

Our Ref: 218345_LEO_001B.docx

8 March 2019

The General Manager
Forbes Shire Council
PO Box 333

FORBES NSW 2871

Attention: Mr Paul Bennett

Dear Sir

DA2018/41 – DAROOBALGIE LANDFILL EXPANSION

We refer to the letter from the NSW Environment Protection Authority (EPA) dated 26 November 2018 in relation to the proposed expansion of the Daroobalgie Waste Management Facility and provide below responses to the additional information request listed in Attachment A of that letter. A headline of each additional information request is included in italics and the EPA letter is provided as **Attachment A** to this response to cross-reference the detailed request.

Proposed Waste Reveal Station

The comments provided by the EPA are noted and the guidance material noted would be used to inform the detailed design of the waste reveal facility.

Hydrogeological Risk Assessment

The EPA noted that the ammonia concentration in the historical groundwater and leachate monitoring data are low (less than 1 mg/L) and not in accordance with the EPA's experience that leachate ammonia concentrations are usually in the hundreds of mg/L. Comments are provided below:

- It is good that the groundwater ammonia is low as this indicates no significant impacts from the existing landfill operation.
- The leachate ammonia data is presented on a logarithmic scale and there are values above 1 mg/L with an isolated peak of around 150 mg/L.
- There is no formal leachate collection system beneath the existing landfill. Therefore, the existing leachate dam collects a mixture of leachate from the face of the landfill, possibly some lateral movement of leachate from the side of the landfill and surface water. The water collected in the leachate dam could therefore be expected to have lower ammonia concentrations compared to leachate collected from the base of a landfill.

The above comments indicate that the recorded ammonia values are consistent with the current site setting and operations.



Liner System – Landfill Expansion

The *Environmental Guidelines: Solid Waste Landfills* (the Landfill Guidelines) (EPA, 2016) suggest using a compacted clay liner at least 1,000 mm thick with an in situ hydraulic conductivity of less than 1×10^{-9} m/s for landfills that receive less than 20,000 tonnes per year (which is the case for the proposed landfill expansion).

However, analysis of the site soil shows that when it is compacted it has a permeability of 4×10^{-8} m/s. This means a compacted clay liner on its own would need to be 40 m thick to meet the above performance objective.

Therefore, the proposed landfill liner system is:

- a 300 mm thick layer of compacted subsoil; and
- a 2.0 mm thick high density polyethylene (HDPE) liner.

As noted in the SEE, the proposed soil/HDPE composite liner system would have a combined hydraulic conductivity of 1.5×10^{-12} m/s which is substantially lower than the maximum suggested by the *Landfill Guidelines* for landfills receiving less than 20,000 tonnes per year of general solid waste. This is based on 1.0×10^{-14} m/s for the HDPE and 4.0×10^{-8} m/s for the compacted soil.

The 1,000 mm thick compacted clay liner suggested by the guidelines for landfills that receive less than 20,000 tonnes per year would have a theoretical travel time of 32 years for water to move through the liner.

The proposed composite liner system has a theoretical travel time of > 6,000 years.

It is our opinion that the proposed composite liner system exceeds the minimum standard suggested by the Landfill Guidelines and will achieve the required outcomes listed for a leachate barrier system in these guidelines. Justification for the proposed composite liner system in accordance with Section 1.10 of the Landfill Guidelines is provided below:

- The proposed composite liner system will achieve the required outcomes for a leachate barrier and is compatible with the required outcomes for all other environmental issues.
- The proposed system will make use of available on site soil material to construct the compacted soil layer. This will avoid the need to import significant quantities of clay material that would be required if a 1,000 mm thick compacted clay liner was used.
- The proposed composite liner system reduces earthworks quantities and retains active landfill capacity whilst achieving the required environmental outcomes.
- The expected hydraulic performance of each component has been fully described in the SEE (and above) and calculations demonstrate the required outcomes for a leachate barrier system can be achieved. The HDPE component would be consistent with the requirements listed in Section 1.2 of the Landfill Guidelines.
- The proposed composite liner system is consistent with the liner system in the approved LEMP for lateral expansion which was developed in consultation with the EPA.
- Detailed hydrogeological investigations were completed at the site including in situ permeability testing. Groundwater level measurements indicate that the groundwater surface is between 22 and 27 metres depth. The quality of groundwater derived from these weak aquifers is poor.



- Aquifers under the site would be classified as having low groundwater vulnerability due to the relatively deep piezometric level, low hydraulic conductivity, and deep layer of silty claystone overlying the aquifer.
- The aquifers beneath the site are assessed to have low sensitivity due to their expected low yields, high salinity and lack of potential use. The groundwater beneath the site is extremely saline. It is unsuitable for human use and of limited use for stock and agricultural purposes.
- Groundwater monitoring has been undertaken at the existing landfill site since November 2000 utilising four piezometers and this data shows no evidence to suggest that the groundwater beneath the site is being negatively impacted by the existing landfill operation. It is noted that the existing landfill has no engineered liner system.
- The landfill is located in an area that has low risk characteristics. The landfill receives less than 20,000 tonnes of waste per year, the average rainfall at Forbes is less than 600 mm (average 527 mm recorded at Camp Street, BOM station 065016) and there is no risk to groundwater and surface water (as detailed in the SEE).

Despite the low risk, the proposed landfill expansion would include a composite liner system designed to meet performance objectives outlined in the Landfill Guidelines.

Liner System – Over Western Face of Existing

The final stage of the landfill (Stage 4E) would require placing a liner over the western face of the existing landfill. The SEE stated that in this stage, the 0.3 m thick compacted subsoil would be replaced with a geosynthetic clay liner (GCL).

It is noted that Stage 4E would not be required for around 45 years from when the expanded landfill commences filling. It is considered that the existing landfill surface would be stable at this time (no significant settlement) and the old cell would not be generating significant gas quantities. Engineering investigation would be undertaken in around year 40, to ascertain the stability of the old landfill cell and gas emissions. The liner system would then be designed taking these investigations into consideration and would include some or all of the following components:

- Additional soil thickness to provide support for the lining system;
- A gas drainage layer/system to provide a gas movement pathway to appropriately sized bio windows;
- A GCL layer;
- A HDPE geomembrane; and
- A geonet drainage layer and appropriate geotextile separation/protection layers.

The engineering investigation undertaken in operational year 40 would be used to detail the lining system to achieve the required environmental outcomes required by the Landfill Guidelines.

Material Specification

Technical specifications developed during detailed design phase would be in accordance with Section 1.1 of the Landfill Guidelines.



Concept Drawings

Concept drawings for the proposed leachate extraction pipe in Stage 4A are included as **Attachment B**. All conceptual details are subject to final detailed engineering design.

Construction Quality Assurance (CQA)

The construction documentation will require that quality assurance measures be implemented to make sure that all critical features of the landfill are constructed according to the approved designs and specifications.

This will include:

- Preparation of a Construction Quality Assurance Plan (CQAP) which will set out the proposed testing, inspection and other verification procedures to be implemented during construction of the landfill works; and
- Preparation of a Construction Quality Assurance Report (CQAR) following construction that will report on the quality assurance that was implemented to ensure that the works comply with the approved designs and specifications.

Leachate Management/DisposalWater Balance Model

A daily water balance model was used to assess the leachate management system. The model is used to:

- estimate the daily leachate generation;
- conduct a water balance for the leachate storage; and
- determine the spill frequency from the leachate storage (note that as it is proposed to have in cell leachate storage, the leachate storage does not actually spill – this calculation was used to estimate storage volumes for particular rainfall years).

The model uses 49 years of daily SILO rainfall and evaporation data for the site (1 January 1969 to 31 December 2017). The SILO data interpolates rainfall and evaporation values from surrounding climate stations to provide a long term data set for the specific location.

By observation, it was determined that the maximum leachate generation would occur during operation of Stage 4C. In accordance with Section 2.3 of the Landfill Guidelines, the following default infiltration percentages were used to estimate leachate generation for this stage:

- 10% for capped areas (note this is higher than the design minimum infiltration for the phytocap of less than 5%);
- 50% for intermediate capped areas; and
- 100% for active areas.

The water balance model allowed for absorption by the waste and adopted the default value of 7% in accordance with Section 2.3 of the Landfill Guidelines.



The model allowed for irrigation of stored leachate based on a soil moisture calculation for the phytocap. Irrigation of 5 mm over 1 ha was triggered if:

- There was leachate in storage;
- The soil moisture deficit was 10 mm below field capacity (a deficit irrigation approach) based on soil moisture calculations using grass;
- And rainfall was less than 5 mm on the day.

Removal of leachate by tanker was triggered when the leachate storage reached 1,000 kL.

It is noted that re-injection of leachate could be used if storage levels were increasing. No allowance for this mitigation measure was included in the leachate modelling. Further, additional irrigation areas could be used to dispose of more leachate if required.

Using the above model, the following leachate storage volumes were estimated (for the worse case):

- | | |
|---|----------|
| • Average daily leachate storage | 142 kL |
| • Average annual maximum storage volume | 1,230 kL |
| • 50 th percentile annual maximum storage volume | 1,150 kL |
| • 75 th percentile annual maximum storage volume | 1,370 kL |
| • 90 th percentile annual maximum storage volume | 1,965 kL |
| • Maximum storage volume | 2,980 kL |

As noted above, this is for the worse case and all other leachate storage calculations would be less. It is noted that the maximum leachate generation/storage would occur in Stage 4C which commences in operational year 22. This would provide adequate time to collect site specific leachate generation data.

Modelling of the irrigation system is generally in accordance with the *Environmental Guidelines: Use of effluent by irrigation* (NSW DEC, 2004) (the Reuse Guidelines) as:

- The area proposed for irrigation is suitable for irrigation (capped areas);
- The area of irrigation would be applied across landfilling areas which are managed by the liner and leachate drainage system – it is considered that this meets the groundwater protection objectives promoted by the Reuse Guidelines;
- A deficit irrigation approach was modelled which ensures the hydraulic load can be assimilated by the soil profile and runoff would not occur due to irrigation;
- Balancing of the irrigation area and leachate storage system was determined through modelling. Typical leachate quality is likely to be classed as medium strength effluent (based on data from other locations) in accordance with the Reuse Guidelines and therefore 75th percentile storage would be required (limiting discharge to 25% of years). However, in cell storage is proposed and there would be no discharge from the system; and
- The system would be managed and monitored and adjusted if required in response to monitoring.



In cell leachate storage is proposed as:

- It removes the need for a surface storage pond that can cause odour and vermin issues;
- An open leachate storage pond needs to manage direct rainfall;
- There will be no leachate discharged from the cell; and
- The cell has a composite liner system capable of storing leachate (as noted in Section 2.1 of the Landfill Guidelines).

The 750 mm stated in the SEE was based on the concept design of Stage 4C and did not allow for a leachate collection sump and final cell grading, and it was based on the maximum calculated leachate storage volume which is much larger than the calculated 75th percentile. The final design of this stage (and all stages) would ensure that the leachate does not rise above the drainage layer.

The maximum leachate storage depth would be in the leachate sump where liquid depth would be required to allow pumping. The proposed composite liner system is capable of managing this deeper storage noting that if an external leachate storage pond was used, the stored leachate level would be much deeper than 300 mm and lining requirements promoted by the Landfill Guidelines should be a standard similar to that of the landfill cell liner.

It is our opinion that the 300 mm storage depth suggested by the Landfill Guidelines is to minimise the interaction of stored leachate with waste, although it is noted that some other maximum level can be justified in the design of the cell (Landfill Guidelines page 18).

The assessment presented in the SEE for the conceptual landfill design is based on modelling. Design of Stage 4A1 would be based on this modelling with the cell floor and leachate sump designed to keep 75th percentile leachate stored volume to within the drainage layer of the landfill cell. Leachate generation data collected from the initial operation of the landfill would be used to update or validate the leachate generation model to inform future cell design.

Phytocap

The Landfill Guidelines are outcome based and not prescriptive. One outcome for the landfill final capping is to minimise infiltration to less than 5% of the annual rainfall.

As noted by the EPA, page 57 of the Landfill Guidelines states:

As a guide, the depth of the cap will typically need to be at least 1.5 metres thick to provide sufficient soil water storage to limit percolation. Adequate storage is particularly important in climates where plant growth is limited for long periods during the year (e.g. in alpine climates). The designer should also consider the rooting depth of plant species. The detailed design should justify the required depth based on the above factors and modelling.

This is only a guide and refers to typical cap thickness. This indicates that the phytocap does need to be 1.5 m thick and modelling can be used to justify a design capping thickness.

The phytocap modelling was based on a daily water balance model that uses soil moisture budgeting. The soil moisture calculations are based on the following equation:

$$\text{Change in Soil Storage} = \text{Precipitation} + \text{Irrigation} - \text{Evapotranspiration} - \text{Runoff} - \text{Drainage}$$



The above equation is used to track soil moisture using a daily time step as described by the following equation:

$$\theta_d = \theta_{d-1} + P_d + I_d - ET_d - R_o - D_d$$

Where	θ_d	=	soil moisture at the end of the current day
	θ_{d-1}	=	soil moisture at the end of the previous day
	P_d	=	rainfall for the current day
	I_d	=	irrigation for the current day
	ET_d	=	crop evapotranspiration for the current day
	R_o	=	runoff
	D_d	=	drainage below the root zone for the current day

The model adopts the following soil properties:

- Soil depth varied depending on the cap thickness modelled
- Maximum water holding capacity 637 mm/m (θ_{max})
- Field capacity 510 mm/m (θ_{FC})
- Crop stress 364 mm/m (θ_{stress})
- Wilting point 218 mm/m (θ_{WP})
- Maximum drainage 18 mm/day (k_{drain})

The following calculations are made based on soil moisture (θ):

- Runoff, $R_o = r_c \times P$
 Where P = rainfall
 r_c = runoff coefficient: $r_c = 0$ when $\theta \leq \theta_{FC}$
 $r_c = (\theta - \theta_{FC}) / (\theta_{max} - \theta_{FC})$ when $\theta > \theta_{FC}$
- Actual evapotranspiration, AET: $AET = PET$ when $\theta > \theta_{stress}$
 $AET = (\theta - \theta_{WP}) / (\theta_{stress} - \theta_{WP}) \times PET$ when $\theta_{WP} < \theta \leq \theta_{stress}$
 $AET = 0$ when $\theta \leq \theta_{WP}$
 Where PET = potential evapotranspiration (pan evaporation x crop factor)
- Deep drainage, D : $D = (\theta - \theta_{FC}) / (\theta_{max} - \theta_{FC}) \times k_{drain}$ when $\theta > \theta_{FC}$
 $D = 0$ when $\theta \leq \theta_{FC}$

The adopted soil water holding parameters were based on analysis of onsite soils that would form the cap.



Assumptions incorporated into the water balance model are summarised below:

- No flood conditions – rainfall not absorbed into the soil profile is shed as run-off;
- Run-off threshold – if soil moisture is less than the FC, rainfall runoff only occurs in the scenario of a daily rainfall event of 5 mm or greater occurring;
- Run-off factor – where a run-off event occurs while the soil moisture is less than the FC, run-off is calculated at 7% of the total daily rainfall (the remainder infiltrated).
- Evapotranspiration factors – seasonal evapotranspiration factors have been conservatively adopted for grass cover, ranging from 0.6 to 0.7, and corrected for soil stress levels (i.e. where soil moisture is less than 50% of the difference between FC and WP);
- The rate at which moisture may percolate through the capping layer when the soil is above FC is directly calculated from the recorded hydraulic conductivity (i.e. 18 mm/hr).

