Phase 2 Environmental Site Assessment, Parcel 6

Prepared for:
Hydro Aluminium Kurri Kurri Pty Ltd

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Prepared by:
ENVIRON Australia Pty Ltd

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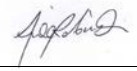
Signature:  Date:21/4/15

This document is issued in confidence to Hydro Aluminium Kurri Kurri Australia Pty Ltd for the purposes of a Phase 2 Environmental Site Assessment. It should not be used for any other purpose. The scope of the Phase 2 Environmental Site Assessment was based on ENVIRON's proposal dated 18 November 2013.

Specific assumptions and limitations identified by ENVIRON as being relevant are set out in the report. The methodology adopted and sources of information used by ENVIRON are outlined in our scope of work. ENVIRON has made no independent verification of this information beyond the agreed scope of works.

This report should be read in full.

VERSION CONTROL RECORD

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Acronyms and Abbreviations

ACM	Asbestos Containing Materials
AHD	Australian Height Datum
ALS	Australian Laboratory Services
BGL	Below Ground Level
CT	Certificate of Title
DEC	NSW Department of Environment and Conservation, now EPA
DP	Deposited Plan
DQI	Data Quality Indicator
DQO	Data Quality Objective
EIL	Ecological Investigation Level
EPA	NSW Environment Protection Authority
ESA	Environmental Site Assessment
F	Fluoride
GMU	Groundwater Management Unit
GPS	Global Positioning System
Ha	Hectare
HIL	Health Investigation Level
HSL	Health Screening Level
HRA	Health Risk Assessment
km	Kilometres
LOR	Limit of Reporting
m	Metres
mg/kg	Milligrams per Kilogram
mg/L	Milligrams per Litre
m AHD	Metres relative to the Australian Height Datum
m BGL	Metres below ground level
mg/L	Micrograms per Litre
NATA	National Association of Testing Authorities
ND	Not Detected
NEHF	National Environmental Health Forum
NEPC	National Environment Protection Council
NEPM	National Environment Protection Measure
NHMRC	National Health and Medical Research Council
NSW	New South Wales
n	Number of Samples
OH&S	Occupational Health & Safety
PQL	Practical Quantitation Limit
QA/QC	Quality Assurance/Quality Control
RPD	Relative Percent Difference
UCL	Upper Confidence Limit
µg/L	Micrograms per Litre
VENM	virgin excavated natural material
-	On tables is "not calculated", "no criteria" or "not applicable"

Executive Summary

This report presents the findings of a Phase 2 Environmental Site Assessment undertaken on part of the Hydro Aluminium Kurri Kurri (Hydro) owned land known as Parcel 6. Parcel 6 is a rural property comprising approximately 31ha and is accessed from Graham Lane, Loxford and located within the buffer zone and to the west of the Hydro Aluminium Kurri Kurri Smelter. Parcel 6 comprises bushland, with some areas of disturbed land and limited tree cover.

The objectives of this Phase 2 ESA assessment were to assess the potential for contamination at Parcel 6 based on historical and current landuse and to assess the suitability of Parcel 6 for environmental conservation (E2) landuse.

A Phase 1 Environmental Site Assessment has previously been completed for the Hydro owned lands including Parcel 6 (ENVIRON (22 October 2013) Phase 1 ESA, Hydro Kurri Kurri Aluminium Smelter). The Phase 1 identified that contamination of Parcel 6 may have occurred from dust deposition due to the proximity of the Hydro smelter, illegal dumping due to the remoteness of the area and localised soil contamination from the demolition of a hobby farm.

To assess the potential for waste and the potential for soil contamination a site walkover was completed and surface soil samples were collected from across the parcel. Surface soil samples from across Parcel 6 were analysed for soluble fluoride and were below the preliminary screening level for residential landuse.

Two samples of asbestos containing materials (ACM) fragments were collected, one from each of the small mounds of soil and illegally dumped ACM fragments on Grahams Lane and at the location of the former hobby farm, and analysed for asbestos content. Laboratory testing confirmed that the ACM fragments contain asbestos. No other soil contamination issues were identified at Parcel 6.

Parcel 6 is considered suitable for the current landuse and the proposed environmental conservation (E2) land use.

Hydro has separately engaged a NSW EPA-accredited Site Auditor to issue a Site Audit Statement certifying that the site is suitable for the proposed use.

ENVIRON considers that interim management is required to remove illegally dumped wastes and secure the site, as follows:

- The ACM fragments in a soil stockpile on Grahams Lane are not located on Parcel 6. As Hydro manages Grahams Lane as part of the buffer zone, Hydro should contact the owner of Grahams Lane to provide notification of the dumped wastes;

- An appropriately licenced asbestos removal contractor be engaged to remove and dispose of the asbestos waste located within fill mounds at the former hobby farm. Validation of this area following removal should be undertaken by an appropriately qualified consultant and documented.

- It is noted that Parcel 6 contains numerous small stockpiles of soil with construction waste such as concrete and metal scrap. This material should be removed for aesthetic reasons.

1 Introduction

1.1 Background

This report presents the findings of a Phase 2 Environmental Site Assessment undertaken on part of the Hydro Aluminium Kurri Kurri Pty Limited (Hydro) owned land known as Parcel 6. Parcel 6 is located off Grahams Lane, Loxford, New South Wales (2326). The location of Parcel 6 is shown in **Figure 1**.

The work has been performed at the request of Hydro Aluminium Kurri Kurri Pty Limited (the "Client").

Hydro is currently evaluating options for the divestment of land parcels for a range of future land uses following the closure of the smelter in May 2014. A Rezoning Masterplan has been developed that identifies Parcel 6 to comprise land suitable for environmental conservation (E2) land use.

A Phase 1 Environmental Site Assessment has previously been prepared for all Hydro owned lands and evaluated the potential for contamination. The Phase 1 identified that contamination of Parcel 6 may have occurred from dust deposition due to the proximity of the Hydro smelter, illegal dumping due to the remoteness of the area and activities associated with a former hobby farm.

It is noted that at the time of the fieldwork, this land parcel was named Employment Land Subarea 6 and as such the soil samples reference this name. Since this time the parcel has been renamed Parcel 6.

