Mulgoa Excavations Pty Ltd

Stormwater Management Assessment: Proposed Materials Recycling Facility, 25 Martin Road, Badgerys Creek, NSW

ENVIRONMENTAL

WATER

WASTEWATER

GEOTECHNICAL

CIVIL

PROJECT MANAGEMENT

P1404242JR03V04
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All enquiries regarding this project are to be directed to the Project Manager.

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1 Overview

1.1 Study Overview

This report is prepared on behalf of Precise Planning (the Client) to support an application to NSW Planning and Environment for a proposed building and demolition recycling facility located at 25 Martin Road, Badgerys Creek, NSW.

This report addresses the requirements of Liverpool City Council (LCC), NSW EPA and NSW Planning and Environment with respect to stormwater management at the site and addresses the Secretary's Environmental Assessment Requirements (SEARs). This report will form part of an Environmental Impact Statement (EIS). This report provides an update of proposed stormwater management measures from previous MA report P1404242JR03V03 (March 2015), based on the revised site layout which includes an enclosed structure over proposed operations areas.

This report details an environmentally sustainable strategy for the management of stormwater generated from the site as well as detailing likely impacts resulting from the proposed development. The solutions and conceptual designs presented in this report draw from field inspections, modelling, relevant planning and engineering controls, policy objectives and guiding principles and represent a model for best practice management techniques for stormwater management.

1.2 Secretary's Environmental Assessment Requirements (SEARs)

The site is considered to be designated development under the Environmental Planning and Assessment Act (1979) and as such has Secretary's Environmental Assessment Requirements (SEARs). This development has been designated SEAR number 862. Key issues relating to this stormwater assessment raised in the SEARs include:

- Potential impacts to soil, groundwater and surface water resources (Section 3);
- Stormwater management during and post site development works (Section 3).
- Details of sediment and erosion controls (Section 3.6 and Attachment A).

1.3 Assessment Scope

The report addresses the following specific stormwater management issues:

- Assessment of peak stormwater discharges from the site for existing and proposed conditions and determination of minimum site On-Site Detention (OSD) requirements.
- Assessment of existing Council infrastructure downslope of the subject site with respect to existing capacity to accept stormwater discharges from the site.
- Design and assessment of proposed water quality measures with respect to existing water quality in downstream receiving environment and minimum pollutant retention rates as per Council guidelines.
- Discussion of current local surface water quality conditions from publicly available data sources.
- Discussion of current likely impacts on site groundwater and receiving waters downslope of the site with respect to NSW EPA and NSW Planning and Environment requirements.
- Preparation of preliminary sediment and erosion control plan for construction works on site.

1.4 Proposed Development

The development proposal involves the following:

- Regrading of the site;
- Placement of recycled asphalt and DGB 20 for vehicle areas;
- Construction of a new materials storage shed which shall enclose proposed storage bays for various recycled materials and a concrete crushing facility;
- Upgrade of the existing site access to Martin Road to include a weighbridge;
- Replacement of existing site fences with new acoustic walls where necessary;
- Erection of prefabricated storage shed including lunch room and toilet on a concrete slab;

- Erection of new site office adjacent to weighbridge.
- Creation of stormwater drainage and treatment measures including OSD basin, bioremediation basin and all associated pit and pipe infrastructure including appropriately designed outlet structures to Lawson Road reserve.
- Associated services infrastructure.

1.5 Policy and Objectives

A number of planning controls and principles have been considered and implemented in the development of the site stormwater management system as summarised below.

1.5.1 Environment NSW Water Quality Objectives

This website gives details of specific water quality objectives for specific river catchments in NSW. These objectives are based on Healthy Rivers Commission (HRC) reports.

1.5.2 Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC, 2000)

These guidelines provide water quality criteria in terms of acceptable trigger values for physical and chemical properties for water bodies. These values are then used to assess the risk of adverse impacts from pollutants.

1.5.3 NSW Planning and Environment Requirements

Correspondence with NSW Planning and Environment indicates that the development requires a soil and water management assessment to consider the impacts on soil, groundwater and surface water resources and how stormwater is to be managed during and post site works. This includes details of sediment and erosion control measures.

1.5.4 Liverpool City Council Development Control Plan (DCP 2008)

This document provides details of water quality and quantity management objectives for all developments in the LCC Local Government Area (LGA). Objectives given in DCP (2008) include specific water quality pollution retention targets, measures for sediment and gross pollutant control, environmental flows and general objectives for quantitative stormwater management.

1.5.5 Liverpool City Council On-Site Detention Policy (July 2004)

This document provides guidance on the requirement for OSD for development sites depending on development proposed and capacity of the downstream stormwater management system.

Specifically, the document states that OSD is required for development sites which increase the impervious area and the downstream stormwater management system does not have the capacity to convey increases in peak discharges arising from site development.

1.5.6 Liverpool City Council On-Site Detention Technical Specifications

This document provides technical specifications for OSD and drainage design including minimum details for plans, minimum tank and discharge control pit requirements, signage and discharge requirements for systems discharging to Council stormwater assets.

1.5.7 Liverpool City Council – Development Design Specification D5 Stormwater Drainage Design (2003)

This document provides detailed design engineering specifications and objectives with respect to drainage design and stormwater management.

1.5.8 Liverpool City Council – Handbook for Drainage Design (2003)

This document includes acceptable engineering design specifications for use in computer modelling of stormwater systems in the LCC LGA. These specifications include typical Intensity Frequency Duration (IFD) rainfall data, impervious fractions for land-use types, minimum drainage easement widths and guidance on pit losses used in hydraulic design of stormwater systems.

1.5.9 NSW Department of Environment and Conservation (2004)

This document provides minimum design requirements and guidelines for stormwater management at composting and organics processing facilities. Whilst this facility is not anticipated to process large amounts of organic material, nor is it going to include composting, this guideline is still considered pertinent to this assessment.

2 Site Description

2.1 Location and Site Description

The subject is located at 25 Martin Road, Badgerys Creek, NSW and is described as Lot 1 DP 611519. The site is within the LCC LGA (Figure 1).

The site is bounded by an existing agricultural site to the north, believed to include a working piggery and a vacant parcel of land to the south. The site is bounded by Martin Road to the east and Lawson Road to the west.

Figure 1: Location of subject site.

The subject site has an area of approximately 2 ha. Inspection on 29.09.2014 reveals the site is currently occupied by a cleared area extending across the eastern half which appears to be utilised for stockpiling materials. Materials consist of soils and recycled building materials such as timber, steel, concrete, *etc*. The western part of the site is revegetated and includes a 2 m (approximately) high embankment. Several small trees (up to 3 m in height) and a number of larger trees were noted in the western part of the site. A second embankment adjacent to the western site boundary was observed to be approximately 0.5 m high at the northern end and approximately 2 m high at the southern end. The site was otherwise undeveloped at the time of inspection.

2.2 Topography and Drainage

The site is located approximately mid-way between Badgerys and South Creeks (approximately 450 m to the west and east respectively). The site generally drains towards the south-west corner to a roadside swale on Lawson Road (approximately 0.1 – 0.3 m deep and 1 – 2 m wide). Elevation ranges from approximately 54 mAHD in the south-west corner to approximately 61.5 mAHD in the north-east corner. Site grades are generally 2 – 3%.

No natural watercourses or drainage lines were noted on the site during inspections. An existing constructed channel was noted on the northern site boundary which appears to cutoff surface flow from neighbouring allotment (to the north). Inspection of the standing water within this drainage feature showed it to be affected by a considerable algal bloom and had a sulphurous odour, indicating that the runoff from the neighbouring site is likely to have elevated nutrient levels.

2.3 Site Soil Profile and Geology

The Penrith 1:100,000 Geological Series Sheet 9030 (1991) indicates that the site is underlain by Bringelly Shale which comprises shale, carbonaceous claystone, claystone, laminite, fine to medium grained lithic sandstone and rare coal/tuff.

The Penrith 1:100,000 soil landscapes sheet 9030 (1989) indicates site soils belong to the Blacktown soil landscape consisting of shallow to moderately deep (<1 m) hardsetting mottled texture contrast soils, red and brown podzolic soils on crests grading to yellow podzolic soils on lower slopes and in drainage lines.

Previous sub-surface investigations to 4.5 m depth found the natural soil profile to typically consist of silty clay with clay overlying shale and siltstone at depth in most areas. Investigations indicated some areas of fill typically consisting of sandy clay, clay and silty clay overlying shale at depth.

