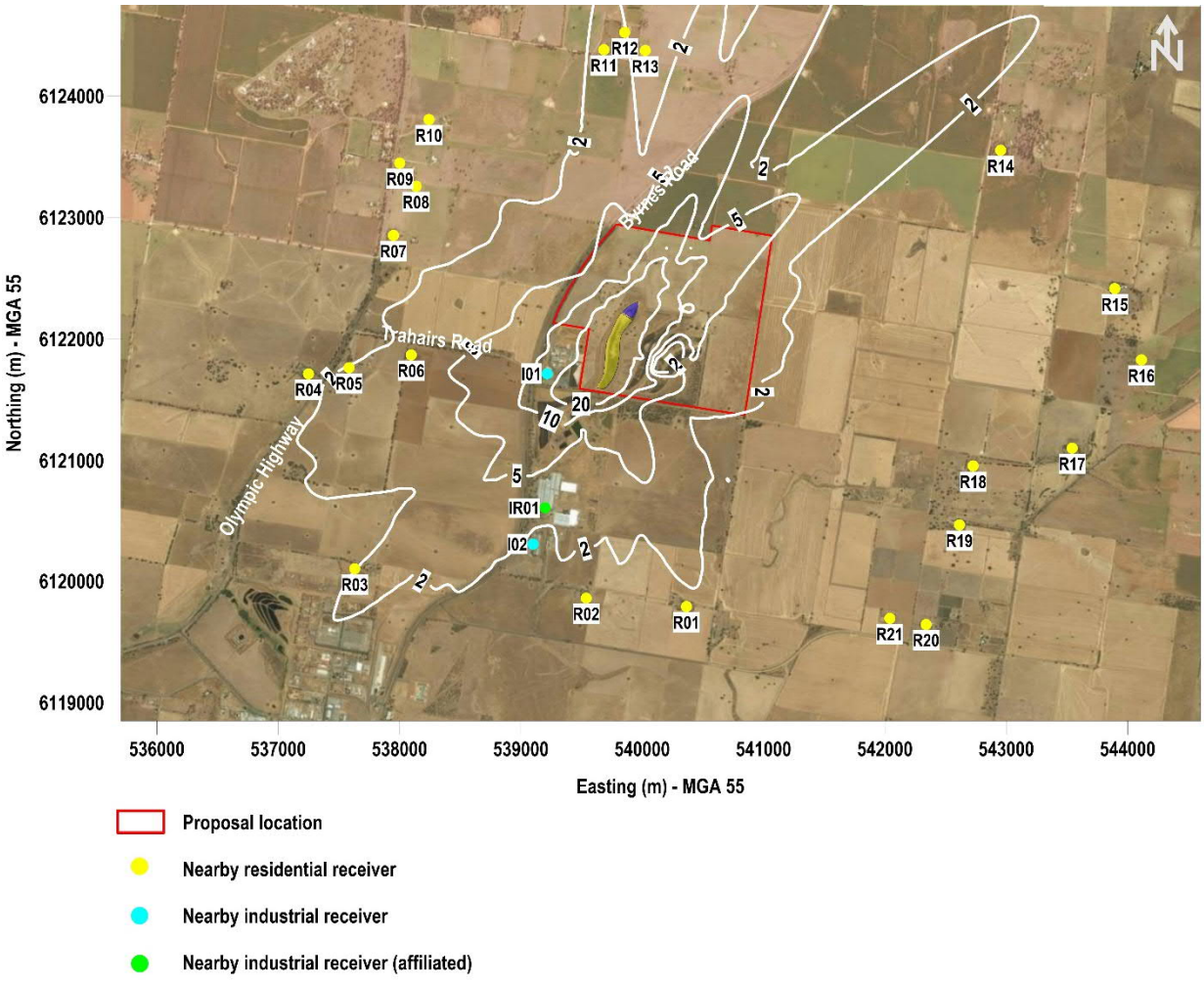
B.1.2 PM_{10}, 24-hour averaged, 100th percentile (µg/m^3)



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