The location of Parcel 6 in the context of the Rezoning Masterplan is shown in **Figure 2**.

1.2 Objectives and Scope of Work

The objectives of the assessment were to assess the potential for contamination at Parcel 6 based on historical and current land use and to assess the suitability of Parcel 6 for environmental conservation (E2) land use.

The scope of work performed to meet the objectives comprised:

- A review of available information relating to land use to assess the potential for soil, groundwater or surface water contamination arising from historic and current activities;
- A review of published geological, hydrogeological and hydrological data to establish the environmental setting and sensitivity;
- Field work comprising:
  - Collection of surface soil samples to provide a coarse grid assessment of the potential for dust deposition from the smelter operations;
  - A site walkover to evaluate other potential locations of buried waste or illegal dumping.
- Data interpretation including comparison against relevant guidelines and a discussion of the findings in terms of human health and environment risk under the current and future land use scenarios.

- Review of options available for remediation or management to render Parcel 6 suitable for the current and proposed land use, if required.

2 Site Description

2.1 Site Location

Parcel 6 is owned by Hydro Aluminium Kurri Kurri Pty Limited and is located approximately 35km north west of the city of Newcastle and 150km north of Sydney, in the suburb of Loxford, Kurri Kurri, New South Wales, Australia. Parcel 6 is accessed from Graham Lane. The location of Parcel 6 is shown in **Figure 1**.

Parcel 6 is located within the Buffer Zone of the Hydro Aluminium Kurri Kurri Smelter, to the west of the smelter. The Buffer Zone is an area of land surrounding the smelter that provides a buffer between the smelter and surrounding communities. Parcel 6 generally comprises bushland, with some areas of disturbed land and limited tree cover.

Parcel 6 is located within the Cessnock Local Government Area and is zoned RU2 – Rural Landscape under the Cessnock Local Environment Plan.

Parcel 6 is approximately 31 hectares (Ha) and comprises the lot numbers in the deposited plan (DP) listed in Table 1:

Table 1: Lot and Deposited Plans for Parcel 6.

Subarea	Lot/ DP	Area (ha)	Total Area (ha)
Parcel 6	Lot 13 DP1082775 Pt 2 Lot 15 DP1082775 Pt 2	17.9 13.6	31.5

Land uses surrounding Parcel 6 are as follows:

- North: Hunter Expressway then dense bushland;
- South: Farmland;
- East: Hunter Expressway then bushland then the smelter;
- West: Farmland.

Parcel 6 is located approximately 600m to the west of the smelter site boundary.

2.2 Site Setting

2.2.1 Topography

Parcel 6 is located in an area of the Buffer Zone that is of higher elevation at approximately 17 mAHD. The topography is relatively flat, with a gentle slope towards the centre of Parcel 6, where a tributary of Black Waterholes Creek bisects the parcel.

2.2.2 Regional Geology

According to the review of the regional geology described on the Sydney Basin Geological Sheet, Parcel 6 is underlain by siltstone, marl and minor sandstone from the Permian aged Rutherford Formation (Dalwood Group) in the Sydney Basin.

Undifferentiated Quaternary alluvium occurs on the surface of Parcel 6 associated with surface water bodies. Quaternary sediments which are associated with Black Waterholes Creek (approximately 100m south east of Parcel 6); Swamp Creek (approximately 400m south east of Parcel 6) and the Hunter River consist of gravel, sand, silt and clay.

2.2.3 Site Hydrology

Surface water from Parcel 6 discharges primarily via infiltration and overland flow to a swampy area in the north eastern portion of Parcel 6. This swampy area is a likely tributary of Black Waterholes Creek, which discharges into Wentworth Swamp, which in turn discharges to the Hunter River approximately 11km northeast of Parcel 6 near Maitland.

The Wentworth Swamp system is within the Fishery Creek Catchment, where declining stream water quality and a reduction in diversity of native plants and animals has occurred due to population growth and development pressures in the last ten years (Hunter-Central Rivers Catchment Management Authority).

2.2.4 Regional Hydrogeology

Regional groundwater is expected to follow topography and flow northeast towards the surface water bodies that discharge to the Hunter River. Locally, groundwater beneath Parcel 6 is expected to flow north east and south west towards the centre of the parcel to a tributary of Black Waterholes Creek.

According to the NSW Office of Environment and Heritage (Natural Resource Atlas), there are 21 licensed groundwater abstractions (bores) located within 2km of Parcel 6. The majority of the groundwater bores are located within the aluminium smelter and buffer zone.

Information for 11 bores located in a 2km radius from Parcel 6 has been included in **Appendix A**. The bores are used for monitoring purposes. No further information, such as depth to water or logging information was provided.

The Hunter River Alluvium Groundwater Management Unit (GMU) is an important groundwater resource to the region. Groundwater extraction for irrigation, urban supply, drought supply, stock, domestic and commercial/ industrial use occurs, with volumes in excess of 10,000ML per annum extracted from the Hunter River Alluvium GMU. Aquifer storage and recovery is also an important use of this Groundwater Management Unit. It is noted that the Hunter River GMU is not the primary drinking water supply in the region, although the protection of drinking water is a water quality objective for the Hunter River (NSW Water Quality and River Flow Objectives) (www.environment.nsw.gov.au/ieo/Hunter/index.htm).

2.3 Site Sensitivity

The sensitivity of Parcel 6 with respect to surface water and groundwater is considered to be moderate based on the following:

- Surface water and groundwater discharge into an unnamed tributary of Black Waterholes Creek, located in the north east of Parcel 6, which discharges to the Hunter River via Wentworth Swamp within the Fishery Creek Catchment, approximately 11km northeast of Parcel 6 near Maitland.

- Declining stream water quality and a reduction in diversity of native plants and animals has occurred within the Fishery Creek Catchment and water quality down gradient of Parcel 6 has been impacted by historical coal mining;

- The Hunter River Groundwater Management Unit is used for irrigation, urban supply, drought supply, stock, domestic and commercial/ industrial use but it is not the main drinking water supply in the region.

