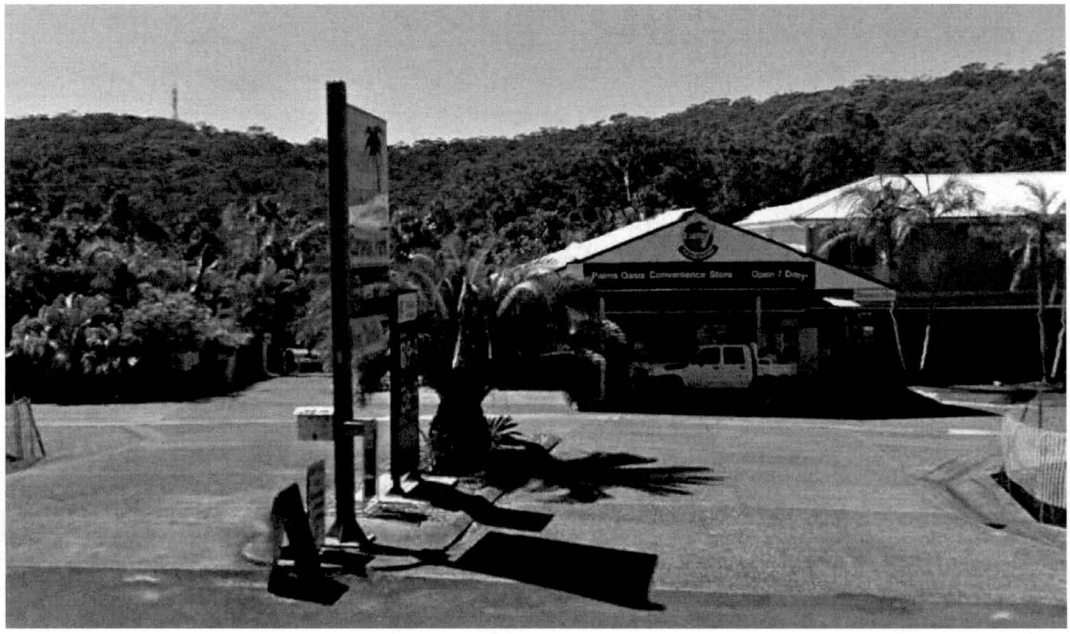
Aurora
ENVIRONMENTAL CONSULTING

Environmental Site Assessment Report

Palms Oasis Caravan Park
321 Boomerang Drive
Blueys Beach NSW 2428



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Environmental Site Assessment (ESA) Report

Palms Oasis Caravan Park
321 Boomerang Drive
BLUEYS BEACH NSW 2428

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EXECUTIVE SUMMARY

Aurora Environmental Consulting Pty Ltd (Aurora) was commissioned by Ingenia Communities Pty Ltd to perform an environmental site assessment (ESA) to provide a contamination status report of the retail petroleum outlet associated with the Palms Oasis Caravan Park, 321 Boomerang Drive, Blueys Beach, NSW.

The objective of this assessment was to assess the status of the retail petroleum outlet (site) with respect to petroleum hydrocarbon contamination potentially associated with current and former operations at the site by drilling, testing, and reporting on the soil and groundwater quality at the site. The assessment targeted areas within the site which were most likely to represent areas of potential hydrocarbon impact based on historical site operations and management practices.

The outcomes of the assessment were:

- The site, including the caravan park is owned by Palms Oasis Pty Ltd. The operational refuelling facility portion of the site is leased to Mr Peter Chapman. The refuelling facility is located within the Palms Oasis Caravan Park, located approximately 25km south of Forster at Blueys Beach, in the Great Lakes Council Local Government Area. The refuelling facility covers an area of approximately 400m^2, and slopes at a moderate gradient to the north west.

- At the time of assessment, the service station comprised an underground petroleum storage system (UPSS) including three (3) underground storage tanks (USTs), three (3) fuel dispensing pumps and associated pipelines. The USTs were installed at the site in the early 1990s.

- There were no visible signs of vegetation stress within the site, or in areas located down gradient (west) of the site.

- The closest environmentally sensitive receptor to the site is the coastal seawater body of Wallis Lake located approximately 1km to the west of the site.

- During the assessment, six (6) boreholes (SB1 to SB6) were drilled to depths of up to 5.0m BGL in locations targeted to identify likely areas of potential soil contamination associated with former service station operations.

- The geology encountered during drilling consisted of sandy gravel and silty clay fill extending from below the concrete slab to approximately 0.8m BGL, underlain by weathered silty clays and clay to the maximum extent of investigation at 5.0m BGL.

- Three (3) groundwater monitoring wells were installed at site during the assessment in accordance with NSW EPA's UPSS Regulations (2008). Each well was sampled as part of the assessment to determine potential groundwater contamination by petroleum hydrocarbons.

- Groundwater below the operational portion of the site is likely to occur as a semi confined aquifer at the interface between the weathered silty clays and the underlying less weathered clay between 2.0m

and 3.2m BGL. The groundwater is flowing in a north-westerly direction towards Wallis Lake with a slope of 0.128m/m.

- Petroleum hydrocarbon impacts to the soils were identified at a depth of between 0.5m and 2.0m below ground level, predominantly in the northern portion of the site adjacent to the USTs. All samples submitted for analysis across the site recorded concentrations below the adopted site assessment criteria, applying clay as the dominant soil type.

- Petroleum hydrocarbon compounds in groundwater were detected in concentrations above the adopted site assessment criteria in samples submitted for analysis from all three monitoring wells. Concentrations of benzene in MW1, Xylenes in MW1 and MW3, and Naphthalene in MW1, MW2 and MW3 exceeded the Groundwater Investigation Level (GIL) assessment criteria for the protection of aquatic ecosystems. The Health Screening Levels (HSLs) criteria for vapour intrusion was not exceeded based on the application of commercial land use for the retail fuel outlet and associated shop.

In summary, the results of the assessment works have indicated that at the time of the assessment, dissolved phase petroleum hydrocarbons in groundwater samples collected at the site were above the adopted site assessment criteria..Given the elevated concentrations of petroleum in groundwater above the specified trigger levels, notification of the contamination to the NSW EPA may be required in accordance with the NSW EPA UPSS Regulations (2008) and/or section 60 of the Contaminated Land Management Act (1997).

Further investigations to determine the extent of soil and groundwater contamination should be conducted to confirm the absence of risk to park residents, groundwater users and sensitive environmental receptors in the vicinity of the site.

1. INTRODUCTION

Aurora Environmental Consulting Pty Ltd (Aurora) was commissioned by Ingenia Communities Pty Ltd to perform an environmental site assessment (ESA) to provide a contamination status report of the retail petroleum outlet associated with the Palms Oasis Caravan Park, 321 Boomerang Drive, Blueys Beach, NSW.

1.1 Objectives

The objectives of the ESA were to:

- Assess the status of the site with respect to petroleum hydrocarbon associated contamination potentially associated with historical operations at the site.
- Define where possible, the vertical and lateral extent of petroleum hydrocarbon associated impact to the soil and groundwater;
- Identify any other potential sources of petroleum hydrocarbon impact on or in close proximity to the site; and
- Assess whether any residual petroleum hydrocarbon impact to soil and groundwater would affect the suitability of the site for continued use as a retail service station facility, and surrounding land uses for their intended purpose.

1.2 Scope of Work

The following tasks were performed during the ESA by Aurora personnel:

- A review of historical environmental reporting for the site, and an historical survey of the site to identify potential on- and off-site contamination sources;
- Collation of geological and hydrogeological information to identify potential receptors and assist with determining the likely fate and distribution of potential contaminants;
- Preparation of a scaled site map identifying key site features including underground services, storage tanks and other physical structures;
- Conduct a site inspection to validate historical information, identify potential contaminant sources and receptors not previously identified during the historical survey and identify safety issues needing consideration during field activities;
- Obtain the necessary works approvals from landowners / site operators prior to commencement of field activities;

- Develop and implement an appropriate investigation and sampling program in accordance with relevant NSW and Australian guidelines and supported by qualified professional judgement during the historical survey, site inspection and field activities;
- Developed and implemented a quality assurance / quality control program (QA/QC) program throughout all stages of the investigation;
- Establish groundwater flow direction based on a level survey and groundwater monitoring well gauging;
- Undertake screening analysis of soil and groundwater samples in the field using available field instrumentation;
- Analysis of selected soil and groundwater samples for a range of analytes typically associated with petroleum hydrocarbon products; and
- Derived conclusions based on field assessment relating to the source, nature and extent of petroleum hydrocarbon related impact at the site associated with former service station operations, and the suitability of the site for continued use as a retail service station facility.

2. BACKGROUND INFORMATION

2.1 Site Use

The site is located at 321 Boomerang Drive, Blueys Beach, located in the Great Lakes Council local government area of NSW. A site location map is provided as **Figure 1** in **Appendix A**. The site forms part of the Palms Oasis Caravan Park, currently owned by Palms Oasis Pty Ltd, with the service station and retail portion of the park sub-leased to Mr Peter Chapman.

The sub-leased portion of the site is used as a retail service station facility which stores and distributes petroleum products for retail consumption, in addition to a general store and cafe. The retail fuel facility and store portion of the caravan park comprises an area of approximately 400m^2. Access to the refuelling facility and park site is from a two lane entrance and exit driveway on Boomerang Drive immediately to the south.

2.2 Physiography

The site is located on the northern side of Boomerang Drive, which links The Lakes Way with the coastal towns of Blueys Beach and Pacific Palms. The site slopes at a low to moderate gradient towards the north-west. The site is located at approximately 12m above sea level.

The nearest sensitive environmental receptor to the site is Wallis Lake, a large coastal seawater body located approximately 1km to the west of the site. The lake enters the Pacific Ocean at Forster approximately 20km north of the site.

2.3 Surrounding Land Use

The service station is located within a predominantly residential setting within the Palms Oasis Caravan Park. For the purposes of the assessment, the service station and associated shop buildings are considered to be commercial in nature. The surrounding land use is summarised in **Table 1** below.

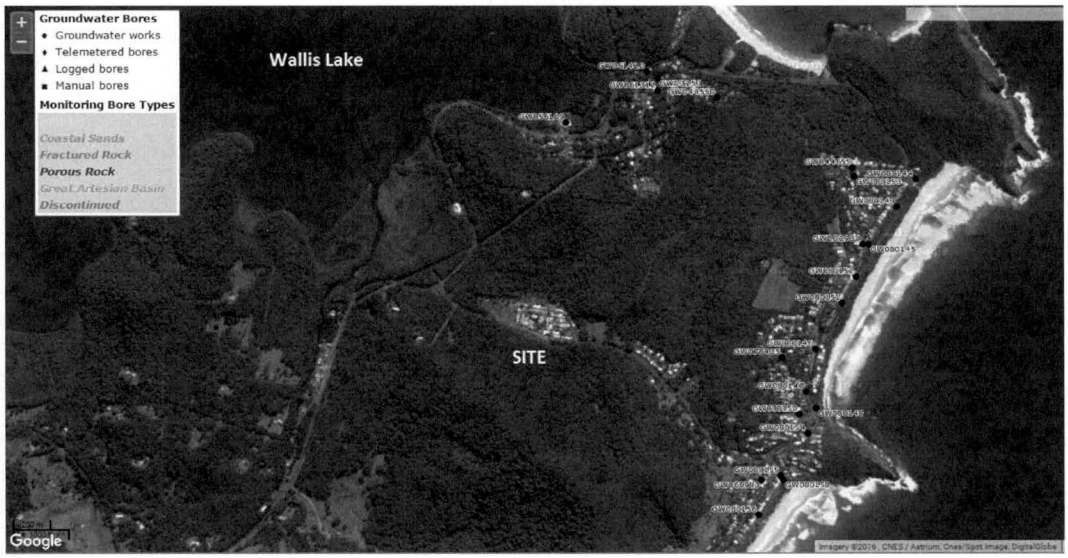
Table 1: Surrounding Land Use

Direction	Description
North	Residential caravan park
East	Residential caravan park
South	Boomerang Drive, then bushland
West	Residential caravan park

2.4 Regional Geology and Hydrogeology

A review of the Newcastle 1:250,000 Geological Sheet produced by the NSW Geological Survey indicates the site and surrounds is underlain by sandstone, siltstone, claystone and shales of the Wootton Beds. The natural soils below the site are overlain by fill material of approximately 0.5m in thickness.

According to the NSW Natural Resources Groundwater Interactive Map hosted by the NSW Office of Water (NOW), there are no licensed bores within 1km of the site. The nearest bores are located within the sand beds of Pacific Palms, approximately 2km east of the site. Given the separation distance between the site and the nearest registered bores, it is considered unlikely that the groundwater quality in the licensed bores would be affected by site operations. See the aerial photo showing the locations of nearest groundwater bores below.



2.5 Previous Environmental Investigations

Aurora was not provided with any historical environmental reports for the site.

2.6 Tank and Line Integrity Testing

In March 2016, Aspen Pty Ltd undertook precision testing on the underground petroleum storage system (UPSS) to determine the integrity of the tanks and lines in use at the site. The works were conducted by Leighton Obrien Pty Ltd, and involved pressure testing on each of the components of the fuel system in accordance with USEPA approved testing procedures. The results identified that the fuel system in use at the site passed all required test parameters, with the exception of a diesel product line which was unable to be tested due to a fitting being unable to be removed for testing to occur. The UPSS Precision Test report is provided as **Appendix C.**

2.7 Site History

Aurora was not provided with any historical environmental reports for the site, however it is understood that the site was constructed in the early 1990s. It is further understood all three underground storage tanks and associated infrastructure currently in use at the site were installed at the time of the park construction.

At the time of the assessment, the site was owned by Mr Norm Lyons and leased to Mr David Chapman, who has tenanted the retail facility since October 2015. Information regarding previous leaseholders or ownership was unavailable. Fuel supply to the site is provided by Access Fuels.

3. SITE FEATURES

At the time of assessment, the site contained an operational service station facility including the following infrastructure:

- Three (3) underground storage tanks (USTs), as summarised in **Table 2**;
- Three (3) fuel dispenser pumps, located below the canopy and dispensing various grades of fuels;
- Vent lines located in the above the canopy; and
- Retail store outlet attached to the service station facility.

A detailed site layout plan showing the approximate locations of the sites features is presented in **Figure 2**, Site Plan, which is located in **Appendix A**. The site appeared in good condition, with minimal visual indicators of hydrocarbon staining.

3.1 Petroleum Storage

The storage of petroleum products is outlined in **Table 2** below.

Table 2: Petroleum Storage Information

Tank Number	Capacity (L)	Product
UST 1	11,800	PULP 95
UST 2	16,200	ULP 91
UST 3	11,800	ADF

The underground storage tanks UST1 to UST3 were installed the early 1990s at the time of site commissioning.

4. FIELD ACTIVITIES

4.1 Summary of Field Activities

Field activities are summarised in the following table:

Table 3: Summary of Field Activities

Activity	Details
Date of Field Activities	22nd March 2016 (drilling, groundwater monitoring well installation, soil sampling) 29th March 2016 (groundwater sampling, surveying)
Drilling	All soil boreholes (SB1 – SB6) were advanced to a maximum depth of 5.0m using push tubing and solid flight augers. Groundwater monitoring wells were installed into three of the six boreholes in accordance with *2nd edition of the Minimum Construction Requirements for Water Bores in Australia (LWBC 2003).* Two (2) wells were installed in the hydraulic downgradient direction of the UPSSs, with one (1) well installed hydraulic upgradient of the site's UPSSs. The wells were installed by Terratest Pty Ltd, under the supervision of a duly qualified Environmental Engineer. Details of the soil bore locations are shown on **Figure 2** in **Appendix A.**
Soil Logging	Soil and rock type classifications and descriptions are based on USCS and AS4482.1-1997. Soil bores were logged by Aurora personnel. The borelogs including monitoring well construction details are attached as **Appendix C.**
Soil Sampling	Soil samples were collected directly from the push tube sleeves. Soil samples were placed in clean, laboratory-supplied acid washed solvent rinsed glass jars with Teflon lids. Soil results summary tables are attached as **Appendix D** and the laboratory results are attached as **Appendix E.**
Soil Sample Screening	Concentrations of volatile organic compounds from collected soil samples were screened using a pho6 to ionisation detector (PID). Volatile organic compounds (VOCs) measured in soil samples using a PID were detected in low concentrations only. PID results are presented on the borelogs attached as **Appendix C.**
Decontamination Procedures	The augers were decontaminated between samples with a phosphate free solution and rinsed with potable water. Disposable gloves were changed between each sample.
Surveying of Wells	Top of casing (TOC) elevations were measured against an arbitrary height datum of 12m for the purpose of comparing respective standing water levels in each of the available groundwater monitoring wells.
Groundwater Gauging and Sampling	Gauging and sampling of all wells was conducted on the 29th March 2016. Groundwater results summary tables are attached as **Appendix D** and the laboratory results are attached as **Appendix E.**
Sample Preservation	Soil and groundwater samples were stored on ice, in an esky whilst on-site and in transit to the laboratory.

4.2 Localised Geological Profile

Borehole logs in **Appendix C** have been provided with information relating to the subsurface conditions observed. The soil profile underlying the site and surrounding areas is observed to consist of:

- Sandy gravel and clay fill material from below the concrete slab to approximately 0.5m BGL;
- Silty clay weathered residual soils from approximately 1.0m to 3.0m BGL;
- Siltstone and claystone weathered bedrock from approximately 3.0m to the maximum extent of drilling at 5.0m BGS.

4.3 Localised Hydrogeology

Groundwater below the site occurs as a semi confined or perched aquifer within the weathered residual claystone soils at approximately 2.0m BGL.

Static water levels (SWLs) are calculated by subtracting the depth to groundwater from each of the respective top of casing (TOC) elevations (measured against an arbitrary height datum of 12m). The SWL and relative elevation of the water in each of the wells is summarised in **Table 4** below.

Table 4: Relative Groundwater Elevation

Location	TOC Elevation	PSH Thickness	Depth to Water (m)	Relative Groundwater Elevation (m)
MW1	12	0.0	1.033	10.967
MW2	13.024	0.0	1.570	11.454
MW3	12.536	0.0	3.700	8.836

- Measured against an arbitrary datum point at MW1 Top of Casing (TOC) of 12m
- Depth to Water measured from top of well casing (m)
- PSH = Phase Separated Hydrocarbon

The groundwater contours are presented on **Figure 3** in **Appendix A**. The groundwater is inferred to be flowing in a north westerly direction towards Wallis Lake with a slope of 0.128m/m.

5. SAMPLING AND ANALYSIS PROGRAM

5.1 Soil

All primary soil samples were submitted to ALS Environmental Laboratories (ALS) in Smithfield, NSW, Australia.

A total of eighteen (18) primary soil samples and two (2) quality assurance (QAQC) sample were collected by an Aurora environmental engineer and submitted to the laboratory for analysis. The soil samples were submitted to the laboratory using appropriate sample preservation methods and chain-of-custody documentation. Soil samples were analysed for the following:

- Total Petroleum Hydrocarbon fractions (TPH);
- Benzene, toluene, ethylbenzene, and total xylenes (BTEX);
- Naphthalene; and
- Lead (Pb).