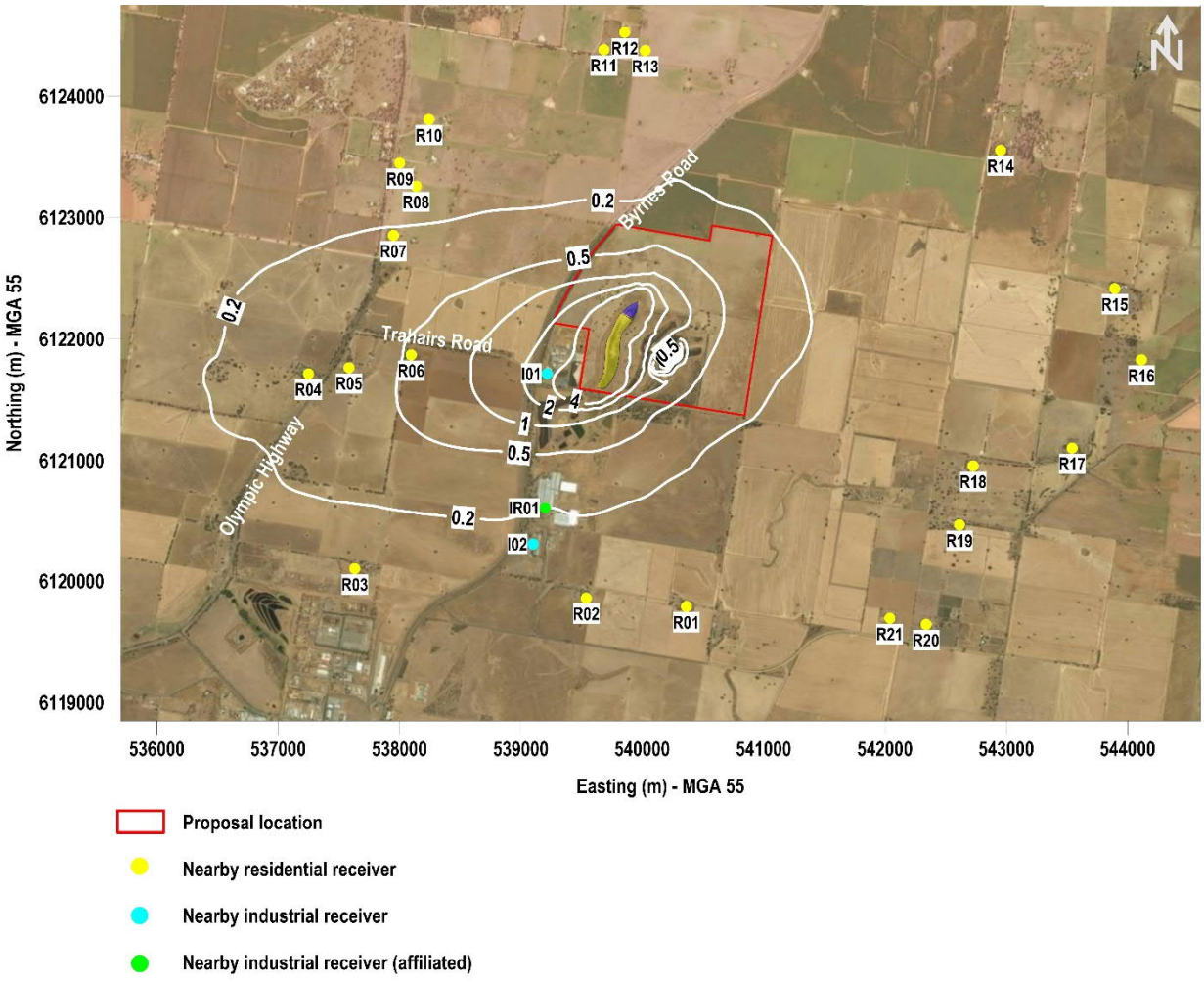
B.1.3 PM_{10}, annually averaged, 100th percentile (µg/m^3)



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