3 Site History

Site history investigations included in the Phase 1 ESA for the Hydro Aluminium Kurri Kurri Smelter, dated 26 August 2013, provided the following historical information relevant to Parcel 6:

- Earliest records (aerial photograph in 1951) showed a hobby farm in the southern portion of Lot 15. The hobby farm comprised several small buildings, which were demolished in the late 1980s.No further buildings are evident since this time. The remainder of Parcel 6 was observed to be bushland.
- Aside from the demolition of the hobby farm, no changes to the layout or use of Parcel 6 were observed in the historical aerial photograph review.
- Parcel 6 is located approximately 1km west of the smelter boundary and may be impacted from smelter dust deposition.
- The remoteness of Parcel 6 and surrounding bushland may also give rise to illegal dumping though it is noted that the Buffer Zone area is fenced and regularly monitored by Hydro personnel.

A site plan showing the location of the hobby farm is included in **Figure 3**.

4 Sampling and Analytical Quality Plan

4.1 Potential Areas and Contaminants of Concern

Based on Parcel 6 historical information as discussed in **Section 3**, the following areas of concern were identified as follows.

- Debris from demolition of the hobby farm.
- Smelter dust deposition.
- Illegal dumping.

Contaminants of concern associated with the range of previous site activities are:

- asbestos;
- fluoride.

4.2 Data Quality Objectives and Data Quality Indicators

Data quality objectives (DQOs) and Data Quality Indicators (DQIs) were developed by ENVIRON using the US EPA seven-step DQO process. Completing the seven-step process helps to define the purpose of the assessment and the type, quality and quantity of data needed to inform decisions relating to the assessment of site contamination.

The seven-step DQO process and DQIs are included in **Appendix F**.

4.3 Sampling Design

The sampling design was optimised following the development of DQOs and DQIs. The sampling design is outlined below. ENVIRON notes that the historical site activities indicate potential contamination to surface soils only. No potential contamination sources to subsurface soils, surface water or groundwater have been identified.

4.3.1 Fluoride

To assess the potential for fluoride in soil from dust deposition from the Hydro Aluminium Kurri Kurri Smelter, surface soil samples were collected at a rate of one sample per 5Ha.

The sample density is lower than that suggested in Table A of NSW EPA (1995) Contaminated Sites: Sampling Design Guidelines. The density is considered adequate for the purposes of this investigation for the following reasons:

- aerial dust deposition is likely to be relatively consistent over the surface of the parcel and therefore sampling on a low density will allow for identification of whether or not dust deposition is an issue; and
- in the event that elevated or variable fluoride concentrations are identified, additional sampling will be completed.

Samples were collected by trowel from surface soils in accessible areas of Parcel 6. As Parcel 6 comprises inaccessible dense bushland, samples were collected around the

perimeter of the bushland and in open areas, where accessible. Sample locations were logged by GPS.

Soil samples were placed into laboratory-supplied paper bags and stored in an ice-filled cooler for transportation to the laboratory. Soil samples were transported to the laboratory under chain of custody conditions. Intra-laboratory duplicate soil samples were collected at a rate of 10%.

Soil samples were analysed for soluble fluoride, as this is the portion of total fluoride that is available for uptake in receptors including biota, flora, fauna and humans. The laboratory was NATA accredited for the analysis.

4.3.2 Asbestos

To assess the potential for asbestos and other illegally dumped wastes to be present at Parcel 6, a site walkover of accessible areas was completed. ENVIRON consider that dense bushland that is not readily accessible by foot is unlikely to have been accessed for waste dumping.

The location and type of dumped wastes were detailed on Field Information Sheets and logged by GPS. Where asbestos was confidently identified by the field personnel, no sampling was completed. If not, a sample of potential asbestos containing material (ACM) was collected for laboratory analysis. ACM fragments were collected into a zip-lock bag using dedicated disposable gloves.

ACM fragments were analysed for asbestos identification by a laboratory NATA accredited for the analysis.

5 Basis for Assessment Criteria

5.1 Soil

The criteria proposed for the assessment of soil contamination were sourced from the following references:

- National Environment Protection Council (2013) National Environmental Protection (Assessment of Site Contamination) Amendment Measure 2013 (No. 1) (NEPM).

The objective of the Phase 2 ESA is to assess soil contamination at Parcel 6 in relation to risks posed to human health and the environment under the current and proposed future land use of rural land. As the contaminants of concern are fluoride and asbestos, guidelines for these contaminants under a rural land use scenario are provided below.

The Health Screening Levels (HSLs) for asbestos are applicable for assessing human health risk via the exposure pathway of inhalation of airborne asbestos and are presented in **Table 2.** The HSLs are generic to all soil types. As there is no HSL for rural landuse, the HSL for Residential A will be used and is considered conservative.

Table 2: Health screening levels for asbestos contamination in soil (w/w)

Form of asbestos	Residential A[1]	Residential B[2]	Recreational C[3]	Commercial/ Industrial D[4]
Bonded ACM	0.01%	0.04%	0.02%	0.05%
FA and AF[1] (friable asbestos)	0.001%			
All forms of asbestos	No visible asbestos for surface soil			

1. The screening level of 0.001% w/w asbestos in soil for FA and AF (i.e. non-bonded/friable asbestos) only applies where the FA and AF are able to be quantified by gravimetric procedures. This screening level is not applicable to free fibres.

NEPM (2013) do not provide criteria for fluoride in soils in Australia. ENVIRON (2013) conducted a preliminary level Human Health Risk Assessment (HRA) specific to fluoride in order to derive a specific preliminary screening level for fluoride for the Hydro Aluminium Kurri Kurri Smelter . The screening levels are protective of the range of human receptors are provided in **Table 3**.

Table 3: Site Specific Soil Assessment Criteria (mg/kg) for Fluoride	
Preliminary screening levels	
Land Use	**Preliminary screening level**
Residential landuse	F 440mg/kg
Recreational landuse	F 1200mg/kg
Commercial/ Industrial landuse	F 17,000mg/kg

Soil investigation results for the samples taken from a grid formation across Parcel 6 have been compared against the residential land use screening level. The fluoride 'residential land use' screening level is considered to be suitably protective of both 'residential' and 'rural' land use because the exposure pathways (including vegetable ingestion) and behavioural assumptions (e.g. soil ingestion rate) for the child are considered to be identical under residential and rural land use scenarios.