ALS is accredited by the National Association of Testing Authorities (NATA) for the analytical testing employed.

Soil bore locations are illustrated in **Figure 2** in **Appendix A**, and the soil analytical results discussed in **Section 7.1**.

5.2 Groundwater

The primary and duplicate groundwater samples collected were submitted to ALS Environmental Laboratories (ALS), in Smithfield, NSW, Australia.

Three (3) primary samples and one (1) quality assurance (QAQC) sample were collected by Aurora personnel and submitted to the primary laboratory for analysis. The groundwater samples were submitted to the laboratory using appropriate sample preservation methods and chain-of-custody documentation. Groundwater samples were analysed for the following:

- Total Petroleum Hydrocarbon fractions (TPH);
- Benzene, toluene, ethylbenzene, and total xylenes (BTEX); and
- Naphthalene.

ALS is accredited by the National Association of Testing Authorities (NATA) for the analytical testing employed.

Groundwater monitoring well locations are illustrated in **Figure 2** in **Appendix A**, and the groundwater analytical results discussed in **Section 7.2**.

6. ASSESSMENT CRITERIA

To assess the relative level and significance of any detected contaminants, reference is made to an established environment and/or human health threshold level or criterion. These criteria are dependant mainly on the proposed use of the site, and the associated environmental and human health risk, either on or off-site, in both the long and short term. More stringent levels apply to more sensitive land use and to chemicals with higher toxicity.

The primary source of guideline values adopted for this assessment is the National Environment Protection (Assessment of Site Contamination) Measure (NEPM (1999, amended 2013)), specifically those provided in Schedule B1: Guideline on Investigation Levels for Soil and Groundwater. The NEPM (amended 2013) emphasises consideration of the site on a site-specific basis using a risk-based approach. According to the NEPM (amended 2013), human health should be a primary concern when assessing land use and exposure scenarios. Furthermore, the selection of the most appropriate investigation levels (for use in a range of environmental settings and land use scenarios) should also consider factors including the protection of ecosystems, groundwater resources and aesthetics.

Based on the current zoning of the site, the surrounding land use, the potential future beneficial use of the site and groundwater beneath it and identified potential receptors at and in the vicinity of the site, the following investigation levels are considered relevant for this ESA.

6.1 Soil Investigation Levels

Schedule B(1) of the NEPM (amended 2013) provides a range of investigation levels for the protection of human health, referred to as Health Investigation Levels (HILs) and Health Screening Levels (HSLs). HILs have been developed for a broad range of metals and organic substances, however do not include the COPCs potentially present at this site. Adoption of HSLs is considered relevant as the identified COPCs are consistent with those considered in the development of HSLs (petroleum/diesel products).

The following should be noted:

HSLs have been developed for selected petroleum compounds and fractions and are applicable to assessing human health risk via the inhalation and direct contact pathways. The HSLs depend on specific soil physicochemical properties, land-use scenarios and the characteristics of building structures. They apply to different soil types, and depths below surface to >4m;

Values for HSLs are provided for four exposure settings based on land-use:

- HSL A - Residential with garden/accessible soil (home grown produce <10% fruit and vegetable intake, (no poultry), also includes children's day care centres, preschools and primary schools;
- HSL B - Residential with minimal opportunities for soil access includes dwellings with fully and permanently paved yard space such as high-rise buildings and flats;
- HSL C - Public open space such as parks, playgrounds, playing fields (eg: ovals), secondary schools and footpaths. It does not include undeveloped public open space (such as urban bushland and reserves) which should be subject to a site-specific assessment where appropriate; and
- HSL D - Commercial/industrial such as shops, offices, factories and industrial sites.

For the ESA, the soil results have been compared to NEPM (1999: amendment 2013) Health Screening Levels and Health Investigation Levels (where relevant), land use scenarios D for clay based soils, based on the retail service station and adjacent commercial operations.

The soil results are compared against the relevant soil guidelines in the results summary tables provided in **Appendix D.**

6.2 Groundwater Investigation Levels

Human Health

The NEPM (1999 - Amendment 2013) provides Tier 1 groundwater HSLs for vapour intrusion for Petroleum Hydrocarbons, that have been developed for protection of site users from vapours released from the impacted groundwater. The HSLs take into consideration the land use receptors (HSL-A, HSL-B, HSL-C, and HSL-D); the depth of groundwater intersection (2m to <4m, 4m to <8m, and 8m+), and the dominant soil type (Sand, Silt or Clay) overlying the groundwater intersection depth. The HSLs are not clean-up levels but are used to trigger additional assessment (Tier 2 or Tier 3) or for development of appropriate risk management options.

As indicated previously, the site is used for commercial purposes, and as such, HSL-D has been selected as the land use receptor. The depth groundwater was encountered as either moist or saturated conditions was approximately 2m bgl, which corresponded to the 1m to <2m depth interval. The geology below the site is predominantly weathered claystone. As such, the dominant lithology type for comparing the reported COPC concentrations with was Clay. Furthermore, to evaluate groundwater conditions at the site, analyte concentrations have been compared to the relevant groundwater guidelines.

Ecological Investigation Levels

The groundwater analytical data has been compared to the following investigation levels for fresh water:

- NSW DECCW (2009) - Guidelines on the Duty to Report Contamination under the Contaminated Land Management Act 1997 Column 1, trigger values for fresh water; and
- NEPM (1999 – Amendment 2013), Schedule B (1) Groundwater Investigation Levels (GILs);

Based on the setting of the site and off-site area, 95% protection levels in fresh water has been used for the assessment of groundwater conditions. The analytical results are compared against the relevant groundwater guidelines in the results summary tables provided in **Appendix D**.

7. ANALYTICAL RESULTS SUMMARY

7.1 Soil Analytical Results

Analytical results of soil samples obtained during the soil boring program indicated the following:

- Concentrations of all organic analytes including TPH, TRH and BTEXN in each soil sample analysed from boreholes SB3 and SB5 were below the laboratory's Limit of Reading (LOR);
- Concentrations of organic analytes including TPH, TRH and BTEXN in each soil sample analysed from boreholes SB1, SB2, SB4 and SB6 were either below the laboratory detection limits, or below the adopted site assessment criteria for clay soils within a commercial land use setting; and
- Concentrations of lead (Pb) in each soil sample analysed from all boreholes SB1 to SB6 were below the adopted Assessment Criteria.

Analytical data and comparison to the relevant site assessment criteria is summarised in **Table D1** in **Appendix D.** The laboratory reports for the soil samples and associated documentation are provided in **Appendix E.**

7.2 Groundwater Analytical Results

Analytical results of groundwater samples indicated the following:

- Concentrations of TPH C_6 – C_9 compounds ranged between 1,180ug/L in MW2 up to 22,500ug/L in MW1;
- Concentrations of TPH C_{10} – C_{36} compounds ranged between 760ug/L in MW2 up to 2,530ug/L in MW1;
- Concentrations of TRH F1 (C_6-C_{10}-BTEX) ranged between 1,060ug/L in MW3 up to 11,800ug/L in MW1.
- Concentrations of TRH F2 (C_{10}-C_{16} – N) ranged between 490ug/L in MW2 up to 1,550ug/L in MW1;
- Concentrations of Benzene ranged between 26ug/L in MW2, up to 3,480 ug/L in MW1, above the adopted GIL criteria of 950ug/L in MW1, but below the adopted HSL criteria of 30,000ug/L;
- Concentrations of Toluene ranged between non-detect in MW2 up to 3,840ug/L in MW1;
- Concentrations of Ethylbenzene ranged between 39ug/L in MW3 up to 1,060ug/L in MW1;
- Concentrations of Total Xylenes ranged between 125ug/L in MW2 up to 4,170ug/L in MW1, above the GIL criteria of 200ug/L in MW1 and MW3, but below the adopted HSL criteria in all wells; and
- Concentrations of Naphthalene ranged between 24ug/L in MW3, up to 258 ug/L in MW1, above the GIL criteria of 16ug/L in all wells, but below the adopted HSL criteria.

Analytical data for groundwater and comparison to the relevant site assessment criteria is summarised in the results summary tables in **Table D2** in **Appendix D**. The laboratory reports and associated documentation are provided in **Appendix E**.

7.3 Discussion of Results

Soil

The analysis results of the soil samples identified low to moderate concentrations of petroleum hydrocarbons present in the soils around the operational portion of the service station site. All concentrations were below the adopted site assessment criteria, with the highest concentrations evident in the soils at approximately 2.0m depth in the northern portion of the site. Soils impacted by hydrocarbons appear confined to this depth by the underlying residual claystone lithology, and are likely to be confined to within the immediate vicinity of the service station site.

The lateral extent of soils impacted by hydrocarbons has not been defined to the north, north east and west, beyond the commercial fuel and retail operations. Due to the residential nature of the caravan park, any future assessment of soils beyond the service station and associated shop would need to be assessed against the applicable residential criteria

Groundwater

The analysis results of the groundwater samples identified moderate to high concentrations of petroleum hydrocarbon present in the groundwater below the site, adjacent to the UST area in the northern portion of the site towards the convenience store building. These concentrations were above the adopted NEPM (2013) GIL assessment criteria for a combination of benzene, xylene and naphthalene compounds. Concentrations however were below the adopted NEPM (2013) HSL assessment criteria based on a soil type of clay within a commercial land use area.

The lateral extent of groundwater impacted by hydrocarbons has not been defined to the north, north east and west, beyond the commercial fuel and retail operations. Due to the residential nature of the caravan park, any future assessment of groundwater beyond the service station and associated shop would need to be assessed against applicable residential criteria.

NSW EPA UPSS Regulations (2008)

The presence of three (3) groundwater wells at the site provides minimum acceptable coverage of the UPSS and satisfies the obligations under the NSW EPA's Protection of the Environment (UPSS) Operations Regulation (2008). In accordance with Clause 21(1)(a) of the UPSS Regulation (2008), the groundwater in each of the five (5) wells is required to be tested for the presence of petroleum hydrocarbons every 6 months.

8. QUALITY ASSURANCE/QUALITY CONTROL (QA/QC)

To ensure that the data reported during the ESA was of known quality, that is, it fulfilled overall project objectives, specific qualitative and quantitative Data Quality Objectives (DQOs) were determined to clarify the study objectives; define appropriate types and methods of collecting data; and, specify tolerable levels of potential error. The DQOs are demonstrated by assessment in terms of Data Quality Indicators (DQIs) that include precision; accuracy; representativeness; completeness; and, comparability. The DQIs that have been adopted for analytical data validation purposes for this project are:

- Use of appropriate field and analytical sampling methodology (i.e. sample location and analysis rationale) including standardised field forms and documentation of (as well as calibration if applicable) field instrumentation utilised;
- Preservation of samples upon collection and during transport to the laboratory meet applicable standards and guidelines;
- Sample holding times meet applicable standards and guidelines;
- Testing must be carried out by a laboratory accredited by NATA, using methods approved by NATA (or the United States Environmental Protection Agency USEPA) for that type of test;
- Laboratory Limits of Reporting (LOR) or Estimated Quantitation Limits (EQL) meet applicable standards and guidelines;
- Frequency of collection of field and laboratory quality control samples meet applicable standards and guidelines;
- Results of the field quality control samples meet applicable standards and guidelines (i.e. trip blanks; rinsates; duplicate and triplicate samples);
- Results of the laboratory quality control samples meet applicable standards and guidelines (i.e. method blanks, laboratory control samples, duplicates, matrix spike, and surrogate recoveries); and
- Occurrence of apparent inconsistencies between laboratory data results as compared to field observations and measurements.

A QA/QC Program was implemented to assess the quality and reliability of the data collected and used in this investigation.

8.1 Field QA/QC Program

Quality control sampling and analysis is routinely conducted as part of Aurora's ongoing QA/QC program to validate the integrity of field procedures and assess the reliability of laboratory analyses. In summary, the

following table outlines the quality control samples collected during the field activities and the analyses conducted on these samples:

Table 5: QA/QC Program

QA/QC Sample	Parent Sample	Date Obtained	QA/QC Sample Type
Soil Boring Program			
QS1	SB4 – 2.0m	22-03-16	Intra-laboratory duplicate
QS2	SB6 – 4.0m	22-03-16	Intra-laboratory duplicate
Groundwater Monitoring Event			
QW1	MW1	29-03-16	Intra-laboratory duplicate

Primary or parent samples and intra-laboratory duplicates were submitted to Australian Laboratory Services (ALS) of Smithfield, New South Wales. The QA/QC program analytical data is summarised in **Table D3** in **Appendix D**.

8.2 Laboratory QA/QC Program

ALS's analytical methods for the tests requested are certified by NATA. The analytical testing laboratory utilised during this ESA was also required to adhere to accepted analytical methodologies and conduct regular quality control checks on their analysis. These procedures and results are documented in the laboratory reports in **Appendix D**.

The QA/QC assessment indicated that, overall, the laboratory results are considered to be indicative of the concentrations present on the site at the time of sample collection. As such, the QAQC data for the assessment has shown that the data set is valid and can be relied upon for the purposes of the investigation.

9. CONCLUSIONS

Based on the results of the baseline ESA conducted, including laboratory analysis for soil and groundwater from the retail fuel facility located at the Palms Oasis Caravan Park, Blueys Beach, the following can be concluded.

- The site, including the caravan park is owned by Palms Oasis Pty Ltd. The operational refuelling facility portion of the site is leased to Mr Peter Chapman. The refuelling facility is located within the Palms Oasis Caravan Park, located approximately 25km south of Forster at Blueys Beach, in the Great Lakes Council Local Government Area. The refuelling facility covers an area of approximately 400m^2, and slopes at a moderate gradient to the north west.

- At the time of assessment, the service station comprised an underground petroleum storage system (UPSS) including three (3) underground storage tanks (USTs), three (3) fuel dispensing pumps and associated pipelines. The USTs were installed at the site in the early 1990s.

- There were no visible signs of vegetation stress within the site, or in areas located down gradient (west) of the site.

- The closest environmentally sensitive receptor to the site is the coastal seawater body of Wallis Lake located approximately 1km to the west of the site.

- During the assessment, six (6) boreholes (SB1 to SB6) were drilled to depths of up to 5.0m BGL in locations targeted to identify likely areas of potential soil contamination associated with former service station operations.

- The geology encountered during drilling consisted of sandy gravel and silty clay fill extending from below the concrete slab to approximately 0.8m BGL, underlain by weathered silty clays and clay to the maximum extent of investigation at 5.0m BGL.

- Three (3) groundwater monitoring wells were installed at site during the assessment in accordance with NSW EPA's UPSS Regulations (2008). Each well was sampled as part of the assessment to determine potential groundwater contamination by petroleum hydrocarbons.

- Groundwater below the operational portion of the site is likely to occur as a semi confined aquifer at the interface between the weathered silty clays and the underlying less weathered clay between 2.0m and 3.2m BGL. The groundwater is flowing in a north-westerly direction towards Wallis Lake with a slope of 0.128m/m.

- Petroleum hydrocarbon impacts to the soils were identified at a depth of between 0.5m and 2.0m below ground level, predominantly in the northern portion of the site adjacent to the USTs. All samples submitted for analysis across the site recorded concentrations below the adopted site assessment criteria, applying clay as the dominant soil type.

- Petroleum hydrocarbon compounds in groundwater were detected in concentrations above the adopted site assessment criteria in samples submitted for analysis from all three monitoring wells. Concentrations of benzene in MW1, Xylenes in MW1 and MW3, and Naphthalene in MW1, MW2 and

MW3 exceeded the Groundwater Investigation Level (GIL) assessment criteria for the protection of aquatic ecosystems. The Health Screening Levels (HSLs) criteria for vapour intrusion was not exceeded based on the application of commercial land use for the retail fuel outlet and associated shop.

In summary, the results of the assessment works have indicated that at the time of the assessment, dissolved phase petroleum hydrocarbons in groundwater samples collected at the site were above the adopted site assessment criteria. Given the elevated concentrations of petroleum in groundwater above the specified trigger levels, notification of the contamination to the NSW EPA may be required in accordance with the NSW EPA UPSS Regulations (2008) and/or section 60 of the Contaminated Land Management Act (1997).

Further investigations to determine the extent of soil and groundwater contamination should be conducted to confirm the absence of risk to park residents, groundwater users and sensitive environmental receptors in the vicinity of the site.

10. LIMITATIONS OF REPORT

The findings of this report are based on site conditions that existed at the time this Environmental Site Assessment (ESA) was conducted at the Palms Oasis Caravan Park, 321 Boomerang Drive, Blueys Beach, NSW. The report was prepared in accordance with accepted environmental practices used by environmental professionals working within this area. Conclusions are made from a limited number of observation points assuming that the soil, groundwater, geological and chemical conditions are representative across the site. No other warranties are made or intended.

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11. REFERENCES

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Australian Standard, AS 4482.1, *Guide to Sampling and Investigation of Potentially Contaminated Soil Part:1 Non-Volatile and Semi-Volatile Compounds*, 1997.

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National Environment Protection Council, *National Environment Protection (Assessment of Site Contamination) Measure*, December 1999 (Amended 2013).

New South Wales Government, *Protection of the Environment Operations (Underground Petroleum Storage Systems) Regulation 2008 under the Protection of Environment Operations Act 1997*, 2008.

