



**Context
Engineering**

**Industrial Development
618 Clayton Road
Clayton South**

**Engineering Services
Report**



Prepared For TROON GROUP

**ADVERTISED
PLAN**

Context Engineering

ABN 56 650 431 637



This Document Is Copyright. Other Than for The Purposes and Subject to The Conditions Prescribed Under the Copyright Act 1968 (Commonwealth), No Part of It May in Any Form or By Any Means (Electronic, Mechanical, Micro-Copying, Photocopying, Recording or Otherwise) Be Reproduced, Stored in A Retrieval System or Transmitted Without Prior Written Permission. This Report Has Been Prepared Solely for The Benefit of Our Client. We Do Not Accept Any Liability for Damage or Loss Resulting from Reliance on This Report, Or Any Part of It, By Any Party Other Than the Client (Named on The Front Page of This Report).

This Document Has Been Approved by The Following Appropriately Qualified and Experienced Professional Civil Engineer:

Nicholas Rees

BEng (Hons), MIEAust, CPEng, NER, Registered Professional Engineer of Queensland (RPEQ) No. 18700

ADVERTISED PLAN

Report Number: R002 - C_23011

Issue	Date	Issue Details	Author	Checked	Approved
A	12 April 2023	Preliminary Issue	EG	NR	NR
B	19 July 2023	Final Issue	EG	NR	NR
C	13 November 2023	RFI Response	EG	NR	NR



Executive Summary

Context Engineering has been commissioned by Troon Group to compile this Engineering Services Report for the proposed development of the site located at 618 Clayton Road, Clayton South.

The proposed site involves the creation of an industrial development consisting of nine (9) new warehouses over a historical landfill. These buildings will be connected via large hardstand areas and a centrally located private road with access to Clayton Road. Each warehouse will also be serviced via adjacent office buildings and carparking spaces.

A summary of the investigation and outcomes presented in this report are as follows:

- Flood Assessment (Section 4) – Site is not located within the Special Building or Land Subject to Inundation Overlay. As such, no further flooding investigations were undertaken.
- Engineering Constraints (Section 6) – Earthworks design based on assumptions derived from geotechnical findings. Site not mapped within a potential acid sulfate soils area. No requirement for Acid Sulfate Soils Management Plan. Proposed vehicular access from Clayton Road only.
- Water and Sewer (Section 7) - New water connection to service site from 225mm water main in Clayton Road verge. Extension of existing 225mm sewer main in Clayton Road and new connection required to service the site.

It is recommended that the proposed Development Application be approved.

**ADVERTISED
PLAN**



Contents

- Executive Summary iii
- 1. Introduction 1
 - 1.1 Objectives 1
- 2. Site Characteristics 2
 - 2.1 Location 2
 - 2.2 Land Usage 2
 - 2.3 Topography 2
 - 2.4 Upstream Catchment 3
 - 2.5 Existing Sewer and Water Services 3
 - 2.6 Existing Easements 4
- 3. Proposed Development 5
- 4. Flood Assessment 6
 - 4.1 Flood Planning Area 6
- 5. Stormwater Drainage 7
- 6. Engineering Constraints 8
 - 6.1 Earthworks 8
 - 6.2 Acid Sulfate Soils 9
 - 6.3 Erosion and Sediment Control 9
 - 6.4 Pedestrian and Vehicular Access 9
- 7. Water and Sewer 10
 - 7.1 Water Connection 10
 - 7.2 Sewer Connection 10
- 8. Erosion and Sediment Control 11
 - 8.1 Erosion and Sedimentation Control Measures 11
 - 8.2 General Erosion and Sediment Control Measures 11
 - 8.3 Spoil and Stockpile Management Measures 11
 - 8.4 Training Requirements 11
 - 8.5 Performance objectives 11
 - 8.6 Monitoring and Maintenance 12
 - 8.7 Self-auditing requirements 12
 - 8.8 Monitoring frequency 12
- 9. Conclusion 13
- 10. Disclaimer 13

**ADVERTISED
PLAN**



Figures

Figure 2-1: Site Location (Source: Nearmap)..... 2

Figure 2-2 External Contour Analysis..... 3

Figure 2-3 Existing Sewer Infrastructure 4

Figure 2-4 Existing Water Infrastructure..... 4

Figure 3-1 Developed Layout Plan..... 5

Figure 4-1 City of Kingston Flood Mapping Overlay 6

Figure 7-1 Clayton Road 225mm Sewer Crossing 10

Tables

Table 2-1 SEW Mapped Asset List 3

Table 6-1 Earthworks Modelling Assumptions..... 8

Table 8-1 Pollutant Criteria..... 12

Table 8-2 Monitoring Frequency..... 12

Appendices

- Appendix A Site Survey
- Appendix B Preliminary Engineering Drawings
- Appendix C Architectural Plans
- Appendix D Lanfill Rehabilitation Plan
- Appendix E Code Response Report

**ADVERTISED
PLAN**



1. Introduction

Context Engineering has been commissioned by Troon Group to compile this Engineering Services Report to support the development application for the proposed industrial warehouses over the following parcels of land:

Property Address:	618 Clayton Road, Clayton South
Property Description:	Lot 1 on TP424544
Client:	Troon Group
Council:	City of Kingston
Site Area:	10.355ha

<i>Project Number:</i>	<i>C_23011</i>
<i>This Report:</i>	<i>Engineering Services Report</i>
<i>Additional Reports:</i>	<i>Stormwater Management Report</i>

The proposed site involves the creation of an industrial development consisting of nine (9) new warehouses over a historical landfill. These buildings will be connected via large hardstand areas and a centrally located private road with access to Clayton Road. Each warehouse will also be serviced via adjacent office buildings and carparking spaces.

This report describes the stormwater management issues associated with the proposed development and includes discussion on the following key items:

- Earthworks;
- Erosion and Sediment Control;
- Flooding;
- Water Connection; and
- Sewer Connection,

This report demonstrates that the proposed development can be suitably serviced with all engineering services described and supports the type and scale of development that is proposed.

1.1 Objectives

The analysis in this report provides details of existing engineering condition, and identifies the existing flooding risk, water and sewer servicing strategy and engineering constraints required to demonstrate the outcome of the relevant City of Kingston planning scheme policies.

The objectives of investigations undertaken for this report is as below:

- Review the civil engineering constraints on the site; and
- Demonstrate the extent of flooding impacts on the site.

Based on the outcomes of the above investigations, this report provides civil engineering recommendations suitable to demonstrate compliance with City of Kingston requirements.

**ADVERTISED
PLAN**



2. Site Characteristics

ADVERTISED PLAN

2.1 Location

The proposed development is situated on a single existing allotment at 618 Clayton Road, Clayton South, described as Lot 1 on TP424544. The property is within the City of Kingston and is classified as Industrial 1 Zone (IN1Z) under the Planning Scheme zoning. The site is located in the suburb of Clayton South and is in close proximity to surrounding amenities, including several other industrial developments in the area. It is situated approximately 1.5km from the Dingley Bypass, which provides connectivity to the east and west. The allotment is currently bound by Clayton Road to the west, Fraser Road to the north, Deals Road to the east and existing industrial development to the south.

In accordance with the site survey, the area of the existing allotment in this proposal is 10.355 hectares.

Full details of the site topography and existing features are shown on the detailed survey in Appendix A. A general locality plan is presented in Figure 2-1 below.



Figure 2-1: Site Location (Source: Nearmap)

2.2 Land Usage

The site is currently developed as a historic landfill area, with the surface of the lot comprised of associated gas management infrastructure and otherwise vacant land. The Landfill Rehabilitation Plan, Clayton Road Landfill by Transpacific Waste Management (dated Feb 2015) outlines that the site operated between 1975 and 1989 and was subsequently capped. There is no formal driveway connection to the lot, however site aerials indicate that vehicles currently access the lot from Fraser Road to the north.

2.3 Topography

Due to the size and usage of the lot, topographic levels vary significantly across the development area. Survey indicates that the lot grades from the high point of RL 47.4m in the southern portion of the site to existing drainage swales along the northern, eastern and western boundaries of the site. The maximum grade on the site is approximately 14.3% in the south-eastern corner of the lot fronting Deals Road.

Survey of the site also showed that there is a raised, elongated mound along the western boundary of the site. This has been assumed to be an earthen stockpile that does not form part of the waste capping layer.



2.4 Upstream Catchment

Vicplan and Lidar (5m tiles accessed from ELVIS 6 March 2023) contours indicate that the properties and roads surrounding the site grade away from the development area, as shown in purple in Figure 2-2 below.

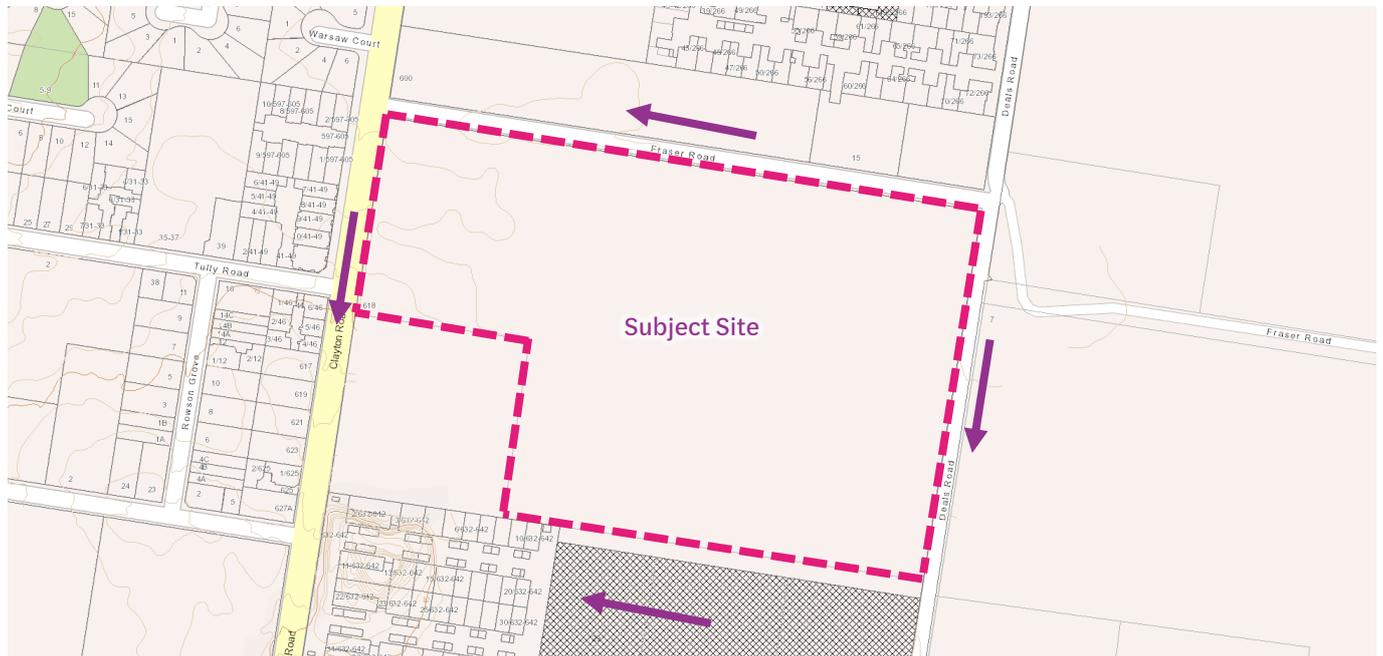


Figure 2-2 External Contour Analysis

As such, the site is not impacted by upstream catchments.

ADVERTISED PLAN

2.5 Existing Sewer and Water Services

The site is in close proximity to SEW-owned sewer and water services.

There is a 225mm water reticulation main adjacent to the site which extends along the eastern verge of Clayton Road. Additional water infrastructure extending into the site was not visible from survey or Google Street View (2022). As such, it was reasonable assumed that the site is not currently serviced via an existing water connection. There is an existing 225mm sewer pipe that crosses Clayton Road approximately 120m south of the site and connects into an existing manhole and 225mm sewer main through Lot 11 on LP5037.

Water and sewer infrastructure within and surrounding the subject site were identified using SEW Map mobile app and are summarised in Table 2-1 below.

Table 2-1 SEW Mapped Asset List

Council ID	Service	Material	Size	Location
87138	Water Main	CICL	225mm	Clayton Road verge
66081	Water Main	CICL	150mm	Clayton Road verge
1052500920	Sewer Connection	VIT Clay	225mm	Clayton Road
1052500919	Sewer Main	VIT Clay	225mm	Multiple lots
1052500904	Sewer Manhole	-	1070mm	Lot 11 on LP5037



These existing services are shown in DBYD excerpts in Figure 2-3 and Figure 2-4 below.

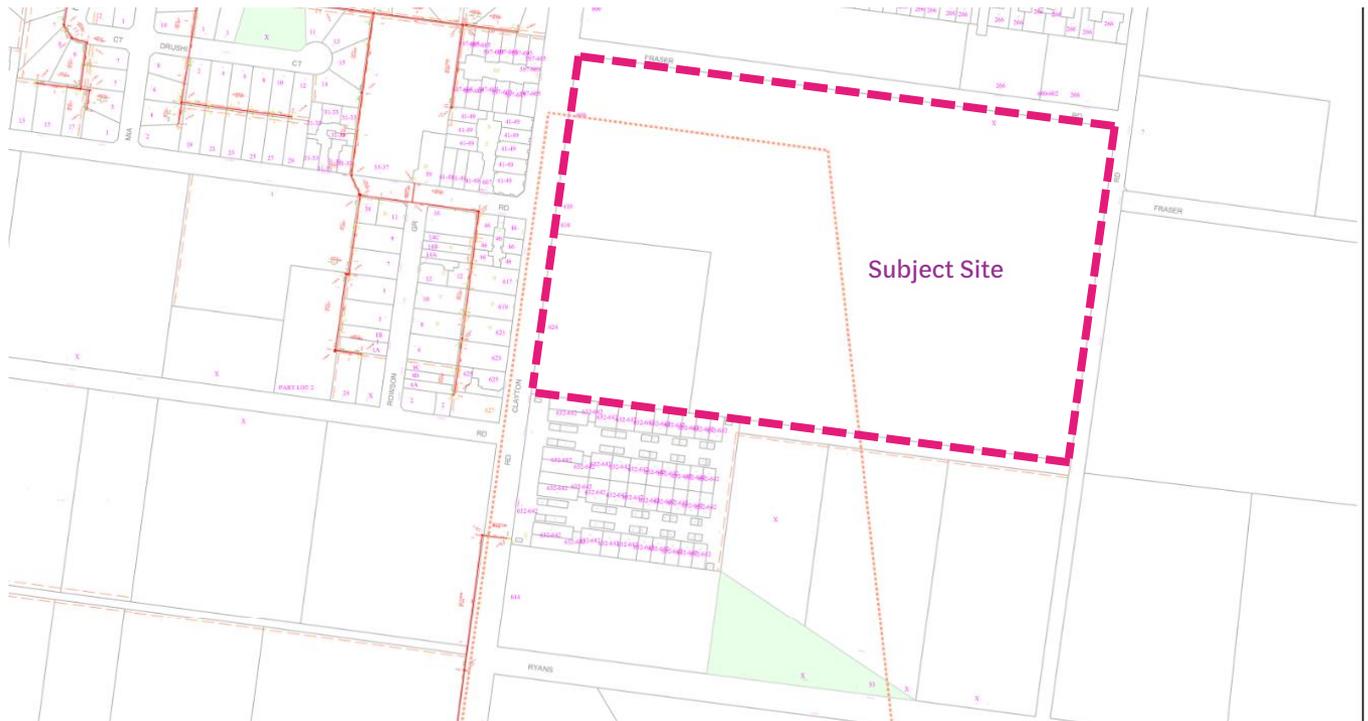


Figure 2-3 Existing Sewer Infrastructure

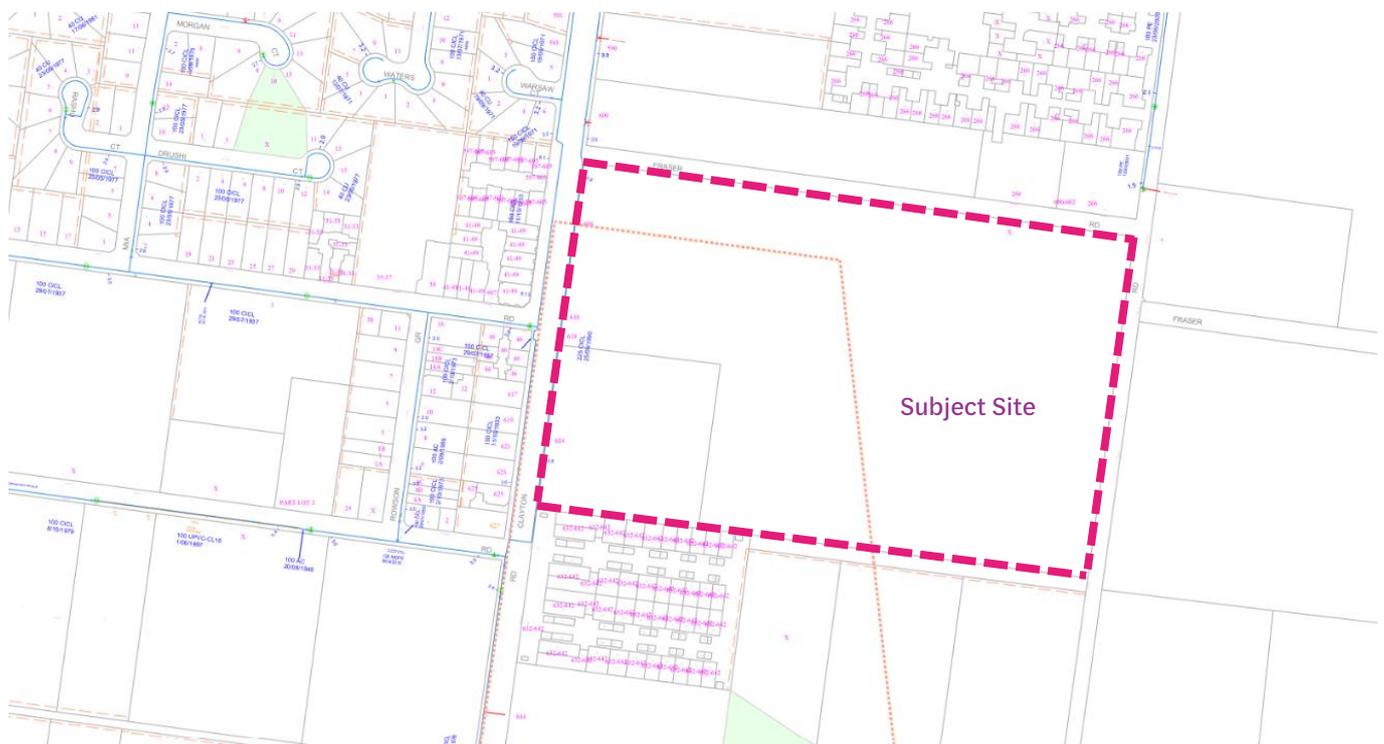


Figure 2-4 Existing Water Infrastructure

ADVERTISED PLAN

2.6 Existing Easements

There are no existing water or sewer easements that traverse the site, in accordance with DBYD and SEW mapping.



3. Proposed Development

The proposed site involves the creation of an industrial development consisting of nine (9) new warehouses over a historical landfill. These buildings will be connected via large hardstand areas and a centrally located private road with access to Clayton Road. Each warehouse will also be serviced via adjacent office buildings and carparking spaces.

Civil construction works will include earthworks to establish the warehouse building pads, internal pavement and the construction of one (1) new vehicle crossover to Clayton Road.

To service this development, new water, sewer and stormwater reticulation will be provided. Stormwater flow mitigation will be managed via on-site detention tanks and stormwater quality treatment will be managed via a proprietary system. The total impervious area of the site has been measured as approximately 94% of the development area.

The indicative layout of the proposed development is shown in Figure 3-1 below. Refer Appendix C for architectural plans.



Figure 3-1 Developed Layout Plan

**ADVERTISED
PLAN**



4. Flood Assessment

4.1 Flood Planning Area

An assessment of flood conditions has been undertaken for the site. The Vicplan Planning Property Report generated for the site indicates that the development is not within the Special Building Overlay (SBO) or the Land Subject to Inundation Overlay (LSIO), as shown in Figure 4-1 below.



Figure 4-1 City of Kingston Flood Mapping Overlay

As such, no further investigation was undertaken for flooding impacts on the site.

**ADVERTISED
PLAN**



5. Stormwater Drainage

A separate report has been prepared for submission with the development application to address the stormwater management plan for the site.

The report prepared by Context Engineering (Ref: R001 – C_23001) identifies the lawful point of discharge and describes stormwater quantity and quality mitigation methods, ensuring compliance with City of Kingston development guidelines.

**ADVERTISED
PLAN**



6. Engineering Constraints

6.1 Earthworks

ADVERTISED PLAN

Geotechnical Limitations and Assumptions

The extents of cut and fill across the site were limited due to the maintenance requirements of the historic landfill. As such, the following documents were used to ascertain the necessary bulk earthworks permissible for the development:

- Landfill Rehabilitation Plan for Clayton Road Landfill, Clayton South by Tonkin & Taylor Pty Ltd (dated February 2015)

This report included an assessment of the adequacy of the existing landfill cap, the potential after-use of the site and contours for the site. Section 3.1 of the document outlines that the landfill cap design (prepared by Golder in 1988) required that the construction of the landfill cap include:

- Minimum 0.5m of compacted clayey soil; and
- Between 0.2m to 0.3m of organic rich topsoil.

The report also analysed the results of eight (8) boreholes that were drilled across the site, that terminated at 1.5m below ground level. 7 out of 8 of these boreholes did not encounter waste, indicating that the capping layer exceeded 1.5m.

Based on the findings of this report, the following assumptions in Table 6-1 were adopted for the preliminary earthworks design of the development.

Table 6-1 Earthworks Modelling Assumptions

Assumption	Justification
Capping layer in developed case to consist of 0.5m of compacted clay only	In the developed case, construction of the proposed buildings and roads will require a 200mm pavement layer. It was assumed that this would be an appropriate substitute for the topsoil layer specified in the Landfill Rehabilitation Plan.
1m maximum cut for building pads and roads	The majority of the boreholes did not encounter waste. Adopting a 0.5m capping depth as specified above, allows for 1m of cut below the existing surface. Localised rehabilitation will be required in areas where the total capping layer is less than 1.5m.
Raised mound removed from existing surface tin	The original capping design prepared by Golder in 1988 does not reference the raised elongated area in the western portion of the site. It was therefore assumed that the mound is an earthen stockpile, that does not form part of the waste capping layer.
Localised waste removal and cap reconstruction for areas that require more than 1m of cut	It has been assumed that areas that require more than 1m of cut, including the northern warehouse building pads and recessed accesses will be rehabilitated with localised waste removal and cap reconstruction.

Design Model

A preliminary earthworks model was developed using the assumptions listed in Table 6-1 above.



6.2 Acid Sulfate Soils

The development is not shown to be within the Coastal Acid Sulfate Soil Mapping of Melbourne. It is therefore not necessary for the development to prepare an Acid Sulfate Soils Management Plan.

6.3 Erosion and Sediment Control

During earthworks, there will be an inevitable area of exposed earth, stripped areas and stockpiles. Appropriate methods to manage this process and ensure minimal impacts to surrounding properties, infrastructure and receiving waters will therefore be required.

In accordance with the requirements of the development, an Erosion and Sediment Control Plan certified by a Registered Professional Engineer has been developed. Drawing C_23011 DA80 in Appendix B identifies and provides construction dimensions for devices necessary to comply with the International Erosion Associations (IECA) Best Practise Management Guide. The proposed devices for the development are silt fences and bunds, inlet protection and a sediment basin.

6.4 Pedestrian and Vehicular Access

The site is bound by the Clayton Road to the west, which includes a kerb and channel and vegetated verge adjacent to the site. Fraser Road to the north and Deals Road to the east are undeveloped, and currently consist of a compacted but unsealed material. External works will be required along Clayton Road to permit vehicular access to the site. The existing kerb is to be maintained where possible.

Access to each of the proposed warehouse units on the site will be via an internal driveway that extends through the centre of the development and terminates at a cul-de-sac in the far eastern portion of the site. It is anticipated that this driveway will connect to Clayton Road via a modified heavy duty vehicle crossing in accordance with City of Kingston standard drawing S203 will be required. Detailed plans of the proposed driveways will be made available to Council during the Operational Works application.

Pedestrian access to the site will be available via several internal footpaths connecting key features of the site. Refer architectural plans for details.

**ADVERTISED
PLAN**



7. Water and Sewer

7.1 Water Connection

The site is currently not connected to the water and sewer mains surrounding the site. As such, additional infrastructure will be required to service the site in the developed case. There is an existing 225mm water main in the Clayton Road verge adjacent to the site. In the developed case, the site will be service via a new 150mm water connection that will connect to the existing main. Due to the size of the site, it is expected that that fire servicing will be required for the development. Requirements for this infrastructure will be addressed as part of detailed design.