There is a possibility that the rural plots may contain a low density of domestic livestock such as poultry and goats, however there is limited evidence of fluoride accumulation in milk and edible tissues of animals fed high levels of fluorides (ATSDR, 2003; NAS, 1971). Rather, fluoride accumulates primarily (up to approximately 99%) in the skeletal tissues of terrestrial animals that consume fluoride-containing foliage (WHO, 1997; ATSDR, 2003). This assumption is supported by site-specific data collected during the 29th annual cattle survey conducted in March 2012 on cattle located within the site's buffer zone, and surrounding areas (AECOM, 2013). The results of this survey concluded that cattle has had little or no exposure to excess environmental fluoride; skeletal fluoride levels decreased compared to 2011 levels, with all fluoride measurements below the toxic threshold; and all cattle examined were in good health and body condition. Consequently, the residential screening level is considered to be suitably protective of rural land use that may contain a low density of domestic livestock.

Consistent with the guidance provided in the NEPM, the data was assessed against the above adopted site guidelines by:

- Comparing individual concentrations against the relevant guidelines and if discrete samples are in excess of the relevant guideline then;
- Comparing the 95% upper confidence limit (UCL) of mean against the relevant guideline also ensuring that:
    - the standard deviation of the results is less than 50% of the relevant investigation or screening level, and
    - no single value exceed 250% of the relevant investigation or screening level.

6 Results

6.1 Site Walkover

A site walkover was completed to identify areas of environmental concern, such as illegally dumped wastes and fill at Parcel 6. The entrance to Parcel 6 is from Grahams Lane, which borders the south eastern boundary of Lot 13 and the north western boundary of Lot 15. There are no roadways or tracks within either Lot 13 or Lot 15.

The north western portion of Parcel 6 (Lot 13) comprised of predominantly dense bushland with two cleared areas near the south western boundary. The cleared areas were overgrown with weeds and grasses and house bricks were observed on the surface at the southern cleared area.

The south eastern portion of Parcel 6 (Lot 15) comprised of a large circular cleared area surrounded by bushland which is the location of the former hobby farm. Hummocky ground and several fill mounds were observed in the cleared area with anthropogenic material such a metal scrap, concrete rubble and ACM fragments at the surface of the mounds.

A dam associated with the former hobby farm was observed to the south east of the former hobby farm location. A fill mound near the dam comprised metal scrap on the surface.

A fill mound comprising soil, gravel and illegally dumped ACM fragments was observed on Grahams Lane between the two lots. It is noted that Grahams Lane does not form part of Parcel 6.

No other signs of disturbed land or of land filling were observed during the walkover.

Photographs are included in **Appendix B**. Field Information Sheets are included in **Appendix C**.

6.2 Soil Investigations

Six surface soil samples were collected from across Parcel 6 as per the sampling design to assess the potential for fluoride in soil from dust deposition from the Hydro Aluminium Kurri Kurri Smelter as shown in **Figure 3**.

One ACM fragment was collected from the small mound of soil with illegally dumped ACM fragments on Grahams Lane and one ACM fragment was collected from a stockpile at the location of the former hobby farm, for asbestos content analysis. The ACM fragments were collected into zip-lock plastic bags using dedicated disposable gloves.

A generalised lithology of the surface soils encountered at Parcel 6 is as follows:

- Topsoil: Silt and silty clay, light brown/ grey/ orange mottled with some cobbles, slightly moist.

6.3 Soil Results

A summary of the soil results is presented in **Table 4**. Laboratory tables are included in **Appendix D** and laboratory reports are included in **Appendix E**.

Table 4: Summary of Soil Results				
Analyte	**No. of Samples**	**Maximum Concentration (mg/kg)**	**No. exceeding Site Criteria**	**Criteria Exceeded (mg/kg)**
Fluoride	6	5	0	-
Asbestos	2	2 - Chrysotile	2	Presence

The results of surface soil sampling for fluoride demonstrate that surface soils at Parcel 6 have not been impacted by stack particulate fallout from the Hydro Aluminium Smelter. Chrysotile asbestos was identified in both ACM fragments collected.

6.4 Quality Assurance/ Quality Control

A quality assurance assessment for this report is presented in **Appendix F**. An assessment was made of data completeness, comparability, representativeness, precision and accuracy based on field and laboratory considerations, as outlined in NSW DEC (2006) and NSW EPA (2007) guidelines. Overall it is considered that the completed investigation works and the data are of suitable quality to meet the project objectives.

7 Site Characterisation

7.1 Conceptual Site Model

Parcel 6 consists of predominantly undisturbed bushland with three cleared areas including the location of a former hobby farm. Parcel 6 is bounded by the Hunter Expressway on the north eastern boundary, rural land on the south western and north western boundaries, Bishops Bridge Road on the south western boundary, and is located in the western portion of the Buffer Zone of the Hydro Aluminium Kurri Kurri Smelter. Grahams Lane bisects the parcel.

A hobby farm was developed on the southern portion (Lot 15) of Parcel 6 in the early 1950s. The hobby farm was demolished in the 1980s and remnant metal, concrete scrap and ACM fragments were identified in the cleared area at the location of the former hobby farm. The remainder of the Parcel 6 comprised undeveloped bushland and no evidence of development was identified during the site walkover.

The presence of concrete and metal scrap and ACM fragments at the location of the former hobby farm and in hummocky ground in this area indicates that demolition of the hobby farm has resulted in the contamination of demolition waste stockpiles with asbestos.

Parcel 6 has not been affected by dust deposition of fluoride from the Hydro Aluminium Kurri Kurri Smelter, with fluoride concentrations in surface soil below the preliminary screening level applicable for the proposed rural landuse. It is noted that there is currently no source of aerial fluoride emissions, as the smelter is in a care and maintenance mode.

A small mound of soil and ACM fragments were observed on Grahams Lane, indicating that accessible areas of Parcel 6 are susceptible to illegal dumping brought from off site. The approximate location of the ACM waste is shown in **Figure 3**.

No other soil contamination issues were identified on the remainder of Parcel 6.

7.2 Waste Characterisation and Disposal

The ACM fragments observed in the mounds of soil at the location of the former hobby farm classify as Asbestos Waste. The ACM fragments should be collected and disposed of by an appropriately licenced contractor and appropriately managed or disposed. Alternatively, planning permission could be sought for emplacement of the waste building materials within a containment cell within the Hydro site.