2.4 Local Stormwater Quality

Reference has been made to the draft Environmental Impact Statement for the Badgerys Creek airport (PPK, 1997). This report detailed surface water quality monitoring that had been completed for Badgerys Creek, including one sampling point adjacent to Elizabeth Drive, Badgerys Creek, approximately 500 m from the subject site (sampling point B3). Results of the monitoring programme showed that surface water quality in local creeks is relatively consistent for several local creeks. A summary of the values from the EIS is provided in Table 1, with the position of sampling points relative to the subject site shown on Figure 2.

Table 1: Summary of water quality monitoring from Badgerys Creek airport EIS (PPK, 1997).

Pollutant	Sampling Site						
	Badgerys Creek			Cosgrove Creek		Thompson Creek	Duncans Creek
	B1	B2	B3	C1	C3	T1	Dn1
Total Suspended Solids	2	33	14	2	5	5	13
Total Phosphorus	<0.02	1.2	0.26	<0.02	<0.02	<0.02	<0.02
Total Nitrogen	0.6	3.3	0.9	0.5	1.01	0.6	<0.75

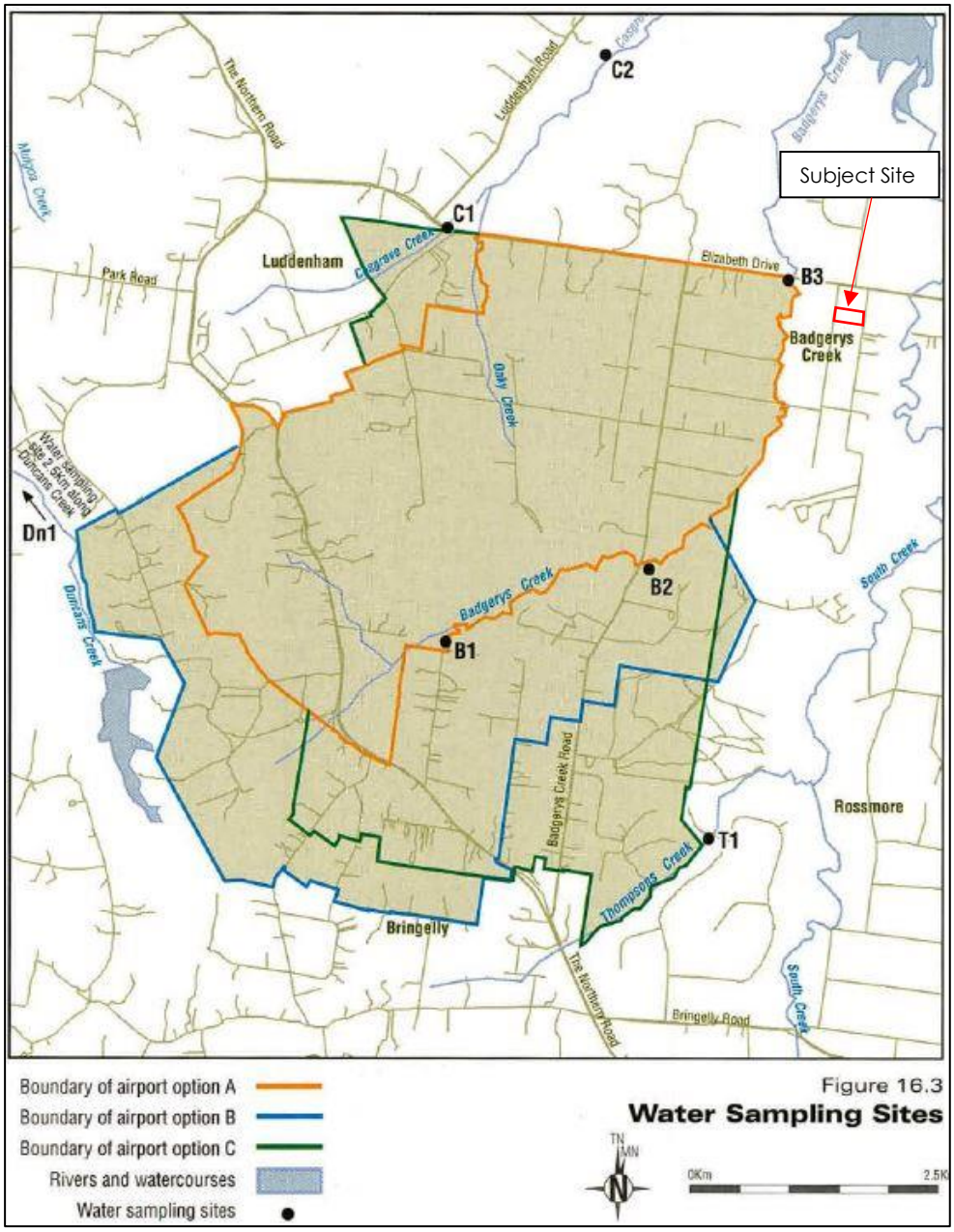

Figure 2: Location of water quality sampling sites for Badgerys Creek airport EIS (PPK, 1997).

3 Stormwater Management

3.1 Stormwater Management and Performance Objectives

Stormwater management objectives are broadly outlined as follows:

- Provide comment and recommendation for likely on-site stormwater quantity management requirements for the proposed development (including minimum OSD requirements) and likely effects of site development on local drainage systems.
- Provide preliminary recommendations for on-site stormwater quality measures to ensure development compliance with identified performance objectives.
- Provide preliminary details of stormwater infrastructure to transfer site stormwater to proposed stormwater treatment and OSD measures.

Performance objectives are specified to generally comply with LCC DCP (2008); OSD Policy (2004); and Technical Specifications (2003), the requirements specified by the NSW Department of Planning and Environment and the NSW EPA and the principles of Ecologically Sustainable Development (ESD) as follows:

- Post-development site stormwater discharge rates are to be maintained or reduced for a range of storm events for the 1 in 5 year ARI, 1 in 20 year ARI and 1 in 100 year ARI average recurrence intervals.
- Post-development stormwater to be directed to Lawson Road drainage via suitably designed pipe(s) and headwall(s) to ensure that the site discharges do not adversely impact on the existing drainage system.
- Post-development site stormwater quality measures are to achieve pollution retention rates compliant with Council requirements as given in Table 2.

Table 2: Stormwater pollutant retention targets (Liverpool City Council, 2009).

Pollutant	Retention Target (%)
Total Suspended Solids	80
Total Phosphorus	45
Total Nitrogen	45
Gross Pollutants	90

3.2 Proposed Stormwater Management System – Overview

The proposed stormwater solution for the site is designed to include the following stormwater quantity and quality control measures:

- Stormwater drainage network including swales, pits, pipes, and headwalls (where necessary) and associated outlet energy dissipation and erosion protection works (where necessary).

- Stormwater bioremediation basins positioned to capture surface and piped stormwater flows from the site for treatment and possible re-use. These are proposed to be located as shown on the attached site plans.

- Rainwater tanks consisting of 5 KL (minimum) rainwater tanks to reduce stormwater runoff and provide non-potable re-use for landscaping, *etc*.

- Site OSD basin / tank to be sized to ensure that performance objectives are met.

- OSD outlet permanent erosion control and energy dissipation measures including headwall sized specifically for the OSD outlet pipes and dumped rip-rap sediment erosion control and energy dissipation structure.

- Site earthworks and landscaping designed specifically to minimise the concentration of runoff, direct runoff to proposed stormwater OSD and bioremediation basins and to minimise potential erosion from site surface flows and overflows from stormwater tanks / basins.

- Stockpile surface water management measures – including bunding the surface around stockpiles to divert flows around stockpiles, temporarily covering stockpiles of easily erodible / organic material and direction of seepage from rainfall falling directly on stockpile areas to site stormwater treatment system (see Section 3.7 for more detail).

Preliminary sizing of the above stormwater management measures is achieved through iterative hydrological, hydraulic and water quality modelling detailed in the following sections.

3.3 Study Methodology and Assumptions

The study used the following computer models to determine preliminary recommendations for site stormwater quantity and quality control measures:

- DRAINS hydrological and hydraulic modelling package to determine existing and post-development peak flow rates to size stormwater system components for the critical duration 1 in 5, 1 in 20 and 1 in 100 year ARI storms respectively. Design rainfall data used in the model were sourced from Council's (2003) Engineering Design Specifications.

- MUSIC 6.1.0 water quality modelling package to determine effects of proposed stormwater harvesting dams on site post-development water quality. Design pollutant generation rates are consistent with Council's DCP (2008) and rainfall and evapotranspiration data were sourced from eWater (2013) and Bureau of Meteorology (2001) respectively.