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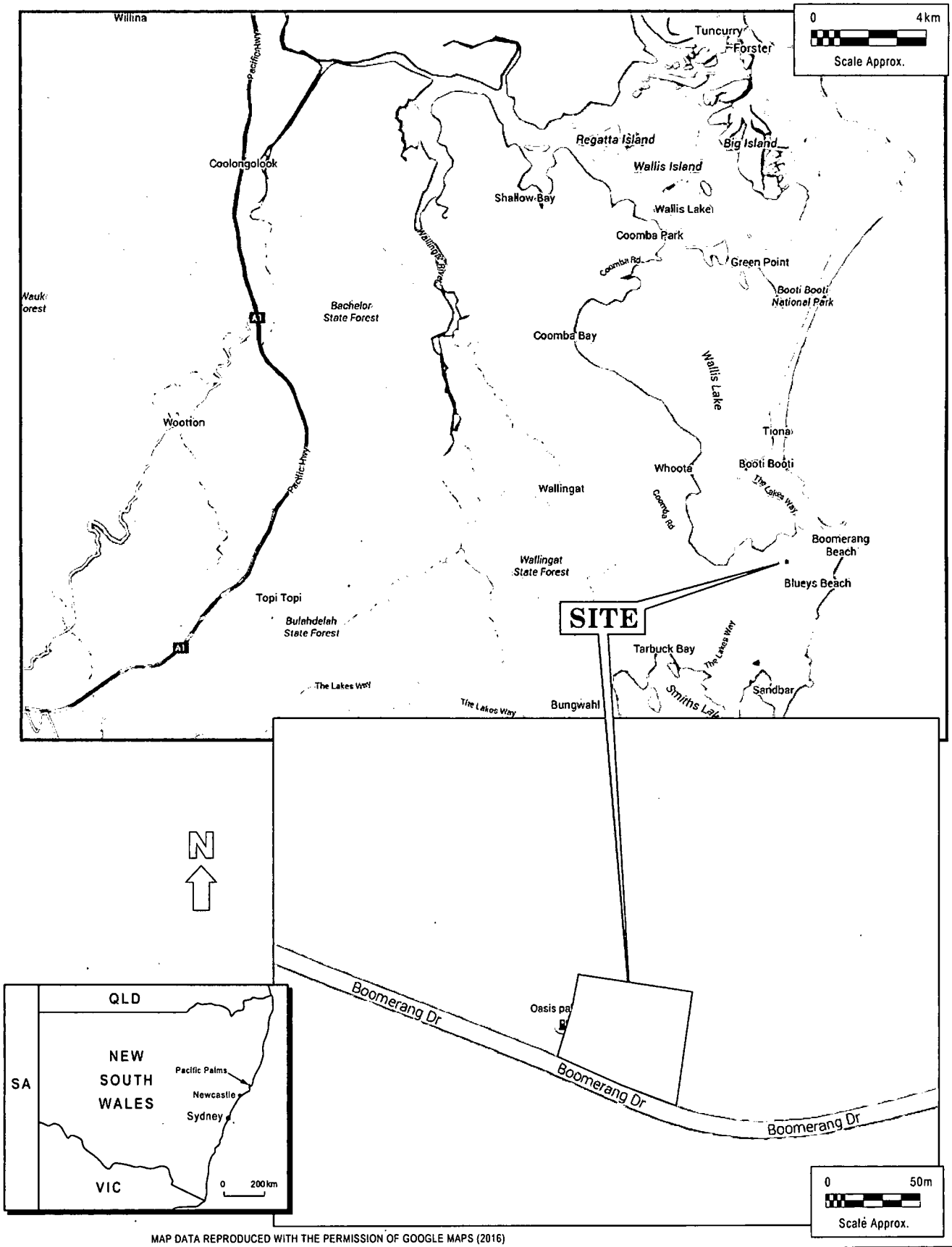
Appendix A

Figures



MAP DATA REPRODUCED WITH THE PERMISSION OF GOOGLE MAPS (2016)

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CHECKED:

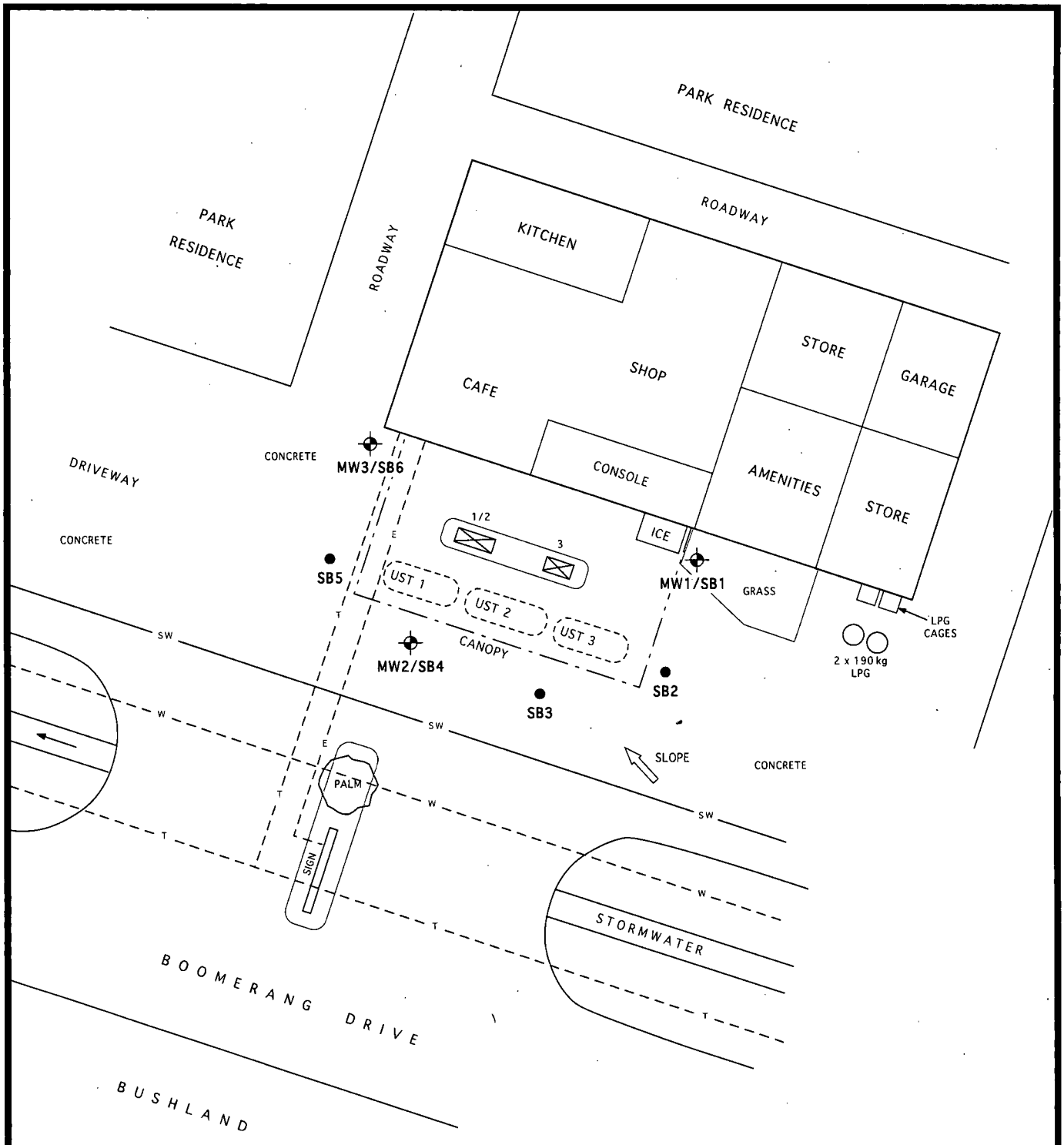
APPROVED:

Palms Oasis Caravan Park, Pacific Palms NSW
Environmental Site Assessment - March 2016

SITE LOCATION PLAN

CLIENT:	LOCATION:
INGENIA COMMUNITIES PTY LTD	321 BOOMERANG DRIVE, PACIFIC PALMS, NSW

DESIGNED: TB	DATE: 24.3.2016	PROJECT NO.:	FIGURE:
DRAWN: RC	REV. NO: A	P16021	1



LEGEND

- GROUNDWATER MONITORING WELL / SOIL BORE
- SOIL BORE
- UST — UNDERGROUND STORAGE TANK
- 1/2 ⊠ — DISPENSER
- —E— ELECTRICITY
- - -W- - WATER
- —SW— STORMWATER
- - -T- - TELSTRA

N

0 5 10
SCALE METRES
APPROX.

STORAGE TANKS		
UST 1	11.8kL	PULP95
UST 2	16.2kL	ULP91
UST 3	11.8kL	ADF

DISPENSERS	
1	PULP95
2	ULP91
3	ADF

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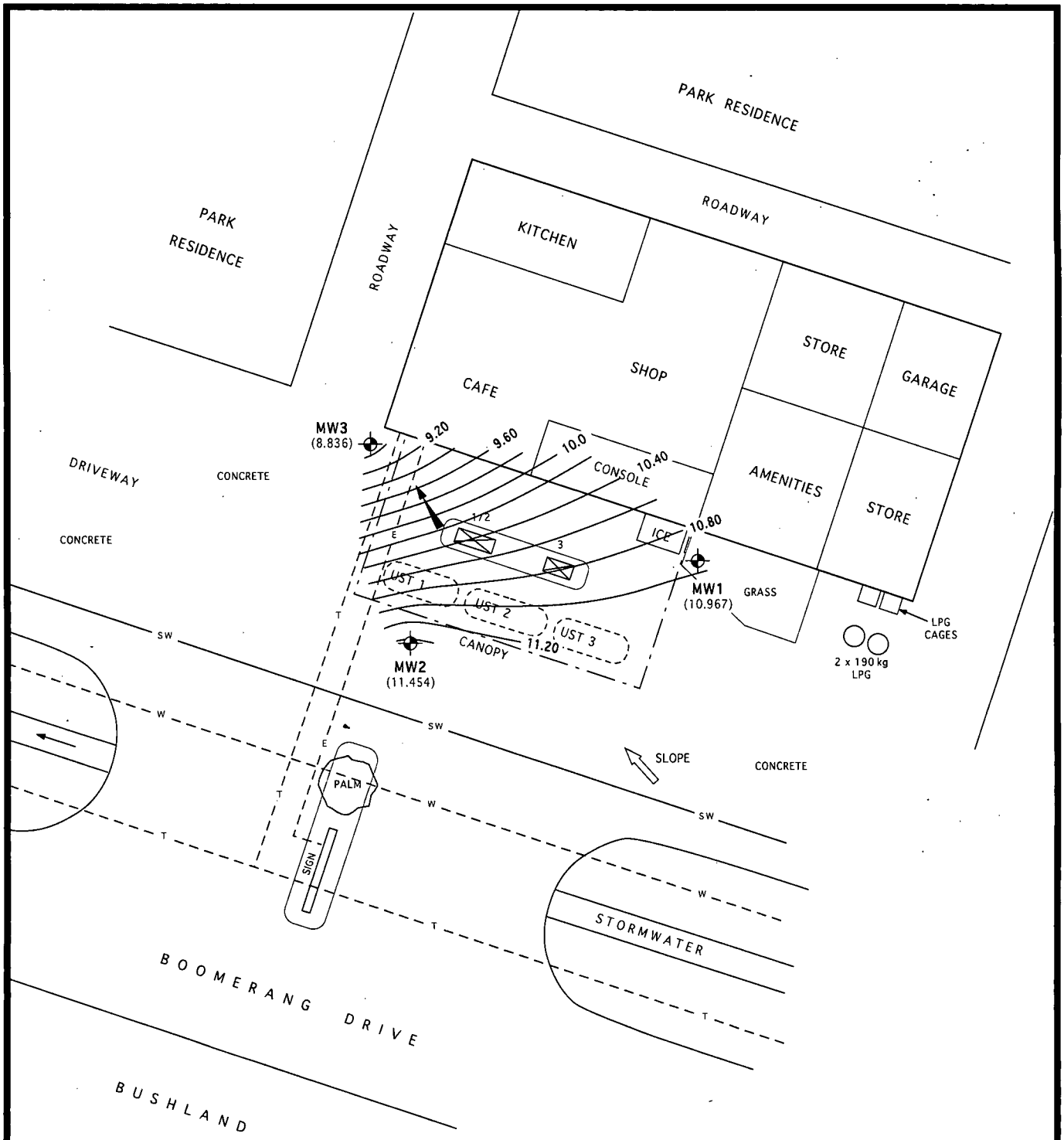
CHECKED:
APPROVED:

Palms Oasis Caravan Park, Pacific Palms NSW
Environmental Site Assessment - March 2016

SITE PLAN

CLIENT: INGENIA COMMUNITIES PTY LTD
LOCATION: 321 BOOMERANG DRIVE, PACIFIC PALMS, NSW

DESIGNED: TB | DATE: 24.3.2016 | PROJECT NO.: P16021 | FIGURE: 2
DRAWN: RC | REV. NO: A



LEGEND

- GROUNDWATER MONITORING WELL
- UST — UNDERGROUND STORAGE TANK
- 1/2 — DISPENSER
- INFERRED GROUNDWATER FLOW DIRECTION
- 10.40 — INFERRED RELATIVE GROUNDWATER ELEVATION CONTOUR
- (10.967) — RELATIVE ELEVATION OF GROUNDWATER

N

0 5 10

SCALE METRES

APPROX.

- E — ELECTRICITY
- W — WATER
- SW — STORMWATER
- T — TELSTRA

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CHECKED:

APPROVED:

Palms Oasis Caravan Park, Pacific Palms NSW

Environmental Site Assessment - March 2016

GROUNDWATER ELEVATION CONTOURS

CLIENT:	LOCATION:
INGENIA COMMUNITIES PTY LTD	321 BOOMERANG DRIVE, PACIFIC PALMS, NSW

DESIGNED:	TB	DATE:	24.3.2016	PROJECT NO.:	FIGURE:
DRAWN:	RC	REV. NO:	A	P16021	3

Appendix B

UPSS Precision Test Report

UPSS Precision Test Report

15-March-2016
Certified Report No: **AG13405**

Palms Oasis Caravan Park
321 Boomerang Dr
Blueys Beach, NSW 2428

Test Date:	14 & 15 March 2016
Reason for Test:	Due Diligence
Customer Contact:	Damien Carpenter, Aspen Group

LEIGHTON O'BRIEN
Leighton O'Brien
Field Services PTY LTD

ABN 49 080 728 641
3rd Floor, 20 Council Street,
Hawthorn East, Victoria, 3123

Telephone: +61(03) 9804 2200
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Website: www.leightonobrien.com

Executive Summary

All Tanks passed the test.
The suction lines associated with Tanks 1 & 2 passed the test.
The Diesel Tank 3 suction line was unable to be tested as the eskay fitting below the pump unit could not be removed.

Recommendations

It is recommended that the Diesel Pump unit be lifted and the eskay fitting associated with this pump be serviced in preparation for a test on the line.

Aim

To investigate the integrity of the UPSSs as a due diligence exercise.

Method

The tanks and all their associated lines (i.e. vent, dip, fill) were subjected to the tank test. Individual tests were also performed on the suction lines.

Summary of Tank Results as Tested

Test Round 1			
Tank	**Test**	**Result**	**Rate**
PULP 95 Tank 1 (11.6 kl)	Wet Static Test	pass (i)	0.14 lt/hr
at 4046 litres or 33.9 % fill (& 0 mm H2O)	Wet Pressure Test	PASS	
14 Mar 2016 Cert. No. 265487	Ullage Test	PASS	
ULP Tank 2 (16 kl)	Wet Static Test	PASS	
at 3123 litres or 19 % fill (& 0 mm H2O)	Wet Pressure Test	PASS	
14 Mar 2016 Cert. No. 265488	Ullage Test	PASS	
Diesel Tank 3 (11.6 kl)	Wet Static Test	pass (i)	0.12 lt/hr
at 4436 litres or 37.1 % fill (& 10 mm H2O)	Wet Pressure Test	PASS	
14 Mar 2016 Cert. No. 265489	Ullage Test	PASS	

Nomenclature for tables above

- A 6.5 times ullage fail is the nitrogen decay equivalent to a liquid leak under 10kPa at the USEPA threshold of 0.38 lt/hr
- 0.38 lt/hr is the PASS/FAIL criteria for a USEPA precision test.
- (i) indicates a liquid ingress was detected during the test at the noted rate
- (e) indicates a liquid egress was detected during the test at the noted rate
- INC indicates an inconclusive result was obtained
- * indicates an overall wet result has been declared

Summary of Line Results as Tested

Line Test Round 1			
Product Lines	Date	Line	Valve
PULP 95 Tank (1) to Pump (1)	15-Mar-16	PASS	NA
ULP Tank (2) to Pump (2)	15-Mar-16	PASS	NA

Other Relevant Observations

- All visible parts of the systems, sealed by the technician, were shown to be tight using soapy water.
- There was no convenient means of gauging the water depth in the tank pit excavation.

Comments/Discussions

All Tanks passed the test.

Minor liquid ingress within the USEPA threshold was detected during he PULP 95 Tank 1 and Diesel Tank 3 wet static tests.

The suction lines associated with Tanks 1 & 2 passed the test.

The Diesel Tank 3 suction line was unable to be tested as the eskay fitting below the pump unit could not be removed.

Tank Type and fuel system

Fuel operation system	Suction system
Tank	Steel
Pipeline	Unknown

Recommendations

It is recommended that the Diesel Pump unit be lifted and the eskay fitting associated with this pump be serviced in preparation for a test on the line.

Addendum

Date of Test:	14 & 15 March 2016
Licensed Tester:	Steve McElhinney
Report Prepared by:	Mahir Hodzic
Report ID:	Blueys Beach AG13405 Diagnostic Report To 15-Mar-16

Glossary of Acronyms used

HC	Hydrocarbons
PSH	Phase Separated Hydrocarbons
UPP	Brand specific double wall high density polyethylene piping
UPSSs	Underground Petroleum Storage Systems
USEPA	United States of America Environmental Protection Agency

The underground pipe and tank configurations contained in this report are deduced from information gathered at the site by Leighton O'Brien Field Services and by information given to Leighton O'Brien Field Services by the client.

Test technology used: Masstech 2 wet test (mass based), Masstech 002 ullage test (pressure or vacuum), ML3P Line Leak Detection System, Quantitative Wet Line Test PM2 and Qualitative Dry Line Test PM2. For further details go to www.nwglde.org/vendor_indexG_M.html

Leighton O'Brien Pty Ltd is the Australian licensee of the MassTech test. The MassTech test is owned and operated by MassTech International Limited and is independently certified as meeting the USEPA standard evaluation for tank tightness testing methods.

Leighton O'Brien Field Services are provided on the terms and conditions set out in the conditions of sale document. The Leighton O'Brien Field Services are warranted to the invoiced value of testing services performed in accordance with section 64A of the Australian Consumer Law (Schedule 2 of the Competition and Consumer Act 2010).

