



Landfill Gas Risk Assessment – 39-45 and 40-46 Cyril Beechey Lane, Cranbourne



Maclaw No.10 Pty Ltd & Greenridge Properties Pty Ltd

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Abbreviations Used by DRC Environmental

ANZECC	Australian and New Zealand Environment and Conservation Council	mg/kg	Milligrams per kilogram (also ppm parts per million)
AST	Aboveground Storage Tank	mg/L	Milligrams per litre (also ppm parts per million)
ACM	Asbestos Containing Materials	mm	Millimetres
C ₆ -C ₃₆	Hydrocarbon chain length fraction	MW	Monitoring Well
B(a)P	Benzo(a)Pyrene	NATA	National Association of Testing Authorities
bgl	below ground level	NEPM	National Environment Protection Measure
BTEX	Benzene, Toluene, Ethyl benzene and Xylenes	NHMRC	National Health and Medical Research
COC	Chain of Custody	NSW EPA	Environment Protection Authority of New South Wales
COPC	Contaminant of Potential Concern	OCP	Organochlorine Pesticides
CUTEP	Clean up to the Extent Practicable	OV	Older Volcanics
DBYD	Dial Before You Dig Service	PAH	Polycyclic Aromatic Hydrocarbons
DNAPL	Dense Nonaqueous Phase Liquids	PAN	Pollution Abatement Notice
DO	Dissolved Oxygen	PCB	Polychlorinated Biphenyls
DRC	DRC Environmental	PID	Photo ionisation Detector
DSI	Detailed Site Investigation	PQL	Practical Quantification Limit
EAO	Environmental Audit Overlay	QA	Quality Assurance
EC	Electrical Conductivity	QC	Quality Control
EIL	Interim Urban Ecological Investigation Level	RPD	Relative Percent Difference
EMP	Environmental Management Plan	RAP	Remediation Action Plan (or Cleanup Plan)
EPA	Victorian Environment Protection Authority	SEPP	State Environment Protection Policy
ESA	Environmental Site Assessment	TCE	Trichloroethylene
GME	Groundwater Monitoring Event	TDS	Total Dissolved Solids
GBM	Gas Barrier Membrane	TIT	Triple Interceptor Trap
HIL	Health Investigation Level	TPH	Total Petroleum Hydrocarbons
Km	Kilometres	µg/L	Micrograms per litre (also ppb parts per billion)
LNAPL	Light Non-Aqueous Phase Liquid	UST	Underground Storage Tank
LOR	Limit of Reporting	VOC	Volatile Organic Compounds
M	Metres	WF	Werribee Formation
mAHD	Metres above Australian Height Datum	WFA	Werribee Formation Aquifer

1 INTRODUCTION

DRC Environmental Pty Ltd (DRC) was commissioned by KLM Spatial to conduct a landfill gas risk assessment for the two blocks of land located at 39-45 Cyril Beechey Lane, which is adjacent to the former Stevensons Road Landfill (SRL) and 40-46 Cyril Beechey Lane, which is adjacent to the former Casey landfill waste transfer station, both located in Cranbourne, Victoria (the Site) (**Figure 1**).

As a result of methane issues previously identified at the former SRL, EPA Victoria (EPA) undertook an assessment on landfill methane management across Victoria¹ (EPA Publication 1270) to provide the community confidence that landfill methane is being adequately managed. Carbon dioxide has not been assessed as part of these works as no basement construction is proposed at the site. The assessment resulted in EPA providing best practice planning guidelines that recommended the following:

- A buffer distance of 500m between dwellings and landfills that accept (or historically accepted) biodegradable waste (includes the former SRL); and
- A buffer distance of 200m between dwellings and landfills that accept solid inert wastes.

The audit report produced for the former SRL for the City of Casey Council (CCC) states the following, “For any developments requiring a planning permit within 500m buffer zone of the SRL (excluding Brookland Greens Estate) it is recommended a site specific landfill gas risk assessment be completed as per the latest version of EPA Publication 1625² – Assessing planning proposals near landfills.”

Works contained within this report were undertaken to meet this CCC requirement.

1.1 Objectives

The objectives of this risk assessment are to determine the following:

- To install and monitor subsurface landfill gas at the site to provide recent data to undertake a site-specific risk assessment in accordance with the CCC requirements; and
- To assess landfill gas risk so that appropriate design measures can be adopted to reduce the potential risk of methane accumulation in residential dwellings on the Site.

¹ EPA Victoria Publication 1270, *Assessment of the potential for methane gas movement from Victoria landfills*, dated February 2009.

² Now EPA Victoria Publication 1642, *Assessing planning proposals within the buffer of a landfill*, dated October 2017.

2 SITE DETAILS

2.1 Site Description

The site is located approximately 53 km south east of the Melbourne CBD. A general summary of the information regarding the site and its surrounds is presented in **Table 2.1** below and the location of the site is presented on **Figure 1**.

Table 2.1: General Site information

Site Location	39-45 & 40-46 Cyril Beechey Lane, Cranbourne, Victoria	
Current land use zoning and planning overlays	Zone:	Farming Zone – subject to Schedule 2 (FZ2)
	Overlays:	Development Plan Overlay – subject to Schedule 1 (DPO1)
	Other:	Aboriginal Cultural Heritage Sensitivity
Municipality	City of Casey	
Title and plan information	Lot 6 LP7319 Lot 5 LP7319	
Site Area	Approximately 8 ha	
Current site use	Western Block (39 to 45 Cyril Beechey Lane)– horse paddocks and residential Eastern Block (40 to 46 Cyril Beechey Lane)– vacant vegetated land	
Surrounding land use	A review of the Land Channel Planning Property Report indicated that the surrounding land use is primarily General Residential Zone (GRZ1) and Special Use Zone (SUZ6).	
Proposed future use	Residential	

The Site is split into two main portions (**Figure 2**):

- Western Block: 39 to 45 Cyril Beechey Lane; and
- Eastern Block: 40 to 46 Cyril Beechey Lane.

Western Block

The Western Block is grassed/open, with some small trees along the eastern perimeter and western side. Access to the Site is via an unsealed road from the southern end of Cyril Beechey Lane and a sealed road from the northern end of Cyril Beechey Lane. A dwelling and associated shed are located adjacent to the western boundary of the sit. Farm dams are located in the south-west and north-west quadrants of the site. The block is directly to the north of the Stevensons Road (Casey/Frankston) landfill and was formerly known as the Vella property.

Eastern Block

The Eastern Block largely comprises of uncleared bushland. The block is directly north of the former Casey landfill waste transfer station. Previous environmental work has not been undertaken at this location, therefore DRC conducted test pitting as the initial stage of investigation.

The geology for both blocks comprises Quaternary sediments, overlying Baxter Sandstones, overlying older Volcanics, Werribee Formation and Silurian bedrock. The Quaternary sediments and Baxter Sandstones largely comprise of sandy layers intermixed with clay/sandy clay lenses and occasional gravel.

3 ENVIRONMENTAL SETTING & SITE CHARACTERISATION

3.1 Topography

The site is located a relatively flat block, at an elevation of approximately 67 to 72 m above sea level. With the eastern block being slightly higher in elevation with a slope downwards towards the Cyril Beechey Lane and the western block.

3.2 Regional Geology & Hydrogeology

A review of the Cranbourne 1:63,360 Geological Survey of Victoria Map indicates that the site is underlain by Quaternary Aged Pleistocene siliceous sand dunes and sheets (including Cranbourne Sand).

The upper aquifer is anticipated to be within the Quaternary Sands (sand, gravel, clay and silts) and have a salinity of 1,001 – 3,500mg/L. In the vicinity of the site the Baxter Sandstones and Quaternary Sands are hydraulically connected. The depth of the upper aquifer is anticipated to be less than 5m bgl. Additionally, Quaternary peaty clay, clay and swamp deposits may exist within low lying areas of both sites.

Beneath these layers are Older Tertiary Volcanics and the Werribee Formation

3.3 Site Specific Geology

The subsurface conditions encountered during the DRC soil investigation are detailed in **Table 3-1** below. As no previous investigative works had been undertaken on the eastern block DRC undertook test pit works to assess soil conditions prior to landfill gas bore installations.

Table 3-1: Geological Profile Beneath the Site

Sequence	Composition/ Lithology	Thickness / Depth	Comment
Western Block			
Fill	Topsoil, SILT / sandy SILT / silty SAND, brown/dark brown, high organic content	80mm to 500mm	Reported at LGB04 overlaying a further sandy CLAY fill later to a total depth of 1.2m bgl. Also reported in SV01 to SV04.
	Clayey SAND / silty SAND, brown, with gravel	Fill depth of this lenses was about 0.1m to 1.2m	Fill was to a depth of 1.2 m bgl at location LGB02 and LGB03 only. These are located along the southern boundary in a former low lying area that had been filled. Absent at locations LGB06 to LGB08. Noted in SV01.
	Sandy CLAY, mottled orange/brown/dark grey/light grey/red	Thickness ranged from 0.9 to 1.0m	
Natural	SAND, fine grained, dark brown/grey, and silty SAND, fine to medium grained, orange	0.2m to 1.3m bgl with thickness of less than 2m	Sand was noted to be wet within LGB03, LGB04, LGB05, LGB06, LGB07 and LG08 between depths of 0.8 and 1.2m bgl. Absent in SV02.
	Sandy CLAY, pale brown, fine to medium grained & Clayey SAND, pale brown/orange, medium grained	From approximately 1.2m bgl to end of bore	Not encountered in SV03 which was drilled to 1.5m bgl. Water was noted to seep into bore LGB01 at 1.8m bgl.

Sequence	Composition/ Lithology	Thickness / Depth	Comment
Eastern Block			
Fill	Topsoil, silty SAND, dark brown or sandy SILT, pale grey	Surface to 0.2m	Reported at LGB11, SV05 to SV08. Fill was reported to be 1.0m thick at SV05.
	Clayey SAND, light brown/grey / silty CLAY, orange-grey / silty SAND, brown	Surface to max 1.3m	Reported at LGB09 (0.6m thick), LGB10 (0.35m thick), LGB13 (1.3m thick) and a thin layer (0.1m) in LGB15. Fill was also reported in test pits TP09 to TP11 in the northern and central portions of the block.
Natural	Layers of silty SAND, pale grey / SAND orange brown / Sandy CLAY, orange to grey / clayey SAND, grey	0.2 to 2.0m bgl	Natural soils reported from 1.0m bgl at SV05 and 1.5m in TP10

Fill as noted to be absent on the western block at locations LGB06 to LGB08 (along the north western boundary and central eastern boundary); and LGB012, LGB14 and LGB16 on the eastern block (in the north western and north eastern corners of the site).

Deeper fill at locations LGB02 and LGB03 along the southern boundary of the western block and TP09, TP10 and LGB13 in the centre of the eastern block, appear to be from filling activities (visible in the Google Earth 2004 aerial photograph).

The subsurface conditions encountered during soil investigation works completed at eastern block were similar to western block. However, an area of filled ground located in the central portion of the eastern block, to depths of around 1.5m BGL. It is also noted that the topographical level of eastern block is somewhat higher than the western block with an estimated rise in ground level of around 1.5m. Based on aerial photograph review, it is estimated that fill may occur across the majority of the eastern block (approximately 2.5 ha).

Bore logs for the drilling of landfill gas bores and test pit logs for the eastern block is provided in **Appendix D**.

T&T works show Tertiary Older Volcanics and the Werribee Formation underlying the shallow geology at the site.

3.4 Site Underground Services (DBYD Plans)

Dial before you dig (DBYD) plans were obtained by DRC prior to the installation of the landfill gas bores. The following details regarding underground services in the vicinity of the site were noted:

- AusNet – no underground conduits are present in the immediate vicinity of the site. The closest underground power line runs along Cemetery Road then west running along the south boundary of the eastern block, with connections leading into from both Cyril Beechey Lane and Cemetery Road which are sourced further to the south;
- National Broadband Network (NBN) – conduits extend into residential lots adjacent to the western boundary of 39-45 Cyril Beechey Lane, a service manhole exists in the southwest corner of the eastern lot;
- City of Casey – Council pipes and pits in residential subdivision to the west, north and east of the site;
- Telstra – conduits extend into residential lots to the west, north and east of the site and along Cyril Beechey Lane;

- APA Group – distribution gas main runs parallel to the western part of the northern boundary of the eastern block, and into residential lots to the west and north of the site;
- Melbourne Water – an easement runs along the length of the western boundary of the site, and a recycled (non-drinking) water main runs parallel to the eastern boundary of the site on the eastern side of Cemetery Road, consisting of a 450mm diameter mild-steel concrete lined (MSCL) pipeline laid in 2004; and
- South East Water – water mains extend into residential lots adjacent to the western boundary of the site, water mains run along the length of Cyril Beechey Lane (225mm diameter, Class 12 uPCV laid in 1987) and Cemetery Road (100mm diameter, Class 12 uPVC laid in 1994). An easement and sewer main run parallel to the western boundary of the site, an easement runs along the length of Cyril Beechey Lane, and an easement that runs perpendicular to the site terminates in the central northern boundary of 39-45 Cyril Beechey Lane, for residences running along Powerscout Retreat.

3.5 Surrounding land use

The Site is proposed to be developed for residential use. The site is located directly adjacent to the north of the former SRL and former Casey landfill waste transfer station, and within the former landfill buffer zone (**Figure 2**). The surrounding area to the north are low-density residential and west is primarily standard density residential use.

Based on the landfill site history and monitoring results LFG is expected to permeate through the unsaturated zone and extend offsite. Landfill gas can also be expected to migrate via the underlying groundwater table (with methane phase shifting from dissolved to unsaturated zones).

3.6 Adjacent Landfill History

The Site is adjacent to the former SRL, this site was originally a sand quarry and later used as a landfill at the completion of quarrying works. The landfill operated from approximately the 1970s to 1996, and accepted soil waste including putrescible waste. At the time of use there was no requirement in the operational license issued by the EPA for the landfill to have a liner system and none was constructed. There was however, a requirement that waste not be deposited below the groundwater level. This requirement was ignored, and waste was placed at depth of up to 25m bgl, which is approximately 10m below the standing water level of the groundwater table. The site remained unlined and unmonitored for approximately 11 years after landfilling ceased.

In response to an EPA issued Pollution Abatement Notice (PAN) issued in January 2007, extensive environmental works including capping of the site (completed 2009), installation of a landfill gas control system (completed in 2010), monitoring and assessment works have occurred at the landfill. Elevated concentrations of methane had been recorded in the adjacent Brookland Greens estate indicating that LFG had migrated off site prior to mitigation measures being implemented on site and some boreholes methane is still being measured above the 1% threshold.

The EPA issued Clean Up Notice (CUN) in 2008 in order to implement specific measures to minimise LFG ground surface emissions and subsurface migration from the site, with a new PAN issued in December 2008.

To comply with the CUN remedial works were undertaken in 2009 and 2010. These works included the:

- installation of a 0.5m wide 11-27m deep cement bentonite diaphragm wall (CBDW) along the western, southern and northern landfill boundaries to minimise LFG migration and groundwater movement to off-site locations;
- upgrading LFG extraction and flare system and leachate extraction system; and
- installation of an engineered cap including geomembrane.

As the landfill was unlined the PAN required a form of 'hydraulic containment' by lowering leachate levels below surrounding groundwater levels and extraction. The leachate and well network was extended to 69 dual purpose

bores (that measured both leachate and LFG), these wells were installed with pneumatic pumps across the landfill site. Leachate is pumped to a holding tank prior to discharge to two lined leachate ponds located on the eastern side of Stevensons Road for treatment. Water is then treated and disposed of under a Trade Waste Agreement (TWA) between the council and South East Water. Further discussion on landfill and surrounding areas monitoring is provided in **Section 4**.

3.7 Literature Review

During works undertaken at the SRL, several consultants have undertaken works at the sites. **Table 3-2** shows the reports, which are further summarised in the below sections.

Table 3-2 Review of Literature

Date of Document	Consultant	Reference	Title
December 2010	Lane Piper	0664A Report04.2	Environmental Audit Report (Groundwater Quality) 2010, Stevensons Road Landfill, Cranbourne, Vic
February 2011	Lane Piper	10205 Report02.2	Environmental Audit Report (Landfill Gas) 2010, Stevensons Road Landfill, Cranbourne, Vic
27 September 2013	Tonkin & Taylor Pty Ltd	3886	Letter: Site Assessment for Proposed Residential Development, 39-45 Cyril Beechey Lane, Cranbourne (multiple dwellings).
14 November 2013	Tonkin & Taylor Pty Ltd	3886.001	Report: 39-45 Cyril Beechey Lane, Cranbourne - Stage 1 Desktop Assessment and Site Suitability Review
15 November 2013	Tonkin & Taylor Pty Ltd	3886.001	Memo: 39-45 Cyril Beechey Lane, Cranbourne – Summary of Site Suitability
22 November 2013	Tonkin & Taylor Pty Ltd	3886.001	Letter: 39-45 Cyril Beechey Lane, Cranbourne – Stage 1 Desktop Assessment and Site Suitability Review
5 December 2016	DRC Environmental Pty Ltd		Monitoring well logs
20 February 2017	DRC Environmental Pty Ltd		Letter: Cyril Beechey Lane – LFG Management and Environmental Process Review Advice
4 July 2019	Environmental Resource Management Australia Pty Ltd (ERM)	805690 / 0446253	Section 53V Environmental Udit of Landfill Aftercare Management 2019, Stevensons Road Closed Landfill. Carms No 59855-13

The following sections provide a summary of the key information presented in the above consultant reports.

3.7.1 City of Casey Council / Lane Piper

City of Casey Council (Council) installed 21 monitoring wells (GB128 - GB132, GB133A - GB133C, GB143A, GB134B, GB135A, GB135B, GB136A - GB136C, GB137a, GB137B, GB138A - GB138C, GB139) were installed on the western block between 22 April and 2 June 2013. Monitoring wells were extended to depths between 1.0 and 18.3 m bgl and groundwater was encountered at depths between 0.55 m and 16.5 m below the top of the casing. Bores which are representative of the site conditions are provided in the attached cross-sections.

The main geological units that constitute aquifers in the vicinity of the site:

- Quaternary sands aquifer (QSA), primarily siliceous sand dunes and sheets up to 7m thick;

- Baxter Formation Aquifer (BFA), referred to as the upper aquifer, up to 16m thick and is connected with the QSA;
- Older Volcanics Aquifer (OVA) up to 25m thick in the site vicinity, forms a local confined aquifer but mostly likely an aquitard in the site area, expected flow direction to the west;
- Werribee Formation Aquifer (WFA) clay, sandy clay, peat, and sand up to 18 m thick, appears unconfined west of the Former Casey Landfill, predicted flow to the north-west; and
- Silurian Bedrock Aquifer (SBA) siltstone, mudstone and shale up to 26m thick with some interconnections with WFA, predicted flow to the north-west.

The upper aquifer was considered to be classified as Segment A1.

Lane Piper Pty Ltd was commissioned by Council to provide the services of an EPA-appointed Environmental Auditor. The following conclusions were made regarding groundwater quality beneath the site following a review of available documentation:

- The groundwater and leachate monitoring network and program is adequate to make an assessment of risk to groundwater and detriment to beneficial uses, however further data is required on the effect of leachate pumping on groundwater levels in order to improve the Conceptual Hydrogeological Model.
- Risks to beneficial uses of groundwater are unacceptable, and additional measures are required to minimise the amount of leachate in the landfill. Groundwater at and near the site is precluded by contamination for the following beneficial uses:
 - Potable Water Supply;
 - Portable Mineral Water;
 - Agriculture, Parks and Gardens;
 - Stock Watering; and
 - Primary Contact Recreation.

Potable mineral water was not further considered as the site is not within a designated mineral springs zone.

The following conclusions were made regarding landfill gas on-site and within the surrounding 500 m buffer following a review of available documentation:

- The LFG monitoring network and program is adequate to make an assessment of risk from LFG.
- The assessed risk level for an uncontrolled event of exposure to workers (on and off-site) in a trench or pit to explosive or asphyxiating levels of LFG is acceptable, assuming continued application of standard occupational health and safety practices in confined spaces.
- The assessed risk level for an uncontrolled event of exposure of occupants of nearby houses to explosive or asphyxiating levels of LFG is insignificant and acceptable.
- The assessed risk level of asphyxiation of an occupant of a house is higher than for explosion where basements are present.
- The emission of methane from leachate contaminated groundwater is considered acceptable, however is dependent upon the contaminant plume extending off-site.
- Estimated indoor methane concentrations for diffusive ingress into a house to methane levels above the Lower Explosive Limit is not considered likely to occur.

- Possible additional sources of landfill gases (including methane, carbon dioxide and hydrogen sulfide) include:
 - Natural attenuation gas derived from biodegradation of groundwater impacted by organic carbon compounds;
 - Partitioning of methane dissolved in groundwater;
 - Sewer gas;
 - Swamp gas;
 - Coal seam gas; and
 - Reticulated utility gas.
- Further data is required to confirm the probability of an explosive gas cloud accumulating in a house within the Brookland Green Estates.

The auditor recommended that Council should require an assessment of the hazard presented by ground-based methane and carbon dioxide in residential areas prior to the development and occupation of buildings within 500 m of the landfill boundary.

Based on the above outcomes of the Audit and as an additional precaution should the SRL landfill gas system be switched off, engineered controls (i.e. installation of an engineered proprietary gas resistant membrane and sub-slab ventilation) have been incorporated into the design of residences to be built on the site. Additionally, a longer-term ground gas monitoring plan for the site is likely required to confirm gas levels over the longer term and to confirm that risk profiles remain “moderate to low” or “acceptable”.

3.7.2 Tonkin & Taylor

The key information presented in the Tonkin and Taylor (T&T) documents is summarised below:

- Historically, there has been migration of LFG from the former SRL, which affected residential houses in the Brookland Greens Estate to the west of the landfill and Site. Significant works have been undertaken at the Stevenson’s Road closed landfill since that time to improve LFG control, including a more optimised LFG extraction system with leachate extraction capabilities, a CBDW (including along the boundary between the site and the landfill), and regular and extensive monitoring. As a result, the impact of LFG on the Brookland Greens Estate has been largely controlled.
- Field investigations by T & T have included:
 - Site walkover and flow measurements in three gas monitoring wells with high methane concentrations;
 - Installation of 17 gas monitoring wells and weekly gas concentration readings on the western block; and
 - Groundwater level gauging.
- A Conceptual Site Model (CSM) reviewed by T & T suggests that LFG has migrated into the geology underlying the site from the SRL and is now trapped by the subsequent installation of the CBDW and the surrounding groundwater table. The possibility of LFG migrating from the Old Casey landfill cannot be ruled out.
- Mitigation measures should be designed for future development on the Site as a moderate to high risk and could include:

- Monolithic concrete floor slabs in all buildings with all joints and penetrations sealed;
 - Proprietary gas-resistant membrane below floor slabs, and passively ventilated or positively pressurised under floor sub-spaces (vapour barrier system); and
 - Oversite capping or blinding and in-ground venting layer.
- Based on the available information, it is concluded that the risk associated with LFG at the Site can be appropriately mitigated using typical building gas protection, and other, measures. The specific building gas protection measures required can be defined as part of the detailed design, once further data is available to confirm the level of risk. On this basis, it is concluded that the Site is suitable for sensitive use including residential.

3.7.3 DRC Environmental Pty Ltd

DRC Environmental Pty Ltd (DRC) was engaged to undertake a landfill gas risk assessment (LFGRA) for the implementation of LFG management measures at the site.

DRC installed 16 LFG bores (LGB01 to LGB16) on-site between 5 and 19 December 2016. LGB01 to LGB08 were installed on the western block, while LGB09 to LGB16 were installed on the eastern block. Boreholes were extended to depths between 1.2m and 2.0m below ground level (bgl) and monitoring implants were installed at depths between 0.8 to 2.0m bgl with tubing to the surface. Bores are shown in **Figures 3A and 3B**.

Water was observed in monitoring well LGB06, however was confined by the underlying clay layer at depths above 0.8m bgl. The soil was recorded as becoming wet in boreholes at depths between 0.9 to 2.0m bgl. At the time of installation, none of the implants were submerged.

These landfill gas bores were monitored on four occasions in 2016 and 2017 and generally reported no detectable methane, with the exception of LGB13, which reported a concentration of 1% methane in December 2016 and 1.3% methane on 11 January 2017. When monitored on 17 February 2017 results had dropped below the methane landfill threshold and reported 0%v/v (February 2017) and 0.5% methane (May 2017).

CIRIA c665 recommends a minimum of six sampling events to assess risk with the key requirement to capture worst case meteorological conditions. NSW EPA (2020) note that under Australian conditions where weather patterns are slower moving may require a longer monitoring time than the minimum two months recommended in CIRIA c665. The DRC monitoring was undertaken in summer and autumn over a six month period, which is considered to give an adequate assessment of worst case temperature conditions in conjunction with historical data.

Barometric pressure was not recorded during fieldworks, so no assessment can be made of whether sampling was undertaken during worst case scenario. However, in line with NSW EPA guidance and British Standard 8576:2013, sampling does not need to be undertaken during worst case scenario conditions, however must be continued until 'it is unlikely that additional data will change the interpretation of the data, the outcome of the risk assessment and proposed remedial actions'.

Landfill gas sampling was carried out on-site by DRC and the following concentrations of landfill gas were noted.

Table 3-3 Landfill Gas Results 2016-2017

Date of Monitoring	Methane	Carbon Dioxide	Oxygen
21 December 2016	Methane was recorded at concentrations below the limit of detection in all wells, except one shallow well (LGB13- eastern block) where methane was recorded at	Western Block -Carbon dioxide was recorded at concentrations between 0 %v/v and 5.6 %v/v with the highest concentration reported in monitoring well LGB03.	Western Block - Oxygen was recorded at concentrations between 0 %v/v (LGB03) and 22.7 %v/v (LGB05 and GB138A).

Date of Monitoring	Methane	Carbon Dioxide	Oxygen
	1 %v/v which is at the Victorian EPA action threshold.	Eastern Block - Carbon dioxide was recorded at concentrations between 0 %v/v and 22.6 %v/v with the highest concentration reported in monitoring well LGB13.	Eastern Block -Oxygen was recorded at concentrations between 0 %v/v (LGB13) and 20.9 %v/v (LGB12).
11 January 2017	Methane was recorded at concentrations below the limit of detection in all wells except one shallow well (LGB13- eastern block) where methane was recorded at 1.3 %v/v which is above current 1 %v/v Victorian EPA action threshold.	Western Block -Carbon dioxide was recorded at concentrations between 0.2 %v/v and 9.9%v/v with the highest concentration reported in monitoring well LGB03.	Western Block - Oxygen was recorded at concentrations between 2.8 % (LGB03) and 21.0 %v/v (GB139).
		Eastern Block - Carbon dioxide was recorded at concentrations between 0.8 %v/v and 30.6 %v/v with the highest concentration reported in monitoring well LGB13.	Eastern Block -Oxygen was recorded at concentrations between 0 %v/v (LGB13) and 20.4 %v/v (LGB12).
17 February 2017	Methane was recorded at concentrations below the limit of detection in all wells.	Western Block -Carbon dioxide was recorded at concentrations between 0 %v/v and 20.4%v/v with the highest concentration reported in monitoring well LGB03.	Western Block -Oxygen was recorded at concentrations between 0 %v/v (LGB03) and 21.0 %v/v (GB139).
		Eastern Block - Carbon dioxide was recorded at concentrations between 0.9 %v/v and 35.1 %v/v with the highest concentration reported in monitoring well LGB09.	Eastern Block -Oxygen was recorded at concentrations between 0 %v/v (LGB11) and 20.5 %v/v (LGB12).
3 May 2017	Methane was recorded at concentrations below the limit of detection in all wells except one shallow well (LGB13- eastern block) where methane was recorded at 0.5 %v/v which is below current 1 %v/v Victorian EPA action threshold.	Western Block -Carbon dioxide was recorded at concentrations between 0 %v/v and 13.5%v/v with the highest concentration reported in monitoring well LGB03.	Western Block - Oxygen was recorded at concentrations between 0.5 %v/v (LGB03) and 25.8 %v/v (GB138A).
		Eastern Block - Carbon dioxide was recorded at concentrations between 1.6 %v/v and 24.6 %v/v with the highest concentration reported in monitoring well LGB13.	Eastern Block -Oxygen was recorded at concentrations between 0 %v/v (LGB11 and LGB13) and 19.8 %v/v (LGB12).

It has been assumed that background CO₂ concentrations at the site are in the order of 5% based on the geology and work undertaken by Environmental Resources Management Pty Ltd (ERM)³. Guideline levels for CO₂ at the site are therefore 6.5% (1.5% above background) based on the Landfill BPEM⁴.

During sampling undertaken by DRC since 2016, CO₂ concentrations were also noted above the guideline level consistently at wells GB135A, GB170, LGB03 to LGB05 and LGB08 on the western block and wells LGB09, LGB10, LGB11 and LGB13 on the eastern block, and intermittently (decreasing to below the guideline level by May 2017) in GB138A and LGB02 on the western block.

Wells GB005 on the western block and LGB09 on the eastern block reported CO₂ concentrations above 6.5% at one or more times during sampling.

³ Environmental Resources Management Pty Ltd, *Stevensons Road Closed Landfill, Section 53V Environmental Audit of Landfill Aftercare Management 2019*, July 2019.

⁴ EPA Publication 788.3, *Best Practice Environmental Management- Siting, Design, Operation and Rehabilitation of Landfills*, April 2015.

No hydrogen sulfide was detected and lower explosive limits (LEL) results were below 0% at all locations.

LGB03 which reported the highest carbon dioxide levels on the western block and LGB09 in the eastern block are located within a low-lying swamp drainage area, which may account for the recorded CO₂ concentrations. LGB13 on the eastern block was installed through a thick layer of fill material (which contained high amounts of organic matter) in the central portion of the site. The CO₂ concentrations at these locations may be representative of active biodegradation occurring, rather than landfill gas emissions.

DRC provided the following conclusions:

- Council has accepted that their own 53V Audit and management measures are commensurate with Audit requirements for the Cyril Beechey land, however they require a site specific LFGRA to support a planning proposal prior to occupancy; and
- The site specific LFGRA is required to be completed at the site as per the latest version of EPA Publication 1625⁵ to meet CCC requirements.

Based on these conclusions DRC has undertaken additional landfill gas assessment works as described below in **Section 4**.

3.7.4 ERM Pty Ltd

ERM was engaged to undertake review and independent environmental audit assessment of compliance with the SRL aftercare management plan (AMP) and verification of completeness of the environmental monitoring program (EMP). These works included consideration of potential harm or detriment to the environment caused by the aftercare management of the landfill and recommendations to address any identified risk to beneficial users.

ERM considers that landfill gas migration from the SRL, prior to implementing control measures, was driven by pressure gradients within geologic layers with high conductivity for gas. These layers, predominantly the deep saturated Werribee Formation (WF) and fractured Older Volcanics (OV). Vertical migration of LFG within these layers was initially limited given lower gas permeability of the OV, however rising groundwater elevations post-quarry activities likely started to flood the deeper WF, resulting in sufficient increase in gas pressure to drive LFG into the overlying OV with transport to this layer by diffusion.

Since remediation works at the SRL, pressure drives for lateral gas flow have decreased, with the introduction of the gas extraction system, leachate extraction system and CBDW. Residual landfill gas still exists in the WF and OV, however OV is now considered to represent a secondary source of gas. LFG within the OV is considered to have a low mobility, but has the potential to move vertically in to the overlying Quaternary or fill units, hence the focus on monitoring shallow LFG bore at the site, to assess if vertical migration of LFG is occurring.

LFG monitoring at SRL has included the additional installation of 34 compliance landfill gas bores (CB01-CB34) installed in June 2014 to 1.3m bgl. These were installed to assess potential off-site risks from SRL and have been monitored on a monthly basis. Data from these bores was applied to the Trigger Response Plan.

During 2017 and 2018 monitoring, these bores reported methane concentrations of between 0.00 and 1.44 gas screening values (GSV) and carbon dioxide between 0.1 and 1.2 GSV. With the outcome that no remedial action was required and there were no further triggers over the bulk of the site. However, elevated results were only reported in two locations, as described below:

- CB022 (located in Kingsbarn Crescent, 40m from Former Casey-Frankston Landfill waste mass)– Due to elevated methane (0.1 – 1.44 GSV) and carbon dioxide (0.1 – 1.03 GSV), technical advice was requested from T&T. Recommendations were issued, and additional passive venting trench was installed

⁵ Now EPA Victoria Publication 1642, *Assessing planning proposals within the buffer of a landfill*, dated October 2017.

beside CB022 in early January 2019. Methane at this location was considered very low to low risk based on the concentrations and flow rate.

- CB033 (located on eastern SRL boundary adjacent to leachate pond)- Permanent pipework was installed in November 2017 to connect surrounding passive vents, which allowed connection of the ground gas vacuum extraction (GGVE) unit to extract from the passive vents. The GGVE operated during the day and kept concentrations low at this location. The GGVE was switched off and replaced with a solar ventilation fan in February 2018. Methane at this location was considered very low to low risk based on the concentrations and flow rate.

DRC notes that both these locations are well away from the site and have several compliance bores between them and the southern site boundary.

Other landfill gas monitoring reported the following:

- Surface emissions, completed biannually across the landfill cap were below action levels (100ppm); and
- Off-site Homes and Buildings & Structures monitoring has ceased in 2017, however two monitors remained in the site office to monitor gas concentrations, no concentrations have been reported above trigger levels.

An updated risk assessment was undertaken by ERM considering all data to 31 December 2018. The outcome was the following risk matrix:

Table E1 Summary of Risk Assessment

Hazard Description	Impact	Relevant Beneficial Use	Risk Rating	Prioritisation
Wild fire entering site from off-site	Air pollution (smoke)	Air SEPP (1a-e)	H	Tolerable
Wild fire entering site from off-site	Degradation of land	Land SEPP – maintenance of ecosystems, human health, buildings and structures, aesthetics, production of food, fauna and fibre	H	Tolerable
Significant emission of fugitive carbon dioxide gas through geological media causing an asphyxiation hazard	Human health risk through use of land.	Air SEPP (1a, b, f)	M*	Tolerable
Significant leak of methane through geological migration that presents an explosion risk	Degradation of land (methane accumulation)	Air SEPP (1a, b, e, f)	M*	Tolerable

H = High, M= Moderate

Hazard Description	Impact	Relevant Beneficial Use	Risk Rating	Prioritisation
Diffuse and acute leakage of leachate through cap liner above 'allowed' rate.	Contamination of groundwater	SEPP (Waters) – water dependent ecosystems and species, agriculture and irrigation (irrigation and stock watering), water-based recreation (primary contact recreation), buildings and structures	M	Tolerable
Diffuse and acute leakage of leachate through basal liner above 'allowed' rate.	Contamination of groundwater	SEPP (Waters) – water dependent ecosystems and species, agriculture and irrigation (irrigation and stock watering), water-based recreation (primary contact recreation), buildings and structures	M	Tolerable
Diffuse and acute leakage of leachate through leachate pond liner above 'allowed' rate	Contamination of groundwater	SEPP (Waters) – water dependent ecosystems and species, agriculture and irrigation (irrigation and stock watering), water-based recreation (primary contact recreation), buildings and structures	M	Tolerable
Diffuse and acute leakage of leachate through leachate pond liner above 'allowed' rate	Contamination of groundwater	SEPP (Waters) – water dependent ecosystems and species, agriculture and irrigation (irrigation and stock watering), water-based recreation (primary contact recreation), buildings and structures	M	Tolerable
Rupture or leakage of leachate transfer system	Contamination of surface water	SEPP (Waters) – water dependent ecosystems and species that are slightly to moderately modified, agriculture and irrigation, human consumption of aquatic foods, industrial and commercial, water-based recreation	M	Tolerable

H = High, M= Moderate

Source: ERM (2019)

ERM concluded that the EMP continued to be appropriate for the nature and extent of the potential environmental risks and was adequate for the notice holder to demonstrate compliance with the notice conditions. However, a LFG Risk Assessment around CB022 and CB032 was required.

4 LANDFILL GAS PATHWAYS

CIRIA, 2007⁶: *Assessing risks posed by hazardous ground gases to buildings* describes the pathways landfill gas can take to receptors. The following table describes the pathways and receptors of landfill gases at the site.

Table 4-1: Landfill Gas Pathways

Source	Pollutant	Receptors	Pathways
Off-site landfill	Methane, carbon dioxide, hydrogen sulphide, oxygen and carbon monoxide	Future site users and construction works	<ul style="list-style-type: none"> • Migration through the subsurface through permeable sands and service trenches; • Surface Emissions through the cap of the adjacent landfill; • Ingress along service lines and into service pits and beneath buildings; • Accumulation into service pits and beneath buildings, within roof voids and within subsurface infrastructure; and • Migration through deeper subsurface soils and groundwater (less likely due to installation of CBDW, residual source now only remains outside the CBDW)
		Buildings and structures	
On-site filling (shallow filling of shallow drainage lines/swampy areas)		Future site users and construction works	

Based on the fact that landfilling activities have ceased and the landfill has been capped, surface (and other) emissions have been reduced since remedial measures have been undertaken. Fugitive emissions surface through the capping are considered to be minor. However, surface emissions testing has been undertaken at the landfill site and details are provided in **Section 4.3**. All the following assessment and monitoring of pathways is discussed below.

4.1 T&T Landfill Soil Gas Monitoring Program

As part of the closure program at SRL ongoing LFG monitoring was undertaken by CCC's environmental consultant T&T to assess migration of gases through the subsurface. Over 100 (last count 108) soil gas probes were installed on the SRL site. In 2009, following installation of the CBDW, 35 additional soil gas probes were installed at 25m intervals outside the CBDW to further assess the effectiveness of the CBDW in controlling the off-site migration of landfill gas.

The follow table describes the methane and pressure trends for T&T installed bores that are on the western block from July 2013 to May 2016. The borehole locations are presented in **Figure 3A**. Trends have not been included for bores within the above table bore data was not considered reliable due to the screens being saturated.

Table 4-2: T&T Installed Landfill Gas Bore Trends

Well ID	Depth Interval (mbgl) Formation	Methane Trend	Pressure Trend
Western Block			
GB130	14.1 – 15.5 Werribee	Initial methane readings fluctuated from approximately 20 to 60%v/v in 2013. In January 2014 methane concentrations stabilised at over 60%v/v before a steady decline to approximately 25%v/v in April	In 2013 and 2014 pressure was varied with results generally around -30mBar. Pressure began to stabilised in 2015 at between 9.14mBar and 30.34mBar and

⁶ Construction Industry Research and Information Association (CIRIA) Publication C665, *Assessing risks posed by hazardous ground gases*, dated December 2007.

Well ID	Depth Interval (mbgl) Formation	Methane Trend	Pressure Trend
Western Block			
		2015 and a further decline between April and July 2015 to 0%v/v	finally stabilised in April 2015 at approximately -2.5mBar.
GB133C	1.0 – 14.0 Werribee	Initially methane concentrations were approximately 64% v/v and decreased to 0.9% v/v in 2014 and further decreased in 2015 to below detection levels.	In 2013 the pressure was varied with results ranging from approximately -19mBar to 157mBar. Pressure started to stabilise to near -2mBar in 2014 and was staggered in 2015, with the lowest reading of -45mBar reported in March 2015 and the highest pressure of 28mBar in May 2015.
GB136A	0.8 – 2.2 Fill	Methane concentrations have consistently been below detection level in this bore since monitoring began in July 2013.	Pressure varied between -12mBar and 12mBar in 2013 and 2014. In 2015 the pressure stabilised to approximately 0mBar.
GB137A	1.5 – 2.5 Fill	Methane concentrations have consistently been below detection level in this bore since monitoring began in July 2013.	Pressure varied between -9mBar and 17mBar in 2013 and 2014. In 2015 the pressure stabilised to approximately 0mBar.
GB137B	160 – 17.0 Werribee	Reported methane concentrations were initially 0% v/v, however these rose in August 2013 to concentrations of above 23% v/v, concentrations started to decline in December 2013 and by December 2014, and once again returned to 0% v/v.	Pressure varied between -41mBar and 15mBar in 2013 and 2014. In 2015 the pressure stabilised to approximately 0mBar, with several dips in pressure noted on 21 April 2015 (-7mBar) and 14 January 2016 (-5mBar).

T&T noted that the highest reported flow rate was 2 L/hour measured in a deep bore in the centre of the site.

4.2 DRC Site Based Soil Gas monitoring

As discussed in **Section 3.7.3**, DRC initially installed eight shallow landfill gas bores on the western block within and a further eight landfill gas bores in the eastern block. These bores contained gas probes and were installed within unsaturated soils at the site in 2016.

DRC installed an additional four landfill gas bores on each of the blocks on 16 February 2018 (SV01 to SV04 on the western block and SV05 to SV08 on the eastern block), to further assess potential shallow landfill gas migration to the site. Locations are shown in **Figures 3A** and **3B**.

In December 2020, a final replacement landfill gas bore was installed within the western block at a location proximal to the south-western boundary of this land parcel. This bore was installed to facilitate the installation of an Ambisense landfill gas monitoring instrument after consultation with the appointed expert peer reviewer.

These were installed to a depth of between 1.5 and 2.0 m bgl with 0.5m screens within the natural soils. Implants were screened with Class 18 uPVC and surrounded with 8/16 sand with a seal of bentonite above, then grouted to the gatic at the surface.

Landfill gas monitoring occurred on these wells on 7 May 2018 and again on the 25 October 2019. Bores did not report any concentrations of methane above the limit of detection. The following concentrations ranges were noted during DRC sampling in 2018 and 2019.