Models used the conceptual design and landscaping layout and surveyed site levels provided by the Client. Plans showing the concept layout, stormwater management, sediment and erosion control measures and existing site contours are provided in Attachment A. Key assumptions used in the modelling included the following:

3.3.1 DRAINS Model

- Modelling time-step adopted for existing and proposed conditions was 0.1 minutes.

- Post-development sub-catchments are based on proposed site contours and lot layout, noting that the use of pit and pipe and specific sizes have not been nominated at this stage of the development (i.e. drainage may be via surface swales directing flows to the stormwater control measures). Sub-catchments were combined for brevity.

- All runoff from site roofs and hardstand areas are assumed to be directed to the site OSD.

- Hardstand, roof and landscaped site areas have pervious / impervious areas as summarised in Table 2 for both existing and developed conditions.

- Existing condition impervious and pervious areas are based on site inspections and aerial photos. Developed conditions are based

on proposed site development and landscaping plans provided by the Client.

- Initial and continuing losses and soil type used in the modelling are conservative and are considered to be consistent with Council guidelines (see Table 4).

- Proposed OSD tank / basin is assumed to be empty at the commencement of storm events as the structure is designed to be a "dry basin".

- OSD basins include low-flow and high-flow outlet pipes for flows as well as a spillway. The outlet pipes are modelled as two pipes with orifices over the outlet (high-flow outlet) and an overland flow path with a set stage discharge relationship to simulate two pipes with orifices over the outlet (low-flow outlet).

- Individual rainwater tanks for site shed, lunch room and weighbridge control room are not included in the model as tanks will increase initial losses and reduce peak discharge rates.

- Lag times and flow path lengths are based on measured lengths from site plans.

3.3.2 MUSIC Model

- Liverpool (Michael Wenden Centre – Bureau of Meteorology station 067020) for the period 1/06/2002 – 1/06/2008 was used as the climate file as it is proximal to the site and represents the most recent rainfall date of minimum 5 years with minimal data gaps.

- Average monthly areal potential evapotranspiration (PET) was sourced from '*Climatic Atlas of Australia – Evapotranspiration'* (Bureau of Meteorology, 2001).

- Input parameters for source and treatment nodes used in MUSIC modelling are consistent with BMT WBM *NSW MUSIC Modelling Guidelines* (BMT WBM, 2015).

- Model used combined catchments based on sub-catchments calculated for the DRAINS hydrological model.

- All stormwater runoff from roofs, landscape and hardstand areas was assumed to go to proposed swales and stormwater bioremediation basins with no bypass flows, except for the small catchment adjacent to the western site boundary.

- Exfiltration rates for all bioremediation basins were set at 0 mm/hr as basins are to be lined.

- Re-use from rainwater tanks was set at 2 kL/day. This assumes a water demand of 730 kL/year for non-potable uses such as vehicle washing and irrigation of landscaped areas.

- OSD tank / basin is not included in the model. This is expected to give a conservative result for total suspended solids and gross pollutant outputs.

3.4 Hydrological Modelling

DRAINS modelling conducted for this study used sub-catchment data and modelling input parameters as summarised in Table 3 and Table 4. Catchment plans and details of drainage requirements are provided in Attachment A. Results (in terms of total peak flow discharged from the site) are summarised in Table 5 with OSD outlet recommendations summarised in Table 6. General comments about the hydrological modelling are as follows:

- The proposed site minor drainage system adequately conveys 1 in 5 year ARI critical duration storm flows to the bioremediation basin and OSD.

- The proposed site overland flow paths adequately convey the 1 in 100 year ARI critical duration storm flows to the bioremediation basin and OSD.

- Site peak runoff is maintained or reduced compared with existing conditions for all storm events up to the 4.5 hour storm for the 1 in 5 year ARI, 1 in 20 year ARI and 1 in 100 year ARI.

- The critical storm duration for the site varies but is generally the 2 hour storm event for the 1 in 5 year ARI the 1 in 20 year ARI and 1 in 100 year ARI.

- Minimum site OSD volume requirement is 425 KL, which equates to 212.5 KL/ha. OSD basin / tank will require multiple outlets as summarised in Table 6.

- Site OSD tank / basin outlet discharges are not likely to adversely impact on the existing Lawson Road drainage system provided suitable energy dissipation measures are included in the outlet design.

- Preliminary design of sediment erosion control measures (temporary and permanent) are detailed in Section 3.6 and site plans in Attachment A.

Table 3: Summary of sub-catchments used in DRAINS hydrological modelling.

Sub-Catchment	Area (ha)	Impervious Area			Pervious Area		
		Area (% of Total)	Length (m)	Slope (%)	Area (% of Total)	Length (m)	Slope (%)
Site Pre	1.99	60.0	265.6	2.5	40.0	129.4	3.5
Site to Neighbours	0.01	0.0	-	-	100.0	23.5	0.5
Site Post to OSD	1.99	84.0	300.0	2.0	16.0	250.0	1.9
Site Post Bypass	0.01	0.0	-	-	100.0	6.0	4.6

Table 4: Summary of additional parameters used in DRAINS hydrological and hydraulic modelling.

Parameter	Value	Unit
Paved Area Depression Storage	1.0	mm
Supplementary Area Depression Storage	1.0	mm
Grassed Area Depression Storage	5.0	mm
Soil Type (Ilsax)	3.0	-
Calculation Time Step	0.01	minutes

Table 5: Summary of results of DRAINS hydrological modelling (total peak site discharge) for 1 in 100 year ARI storms.

Storm (ARI and duration)	Existing Peak Discharge (m^3/s)	Post-Development Peak Discharge (m^3/s)	Change in Peak Discharge (m^3/s)
1 in 5 year ARI, 120 minute storm	0.29	0.26	-0.03
1 in 20 year ARI, 120 minute storm	0.46	0.43	-0.03
1 in 100 year ARI, 120 minute storm	0.64	0.54	-0.10

Table 6: OSD outlet requirements summary.

OSD Outlet	Invert Level (mAHD)	Outlet Characteristics
Lower Outlet	54.4	2 x 300 mm pipes with 220 mm orifice plates over outlet.
Upper Outlet	55.165	2 x 450 mm pipes with 322 mm orifice plates over outlets
Weir	55.8	3 m wide x 0.20 m deep

3.5 Site Stormwater Quality

3.5.1 MUSIC Model Set-up

MUSIC model was set-up with sub-catchments and treatment nodes as detailed in the following tables and assumptions outlined in Section 3.3.2. Sub-catchments were assigned event mean and baseflow pollutant concentration based on the catchment usage and soil parameters based on the site sub-surface investigations. Catchments used in the modelling are summarised in Table 7. Details of pollutant generation rates used are given in Table 8, with soil parameters summarised in Table 9. Treatment node inputs are summarised in Table 10. Rates and parameters adopted are based on MUSIC modelling guidelines and NSW MUSIC Modelling Guidelines (BMT WBM, August 2015).

Table 7: Catchments used in MUSIC water quality modelling.

Scenario	Model Catchment	Catchment Area (ha)	Impervious Area (% of Total Area)	Pervious Area (% of Total Area)	Adopted Catchment Usage
Existing Conditions	Site Pre	1.99	60	40	Landscaped Areas
	Site Pre to Neighbours	0.01	0	100	Landscaped Areas
Developed Conditions	Site Road Base to Basin	0.32	100	0	Unsealed Roads
	Site Landscaping to Basin	0.32	0	100	Landscaped Areas
	Site Roof	1.35	100	0	Roof
	Site Bypass	0.01	0	100	Landscaped Areas

Table 8: Event mean and baseflow concentration of pollutants used in MUSIC modelling (SMCMA, 2010).

Land-use	Guideline Adopted	Parameter	Storm Flow (SF) (mg/L)	Standard Deviation (mg/L)	Base Flow (BF) (mg/L)	Standard Deviation (mg/L)
Unsealed Roads	BMT WBM (2015)	Total suspended solids (mg/L)	1000.00	2.09	15.80	1.48
		Total phosphorus (mg/L)	0.500	1.78	0.141	1.55
		Total nitrogen (mg/L)	2.19	1.55	1.29	1.32
Landscaped Areas	BMT WBM (2015)	Total suspended solids (mg/L)	141	2.09	15.80	1.48
		Total phosphorus (mg/L)	0.251	1.78	0.141	1.55
		Total nitrogen (mg/L)	2.00	1.55	1.29	1.32
Roofs	BMT WBM (2015)	Total suspended solids (mg/L)	20.00	2.09	1.00[1]	1.02[1]
		Total phosphorus (mg/L)	0.129	1.78	1.00[1]	1.02[1]
		Total nitrogen (mg/L)	2.00	1.55	1.00[1]	1.02[1]

Notes: [1.] Base flow for roof areas not given in guidelines due to lack of base flow from roofs. Storm flow values adopted for model.