The phytocap modelling indicates that the proposed 1.0 m cap limits infiltration to 0.3% - much lower than the required outcome. It is further noted that the cap would have a 1.0 m revegetation layer and 100 mm topsoil layer. The topsoil layer was not included in the modelling.

This landfill capping thickness is consistent with other landfills in the western areas of NSW where the climate has a significant rainfall deficit. It would not be a typical thickness in higher rainfall areas.

The commitment is that the landfill phytocap will be designed and constructed in accordance with required outcomes listed in Section 9.4 of the Landfill Guidelines, i.e. limit infiltration to less than 5% of the annual rainfall.

As noted in the discussion above, leachate generation would be monitored, and this could be used to monitor the integrity and performance of the final cap.

We trust that the above adequately addresses the comment provided by the EPA. Please do not hesitate to contact the writer if any further clarification is required.

Yours faithfully
Geolyse Pty Ltd



MARTIN HAEGE
Principal Environmental Engineer

No. of Attachments – A – EPA letter dated 26 November 2018

B – Drawing Set 213141_07G_C001-C015



ATTACHMENT A: EPA letter dated 26 November 2018



Our reference: EF13/2957; DOC18/755908-02
Contact: Ms Alex McGuirk; (02) 6333 3807

The General Manager
Forbes Shire Council
PO Box 33
FORBES NSW 2871

Attention: Mr Mathew Teale

26 November 2018

Dear Mr Teale,

DEVELOPMENT APPLICATION DA2018/41 – STOP THE CLOCK

I refer to the Environment Protection Authority's (EPA) 'stop the clock' letter, dated 17 October 2018, in relation to development application DA2018/41 for the proposed expansion of the Daroobalgie Waste Management Facility (the Proposal).

The EPA has reviewed the Statement of Environmental Effects (SoEE) in greater detail and has set out in **Attachment A** the additional information required to be able to issue general terms of approval (GTA).

Regarding the proposed waste receival station, the SoEE provides conceptual information only. Therefore, the EPA would like to draw Forbes Shire Council's (Council) attention to the *Handbook for Design and Operation of Rural and Regional Transfer Stations* (NSW Department of Environment and Conservation, 2006), the *Guide to Best Practice at Resource Recovery Centres* (Sustainability Victoria, 2009) and the *Community Recycling Centres: Operations and management handbook* (NSW EPA, 2017) for consideration during detailed design. Relevant considerations are, for example, site layout relative to topography and prevailing weather conditions, visual screens/buffers, stockpile limits and management of by-catch/unacceptable wastes.

Should consent be granted for the proposal, the EPA will require detailed construction soil and water management plans be prepared by a suitably qualified person (CPESC or equivalent) for both the construction of the Proposal and post-construction operation. The EPA will also require a construction environmental management plan (CEMP) and that the proposed update to the landfill environmental management plan (LEMP) is consistent with the *Environmental Guidelines: Solid Waste Landfill*, (NSW EPA, 2016; the minimum standards).

The EPA notes that Officers from Forbes Council and the EPA are due to meet to discuss the proposal and the additional information required on 28 November 2018. Should the information sought in Attachment A negate, or postpone, the need for this meeting please contact Ms Alex McGuirk at the Central West (Bathurst) Office of the EPA as soon as possible by telephoning (02) 6333 3807.

Yours sincerely

A handwritten signature in black ink, appearing to read 'Darryl Clift'.

DARRYL CLIFT
Head Regional Operations Central West
Environment Protection Authority

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ABN 30 841 387 271
www.epa.nsw.gov.au

Attachment A: Request for additional information

Hydrogeological risk assessment

The SoEE provides groundwater and leachate monitoring data from the existing Daroobalgie Waste Disposal Depot (environment protection licence 6118) since November 2000.

The EPA notes that the main ammonia concentrations are very low, less than 1 mg/L, which is not in accordance with the EPA's experience that leachate ammonia concentrations are usually in the hundreds of mg/L. Considering this the EPA request information on possible reasons for these low ammonia concentrations.

Specifications, drawings and construction quality assurance

Liner system

The SoEE proposes a concept design for the liner system consisting of 0.3 m layer of compacted subsoil overlaid with 2.0 mm HDPE liner, and a geosynthetic clay liner (GCL) over the western batter of the existing landfill. Please be advised it is the EPA's view that this proposed liner system is not equivalent to the liner requirements in section 1.1 of the minimum standards, accordingly the EPA requests additional information.

This additional information may consist of additional justification for the proposed alternative liner system (refer section 1.10 of the minimum standards) or a revised proposal to adopt a liner system in accordance with the requirements of section 1.1. Regarding additional justification please be advised that the minimum standards are at least in part based on guidelines from other jurisdictions and those jurisdictions in the main require, composite liner systems e.g. GCL and HDPE when geosynthetics are proposed.

In addition, regarding placing part of the liner system on the western batter of the existing landfill, the EPA also requests a commitment from Council to address the requirements of section 1.11 of the guidelines.

Material specifications

The EPA notes the SoEE is silent as to whether the specifications of the components of the leachate barrier and leachate collection system will be in accordance with section 1.1 of the guidelines e.g. the HDPE liner, the geotextiles, the leachate drainage layer and the leachate pipework. The EPA request this information.

Concept drawings

The EPA notes that a 450 mm diameter leachate extraction riser and sidewall lining is proposed, this is acceptable, notwithstanding that the EPA requests additional information. The EPA requests concept drawings, plans and cross-sections, depicting the riser and layout of the leachate collection system for the first stage of the proposed expansion.

Construction quality assurance (CQA)

The EPA notes the SoEE is silent on CQA. The EPA request a statement committing to CQA generally in accordance with section 11 of the minimum standards, or an equivalent alternative.

Leachate management/disposal

The SoEE has modelled leachate generation and concludes that maximum leachate storage required is 2,900 kL. The EPA requests information on what model was used, for example Hydrologic Evaluation of Landfill Performance (HELP; refer section 2.3 of the minimum standards).

The EPA notes that leachate storage requirements are based on leachate irrigation over one hectare, however the SoEE is silent on whether the requirements for leachate irrigation in section 2.2 of the minimum standards were considered, for example, consideration of the *Environmental Guidelines: Use of Effluent by Irrigation* (NSW DEC, 2004; the effluent guidelines). The EPA requests this information.

The EPA further notes that storage of leachate within the landfill is proposed. Please be advised that section 1.9 of the minimum standards requires the leachate level to be no greater than 300 mm above the upper surface of the base liner, the SoEE proposes 750 mm. Considering this it is likely a leachate storage dam is required (refer section 2.1 of the minimum standards).

In summary the EPA requests information on what leachate modelling/water balance what was used, whether the effluent guidelines or any other similar guidelines were referenced and a revised proposal that does not propose leachate storage within the landfill.

Phytocap

The SoEE states that modelling was undertaken and proposes a 1m phytocap, which is not in accordance section 9.4 of the guidelines which states that phytocaps typically need to be 1.5 m thick. The SoEE is silent on what model was used, for example, section 9.4 of the guidelines reference LEACHM.

Accordingly, the EPA requests further design justification for the photocap, or a commitment to a phytocap in accordance with section 9.4 of the guidelines.

ATTACHMENT B: Drawing Set 213141_07G_C001-C015

DAROOBALGIE LANDFILL EXTENSION

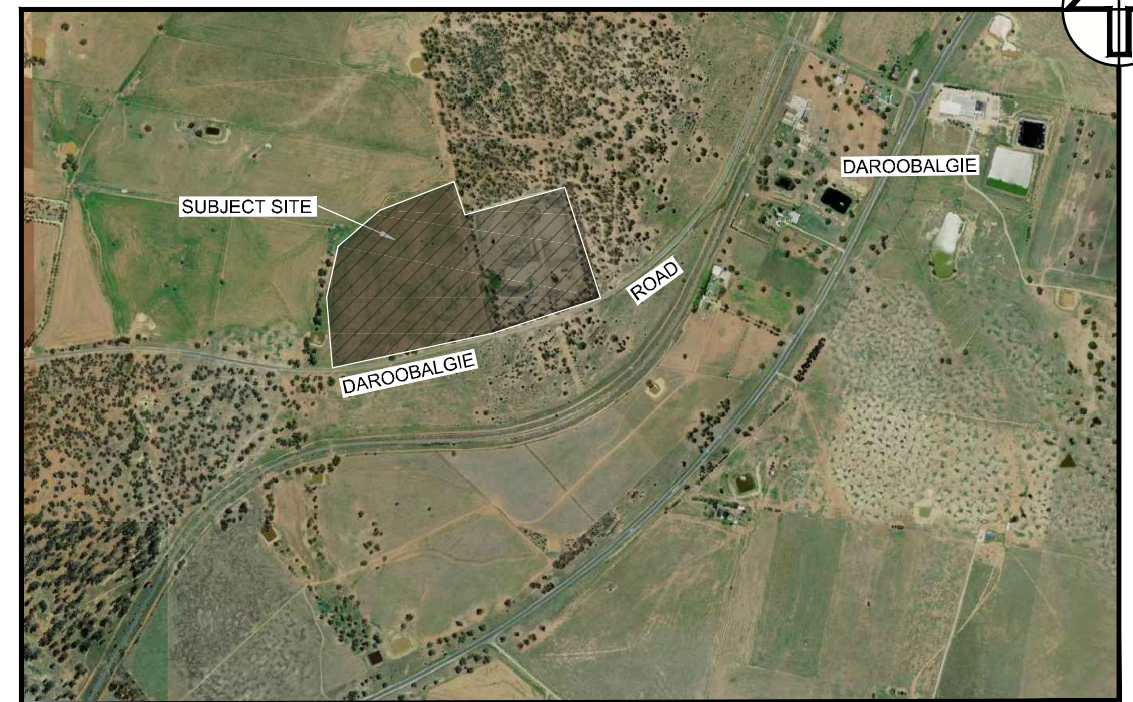
DAROOBALGIE ROAD, FORBES

FORBES SHIRE COUNCIL

CONCEPTUAL STAGING PLANS



SCHEDULE OF DRAWINGS	
DRAWING	TITLE
C001	TITLE SHEET AND SCHEDULE OF DRAWINGS
C002	EXISTING SITE LAYOUT
C003	EXISTING SITE FINISHED SURFACE
C004	EXCAVATION STAGE 4A1
C005	EXCAVATION STAGE 4A2 & FILLING STAGE 4A1
C006	EXCAVATION STAGE 4B & FILLING STAGE 4A2
C007	EXCAVATION STAGE 4C & FILLING STAGE 4B
C008	FILLING STAGE 4C
C009	FILLING STAGE 4D
C010	FILLING STAGE 4E
C011	OVERALL FINISHED SURFACE
C012	TYPICAL CROSS SECTION AND CAPPING DETAILS
C013	TYPICAL LINER DETAILS
C014	LANDFILL CELL SUBGRADE AND LEACHATE DRAINAGE SYSTEM STAGE 1
C015	TYPICAL CROSS SECTIONS LEACHATE DETAILS



SITE LOCALITY
1:1250


CONCEPT DESIGN
NOT FOR CONSTRUCTION

REV.	DATE	DFTD.	APPD.	DETAILS
A	27/11/2017	AH	PPO	FOR REVIEW
B	02/05/2018	AP	PPO	AMENDED TO SUIT FINAL LOT BODY
C	23/07/2018	AP	PPO	AMENDED TO AVOID WOODLAND
D	08/08/2018	AP	PPO	TOP GRADE INCREASED AND BATTERS FLATTENED
E	10/08/2018	AP	PPO	STAGE 4A1 AND ACCESS RAMP ADDED
F	13/08/2018	AP	PPO	FILLING STAGE 4E ADDED
G	12/12/2018	AH	PPO	LEACHATE DRAINAGE SYSTEM AND DETAILS ADDED

	FILE	INITIALS	DATE
SURVEY	213141 SURVEY MARCH 2018.MJO	GW	13/03/18
DESIGN	213141_02F_TIP_EXTENSION.project	PPO	13/08/18
DRAINS/ HEC-RAS MODELLING	-	-	-
ENGINEERING/ SURVEYING APPROVAL		-	-

DRAWING SCALE
DO NOT SCALE FROM THESE DRAWINGS. ALL MEASUREMENTS SHALL BE CONFIRMED ON SITE AND WITH GEOLYSE PTY. LTD. PRIOR TO CONSTRUCTION

APPROVAL AUTHORITY	FORBES SHIRE COUNCIL
CLIENT	FORBES SHIRE COUNCIL
PROJECT	DAROOBALGIE LANDFILL EXTENSION

**GEOLYSE**
ORANGE

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ORANGE, NSW 2800
Ph: (02) 9393 5000
Fx: (02) 9393 5050

orange@geolyse.com
www.geolyse.com

DRAWING TITLE SHEET AND SCHEDULE OF DRAWINGS			
PROJECT NUMBER 213141	DRAWING FILE 213141_07G_C001-C015.dwg	ORIGINAL	A1
SURVEY MARK -	R.L. -	DATUM A.H.D.	SET 07
IMAGE SOURCE			
STATUS FOR REVIEW	SHEET C001 OF C015		

NOTES:

1. THIS PLAN IS PREPARED FROM A FIELD SURVEY FOR THE PURPOSE OF DESIGNING NEW CONSTRUCTIONS ON THE LAND AND SHOULD NOT BE USED FOR ANY OTHER PURPOSE.
2. VISIBLE SERVICES HAVE BEEN LOCATED ONLY. PRIOR TO ANY DEMOLITION, EXCAVATION OR CONSTRUCTION ON THE SITE, THE RELEVANT AUTHORITIES SHOULD BE CONTACTED FOR LOCATION OF FURTHER UNDERGROUND SERVICES AND DETAILED LOCATIONS OF ALL SERVICES.
3. CONTOUR INTERVAL 0.5m.
4. DATUM IS ASSUMED
5. THESE NOTES ARE AN INTEGRAL PART OF THIS PLAN.

CONCEPT DESIGN
NOT FOR CONSTRUCTION

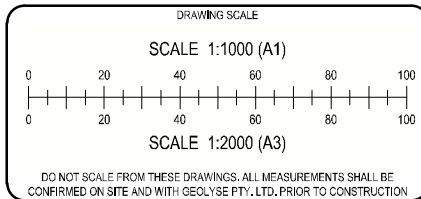
LEGEND:

- EXISTING BOTTOM OF BANK
- EXISTING BOUNDARY
- EXISTING CONTOUR (0.5m INTERVAL)
- EXISTING EDGE OF BITUMEN
- EXISTING EXISTING ACCESS TRACK CENTRELINE
- EXISTING FENCE LINE
- EXISTING OVERHEAD POWERLINE
- EXISTING STOCK PILES
- EXISTING TOP OF BANK
- EXISTING OUTLINE OF VEGETATION
- EXISTING BORE HOLE
- EXISTING GATE
- EXISTING HYDRANT
- EXISTING POWER POLE
- EXISTING SIGN POST
- EXISTING TAP
- EXISTING WATER METER
- EXISTING GRAVEL ACCESS ROAD



REV.	DATE	DFTD.	APPD.	DETAILS
A	27/11/2017	AH	PPO	FOR REVIEW
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G	12/12/2018	AH	PPO	LEACHATE DRAINAGE SYSTEM AND DETAILS ADDED

	FILE	INITIALS	DATE
SURVEY	213141 SURVEY MARCH 2018.MJO	GW	13/03/18
DESIGN	213141_02F_TIP_EXTENSION.project	PPO	13/08/18
DRAINS/ HEC-RAS MODELLING			
ENGINEERING/ SURVEYING APPROVAL			



APPROVAL AUTHORITY	FORBES SHIRE COUNCIL
CLIENT	FORBES SHIRE COUNCIL
PROJECT	DAROOBALGIE LANDFILL EXTENSION

GEOLYSE

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DRAWING			
EXISTING SITE LAYOUT			
PROJECT NUMBER 213141	DRAWING FILE 213141_07G_C001-C015.dwg	ORIGINAL	A1
SURVEY MARK	R.L.	DATUM A.H.D.	
IMAGE SOURCE		SET	07
STATUS FOR REVIEW	SHEET C002 OF C015		

NOTES:

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3. NATURAL CONTOUR INTERVAL 0.5m.
DESIGN CONTOUR INTERVAL 0.5m
4. DATUM IS ASSUMED
5. THESE NOTES ARE AN INTEGRAL PART OF THIS PLAN.