Table 4-3: DRC Soil Gas Sampling 2018-2019

Location	Methane	Carbon Dioxide	Oxygen
Western Block	Methane was recorded at concentrations below the limit of detection in all wells.	Carbon dioxide was recorded at concentrations between 0.6 and 4.7 %v/v, with the highest reported at SV02 and SV03. All results are under guideline values of 6%v/v.	Oxygen was recorded at concentrations between 11.5% and 20.5 %v/v, with the highest O ₂ at SV01.
Eastern Block	Methane was recorded at concentrations below the limit of detection in all bores.	Carbon dioxide was recorded at concentrations between 0.8 and 22.6 %v/v with the highest concentration reported in monitoring well SV07 in the central portion of the block.	Oxygen was recorded at concentrations between 0% (SV07) and 21.7 %v/v (SV05).

All bore logs for bores installed by DRC are provided in **Appendix D**.

No hydrogen sulfide was detected and lower explosive limits (LEL) results were below 0% at all locations.

Carbon dioxide and oxygen results suggest that oxygen is being displaced at several locations, with low oxygen noted at SV03 (western block) and no oxygen reported at SV07 (eastern block). Carbon dioxide levels were above guideline values at SV07 on the eastern block, however based on the location of the sample (in the middle of the site) and was installed near a thick layer of fill material with high amounts of organic matter. Based on the lack of any elevated CO₂ concentrations along the site boundary and the fill material nearby this location CO₂ concentrations may be representative of active biodegradation occurring, rather than landfill gas emissions.

Table 1 (attached) shows sampling results from DRC monitoring. **Appendix E** provides calibration certificates for works undertaken.

In early 2018 additional gas clam sampling was also undertaken on a soil vapour bore in each the eastern and western blocks. The gas clam was installed by DRC on SV02 in the southern central portion of the western block for a period of 20 days and then moved to SV07 in the central portion of the eastern block for a period of 11 days. Data collected from the gas clam is provided in **Table 2** (attached) and summarised in **Table 4-4**.

Table 4-4: Gas Clam Concentration Ranges (April - May 2018)

Location / Dates	Methane	Carbon Dioxide	Oxygen	Hydrogen Sulfide	Carbon Monoxide
Western Block SV02 11 – 30 April 2018	Methane was recorded at concentrations below the limit of detection.	Carbon dioxide was recorded at concentrations between 2.1 %v/v and 2.8 %v/v.	Oxygen was recorded at concentrations between 15.4 %v/v and 18.6 %v/v.	Hydrogen sulfide was reported at concentrations below the limit of detection.	Carbon monoxide was recorded at concentrations between 1 and 8 %v/v.
Eastern Block SV07 30 April – 11 May 2018		Carbon dioxide was recorded at concentrations between 5.1 %v/v and 18 %v/v.	Oxygen was recorded at concentrations between 0 %v/v and 12.4. %v/v.		Carbon monoxide was recorded at concentrations between 1 and 7 %v/v.

Carbon dioxide levels at both locations were consistently above guideline levels (1.5% plus 5% background) during gas clam monitoring at SV07, confirming the May 2018 monitoring results.

An inverse relationship between CO₂ and oxygen is noted at SV07, with oxygen being displaced by CO₂. The highest oxygen readings were reported on 7 and 10 May 2018.

On the 16 December 2020 an Ambisense Gasflux instrument was installed at the location SV09 for the purpose of longer term landfill gas and barometric monitoring. This instrument collected landfill gas data and gas flow data across the period between the 16 December 2020 through to the 6 January 2021. The resultant data collected from the Ambisense instrument is provided in graphical and numerical form in **Appendix H** to this LFGRA.

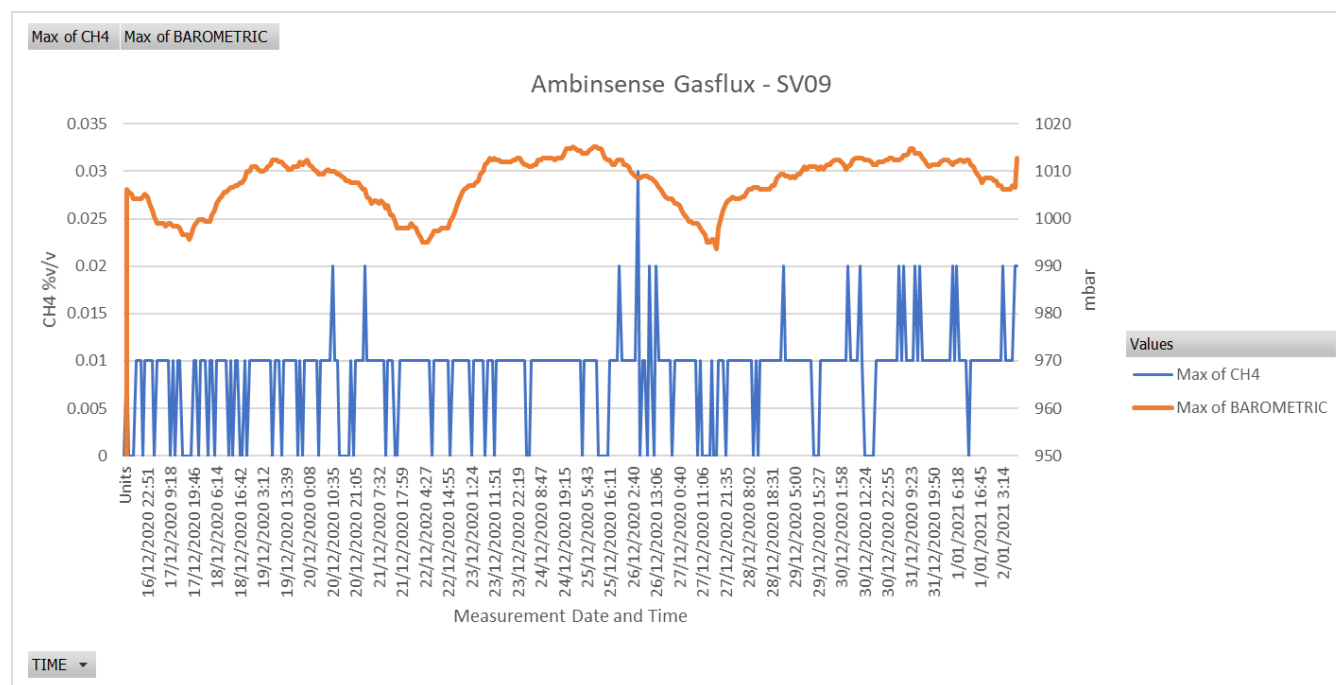
Table 4-5 provides a summary of measured data collected from this monitoring event.

Table 4-5: Ambisense Gasflux Concentration Ranges (December 2020 - January 2021)

Location / Dates	Methane	Carbon Dioxide	Oxygen	Hydrogen Sulfide	Carbon Monoxide	Borehole Flow
Western Block SV09 12 December 2020 – 6 January 2021	Methane was recorded at concentrations between 0.00 %v/v and 0.03 %v/v.	Carbon dioxide was recorded at concentrations between 0.14 %v/v and 6.41 %v/v.	Oxygen was recorded at concentrations between 16.76 %v/v and 20.69 %v/v.	Hydrogen sulfide was reported at concentrations between 0.00 %v/v and 1.69 %v/v.	Carbon monoxide was recorded at concentrations between 0.64 %v/v and 10.53 %v/v.	Flow range recorded peak at 1.18 l/hr with an average flow at 0.01 l/hr

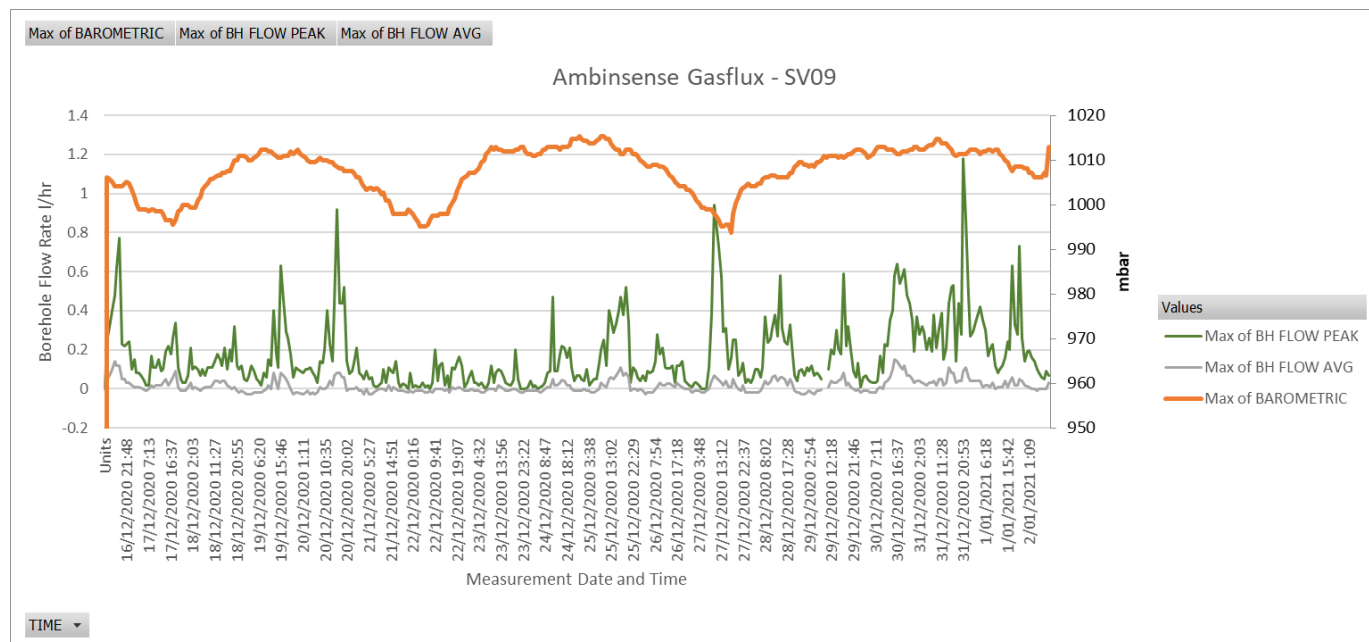
In addition to the numerical data collected at SV09, the following charts have been developed to display barometric pressure affects against both methane %v/v and flow rate.

Chart 4-1: Methane and Barometric Affect SV09



The above chart confirms that barometric pressure has a negligible effect on detected methane, noting that methane concentrations are extremely low.

Chart 4-2: Flow Rate and Barometric Affect SV09



The above chart confirms that barometric pressure has minor effect on borehole flow rate, noting that measured borehole flow rate is extremely low. It is noted though that once barometric pressure decreases, borehole flow rate is indicated to rise to around ~1 l/hr momentarily before stabilizing to low flow rates.

In summary, Ambisense Gasflux monitoring has indicated that very low levels of methane were detected at SV09 near to the south eastern boundary of the western block. This location is closest to the existing closed Casey landfill site south of the subject land. Furthermore, flows appear to be extremely low with noted elevated flows at times where falling barometric pressure was observed. This observation is expected and is typical of natural conditions without underlying or external gas flux influences.

4.3 Landfill Gas Surface Emissions

Run Energy undertook surface emissions sampling on 15 November 2015 (**Appendix C**). Works included a walkover of SRL, walkover old Casey landfill and walkover of transfer station using Gastec Flame Ionisation Detector (FID) with GPS. Wand was swept 50mm from the ground surface with gas readings taken at 21,677 discrete locations. Of the readings taken 13 reported methane at concentrations between 1-10ppm and one reading between 11-<100ppm. All results below closed landfill gas action level (BPEM 788.3, April 2015) of 100ppm methane in air.

Additionally, DRC undertook surface emissions sampling of the eastern and western blocks of the site on 26 June 2020 in approximately 25m grids (where possible). DRC used an Inspectra Laser Portable gas leak detector and GPS. The wand was swept 50mm from the ground surface with regular gas readings taken. The following readings were reported:

- Western Block – of the 103 readings taken, all results below 0.0 ppm methane.
- Eastern Block – majority of results were below 0.0 ppm methane, however two locations reported concentrations of 1.1ppm (along the eastern block boundary) and 1.9ppm (near the two water tanks).

All results were well below closed landfill gas action levels of 100ppm methane in air. Figures showing the walked routes and locations where results were above 0.0ppm are provided in **Figure 4A and 4B**.

4.4 In-home Monitoring

As a part of works undertaken at and surrounding SRL in-home monitoring was undertaken at 71 houses in the adjacent estate. Initially works in September 2008 including monitoring of 330 houses, however by September 2009 a long-term monitoring plan was developed by AECOM. This plan selected 50 homes to be included in the ongoing plan with monitors removed from remaining homes. During removal of in-home monitors 21 houses requested that the monitors be retained.

Continuous monitors with alarm limits at 1% v/v of methane and 1.5% carbon dioxide were placed in houses including in cupboards, below kitchen or bathroom sinks. Uploading initially 2010 weekly but was decreased to monthly in 2011. Data was uploaded and monitors recalibrated by RUN Energy. Additionally, RUN Energy undertook in-house sweeps during data uploading within houses to check for elevated gases elsewhere in the house.

Database for in-home monitoring between July 2008 and June 2010 contained a total of 71,855,341 data readings of 2-minute frequencies. Methane was detected in 14 houses in 2010, of these detections, two properties had methane detections above 20% LEL trigger, with the EPA issuing a CUN for one property. This one property was found to be partially built on piers with gas intrusion through poorly sealed services penetrations through the concrete slab.

4.5 Service Pit Monitoring

An initial assessment of methane accumulation in service pits in the vicinity of the site and SRL was undertaken weekly in 2008-2009. Monitoring of 295 storm water pits and 220 electrical pits was undertaken. However due to the expansion of bore network and completion of CBDW and other mitigation measure (including grated storm water pit covers) and venting at off-site locations, service pit monitoring was suspended in February 2010.

Aggregate data for the monitoring period 1 November 2008 to 16 February 2010 indicated that all 65 service pit detections were below the trigger level of 5% v/v methane.

4.6 Design of Landfill Gas Management System

The Gas Collection System (GCS) and management measure upgrade works within the SRL Landfill were practically completed by early July 2010. These works covered the connection of the GCS to the new ring main, together with the new capping of the landfill as well as the completion of the CBDW and shallow gas extraction trench (inside the CBDW) and boundary gas extraction bores (inside the CBDW). The main components of the GCS are described in **Table 4-6**.

Table 4-6 – Gas Mitigation Measures And GCS

Item	Description
Landfill Cap	<p>The engineered landfill cap is constructed with several layers as follows:</p> <ul style="list-style-type: none"> (1) historical waste mass (2) historical earthen fill cover consisting of compacted clay cap and a varying thickness of earthen fill and mulch layers (3) compacted sub-base (thickness varies as required by design) (4) LLDPE geomembrane (5) cushion geotextile layer (6) soil sub-base (500 mm thickness) (7) final surface layer (300mm thickness).

Item	Description
CBDW, shallow LFG extraction trench and associated LFG bores	The purpose of the CBDW is to aid in the control of LFG migration off-site and to limit leachate migration. The CBDW is installed along the full extent of the northern and western Site boundaries with 50 metre and 45 metre return walls extending along the eastern and southern boundaries at the south west and north east corners respectively. A shallow LFG extraction trench is installed in conjunction with the CBDW and is connected to a LFG ring main extraction system. In conjunction with the CBDW and shallow LFG extraction trench, a series of LFG bores are installed at 25 metre intervals along the landfill side of the CBDW.
Ring Main Extraction System	LFG is extracted via a ring main extraction system. The ring main runs around the perimeter of the landfill with individual branch main lines running to groups of LFG extraction wells. Separate LFG extraction wells are connected via individual flow lines. The ring main connects LFG extraction wells to LFG flares. Control valves located throughout the system allow regulation of suction and flow from selected portions of the Site as required. Condensate traps situated at select locations collect condensate and prevent blockage in LFG pipe system.
Flares	Three LFG destruction flares operate continuously at Site. Two flares is present for back up purposes. A telemetry system provides notification of any unscheduled shut downs 24hrs/ day.
Dual Purpose Leachate/ LFG Extraction Wells	90 dual purpose leachate/ LFG extraction wells are installed throughout the site at variable depths for leachate and LFG extraction purposes.
Primary LFG Probes	35 primary LFG probes are located at approximate 25 metre intervals between the CBDW and site boundary.

A Landfill Gas Management Plan (LGMP) has been implemented by AECOM and currently managed by RUN Energy. The objectives of the Plan, as established within the primary guidance document United Kingdom Environment Agency (2004) *LFTGN03 Guidance on the Management of LFG* (LFTGN03) are intended to:

- Provide a Site-specific estimate of LFG produced on-site.
- Identify and assess site specific risks associated with LFG.
- Identify management and operational control measures to address the risks.
- Determine performance criteria for the control measures.
- Determine design objectives for the implementation of control measures through a LFG management and control system.
- Determine installation criteria, site specific methods and construction quality assurance (CQA) procedures for establishing the LFG management and control system.
- Determine procedures and responsibilities for installation, operation, maintenance and monitoring (OM&M) of the LFG management and control system.
- Demonstrate that the performance of the LFG management and control system meets the agreed requirements and criteria.
- Determine procedures for managing changes to the LFG management and control system.

The overall purpose of the GCS is to effectively extract LFG. The rate of extraction is balanced so that the extraction rate is close to generation rate of LFG meaning an accumulation of positive pressure LFG is unlikely to occur in the waste mass. Given this and the presence of the CBDW it is considered very unlikely that a significant volume of methane could migrate to the Site.

4.6.1 Hydrogeological Cross Section

Hydrogeological cross sections across the site are provided in **Appendix A** and were undertaken as part of CCC work at the site.

The regional geology includes Paleozoic bedrock overlain by younger terrestrial sediment deposits and Cainozoic aged Volcanics (including Werribee Formation, Older Volcanics Formation, the Baxter Sandstones and Newer Volcanics).

Groundwater at the site is found within the Werribee Formation (WF) at depths of greater than 12 m bgl, however some saturation of shallower soils was noted during the installation of shallow soil vapour bores at the site. This suggests that rainwater and surface infiltration is occurring through the sandy surface soils at the site.

Based on AECOMs findings, at the SRL it is noted that the Baxter Sandstones (which they have considered as Fyansford-Brighton Group) and Quaternary Sands are hydraulically connected and contain the shallow water table aquifer with depths to groundwater approximately 1 to 6.1m bgl. Groundwater flow direction was inferred to be towards the west with a component of flow vertically (downwards) into the underlying Older Volcanics and/or Werribee Formation Aquifer (WFA).

Some localised linear mounding may be occurring within the Quaternary Sands and fill in the western block along the surface drainage lines shown on **Figure 3A**.

The predominant flow direction of the WFA at the SRL site was noted to be west to north-west, with the Auditor considering flow possible to the southwest.

Gas migration beneath the site from the landfill has historically occurred, however, since the installation of the CBDW a reduction in gas pressure and hence methane migration to the site has been observed (as shown in **Figure 6**). Additionally, surface emission monitoring at the site does not show any methane being emitted post-2015.

5 RISK SCREENING

5.1 Receptors

Should the proposed residential development occur at the site, receptors are considered to be future residents and users of any public open space or conservation areas at the site.

5.2 Pathways

As discussed in **Section 4**, potential pathways to these receptors are through subsurface migration ingress and accumulation within service pits and beneath buildings. The main potential pathway is through the unsaturated zone beneath the SRL to the site.

Shallow swamp deposits along drainage lines at the site may be a second source of landfill gases, due to the decomposition in swampy areas.

5.3 Semi-Quantitative Risk Assessment

A semi-quantitative risk assessment was conducted for landfill gas using the modified Wilson and Card classification outlined in CIRIA c665 as per Table 5-1 below. The gas screening value (GSV) threshold can be used to calculate risk from either methane or carbon dioxide.

Table 5-1 – Modified Wilson and Card Classification

Characteristic Situation	Risk Classification	Gas Screening Value (GSV) Threshold (L/hr)	Additional Factors	Typical Source of Generation
1	Very Low	<0.07	Typically methane <1% and/or carbon dioxide <5%, otherwise consider increase to Situation 2	Natural soil with low organic content. 'Typical' made ground
2	Low	<0.7	Borehole air flow rate not to exceed >70 L/hr, otherwise consider increase to Situation 3	Natural soil, high peat / organic content. 'Typical' made ground
3	Moderate	<3.5	-	Old landfill, inert waste, mineworking flooded
4	Moderate to High	<15	Quantitative risk assessment required to evaluate scope of protective measures	Mineworking – susceptible to flooding, completed landfill
5	High	<70	-	Mineworking unflooded inactive with shallow workings near surface
6	Very High	>70	-	Recent landfill site

The methane or carbon dioxide value to be compared to the GSV is calculated by multiplying the highest reported concentration by the highest borehole flow rate.

As a conservative measure, we have used the highest flow rate reported for the site by T&T (2 L/hr) and the highest concentrations from the more recent DRC sampling data (methane 1.3% and carbon dioxide 35.1%), this results in GSVs of 0.026 and 0.702 for methane and carbon dioxide respectively.

This classifies the site as **Characteristic Situation 3** with a “**Moderate**” risk rating, which is consistent with the old landfill source and the findings and recommendations of the ERM environmental audit for the Brookland Greens Estate located east and south subject land.

The controls to manage landfill gas such as passive venting systems to be implemented at the site as part of the residential design to protect against future risk are in line with the recommended controls for a Situation 3 site as per CIRIA c665.

5.4 Data Validity

Data collection has occurred across this site in a number of phases since 2010. More recent collection of data by DRC across an extended period of time has resulted in a volume of data that has demonstrated consistency enabling a conclusion the data is of suitable reliability and validity to make the appropriate determination of risk rating for this site.

6 DETAILED SPECIFICATION FOR PROTECTIVE MEASURES

Based on the potential of LFG to exist beneath the site, further LFG bores were installed and monitored. As an additional precaution, should residential development be undertaken at the site, all proposed residences would be built by a single developer as slab-on-grade with no basements and with no blocks sold as undeveloped land. Any proposed residences would also require an installed engineered proprietary gas resistant membrane with a permeable gas venting layer that will initially be passively vented, but as a contingency could be converted to an actively vented layer if required with any future change in LFG risk profile. Full details of the proposed protective measures are provided in the below sections.

6.1 Operational Management and Control Measures for Residential Development/Uses

The hierarchy of hazard control at the site to eliminate potential exposure to LFG of users of the site includes:

- Engineered controls; and
- Administrative and Monitoring controls.

Based on the potential risk to landfill gas migration through the subsurface from SRL to the site engineered controls (i.e. installation of an engineered proprietary gas resistant membrane) have been incorporated into the design of residences to be built on the site. Additionally, it is proposed that all underground services at the site have venting to stop accumulation of methane and carbon dioxide within the service, and to stop the service providing a preferential pathway beneath buildings or structures on the site.

Currently the EPA is implementing administrative and monitoring controls on the adjacent former landfill site. These include the issuing of PANs and CUN with required monitoring for landfill gas of surrounding areas. Extensive remediation of landfill gases at the SRL has occurred through the use of the PAN and CUN process.

EPA Publication 1490 (*Closed Landfill Guidelines*, December 2012) also requires that all landfills have an Auditor verified environmental monitoring program in place. The program is currently being undertaken by CCC and Run Energy.

An EPA Auditor also reviews the verification, testing and compliance of the LFG systems on both the landfill site and surrounding properties. The LFG system is currently run by the CCC and Run Energy representatives undertake testing. All works undertaken by CCC and Run Energy were verified by the Auditor in 2011.

6.2 Gas Protection Score and Protective Measures

With reference to the NSW EPA Assessment and Management of Hazardous Ground Gases (NSW EPA, 2019), it is deemed the site presents a **“Moderate”** risk based on the outcomes of the Semi-Quantitative risk assessment detailed in Section 5 of this report. This indicates a gas protection value of **“3.0”** is applicable as a risk rating to the proposed buildings for these site’s.

In order to meet the protection score requirement of **3.0** specified by the NSW EPA guideline, both a sub-slab venting system, combined with a reinforced floor slab, sub-slab methane sensors and proprietary membrane are recommended. The design specification, layout and construction quality assurance requirement of the proposed protective measures are provided as **Appendix G** of this report.

With reference to the guidance offered by Table 9 of the NSW EPA guideline, the following protective measures and their protective measure scores are relevant to the measures proposed to be implemented at this site:

6.2.1 Concrete Slab System

An engineered designed, reinforced slab system supported by Cupolex formwork is proposed for the site. Cupolex is a type of waffle pod slab using polypropylene plastic domes to support and provided formwork for the concrete slab. A minimum reinforced floor slab of 85mm thickness is proposed for each dwelling.

- **A Protection Score 0.5:** Reinforced concrete ground-bearing floor slab or waffle pod slab.

6.2.2 Passive Ventilation System Details

In order to meet the venting requirements of the sub-slab, the Cupolex system, which is a form of cast in-situ passive sub-slab venting system, is recommended for the slab footprint in the area. The design specification, layout and construction quality assurance requirement of the Passive Venting System (PVS) are detailed in **Appendix G** of this report.

The Cupolex system for this site is a combination of primarily 260mm height domes with beton stops and sub-slab passive venting infrastructure. Proposed venting may include the use of passive or hybrid turbines and slab side venting. Design details and performance specifications for venting are provided in **Appendix G**. Details of the Cupolex system including the location of H260mm domes, beton stops and venting feeds / exhausts are provided in **Appendix G**.

- **A Protection Score 2.5:** Passive sub-floor ventilation with very good performance;

6.2.3 Proprietary Gas Barrier Membrane

DRC recommends the proprietary product **Perlastic** as a suitable methane gas barrier membrane (GBM) for this development site. Perlastic Industrial Coatings Inc. are the owner and supplier of **Perlastic** and as a consequence, DRC recommend that experienced applicators of **Perlastic** should be engaged to install the GBM.

DRC has reviewed the manufacturers specification for the performance of the membrane in terms of its physical properties, strength, chemical resistance and gas permeability. In the opinion of DRC, the **Perlastic** GBM meets and exceeds performance requirements for a GBM suitable for use at this site.

The development is intended to be completed under the supervision of a single building contractor with standard footing and slab on ground designs. **Appendix G** provides indicative structural engineering drawings of the proposed development which included design guidance and references to the location and layout of the site and the proposed **Perlastic** GBM and passive venting layer.

A summary provided by the performance metrics applicable to the Perlastic GBM, as supplied by the manufacturer, are provided as **Appendix B** to this report.

GBMs can be specified for the site however they must meet the protective measures specified by this LFGRA. If any doubt exists a professional environmental consultant acceptable to the responsible authority should be consulted to undertake a review of the GBM or proposed product to assess its suitability for use in this application.

On this basis we would recommend **Protection Score of 2.0** may be appropriate for the proprietary GBM layer as prescribed for this site.

In addition to the GBM, it is noted that the Cupolex system itself is made from a chemical resistant robust polypropylene plastic that forms a barrier due to the inter-connectivity of the system and is held in place by the weight of the concrete slab throughout. Although not a traditional GBM, it is reasonable to expect that the Cupolex system's consistent and tight polypropylene construction forms a continuous plastic barrier which adds another level of protection to any micro-cracks or cracks that may form between floor and wall connections that may present within the concrete slab over time.

On this basis we would recommend an additional **Protection Score of 1.0** may be appropriate for the Cupolex system provide each penetration is cut to size, and sealed with a chemical resistant epoxy resin or Sikaflex type product.

6.3 Protection Score Summary

With reference to the above protection details, it is noted that the Cupolex system, appears to provide a significant level of protection to the proposed building from vapour ingress. It is noted that from a total applicable protection score perspective, the aforementioned measures provides a total **Protection Score of 6.0 comprised of:**

- **Protection Score 0.5:** Reinforced concrete ground-bearing floor slab or waffle pod slab;
- **Protection Score 2.5:** Passive sub-floor ventilation with very good performance;
- **Protection Score 2.0:** Proprietary Gas Barrier Membrane (GBM) with sealed penetrations; and
- **Protection Score 1.0:** Tightly sealed polypropylene plastic barrier with sealed penetrations.

Whilst excessive, the protection measures detailed above are considered a belts and braces approach with multiple levels of redundancy to avoid methane and or ground gas intrusion risks applicable to this site. The final design and application of these measures should be presented as a Gas Vapour Management Plan or GVMP. The current GVMP is provided as **Appendix G** to this LFGRA. It is noted that as site specific details and building designs are developed for the project, the GVMP may require refinement thus it is considered design documentation provided as a draft as **Appendix G** will need further revisions to incorporate final structural engineering design, venting layout and wiring requirements.

Revisions to the GVMP should however incorporate the protection measures prescribed by this LFGRA. The final version of the GVMP is recommended to be reviewed and verified by an Environmental Auditor or Environmental Professional with experience in design development of gas mitigation measures and techniques.

7 CONCLUSIONS

Based on the remediation works undertaken at the SRL site and landfill gas monitoring works undertaken at 39-45 and 40-46 Cyril Beechey Lane, there is potential for landfill gases still be present beneath the site.

The Auditor concluded from the assessment of risk pertaining to all receptors including residents in houses within the 500m buffer SRL site (including the subject site):

- Risk level for uncontrolled event of exposure to workers in trench or pits is ‘acceptable’; assuming continued application of standard OHS practices in regards to confined space entry;
- Risk level for uncontrolled event of exposure to occupants of nearby houses from LFG explosion is ‘insignificant’ and asphyxiating levels of LFG was considered ‘acceptable’;
- Emission of methane from leachate contaminated groundwater is possible but unlikely pathway for the migration of methane off the landfill site, risk is considered ‘acceptable’; and
- Estimated indoor methane concentrations for diffusive ingress into a house to methane levels above the LEL is not considered likely to occur.

A site-specific landfill gas assessment has been undertaken by DRC. Results reported from this confirm that methane concentrations at the sites are below the limit of reporting and generally carbon dioxide concentrations are below guideline values, with the exception of one location SV07 in the central portion of the eastern block. Based on the lack of any elevated CO₂ concentrations along the site boundary and the construction near buried fill material with high organic matter, CO₂ concentrations may be representative of active biodegradation occurring, rather than landfill gas emissions.

Based on the lack of surface migration of LFG at the site and the gas relief system which is now in place at SRL there is no pressure gradient pushing LFG to the site.

Noting the risk screening applied to this site, DRC recommend that based on a “Moderate” risk, the site has been classified by the modified Wilson and Card classification as a “3”.

Based on this risk classification, DRC has prescribed various protection measures with associated protection scores in accordance with the NSW EPA Assessment and Management of Hazardous Ground Gases (NSW EPA, 2019), resulting in a total **Protection Score of 6.0 comprised of:**

- **Protection Score 0.5:** Reinforced concrete ground-bearing floor slab or waffle pod slab;
- **Protection Score 2.5:** Passive sub-floor ventilation with very good performance;
- **Protection Score 2.0:** Proprietary Gas Barrier Membrane (GBM) with sealed penetrations; and
- **Protection Score 1.0:** Tightly sealed polypropylene plastic barrier with sealed penetrations.

The protection measures detailed above are considered a belts and braces approach with multiple levels of redundancy to avoid methane and or ground gas intrusion risks applicable to this site. The final design and application of these measures should be presented as a Gas Vapour Management Plan or GVMP. The current GVMP is provided as **Appendix G** to this LFGRA. Revisions to the GVMP should however incorporate the protection measures prescribed by this LFGRA. It is noted that as site specific details and building designs are developed for the project, the GVMP may require refinement thus it is considered the GVMP will need further revisions to incorporate final structural engineering design, venting layout and wiring requirements. Revisions to the GVMP should however incorporate the protection measures prescribed by this LFGRA. With these protection measures in place, the landfill gas risk applicable to this site is acceptable can be managed for long term safe use of the site. The final version of the GVMP is recommended to be reviewed and verified by an Environmental Auditor or Environmental Professional with experience in design development of gas mitigation measures and techniques.

8 Statement of Limitations

This document has been prepared based on a specific brief provided to DRC Environmental by Maclaw No.10 Pty Ltd & Greenridge Properties Pty Ltd. This document has been prepared with care and consideration to acceptable standards and current industry practice. This document is based on sub-surface conditions that may be variable which may result in changes to procedures, advice, recommendations or professional conclusions established by this document. DRC Environmental therefore reserve the right to change or withdraw this report.

DRC Environmental recommends only suitably qualified and experienced contractors and consultants should undertake technical assessment of this document and attempt contaminated land remediation projects.

Report prepared by:



Renee Prochazka
Principal Environmental Scientist

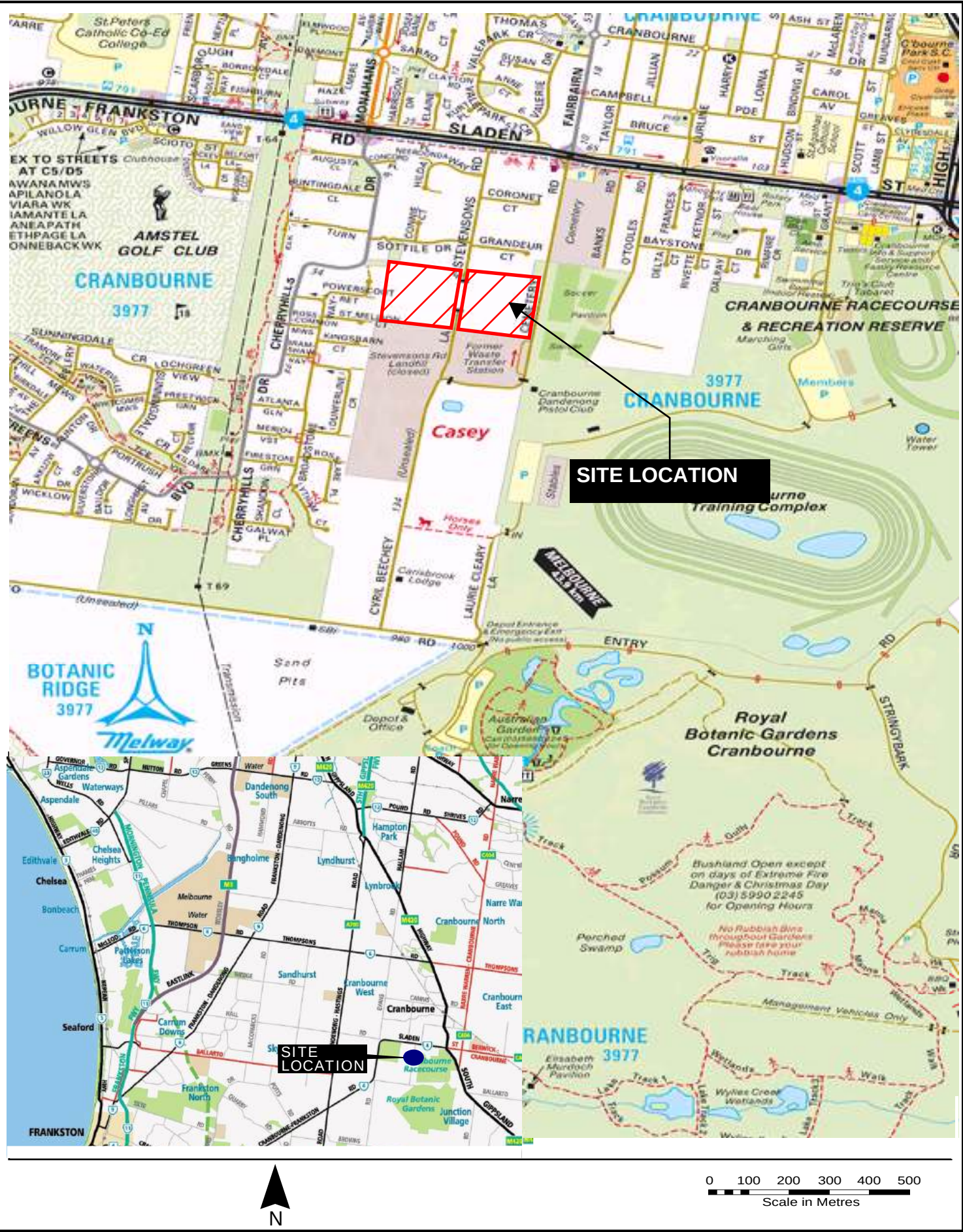
Reviewed and approved by:



Patrick Baldwin CEnvP SC
Principal Environmental Engineer / Managing Director
Certified Environmental Practitioner – Site Contamination Specialist

DRC Environmental Pty Ltd
27 July 2021

FIGURES



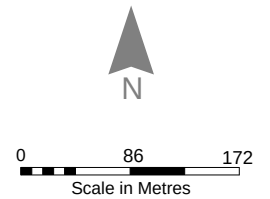
 DRC ENVIRONMENTAL DEVELOPMENT REMEDIATION CONSULTANTS	PROJECT: LANDFILL GAS RISK ASSESSMENT CYRIL BEECHEY LANE	TITLE: SITE LOCATION PLAN
	CLIENT: KLM SPATIAL	
DRC Environmental Pty Ltd "Development Remediation Consultants" PO Box 586, Rosanna VIC 3084 Website: www.drcenviro.com.au Email: admin@drcenviro.com.au	DATE: May 2017 DESIGNED: RP	DRAWN: LB SOURCE: UBD City Streets



LEGEND:

Approximate Site Boundary 

Approximate location of cement bentonite diaphragm wall (CBDW) 



TITLE:

Site Layout

PROJECT:

**LANDFILL GAS RISK ASSESSMENT
- CYRIL BEECHEY LANE**

CLIENT:

KLM SPATIAL

DATE: 31/05/18

DESIGNED: REC

DRAWN: REC

SOURCE: Nearmap

FIGURE:

2



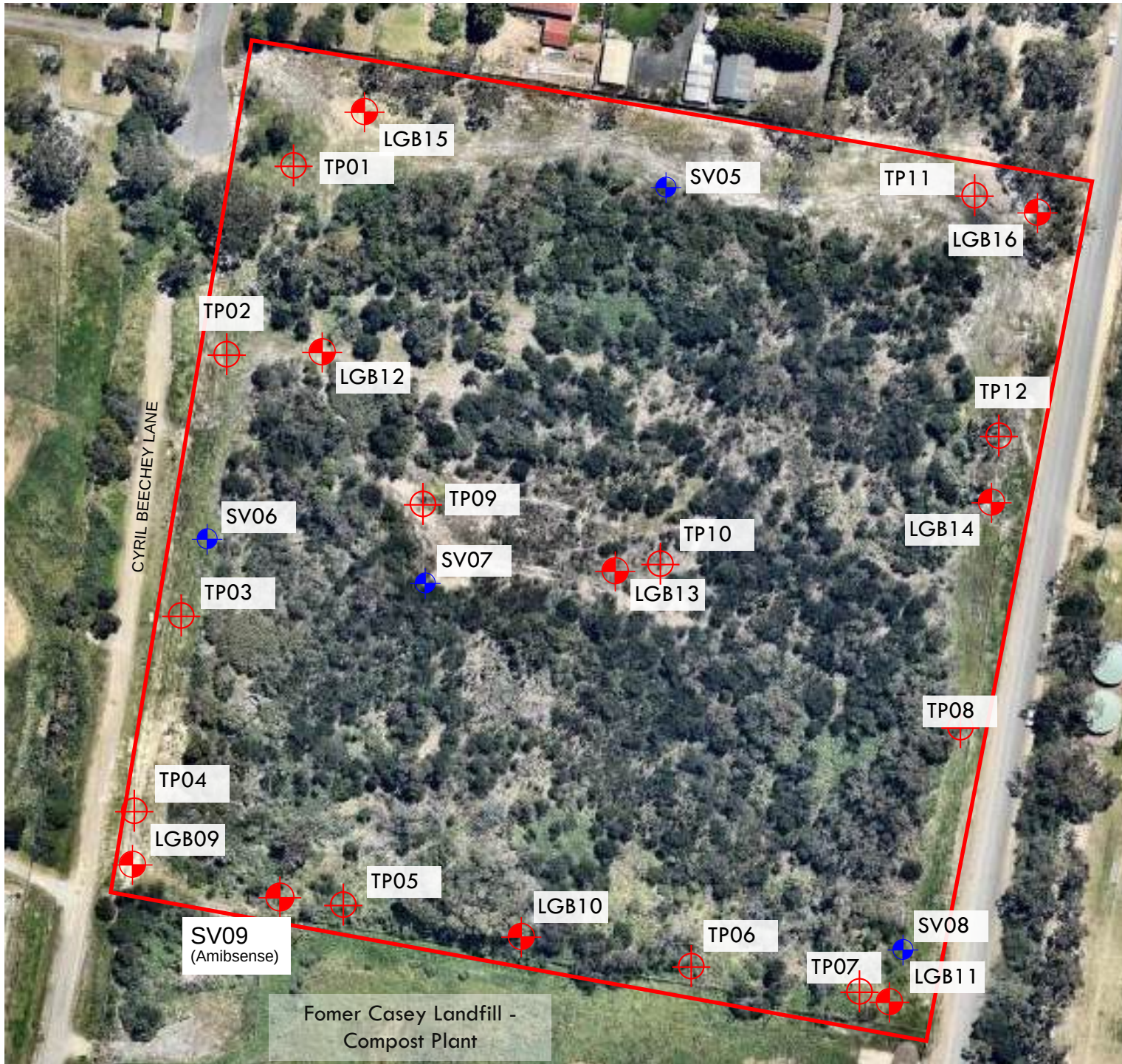
LEGEND:

- Site Boundary
- Approximate DRC Landfill Gas Bore Locations
- Approximate Location CCC Landfill Gas Bores
- Current and Former Drainage Lines

N

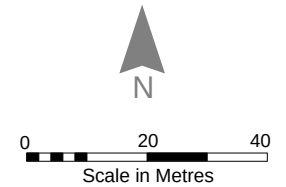
0 20 40
Scale in Metres

TITLE: Western Block- 39-45 Landfill Gas Bore Locations	
PROJECT: LANDFILL GAS RISK ASSESSMENT - CYRIL BEECHEY LANE	
CLIENT: KLM SPATIAL	
DATE:	31/05/18
DESIGNED:	REC
DRAWN:	REC
SOURCE:	Nearmap
FIGURE:	3A



LEGEND:

-  Site Boundary
-  Approximate Landfill Gas Bore Locations
-  Approximate Test Pit Locations



TITLE:

**Eastern Block - 40-46
Landfill Gas Bores and
Test Pit Locations**

PROJECT:

LANDFILL GAS RISK ASSESSMENT
- CYRIL BEECHEY LANE

CLIENT:

KLM SPATIAL

DATE: 31/05/18

DESIGNED: REC

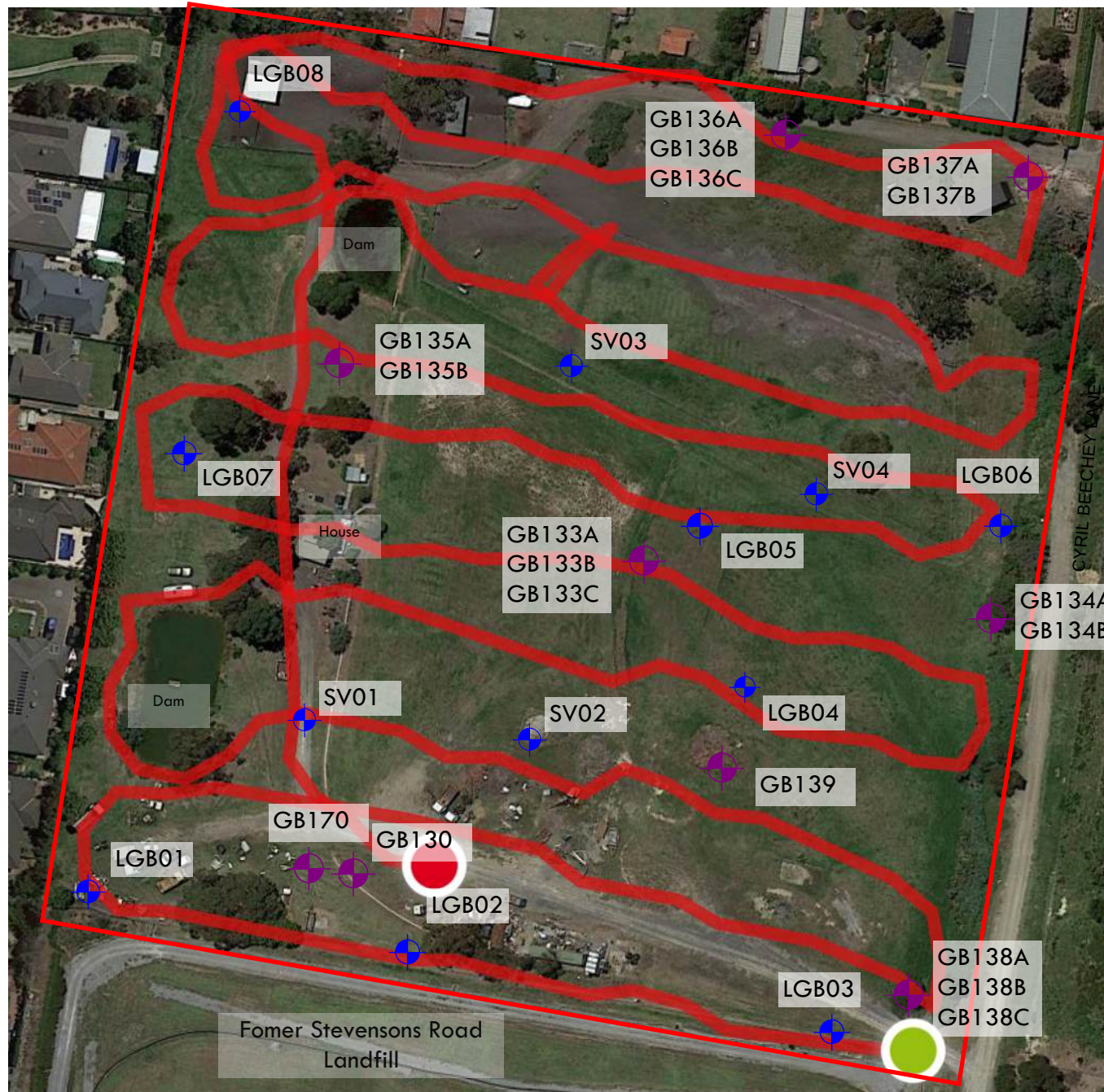
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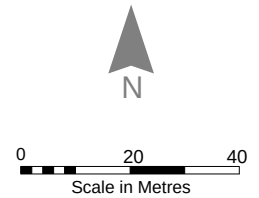
3B

This figure remains the intellectual property of DRC Environmental Pty Ltd. This figure may only be used for environmental description purposes and remains the property of DRC Environmental Pty Ltd.