Table 9: Soil parameters used in MUSIC modelling.

Modelling Parameter	Value Adopted for Unsealed Roads and Agricultural	Value Adopted for Roofs
Rainfall Threshold (mm/day)	1.5	0.3
Soil Storage Capacity (mm)	54	n/a
Initial Storage (% of Capacity)	25	n/a
Field Capacity (mm)	51	n/a
Infiltration Capacity Coefficient - a	180	n/a
Infiltration Capacity Coefficient - b	3	n/a
Initial Depth – Groundwater (mm)	10	n/a
Daily Recharge Rate – Groundwater (%)	25	n/a
Daily Baseflow Rate – Groundwater (%)	25	n/a
Daily Deep Seepage Rate – Groundwater (%)	0	n/a

Table 10: Parameters used in treatment node for post-development conditions.

Treatment Node	Parameters Adopted for MUSIC model
Bioremediation Basin	Low Flow Bypass – 0 m^3/s
	High Flow Bypass – 1 m^3/s
	Extended Detention Depth – 0.25 m
	Surface Area – 60 m^2
	Filter Area – 30 m^2
	Saturated Hydraulic Conductivity – 100 mm/hr (lined)
	Filter Depth – 0.3 m
	TN Content of Filter Media – 500 mg/kg
	Orthophosphate Content of Filter Media – 50 mg/kg
	Base Lined and underdrain present
	Exfiltration rate – 0 mm/hr
Rainwater Tank	Low Flow Bypass – 0 m^3/s
	High Flow Bypass – 0.5 m^3/s
	Overflow pipe diameter – 50 mm
	Depth above overflow – 0.2 m
	Potential Evapotranspiration – 0 mm/day
	Daily Demand[1] – 2 kL/day
	Surface Area – 2.5 m^2
	Volume below overflow – 10 kL/lot
Grassed Swale	Low Flow Bypass – 0 m^3/s
	Length – 160 m
	Bed Slope – 1.5%
	Base Width – 0.5 m
	Top Width – 2.0 m
	Depth – 0.25 m
	Vegetation Height – 0.15 m
	Exfiltration rate – 0 mm/hr

Notes: 1. Demand assumed based on site toilet flushing, landscape watering, vehicle washdown and dust suppression requirements.

3.5.2 MUSIC Model Results

Results of the MUSIC model are summarised in Table 11 and Table 12. Results indicate that post-development water quality objectives will be met by the proposed treatment train. The model suggests that a significant amount of sediment and gross pollutants will be captured by grassed swales and bioremediation basin and shall need to be

periodically removed to maintain swale and basin aesthetics and preserve treatment efficiency.

Table 11: Summary of MUSIC modelling results – NorBE (total residual loads).

Model	Total Suspended Solids (kg/year)	Total Phosphorus (kg/year)	Total Nitrogen (kg/year)	Gross Pollutants (kg/year)
Existing Conditions	2,270	4.09	14.9	210
Post Development Conditions	96	1.04	11.0	0
Reduction (%)	95.8	74.6	26.2	100.0

Table 12: Summary of MUSIC modelling results – Pollution retention rates.

Model	Total Suspended Solids (kg/year)	Total Phosphorus (kg/year)	Total Nitrogen (kg/year)	Gross Pollutants (kg/year)
Post Development – Generated	2,300	2.16	20.7	266
Post Development – Discharged	96	1.04	11.0	0
Retention Rate (%)	95.8	51.9	46.9	100.0
Target (LCC, 2008)	80.0	45.0	45.0	90.0

3.5.3 ANZECC (2000) Guidelines and Existing Local Water Quality

Site stormwater quality management modelling results are compared with ANZECC (2000) guidelines trigger values for south-east Australian lowland rivers (Table 13) and existing local water quality to determine if average daily discharges are within acceptable limits.

Table 13: ANZECC (2000) guidelines trigger values for aquatic ecosystems in south-east Australia lowland rivers.

Pollutant	ANZECC (2000) trigger value (mg/L)
Total Suspended Solids	50
Total Phosphorus	0.05
Total Nitrogen	0.5

A comparison of the MUSIC modelling results and water quality monitoring results for sampling point B3 given in the draft Environmental Impact Statement for the Badgerys Creek Airport (PPK, 1997) is provided in Table 14.

Table 14: Summary of MUSIC results and existing water quality in Badgerys Creek (PPK, 1997).

Pollutant	MUSIC Result for Average Site Discharge (mg/L)	Complies with ANZECC (2000) trigger value (Y/N)	Existing Water Quality in Badgerys Creek (PPK, 1997) (mg/L)	Complies with ANZECC (2000) trigger value (Y/N)
Total Suspended Solids	2.29	Y	14	Y
Total Phosphorus	0.06	N	0.26	N
Total Nitrogen	0.41	Y	0.90	N

From the above it may be seen that average site discharges comply with suggested trigger values for aquatic ecosystems given in ANZECC (2000) guidelines. Site average stormwater discharges are only fractionally over suggested trigger values for phosphorus. Site water quality measures result in a significant improvement when compared to existing water quality in Badgerys Creek and subsequently the 10 µg/L exceedance of phosphorus is considered acceptable.

3.6 Site Sediment and Erosion Control

The SEARs and Council's DCP (2008) require that a Soil and Water Management Plan be prepared for the construction phase of works at the site. Council's (2008) policy requires that the site construction sediment and erosion control plan be prepared in accordance with NSW Landcom (2005) guidelines.

A detailed Stormwater Management Plan is provided in Attachment A of this document with the following proposed measures:

- Proposed site clearance and bulk earthworks are to be undertaken in a single stage, following the implementation of site sediment control fences.

- Proposed bioremediation basin and OSD basin are to be configured as sedimentation basins during site earthworks. Proposed spillway and embankment levels are to be set 0.5 m higher than design finished level with internal and external batters at 1V:3H. This shall give basins a minimum volume of 480 m^3, allowing for 2.0 ha of disturbed area to be treated. Landcom (2005) guidelines require a minimum of 225 m^3 for the site, which can be accommodated in the proposed OSD.

- Diversion swales are to be constructed as shown on the plans to direct surface flows around disturbed site areas.

- Sediment fencing is to be used at the downslope end of the site for the duration of all earthworks. Where concentrated surface flows are expected, straw bales supported by 1.0 m star pickets driven a minimum of 0.6 m into the ground are to be included and remain in place until vegetation is established.

- All site stockpile areas are to include sediment fencing downslope of them.

- Stabilised site access is to be used at all times during construction phase. The existing site access is to be used where feasible.

3.7 Stockpile Management

Site stockpiles shall require specific stormwater management in accordance with the policies and objectives outlined in Section 1.5. Specific comments and recommendations for stockpile management are as follows:

- The facility is not designed to receive food waste, Biosolids or putrescible wastes. Green organic waste to be received by the facility will be garden / landscaping organic wastes (e.g. wood chips, loppings, tree stumps, *etc.*) and untreated timber wastes (e.g. off-cuts, sawdust, crates / pallets *etc.*). These recyclable materials are considered to be Category 1 organics (lowest potential environmental impact) in accordance with NSW DEC (2004) guidelines.

- All stockpiles are to be located within the shed which will eliminate seepage to site stormwater treatment system by preventing rainfall from falling directly on stockpile areas.

- All surfaces beneath stockpile areas are to be prepared prior to establishment of stockpiles. Preparation shall include placement of inert low-permeability material (e.g. compacted clay, asphalt, *etc*.) designed to withstand anticipated loads from both the stockpiles and equipment / plant used to transport and process stockpiled material including fire management plant.

- No specific leachate barrier, collection or storage system is expected to be required for the site given that no Category 2 / 3 organics are to be recycled at the facility. The proposed swale and bioremediation basin are designed to provide adequate treatment of minor surface water seepage from stockpiles.

3.8 Recommendations

The following recommendations are made with respect to site stormwater management:

- Periodic (quarterly for the first year, yearly thereafter) water / groundwater quality monitoring may be undertaken by site management to ensure that site stormwater quality measures are achieving objectives. An annual report on site stormwater quality monitoring may be prepared for Council by a suitably qualified person.