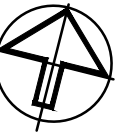
CONCEPT DESIGN
NOT FOR CONSTRUCTION

LEGEND:

- | | | | |
|-----------|---|-------|--------------------------------|
| — 290 — | CONTOUR (0.5m INTERVAL) | — — — | EXISTING TOP OF BANK |
| - - - - - | EXISTING APPROXIMATE ASBESTOS AREA | ~~~~~ | EXISTING OUTLINE OF VEGETATION |
| - . - . - | EXISTING BOTTOM OF BANK | ⊕ | EXISTING BORE HOLE |
| — — — | EXISTING BOUNDARY | ⌵ | EXISTING GATE |
| — — — | EXISTING EDGE OF BITUMEN | FH □ | EXISTING HYDRANT |
| - - - - - | EXISTING EXISTING ACCESS TRACK CENTRELINE | PP ○ | EXISTING POWER POLE |
| - / - / - | EXISTING FENCE LINE | △ | EXISTING SIGN POST |
| — ε — | EXISTING OVERHEAD POWERLINE | TAP ○ | EXISTING TAP |
| — — — | EXISTING STOCK PILES | WMR □ | EXISTING WATER METER |

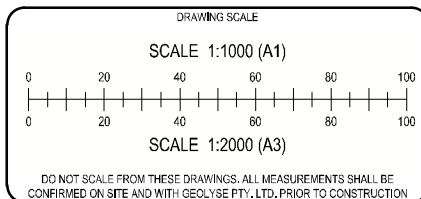
LEVELS SHOWN ARE FINAL FINISHED
TOP OF CAPPING SURFACE LEVELS

LOCATION AND EXTENT OF WORKS IN THIS AREA
SHOWN INDICATIVELY. FINAL LANDFILL SUBJECT
TO DETAILED DESIGN.



REV.	DATE	DFTD.	APPD.	DETAILS
A	27/11/2017	AH	PPO	FOR REVIEW
B	02/05/2018	AP	PPO	AMENDED TO SUIT FINAL LOT B'DY
C	23/07/2018	AP	PPO	AMENDED TO AVOID WOODLAND
D	08/08/2018	AP	PPO	TOP GRADE INCREASED AND BATTERS FLATTENED
E	10/08/2018	AP	PPO	STAGE 4A1 AND ACCESS RAMP ADDED
F	13/08/2018	AP	PPO	FILLING STAGE 4E ADDED
G	12/12/2018	AH	PPO	LEACHATE DRAINAGE SYSTEM AND DETAILS ADDED

	FILE	INITIALS	DATE
SURVEY	213141 SURVEY MARCH 2018.MJO	GW	13/03/18
DESIGN	213141_02F_TIP_EXTENSION.project	PPO	13/08/18
DRAINS/ HEC-RAS MODELLING	-	-	-
ENGINEERING/ SURVEYING APPROVAL	-	-	-



APPROVAL AUTHORITY	FORBES SHIRE COUNCIL
CLIENT	FORBES SHIRE COUNCIL
PROJECT	DAROOBALGIE LANDFILL EXTENSION

 **GEOLYSE**

ORANGE

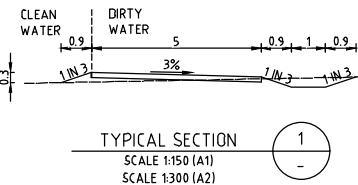
154 PEISLEY STREET
P.O. BOX 1993
ORANGE, NSW 2800
Ph: (02) 9393 5000
Fx: (02) 9393 5050

orange@geolyse.com
www.geolyse.com

DRAWING			
EXISTING SITE FINISHED SURFACE			
PROJECT NUMBER 213141	DRAWING FILE 213141_07G_C001-C015.dwg	ORIGINAL	A1
SURVEY MARK	R.L.	DATUM A.H.D.	SET
IMAGE SOURCE			07
STATUS FOR REVIEW	SHEET C003	OF C015	

NOTES:

- THIS PLAN IS PREPARED FROM A FIELD SURVEY FOR THE PURPOSE OF DESIGNING NEW CONSTRUCTIONS ON THE LAND AND SHOULD NOT BE USED FOR ANY OTHER PURPOSE.
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- NATURAL CONTOUR INTERVAL 0.5m.
DESIGN CONTOUR INTERVAL 0.5m
- DATUM IS ASSUMED
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CONCEPT DESIGN
NOT FOR CONSTRUCTION

STAGE VOLUMES

STAGE	EXCAVATION VOLUME (cu.m.)	VOID VOLUME (cu.m.)	CAPPING VOLUME (cu.m.)	YEARS TAKEN TO FILL (yrs)
STAGE 3 FINAL CAPPING				57,000
4A1	54,000	60,000	5,000	3
4A2	48,000	128,000	10,000	7
4B	65,000	224,000	18,000	12
4C	64,000	296,000	24,000	16
4D		170,000	14,000	9
4E		104,000	8,000	5
STAGE 4 FINAL CAPPING				95,000
TOTAL	231,000	982,000	231,000	52

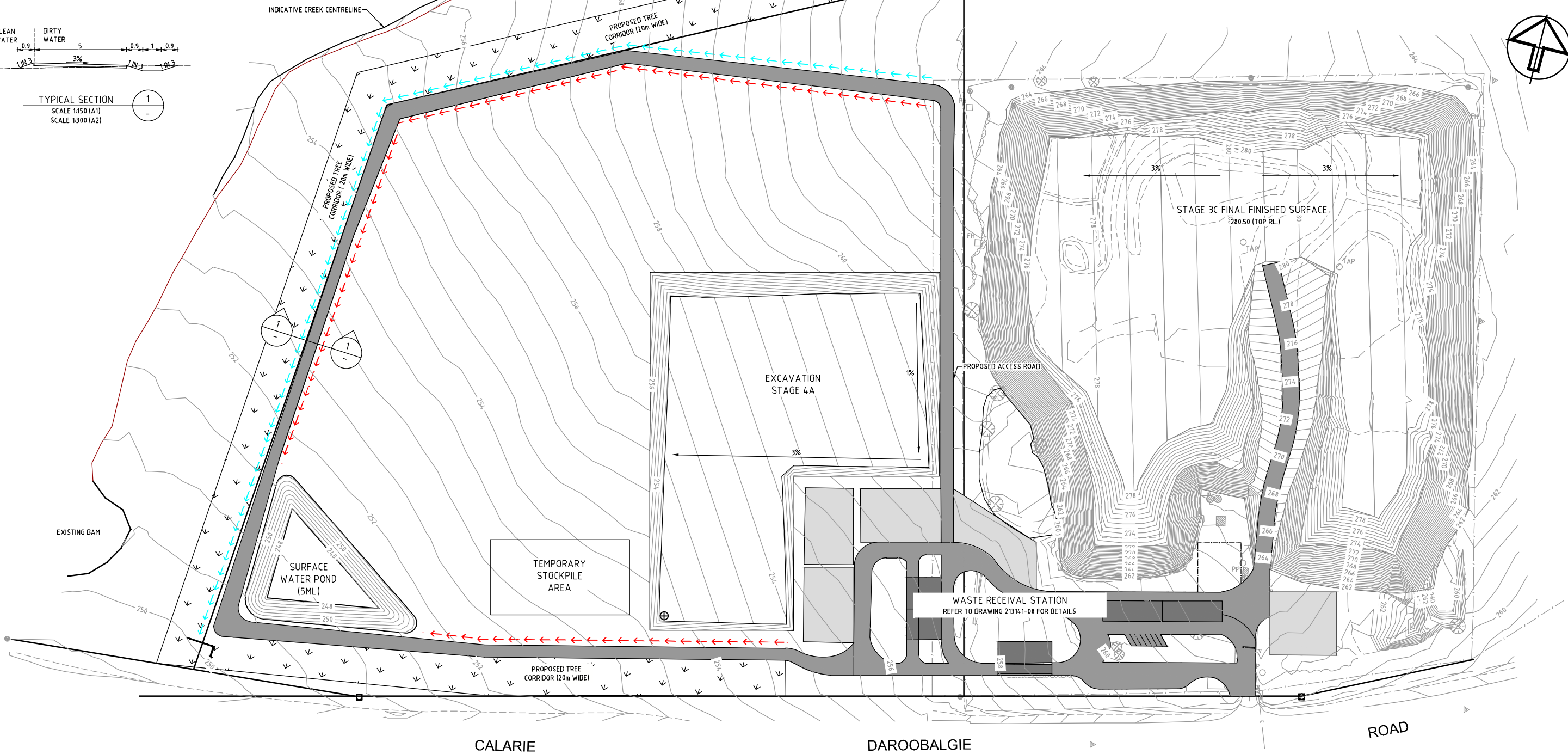
NOTE:

- VOLUMES STATED ARE BASED ON FINAL FINISHED DESIGN SURFACE FOR EXISTING LANDFILL SITE AS SHOWN ON SHEET C003.
- YEARS TAKEN TO FILL BASED ON AN AVERAGE YEARLY VOLUME OF 19,000m³
- ALL VOLUMES ARE IN-SITU QUANTITIES AND DO NOT MAKE ALLOWANCES FOR ANY BULKING OR COMPACTION FACTORS
- NO ALLOWANCE HAS BEEN MADE FOR STRIPPING OF EXISTING TOPSOIL / UNSUITABLE MATERIAL.

LOCATION AND EXTENT OF WORKS IN THIS AREA SHOWN INDICATIVELY. FINAL LANDFILL SUBJECT TO DETAILED DESIGN.

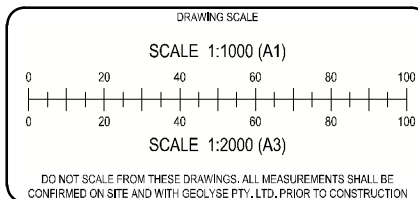
LEGEND:

— 290 —	CONTOUR (0.5m INTERVAL)	—	EXISTING TOP OF BANK
---	EXISTING APPROXIMATE ASBESTOS AREA	~	EXISTING OUTLINE OF VEGETATION
- - -	EXISTING BOTTOM OF BANK	⊕	EXISTING BORE HOLE
---	EXISTING BOUNDARY	⊕	EXISTING GATE
---	EXISTING EDGE OF BITUMEN	FH	EXISTING HYDRANT
---	EXISTING EXISTING ACCESS TRACK CENTRELINE	PP	EXISTING POWER POLE
---	EXISTING FENCE LINE	TAP	EXISTING SIGN POST
---	EXISTING OVERHEAD POWERLINE	WHR	EXISTING TAP
---	EXISTING STOCK PILES		EXISTING WATER METER
---	DIVERSION DRAIN CLEAN		PROPOSED TREE CORRIDOR
---	DIVERSION DRAIN DIRTY		PROPOSED BUILDINGS
---	LEVEL SPREADER		PROPOSED ROADS
⊕	LEACHATE EXTRACTION POINT		PROPOSED STOCKPILE AREAS



REV.	DATE	DFTD.	APPD.	DETAILS
A	27/11/2017	AH	PPO	FOR REVIEW
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F	13/08/2018	AP	PPO	FILLING STAGE 4E ADDED
G	12/12/2018	AH	PPO	LEACHATE DRAINAGE SYSTEM AND DETAILS ADDED

FILE	INITIALS	DATE
SURVEY	213141 SURVEY MARCH 2018.MJO	GW/ 13/03/18
DESIGN	213141_02F_TIP_EXTENSION.project	PPO 13/08/18
DRAINS/ HEC-RAS MODELLING		
ENGINEERING/ SURVEYING APPROVAL		



APPROVAL AUTHORITY	FORBES SHIRE COUNCIL
CLIENT	FORBES SHIRE COUNCIL
PROJECT	DAROOBALGIE LANDFILL EXTENSION

GEOLYSE

ORANGE

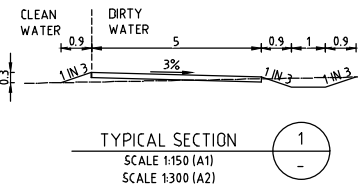
154 PEISLEY STREET
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ORANGE, NSW 2800
Ph. (02) 9393 5000
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orange@geolyse.com
www.geolyse.com

DRAWING		EXCAVATION STAGE 4A1	
PROJECT NUMBER 213141	DRAWING FILE 213141_07G_C001-C015.dwg	ORIGINAL	A1
SURVEY MARK	R.L.	DATUM A.H.D.	SET
IMAGE SOURCE			07
STATUS FOR REVIEW	SHEET C004 OF C015		

NOTES:

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DESIGN CONTOUR INTERVAL 0.5m
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CONCEPT DESIGN
NOT FOR CONSTRUCTION

STAGE VOLUMES

STAGE	EXCAVATION VOLUME (cu.m.)	VOID VOLUME (cu.m.)	CAPPING VOLUME (cu.m.)	YEARS TAKEN TO FILL (yrs)
STAGE 3 FINAL CAPPING			57,000	
4A1	54,000	60,000	5,000	3
4A2	48,000	128,000	10,000	7
4B	65,000	224,000	18,000	12
4C	64,000	296,000	24,000	16
4D		170,000	14,000	9
4E		104,000	8,000	5
STAGE 4 FINAL CAPPING			95,000	
TOTAL	231,000	982,000	231,000	52