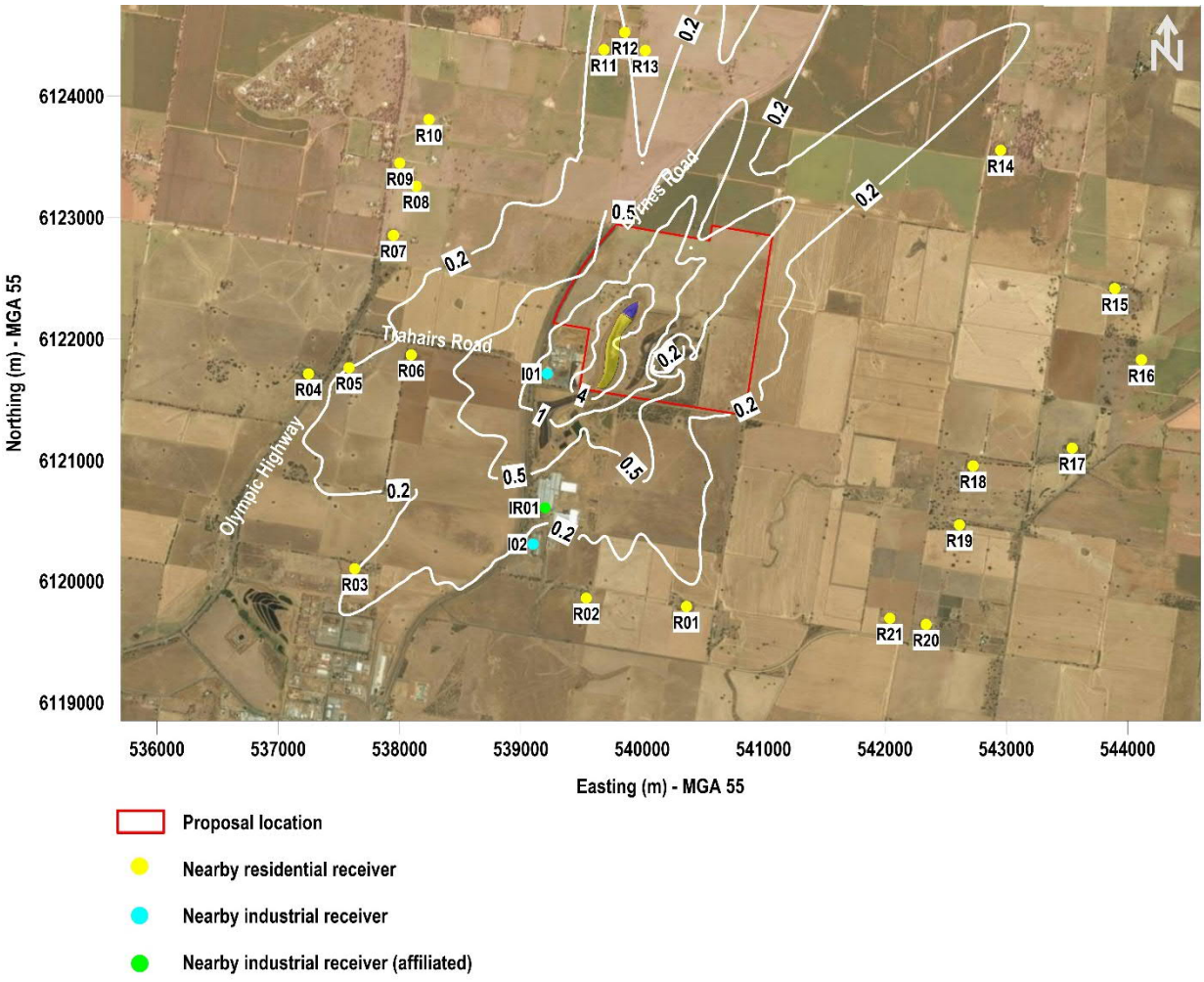
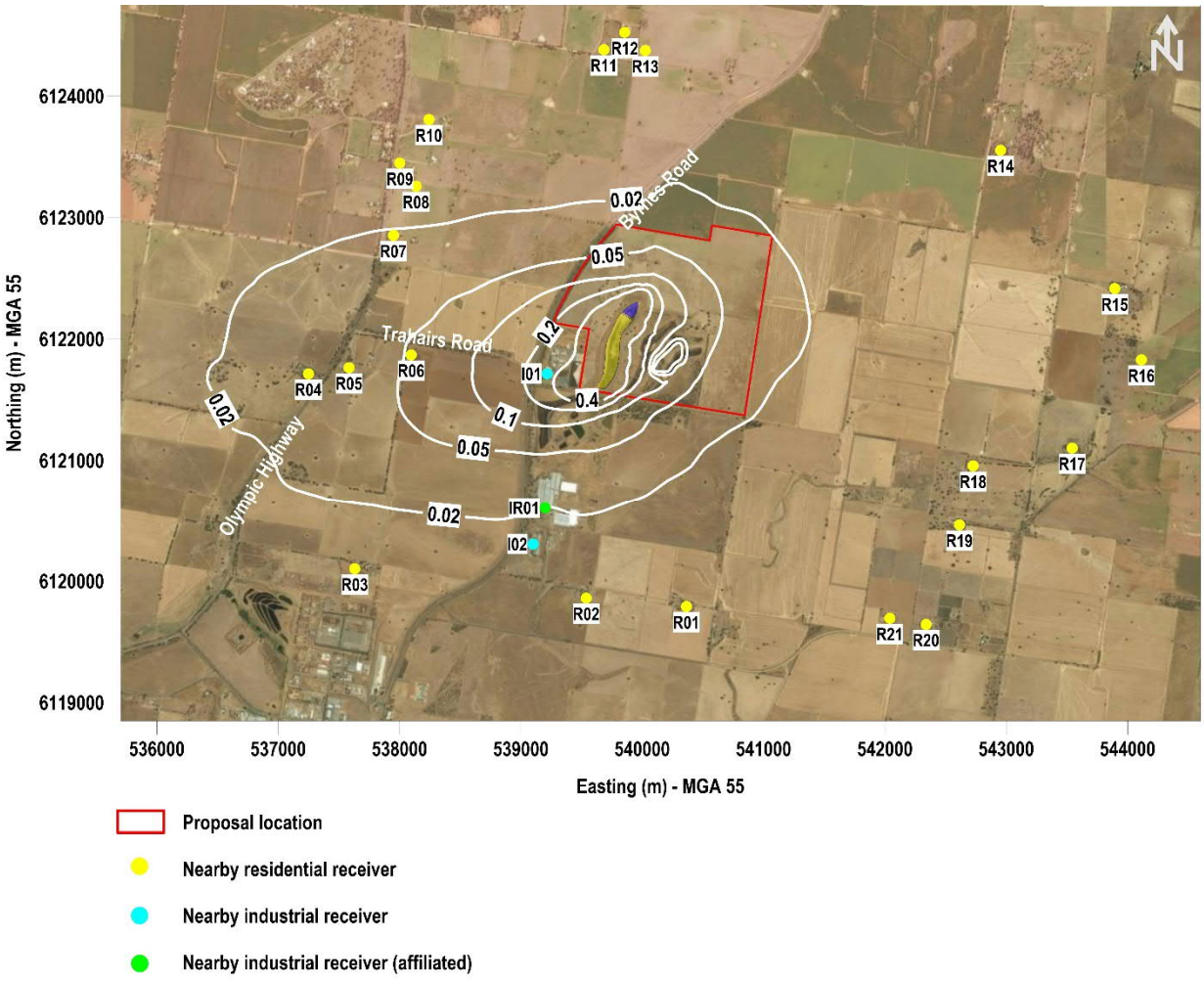
B.1.4 $PM_{2.5}$, 24-hour averaged, 100th percentile (µg/m^3)