LEGEND:

-  Site Boundary
-  Surface Sampling Path
-  Approximate DRC Landfill Gas Bore Locations
-  Approximate Location CCC Landfill Gas Bores



TITLE:

**Western Block- 39-45
Surface Emission
Sampling**

PROJECT:

LANDFILL GAS RISK ASSESSMENT
- CYRIL BEECHEY LANE

CLIENT:

KLM SPATIAL

DATE: 30/06/20
DESIGNED: REP
DRAWN: REP
SOURCE: Nearmap

FIGURE:

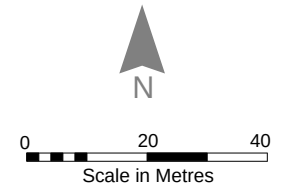
4A

A4 size



LEGEND:

- Site Boundary
- Approximate Landfill Gas Bore Locations
- Approximate Test Pit Locations
- Approximate Reading locations



TITLE:

**Eastern Block - 40-46
Surface Emission
Sampling**

PROJECT:

LANDFILL GAS RISK ASSESSMENT
- CYRIL BEECHEY LANE

CLIENT:

KLM SPATIAL

DATE:

July 2020

DESIGNED:

REP

DRAWN:

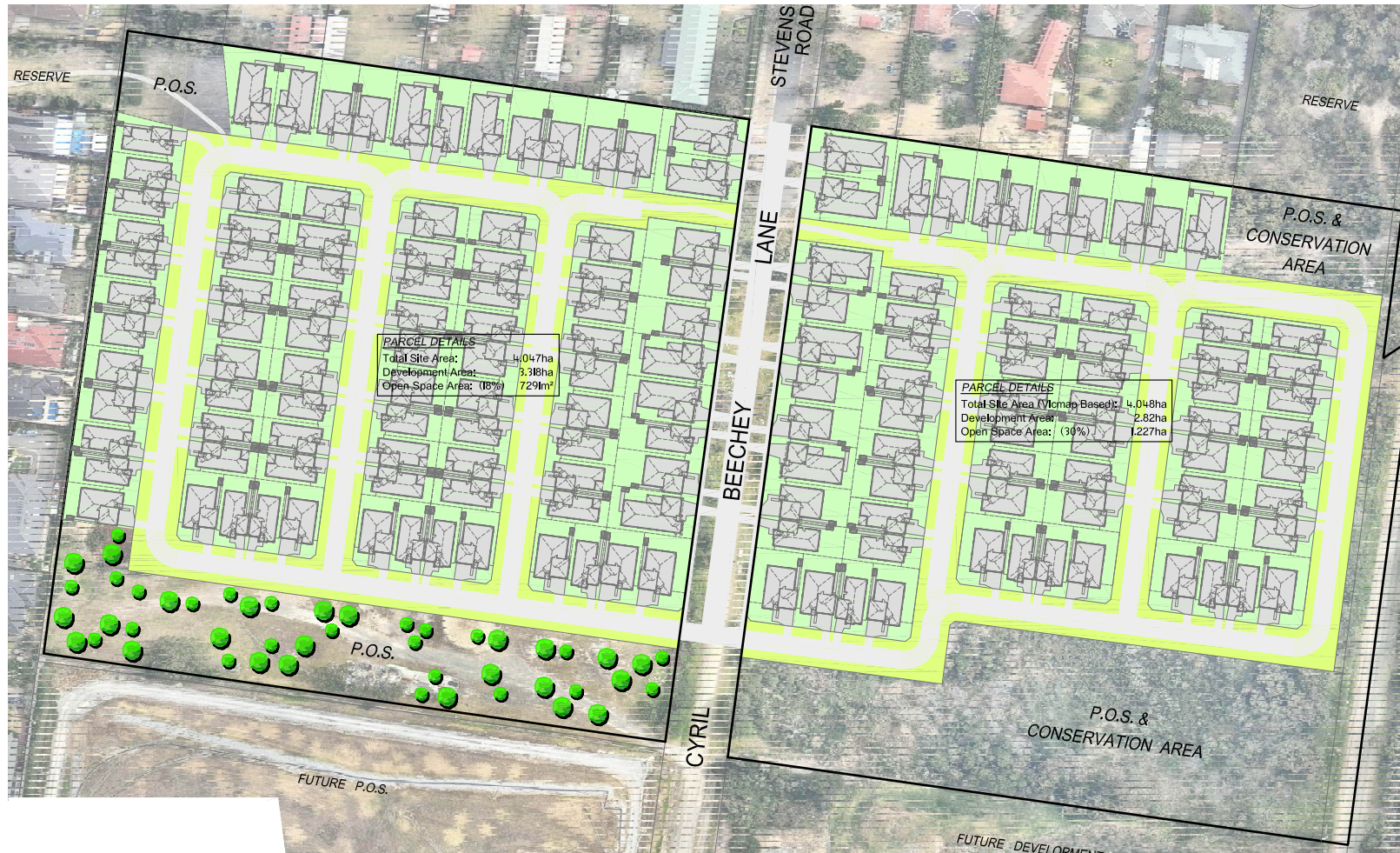
RWW

SOURCE:

Nearmap

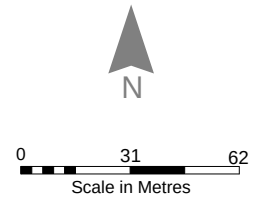
FIGURE:

4B



LEGEND:

APPROXIMATE
SITE BOUNDARY



TITLE:

**Proposed Residential
Development**

PROJECT:

**Cyril Beechey Lane,
Cranbourne**

CLIENT:

KLM Spatial

DATE: 31/05/18

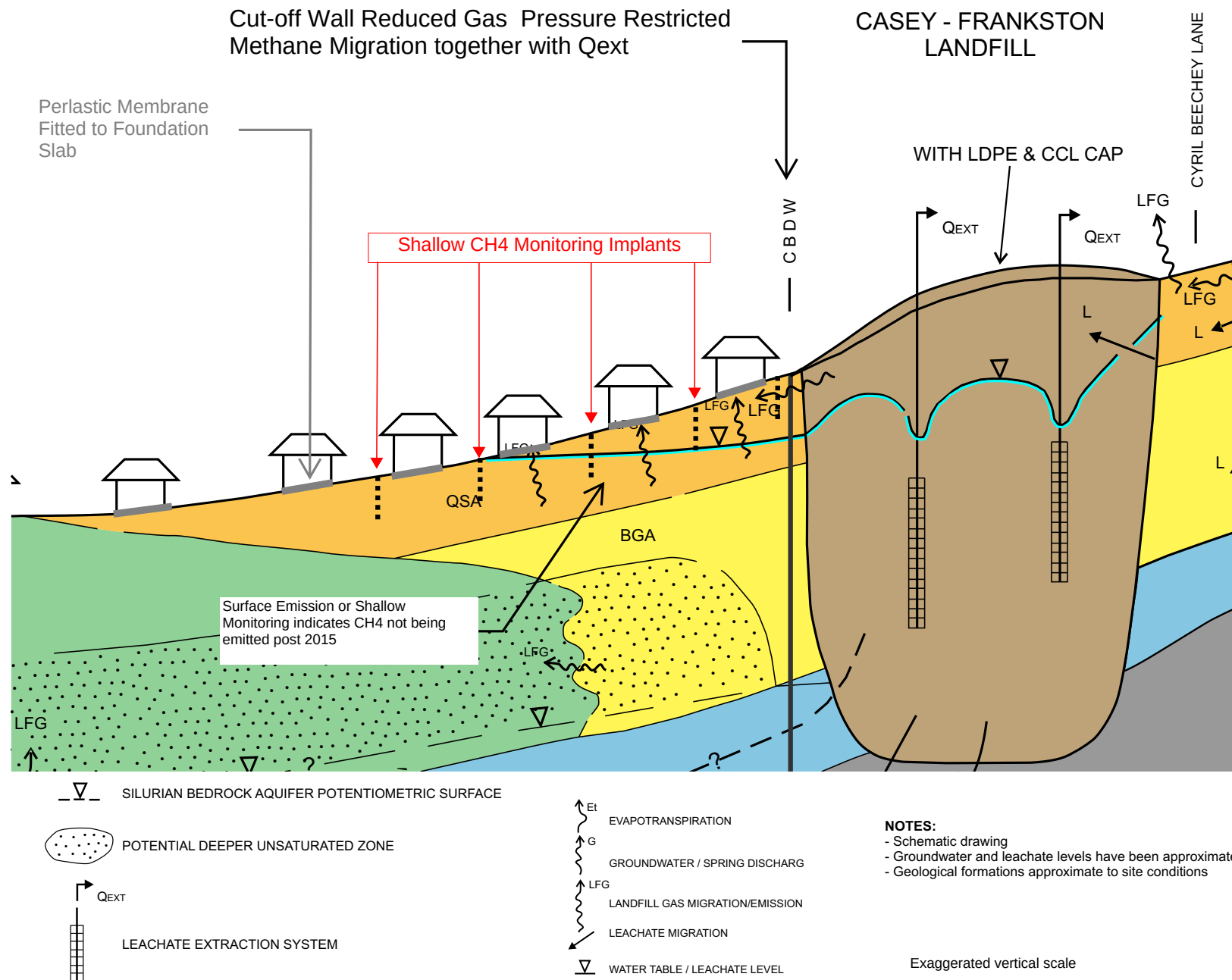
DESIGNED: REC

DRAWN: REC

SOURCE: KLM Plan 3865.06 PP01

FIGURE:

5



- | | |
|---|---|
|  | SAND AND SILTS (QSA) |
|  | BRIGHTON GROUP (BGA, SANDS) |
|  | OLDER VOLCANICS (OV, BASALT) |
|  | WERRIBEE FORMATION (WFA, SANDS) |
|  | SANDSTONE, SILTSTONE SHALE (SBA, BEDROCK) |

NTS
Scale in Metres
Exaggerated vertical scale

TITLE:

Updated CSM (From Audit Report 2011)

PROJECT:

Cyril Beechey Lane,
Cranbourne

CLIENT:

KLM Spatial

DATE: 14/03/17

DESIGNED: PLB

DRAWN: PLB
SOURCE: s53V Audit Report Stevensons Rd
Landfill

JOB NUMBER:

Cyril Beechey

FIGURE:

5

TABLES



Table 1 - Recorded LFG Monitoring Data

Site Name	ID	Date	CH4%	CO2%	O2%	Comment
Site 1: 39-45 Cyril Beechey Lane	LGB01	21/12/2016	-	-	20.8	
Site 1: 39-45 Cyril Beechey Lane	LGB02	21/12/2016	-	0.3	20.5	
Site 1: 39-45 Cyril Beechey Lane	LGB03	21/12/2016	-	5.6	-	CO2 above 1.5% v/v of Background
Site 1: 39-45 Cyril Beechey Lane	LGB04	21/12/2016	-	13	6.4	CO2 above 1.5% v/v of Background
Site 1: 39-45 Cyril Beechey Lane	LGB05	21/12/2016	-	0.2	22.7	
Site 1: 39-45 Cyril Beechey Lane	LGB06	21/12/2016	-	0.7	20.1	
Site 1: 39-45 Cyril Beechey Lane	LGB07	21/12/2016	-	0.1	20.9	
Site 1: 39-45 Cyril Beechey Lane	LGB08	21/12/2016	-	0.1	20.8	
Site 1: 39-45 Cyril Beechey Lane	GB005	21/12/2016	-	0.4	20.3	
Site 1: 39-45 Cyril Beechey Lane	GB006	21/12/2016	-	1.4	19.6	
Site 1: 39-45 Cyril Beechey Lane	GB130	21/12/2016	-	0.3	20.7	
Site 1: 39-45 Cyril Beechey Lane	GB133A	21/12/2016				Landfill Gas Bore Flooded - No readings taken
Site 1: 39-45 Cyril Beechey Lane	GB133B	21/12/2016				Landfill Gas Bore Flooded - No readings taken
Site 1: 39-45 Cyril Beechey Lane	GB133C	21/12/2016				Landfill Gas Bore Flooded - No readings taken
Site 1: 39-45 Cyril Beechey Lane	GB134A	21/12/2016				Landfill Gas Bore Flooded - No readings taken
Site 1: 39-45 Cyril Beechey Lane	GB134B	21/12/2016				Landfill Gas Bore Flooded - No readings taken
Site 1: 39-45 Cyril Beechey Lane	GB135A	21/12/2016	-	8.4	6	CO2 above 1.5% v/v of Background
Site 1: 39-45 Cyril Beechey Lane	GB135B	21/12/2016				Landfill Gas Bore Flooded - No readings taken
Site 1: 39-45 Cyril Beechey Lane	GB136A	21/12/2016	-	0.9	19.9	
Site 1: 39-45 Cyril Beechey Lane	GB136B	21/12/2016				Landfill Gas Bore Flooded - No readings taken
Site 1: 39-45 Cyril Beechey Lane	GB136C	21/12/2016				Landfill Gas Bore Flooded - No readings taken
Site 1: 39-45 Cyril Beechey Lane	GB137A	21/12/2016	-	0.4	20.7	
Site 1: 39-45 Cyril Beechey Lane	GB137B	21/12/2016	-	1.3	17.8	
Site 1: 39-45 Cyril Beechey Lane	GB138A	21/12/2016	-	2.1	22.7	
Site 1: 39-45 Cyril Beechey Lane	GB138B	21/12/2016	-	-	24.4	
Site 1: 39-45 Cyril Beechey Lane	GB138C	21/12/2016	-	0.1	15.7	
Site 1: 39-45 Cyril Beechey Lane	GB139	21/12/2016	-	-	21.6	
Site 1: 39-45 Cyril Beechey Lane	GB170	21/12/2016	-	4.6	11.8	CO2 above 1.5% v/v of Background
Site 2: 40-46 Cyril Beechey Lane (LGB09		21/12/2016	-	-	20.8	
Site 2: 40-46 Cyril Beechey Lane (LGB10		21/12/2016	-	8.1	15	CO2 above 1.5% v/v of Background
Site 2: 40-46 Cyril Beechey Lane (LGB11		21/12/2016	-	22.1	0.9	CO2 above 1.5% v/v of Background
Site 2: 40-46 Cyril Beechey Lane (LGB12		21/12/2016	-	-	20.9	
Site 2: 40-46 Cyril Beechey Lane (LGB13		21/12/2016	1	27.6	0	CH4 at 1% v/v
Site 2: 40-46 Cyril Beechey Lane (LGB14		21/12/2016	-	0.7	20.1	
Site 2: 40-46 Cyril Beechey Lane (LGB15		21/12/2016	-	-	20.8	
Site 2: 40-46 Cyril Beechey Lane (LGB16		21/12/2016	-	1.3	19.5	



Table 1 - Recorded LFG Monitoring Data

Site Name	ID	Date	CH4%	CO2%	O2%	Comment
Site 1: 39-45 Cyril Beechey Lane	LGB01	11/01/2017	-	0.2	20.2	
Site 1: 39-45 Cyril Beechey Lane	LGB02	11/01/2017	-	5	11.8	
Site 1: 39-45 Cyril Beechey Lane	LGB03	11/01/2017	-	9.9	2.8	CO2 above 1.5% v/v of Background
Site 1: 39-45 Cyril Beechey Lane	LGB04	11/01/2017	-	12	5.8	CO2 above 1.5% v/v of Background
Site 1: 39-45 Cyril Beechey Lane	LGB05	11/01/2017	-	8.6	11	CO2 above 1.5% v/v of Background
Site 1: 39-45 Cyril Beechey Lane	LGB06	11/01/2017	-	0.2	20.5	
Site 1: 39-45 Cyril Beechey Lane	LGB07	11/01/2017	-	2	18.8	
Site 1: 39-45 Cyril Beechey Lane	LGB08	11/01/2017	-	7.1	13.5	CO2 above 1.5% v/v of Background
Site 1: 39-45 Cyril Beechey Lane	GB005	11/01/2017	-	2.5	18.3	
Site 1: 39-45 Cyril Beechey Lane	GB006	11/01/2017	-	2	19.1	
Site 1: 39-45 Cyril Beechey Lane	GB130	11/01/2017	-	2.8	18.5	
Site 1: 39-45 Cyril Beechey Lane	GB133A	11/01/2017				Landfill Gas Bore Flooded - No readings taken
Site 1: 39-45 Cyril Beechey Lane	GB133B	11/01/2017				Landfill Gas Bore Flooded - No readings taken
Site 1: 39-45 Cyril Beechey Lane	GB133C	11/01/2017				Landfill Gas Bore Flooded - No readings taken
Site 1: 39-45 Cyril Beechey Lane	GB134A	11/01/2017				Landfill Gas Bore Flooded - No readings taken
Site 1: 39-45 Cyril Beechey Lane	GB134B	11/01/2017				Landfill Gas Bore Flooded - No readings taken
Site 1: 39-45 Cyril Beechey Lane	GB135A	11/01/2017	-	9.1	10.2	CO2 above 1.5% v/v of Background
Site 1: 39-45 Cyril Beechey Lane	GB135B	11/01/2017				Landfill Gas Bore Flooded - No readings taken
Site 1: 39-45 Cyril Beechey Lane	GB136A	11/01/2017	-	0.6	20.7	
Site 1: 39-45 Cyril Beechey Lane	GB136B	11/01/2017				Landfill Gas Bore Flooded - No readings taken
Site 1: 39-45 Cyril Beechey Lane	GB136C	11/01/2017				Landfill Gas Bore Flooded - No readings taken
Site 1: 39-45 Cyril Beechey Lane	GB137A	11/01/2017	-	0.5	20.5	
Site 1: 39-45 Cyril Beechey Lane	GB137B	11/01/2017	-	2.3	15.5	
Site 1: 39-45 Cyril Beechey Lane	GB138A	11/01/2017	-	6.8	14.1	CO2 above 1.5% v/v of Background
Site 1: 39-45 Cyril Beechey Lane	GB138B	11/01/2017	-	0.7	20.4	
Site 1: 39-45 Cyril Beechey Lane	GB138C	11/01/2017	-	0.9	17.6	
Site 1: 39-45 Cyril Beechey Lane	GB139	11/01/2017	-	0.2	21	
Site 1: 39-45 Cyril Beechey Lane	GB170	11/01/2017	-	8.2	7.9	CO2 above 1.5% v/v of Background
Site 2: 40-46 Cyril Beechey Lane (LGB09	LGB09	11/01/2017	-	27.7	0.1	CO2 above 1.5% v/v of Background
Site 2: 40-46 Cyril Beechey Lane (LGB10	LGB10	11/01/2017	-	7.7	15	CO2 above 1.5% v/v of Background
Site 2: 40-46 Cyril Beechey Lane (LGB11	LGB11	11/01/2017	-	21.9	1.1	CO2 above 1.5% v/v of Background
Site 2: 40-46 Cyril Beechey Lane (LGB12	LGB12	11/01/2017	-	0.5	20.4	
Site 2: 40-46 Cyril Beechey Lane (LGB13	LGB13	11/01/2017	1.3	30.6	-	CH4 at 1% v/v
Site 2: 40-46 Cyril Beechey Lane (LGB14	LGB14	11/01/2017	-	0.8	20	
Site 2: 40-46 Cyril Beechey Lane (LGB15	LGB15	11/01/2017	-	4.4	16.6	CO2 above 1.5% v/v of Background
Site 2: 40-46 Cyril Beechey Lane (LGB16	LGB16	11/01/2017	-	1.4	19.5	



Table 1 - Recorded LFG Monitoring Data

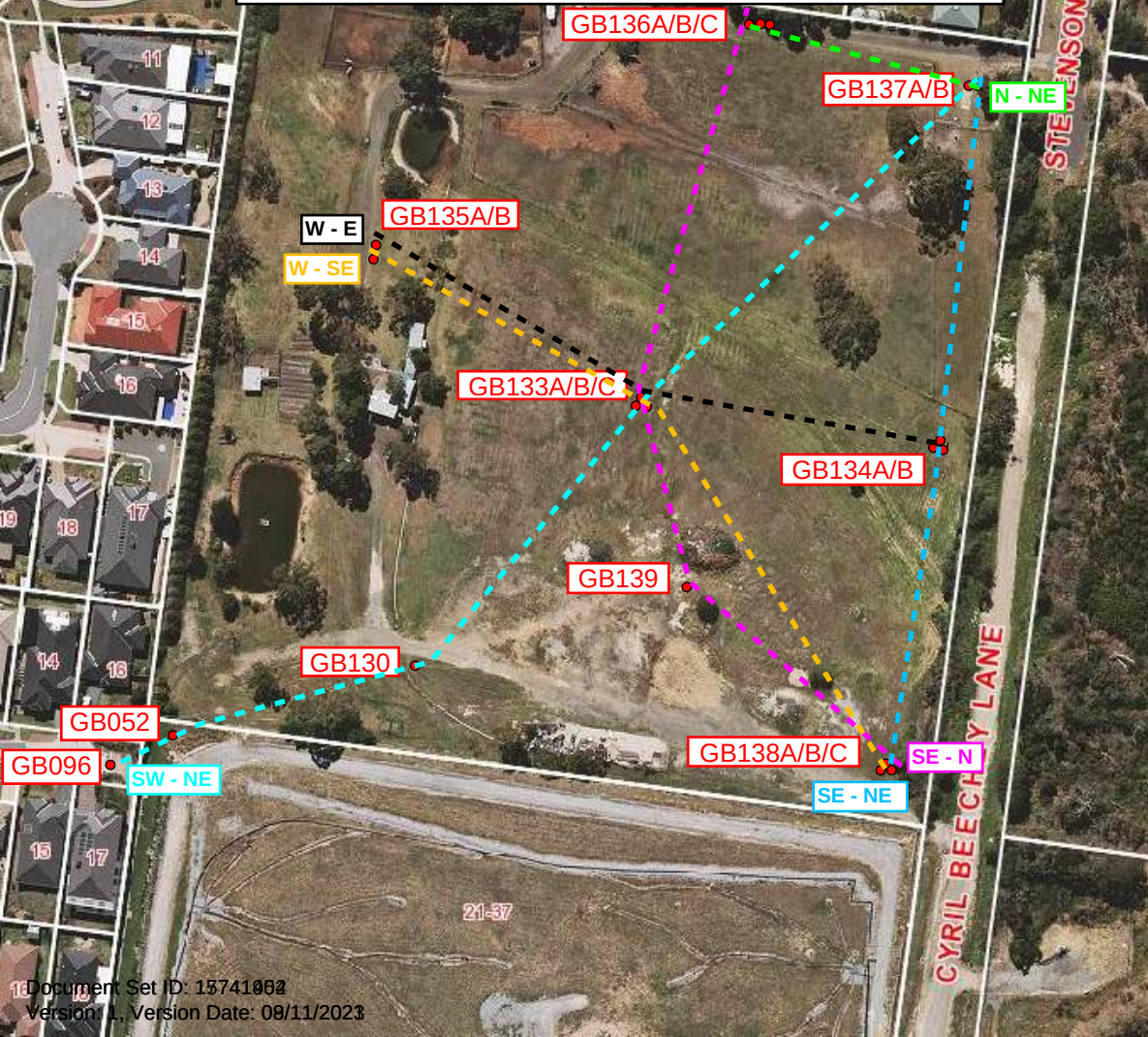
Site Name	ID	Date	CH4%	CO2%	O2%	Comment
Site 1: 39-45 Cyril Beechey Lane	LGB01	17/02/2017	-	0.2	20.7	
Site 1: 39-45 Cyril Beechey Lane	LGB02	17/02/2017	-	7.4	13.4	
Site 1: 39-45 Cyril Beechey Lane	LGB03	17/02/2017	-	20.4	0	
Site 1: 39-45 Cyril Beechey Lane	LGB04	17/02/2017	-	11.8	7.1	
Site 1: 39-45 Cyril Beechey Lane	LGB05	17/02/2017	-	7.4	13.1	
Site 1: 39-45 Cyril Beechey Lane	LGB06	17/02/2017	-	0.2	20.8	
Site 1: 39-45 Cyril Beechey Lane	LGB07	17/02/2017	-	1.7	19.4	
Site 1: 39-45 Cyril Beechey Lane	LGB08	17/02/2017	-	7.9	12.9	
Site 1: 39-45 Cyril Beechey Lane	GB005	17/02/2017	-	1.5	19	
Site 1: 39-45 Cyril Beechey Lane	GB006	17/02/2017	-	2.1	18.7	
Site 1: 39-45 Cyril Beechey Lane	GB130	17/02/2017	-	4.1	17.6	
Site 1: 39-45 Cyril Beechey Lane	GB133A	17/02/2017				Landfill Gas Bore Flooded - No readings taken
Site 1: 39-45 Cyril Beechey Lane	GB133B	17/02/2017				Landfill Gas Bore Flooded - No readings taken
Site 1: 39-45 Cyril Beechey Lane	GB133C	17/02/2017				Landfill Gas Bore Flooded - No readings taken
Site 1: 39-45 Cyril Beechey Lane	GB134A	17/02/2017				Landfill Gas Bore Flooded - No readings taken
Site 1: 39-45 Cyril Beechey Lane	GB134B	17/02/2017				Landfill Gas Bore Flooded - No readings taken
Site 1: 39-45 Cyril Beechey Lane	GB135A	17/02/2017	-	9.3	10.2	
Site 1: 39-45 Cyril Beechey Lane	GB135B	17/02/2017				Landfill Gas Bore Flooded - No readings taken
Site 1: 39-45 Cyril Beechey Lane	GB136A	17/02/2017	-	0.7	20.2	
Site 1: 39-45 Cyril Beechey Lane	GB136B	17/02/2017				Landfill Gas Bore Flooded - No readings taken
Site 1: 39-45 Cyril Beechey Lane	GB136C	17/02/2017				Landfill Gas Bore Flooded - No readings taken
Site 1: 39-45 Cyril Beechey Lane	GB137A	17/02/2017	-	0.6	20.4	
Site 1: 39-45 Cyril Beechey Lane	GB137B	17/02/2017	-	2.7	15.1	
Site 1: 39-45 Cyril Beechey Lane	GB138A	17/02/2017	-	5.6	14.3	
Site 1: 39-45 Cyril Beechey Lane	GB138B	17/02/2017	-	0.7	20.1	
Site 1: 39-45 Cyril Beechey Lane	GB138C	17/02/2017	-	0.7	18.6	
Site 1: 39-45 Cyril Beechey Lane	GB139	17/02/2017	-	0	21	
Site 1: 39-45 Cyril Beechey Lane	GB170	17/02/2017	-	10.8	0.7	
Site 2: 40-46 Cyril Beechey Lane (	LGB09	17/02/2017	-	35.1	0	
Site 2: 40-46 Cyril Beechey Lane (	LGB10	17/02/2017	-	8.6	15.5	
Site 2: 40-46 Cyril Beechey Lane (	LGB11	17/02/2017	-	26.1	0.4	
Site 2: 40-46 Cyril Beechey Lane (	LGB12	17/02/2017	-	0.5	20.5	
Site 2: 40-46 Cyril Beechey Lane (	LGB13	17/02/2017	0	30.4	0.1	
Site 2: 40-46 Cyril Beechey Lane (	LGB14	17/02/2017	-	0.9	20.1	
Site 2: 40-46 Cyril Beechey Lane (	LGB15	17/02/2017	-	4.1	17.3	
Site 2: 40-46 Cyril Beechey Lane (	LGB16	17/02/2017	-	1.7	19.4	

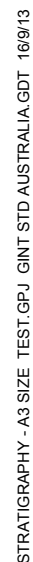
Site Name	ID	Date	CH4%	CO2%	O2%	Comment
Site 1: 39-45 Cyril Beechey Lane	LGB01	3/05/2017				Landfill Gas Bore Flooded - No readings taken
Site 1: 39-45 Cyril Beechey Lane	LGB02	3/05/2017	-	4.9	9	
Site 1: 39-45 Cyril Beechey Lane	LGB03	3/05/2017	-	13.5	0.5	
Site 1: 39-45 Cyril Beechey Lane	LGB04	3/05/2017				Landfill Gas Bore Flooded - No readings taken
Site 1: 39-45 Cyril Beechey Lane	LGB05	3/05/2017				Landfill Gas Bore Flooded - No readings taken
Site 1: 39-45 Cyril Beechey Lane	LGB06	3/05/2017				Landfill Gas Bore Flooded - No readings taken
Site 1: 39-45 Cyril Beechey Lane	LGB07	3/05/2017	-	2.4	18.6	
Site 1: 39-45 Cyril Beechey Lane	LGB08	3/05/2017				Landfill Gas Bore Flooded - No readings taken
Site 1: 39-45 Cyril Beechey Lane	GB005	3/05/2017	-	6.9	4.4	
Site 1: 39-45 Cyril Beechey Lane	GB006	3/05/2017	-	2.5	17.8	
Site 1: 39-45 Cyril Beechey Lane	GB130	3/05/2017	-	4	17.4	
Site 1: 39-45 Cyril Beechey Lane	GB133A	3/05/2017				Landfill Gas Bore Flooded - No readings taken
Site 1: 39-45 Cyril Beechey Lane	GB133B	3/05/2017				Landfill Gas Bore Flooded - No readings taken
Site 1: 39-45 Cyril Beechey Lane	GB133C	3/05/2017				Landfill Gas Bore Flooded - No readings taken
Site 1: 39-45 Cyril Beechey Lane	GB134A	3/05/2017				Landfill Gas Bore Flooded - No readings taken
Site 1: 39-45 Cyril Beechey Lane	GB134B	3/05/2017				Landfill Gas Bore Flooded - No readings taken
Site 1: 39-45 Cyril Beechey Lane	GB135A	3/05/2017	-	7.5	12.8	
Site 1: 39-45 Cyril Beechey Lane	GB135B	3/05/2017				Landfill Gas Bore Flooded - No readings taken
Site 1: 39-45 Cyril Beechey Lane	GB136A	3/05/2017	-	1.8	19	
Site 1: 39-45 Cyril Beechey Lane	GB136B	3/05/2017				Landfill Gas Bore Flooded - No readings taken
Site 1: 39-45 Cyril Beechey Lane	GB136C	3/05/2017				Landfill Gas Bore Flooded - No readings taken
Site 1: 39-45 Cyril Beechey Lane	GB137A	3/05/2017	-	0.9	19.9	
Site 1: 39-45 Cyril Beechey Lane	GB137B	3/05/2017	-	3.2	13.9	
Site 1: 39-45 Cyril Beechey Lane	GB138A	3/05/2017	-	0	25.8	
Site 1: 39-45 Cyril Beechey Lane	GB138B	3/05/2017	-	0	21.6	
Site 1: 39-45 Cyril Beechey Lane	GB138C	3/05/2017	-	0	18.9	
Site 1: 39-45 Cyril Beechey Lane	GB139	3/05/2017	-	0	22	
Site 1: 39-45 Cyril Beechey Lane	GB170	3/05/2017	-	11.2	2	
Site 2: 40-46 Cyril Beechey Lane (	LGB09	3/05/2017				Landfill Gas Bore Flooded - No readings taken
Site 2: 40-46 Cyril Beechey Lane (	LGB10	3/05/2017	-	6.9	13.4	
Site 2: 40-46 Cyril Beechey Lane (	LGB11	3/05/2017	-	19.7	0	
Site 2: 40-46 Cyril Beechey Lane (	LGB12	3/05/2017	-	0.9	19.8	
Site 2: 40-46 Cyril Beechey Lane (	LGB13	3/05/2017	0.5	24.6	0	
Site 2: 40-46 Cyril Beechey Lane (	LGB14	3/05/2017	-	1.6	19.2	
Site 2: 40-46 Cyril Beechey Lane (	LGB15	3/05/2017	-	4.6	16.1	
Site 2: 40-46 Cyril Beechey Lane (	LGB16	3/05/2017	-	3.4	17.5	
Site 1: 39-45 Cyril Beechey Lane	SV01	7/03/2018	-	0.6	20.5	
Site 1: 39-45 Cyril Beechey Lane	SV02	7/03/2018	-	4.7	16.5	
Site 1: 39-45 Cyril Beechey Lane	SV03	7/03/2018	-	2.2	11.5	
Site 1: 39-45 Cyril Beechey Lane	SV04	7/03/2018	-	3.9	17.2	
Site 1: 39-45 Cyril Beechey Lane	SV05	7/03/2018	-	0.8	20.3	
Site 1: 39-45 Cyril Beechey Lane	SV06	7/03/2018	-	0.8	20.4	
Site 1: 39-45 Cyril Beechey Lane	SV07	7/03/2018	-	22.6	0	
Site 1: 39-45 Cyril Beechey Lane	SV08	7/03/2018	-	4.9	18.3	
Site 1: 39-45 Cyril Beechey Lane						
Site 1: 39-45 Cyril Beechey Lane	LGB01	25/10/2019				Landfill Gas Bore not found - No readings taken
Site 1: 39-45 Cyril Beechey Lane	LGB02	25/10/2019				Landfill Gas Bore sampled but pump flow failed
Site 1: 39-45 Cyril Beechey Lane	LGB07	25/10/2019	-	3	13.3	
Site 1: 39-45 Cyril Beechey Lane	LGB08	25/10/2019	-			Landfill Gas Bore found - No readings taken as horse was in paddock
Site 2: 40-46 Cyril Beechey Lane (	LGB09	25/10/2019	-	2.1	21.5	
Site 2: 40-46 Cyril Beechey Lane (	LGB10	25/10/2019	-	4	19.1	
Site 2: 40-46 Cyril Beechey Lane (	LGB11	25/10/2019				Landfill Gas Bore not found - No readings taken
Site 2: 40-46 Cyril Beechey Lane (	LGB12	25/10/2019	-	0.9	19.4	Water in well
Site 2: 40-46 Cyril Beechey Lane (	LGB13	25/10/2019	-	12.8	0	
Site 2: 40-46 Cyril Beechey Lane (	LGB14	25/10/2019	-	1.2	20.8	
Site 2: 40-46 Cyril Beechey Lane (	LGB15	25/10/2019				Landfill Gas Bore not found - No readings taken
Site 2: 40-46 Cyril Beechey Lane (	LGB16	25/10/2019	-	1.6	20.3	Water in well
Site 1: 39-45 Cyril Beechey Lane	SV01	25/10/2019				Landfill Gas Bore damaged - No readings taken
Site 1: 39-45 Cyril Beechey Lane	SV05	25/10/2019				Landfill Gas Bore lid missing - Pump flow failed
Site 1: 39-45 Cyril Beechey Lane	SV06	25/10/2019				Landfill Gas Bore not found - No readings taken
Site 1: 39-45 Cyril Beechey Lane	SV07	25/10/2019				Landfill Gas Bore damaged - No readings taken
Site 1: 39-45 Cyril Beechey Lane	SV08	25/10/2019				Landfill Gas Bore not found - No readings taken

Site Name	ID	Date	CH4%	CO2%	O2%	Comment
Site 1: 39-45 Cyril Beechey Lane	GB130	25/10/2019	-	0.1	21.6	Landfill Gas Bore submerged with water - No readings taken
Site 1: 39-45 Cyril Beechey Lane	GB135A	25/10/2019				
Site 1: 39-45 Cyril Beechey Lane	GB135B	25/10/2019	-	0.1	20.9	
Site 1: 39-45 Cyril Beechey Lane	GB136A	25/10/2019	-	0.8	20.4	
Site 1: 39-45 Cyril Beechey Lane	GB136B	25/10/2019	-	0.8	20.2	
Site 1: 39-45 Cyril Beechey Lane	GB136C	25/10/2019	-	0.1	20.8	
Site 1: 39-45 Cyril Beechey Lane	GB137A	25/10/2019	-	0.4	20.9	
Site 1: 39-45 Cyril Beechey Lane	GB137B	25/10/2019	-	2	18.7	
Site 1: 39-45 Cyril Beechey Lane	GB170	25/10/2019	-	0.1	21.7	
Site 1: 39-45 Cyril Beechey Lane	LGB02	27/11/2019	0.5	0.4	17.8	Landfill Gas Bore damaged - No readings taken
Site 1: 39-45 Cyril Beechey Lane	LGB05	27/11/2019	-	8.6	7.2	
Site 1: 39-45 Cyril Beechey Lane	SV02	27/11/2019				
Site 1: 39-45 Cyril Beechey Lane	SV03	27/11/2019	-	2.4	17.9	
Site 1: 39-45 Cyril Beechey Lane	SV04	27/11/2019	-	4.2	13.9	
Site 1: 39-45 Cyril Beechey Lane	GB133B	27/11/2019	-	0	20.9	
Site 1: 39-45 Cyril Beechey Lane	GB133C	27/11/2019	-	3.6	16.3	
Site 1: 39-45 Cyril Beechey Lane	GB134A	27/11/2019	-	0	20.9	
Site 1: 39-45 Cyril Beechey Lane	GB134B	27/11/2019				Landfill Gas Bore not found - No readings taken
Site 1: 39-45 Cyril Beechey Lane	GB138A	27/11/2019	-	0.7	18.7	
Site 1: 39-45 Cyril Beechey Lane	GB138B	27/11/2019	-	0	23.5	
Site 1: 39-45 Cyril Beechey Lane	GB138C	27/11/2019	-	0.8	16.5	
Site 1: 39-45 Cyril Beechey Lane	GB139	27/11/2019	-	0.1	20.8	