- Daily inspection of all stockpiles and bunds should be undertaken by site Superintendent with issues noted and remedial actions undertaken as soon as feasible where any such issues arise.

- Monthly inspection and cleaning of site swale, bioremediation basin and all stormwater pits / pipes to ensure system performance.

4 References

www.environment.nsw.gov.au/ieo/

http://www.toolkit.net.au/specials/

Australian and New Zealand Environment and Conservation Council (2000) *Australian and New Zealand Guidelines for Fresh and Marine Water Quality.*

BMT WBM (on behalf of Greater Sydney Local Land Services) (August 2015) *NSW MUSIC Modelling Guidelines.*

Bureau of Meteorology (2001) *Climatic Atlas of Australia Evapotranspiration.*

Liverpool City Council (2008) *Development Control Plan.*

Liverpool City Council (2003) *Development Design Specification D5 Stormwater Drainage Design*.

Liverpool City Council (2003) *Handbook for Drainage Design*.

Liverpool City Council (July 2004) *On-Site Detention Policy*

Liverpool City Council (January 2003) *On-Site Detention Technical Specifications*

NSW Department of Minerals and Energy (1991) *Penrith 1:100,000 Geological Series Sheet 9030*.

NSW Department of Environment and Conservation (2004) *Environmental Guidelines: Composting and Related Organics Processing Facilities.*

NSW Planning and Environment (2014) *Secretary's Environmental Assessment Requirements (SEAR 863).*

NSW Landcom (2005) *Managing Urban Stormwater – Soils and Construction Volume 1.*

PPK Environment and Infrastructure Pty Ltd (1997) *Draft Environmental Impact Statement for the Badgerys Creek airport*.

Soil Conservation Service of NSW (1989) *Penrith 1:100,000 Soil Landscapes sheet 9030*.

5 Attachment A – Site Plans

PROJECT: MATERIALS RECYCLING FACILITY

PLANSET: STORMWATER MANAGEMENT

CLIENT: MULGOA EXCAVATIONS PTY LTD

LOCALITY PLAN
N.T.S.

25 MARTIN ROAD, BADGERYS CREEK, NSW

DRAWING LIST

DWG No.	REV	DWG TITLE
GENERAL		
PS01-A000	A	COVER SHEET
SEDIMENT AND EROSION CONTROL		
PS01-B300	A	SEDIMENT AND EROSION CONTROL PLAN
PS01-B301	A	SEDIMENT AND EROSION CONTROL DETAIL
STORMWATER DRAINAGE		
PS01-E100	A	STORMWATER MANAGEMENT LAYOUT
PS01-E101	A	EXISTING SITE STORMWATER CATCHMENTS
PS01-E102	A	DEVELOPED SITE STORMWATER CATCHMENTS
PS01-EZ00	A	DRAINS AND MUSIC MODEL SETUP AND RESULTS

NOTE: PLANS BASED ON SITE PLAN PROVIDED BY PRECISE PLANNING (FEB 2017)

DEVELOPMENT APPLICATION

REV	DESCRIPTION	DATE	DRAWN	DESIGNED	CHECKED	APPRVD
A	DEVELOPMENT APPLICATION	20/02/17	MGD	MGD	JSF	JSF

SCALE

GRID | DATUM | PROJECT MANAGER: JEFF FULTON

CLIENT: MULGOA EXCAVATIONS PTY LTD

PROJECT NAME/PLANSET TITLE
MATERIALS RECYCLING FACILITY
STORMWATER MANAGEMENT
25 MARTIN ROAD
BADGERYS CREEK, NSW

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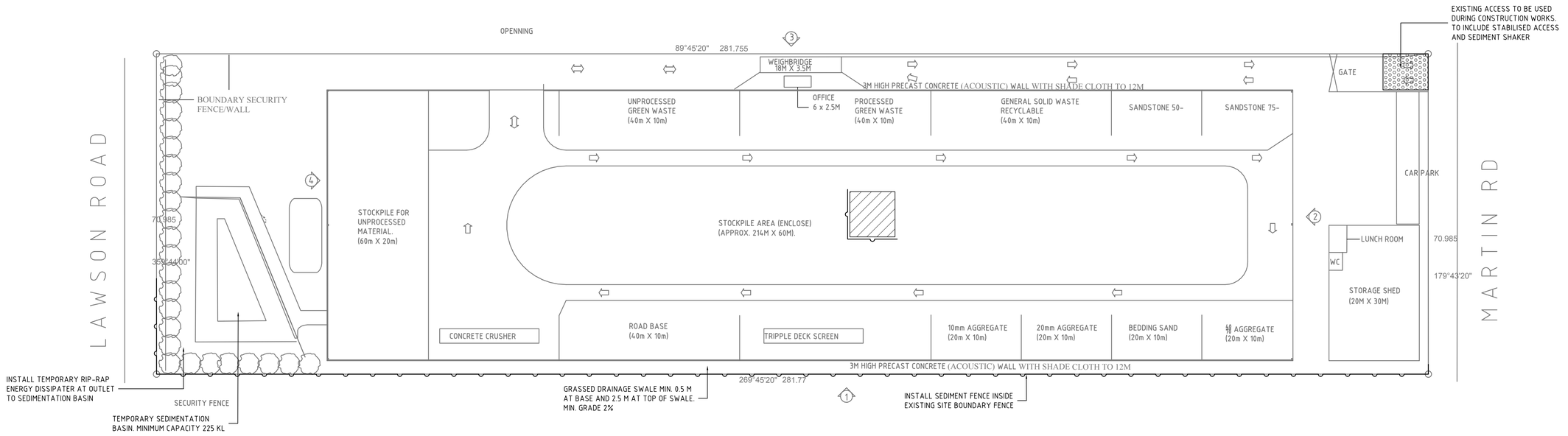
DRAWING TITLE: COVER SHEET

PROJECT NO.	PLANSET NO.	RELEASE NO.	DRAWING NO.	REVISION
P1404242	PS01	R01	PS01-A000	A

DRAWING ID: P1404242-PS01-R01-A000

PRINTED: --- USER: MDUMAS

A1 / A3 LANDSCAPE (A1LC_v02.0.01)



KEY

- SEDIMENT CONTROL FENCE
- MATERIALS STOCKPILE DURING CONSTRUCTION
- STABILISED SITE ACCESS AND SEDIMENT SHAKER

DEVELOPMENT APPLICATION

REV	DESCRIPTION	DATE	DRAWN	DESIGNED	CHECKED	APPRVD
A	DEVELOPMENT APPLICATION	20/02/17	MGD	MGD	JSF	JSF

SCALE: A1 (A3) 1:500 (1:1,000) — 0 5 10 15 20 25 30 35 40 45 50 METRES

GRID | DATUM: MAHD | PROJECT MANAGER: JEFF FULTON

CLIENT: MULGOA EXCAVATIONS PTY LTD

PROJECT NAME/PLANSET TITLE: MATERIALS RECYCLING FACILITY
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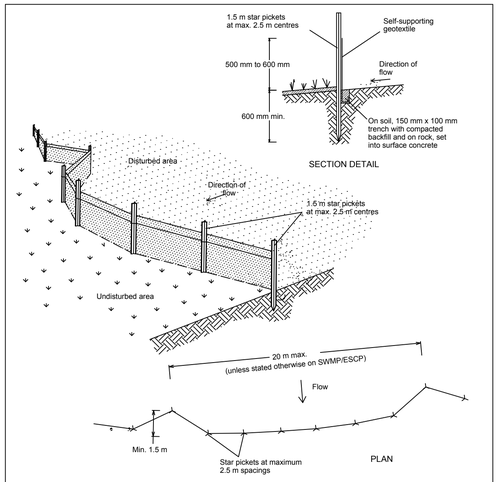
DRAWING TITLE: SEDIMENT AND EROSION CONTROL PLAN

PROJECT NO.	PLANSET NO.	RELEASE NO.	DRAWING NO.	REVISION
P1404242	PS01	R01	PS01-B300	A

DRAWING ID: P1404242-PS01-R01-B300

PRINTED ---- USER: MGMAS

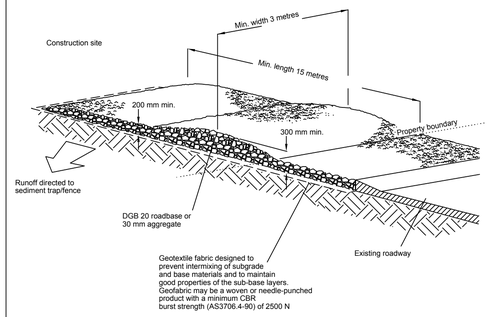
A1 / A3 LANDSCAPE (A1LC_v02.0.01)



Construction Notes

1. Construct sediment fences as close as possible to being parallel to the contours of the site, but with small returns as shown in the drawing to limit the catchment area of any one section. The catchment area should be small enough to limit water flow if concentrated at one point to 50 litres per second in the design storm event, usually the 10-year event.
2. Cut a 150-mm deep trench along the upslope line of the fence for the bottom of the fabric to be entrenched.
3. Drive 1.5 metre long star pickets into ground at 2.5 metre intervals (max) at the downslope edge of the trench. Ensure any star pickets are fitted with safety caps.
4. Fix self-supporting geotextile to the upslope side of the posts ensuring it goes to the base of the trench. Fix the geotextile with wire ties or as recommended by the manufacturer. Only use geotextile specifically produced for sediment fencing. The use of shade cloth for this purpose is not satisfactory.
5. Join sections of fabric at a support post with a 150-mm overlap.
6. Backfill the trench over the base of the fabric and compact it thoroughly over the geotextile.