Details of Pressure Line Test

PULP 95 Tank (1) to Pump (1)				
Line	PASS	Time	kPa	ml/hr
Valve	NA	8:10:27	61.7	-1.1
Tested	Dry			
Start	08:03:45			
Date	15-Mar-16			
Unit SN				
Cert No.	40993			

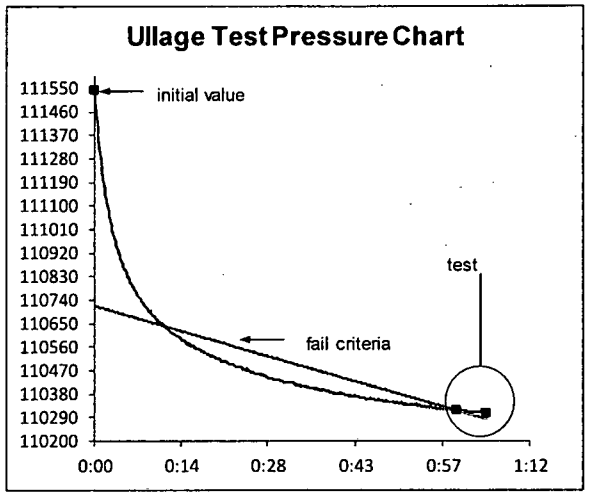
ULP Tank (2) to Pump (2)				
Line	PASS	Time	kPa	ml/hr
Valve	NA	8:38:20	59.3	-2.1
Tested	Dry			
Start	08:31:52			
Date	15-Mar-16			
Unit SN				
Cert No.	40994			

MassTech Tank Test Report

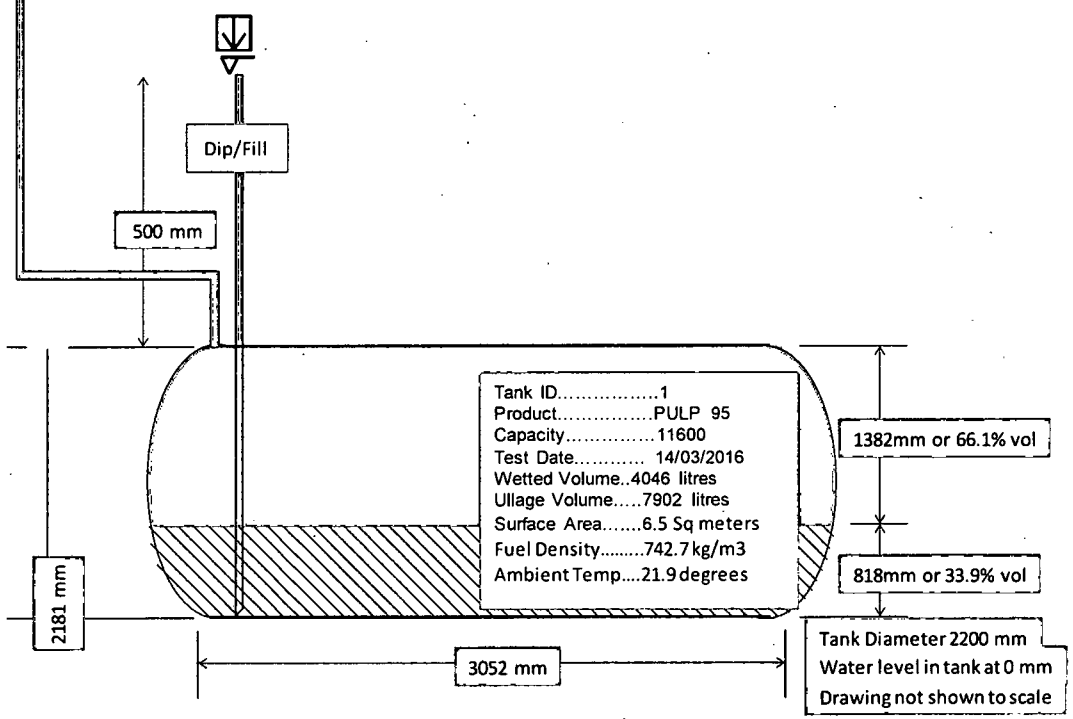
Wet (static) pass (i)
Wet (pressure) PASS
Dry PASS

Facility Details
Palms Oasis Caravan Park
321 Boomerang Dr
Blueys Beach, NSW 2428

PULP 95 Tank 1



Mass Test	Time	Units
Mass 1	11:48:40 AM	5.64064
Mass 2	11:51:28 AM	5.64065
Mass 3	11:54:08 AM	5.64066
Mass 4	12:43:48 PM	5.64149
Mass 5	12:46:58 PM	5.64149
Mass 6	12:49:38 PM	5.64150
Mass 7	3:03:29 PM	5.64163
Mass 8	3:06:10 PM	5.64164
Ullage Test	Time	Pascals
Initial Value	13:26:05	111546
Test 1 Value	14:25:55	110316
Test 2 Value	14:30:55	110309
	dP/dT(Pa/5min)	-7
	Pass limit (Pa/5min)	-33.6



LEGEND

Pressurised Product Level

Point Sealed for Ullage Test

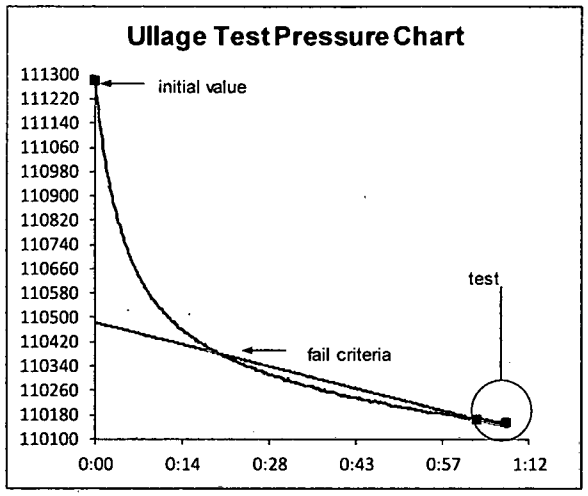
Nitrogen Injection Point

MassTech Tank Test Report

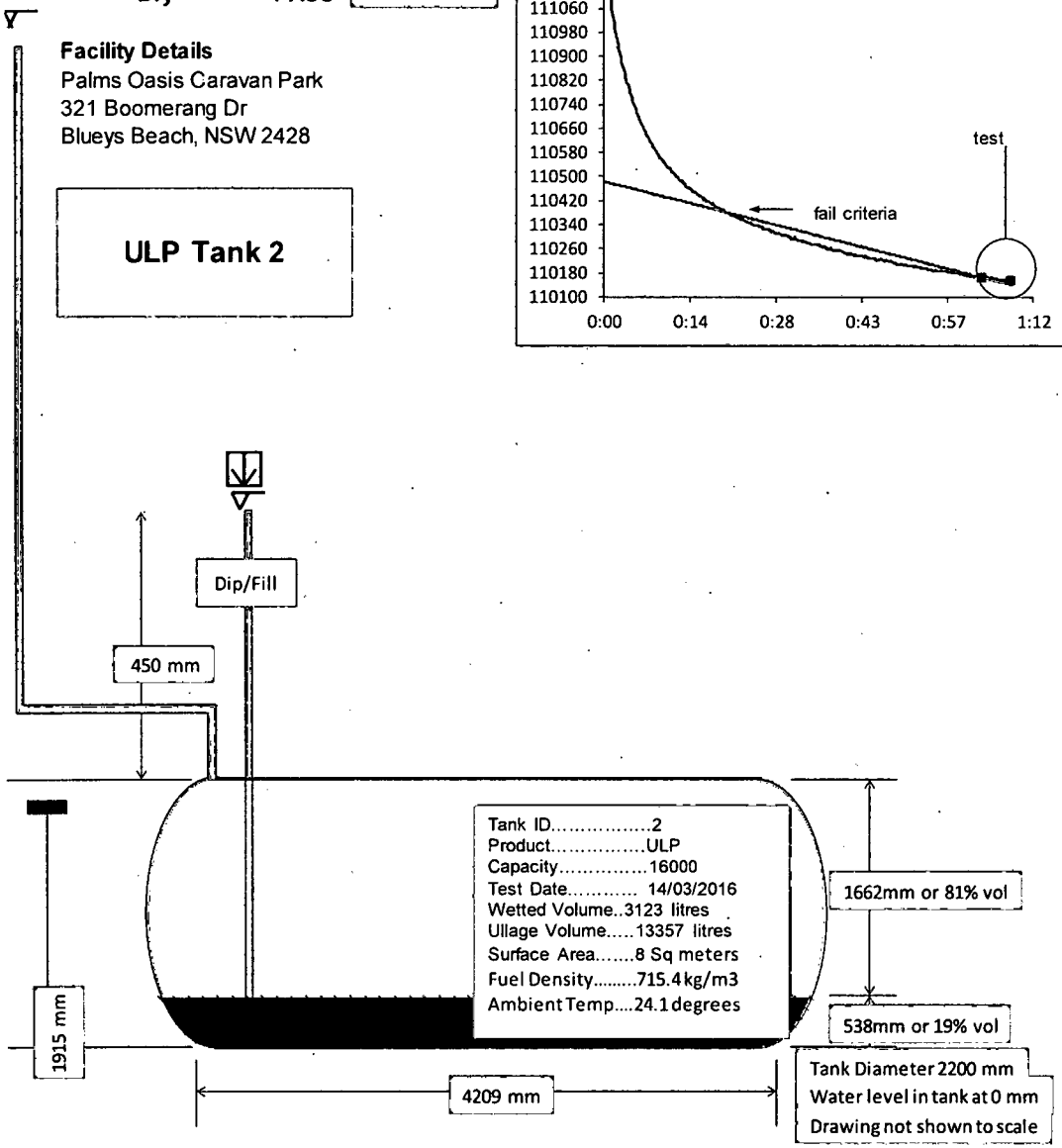
Wet (static)	PASS	
Wet (pressure)	PASS	
Dry	PASS	

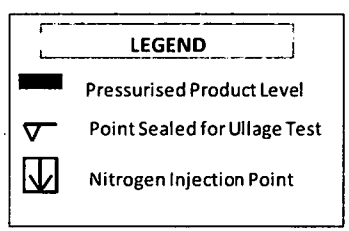
Facility Details
Palms Oasis Caravan Park
321 Boomerang Dr
Blueys Beach, NSW 2428

ULP Tank 2



Mass Test	Time	Units
Mass 1	11:48:53 AM	3.46629
Mass 2	11:51:40 AM	3.46629
Mass 3	11:54:21 AM	3.46629
Mass 4	12:47:11 PM	3.46654
Mass 5	12:49:50 PM	3.46654
Mass 6	12:52:17 PM	3.46655
Mass 7	3:03:42 PM	3.46669
Mass 8	3:06:23 PM	3.46669
Ullage Test	Time	Pascals
Initial Value	13:31:05	111279
Test 1 Value	14:34:25	110165
Test 2 Value	14:39:25	110154
	dP/dT(Pa/5min)	-11
	Pass limit (Pa/5min)	-25.2



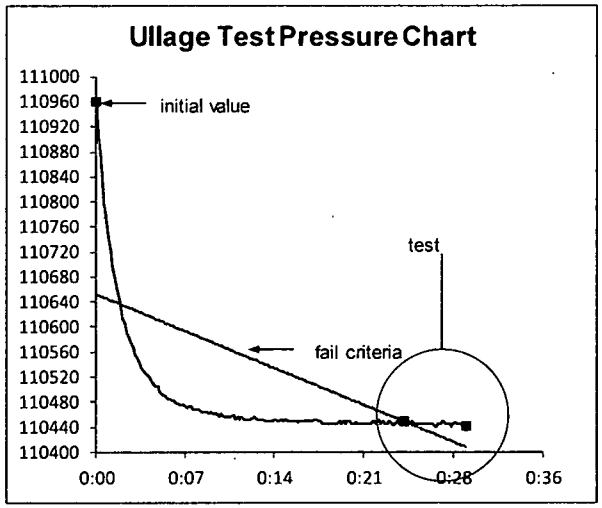


MassTech Tank Test Report

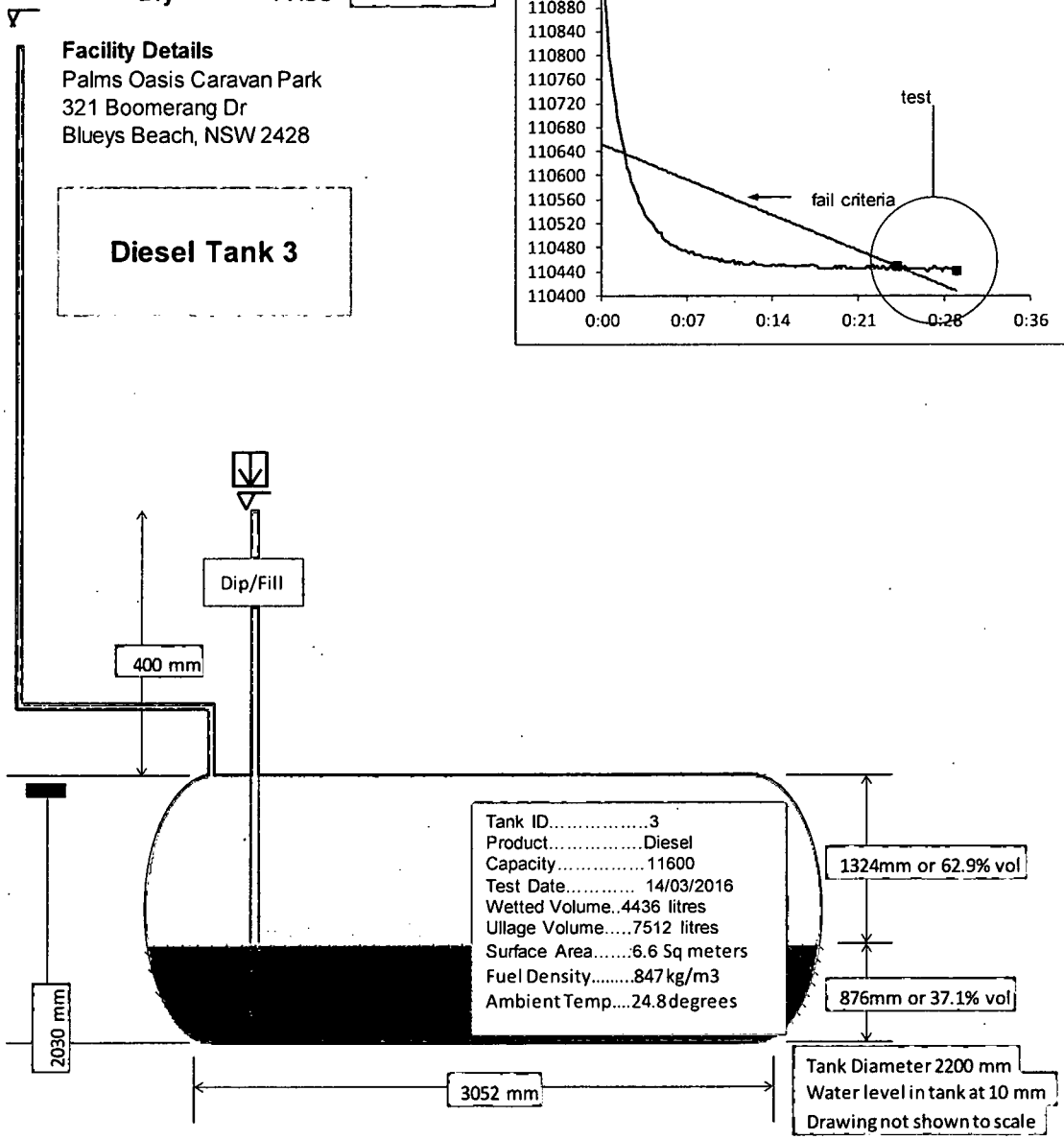
Wet (static)	pass (i)
Wet (pressure)	PASS
Dry	PASS

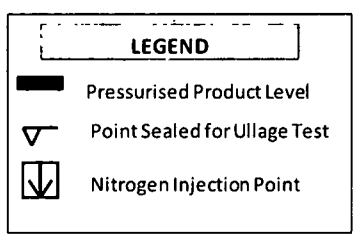
Facility Details
Palms Oasis Caravan Park
321 Boomerang Dr
Blueys Beach, NSW 2428

Diesel Tank 3

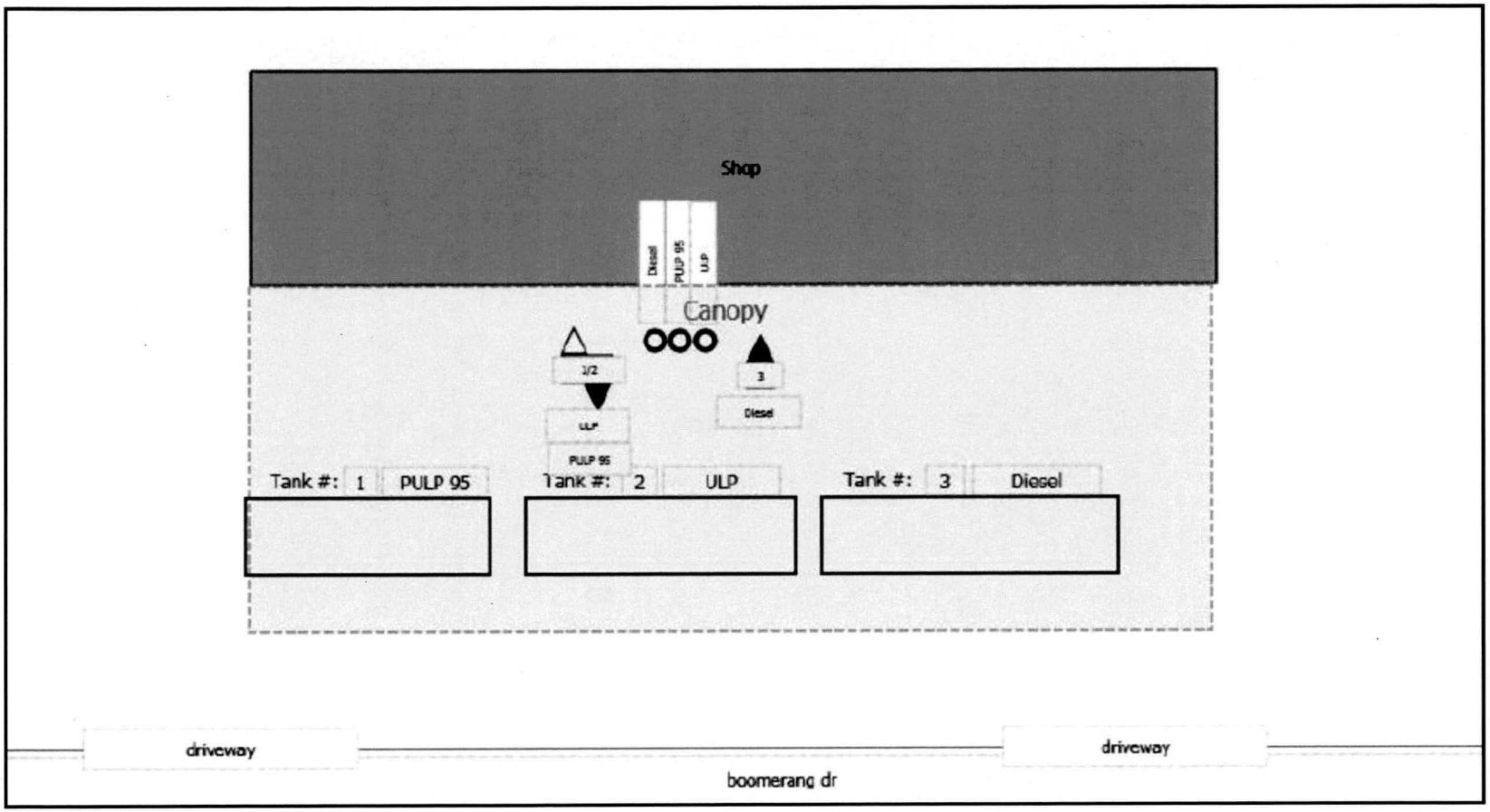


Mass Test	Time	Units
Mass 1	3:16:03 PM	6.91261
Mass 2	3:18:25 PM	6.91262
Mass 3	3:20:46 PM	6.91263
Mass 4	4:02:53 PM	6.91337
Mass 5	4:05:13 PM	6.91338
Mass 6	4:07:42 PM	6.91339
Mass 7	4:57:49 PM	6.91295
Mass 8	5:00:07 PM	6.91296
Ullage Test	Time	Pascals
Initial Value	16:17:40	110961
Test 1 Value	16:42:29	110449
Test 2 Value	16:47:29	110442
	dP/dT(Pa/5min)	-7
	Pass limit (Pa/5min)	-40.9





Site Mud Map


Shop
Diesel
PULP 95
ULP
Canopy
1/2
ULP
PULP 95
3
Diesel
Tank #: 1 PULP 95
Tank #: 2 ULP
Tank #: 3 Diesel
driveway
driveway
boomerang dr