APPENDIX A – HYDROGEOLOGICAL CROSS SECTIONS

Appendix A -
CROSS SECTION ALIGNMENT MAP FOR
39 - 45 CYRIL BEECHEY LANE, CRANBOURNE





CROSS SECTION FOR DEEP BORES INSTALLED AT 39 - 45 CYRIL BEECHEY LANE CRANBOURNE: SE - NE

Cement Seal: 1 pipe group, 1 pipe

Bentonite Seal: 1 pipe group, 1 pipe

Filter Pack: 1 pipe group, 1 pipe

Slotted Pipe: 1 pipe group, 1 pipe

Slough at bottom of hole

Topsoil

USCS Silty Sand

USCS Poorly-graded Sand

USCS Clayey Sand

USCS Low to High Plasticity Clay

USCS Low Plasticity Sandy Clay

USCS Sandy Silt

USCS Silt

TOP OF FILL

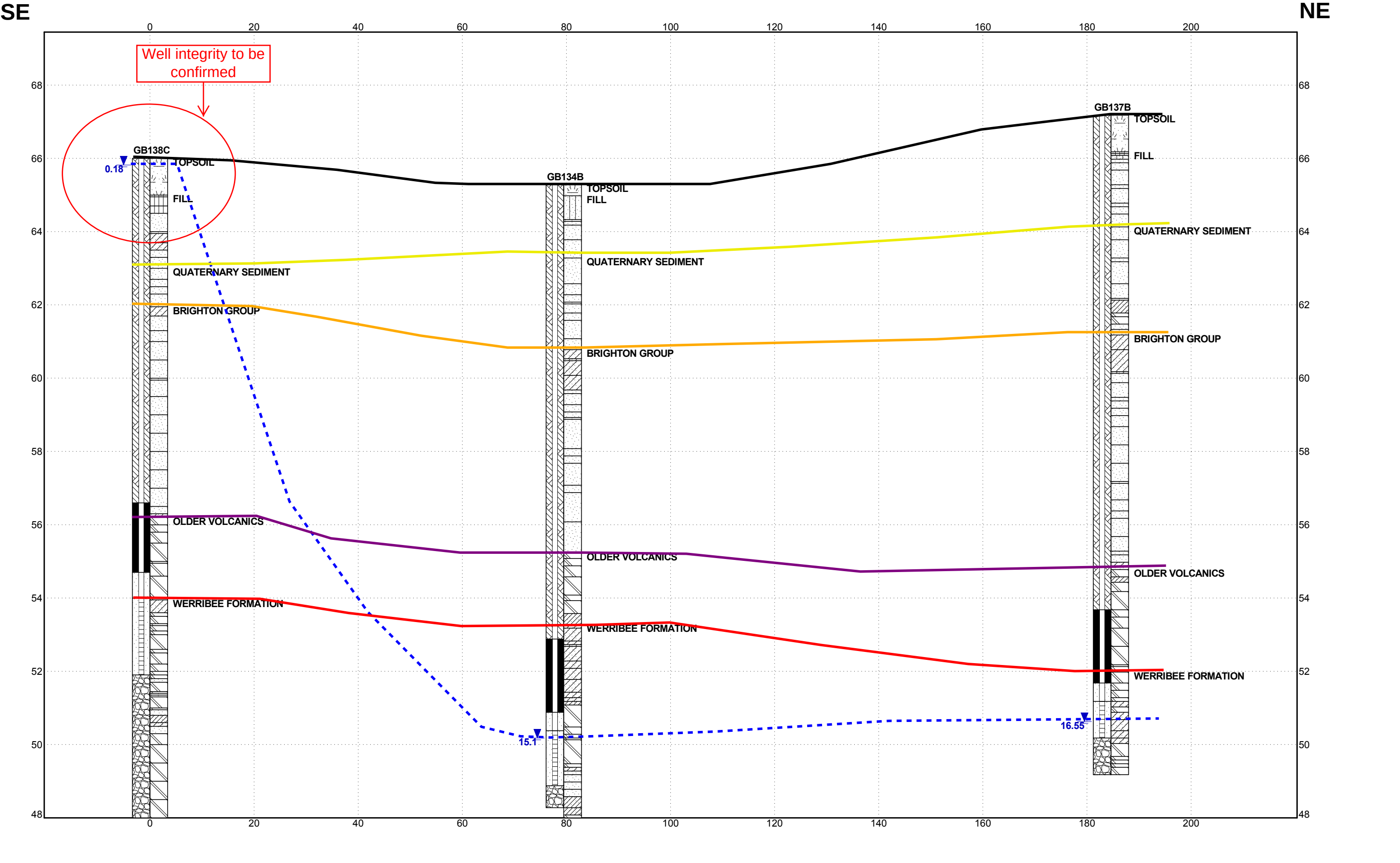
TOP OF QUATERNARY SEDIMENTS

TOP OF BRIGHTON GROUP

TOP OF OLDER VOLCANICS

TOP OF WERRIBEE FORMATION

Water Levels as at 30/08/2013



STRATIGRAPHY - A3 SIZE TEST.GPJ GINT STD AUSTRALIA.GDT 16/9/13

CROSS SECTION FOR DEEP BORES INSTALLED AT 39 - 45 CYRIL BEECHEY LANE CRANBOURNE: SW - NE

Cement Seal: 1 pipe group, 1 pipe

Bentonite Seal: 1 pipe group, 1 pipe

Filter Pack: 1 pipe group, 1 pipe

Slotted Pipe: 1 pipe group, 1 pipe

Bentonite: Bottom of hole

Slough at bottom of hole

Concrete

No Lithology

USCS Poorly-graded Sand

USCS Low Plasticity Silty Clay

USCS Low to High Plasticity Clay

USCS Low Plasticity Sandy Clay

USCS Clayey Sand

USCS Low Plasticity Silty Clay

Topsoil

USCS Sandy Silt

USCS Silt

USCS Silty Sand

TOP OF FILL

TOP OF QUATERNARY SEDIMENTS

TOP OF BRIGHTON GROUP

TOP OF OLDER VOLCANICS

TOP OF WERRIBEE FORMATION

Water Levels as at 30/08/2013

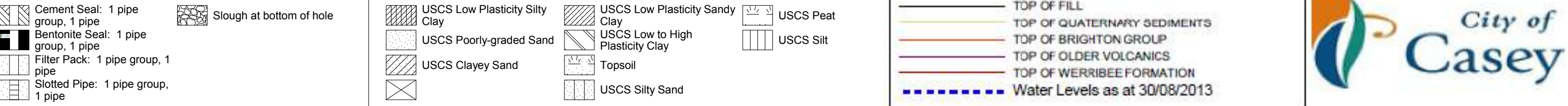


STRATIGRAPHY - A3 SIZE TEST.GPJ GINT STD AUSTRALIA.GDT 17/9/13

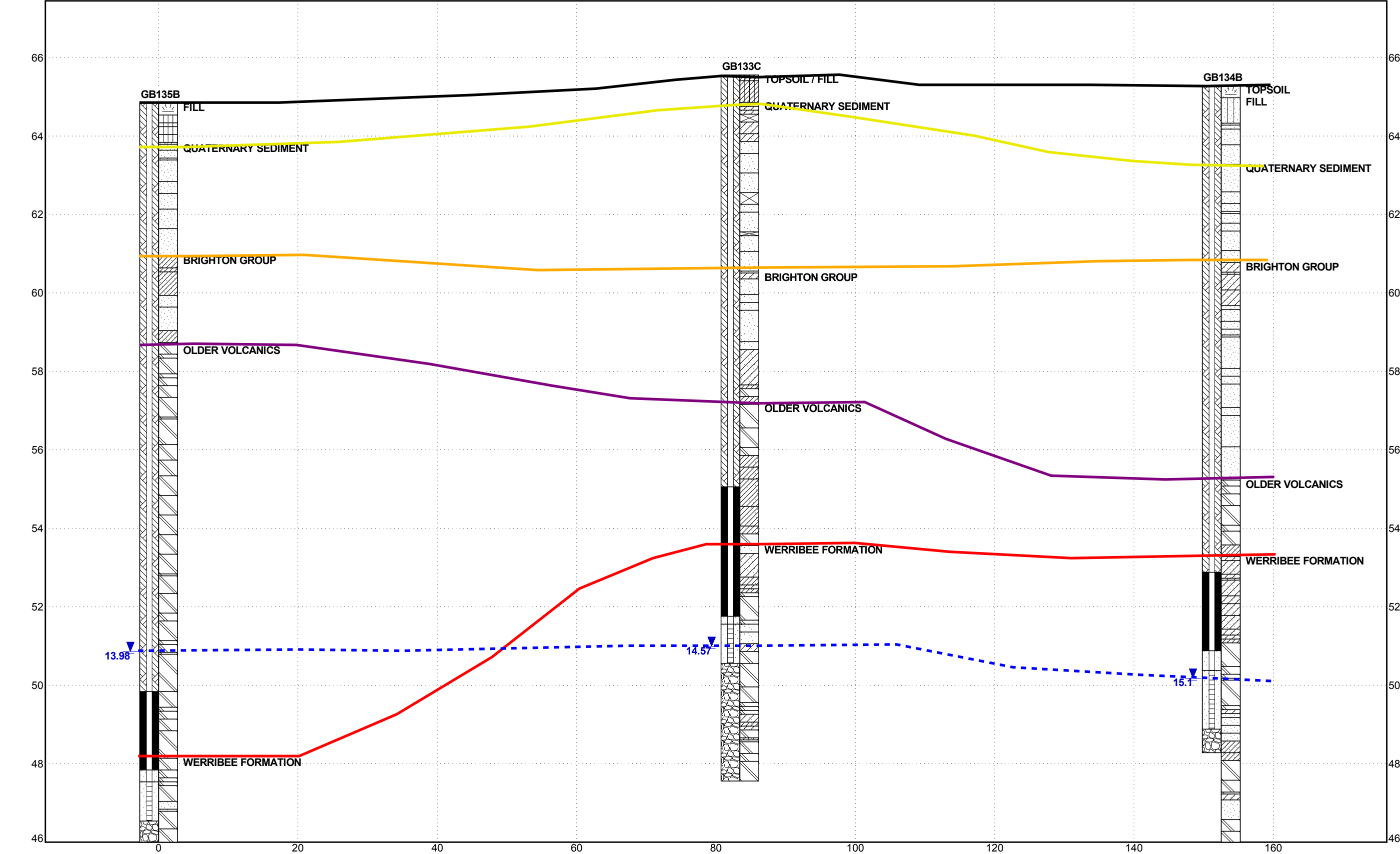
The diagram is a geological cross-section oriented SW-NE, showing four boreholes: GB096, GB130, GB133C, and GB137B. The horizontal axis represents distance in meters (0 to 300), and the vertical axis represents elevation in meters (40 to 70). The stratigraphic layers identified are: TOPSOIL / FILL, QUATERNARY SEDIMENT, BRIGHTON GROUP, OLDER VOLCANICS, and WERRIBEE FORMATION. Water levels as of 30/08/2013 are indicated by blue dashed lines with downward arrows at elevations of 14.64, 14.57, and 16.55. The borehole logs show various materials: GB096 has a cement seal, bentonite seal, filter pack, and slotted pipe; GB130 has a bentonite seal and filter pack; GB133C has a bentonite seal and filter pack; GB137B has a bentonite seal and filter pack. The Werribee Formation is shown as a red line, Older Volcanics as a purple line, Brighton Group as an orange line, and Quaternary Sediment as a yellow line. The top of the fill is a black line, and the top of the quaternary sediments is a green line.

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Version: 1, Version Date: 09/11/2023

CROSS SECTION FOR DEEP BORES INSTALLED AT 39 - 45 CYRIL BEECHEY LANE CRANBOURNE: W - E



WE



STRATIGRAPHY - A3 SIZE TEST.GPJ GINT STD AUSTRALIA GDT 16/9/13

CROSS SECTION FOR DEEP BORES INSTALLED AT 39 - 45 CYRIL BEECHEY LANE CRANBOURNE: W - SE

Cement Seal: 1 pipe group, 1 pipe

Bentonite Seal: 1 pipe group, 1 pipe

Filter Pack: 1 pipe group, 1 pipe

Slotted Pipe: 1 pipe group, 1 pipe

Slough at bottom of hole

USCS Low Plasticity Silty Clay

USCS Poorly-graded Sand

USCS Clayey Sand

USCS Low Plasticity Silty Clay

USCS Low Plasticity Sandy Clay

USCS Low to High Plasticity Clay

USCS Peat

USCS Silt

USCS Silty Sand

Topsoil

USCS Sandy Silt

TOP OF FILL

TOP OF QUATERNARY SEDIMENTS

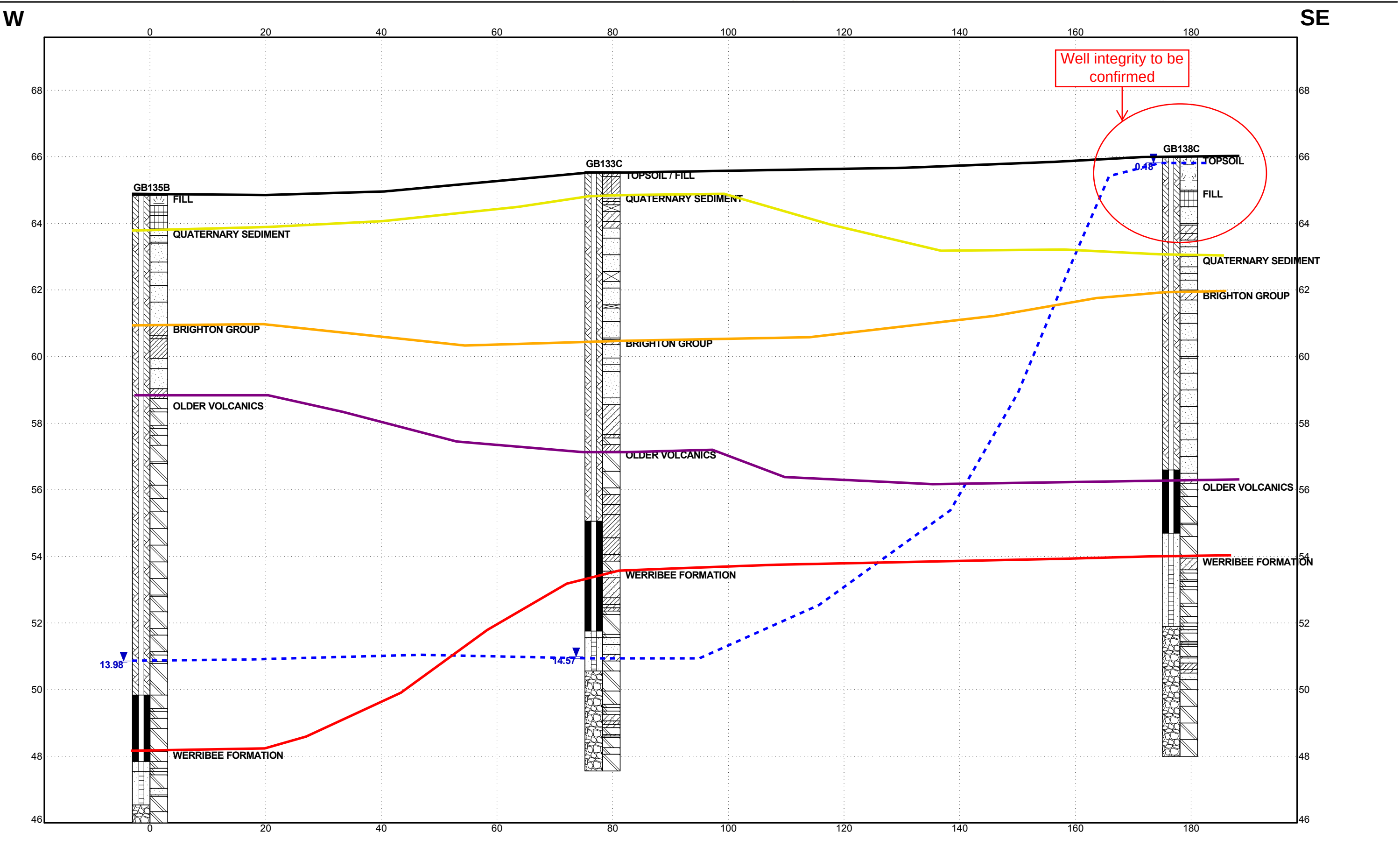
TOP OF BRIGHTON GROUP

TOP OF OLDER VOLCANICS

TOP OF WERRIBEE FORMATION

Water Levels as at 30/08/2013





STRATIGRAPHY - A3 SIZE TEST.GPJ GINT STD AUSTRALIA.GDT 16/9/13

CROSS SECTION FOR MID BORES INSTALLED AT 39 - 45 CYRIL BEECHEY LANE CRANBOURNE: SE - N

Bentonite Seal: 1 pipe group, 1 pipe

Filter Pack: 1 pipe group, 1 pipe

Slotted Pipe: 1 pipe group, 1 pipe

Cement Seal: 1 pipe group, 1 pipe

No Lithology

TOP OF FILL

TOP OF QUATERNARY SEDIMENTS

TOP OF BRIGHTON GROUP

TOP OF OLDER VOLCANICS

TOP OF WERRIBEE FORMATION

Water Levels as at 30/08/2013



The diagram is a geological cross-section oriented from SE (left) to N (right). The horizontal axis represents distance in meters, ranging from 0 to 200. The vertical axis represents elevation in meters, ranging from 55 to 67. Three bore locations are marked: GB138B at approximately 0m, GB133B at approximately 100m, and GB136B at approximately 190m. The bore logs show different pipe types: Bentonite Seal (solid black), Filter Pack (stippled), Slotted Pipe (horizontal lines), and Cement Seal (diagonal lines). The geological layers are color-coded and labeled: TOPSOIL (black), FILL (grey), QUATERNARY SEDIMENT (yellow), BRIGHTON GROUP (orange), and OLDER VOLCANICS (purple). A dashed blue line represents the water level as of 30/08/2013, with specific values of 1.42m and 2.6m indicated at GB138B and GB136B respectively. The layers are generally thicker at the bore locations. The Brighton Group layer is notably thicker at GB138B and GB136B compared to GB133B.

Feature / Layer Boundary	Distance (m)	Elevation (m)
Top of Fill	0	66.0
Top of Fill	100	65.5
Top of Fill	190	65.5
Top of Quaternary Sediments	0	63.1
Top of Quaternary Sediments	100	64.8
Top of Quaternary Sediments	190	63.6
Top of Brighton Group	0	62.0
Top of Brighton Group	100	60.6
Top of Brighton Group	190	60.2
Top of Older Volcanics	0	56.3
Top of Older Volcanics	100	57.2
Top of Older Volcanics	190	56.2

STRATIGRAPHY - A3 SIZE TEST.GPJ GINT STD AUSTRALIA.GDT 16/9/13

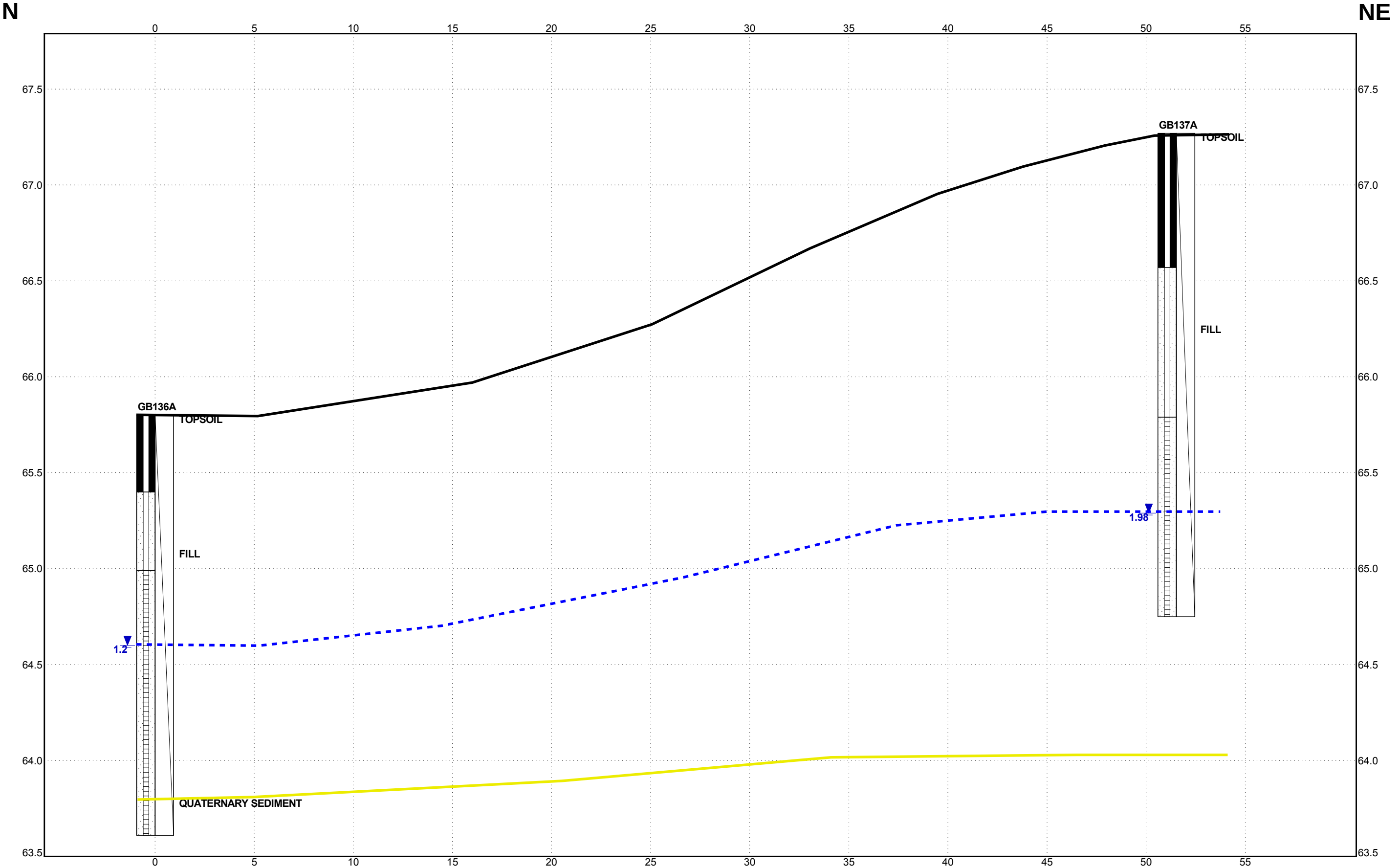
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Version: 1, Version Date: 09/11/2023

CROSS SECTION FOR SHALLOW BORES INSTALLED AT 39 - 45 CYRIL BEECHEY LANE CRANBOURNE: N - NE

- Bentonite Seal: 1 pipe group, 1 pipe
- Filter Pack: 1 pipe group, 1 pipe
- Slotted Pipe: 1 pipe group, 1 pipe

No Lithology

- TOP OF FILL
- TOP OF QUATERNARY SEDIMENTS
- TOP OF BRIGHTON GROUP
- TOP OF OLDER VOLCANICS
- TOP OF WERRIBEE FORMATION
- Water Levels as at 30/08/2013



STRATIGRAPHY - A3 SIZE TEST.GPJ GINT STD AUSTRALIA.GDT 16/9/13

CROSS SECTION FOR SHALLOW BORES INSTALLED AT 39 - 45 CYRIL BEECHHEY LANE CRANBOURNE: SE - N

Bentonite Seal: 1 pipe group, 1 pipe

Filter Pack: 1 pipe group, 1 pipe

Slotted Pipe: 1 pipe group, 1 pipe

No Lithology

TOP OF FILL

TOP OF QUATERNARY SEDIMENTS

TOP OF BRIGHTON GROUP

TOP OF OLDER VOLCANICS

TOP OF WERRIBEE FORMATION

Water Levels as at 30/08/2013



The diagram is a cross-section from SE to N, showing three bore profiles: GB138A (left), GB133A (center), and GB136A (right). The vertical axis represents elevation in meters, ranging from 63.6 to 66.2. The horizontal axis represents distance in meters, ranging from 0 to 200. The bore profiles are shown as vertical columns with different patterns representing different components: Bentonite Seal (solid black), Filter Pack (stippled), and Slotted Pipe (horizontal lines). The geological layers are indicated by colored lines: TOP OF FILL (black), TOP OF QUATERNARY SEDIMENTS (yellow), TOP OF BRIGHTON GROUP (orange), TOP OF OLDER VOLCANICS (purple), and TOP OF WERRIBEE FORMATION (brown). Water levels are shown as blue dashed lines with arrows pointing to the bore profiles. The water level at GB138A is 1.08m, at GB133A is 0.6m, and at GB136A is 1.2m. The diagram also shows the ground surface profile and the locations of the bores relative to the geological layers.

Distance (m)	Elevation (m)	Feature
0	66.05	GB138A TOPSOIL
0	65.05	GB138A FILL
0	64.85	GB138A QUATERNARY SEDIMENT
100	65.55	GB133A TOPSOIL / FILL / QS
100	64.85	GB133A QUATERNARY SEDIMENT
200	65.8	GB136A TOPSOIL
200	65.05	GB136A FILL
200	63.8	GB136A QUATERNARY SEDIMENT

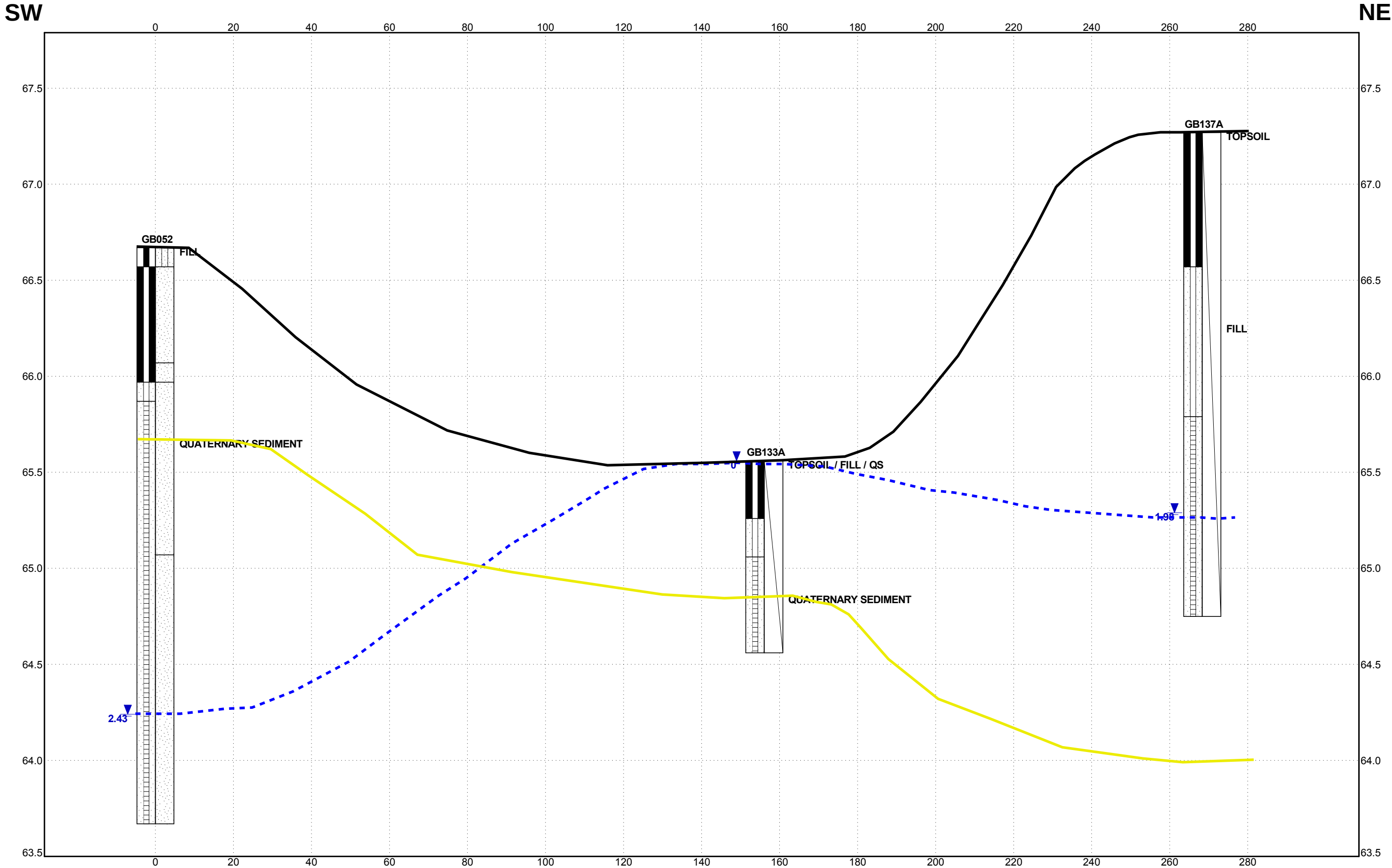
Document Set ID: 15741062
Version: 1, Version Date: 09/11/2023

CROSS SECTION FOR SHALLOW BORES INSTALLED AT 39 - 45 CYRIL BEECHEY LANE CRANBOURNE: SW - NE

- Top Cap: 1 pipe group, 1st pipe
- Bentonite Seal: 1 pipe group, 1 pipe
- Filter Pack: 1 pipe group, 1 pipe
- Slotted Pipe: 1 pipe group, 1 pipe

- USCS Silty Sand
- USCS Poorly-graded Sand
- No Lithology

- TOP OF FILL
- TOP OF QUATERNARY SEDIMENTS
- TOP OF BRIGHTON GROUP
- TOP OF OLDER VOLCANICS
- TOP OF WERRIBEE FORMATION
- Water Levels as at 30/08/2013



STRATIGRAPHY - A3 SIZE TEST.GPJ GINT STD AUSTRALIA.GDT 16/9/13

CROSS SECTION FOR SHALLOW BORES INSTALLED AT 39 - 45 CYRIL BEECHEY LANE CRANBOURNE: W - E

Bentonite Seal: 1 pipe group, 1 pipe

Filter Pack: 1 pipe group, 1 pipe

Slotted Pipe: 1 pipe group, 1 pipe

No Lithology

TOP OF FILL

TOP OF QUATERNARY SEDIMENTS

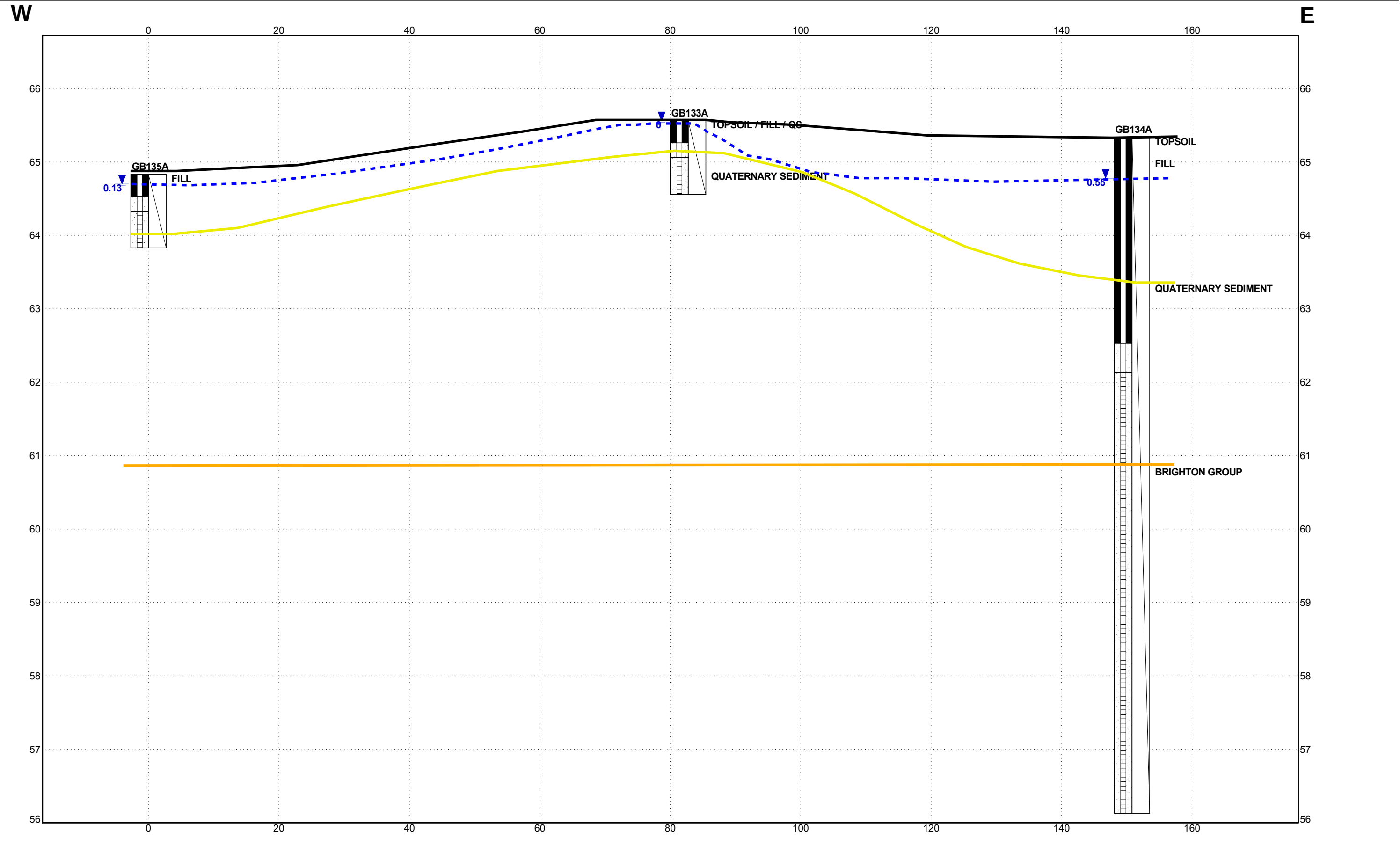
TOP OF BRIGHTON GROUP

TOP OF OLDER VOLCANICS

TOP OF WERRIBEE FORMATION

Water Levels as at 30/08/2013



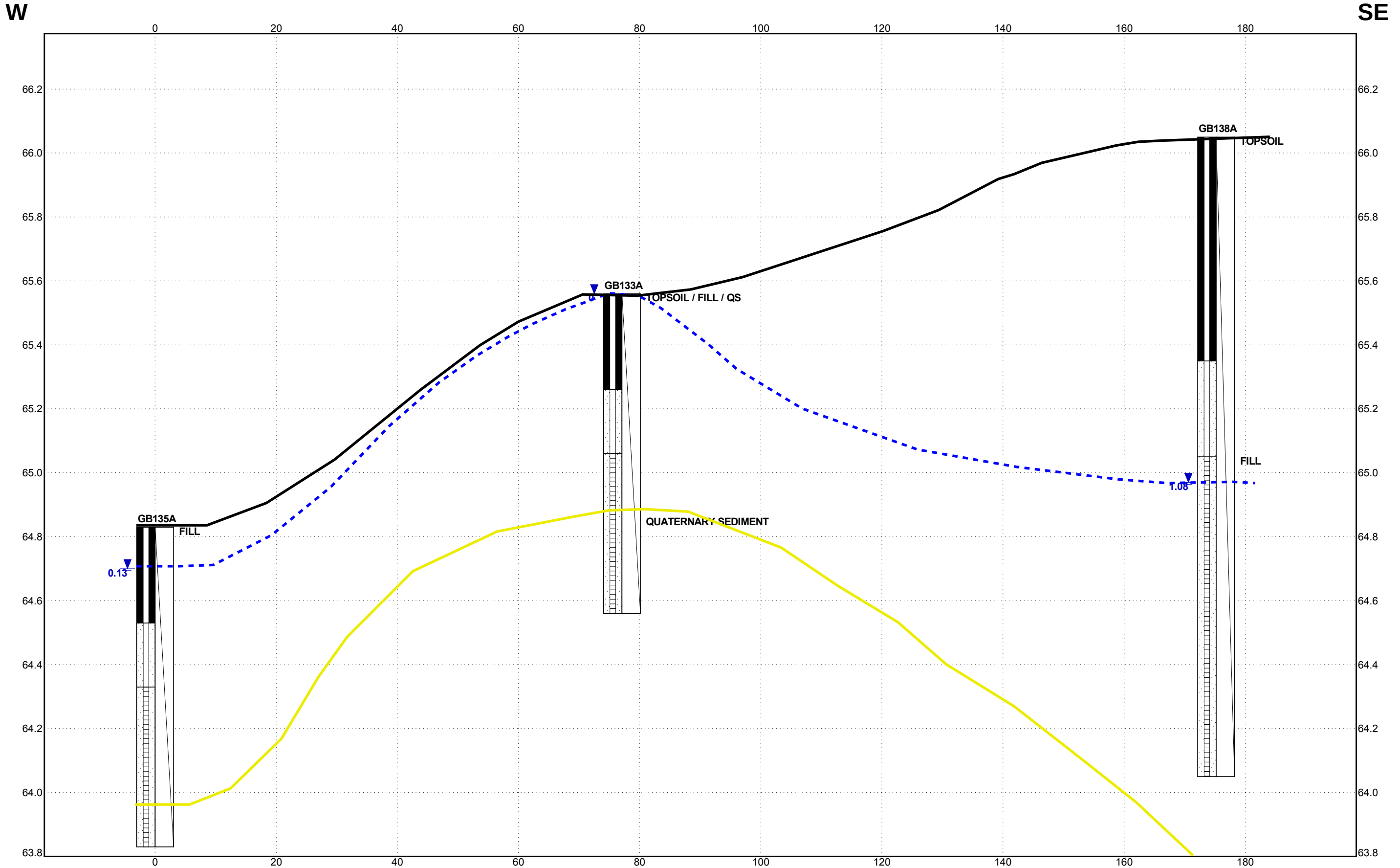


CROSS SECTION FOR SHALLOW BORES INSTALLED AT 39 - 45 CYRIL BEECHEY LANE CRANBOURNE: W - SE

- Bentonite Seal: 1 pipe group, 1 pipe
- Filter Pack: 1 pipe group, 1 pipe
- Slotted Pipe: 1 pipe group, 1 pipe

No Lithology

- TOP OF FILL
- TOP OF QUATERNARY SEDIMENTS
- TOP OF BRIGHTON GROUP
- TOP OF OLDER VOLCANICS
- TOP OF WERRIBEE FORMATION
- Water Levels as at 30/08/2013



STRATIGRAPHY - A3 SIZE TEST.GPJ GINT STD AUSTRALIA.GDT 16/9/13

APPENDIX B – PERLASTIC GBM



PERLASTIC™

INDUSTRIAL COATINGS

Brownfield Development | Waterproofing | Corrosion Protection

PERLASTIC™

Industrial Coatings

What is a brownfield?

In the face of society's increasing needs and limited space, the rehabilitation of brownfields remains a necessary, complex and dynamic challenge.

The manufacturers of PERLASTIC™ offer an innovative and reliable solution to meet the challenge of gas vapor containment. With more than 10 years of proven performance, PERLASTIC™ is the answer to providing an impermeable membrane for brownfield sites. With millions of square feet already in place, PERLASTIC™ sets the industry standard to prevent potentially hazardous gases or vapors from entering a structure. The combination of the unsurpassed quality along with the technical expertise of our in-house engineers has led PERLASTIC™ Industrial Coatings to the forefront of membrane brownfield redevelopment. We are ready to work with you in helping the revitalize, enhance and protect some of the best situated properties in your city.

Brownfields are areas the United States Environmental Protection Agency defines as “abandoned, idled, or under-used industrial and commercial facilities where expansion or redevelopment is complicated by real or perceived environmental contamination.”

Features & Benefits

- Cold spray-applied membrane, provides excellent sealing of penetrations.
- Seamless, monolithic membrane. No seam welding required.
- Significant cost savings over conventional sheet membrane systems.
- Ability to function well in large-scale industrial applications as well as smaller residential applications.
- Rapid and simple installation minimizes construction time.
- Over 10 years of proven performance and successful installations

PHYSICAL PROPERTIES	TEST METHOD	VALUE
WATERPROOFING		
Soil Burial	ASTM E154-88	Passed
Water Penetration Rate	ASTM D2434	<7.75 x 10 ⁻⁹ cm/sec
Water Vapor Permeability	ASTM E96	0.24 perms
Water Vapor Transmission	ASTM E96	0.10 grains/h-ft ²
GAS VAPOR MEMBRANE		
Hydrogen Sulfide Gas Permeability	ASTM D1434	None Detected
Benzene, Toluene, Ethylene, Xylene, Gasoline, Hexane, Perchloroethylene, Trichloroethylene, Vinyl Chloride	ASTM D543 Tested at 20,000 ppm	<1% weight change
Sodium Sulfate (2% water solution)	ASTM D543, D412, D1434	<1% weight change
Acid Exposure (10% H ₂ SO ₄ for 90 days)	ASTM D543	<1% weight change
Chromate Exposure *10% Chromium 6+ salt for 31 days	ASTM E96	<1% weight change
Air Infiltration	ASTM E283-91	0 cfm/sq.ft.
Bonded Seam Strength Tests	ASTM D6392	Passed
Micro Organism Resistance (Soil Burial) average weight change, average tensile strength change, average tensile stress change, average elongation change, bonded seams, methane permeability	ASTM D4068-88	Passed
Methane Permeability	ASTM 1434-82	Passed
Oil Resistance Test average weight change, average tensile strength change, average tensile stress change, average elongation change, bonded seams	ASTM D543-87	Passed
Heat Aging average tensile strength change, average tensile stress change, average elongation change bonded seams	ASTM 1434	Passed
Environmental Stress-Cracking	ASTM D4068-88	Passed
Direct Flame	ASTM D1693-78	0 sec.
Potable Water Containment	ANSI/NSF 61	>300,000 gallons

GENERAL PROPERTIES	TEST METHOD	RESULT
Coefficient of Friction (with geotextile both sides)	ASTM D5321	0.72
Cold Bond Test	ASTM D146	Passed. No cracking at -25 F
Tear Strength Test	ASTM D624	1.92 (lbf)
Freeze-Thaw Resistance (100 cycles)	ASTM D742	Meets criteria
Accelerated Weathering and Ultraviolet Exposure Pull off Adhesion of Strength to Galvanized Steel	ASTM D822	No adverse effect after 500 hours
Hydrostatic Head Resistance	ASTM D751	Tested to 138 ft. or 60 psi
Elongation	ASTM D412	1,200% no reinforcing 70% recovery
Shore A Durometer Test	ASTM D2240	48
Elongation at Break	ASTM D751	270%
Puncture Deflection	ASTM E154	7.3 inches
Tensile Strength at Break	ASTM D412	89.5 psi, no reinforcing
Tensile Strength (8 oz. non-woven geotextile both sides)	ASTM D751	196 psi (same as geotextile tested separately)
Tensile Bond Strength to Concrete	ASTM D413	2,556 lbs/ft ² uplift force
Puncture Resistance (8 oz. non-woven geotextile both sides)	ASTM D4833	286 lbs travel of probe = 0.756 in
Salt Spray Testing	ASTM B117	1344 - Pass
Rust Creep	ASTM D1654	1344 hrs - Pass

PERLASTIC™ Industrial Coatings



High School | California | 300,000 sf

Use: School built on former dairy farm land

Soil Condition: Methane gas

Mitigation System : PERLASTIC™ gas vapor membrane system and “passive” venting system

Application: PERLASTIC™ gas vapor membrane was spray-applied onto a geotextile fabric under the slab to provide an impermeable gas vapor barrier that prevents gas intrusion.