8 Conclusions and Recommendations

This report presents the findings of a Phase 2 Environmental Site Assessment undertaken on part of the Hydro Aluminium Kurri Kurri (Hydro) owned land known as Parcel 6. Parcel 6 is a rural property comprising approximately 31ha and is accessed from Graham Lane, Loxford and located within the buffer zone and to the west of the Hydro Aluminium Kurri Kurri Smelter. Parcel 6 comprises bushland, with some areas of disturbed land and limited tree cover.

The objectives of this Phase 2 ESA assessment were to assess the potential for contamination at Parcel 6 based on historical and current landuse and to assess the suitability of Parcel 6 for environmental conservation (E2) landuse.

A Phase 1 Environmental Site Assessment has previously been completed for the Hydro owned lands including Parcel 6 (ENVIRON (22 October 2013) Phase 1 ESA, Hydro Kurri Kurri Aluminium Smelter). The Phase 1 identified that contamination of Parcel 6 may have occurred from dust deposition due to the proximity of the Hydro smelter, illegal dumping due to the remoteness of the area and localised soil contamination from the demolition of a hobby farm.

To assess the potential for waste and the potential for soil contamination a site walkover was completed and surface soil samples were collected from across the parcel. Surface soil samples from across Parcel 6 were analysed for soluble fluoride and were below the preliminary screening level for residential landuse.

Two samples of asbestos containing materials (ACM) fragments were collected, one from each of the small mounds of soil and illegally dumped ACM fragments on Grahams Lane and at the location of the former hobby farm, and analysed for asbestos content. Laboratory testing confirmed that the ACM fragments contain asbestos. No other soil contamination issues were identified at Parcel 6.

Parcel 6 is considered suitable for the current landuse and the proposed environmental conservation (E2) land use.

Hydro has separately engaged a NSW EPA-accredited Site Auditor to issue a Site Audit Statement certifying that the site is suitable for the proposed use.

ENVIRON considers that interim management is required to remove illegally dumped wastes and secure the site, as follows:

- The ACM fragments in a soil stockpile on Grahams Lane are not located on Parcel 6. As Hydro manages Grahams Lane as part of the buffer zone, Hydro should contact the owner of Grahams Lane to provide notification of the dumped wastes;

- An appropriately licenced asbestos removal contractor be engaged to remove and dispose of the asbestos waste located within fill mounds at the former hobby farm. Validation of this area following removal should be undertaken by an appropriately qualified consultant and documented.

- It is noted that Parcel 6 contains numerous small stockpiles of soil with construction waste such as concrete and metal scrap. This material should be removed for aesthetic reasons.

9 References

AECOM. 2013. Hydro Aluminum – 2012 Annual Environmental Management Review. 2 June 2013;

ANZECC & NHMRC (1992) Australian and New Zealand Guidelines for the Assessment and Management of Contaminated Sites;

ENVIRON (2013) Preliminary Screening Level, Health Risk Assessment for Fluoride and Aluminium, Part of the Kurri Kurri Aluminium Smelter, Hart Road, Loxford;

ENVIRON (2013) Phase 1 ESA, Hydro Kurri Kurri Aluminium Smelter;

Hunter Catchment Management Trust (2000) Wallis and Fishery Creeks Total Catchment Management Strategy;

National Academy of Sciences. 1971a. Biologic effects of atmospheric pollutants: Fluorides. Washington, DC: National Academy of Sciences, National Research Council, Committee on Biologic Effects of Atmospheric Pollutants, 239.

National Environment Protection Council (2013) National Environmental Protection (Assessment of Site Contamination) Amendment Measure (NEPM);

NSW DEC (2006) Guidelines for the NSW Site Auditor Scheme (Second Edition);

NSW DEC (2007) Guidelines for the Assessment and Management of Groundwater Contamination;

NSW DECC (2008) Waste Classification Guidelines;

World Health Organisation (1997) Environmental Health Criteria for Fluorides and Fluorosis. 2nd ed. Internal Technical Report, International Program on Safety, WHO, Geneva.

10 Limitations

ENVIRON Australia prepared this report in accordance with the scope of work as outlined in our proposal to Hydro Aluminium Kurri Kurri Pty Ltd dated 25 June 2012 and in accordance with our understanding and interpretation of current regulatory standards.

A representative program of sampling and laboratory analyses was undertaken as part of this investigation, based on past and present known uses of Parcel 6. While every care has been taken, concentrations of contaminants measured may not be representative of conditions between the locations sampled and investigated. We cannot therefore preclude the presence of materials that may be hazardous.

Site conditions may change over time. This report is based on conditions encountered at Parcel 6 at the time of the report and ENVIRON disclaims responsibility for any changes that may have occurred after this time.

The conclusions presented in this report represent ENVIRON's professional judgment based on information made available during the course of this assignment and are true and correct to the best of ENVIRON's knowledge as at the date of the assessment.