7.2 Sewer Connection

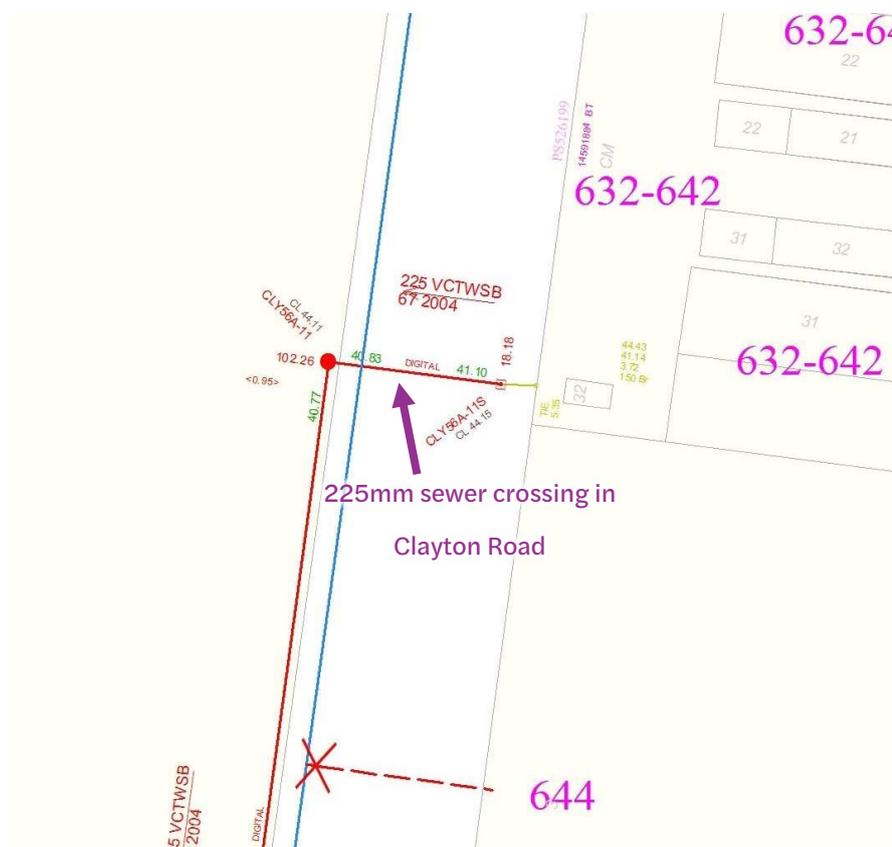
There is an existing 225mm sewer main to the south, with a crossing under Clayton Road identified via SEW mapping and shown in Figure 7-1.

The features of this line are listed below, with associated data sources:

- **Approx Surface Level:** RL 44.5m AHD
- **USIL:** RL 41.1m AHD (5M_DEM accessed via ELVIS 2023)
- **Depth to Invert:** 3.4m
- **Pipe Size:** 225mm (SEW Mapping)

In the developed case, the configuration is proposed to be improved via the construction two (2) new manholes and extension of the existing line. Refer Appendix B for further details.

The development intent for the site of industrial land use is to be maintained. As such, it has been assumed that the SEW will permit the development to connect into the existing network.



ADVERTISED PLAN

Figure 7-1 Clayton Road 225mm Sewer Crossing

The adjacent manhole (identified as CLY56A-11 in SEW mapping) is not visible via aerial imagery. As such, it will be necessary to confirm the existence and location of this infrastructure prior to detailed design of the sewer.



8. Erosion and Sediment Control

8.1 Erosion and Sedimentation Control Measures

During construction, it shall be the responsibility of the Principal Contractor to ensure that the development complies with the relevant erosion and sediment control objectives, as outlined in the relevant Council guidelines.

This section of the report provides suggested inclusions in an erosion and sediment control plan for the proposed development site. This plan includes recommendations for monitoring & reporting responsibilities and the construction of site-specific sedimentation and erosion control measures. Detailed drawings specifying the proposed erosion and sediment control measures are to be provided at the Operational Works stage of the development.

8.2 General Erosion and Sediment Control Measures

It shall be the responsibility of the Principal Contractor to ensure the following erosion and sediment control measures are implemented on site:

- Clean stormwater runoff from upstream allotments is to be directed away from the development site using earth bunds or cut-off drains, as deemed appropriate by a suitable supervisor;
- The prevention of sediment runoff towards other allotments via the effective implementation of silt fences, sediment basins or other mitigation devices as deemed appropriate by a suitable supervisor;
- Sediment runoff shall also be prevented from entering the Council stormwater drainage system via the implementation of control measures such as gully pit sediment barriers;
- Erosion shakedown points shall be established at all vehicular access points, with shakedown areas regularly swept clean and sediment removed;
- Erosion and sediment control measures are not to be removed from the development site until the site is completely rehabilitated and the surface is capable of resisting erosion.

8.3 Spoil and Stockpile Management Measures

It shall be the responsibility of the Principal Contractor to ensure the following spoil and stockpile management measures are implemented on site:

- Where the stockpiling of spoil and excess earthworks is necessary on the development site, stockpiles shall be established as far away as possible from stormwater inlets and pipelines to reduce the likelihood of sediment runoff;
- Stockpiles are to be established within a designated zone of fill material and should be surrounded with appropriate erosion and sediment control measures.

**ADVERTISED
PLAN**

8.4 Training Requirements

It shall be the responsibility of the Principal Contractor to ensure the following training protocols are implemented on the development site:

- Site induction courses shall include details of an environmental management reporting system, through which personnel will be able to report perceived erosion and sediment control issues on site.

8.5 Performance objectives

Construction phase erosion and sediment control measures must achieve the following water quality objectives (WQO's) for a site runoff up to the design event as per Council's Design Objectives.

Table 8-1 summarises the pollutants and the criteria required to be achieved.



ADVERTISED PLAN

Table 8-1 Pollutant Criteria

Pollutant	Criteria
Total Suspended Solids	<mg/L
Turbidity	Turbidity not >10% receiving waters turbidity
pH	6.5 – 8.5

8.6 Monitoring and Maintenance

The following monitoring and maintenance procedures will be undertaken by the land developer during all phases of the project:

- Earthworks and site cleaning are undertaken in accordance with the Erosion and Sediment Control plans
- Self-auditing program must be developed
- Any worn, damaged, or defective materials are to be immediately rectified to prevent uncontrolled discharge from the site
- Monitoring frequencies to be undertaken as per 3.1.8 Monitoring Frequency

Self-audits, original test results and weekly sheet shall be kept on-site and available for council officers. Non-complying test results (Table 8-1 Pollutant Criteria) must be reported to council immediately.

8.7 Self-auditing requirements

The self-auditing program will be performed at least once a week, immediately before site closure and following rainfall events that cause runoff. These self-audits must be undertaken systematically and record:

- Installation/removal of any erosion and sediment control measures
- Condition of each device employed
- Circumstances contributing to damage of any measure
- Storage capacity available in pollution control structures (e.g. portable toilets, pollutant traps etc)
- Time, date, volume, and type of additional flocculants
- Maintenance or repair requirements for each measure

8.8 Monitoring frequency

Stormwater monitoring shall take place at the following intervals when surface water leaves the site:

Table 8-2 Monitoring Frequency

Parameter	Frequency
TSS, NFR	Monthly or during discharge event (>25mm in any 24 hour period)
pH	In acid sulfate soils risk area, daily or during controlled discharge event
Total P, Total N	3 monthly



9. Conclusion

Context Engineering has been commissioned by Troon Group to compile this Engineering Services Report for the proposed development of the site located at 618 Clayton Road, Clayton South.

The proposed site involves the creation of an industrial development consisting of nine (9) new warehouses over a historical landfill. These buildings will be connected via large hardstand areas and a centrally located private road with access to Clayton Road. Each warehouse will also be serviced via adjacent office buildings and carparking spaces.

A summary of the investigation and outcomes presented in this report are as follows:

- Flood Assessment (Section 4) – Site is not located within the Special Building or Land Subject to Inundation Overlay. As such, no further flooding investigations were undertaken.
- Engineering Constraints (Section 6) – Earthworks design based on assumptions derived from geotechnical findings. Site not mapped within a potential acid sulfate soils area. No requirement for Acid Sulfate Soils Management Plan. Proposed vehicular access from Clayton Road only.
- Water and Sewer (Section 7) - New water connection to service site from 225mm water main in Clayton Road verge. Extension of existing 225mm sewer main in Clayton Road and new connection required to service the site.

It is recommended that the proposed Development Application be approved.

10. Disclaimer

This report has been prepared on behalf of and for the exclusive use of Troon Group and is subject to and issued in accordance with the agreement between Context Engineering.

Our investigation and analysis has been specifically catered for the particular requirements Troon Group and may not be applicable beyond this scope. For this reason, any other third parties are not authorised to utilise this report without further input and advice from Context Engineering.

Context Engineering accepts no liability or responsibility whatsoever for the report in respect of any use of or reliance upon this report by any third party.

The investigation and analysis have relied on information provided by others. We accept no responsibility for the accuracy of material supplied by others. The accuracy of the investigation, analysis and report are dependent upon the accuracy of this information.

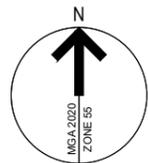
**ADVERTISED
PLAN**

618 Clayton Road, Clayton South
ENGINEERING SERVICES REPORT

Appendix A Site Survey

TROON GROUP

**ADVERTISED
PLAN**



SEE SHEET 11 FOR SURVEY REPORT, NOTES AND LEGEND

WARNING
BEWARE OF UNDERGROUND & OVERHEAD SERVICES
The locations of existing utility services are approximate only and their exact position should be proven on site. No guarantee is given that all existing utility services are shown. Locate all utility services before commencement of works.
DIAL 1100 BEFORE YOU DIG
www.1100.com.au

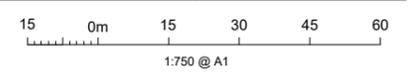
LICENSED SURVEYOR CERTIFICATION:
This plan has been prepared from a survey completed on the 03/02/2023. The survey was carried out under my direction and supervision in accordance with the Surveying Act 2004. This plan is accurate and correctly represents the adopted boundaries and achieves the survey accuracy required by Regulation 7(1) of the Surveying (Cadastral Surveys) Regulations 2015.
Digitally Signed:

ADVERTISED PLAN

CLIENT:
TROON GROUP 
PROJECT:
618 CLAYTON ROAD
CLAYTON SOUTH VIC 3169

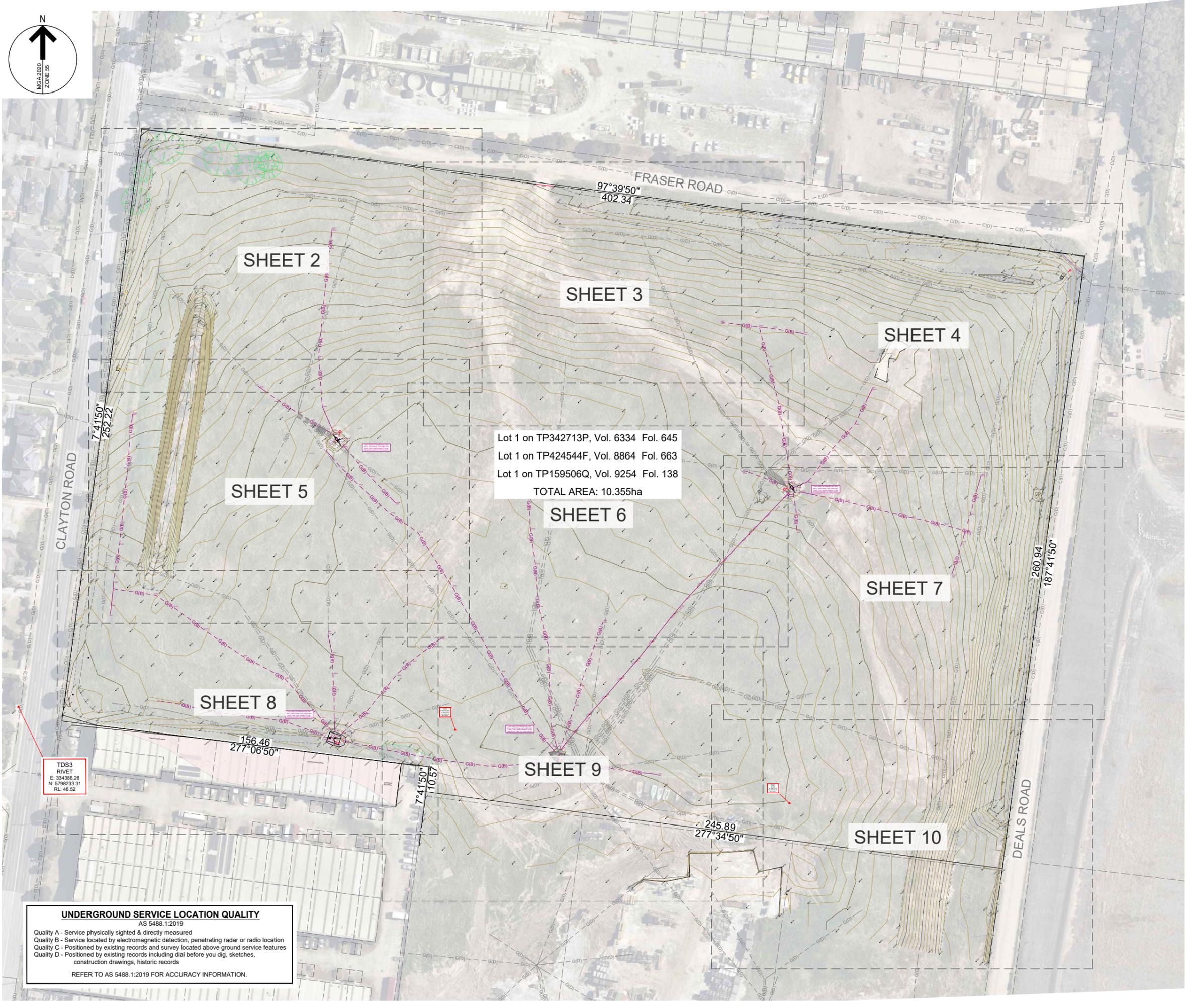
DRAWING:
PLAN OF TITLE RE-ESTABLISHMENT, FEATURE, LEVEL AND SERVICES SURVEY

Proj. Ref:	23319/S1	Approved by:	SST
Sheet:	1 of 11	Approval Date:	10/02/2023



DRAWING NUMBER: 23319-S1-D1 **VERSION:** 01

TAYLORS
Urban Development | Infrastructure
8/270 Ferntree Gully Road, Notting Hill VIC 3168
Phone: (03) 9501 2800 | www.taylorstds.com.au



Lot 1 on TP342713P, Vol. 6334 Fol. 645
Lot 1 on TP424544F, Vol. 8864 Fol. 663
Lot 1 on TP159506Q, Vol. 9254 Fol. 138
TOTAL AREA: 10.355ha

UNDERGROUND SERVICE LOCATION QUALITY
AS 5488.1:2019
Quality A - Service physically sighted & directly measured
Quality B - Service located by electromagnetic detection, penetrating radar or radio location
Quality C - Positioned by existing records and survey located above ground service features
Quality D - Positioned by existing records including dial before you dig, sketches, construction drawings, historic records
REFER TO AS 5488.1:2019 FOR ACCURACY INFORMATION.

618 Clayton Road, Clayton South
ENGINEERING SERVICES REPORT

Appendix B Preliminary Engineering Drawings

TROON GROUP

**ADVERTISED
PLAN**

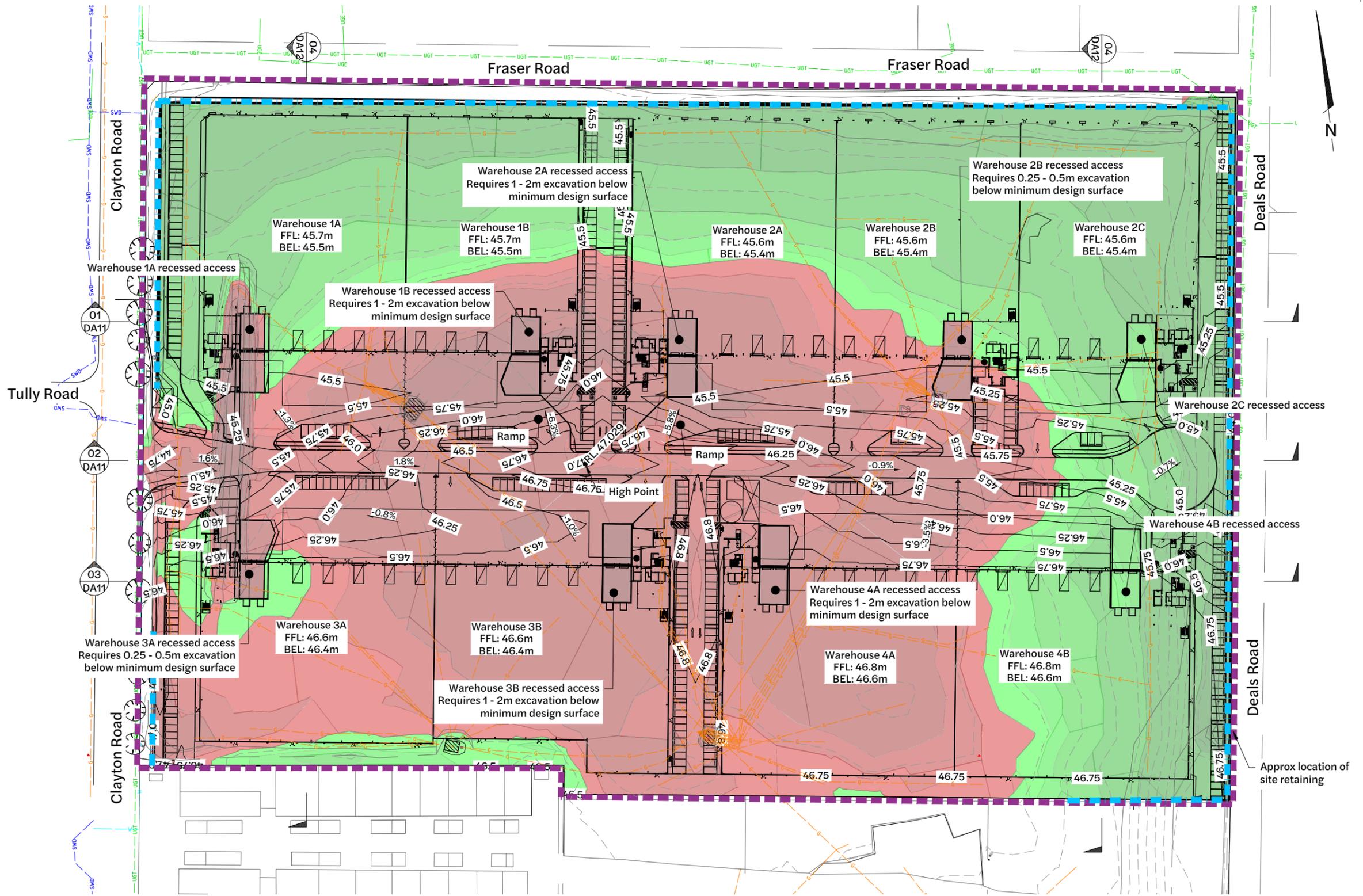
Legend

- Property Boundary
- 0.25 Design Contour
- 0.5 Existing Surface Contour
- Existing Stormwater Drainage
- Existing Sewerage Reticulation
- Existing Water Reticulation
- Existing Gas
- Existing Overhead Electrical
- Approx Retaining Wall Location

Bulk Earthworks Legend	
Cut	Fill
> 15.0m	> 15.0m
10.0 to 15.0m	10.0 to 15.0m
5.0 to 10.0m	5.0 to 10.0m
2.0 to 5.0m	2.0 to 5.0m
1.0 to 2.0m	1.0 to 2.0m
0.5 to 1.0m	0.5 to 1.0m
0.25 to 0.5m	0.25 to 0.5m
0.0 to 0.25m	0.0 to 0.25m

Earthworks Schedule (Stripped Surface to Bulk Earthworks)	
Type	Volume (m ³)
Cut	-33,000 (approx)
Fill	84,000 (approx)
Total Balance	51,000 (approx)*

*100mm strip and 200mm pavement and structural slab depth. Recessed areas 1.3m below design surface.



ADVERTISED
PLAN

Bulk Earthwork Layout Plan
1:750 Scale

ENERGY SERVICE PROVIDERS

Note: Service locations are approximate only from provider plans. Locations are to be confirmed prior to the start of construction. Refer **Before You Dig** service location plans - available at www.hyda.com.au

TELECOMMUNICATIONS SERVICE PROVIDERS

Note: Service locations are approximate only from provider plans. Locations are to be confirmed prior to the start of construction. Refer **Before You Dig** service location plans - available at www.hyda.com.au

Revision	Date	Issue Details	Drawn	Designed	QR Code	Status
1	05.03.23	Issued for Approval	EG	EG		Issued for Approval Not for Construction
2	29.05.23	Issued for Information	EG	EG		
3	19.07.23	Issued for Approval	EG	EG		
4	06.11.23	Futher Information Request Response	CG	EG		

Scale
1:750 15 0 15 30m A1 1:1500 A3

Tron Group

**618 Clayton Road
Clayton South**

Context Engineering

Disclaimer
All dimensions to be checked on site by contractor prior to construction. Use written dimensions only, do not scale.

Bulk Earthworks Layout Plan		
Project No. C_23011	Drawing No. DA10	Revision 4

FILE: Z:\WORK\VIC_23011 - 618 CLAYTON ROAD CLAYTON VIC_MODEL\AUTOCAD\DA DRAWINGS\C_23011_DAO_BULK_EARTHWORKS_LAYOUT_PLAN.DWG LAST SAVED BY: CONTE

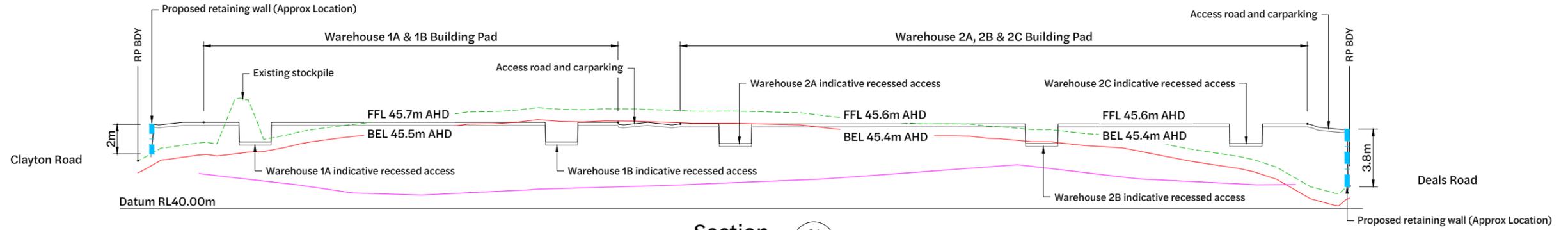
Legend

- Existing Surface
- Minimum Design Surface - 0.8m Below Assumed Surface*
- Minimum Capping Layer- 2.5m above depth to waste encountered**
- Design Surface
- Bulk Earthworks Surface
- █ Proposed Retaining Wall (Approx Location)

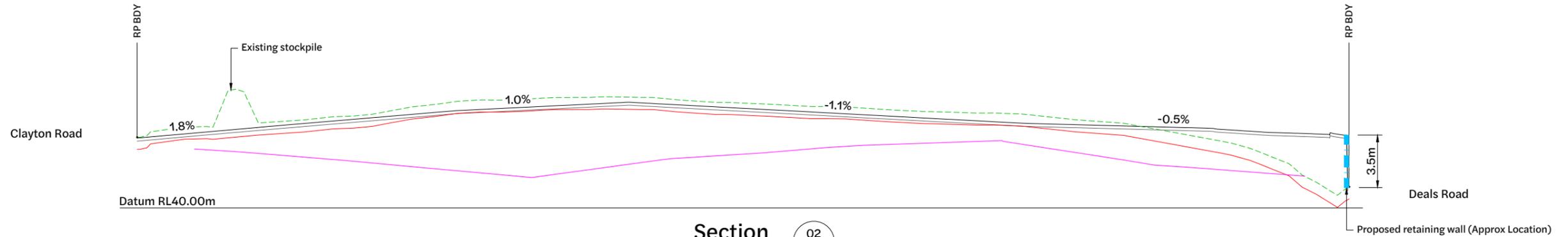
* Assumed surface does not include existing stockpile

** Refer Clayton Road Landfill - Cap Soil Assessment by Resolve Environmental for depth of waste.

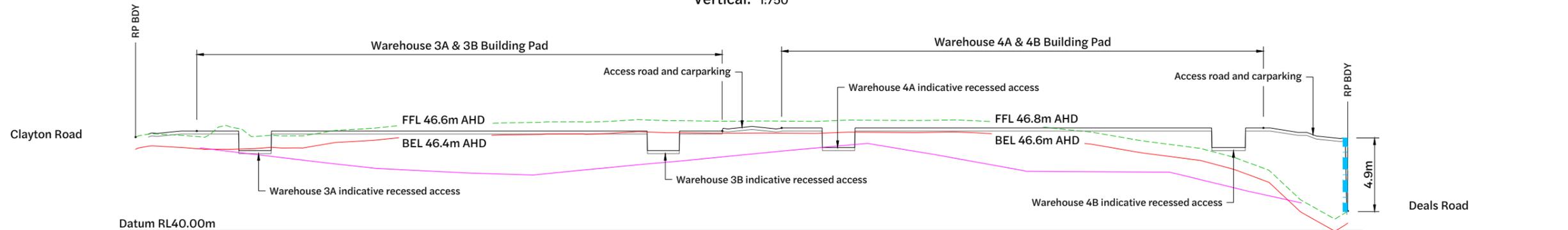
ADVERTISED PLAN



Section 01
Horizontal: 1:750
Vertical: 1:750



Section 02
Horizontal: 1:750
Vertical: 1:750

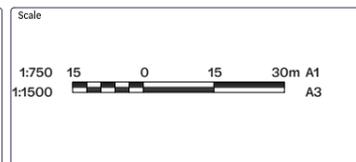


Section 03
Horizontal: 1:750
Vertical: 1:750

Note:
Typical sections have been drawn with 5x vertical exaggeration to assist with visualizing site levels and grades.