B.1.5 $PM_{2.5}$, annually averaged, 100th percentile (µg/m^3)



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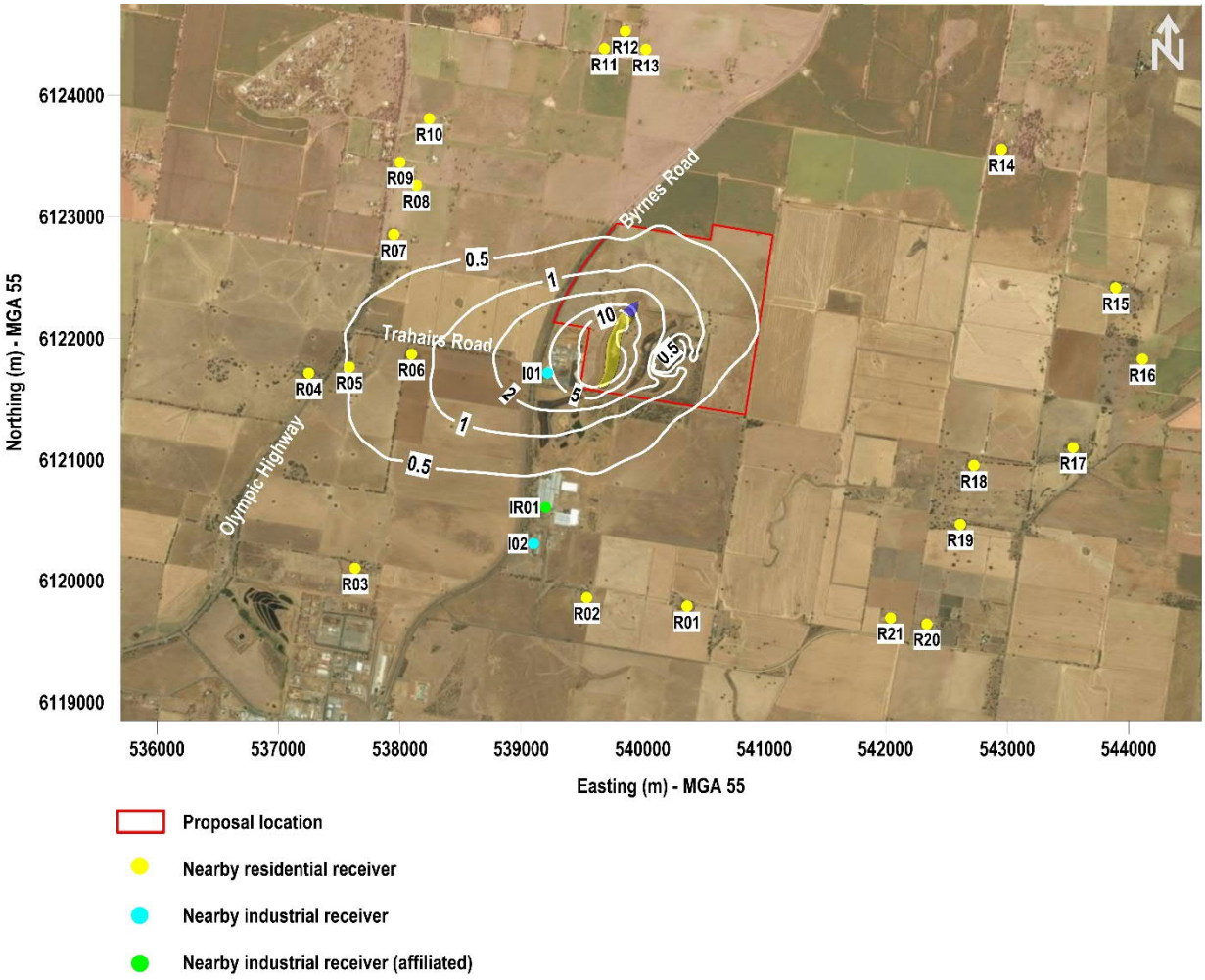