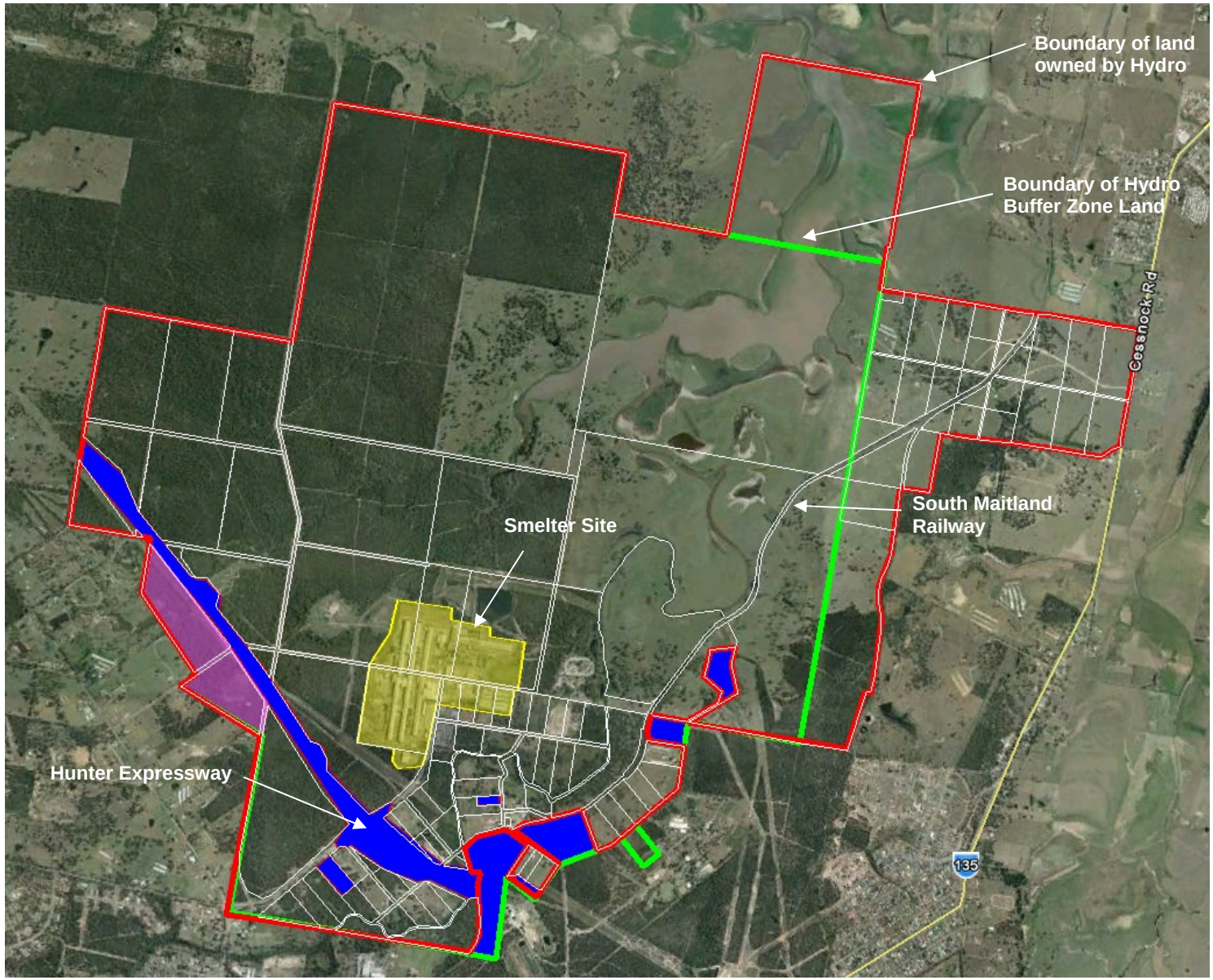
ENVIRON did not independently verify all of the written or oral information provided to ENVIRON during the course of this investigation. While ENVIRON has no reason to doubt the accuracy of the information provided to it, the report is complete and accurate only to the extent that the information provided to ENVIRON was itself complete and accurate.

This report does not purport to give legal advice. This advice can only be given by qualified legal advisors.

10.1 User Reliance

This report has been prepared exclusively for Hydro Aluminium Kurri Kurri Pty Ltd and may not be relied upon by any other person or entity without ENVIRON's express written permission.