Revision	Date	Issue Details	Drawn	Designed	QR Code	Status
1	29.05.23	Issued for Approval	EG	EG		Issued for Approval Not for Construction
2	19.07.23	Issued for Approval	EG	EG		
3	06.11.23	Further Information Request Response	CG	EG		

Issued for Approval
Not for Construction



Troon Group

618 Clayton Road Clayton South



Bulk Earthworks Sections (Sheet 1 of 2)		
Project No.	Drawing No.	Revision
C_23011	DA11	3

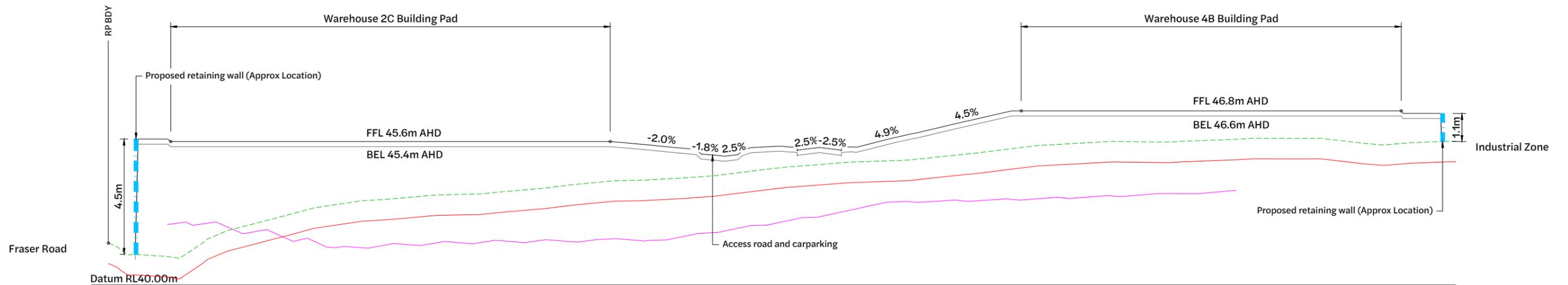
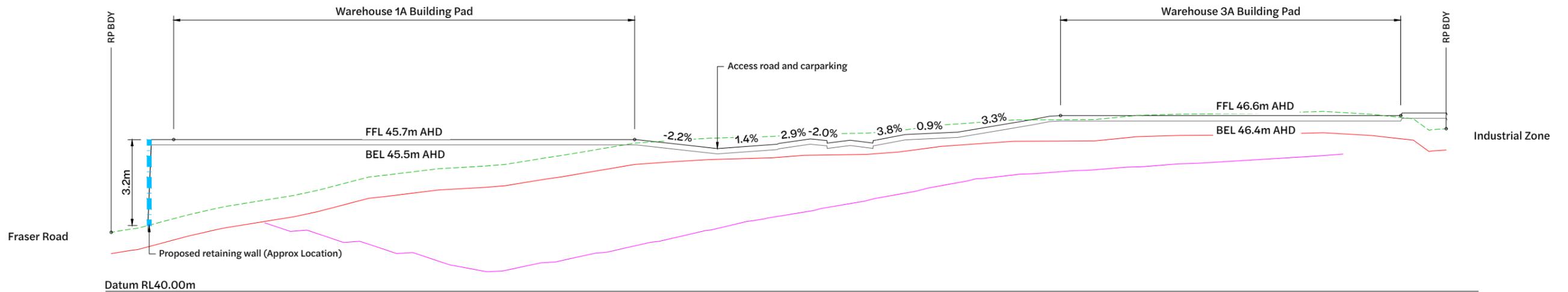
Legend

- Existing Surface
- Minimum Design Surface - 0.8m Below Assumed Surface*
- Minimum Capping Layer- 2.5m above depth to waste encountered**
- Design Surface
- Bulk Earthworks Surface
- █ Proposed Retaining Wall (Approx Location)

* Assumed surface does not include existing stockpile

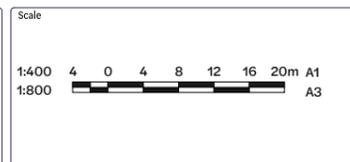
** Refer Clayton Road Landfill - Cap Soil Assessment by Resolve Environmental for depth of waste.

ADVERTISED PLAN



Note:
Typical sections have been drawn with 5x vertical exaggeration to assist with visualizing site levels and grades.

Revision	Date	Issue Details	Drawn	Designed	QR Code	Status
1	29.05.23	Issued for Approval	EG	EG		Issued for Approval Not for Construction
2	19.07.23	Issued for Approval	EG	EG		
3	06.11.23	Further Information Request Response	CG	EG		



Client
Troon Group

Project
**618 Clayton Road
Clayton South**

Disclaimer
All dimensions to be checked on site by contractor prior to construction. Use written dimensions only, do not scale.



Drawing Title		
Bulk Earthworks Sections (Sheet 2 of 2)		
Project No. C_23011	Drawing No. DA12	Revision 3

Legend

-  Property Boundary
-  Existing Stormwater Drainage
-  Existing Sewerage Reticulation
-  Existing Water Reticulation
-  Existing Gas
-  Existing Overhead Electrical
-  Proposed Stormwater
-  Proposed Stormwater Inlet

Catchment D1 Legal Point of Discharge
Existing 225m connection in Clayton Road to existing gully pit to be removed and replaced with 300mm pipe
Approx SL: 42.05m

Proposed Detention Tank
SL: 45.5m
Inlet IL: 41.760m
Outlet IL: 41.600m
Min storage volume: 1740m³

Indicative D1A Filterra Location
Treatment Area: 70m²

Major flows exceeding capacity of piped infrastructure to be directed to Clayton Road

Indicative D2 Filterra Location
Treatment Area: 100m²

Proposed detention tank
SL: 46.6m
Slab depth: 0.2m
Inlet IL: 44.425m
Outlet IL: 44.400m
Min storage volume: 1100m³

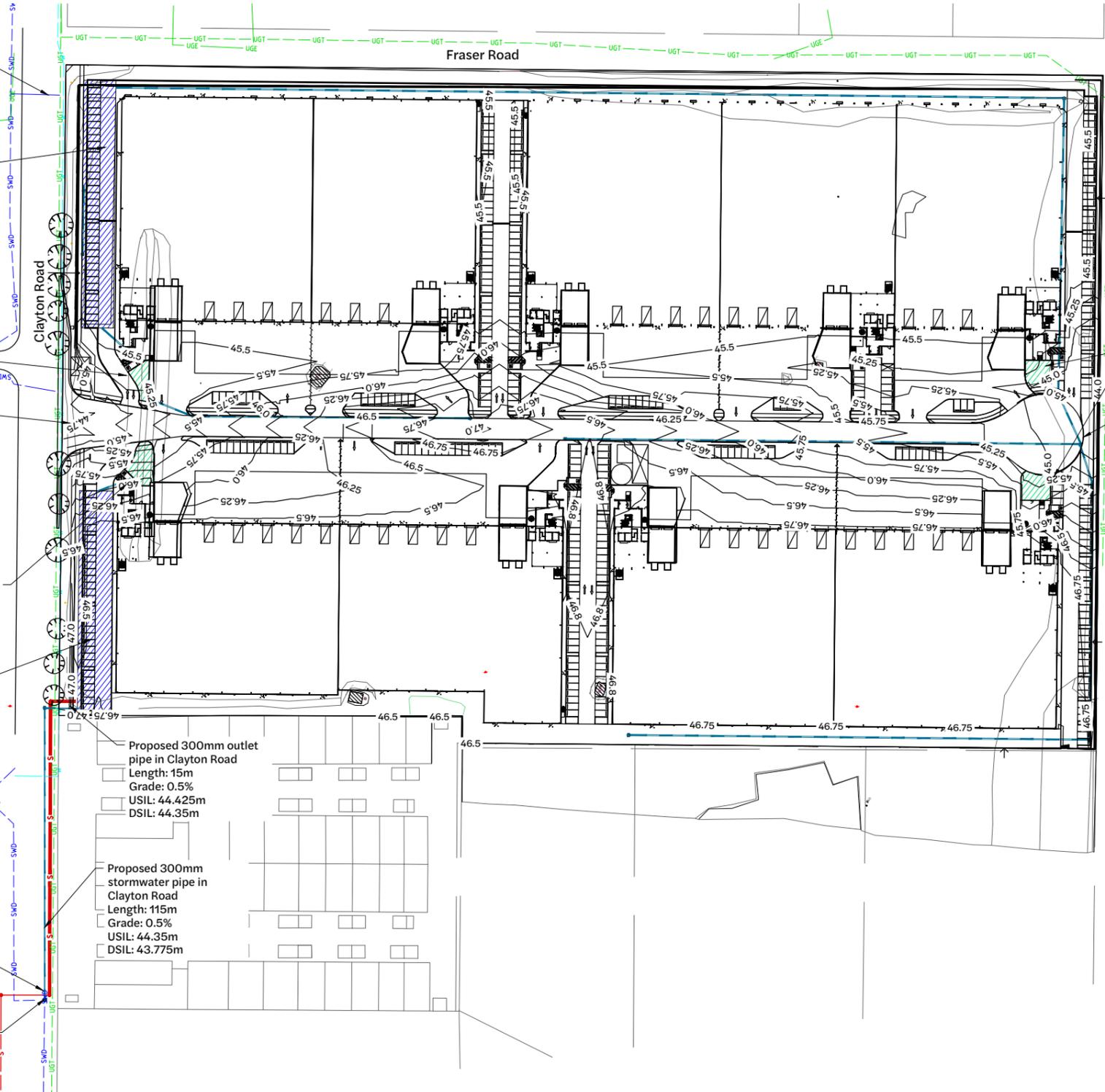
Proposed 300mm outlet pipe in Clayton Road
Length: 15m
Grade: 0.5%
USIL: 44.425m
DSIL: 44.35m

Proposed 300mm stormwater pipe in Clayton Road
Length: 115m
Grade: 0.5%
USIL: 44.35m
DSIL: 43.775m

Catchment D2 Legal Point of Discharge
Existing 300m pipe in Clayton Road

Assumed SL (Lidar): 44.6m
Assumed Cover: 0.6m
Approx Connection IL: 43.7m

ADVERTISED PLAN



Stormwater Drainage Layout Plan
1:1000 Scale

ENERGY SERVICE PROVIDERS



Note: Service locations are approximate only from provider plans. Locations are to be confirmed prior to the start of construction. Refer **Before You Dig** service location plans - available at www.byda.com.au

TELECOMMUNICATIONS SERVICE PROVIDERS

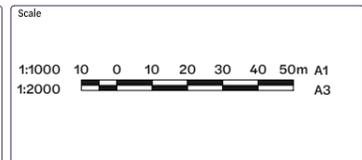


Note: Service locations are approximate only from provider plans. Locations are to be confirmed prior to the start of construction. Refer **Before You Dig** service location plans - available at www.byda.com.au

Revision	Date	Issue Details	Drawn	Designed	QR Code	Status
1	11.04.23	Issued for Information	EG	EG		Issued for Approval Not for Construction
2	19.07.23	Issued for Approval	EG	EG		
3	06.11.23	Further Information Request Response	CG	EG		

Drawn	Designed	QR Code	Status
CG	EG		Issued for Approval Not for Construction

Issued for Approval
Not for Construction



Client: **Troon Group**

Project: **618 Clayton Road Clayton South**

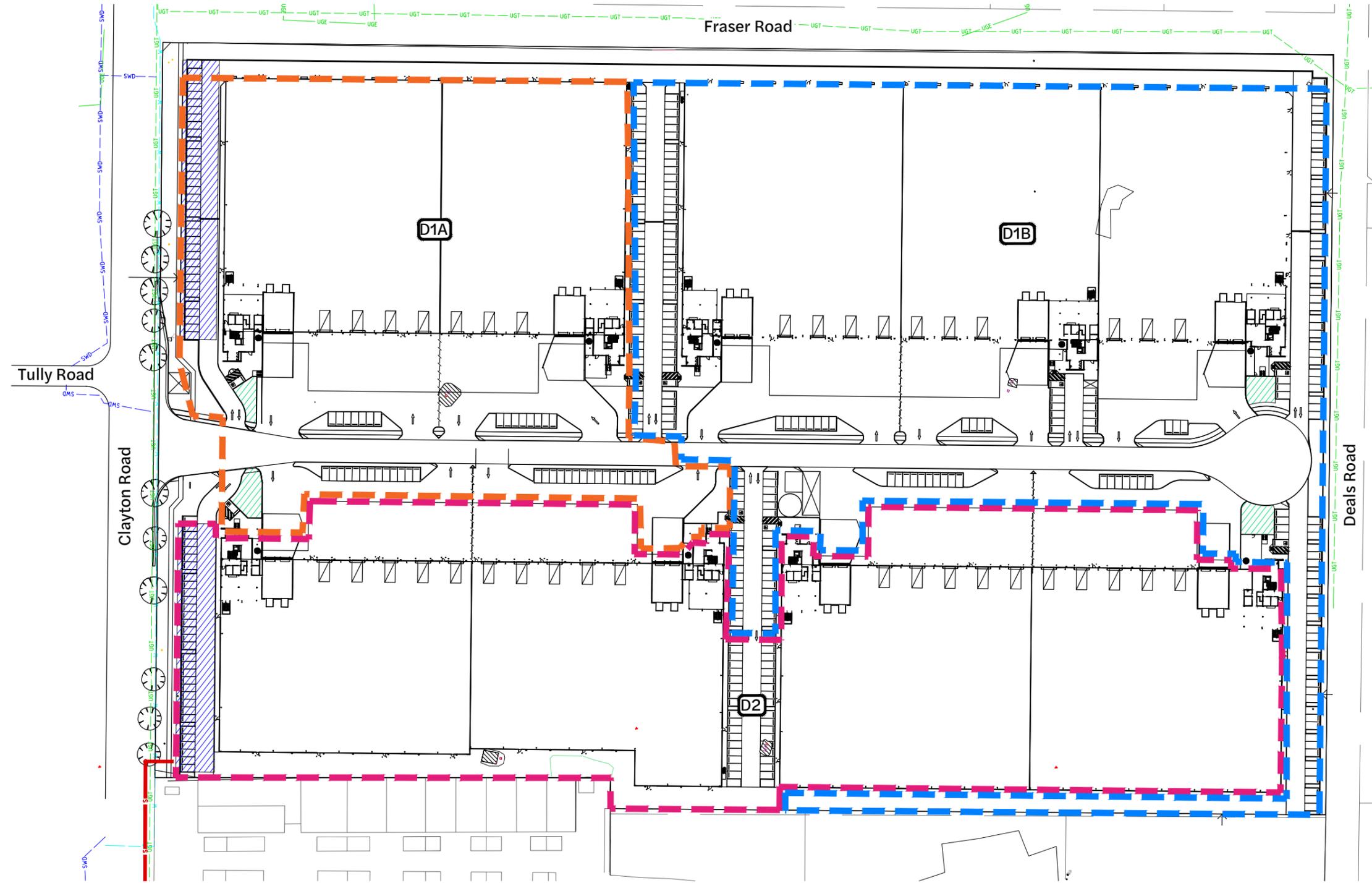


Drawing Title		
Stormwater Drainage Layout Plan		
Project No. C_23011	Drawing No. DA40	Revision 3

FILE: Z:\WORK\VIC_23011 - 618 CLAYTON ROAD CLAYTON VIC_MODEL\AUTOCAD\DWG\DRAWINGS\C_23011_DWG_STORMWATER_DRAINAGE_LAYOUT_PLAN.DWG LAST SAVED BY: CONE

Legend

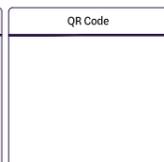
-  Property Boundary
-  Existing Stormwater Drainage
-  Existing Water Reticulation
-  Existing Gas
-  Existing Underground Electrical
-  Catchment D1A Boundary
-  Catchment D1B Boundary
-  Catchment D2 Boundary



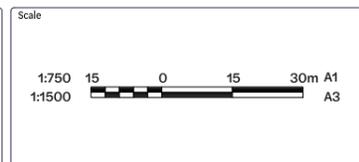
**ADVERTISED
PLAN**

Developed Catchment Plan
1:750 Scale

Revision	Date	Issue Details	Drawn	Designed	QR Code	Status
1	28.03.23	Issued for Approval	CG	EG		Issued for Approval Not for Construction
2	30.06.23	Issued for Approval	EG	EG		
3	06.11.23	Further Information Request Response	CG	EG		



Issued for Approval
Not for Construction



Client
Troon Group

Project
**618 Clayton Road
Clayton South**

Disclaimer
All dimensions to be checked on site by contractor prior to construction. Use written dimensions only, do not scale.



Drawing Title		
Developed Catchment Plan		
Project No. C_23011	Drawing No. DA42	Revision 3

ENERGY SERVICE PROVIDERS

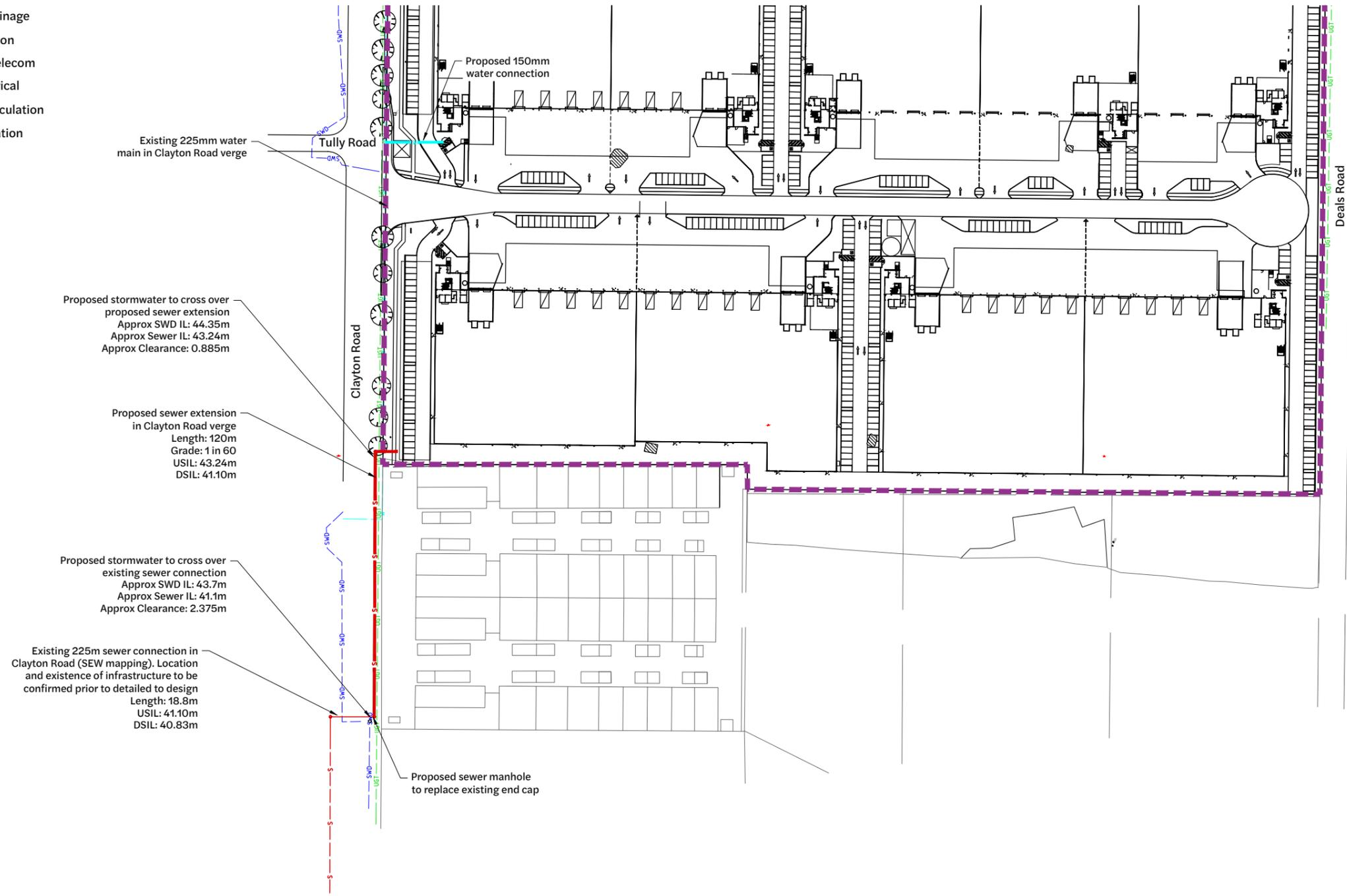
Note: Service locations are approximate only from provider plans. Locations are to be confirmed prior to the start of construction. Refer **Before You Dig** service location plans - available at www.byda.com.au

TELECOMMUNICATIONS SERVICE PROVIDERS

Note: Service locations are approximate only from provider plans. Locations are to be confirmed prior to the start of construction. Refer **Before You Dig** service location plans - available at www.byda.com.au

Legend

- Property Boundary
- Existing Sewerage Reticulation
- Existing Stormwater Drainage
- Existing Water Reticulation
- Existing Underground Telecom
- Existing Overhead Electrical
- Proposed Sewerage Reticulation
- Proposed Water Reticulation



Sewer & Water Layout Plan
1:1000 Scale

ADVERTISED PLAN

ENERGY SERVICE PROVIDERS

Note: Service locations are approximate only from provider plans. Locations are to be confirmed prior to the start of construction. Refer **Before You Dig** service location plans - available at www.byda.com.au

TELECOMMUNICATIONS SERVICE PROVIDERS

Note: Service locations are approximate only from provider plans. Locations are to be confirmed prior to the start of construction. Refer **Before You Dig** service location plans - available at www.byda.com.au

Revision	Date	Issue Details	Drawn	Designed	QR Code	Status
1	12.04.23	Issued for Information	EG	EG		Issued for Approval Not for Construction
2	30.06.23	Issued for Approval	EG	EG		
3	06.11.23	Further Information Request Response	CG	EG		

Scale
1:1000
1:2000

Scale

Client

Troon Group

Project

618 Clayton Road Clayton South

Disclaimer

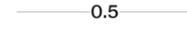
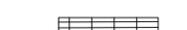
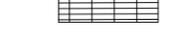
All dimensions to be checked on site by contractor prior to construction. Use written dimensions only, do not scale.



Drawing Title		
Sewer & Water Layout Plan		
Project No.	Drawing No.	Revision
C_23011	DA50	3

FILE: Z:\WORK\C_23011 - 618 CLAYTON ROAD CLAYTON VIC_MODEL\AUTOCAD\DWG\DWG\C_23011_DWG_SEWER & WATER LAYOUT PLAN.DWG LAST SAVED BY:CCO

Legend

-  Property Boundary
-  0.5 Existing Surface Contour
-  Existing Stormwater Drainage
-  Existing Sewerage Reticulation
-  Existing Water Reticulation
-  Existing Gas
-  Existing Overhead Electrical
-  Proposed Sediment Fence (or As Directed by Site Superintendent)
-  Temporary Exit Washdown Device - Refer Detail
-  Proposed Area of Disturbance
-  Inlet Protection

ADVERTISED
PLAN



Erosion and Sediment Control Layout Plan
1:1000 Scale

ENERGY SERVICE PROVIDERS



Note: Service locations are approximate only from provider plans. Locations are to be confirmed prior to the start of construction. Refer **Before You Dig** service location plans - available at www.byda.com.au

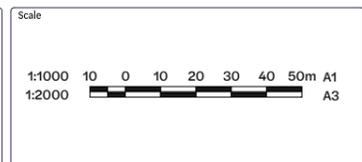
TELECOMMUNICATIONS SERVICE PROVIDERS



Note: Service locations are approximate only from provider plans. Locations are to be confirmed prior to the start of construction. Refer **Before You Dig** service location plans - available at www.byda.com.au

Revision	Date	Issue Details	Drawn	Designed	QR Code	Status
1	19.07.23	Issued for Approval	EG	EG		Issued for Approval Not for Construction
2	06.11.23	Futher Information Request Response	CG	EG		

Issued for Approval
Not for Construction



Client
Troon Group

Project
618 Clayton Road
Clayton South

Disclaimer
All dimensions to be checked on site by contractor prior to construction. Use written dimensions only, do not scale.