Restaurant | Illinois | 2,400 sf

Use: Fast food restaurant on former service station site

Soil Condition: Residual petroleum contaminants

Mitigation System: PERLASTIC™ gas vapor membrane system

Application: PERLASTIC™ gas vapor membrane system spray-applied under the slab and sealed to all footings and pipe penetrations.



Public Storage | Massachusetts | 32,000 sf

Use: Former tannery site

Soil Condition: Metals, petroleum contaminants, PAHs

Mitigation System: PERLASTIC™ gas vapor membrane system

Application : PERLASTIC™ gas vapor membrane system spray-applied

Project Profiles

Re-purposed Manufacturing Building | Massachusetts | 80,000 sf

Use: Office buildings on former manufacturing site

Soil Condition: Residual organic compounds, VOC's

Mitigation System: Remediation of soil, PERLASTIC™ gas vapor membrane, and an “active” venting system

Application: PERLASTIC™ was spray-applied under slab and onto geotextile fabric, attached onto piles, pile caps, grade beams and penetrations.



Big Box Center | Oregon | 150,000 sf

Use: Large retail store on closed landfill site

Soil Condition : Methane gas

Mitigation System: PERLASTIC™ gas vapor membrane and a geotextile composite venting system

Application: Vent pipes were used to direct methane gas to roof for release; PERLASTIC™ membrane applied to provide barrier between the soil and structure to prevent intrusion of methane gas.



Library | California | 400,000 sf

Use: New public library situated 50 feet below grade

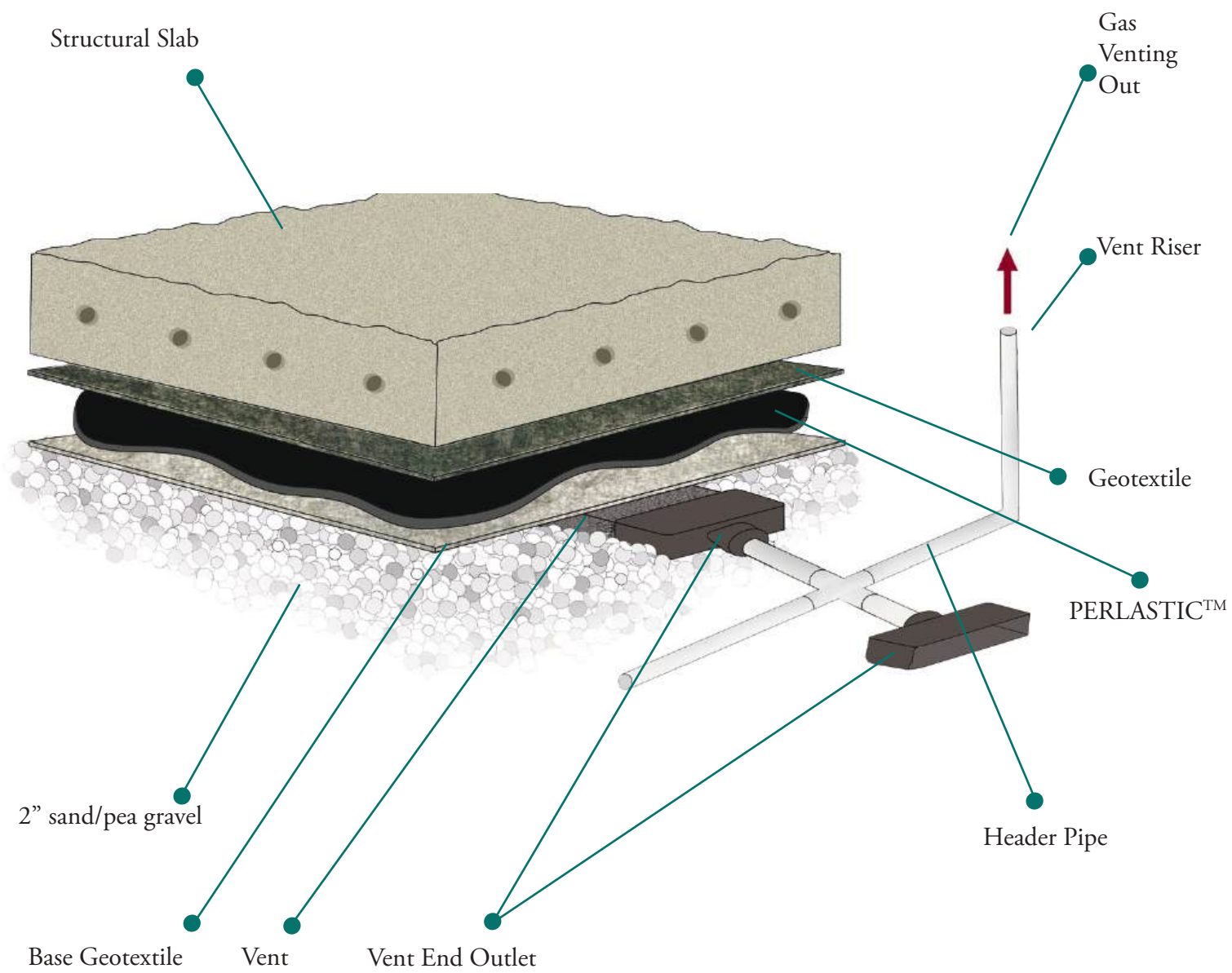
Soil Condition: Pressurized methane gas

Mitigation System: PERLASTIC™ gas vapor membrane and waterproofing system

Application: PERLASTIC™ spray-applied under the slab and up the walls to seal the entire building to prevent methane gas and water from migrating into the structure.



Typical Active Gas Venting System



What is a smoke test?

A smoke test is a method of ensuring that a membrane is impermeable and free of holes. Smoke is pumped under the membrane for a specified period of time while the surface of the membrane is observed for minute holes where the smoke is clearly visible. Since the applicator is present during the smoke test, any holes can be immediately detected and repaired. This process has been field tested under hundreds of buildings and found to be highly successful. The smoke testing process assures engineers, developers, and owners that they are getting a fully tested, gas-tight membrane installation.

Smoke testing process



Equipment set-up
for smoke test



Puncture detected by
exiting smoke.



Starting smoke
test procedure



Applicator patching
procedure



Patched
membrane

PERLASTIC™ Industrial Coatings, a division of Global Polymers Solutions, are the premium asphalt-based, polymer modified linings that create superior long term protection for concrete, steel, ductile iron, aged FRP and other industrial substrates. Best of all, these products are easily applied and they are offered in spray, brush, roller, or trowel-grade formulations. PERLASTIC™ technology provides corrosion and chemical resistant protection to tanks, pipelines, containment areas, processing equipment and facilities in all types of environments.



PERLASTIC™
INDUSTRIAL COATINGS

www.perlastic.com
800.933.1031

APPENDIX C – RUN ENERGY SURFACE EMISSIONS REPORT

Memorandum

To	City of Casey
CC	Dean Wilson Angelo Grixti
From	Anthony Hawks
Date	23 November 2015
Subject	Surface Emissions Survey Stevensons Road Closed Landfill

The following memo is a report on the surface emission survey completed at the Stevensons Road Closed Landfill

If you have any queries please do not hesitate to contact.

Thanks,

Ian Greig

Ian Greig
Group Technical Manager

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1 INTRODUCTION

- Run Energy undertook a landfill cap fugitive emission survey on the Stevensons Road Closed Landfill.
- Survey was complete from 15 Nov 2015

1.1 Scope of Survey

- The emissions survey was completed on following areas of the landfill:
 - Walkover of Stevensons Road Closed Landfill
 - Walkover of Old Casey landfill area
 - Walkover of Transfer Station

2 Methodology

2.1 Guidelines Used

- Survey was completed in accordance with the “*Draft Landfill Gas Fugitive Emissions Monitoring Guidelines (Vic EPA Publication 1416 Sept 2011)*”
- Results were analysed in accordance with table 6.4 which outlines landfill surface gas action levels from “*Best Practice Environmental Management – Siting, Design, Operation and Rehabilitation of Landfills*’ (EPA Victoria, Publication 788.2, October 2014) (‘EPA publication 788.2’)

Table 6.4: Landfill gas action levels

Location	Parameter(s)	Action level and unit
Landfill surface final cap	Methane concentration in air*	100 ppm
Within 50mm of penetrations through the final cap	Methane concentration in air**	100 ppm
Landfill surface intermediate cover areas***	Methane concentration in air*	200 ppm
Within 50mm of penetrations through the intermediate cover	Methane concentration in air**	1000 ppm

* Point of measurement is 50mm above the landfill surface.

** Point of measurement is 50mm from the point of discharge.

*** Intermediate cover areas are those that do not have an engineered landfill cap and are not scheduled to receive waste during the next three months.

2.2 Instrument Used

- Emissions were measured using a Crowcon Gastec MK 5 with built in GPS, Flame Ionisation Detector (FID) - detection capability from 1 to 9,999ppm of methane (Serial Number – GT000000359)
- Refer Appendix A for calibration certificate
- The FID was bump tested prior to commencement against calibration gas
- The unit was ‘autozero’ to clean air prior to sampling starting

2.3 Methodology Overview

- Performed by sweeping end of FID wand within 50mm of the ground surface.
- Samples were taken continuously (where possible) on a 25m grid across the site
- Survey was taken at walking pace
- Wind speed was measured regularly (minimum twice per grid line) at a height of approximately 50mm from surface and found to be within specified requirements.

3 Results

3.1 Sampling Completed

Date of Sampling	Sampling Location
15 Nov 2015	<ul style="list-style-type: none"> 21,677 samples were taken over the landfill site.

3.2 Weather Conditions

Metric	Condition
Rain	No rain 1 day prior to SEM
Wind speed	Wind was from east south corner at 2 km/h with gusts of 2 km/h
Temperature	Temperature at 10am when sampling began was 15.6 C
Atmospheric Pressure	1021.7 mbar

3.3 Survey Data Summary

Methane Level Sample Range	Total Samples	Comment
All samples	21,677	Presented in the “Google Earth Map Surface Emissions Survey” in Appendix B
0 ppm	21,664	
1 ppm to 10ppm	13	
11 ppm to 100 ppm	1	
101 ppm to 499 ppm	0	
500 ppm to 999 ppm	0	

Note.

1. Relative value is used. Relative PPM reading (after autozero setting is deducted)

- Monitoring data is collected into a csv file and included as a separate csv file

3.4 Landfill Gas Action Levels

- Stevensons Road Closed Landfill is a closed landfill with final capping
- Surface emission methane levels in accordance to landfill gas action levels (outlined Section 2.1 of this report) are summarised as follows:

Location	Parameter(s)	Action level and unit	Total Samples
Landfill cap surface final cap	Methane concentration in air*	>100 ppm	None
Within 50 mm of penetrations through the final cap	Methane concentration in air**	>100 ppm	None No penetrations were observed
Landfill surface intermediate cover areas	Methane concentration in air*	>200 ppm	None Site had final cap
Within 50 mm of penetrations through the intermediate cover	Methane concentration in air**	>1000 ppm	None Site had final cap

*Point of measurement is 50mm above the landfill surface.

**Point of measurement is 50mm from the point of discharge.

***Intermediate cover areas are those that do not have an engineered landfill cap and are not scheduled to receive waste during the next three months.'.

- Outlined in the *EPA publication 788.2* there is requirement to “notify EPA Victoria within 24 hours of detection of any exceedance of the action levels detailed in Table 6.4, except for onsite exceedance rectified within 24 hours”

3.5 Map: All Surface Emission Data



3.6 Map: Locations Requiring Action

No action required	
1	
2	
3	



4 Conclusion

- Stevensons Road Closed Landfill is a closed landfill with final capping
- In accordance EPA guidelines the action level for landfill surface final cover > 100ppm methane.

Appendix A – Calibration Certificate

		K.D. FISHER & CO. PTY LTD SERVICE CENTRE	
HEAD OFFICE:		18 Benjamin Street, St Marys, Adelaide, S.A. 5042	
A.B.N. 27 007 679 647		Ph: 08 8277 3288 Fax: 08 8276 4024 Website: www.kdfisher.com.au	
CALIBRATION CERTIFICATE			
Gas Detection Equipment			
Customer:	Run Energy Pty Limited	Calibration Date:	13/05/2015
	Unit 8, 20 Duerdin Street	KDF Reference No.:	R1505032
	Clayton	Model:	Gas-Tec Mk V
	Victoria 3168	Serial No.:	GT0000000359
		Customer ID:	
INSPECTION REPORT OF ACCESSORIES			
The equipment was calibrated in accordance with AS/NZS 60079.29.2:2008 and the manufacturer's instructions.			
Service details: Replaced MEMS flow sensor. Replaced hydrophobic filters. Calibrated to specifications.			
<u>Gas cylinders used for calibration</u>			
Cylinder #: 457641			
Analysis: 84.7ppm (+/- 2.4ppm) Methane			
Certificate Date: 12/07/2011			
Cylinder #: 390366			
Analysis: 839ppm (+/- 20ppm) Methane			
Certificate Date: 12/07/2011			
Cylinder #: 428441			
Analysis: 8700ppm (+/- 200ppm) Methane			
Certificate Date: 12/07/2011			
Installation Date:	29/10/2013	Next Service Date:	13/11/2015
Calibrated, inspected and tested by:			
			
Jeff Harvey - Service Technician			

APPENDIX D – GEOLOGICAL LOGS

PROJECT No: Cyril Beechey Lane

DATE: 05/12/16

X COORDINATE:

SITE: 39-45 Cyril Beechey Ln

LOGGED BY: REC

Y COORDINATE:

CLIENT: KLM Spatial

TOTAL DEPTH: 2

ELEVATION: 65.7

DEPTH (m)	WELL CONSTRUCTION	LEGEND	DESCRIPTION	ADDITIONAL OBSERVATIONS	CONSISTENCY/DENSITY	MOISTURE CONTENT	PID (ppm)	SAMPLE LABEL	ELEVATION (approx)
0			Ground Surface						65.7
			FILL: Sandy Silty GRAVEL at surface, brown	Geofabric at 0.1m		D			65.6
			NAT: SAND, dark brown, fine grained		L				
1			NAT: Sandy CLAY, pale brown, fine grained becoming medium grained with depth		F	M			64.9
			NAT: Clayey SAND, pale brown, medium grained		MD				64.2
2			End of Borehole @ 2.0m	Implant installed at 1.8m					
				Water at base of borehole		W			63.7

Descriptions are based on observations and hand testing of grab samples. Mechanical Tests were not performed unless otherwise stated.

First Occurrence of Groundwater: ~1.9m

Static Groundwater Level:

Reviewed By: PLB

FILE Cyril Beechey / Borelogs

PROJECT No: Cyril Beechey Lane

DATE: 05/12/16

X COORDINATE:

SITE: 39-45 Cyril Beechey Ln

LOGGED BY: REC

Y COORDINATE:

CLIENT: KLM Spatial

TOTAL DEPTH: 2

ELEVATION: 65.7

DEPTH (m)	WELL CONSTRUCTION	LEGEND	DESCRIPTION	ADDITIONAL OBSERVATIONS	CONSISTENCY/DENSITY	MOISTURE CONTENT	PID (ppm)	SAMPLE LABEL	ELEVATION (approx)
0			Ground Surface						65.7
			FILL: Crushed Siltstone, pale brown/light brown		L	D			65.5
			FILL: Sandy CLAY, mottled orange/brown/dark grey/light grey/red						
					F	M			
1				Implant installed at 1.1m					64.5
			NAT: SAND, grey, medium grained						
				Saturated soil caving back in					
			NAT: Clayey SAND, brown/orange, medium grained		L	W			64.1
2			End of Borehole @ 2.0m						63.7

Descriptions are based on observations and hand testing of grab samples. Mechanical Tests were not performed unless otherwise stated.

First Occurrence of Groundwater: ~1.2m

Static Groundwater Level:

Reviewed By: PLB

FILE Cyril Beechey / Borelogs

PROJECT No: Cyril Beechey Lane

DATE: 05/12/16

X COORDINATE:

SITE: 39-45 Cyril Beechey Ln

LOGGED BY: REC

Y COORDINATE:

CLIENT: KLM Spatial

TOTAL DEPTH: 2

ELEVATION: 65.7

DEPTH (m)	WELL CONSTRUCTION	LEGEND	DESCRIPTION	ADDITIONAL OBSERVATIONS	CONSISTENCY/DENSITY	MOISTURE CONTENT	PID (ppm)	SAMPLE LABEL	ELEVATION (approx)
0			Ground Surface						65.7
			FILL: Sandy Silty GRAVELS, light brown, angular basaltic gravels		L	D			65.4
			FILL: Sandy CLAY, mottled orange/brown/dark grey/light grey/red		F				
			Becoming stiff @ 0.5m			M			
1				Implant installed at 1.1m	ST				64.5
			NAT: SAND, grey, medium grained	Saturated soil caving back in					64.3
			NAT: Clayey SAND, brown/orange and grey, medium grained		L	W			
2			End of Borehole @ 2.0m						63.7

Descriptions are based on observations and hand testing of grab samples. Mechanical Tests were not performed unless otherwise stated.

First Occurrence of Groundwater: ~1.2m

Static Groundwater Level:

Reviewed By: PLB

FILE Cyril Beechey / Borelogs

PROJECT No: Cyril Beechey Lane

DATE: 05/12/16

X COORDINATE:

SITE: 39-45 Cyril Beechey Ln

LOGGED BY: REC

Y COORDINATE:

CLIENT: KLM Spatial

TOTAL DEPTH: 2

ELEVATION: 65.7

DEPTH (m)	WELL CONSTRUCTION	LEGEND	DESCRIPTION	ADDITIONAL OBSERVATIONS	CONSISTENCY/DENSITY	MOISTURE CONTENT	PID (ppm)	SAMPLE LABEL	ELEVATION (approx)
0			Ground Surface						65.7
			Topsoil: Sandy SILT, brown, organic content		L	D			65.7
			NAT: Sandy CLAY, mottled orange/brown/dark grey/light grey/red						
					F	M			
1			NAT: SAND, grey, medium grained	Implant installed at 1.0m	L				64.7
			NAT: Clayey SAND, grey/brown, medium grained	Saturated soil caving back in					64.5
					MD	W			
2			End of Borehole @ 2.0m						63.7

Descriptions are based on observations and hand testing of grab samples. Mechanical Tests were not performed unless otherwise stated.

First Occurrence of Groundwater: ~1.0m

Static Groundwater Level:

Reviewed By: PLB

FILE Cyril Beechey / Borelogs

PROJECT No: Cyril Beechey Lane

DATE: 05/12/16

X COORDINATE:

SITE: 39-45 Cyril Beechey Ln

LOGGED BY: REC

Y COORDINATE:

CLIENT: KLM Spatial

TOTAL DEPTH: 2

ELEVATION: 65.7

DEPTH (m)	WELL CONSTRUCTION	LEGEND	DESCRIPTION	ADDITIONAL OBSERVATIONS	CONSISTENCY/DENSITY	MOISTURE CONTENT	PID (ppm)	SAMPLE LABEL	ELEVATION (approx)
0			Ground Surface						65.7
			FILL: Silty SAND, light brown, fine to medium grained			D			
			NAT: Clayey SAND, dark brown/black, fine to medium grained		L				65.5
			NAT: SAND, brown/orange, medium grained, gravels present			M			65.3
1				Implant installed at 1.0m	MD				
				Saturated soil caving back in					64.4
			NAT: Clayey SAND, orange/brown, medium grained			W			
			Becoming grey @ 1.5m		L				
2			End of Borehole @ 2.0m						63.7

Descriptions are based on observations and hand testing of grab samples. Mechanical Tests were not performed unless otherwise stated.

First Occurrence of Groundwater: ~1.1m

Static Groundwater Level:

Reviewed By: PLB

FILE Cyril Beechey / Borelogs

PROJECT No: Cyril Beechey Lane

DATE: 05/12/16

X COORDINATE:

SITE: 39-45 Cyril Beechey Ln

LOGGED BY: REC

Y COORDINATE:

CLIENT: KLM Spatial

TOTAL DEPTH: 2

ELEVATION: 65.7

DEPTH (m)	WELL CONSTRUCTION	LEGEND	DESCRIPTION	ADDITIONAL OBSERVATIONS	CONSISTENCY/DENSITY	MOISTURE CONTENT	PID (ppm)	SAMPLE LABEL	ELEVATION (approx)
0			Ground Surface						65.7
			NAT: Silty SAND, dark grey/black, fine grained			D			65.5
			NAT: SAND, pale brown/grey, fine to medium grained		L				64.9
				Wet above clayey sand layer					
1			NAT: Clayey SAND, orange/grey, medium grained			M			
					F				
				Implant installed at 1.7m					
2			End of Borehole @ 2.0m						63.7

Descriptions are based on observations and hand testing of grab samples. Mechanical Tests were not performed unless otherwise stated.

First Occurrence of Groundwater: N/A

Static Groundwater Level: N/A

Reviewed By: PLB

FILE Cyril Beechey / Borelogs

PROJECT No: Cyril Beechey Lane

DATE: 05/12/16

X COORDINATE:

SITE: 39-45 Cyril Beechey Ln

LOGGED BY: REC

Y COORDINATE:

CLIENT: KLM Spatial

TOTAL DEPTH: 2

ELEVATION: 65.7

DEPTH (m)	WELL CONSTRUCTION	LEGEND	DESCRIPTION	ADDITIONAL OBSERVATIONS	CONSISTENCY/DENSITY	MOISTURE CONTENT	PID (ppm)	SAMPLE LABEL	ELEVATION (approx)
0			Ground Surface						65.7
			NAT: Silty SAND, dark grey/black, fine grained						
			NAT: SAND, grey, fine to medium grained			M			65.5
1			Becoming brown @ 0.9m	Implant installed at 0.9m Wet at 0.9m	L				
						W			
2			End of Borehole @ 2.0m						63.7

Descriptions are based on observations and hand testing of grab samples. Mechanical Tests were not performed unless otherwise stated.

First Occurrence of Groundwater: ~0.9m

Static Groundwater Level: N/A

Reviewed By: PLB

FILE Cyril Beechey / Borelogs

PROJECT No: Cyril Beechey Lane

DATE: 05/12/16

X COORDINATE:

SITE: 39-45 Cyril Beechey Ln

LOGGED BY: REC

Y COORDINATE:

CLIENT: KLM Spatial

TOTAL DEPTH: 2

ELEVATION: 65.7

DEPTH (m)	WELL CONSTRUCTION	LEGEND	DESCRIPTION	ADDITIONAL OBSERVATIONS	CONSISTENCY/DENSITY	MOISTURE CONTENT	PID (ppm)	SAMPLE LABEL	ELEVATION (approx)
0			Ground Surface						65.7
			NAT: Sandy SILT, dark brown, fine grained		F				
			NAT: Clayey SAND, orange/brown, fine grained			M			65.3
1			NAT: SAND, grey, fine to medium grained, gravels present	Implant installed at 0.9m Wet at 0.9m					64.8
			Becoming wetter with depth		L				
						W			
2			End of Borehole @ 2.0m						63.7

Descriptions are based on observations and hand testing of grab samples. Mechanical Tests were not performed unless otherwise stated.

First Occurrence of Groundwater: ~0.9m

Static Groundwater Level: N/A

Reviewed By: PLB

FILE Cyril Beechey / Borelogs

PROJECT No: Cyril Beechey Lane

DATE: 08/12/16

X COORDINATE:

SITE: 40-46 Cyril Beechey Ln

LOGGED BY: REC

Y COORDINATE:

CLIENT: KLM Spatial

TOTAL DEPTH: 2

ELEVATION: 65.7

DEPTH (m)	WELL CONSTRUCTION	LEGEND	DESCRIPTION	ADDITIONAL OBSERVATIONS	CONSISTENCY/DENSITY	MOISTURE CONTENT	PID (ppm)	SAMPLE LABEL	ELEVATION (approx)
0			Ground Surface						65.7
			FILL: Clayey SAND with Gravels and Crushed Siltstone, light brown and grey, clay pockets		L				
			NAT: SAND, dark grey changing to brown			M			65.1
1			NAT: Silty CLAY, mottled dark grey/brown/orange/red		F				64.9
				Implant installed at 1.5m					64.1
			NAT: Sandy CLAY, grey						
			NAT: SAND, light brown, medium grained		L	W			63.9
2			End of Borehole @ 2.0m						63.7

Descriptions are based on observations and hand testing of grab samples. Mechanical Tests were not performed unless otherwise stated.

First Occurrence of Groundwater: ~1.6m

Static Groundwater Level: N/A

Reviewed By: PLB

FILE Cyril Beechey / Borelogs

PROJECT No: Cyril Beechey Lane

DATE: 08/12/16

X COORDINATE:

SITE: 40-46 Cyril Beechey Ln

LOGGED BY: REC

Y COORDINATE:

CLIENT: KLM Spatial

TOTAL DEPTH: 2

ELEVATION: 65.7

DEPTH (m)	WELL CONSTRUCTION	LEGEND	DESCRIPTION	ADDITIONAL OBSERVATIONS	CONSISTENCY/DENSITY	MOISTURE CONTENT	PID (ppm)	SAMPLE LABEL	ELEVATION (approx)
0			Ground Surface						65.7
			FILL: Silty CLAY, with Crushed Siltstone and Gravels, orange and grey		F				65.4
			NAT: Sandy SILT, brown, organic component						
			NAT: SAND, brown, becoming lighter with depth		L	M			64.9
				Implant installed at 1.5m					64.1
			NAT: Clayey SAND, light brown		S	W			63.7
2			End of Borehole @ 2.0m						

Descriptions are based on observations and hand testing of grab samples. Mechanical Tests were not performed unless otherwise stated.

First Occurrence of Groundwater: ~1.6m

Static Groundwater Level: N/A

Reviewed By: PLB

FILE Cyril Beechey / Borelogs

PROJECT No: Cyril Beechey Lane

DATE: 08/12/16

X COORDINATE:

SITE: 40-46 Cyril Beechey Ln

LOGGED BY: REC

Y COORDINATE:

CLIENT: KLM Spatial

TOTAL DEPTH: 1.2

ELEVATION: 65.7

DEPTH (m)	WELL CONSTRUCTION	LEGEND	DESCRIPTION	ADDITIONAL OBSERVATIONS	CONSISTENCY/DENSITY	MOISTURE CONTENT	PID (ppm)	SAMPLE LABEL	ELEVATION (approx)
0			Ground Surface						65.7
			FILL: Sandy SILT with Gravels, clay pockets, crushed siltstone		L	M			
1			NAT: Silty SAND, dark grey, fine grained, some organic content	Implant installed at 1.0m					64.9
			Organic/anaerobic odour in saturated soil	Water filled in to 1.1m		W			64.5
			End of Borehole @ 1.2m						
2									

Descriptions are based on observations and hand testing of grab samples. Mechanical Tests were not performed unless otherwise stated.

First Occurrence of Groundwater: ~1.1m

Static Groundwater Level: N/A

Reviewed By: PLB

FILE Cyril Beechey / Borelogs

PROJECT No: Cyril Beechey Lane

DATE: 19/12/16

X COORDINATE:

SITE: 40-46 Cyril Beechey Ln

LOGGED BY: REC

Y COORDINATE:

CLIENT: KLM Spatial

TOTAL DEPTH: 1.5

ELEVATION: 65.7

DEPTH (m)	WELL CONSTRUCTION	LEGEND	DESCRIPTION	ADDITIONAL OBSERVATIONS	CONSISTENCY/DENSITY	MOISTURE CONTENT	PID (ppm)	SAMPLE LABEL	ELEVATION (approx)
0			NAT: SAND, dark grey, fine grained			D			65.7
			Becoming grey @ 0.4m		L				
1			Becoming brown @ 1.0m	Implant installed at 1.1m	MD	M			
			End of Borehole @ 1.5m			W			64.2
2									

Descriptions are based on observations and hand testing of grab samples. Mechanical Tests were not performed unless otherwise stated.

First Occurrence of Groundwater: ~1.4m

Static Groundwater Level: N/A

Reviewed By: PLB

FILE Cyril Beechey / Borelogs

PROJECT No: Cyril Beechey Lane

DATE: 08/12/16

X COORDINATE:

SITE: 40-46 Cyril Beechey Ln

LOGGED BY: REC

Y COORDINATE:

CLIENT: KLM Spatial

TOTAL DEPTH: 1.5

ELEVATION: 65.7

DEPTH (m)	WELL CONSTRUCTION	LEGEND	DESCRIPTION	ADDITIONAL OBSERVATIONS	CONSISTENCY/DENSITY	MOISTURE CONTENT	PID (ppm)	SAMPLE LABEL	ELEVATION (approx)
0			Ground Surface						65.7
			FILL: Mixed Soil; SAND with Clay and Gravels present, clay grey/white and dark grey, sand brown/grey and fine grained	Soil feels warm from 0.5m	L				
						M			64.9
1			FILL: Clayey SAND, grey, fine to medium grained	Hydrocarbon odour @ 1.0m	F				
				Implant installed at 1.2m					64.4
			NAT: SAND, brown and dark grey, some organic content		MD				
						W			64.2
			End of Borehole @ 1.5m						
2									
<p>Descriptions are based on observations and hand testing of grab samples. Mechanical Tests were not performed unless otherwise stated.</p> <p>First Occurrence of Groundwater: ~1.4m</p> <p>Static Groundwater Level: N/A</p>									
				Reviewed By: PLB	FILE Cyril Beechey / Borelogs				

PROJECT No: Cyril Beechey Lane

DATE: 19/12/16

X COORDINATE:

SITE: 40-46 Cyril Beechey Ln

LOGGED BY: REC

Y COORDINATE:

CLIENT: KLM Spatial

TOTAL DEPTH: 1.6

ELEVATION: 65.7

DEPTH (m)	WELL CONSTRUCTION	LEGEND	DESCRIPTION	ADDITIONAL OBSERVATIONS	CONSISTENCY/DENSITY	MOISTURE CONTENT	PID (ppm)	SAMPLE LABEL	ELEVATION (approx)
0			Ground Surface						65.7
			SAND, dark grey, fine grained, some silt and organic content at surface						
1			FILL: Sandstone, black, amongst dark brown sand		L	D			64.7
			NAT: SAND, light brown, fine grained			M			64.3
			End of Borehole @ 1.6m	Implant installed at 1.5m					64.1
2									

Descriptions are based on observations and hand testing of grab samples. Mechanical Tests were not performed unless otherwise stated.

First Occurrence of Groundwater: N/A

Static Groundwater Level: N/A

Reviewed By: PLB

FILE Cyril Beechey / Borelogs

PROJECT No: Cyril Beechey Lane

DATE: 8/12/16

X COORDINATE:

SITE: 40-46 Cyril Beechey Ln

LOGGED BY: REC

Y COORDINATE:

CLIENT: KLM Spatial

TOTAL DEPTH: 2

ELEVATION: 65.7

DEPTH (m)	WELL CONSTRUCTION	LEGEND	DESCRIPTION	ADDITIONAL OBSERVATIONS	CONSISTENCY/DENSITY	MOISTURE CONTENT	PID (ppm)	SAMPLE LABEL	ELEVATION (approx)
0			Ground Surface						65.7
			FILL: Silty SAND with gravels, brown						65.6
			NAT: SAND, dark grey						
			Becoming pale grey @ 0.4m						
			Becoming brown @ 0.8m						
1			From 1.2m alternating colours of brown and dark grey		L	M			
2			End of Borehole @ 2.0m	Implant installed at 2.0m					63.7

Descriptions are based on observations and hand testing of grab samples. Mechanical Tests were not performed unless otherwise stated.

First Occurrence of Groundwater: N/A

Static Groundwater Level: N/A

Reviewed By: PLB

FILE Cyril Beechey / Borelogs

PROJECT No: Cyril Beechey Lane

DATE: 19/12/16

X COORDINATE:

SITE: 40-46 Cyril Beechey Ln

LOGGED BY: REC

Y COORDINATE:

CLIENT: KLM Spatial

TOTAL DEPTH: 1.6

ELEVATION: 65.7

DEPTH (m)	WELL CONSTRUCTION	LEGEND	DESCRIPTION	ADDITIONAL OBSERVATIONS	CONSISTENCY/DENSITY	MOISTURE CONTENT	PID (ppm)	SAMPLE LABEL	ELEVATION (approx)
0			Ground Surface						65.7
			NAT: SAND, dark grey, fine grained			D			
			Becoming grey @ 0.6m		L				
1			NAT: Silty SAND, brown		MD	M			64.7
			End of Borehole @ 1.6m	Implant installed at 1.5m					64.1
2									

Descriptions are based on observations and hand testing of grab samples. Mechanical Tests were not performed unless otherwise stated.

First Occurrence of Groundwater: N/A

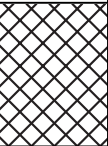
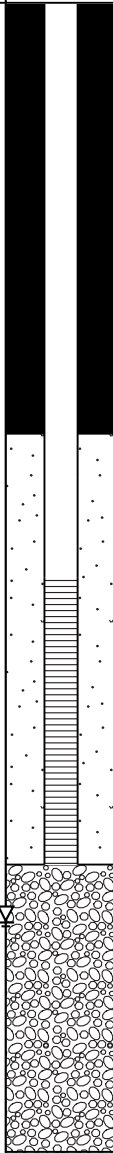
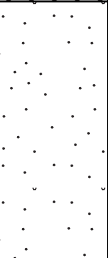
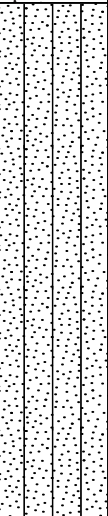
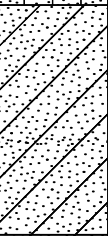
Static Groundwater Level: N/A

Reviewed By: PLB

FILE Cyril Beechey / Borelogs

MONITORING WELL LOG SV01

PROJECT No. 39-45 Cyril Beechey Lane	EQUIPMENT & METHODS Solid Auger	X COORDINATE See site layout
SITE 39-45 Cyril Beechey Ln, Cranbourne	DATE COMPLETED 16/02/2018	Y COORDINATE See site layout
CLIENT KLM Spatial	TOTAL DEPTH 2.0 mbgl.	ELEVATION 65-67 mAHD
		LOGGED BY RWW

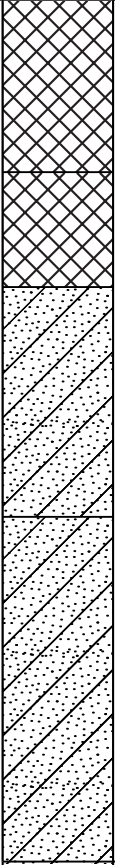
LOCATION DESCRIPTION									
Depth (m)	Graphic Log	Drilling Method	Material Description	Samples	Consistency/ Density	Moisture Content	Additional Observations	Well Construction Details	Water Column
0.1		A	FILL: Silty SAND; fine to medium grained; dark brown; with trace fine roots.	No Samples taken.	L	D	No rubble, ACM, staining or odour present.		
0.2									
0.3			SAND; fine to medium grained; yellow.		MD	M-D			
0.4									
0.5									
0.6									
0.7			Silty SAND; fine to medium grained; orange; trace fine to medium grained gravel.			M			
0.8									
0.9									
1									
1.1									
1.2									
1.3									
1.4									
1.5			Increasing clay content with yellow and orange mottle.						
1.6			Clayey SAND; fine to medium grained; grey and orange mottled.			M-W			
1.7									
1.8									
1.9									
2			EOBH @ 2.0 mbgl.						
2.1									
2.2									
2.3									
2.4									

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MONITORING WELL LOG SV02

PROJECT No. 39-45 Cyril Beechey Lane	EQUIPMENT & METHODS Solid Auger	X COORDINATE See site layout
SITE 39-45 Cyril Beechey Ln, Cranbourne	DATE COMPLETED 16/02/2018	Y COORDINATE See site layout
CLIENT KLM Spatial	TOTAL DEPTH 1.5 mbgl.	ELEVATION 65-67 mAHD
		LOGGED BY RWW

LOCATION DESCRIPTION

Depth (m)	Graphic Log	Drilling Method	Material Description	Samples	Consistency/ Density	Moisture Content	Additional Observations	Well Construction Details	Water Column
0.1		A	FILL: SILT; white to yellow; trace fine grained sand.	No Samples taken.	L	D	No rubble, ACM, staining or odour present.		
0.2									
0.3			TOPSOIL: Sandy SILT; dark brown; fine to medium grained sand.						
0.4									
0.5			Clayey SAND; fine to medium grained; orange and yellow mottle.		MD	M-D			
0.6									
0.7									
0.8									
0.9									
1.0			Sandy CLAY; low plasticity; orange and yellow; fine to medium grained sand.		F	M			
1.1									
1.2									
1.3			Colour change to orange red.		D				
1.4									
1.5			EOBH @ 1.5 mbgl.						
1.6									
1.7									
1.8									
1.9									
2.0									
2.1									
2.2									
2.3									
2.4									

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MONITORING WELL LOG SV03

PROJECT No. 39-45 Cyril Beechey Lane	EQUIPMENT & METHODS Solid Auger	X COORDINATE See site layout
SITE 39-45 Cyril Beechey Ln, Cranbourne	DATE COMPLETED 16/02/2018	Y COORDINATE See site layout
CLIENT KLM Spatial	TOTAL DEPTH 1.5 mbgl.	ELEVATION 65-67 mAHD
		LOGGED BY RWW

LOCATION DESCRIPTION

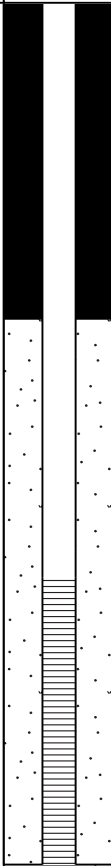
Depth (m)	Graphic Log	Drilling Method	Material Description	Samples	Consistency/ Density	Moisture Content	Additional Observations	Well Construction Details	Water Column
0.1		A	FILL: Sandy SILT; dark brown; fine to medium grained sand.	No Samples taken.	L	D	No rubble, ACM, staining or odour present.		
0.2									
0.3									
0.4									
0.5		Silty SAND; fine to medium grained; yellow orange; with trace fine grained gravels.	MD		M				
0.6									
0.7									
0.8									
0.9									
1									
1.1									
1.2		Silty SAND; fine to medium grained; dark grey with some deep orange.							
1.3									
1.4									
1.5		EOBH @ 1.5 mbgl.							
1.6									
1.7									
1.8									
1.9									
2									
2.1									
2.2									
2.3									
2.4									

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MONITORING WELL LOG SV04

PROJECT No. 39-45 Cyril Beechey Lane	EQUIPMENT & METHODS Solid Auger	X COORDINATE See site layout
SITE 39-45 Cyril Beechey Ln, Cranbourne	DATE COMPLETED 16/02/2018	Y COORDINATE See site layout
CLIENT KLM Spatial	TOTAL DEPTH 1.5 mbgl.	ELEVATION 65-67 mAHD
		LOGGED BY RWW

LOCATION DESCRIPTION

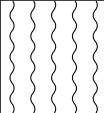
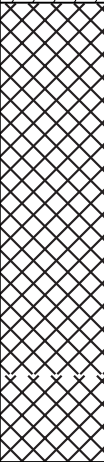
Depth (m)	Graphic Log	Drilling Method	Material Description	Samples	Consistency/ Density	Moisture Content	Additional Observations	Well Construction Details	Water Column
0.1		A	FILL: Clayey SILT; dark brown.	No Samples taken.	L	D	No rubble, ACM, staining or odour present.		
0.2									
0.3									
0.4									
0.5			Clayey SAND; fine to medium grained; yellow brown; with trace fine grained gravels.		MD	M			
0.6			Sandy CLAY; medium to low plasticity; orange with grey mottle; fine to medium grained sand; with trace fine grained gravels.		D				
0.7									
0.8									
0.9									
1.0									
1.1									
1.2	Clayey SAND; fine to medium grained; grey.	MD							
1.3									
1.4									
1.5	EOBH @ 1.5 mbgl.								
1.6									
1.7									
1.8									
1.9									
2									
2.1									
2.2									
2.3									
2.4									

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MONITORING WELL LOG SV05

PROJECT No. 40-46 Cyril Beechey Lane	EQUIPMENT & METHODS Solid Auger	X COORDINATE See site layout
SITE 40-46 Cyril Beechey Ln, Cranbourne	DATE COMPLETED 16/02/2018	Y COORDINATE See site layout
CLIENT KLM Spatial	TOTAL DEPTH 1.5 mbgl.	ELEVATION 65-67 mAHD
		LOGGED BY RWW

LOCATION DESCRIPTION

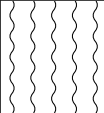
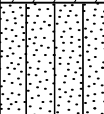
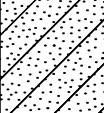
Depth (m)	Graphic Log	Drilling Method	Material Description	Samples	Consistency/ Density	Moisture Content	Additional Observations	Well Construction Details	Water Column
0.1		A	TOPSOIL: Silty SAND; fine to medium grained; dark brown.	No Samples taken.	L	D	No rubble, ACM, staining or odour present.		
0.2			FILL: sandy SILT; low plasticity; pale grey; fine to medium grained sand.						
0.3									
0.4									
0.5									
0.6									
0.7									
0.8									
0.9									
1									
1.1			SAND; fine to medium grained; orange brown.		L-MD				
1.2									
1.3									
1.4									
1.5									
1.6			Medium grained and slightly more pale.			M			
1.7									
1.8									
1.9									
2			EOBH @ 1.5 mbgl.						
2.1									
2.2									
2.3									
2.4									

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MONITORING WELL LOG SV06

PROJECT No. 40-46 Cyril Beechey Lane	EQUIPMENT & METHODS Solid Auger	X COORDINATE See site layout
SITE 40-46 Cyril Beechey Ln, Cranbourne	DATE COMPLETED 16/02/2018	Y COORDINATE See site layout
CLIENT KLM Spatial	TOTAL DEPTH 1.5 mbgl.	ELEVATION 65-67 mAHD
		LOGGED BY RWW

LOCATION DESCRIPTION

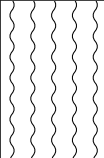
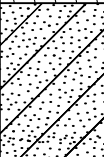
Depth (m)	Graphic Log	Drilling Method	Material Description	Samples	Consistency/ Density	Moisture Content	Additional Observations	Well Construction Details	Water Column
0.1		A	TOPSOIL: sandy SILT; dark brown; medium to fine grained; with some fine roots.	No Samples taken.	L	D	No rubble, ACM, staining or odour present.		
0.2			Silty SAND; medium to fine grained; pale grey.			M-D			
0.3									
0.4									
0.5									
0.6									
0.7			SAND; medium grained; brown orange.		MD	M			
0.8									
0.9									
1.0									
1.1									
1.2			Sandy CLAY; low to medium plasticity; orange with grey mottle; with trace fine grained gravels.						
1.3									
1.4									
1.5			EOBH @ 1.5 mbgl.						
1.6									
1.7									
1.8									
1.9									
2.0									
2.1									
2.2									
2.3									
2.4									

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MONITORING WELL LOG SV07

PROJECT No. 40-46 Cyril Beechey Lane	EQUIPMENT & METHODS Solid Auger	X COORDINATE See site layout
SITE 40-46 Cyril Beechey Ln, Cranbourne	DATE COMPLETED 16/02/2018	Y COORDINATE See site layout
CLIENT KLM Spatial	TOTAL DEPTH 2.0 mbgl.	ELEVATION 65-67 mAHD
		LOGGED BY RWW

LOCATION DESCRIPTION

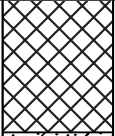
Depth (m)	Graphic Log	Drilling Method	Material Description	Samples	Consistency/ Density	Moisture Content	Additional Observations	Well Construction Details	Water Column
0.1		A	TOPSOIL: clayey SAND; fine to medium grained; orange brown.	No Samples taken.	L	D	No rubble, ACM, staining or odour present.		
0.2									
0.3			Clayey SAND; medium grained; grey.		MD	M			
0.4									
0.5									
0.6			Colour change to pale grey.		M				
0.7									
0.8									
0.9									
1.0									
1.1									
1.2			Sandy CLAY; low plasticity; pale grey; fine to medium grained sand.		F-St				
1.3									
1.4									
1.5			Colour change to orange brown.		F				
1.6									
1.7			SAND; medium grained; yellow.		L				
1.8									
1.9									
2.0			EOBH @ 2.0 mbgl.						
2.1									
2.2									
2.3									
2.4									

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MONITORING WELL LOG BH01

PROJECT No. 40-46 Cyril Beechey Lane	EQUIPMENT & METHODS Solid Auger	X COORDINATE See site layout
SITE 40-46 Cyril Beechey Ln, Cranbourne	DATE COMPLETED 16/02/2018	Y COORDINATE See site layout
CLIENT KLM Spatial	TOTAL DEPTH 6.0 mbgl.	ELEVATION 65-67 mAHD
		LOGGED BY RWW

LOCATION DESCRIPTION

Depth (m)	Graphic Log	Drilling Method	Material Description	Samples	Consistency/ Density	Moisture Content	Additional Observations	Well Construction Details	Water Column
0.5		A	FILL: clayey SAND; fine to medium grained; orange brown.	No Samples taken.	L	D	No rubble, ACM, staining or odour present.	No well installed.	
1			Clayey SAND; medium grained; grey.		MD	M-D			
1.5			Increase in clay content.		D	M			
2			Sandy CLAY; low plasticity; pale grey; fine to medium grained sand.		F-St				
2.5			Colour change to orange brown.		S-F				
3			Clayey SAND; fine to medium grained; yellow brown.		MD	M-W			
3.5						W			
4									
4.5			Colour change dark grey.						
5									
5.5									
6			EOBH @ 6.0 mbgl.						