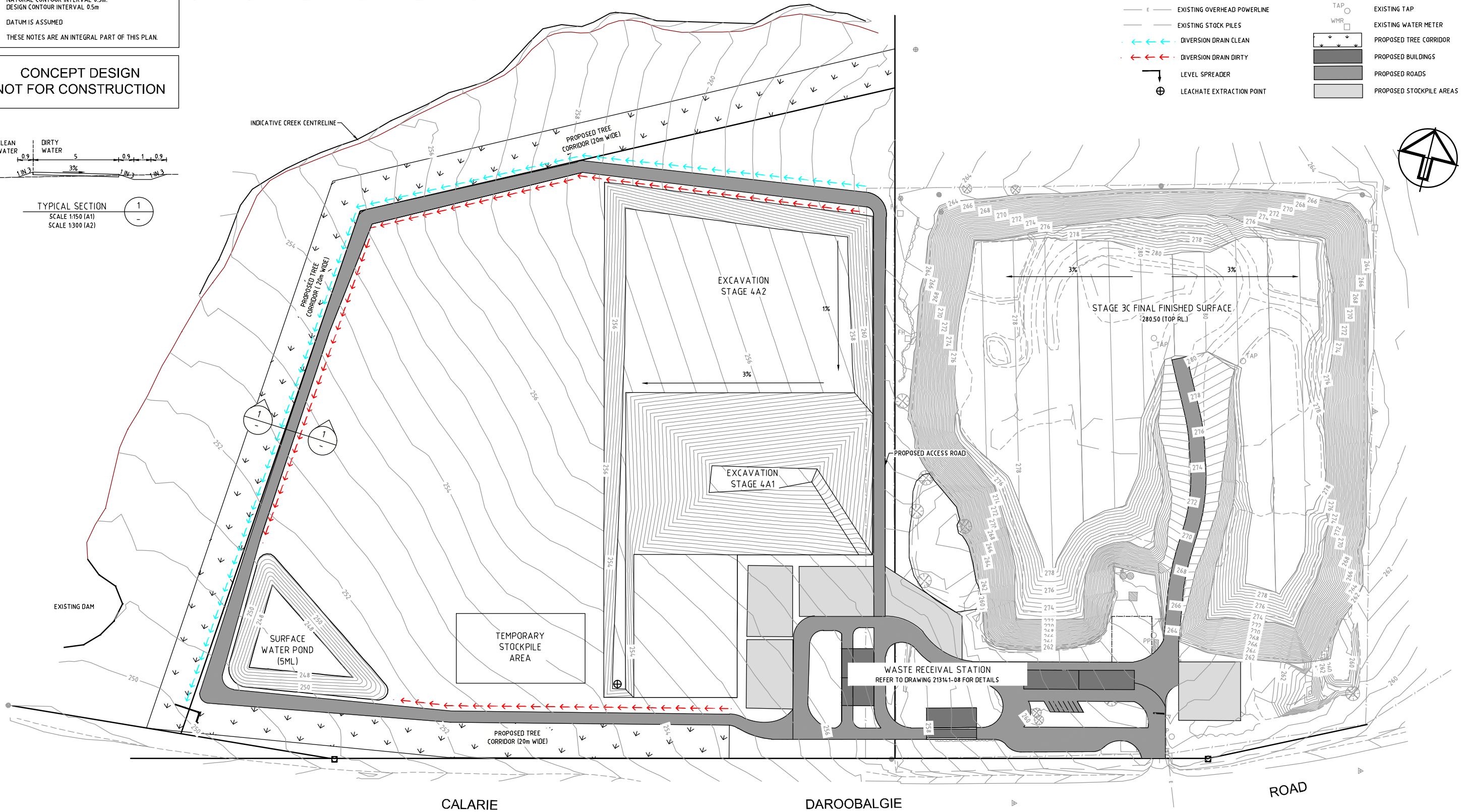
NOTE:

- VOLUMES STATED ARE BASED ON FINAL FINISHED DESIGN SURFACE FOR EXISTING LANDFILL SITE AS SHOWN ON SHEET C003.
- YEARS TAKEN TO FILL BASED ON AN AVERAGE YEARLY VOLUME OF 19,000m³
- ALL VOLUMES ARE IN-SITU QUANTITIES AND DO NOT MAKE ALLOWANCES FOR ANY BULKING OR COMPACTION FACTORS
- NO ALLOWANCE HAS BEEN MADE FOR STRIPPING OF EXISTING TOPSOIL / UNSUITABLE MATERIAL.

LOCATION AND EXTENT OF WORKS IN THIS AREA SHOWN INDICATIVELY. FINAL LANDFILL SUBJECT TO DETAILED DESIGN.

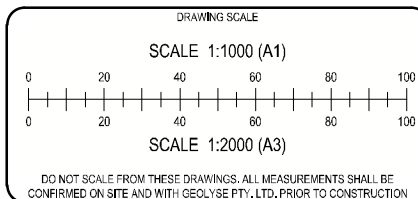
LEGEND:

— 290 —	CONTOUR (0.5m INTERVAL)	—	EXISTING TOP OF BANK
- - - - -	EXISTING APPROXIMATE ASBESTOS AREA	~ ~ ~ ~ ~	EXISTING OUTLINE OF VEGETATION
- - - - -	EXISTING BOTTOM OF BANK	⊕	EXISTING BORE HOLE
—	EXISTING BOUNDARY	⊕	EXISTING GATE
—	EXISTING EDGE OF BITUMEN	FH	EXISTING HYDRANT
- - - - -	EXISTING EXISTING ACCESS TRACK CENTRELINE	PP	EXISTING POWER POLE
- - - - -	EXISTING FENCE LINE	⊕	EXISTING SIGN POST
—	EXISTING OVERHEAD POWERLINE	TAP	EXISTING TAP
—	EXISTING STOCK PILES	WHR	EXISTING WATER METER
← — — — — →	DIVERSION DRAIN CLEAN	→ — — — — ←	PROPOSED TREE CORRIDOR
← — — — — →	DIVERSION DRAIN DIRTY	■	PROPOSED BUILDINGS
⊕	LEVEL SPREADER	■	PROPOSED ROADS
⊕	LEACHATE EXTRACTION POINT	■	PROPOSED STOCKPILE AREAS



REV.	DATE	DFTD.	APPD.	DETAILS
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F	13/08/2018	AP	PPO	FILLING STAGE 4E ADDED
G	12/12/2018	AH	PPO	LEACHATE DRAINAGE SYSTEM AND DETAILS ADDED

FILE	INITIALS	DATE
SURVEY	213141 SURVEY MARCH 2018.MJO	GW/ 13/03/18
DESIGN	213141_02F_TIP_EXTENSION.project	PPO 13/08/18
DRAINS/ HEC-RAS MODELLING		
ENGINEERING/ SURVEYING APPROVAL		



APPROVAL AUTHORITY	FORBES SHIRE COUNCIL
CLIENT	FORBES SHIRE COUNCIL
PROJECT	DAROOBALGIE LANDFILL EXTENSION

GEOLYSE

ORANGE

154 PEISLEY STREET
P.O. BOX 1983
ORANGE, NSW 2800
Ph. (02) 9393 5000
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orange@geolyse.com
www.geolyse.com

DRAWING	EXCAVATION STAGE 4A2 & FILLING STAGE 4A1	ORIGINAL
PROJECT NUMBER	213141	A1
SURVEY MARK	R.L.	DATUM A.H.D.
IMAGE SOURCE		SET
STATUS FOR REVIEW	SHEET C005 OF C015	07

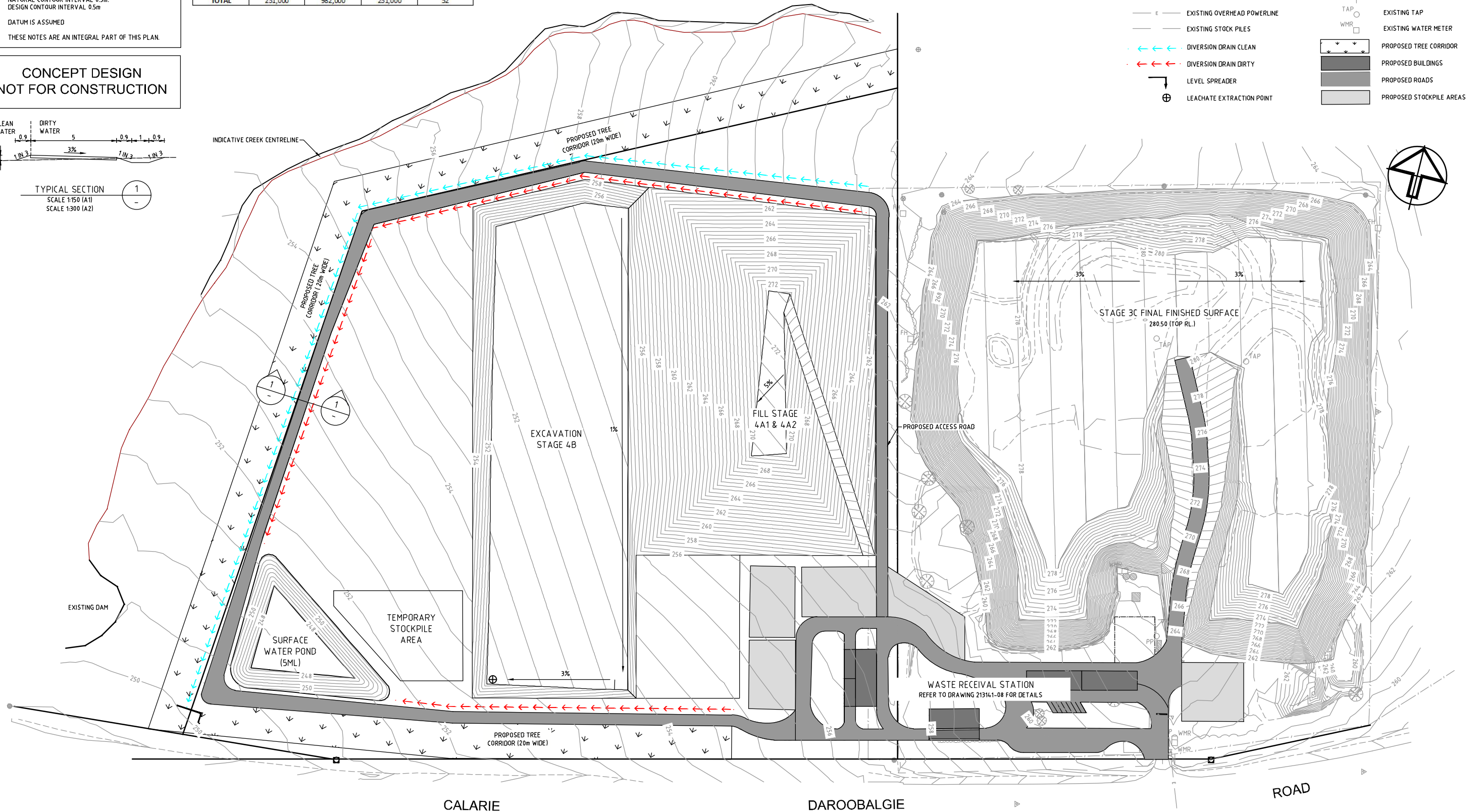
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DESIGN CONTOUR INTERVAL 0.5m
4. DATUM IS ASSUMED
5. THESE NOTES ARE AN INTEGRAL PART OF THIS PLAN.

The diagram illustrates a typical cross-section of a sewer line. It is divided into two main sections: 'CLEAN WATER' on the left and 'DIRTY WATER' on the right. The 'CLEAN WATER' section has a slope of 1 IN 3. The 'DIRTY WATER' section has a slope of 3%. The diagram shows the sewer line entering a manhole from the left, passing through a series of manholes, and exiting to the right. The manholes are shown as circular structures with a diameter of 1 IN 3. The sewer line is shown as a horizontal line with a slight downward slope. The diagram is labeled 'TYPICAL SECTION' and includes a scale of 1:150 (A1) and 1:300 (A2). A circular symbol with the number '1' and a minus sign is also present.

STAGE VOLUMES				
STAGE	EXCAVATION VOLUME (cu.m.)	VOID VOLUME (cu.m.)	CAPPING VOLUME (cu.m.)	YEARS TAKEN TO FILL (yrs)
STAGE 3 FINAL CAPPING			57,000	
4A1	54,000	60,000	5,000	3
4A2	48,000	128,000	10,000	7
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4E		104,000	8,000	5
STAGE 4 FINAL CAPPING			95,000	
TOTAL	231,000	982,000	231,000	52

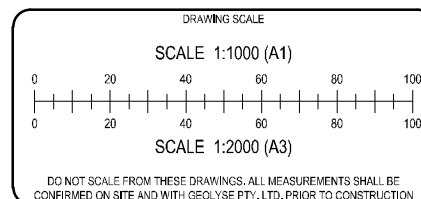
1. VOLUMES STATED ARE BASED ON FINAL FINISHED DESIGN SURFACE FOR EXISTING LANDFILL SITE AS SHOWN ON SHEET C003.
2. YEARS TAKEN TO FILL BASED ON AN AVERAGE YEARLY VOLUME OF 19,000m³
3. ALL VOLUMES ARE IN-SITU QUANTITIES AND DO NOT MAKE ALLOWANCES FOR ANY BULKING OR COMPACTION FACTORS
4. NO ALLOWANCE HAS BEEN MADE FOR STRIPPING OF EXISTING TOPSOIL / UNSUITABLE MATERIAL.

	CONTOUR (0.5m INTERVAL)		EXISTING TOP OF BANK
	EXISTING APPROXIMATE ASBESTOS AREA		EXISTING OUTLINE OF VEGETATION
	EXISTING BOTTOM OF BANK		EXISTING BORE HOLE
	EXISTING BOUNDARY		EXISTING GATE
	EXISTING EDGE OF BITUMEN		EXISTING HYDRANT
	EXISTING EXISTING ACCESS TRACK CENTRELIN		EXISTING POWER POLE
	EXISTING FENCE LINE		EXISTING SIGN POST
	EXISTING OVERHEAD POWERLINE		EXISTING TAP
	EXISTING STOCK PILES		EXISTING WATER METER
	DIVERSION DRAIN CLEAN		PROPOSED TREE CORRIDOR
	DIVERSION DRAIN DIRTY		PROPOSED BUILDINGS
	LEVEL SPREADER		PROPOSED ROADS
	LEACHATE EXTRACTION POINT		PROPOSED STOCKPILE AREAS



REV.	DATE	DFID.	APPD.	DETAILS
A	27/11/2017	AH	PPC	FOR REVIEW
B	02/05/2018	AP	PPC	AMENDED TO SUIT FINAL LOT B'DY
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F	13/08/2018	AP	PPC	FILLING STAGE 4E ADDED
G	12/12/2018	AH	PPC	LEACHATE DRAINAGE SYSTEM AND DETAILS ADDED

	FILE	INITIALS	DATE
SURVEY	213141 SURVEY MARCH 2016.MJO	GW	13/03/18
DESIGN	213141_02F_TIP_EXTENSION.project	PPO	13/08/18
DRAINS/ HEC-RAS MODELLING	-	-	-
ENGINEERING/ SURVEYING APPROVAL		-	-



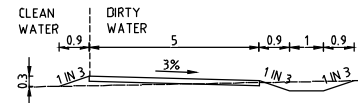
APPROVAL AUTHORITY	FORBES SHIRE COUNCIL
CLIENT	FORBES SHIRE COUNCIL
PROJECT	DAROOBALGIE LANDFILL EXTENSION



DRAWING				EXCAVATION STAGE 4B & FILLING STAGE 4A2			
PROJECT NUMBER 213141		DRAWING FILE 213141_07G_C001-C015.dwg			ORIGINAL		
SURVEY MARK -		R.L. -		DATUM A.H.D.		A1	
IMAGE SOURCE						SET	
STATUS FOR REVIEW		SHEET C006		OF C015		07	

NOTES:

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DESIGN CONTOUR INTERVAL 0.5m
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CONCEPT DESIGN
NOT FOR CONSTRUCTIONTYPICAL SECTION
SCALE 1:150 (A1)
SCALE 1:300 (A2)

STAGE VOLUMES

STAGE	EXCAVATION VOLUME (cu.m.)	VOID VOLUME (cu.m.)	CAPPING VOLUME (cu.m.)	YEARS TAKEN TO FILL (yrs)
STAGE 3 FINAL CAPPING			57,000	
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4C	64,000	296,000	24,000	16
4D		170,000	14,000	9
4E		104,000	8,000	5
STAGE 4 FINAL CAPPING			95,000	
TOTAL	231,000	982,000	231,000	52