Drawing Title Erosion and Sediment Control Layout Plan		
Project No. C_23011	Drawing No. DA80	Revision 2

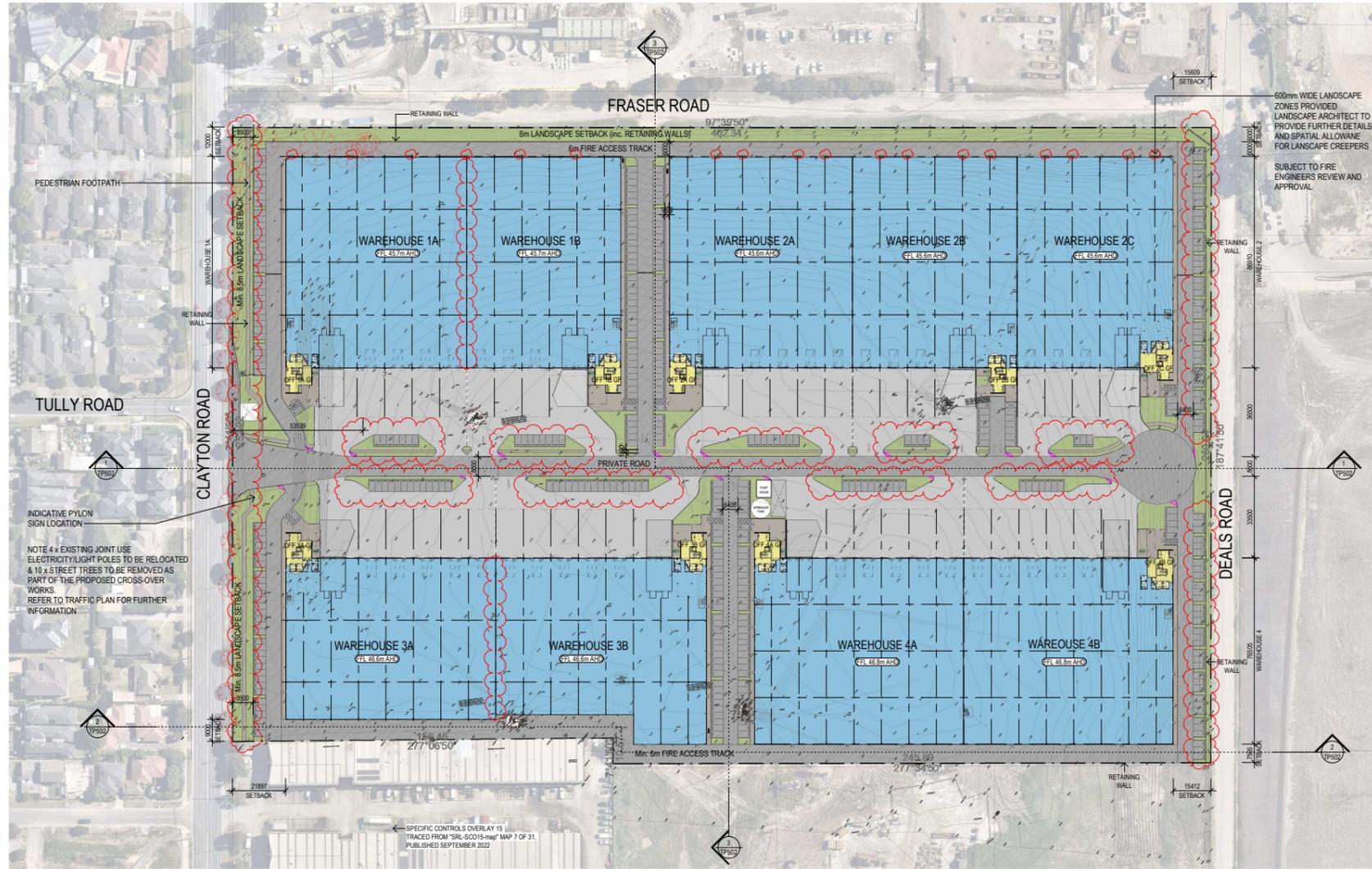
FILE: Z:\ARCHIVE\C_23011 - 618 CLAYTON ROAD\CLAYTON_E_MODEL\AUTOCAD\DWG\DWG\C_23011_DWG_EROSION AND SEDIMENT CONTROL LAYOUT PLAN.DWG LAST SAVED BY: CONTE

618 Clayton Road, Clayton South
ENGINEERING SERVICES REPORT

Appendix C Architectural Plans

TROON GROUP

**ADVERTISED
PLAN**



SITE CONCEPT PLAN
SCALE: 1: 1000

ADVERTISED PLAN

LEGEND

- INDICATES EXTENT OF HEAVY DUTY HARDSTAND TO CIVIL ENGINEERS DETAILS
- INDICATES EXTENT OF LIGHT DUTY PAVEMENT TO CIVIL ENGINEERS DETAILS
- CONCRETE PAVING WITH EXPOSED AGGREGATE FINISH OR SIMILAR
- AREA OF GRASS / LANDSCAPING. REFER TO LANDSCAPE ARCHITECT'S DRAWINGS FOR LANDSCAPE LAYOUT AND DETAILS
- SPECIFIC CONTROLS OVERLAY 15 TRACED FROM "SRL-SD015-map" MAP 7 OF 31, PUBLISHED SEPTEMBER 2022
- INDICATES LOCATION OF GAS PIT
- TREE TO BE REMOVED

NOTES

- ALL NEW CROSSOVERS IN ACCORDANCE WITH LOCAL COUNCIL REQUIREMENTS
- ALL PARKING SPACES IN ACCORDANCE WITH VICTORIAN PLANNING SCHEME
- ALL DISABLED PARKING SPACES IN ACCORDANCE WITH AUSTRALIAN STANDARD AS2890 (5.4m x 2.4m)
- SITE STORMWATER DRAINAGE IN ACCORDANCE WITH LOCAL AUTHORITY & COUNCIL REQUIREMENTS
- ALL RELATIVE LEVELS ARE SHOWN TO A H.D. (Australian Height Datum)
- AREAS CALCULATED HAVE BEEN TAKEN TO OUTSIDE FACE OF WALL GIRT TO WAREHOUSE AREAS AND OUTSIDE FACE OF EXTERNAL WALL TO ALL OTHER OFFICE AREAS.
- LEVELS SHOWN ARE INDICATIVE ONLY AND ARE SUBJECT TO FURTHER CIVIL ENGINEER DETAILED DESIGN. LEVELS MAY VARY +/- 300mm
- ALL EXTERNAL LIGHTING TO BE ENERGY EFFICIENT, WITH SUITABLE BATTERIES, INSTALLED AS PER AS1158.4 AND LOCATED SO THAT NO DIRECT LIGHT IS EMITTED OUTSIDE THE SITE.
- SURVEY OVERLAIN ON PLAN IS PROVIDED BY TAYLORS, DOCUMENT NAME "23219 - PS (V1)"

DEVELOPMENT ANALYSIS

	AREA	PERCENTAGE
SITE AREA	103,536m ²	
SITE COVERAGE	65,529m ²	63%
PERMEABILITY	7,603m ²	7.4%

PLEASE NOTE OVERALL AREAS ARE BASED ON THE EXISTING SURVEY PROVIDED BY TAYLORS, DOCUMENT NAME "23219 - PS (V1)"

DEVELOPMENT ANALYSIS

BUILDING	GLA	NFA
WAREHOUSE 1		WAREHOUSE 1
TENANCY 1A	6,430 m ²	5372 m ²
WAREHOUSE 1A	135 m ²	129 m ²
OFFICE	325 m ²	299 m ²
OFFICE	6,891 m ²	5800 m ²
TENANCY 1B		TENANCY 1B
WAREHOUSE	5,487 m ²	4595 m ²
OFFICE	135 m ²	129 m ²
OFFICE	325 m ²	299 m ²
TOTAL WAREHOUSE 1 AREA	12,639 m ²	10,823 m ²
WAREHOUSE 2		WAREHOUSE 2
TENANCY 2A		TENANCY 2A
WAREHOUSE	6,505 m ²	5436 m ²
OFFICE	135 m ²	129 m ²
OFFICE	325 m ²	299 m ²
OFFICE	6,966 m ²	5864 m ²
TENANCY 2B		TENANCY 2B
WAREHOUSE	5,867 m ²	4963 m ²
OFFICE	126 m ²	120 m ²
OFFICE	335 m ²	308 m ²
OFFICE	6,328 m ²	5391 m ²
TENANCY 2C		TENANCY 2C
WAREHOUSE	5,487 m ²	4585 m ²
OFFICE	152 m ²	146 m ²
OFFICE	306 m ²	279 m ²
OFFICE	5,945 m ²	5010 m ²
TOTAL WAREHOUSE 2 AREA	19,239 m ²	16,265 m ²
WAREHOUSE 3		WAREHOUSE 3
TENANCY 3A		TENANCY 3A
WAREHOUSE	5,688 m ²	4588 m ²
OFFICE	135 m ²	129 m ²
OFFICE	325 m ²	299 m ²
OFFICE	6,148 m ²	4887 m ²
TENANCY 3B		TENANCY 3B
WAREHOUSE	5,918 m ²	4688 m ²
OFFICE	135 m ²	129 m ²
OFFICE	325 m ²	299 m ²
OFFICE	6,379 m ²	5116 m ²
TOTAL WAREHOUSE 3 AREA	12,528 m ²	10,003 m ²
WAREHOUSE 4		WAREHOUSE 4
TENANCY 4A		TENANCY 4A
WAREHOUSE	6,547 m ²	5305 m ²
OFFICE	135 m ²	129 m ²
OFFICE	325 m ²	299 m ²
OFFICE	7,007 m ²	5733 m ²
TENANCY 4B		TENANCY 4B
WAREHOUSE	6,507 m ²	5339 m ²
OFFICE	133 m ²	127 m ²
OFFICE	328 m ²	313 m ²
OFFICE	6,968 m ²	5779 m ²
TOTAL WAREHOUSE 4 AREA	13,975 m ²	11,512 m ²
TOTAL AREA	58,581 m ²	48,603 m ²

PARKING	NO.
WAREHOUSE 1	
1A RATE (PER 100m ²)	0.60
CAR BAYS	41
ACCESSIBLE	1
1B RATE (PER 100m ²)	0.82
CAR BAYS	48
ACCESSIBLE	1
WH1 TOTAL	91
WAREHOUSE 2	
2A RATE (PER 100m ²)	0.76
CAR BAYS	48
ACCESSIBLE	1
2B & 2C RATE (PER 100m ²)	0.51
CAR BAYS	60
ACCESSIBLE	2
WH2 TOTAL	111
WAREHOUSE 3	
3A RATE (PER 100m ²)	0.75
CAR BAYS	45
ACCESSIBLE	1
3B RATE (PER 100m ²)	0.86
CAR BAYS	53
ACCESSIBLE	1
WH3 TOTAL	100
WAREHOUSE 4	
4A RATE (PER 100m ²)	0.72
CAR BAYS	47
ACCESSIBLE	1
4B RATE (PER 100m ²)	0.68
CAR BAYS	44
ACCESSIBLE	1
WH4 TOTAL	93
CAR PARK TOTAL	395

No.	DATE	REVISION	BY	CHK
P2	05.05.2023	PRELIMINARY ISSUE	JB	GA
P3	07.06.23	PRELIMINARY ISSUE	JB	BM
A	07.08.2023	COUNCIL SUBMISSION	JB	BM
P4	20.10.2023	PRELIMINARY ISSUE	SP	BM
PS	27.10.2023	PRELIMINARY ISSUE	SP	BM

All areas indicated are indicative for design and planning purposes only and should not be used for any contractual reasons without verification by a licensed surveyor or further design development being completed.

Watson Young Architects Pty. Melbourne (Pty) (Sydney) © 2018-2023 ACN 11138700
6 Garton Street Prahran VIC 3181 | e: info@watsonyoung.com.au | w: watsonyoung.com.au
© Watson Young Architects. This drawing is protected by copyright.

PROJECT:
PROPOSED INDUSTRIAL DEVELOPMENT
618 CLAYTON ROAD, CLAYTON STH VIC

TITLE:
ESTATE MASTER PLAN



CLIENT:
TROON
GROUP

DATE: JANUARY, 2022
DRAWN BY: JB
SCALE: 1:1000 @ B1
SCALE:

JOB NO:
21326
DRAWING NO:
TP002
REVISION:
P5

watson young

618 Clayton Road, Clayton South
ENGINEERING SERVICES REPORT

Appendix D Lanfill Rehabilitation Plan

TROON GROUP

**ADVERTISED
PLAN**



ADVERTISED PLAN

19 March 2015

Julian Howard
Environment Specialist
Transpacific Waste Management
46 Victory Road
CLARINDA VIC 3169

Our ref: 31/27076/06
241271
Your ref:

Dear Julian

Former Clayton Road Landfill Auditor's Verification of Rehabilitation Plan

1 Introduction

Transpacific Waste Management (TWM) has engaged Wajahat Bajwa (an EPA appointed environmental auditor) of GHD to review and verify the Landfill Rehabilitation Plan prepared by Tonkin & Taylor Pty Ltd (T&T) in relation to the former Clayton Road landfill (the landfill). This letter outlines the Auditor's review of the Landfill Rehabilitation Plan in the context of relevant EPA guidelines, which is the basis for the Auditor's verification of the Landfill Rehabilitation Plan.

1.1 Context

EPA issued supporting PAN 90003966 on 23 January 2014 in relation to the landfill. This letter addresses the following PAN requirements, in particular LC3.2:

- LC3.1 By 31 March 2015 you must supply to the Authority an updated Landfill Rehabilitation Plan for the premises. The Landfill Rehabilitation Plan must contain time bound milestones for implementation.*
- LC3.2. The Landfill Rehabilitation Plan referred to in requirement 3.1 must be verified by an environmental auditor appointed pursuant to the EP Act to ensure that it is in accordance with the most recent version of the Best Practice Environmental Management Guidelines, Siting, Design, Operation and Rehabilitation of Landfills (EPA Publication 788) (the Landfill BPEM).*
- LC3.3. The Landfill Rehabilitation Plan must include:*
- a) *An assessment of landfill cap performance on the single landfill cell to determine if current capping at the premises;*
 - i. *reduces infiltration of surface water to minimise the risks of impacts on groundwater, or where impacts on groundwater have occurred, that these impacts are not worsened and;*
 - ii. *is sufficient to allow any landfill gas management measures to achieve compliance with the landfill gas action levels in Table 6.4 of the landfill BPEM.*
 - b) *Where required, a landfill cap design specification and Construction Quality Assurance (CQA) plan in accordance with the Landfill BPEM and Section 18 of EPA Publication 1323.2 (2011) the Landfill Licensing Guidelines, detailing any additional capping work needed to meet this requirement.*



ADVERTISED PLAN

2 Assessment scope

The scope of the Auditor's assessment includes consideration of the Landfill Rehabilitation Plan in relation to:

- The requirements of the PAN.
- The requirements set out in the Closed Landfill Guidelines.

3 Overview of auditors assessment

The Landfill Rehabilitation Plan does not comment on whether the existing cap profile is in accordance with a former version of the Landfill BPEM, previous EPA approval for a former licence condition. Rather, a cap performance assessment has been carried out.

The Auditor has specifically assessed the Landfill Rehabilitation Plan against the requirements of the PAN and the Closed Landfill Guidelines. EPA advised that, with consideration to the Closed Landfill Guidelines, compliance with the current Landfill BPEM requirements is not strictly required, as the landfill has already been capped in accordance with a previous approval.

The Auditor considers that the cap was constructed in general accordance with the previous Waste Discharge Licence ES286/2, and as such a cap performance assessment may not be necessary at this stage.

However the Auditor has reviewed the cap performance assessment prepared by T&T and provides the following comments:

- The Auditor has reviewed the landfill cap investigation to confirm that existing cap generally complies with previous licence condition 11, which required that:
 - (a) *At cessation of waste disposal operations a final cover consisting of at least 500 millimetres depth of compacted clean earth shall be placed over the landfill.*
 - (b) *The final surface of the site after covering as specified in paragraph (a) shall be graded, drained and vegetated in such a manner as to minimise erosion and to prevent ponding of stormwater.*

Whilst some areas of the cap were found to contain less than 0.5 m of compacted clay, the total cap thickness in these areas was generally in excess of 1 m. Noting the previous licence condition 11 (a) required a final cover of compacted earth (as opposed to compacted clay), the cap seems to have met this requirement. T&T also observed that the cap surface was well grassed with no signs of erosion damage to the landfill cap; although there were some bare to sparse areas of vegetation due to vehicle traffic. No significant depressions in the cap were observed by T&T. As such, the Auditor is satisfied that the requirements of previous licence conditions 11 (a) and (b) have been met.

- Three undisturbed samples of the compacted clay within the landfill cap were collected by T&T, and laboratory analysis showed permeability ranging from 9×10^{-11} to 3×10^{-9} . Whilst the previous licence condition 11 did not include a permeability requirement, this indicates that the existing cap can be expected to have a low permeability, and seepage through the cap will be reduced.
- T&T has conducted HELP modelling to evaluate stormwater infiltration into the landfill waste mass during an average year and for a 90th percentile 2 year wet period. The model results indicate that



ADVERTISED PLAN

infiltration at the site is expected to range between 112 L/ha/day and 468 L/ha/day. It is noted that T&T has referred to the Landfill BPEM seepage rate requirement for a Type 3 landfill cap (i.e. 750 L/ha/day), however the Auditor considers that the requirement for a Type 2 landfill is applicable as the landfill has accepted putrescible waste (i.e. 7.5 L/ha/day). As such the existing landfill cap does not meet the seepage rate requirement of the current Landfill BPEM. Regardless, as discussed above, compliance with this Landfill BPEM requirement is not applicable.

- Surface gas emissions monitoring conducted in January 2014 and August 2014 shows that surface methane concentrations were generally below the relevant landfill gas action level (100 ppm for final cap), however one exceedance at a single discrete location near the northern edge of the existing cap was noted in August 2014. It is understood that localised repair works will be carried out to remove the defective area of the cap, if the exceedance is detected during the next surface gas monitoring event. The Auditor agrees with T&T's conclusion that the existing landfill cap is considered adequate to generally achieve compliance with the landfill gas action level, with the exception of occasional localised defects that can be readily repaired.
- The Auditor expects that potential impacts to groundwater associated with the landfill will be assessed through the Hydrogeological Assessment (HA) currently being prepared and future regional groundwater audits in the aftercare period. The HA is required to specify maximum target leachate levels for the landfill which allow for protection of the groundwater environment and effective management of landfill gas.
- It is noted that the risk of landfill gas impact via other pathways (i.e. sub-surface migration) will be assessed in the Auditor's verification of the HA, and in subsequent future aftercare management audits. A total of 12 perimeter landfill gas monitoring bores are in the process of being installed and monitored to inform the Auditor's verification of the HA.
- Other than maintenance of the existing landfill cap (as required), no further rehabilitation works have been identified for the site. The Auditor considers that the need for further rehabilitation works may be identified through the regional groundwater audits, future aftercare management audits and HA discussed above.

4 Auditor's verification of Landfill Rehabilitation Plan

I, Wajahat Bajwa of GHD, an environmental auditor (appointed pursuant to the *Environment Protection Act 1970*) am of the opinion that the report *Landfill Rehabilitation Plan, Clayton Road Landfill* prepared by T&T, dated February 2015, has:

- been prepared in accordance with the relevant requirements of the PAN and the Closed Landfill Guidelines, as set out in Attachment 2.
- included an assessment of the performance of the landfill cap, although the Auditor considers that the cap was constructed in general accordance with the previous Waste Discharge Licence ES286/2, and as such a cap performance assessment is not necessary.

The Auditor expects that potential landfill gas risk and impacts to groundwater associated with the landfill will be assessed through the aftercare management auditing process including the regional groundwater audits. Further, the HA currently being prepared in response to another supporting PAN is required to



specify maximum target leachate levels for the landfill which allow for protection of the groundwater environment and effective management of landfill gas. It is considered that further rehabilitation works may need to be implemented should unacceptable risks be identified through the auditing process or if an improved cap is considered necessary in achieving and maintaining the target leachate levels set out by the above referred HA.

Yours sincerely

A handwritten signature in black ink, appearing to read 'Wajahat Bajwa', is written over a light blue rectangular background.

Wajahat Bajwa

Environmental Auditor (appointed pursuant to the *Environment Protection Act 1970*)
(03) 8687 8752

Attachments: 1. Landfill Rehabilitation Plan, Clayton Road Landfill
2. Auditor's review of rehabilitation plan

**ADVERTISED
PLAN**



Attachment 1

Landfill Rehabilitation Plan, Clayton Road
Landfill

**ADVERTISED
PLAN**

REPORT

Transpacific Waste Management

Landfill Rehabilitation Plan
Clayton Road Landfill, Clayton Road,
Clayton South

ADVERTISED PLAN

Report prepared for:

Transpacific Waste Management

Report prepared by:

Tonkin & Taylor Pty Ltd

Distribution:

Transpacific Waste Management

1 copy

EPA Victoria

1 copy

Tonkin & Taylor Pty Ltd (FILE)

1 copy

February 2015

T&T Ref: 4480.000-Rev1



Table of contents

1	Introduction	1
1.1	General	1
1.2	Purpose and scope	1
1.3	PAN requirements	1
1.4	EPA guidance	2
2	Site description	3
2.1	Site location & setting	3
2.2	Historical landfilling activity	3
2.3	Groundwater audits	3
2.4	Surrounding land use	4
2.5	Post-closure after-use	5
2.5.1	Proposed site after-use	5
2.5.2	Cap operational requirements to maintain proposed after-use	5
3	Assessment of existing landfill cap	6
3.1	Landfill cap design	6
3.2	Landfill cap construction	6
3.3	Landfill cap investigation	6
3.3.1	General	6
3.3.2	Definitions	7
3.3.3	Investigation scope and preliminary works	7
3.3.4	Site observations	7
3.3.5	Results	7
3.3.6	Landfill gas assessment	9
3.3.7	Seepage assessment	9
3.3.8	Assessment of cap performance	10
4	Pre- and post-settlement contours	12
5	Preservation/installation of infrastructure through cap	13
5.1	Preservation of existing infrastructure through the cap	13
5.2	Installation of new infrastructure penetrating the cap	13
6	Proposed rehabilitation works and timelines	14
6.1	Proposed rehabilitation works	14
6.2	Procedure to rehabilitate minor localised defects	14
6.3	Rehabilitation timelines	15
7	Applicability	16

**ADVERTISED
PLAN**

Figures

Appendix A:	Pollution abatement notice (ID. 90003966)
Appendix B:	1988 landfill cap design
Appendix C:	Investigation Borehole Logs
Appendix D:	Permeability Test Results
Appendix E:	2014 surface emission walkover survey results
Appendix F:	HELP model for infiltration assessment
Appendix G:	Final landfill cap contours (from Golder, 1990)
Appendix H:	2009 site topographic and feature survey (Charter Keck Cramer)

1 Introduction

1.1 General

Tonkin & Taylor Pty Ltd (T&T) has prepared this Landfill Rehabilitation Plan (LRP) on behalf of Transpacific Waste Management (TWM) for the closed Clayton Road Landfill (the site), located on the corner of Clayton Road and Ryans Road, Clayton South, Victoria. The site location is shown on Figure 1.

1.2 Purpose and scope

This LRP has been prepared to meet the requirements of the Supporting Pollution Abatement Notice (PAN) ID. 90003966, issued to the site on 21 January 2014 as part of the routine post-closure process described in EPA Publication 1490 (refer Section 1.3) and has been prepared in general accordance with the guidelines presented by EPA (refer Section 1.4).

This plan includes the following:

- An assessment on the adequacy of the existing landfill cap;
- The potential after-uses of the site; and
- Pre- and post-settlement contours for the site.

1.3 PAN requirements

The site operated between 1975 and 1989 under EPA Waste Discharge Licence ES286/2, dated 9 May 1975 and with the last known amendment in December 1989¹. After closure, the site was issued a PAN (ID: 6382), first issued 6 August 1992 and last amended on 28 June 2007. The EPA issued the site with a Supporting PAN (Notice ID #90003966) on 21 January 2014. A copy of the PAN (ID. 90003966) is provided in Appendix A.

This LRP addresses Condition LC3.1 and Condition LC3.5 of the Supporting PAN (ID. 90003966):

“LC3.1 By 31 March 2015 you must supply to the Authority an updated Landfill Rehabilitation Plan for the premises. The Landfill Rehabilitation Plan must provide time bound milestones for implementation.”

“LC3.3. The Landfill Rehabilitation Plan must include:

- a) An assessment of landfill cap performance on the single landfill cell to determine if current capping at the premises:
 - i) reduces infiltration of surface water to minimise the risks of impacts on groundwater, or where impacts on groundwater have occurred, that these impacts are not worsened.*
 - ii) is sufficient to allow any landfill gas management measures to achieve compliance with the landfill gas action levels in Table 6.4 of the landfill BPEM.**
- b) Where required, a landfill cap design specification and Construction Quality Assurance (CQA) plan in accordance with the Landfill BPEM and Section 18 of EPA*

¹ Based on references in correspondence from Golder Associates (Golder Associates, *Former Tip Site – Clayton Road/Ryans Road, Clayton – Town Planning Permit TP 112100*, 23 April 1990). It is noted that this version of the licence has not been sighted. The latest licence provided to us by TWM was dated August 1987.

Publication 1323.2 (2011) the Landfill Licensing Guidelines, detailing any additional capping work needed to meet this requirement.”