SEDIMENT FENCE SD 6-8

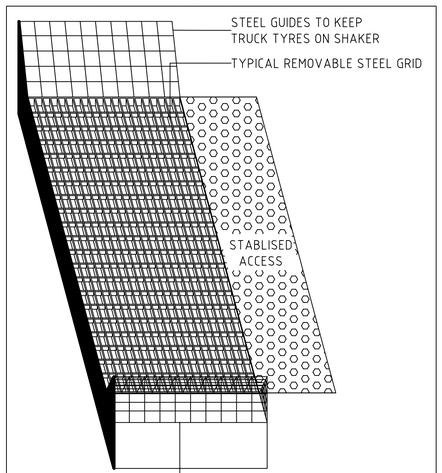


Construction Notes

1. Strip the topsoil, level the site and compact the subgrade.
2. Cover the area with needle-punched geotextile.
3. Construct a 200 mm thick pad over the geotextile using road base or 30 mm aggregate.
4. Ensure the structure is at least 15 metres long or to building alignment and at least 3 metres wide.
5. Where a sediment fence joins onto the stabilised access, construct a hump in the stabilised access to divert water to the sediment fence

STABILISED SITE ACCESS SD 6-14

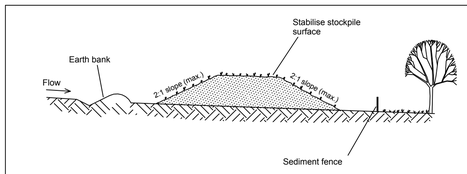
TYPICAL SEDIMENT SHAKER



NOT TO SCALE

NOTES:

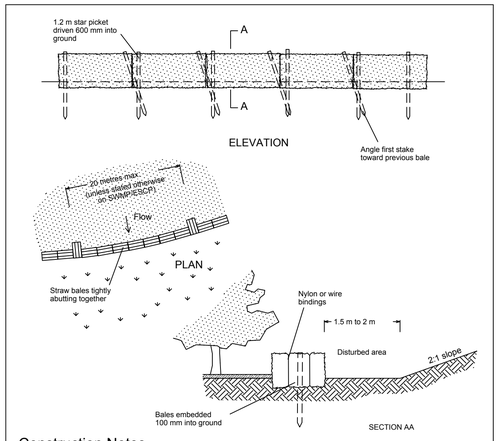
1. INSTALL SEDIMENT SHAKER AT THE SITE ACCESS POINT.
2. MUD/DIRT NOT REMOVED BY SHAKER MUST BE MANUALLY REMOVED FROM VEHICLES PRIOR TO ENTERING PUBLIC ROADWAY.
3. SEDIMENT SHAKER TO BE CLEANED AND MAINTAINED REGULARLY TO ENSURE EFFECTIVE PERFORMANCE.
4. ALL DEBRIS / DIRT EMANATING FROM SITE AND ON TO PUBLIC ROAD IS TO BE SWEPT OFF DAILY.



Construction Notes

1. Place stockpiles more than 2 (preferably 5) metres from existing vegetation, concentrated water flow, roads and hazard areas.
2. Construct on the contour as low, flat, elongated mounds.
3. Where there is sufficient area, topsoil stockpiles shall be less than 2 metres in height.
4. Where they are to be in place for more than 10 days, stabilise following the approved ESCP or SWMP to reduce the C-factor to less than 0.10.
5. Construct earth banks (Standard Drawing 5-5) on the upslope side to divert water around stockpiles and sediment fences (Standard Drawing 6-8) 1 to 2 metres downslope.

STOCKPILES SD 4-1



Construction Notes

1. Construct the straw bale filter as close as possible to being parallel to the contours of the site.
2. Place bales lengthwise in a row with ends tightly abutting. Use straw to fill any gaps between bales. Straws are to be placed parallel to ground.
3. Ensure that the maximum height of the filter is one bale.
4. Embed each bale in the ground 75 mm to 100 mm and anchor with two 1.2 metre star pickets or stakes. Angle the first star picket or stake in each bale towards the previously laid bale. Drive them 600 mm into the ground and, if possible, flush with the top of the bales. Where star pickets are used and they protrude above the bales, ensure they are fitted with safety caps.
5. Where a straw bale filter is constructed downslope from a disturbed batter, ensure the bales are placed 1 to 2 metres downslope from the toe.
6. Establish a maintenance program that ensures the integrity of the bales is retained - they could require replacement each two to four months.

STRAW BALE FILTER SD 6-7

DEVELOPMENT APPLICATION

REV	DESCRIPTION	DATE	DRAWN	DESIGNED	CHECKED	APPRVD
A	DEVELOPMENT APPLICATION	20/02/17	MGD	MGD	JSF	JSF

SCALE

GRID | DATUM | PROJECT MANAGER: JEFF FULTON

CLIENT: MULGOA EXCAVATIONS PTY LTD

PROJECT NAME/PLANSET TITLE: MATERIALS RECYCLING FACILITY
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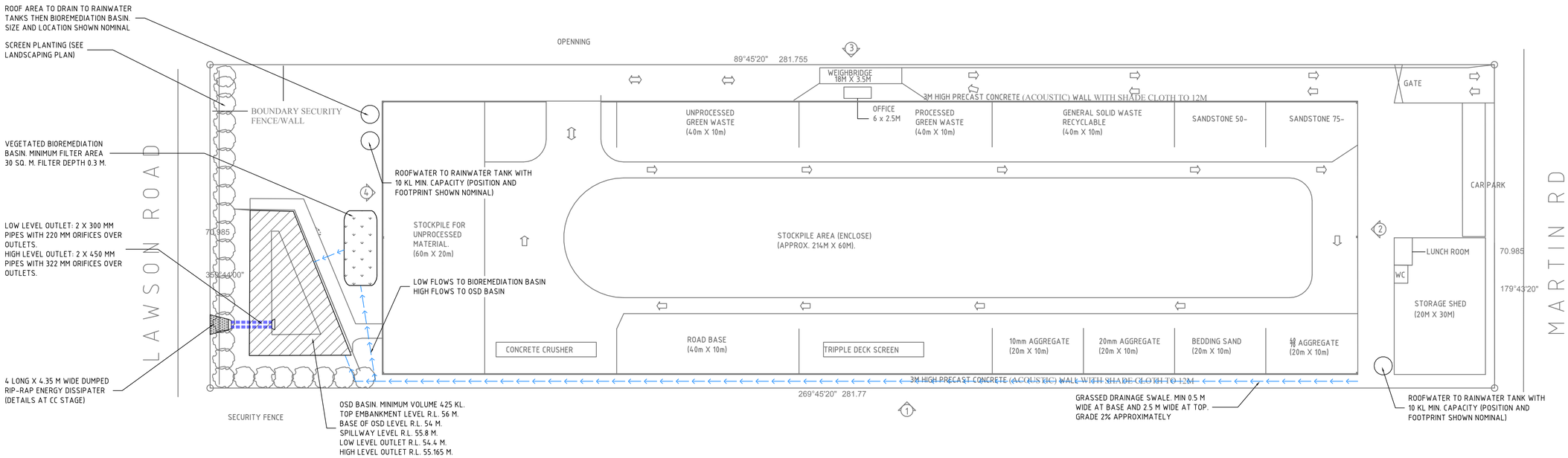
DRAWING TITLE: SEDIMENT AND EROSION CONTROL DETAILS