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MONITORING WELL LOG SV08

PROJECT No. 40-46 Cyril Beechey Lane	EQUIPMENT & METHODS Solid Auger	X COORDINATE See site layout
SITE 40-46 Cyril Beechey Ln, Cranbourne	DATE COMPLETED 16/02/2018	Y COORDINATE See site layout
CLIENT KLM Spatial	TOTAL DEPTH 1.5 mbgl.	ELEVATION 65-67 mAHD
		LOGGED BY RWW

LOCATION DESCRIPTION

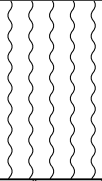
Depth (m)	Graphic Log	Drilling Method	Material Description	Samples	Consistency/ Density	Moisture Content	Additional Observations	Well Construction Details	Water Column
0.1		A	TOPSOIL: sandy SILT; low plasticity; dark brown; medium to fine grained sand; with some fine roots.	No Samples taken.	L	M	Some rubbish at surface: bottles, wrappers and plastic.		
0.2									
0.3									
0.4			Silty SAND; medium to fine grained; grey.				No rubble, ACM, staining or odour present.		
0.5									
0.6									
0.7									
0.8									
0.9			Colour change to pale grey.		MD				
1.0									
1.1									
1.2			Sandy CLAY; medium to low plasticity; orange grey; fine to medium grained sand.						
1.3									
1.4									
1.5			EOBH @ 1.5 mbgl.						
1.6									
1.7									
1.8									
1.9									
2.0									
2.1									
2.2									
2.3									
2.4									

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ENVIRONMENTAL TEST PIT LOG TP01

PROJECT No. 40-46 Cyril Beechey Lane	EQUIPMENTS & METHODS	X COORDINATE Refer to site layout plan
SITE 40-46 Cyril Beechey Lane, Cranbourne	Test Pitting with Excavator	Y COORDINATE Refer to site layout plan
CLIENT KLM Spatial	DATE COMPLETED 07/04/17	ELEVATION 72m
LOGGED BY REC		

LOCATION DESCRIPTION

Graphic Log	Material Description	Depth (m)	PID	Samples	Consistency	Moisture	Additional Observations
	TOPSOIL: silty SAND; fine grained sand; dark grey/black; grass roots present.		0.0		L	M	Some minor rubble and steel wire near surface
				TP01_0.1			
	SAND; fine grained; dark grey.		0.0				
				TP01_0.3			
		0.5					
			0.0				
	Colour change to grey.			TP01_0.8		M-W	
	End of Test Pit @ 1.0 mbgl.	1					
		1.5					

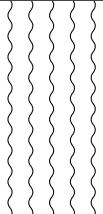
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ENVIRONMENTAL TEST PIT LOG TP02

PROJECT No. 40-46 Cyril Beechey Lane	EQUIPMENTS & METHODS	X COORDINATE Refer to site layout plan
SITE 40-46 Cyril Beechey Lane, Cranbourne	Test Pitting with Excavator	Y COORDINATE Refer to site layout plan
CLIENT KLM Spacial	DATE COMPLETED 07/04/17	ELEVATION 72m
LOGGED BY REC		

LOCATION DESCRIPTION

Graphic Log	Material Description	Depth (m)	PID	Samples	Consistency	Moisture	Additional Observations
	TOPSOIL: silty SAND; dark grey; fine grained sand; grass roots present.		0.0		L	M	Some rubbish at surface; plastic etc
				TP02_0.1			
	SAND; grey; fine grained.		0.0	TP02_0.3			
		0.5					
	End of Test Pit @ 1.0 mbgl.	1					
		1.5					

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ENVIRONMENTAL TEST PIT LOG TP03

PROJECT No. 40-46 Cyril Beechey Lane	EQUIPMENTS & METHODS	X COORDINATE Refer to site layout plan
SITE 40-46 Cyril Beechey Lane, Cranbourne	Test Pitting with Excavator	Y COORDINATE Refer to site layout plan
CLIENT KLM Spacial	DATE COMPLETED 07/04/17	ELEVATION 72m
LOGGED BY REC		

LOCATION DESCRIPTION

Graphic Log	Material Description	Depth (m)	PID	Samples	Consistency	Moisture	Additional Observations
	TOPSOIL: silty SAND; fine grained sand; dark grey/black; grass roots present.		0.0		L	M	No rubbish, odours, staining, or potential ACM observed
				TP03_0.1			
	SAND; fine grained; grey.		0.0	TP03_0.4			
	End of Test Pit @ 0.8 mbgl.	0.5					
		1					
		1.5					

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ENVIRONMENTAL TEST PIT LOG TP04

PROJECT No. 40-46 Cyril Beechey Lane	EQUIPMENTS & METHODS	X COORDINATE Refer to site layout plan
SITE 40-46 Cyril Beechey Lane, Cranbourne	Test Pitting with Excavator	Y COORDINATE Refer to site layout plan
CLIENT KLM Spacial	DATE COMPLETED 07/04/17	ELEVATION 72m
LOGGED BY REC		

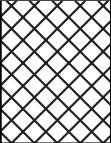
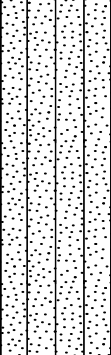
LOCATION DESCRIPTION							
Graphic Log	Material Description	Depth (m)	PID	Samples	Consistency	Moisture	Additional Observations
	TOPSOIL: silty SAND; fine grained sand; dark grey; grass roots present.		0.0		L	M	No rubbish, odours, staining, or potential ACM observed
				TP04_0.1			
	SAND; fine to coarse grained; grey; becoming lighter in colour with depth.	0.0	0.0	TP04_0.4			
		0.5					
	End of Test Pit @ 0.8 mbgl.						
		1					
		1.5					

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ENVIRONMENTAL TEST PIT LOG TP05

PROJECT No. 40-46 Cyril Beechey Lane	EQUIPMENTS & METHODS	X COORDINATE Refer to site layout plan
SITE 40-46 Cyril Beechey Lane, Cranbourne	Test Pitting with Excavator	Y COORDINATE Refer to site layout plan
CLIENT KLM Spatial	DATE COMPLETED 07/04/17	ELEVATION 72m
LOGGED BY REC		

LOCATION DESCRIPTION

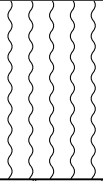
Graphic Log	Material Description	Depth (m)	PID	Samples	Consistency	Moisture	Additional Observations
	FILL: SAND; fine grained; grey; (small stockpile).		0.0	TP05_0.1	L	M	Wood debris round surface and bark/mulch
			0.0	TP05_0.2			
		0.5					
		0.0		TP05_0.7			
	TOPSOIL: silty SAND; fine grained; dark grey; grass roots present.						
	SAND; fine grained; grey.						
	End of Test Pit @ 0.8 mbgl.						
		1					
		1.5					

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ENVIRONMENTAL TEST PIT LOG TP06

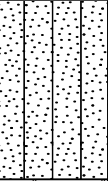
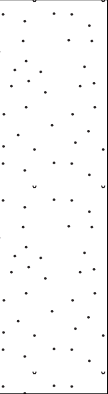
PROJECT No. 40-46 Cyril Beechey Lane	EQUIPMENTS & METHODS	X COORDINATE Refer to site layout plan
SITE 40-46 Cyril Beechey Lane, Cranbourne	Test Pitting with Excavator	Y COORDINATE Refer to site layout plan
CLIENT KLM Spacial	DATE COMPLETED 07/04/17	ELEVATION 72m
LOGGED BY REC		

LOCATION DESCRIPTION							
Graphic Log	Material Description	Depth (m)	PID	Samples	Consistency	Moisture	Additional Observations
	TOPSOIL: silty SAND; fine grained; dark grey; grass roots present.	0.0	0.0	TP06_0.1 DUP1_070417 SPL1_070417	L	M	No rubbish, odours, staining, or potential ACM observed
	SAND; fine to medium grained; grey.			TP06_0.3			
	End of Test Pit @ 0.8 mbgl.	0.5					
		1					
		1.5					

ENVIRONMENTAL TEST PIT LOG TP07

PROJECT No. 40-46 Cyril Beechey Lane	EQUIPMENTS & METHODS	X COORDINATE Refer to site layout plan
SITE 40-46 Cyril Beechey Lane, Cranbourne	Test Pitting with Excavator	Y COORDINATE Refer to site layout plan
CLIENT KLM Spatial	DATE COMPLETED 07/04/17	ELEVATION 72m
LOGGED BY REC		

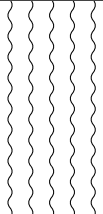
LOCATION DESCRIPTION

Graphic Log	Material Description	Depth (m)	PID	Samples	Consistency	Moisture	Additional Observations
	TOPSOIL: silty SAND; fine grained sand; dark grey; grass roots present.	0.0	0.0		L	D-M	No rubbish, odours, staining, or potential ACM observed
				TP07_0.1			
	SAND; fine to medium grained; grey;	0.0	0.0			M	
				TP07_0.3			
	End of Test Pit @ 0.8 mbgl.	0.5					
		1					
		1.5					

ENVIRONMENTAL TEST PIT LOG TP08

PROJECT No. 40-46 Cyril Beechey Lane	EQUIPMENTS & METHODS	X COORDINATE Refer to site layout plan
SITE 40-46 Cyril Beechey Lane, Cranbourne	Test Pitting with Excavator	Y COORDINATE Refer to site layout plan
CLIENT KLM Spacial	DATE COMPLETED 07/04/17	ELEVATION 72m
LOGGED BY REC		

LOCATION DESCRIPTION

Graphic Log	Material Description	Depth (m)	PID	Samples	Consistency	Moisture	Additional Observations
	TOPSOIL: silty SAND; fine grained sand; dark grey; grass roots present.	0.0	0.0		L	D-M	No rubbish, odours, staining, or potential ACM observed
				TP08_0.1			
	SAND; fine to medium grained; grey.	0.0	0.0	TP08_0.3		M	
	End of Test Pit @ 1.0 mbgl.	1					
		1.5					

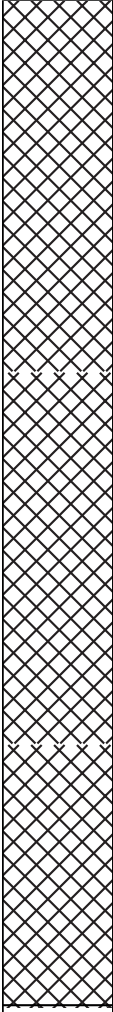
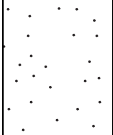
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ENVIRONMENTAL TEST PIT LOG TP09

PROJECT No. 40-46 Cyril Beechey Lane	EQUIPMENTS & METHODS	X COORDINATE Refer to site layout plan
SITE 40-46 Cyril Beechey Lane, Cranbourne	Test Pitting with Excavator	Y COORDINATE Refer to site layout plan
CLIENT KLM Spacial	DATE COMPLETED 07/04/17	ELEVATION 72m
LOGGED BY REC		

LOCATION DESCRIPTION

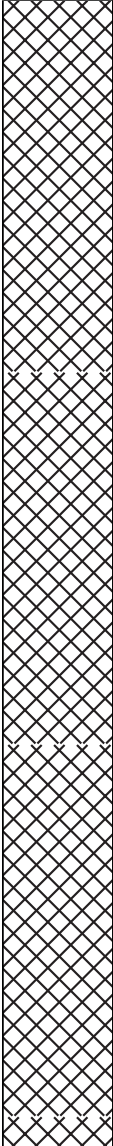
Graphic Log	Material Description	Depth (m)	PID	Samples	Consistency	Moisture	Additional Observations
	FILL: sandy CLAY with sand pockets; grey and orange clay; fine to medium grained sand; pockets of black sand.	0.1	0.1	TP09_0.1	L	M	Organic/ hydrocarbon like odour.
		0.5					
	Sandy CLAY; grey; fine to medium grained sand.	0.2		TP09_0.8 DUP2_070417 SPL2_070417	ST		
		1					
	SAND; fine to medium grained; brown orange; clay pockets.	0.3	0.3	TP09_1.4	MD		Organic/ hydrocarbon like odour.
	End of Test Pit @ 1.6 mbgl.	1.5					

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ENVIRONMENTAL TEST PIT LOG TP10

PROJECT No. 40-46 Cyril Beechey Lane	EQUIPMENTS & METHODS	X COORDINATE Refer to site layout plan
SITE 40-46 Cyril Beechey Lane, Cranbourne	Test Pitting with Excavator	Y COORDINATE Refer to site layout plan
CLIENT KLM Spacial	DATE COMPLETED 07/04/17	ELEVATION 72m
LOGGED BY REC		

LOCATION DESCRIPTION

Graphic Log	Material Description	Depth (m)	PID	Samples	Consistency	Moisture	Additional Observations
	FILL: SAND; fine to medium grained; brown grey; with some orange and grey clay pockets.	0.0		TP10_0.1	L	M	Hydrocarbon/organic like odour. Strong hydrocarbon/organic like odour.
		0.5					
	FILL: sandy CLAY; grey; fine to coarse grained sand.	0.1		TP10_0.7	ST		
		1					
	FILL: silty SAND; fine grained; dark brown/black.	0.6		TP10_1.0	D		
	Colour change to brown.	0.3		TP10_1.1			
		1.5					
	SAND; fine to medium grained; grey.	0.1		TP10_1.6	L		
	End of Test Pit @ 1.8 mbgl.						

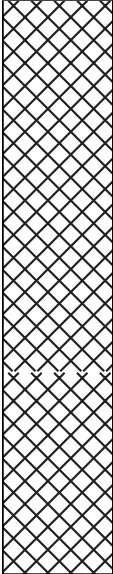
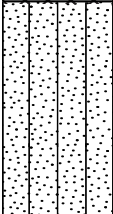
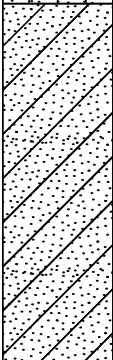
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ENVIRONMENTAL TEST PIT LOG TP11

PROJECT No. 40-46 Cyril Beechey Lane	EQUIPMENTS & METHODS	X COORDINATE Refer to site layout plan
SITE 40-46 Cyril Beechey Lane, Cranbourne	Test Pitting with Excavator	Y COORDINATE Refer to site layout plan
CLIENT KLM Spacial	DATE COMPLETED 07/04/17	ELEVATION 72m
LOGGED BY REC		

LOCATION DESCRIPTION

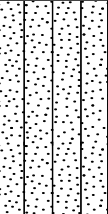
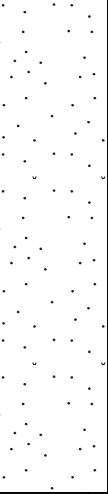
Graphic Log	Material Description	Depth (m)	PID	Samples	Consistency	Moisture	Additional Observations
	FILL: silty CLAY with sandy SILT; dark grey and orange; grey sand; some fine grained sand; roots and some rubbish present.	0.0	0.0		F/L	M	Rubbish amongst fill
				TP11_0.1			
	Silty SAND; fine grained; brown orange.	1	0.0	TP11_0.8	L		
	Clayey SAND; fine to medium grained; dark grey.	1.5					
	End of Test Pit @ 1.6 mbgl.						

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ENVIRONMENTAL TEST PIT LOG TP12

PROJECT No. 40-46 Cyril Beechey Lane	EQUIPMENTS & METHODS	X COORDINATE Refer to site layout plan
SITE 40-46 Cyril Beechey Lane, Cranbourne	Test Pitting with Excavator	Y COORDINATE Refer to site layout plan
CLIENT KLM Spacial	DATE COMPLETED 07/04/17	ELEVATION 72m
LOGGED BY REC		

LOCATION DESCRIPTION

Graphic Log	Material Description	Depth (m)	PID	Samples	Consistency	Moisture	Additional Observations
	TOPSOIL: silty SAND; fine grained; dark grey; grass roots present.		0.0		L	D-M	No rubbish, odours, staining, or potential ACM observed
				TP12_0.1			
	SAND; fine to medium grained; grey.	0.5				M	
	End of Test Pit @ 1.0 mbgl.	1					
		1.5					

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APPENDIX E - EQUIPMENT CALIBRATION

Gas Calibration Certificate

Instrument GFM410
 Serial No. 10240
 Sensors CH4, CO2, O2, H2S, CO



Air-Met Scientific Pty Ltd
 1300 137 067

Item	Test	Pass	Comments
Battery	Charge Condition	✓	
	Fuses	✓	
	Capacity	✓	
	Recharge OK?	✓	
Switch/keypad	Operation	✓	
Display	Intensity	✓	
	Operation (segments)	✓	
Grill Filter	Condition	✓	
	Seal	✓	
Pump	Operation		
	Filter		
	Flow		
	Valves, Diaphragm		
PCB	Condition	✓	
Connectors	Condition	✓	
Sensor	CH4	✓	
	CO2	✓	
	O2	✓	
	H2S	✓	
	CO	✓	
Alarms	Beeper	✓	
	Settings	✓	
Software	Version		
Datalogger	Operation		
Download	Operation		
Other tests:			

Certificate of Calibration

This is to certify that the above instrument has been calibrated to the following specifications:

Diffusion mode	Aspirated mode				
Sensor	Serial no	Calibration gas and concentration	Certified	Gas bottle No	Instrument Reading
Oxy		20.90%		Fresh Air	20.90%
CO2		40.0%	NIST	ME307	40.0%
CH4		60.0%	NIST	ME307	60.0%

Calibrated by:

Humaira Cadekiwala

Calibration date: 17/02/2017

Next calibration due: 19/08/2017

Gas Calibration Certificate

Instrument **GFM410**
 Serial No. **10240**
 Sensors **CH4, CO2, O2, H2S, CO**



Air-Met Scientific Pty Ltd
 1300 137 067

Item	Test	Pass	Comments
Battery	Charge Condition	✓	
	Fuses	✓	
	Capacity	✓	
	Recharge OK?	✓	
Switch/keypad	Operation	✓	
Display	Intensity	✓	
	Operation (segments)	✓	
Grill Filter	Condition	✓	
	Seal	✓	
Pump	Operation		
	Filter		
	Flow		
	Valves, Diaphragm		
PCB	Condition	✓	
Connectors	Condition	✓	
Sensor	CH4	✓	
	CO2	✓	
	O2	✓	
	H2S	✓	
	CO	✓	
Alarms	Beeper	✓	
	Settings	✓	
Software	Version		
Datalogger	Operation		
Download	Operation		
Other tests:			

Certificate of Calibration

This is to certify that the above instrument has been calibrated to the following specifications:

Diffusion mode		Aspirated mode			
Sensor	Serial no	Calibration gas and concentration	Certified	Gas bottle No	Instrument Reading
Oxy		20.90%		Fresh Air	20.90%
CO2		40.0%	NIST	ME307	40.0%
CH4		60.0%	NIST	ME307	60.0%

Calibrated by:

Yu Chee

Calibration date: 2/05/2017

Next calibration due: 1/11/2017

GasClam Calibration Certificate

1/1

Serial Number: SN000014-11-09

Software Version: 6.0.13

Ryan YUN

Gasclam Name: MGC-014

Firmware Version: 7.9

HydroTerra

09/04/2018 12:08:48 PM

Sensor Type: Hydrogen Sulphide**Offset:** -44**Slope:** 1.32**Enter Values 1:** 0 ppm**AD Values 1:** 34**Enter Values 2:** 25 ppm**AD Values 2:** 809**Calibration:** 09-April-2018 11:52**Units:** ppm**Decimal Places:** 0**Range:** 100**Expiration:** 24-February-2017 **Pumping Time:** 30**Error:** 0**Warm Up Time:** 30**Response Time:** 30**Calibration Type:** Two-point**User:** Ryan YUN**Location:** HydroTerra

Sensor Type: Carbon Monoxide**Offset:** -26**Slope:** 1.7895**Enter Values 1:** 0 ppm**AD Values 1:** 15**Enter Values 2:** 50 ppm**AD Values 2:** 129**Calibration:** 09-April-2018 11:45**Units:** ppm**Decimal Places:** 0**Range:** 1000**Expiration:** 22-February-2017 **Pumping Time:** 30**Error:** 0**Warm Up Time:** 30**Response Time:** 30**Calibration Type:** Two-point**User:** Ryan YUN**Location:** HydroTerra

Sensor Type: Oxygen**Offset:** -99**Slope:** 1.0481**Enter Values 1:** 20.9 %**AD Values 1:** 3361**Enter Values 2:** 0 %**AD Values 2:** 95**Calibration:** 09-April-2018 11:38**Units:** %**Decimal Places:** 1**Range:** 25**Expiration:** 03-March-2017 **Pumping Time:** 30**Error:** 0**Warm Up Time:** 30**Response Time:** 30**Calibration Type:** Two-point**User:** Ryan YUN**Location:** HydroTerra

Sensor Type: Methane (100%)**Offset:** -859**Slope:** 1.3146**Enter Values 1:** 0.0 %**AD Values 1:** 654**Enter Values 2:** 60 %**AD Values 2:** 2523**Calibration:** 09-April-2018 11:38**Units:** %**Decimal Places:** 1**Range:** 100**Expiration:** 17-February-2017 **Pumping Time:** 30**Error:** 300**Warm Up Time:** 30**Response Time:** 30**Calibration Type:** Two-point**User:** Ryan YUN**Location:** HydroTerra

Sensor Type: Carbon Dioxide (100%)**Offset:** -502**Slope:** 0.7661**Enter Values 1:** 0.0 %**AD Values 1:** 656**Enter Values 2:** 40 %**AD Values 2:** 2794**Calibration:** 09-April-2018 11:38**Units:** %**Decimal Places:** 1**Range:** 100**Expiration:** 25-February-2017 **Pumping Time:** 30**Error:** 300**Warm Up Time:** 30**Response Time:** 30**Calibration Type:** Two-point**User:** Ryan YUN**Location:** HydroTerra



Calibration Certificate

Unit Serial Number: 6083

Date Time: 28/10/2020, 17:11

Firmware Version: 1.3.28

Calibration Completed By: Luke Silvester

CO2_nc

DATE TIME: 28/10/2020 16:42

	Ref	ADC	Value(information)	Error	Error %
Low	0	396	0.02	0.02	---
High	40	1153.2	40.56	0.56	1.4

CO2_nc sensor pass

CH4_nc

DATE TIME: 28/10/2020 16:42

	Ref	ADC	Value(information)	Error	Error %
Low	0	404	0.02	0.02	---
High	60	1751.2	60.3	0.3	0.5

CH4_nc sensor pass

O2(exbrd)

DATE TIME: 28/10/2020 16:42

	Ref	ADC	Value(information)	Error	Error %
Low	0	87.6	-0.03	-0.03	---
High	20.9	2202.6	21.2	0.3	1.44

O2(exbrd) sensor pass

GaugPr

DATE TIME: 28/10/2020 16:14

	Ref	ADC	Value(information)	Error	Error %
ref 0	0	545.6	0.14	0.14	--
ref 1	-94.4	158.2	-94.73	-0.33	0.35

GaugPr sensor pass

BaroPr

DATE TIME: 28/10/2020 16:14

	Ref	ADC	Value(information)	Error	Error %
Low	1011.3	1893	1011.4	0.1	0.01
High	773.1	1397	773.5	0.4	0.05

BaroPr sensor pass

VOC

DATE TIME: 28/10/2020 17:06

	Ref	ADC	Value(information)	Error	Error %
Low	0	54	1.25	1.25	---
High	100	133	100.9	0.9	0.9

VOC sensor pass

%RH

DATE TIME: 28/10/2020 16:30

	Ref	ADC	Value(information)	Error	Error %
Low	48.2	1351	47.08	-1.12	-2.32
High	3.8	736.8	3.89	0.09	2.26

%RH sensor pass

CO

DATE TIME: 28/10/2020 16:57

	Ref	ADC	Value(information)	Error	Error %
ref 0	0	1026.6	1.25	1.25	--
ref 1	100	1347	101.44	1.44	1.44

CO sensor pass

H2S

DATE TIME: 28/10/2020 16:46

	Ref	ADC	Value(information)	Error	Error %
ref 0	0	1021.2	-0.2	-0.2	--
ref 1	25	1209.8	23.98	-1.02	-4.08

H2S sensor pass

BH-flow

	Ref	ADC	Value(information)	Error	Error %
Low1	0	819.4	0.03	0.03	---
Low2	18	2830.2	18.16	0.16	0.9
High3	30	3420.4	30.64	0.64	2.13
High4	48	3864	49.22	1.22	2.54

BH-flow sensor pass

Issued By:

Biogas Systems Australia
17 Sydenham Road Norwood, SA, 5067
Phone:1300 651 412

Signed By:



Date: 28th October 2020

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APPENDIX F – EXTRACT FROM CIRIA GUIDANCE

prescriptive approach to detailing protective systems and allow a wider choice in the use of different components. For example a ventilated underfloor void or a positive pressurisation system is one level of protection.

The key issue surrounding gas membranes is their ability to survive the construction process intact (see Chapter 9) and also possibly resist differential settlements. Membranes should be selected based on their performance characteristics and ability to survive the construction phase. An unreinforced 1200 g membrane is unlikely to achieve this and the minimum thickness of gas resistant membrane proposed is unreinforced 2000 g for low-risk sites. The range of protective measures that are available, and their detailed design, is discussed in Chapter 9.

Table 8.6

Typical scope of gas protective measures

Characteristic situation	Residential building (not those which belong to Situation B) ¹		Office/commercial/Industrial development	
(From Table 8.5)	Number of levels of protection	Typical scope of protective measures	Number of levels of protection	Typical scope of protective measures
1	None	No special precautions	None	No special precautions
2	2	a. Reinforced concrete cast <i>in situ</i> floor slab (suspended, non-suspended or raft) with at least 1200 g DPM ² and underfloor venting. b. Beam and block or pre-cast concrete and 2000 g DPM/reinforced gas membrane and underfloor venting. All joints and penetrations sealed.	1 to 2	a) Reinforced concrete cast <i>in situ</i> floor slab (suspended, non-suspended or raft) with at least 1200 g DPM ² . b) Beam and block or pre-cast concrete slab and minimum 2000 g DPM/reinforced gas membrane. c) Possibly underfloor venting or pressurisation in combination with a) and b) depending on use. All joints and penetrations sealed.
3	2	All types of floor slab as above. All joints and penetrations sealed. Proprietary gas resistant membrane and passively ventilated or positively pressurised underfloor sub-space.	1 to 2	All types of floor slab as above. All joints and penetrations sealed. Minimum 2000 g/reinforced gas proof membrane and passively ventilated underfloor sub-space or positively pressurised underfloor sub-space.
	3	All types of floor slab as above. All joints and penetrations sealed. Proprietary gas resistant membrane and passively ventilated underfloor sub-space or positively pressurised underfloor sub-space, oversite capping or blinding and in-ground venting layer.	2 to 3	All types of floor slab as above. All joints and penetrations sealed. Proprietary gas resistant membrane and passively ventilated or positively pressurised underfloor sub-space with monitoring facility.
	4	Reinforced concrete cast <i>in situ</i> floor slab (suspended, non-suspended or raft). All joints and penetrations sealed. Proprietary gas resistant membrane and ventilated or positively pressurised underfloor sub-space, oversite capping and in-ground venting layer and in-ground venting wells or barriers.	3 to 4	Reinforced concrete cast <i>in situ</i> floor slab (suspended, non-suspended or raft). All joints and penetrations sealed. Proprietary gas resistant membrane and passively ventilated or positively pressurised underfloor sub-space with monitoring facility. In ground venting wells or barriers.
	5	Not suitable unless gas regime is reduced first and quantitative risk assessment carried out to assess design of protection measures in conjunction with foundation design.	4 to 5	Reinforced concrete cast <i>in situ</i> floor slab (suspended, non-suspended or raft). All joints and penetrations sealed. Proprietary gas resistant membrane and actively ventilated or positively pressurised underfloor sub-space with monitoring facility, with monitoring. In ground venting wells and reduction of gas regime.

Note:

- 1 For low rise traditional housing with ventilated clear underfloor void (ie Situation B. See Table 8.7, Box 8.4 and Section 8.3.2).

Typical scope of protective measures may be rationalised for specific developments on the basis of quantitative risk assessments.

Note the type of protection is given for illustration purposes only. Information on the detailing and construction of passive protection measures is given in BR414 (Johnson, 2001). Individual site-specific designs should provide the same number of separate protective methods for any given characteristic situation (see Card, 1996).

APPENDIX G – GAS VAPOUR MANAGEMENT PLAN



Gas Vapour Management Plan, 39-45 Cyril Beechey Lane, Cranbourne



Maclaw No.10 Pty Ltd and Greenridge Properties Pty Ltd

DRAFT

16 December 2019

DRC GVMP - Cyril Beechey Lane, Cranbourne DRAFT 121219

Office Address: 1405 Burke Road, Kew East, VIC 3102.

Email: admin@drcenviro.com.au Website: drcenviro.com.au

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Gas Vapour Management Plan, 39-45 Cyril Beechey Lane, Cranbourne

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Document History

<u>Version</u>	<u>Status</u>	<u>Author</u>	<u>Reviewer</u>
DRC GVMP 39-45 Cyril Beechey Lane, Cranbourne DRAFT 171219	DRAFT	PLB	PLB

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1 BACKGROUND

This Gas Vapour Management Plan (GVMP) has been developed by DRC Environmental Pty Ltd (DRC) for the proposed multi-townhouse development site located at 39-45 Cyril Beechey Lane, Cranbourne (the site). The GVMP is a defined requirement of the environmental audit and is referenced by the Statement of Environmental Audit as a condition of the issue of the environmental audit.

This document intends to define the plan for the management of construction and environmental works at the site and provides details of methane gas barrier membrane (GBM) and passive venting system (PVS) and design recommendations required for the proposed development.

The site is located immediately north of the Stevensons Road Closed Landfill (SRCL) site which has been subject to intensive EPA Victoria regulation since 2007 via a Post Closure Pollution Abatement Notice (PC-PAN). As a result of this PC-PAN a series of Section 53V Environmental Audits have been produced for the purpose of evaluation of landfill gas risks posed by the SRCL site and recommendations applicable to development within a 500m buffer zone of the site. This GVMP has been developed to meet the most recent s53V Auditor's recommendations applicable to the subject land and its potential for residential development.

1.1 Introduction

The site is proposed to be developed for approximately ninety double-storey townhouses with small yard areas and driveway access. The site is currently subject to a pending planning scheme amendment for the purpose of rezoning from an antiquated rural zoning to a more relevant residential zoning consistent with neighboring land uses to the north and west of the subject land. As part of this process, as required by the responsible authority for this re-zoning, being the Casey City Council, a Landfill Gas Risk Assessment (LFGRA) is required as recommended by the Section 53V Environmental Audit report¹ completed for the site. During the preparation of the LFGRA, based on the location of the subject land and the recommendations of the s53V Audit report as published in 2019, it is recommended by DRC that a requirement for the site will be a Gas Vapour Management Plan (GVMP) to manage construction of a GBM and PVS beneath dwellings to suitably manage the potential for landfill gas. This plan provides conceptual details of the required GBM and PVS that would typically be required for the site.

To assist with a third party peer review of the proposed GVMP, in consultation with Casey City Council, Mr Craig Barker of Ground Consulting Pty Ltd, whom is an accredited Victorian Environmental Auditor, has been pointed by Maclaw No.10 Pty Ltd and Greenridge Properties Pty Ltd to undertake technical review of this plan.

1.2 Guidance documents relevant to this GVMP

The following guidelines are referenced or applicable to this EMP:

- Environment Protection Act 1970 (Vic);
- Occupational Health and Safety Regulations 2007 (Vic);
- Amendment of the National Environment Protection (Assessment of Site Contamination) Measure 1999, May 2013 (NEPM 2013);
- British Standards 8485 Code of Practice for the Design of Protective Measures for Methane and Carbon Dioxide Ground Gases for New Buildings;
- Construction Industry Research and Information Association (CIRIA) (2007), c665- Assessing risk posed by hazardous ground gases to buildings, London, UK.
 - EPA Victoria Publication 1490.1, Closed Landfill Guidelines, 2018.

¹ Stevensons Road Closed Landfill, Section 53V Environmental Audit of Landfill Aftercare Management, 2019, ERM, Auditor: P.Fridell.

- State Environment Protection Policies including:
 - SEPP (Prevention and Management of Contaminated Land);
 - SEPP (Air Quality Management); and
 - SEPP (Ambient Air Quality);
- Stevensons Road Closed Landfill, Section 53V Environmental Audit of Landfill Aftercare Management, 2019, ERM, Auditor: P.Fridell.

2 SPECIFICATION FOR GAS BARRIER MEMBRANE AND PASSIVE VENTING SYSTEM

2.1 Operational Management and Control Measures for LFG

The hierarchy of hazard control at the site to eliminate potential exposure to LFG of users of the site includes:

- Engineered controls; and
- Administrative and Monitoring controls.

Based on the potential risk to landfill gas migration through the subsurface from the former landfill to the site, certain engineered controls (i.e. installation of an engineered proprietary gas resistant membrane) have been incorporated into the design of residences to be built on the site.

EPA Publication 1490.1 (*Closed Landfill Guidelines*, 2018) also requires that all landfills have an Auditor verified environmental monitoring program in place. The program is currently being undertaken by Casey City Council. This is considered by DRC to be an **Administrative control** by an authority responsible for management of landfill gas migration and protection of the broader community and land users (Casey City Council own and maintain the adjacent former Stevenson Road Closed Landfill (SRCL) site).

2.2 Building Protection Measures

CIRIA c665² Table 8.6 describes the typical scope of gas protective measures based on the above calculated risk. Based on a “Moderate” risk the site has been classified by the modified Wilson and Card classification as number “CS3”. This classification is recommended by the 2019 s53V Environmental Audit report³ based on the site’s proximity to the Brookland Greens Estate, with reference to Audit recommendation, 1708-R2 which states:

“Any new buildings, building alterations requiring a planning permit within Brookland Greens Estate need to install gas protection measures required for a characteristic gas situation (CS3) in accordance with the most recent version of British Standards 8485 Code of Practice for the Design of Protective Measures for Methane and Carbon Dioxide Ground Gases for New Buildings.”

Typical protective measures of this classification are as follows:

- Reinforced concrete cast in situ floor stack with underfloor venting; or
- Beam and block or precast concrete with reinforced gas membrane and underfloor venting; and
- All joints and penetrations sealed. Proprietary gas resistant membrane and passively ventilated or positively pressurized underfloor sub-space.

In accordance with the sites risk rating, a proprietary gas resistance membrane is recommended for all house footprints at the site combined with a passive sub-floor venting system. Additionally, sewer services greater than 1.5m bgl are required to be vented with double containment lines on sewer services to ensure potential for LFG ingress is managed. It is noted that no consideration to the development of basements or sub-grade habitable spaces has been considered by this GVMP (these potential future land uses are specifically excluded under a pending s173 agreement for the subject land).

² Construction Industry Research and Information Association (CIRIA) (2007), c665- Assessing risk posed by hazardous ground gases to buildings, London, UK.

³ Section 53V Environmental Audit of Landfill Aftercare Management 2019, ERM, Auditor: P.Fridell.

2.3 Recommended Proprietary Gas Barrier Membrane

DRC recommends the proprietary product **Perlastic** as the most suitable methane gas barrier membrane (GBM) for this development site. Perlastic Industrial Coatings Inc. are the owner and supplier of **Perlastic** and as a consequence, DRC recommend that only approved applicators of **Perlastic** should be engaged to install the GBM.

The development is intended to be completed under the supervision of a single building contractor with standard footing and slab on ground designs. **Appendix A** provides indicative structural engineering drawings of the proposed development which included design guidance and references to the location and layout of the site and the proposed **Perlastic** GBM and passive venting layer. These drawings have been updated with specification notes and controls cross referencing the requirements set out by this GVMP.

DRC has reviewed the manufacturers specification for the performance of the membrane in terms of its physical properties, strength, chemical resistance and gas permeability. In the opinion of DRC, the **Perlastic** GBM meets and exceeds performance requirements for a GBM suitable for use at this site.

A summary provided by the performance metrics applicable to the Perlastic GBM, as supplied by the manufacturer, are provided as **Appendix B** to this GVMP.

2.4 GBM Installation – Typical Arrangement

Appendix A shows indicative structural design for installation of the Perlastic GBM including slab interactions, slab penetrations, external and internal rib details, joins and application specification are provided.

Figure 1 provides general arrangement details for typical concrete slab details and typical penetration details.

Each of these drawings are intended to be descriptive of a typical GBM arrangement and are the basis upon which application of the GBM and construction should be implemented at the site.

Each of these drawings will be used for assessment of the GBM quality control process as description.