Auditor verification of this LRP will be required, in accordance with Condition LC3.2 of the PAN (ID. 90003966):

“LC3.2. The Landfill Rehabilitation Plan referred to in requirement 3.1 must be verified by an environmental auditor appointed pursuant to the EP Act to ensure that it is in accordance with the most recent version of the Best Practice Environmental Management Guidelines, Siting, Design, Operation and Rehabilitation of Landfills (EPA Publication 788) (the Landfill BPEM)”

1.4 EPA guidance

This LRP has been developed based on the guidelines presented in the following documents:

- EPA Publication 788.2: Best Practice Environmental Management - Siting, Design, Operation and Rehabilitation of Landfills, dated October 2014.
- EPA Publication 1323.2: *Landfill Licencing Guidelines*, dated August 2011.
- EPA Publication 1490: *Closed Landfill Guidelines*, dated December 2012

**ADVERTISED
PLAN**

2 Site description

2.1 Site location & setting

The site is located at the corner of Clayton Road and Ryans Road, Clayton South, Victoria. The site occupies approximately 14 hectares and was a former sand quarry before landfilling commenced in the quarry void from 1975 to 1989.

The site has been capped with a nominal 500 mm compacted clay and 250 mm topsoil. The landfill cap design provided for a mounded profile to encourage stormwater to shed from the site. The mounded area is surrounded by open channel earthen drains that discharge at the corners of the site.

The site is also well vegetated, minimising the potential for erosion/scouring to the landfill cap.

A landfill gas extraction system has been installed by Energy Developments Limited (EDL) with the collected gas used for electricity generation. The power generation plant is located on the south east corner of the site.

The area surrounding the site is generally flat. The ground elevation at the site ranges between approximately 40 mAHD² to 46.8 mAHD and is dominated by the mound located approximately in the centre of the site.

The site location is shown on Figure 1.

2.2 Historical landfilling activity

The landfill operated between 1975 and 1989 as a single, unlined, monocell accepting mainly solid inert waste and some putrescible waste from industrial sources totalling approximately 3,750,000 m³. The exact depth of waste is not known, but estimated to be between 20 m to 25 m deep.

The site was constructed without any base or sidewall liners, consistent with industry practice at the time. No leachate extraction occurs at the site, although three leachate sumps have recently been installed. There is a landfill gas extraction system installed at the site.

The as-built final cap that covers the site is made up of a nominal 500 mm layer of compacted clay covered by a 250 mm topsoil layer, which is understood to have been completed in 1992. The site is mounded with a peak in the central area allowing surface water to flow around the edges of the site.

2.3 Historical groundwater assessment

Regular environmental monitoring is carried out at the site, as part of the Clayton South Groundwater Study Area (CSGSA). The last environmental audit of the CSGSA³ defined the extent of the CSGSA as including a number of adjoining closed and operating landfills in the Clayton South area, including:

- Clayton Road (closed) landfill (i.e. the site);
- Ryans Road (closed) landfill;
- Deals Road (closed) landfill;

² AHD = Australian Height Datum

³ Golder Associates (Golder, 2010), *Stage 3 Environmental Audit Report – Regional Groundwater in the Clayton South Area*, 087613097-007-R-Rev 1, 22 March 2010 (herein “the 2010 Audit”),

- Fraser Road landfill;
- Victory Road landfill; and
- Clayton Regional landfill.

The study area also incorporates the Spring Valley Golf Course, two other closed landfills⁴, a sand quarry, market gardens and a former commercial nursery. The 2010 Audit also notes that there are “several” other closed landfill within the vicinity of the CSGSA.

The 2010 Audit concluded that

- Groundwater quality monitoring results indicated that there were impacts to the underlying aquifers (the Brighton Group Aquifer and Fyansford Formation Aquifer) derived from landfilling activities within the CSGSA.
- It was likely that all beneficial uses within the study area were precluded on the basis of several parameters/analytes (i.e. pH, TDS, chloride, sodium, ammonia, sulphate, manganese and iron), but that risks could be managed through restricting groundwater extraction and consideration of groundwater levels in later landfill cell designs; and
- A potential risk of harm was identified to down-gradient groundwater beneficial uses resulting from landfilling activity within the CSGSA. The affected beneficial uses included potable water supply, agriculture, primary contact recreation, parks and gardens and industrial water supply.

In December 2014, the Auditor provided TWM with a draft review of groundwater monitoring results for the period February 2010 to January 2014⁵. Based on this review, the Auditor concluded that, during the monitoring period under consideration:

- There was no significant change to the quality of the groundwater at the southern boundary of the CSGSA (i.e. down gradient of the landfills) in existing monitoring wells; and
- There was no significant change to the groundwater quality in the irrigation quality boundary (i.e. a sub-area within the main study area), although in some cases there were indications of impacts to groundwater quality at wells around Fraser Road, Ryans Road and Victory Road landfills.

It is noted that, except for certain specific cases (i.e. as noted above), the 2010 Audit and the 2014 assessment consider the quality of groundwater within the CSGSA as a whole. That is, the potential contribution of any one site to impacts on groundwater quality are (generally) not defined and it is the risks associated with the combined impact of all sites that has been assessed.

2.4 Surrounding land use

The property uses surrounding the site are presented in Table 2-1.

ADVERTISED PLAN

⁴ Including a former landfill now on the Allied Sands site north of the Victory Road landfill and the former City of Prahran landfill in the north east corner of the closed Deals Road landfill. The 2010 Audit notes that limited information is available for these two sites.

⁵ Golder Associates (Golder, 2014), *Auditor Review of Groundwater Monitoring for Clayton South Landfills* [DRAFT], reference 107613046-025-R-RevA, December 2014.

Table 2-1: Surrounding land use

Direction	Land use
North	Industrial area including Boral Concrete, light commercial office units.
East	Fraser Rd Landfill. Further east is the Grange recreational reserve and the Spring Valley Golf Club, with residential and commercial/light industrial facilities further east. The nearest residential buildings are located approximately 1km east-northeast of the site.
South	Industrial site directly south and further south Clayton Rd Regional Landfill (A Council operational putrescible landfill). To the south west is a poultry farm and quarry.
West	To the immediate west and north west are residential areas. The closest residential home is located 25 m west of the landfill across Clayton Rd. To the south west is the Victory Rd Landfill (TWM's operational solid inert landfill, ES419). Further to the south west, is a poultry farm and quarry.

2.5 Post-closure afteruse

2.5.1 Proposed site afteruse

The 1988 report prepared by Golder Associates Pty Ltd (Golder, 1998⁶) indicated that the proposed site afteruse is restricted to low-rise public and commercial buildings or public or open space/passive recreation. However, we note that the current site owner (Serpentine Investments Limited) has advised TWM that there are currently no plans to develop the site at the conclusion of the aftercare period.

If low rise public and commercial building were to be constructed on the site, appropriate engineering controls would need to be included in the building design(s) to mitigate risks associated with differential settlement and landfill gas.

2.5.2 Cap operational requirements to maintain proposed after-use

Other than routine monitoring and maintenance to both the landfill capping system and other landfill control and monitoring infrastructure, there are no specific operational requirements for the on-going suitability of the landfill cap for its proposed after-use.

The requirements for on-going routine monitoring and maintenance are described in the Aftercare Management Plan⁷.

**ADVERTISED
PLAN**

⁶ Golder Associates (Golder, 1988), *End Use Development, Clayton Road Landfill, Clayton*, reference 88612104, dated 8 September 1988.

⁷ Tonkin & Taylor Pty Ltd (T&T, 2015), *Aftercare Management Plan, Clayton Road (Closed) Landfill*, reference 4480.000, dated February 2015.

3 Assessment of existing landfill cap

3.1 Landfill cap design

The landfill cap design was prepared by Golder in 1988:

- Cleanaway Final Cover Design - Clayton Road Landfill Site, Clayton, reference 88612104, dated May 1988.

The design required the construction of a landfill cap that included:

- Minimum 0.5 m of compacted clayey soil; and
- Between 0.2 m to 0.3 m of organic rich topsoil.

Additional specification for the completed clayey soil layer required:

- Low plasticity sandy or silty clay, or clayey sand, with not less than 40% (by weight) of the material passing the 0.075 mm sieve size.
- No rock inclusion greater than 50 mm in diameter, to comprise not more than 10 % (by weight) of the clayey soil.
- Clayey soil placed in maximum 300 mm thick loose layers to achieve not less than 90 % Standard compaction for the first layer and not less than 95 % Standard compaction for the upper layer.

The landfill cap was designed to produce a mound, in order to minimise the effect of settlement and to promote runoff of stormwater from the site, with target post-settlement grades of between 5 % and 8 %.

A conceptual perimeter drainage system was proposed, requiring minimum design falls of 1:100. Discharge points were nominated at the northeast, northwest and southeast corners of the site.

The 1988 Golder design has been provided in Appendix B.

3.2 Landfill cap construction

The construction of the landfill cap is understood to have been completed in the first half of 1992⁸.

However a construction verification report (or similar document) has not been sighted, which summarises the construction methodologies and results of materials testing carried out.

3.3 Landfill cap investigation

3.3.1 General

On 6 October 2014, T&T carried out an investigation of the landfill cap. The objective of the investigation was to assess the materials used in the landfill cap construction and to determine thickness and *in situ* permeability of the compacted clayey soil layer.

⁸ Based on an internal memo by Envirogard dated July 1992, discussing clay volumes used following the completion of capping works. Envirogard was a subsidiary of Brambles Australia Ltd, which was the Licence Holder for the site at the time.

3.3.2 Definitions

For the purposes of this investigation, the following definitions are used:

- “Low permeability layer” refers to the low permeability layer of clayey soil installed as a barrier to surface water infiltration into the waste and emissions of landfill gas to the ambient atmosphere.
- “Landfill cap” refers to the existing soil profile from the top of waste to the current surface level across the site. Landfill caps typically comprise of one or more layers including a low permeability layer and a topsoil layer to promote vegetation growth.

3.3.3 Investigation scope and preliminary works

The scope of work required eight boreholes to be drilled across the site, with a maximum depth of approximately 1.0 m and the collection of three undisturbed samples to assess the permeability of the low permeability layer.

The borehole locations were selected taking into account the location of the existing landfill gas extraction system infrastructure. The locations were marked out on site using GPS and an accredited buried serviced locator cleared the borehole locations of buried infrastructure.

3.3.4 Site observations

During the investigation works, it was observed that the landfill cap comprises an elongated mound located in the approximate centre of the site.

The cap surface is well grassed and no signs of erosion damage to the landfill cap were observed during the works – although there were some bare to sparse areas of vegetation due to vehicle traffic. No significant depressions in the cap were observed during the works.

Based on observations, stormwater can be expected to migrate from the top of the mound to the site boundaries, where drains have been installed around most of the site. While the drains did have grass growing in them, they were distinct and did not appear blocked with dirt or debris.

3.3.5 Results

All eight (8) boreholes were drilled to a maximum depth of 1.5 mbgl⁹. The bore locations are shown on Figure 2 and borehole logs provided in Appendix C. The results are summarised in Table 3-1.

**ADVERTISED
PLAN**

⁹ below ground level

Table 3-1: Summary of drilling works

Borehole ID	Cap thickness ¹ (m)	Topsoil thickness (m)	Thickest clay layer (total clay thickness) ² (m)	Borehole depth (m bgl)
BH01	1.5+	0.6	0.4	1.5
BH02	1.5+	0.1	0.4 (1)	1.5
BH03	1.5+	0.3	1.2	1.5
BH04	1.5+	0.3	0.35	1.5
BH05	1.5+	0.1	1.4	1.5
BH06	1.1	0.2	0.9	1.5
BH07	1.5+	0.3	0.75 (0.95)	1.5
BH08	1.5+	0.1	0.9 (1.1)	1.5

Notes:

1. Test boreholes terminated at 1.5 m below ground level. Where depth to waste is reported at 1.5+, this indicates that waste was not encountered in the test boreholes.
2. In places across the cap, multiple clay layers were observed in the boreholes that were separated by distinct layers of sand. Therefore, results for these areas include both the thickness of the largest distinct clay layer as well as the total (combined) thickness of clay observed within the cap profile.

Observations from the drilling investigation are summarised as follows:

- There is a variable thickness of low permeability clay present across the site, between 0.35 m and 1.4 m thick.
- At BH02, BH07 and BH08, low permeability clay layers were interspaced with layers of more permeable material (i.e. sand). However, the cumulative thickness of the individual clay layers was approximately 1 m.
- There was only approximately 0.35 m of low permeability clay encountered at BH04. However, this was overlain by approximately 300 mm of clayey silt, which can be expected to be of relatively low permeability and impede infiltration of surface water through the landfill cap.
- The “true” thickness of the clay layer at the base of BH01 is unknown, as the borehole terminated within this layer and is likely to be thicker than observed during the drilling works.
- While the clay at the base was interpreted as being fill, the presence of plastic bags is unusual and has been interpreted as being windblown debris.
- Waste was generally not encountered in the drilling works at the site, except at BH06.

Three undisturbed samples were collected from BH04, BH05 and BH08 using U63 push-tubes. The samples were tested for permeability at the NATA¹⁰ accredited laboratories of Chadwick Geotechnics Pty Ltd (CGeo). The test results are provided in Appendix D and are summarised in Table 3-2.

**ADVERTISED
PLAN**

¹⁰ NATA – National Association of Testing Authorities (Australia)

Table 3-2: Permeability test results

Borehole ID	Laboratory Tested Permeability (m/sec)
BH04	3×10^{-9}
BH05	2×10^{-10}
BH08	9×10^{-11}

**ADVERTISED
PLAN**

Based on the outcomes of the permeability testing, the following is noted:

- Of the three samples collected to establish the permeability of the capping material, two samples were of significantly lower permeability than recommended by the Landfill BPEM.
- The permeability of the remaining sample (BH04) marginally failed to meet the Landfill BPEM recommended value but will still limit infiltration of stormwater through the landfill cap and, given the local geology, will likely be of lower permeability than the surrounding *in situ* soils.

3.3.6 Landfill gas assessment

The site has an active landfill gas collection system installed, comprising approximately 70 extraction wells. The extracted landfill gas is used to generate electricity at the power generation station located in the south east corner of the site.

Surface emissions walkover surveys were carried out at the site in January 2014 and August 2014, to monitor for methane emissions migrating through the landfill cap. The results of the surveys are provided in Appendix E. The surface emission walkover surveys were carried out during periods of generally decreasing barometric pressure (i.e. when higher emissions of landfill gas to the surface can be expected).

Generally no fugitive landfill gas emissions were detected at the site above 100 ppm¹¹ during the walkover surveys. The only exception was during August 2014 at a single discrete location near the northern edge of the existing cap.

TWM has been advised of the results and are understood to be awaiting the next survey (due early 2015) to verify whether the hotspot remains. If it is still present, then localised repair works will be carried out to remove the defective area of the cap.

Based on the results of the surface emissions walkovers, the existing landfill cap is considered adequate to generally achieve compliance with the landfill gas recommendations of the Landfill BPEM, with the exception of occasional localised defects that can be readily repaired (refer Section 6).

3.3.7 Seepage assessment

The results of the October 2014 field investigation were entered into a HELP¹² model to evaluate the stormwater infiltration into the landfill waste mass during an average year and for a 90th percentile 2 year wet period.

¹¹ The Landfill BPEM requires no more than 100ppm of methane to be emitted through the landfill cap (as measured 50mm above the surface of the landfill cap).

¹² Hydraulic Evaluation of Landfill Performance (HELP)

Climate parameters were based on a simulated 30 year period, using climate statistics from the Moorabbin Airport¹³ weather station, located approximately 3.7 km to the southwest of the site. The model assumptions, inputs and results are provided in Appendix F.

The results of the HELP modelling are summarised as follows:

- The changes in surface profile and slope length has a negligible impact on stormwater infiltration through the landfill cap.
- Approximately 3,000 m³ of surface water infiltration through the landfill cap is estimated over the modelled 90th percentile 2 year wet period. On average, over the 30 year period, it is estimated that approximately 1,100 m³/year of stormwater will infiltrate through the landfill cap.
- When averaged across the surface of the entire site, the infiltration volumes are equivalent to approximately 21 mm/m² during the 90th percentile 2 year wet period and 8 mm/m² during an average year.
- Based on the mean average rainfall for the area (from climate data for Moorabbin Airport), the infiltration of stormwater through the landfill cap ranges between 0.6 % and 2.5 % of the total average annual rainfall.

The Landfill BPEM recommends that existing landfill caps for unlined landfills should be no greater than 750 L/ha/day (i.e. 75 % of the required liner seepage for Type 3 landfills). Based on the results of modelling, infiltration at the site is expected to range between 112 L/ha/day and 468 L/ha/day, which meets the performance requirement.

3.3.8 Assessment of cap performance

Based on the outcomes of the assessment of landfill cap performance, the following has been noted:

- The cap is mounded, well vegetated and no significant depressions were observed during the investigation works. Stormwater is expected to be shed from the top of the mound to drains located around the perimeter of the site.
- The existing landfill cap is of variable thickness, although generally comprises a significant thickness of low permeability clay material over much of the site (whether as a single discrete layer of clay or interspersed with other layers).
- Permeability of the clay at the site is low and will reduce infiltration of stormwater through the landfill cap and provide a barrier to landfill gas emissions, despite permeability test result at BH04 being marginally higher than recommended by the Landfill BPEM.
- HELP modelling indicates that infiltration of stormwater through the cap will not exceed the Landfill BPEM recommendation of 750 L/ha/day.
- Active landfill gas extraction occurs at the site. Surface emissions surveys indicate that the landfill cap is generally adequate as a barrier to landfill gas emissions, despite a single defective area that exceeds the Landfill BPEM recommendation.
- The identified area will be monitored during the next surface emissions survey in early 2015 and will be repaired if ongoing exceedance of the Landfill BPEM recommendation is recorded.

Based on the observed subsurface profile, the landfill cap at the site does not strictly meet all the requirements for a Type 3 (solid inert waste) Landfill BPEM cap, which is not surprising considering the rehabilitation works were completed prior to the first issue of the Landfill BPEM.

¹³ Bureau of Meteorology station #86077

However, the existing clay capping is expected to perform as a low permeability monolithic clay lined landfill cap and is considered adequate to reduce infiltration of stormwater to the waste mass and landfill gas emissions to atmosphere, thereby meeting the intent of the Landfill BPEM recommendations.

**ADVERTISED
PLAN**

4 Pre- and post-settlement contours

There are no clear pre- and post-settlement design contours available for the site. T&T has been provided with a letter from Golder Associates¹⁴ that discusses the final landform of the landfill cap. This letter references design levels approved in the (unsighted) 1989 revision of the site's Waste Discharge Licence and mentions that the design contours allow for surface water drainage to occur at the site after long term settlement.

A copy of the plan showing the design contours discussed in the Golder Associates letter is provided in Appendix G. This has been assumed to represent post-settlement design contours.

The 1989 post-settlement design contours describe:

- A mounded structure located approximately centrally to the site, with steeper slopes to the north and east and shallower slopes to the west and south.
- Ground elevations range between approximately 40 mAHD and 47 mAHD, with the northern and eastern boundaries lower than the southern and western sides of the site.

A topographic survey of the site, dated February 2009¹⁵, is provided in Appendix H. The surface shown in the survey is broadly similar to that described in the 1989 post-settlement contour plan:

- The top of the mound is located approximately central to the site, although the top of the mound covers a wider area than shown in the 1989 post-settlement contour plans.
- The mound has steeper slopes to the north and east and shallower slopes at the top of the mound and in the southern and western parts of the site:
 - Measured gradients range between approximately 5%-7% in the north of the site, approximately 9%-17% in the east and between approximately 1.5% and 5% in the central, western and southern parts of the site.
 - Ground elevations range between approximately 41m AHD and 47.8m AHD, with the northern and eastern sides of the site lower than in the west and south.

While surface gradients in parts of the site are lower than recommended by the Landfill BPEM (which recommends gradients between 5 % and 20 %), the age of the waste means that further significant settlement of the waste is unlikely (i.e. so significant areas of ponding are unlikely).

**ADVERTISED
PLAN**

¹⁴ Golder Associates (1990), *Former Tip Site – Clayton Road/Ryans Road, Clayton – Town Planning Permit TP 112100*, reference 89612375, 23 April 1990).

¹⁵ Charter Keck Cramer (2009), *Feature and Levels Survey, Cleanaway Site – Ryans Road, Clayton South, 3169*, Version 1, reference 10085572, 24 February 2009)

5 Preservation/installation of infrastructure through cap

5.1 Preservation of existing infrastructure through the cap

There is a variety of existing landfill control and monitoring infrastructure installed through the existing landfill cap materials, primarily relating to landfill leachate and LFG. This infrastructure must remain undamaged and in good working order during the aftercare period and works should include:

- Extending vertical infrastructure (e.g. standpipes, well heads etc.), as necessary, to keep their tops above the finished cap levels and reduce the risk of the infrastructure being buried, run over or otherwise lost and/or destroyed.
- Clear identification of horizontal infrastructure (e.g. pipes both above and below surface) to prevent either physical damage or disruption of vertical alignments.

During any works to the landfill cap, material must be installed around existing infrastructure in such a way as the overall integrity of the finished landfill cap is preserved (i.e. surface water and oxygen infiltration to the waste mass is minimised, as is landfill gas migration through the cap).

5.2 Installation of new infrastructure penetrating the cap

Any infrastructure that requires installation through the landfill cap must be installed in a manner that minimises damage to the landfill cap and restores the integrity of the landfill cap following the completion of works, including:

- The installation contractor is to provide a detailed installation procedure which describes (at a minimum):
 - The expected location(s) and extent of cap penetration and how incidental damage to the capping system will be minimised/eliminated during installation works.
 - How the infrastructure will be tied into the landfill cap, specifically detailing tie-in and repair the clay, such that the integrity of the landfill cap is retained.
 - Remedial works that will be carried out following the installation of the infrastructure.
- TWM personnel (or authorised representatives thereof) should inspect the works to independently verify that the installation process is being undertaken as per the procedure provided by the contractor. Photographs should be taken and retained to demonstrate the contractor's compliance.

Depending on the size, extent and/or duration of the works, a factual report describing the works (particularly the finished remedial works to the capping system) may be necessary so that an auditor and/or EPA may understand the installation and remedial works that were carried out.

**ADVERTISED
PLAN**

6 Proposed rehabilitation works and timelines

6.1 Proposed rehabilitation works

Based on the outcomes of the landfill cap assessment, no large scale rehabilitation works are considered necessary for the site, (refer Section 3).

However, from time to time, small localised repairs to the landfill cap may be necessary for defects based on the outcomes of site inspections and/or surface emissions monitoring. A procedure describing the works to repair small, localised, defects is presented in Section 6.2.

It is possible that, at some stage, monitoring or site investigation may indicate that large scale rehabilitation works are necessary. In this event, a separate process of assessment and design will need to be carried out to address the specific nature of the defect(s) identified.

6.2 Procedure to rehabilitate minor localised defects

The following procedure shall be followed to rehabilitate minor localised defects in the landfill cap (i.e. small, discrete cracks, etc.).

- a Using a suitable portable methane detector (i.e. Flame Ionising Detector or Laser Spectrometer) delineate the full extent of the defect to the landfill cap (i.e. where methane concentrations exceed 100 ppm, measured from 5 cm above ground surface).
 - If methane is not detected (i.e. due to unfavourable atmospheric conditions etc.) the extent of the defect can be visually delineated.
- b Excavate a minimum 1.0 m radius around the defect, to a depth of 0.5 m. If waste is encountered prior to 0.5 m depth, then the excavation will cease at the top of waste.
- c Batter the sides of the excavation at 1(v):2(h).
- d Backfill the excavation in lifts not exceeding 150 mm thick and compact each layer using appropriate compactive plant.
 - The excavation should be backfilled with a suitable clayey soil, free of rocks (or other inclusions) greater than 50 mm diameter and meeting the parameters outlined in Table 6-1. If the excavated material meets the criteria in Table 6-1, it can be used to backfill after being appropriately moisture conditioned. If not, a clayey soil that meets the criteria in Table 6-1 and the "Fill" criteria in EPA Publication IWRG 621¹⁶ will be imported to site and used to backfill the excavation.
 - Each backfill lift will be compacted using dedicated compaction equipment, which shall cover the entirety of each layer of backfill and give each layer a uniform degree of compactive effort. All backfill will be compacted to achieve a minimum dry density ratio of 95% Standard/Hilf density ratio at a moisture content between (and inclusive of) 0% and +3% (wet) of Standard Optimum Moisture Content.
 - If the sides and base of the excavation are formed within a clayey soil, they will be lightly scarified using the teeth of an excavator bucket (or equivalent) prior to the first lift of backfill. The surface of each subsequent lift will also be lightly scarified prior to the placement of the next lift.

¹⁶ EPA Victoria (EPA, 2009), *Industrial Waste Resource Guidelines – Soil Hazard Categorisation and Management*, Publication IWRG 621, June 2009.

- o When using appropriate compaction plant, scarification of the previous layer will prevent lamination between layers forming, which may potentially act as migration/infiltration pathways for landfill gas migration and stormwater.
- When backfilling the excavation, care will be taken to work the soil into the edges of the excavation to prevent potential laminations forming.
- Once the final lift of backfill has been compacted, the surface shall be worked into a smooth surface to promote surface water runoff.