PROJECT NO.	PLANSET NO.	RELEASE NO.	DRAWING NO.	REVISION
P1404242	PS01	R01	PS01-B301	A

DRAWING ID: P1404242-PS01-R01-B301



KEY

- OSD BASIN
- GRASSED SWALE
- BIOREMEDIATION BASIN
- ENERGY DISSIPATER

DEVELOPMENT APPLICATION

REV	DESCRIPTION	DATE	DRAWN	DESIGNED	CHECKED	APPRVD
A	DEVELOPMENT APPLICATION	20/02/17	MGD	MGD	JSF	JSF

SCALE: A1 (A3) 1:500 (1:1,000) — 0 5 10 15 20 25 30 35 40 45 50 METRES

GRID | DATUM: MAHD | PROJECT MANAGER: JEFF FULTON

CLIENT: MULGOA EXCAVATIONS PTY LTD

PROJECT NAME/PLANSET TITLE: MATERIALS RECYCLING FACILITY
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DRAWING TITLE: STORMWATER MANAGEMENT LAYOUT

PROJECT NO.	PLANSET NO.	RELEASE NO.	DRAWING NO.	REVISION
P1404242	PS01	R01	PS01-E100	A

DRAWING ID: P1404242-PS01-R01-E100

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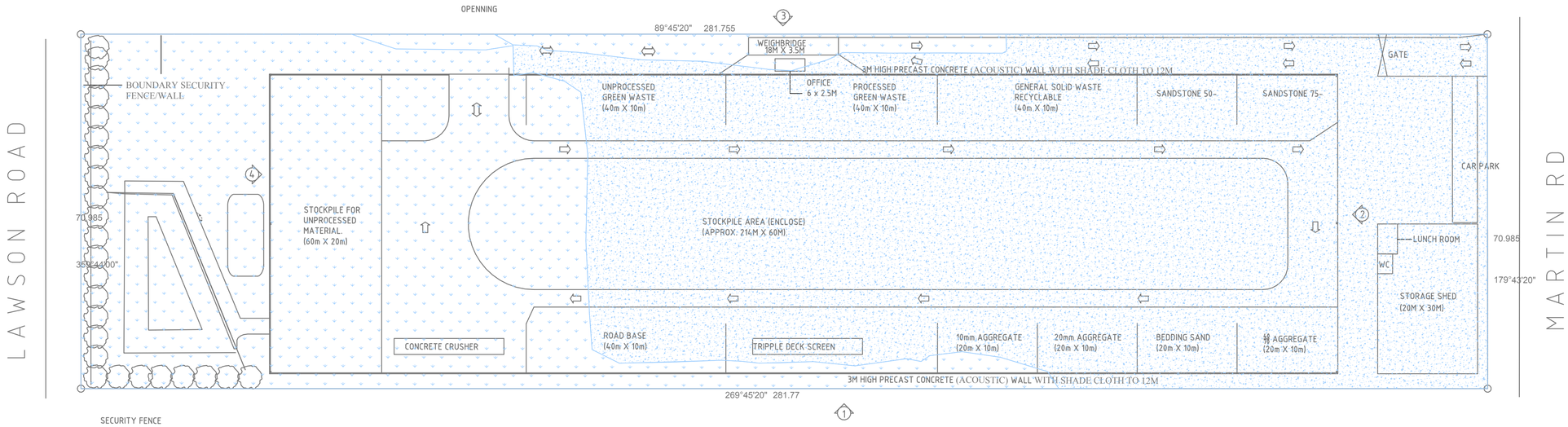

KEY

CATCHMENT BOUNDARY

GRASSED (LANDSCAPED AREAS)

IMPERVIOUS (LANDSCAPED AREAS)

DEVELOPMENT APPLICATION

REV	DESCRIPTION	DATE	DRAWN	DESIGNED	CHECKED	APPRVD
A	DEVELOPMENT APPLICATION	20/02/17	MGD	MGD	JSF	JSF

SCALE: A1 (A3) 1:500 (1:1,000) — 0 5 10 15 20 25 30 35 40 45 50 METRES

GRID	DATUM	PROJECT MANAGER
	MAHD	JEFF FULTON

CLIENT: MULGOA EXCAVATIONS PTY LTD

PROJECT NAME/PLANSET TITLE: MATERIALS RECYCLING FACILITY
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DRAWING TITLE: EXISTING SITE STORMWATER CATCHMENTS

PROJECT NO.	PLANSET NO.	RELEASE NO.	DRAWING NO.	REVISION
P1404242	PS01	R01	PS01-E101	A

DRAWING ID: P1404242-PS01-R01-E101

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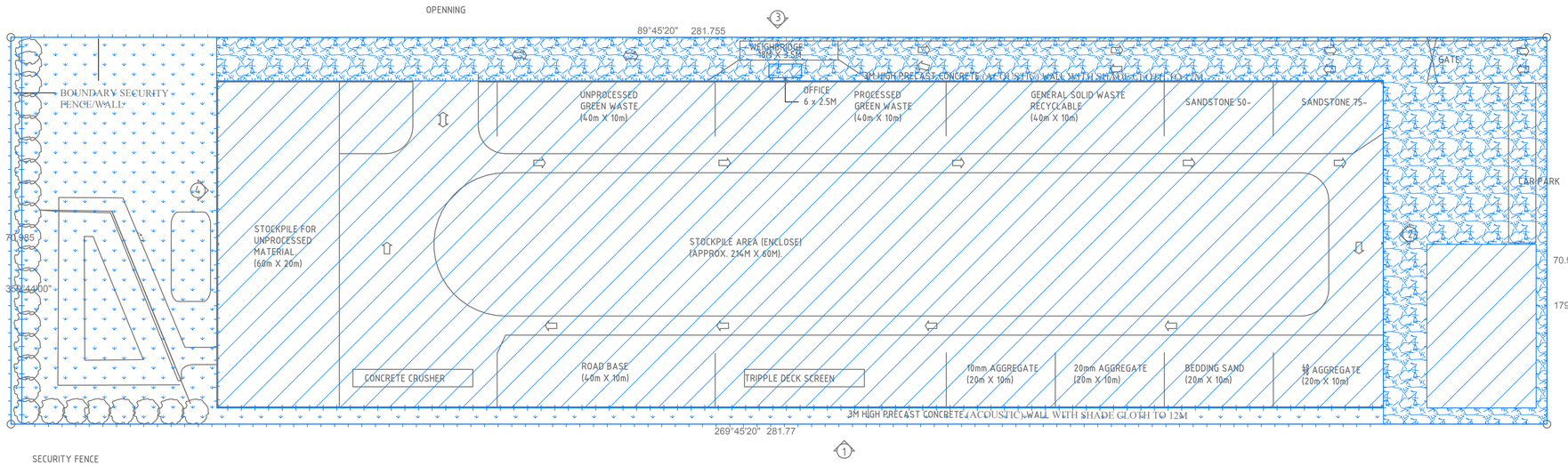

KEY

- CATCHMENT BOUNDARY
- GRASSED (LANDSCAPED AREAS)
- ROOF
- UNSEALED ROAD

DEVELOPMENT APPLICATION

REV	DESCRIPTION	DATE	DRAWN	DESIGNED	CHECKED	APPRVD
A	DEVELOPMENT APPLICATION	20/02/17	MGD	MGD	JSF	JSF

SCALE
0 5 10 15 20 25 30 35 40 45 50 METRES
A1 (A3) 1:500 (1:1,000)

GRID	DATUM	PROJECT MANAGER
	MAHD	JEFF FULTON

CLIENT
MULGOA EXCAVATIONS PTY LTD

PROJECT NAME/PLANSET TITLE
MATERIALS RECYCLING FACILITY
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DRAWING TITLE
DEVELOPED SITE STORMWATER CATCHMENTS