Appendix C

Soil Borelogs

BOREHOLE LOG REPORT

Aurora ENVIRONMENTAL CONSULTING

BOREHOLE LOG: SB1/MW1

Site Name: Palms Oasis Caravan Park

Location: 321 Boomerang Drive, Blueys Beach, NSW

Job Description: Environmental Site Assessment and UPSS Well Installation

Date hole commenced:	22/03/2016	Borehole depth:	5.0m	Contractor:	**Terratest**
Date hole completed:	22/03/2016	R.L casing:	12.000m	Driller:	**JC**
Logged by: T Brown		R.L surface:	-	Drill rig:	**Geoprobe**
		Datum:	12m	Drilling fluid:	**N/A**

Depth (m)	Drilling Method	Piezometer Construction Details	Symbol	Material Description	Field Sample ANALYSED	PID Readings (ppm)	Lab Analysis	Other Comments
1.0	HAUGER			GRAVEL				
				SAND: loose, sat, grey, f sand, p graded, h perm	#	0	SB1 - 0.5m	No Odour
				SILTY GRAVELY CLAY: moderate plasticity, grey, moist, firm	#	25	SB1 - 1.0m	No Odour
GE 2.0	SOLID FLIGHT AUGER			CLAY: moderate plasticity, brown becoming grey/brown below 1.5m, moist becoming wet below 2.0m, firm	#	440	SB1 - 2.0m	Moderate Odour
3.0				CLAY: low to moderate plasticity, red/brown/grey bands of weathered bedrock, hard	#	125	SB1 - 3.0m	Moderate Odour
4.0					#	0	SB1 - 4.0m	No Odour
5.0					#	0	SB1 - 5.0m	No Odour
6.0	Borehole Terminated at 5.0m depth GE: Groundwater Encountered							

Cement/Grout
Backfill/Cuttings
Bentonite
Sand/Filter Pack

GEOLOGY

Asphalt/Concrete
Sand
Silt

Clay
Rock
Gravel

BOREHOLE LOG REPORT

Aurora ENVIRONMENTAL CONSULTING

BOREHOLE LOG: SB2

Site Name: Palms Oasis Caravan Park

Location: 321 Boomerang Drive, Blueys Beach, NSW

Job Description: Environmental Site Assessment and UPSS Well Installation

Date hole commenced:	22/03/2016	Borehole depth:	5.0m	Contractor:	**Terratest**
Date hole completed:	22/03/2016	R.L casing:	-	Driller:	**JC**
Logged by: T Brown		R.L surface:	-	Drill rig:	**Geoprobe**
		Datum:	12m	Drilling fluid:	**N/A**

Depth (m)	Drilling Method	Piezometer Construction Details	Symbol	Material Description	Field Sample ANALYSED	PID Readings (ppm)	Lab Analysis	Other Comments
	H.A.E.R			CONCRETE				
				SAND: loose, sat, grey, f sand, p graded, h perm	#	0	SB2 - 0.5m	No Odour
				SILTY GRAVELY CLAY: moderate plasticity, grey, moist, firm				
1.0	G			CLAY: moderate plasticity, brown becoming grey/brown below 1.5m, moist becoming wet below 2.0m, firm	#	30	SB2 - 1.0m	Low Odour
GE								
2.0					#	115	SB2 - 2.0m	Moderate Odour
	PUSH TUBE			CLAY: low to moderate plasticity, red/brown/grey bands of weathered bedrock, hard				
3.0					#	25	SB2 - 3.0m	Low Odour
4.0					#	0	SB2 - 4.0m	No Odour
5.0					#	0	SB2 - 5.0m	No Odour
6.0	Borehole Terminated at 5.0m depth GE: Groundwater Encountered							

Cement/Grout
Backfill/Cuttings
Bentonite
Sand/Filter Pack

GEOLOGY

Asphalt/Concrete
Sand
Silt
Clay
Rock
Gravel

BOREHOLE LOG REPORT

Aurora ENVIRONMENTAL CONSULTING

BOREHOLE LOG: SB3

Site Name: Palms Oasis Caravan Park

Location: 321 Boomerang Drive, Blueys Beach, NSW

Job Description: Environmental Site Assessment and UPSS Well Installation

Date hole commenced:	22/03/2016	Borehole depth:	5.0m	Contractor:	**Terratest**
Date hole completed:	22/03/2016	R.L casing:	-	Driller:	**JC**
Logged by: T Brown		R.L surface:	-	Drill rig:	**Geoprobe**
		Datum:	12m	Drilling fluid:	**N/A**

Depth (m)	Drilling Method	Piezometer Construction Details	Symbol	Material Description	Field Sample ANALYSED	PID Readings (ppm)	Lab Analysis	Other Comments
	HAU GER			CONCRETE				
				SAND: loose, sat, grey, f sand, p graded, h perm	#	0	SB3 - 0.5m	No Odour
				SILTY GRAVELY CLAY: moderate plasticity, grey, moist, firm				
1.0				CLAY: moderate plasticity, brown becoming grey/brown below 1.5m, moist becoming wet below 2.0m, firm	#	30	SB3 - 1.0m	No Odour
GE 2.0					#	115	SB3 - 2.0m	No Odour
	PUSH TUBE			CLAY: low to moderate plasticity, red/brown/grey bands of weathered bedrock, hard				
3.0					#	25	SB3 - 3.0m	No Odour
4.0					#	0	SB3 - 4.0m	No Odour
5.0					#	0	SB3 - 5.0m	No Odour
6.0	Borehole Terminated at 5.0m depth GE: Groundwater Encountered							

Cement/Grout
Backfill/Cuttings
Bentonite
Sand/Filter Pack

GEOLOGY

Asphalt/Concrete
Sand
Silt
Clay
Rock
Gravel

BOREHOLE LOG REPORT

Aurora ENVIRONMENTAL CONSULTING

BOREHOLE LOG: SB4/MW2

Site Name: Palms Oasis Caravan Park

Location: 321 Boomerang Drive, Blueys Beach, NSW

Job Description: Environmental Site Assessment and UPSS Well Installation

Date hole commenced:	22/03/2016	Borehole depth:	5.0m	Contractor:	**Terratest**
Date hole completed:	22/03/2016	R.L casing:	13.024m	Driller:	**JC**
Logged by: T Brown		R.L surface:	-	Drill rig:	**Geoprobe**
		Datum:	12m	Drilling fluid:	**N/A**

Depth (m)	Drilling Method	Piezometer Construction Details	Symbol	Material Description	Field Sample ANALYSED	PID Readings (ppm)	Lab Analysis	Other Comments
	HAND AUGER			CONCRETE				
				SAND: loose, sat, grey, f sand, p graded, h perm	#	0	SB4 - 0.5m	No Odour
1.0				SILTY GRAVELY CLAY: moderate plasticity, grey, moist, firm				
				CLAY: moderate plasticity, brown becoming grey/brown below 1.5m, moist becoming wet below 2.0m, firm	#	10	SB4 - 1.0m	No Odour
GE 2.0	SOLID FLIGHT AUGER				#	45	SB4 - 2.0m	Low Odour
				CLAY: low to moderate plasticity, red/brown/grey bands of weathered bedrock, hard				
3.0					#	25	SB4 - 3.0m	Low Odour
4.0					#	0	SB4 - 4.0m	No Odour
5.0					#	0	SB4 - 5.0m	No Odour
6.0				Borehole Terminated at 5.0m depth GE: Groundwater Encountered				

Cement/Grout
Backfill/Cuttings
Bentonite
Sand/Filter Pack

GEOLOGY

Asphalt/Concrete
Sand
Silt
Clay
Rock
Gravel

BOREHOLE LOG REPORT

Aurora ENVIRONMENTAL CONSULTING

BOREHOLE LOG: SB5

Site Name: Palms Oasis Caravan Park

Location: 321 Boomerang Drive, Blueys Beach, NSW

Job Description: Environmental Site Assessment and UPSS Well Installation

Date hole commenced:	22/03/2016	Borehole depth:	5.0m	Contractor:	**Terratest**
Date hole completed:	22/03/2016	R.L casing:	-	Driller:	**JC**
Logged by: T Brown		R.L surface:	-	Drill rig:	**Geoprobe**
		Datum:	12m	Drilling fluid:	**N/A**

Depth (m)	Drilling Method	Piezometer Construction Details	Symbol	Material Description	Field Sample ANALYSED	PID Readings (ppm)	Lab Analysis	Other Comments
	HAU GER			CONCRETE				
				SAND: loose, sat, grey, f sand, p graded, h perm				
1.0				SILTY GRAVELY CLAY: moderate plasticity, grey, moist, firm	#	0	SB5 - 0.5m	No Odour
					#	0	SB5 - 1.0m	No Odour
GE				CLAY: moderate plasticity, brown becoming grey/brown below 1.5m, moist becoming wet below 2.0m, firm				
2.0	PUSH TUBE				#	0	SB5 - 2.0m	No Odour
3.0				CLAY: low to moderate plasticity, red/brown/grey bands of weathered bedrock, hard	#	0	SB5 - 3.0m	No Odour
4.0					#	0	SB5 - 4.0m	No Odour
5.0					#	0	SB5 - 5.0m	No Odour
6.0	Borehole Terminated at 5.0m depth GE: Groundwater Encountered							

Cement/Grout
Backfill/Cuttings
Bentonite
Sand/Filter Pack

GEOLOGY

Asphalt/Concrete
Sand
Silt
Clay
Rock
Gravel

BOREHOLE LOG REPORT

Aurora ENVIRONMENTAL CONSULTING

BOREHOLE LOG: SB6/MW3

Site Name: Palms Oasis Caravan Park

Location: 321 Boomerang Drive, Blueys Beach, NSW

Job Description: Environmental Site Assessment and UPSS Well Installation

Date hole commenced:	22/03/2016	Borehole depth:	5.0m	Contractor:	**Terratest**
Date hole completed:	22/03/2016	R.L casing:	12.536m	Driller:	**JC**
Logged by: T Brown		R.L surface:	-	Drill rig:	**Geoprobe**
		Datum:	12m	Drilling fluid:	**N/A**

Depth (m)	Drilling Method	Piezometer Construction Details	Symbol	Material Description	Field Sample ANALYSED	PID Readings (ppm)	Lab Analysis	Other Comments
	HAND AUGER			CONCRETE				
				SAND: loose, sat, grey, f sand, p graded, h perm	#	0	SB6 - 0.5m	No Odour
				SILTY GRAVELY CLAY: moderate plasticity, grey, moist, firm				
1.0				CLAY: moderate plasticity, brown becoming grey/brown below 1.5m, moist becoming wet below 2.0m, firm	#	10	SB6 - 1.0m	No Odour
GE	SOLID FLIGHT AUGER							
2.0					#	150	SB6 - 2.0m	Moderate Odour
				CLAY: low to moderate plasticity, red/brown/grey bands of weathered bedrock, hard				
3.0					#	10	SB6 - 3.0m	Low Odour
4.0					#	0	SB6 - 4.0m	No Odour
5.0					#	0	SB6 - 5.0m	No Odour
6.0				Borehole Terminated at 5.0m depth GE: Groundwater Encountered				

Cement/Grout
Backfill/Cuttings
Bentonite
Sand/Filter Pack

GEOLOGY

Asphalt/Concrete
Sand
Silt
Clay
Rock
Gravel

Appendix D

Soil and Groundwater Results Summary Tables

Aurora
ENVIRONMENTAL CONSULTING

TABLE D1

Soil Analytical Summary
TPH, TRH & BTEXN and Lead
PALMS OASIS CARAVAN PARK
321 BOOMERANG DRIVE, BLUEYS BEACH, NSW

Sample ID	Date Sample Obtained	Total Petroleum Hydrocarbons (TPH)					Total Recoverable Hydrocarbons (TRH)						Benzene, Toluene, Ethylbenzene & Xylenes (BTEXN)							
		C_6-C_9	C_{10}-C_{14}	C_{15}-C_{28}	C_{29}-C_{36}	Total TPH C_{16}-C_{36}^	C_6-C_{10}	C_6-C_{10} (F1)	C_{10}-C_{16} (F2)	C_{16}-C_{34}	C_{34}-C_{40}	Total TRH C_6-C_{40}^	Benzene	Toluene	Ethyl-benzene	*m & p* Xylenes	*o*-Xylenes	Total BTEX^	Naphthalene	Lead
SB1 - 0.5m	22-Mar-16	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	
SB1 - 2.0m	22-Mar-16	697	nd	nd	nd	nd	774	458	nd	nd	nd	774	7.6	82.9	27.7	146.0	50.8	315.0	7.0	51
SB1 - 4.0m	22-Mar-16	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	
SB2 - 0.5m	22-Mar-16	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	
SB2 - 2.0m	22-Mar-16	171	nd	nd	nd	nd	210	nd	nd	nd	nd	210	nd	3.7	5.5	15.8	3.7	28.7	4.0	15
SB2 - 4.0m	22-Mar-16	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	
SB3 - 0.5m	22-Mar-16	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	
SB3 - 2.0m	22-Mar-16	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	19
SB3 - 4.0m	22-Mar-16	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	
SB4 - 0.5m	22-Mar-16	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	
SB4 - 2.0m	22-Mar-16	148	nd	nd	nd	nd	188	184	nd	nd	nd	188	nd	nd	3.8	0.6	nd	4.4	1.0	14
SB4 - 4.0m	22-Mar-16	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	
SB5 - 0.5m	22-Mar-16	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	
SB5 - 2.0m	22-Mar-16	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	14
SB5 - 4.0m	22-Mar-16	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	
SB6 - 0.5m	22-Mar-16	12	nd	nd	nd	nd	15	nd	nd	nd	nd	15	0.3	nd	1.3	8.6	nd	10.2	nd	
SB6 - 2.0m	22-Mar-16	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	0.4	nd	0.6	1.4	nd	2.4	nd	14
SB6 - 4.0m	22-Mar-16	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	
QS1	22-Mar-16	134	nd	nd	nd	nd	179	168	nd	nd	nd	179	nd	nd	4.0	6.1	0.8	10.9	2.0	
QS2	22-Mar-16	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	
CRC Care (2011) Health Screening Levels																				
HSL D (commercial / industrial)	SAND	0 to <1m	—	—	—	—	—	—	260*	NL	—	—	—	3	NL	NL	230		—	NL	—
		1 to <2m	—	—	—	—	—	—	370*	NL	—	—	—	3	NL	NL	NL		—	NL	—
		2 to <4m	—	—	—	—	—	—	630*	NL	—	—	—	3	NL	NL	NL		—	NL	—
		4m+	—	—	—	—	—	—	NL*	NL	—	—	—	3	NL	NL	NL		—	NL	—
	Saturation Concentration (Csat)		—	—	—	—	—	—	950	560	—	—	—	360	560	64	300		—	9	—
HSL D (commercial / industrial)	SILT	0 to <1m	—	—	—	—	—	—	250	NL	—	—	—	4	NL	NL	NL		—	NL	—
		1 to <2m	—	—	—	—	—	—	360	NL	—	—	—	4	NL	NL	NL		—	NL	—
		2 to <4m	—	—	—	—	—	—	590	NL	—	—	—	6	NL	NL	NL		—	NL	—
		4m+	—	—	—	—	—	—	NL	NL	—	—	—	10	NL	NL	NL		—	NL	—
	Saturation Concentration (Csat)		—	—	—	—	—	—	910	570	—	—	—	440	640	69	330		—	10	—
HSL D (commercial / industrial)	CLAY	0 to <1m	—	—	—	—	—	—	310	NL	—	—	—	4	NL	NL	NL		—	NL	—
		1 to <2m	—	—	—	—	—	—	480	NL	—	—	—	6	NL	NL	NL		—	NL	—
		2 to <4m	—	—	—	—	—	—	NL	NL	—	—	—	9	NL	NL	NL		—	NL	—
		4m+	—	—	—	—	—	—	NL	NL	—	—	—	18	NL	NL	NL		—	NL	—
	Saturation Concentration (Csat)		—	—	—	—	—	—	650	560	—	—	—	430	630	68	330		—	10	—
LOR		10	50	100	100	50	10	10	50	100	100	50	0.2	0.5	0.5	0.5	0.5	0.2	1	5
Laboratory Methodology		EP080/071					EP080/071						EP080							EG005T

Notes:

- Sample ID: BH##.#-#.# denotes a soil sample taken a specific depth (m) and Q# denotes a quality assurance sample;
- All Units = µg/L;
- "nd" denotes concentrations not detected above the laboratory Limit of Reporting (LOR);
- C6-C10 (F1) fraction is determined by subtracting the total BTEX value from the C6-C10 fraction result as reported by the laboratory;
- C10-C16 (F2) fraction is determined by subtracting the total Napthalene value from the C10-C16 fraction result as reported by the laboratory;
- " - " denotes that analysis was not requested;
- "—" denotes that no relevant criteria are available;
- "^" denotes that the total is the sum of individual results;
- 95% UCL of mean denotes 95% Upper Confidence Level of mean;
- Sample mean, standard deviating and 95%UCL of mean do not include the quality assurance samples;

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TABLE D2

Groundwater Analytical Summary
TPH, TRH, BTEXN
PALMS OASIS CARAVAN PARK
321 Boomerang Drive, Blueys Beach, NSW