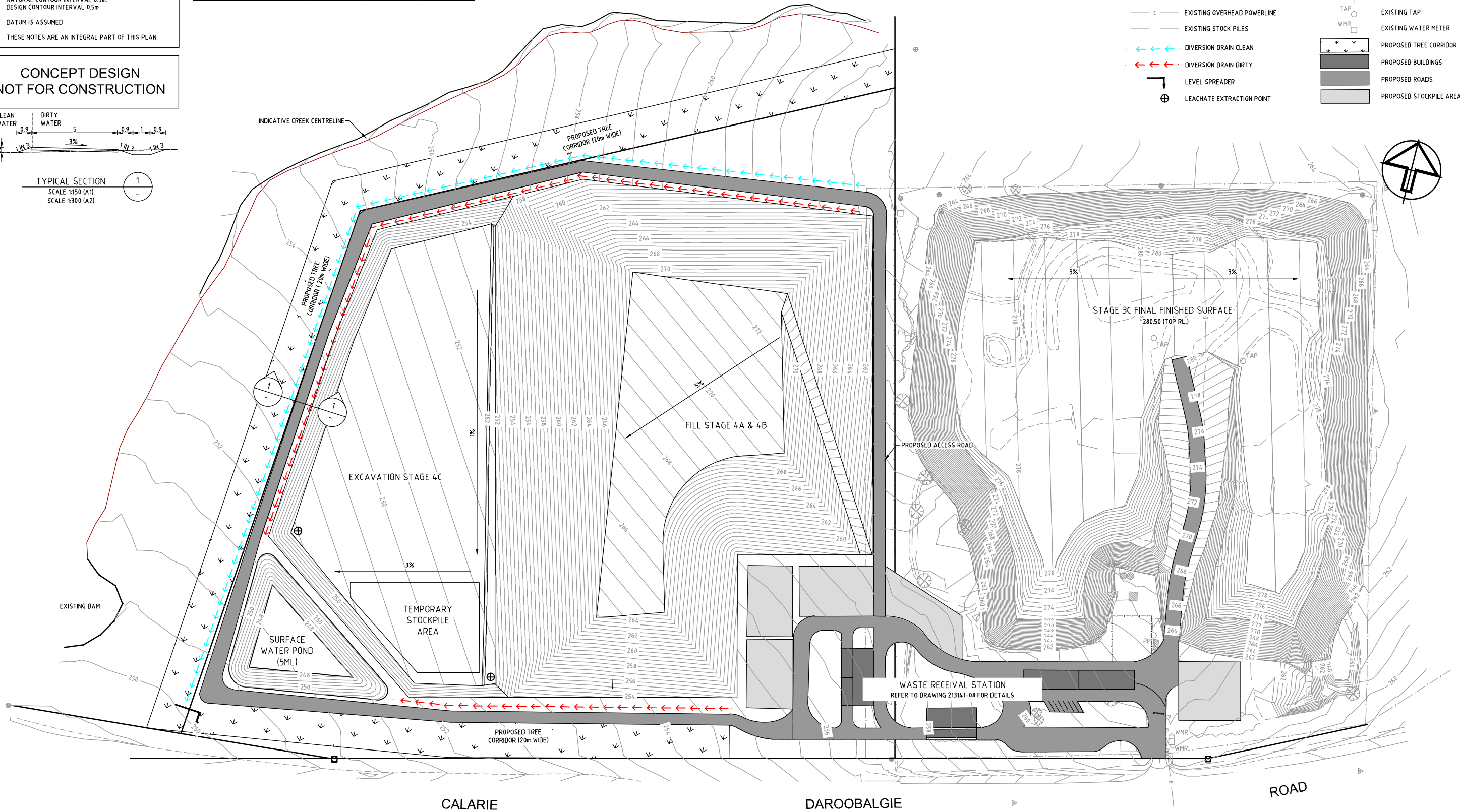
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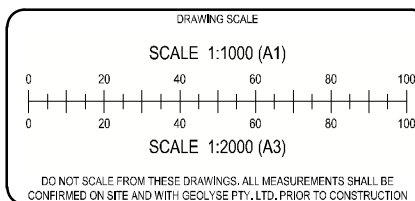
LEGEND:

— 290 —	CONTOUR (0.5m INTERVAL)	— — — — —	EXISTING TOP OF BANK
- - - - -	EXISTING APPROXIMATE ASBESTOS AREA	~ ~ ~ ~ ~	EXISTING OUTLINE OF VEGETATION
- - - - -	EXISTING BOTTOM OF BANK	⊕	EXISTING BORE HOLE
— — — — —	EXISTING BOUNDARY	⌵	EXISTING GATE
— — — — —	EXISTING EDGE OF BITUMEN	FH	EXISTING HYDRANT
- - - - -	EXISTING EXISTING ACCESS TRACK CENTRELINE	PP	EXISTING POWER POLE
- - - - -	EXISTING FENCE LINE	⌵	EXISTING SIGN POST
— — — — —	EXISTING OVERHEAD POWERLINE	TAP	EXISTING TAP
— — — — —	EXISTING STOCK PILES	WMR	EXISTING WATER METER
— — — — —	DIVERSION DRAIN CLEAN	⌵	PROPOSED TREE CORRIDOR
— — — — —	DIVERSION DRAIN DIRTY	⌵	PROPOSED BUILDINGS
— — — — —	LEVEL SPREADER	⌵	PROPOSED ROADS
⊕	LEACHATE EXTRACTION POINT	⌵	PROPOSED STOCKPILE AREAS



REV.	DATE	DFTD.	APPD.	DETAILS
A	27/11/2017	AH	PPO	FOR REVIEW
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	FILE	INITIALS	DATE
SURVEY	213141 SURVEY MARCH 2018.MJO	GW	13/03/18
DESIGN	213141_02F_TIP_EXTENSION.project	PPO	13/08/18
DRAINS/ HEC-RAS MODELLING	-	-	-
ENGINEERING/ SURVEYING APPROVAL		-	-



APPROVAL AUTHORITY	FORBES SHIRE COUNCIL
CLIENT	FORBES SHIRE COUNCIL
PROJECT	DAROOBALGIE LANDFILL EXTENSION

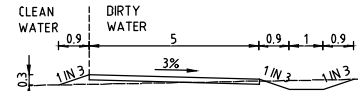
GEOLYSE
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P.O. BOX 1983
ORANGE, NSW 2800
Ph: (02) 9393 5000
Fx: (02) 9393 5050
orange@geolyse.com
www.geolyse.com

DRAWING		EXCAVATION STAGE 4C & FILLING STAGE 4B			
PROJECT NUMBER 213141		DRAWING FILE 213141_07G_C001-C015.dwg			ORIGINAL
SURVEY MARK -		R.L. -		DATUM A.H.D.	
IMAGE SOURCE					SET
STATUS FOR REVIEW		SHEET C007		OF C015	07

NOTES:

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- NATURAL CONTOUR INTERVAL 0.5m.
DESIGN CONTOUR INTERVAL 0.5m
- DATUM IS ASSUMED
- THESE NOTES ARE AN INTEGRAL PART OF THIS PLAN.

CONCEPT DESIGN
NOT FOR CONSTRUCTION



TYPICAL SECTION
SCALE 1:150 (A1)
SCALE 1:300 (A2)

STAGE VOLUMES

STAGE	EXCAVATION VOLUME (cu.m.)	VOID VOLUME (cu.m.)	CAPPING VOLUME (cu.m.)	YEARS TAKEN TO FILL (yrs)
STAGE 3 FINAL CAPPING				57,000
4A1	54,000	60,000	5,000	3
4A2	48,000	128,000	10,000	7
4B	65,000	224,000	18,000	12
4C	64,000	296,000	24,000	16
4D		170,000	14,000	9
4E		104,000	8,000	5
STAGE 4 FINAL CAPPING				95,000
TOTAL	231,000	982,000	231,000	52

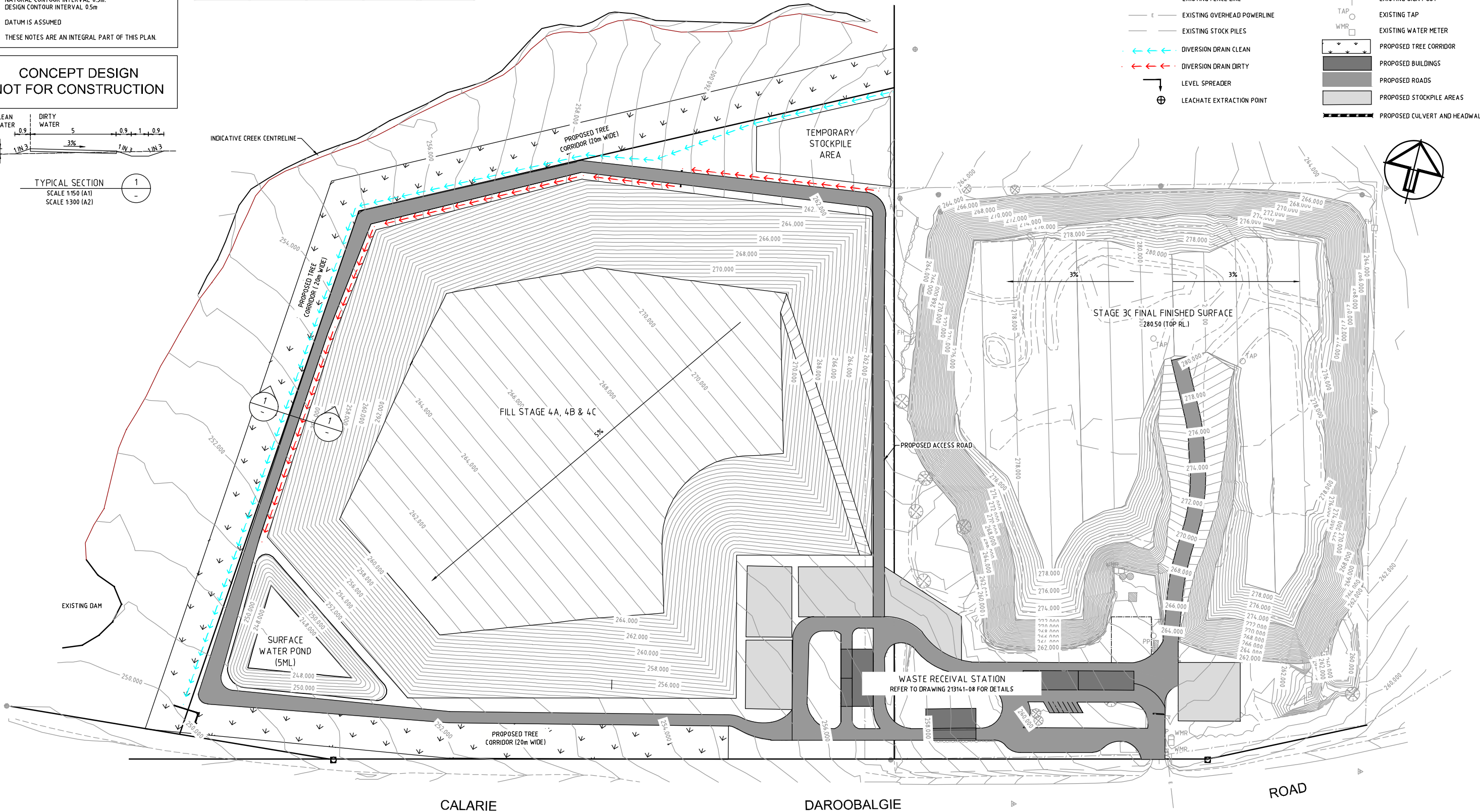
NOTE:

- VOLUMES STATED ARE BASED ON FINAL FINISHED DESIGN SURFACE FOR EXISTING LANDFILL SITE AS SHOWN ON SHEET C003.
- YEARS TAKEN TO FILL BASED ON AN AVERAGE YEARLY VOLUME OF 19,000m³.
- ALL VOLUMES ARE IN-SITU QUANTITIES AND DO NOT MAKE ALLOWANCES FOR ANY BULKING OR COMPACTION FACTORS
- NO ALLOWANCE HAS BEEN MADE FOR STRIPPING OF EXISTING TOPSOIL / UNSUITABLE MATERIAL.

LOCATION AND EXTENT OF WORKS IN THIS AREA SHOWN INDICATIVELY. FINAL LANDFILL SUBJECT TO DETAILED DESIGN.

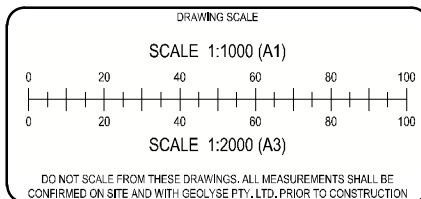
LEGEND:

- 290 — CONTOUR (0.5m INTERVAL)
- - - - - EXISTING APPROXIMATE ASBESTOS AREA
- - - - - EXISTING BOTTOM OF BANK
- — — — — EXISTING BOUNDARY
- — — — — EXISTING EDGE OF BITUMEN
- - - - - EXISTING EXISTING ACCESS TRACK CENTRELINE
- - - - - EXISTING FENCE LINE
- - - - - EXISTING OVERHEAD POWERLINE
- — — — — EXISTING STOCK PILES
- ← — — — — DIVERSION DRAIN CLEAN
- ← — — — — DIVERSION DRAIN DIRTY
- ⊥ — — — — LEVEL SPREADER
- ⊕ — — — — LEACHATE EXTRACTION POINT
- — — — — EXISTING TOP OF BANK
- — — — — EXISTING OUTLINE OF VEGETATION
- ⊕ — — — — EXISTING BORE HOLE
- ⊕ — — — — EXISTING GATE
- FH — — — — EXISTING HYDRANT
- PP — — — — EXISTING POWER POLE
- ⊕ — — — — EXISTING SIGN POST
- TAP — — — — EXISTING TAP
- WHR — — — — EXISTING WATER METER
- ⬇ — — — — PROPOSED TREE CORRIDOR
- — — — — PROPOSED BUILDINGS
- — — — — PROPOSED ROADS
- — — — — PROPOSED STOCKPILE AREAS
- — — — — PROPOSED CULVERT AND HEADWALL



REV.	DATE	DFTD.	APPD.	DETAILS
A	27/11/2017	AH	PPO	FOR REVIEW
B	02/05/2018	AP	PPO	AMENDED TO SUIT FINAL LOT B'DY
C	23/07/2018	AP	PPO	AMENDED TO AVOID WOODLAND
D	08/08/2018	AP	PPO	TOP GRADE INCREASED AND BATTERS FLATTENED
E	10/08/2018	AP	PPO	STAGE 4A1 AND ACCESS RAMP ADDED
F	13/08/2018	AP	PPO	FILLING STAGE 4E ADDED
G	12/12/2018	AH	PPO	LEACHATE DRAINAGE SYSTEM AND DETAILS ADDED

FILE	INITIALS	DATE
SURVEY	213141 SURVEY MARCH 2018.MJO	GW/ 13/03/18
DESIGN	213141_02F_TIP_EXTENSION.project	PPO/ 13/08/18
DRAINS/ HEC-RAS MODELLING		
ENGINEERING/ SURVEYING APPROVAL		



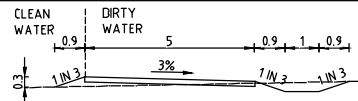
APPROVAL AUTHORITY	FORBES SHIRE COUNCIL
CLIENT	FORBES SHIRE COUNCIL
PROJECT	DAROOBALGIE LANDFILL EXTENSION

GEOLYSE
ORANGE
154 PEISLEY STREET
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ORANGE, NSW 2800
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orange@geolyse.com
www.geolyse.com

DRAWING		FILLING STAGE 4C	
PROJECT NUMBER 213141	DRAWING FILE 213141_07G_C001-C015.dwg	ORIGINAL	
SURVEY MARK	R.L.	DATUM A.H.D.	
IMAGE SOURCE	STATUS FOR REVIEW		SET
SHEET C008	OF C015	07	