B.2 Operations

B.2.1 TSP, annually averaged, 100th percentile (µg/m3)



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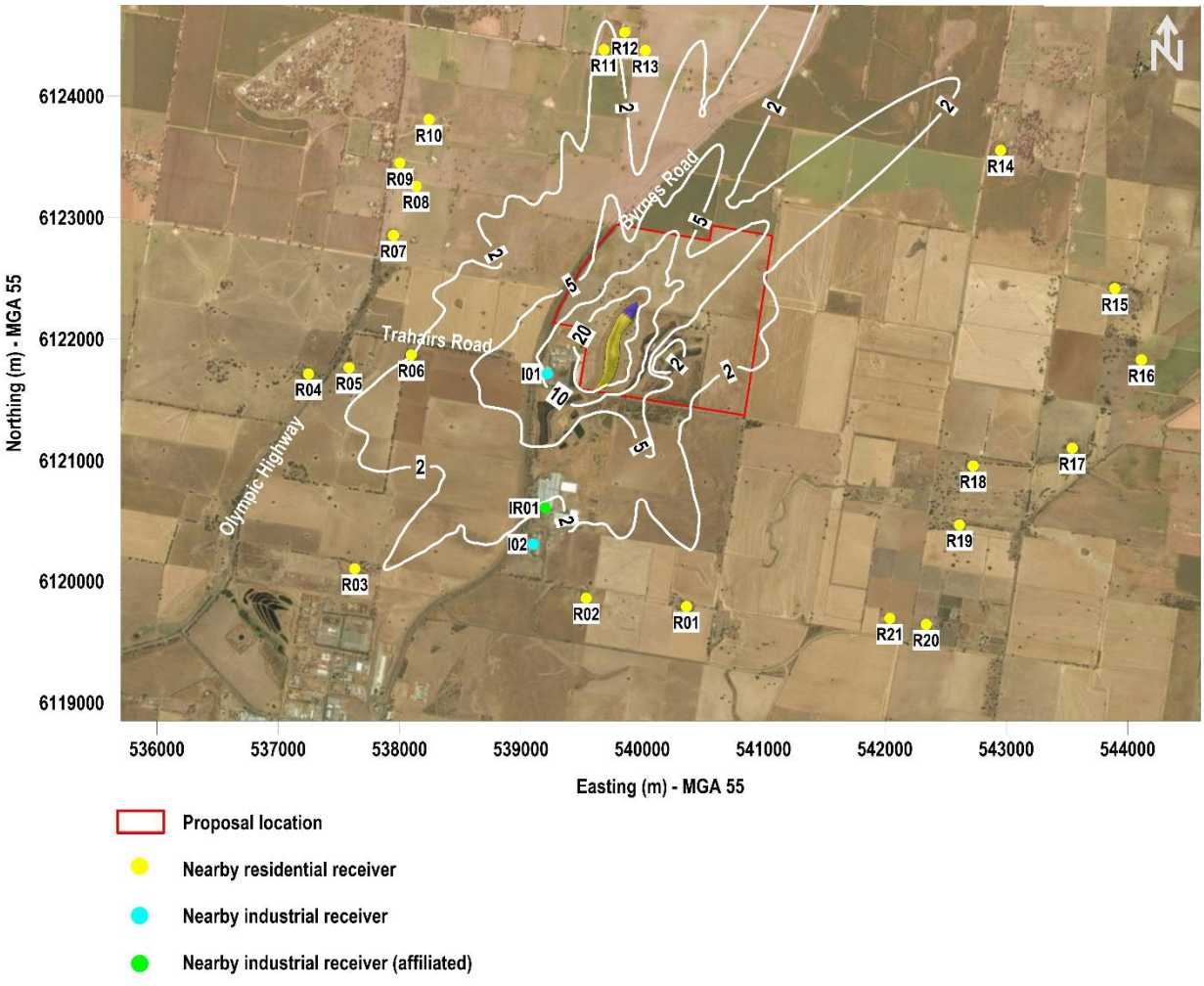