Table 6-1: Required Clay Soil Properties

Parameter	Unit	Criteria
Particle Size:		
19 mm	% wt passing	≥70
0.075 mm		≥30
2 µm		≥15
Plasticity Index	n/a	≥10
Cation exchange capacity ¹⁷	mEq/100g	≥10

- e Using the portable methane detector, scan the repaired area for methane concentrations >100 ppm (measured 5 cm above the ground surface). The repaired area should also be specifically targeted during the next surface emissions walkover survey.

Construction quality assurance testing should be carried out at the following test frequencies:

- Clay material properties: 1 test per 5,000 m³ per source of clay material.
- Field density and moisture content: 1 test per 500 m³.

TWM personnel (or authorised representatives thereof) should inspect the works to independently verify that the repair works are being undertaken as per the procedure above. Photographs should be taken and retained to demonstrate the contractor's compliance.

Depending on the size, extent and/or duration of the works, a factual report describing the works should be prepared so that an auditor and/or EPA may understand the remedial works that were carried out.

6.3 Rehabilitation timelines

As discussed in Section 6.1, no large scale rehabilitation works have been identified for the site.

Minor rehabilitation works on localised, discrete landfill cap defects (i.e. as described in Section 6.2), should be carried out no later than 6 months after a defect has been identified and verified.

**ADVERTISED
PLAN**

¹⁷ When tested in accordance with EPA Victoria Methods 14 and 15 or APHA 3125.

7 Applicability

This report has been prepared for the benefit of Transpacific Waste Management with respect to the particular brief given to us and it may not be relied upon in other contexts or for any other purpose without our prior review and agreement.

Tonkin & Taylor Pty Ltd

Environmental and Engineering Consultants

Report prepared by:



.....
Ben Hart

Environmental Engineer

Authorised for Tonkin & Taylor Pty Ltd by:



.....
Simonne Eldridge

Project Director

BMH

\\\\ttgroup.local\\corporate\\south melbourne\\projects\\4480\\workingmaterial\\rehab plan\\4480_bmhr03_rev1_090215.docx

**ADVERTISED
PLAN**

Figures

**ADVERTISED
PLAN**

LEGEND

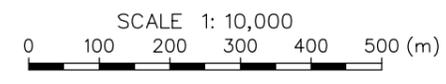
----- Approximate site boundary

----- Facilities within license boundary



ADVERTISED PLAN

- NOTES:
1. Aerials sourced from NearMaps data (Images Copyright: 2014).



Tonkin & Taylor Pty Ltd
 Environmental and Engineering Consultants
 Kings Technology Park, Level 4, 111 Coventry St
 Southbank, Victoria, 3006
 Ph: (03) 9863 8686
 www.tonkintaylor.com.au

DRAWN	LJD	Feb. 15
DRAFTING CHECKED		
APPROVED		
CADFILE :	\\4480.000-F 1.dwg	
SCALES (AT A3 SIZE)	1: 10,000	
PROJECT No.	4480.000	

TRANSPACIFIC WASTE MANAGEMENT PTY LTD
 LANDFILL REHABILITATION PLAN
 CLAYTON ROAD LANDFILL, CLAYTON SOUTH, VIC
 Site Location

FIG. No. Figure 1

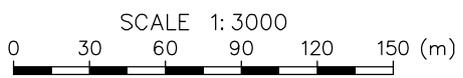
REV. 0

P:\4480\WorkingMaterial\CAD\4480.000-F1.dwg, Layout1, 5/02/2015 9:08:44 a.m., ljd



LEGEND

- - - - - Approximate site boundary
- Facilities within license boundary
- ⊕ BH02 Borehole location
- PERM Permeability sample location



NOTES:
 1. Aerials sourced from NearMaps data (Images Copyright: 2014).

ADVERTISED
PLAN



Tonkin & Taylor Pty Ltd
 Environmental and Engineering Consultants
 Kings Technology Park, Ground Floor 95 Coventry St
 Southbank, Victoria, 3006
 Ph: (03) 9863 8686
 www.tonkintaylor.com.au

DRAWN	LJD	Feb.15
DRAFTING CHECKED		
APPROVED		
CADFILE : 4480.000-F2.dwg		
SCALES (AT A4 SIZE) 1: 3000		
PROJECT No.	4480.000	

TRANSPACIFIC WASTE MANAGEMENT PTY LTD
 LANDFILL REHABILITATION PLAN
 CLAYTON ROAD LANDFILL, CLAYTON SOUTH, VIC
 Test Borehole Location Plan

FIG. No. Figure 2 REV. 0

P:\4480\WorkingMaterial\CAD\4480.000-F2.dwg F02 5/02/2015 9:08:12 a.m.

Appendix A:

Pollution abatement notice (ID. 90003966)

**ADVERTISED
PLAN**

STATE OF VICTORIA

Environment Protection Act 1970

WASTE DISCHARGE LICENCE

Pursuant to Section of the Environment Protection Act 1970, a licence is hereby

issued to **Brambles Holdings Ltd**
PO Box 5
HULLMARINE, 3043

to discharge waste to the land environment
at the south east corner of Clayton and Fraser Roads, Oakleigh

subject to the attached conditions.

Licence Number ES 286/2

Date of Issue 9 May 1975

Date of Amendment/Transfer/Re-issue

17 AUG 1987

**ADVERTISED
PLAN**

RICHARD ALAN GRAHAM
MANAGER - SOUTH METROPOLITAN
DELEGATE OF THE
ENVIRONMENT PROTECTION AUTHORITY

EPA WASTE DISCHARGE LICENCE

LICENCE NO. ES286/2

SCHEDULE A PAGE 1

1. Wastes shall be discharged only into or onto that piece of land (hereinafter referred to as "the site") delineated and hatched on the plan annexed as Schedule B and being part Crown Allotment 1, Sections 2 and 11, Parish of Mordialloc.
2. The wastes shall consist only of the following components:
 - (a) domestic garbage
 - (b) commercial refuse
 - (c) industrial waste;in accordance with subsequent conditions of this licence.
3. Notwithstanding Condition 2, the following wastes shall not be deposited at the site:
 - (a) soluble chemical wastes;
 - (b) hazardous wastes;
 - (c) liquid wastes other than domestic grease-trap wastes.

Landfill Operation

4.
 - (a) All wastes, other than wastes for recycling, shall be tipped or deposited in layers not exceeding a depth of 2.0 metres.
 - (b) Every layer of waste shall be evenly and properly consolidated by mechanical plant.
 - (c) All solid putrescible waste (other than domestic garbage) shall be deposited at the base of the tipping area and covered immediately with a layer of clean earth or with a layer of other waste material.
 - (d) All wastes deposited in the landfill shall be covered by the end of each day's operations by a layer of clean earth or other dense and incombustible material so that no wastes are exposed.
 - (e) Not less than once a week, all wastes deposited in the landfill shall be covered (unless already covered in complying with paragraphs (c) and (d) above) by a layer of clean earth or other dense and incombustible material not less than 300 millimetres in depth.
 - (f) A stockpile of cover material adequate for at least two weeks operation shall be stored in readiness near the tipping area.

SCHEDULE A PAGE 2

- Excavation Plans*
- (g) No putrescible wastes shall be deposited in water.
 - × (h) No putrescible wastes shall be deposited above the level of the highest point on the rim of the excavation.
 - (i) All metal wastes deposited in the landfill shall be compacted and deposited at the base of the tipping area.

Disposal to Browns Hole

- 5. (a) The restrictions on waste disposal in this condition apply only to the area known as Browns Hole, and identified on the plan annexed as Schedule B.
- × (b) No putrescible wastes (including commercial waste which contains putrescible waste) shall be deposited below a level which is one metre above the top of the black sand seam on the exposed west wall of Browns Hole.
- ✓ (c) The level described in condition 5(b) shall be indicated by a fixed marker on the exposed western wall.

**ADVERTISED
PLAN**

Fires

- 6. (a) No wastes shall be burnt at the site. In the event of a fire breaking out, prompt action shall be taken to extinguish the fire.
- (b) An adequate water supply and distribution system shall at all times be provided to the site so that water may be discharged by means of a hose to extinguish a fire at any part of the site.

Fencing and Screens

- 7. (a) The site shall be fenced and gated in such a manner as to restrict access to the site when it is unmanned.
- (b) Any litter arising from the operations of the site shall at all times be confined within the boundaries of the site.
- (c) All site fencing and litter screens shall be kept clean.

SCHEDULE A PAGE 3

Signs

8. Suitable signs shall be prominently displayed at the site indicating:
- (a) that fires shall not be lit on the site;
 - (b) the hours of opening of the site;
 - (c) that the depositing of soluble chemical, liquid or hazardous wastes is prohibited.

Site Management

9. (a) The tipping area shall at all times be screened from view from adjacent premises and public places by means of suitable trees and/or shrubs and/or earthen embankments.
- (b) All surface drainage shall be permanently diverted away from those portions of the site which are or have been used for waste deposit.
- (c) All weather access road(s) shall be provided and maintained to the tipping areas.
- (d) Unless notice is received in writing from the Authority for removal in an approved manner -
- (i) All leachate seeping from the landfill shall be collected and disposed of within the boundaries of the site.
 - (ii) No discharge of leachate shall occur beyond the boundaries of the site.
 - (iii) No stormwater polluted by leachate shall be permitted to discharge beyond the boundaries of the site.
 - (iv) No groundwater shall be discharged beyond the boundaries of the site.
- (e) No discharge of waste shall occur beyond the boundaries of the site.
- (f) No stormwater polluted by waste shall be permitted to discharge beyond the boundaries of the site.
- (g) The site shall be manned at all times it is open for the reception of wastes.

ADVERTISED
PLAN

ASK STURTON
ADVERTISED

SCHEDULE A PAGE 4

10. Odours

Any odours arising from the operation of the site shall not be obnoxious or offensive to persons beyond the boundaries of the site.

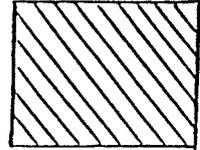
11. Site Completion

- (a) At cessation of waste disposal operations a final cover consisting of at least 500 millimetres depth of compacted clean earth shall be placed over the landfill.
- (b) The final surface of the site after covering as specified in paragraph (a) shall be graded, drained and vegetated in such a manner as to minimise erosion and to prevent ponding of stormwater.
- (c) After settlement, the final surface levels of the completed site shall blend in with the topography of the surrounding land.

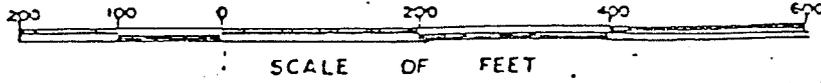
**ADVERTISED
PLAN**

PART " OF CROWN ALLOTMENT I SECTION II
PARISH OF MORDIALLOC
COUNTY OF BOURKE

KEY:

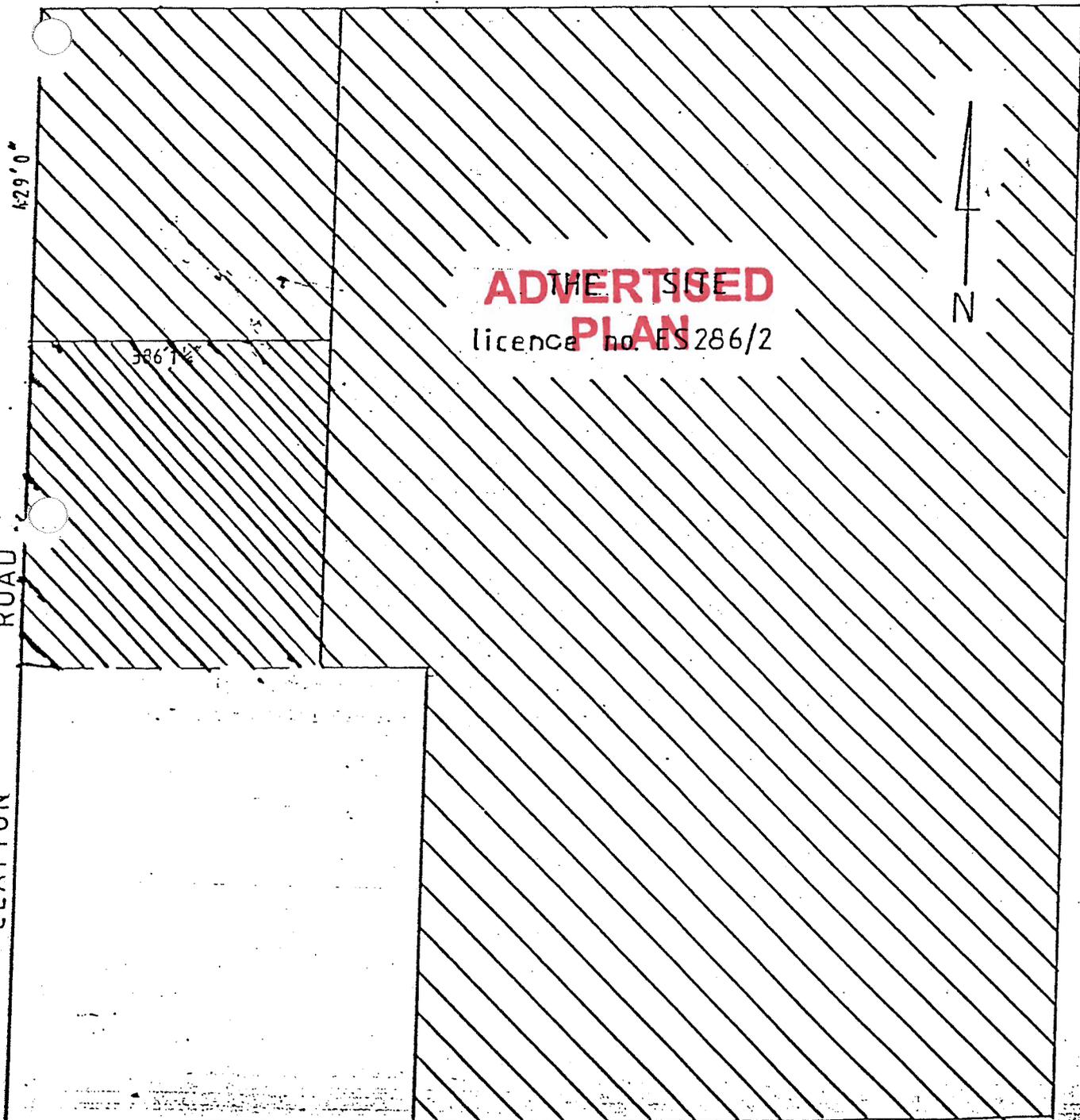


Browns
Hole



SCHEDULE B LICENCE NO. ES.286/2.

FRASER ROAD



629'0"

386'1/2"

THE ADVERTISED SITE
licence no. ES286/2



ROAD

ROAD

DEALS

RYANS ROAD

Appendix B: 1988 landfill cap design

**ADVERTISED
PLAN**



Golder Associates
CONSULTING ENGINEERS

REPORT

TO

CLEANAWAY

FINAL COVER DESIGN

CLAYTON ROAD LANDFILL SITE, CLAYTON

MAY 1988

88612104

**ADVERTISED
PLAN**

Directors and Principals JR MORGAN PN HAYTER M KURZEME AJ McCONNELL RJ PARKER IM SMITH HK SULLIVAN TN HAGAN KJ ROSENGREN
Associates JN BECKETT WN DAVIES GR FORREST RG FRIDAY DB McINNES RJ MORPHET DK NOLAN CF SWINDELLS JS TUCKER BJ WHITE

GOLDER ASSOCIATES PTY LTD (MELBOURNE) 25 BURWOOD ROAD HAWTHORN VICTORIA 3122 AUSTRALIA
TELEPHONE (03) 819 4044 • TELEX AA33616 • FACSIMILE (03) 818 7990

Other Offices SYDNEY • BRISBANE • PERTH • CAIRNS • WOLLONGONG • MAROOCHYDORE • TRARALGON • FIJI • CANADA • USA • UK

Golder Associates



Golder Associates
CONSULTING ENGINEERS

**ADVERTISED
PLAN**

88612104
April 3, 1989

Cleanaway Envirogard,
P.O. Box 305,
TULLAMARINE VIC 3043

ATTENTION: Mr. Paul Morris

Dear Sir,

FINAL COVER DESIGN, CLAYTON ROAD LANDFILL SITE, CLAYTON

At the request of Cleanaway Envirogard, Golder Associates has prepared the enclosed report outlining the design of final cover for the Clayton Road Landfill Site, Clayton. The design of the final cover is based on a surface shape that will promote shedding of surface water, even after significant settlement has occurred, and construction of final cover consisting of a minimum of 500 mm of compacted clay. The proposed design includes a mounded surface to a maximum elevation of RL 50 to 51 with maximum side slopes of between 5 and 8%.

The proposed design was prepared with the expectation that the site would be left as open space. We understand that since finalising this report consideration has been given to the possibility of developing the site for commercial purposes. To date there are no indications of the nature of any possible development.

If commercial development of the site is proposed it will be important to take account of the long term site requirements in the formation of the final cover. Although measures will still be required to minimise infiltration of water into the landfill, they may need to be somewhat different to those proposed in the accompanying report. For example, it may necessary to contour the surface in a different manner ready for building construction. This may require a relatively flat surface in the short term with final contouring and/or drainage of the site being achieved during landscaping after buildings, carparks, etc have been completed.

A decision will be required quickly by Cleanaway Envirogard on these matters given that final shaping of the surface should begin within the near future. Should you require further discussion or clarification of these matters please contact this office.

Yours faithfully,
GOLDER ASSOCIATES PTY. LTD.

per:

Roger Parker
RJP/4207

Directors and Principals JR MORGAN PN HAYTER M KURZEME AJ McCONNELL RJ PARKER IM SMITH HK SULLIVAN TN HAGAN KJ ROSENGREN
Associates JN BECKETT WN DAVIES GR FORREST RG FRIDAY DB McINNES RJ MORPHET DK NOLAN CF SWINDELLS JS TUCKER BJ WHITE

GOLDER ASSOCIATES PTY LTD (MELBOURNE) 25 BURWOOD ROAD HAWTHORN VICTORIA 3122 AUSTRALIA
TELEPHONE (03) 819 4044 • TELEX AA33616 • FACSIMILE (03) 818 7990

Other Offices SYDNEY • BRISBANE • PERTH • CAIRNS • WOLLONGONG • MAROOCHYDORE • TRARALGON • FUJI • CANADA • USA • UK



Golder Associates
CONSULTING ENGINEERS

REPORT

TO

CLEANAWAY

FINAL COVER DESIGN

CLAYTON ROAD LANDFILL SITE, CLAYTON

MAY 1988

88612104

**ADVERTISED
PLAN**

Directors and Principals JR MORGAN PN HAYTER M KURZEME AJ McCONNELL RJ PARKER IM SMITH HK SULLIVAN TN HAGAN KJ ROSENGREN
Associates JN BECKETT WN DAVIES GR FORREST RG FRIDAY DB McINNES RJ MORPHET DK NOLAN CF SWINDELLS JS TUCKER BJ WHITE

GOLDER ASSOCIATES PTY LTD (MELBOURNE) 25 BURWOOD ROAD HAWTHORN VICTORIA 3122 AUSTRALIA
TELEPHONE (03) 819 4044 • TELEX AA33616 • FACSIMILE (03) 818 7990

Other Offices SYDNEY • BRISBANE • PERTH • CAIRNS • WOLLONGONG • MARDOCHYDRE • TRARALGON • FIJI • CANADA • USA • UK

Golder Associates

May 2, 1988

i.

88612104

TABLE OF CONTENTS

1. **INTRODUCTION**
2. **GEOLOGICAL CONDITIONS**
3. **SETTLEMENT**
4. **LEACHATE CONTROL**
5. **MOUND DESIGN**
6. **DRAINAGE**
7. **COVER DESIGN**
8. **SUMMARY OF CONCLUSIONS AND RECOMMENDATIONS**

**ADVERTISED
PLAN**

LIST OF FIGURES

- Figure 1 **Design Contours**
- Figure 2 **Cross-sections - Long Term**

1. INTRODUCTION

This report presents the results of a geotechnical study to provide a technical design for final cover of the Cleanaway industrial landfill site in Clayton Road, Clayton. The work was performed at the request of Mr Steven Lewandowski, Manager South Eastern Region.

Cleanaway's Clayton Road site covers an area of about 14ha and is bounded by Clayton Road, Ryans Road, Deals Road and Frazer Road. The south-west corner of the site is currently occupied by Cleanaway offices and Lofts Quarry and Sand Supplies. Tipping at the site commenced in 1975 and it is understood that about 12 to 15 months tipping space is still available.

Operation of the Clayton Road site is controlled by EPA Waste Discharge License Number ES286/2 dated 9 May 1975 and amendment dated 11 August 1987. Section 11 of the license concerns site completion and states the following:

- (a) At cessation of waste disposal operations a final cover consisting of at least 500 mm depth of compacted clean earth shall be placed over the landfill.
- (b) The final surface of the site after covering as specified in paragraph (a) shall be graded, drained and vegetated in such a manner as to minimise erosion and to prevent ponding of stormwater.
- (c) After settlement, the final surface levels of the completed site shall blend in with the topography of the surrounding land.

**ADVERTISED
PLAN**

ADVERTISED PLAN

To provide a design which meets these requirements this technical study has been performed taking account of the following:

- . mounding of the site necessary to ensure satisfactory drainage
- . likely settlement that will occur after construction of final cover
- . avoidance of the development of leachate springs
- . design and specification of final cover to minimise rainfall infiltration.

This design is based on technical considerations and does not attempt to address landscaping issues. In preparation of the design account has been taken of drainage requirements for the site. Golder Associates are not experienced in engineering design of drainage systems and a review of drainage aspects of the following design may be required by a civil engineering consultant to satisfy local government authorities.

2. GEOLOGICAL CONDITIONS

The site is located in an area of Melbourne locally referred to as "the Sand-Belt Area". The Geological Survey of Victoria 1:63360 mapsheet for Ringwood indicates that the site is underlain by the Tertiary aged Brighton Sands which comprise mainly fine grained sands. Numerous sand pits exist in the area and many of these are now being used as tip sites. The sand in the area generally requires washing to render it suitable for commercial use suggesting that it is a silty or clayey sand. It is assumed that the Cleanaway site was also mined in sand which required washing and thus the pit walls are formed in silty or clayey sand.

ADVERTISED PLAN

Because of the intensity of sand mining in the area groundwater levels in the region are well below ground surface; probably of the order of 15 to 20m below original ground surface. As the pits are progressively filled it can be expected that the water levels will recover to near their original levels. Although the long term groundwater level will depend on many factors it is likely that the ultimate groundwater level will be much higher than its current position, probably rising to be within a meter of the original ground surface.

3. SETTLEMENT

Fourteen settlement markers have been established on the southern part of the site, as shown on Figure 1, and monitored by Parkhill and Freeman Partners Pty. Ltd. The markers were established in October 1986 and surveyed at two to three month intervals until November 1987. The results of the monitoring are shown on Table 1 and indicate similar amounts of settlement for markers 1 to 10. Settlement at markers 11 to 14 is more variable probably indicating different filling conditions or shallower depths of fill.

For settlement markers 1 to 10 the average settlement between October 1986 and November 1987 was 650mm. For a fill depth of about 25m this amount of settlement is equivalent to 2.5% of fill thickness occurring over a period of about one year. This amount of settlement is similar to the results of monitoring at a non-putrescible tip site in Sydney for which data are available.

Long term settlement of waste generally varies logarithmically with time so that it decreases with normal time. The settlement data available from the Clayton Road site are insufficient to enable accurate prediction of long term settlement, since to complete mounding, additional fill will have to be placed, resulting in an increase in the rate of settlement.

ADVERTISED PLAN

Typically, we would expect settlement beyond the first 12 months of site completion to be 3 to 4% of total fill thickness. Further long term settlement of at least 1m and possibly more under mounded areas can therefore be expected. In areas where fill is still being placed or where significant amounts of fill need to be placed to develop a mound, long term settlement of about 1.5 m should be allowed for.

It is recommended that settlement monitoring continue at the site for as long as possible to enable refinement of long term settlement estimates.

4. LEACHATE CONTROL

Final closure of the site will involve mounding of the site and capping with a clay soil to minimise infiltration of rain water. However, this will not totally eliminate infiltration and consideration has to be given to possible mounding of leachate beneath the site. If significant mounding does occur then there is risk of leachate seepage around the perimeter of the site, ie development of leachate springs.

The likely change in groundwater or leachate level has been evaluated by using well formulae to estimate the rise in water level due to possible infiltration. For the purposes of the analysis it has been conservatively assumed that 10% of all rainfall on the site will infiltrate through the clay capping. Using this quantity of inflow and adopting a coefficient of permeability for the sand of 0.4m/day, it can be calculated that the increase in water level above long term regional groundwater level (ie mounding), will be about 0.5m. This rise in water level is considered acceptable and should not lead to generation of leachate springs. The calculated rise in water level is directly proportional to the rate of infiltration. The assumed volume of 10% of total rainfall is considered to be conservative particularly once vegetation is established since this will increase evapo-transpiration.

ADVERTISED PLAN

5. MOUND DESIGN

Mounding of the site is required to promote rainfall run-off and to lessen the impact of settlement and more importantly differential settlement. The mounding of the site needs to be sufficiently steep to ensure that differential settlement does not cause ponding of water. Conversely, the mound should not be so steep or high that it looks out of place with the surrounding topography.