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DESIGN CONTOUR INTERVAL 0.5m
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CONCEPT DESIGN
NOT FOR CONSTRUCTIONTYPICAL SECTION
SCALE 1:150 (A1)
SCALE 1:300 (A2)

1

STAGE VOLUMES

STAGE	EXCAVATION VOLUME (cu.m.)	VOID VOLUME (cu.m.)	CAPPING VOLUME (cu.m.)	YEARS TAKEN TO FILL (yrs)
STAGE 3 FINAL CAPPING				
4A1	54,000	60,000	5,000	3
4A2	48,000	128,000	10,000	7
4B	65,000	224,000	18,000	12
4C	64,000	296,000	24,000	16
4D		170,000	14,000	9
4E		104,000	8,000	5
STAGE 4 FINAL CAPPING				
TOTAL	231,000	982,000	231,000	52

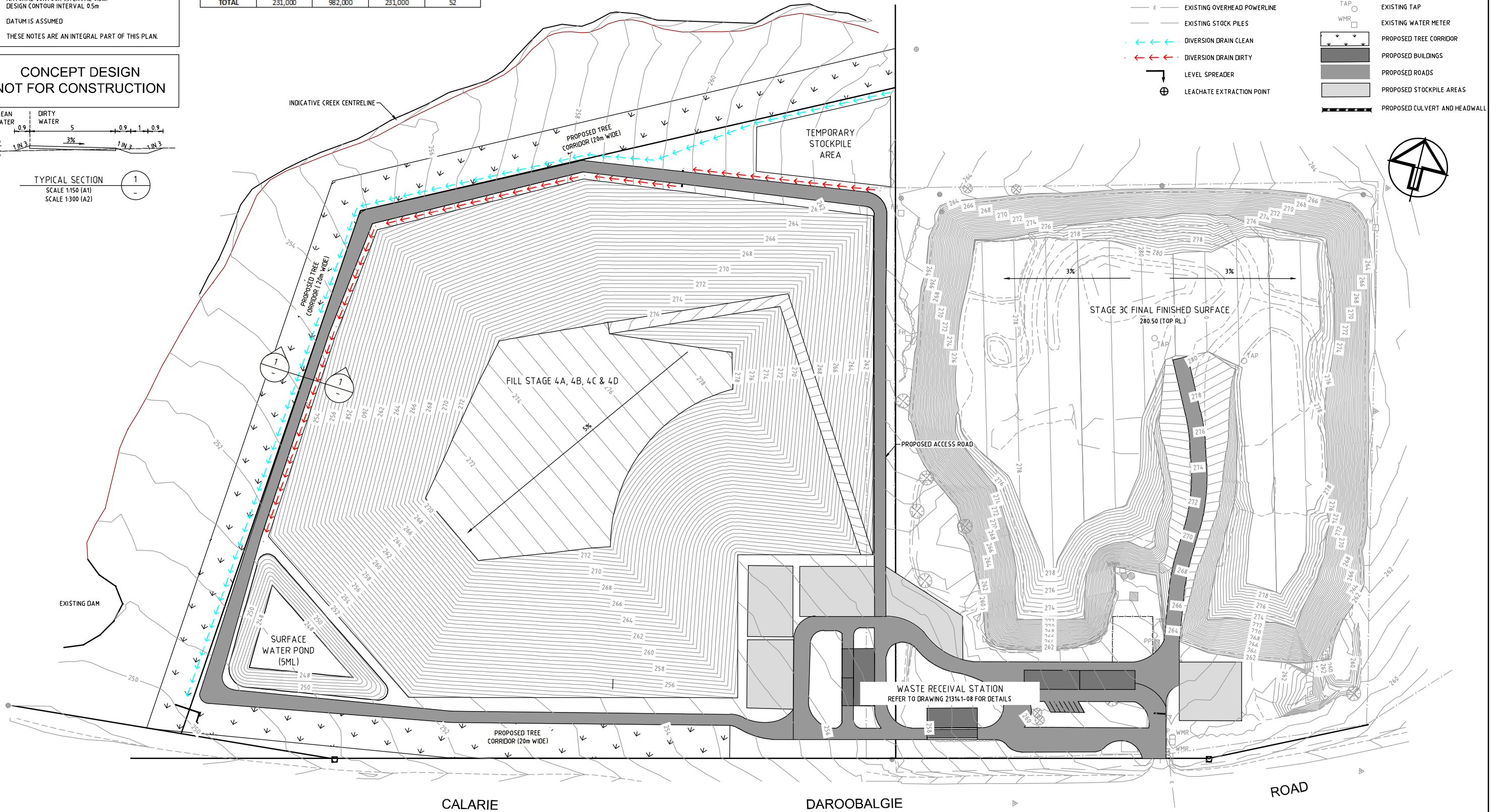
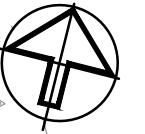
NOTE:

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LOCATION AND EXTENT OF WORKS IN THIS AREA
SHOWN INDICATIVELY. FINAL LANDFILL SUBJECT
TO DETAILED DESIGN.

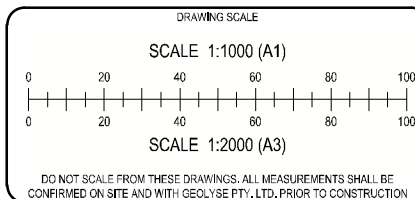
LEGEND:

- 290 CONTOUR (0.5m INTERVAL)
- EXISTING APPROXIMATE ASBESTOS AREA
- EXISTING BOTTOM OF BANK
- EXISTING BOUNDARY
- EXISTING EDGE OF BITUMEN
- EXISTING EXISTING ACCESS TRACK CENTRELINE
- EXISTING FENCE LINE
- E EXISTING OVERHEAD POWERLINE
- EXISTING STOCK PILES
- DIVERSION DRAIN CLEAN
- DIVERSION DRAIN DIRTY
- LEVEL SPREADER
- LEACHATE EXTRACTION POINT
- EXISTING TOP OF BANK
- EXISTING OUTLINE OF VEGETATION
- EXISTING BORE HOLE
- EXISTING GATE
- EXISTING HYDRANT
- EXISTING POWER POLE
- EXISTING SIGN POST
- EXISTING TAP
- EXISTING WATER METER
- PROPOSED TREE CORRIDOR
- PROPOSED BUILDINGS
- PROPOSED ROADS
- PROPOSED STOCKPILE AREAS
- PROPOSED CULVERT AND HEADWALL



REV.	DATE	DFTD.	APPD.	DETAILS
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F	13/08/2018	AP	PPO	FILLING STAGE 4E ADDED
G	12/12/2018	AH	PPO	LEACHATE DRAINAGE SYSTEM AND DETAILS ADDED

FILE	INITIALS	DATE
SURVEY 213141 SURVEY MARCH 2018.MJO	GW	13/03/18
DESIGN 213141_02F_TIP_EXTENSION.project	PPO	13/08/18
DRAINS/ HEC-RAS MODELLING		
ENGINEERING/ SURVEYING APPROVAL		



APPROVAL AUTHORITY	FORBES SHIRE COUNCIL
CLIENT	FORBES SHIRE COUNCIL
PROJECT	DAROOBALGIE LANDFILL EXTENSION

GEOLYSE

ORANGE

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Fx: (02) 9393 5050

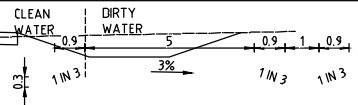
orange@geolyse.com
www.geolyse.com

DRAWING	FILLING STAGE 4D
PROJECT NUMBER 213141	DRAWING FILE 213141_07G_C001-C015.dwg
SURVEY MARK	R.L. DATUM A.H.D.
IMAGE SOURCE	STATUS FOR REVIEW
SHEET C009 OF C015	SET 07

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DESIGN CONTOUR INTERVAL 0.5m
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CONCEPT DESIGN
NOT FOR CONSTRUCTION



TYPICAL SECTION
SCALE 1:150 (A1)
SCALE 1:300 (A2)

STAGE VOLUMES

STAGE	EXCAVATION VOLUME (cu.m.)	VOID VOLUME (cu.m.)	CAPPING VOLUME (cu.m.)	YEARS TAKEN TO FILL (yrs)
STAGE 3 FINAL CAPPING				
4A1	54,000	60,000	5,000	3
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4B	65,000	224,000	18,000	12
4C	64,000	296,000	24,000	16
4D		170,000	14,000	9
4E		104,000	8,000	5
STAGE 4 FINAL CAPPING				
TOTAL	231,000	982,000	231,000	52

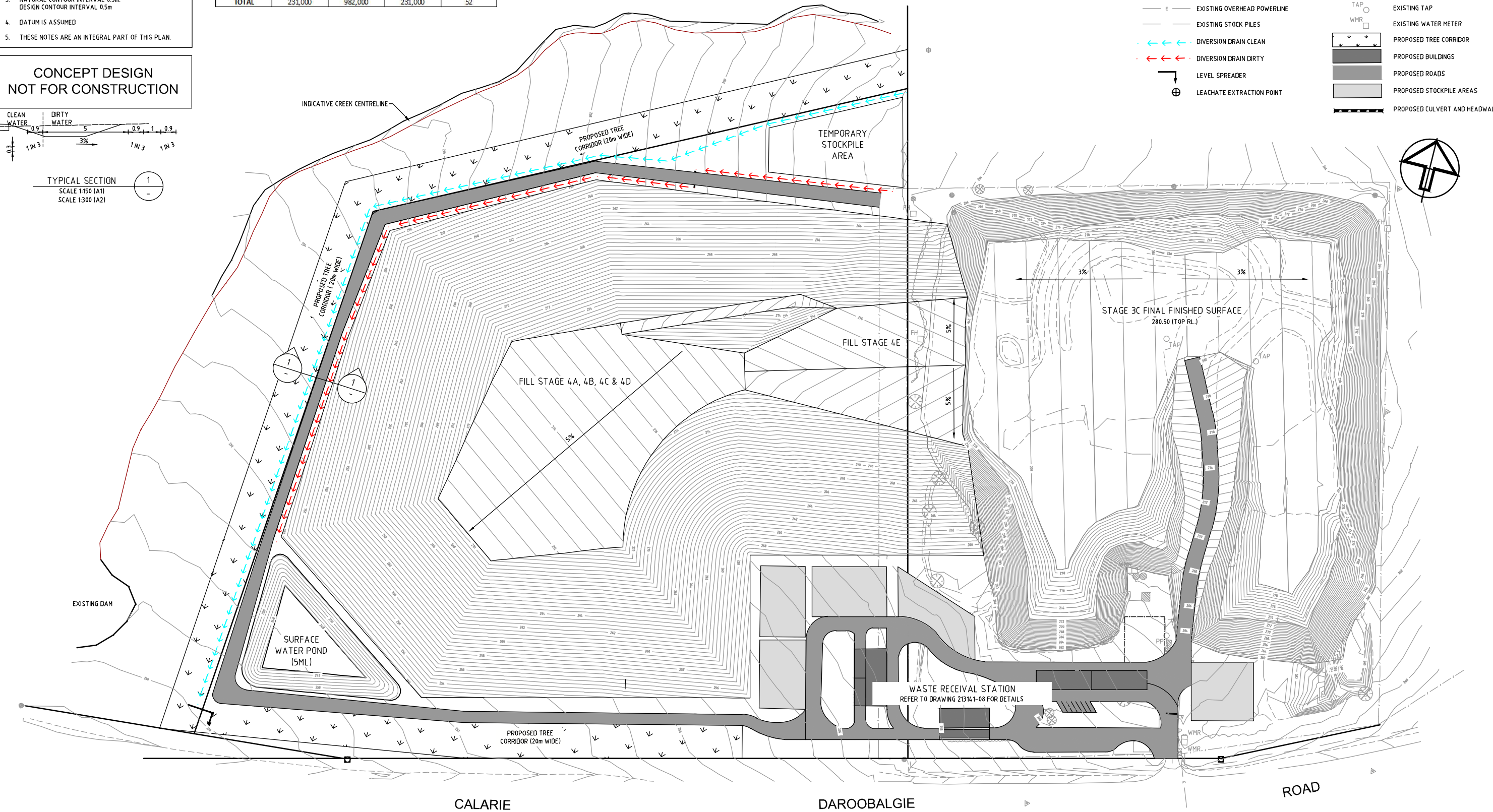
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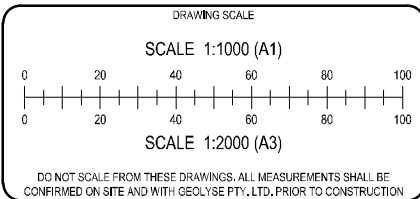
LEGEND:

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- EXISTING APPROXIMATE ASBESTOS AREA
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- EXISTING EDGE OF BITUMEN
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FILE	INITIALS	DATE
SURVEY	213141 SURVEY MARCH 2018.MJO	GW/ 13/03/18
DESIGN	213141_02F_TIP_EXTENSION.project	PPO 13/08/18
DRAINS/ HEC-RAS MODELLING		
ENGINEERING/ SURVEYING APPROVAL		



APPROVAL AUTHORITY	FORBES SHIRE COUNCIL
CLIENT	FORBES SHIRE COUNCIL
PROJECT	DAROOBALGIE LANDFILL EXTENSION

GEOLYSE
ORANGE
154 PEISLEY STREET
P.O. BOX 1983
ORANGE, NSW 2800
Ph: (02) 9393 5000
Fx: (02) 9393 5050
orange@geolyse.com
www.geolyse.com

DRAWING		FILLING STAGE 4E	
PROJECT NUMBER 213141	DRAWING FILE 213141_07G_C001-C015.dwg	ORIGINAL	A1
SURVEY MARK	R.L.	DATUM	A.H.D.
IMAGE SOURCE		SET	07
STATUS FOR REVIEW	SHEET C010 OF C015		

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DESIGN CONTOUR INTERVAL 0.5m
- DATUM IS ASSUMED
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CONCEPT DESIGN
NOT FOR CONSTRUCTION