B.2.2 PM_{10}, 24-hour averaged, 100th percentile (µg/m^3)



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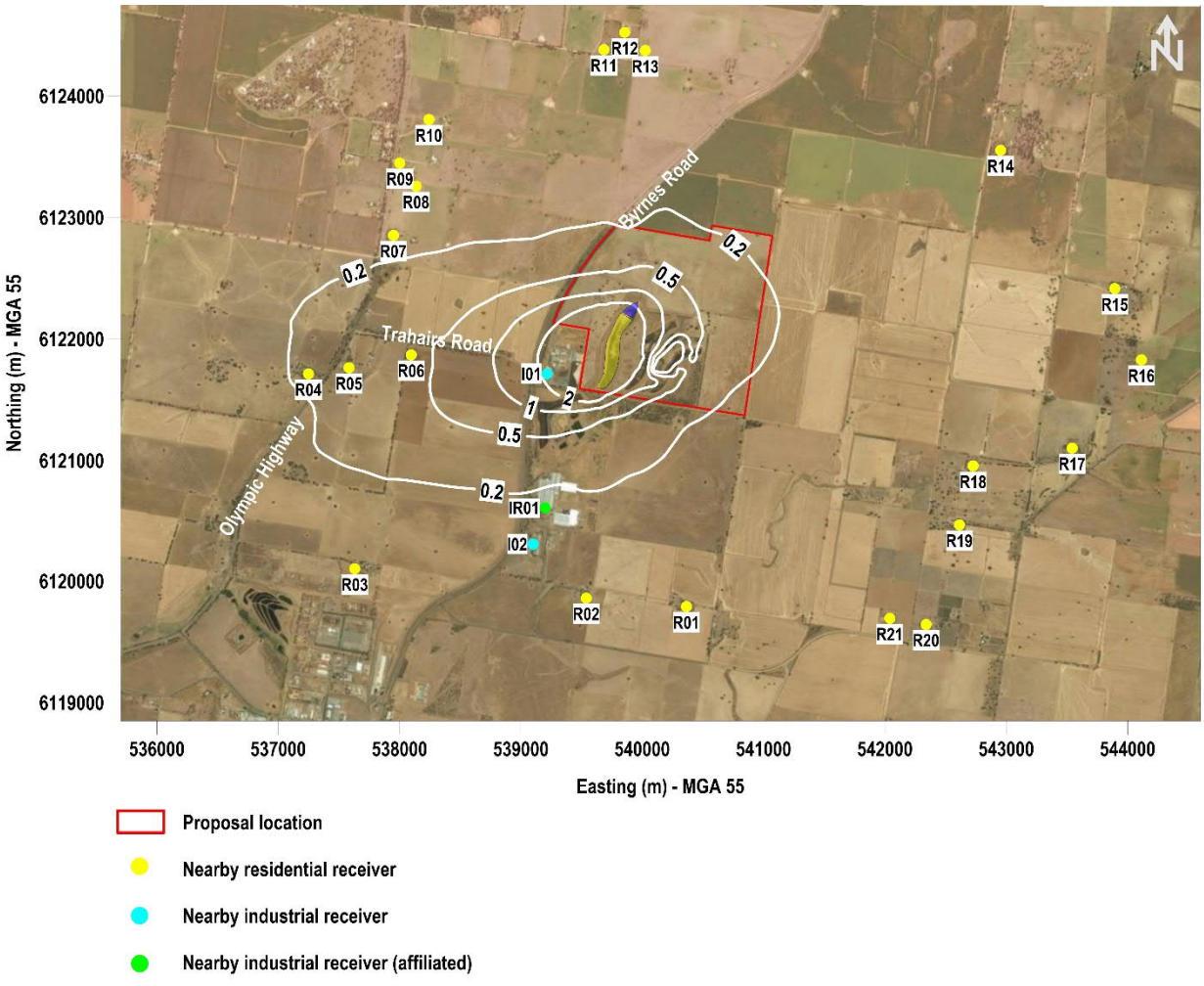
B.2.3 PM_{10}, annually averaged, 100th percentile (µg/m^3)



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