To meet these conflicting requirements, final gradients of between 5 and 8% are considered appropriate for the sides of the mound. The minimum gradient considered necessary to ensure that ponding of water does not occur is 5%. Slopes of more than 10% are considered to be incompatible with the surrounding land forms.

Design contours for the site have been prepared as shown on Figure 1. Two sets of contours are shown. The solid lines are the long term target contours based on gradients generally of around 5 to 8%. These are target contours after say 90% of long term settlement has occurred.

The dashed lines on Figure 1 are the contours for end of mound and cover construction. They have steeper gradients than the long term contours, particularly in the middle of the site where allowance has been made for 1.5 m of settlement.

In preparation of these contours it has been assumed that, where possible, the ultimate contours should grade to near the existing ground surface levels around the perimeter of the site. However, there is also a need to achieve levels around the perimeter of the site which promote site drainage to no more than 3 or 4 locations. Therefore in some areas filling at the site boundary will be need to be above the surrounding ground surface levels,

ADVERTISED PLAN

utilising the existing bund walls.

6. DRAINAGE

Discussions with engineering staff of the City of Oakleigh indicate that it should be permissible to discharge clean surface water runoff to the surrounding stormwater drainage system. Discharge towards Clayton Road may have to be connected to the underground stormwater system. If possible, the Council would prefer site discharge to be at three or four specific points rather than uncontrolled flow from the site. Furthermore they request that any drains be graded at slopes of at least 1:100. *

Perimeter drains have been shown schematically on Figure 1 as follows:

- running northward along the Clayton Road boundary
- running east and west along the Frazer Road boundary
- running north and south along the Deals Road boundary
- running east along the Ryans road boundary

Discharge points are located near the north-west, north-east and south-east corners of the site. The contouring around the perimeter of the site has been designed to achieve a fall of at 1:100. The drains are all located along the edge of the site where settlement should be negligible. A check on likely site run-off for a 1 in 5 year storm event indicates that discharge should be easily handled by table drains with cross-sectional area in the range of 0.5 to 1.0m². Further evaluation of the drainage design will be required by an appropriately qualified civil engineer to consider such matters as drain size, surfacing of drains to minimise risk of erosion and design of discharge points.

ADVERTISED PLAN

7. COVER DESIGN

To minimise rainwater infiltration it is recommended that the final cover comprise the following:

- . not less than 0.5m of compacted clayey soil
- . 0.2 to 0.3m of organic rich topsoil.

The clayey cover material should be a sandy or silty clay or clayey sand. The fines content (percentage by weight passing the 0.075mm sieve) of the soil should be not less than 40%. The soil should have low plasticity, ie be classified as CL according to the Unified Classification System. Some gravel up to 50 mm diameter can be tolerated in the clay blanket although gravel-size particles should not comprise more than 10% by mass. The clayey soil should be compacted in layers not more than 300mm loose thickness to achieve the following Standard dry density ratios:

- . not less than 90% in the first layer
- . not less than 95% in top layer.

Maximum Standard dry density for the soil should be determined using Australian Standard AS1289, Test E1.1 - 1977.

After establishment of final cover the site should be vegetated as quickly as possible to minimise the erosion. Hardy, quick growing grasses that require little watering in summer should be sown.

The clay blanket and vegetation should extend well beyond the edge of the quarry wherever possible.

ADVERTISED PLAN

Specific measures have not been included in the cover design for control of methane gas. It is likely that sufficient putrescible material has been deposited on the site to cause generation of significant quantities of methane gas, particularly as the water table rises and decomposition becomes anaerobic. With the clayey soil cover in place methane gas seepage from the site will occur as slow diffusion through the the clay cover and seepage through the sandy soils around the perimeter of the site. This is not considered to be a major problem since there are no buildings close to the site and there is no development currently proposed for the site.

8. SUMMARY OF CONCLUSIONS AND RECOMMENDATIONS.

A technical design has been prepared for final closure of the Cleanaway landfill site in Clayton Road, Clayton. The design has been based on the need to mound the site to promote surface water run-off and the need to cover the surface with low permeability soil to minimise infiltration of water. The main features of the design are:

- . During closure the site will be mounded to achieve a maximum elevation of RL 50 to RL 51, as shown on Figure 1. Maximum elevation after long term settlement (say after 10 to 15 years) is expected to be around RL 49.
- . Long term side slopes on the mound of 5 to 8% have been adopted to ensure that differential settlement of the fill does not result in surface irregularities that will cause ponding of water.
- . In the long term it is expected that groundwater will recover to its original pre-mining level. Possible mounding of groundwater/leachate beneath the covered area should not result in development of leachate springs.

May 2, 1988

9.

88612104

- . Final cover design should comprise at least 0.5m of compacted clayey soil covered by 0.2 to 0.3m of organic rich topsoil. Vegetation should be established on the site as quickly as possible after site closure.
- . A schematic perimeter drainage system is shown on Figure 1. Clean water discharge from the site will be at three locations at the north-east, south-east and north-west corners of the site.

GOLDER ASSOCIATES PTY LTD

per:



Roger J. Parker

RJP/d1/2414

**ADVERTISED
PLAN**

TABLE 1
SETTLEMENT DATA

POINT NO.	REDUCED LEVEL AHD				
	OCT. 86	DEC. 86	MAR. 87	JUN. 87	NOV. 87
1	45.19	45.10	44.96	44.87	44.72
2	44.59	44.64	-	44.33	44.19
3	43.81	43.63	43.48	43.38	43.21
4	44.00	43.73	43.57	43.45	43.26
5	44.00	43.44	43.34	43.26	43.15
6	43.65	43.11	42.97	42.85	42.67
7	43.58	43.43	43.33	43.21	43.06
8	44.17	44.00	43.89	43.75	43.59
9	44.39	44.12	43.98	43.85	43.66
10	44.51	44.35	44.30	44.25	44.19
11	44.40	44.43	44.38	44.35	44.29
12	44.05	44.16	44.15	44.12	44.07
13	45.02	44.88	44.75	44.70	44.60
14	44.53	44.22	44.20	REMOVED	43.66

**ADVERTISED
PLAN**

Appendix C: Investigation Borehole Logs

**ADVERTISED
PLAN**

CLIENT:	Transpacific Waste Management	DATE COMMENCED:	6.10.2014
PROJECT:	Clayton Road Landfill (closed)	DATE COMPLETED:	6.10.2014
LOCATION:	Corner Clayton Rd and Fraser Rd, Clayton South	LOGGED BY:	ALK
JOB NUMBER:	4480	CHECKED BY:	BMH

Drill Contractor:	Chadwick Geo.	Bore Size:	100mm	Hole Angle:	°	Easting:	334483	Surface R.L.:	
Drill Model:	AMS	Drill Fluid:		Bearing:		Northing:	5798419	Offset:	

Method	RL (m)	Depth (m)	Geological Unit	Graphic Log	Classification Symbol	Material Description	Moisture Condition	Consistency / Strength	Cementation / Weathering	Sample / Test	Tests				Field Records / Comments	Water
											DCP	SV (kPa)	PP (kPa)	MC (%)		
HA		0.5				FILL: Sandy SILT trace gravel; brown, low to medium plasticity, sand; fine to medium	D									
		1.0				FILL: Silty SAND; brown, fine to medium, occasional glass fragments	M									
		1.5				FILL: Sandy CLAY; brown orange mottled red, medium to high plasticity, sand; fine to medium, with plastic bags	M	VSt								
		1.5				End of BH01 at 1.50m										
		2.0														

ADVERTISED
PLAN

This log should be read in conjunction with the T&T Pty Ltd Log Summary Sheet and the Project Plan

CLIENT:	Transpacific Waste Management	DATE COMMENCED:	6.10.2014
PROJECT:	Clayton Road Landfill (closed)	DATE COMPLETED:	6.10.2014
LOCATION:	Corner Clayton Rd and Fraser Rd, Clayton South	LOGGED BY:	ALK
JOB NUMBER:	4480	CHECKED BY:	BMH

Drill Contractor:	Chadwick Geo.	Bore Size:	150mm	Hole Angle:	°	Easting:	334617	Surface R.L.:	
Drill Model:	AMS	Drill Fluid:		Bearing:		Northing:	5798404	Offset:	

Method	RL (m)	Depth (m)	Geological Unit	Graphic Log	Classification Symbol	Material Description	Moisture Condition	Consistency / Strength	Cementation / Weathering	Sample / Test	Tests				Field Records / Comments	Water	
											DCP	SV (kPa)	PP (kPa)	MC (%)			
SA						FILL: Silty SAND; grey, fine to medium	D-M										
						FILL: Sandy CLAY trace gravel; brown orange mottled red/light grey, medium to high plasticity, sand; fine to coarse, gravel; fine to coarse	M	VSt									
		0.5				FILL: Silty SAND trace gravel; grey, fine to medium, gravel; basalt, fine to coarse	M										
						FILL: Sandy CLAY; red mottled brown orange, medium to high plasticity	M	St									
		1.0				FILL: Clayey SAND; pale grey, fine to medium, clay; medium plasticity											
						FILL: Sandy CLAY with gravel; brown mottled orange, medium to high plasticity, sand; fine to medium, gravel; brick/siltstone, fine to medium	M	St									
	1.5					End of BH02 at 1.50m											
	2.0																

ADVERTISED PLAN

CLIENT:	Transpacific Waste Management	DATE COMMENCED:	6.10.2014
PROJECT:	Clayton Road Landfill (closed)	DATE COMPLETED:	6.10.2014
LOCATION:	Corner Clayton Rd and Fraser Rd, Clayton South	LOGGED BY:	ALK
JOB NUMBER:	4480	CHECKED BY:	BMH

Drill Contractor:	Chadwick Geo.	Bore Size:	150mm	Hole Angle:	°	Easting:	334734	Surface R.L.:	
Drill Model:	AMS	Drill Fluid:		Bearing:		Northing:	5798392	Offset:	

Method	RL (m)	Depth (m)	Geological Unit	Graphic Log	Classification Symbol	Material Description	Moisture Condition	Consistency / Strength	Cementation / Weathering	Sample / Test	Tests				Field Records / Comments	Water
											DCP	SV (kPa)	PP (kPa)	MC (%)		
SA						FILL: Clayey SAND; dark grey, fine to medium, clay; medium to high plasticity - As above except grey mottled orange, trace gravel, basalt, fine	M									
		0.5				FILL: Sandy CLAY with gravel; brown mottled orange/red, medium to high plasticity, sand; fine to coarse, gravel; basalt/siltstone, fine to medium - As above except dark grey mottled orange	M	VSt								
		1.0				- As above except dark brown mottled orange/red, gravel; brick/siltstone/basalt										
	1.5					End of BH03 at 1.50m										
	2.0															

ADVERTISED PLAN

This log should be read in conjunction with the T&T Pty Ltd Log Summary Sheet and the Project Plan

CLIENT:	Transpacific Waste Management	DATE COMMENCED:	6.10.2014
PROJECT:	Clayton Road Landfill (closed)	DATE COMPLETED:	6.10.2014
LOCATION:	Corner Clayton Rd and Fraser Rd, Clayton South	LOGGED BY:	ALK
JOB NUMBER:	4480	CHECKED BY:	BMH

Drill Contractor:	Chadwick Geo.	Bore Size:	150mm	Hole Angle:	°	Easting:	334488	Surface R.L.:	
Drill Model:	AMS	Drill Fluid:		Bearing:		Northing:	5798303	Offset:	

Method	RL (m)	Depth (m)	Geological Unit	Graphic Log	Classification Symbol	Material Description	Moisture Condition	Consistency / Strength	Cementation / Weathering	Sample / Test	Tests				Field Records / Comments	Water
											DCP	SV (kPa)	PP (kPa)	MC (%)		
SA						FILL: Clayey SILT trace gravel; brown, medium plasticity, gravel; siltstone, fine	D-M	St								
		0.5				FILL: Sandy CLAY; brown orange mottled red/light grey, medium to high plasticity, sand; fine to coarse, gravel; basalt/siltstone, fine	D-M	VSt								
		1.0				FILL: Silty SAND trace gravel; brown, fine to medium, gravel; basalt/siltstone, fine to medium - As above except light grey brown, with gravel; siltstone, fine to coarse	D									
		1.5				- As above except grey mottled orange, no gravel										
						End of BH04 at 1.50m										
	2.0															

ADVERTISED PLAN

CLIENT:	Transpacific Waste Management	DATE COMMENCED:	6.10.2014
PROJECT:	Clayton Road Landfill (closed)	DATE COMPLETED:	6.10.2014
LOCATION:	Corner Clayton Rd and Fraser Rd, Clayton South	LOGGED BY:	ALK
JOB NUMBER:	4480	CHECKED BY:	BMH

Drill Contractor:	Chadwick Geo.	Bore Size:	100mm	Hole Angle:	°	Easting:	334625	Surface R.L.:	
Drill Model:	AMS	Drill Fluid:		Bearing:		Northing:	5798298	Offset:	

Method	RL (m)	Depth (m)	Geological Unit	Graphic Log	Classification Symbol	Material Description	Moisture Condition	Consistency / Strength	Cementation / Weathering	Sample / Test	Tests				Field Records / Comments	Water
											DCP	SV (kPa)	PP (kPa)	MC (%)		
HA						FILL: Sandy CLAY trace gravel; brown, medium to high plasticity, sand; fine to medium, gavel; basalt, fine to medium - As above except brown orange mottled dark grey	M	St								
		0.5				- As above except dark grey mottled red										
		1.0				- As above except with gravel, brick/titles/basalt, fine to coarse										
	1.5					End of BH05 at 1.50m										
	2.0															

ADVERTISED PLAN

This log should be read in conjunction with the T&T Pty Ltd Log Summary Sheet and the Project Plan

CLIENT:	Transpacific Waste Management	DATE COMMENCED:	6.10.2014
PROJECT:	Clayton Road Landfill (closed)	DATE COMPLETED:	6.10.2014
LOCATION:	Corner Clayton Rd and Fraser Rd, Clayton South	LOGGED BY:	ALK
JOB NUMBER:	4480	CHECKED BY:	BMH

Drill Contractor:	Chadwick Geo.	Bore Size:	150mm	Hole Angle:	°	Easting:	334756	Surface R.L.:	
Drill Model:	AMS	Drill Fluid:		Bearing:		Northing:	5798260	Offset:	

Method	RL (m)	Depth (m)	Geological Unit	Graphic Log	Classification Symbol	Material Description	Moisture Condition	Consistency / Strength	Cementation / Weathering	Sample / Test	Tests				Field Records / Comments	Water
											DCP	SV (kPa)	PP (kPa)	MC (%)		
SA						FILL: Silty SAND trace gravel; dark grey, fine to medium, gravel; fine to medium	M									
						FILL: Sandy CLAY; brown orange mottled light grey, medium to high plasticity, sand; fine to medium, gravel; basalt, fine	M	VSt								
		0.5				- As above except with gravel; siltstone, fine to medium										
						WASTE: Gravely CLAY; brown orange, medium to high plasticity, gravel; siltstone, fine to coarse, with plastic bags	D-M									
		1.5				End of BH06 at 1.50m										
		2.0														

ADVERTISED PLAN

This log should be read in conjunction with the T&T Pty Ltd Log Summary Sheet and the Project Plan

CLIENT: Transpacific Waste Management	DATE COMMENCED: 6.10.2014
PROJECT: Clayton Road Landfill (closed)	DATE COMPLETED: 6.10.2014
LOCATION: Corner Clayton Rd and Fraser Rd, Clayton South	LOGGED BY: ALK
JOB NUMBER: 4480	CHECKED BY: BMH

Drill Contractor: Chadwick Geo.	Bore Size: 150mm	Hole Angle: °	Easting: 334581	Surface R.L.:
Drill Model: AMS	Drill Fluid:	Bearing:	Northing: 5798158	Offset:

Method	RL (m)	Depth (m)	Geological Unit	Graphic Log	Classification Symbol	Material Description	Moisture Condition	Consistency / Strength	Cementation / Weathering	Sample / Test	Tests				Field Records / Comments	Water	
											DCP	SV (kPa)	PP (kPa)	MC (%)			
SA						FILL: Clayey SILT with gravel, brown, medium plasticity, gravel; siltstone/basalt, fine to coarse, sub-angular	D-M	St									
						FILL: Silty CLAY trace gravel; brown mottled orange/grey, medium to high plasticity, gravel; siltstone, fine	D-M	St									
		0.5				FILL: Silty SAND trace gravel; grey, fine to coarse, gravel; basalt; fine	D-M										
		1.0				FILL: Sandy CLAY trace gravel; brown orange mottled grey and white, medium to high plasticity, sand; fine to coarse, gravel; basalt, fine to medium	M	St									
		1.5				FILL: Silty CLAY with sand: brown orange mottled red/light grey, high plasticity, sand; fine to medium	M	VSt									
						End of BH07 at 1.50m											
	2.0																

ADVERTISED PLAN

This log should be read in conjunction with the T&T Pty Ltd Log Summary Sheet and the Project Plan

CLIENT:	Transpacific Waste Management	DATE COMMENCED:	6.10.2014
PROJECT:	Clayton Road Landfill (closed)	DATE COMPLETED:	6.10.2014
LOCATION:	Corner Clayton Rd and Fraser Rd, Clayton South	LOGGED BY:	ALK
JOB NUMBER:	4480	CHECKED BY:	BMH

Drill Contractor:	Chadwick Geo.	Bore Size:	100mm	Hole Angle:	°	Easting:	334754	Surface R.L.:	
Drill Model:	AMS	Drill Fluid:		Bearing:		Northing:	5798153	Offset:	

Method	RL (m)	Depth (m)	Geological Unit	Graphic Log	Classification Symbol	Material Description	Moisture Condition	Consistency / Strength	Cementation / Weathering	Sample / Test	Tests				Field Records / Comments	Water
											DCP	SV (kPa)	PP (kPa)	MC (%)		
HA						FILL: Clayey SAND; grey fine to medium grained clay; medium to high plasticity	D-M									
						FILL: Sandy CLAY; brown mottled orange/red/grey, medium to high plasticity, sand; fine to medium	M									
		0.5				FILL: Silty SAND; dark grey, fine to medium	M-W									
		1.0				FILL: Sandy CLAY; brown orange mottled light grey, medium to high plasticity, sand; fine to medium, gravel; fine - As above except dark grey mottled brown - As above except grey mottled brown, trace gravel; siltstone/basalt, fine to coarse	M-W									
	1.5				End of BH08 at 1.50m											
	2.0															

ADVERTISED PLAN

Appendix D: Permeability Test Results

**ADVERTISED
PLAN**

Head Office
32 Fiveways Boulevard
KEYSBOROUGH VIC 3173

Ph: +61 3 8796 7900
Fax: +61 3 8796 7944



**ADVERTISED
PLAN**

COEFFICIENT OF PERMEABILITY

Customer: Tonkin & Taylor Pty Ltd
Customer Address: Ground Floor, 95 Coventry Street, Southbank VIC 3205
Project: Clayton Road Landfill
Location: Clayton
Customer Order No.: 4480

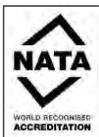
Report Number: 307785 - 1
Report Date: 13/10/2014
Request No: -
Test Method: AS1289.6.7.3
Page: 1 of 1

Testing performed and reported at our Keysborough Laboratory

Sample No.:	1407760	1407761	1407762
Date Tested:	9 - 11/10/2014	7 - 9/10/2014	8 - 10/10/2014
ID No:	1	2	3
Sample Description:	Sandy Clay with some gravel and organics (FILL)	Sandy Clay	Sandy Clay
Sample Location	BH04 0.3 - 0.65m	BH05 0.3 - 0.6m	BH08 0.6 - 1.0m
Date Sampled:	06/10/14	6/10/2014	6/10/2014
Sampled By:	ALK	ALK	ALK
Sampling Procedure:	AS1289.1.2.1.6.5.3	AS1289.1.2.1.6.5.3	AS1289.1.2.1.6.5.3
Sample Type:	U63	U63	U63
Compaction details			
Maximum Dry Density - MDD (t/m ³) AS1289 5.1.1	-	-	-
Optimum Moisture Content - OMC (%) AS1289.5.1.1 :	-	-	-
Compactive Effort AS1289.5.1.1 :	-	-	-
Oversize material retained on 19.0mm sieve (%):	-	-	-
Moulding details			
No of layers	-	-	-
Length of specimen	64.2	64.7	64.5
Diameter of specimen	63.5	63.6	63.7
Length to diameter ratio	~1 : 1	~1 : 1	~1 : 1
Nominated % Maximum Dry Density Compaction :	-	-	-
Nominated % Moisture Content Compaction :	-	-	-
Initial Dry Density (t/m ³) :	1.90	1.82	1.91
Achieved Percentage of Density Ratio (%) :	-	-	-
Initial Moisture Content (%) :	14.7	13.0	14.0
Moulded Moisture Content (%) :	-	-	-
Achieved Percentage of Moisture Ratio (%) :	-	-	-
Specimen details after test			
Moisture content (%)	18.1	17.2	16.2
Mean effective stress (kPa)	50	100	100
Permeant used	De-aired water	De-aired water	De-aired water
Permeability (k) m/sec	3 x 10⁻⁹	2 x 10⁻¹⁰	9 x 10⁻¹¹

Remarks:

NOTE: sample from BH04 very hard to remove from U63.



Accredited for compliance with ISO/IEC 17025. The results of tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.

APPROVED SIGNATORY

A. Catton

A. Catton

NATA Accreditation No. 12719

Form No.: CG.325.002

Issue Date: 19/02/2013

Appendix E:

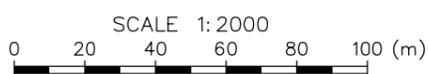
**2014 surface emission walkover survey
results**

**ADVERTISED
PLAN**

ADVERTISED PLAN

LEGEND

- Location of methane reading 0-100ppm
- - - - - Site boundaries
- — — — — Walkover path



Aerial photo sourced from Nearmaps, flown 12-3-2012



Tonkin & Taylor Pty Ltd
 Environmental and Engineering Consultants
 Kings Technology Park, Ground Floor, 95 Coventry St
 Southbank, Victoria, 3006
 Ph: (03) 9863 8686

DRAWN	LJD	Jan.14
DRAFTING CHECKED		
APPROVED		
CADFILE : 2390.500-CR.WO-F2.dwg		
SCALES (AT A3 SIZE)		
AS SHOWN		
PROJECT No.	2390.500	

TRANSPACIFIC WASTE MANAGEMENT CLAYTON ROAD LANDFILL WALKOVER SURVEY

Walkover Survey Results - 14th January 2014

FIG. No. Figure 2

REV. 0



T:\South Melbourne\Projects\2390\2390.501\Working Material\CLAYTON RD\CAD\2390.501-CR-F1.dwg F1 13/08/2014 1:07:32 p.m.



NOTES:

1. Aerial sourced from NearMap data, date flown: 2014.08.03 (Images Copyright: 2014).

ADVERTISED PLAN

Tonkin & Taylor Pty Ltd
 Environmental and Engineering Consultants
 Kings Technology Park, Ground Floor 95 Coventry St
 Southbank, Victoria, 3006
 Ph: (03) 9863 8686
 www.tonkintaylor.com.au

DRAWN	VTG	Aug.14
DRAFTING CHECKED		
APPROVED		
CADFILE : 2390.501-CR-F1.dwg		
SCALES (AT A4 SIZE)		
1: 4000		
PROJECT No.	2390.501	

TRANSPACIFIC INDUSTRIES PTY LTD
 CLAYTON ROAD, CLAYTON
 LANDFILL GAS EMISSIONS REPORT – AUGUST 2014
 Site Walkover

FIG. No.	Figure 1	REV.	0
----------	----------	------	---

Appendix F:

HELP model for infiltration assessment

**ADVERTISED
PLAN**

Memo

To:	Ben Hart	T&T Ref:	751104
From:	Emily Lindsay	Date:	16 January 2015
cc:	Tony Bryce		
Subject:	Clayton Road Landfill HELP Modelling - Landfill Cap Seepage (4480)		

As requested, The Hydrologic Evaluation of Landfill Performance (HELP) has been used to model the landfill cap seepage from Clayton Road Landfill. Summarised below is the input data, and results generated for the average year (of a 30 year period) and 90th percentile 2 year wet period.

INPUT DATA

Weather

- 30 years of weather data has been simulated within HELP, based on average annual rainfall and temperature statistics from Moorabbin Airport (site located 7.3 km from Clayton Road Landfill).
- Results have been presented for the average year and for years 23 and 24, which are representative of the 90th percentile 2 year wet period.

The following assumptions have been made:

- Surface water settings 100% area where runoff is possible
Vegetation cover: good standard of grass
- Evapotranspiration Maximum leaf area index: 3.5
Evaporative zone depth: 25 cm
Growing season: 357 (start day) – 317 (end day). (Based on HELP default data for Laverton).
Average wind speed and relative humidity statistics from Moorabbin Airport site.

Cap Profile

- 8 boreholes logs have been assessed as part of the Clayton Road Landfill rehabilitation plan. From inspection, it seems there is a “good” clay capping everywhere except in the areas of BH 1, 2 and 4. However, BH2 shows a total of 1 m thick clay (with sand layers interspersed) and BH 4 has approximate 750 mm of low permeability material, leaving only BH 1 as slightly marginal. Other BHs show a clay thickness varying from 900 mm to 1.5 m.
- Three permeability tests have been undertaken for the site, showing $K = 1 \times 10^{-9}$ m/s, $k = 2 \times 10^{-10}$ m/s and $k = 9 \times 10^{-11}$ m/s.