STAGE VOLUMES

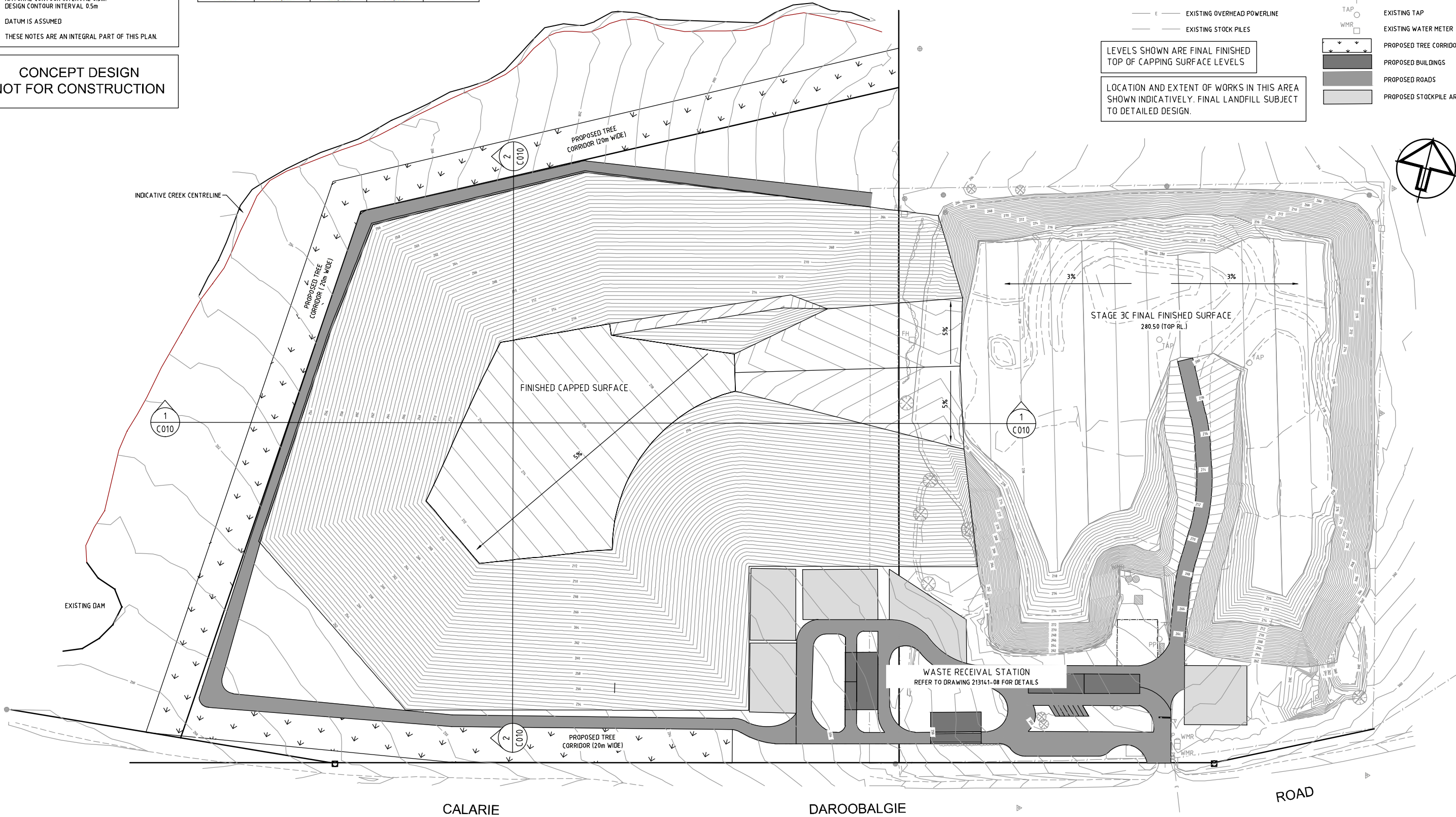
STAGE	EXCAVATION VOLUME (cu.m.)	VOID VOLUME (cu.m.)	CAPPING VOLUME (cu.m.)	YEARS TAKEN TO FILL (yrs)
STAGE 3 FINAL CAPPING				
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4C	64,000	296,000	24,000	16
4D		170,000	14,000	9
4E		104,000	8,000	5
STAGE 4 FINAL CAPPING				
TOTAL	231,000	982,000	231,000	52

NOTE:

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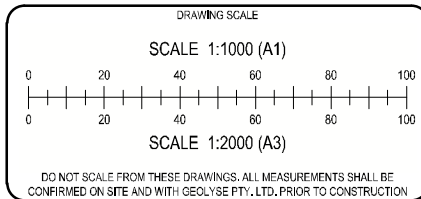
LEGEND:

— 290 —	CONTOUR (0.5m INTERVAL)	— — —	EXISTING TOP OF BANK
— — —	EXISTING APPROXIMATE ASBESTOS AREA	— — —	EXISTING OUTLINE OF VEGETATION
— — —	EXISTING BOTTOM OF BANK	⊕	EXISTING BORE HOLE
— — —	EXISTING BOUNDARY	⋈	EXISTING GATE
— — —	EXISTING EDGE OF BITUMEN	FH □	EXISTING HYDRANT
— — —	EXISTING EXISTING ACCESS TRACK CENTRELINE	PP ○	EXISTING POWER POLE
— / — / —	EXISTING FENCE LINE	△	EXISTING SIGN POST
— e —	EXISTING OVERHEAD POWERLINE	TAP ○	EXISTING TAP
— — —	EXISTING STOCK PILES	WHR □	EXISTING WATER METER
LEVELS SHOWN ARE FINAL FINISHED TOP OF CAPPING SURFACE LEVELS		— — —	PROPOSED TREE CORRIDOR
LOCATION AND EXTENT OF WORKS IN THIS AREA SHOWN INDICATIVELY. FINAL LANDFILL SUBJECT TO DETAILED DESIGN.		■	PROPOSED BUILDINGS
		■	PROPOSED ROADS
		■	PROPOSED STOCKPILE AREAS



REV.	DATE	DFTD.	APPD.	DETAILS
A	27/11/2017	AH	PPO	FOR REVIEW
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FILE	INITIALS	DATE
SURVEY	213141 SURVEY MARCH 2018.MJO	GW/ 13/03/18
DESIGN	213141_02F_TIP_EXTENSION.project	PPO 13/08/18
DRAINS/ HEC-RAS MODELLING		
ENGINEERING/ SURVEYING APPROVAL		



APPROVAL AUTHORITY	FORBES SHIRE COUNCIL
CLIENT	FORBES SHIRE COUNCIL
PROJECT	DARROOBALGIE LANDFILL EXTENSION

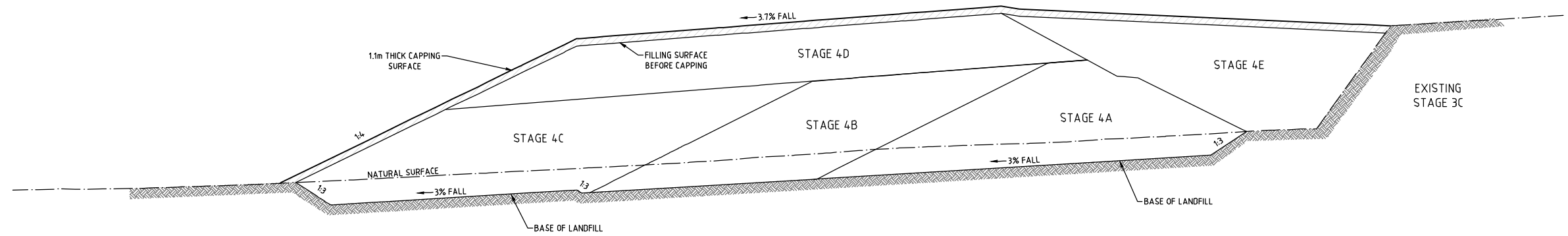
GEOLYSE

ORANGE

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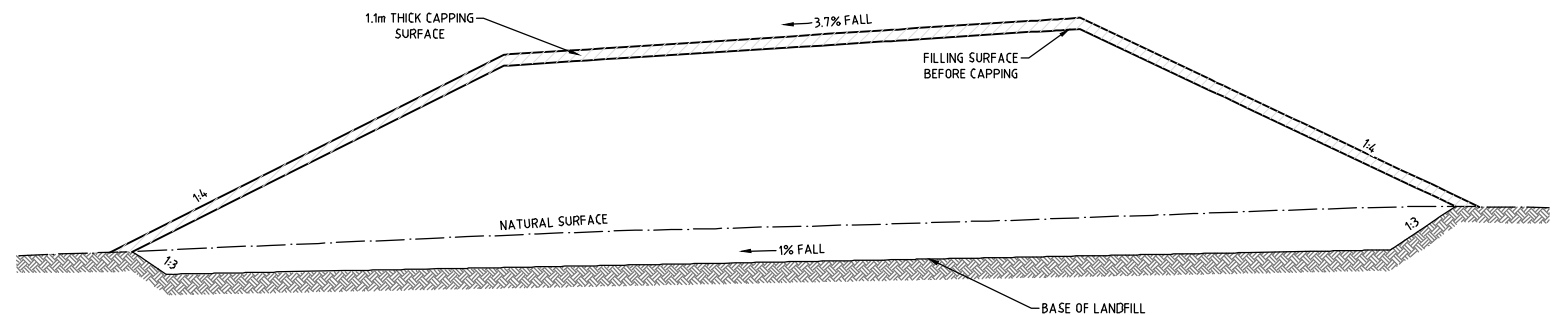
orange@geolyse.com
www.geolyse.com

DRAWING			
OVERALL FINISHED SURFACE			
PROJECT NUMBER 213141	DRAWING FILE 213141_07_G_C001-C015.dwg	ORIGINAL	A1
SURVEY MARK	R.L.	DATUM A.H.D.	SET
IMAGE SOURCE			07
STATUS FOR REVIEW	SHEET C011 OF C015		



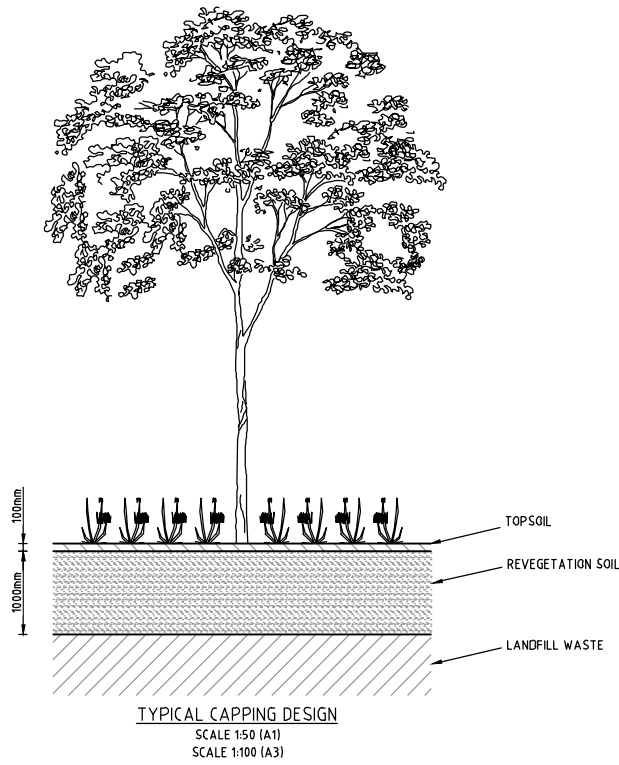
FINISHED SURFACE LONG SECTION
HORIZONTAL SCALE 1:750 (A1) 1:1500 (A3)
VERTICAL SCALE 1:375 (A1) 1:750 (A3)

1
C009



FINISHED SURFACE TYPICAL SECTION
HORIZONTAL SCALE 1:750 (A1) 1:1500 (A3)
VERTICAL SCALE 1:375 (A1) 1:750 (A3)

2
C009



REV.	DATE	DFTD.	APPD.	DETAILS
A	27/11/2017	AH	PPO	FOR REVIEW
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DESIGN	213141_02F_TIP_EXTENSION.project	PPO	13/08/18
DRAINS/ HEC-RAS MODELLING	-	-	-
ENGINEERING/ SURVEYING APPROVAL		-	-

DRAWING SCALE

REFER TO INDIVIDUAL
DRAWING/SECTION SCALES

DO NOT SCALE FROM THESE DRAWINGS. ALL MEASUREMENTS SHALL BE
CONFIRMED ON SITE AND WITH GEOLYSE PTY. LTD. PRIOR TO CONSTRUCTION

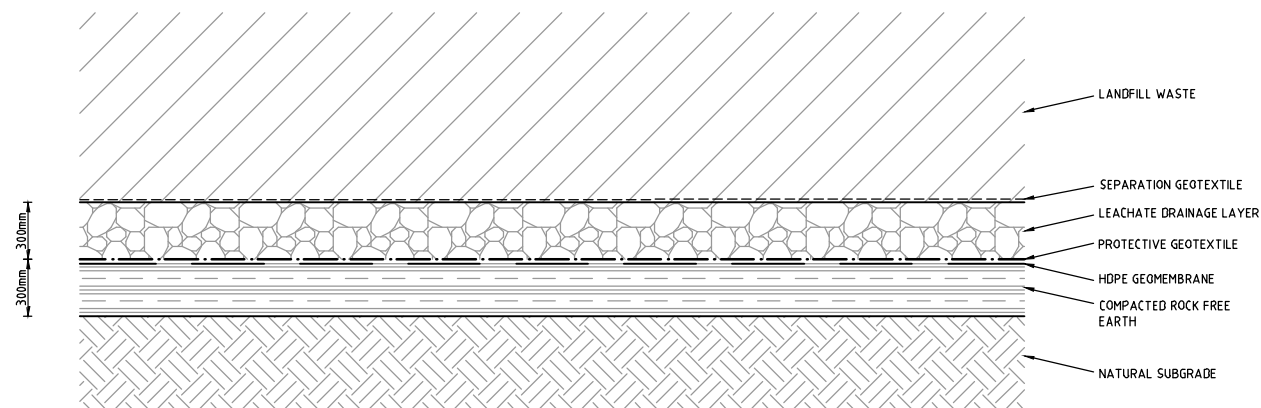
APPROVAL AUTHORITY	FORBES SHIRE COUNCIL
CLIENT	FORBES SHIRE COUNCIL
PROJECT	DAROOBALGIE LANDFILL EXTENSION