Sample ID	Date Sample Obtained	Land Use at Well Location	Soil Profile Conditions: Depth Water Encountered (mBGS)	Soil Profile Conditions: Major Soil Texture above Water	Soil Profile Conditions: HSL Texture Category	Total Petroleum Hydrocarbons (TPH): C_6-C_9	C_{10}-C_{14}	C_{15}-C_{28}	C_{29}-C_{36}	Total TPH C_{10}-C_{36}^	Total Recoverable Hydrocarbons (TRH): C_6-C_{10}	F1 (C_6-C_{10} - BTEX)	>C_{10}-C_{16}	F2 (>C_{10}-C_{16} - N)	>C_{16}-C_{34}	>C_{34}-C_{40}	Total TRH C_{10}-C_{40}^	Benzene, Toluene, Ethylbenzene, Xylenes & Naphthalene (BTEXN): Benzene	Toluene	Ethyl-benzene	m & p Xylenes	o-Xylenes	Total BTEX^	Naphthalene
MW1	29-Mar-16	D. Commercial/Industrial	1.0	Clay	Clay	22,500	2,430	100	nd	2,530	24,300	11,600	1,610	1,550	nd	nd	1,810	3,480	3,840	1,060	2,990	1,180	12,600	254.0
MW2	29-Mar-16	D. Commercial/Industrial	1.6	Clay	Clay	1,180	770	250	nd	970	1,610	1,280	580	490	200	nd	780	76	nd	179	111	14	330	92.6
MW3	29-Mar-16	D. Commercial/Industrial	3.7	Clay	Clay	1,700	760	nd	nd	760	2,070	1,060	520	500	nd	nd	520	528	3	39	378	58	1,010	24.8
QW1 (MW1)	29-Mar-16	D. Commercial/Industrial	1.0	Clay	Clay	21,200	-	-	-	-	22,700	10,400	-	-	nd	nd	-	3,340	3,870	1,030	3,000	1,970	12,300	246.0
NEPM (1999;amendment 2013) Groundwater Investigation Levels																								
Fresh Water						—	—	—	—	—	—		—	—	—	—	—	950	—	—	200*	350	—	16
NEPM (1999;amendment 2013) Groundwater HSLs for Vapour Intrusion																								
HSL A & HSL B	A & B: Low to High Density Residential	2 to <4m	Sand			—	—	—	—	—	—	1,000	—	1,000	—	—	—	800	NL	NL	NL		—	NL
		4 to <8m				—	—	—	—	—	—	1,000	—	1,000	—	—	—	800	NL	NL	NL		—	NL
		8m+				—	—	—	—	—	—	1,000	—	1,000	—	—	—	900	NL	NL	NL		—	NL
		Solubility Limit				—	—	—	—	—	—	9,000	—	3,000	—	—	—	59,000	61,000	3,900	21,000		—	170
HSL A & HSL B	A & B: Low to High Density Residential	2 to <4m	Silt			—	—	—	—	—	—	6,000	—	NL	—	—	—	4,000	NL	NL	NL		—	NL
		4 to <8m				—	—	—	—	—	—	6,000	—	NL	—	—	—	5,000	NL	NL	NL		—	NL
		8m+				—	—	—	—	—	—	6,000	—	NL	—	—	—	5,000	NL	NL	NL	—	—	NL
		Solubility Limit				—	—	—	—	—	—	9,000	—	3,000	—	—	—	59,000	61,000	3,900	21,000		—	170
HSL A & HSL B	A & B: Low to High Density Residential	2 to <4m	Clay			—	—	—	—	—	—	NL	—	NL	—	—	—	5,000	NL	NL	NL		—	NL
		4 to <8m				—	—	—	—	—	—	NL	—	NL	—	—	—	5,000	NL	NL	NL		—	NL
		8m+				—	—	—	—	—	—	NL	—	NL	—	—	—	5,000	NL	NL	NL		—	NL
		Solubility Limit				—	—	—	—	—	—	9,000	—	3,000	—	—	—	59,000	61,000	3,900	21,000		—	170
NEPM (1999;amendment 2013) Groundwater HSLs for Vapour Intrusion																								
HSL D	D. Commercial / Industrial	2 to <4m	Sand			—	—	—	—	—	—	6,000	—	NL	—	—	—	5,000	NL	NL	NL		—	NL
		4 to <8m				—	—	—	—	—	—	6,000	—	NL	—	—	—	5,000	NL	NL	NL		—	NL
		8m+				—	—	—	—	—	—	7,000	—	NL	—	—	—	5,000	NL	NL	NL		—	NL
		Solubility Limit				—	—	—	—	—	—	9,000	—	3,000	—	—	—	59,000	61,000	3,900	21,000		—	170
HSL D	D. Commercial / Industrial	2 to <4m	Silt			—	—	—	—	—	—	NL	—	NL	—	—	—	30,000	NL	NL	NL	—	—	NL
		4 to <8m				—	—	—	—	—	—	NL	—	NL	—	—	—	30,000	NL	NL	NL	—	—	NL
		8m+				—	—	—	—	—	—	NL	—	NL	—	—	—	30,000	NL	NL	NL		—	NL
		Solubility Limit				—	—	—	—	—	—	9,000	—	3,000	—	—	—	59,000	61,000	3,900	21,000		—	170
HSL D	D. Commercial / Industrial	2 to <4m	Clay			—	—	—	—	—	—	NL	—	NL	—	—	—	30,000	NL	NL	NL		—	NL
		4 to <8m				—	—	—	—	—	—	NL	—	NL	—	—	—	30,000	NL	NL	NL	—	—	NL
		8m+				—	—	—	—	—	—	NL	—	NL	—	—	—	35,000	NL	NL	NL	—	—	NL
		Solubility Limit				—	—	—	—	—	—	9,000	—	3,000	—	—	—	59,000	61,000	3,900	21,000		—	170
LOR						20	50	100	50	50	20	20	100	NA	100	100	100	1	2	2	2	2	1	5
Laboratory Methodology						EP080/071					EP080/071							EP080						

Notes:
- Sample ID: MW-# denotes a water sample obtained from a monitoring well;
- All Units = µg/L;
- "nd" denotes concentrations not detected above the laboratory Limit of Reporting (LOR);
- F1 (C6-C10 - BTEX) fraction is determined by subtracting the total BTEX value from the C6-C10 fraction result as reported by the laboratory;
- F2 (C10-C16 - N) fraction is determined by subtracting the naphthalene value from the >C10-C16 fraction result;
- " - " denotes that analysis was not requested or was not undertaken;
- "—" denotes that no relevant criteria are available;
- "^" denotes that the total is the sum of individual results;
- "NA" denotes Not Applicable;
- "cll" denotes the laboratory LOR concentration for the analysis. If this is greater than the standard LOR at the bottom of the table, the particular sample required dilution due to the presence of high level contaminants/or the LOR was raised due to ambient background levels in the laboratory and the LOR values have been adjusted accordingly;
- "H" indicates the values have been calculated using a hardness of 30 mg/L of CaCO3. Refer to ANZECC & ARMCANZ (2000) for further guidance on recalculating for site specific hardness;
- NEPM (1999;amendment 2013) Groundwater Investigation Levels (GILs) are obtained from the National Environmental Protection (Assessment of Site Contamination) Measure (NEPM), Schedule B(1) Table 1(C). GILs for Fresh Waters and Marine Waters are based on trigger values for slightly-moderately disturbed ecosystems obtained from the National Water Quality Management Strategy (NWQMS), Australian and New Zealand Guidelines for Fresh and Marine Water Quality (Australian and New Zealand Environment and Conservation Council (ANZECC) & Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ), October 2000). GILs for Drinking Water are based on the health values of the National Water Quality Management Strategy (NWQMS), Australian Drinking Water Guidelines (National Health and Medical Research Council (NHMRC) and National Resource Management Ministerial Council (NRMMC), 2011);
- ANZECC & ARMCANZ (2000) Stock Watering denotes investigation levels for Livestock Drinking Water Quality;
- NHMRC (2008) Recreation Water denotes investigation levels for managing risk in Recreational Water, based on Drinking Water investigation levels multiplied by 10, as recommended in Section 9.3.2 of the guideline;
- "#" denotes that guideline is for p-xylenes only;
- NSW EPA (1994) denotes the New South Wales (NSW) Environment Protection Agency (EPA) "Guidelines for assessing service station sites 1994";
- "*" denotes guideline being based on waters being visually free of oil and grease;
- NEPM (1999;amendment 2013) Health Screening Levels (HSLs) for Vapour Intrusion are obtained from the National Environmental Protection (Assessment of Site Contamination) Measure (NEPM), Schedule B(1) Table 1A(4);
- Shading denotes concentration exceeds the relevant guideline;
- "NL" denotes not limiting. The solubility limit is defined as the groundwater concentration at which the water cannot dissolve any more of an individual chemical based on a petroleum mixture. The soil vapour that is in equilibrium with the groundwater will be at its maximum. If the derived groundwater HSL exceeds the solubility limit, a soil-vapour source concentration for a petroleum mixture could not exceed a level that would results in the maximum allowable vapour risk for the given scenario. For these scenarios, no HSL is presented for these chemicals and the HSL is shown as 'NL';
- Land-use setting includes: HSL A - Residential with garden/accessible soil (home grown produce <10% fruit and vegetable intake (no poultry)), also includes childcare centres, preschools and primary schools; HSL B - Residential with minimal opportunities for soil access: includes dwellings with fully and permanently paved yard space such as high-rise buildings and apartments; HSL C - Public open space such as parks, playgrounds, playing fields (e.g. ovals), secondary schools and footpaths. This does not include undeveloped public open space where the potential for exposure is low and where a site-specific assessment may be more appropriate; and, HSL D - Commercial/industrial. Includes premises such as shops, offices, factories and industrial sites; and
- The HSL figures in the above table may be multiplied by a factor to account for biodegradation. A factor of 10 may apply for source depths from 2m to <4m or by a factor of 100 for source depths of 4m and deeper. To apply the attenuation factor for vapour degradation, a number of conditions must be satisfied. Firstly, the maximum length of the shorter side of the concrete slab and surrounding pavement cannot exceed 15m, as this would prevent oxygen penetration to the centre of the slab. Secondly, measurement of oxygen in the subsurface is required to determine the potential for biodegradation. Oxygen must be confirmed to be present at >5% to use these factors.

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Table D3

Soil and Groundwater QA/QC Summary
TPH, TRH, BTEXN
PALMS OASIS CARAVAN PARK
321 BOOMERANG DRIVE, BLUEYS BEACH, NSW

Sample ID	Date Sample Obtained	Total Petroleum Hydrocarbons (TPH)				Total Recoverable Hydrocarbons (TRH)					Benzene, Toluene, Ethylebenze, Xylenes & Naphthalene (BTEXN)				
		C_6-C_9	C_{10}-C_{14}	C_{15}-C_{28}	C_{29}-C_{36}	C_6-C_{10}	C_6-C_{10} (F1)	C_{10}-C_{16}	C_{16}-C_{34}	C_{34}-C_{40}	Benzene	Toluene	Ethyl-Benzene	Xylenes	Naphthalene
Duplicate/Triplicate Sample															
SB4 - 2.0m	22-Mar-16	148	nd	nd	nd	188	184	nd	nd	nd	nd	nd	3.8	4.4	1
QS1		134	nd	nd	nd	179	168	nd	nd	nd	nd	nd	4	6.9	2
RPD %		9.9%	N/A	N/A	N/A	4.9%	9.1%	N/A	N/A	N/A	N/A	N/A	5.1%	44.2%	66.7%
SB6 - 4.0m	22-Mar-16	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
QS2		nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
RPD %		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
MW1	22-Mar-16	22500	2430	100	nd	24300	11800	1810	nd	nd	3480	3840	1060	4170	258
QW1		21200	-	-	-	22700	10400	-	-	-	3340	3870	1030	4070	246
RPD %		5.9%	N/A	N/A	N/A	6.8%	12.6%	N/A	N/A	N/A	4.1%	0.8%	2.9%	2.4%	4.8%

Notes:
- Sample ID: SB##.#-#.# denotes a soil sample taken a specific depth (m) and Q# denotes a quality assurance sample;
- All Units = mg/kg;
- "nd" denotes concentrations not detected above the laboratory Limit of Reporting (LOR);
- " - " denotes that analysis was not requested;
- "^" denotes that the total is the sum of individual results;
- RPD = relative percent difference of duplicate sample results;
- Concentrations in RED are half the LOR for purposes of calculating RPD where the laboratory results returned nd for either the parent or the duplicate sample, but a detectable concentration was reported for the other sample; and
- Shading denotes an unacceptable RPD (>5xLOR).

Appendix E

Soil and Groundwater Laboratory Analytical Reports

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **ES1606407**	Page	: 1 of 7
Client	: **AURORA ENVIRONMENTAL CONSULTING**	Laboratory	: Environmental Division Sydney
Contact	: MR TIM BROWN	Contact	:
Address	: PO BOX 165 NEWCASTLE NSW,AUSTRALIA 2300	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: +61 04 3823 3779	Telephone	: +61-2-8784 8555
Project	: BLUEYS BEACH	Date Samples Received	: 22-Mar-2016 17:03
Order number	: ----	Date Analysis Commenced	: 24-Mar-2016
C-O-C number	: ----	Issue Date	: 01-Apr-2016 16:05
Sampler	: TIM BROWN		
Site	: BLUEYS BEACH		
Quote number	: ----		
No. of samples received	: 20		
No. of samples analysed	: 20		

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Accredited for compliance with
ISO/IEC 17025.

NATA
WORLD RECOGNISED ACCREDITATION

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Celine Conceicao	Senior Spectroscopist	Sydney Inorganics, Smithfield, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Organics, Smithfield, NSW

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.

- EP080: Particular samples required dilution due to the presence of high level contaminants. LOR values have been adjusted accordingly.

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	SB1 0.5m	SB1 2.0m	SB1 4.0m	SB2 0.5m	SB2 2.0m
			Client sampling date / time	[22-Mar-2016]	[22-Mar-2016]	[22-Mar-2016]	[22-Mar-2016]	[22-Mar-2016]
Compound	CAS Number	LOR	Unit	ES1606407-001	ES1606407-002	ES1606407-003	ES1606407-004	ES1606407-005
				Result	Result	Result	Result	Result
EA055: Moisture Content								
Moisture Content (dried @ 103°C)	----	1	%	14.2	17.4	18.0	14.4	12.4
EG005T: Total Metals by ICP-AES								
Lead	7439-92-1	5	mg/kg	----	51	----	----	15
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	<10	697	<10	<10	171
C10 - C14 Fraction	----	50	mg/kg	<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
C29 - C36 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
^ C10 - C36 Fraction (sum)	----	50	mg/kg	<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	774	<10	<10	210
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg	<10	458	<10	<10	181
>C10 - C16 Fraction	----	50	mg/kg	<50	<50	<50	<50	<50
>C16 - C34 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
>C34 - C40 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
^ >C10 - C40 Fraction (sum)	----	50	mg/kg	<50	<50	<50	<50	<50
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg	<50	<50	<50	<50	<50
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	<0.2	7.6	<0.2	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg	<0.5	82.9	<0.5	<0.5	3.7
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	27.7	<0.5	<0.5	5.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	146	<0.5	<0.5	15.8
ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	50.8	<0.5	<0.5	3.7
^ Sum of BTEX	----	0.2	mg/kg	<0.2	315	<0.2	<0.2	28.7
^ Total Xylenes	1330-20-7	0.5	mg/kg	<0.5	197	<0.5	<0.5	19.5
Naphthalene	91-20-3	1	mg/kg	<1	7	<1	<1	4
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.2	%	90.2	101	99.6	96.7	94.5
Toluene-D8	2037-26-5	0.2	%	85.9	92.5	91.0	95.0	87.0
4-Bromofluorobenzene	460-00-4	0.2	%	96.0	108	102	107	88.7

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	SB2 4.0m	SB3 0.5m	SB3 2.0m	SB3 4.0m	SB4 0.5m
			Client sampling date / time	[22-Mar-2016]	[22-Mar-2016]	[22-Mar-2016]	[22-Mar-2016]	[22-Mar-2016]
Compound	CAS Number	LOR	Unit	ES1606407-006	ES1606407-007	ES1606407-008	ES1606407-009	ES1606407-010
				Result	Result	Result	Result	Result
EA055: Moisture Content								
Moisture Content (dried @ 103°C)	---	1	%	22.2	15.0	17.7	25.9	14.2
EG005T: Total Metals by ICP-AES								
Lead	7439-92-1	5	mg/kg	----	----	19	----	----
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	---	10	mg/kg	<10	<10	<10	<10	<10
C10 - C14 Fraction	---	50	mg/kg	<50	<50	<50	<50	<50
C15 - C28 Fraction	---	100	mg/kg	<100	<100	<100	<100	<100
C29 - C36 Fraction	---	100	mg/kg	<100	<100	<100	<100	<100
^ C10 - C36 Fraction (sum)	---	50	mg/kg	<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	<10	<10	<10
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg	<10	<10	<10	<10	<10
>C10 - C16 Fraction	---	50	mg/kg	<50	<50	<50	<50	<50
>C16 - C34 Fraction	---	100	mg/kg	<100	<100	<100	<100	<100
>C34 - C40 Fraction	---	100	mg/kg	<100	<100	<100	<100	<100
^ >C10 - C40 Fraction (sum)	---	50	mg/kg	<50	<50	<50	<50	<50
^ >C10 - C16 Fraction minus Naphthalene (F2)	---	50	mg/kg	<50	<50	<50	<50	<50
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^ Sum of BTEX	---	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
^ Total Xylenes	1330-20-7	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Naphthalene	91-20-3	1	mg/kg	<1	<1	<1	<1	<1
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.2	%	83.1	96.7	92.2	80.7	91.5
Toluene-D8	2037-26-5	0.2	%	84.6	97.9	103	81.4	86.5
4-Bromofluorobenzene	460-00-4	0.2	%	85.4	110	113	88.8	95.6

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	SB4 2.0m	SB4 4.0m	SB5 0.5m	SB5 2.0m	SB5 4.0m
			Client sampling date / time	[22-Mar-2016]	[22-Mar-2016]	[22-Mar-2016]	[22-Mar-2016]	[22-Mar-2016]
Compound	CAS Number	LOR	Unit	ES1606407-011	ES1606407-012	ES1606407-013	ES1606407-014	ES1606407-015
				Result	Result	Result	Result	Result
EA055: Moisture Content								
Moisture Content (dried @ 103°C)	----	1	%	20.3	22.8	12.1	17.7	23.6
EG005T: Total Metals by ICP-AES								
Lead	7439-92-1	5	mg/kg	14	----	----	14	----
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	148	<10	<10	<10	<10
C10 - C14 Fraction	----	50	mg/kg	<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
C29 - C36 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
^ C10 - C36 Fraction (sum)	----	50	mg/kg	<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	188	<10	<10	<10	<10
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg	184	<10	<10	<10	<10
>C10 - C16 Fraction	----	50	mg/kg	<50	<50	<50	<50	<50
>C16 - C34 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
>C34 - C40 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
^ >C10 - C40 Fraction (sum)	----	50	mg/kg	<50	<50	<50	<50	<50
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg	<50	<50	<50	<50	<50
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg	3.8	<0.5	<0.5	<0.5	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	0.6	<0.5	<0.5	<0.5	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^ Sum of BTEX	----	0.2	mg/kg	4.4	<0.2	<0.2	<0.2	<0.2
^ Total Xylenes	1330-20-7	0.5	mg/kg	0.6	<0.5	<0.5	<0.5	<0.5
Naphthalene	91-20-3	1	mg/kg	1	<1	<1	<1	<1
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.2	%	116	82.0	97.5	89.4	88.5
Toluene-D8	2037-26-5	0.2	%	84.3	84.4	95.1	84.8	80.7
4-Bromofluorobenzene	460-00-4	0.2	%	104	81.5	109	92.7	94.9

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	SB6 0.5m	SB6 2.0m	SB6 4.0m	QS1	QS2
			Client sampling date / time	[22-Mar-2016]	[22-Mar-2016]	[22-Mar-2016]	[22-Mar-2016]	[22-Mar-2016]
Compound	CAS Number	LOR	Unit	ES1606407-016	ES1606407-017	ES1606407-018	ES1606407-019	ES1606407-020
				Result	Result	Result	Result	Result
EA055: Moisture Content								
Moisture Content (dried @ 103°C)	---	1	%	16.0	18.3	22.8	18.4	22.7
EG005T: Total Metals by ICP-AES								
Lead	7439-92-1	5	mg/kg	---	14	---	---	---
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	---	10	mg/kg	12	<10	<10	134	<10
C10 - C14 Fraction	---	50	mg/kg	<50	<50	<50	<50	<50
C15 - C28 Fraction	---	100	mg/kg	<100	<100	<100	<100	<100
C29 - C36 Fraction	---	100	mg/kg	<100	<100	<100	<100	<100
^ C10 - C36 Fraction (sum)	---	50	mg/kg	<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	15	<10	<10	179	<10
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg	<10	<10	<10	168	<10
>C10 - C16 Fraction	---	50	mg/kg	<50	<50	<50	<50	<50
>C16 - C34 Fraction	---	100	mg/kg	<100	<100	<100	<100	<100
>C34 - C40 Fraction	---	100	mg/kg	<100	<100	<100	<100	<100
^ >C10 - C40 Fraction (sum)	---	50	mg/kg	<50	<50	<50	<50	<50
^ >C10 - C16 Fraction minus Naphthalene (F2)	---	50	mg/kg	<50	<50	<50	<50	<50
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	0.3	0.4	<0.2	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg	1.3	0.6	<0.5	4.0	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	8.6	1.4	<0.5	6.1	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	<0.5	0.8	<0.5
^ Sum of BTEX	---	0.2	mg/kg	10.2	2.4	<0.2	10.9	<0.2
^ Total Xylenes	1330-20-7	0.5	mg/kg	8.6	1.4	<0.5	6.9	<0.5
Naphthalene	91-20-3	1	mg/kg	<1	<1	<1	2	<1
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.2	%	89.7	84.4	85.3	119	85.9
Toluene-D8	2037-26-5	0.2	%	88.3	85.2	82.7	102	83.1
4-Bromofluorobenzene	460-00-4	0.2	%	97.6	89.4	88.2	114	89.5

Surrogate Control Limits

Sub-Matrix: **SOIL**		Recovery Limits (%)	
Compound	*CAS Number*	*Low*	*High*
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	73	133
Toluene-D8	2037-26-5	74	132
4-Bromofluorobenzene	460-00-4	72	130

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **ES1606407**	Page	: 1 of 6
Client	: **AURORA ENVIRONMENTAL CONSULTING**	Laboratory	: Environmental Division Sydney
Contact	: MR TIM BROWN	Contact	:
Address	: PO BOX 165 NEWCASTLE NSW,AUSTRALIA 2300	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: +61 04 3823 3779	Telephone	: +61-2-8784 8555
Project	: BLUEYS BEACH	Date Samples Received	: 22-Mar-2016
Order number	: ----	Date Analysis Commenced	: 24-Mar-2016
C-O-C number	: ----	Issue Date	: 01-Apr-2016
Sampler	: TIM BROWN		
Site	: BLUEYS BEACH		
Quote number	: ----		
No. of samples received	: 20		
No. of samples analysed	: 20		

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ISO/IEC 17025.