PROJECT NO.	PLANSET NO.	RELEASE NO.	DRAWING NO.	REVISION
P1404242	PS01	R01	PS01-E102	A

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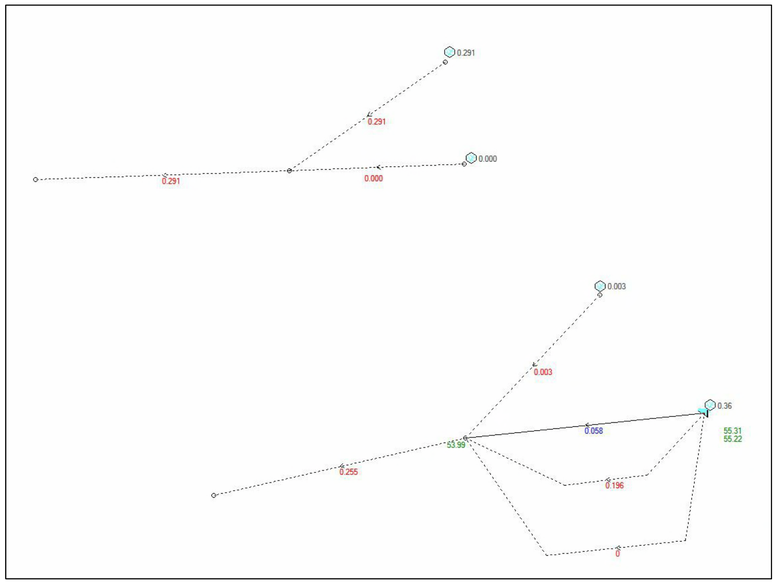
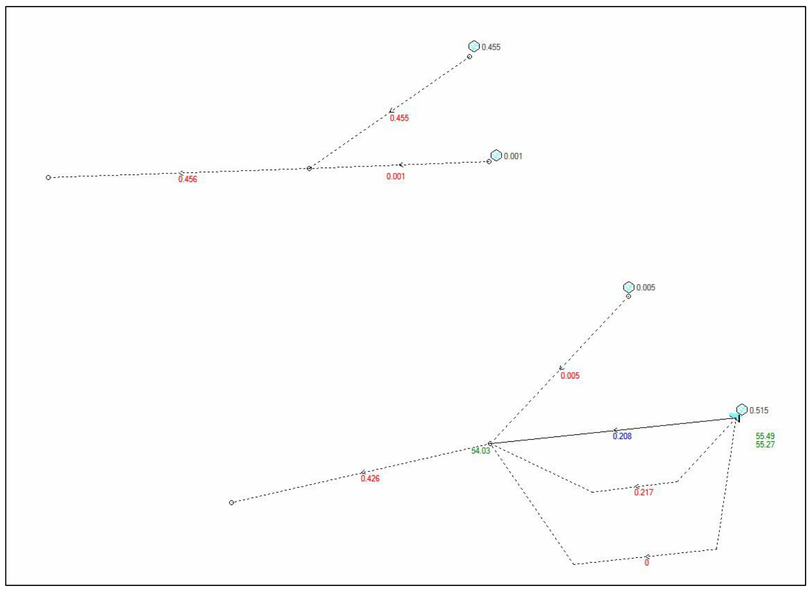
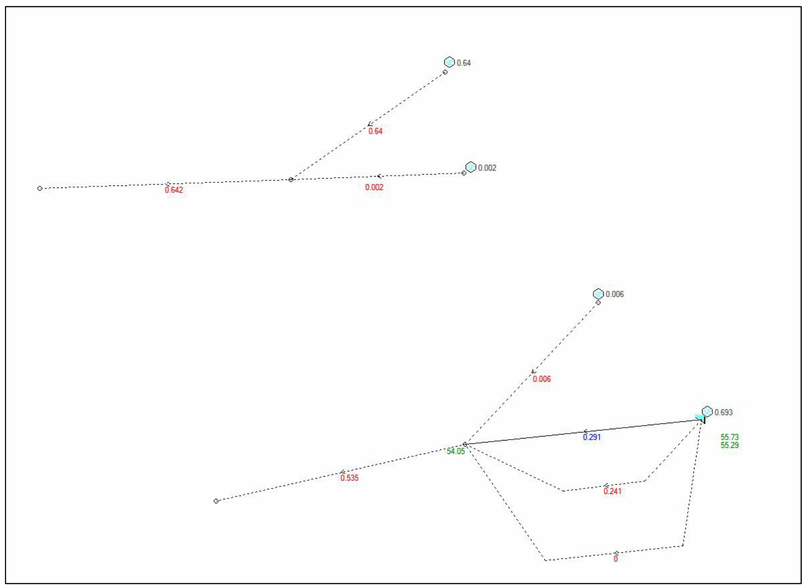
DRAWING ID: P1404242-PS01-R01-E102



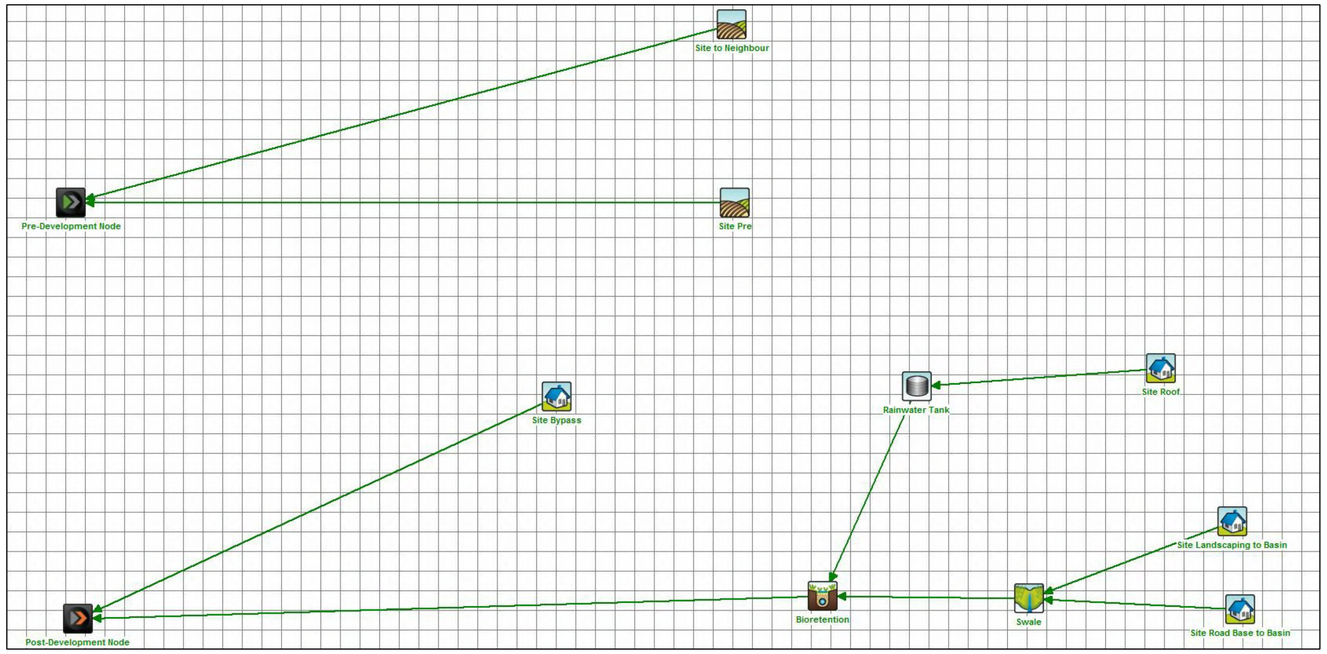
DRAINS MODEL RESULTS – 1 IN 5 YEAR ARI



DRAINS MODEL RESULTS – 1 IN 20 YEAR ARI



DRAINS MODEL RESULTS – 1 IN 100 YEAR ARI



MUSIC MODEL SETUP

Treatment Train Effectiveness - Post-Development Node

	Sources	Residual Load	% Reduction
Flow (ML/yr)	9.12	8.8	3.6
Total Suspended Solids (kg/yr)	2300	95.5	95.8
Total Phosphorus (kg/yr)	2.16	1.04	51.9
Total Nitrogen (kg/yr)	20.7	11	46.8
Gross Pollutants (kg/yr)	266	0	100

Include Pre-Development

MUSIC MODEL RESULTS

DEVELOPMENT APPLICATION

REV	DESCRIPTION	DATE	DRAWN	DESIGNED	CHECKED	APPRVD
A	DEVELOPMENT APPLICATION	17/2/17	MGD	MGD	JSF	JSF

SCALE

GRID | DATUM | PROJECT MANAGER: JEFF FULTON

CLIENT: MULGOA EXCAVATIONS PTY LTD

PROJECT NAME/PLANSET TITLE
MATERIALS RECYCLING FACILITY
STORMWATER MANAGEMENT
25 MARTIN ROAD
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DRAWING TITLE
DRAINS AND MUSIC MODEL SETUP AND RESULTS

PROJECT NO.	PLANSET NO.	RELEASE NO.	DRAWING NO.	REVISION
P1404242	PS01	R01	PS01-EZ00	A

DRAWING ID: P1404242-PS01-R01-EZ00

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