Figures



Approximate Location of Smelter

Approximate Location of Buffer Zone

Land not owned by Hydro

Parcel 6

N

Hydro Aluminium Kurri Kurri – Phase 2 Environmental Site Assessment

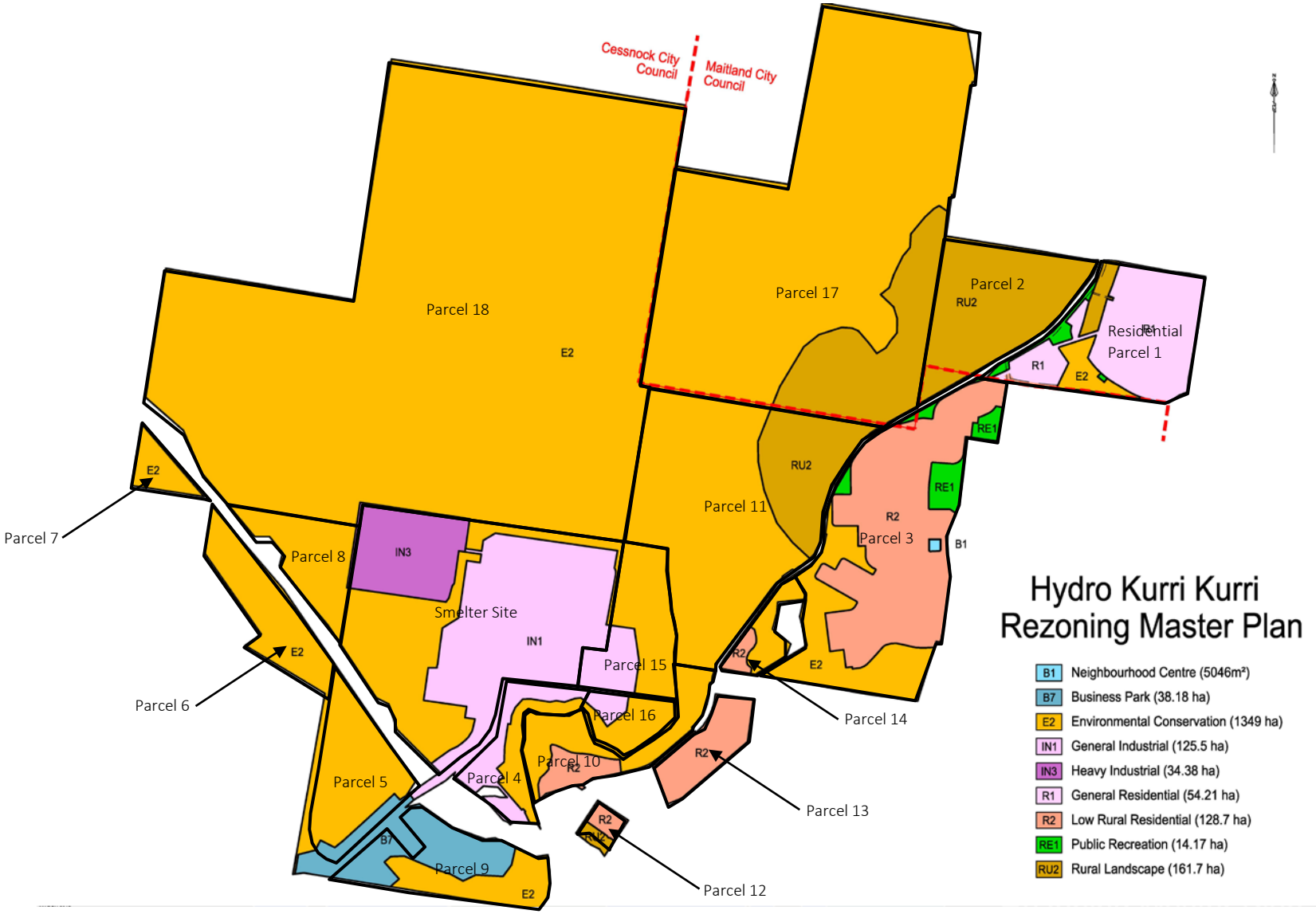
Parcel 6 - Site Location

ENVIRON

JOB NO: AS130348

DATE: February 2014

FIGURE 1



Proposed Land Zonings taken from
Hydro Kurri Kurri Preliminary Masterplan dated 26/3/15

Hydro Aluminium Kurri Kurri – Phase 2 Buffer Zone investigations

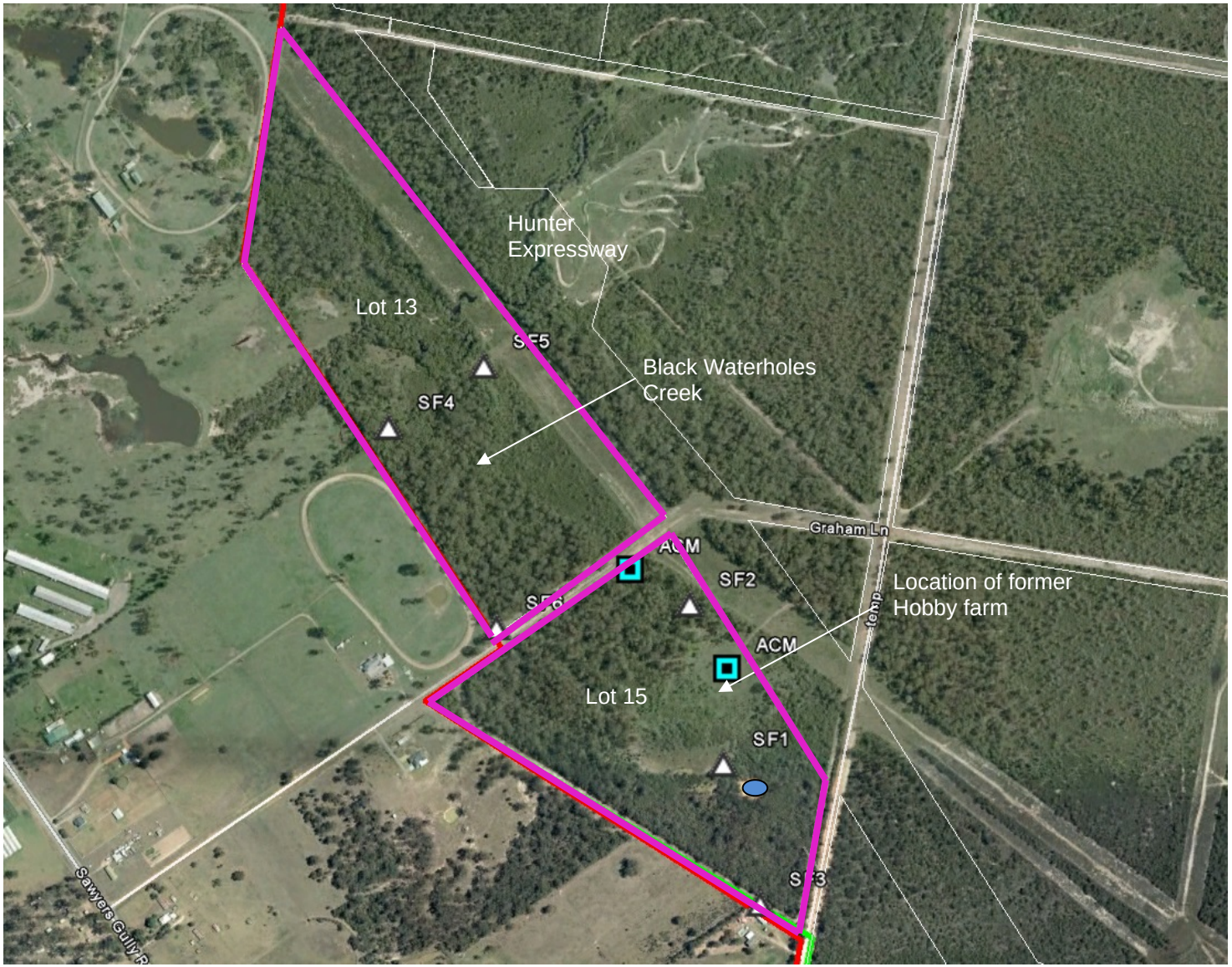
Land Parcels and Proposed Land Zoning

ENVIRON

JOB NO: AS 130348

DATE: March 2015

FIGURE 2



KEY:

- Site Boundary
- Onsite Dam
- △ SF — Soil Sample for Fluoride Analysis
- ACM — Stockpile of ACM and other wastes