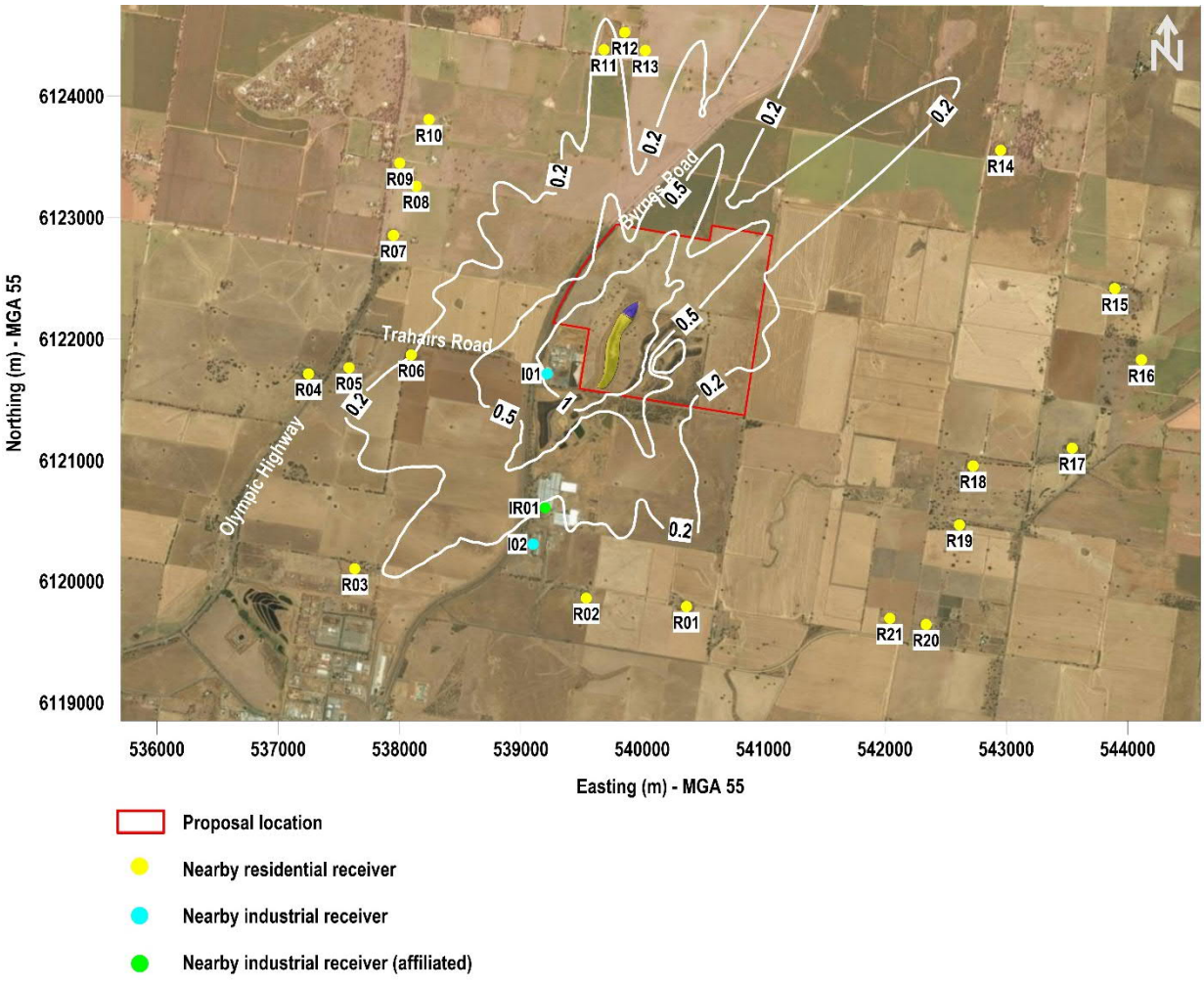
B.2.4 $PM_{2.5}$, 24-hour averaged, 100th percentile (µg/m³)



B.2.5 $PM_{2.5}$, annually averaged, 100th percentile (µg/m³)