NATA
WORLD RECOGNISED
ACCREDITATION

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Celine Conceicao	Senior Spectroscopist	Sydney Inorganics, Smithfield, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Organics, Smithfield, NSW

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EA055: Moisture Content (QC Lot: 405778)									
ES1606407-003	SB1 4.0m	EA055-103: Moisture Content (dried @ 103°C)	---	1	%	18.0	18.6	2.96	0% - 50%
ES1606407-014	SB5 2.0m	EA055-103: Moisture Content (dried @ 103°C)	---	1	%	17.7	18.1	2.56	0% - 50%
EG005T: Total Metals by ICP-AES (QC Lot: 408867)									
EB1607510-068	Anonymous	EG005T: Lead	7439-92-1	5	mg/kg	14	15	0.00	No Limit
ES1606288-038	Anonymous	EG005T: Lead	7439-92-1	5	mg/kg	367	327	11.4	0% - 20%
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 404916)									
ES1606407-001	SB1 0.5m	EP080: C6 - C9 Fraction	---	10	mg/kg	<10	<10	0.00	No Limit
ES1606407-012	SB4 4.0m	EP080: C6 - C9 Fraction	---	10	mg/kg	<10	<10	0.00	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 405170)									
ES1606407-001	SB1 0.5m	EP071: C15 - C28 Fraction	---	100	mg/kg	<100	<100	0.00	No Limit
		EP071: C29 - C36 Fraction	---	100	mg/kg	<100	<100	0.00	No Limit
		EP071: C10 - C14 Fraction	---	50	mg/kg	<50	<50	0.00	No Limit
ES1606407-011	SB4 2.0m	EP071: C15 - C28 Fraction	---	100	mg/kg	<100	<100	0.00	No Limit
		EP071: C29 - C36 Fraction	---	100	mg/kg	<100	<100	0.00	No Limit
		EP071: C10 - C14 Fraction	---	50	mg/kg	<50	<50	0.00	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 405762)									
ES1605765-126	Anonymous	EP080: C6 - C9 Fraction	---	10	mg/kg	<10	<10	0.00	No Limit
ES1606532-005	Anonymous	EP080: C6 - C9 Fraction	---	10	mg/kg	<10	<10	0.00	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 404916)									
ES1606407-001	SB1 0.5m	EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	0.00	No Limit
ES1606407-012	SB4 4.0m	EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	0.00	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 405170)									
ES1606407-001	SB1 0.5m	EP071: >C16 - C34 Fraction	---	100	mg/kg	<100	<100	0.00	No Limit
		EP071: >C34 - C40 Fraction	---	100	mg/kg	<100	<100	0.00	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 405170) - continued									
ES1606407-001	SB1 0.5m	EP071: >C10 - C16 Fraction	---	50	mg/kg	<50	<50	0.00	No Limit
ES1606407-011	SB4 2.0m	EP071: >C16 - C34 Fraction	---	100	mg/kg	<100	<100	0.00	No Limit
		EP071: >C34 - C40 Fraction	---	100	mg/kg	<100	<100	0.00	No Limit
		EP071: >C10 - C16 Fraction	---	50	mg/kg	<50	<50	0.00	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 405762)									
ES1605765-126	Anonymous	EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	0.00	No Limit
ES1606532-005	Anonymous	EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	0.00	No Limit
EP080: BTEXN (QC Lot: 404916)									
ES1606407-001	SB1 0.5m	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.00	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Naphthalene	91-20-3	1	mg/kg	<1	<1	0.00	No Limit
ES1606407-012	SB4 4.0m	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.00	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Naphthalene	91-20-3	1	mg/kg	<1	<1	0.00	No Limit
EP080: BTEXN (QC Lot: 405762)									
ES1605765-126	Anonymous	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.00	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Naphthalene	91-20-3	1	mg/kg	<1	<1	0.00	No Limit
ES1606532-005	Anonymous	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.00	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Naphthalene	91-20-3	1	mg/kg	<1	<1	0.00	No Limit

Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Spike (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **SOIL**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EG005T: Total Metals by ICP-AES (QCLot: 408867)								
EG005T: Lead	7439-92-1	5	mg/kg	<5	40 mg/kg	93.4	80	114
EP080/071: Total Petroleum Hydrocarbons (QCLot: 404916)								
EP080: C6 - C9 Fraction	---	10	mg/kg	<10	26 mg/kg	91.0	68	128
EP080/071: Total Petroleum Hydrocarbons (QCLot: 405170)								
EP071: C10 - C14 Fraction	---	50	mg/kg	<50	200 mg/kg	102	75	129
EP071: C15 - C28 Fraction	---	100	mg/kg	<100	300 mg/kg	115	77	131
EP071: C29 - C36 Fraction	---	100	mg/kg	<100	200 mg/kg	102	71	129
EP080/071: Total Petroleum Hydrocarbons (QCLot: 405762)								
EP080: C6 - C9 Fraction	---	10	mg/kg	<10	26 mg/kg	83.7	68	128
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 404916)								
EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	31 mg/kg	96.0	68	128
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 405170)								
EP071: >C10 - C16 Fraction	---	50	mg/kg	<50	250 mg/kg	99.7	77	125
EP071: >C16 - C34 Fraction	---	100	mg/kg	<100	350 mg/kg	112	74	138
EP071: >C34 - C40 Fraction	---	100	mg/kg	<100	150 mg/kg	96.6	63	131
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 405762)								
EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	31 mg/kg	84.1	68	128
EP080: BTEXN (QCLot: 404916)								
EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	1 mg/kg	89.2	62	116
EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	1 mg/kg	93.4	65	117
EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	2 mg/kg	90.5	66	118
EP080: Naphthalene	91-20-3	1	mg/kg	<1	1 mg/kg	73.8	63	119
EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	1 mg/kg	88.4	68	120
EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	1 mg/kg	88.5	67	121
EP080: BTEXN (QCLot: 405762)								
EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	1 mg/kg	81.6	62	116
EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	1 mg/kg	87.0	65	117
EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	2 mg/kg	90.8	66	118
EP080: Naphthalene	91-20-3	1	mg/kg	<1	1 mg/kg	85.4	63	119
EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	1 mg/kg	89.9	68	120
EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	1 mg/kg	88.0	67	121

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **SOIL**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EG005T: Total Metals by ICP-AES (QCLot: 408867)							
EB1607510-069	Anonymous	EG005T: Lead	7439-92-1	250 mg/kg	94.7	70	130
EP080/071: Total Petroleum Hydrocarbons (QCLot: 404916)							
ES1606407-001	SB1 0.5m	EP080: C6 - C9 Fraction	---	32.5 mg/kg	73.2	70	130
EP080/071: Total Petroleum Hydrocarbons (QCLot: 405170)							
ES1606407-001	SB1 0.5m	EP071: C10 - C14 Fraction	---	523 mg/kg	125	73	137
		EP071: C15 - C28 Fraction	---	2319 mg/kg	102	53	131
		EP071: C29 - C36 Fraction	---	1714 mg/kg	122	52	132
EP080/071: Total Petroleum Hydrocarbons (QCLot: 405762)							
ES1605765-126	Anonymous	EP080: C6 - C9 Fraction	---	32.5 mg/kg	87.7	70	130
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 404916)							
ES1606407-001	SB1 0.5m	EP080: C6 - C10 Fraction	C6_C10	37.5 mg/kg	74.9	70	130
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 405170)							
ES1606407-001	SB1 0.5m	EP071: >C10 - C16 Fraction	---	860 mg/kg	96.7	73	137
		EP071: >C16 - C34 Fraction	---	3223 mg/kg	118	53	131
		EP071: >C34 - C40 Fraction	---	1058 mg/kg	111	52	132
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 405762)							
ES1605765-126	Anonymous	EP080: C6 - C10 Fraction	C6_C10	37.5 mg/kg	83.5	70	130
EP080: BTEXN (QCLot: 404916)							
ES1606407-001	SB1 0.5m	EP080: Benzene	71-43-2	2.5 mg/kg	75.3	70	130
		EP080: Ethylbenzene	100-41-4	2.5 mg/kg	73.3	70	130
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2.5 mg/kg	73.1	70	130
		EP080: Naphthalene	91-20-3	2.5 mg/kg	82.0	70	130
		EP080: ortho-Xylene	95-47-6	2.5 mg/kg	72.7	70	130
		EP080: Toluene	108-88-3	2.5 mg/kg	74.0	70	130
EP080: BTEXN (QCLot: 405762)							
ES1605765-126	Anonymous	EP080: Benzene	71-43-2	2.5 mg/kg	71.4	70	130
		EP080: Ethylbenzene	100-41-4	2.5 mg/kg	80.4	70	130
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2.5 mg/kg	80.3	70	130
		EP080: Naphthalene	91-20-3	2.5 mg/kg	78.2	70	130
		EP080: ortho-Xylene	95-47-6	2.5 mg/kg	82.3	70	130

Sub-Matrix: **SOIL**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*Concentration*	*MS*	*Low*	*High*
EP080: BTEXN (QCLot: 405762) - continued							
ES1605765-126	Anonymous	EP080: Toluene	108-88-3	2.5 mg/kg	77.1	70	130

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **ES1606407**	Page	: 1 of 5
Client	: **AURORA ENVIRONMENTAL CONSULTING**	Laboratory	: Environmental Division Sydney
Contact	: MR TIM BROWN	Telephone	: +61-2-8784 8555
Project	: BLUEYS BEACH	Date Samples Received	: 22-Mar-2016
Site	: BLUEYS BEACH	Issue Date	: 01-Apr-2016
Sampler	: TIM BROWN	No. of samples received	: 20
Order number	: ---	No. of samples analysed	: 20

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **NO Matrix Spike outliers occur.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **NO Analysis Holding Time Outliers exist.**

Outliers : Frequency of Quality Control Samples

- **NO Quality Control Sample Frequency Outliers exist.**

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)		Sample Date	Extraction / Preparation			Analysis		
			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA055: Moisture Content								
Soil Glass Jar - Unpreserved (EA055-103)								
SB1 0.5m,	SB1 2.0m,	**22-Mar-2016**	---	---	---	**24-Mar-2016**	05-Apr-2016	✓
SB1 4.0m,	SB2 0.5m,							
SB2 2.0m,	SB2 4.0m,							
SB3 0.5m,	SB3 2.0m,							
SB3 4.0m,	SB4 0.5m,							
SB4 2.0m,	SB4 4.0m,							
SB5 0.5m,	SB5 2.0m,							
SB5 4.0m,	SB6 0.5m,							
SB6 2.0m,	SB6 4.0m,							
QS1,	QS2							
EG005T: Total Metals by ICP-AES								
Soil Glass Jar - Unpreserved (EG005T)								
SB1 2.0m,	SB2 2.0m,	**22-Mar-2016**	**30-Mar-2016**	18-Sep-2016	✓	**31-Mar-2016**	18-Sep-2016	✓
SB3 2.0m,	SB4 2.0m,							
SB5 2.0m,	SB6 2.0m							
EP080/071: Total Petroleum Hydrocarbons								
Soil Glass Jar - Unpreserved (EP071)								
SB1 0.5m,	SB1 2.0m,	**22-Mar-2016**	**30-Mar-2016**	05-Apr-2016	✓	**31-Mar-2016**	09-May-2016	✓
SB1 4.0m,	SB2 0.5m,							
SB2 2.0m,	SB2 4.0m,							
SB3 0.5m,	SB3 2.0m,							
SB3 4.0m,	SB4 0.5m,							
SB4 2.0m,	SB4 4.0m,							
SB5 0.5m,	SB5 2.0m,							
SB5 4.0m,	SB6 0.5m,							
SB6 2.0m,	SB6 4.0m,							
QS1,	QS2							

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)		Sample Date	Extraction / Preparation			Analysis		
			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP080/071: Total Petroleum Hydrocarbons								
Soil Glass Jar - Unpreserved (EP080)								
SB3 2.0m		**22-Mar-2016**	**24-Mar-2016**	05-Apr-2016	✓	**30-Mar-2016**	05-Apr-2016	✓
Soil Glass Jar - Unpreserved (EP080)								
SB1 0.5m,	SB1 2.0m,	**22-Mar-2016**	**24-Mar-2016**	05-Apr-2016	✓	**31-Mar-2016**	05-Apr-2016	✓
SB1 4.0m,	SB2 0.5m,							
SB2 2.0m,	SB2 4.0m,							
SB3 0.5m,	SB3 4.0m,							
SB4 0.5m,	SB4 2.0m,							
SB4 4.0m,	SB5 0.5m,							
SB5 2.0m,	SB5 4.0m,							
SB6 0.5m,	SB6 2.0m,							
SB6 4.0m,	QS1,							
QS2								

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **SOIL**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Moisture Content	EA055-103	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	4	35	**11.43**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Total Metals by ICP-AES	EG005T	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	2	35	**5.71**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Total Metals by ICP-AES	EG005T	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	2	35	**5.71**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Total Metals by ICP-AES	EG005T	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	2	35	**5.71**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
Moisture Content	EA055-103	SOIL	In house: A gravimetric procedure based on weight loss over a 12 hour drying period at 103-105 degrees C. This method is compliant with NEPM (2013) Schedule B(3) Section 7.1 and Table 1 (14 day holding time).
Total Metals by ICP-AES	EG005T	SOIL	In house: Referenced to APHA 3120; USEPA SW 846 - 6010. Metals are determined following an appropriate acid digestion of the soil. The ICPAES technique ionises samples in a plasma, emitting a characteristic spectrum based on metals present. Intensities at selected wavelengths are compared against those of matrix matched standards. This method is compliant with NEPM (2013) Schedule B(3)
TRH - Semivolatile Fraction	EP071	SOIL	In house: Referenced to USEPA SW 846 - 8015A Sample extracts are analysed by Capillary GC/FID and quantified against alkane standards over the range C10 - C40.
TRH Volatiles/BTEX	EP080	SOIL	In house: Referenced to USEPA SW 846 - 8260B Extracts are analysed by Purge and Trap, Capillary GC/MS. Quantification is by comparison against an established 5 point calibration curve.

Preparation Methods	Method	Matrix	Method Descriptions
Hot Block Digest for metals in soils sediments and sludges	EN69	SOIL	In house: Referenced to USEPA 200.2. Hot Block Acid Digestion 1.0g of sample is heated with Nitric and Hydrochloric acids, then cooled. Peroxide is added and samples heated and cooled again before being filtered and bulked to volume for analysis. Digest is appropriate for determination of selected metals in sludge, sediments, and soils. This method is compliant with NEPM (2013) Schedule B(3) (Method 202)
Methanolic Extraction of Soils for Purge and Trap	* ORG16	SOIL	In house: Referenced to USEPA SW 846 - 5030A. 5g of solid is shaken with surrogate and 10mL methanol prior to analysis by Purge and Trap - GC/MS.
Tumbler Extraction of Solids	ORG17	SOIL	In house: Mechanical agitation (tumbler). 10g of sample, Na2SO4 and surrogate are extracted with 30mL 1:1 DCM/Acetone by end over end tumble. The solvent is decanted, dehydrated and concentrated (by KD) to the desired volume for analysis.