GEOLYSE
ORANGE

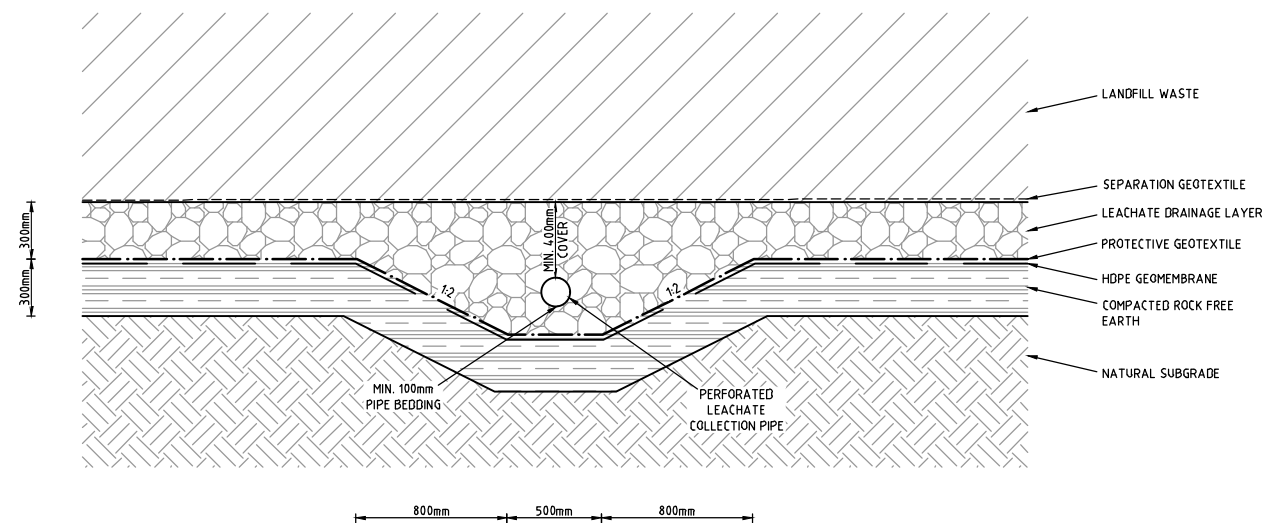
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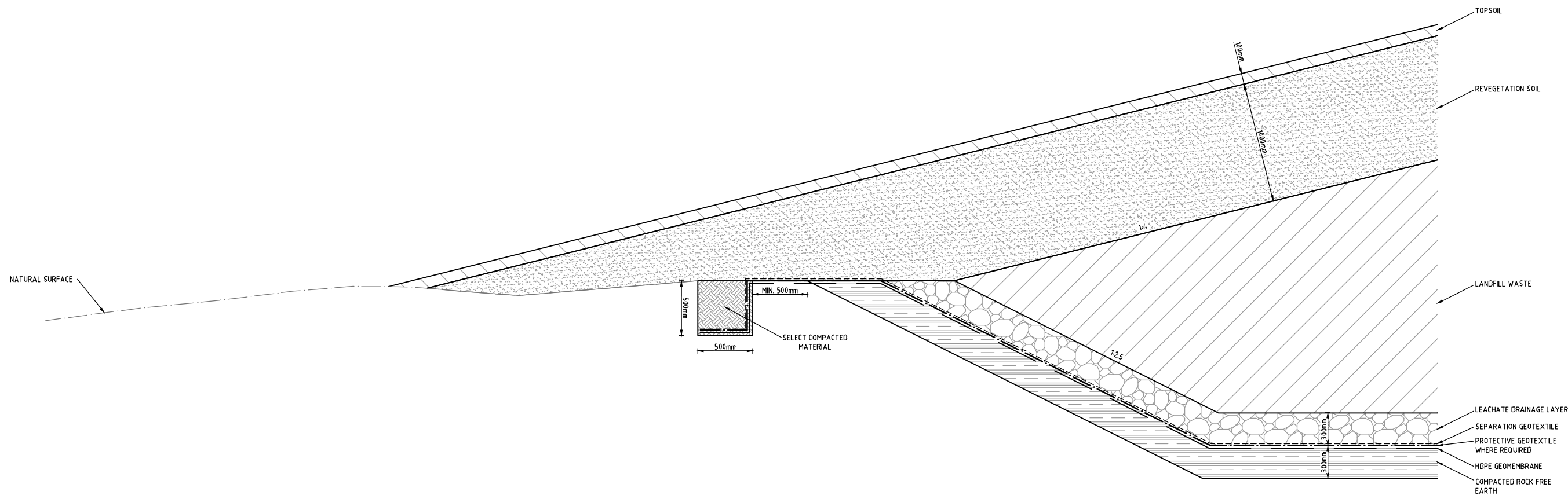
DRAWING TYPICAL CROSS SECTIONS CAPPING DETAILS			
PROJECT NUMBER 213141	DRAWING FILE 213141_07G_C001-C015.dwg	ORIGINAL	A1
SURVEY MARK -	R.L. -	DATUM A.H.D.	SET
IMAGE SOURCE			07
STATUS FOR REVIEW	SHEET C012 OF C015		



TYPICAL LINER DESIGN (IF REQUIRED)
SCALE 1:20 (A1)
SCALE 1:40 (A3)



TYPICAL LEACHATE COLLECTION DRAIN (IF REQUIRED)
SCALE 1:20 (A1)
SCALE 1:40 (A3)



TYPICAL LINER TERMINATION (IF REQUIRED)
SCALE 1:20 (A1)
SCALE 1:40 (A3)


CONCEPT DESIGN
NOT FOR CONSTRUCTION

REV.	DATE	DFTD.	APPD.	DETAILS
A	27/11/2017	AH	PPO	FOR REVIEW
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D	08/08/2018	AP	PPO	TOP GRADE INCREASED AND BATTERS FLATTENED
E	10/08/2018	AP	PPO	STAGE 4A1 AND ACCESS RAMP ADDED
F	13/08/2018	AP	PPO	FILLING STAGE 4E ADDED
G	12/12/2018	AH	PPO	LEACHATE DRAINAGE SYSTEM AND DETAILS ADDED

	FILE	INITIALS	DATE
SURVEY	213141 SURVEY MARCH 2018.MJO	GW	13/03/18
DESIGN	213141_02F_TIP_EXTENSION.project	PPO	13/08/18
DRAINS/ HEC-RAS MODELLING	-	-	-
ENGINEERING/ SURVEYING APPROVAL		-	-

DRAWING SCALE
REFER TO INDIVIDUAL DRAWING/SECTION SCALES
DO NOT SCALE FROM THESE DRAWINGS. ALL MEASUREMENTS SHALL BE CONFIRMED ON SITE AND WITH GEOLYSE PTY. LTD. PRIOR TO CONSTRUCTION

APPROVAL AUTHORITY	FORBES SHIRE COUNCIL
CLIENT	FORBES SHIRE COUNCIL
PROJECT	DAROOBALGIE LANDFILL EXTENSION

	GEOLYSE
ORANGE	154 PEISLEY STREET P.O. BOX 1983 ORANGE, NSW 2800 Ph: (02) 8393 5000 Fx: (02) 8393 5050
orange@geolyse.com www.geolyse.com	

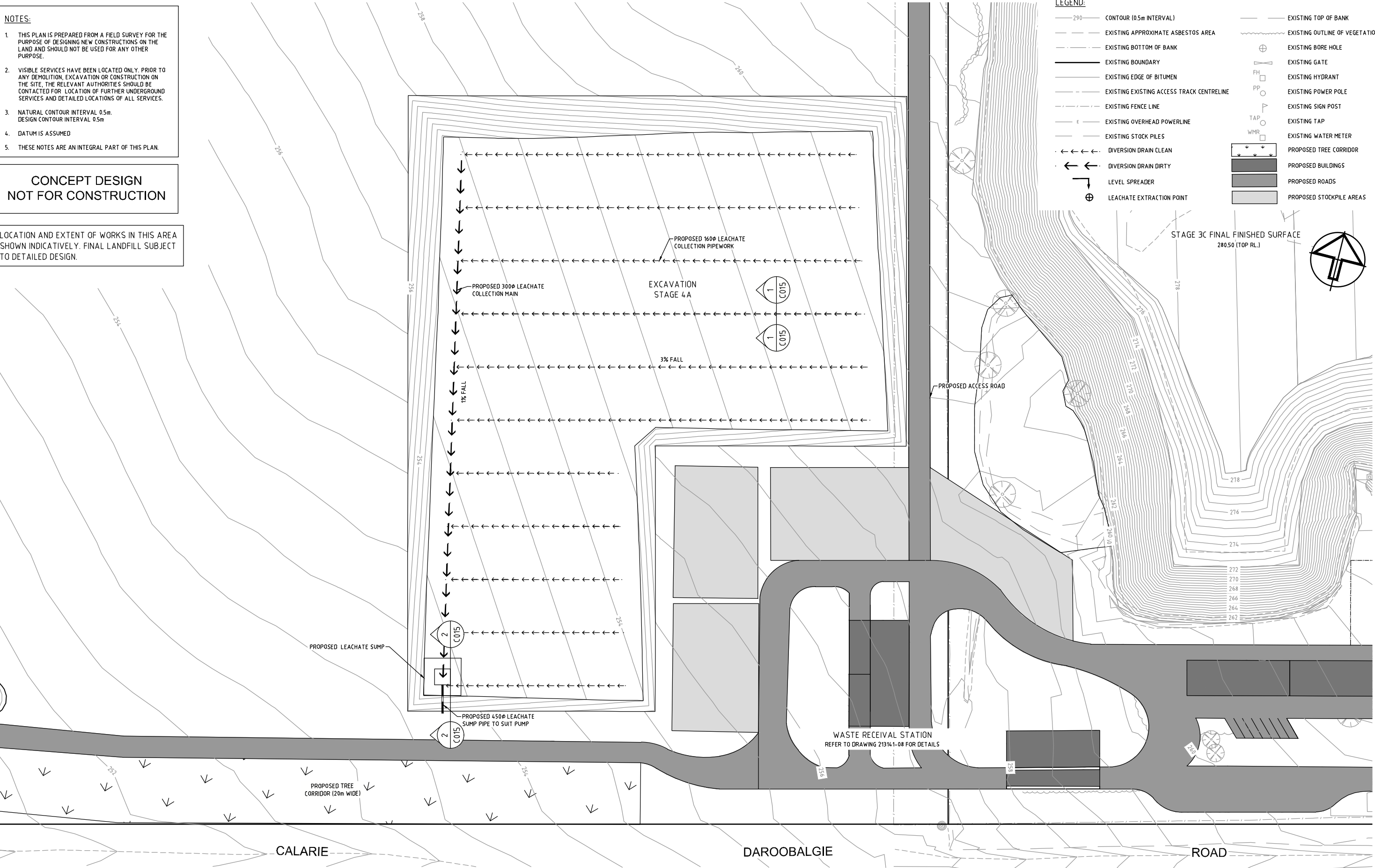
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TYPICAL LINER DETAILS			
PROJECT NUMBER 213141	DRAWING FILE 213141_07G_C001-C015.dwg	ORIGINAL	A1
SURVEY MARK -	R.L. -	DATUM A.H.D.	
IMAGE SOURCE		SET	07
STATUS FOR REVIEW	SHEET C013	OF C015	

NOTES:

1. THIS PLAN IS PREPARED FROM A FIELD SURVEY FOR THE PURPOSE OF DESIGNING NEW CONSTRUCTIONS ON THE LAND AND SHOULD NOT BE USED FOR ANY OTHER PURPOSE.
2. VISIBLE SERVICES HAVE BEEN LOCATED ONLY. PRIOR TO ANY DEMOLITION, EXCAVATION OR CONSTRUCTION ON THE SITE, THE RELEVANT AUTHORITIES SHOULD BE CONTACTED FOR LOCATION OF FURTHER UNDERGROUND SERVICES AND DETAILED LOCATIONS OF ALL SERVICES.
3. NATURAL CONTOUR INTERVAL 0.5m.
DESIGN CONTOUR INTERVAL 0.5m
4. DATUM IS ASSUMED
5. THESE NOTES ARE AN INTEGRAL PART OF THIS PLAN.

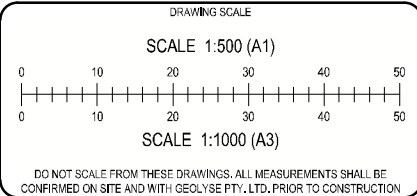
CONCEPT DESIGN
NOT FOR CONSTRUCTION

LOCATION AND EXTENT OF WORKS IN THIS AREA
SHOWN INDICATIVELY. FINAL LANDFILL SUBJECT
TO DETAILED DESIGN.



REV.	DATE	DFTD.	APPD.	DETAILS
A	27/11/2017	AH	PPO	FOR REVIEW
B	02/05/2018	AP	PPO	AMENDED TO SUIT FINAL LOT B'DY
C	23/07/2018	AP	PPO	AMENDED TO AVOID WOODLAND
D	08/08/2018	AP	PPO	TOP GRADE INCREASED AND BATTERS FLATTENED
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G	12/12/2018	AH	PPO	LEACHATE DRAINAGE SYSTEM AND DETAILS ADDED

	FILE	INITIALS	DATE
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DESIGN	213141_02F_TIP_EXTENSION.project	PPO	13/08/18
DRAINS/ HEC-RAS MODELLING	-	-	-
ENGINEERING/ SURVEYING APPROVAL	-	-	-



APPROVAL AUTHORITY	FORBES SHIRE COUNCIL
CLIENT	FORBES SHIRE COUNCIL
PROJECT	DAROOBALGIE LANDFILL EXTENSION

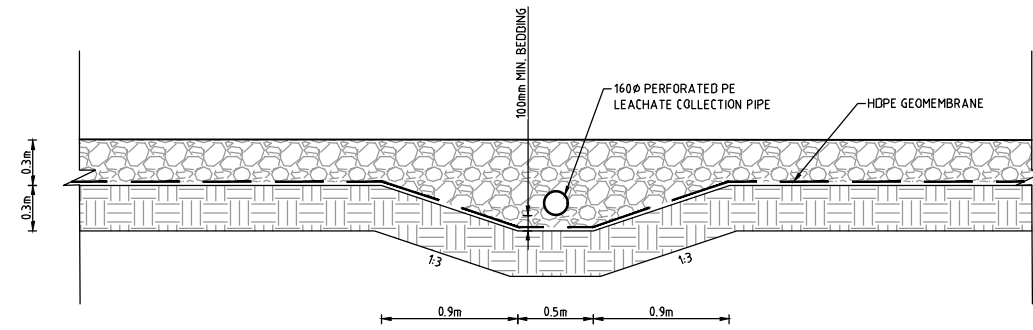
 **GEOLYSE**

ORANGE

154 PEISLEY STREET
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Ph. (02) 9393 5000
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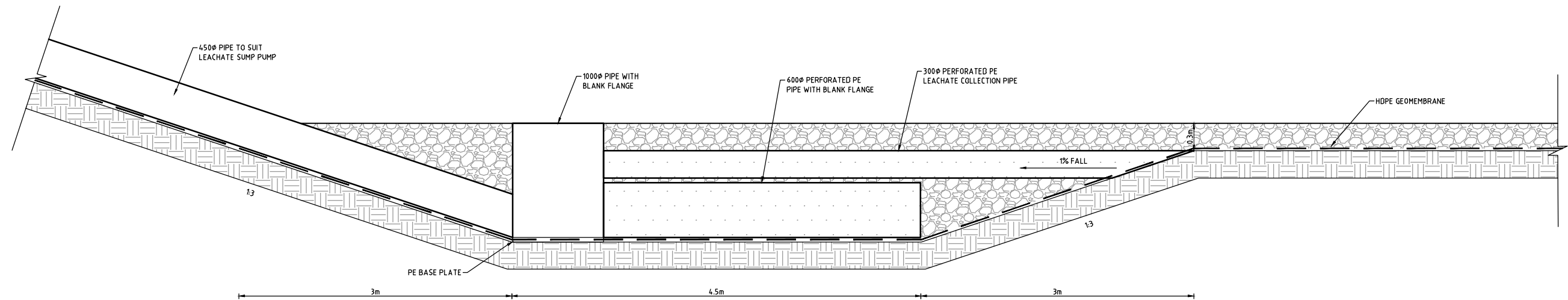
orange@geolyse.com
www.geolyse.com

DRAWING			
LANDFILL CELL SUBGRADE AND LEACHATE DRAINAGE SYSTEM STAGE 4A1			
PROJECT NUMBER 213141	DRAWING FILE 213141_07G_C001-C015.dwg	ORIGINAL	A1
SURVEY MARK	R.L.	DATUM A.H.D.	SET
IMAGE SOURCE			07
STATUS FOR REVIEW	SHEET C014	OF C015	



LEACHATE COLLECTION DRAIN TYPICAL SECTION
SCALE 1:25 (A1)
SCALE 1:50 (A3)

1
C014



LEACHATE SUMP TYPICAL SECTION
SCALE 1:25 (A1)
SCALE 1:50 (A3)

2
C014

LEGEND:

- DESIGN SURFACE
- DESIGN PIPES
- DESIGN HDPE GEOMEMBRANE
- DESIGN LEACHATE DRAINAGE LAYER
- DESIGN COMPACTED CLAY LINER

REV.	DATE	DFTD.	APPD.	DETAILS
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APPROVAL AUTHORITY	FORBES SHIRE COUNCIL
CLIENT	FORBES SHIRE COUNCIL
PROJECT	DAROOBALGIE LANDFILL EXTENSION

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DRAWING			
TYPICAL CROSS SECTIONS LEACHATE DETAILS			
PROJECT NUMBER 213141	DRAWING FILE 213141_07G_C001-C015.dwg	ORIGINAL	A1
SURVEY MARK -	R.L. -	DATUM A.H.D.	SET
IMAGE SOURCE			07
STATUS FOR REVIEW	SHEET C015	OF C015	