Based on these results, we have assumed it would be sufficiently conservative to model a clay cap 900 mm thick with a permeability of 1×10^{-9} m/s, with a 300 mm layer of silty topsoil above this. Within HELP the clay layer has been modelled as “sandy clay” (which is in agreement with the sample descriptions from the permeability testing). The topsoil layer has been modelled as “silty loam”.

- The landfill has been modelled in three sections, based on the steepness of the landfill surface. Individual results have been produced for all three areas. See attached survey plan for definition of areas.

	Area (ha)	Surface Slope	Surface Slope Length (m)
A	1.14	17%	36
B	7.19	6%	135
C	5.14	1%	105

RESULTS

Total percolation through clay layer (mm)

	90th percentile 2 Year Wet Period		
Area	23rd Year Annual Total	24th Year Annual Total	Average Year Annual Total
A	16.74	4.26	8.19
B	17.16	4.02	8.13
C	17.06	4.85	8.10

Total percolation through clay layer (m³)

	90th percentile 2 Year Wet Period		
Area	23rd Year Annual Total	24th Year Annual Total	Average Year Annual Total
A	190.9	48.5	93.4
B	1234.1	289.0	548.3
C	923.0	262.5	438.0
Total	2347.9	600.0	1079.6

CONCLUSIONS

- Across the three areas, the change in slope and surface slope length has negligible impact on the percolation of rainwater through the cap. Total percolation volume across each other is impacted significantly by surface area.
- The mean annual rainfall for the area (from Moorabbin Airport) is 710.1 mm. Therefore the total precipitated volume across the site is 95,650 m³. Percolation through the cap ranges from 0.6 – 2.5% of this total average annual rainfall.

**ADVERTISED
PLAN**

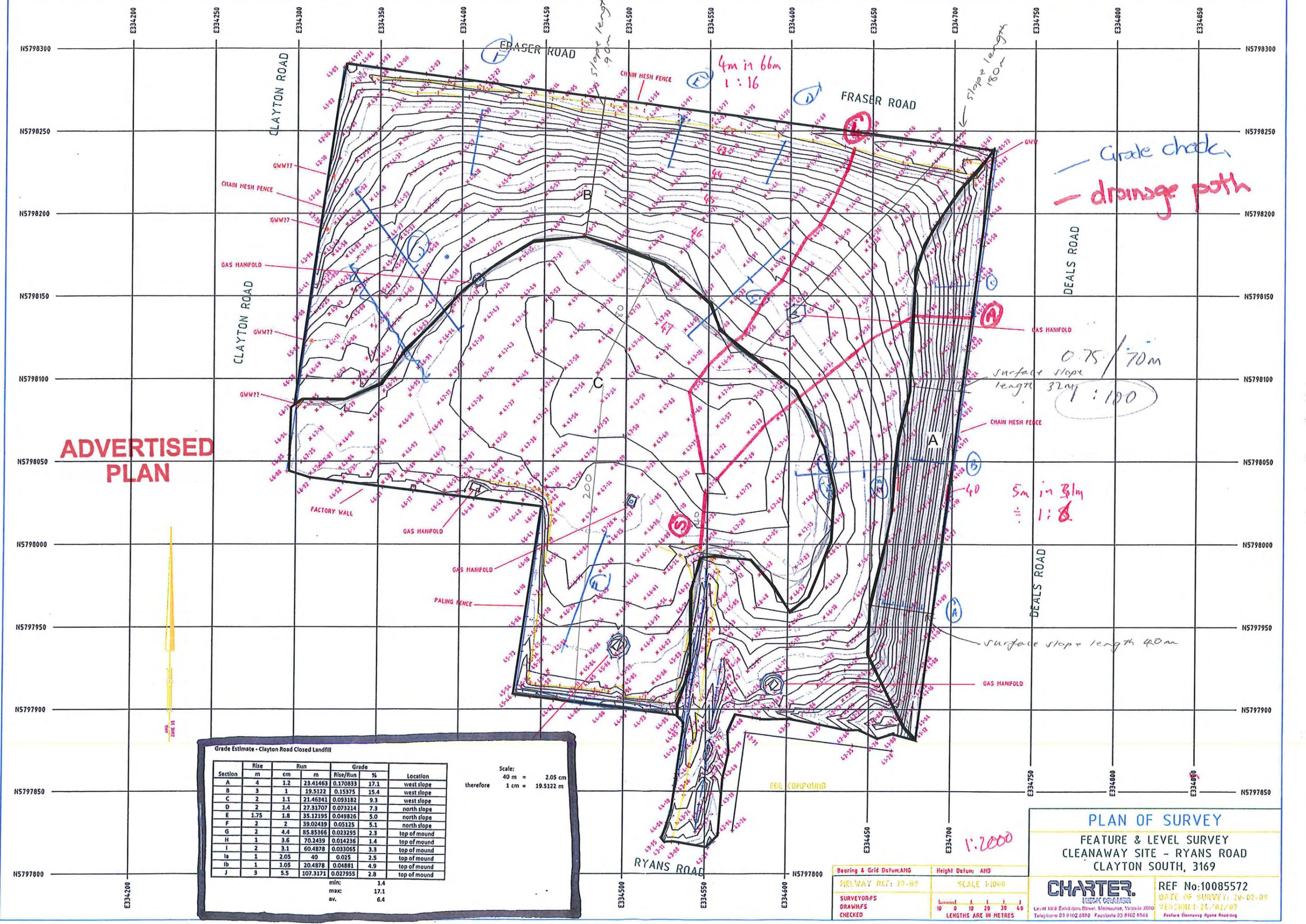
ADVERTISED PLAN

Grade Estimate - Clayton Road Closed Landfill

Section	Rise		Run		Grade		Location
	m	cm	m	cm	Rise/Run	%	
A	4	1.2	23.41463	0.170833	17.1		west slope
B	3	1	19.5122	0.15375	15.4		west slope
C	2	1.1	21.46341	0.093182	9.3		west slope
D	2	1.4	27.31707	0.073214	7.3		north slope
E	1.75	1.8	35.12195	0.049826	5.0		north slope
F	2	2	39.02439	0.05125	5.1		north slope
G	2	4.4	85.85366	0.023295	2.3		top of mound
H	1	3.6	70.2439	0.014236	1.4		top of mound
I	2	3.1	60.4878	0.033065	3.3		top of mound
Ia	1	2.05	40	0.025	2.5		top of mound
Ib	1	1.05	20.4878	0.04881	4.9		top of mound
J	3	5.5	107.3171	0.027955	2.8		top of mound

min: 1.4
max: 17.1
av: 6.4

Scale: 40 m = 2.05 cm
therefore 1 cm = 19.5122 m



PLAN OF SURVEY
FEATURE & LEVEL SURVEY
CLEANAWAY SITE - RYANS ROAD
CLAYTON SOUTH, 3169

Bearing & Grid Datum: **AMG** Height Datum: **AHD**

MELWAY REF: **79-89** SCALE: **1:1000**

SURVEYOR: **FS** DRAWN: **FS** CHECKED: **FS**

LENGTHS ARE IN METRES

CHARTER
LEVEL 18/6 Exhibition Street, Melbourne, Victoria 3000
 Telephone 03 6102 8888 Facsimile 03 6102 8544

REF No: **10085572**
 DATE OF SURVEY: **20-02-09**
 VERSION: **1-24/02/09**
 Feature Cleanaway Ryans Road-09

Appendix G:

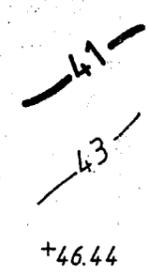
**Final landfill cap contours (from Golder,
1990)**

**ADVERTISED
PLAN**

CLAYTON ROAD LANDFILL FINAL LANDFORM

FIGURE 1

LEGEND



FINAL CONTOUR - (PLANNING PERMIT)

FINAL CONTOUR - (EPA LICENCE dated 19/12/89)

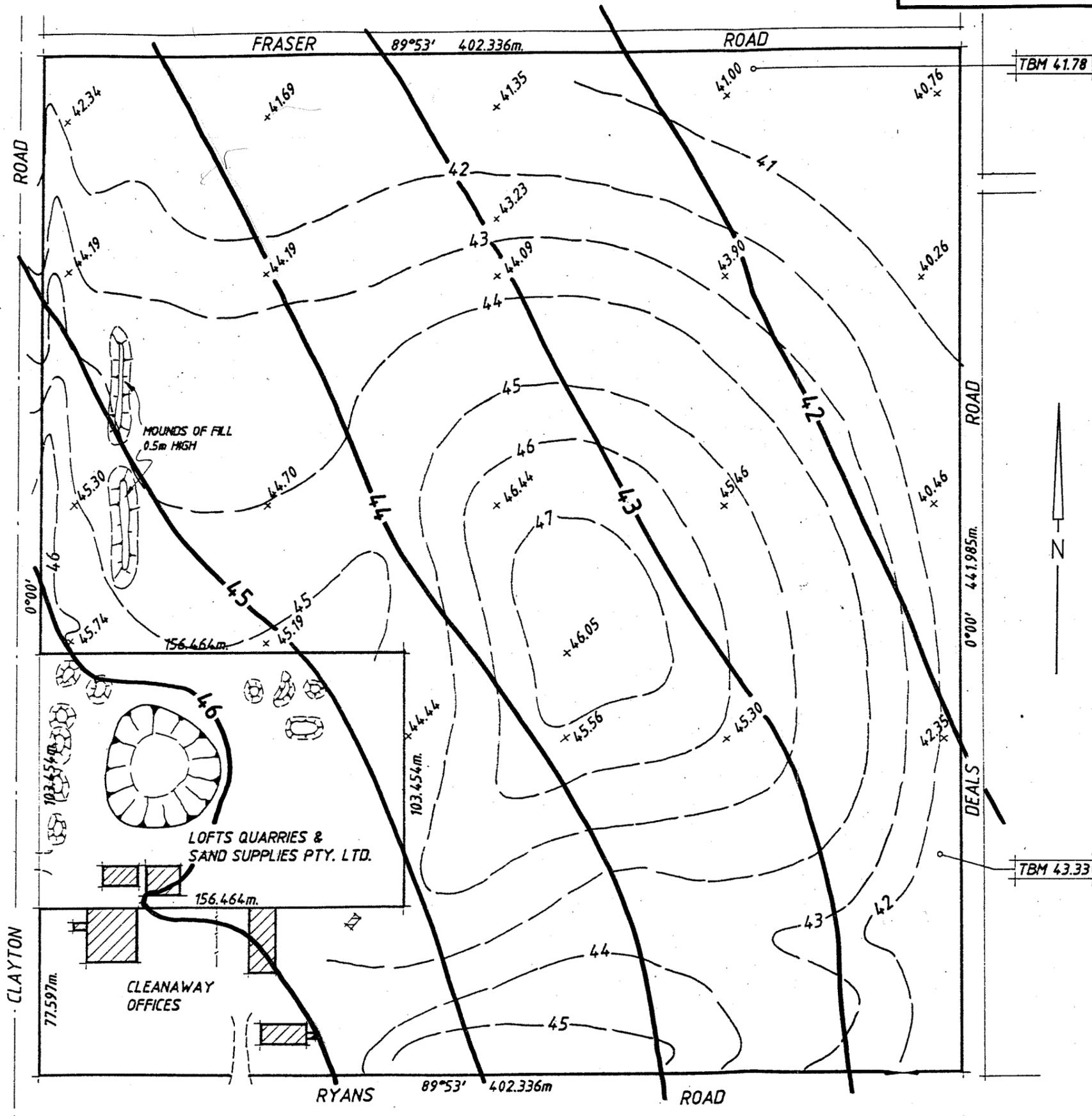
SPOT LEVEL (AHD) - 19/4/1990

SURVEY BY PARKHILL AND FREEMAN

SCALE 1:2000

**ADVERTISED
PLAN**

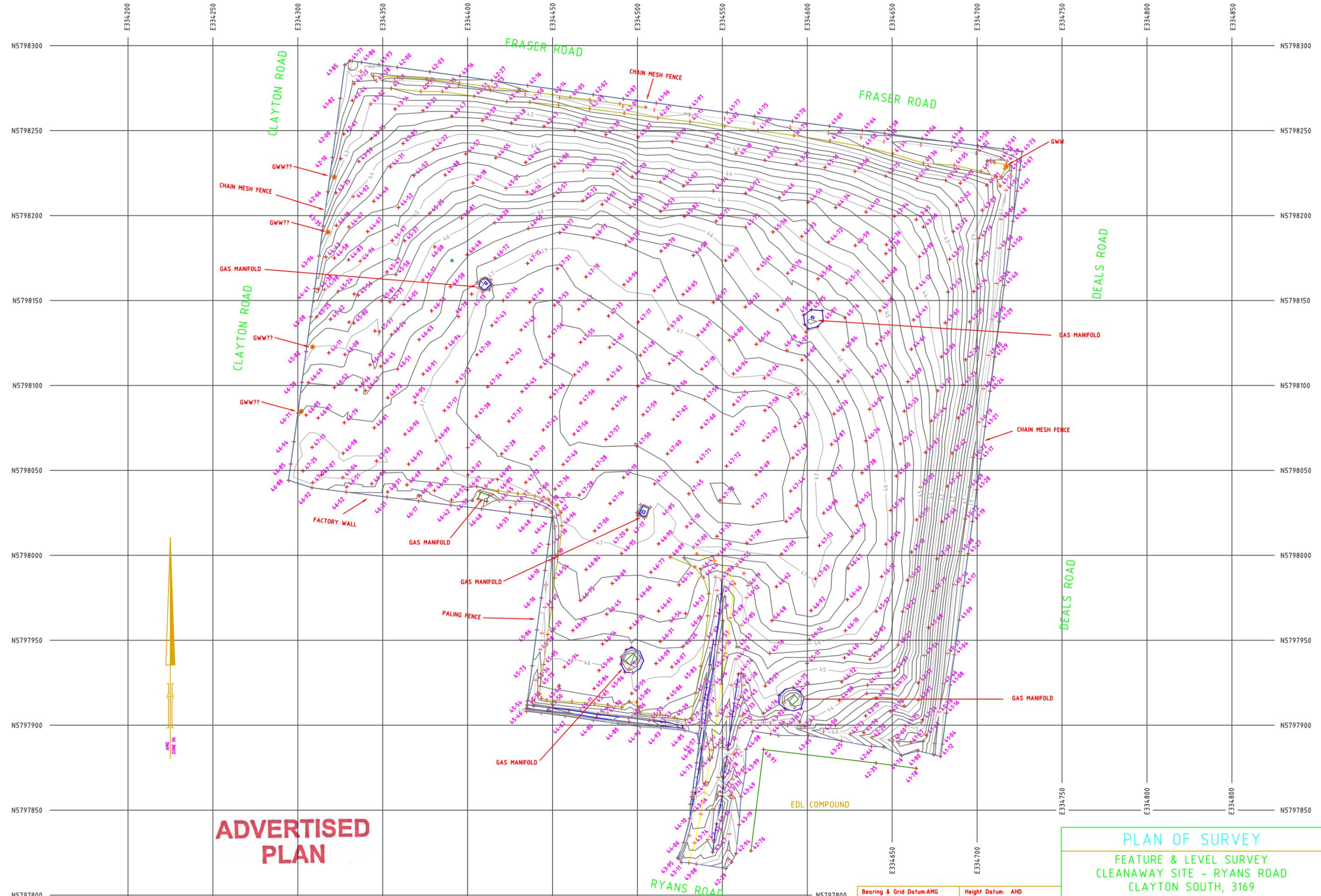
Job No. 89612375



Appendix H:

**2009 site topographic and feature survey
(Charter Keck Cramer)**

**ADVERTISED
PLAN**



**ADVERTISED
PLAN**

PLAN OF SURVEY
 FEATURE & LEVEL SURVEY
 CLEANAWAY SITE - RYANS ROAD
 CLAYTON SOUTH, 3169

Bearing & Grid Datum: AMG	Height Datum: AHD
MELWAY REF: 79-B9	SCALE 1:1000
SURVEYOR: FS	 LENGTHS ARE IN METRES
DRAWN: FS	
CHECKED	

CHARTER
 KECK CRAMER
 Level 19/8 Exhibition Street, Melbourne, Victoria 3000
 Telephone 03 8102 8888 Facsimile 03 8102 8844

REF No: 10085572
 DATE OF SURVEY: 20-02-09
 VERSION: 1-24/02/09
 Feature: Cleanaway Ryans Road-4w



Attachment 2

Auditor's review of rehabilitation plan

**ADVERTISED
PLAN**



ADVERTISED PLAN

Auditor's review of the rehabilitation plan

Item	EPA Requirement	Auditor's comments on the Rehabilitation Plan dated February 2015
PAN Requirements		
1.	The Landfill Rehabilitation Plan must contain time bound milestones for implementation.	The landfill has already been capped, and no further rehabilitation works have been identified for the site. Maintenance of the landfill cap will be conducted from time to time (as required to repair localised, discrete landfill cap defects) and these will be carried out no later than 6 months after a defect has been identified and verified. The Auditor considers this to be acceptable.
2.	The Rehabilitation Plan must be verified by an environmental auditor to ensure it is in accordance with Landfill BPEM.	The Auditor's verification is provided in this letter. As discussed in Section 3, the Auditor has specifically assessed the Landfill Rehabilitation Plan against the requirements of the PAN and the Closed Landfill Guidelines. Compliance with the current Landfill BPEM requirements is not strictly required, as the landfill has already been capped in accordance with a previous approval.
3.	<p>The Rehabilitation Plan must include an assessment of landfill cap performance on the single landfill cell to determine if current capping at the premises:</p> <ul style="list-style-type: none">reduces infiltration of surface water to minimise the risks of impacts on groundwater, or where impacts on groundwater have occurred, that these impacts are not worsened; andis sufficient to allow any landfill gas management measures to achieve compliance with the landfill gas action levels in Table 6.4 of the Landfill BPEM.	<p>As discussed in Section 3, the Auditor considers that a landfill cap assessment is not required, as the landfill has already been capped in accordance with a previous approval.</p> <p>However, the Auditor's review of the cap performance assessment is provided in Section 3.</p>
4.	Where required, a landfill cap design specification and Construction Quality Assurance (CQA) plan should be prepared in accordance with the Landfill BPEM and Section 18 of EPA Publication 1323.2 (2011) the Landfill Licensing Guidelines, detailing any additional capping work needed to meet this requirement.	This requirement is not applicable, as no further rehabilitation works have been identified for the site. However, it is considered that the need for further rehabilitation works may be identified through the HA (refer to Section 3).
Publication 1490: Closed Landfill Guidelines		



Item	EPA Requirement	Auditor's comments on the Rehabilitation Plan dated February 2015
5.	<p>The plan must detail rehabilitation and intended future use of the site during the aftercare phase.</p> <p>Afteruses must take into consideration current and likely future land use in the surrounding area.</p> <p>The afteruse must be appropriate to minimise risks to the environment and human health and not prevent effective aftercare management.</p>	<p>Section 2.5.1 of the Rehabilitation Plan discusses the proposed afteruse of the site. It is understood that the likely site afteruse will be public open space/passive recreation. This is considered to be an appropriate use that would not prevent effective aftercare management.</p> <p>It is expected that the potential risks to the environment and human health at the landfill site would be assessed through regular aftercare audits.</p>
6.	<p>An assessment of the cap performance is required for the whole site or individual cells where it cannot be demonstrated that:</p> <ul style="list-style-type: none"><li data-bbox="293 679 846 735">• The cap has been constructed to standards set in a former or current version of Landfill BPEM.<li data-bbox="293 751 853 807">• The cap has been constructed in accordance with EPA approval or a former licence condition.	<p>As discussed in Section 3, the Auditor considers that the cap was constructed in general accordance with the previous Waste Discharge Licence ES286/2, and as such a cap performance assessment is not necessary. However the Auditor has reviewed and provided comment on the cap performance assessment prepared by T&T (refer to Section 3).</p>

**ADVERTISED
PLAN**

618 Clayton Road, Clayton South
ENGINEERING SERVICES REPORT

Appendix E Code Response Report

TROON GROUP

**ADVERTISED
PLAN**



**Context
Engineering**

**Industrial Development
618 Clayton Road
Clayton Road**

**Provision Compliance
Report**



Prepared For TROON GROUP

**ADVERTISED
PLAN**

Context Engineering

ABN 56 650 431 637



This Document Is Copyright. Other Than for The Purposes and Subject to The Conditions Prescribed Under the Copyright Act 1968 (Commonwealth), No Part of It May in Any Form or By Any Means (Electronic, Mechanical, Micro-Copying, Photocopying, Recording or Otherwise) Be Reproduced, Stored in A Retrieval System or Transmitted Without Prior Written Permission. This Report Has Been Prepared Solely for The Benefit of Our Client. We Do Not Accept Any Liability for Damage or Loss Resulting from Reliance on This Report, Or Any Part of It, By Any Party Other Than the Client (Named on The Front Page of This Report).

This Document Has Been Approved by The Following Appropriately Qualified and Experienced Professional Civil Engineer:

Nicholas Rees

BEng (Hons), MIEAust, CPEng, NER, Registered Professional Engineer of Queensland (RPEQ) No. 18700

ADVERTISED PLAN

Report Number: R003 - C_23011

Issue	Date	Issue Details	Author	Checked	Approved
A	26 June 2023	Preliminary Issue	EG	NR	NR



1.0 Executive Summary

Context Engineering has been commissioned by Troon Group to compile this Provision Compliance Report for the proposed development of the site located at 618 Clayton Road, Clayton South.

The proposed site involves the creation of an industrial development consisting of nine (9) new warehouses over a historical landfill. These buildings will be connected via large hardstand areas and a centrally located private road with access to Clayton Road. Each warehouse will also be serviced via adjacent office buildings and carparking spaces.

A summary of the investigation and outcomes presented in this report are as follows:

- Stormwater Management in Urban Developments Provision – Development complies with acceptable outcomes or presents performance solutions.

It is recommended that the proposed Development Application be approved.

**ADVERTISED
PLAN**

2.0 Stormwater Management in Urban Development

2.1 Clause 53.18 – 5 Stormwater Management Objectives for Building and Works

Performance Outcomes	Acceptable Outcomes	Does the proposal meet the acceptable outcomes?	Council Use
<p>Objective</p> <p>a) To encourage stormwater management that maximises the retention and reuse of stormwater.</p> <p>b) To encourage development that reduces the impact of stormwater on the drainage system and filters sediment and waste from stormwater prior to discharge from the site.</p> <p>c) To encourage stormwater management that contributed to cooling, local habitat improvements and provision of attractive an enjoyable spaces.</p> <p>d) To ensure that industrial and commercial chemical pollutants and other toxicants do not enter the stormwater system.</p>	<p>Standard W2</p> <p>The stormwater management system should be designed to:</p> <ul style="list-style-type: none"> • Meet the current best practice performance objectives for stormwater quality as contained in the Urban Stormwater- Best Practise Environmental Management Guidelines (Victorian Stormwater Committee, 1999). • Minimise the impact of chemical pollutants and other toxicants including, but not limited to, bunding and covering or roofing of storage, loading and work areas. • Contribute to cooling, improving local habitat and providing attractive and enjoyable outcomes. 	<p><input checked="" type="checkbox"/> Complies</p> <p><input type="checkbox"/> Performance Solution</p> <p><input type="checkbox"/> Not Applicable</p> <p>Stormwater runoff from the site to be treated via proprietary Filtterra system.</p> <p>Refer Civil Engineering Report by Context Engineering for further details.</p>	<p style="text-align: center;">ADVERTISED PLAN</p>

2.2 Clause 53.18 – 6 Site Management Objectives

Performance Outcomes	Acceptable Outcomes	Does the proposal meet the acceptable outcomes?	Council Use
<p>PO1</p> <p>a) To protect drainage infrastructure and receiving waters from sedimentation and contamination</p> <p>b) To protect the site and surrounding area from environmental degradation prior to and during construction of subdivision works</p>	<p>Standard W3</p> <p>An application should describe how the site will be managed prior to and during construction period and may set out requirements for managing:</p> <ul style="list-style-type: none"> • Erosion and sediment. • Stormwater. • Litter, concrete and other construction wastes. • Chemical contamination. <p>ADVERTISED PLAN</p>	<p><input checked="" type="checkbox"/> Complies</p> <p><input type="checkbox"/> Performance Solution</p> <p><input type="checkbox"/> Not Applicable</p> <p>Erosion and sediment control during construction is detailed in the Engineering Services by Context Engineering.</p> <p>Refer drawing C_23065 DA80 Erosion and Sediment Control Layout Plan for further details.</p>	

3. Recommendations

It is recommended that the proposed Development Application be approved.

4. Disclaimer

This report has been prepared on behalf of and for the exclusive use of Troon Group and is subject to and issued in accordance with the agreement between Context Engineering.

Our investigation and analysis has been specifically catered for the particular requirements Troon Group and may not be applicable beyond this scope. For this reason, any other third parties are not authorised to utilise this report without further input and advice from Context Engineering.

Context Engineering accepts no liability or responsibility whatsoever for the report in respect of any use of or reliance upon this report by any third party.

The investigation and analysis have relied on information provided by others. We accept no responsibility for the accuracy of material supplied by others. The accuracy of the investigation, analysis and report are dependent upon the accuracy of this information

**ADVERTISED
PLAN**