AURORA ENVIRONMENTAL CONSULTING

COC number: _____

Aurora

SITE, COC AND CONTACT DATA

Site Name:	BLUEYS BEACH	Sampler Name:	T. BROWN
ALS Quote	SY/561/15	Contact Number:	0438233779
Job No.:	BLUEYS BEACH	Contact e-mail:	
Required TAT:	24 hrs 48 hrs 3 days 5days 7 days	PM name (if not sampler):	Tim Brown
Data QA level:		PM e-mail:	tim@auroraenvironmentalconsulting.com.au

Laboratory:
ALS Sydney
277 Woodpark Rd
Smithfield NSW 2164
Contact: Barbara Hanna
Phone: (02) 87848555 Fax: (02) 87848550

CHAIN OF CUSTODY

Relinquished by (print):	T. BROWN	Received by (print):	Mark Spencer	Relinquished:		Received by:	Ravi
(sign)		(sign)		(sign)		(sign)	
Date / Time:	22-3-16	Date / Time:	5:01pm 22/03	Date / Time:		Date / Time:	23/3/16 10:42
Notes:	" BLUEYS "	Temp. (°C)	1.C	Notes:		Temp. (°C)	3.6 C
		Notes:	ice present / no ice seals intact / no seal			Notes:	ice present / no ice seals intact / no seal

Send Results to:
Mr Tim Brown
PO Box 165 Newcastle NSW 2300

tim@auroraenvironmentalconsulting.com.au
Phone: 0438233779

	Sample ID	Lab ID	Sample Point	Sample Type	Date	Start Depth	End Depth	Units	# Containers	Organic Analytes: TPH	BTEX	PAH	EPA SCREEN	OCPs	PCBs				Metals: Lead	8 metals		Other Analytes					Comments
1	SB1 0.5m		BH	Soil	22/3/16				1x	✓	✓																
2	SB1 2.0m									✓	✓								✓								
3	SB1 4.0m									✓	✓																
4	SB2 0.5m									✓	✓																
5	SB2 2.0m									✓	✓								✓								
6	SB2 4.0m									✓	✓																
7	SB 3 0.5m									✓	✓																
8	SB 3 2.0m									✓	✓								✓								
9	SB 3 4.0m									✓	✓																
10	SB 4 0.5m									✓	✓																
11	SB 4 2.0m									✓	✓								✓								
12	SB 4 4.0m									✓	✓																
13	SB5 0.5m									✓	✓																
14	SB5 2.0m									✓	✓								✓								
15	SB5 4.0m									✓	✓																
16	SB6 0.5m									✓	✓																

Environmental Division
Sydney
Work Order Reference
ES1606407

Telephone : +61-2-8784 8555

Notes:
8 metals: As, Cd, Cr, Cu, Pb, Hg, Ni & Zn
16 metals: Sb, As, Be, Cd, Cr, Co, Cu, Pb, Mo, Hg, Ni, Se, Ag, Sn, V and Zn
Nat. Att. Param.: CH_4, NO_3^{2-}, SO_4^{2-} and Fe^{2+}
Sample Point : HA, BH, MW, GR, ST, A, N/A
Sample Type: Soil, Groundwater, Surface water, Sediment, Soil Vapour, Trade Waste, Stormwater, Air, QC
Depth Units: m, cm, mm, N/A

E-MAILED

AURORA ENVIRONMENTAL CONSULTING

Page 2 of 2 COC number: _____

Aurora

SITE, COC AND CONTACT DATA

Site Name:	BLUEYS BEACH	Sampler Name:	T.Brown
ALS Quote	SY/561/15	Contact Number:	0438 233779
Job No.:	BLUEYS BEACH	Contact e-mail:	
Required TAT:	24 hrs 48 hrs 3 days 5days 7 days	PM name (if not sampler):	Tim Brown
Data QA level:		PM e-mail:	tim@auroraenvironmentalconsulting.com.au

Laboratory:
ALS Sydney
277 Woodpark Rd
Smithfield NSW 2164
Contact: Barbara Hanna
Phone: (02) 87848555 Fax: (02) 87848550

CHAIN OF CUSTODY

Relinquished by (print): T.Brown		Received by (print):		Relinquished:	Received by:
(sign)		(sign)		(sign)	(sign)
Date / Time:		Date / Time:		Date / Time:	Date / Time: 23/3/16 19:00
Notes: BLUEYS BH		Temp. (°C)		Notes:	Temp. (°C) 3.6
		Notes:	ice present / no ice seals intact / no seal		Notes: ice present / no ice seals intact / no seal

Send Results to:
Mr Tim Brown
PO Box 165 Newcastle NSW 2300
tim@auroraenvironmentalconsulting.com.au
Phone: 0438233779

									Organic Analytes								Metals			Other Analytes					
Sample ID	Lab ID	Sample Point	Sample Type	Date	Start Depth	End Depth	Units	# Containers	TPH	BTEX	PAH	EPA SCREEN	OCPs	PCBs			Lead	8 metals							Comments
17 SB6 2-0m		BH	Soil	22/3/16				1x	✓	✓							✓								
18 SB6 4-0m		↓	↓	↓				↓	✓	✓															
19 QS1									✓	✓															
20 QS2		↓	↓	↓				↓	✓	✓															

Notes:
8 metals: As, Cd, Cr, Cu, Pb, Hg, Ni & Zn
Sample Point : HA, BH, MW, GR, ST, A, N/A
15 metals: Sb, As, Be, Cd, Cr, Co, Cu, Pb, Mo, Hg, Ni, Se, Ag, Sn, V and Zn
Sample Type: Soil, Groundwater, Surface water, Sediment, Soil Vapour, Trade Waste, Stormwater, Air, QC
Nat. Att. Param.: CH_4, NO_3^{2-}, SO_4^{2-} and Fe^{2+}
Depth Units: m, cm, mm, N/A

E-MAILED

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **ES1606746**	Page	: 1 of 4
Client	: **AURORA ENVIRONMENTAL CONSULTING**	Laboratory	: Environmental Division Sydney
Contact	: MR TIM BROWN	Contact	:
Address	: PO BOX 165 NEWCASTLE NSW,AUSTRALIA 2300	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: +61 04 3823 3779	Telephone	: +61-2-8784 8555
Project	: BLUEYS BEACH	Date Samples Received	: 29-Mar-2016 14:15
Order number	: ----	Date Analysis Commenced	: 30-Mar-2016
C-O-C number	: ----	Issue Date	: 05-Apr-2016 16:16
Sampler	: TIM BROWN		
Site	: BLUEYS BEACH		
Quote number	: ----		
No. of samples received	: 4		
No. of samples analysed	: 4		

NATA Accredited Laboratory 825
Accredited for compliance with
ISO/IEC 17025.

NATA
WORLD RECOGNISED ACCREDITATION

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Edwandy Fadjar	Organic Coordinator	Sydney Organics, Smithfield, NSW

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.

Analytical Results

Sub-Matrix: **GROUNDWATER** (Matrix: **WATER**)			Client sample ID	MW1	MW2	MW3	QW1	----
			Client sampling date / time	[29-Mar-2016]	[29-Mar-2016]	[29-Mar-2016]	[29-Mar-2016]	----
Compound	*CAS Number*	*LOR*	*Unit*	**ES1606746-001**	**ES1606746-002**	**ES1606746-003**	**ES1606746-004**	--------
				Result	Result	Result	Result	Result
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	20	µg/L	**22500**	**1180**	**1700**	**21200**	----
C10 - C14 Fraction	----	50	µg/L	**2430**	**720**	**760**	----	----
C15 - C28 Fraction	----	100	µg/L	**100**	**250**	<100	----	----
C29 - C36 Fraction	----	50	µg/L	<50	<50	<50	----	----
^ **C10 - C36 Fraction (sum)**	----	50	µg/L	**2530**	**970**	**760**	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	20	µg/L	**24300**	**1610**	**2070**	**22700**	----
^ **C6 - C10 Fraction minus BTEX (F1)**	C6_C10-BTEX	20	µg/L	**11800**	**1280**	**1060**	**10400**	----
>C10 - C16 Fraction	----	100	µg/L	**1810**	**580**	**520**	----	----
>C16 - C34 Fraction	----	100	µg/L	<100	**200**	<100	----	----
>C34 - C40 Fraction	----	100	µg/L	<100	<100	<100	----	----
^ **>C10 - C40 Fraction (sum)**	----	100	µg/L	**1810**	**780**	**520**	----	----
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	100	µg/L	**1550**	**490**	**500**	----	----
EP080: BTEXN								
Benzene	71-43-2	1	µg/L	**3480**	**26**	**528**	**3340**	----
Toluene	108-88-3	2	µg/L	**3840**	<2	**3**	**3870**	----
Ethylbenzene	100-41-4	2	µg/L	**1060**	**179**	**39**	**1030**	----
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	**2990**	**111**	**378**	**3000**	----
ortho-Xylene	95-47-6	2	µg/L	**1180**	**14**	**58**	**1070**	----
^ **Total Xylenes**	1330-20-7	2	µg/L	**4170**	**125**	**436**	**4070**	----
^ **Sum of BTEX**	----	1	µg/L	**12600**	**330**	**1010**	**12300**	----
Naphthalene	91-20-3	5	µg/L	**258**	**92**	**24**	**246**	----
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	2	%	**106**	**113**	**102**	**109**	----
Toluene-D8	2037-26-5	2	%	**107**	**116**	**104**	**111**	----
4-Bromofluorobenzene	460-00-4	2	%	**109**	**122**	**89.7**	**112**	----

Surrogate Control Limits

Sub-Matrix: **GROUNDWATER**		Recovery Limits (%)	
Compound	*CAS Number*	*Low*	*High*
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	71	137
Toluene-D8	2037-26-5	79	131
4-Bromofluorobenzene	460-00-4	70	128

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **ES1606746**	Page	: 1 of 4
Client	: **AURORA ENVIRONMENTAL CONSULTING**	Laboratory	: Environmental Division Sydney
Contact	: MR TIM BROWN	Contact	:
Address	: PO BOX 165 NEWCASTLE NSW,AUSTRALIA 2300	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: +61 04 3823 3779	Telephone	: +61-2-8784 8555
Project	: BLUEYS BEACH	Date Samples Received	: 29-Mar-2016
Order number	: ----	Date Analysis Commenced	: 30-Mar-2016
C-O-C number	: ----	Issue Date	: 05-Apr-2016
Sampler	: TIM BROWN		
Site	: BLUEYS BEACH		
Quote number	: ----		
No. of samples received	: 4		
No. of samples analysed	: 4		

NATA Accredited Laboratory 825
Accredited for compliance with
ISO/IEC 17025.

NATA
WORLD RECOGNISED
ACCREDITATION

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Edwandy Fadjar	Organic Coordinator	Sydney Organics, Smithfield, NSW

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 409746)									
EN1601176-001	Anonymous	EP080: C6 - C9 Fraction	---	20	µg/L	<20	<20	0.00	No Limit
ES1606656-005	Anonymous	EP080: C6 - C9 Fraction	---	20	µg/L	<20	<20	0.00	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 409746)									
EN1601176-001	Anonymous	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	0.00	No Limit
ES1606656-005	Anonymous	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	0.00	No Limit
EP080: BTEXN (QC Lot: 409746)									
EN1601176-001	Anonymous	EP080: Benzene	71-43-2	1	µg/L	<1	<1	0.00	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.00	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	0.00	No Limit
		EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.00	No Limit
		EP080: Toluene	108-88-3	2	µg/L	<2	<2	0.00	No Limit
		EP080: Naphthalene	91-20-3	5	µg/L	<5	<5	0.00	No Limit
ES1606656-005	Anonymous	EP080: Benzene	71-43-2	1	µg/L	<1	<1	0.00	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.00	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	0.00	No Limit
		EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.00	No Limit
		EP080: Toluene	108-88-3	2	µg/L	<2	<2	0.00	No Limit
		EP080: Naphthalene	91-20-3	5	µg/L	<5	<5	0.00	No Limit

Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Spike (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EP080/071: Total Petroleum Hydrocarbons (QCLot: 407931)								
EP071: C10 - C14 Fraction	---	50	µg/L	<50	2000 µg/L	104	76	116
EP071: C15 - C28 Fraction	---	100	µg/L	<100	3000 µg/L	97.9	83	109
EP071: C29 - C36 Fraction	---	50	µg/L	<50	2000 µg/L	97.5	75	113
EP080/071: Total Petroleum Hydrocarbons (QCLot: 409746)								
EP080: C6 - C9 Fraction	---	20	µg/L	<20	260 µg/L	88.6	75	127
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 407931)								
EP071: >C10 - C16 Fraction	---	100	µg/L	<100	2500 µg/L	103	76	114
EP071: >C16 - C34 Fraction	---	100	µg/L	<100	3500 µg/L	97.5	81	111
EP071: >C34 - C40 Fraction	---	100	µg/L	<100	1500 µg/L	103	77	119
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 409746)								
EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	310 µg/L	87.0	75	127
EP080: BTEXN (QCLot: 409746)								
EP080: Benzene	71-43-2	1	µg/L	<1	10 µg/L	86.7	70	122
EP080: Ethylbenzene	100-41-4	2	µg/L	<2	10 µg/L	84.4	70	120
EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	10 µg/L	83.8	69	121
EP080: Naphthalene	91-20-3	5	µg/L	<5	10 µg/L	89.9	70	120
EP080: ortho-Xylene	95-47-6	2	µg/L	<2	10 µg/L	86.8	72	122
EP080: Toluene	108-88-3	2	µg/L	<2	10 µg/L	83.0	69	123

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP080/071: Total Petroleum Hydrocarbons (QCLot: 409746)							
EN1601176-001	Anonymous	EP080: C6 - C9 Fraction	---	325 µg/L	87.2	70	130
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 409746)							
EN1601176-001	Anonymous	EP080: C6 - C10 Fraction	C6_C10	375 µg/L	86.9	70	130
EP080: BTEXN (QCLot: 409746)							
EN1601176-001	Anonymous	EP080: Benzene	71-43-2	25 µg/L	82.8	70	130

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*Concentration*	*MS*	*Low*	*High*
EP080: BTEXN (QCLot: 409746) - continued							
EN1601176-001	Anonymous	EP080: Ethylbenzene	100-41-4	25 µg/L	80.7	70	130
		EP080: meta- & para-Xylene	108-38-3 106-42-3	25 µg/L	80.4	70	130
		EP080: Naphthalene	91-20-3	25 µg/L	90.0	70	130
		EP080: ortho-Xylene	95-47-6	25 µg/L	83.1	70	130
		EP080: Toluene	108-88-3	25 µg/L	83.4	70	130

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **ES1606746**	Page	: 1 of 4
Client	: **AURORA ENVIRONMENTAL CONSULTING**	Laboratory	: Environmental Division Sydney
Contact	: MR TIM BROWN	Telephone	: +61-2-8784 8555
Project	: BLUEYS BEACH	Date Samples Received	: 29-Mar-2016
Site	: BLUEYS BEACH	Issue Date	: 05-Apr-2016
Sampler	: TIM BROWN	No. of samples received	: 4
Order number	: ----	No. of samples analysed	: 4

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **NO Matrix Spike outliers occur.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **NO Analysis Holding Time Outliers exist.**

Outliers : Frequency of Quality Control Samples

- **Quality Control Sample Frequency Outliers exist - please see following pages for full details.**

Outliers : Frequency of Quality Control Samples

Matrix: **WATER**

Quality Control Sample Type	Count		Rate (%)		Quality Control Specification
Method	QC	Regular	Actual	Expected	
Laboratory Duplicates (DUP)					
TRH - Semivolatile Fraction	0	19	0.00	10.00	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)					
TRH - Semivolatile Fraction	0	19	0.00	5.00	NEPM 2013 B3 & ALS QC Standard

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / *Container / Client Sample ID(s)*	*Sample Date*	*Extraction / Preparation*			*Analysis*		
		Date extracted	*Due for extraction*	*Evaluation*	*Date analysed*	*Due for analysis*	*Evaluation*
EP080/071: Total Petroleum Hydrocarbons							
Amber Glass Bottle - Unpreserved (EP071)							
MW1, MW2, MW3	**29-Mar-2016**	**30-Mar-2016**	05-Apr-2016	✓	**04-Apr-2016**	09-May-2016	✓
EP080/071: Total Petroleum Hydrocarbons							
Amber VOC Vial - Sulfuric Acid (EP080)							
MW1, MW2, MW3, QW1	**29-Mar-2016**	**31-Mar-2016**	12-Apr-2016	✓	**31-Mar-2016**	12-Apr-2016	✓

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
TRH - Semivolatile Fraction	EP071	0	19	**0.00**	**10.00**	×	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
TRH - Semivolatile Fraction	EP071	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
TRH - Semivolatile Fraction	EP071	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
TRH - Semivolatile Fraction	EP071	0	19	**0.00**	**5.00**	×	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
TRH - Semivolatile Fraction	EP071	WATER	In house: Referenced to USEPA SW 846 - 8015A The sample extract is analysed by Capillary GC/FID and quantification is by comparison against an established 5 point calibration curve of n-Alkane standards. This method is compliant with the QC requirements of NEPM (2013) Schedule B(3)
TRH Volatiles/BTEX	EP080	WATER	In house: Referenced to USEPA SW 846 - 8260B Water samples are directly purged prior to analysis by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. Alternatively, a sample is equilibrated in a headspace vial and a portion of the headspace determined by GCMS analysis. This method is compliant with the QC requirements of NEPM (2013) Schedule B(3)

Preparation Methods	Method	Matrix	Method Descriptions
Separatory Funnel Extraction of Liquids	ORG14	WATER	In house: Referenced to USEPA SW 846 - 3510B 100 mL to 1L of sample is transferred to a separatory funnel and serially extracted three times using 60mL DCM for each extract. The resultant extracts are combined, dehydrated and concentrated for analysis. This method is compliant with NEPM (2013) Schedule B(3) . ALS default excludes sediment which may be resident in the container.
Volatiles Water Preparation	ORG16-W	WATER	A 5 mL aliquot or 5 mL of a diluted sample is added to a 40 mL VOC vial for sparging.

AURORA ENVIRONMENTAL CONSULTING

Page 1 of 1 COC number:

Aurora

SITE, COC AND CONTACT DATA

Site Name:	BLUEYS BEACH	Sampler Name:	T. BROWN
ALS Quote	SY/561/15	Contact Number:	0438 233779
Job No.:	BLUEYS BEACH	Contact e-mail:	
Required TAT:	24 hrs 48 hrs 3 days 5days 7 days	PM name (if not sampler):	Tim Brown
Data QA level:		PM e-mail:	tim@auroraenvironmentalconsulting.com.au

Laboratory:
ALS Sydney
277 Woodpark Rd
Smithfield NSW 2164
Contact: Barbara Hanna
Phone: (02) 87848555 Fax: (02) 87848550

CHAIN OF CUSTODY

Relinquished by (print):	T. BROWN	Received by (print):	M McRAE	Relinquished:		Received by:	Ray
(sign)		(sign)		(sign)		(sign)	
Date / Time:	29-3-16	Date / Time:	29/3/16 14:15	Date / Time:		Date / Time:	29/3/16
Notes:	"BLUEYS"	Temp. (°C)	8	Notes:		Temp. (°C)	37°C.
		Notes:	ice present / no ice seals intact / no seal			Notes:	ice present / no ice seals intact / no seal

Send Results to:
Mr Tim Brown
PO Box 165 Newcastle NSW 2300
tim@auroraenvironmentalconsulting.com.au
Phone: 0438233779

										Organic Analytes									Metals		Other Analytes					
Sample ID	Lab ID	Sample Point	Sample Type	Date	Start Depth	End Depth	Units	# Containers	TPH	BTEX	PAH	EPA SCREEN	OCPs	PCBs				Lead	8 metals						Comments
1 MW1		MW	GW	29-3-16				3x	✓	✓															
2 MW2								✓	✓	✓															
3 MW3								✓	✓	✓															
4 QW1								2x	✓	✓															

Environmental Division
Sydney
Work Order Reference
ES1606746

Telephone : + 61-2-8784 8555

Notes:
8 metals: As, Cd, Cr, Cu, Pb, Hg, Ni & Zn
16 metals: Sb, As, Be, Cd, Cr, Co, Cu, Pb, Mo, Hg, Ni, Se, Ag, Sn, V and Zn
Nat. Att. Param.: CH_4, NO_3^{2-}, SO_4^{2-} and Fe^{2+}
Sample Point : HA, BH, MW, GR, ST, A, N/A
Sample Type: Soil, Groundwater, Surface water, Sediment, Soil Vapour, Trade Waste, Stormwater, Air, QC
Depth Units: m, cm, mm, N/A

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