As a process the following installation steps are required:

- ✓ Provision of ground screw piling or beam and block edge beams and or pad footings at the required areas across the site;
- ✓ Siting and installation of underground services, includes clean up and levelling;
- ✓ Application of sub-grade venting layer at a thickness of 300mm using materials specified in **Section 2.5** off this GVMP. (**Arrangement as per Appendix A**);
- ✓ Installation of 50mm diameter, slotted uPVC (pressure pipe class) venting pipes, sitting mid-height within the venting layer (**as per drawing SO1 in Appendix A**);
- ✓ Application of 50mm blinding concrete slab, screed to level tolerance of 20mm (**as per Appendix A**);
- ✓ Installation of GBM above sub-grade venting layer and below waffle pod footings, (**as per Figure 1**);
- ✓ Application of collar tie with **Perlastic** spray seal to each penetrating service (**as per Figure 1**);
- ✓ Application of **Perlastic** spray seal to starter reinforcement bars, pile caps and other structural joints
- ✓ Installation of the geotextile fabric, similar to a HDPE-BIDIM composite that must be approved by **Perlastic** for use with the **Perlastic** GBM in accordance with Perlastic Industrial Coatings Inc. application methodology by an applicator approved by Global Polymer Solutions;

- ✓ Spray-seal using Perlastic spray grade to each penetration and across geotextile seam joins including **300mm each side of join**;
- ✓ Undertake **smoke test** at each penetration (where applicable);
- ✓ Complete additional spray seal (if required) at failed penetrations or seams and re-test as necessary.

It is noted that when a 'Hold Point' work quality inspection is referenced by this GVMP, this Hold Point inspection is to be conducted by a person competent in the assessment and inspection of gas membrane requirements.

2.5 Recommended Sub-Slab Passive Ventilation System

As recommended based on the site's risk rating for the management of potential LFG risk (from the former landfill), a passive sub-slab ventilation system is required for each concrete footing system installed at the site. This venting layer sits below the waffle pod footing system.

The passive ventilation system (PVS) is recommended to follow the following general design guidance:

1. Sub-grade Material

The granular sub-grade shall be a minimum 300mm thick and comprise of maximum 50 mm compacted sub-8 mm or quarter-minus type quarry product with top blinding concrete for use as a sub-grade material for the purpose of the PVS layer.

2. Sub-grade Tolerances

Sub-grade material shall be placed to allow levels and grades as advised by the Structural Engineer.

The builder shall prepare and maintain the sub-grade such that it is smooth, stiff, and graded to the reduced levels as advised by the incumbent Structural Engineer. The surface shall be free (swept) from any inclusions or debris of any kind larger than 20 mm in diameter. The sub-grade requires inspection immediately prior to pipework placement.

3. Final sub-grade inspection

The Contractor shall arrange an inspection of the sub-grade during pipework embedment and then prior to blinding concrete being placed. A record of each meeting should be kept detailing acceptance and or any action items required for rectification.

4. Venting Pipework - Fittings and Pipeline Accessories

Venting pipework shall be uPVC – Type 'M' pressure class and shall be "iPlex" or similar approved manufacture. For the pipework runs within the sub-grade material, this pipework is to be continuously machine slotted, to provide for an effective open area to solid pipe area ratio of at least 4 %. This venting pipe is to be generally located at mid-height across the minimum 300 mm thick sub-grade venting layer

Fittings for venting pipe installations shall be uPVC – Type 'M' pressure class and shall be "iPlex" or similar approved manufacture. Each building footprint requires two venting pipe outlet points that are required to be protected from water, rain, runoff or liquids infiltration. Pipeworks should be free of obstructions and dry. Any liquids or water present within pipework will be required to be removed or drained prior to application of the blinding concrete layer.

Venting pipework is to be laid such that the pipes effectively self-drain of liquids across their runs.

Inspection **Hold Point 1** is to be conducted upon the practical completion of the Venting Pipework.

5. Application of Blinding Concrete Layer

Upon the PVS system embedment and coverage with sub-grade material, a final capping layer of blinding concrete is recommended on a nominal minimum thickness of 50mm with a screed tolerance of 20mm. This layer is required to be smoothed and scaled of any rough or protruding rock fragments in preparation of GBM geotextile placement. Prior to geotextile placement, it is recommended the blinding layer be inspected and certified to be acceptable for GBM placement.

Inspection **Hold Point 2** is to be conducted upon the practical completion of the blinding concrete layer atop the sub-grade material.

2.6 Recommended GBM Quality Control Process

The following process has been developed for Quality Control of the manufacture and installation of the GBM in consultation with Perlastic Industrial Coatings Inc.:

1. Ordering the Perlastic Materials

Once the drawings are submitted, the GBM Contractor and Perlastic Industrial Coatings Inc. will review to verify the amount of material needed for each phase of building. A quote will be provided to the builders prior to ordering.

2. Installation of Perlastic Coating

Installation will fall under GBM Contractor control. Once penetrations are sealed (at which Inspection **Hold Point 3** will be required for sign-off), the spray application of Perlastic can begin. A documented record for each application (lot # or similar) will be produced to track date of application, weather conditions (temp, humidity or any factors that could possibly affect the process). Once applied, note time that coating is fully cured including curing testing.

3. QC Process GBM Thickness

Placement and a thickness check should be verified and signed off. The thickness check should be undertaken in an area outside of the slab footprint using a caliper to measure total thickness of Perlastic coating. The anticipated thickness of the Perlastic will be 1.5mm dry film thickness (DFT). The geotextile thickness is 40-45 mils (1000th of an inch). 1.5 mm DFT equates to 60 mils, so total thickness will be 100-105 mils minimum. This verification step should be undertaken at a minimum of 3 locations per slab.

Inspection **Hold Point 4** is matched to this above checking process.

4. Smoke Test GBM Competency Surrounding Penetrations

As part of the QC process, the GBM Contractor will perform a smoke test on each GBM after the coating process is finished. The test should be documented and completed for at least each penetration. The test procedure requires a documented sign-off verifying if the test passes or if repairs were required and then re-testing process.

Inspection **Hold Point 5** is matched to this above checking process.

5. Final Documentation

Once all QC is performed, a final report for each GBM is required to be completed by a person independent of the GBM and must include photographic evidence and the following information:

- Blinding inspection;
- Inspection note that GBM Geotextile is as per design;
- Factory QC Information;
- Installation inspection;
- Thickness inspection;
- Perlastic spray seal and coating records;
- Smoke testing inspection; and
- Final certification by a competent person.

At completion, an Environmental Consultant competent in the design and construction of the GBM and PVS will provide a completion report for the purpose of practical completion.

3 STATEMENT OF LIMITATIONS

This document has been prepared based on a specific brief provided to DRC Environmental by Maclaw No.10 Pty Ltd and Greenridge Properties Pty Ltd . This document has been prepared with care and consideration to acceptable standards and current industry practice. This document is based on sub-surface conditions that may be variable which may result in changes to procedures, advice, recommendations or professional conclusions established by this document. DRC Environmental therefore reserve the right to change or withdraw this report.

DRC Environmental recommends only suitably qualified and experienced contractors and consultants should undertake technical assessment of this document and attempt contaminated land remediation projects.

Report prepared by:

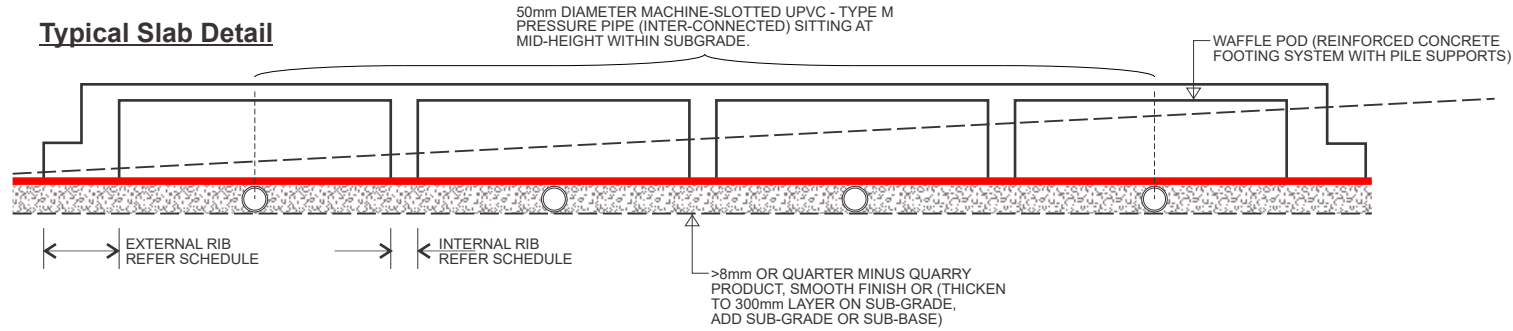


Patrick Baldwin
Principal Environmental Engineer / Director
Certified Environmental Practitioner – Site Contamination Specialist

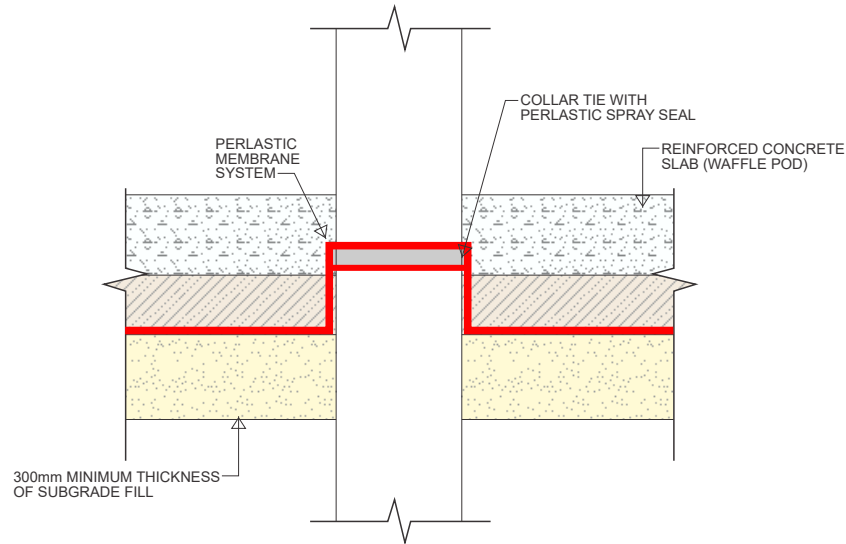
DRC Environmental Pty Ltd
16 December 2019

FIGURES

Typical Slab Detail



Typical Penetration Detail



Vent Pipework Specification:

uPVC - Type M pressure pipe (as per iPlex or equivalent) with compressive strength to suit concrete slab is required to site on slab sub-grade beneath the Perlastic membrane layer to allow sub-membrane venting in accordance with BS8485:2015 B.6, as per DRC Environmental specification. Venting pipes should be laid as per general arrangement with Intrax. Drawing SO5. After placement the venting arrangement is required to be inspected (Hold Point 1) prior to Perlastic Membrane placement and layout.

Subgrade Specification:

As per DRC Environmental specification. An approved >8mm or Quarter Minus product should be used with minimal compaction, capped with a 50mm blinding concrete layer (Hold Point 2) smoothed or troweled at surface to allow a flat platform for Perlastic System geotextile placement. Prior to geotextile placement, inspection of the placed subgrade layer is required for unevenness or risk of puncture damage to the placed geotextile.

Penetration Detail Notes:

Each penetration is required to be booted, collar tied and sprayed using Perlastic Spray Seal to the satisfaction of the installer (Hold Point 3) Upon completion, and prior to the reinforced concrete slab pour, each penetration should be inspected and tested using smoke (Hold Point 4) Collar ties and boot should not extend above the concrete slab finish floor level.

Inspection Notes:

An "Inspection" (Hold Point 5) is defined as a site inspection, photos, measurements and completion of a site inspection and compliance report for each component of the passive venting and gas-proof membrane system, by a suitably qualified and experienced competent person. The inspection should be completed in consultation with the appointed building surveyor with inspection reports kept from building occupancy compliance certificate and the completion of building works.



DRC ENVIRONMENTAL
DEVELOPMENT REMEDIATION CONSULTANTS

TITLE:

**General Specification
for GBM Application**

PROJECT:

**Gas Vapour Management Plan
(GVMP)
39-45 Cyril Beechey Lane,
Cranbourne, VIC.**

CLIENT:

KLM Spatial

DATE:

December 2019

DESIGNED:

PB

DRAWN:

LB

FIGURE: **1**

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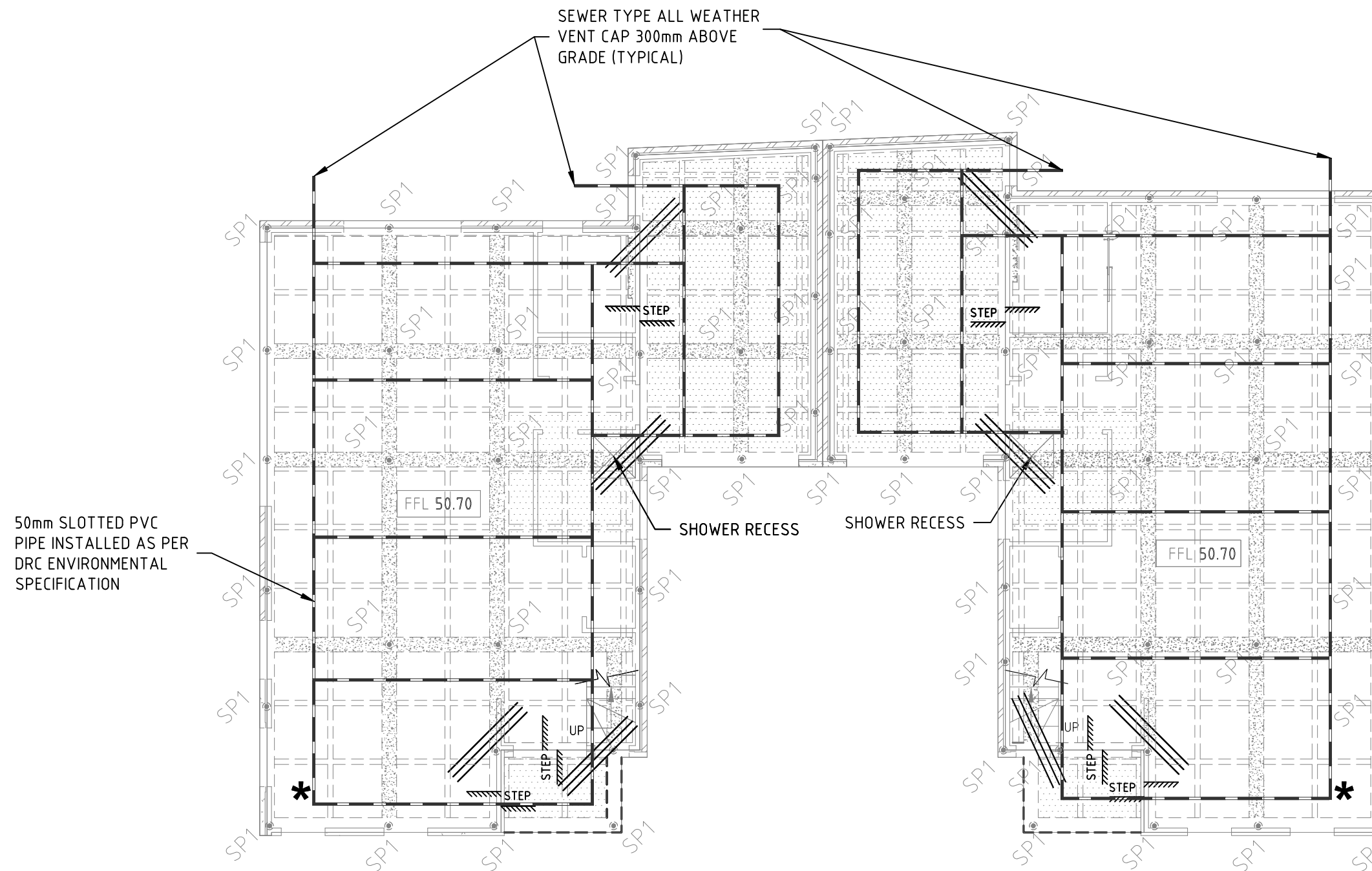
APPENDIX A – INDICATIVE STRUCTURAL DESIGN DRAWINGS

PROPOSED RESIDENCE

39-45 CYRIL BEECHEY LANE, CRANBOURNE

DWG No.	DESCRIPTION
S00	COVER SHEET
S01	VENTING LAYOUT
S02	SLAB DETAIL -1
S03	SLAB DETAIL -2

				 DRC ENVIRONMENTAL <small>DEVELOPMENT REMEDIATION CONSULTANTS</small> 1405 Burke Road, Kew East VIC 3102	Client: KLM SPATIAL Project: PROPOSED RESIDENCE 39-45 CYRIL BEECHEY LANE CRANBOURNE Drawing: COVER SHEET	PRELIMINARY ISSUE NOT FOR CONSTRUCTION		
						Date: DEC. 19	Engineer: PLB	Drawn: D.Z.
						Scale @ A3: AS SHOWN	Checked:	No. of Sheets: 4
P1	PRELIMINARY ISSUE	16.12.19				Job No. 105008	Drawing No. S00	Rev. P1
Rev.	Remark/Comment	Date:	Appr.					



P1	PRELIMINARY ISSUE	16.12.19	
Rev.	Remark/Comment	Date:	Appr.

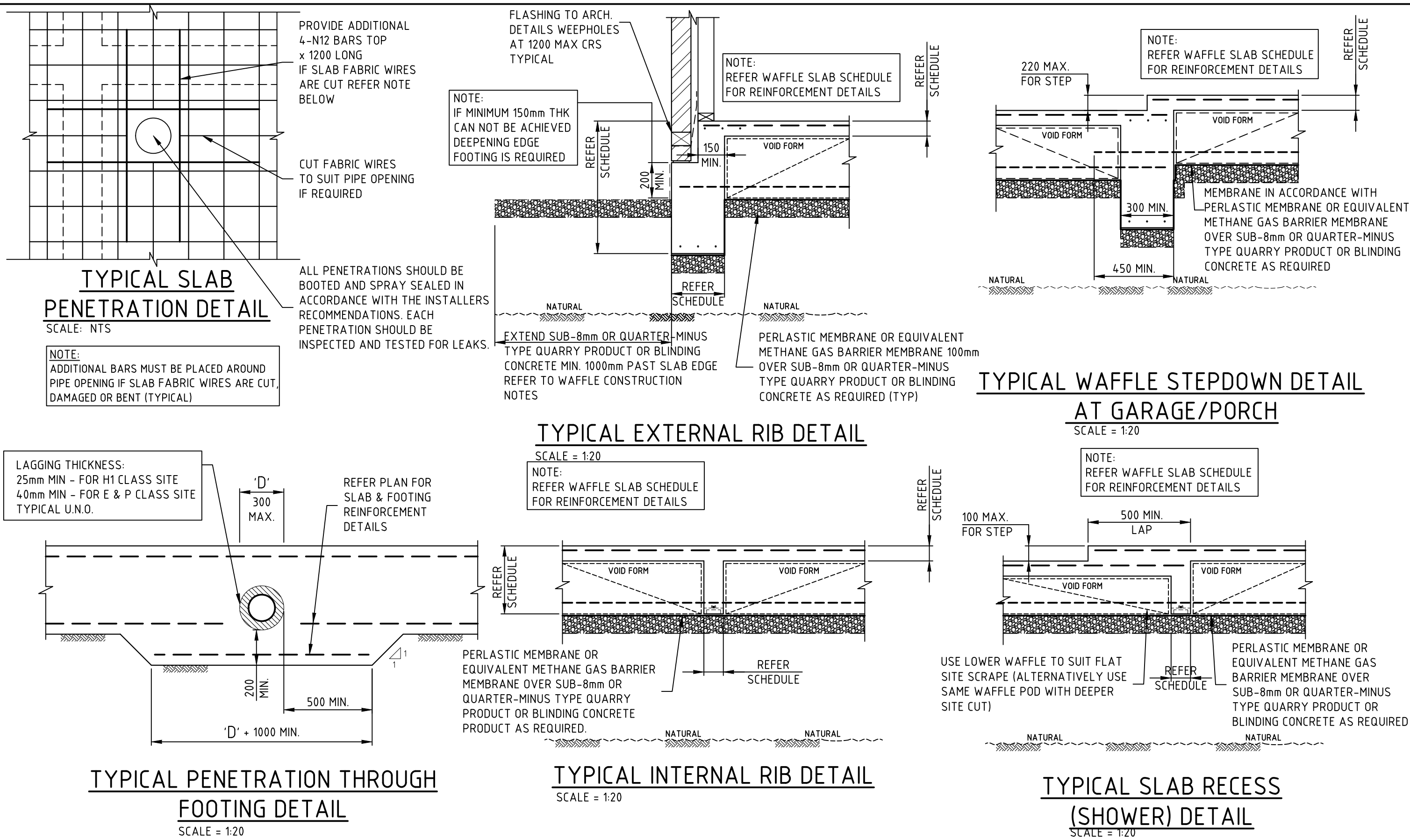


Client:
KLM SPATIAL

Project:
PROPOSED RESIDENCE
39-45 CYRIL BEECHEY LANE
CRANBOURNE
Drawing:
VENTING LAYOUT

PRELIMINARY ISSUE
NOT FOR CONSTRUCTION

Date:	DEC. 19	Engineer: PLB	Drawn: D.Z.
Scale @ A3:	AS SHOWN	Checked:	No. of Sheets: 4
Job No.	105008	Drawing No.	S01
			Rev. P1

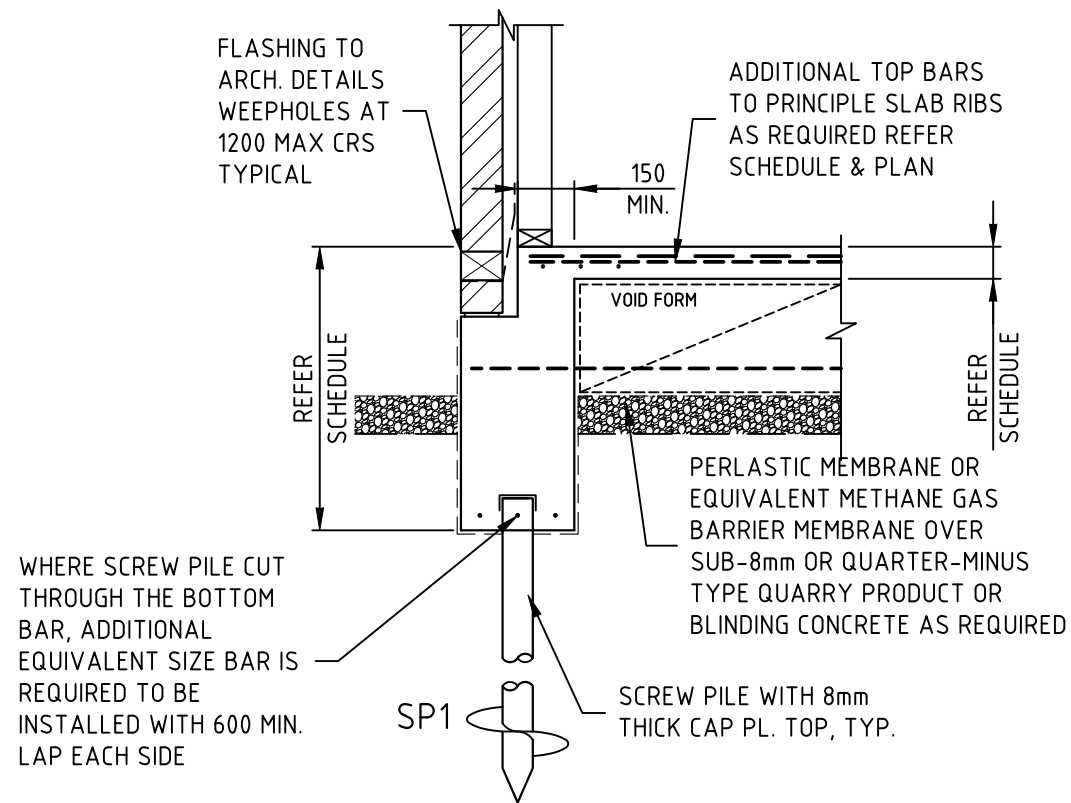


P1	PRELIMINARY ISSUE	16.12.19	
Rev.	Remark/Comment	Date:	Appr.



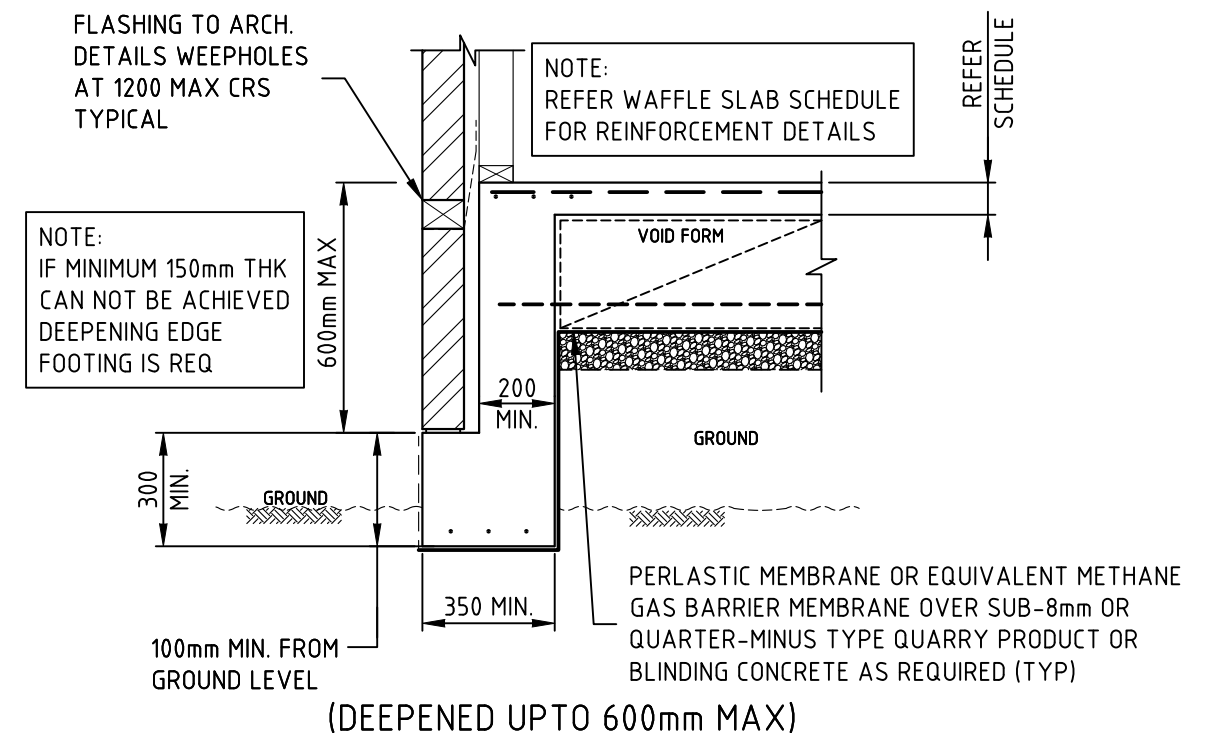
Client: KLM SPATIAL
Project: PROPOSED RESIDENCE 39-45 CYRIL BEECHEY LANE CRANBOURNE
Drawing: SLAB DETAIL -1

PRELIMINARY ISSUE			
NOT FOR CONSTRUCTION			
Date: DEC. 19	Engineer: PLB	Drawn: D.Z.	
Scale @ A3: AS SHOWN	Checked:	No. of Sheets: 4	
Job No. 105008	Drawing No. S02	Rev. P1	



TYPICAL EXTERNAL RIB ON SCREW PILE DETAIL

SCALE = 1:20

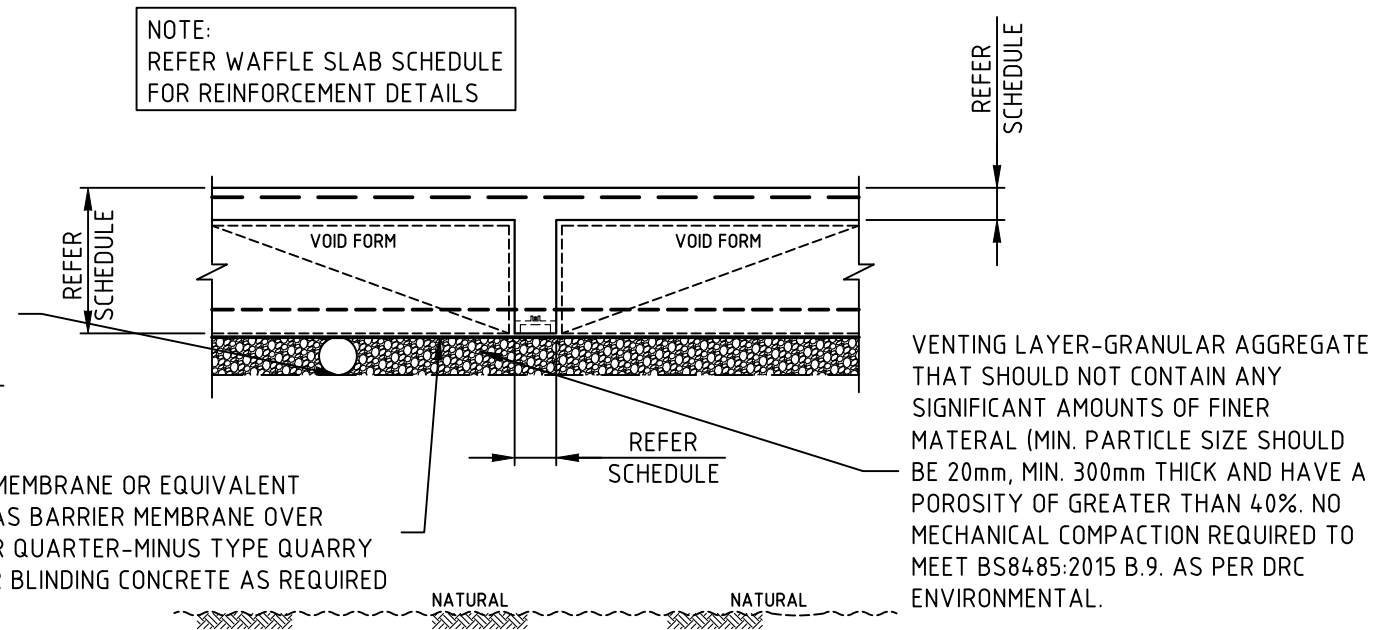


TYPICAL EXTERNAL RIB WITH DEEPENED

REBATE DETAIL (IF REQUIRED)

SCALE = 1:20

A STRUCTURALLY SOUND VENTED MATTING LAYER, RATED TO >200KPA COMPRESSIVE STRENGTH, SIMILAR TO PRODRAINTM, IS REQUIRED TO SITE ON SLAB SUB-GRADE BENEATH THE PERLASTIC MEMBRANE LAYER TO ALLOW SUB-MEMBRANE VENTING IN ACCORDANCE WITH BS8485:2015 B.6, AS PER DRC ENVIRONMENTAL SPECIFICATION. DRAINAGE STRIPS SHOULD BE LAID AS PER GENERAL ARRANGEMENT IN S05.



TYPICAL INTERNAL RIB DETAIL

WITH 50mm PVC PIPE

SCALE = 1:20

P1	PRELIMINARY ISSUE	16.12.19	
Rev.	Remark/Comment	Date:	Appr.



Client:
KLM SPATIAL

Project:
PROPOSED RESIDENCE
39-45 CYRIL BEECHEY LANE
CRANBOURNE
Drawing:
SLAB DETAIL -2

PRELIMINARY ISSUE

NOT FOR CONSTRUCTION

Date: DEC. 19	Engineer: PLB	Drawn: D.Z.
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Job No. 105008	Drawing No. S03	Rev. P1

APPENDIX B – PERLASTIC GBM INFORMATION

PRODUCT DESCRIPTION

Perlastic® products are a family of corrosion protection products for industrial applications over metal or concrete. Perlastic SG is a two part, spray applied elastomeric membrane engineered to resist the corrosion/ chemical attack of the substrate. The chemically resistant asphalt-based formula provides excellent barrier properties to withstand many of the aggressive chemistries found on industrial sites.

Perlastic is a two component product that mixes in the air as it is sprayed from the nozzle. The catalyst (B component) is supplied with the Perlastic and mixes at the nozzle at a 12:1 ratio.

Perlastic should be applied to a thickness of 60 mils (1.5mm) for typical exposed applications. For applications where the Perlastic will be subject to immersed conditions, a minimum of 80 mils (2mm) is required.

Perlastic® SG is specially formulated as a corrosion protection barrier for use on:

- Structural steel
- Steel and concrete tanks and related structures
- Concrete secondary containment structures
- Mechanical equipment and conveyors
- Steel and concrete pipes and related structures

LIMITATIONS

Perlastic should not be used as an exposed wearing surface. Do not apply to contaminated surfaces. Substrate temperature should be above 40°F (18°C). Do not apply when ambient temperatures are expected to be below freezing within 48 hours. Properly ventilate. Cure rates are extended in high humidity conditions. Check with Global Polymer Solutions for direct exposure to chemicals for compatibility. Not recommended for contact with petroleum based products. Do not allow material to freeze prior to application.

PACKAGING

Perlastic SG is available in plastic lined plastic 55 gallon drums, and in 275 gallon totes. Perlastic catalyst (B component) is available in 55 gallon drums.

INSTALLATION

General: Global Polymer Solutions recommends installation of Perlastic SG by an applicator that has been trained in the proper installation methods. Global Polymer Solutions provides training to applicators and on-site supervision.

Surface Prep: Perlastic SG is self priming and can be sprayed directly over mildly rusted steel. Power washing to remove any loose particles, oils and grease is required. Concrete should have a minimum of 28 days cure time prior to application on horizontal surfaces. All surfaces must be clean, sound and free of contaminants that may affect adhesion.

Detail Work: Prior to applying SG to vertical and horizontal surfaces, all cracks and transitions, inside and outside corners should be details with Perlastic RG. Consult the Perlastic Application Guide for more specific instruction.

Membrane Application: Perlastic membrane can be applied in thicknesses from 40 to 120 mils thick in a single application with multiple passes of the spray nozzle. Approximately six gallons of Perlastic will yield a 100 ft² surface at 60 mils (1.5mm) dry.

Equipment: A dual pump spraying system is required. Spray equipment should be capable of an operating pressure of greater than 400 psi, and support a tip size of 4015. The Catalyst (B component) side must be capable of greater than 150 psi, and support a tip size of 4010. Tip sizes are selected to control mixing ratio.

Quality Control: Global Polymer Solutions recommends on site supervision of the Perlastic system by a qualified and trained third party inspector. Contact Global Polymer Solutions for more information on the inspector program.

PERLASTIC®SG MECHANICAL & PHYSICAL PROPERTIES		
MECHANICAL PROPERTY	TEST METHOD	TYPICAL RESULT
Tensile Stress @ Break	ASTM D412	100 PSI
Tensile Elongation @ Break	ASTM D412	920%
Elastic Recovery %	ASTM D412	71%
Tear Strength Max	ASTM D624	1.6 (lbf)
Shore A Durometer Testing	ASTM D2240	31
Shore 00 Durometer Testing	ASTM D2240	87
Penetration Value	ASTM D5	25 dmm
Puncture Deflection	ASTM E154	>10 inches
Low Temperature Flexibility	ASTM D5147	Pass @ 6°F
Brittleness Temperature by Impact	ASTM D746	Pass @ 31°F
Peel Adhesion to Alloy Steel 1080 *	ASTM D903	10 lbf/in - CF*
Peel Adhesion to Galvanized Steel *	ASTM D903	15 lbf/in - CF*
Peel Adhesion to Steel with Flash Rust *	ASTM D903	22 lbf/in - CF*
Peel Adhesion to Concrete *	ASTM D903	19 lbf/in - CF*
Positest Adhesion to Alloy Steel 1080 *	ASTM D4541	104 PSI - MM*
Positest Adhesion to Flash Rust *	ASTM D4541	150 PSI - MM*
Positest Adhesion to Galvanized Steel *	ASTM D4541	107 PSI - MM*
Positest Adhesion to Concrete *	ASTM D7234	120 PSI - MM*

PHYSICAL PROPERTY	TEST METHOD	TYPICAL RESULT
Return to Service	Internal Method	1 day
Walk-On Time	Internal Method	45 min (light)
Full Cure Time	Internal Method	48 hrs
Specific Gravity to Fully Cured Membrane	D792	1.08
Typical Moisture Content of Cured Membrane	Karl Fisher	0.21%
Thermal Resistance (k)	ASTM C518	0.074 W/(K · m)
Volume Resistivity	ASTM D257	1.90 x 10 ²⁰ Ω · cm
Surface Resistivity	ASTM D257	9.54 x 10 ⁹ Ω
Dielectric Strength in Oil	ASTM D149	41 V/mil
Dielectric Constant (k)	ASTM D150	4.67
Dissipation Factor (D)	ASTM D150	0.493
Water Vapor Transmission	ASTM E96-B	0.27 perms
Water Vapor Permeability	ASTM E96-B	0.11 grains/h-ft ²

PERLASTIC® SG EXPOSURE TESTING		
EXPOSURE TESTING	TEST METHOD	TYPICAL RESULT
Salt Spray Testing - 1344 hrs	ASTM B117	Pass
Rust Creep (Salt Spray) - 1344 hrs	ASTM D1654	Pass
UL 94 Flammability Rating	UL 94	V2
Direct Flame Test	ASTM D2939	0 sec
Chip Resistance	ASTM D3170	No defects, rating = 10

* +14 Day Cure ; CF = Cohesive Failure / AF = Adhesive Failure / MM = Mixed Mode (AF & CF)

Check with Technical Services before coating for compatibility issues for surfaces like coal tar or other.

WARRANTY

GLOBAL POLYMER SOLUTIONS warrants this product to be free of defects in material and workmanship. GLOBAL POLYMER SOLUTIONS's sole obligation and Buyer's exclusive remedy in connection with the products shall be limited, at GLOBAL POLYMER SOLUTIONS's option, to either replace the products not conforming to this Warranty or credit to Buyer's account in the invoiced amount of the nonconforming products. Any claim under this Warranty must be made by the Buyer to GLOBAL POLYMER SOLUTIONS in writing within (5) days of Buyer's discovery of the claimed defect, but in no event later than the expiration of the applicable shelf life, or one year from the delivery date, whichever is earlier. Buyer's failure to notify GLOBAL POLYMER SOLUTIONS of such nonconformance as required herein shall bar Buyer from recovery under this Warranty.

GLOBAL POLYMER SOLUTIONS makes no other warranties whether express, implied, or statutory, such as warranties of merchantability or fitness for a particular purpose, shall apply. In no event shall GLOBAL POLYMER SOLUTIONS be liable for consequential or incidental damages.

Any recommendations or suggestion relating to the use of the products made by GLOBAL POLYMER SOLUTIONS, whether in its technical literature, or in response to specific inquiry, or otherwise, is based on data believed to be reliable; however, the products and information are intended for use by buyers having requisite skill and know-how in the industry, and therefore it is for Buyer to satisfy itself of the suitability of the products for its own particular use and it shall be deemed that Buyer has done so, at its sole discretion and risk. Variation in environment, changes in procedures of use, or extrapolation of data may cause unsatisfactory results.

LIMITATION OF LIABILITY

GLOBAL POLYMER SOLUTIONS's liability on any claim of any kind, including claims based upon GLOBAL POLYMER SOLUTIONS's negligence or strict liability, for any loss or damage arising out of, connected with, or resulting from the use of the products, shall in no case exceed the purchase price allocable to the products or part thereof which gives rise to the claim. In no event shall GLOBAL POLYMER SOLUTIONS be liable for consequential or incidental damages.

GLOBAL POLYMER SOLUTIONS LLC

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APPENDIX H – AMBISENSE DATA



Landfill Gas Risk Assessment
Ambinsense Gasflux Data - SV09
December 2020 - January 2021

Site: 40 -46 Cyril Beechey Lane,
Cranbourne

TIME	CH4	CO2	O2	CO	H2S	BAROMETRIC	BH FLOW AVG	BH FLOW PEAK
Units	%v/v	%v/v	%v/v	ppm	ppm	mbar	l/hr	l/hr
16/12/2020 13:26	0.01	0.14	20.69	1.33	0	1006.13	0.05	0.24
16/12/2020 14:28	0	0.27	20.67	1.03	0	1005.65	0.07	0.32
16/12/2020 15:31	0	0.49	20.57	1.13	0	1005.18	0.1	0.4
16/12/2020 16:34	0	0.7	20.46	1.6	0	1004.22	0.14	0.48
16/12/2020 17:37	0.01	0.94	20.29	1.46	0	1004.22	0.12	0.62
16/12/2020 18:39	0.01	1.1	20.05	1.13	0.01	1004.22	0.12	0.77
16/12/2020 19:42	0.01	1.38	19.9	1.42	0.02	1004.22	0.05	0.23
16/12/2020 20:45	0	1.69	19.7	1.2	0.02	1004.7	0.05	0.22
16/12/2020 21:48	0.01	1.9	19.53	0.72	0.04	1005.18	0.03	0.23
16/12/2020 22:51	0.01	2.1	19.41	1.15	0.02	1004.7	0.03	0.24
16/12/2020 23:53	0.01	2.36	19.28	1.06	0.08	1003.26	0.02	0.1
17/12/2020 0:56	0.01	2.49	19.17	1.11	0.06	1001.82	0.01	0.15
17/12/2020 1:59	0	2.66	19.06	1.45	0.13	1000.38	0.01	0.08
17/12/2020 3:02	0.01	2.77	18.97	1.11	0.07	998.94	0.01	0.08
17/12/2020 4:05	0.01	3	18.89	1.13	0.08	998.94	0.002	0.064
17/12/2020 5:07	0.01	3.1	18.85	1.2	0.12	998.94	-0.005	0.039
17/12/2020 6:10	0.01	3.26	18.79	1.07	0.1	998.94	-0.008	0.02
17/12/2020 7:13	0.01	3.34	18.76	0.82	0.12	998.46	0	0.02
17/12/2020 8:16	0.01	3.59	18.75	0.93	0.11	998.94	0.02	0.17
17/12/2020 9:18	0	3.68	18.83	1.4	0.13	998.94	0.01	0.11
17/12/2020 10:21	0.01	3.73	18.88	1.56	0.17	998.46	0.02	0.11
17/12/2020 11:23	0	3.9	18.98	2.49	0.28	998.46	0.02	0.15
17/12/2020 12:25	0.01	3.86	19.19	3.56	0.41	998.46	0.02	0.09
17/12/2020 13:28	0.01	3.88	19.27	4.55	0.41	997.98	0.03	0.1
17/12/2020 14:31	0	3.88	19.26	4.95	0.41	996.54	0.05	0.19
17/12/2020 15:34	0	3.91	19.16	3.74	0.39	996.54	0.02	0.22
17/12/2020 16:37	0	4.04	19.02	3.39	0.35	996.54	0.04	0.18
17/12/2020 17:40	0	4.15	18.9	3.43	0.47	995.58	0.06	0.26
17/12/2020 18:43	0	4.14	18.78	3.34	0.37	996.54	0.09	0.34
17/12/2020 19:46	0.01	4.21	18.61	2.36	0.32	998.46	0.01	0.11
17/12/2020 20:49	0.01	4.3	18.48	2.45	0.28	998.94	-0.01	0.05
17/12/2020 21:52	0	4.5	18.39	2	0.32	999.9	-0.01	0.03
17/12/2020 22:54	0.01	4.5	18.32	1.96	0.32	999.9	-0.01	0.03
17/12/2020 23:57	0.01	4.46	18.29	1.82	0.3	999.9	0.01	0.07
18/12/2020 1:00	0.01	4.55	18.21	2.4	0.22	999.42	0.03	0.21
18/12/2020 2:03	0	4.69	18.18	1.82	0.3	999.42	0	0.1
18/12/2020 3:05	0.01	4.69	18.14	1.82	0.24	999.42	0.008	0.116
18/12/2020 4:08	0.01	4.75	18.12	1.2	0.21	1000.86	0.001	0.098
18/12/2020 5:11	0	4.87	18.07	1.18	0.17	1001.82	-0.01	0.07
18/12/2020 6:14	0.01	4.88	18.03	1.38	0.15	1003.26	0	0.1
18/12/2020 7:17	0.01	5.02	17.98	1.42	0.19	1004.22	0.01	0.07
18/12/2020 8:19	0.01	5.06	17.99	1.45	0.22	1004.7	0.01	0.11



Landfill Gas Risk Assessment
Ambinsense Gasflux Data - SV09
December 2020 - January 2021

Site: 40 -46 Cyril Beechey Lane,
Cranbourne

TIME	CH4	CO2	O2	CO	H2S	BAROMETRIC	BH FLOW AVG	BH FLOW PEAK
Units	%v/v	%v/v	%v/v	ppm	ppm	mbar	l/hr	l/hr
18/12/2020 9:22	0.01	5.09	18.02	1.73	0.19	1005.65	0.01	0.11
18/12/2020 10:24	0.01	5.26	18.06	1.78	0.24	1005.65	0.02	0.11
18/12/2020 11:27	0	5.18	18.11	1.15	0.19	1006.13	0.04	0.14
18/12/2020 12:30	0.01	5.39	18.15	1.62	0.34	1006.61	0.04	0.18
18/12/2020 13:33	0	5.27	18.18	2.05	0.39	1006.61	0.03	0.15
18/12/2020 14:36	0.01	5.36	18.24	2.76	0.45	1007.09	0.04	0.12
18/12/2020 15:39	0.01	5.37	18.22	2.94	0.52	1007.09	0.04	0.21
18/12/2020 16:42	0	5.39	18.3	3.3	0.56	1007.57	0.02	0.1
18/12/2020 17:45	0	5.29	18.37	3.79	0.52	1007.57	0.01	0.2
18/12/2020 18:49	0.01	5.27	18.15	2.63	0.39	1008.53	0	0.14
18/12/2020 19:52	0	5.33	18	2.22	0.32	1009.97	0.01	0.32
18/12/2020 20:55	0.01	5.38	17.85	2.58	0.34	1009.97	-0.01	0.12
18/12/2020 21:57	0.01	5.45	17.78	1.6	0.3	1010.93	-0.02	0.1
18/12/2020 23:00	0.01	5.48	17.67	1.69	0.21	1010.93	-0.01	0.12
19/12/2020 0:03	0.01	5.44	17.57	1.87	0.22	1010.93	-0.02	0.05
19/12/2020 1:06	0.01	5.6	17.54	1.69	0.19	1010.45	-0.028	0.042
19/12/2020 2:09	0.01	5.65	17.55	0.98	0.24	1009.97	-0.03	0.065
19/12/2020 3:12	0.01	5.6	17.51	1.11	0.21	1009.97	-0.03	0.12
19/12/2020 4:14	0.01	5.59	17.46	1.42	0.15	1010.45	-0.02	0.09
19/12/2020 5:17	0.01	5.61	17.48	1.24	0.19	1010.93	-0.02	0.05
19/12/2020 6:20	0.01	5.67	17.47	1.42	0.17	1011.41	-0.02	0.04
19/12/2020 7:22	0	5.67	17.53	1.51	0.22	1012.37	-0.02	0.02
19/12/2020 8:25	0.01	5.85	17.62	1.15	0.22	1012.37	-0.01	0.08
19/12/2020 9:28	0.01	5.82	17.72	1.47	0.24	1012.37	0	0.06
19/12/2020 10:30	0.01	6	17.74	2.18	0.34	1011.89	0.02	0.15
19/12/2020 11:33	0	5.9	17.91	1.69	0.24	1011.89	0	0.12
19/12/2020 12:36	0.01	5.99	17.85	1.78	0.3	1011.41	0.08	0.4
19/12/2020 13:39	0.01	5.94	17.96	2.23	0.35	1010.93	0.03	0.18
19/12/2020 14:42	0.01	5.88	18.02	2.49	0.28	1010.45	0	0.11
19/12/2020 15:46	0.01	5.77	17.97	2.9	0.22	1010.45	0.08	0.63
19/12/2020 16:48	0.01	5.95	18.01	2.45	0.32	1010.93	0.07	0.45
19/12/2020 17:51	0.01	5.81	18.05	1.91	0.17	1010.93	0.05	0.29
19/12/2020 18:54	0	5.79	17.86	2.36	0.3	1010.93	0.03	0.26
19/12/2020 19:57	0.01	5.81	17.73	1.95	0.22	1011.89	0	0.18
19/12/2020 21:00	0	5.8	17.65	1.73	0.21	1011.41	-0.03	0.06
19/12/2020 22:03	0.01	5.86	17.58	1.37	0.17	1011.89	-0.02	0.11
19/12/2020 23:05	0.01	5.75	17.5	0.98	0.15	1012.37	-0.02	0.102
20/12/2020 0:08	0.01	5.84	17.44	1.45	0.24	1011.41	-0.024	0.092
20/12/2020 1:11	0.01	5.93	17.39	1.12	0.13	1010.93	-0.03	0.08
20/12/2020 2:14	0.01	5.89	17.34	1.06	0.15	1010.45	-0.02	0.1
20/12/2020 3:17	0.01	6.05	17.33	1.6	0.19	1009.97	-0.01	0.1
20/12/2020 4:20	0	5.88	17.31	1.63	0.17	1009.49	-0.03	0.11



Landfill Gas Risk Assessment
Ambinsense Gasflux Data - SV09
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Site: 40 -46 Cyril Beechey Lane,
Cranbourne

TIME	CH4	CO2	O2	CO	H2S	BAROMETRIC	BH FLOW AVG	BH FLOW PEAK
Units	%v/v	%v/v	%v/v	ppm	ppm	mbar	l/hr	l/hr
20/12/2020 5:22	0.01	5.93	17.31	0.8	0.15	1009.49	-0.02	0.08
20/12/2020 6:25	0.01	6.13	17.28	1.38	0.22	1009.49	-0.03	0.07
20/12/2020 7:28	0.01	6.27	17.28	0.93	0.26	1009.97	-0.02	0.03
20/12/2020 8:30	0.01	6.35	17.38	0.82	0.24	1010.45	0.01	0.14
20/12/2020 9:33	0.01	6.35	17.51	1.24	0.21	1009.97	0	0.13
20/12/2020 10:35	0.02	6.36	17.63	1.6	0.28	1009.97	0	0.2
20/12/2020 11:38	0.01	6.32	17.7	1.87	0.32	1009.97	0.01	0.4
20/12/2020 12:41	0.01	6.34	17.87	2.27	0.41	1009.49	0.04	0.23
20/12/2020 13:44	0	6.21	17.97	2.18	0.41	1009.49	0.02	0.14
20/12/2020 14:47	0	6.28	17.98	2.76	0.39	1009.01	0.07	0.43
20/12/2020 15:50	0	6.11	18.08	2.58	0.43	1008.53	0.08	0.92
20/12/2020 16:53	0	6.16	18.1	2.94	0.41	1008.05	0.08	0.44
20/12/2020 17:56	0	6.03	18.07	3.2	0.3	1008.05	0.06	0.44
20/12/2020 18:59	0.01	6.03	17.84	2.76	0.26	1007.57	0.06	0.52
20/12/2020 20:02	0	6.04	17.7	2.27	0.24	1007.57	-0.01	0.14
20/12/2020 21:05	0.01	6.08	17.62	1.91	0.24	1007.57	-0.001	0.078
20/12/2020 22:08	0.01	6.1	17.54	1.82	0.28	1007.57	0	0.092
20/12/2020 23:10	0.01	6.17	17.48	1.73	0.34	1007.09	0.001	0.132
21/12/2020 0:13	0.01	6.14	17.48	1.38	0.35	1006.13	0.01	0.21
21/12/2020 1:16	0.02	6.19	17.46	1.64	0.28	1006.13	-0.01	0.08
21/12/2020 2:19	0.01	6.19	17.45	1.4	0.22	1004.7	-0.01	0.07
21/12/2020 3:22	0.01	6.08	17.42	1.64	0.26	1004.22	-0.03	0.05
21/12/2020 4:24	0.01	6.05	17.37	1.11	0.21	1003.26	0	0.09
21/12/2020 5:27	0.01	6.14	17.36	0.78	0.24	1003.74	-0.03	0.05
21/12/2020 6:30	0.01	6.21	17.32	1.42	0.26	1003.74	-0.03	0.06
21/12/2020 7:32	0.01	6.28	17.36	0.64	0.26	1003.26	-0.02	0.02
21/12/2020 8:35	0.01	6.26	17.48	1.64	0.35	1003.74	-0.01	0.01
21/12/2020 9:38	0.01	6.29	17.59	1.2	0.39	1003.26	0	0.02
21/12/2020 10:40	0	6.41	17.73	1.87	0.37	1002.3	0	0.03
21/12/2020 11:43	0.01	6.15	17.89	1.96	0.39	1002.78	0	0.1
21/12/2020 12:45	0.01	6.32	17.92	2.4	0.41	1000.86	-0.01	0.03
21/12/2020 13:48	0.01	6.17	17.98	2.18	0.41	1000.86	0.02	0.11
21/12/2020 14:51	0	6.13	18.01	2.76	0.39	999.42	-0.01	0.09
21/12/2020 15:53	0	6.17	17.98	2.76	0.45	997.98	0.01	0.08
21/12/2020 16:56	0.01	6.01	18.01	2.76	0.43	997.98	0	0.14
21/12/2020 17:59	0.01	5.96	17.97	2.94	0.41	997.98	-0.01	0.03
21/12/2020 19:02	0.01	5.89	17.91	2.45	0.41	997.98	-0.01	0.01
21/12/2020 20:05	0.01	6.02	17.85	2.18	0.39	997.98	-0.01	0.028
21/12/2020 21:08	0.01	5.92	17.79	2.27	0.35	997.98	-0.014	0.017
21/12/2020 22:11	0.01	5.93	17.74	2.58	0.34	998.94	-0.02	0
21/12/2020 23:14	0.01	5.94	17.74	1.69	0.34	998.46	-0.01	0.08
22/12/2020 0:16	0.01	6	17.7	1.96	0.32	997.98	-0.02	0.01



Landfill Gas Risk Assessment
Ambinsense Gasflux Data - SV09
December 2020 - January 2021

Site: 40 -46 Cyril Beechey Lane,
Cranbourne

TIME	CH4	CO2	O2	CO	H2S	BAROMETRIC	BH FLOW AVG	BH FLOW PEAK
Units	%v/v	%v/v	%v/v	ppm	ppm	mbar	l/hr	l/hr
22/12/2020 1:19	0.01	5.94	17.69	2.05	0.34	997.02	-0.01	0.02
22/12/2020 2:22	0.01	5.89	17.67	1.82	0.37	996.06	-0.01	0.01
22/12/2020 3:25	0.01	5.92	17.68	1.47	0.3	995.1	-0.01	0.01
22/12/2020 4:27	0.01	5.83	17.66	1.69	0.34	995.1	-0.01	0.03
22/12/2020 5:30	0.01	5.85	17.66	1.42	0.32	995.1	-0.02	0.01
22/12/2020 6:33	0.01	5.86	17.7	1.18	0.28	995.58	-0.02	0.02
22/12/2020 7:36	0	5.9	17.68	1.55	0.35	996.54	-0.01	0
22/12/2020 8:38	0.01	5.86	17.72	1.6	0.34	997.5	-0.02	0.03
22/12/2020 9:41	0.01	5.86	17.73	1.78	0.32	997.5	0	0.2
22/12/2020 10:44	0.01	5.92	17.77	2	0.39	997.5	0	0.04
22/12/2020 11:47	0.01	5.89	17.79	1.51	0.3	997.98	0	0.12
22/12/2020 12:49	0.01	5.82	17.78	2.22	0.34	997.98	0	0.13
22/12/2020 13:52	0.01	5.84	17.83	2.27	0.37	997.98	-0.01	0.02
22/12/2020 14:55	0.01	5.98	17.84	1.95	0.41	997.98	0	0.07
22/12/2020 15:59	0	5.8	17.91	1.96	0.26	999.42	-0.02	0
22/12/2020 17:01	0.01	5.77	17.87	1.78	0.3	1000.38	0.01	0.11
22/12/2020 18:04	0.01	5.89	17.79	1.78	0.3	1001.34	0	0.1
22/12/2020 19:07	0.01	5.84	17.78	1.27	0.26	1003.26	0.006	0.142
22/12/2020 20:10	0.01	5.87	17.73	1.91	0.34	1004.22	0.008	0.162
22/12/2020 21:13	0.01	5.88	17.71	1.36	0.26	1005.65	0	0.12
22/12/2020 22:15	0.01	5.86	17.7	2	0.3	1006.13	-0.01	0.01
22/12/2020 23:18	0.01	5.83	17.69	1.82	0.28	1006.61	-0.01	0.03
23/12/2020 0:21	0.01	5.84	17.68	1.24	0.28	1007.09	-0.01	0.06
23/12/2020 1:24	0	5.93	17.66	1.96	0.21	1007.09	0	0.09
23/12/2020 2:26	0.01	5.82	17.64	1.6	0.24	1007.09	-0.01	0.03
23/12/2020 3:29	0.01	5.77	17.65	1.2	0.22	1007.57	-0.01	0.03
23/12/2020 4:32	0.01	5.8	17.62	1.63	0.22	1008.05	-0.01	0.02
23/12/2020 5:35	0.01	5.85	17.61	1.6	0.21	1009.49	-0.02	0.03
23/12/2020 6:38	0.01	5.93	17.59	0.93	0.24	1009.97	-0.02	0.01
23/12/2020 7:40	0	5.9	17.62	1.14	0.26	1011.41	-0.01	0
23/12/2020 8:43	0.01	6.01	17.63	1.33	0.35	1011.89	0	0.03
23/12/2020 9:45	0.01	5.81	17.72	1.51	0.26	1012.85	0	0.12
23/12/2020 10:48	0.01	5.88	17.75	1.38	0.26	1012.37	0	0.03
23/12/2020 11:51	0	5.88	17.76	1.96	0.3	1012.85	-0.01	0.08
23/12/2020 12:53	0.01	5.88	17.81	1.96	0.41	1012.37	0.02	0.1
23/12/2020 13:56	0.01	5.86	17.94	2.31	0.37	1012.37	0.01	0.09
23/12/2020 14:59	0.01	5.74	17.92	2.8	0.41	1011.89	0	0.06
23/12/2020 16:02	0.01	5.7	17.92	2.49	0.37	1011.89	-0.01	0.03
23/12/2020 17:05	0.01	5.75	17.86	1.69	0.41	1011.89	-0.01	0.021
23/12/2020 18:07	0.01	5.75	17.89	2.67	0.37	1011.89	-0.006	0.02
23/12/2020 19:10	0.01	5.64	17.77	2.09	0.35	1011.89	0	0.044
23/12/2020 20:13	0.01	5.73	17.69	2	0.28	1012.37	0	0.2



Landfill Gas Risk Assessment
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Site: 40 -46 Cyril Beechey Lane,
Cranbourne

TIME	CH4	CO2	O2	CO	H2S	BAROMETRIC	BH FLOW AVG	BH FLOW PEAK
Units	%v/v	%v/v	%v/v	ppm	ppm	mbar	l/hr	l/hr
23/12/2020 21:16	0.01	5.67	17.61	2.22	0.37	1012.37	-0.01	0.05
23/12/2020 22:19	0.01	5.69	17.56	1.29	0.35	1012.85	-0.02	0
23/12/2020 23:22	0.01	5.7	17.53	2.14	0.32	1012.85	-0.02	0
24/12/2020 0:25	0.01	5.67	17.5	1.91	0.28	1011.89	-0.01	0
24/12/2020 1:27	0.01	5.72	17.49	1.27	0.28	1011.41	-0.01	0.01
24/12/2020 2:30	0	5.61	17.46	1.56	0.34	1011.41	-0.01	0.04
24/12/2020 3:33	0	5.68	17.43	1.51	0.26	1010.93	-0.01	0.01
24/12/2020 4:36	0.01	5.59	17.43	1.6	0.24	1010.93	-0.01	0.02
24/12/2020 5:38	0.01	5.69	17.41	1.65	0.3	1011.41	-0.01	0
24/12/2020 6:41	0.01	5.72	17.39	1.64	0.28	1011.41	-0.02	0.01
24/12/2020 7:44	0.01	5.65	17.39	1.33	0.26	1012.37	-0.01	0.02
24/12/2020 8:47	0.01	5.76	17.39	1.2	0.34	1012.37	0	0.03
24/12/2020 9:49	0.01	5.71	17.47	2	0.39	1012.85	0.01	0.08
24/12/2020 10:52	0.01	5.76	17.54	2.05	0.32	1012.85	0.01	0.09
24/12/2020 11:54	0.01	5.64	17.59	1.73	0.39	1012.85	0.05	0.47
24/12/2020 12:57	0.01	5.73	17.62	2.45	0.39	1012.85	0.02	0.09
24/12/2020 14:00	0.01	5.7	17.72	1.58	0.39	1012.85	0.02	0.09
24/12/2020 15:03	0.01	5.65	17.69	2.31	0.41	1012.37	0.03	0.18
24/12/2020 16:06	0.01	5.55	17.61	2.94	0.37	1012.85	0.045	0.218
24/12/2020 17:09	0.01	5.68	17.56	2.58	0.37	1012.85	0.041	0.208
24/12/2020 18:12	0.01	5.7	17.47	2.67	0.37	1012.85	0.02	0.16
24/12/2020 19:15	0.01	5.66	17.41	2.18	0.3	1013.33	0.02	0.21
24/12/2020 20:18	0.01	5.67	17.34	2.04	0.26	1014.77	0	0.11
24/12/2020 21:21	0.01	5.68	17.25	1.78	0.32	1014.77	-0.01	0.04
24/12/2020 22:24	0.01	5.69	17.17	1.33	0.24	1014.77	-0.01	0.07
24/12/2020 23:27	0.01	5.81	17.12	1.96	0.24	1015.25	-0.01	0.07
25/12/2020 0:29	0.01	5.62	17.09	1.55	0.35	1014.77	-0.01	0.05
25/12/2020 1:32	0.01	5.78	17.1	1.64	0.34	1014.29	0	0.04
25/12/2020 2:35	0.01	5.68	17.09	2.18	0.32	1014.29	-0.01	0.1
25/12/2020 3:38	0	5.76	17.09	1.58	0.28	1013.81	-0.01	0.02
25/12/2020 4:40	0.01	5.69	17.09	1.73	0.32	1013.81	-0.02	0.03
25/12/2020 5:43	0.01	5.7	17.05	1.47	0.22	1013.81	-0.02	0.05
25/12/2020 6:46	0.01	5.68	17.05	1.76	0.26	1014.29	-0.01	0.05
25/12/2020 7:49	0.01	5.69	17.09	1.49	0.3	1014.77	0	0.13
25/12/2020 8:51	0.01	5.77	17.1	1.73	0.35	1015.25	0.03	0.2
25/12/2020 9:54	0.01	5.74	17.17	1.6	0.39	1015.25	0.02	0.25
25/12/2020 10:56	0	5.77	17.28	1.82	0.37	1014.77	0.01	0.12
25/12/2020 11:59	0	5.74	17.34	2.49	0.47	1014.77	0.05	0.4
25/12/2020 13:02	0	5.67	17.48	3.03	0.41	1013.81	0.06	0.36
25/12/2020 14:05	0	5.65	17.5	3.12	0.48	1012.85	0.051	0.289
25/12/2020 15:08	0	5.66	17.48	3.25	0.43	1012.37	0.068	0.333
25/12/2020 16:11	0.01	5.57	17.44	3.07	0.45	1012.37	0.09	0.4



Landfill Gas Risk Assessment
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Site: 40 -46 Cyril Beechey Lane,
Cranbourne

TIME	CH4	CO2	O2	CO	H2S	BAROMETRIC	BH FLOW AVG	BH FLOW PEAK
Units	%v/v	%v/v	%v/v	ppm	ppm	mbar	l/hr	l/hr
25/12/2020 17:14	0.01	5.65	17.36	2.98	0.47	1011.41	0.11	0.47
25/12/2020 18:17	0.01	5.66	17.32	2.49	0.41	1011.41	0.07	0.38
25/12/2020 19:20	0.01	5.69	17.22	2.31	0.39	1012.37	0.08	0.52
25/12/2020 20:23	0.02	5.72	17.14	1.96	0.39	1012.37	0.06	0.34
25/12/2020 21:26	0.01	5.69	17.06	2.58	0.41	1012.37	-0.01	0.03
25/12/2020 22:29	0.01	5.74	17.01	2.09	0.41	1011.41	0	0.11
25/12/2020 23:32	0.01	5.66	16.96	1.87	0.43	1011.41	0	0.09
26/12/2020 0:35	0.01	5.75	16.93	1.46	0.43	1010.93	-0.01	0.06
26/12/2020 1:37	0.01	5.75	16.89	1.69	0.41	1009.97	0	0.04
26/12/2020 2:40	0.01	5.69	16.86	1.91	0.41	1009.49	-0.01	0.07
26/12/2020 3:43	0.01	5.68	16.86	1.69	0.32	1009.01	-0.03	0.04
26/12/2020 4:46	0.03	5.67	16.81	1.64	0.35	1008.53	-0.02	0.09
26/12/2020 5:49	0	5.76	16.78	1.15	0.26	1008.53	-0.02	0.08
26/12/2020 6:51	0.01	5.67	16.76	1.06	0.35	1009.01	-0.02	0.09
26/12/2020 7:54	0.01	5.81	16.82	1.69	0.39	1009.01	0	0.14
26/12/2020 8:57	0	5.93	16.92	2.05	0.43	1009.01	0.01	0.28
26/12/2020 9:59	0.02	5.86	17.03	1.74	0.48	1008.53	0.03	0.18
26/12/2020 11:02	0.01	5.93	17.1	2.14	0.56	1008.53	0.02	0.21
26/12/2020 12:03	0	5.9	17.36	3.47	0.73	1008.05	0.02	0.11
26/12/2020 13:06	0.02	5.75	17.56	4.19	0.82	1007.57	0.027	0.103
26/12/2020 14:09	0.01	5.7	17.6	5.31	0.85	1006.61	0.028	0.103
26/12/2020 15:13	0.01	5.69	17.57	6.47	0.99	1006.13	0.02	0.12
26/12/2020 16:15	0.01	5.63	17.7	8.97	1.25	1005.18	0.01	0.03
26/12/2020 17:18	0.01	5.48	17.76	9.23	1.29	1004.7	0.03	0.12
26/12/2020 18:22	0.01	5.54	17.69	7.22	1.18	1004.22	0.02	0.12
26/12/2020 19:25	0.01	5.55	17.5	6.15	1.24	1004.22	0.01	0.14
26/12/2020 21:31	0	5.66	17.27	5.39	1.2	1004.22	0	0.04
26/12/2020 22:34	0.01	5.69	17.19	5.04	1.2	1003.26	0	0.03
26/12/2020 23:37	0.01	5.65	17.14	5.13	1.14	1003.26	0	0.02
27/12/2020 0:40	0.01	5.61	17.12	3.83	0.99	1002.78	-0.02	0.01
27/12/2020 1:43	0.01	5.64	17.05	4.06	0.9	1001.82	-0.01	0.03
27/12/2020 2:45	0.01	5.71	17.03	3.83	0.87	1000.86	-0.01	0.03
27/12/2020 3:48	0.01	5.67	17.04	3.61	0.85	1000.38	-0.01	0.02
27/12/2020 4:51	0.01	5.73	17.04	3.65	0.85	999.42	-0.02	0
27/12/2020 5:54	0.01	5.69	17.07	3.12	0.83	999.42	-0.02	0
27/12/2020 6:56	0.01	5.57	17.1	3.47	0.83	998.94	-0.01	0
27/12/2020 7:59	0.01	5.69	17.15	2.8	0.9	998.94	0	0.11
27/12/2020 9:01	0	5.81	17.31	4.5	1.05	998.94	0.04	0.38
27/12/2020 10:04	0.01	5.68	17.42	4.81	1.03	997.98	0.07	0.94
27/12/2020 11:06	0	5.76	17.5	5.75	1.18	997.5	0.057	0.848
27/12/2020 12:09	0	5.6	17.61	6.38	1.18	996.54	0.044	0.728
27/12/2020 13:12	0	5.55	17.61	5.62	1.11	995.1	0.03	0.57



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Site: 40 -46 Cyril Beechey Lane,
Cranbourne

TIME	CH4	CO2	O2	CO	H2S	BAROMETRIC	BH FLOW AVG	BH FLOW PEAK
Units	%v/v	%v/v	%v/v	ppm	ppm	mbar	l/hr	l/hr
27/12/2020 14:15	0	5.64	17.62	6.02	1.18	995.1	0.02	0.29
27/12/2020 15:17	0.01	5.51	17.64	7.13	1.2	995.58	0.04	0.31
27/12/2020 16:20	0	5.52	17.59	6.46	1.11	995.58	0.01	0.1
27/12/2020 17:23	0	5.52	17.52	5.53	1.05	993.66	0.01	0.16
27/12/2020 18:26	0.01	5.61	17.46	4.37	0.9	997.98	0.05	0.25
27/12/2020 19:29	0.01	5.63	17.28	3.7	0.8	1000.38	0.02	0.25
27/12/2020 20:32	0.01	5.54	17.19	3.12	0.74	1001.82	0	0.07
27/12/2020 21:35	0	5.52	17.14	3.12	0.73	1003.26	-0.01	0.09
27/12/2020 22:37	0.01	5.66	17.09	3.12	0.67	1003.74	0.02	0.13
27/12/2020 23:40	0.01	5.69	17.05	2.36	0.58	1004.22	-0.02	0.03
28/12/2020 0:43	0.01	5.6	17.04	2.18	0.63	1004.7	-0.02	0.05
28/12/2020 1:46	0.01	5.62	17.04	2.49	0.6	1004.22	-0.02	0.03
28/12/2020 2:49	0.01	5.52	17.02	2.27	0.52	1004.22	-0.02	0.05
28/12/2020 3:51	0.01	5.65	16.97	2	0.5	1004.22	-0.02	0.1
28/12/2020 4:54	0.01	5.67	16.93	1.78	0.52	1004.7	-0.02	0.1
28/12/2020 5:57	0.01	5.64	16.94	1.56	0.52	1004.7	-0.01	0.06
28/12/2020 7:00	0.01	5.7	16.94	2.18	0.52	1005.65	0.01	0.11
28/12/2020 8:02	0.01	5.74	16.99	1.42	0.54	1006.13	0.04	0.37
28/12/2020 9:05	0.01	5.77	17.13	2.04	0.58	1006.13	0.022	0.237
28/12/2020 10:08	0	5.81	17.22	2.05	0.58	1006.61	0.038	0.256
28/12/2020 11:10	0.01	5.83	17.27	2.85	0.69	1006.61	0.061	0.311
28/12/2020 12:13	0	5.73	17.43	3.25	0.76	1006.61	0.07	0.38
28/12/2020 13:16	0.01	5.71	17.53	4.28	0.78	1006.13	0.04	0.27
28/12/2020 14:19	0.01	5.73	17.55	3.7	0.8	1006.13	0.06	0.58
28/12/2020 15:22	0.01	5.61	17.53	4.46	0.8	1006.13	0.06	0.31
28/12/2020 16:25	0.01	5.64	17.58	4.14	0.8	1006.13	0.05	0.24
28/12/2020 17:28	0.01	5.61	17.54	3.97	0.74	1006.13	0.02	0.23
28/12/2020 18:31	0.01	5.61	17.43	3.97	0.73	1007.09	0.05	0.33
28/12/2020 19:34	0.01	5.7	17.37	3.34	0.71	1007.09	0.03	0.22
28/12/2020 20:37	0.01	5.6	17.29	2.76	0.61	1008.53	-0.01	0.07
28/12/2020 21:40	0.01	5.67	17.24	2.67	0.58	1009.01	-0.02	0.04
28/12/2020 22:43	0.01	5.65	17.17	2.58	0.52	1009.49	-0.02	0.09
28/12/2020 23:46	0.02	5.57	17.08	2.27	0.5	1009.49	-0.03	0.1
29/12/2020 0:49	0.01	5.68	17.03	1.87	0.52	1009.01	-0.03	0.07
29/12/2020 1:52	0.01	5.73	17	1.64	0.5	1009.01	-0.02	0.11
29/12/2020 2:54	0.01	5.73	16.99	2.13	0.45	1008.53	-0.01	0.09
29/12/2020 3:57	0.01	5.76	16.97	1.96	0.47	1009.01	-0.02	0.12
29/12/2020 5:00	0.01	5.75	16.96	1.42	0.43	1008.53	-0.03	0.07
29/12/2020 6:03	0.01	5.74	16.94	1.05	0.47	1009.49	-0.01	0.08
29/12/2020 7:06	0.01	5.84	16.96	1.38	0.45	1009.49	-0.01	0.072
29/12/2020 8:08	0.01	5.9	17.03	1.67	0.48	1009.97	-0.006	0.052
29/12/2020 9:11	0.01	5.88	17.19	2.18	0.58	1010.93		



Landfill Gas Risk Assessment
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Site: 40 -46 Cyril Beechey Lane,
Cranbourne

TIME	CH4	CO2	O2	CO	H2S	BAROMETRIC	BH FLOW AVG	BH FLOW PEAK
Units	%v/v	%v/v	%v/v	ppm	ppm	mbar	l/hr	l/hr
29/12/2020 10:13	0.01	5.88	17.34	2.27	0.58	1010.45		
29/12/2020 11:16	0.01	5.92	17.45	2.76	0.74	1010.93	0.01	0.1
29/12/2020 12:18	0.01	5.7	17.67	3.92	0.85	1010.93	0.04	0.2
29/12/2020 13:21	0	5.69	17.79	4.28	0.89	1010.93	0.03	0.18
29/12/2020 14:24	0	5.64	17.8	5.04	0.9	1010.93	0.03	0.3
29/12/2020 15:27	0	5.6	17.82	5.4	1.07	1010.45	0.04	0.21
29/12/2020 16:30	0.01	5.61	17.93	6.15	1.14	1010.93	0.05	0.18
29/12/2020 17:33	0.01	5.53	17.96	6.6	1.12	1010.45	0.08	0.59
29/12/2020 18:38	0.01	5.59	17.8	5.22	0.89	1010.93	0.02	0.22
29/12/2020 19:41	0.01	5.58	17.64	4.5	0.9	1011.41	0.03	0.32
29/12/2020 20:44	0.01	5.61	17.54	4.1	0.92	1011.41	0.01	0.2
29/12/2020 21:46	0.01	5.71	17.46	3.7	0.92	1011.89	0	0.09
29/12/2020 22:49	0.01	5.59	17.41	3.34	0.89	1012.37	-0.01	0.06
29/12/2020 23:52	0.01	5.67	17.36	3.25	0.9	1012.37	0	0.13
30/12/2020 0:55	0.01	5.66	17.37	3.21	0.89	1012.37	-0.02	0.01
30/12/2020 1:58	0.01	5.71	17.35	2.72	0.83	1011.89	-0.01	0.06
30/12/2020 3:00	0.01	5.63	17.37	2.76	0.76	1011.41	-0.01	0.07
30/12/2020 4:03	0.01	5.77	17.3	2.45	0.8	1010.45	-0.01	0.05
30/12/2020 5:06	0.02	5.68	17.3	2.63	0.76	1010.93	-0.018	0.035
30/12/2020 6:09	0.01	5.59	17.31	2.63	0.8	1011.41	-0.02	0.03
30/12/2020 7:11	0.01	5.57	17.34	2.85	0.78	1012.37	-0.02	0.03
30/12/2020 8:14	0.01	5.64	17.38	2.49	0.8	1012.85	0	0.04
30/12/2020 9:17	0.01	5.68	17.48	2.76	0.89	1012.85	0.01	0.17
30/12/2020 10:19	0.02	5.66	17.57	3.48	0.89	1012.85	0	0.08
30/12/2020 11:22	0.01	5.67	17.69	4.55	1.09	1012.85	0.03	0.23
30/12/2020 12:24	0	5.55	17.88	6.07	1.18	1012.37	0.04	0.22
30/12/2020 13:27	0	5.48	17.95	6.11	1.18	1012.37	0.06	0.35
30/12/2020 14:30	0	5.58	17.93	4.95	1.12	1012.37	0.1	0.4
30/12/2020 15:33	0	5.6	17.93	5.84	1.2	1011.89	0.15	0.58
30/12/2020 16:37	0	5.5	17.9	5.62	1.14	1011.41	0.14	0.64
30/12/2020 17:40	0.01	5.45	17.91	5.53	1.18	1011.41	0.12	0.54
30/12/2020 18:44	0.01	5.47	17.8	4.72	0.92	1011.89	0.1	0.58
30/12/2020 19:46	0.01	5.55	17.7	4.72	0.94	1011.89	0.12	0.61
30/12/2020 20:49	0.01	5.57	17.62	4.06	0.9	1011.89	0.07	0.48
30/12/2020 21:52	0.01	5.55	17.57	3.74	0.9	1012.37	0.07	0.44
30/12/2020 22:55	0.01	5.55	17.54	3.88	0.83	1012.37	0.05	0.35
30/12/2020 23:58	0.01	5.59	17.51	3.34	0.85	1012.85	0.03	0.19
31/12/2020 1:00	0.01	5.61	17.52	3.43	0.87	1012.85	0.04	0.37
31/12/2020 2:03	0.01	5.55	17.52	3.16	0.85	1012.37	0.04	0.28
31/12/2020 3:06	0.01	5.66	17.51	3.61	0.87	1012.37	0.032	0.318
31/12/2020 4:09	0.02	5.59	17.5	3.29	0.85	1012.37	0.027	0.29
31/12/2020 5:12	0.01	5.57	17.52	3.25	0.82	1012.85	0.02	0.2



Landfill Gas Risk Assessment
Ambinsense Gasflux Data - SV09
December 2020 - January 2021

Site: 40 -46 Cyril Beechey Lane,
Cranbourne

TIME	CH4	CO2	O2	CO	H2S	BAROMETRIC	BH FLOW AVG	BH FLOW PEAK
Units	%v/v	%v/v	%v/v	ppm	ppm	mbar	l/hr	l/hr
31/12/2020 6:14	0.02	5.57	17.53	2.53	0.8	1013.33	0.03	0.26
31/12/2020 7:17	0.01	5.68	17.53	2.89	0.78	1013.33	0.03	0.19
31/12/2020 8:20	0.01	5.68	17.54	2.76	0.83	1013.81	0.04	0.38
31/12/2020 9:23	0.01	5.56	17.57	2.98	0.89	1014.77	0.02	0.21
31/12/2020 10:25	0.01	5.62	17.63	3.47	0.87	1014.77	0.05	0.31
31/12/2020 11:28	0.02	5.63	17.7	4.05	0.96	1013.81	0.05	0.39
31/12/2020 12:30	0.01	5.53	17.8	3.88	0.99	1013.81	0.02	0.15
31/12/2020 13:33	0.02	5.54	17.82	3.74	0.92	1013.81	0.03	0.21
31/12/2020 14:35	0.01	5.57	17.84	4.23	1.01	1012.85	0.11	0.44
31/12/2020 15:38	0.01	5.6	17.94	4.77	1.09	1012.37	0.08	0.52
31/12/2020 16:41	0.01	5.47	17.9	4.19	0.98	1011.41	0.08	0.53
31/12/2020 17:44	0.01	5.51	17.9	4.63	0.99	1010.93	0.03	0.14
31/12/2020 18:47	0.01	5.47	17.9	4.77	0.94	1011.41	0.04	0.44
31/12/2020 19:50	0.01	5.43	17.84	4.41	0.92	1011.41	0.04	0.28
31/12/2020 20:53	0.01	5.5	17.79	4.32	0.87	1011.41	0.09	1.18
31/12/2020 21:56	0.01	5.5	17.74	3.83	0.89	1011.41	0.11	0.87
31/12/2020 22:58	0.01	5.5	17.7	3.88	0.85	1011.89	0.06	0.48
1/01/2021 0:01	0.01	5.51	17.68	3.39	0.82	1012.37	0.04	0.27
1/01/2021 1:04	0.01	5.53	17.66	3.03	0.82	1012.37	0.04	0.29
1/01/2021 2:07	0.01	5.47	17.66	2.76	0.8	1012.37	0.04	0.344
1/01/2021 3:10	0.01	5.56	17.65	3.07	0.78	1011.89	0.04	0.386
1/01/2021 4:12	0.02	5.5	17.64	2.94	0.8	1011.41	0.04	0.42
1/01/2021 5:15	0.01	5.47	17.64	2.67	0.74	1011.89	0.01	0.35
1/01/2021 6:18	0.02	5.53	17.64	2.58	0.8	1011.89	0.02	0.3
1/01/2021 7:21	0.01	5.58	17.65	2.89	0.82	1012.37	0.02	0.17
1/01/2021 8:23	0.01	5.6	17.68	3.03	0.82	1012.37	0.01	0.2
1/01/2021 9:26	0.01	5.63	17.76	3.7	0.92	1011.89	0.03	0.23
1/01/2021 10:28	0.01	5.52	17.85	4.32	0.94	1012.37	0	0.12
1/01/2021 11:31	0	5.58	17.92	4.9	1.2	1012.37	0.01	0.08
1/01/2021 12:33	0.01	5.44	18.14	8.03	1.42	1011.41	0.01	0.1
1/01/2021 13:36	0.01	5.33	18.25	8.92	1.57	1010.93	0.01	0.12
1/01/2021 14:40	0.01	5.32	18.27	9.32	1.59	1009.97	0.04	0.16
1/01/2021 15:42	0.01	5.2	18.36	9.86	1.6	1009.49	0.01	0.24
1/01/2021 16:45	0.01	5.25	18.31	9.23	1.59	1008.53	0.03	0.2
1/01/2021 17:48	0.01	5.23	18.33	10.53	1.69	1007.57	0.06	0.63
1/01/2021 18:52	0.01	5.29	18.19	8.12	1.55	1008.53	0.02	0.33
1/01/2021 19:55	0.01	5.4	18.05	7.58	1.51	1008.53	0.02	0.28
1/01/2021 20:57	0.01	5.4	17.96	6.38	1.51	1008.53	0.05	0.73
1/01/2021 22:00	0.01	5.4	17.86	6.11	1.46	1008.53	0.04	0.26
1/01/2021 23:03	0.01	5.41	17.81	6.24	1.31	1008.05	0.02	0.14
2/01/2021 0:06	0.01	5.33	17.74	5.35	1.27	1008.05	0.012	0.193
2/01/2021 1:09	0.01	5.41	17.72	4.99	1.25	1007.09	0.007	0.194



Landfill Gas Risk Assessment
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 December 2020 - January 2021

Site: 40 -46 Cyril Beechey Lane,
 Cranbourne

TIME	CH4	CO2	O2	CO	H2S	BAROMETRIC	BH FLOW AVG	BH FLOW PEAK
Units	%v/v	%v/v	%v/v	ppm	ppm	mbar	l/hr	l/hr
2/01/2021 2:12	0.01	5.43	17.7	4.68	1.18	1007.09	0	0.16
2/01/2021 3:14	0.02	5.44	17.68	3.96	1.16	1006.13	0	0.14
2/01/2021 4:17	0.01	5.4	17.68	4.05	1.11	1006.13	-0.01	0.1
2/01/2021 5:20	0.01	5.42	17.68	3.92	1.05	1006.13	0	0.08
2/01/2021 6:23	0.01	5.42	17.65	4.1	0.99	1006.13	0	0.06
2/01/2021 7:25	0.01	5.38	17.67	3.56	0.99	1007.09	0	0.05
2/01/2021 8:28	0.02	5.5	17.71	3.88	1.16	1006.61	0	0.09
MAX	0.03	6.41	20.69	10.53	1.69	1015.25	0.15	1.18
MIN	0	0.14	16.76	0.64	0	993.66	-0.03	0
AVE	0.01	5.45	17.72	2.79	0.55	1007.44	0.01	0.17