N

Hydro Aluminium Kurri Kurri – Phase 2 Environmental Site Assessment

Parcel 6 – Site Layout and Sampling Locations

ENVIRON

JOB NO: AS130348

DATE: February 2014

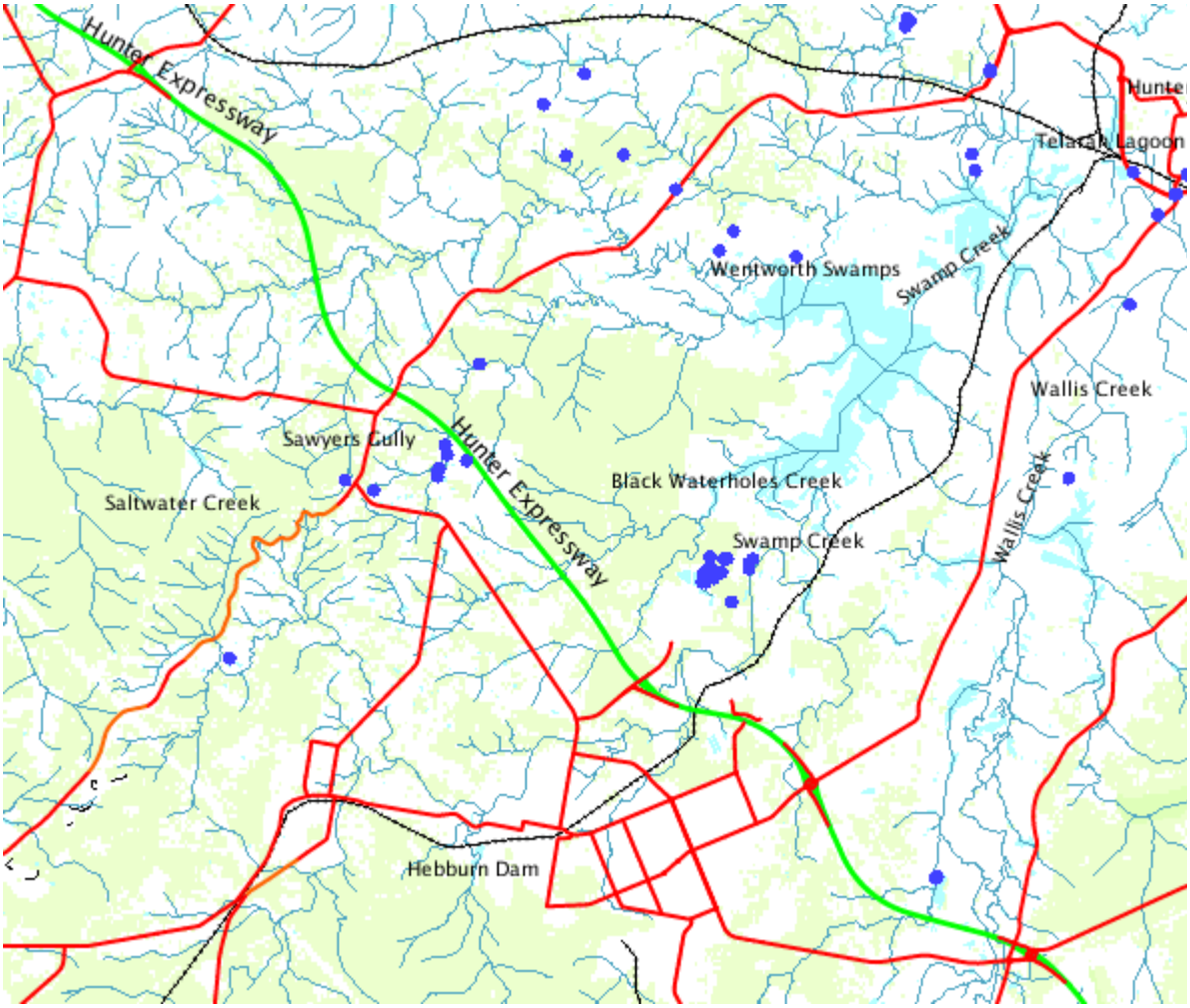
FIGURE 3

Appendix A

Surrounding Groundwater Bores

Groundwater Bores near Employment Land Subarea 6

Map created with NSW Natural Resource Atlas - http://www.nratlas.nsw.gov.au
Monday, January 13, 2014



0 16 Km

Legend

Symbol	Layer	Custodian
	Cities and large towns renderImage: Cannot build image from features	
Cowra	Populated places renderImage: Cannot build image from features	
	Towns	
	Groundwater Bores	
	Catchment Management Authority boundaries	
	Major rivers	

Topographic base map

Groundwater Works Summary

For information on the meaning of fields please see Glossary
Document Generated on Monday, January 6, 2014

Print Report

Works Details Site Details Form A Licensed Construction Water Bearing Zones Drillers Log

Work Requested -- GW079088

Works Details (top)

GROUNDWATER NUMBER	GW079088
LIC-NUM	
AUTHORISED-PURPOSES	
INTENDED-PURPOSES	MONITORING BORE
WORK-TYPE	Bore
WORK-STATUS	(Unknown)
CONSTRUCTION-METHOD	(Unknown)
OWNER-TYPE	(Unknown)
COMMENCE-DATE	
COMPLETION-DATE	
FINAL-DEPTH (metres)	
DRILLED-DEPTH (metres)	
CONTRACTOR-NAME	
DRILLER-NAME	
PROPERTY	
GWMA	
GW-ZONE	
STANDING-WATER-LEVEL	
SALINITY	
YIELD	

Site Details (top)

REGION	20 - HUNTER
RIVER-BASIN	
AREA-DISTRICT	
CMA-MAP	
GRID-ZONE	
SCALE	
ELEVATION	
ELEVATION-SOURCE	
NORTHING	6371306.00
EASTING	358054.00
LATITUDE	32 47' 13"
LONGITUDE	151 29' 3"
GS-MAP	

AMG-ZONE	56
COORD-SOURCE	
REMARK	

Form-A (top)

no details

Licensed (top)

no details

Water Bearing Zones (top)

no details

Drillers Log (top)

no details

Groundwater Works Summary

For information on the meaning of fields please see Glossary
Document Generated on Monday, January 6, 2014

Print Report

Works Details Site Details Form A Licensed Construction Water Bearing Zones Drillers Log

Work Requested -- GW079090

Works Details (top)

GROUNDWATER NUMBER	GW079090
LIC-NUM	
AUTHORISED-PURPOSES	
INTENDED-PURPOSES	MONITORING BORE
WORK-TYPE	Bore
WORK-STATUS	(Unknown)
CONSTRUCTION-METHOD	(Unknown)
OWNER-TYPE	(Unknown)
COMMENCE-DATE	
COMPLETION-DATE	
FINAL-DEPTH (metres)	
DRILLED-DEPTH (metres)	
CONTRACTOR-NAME	
DRILLER-NAME	
PROPERTY	
GWMA	
GW-ZONE	
STANDING-WATER-LEVEL	
SALINITY	
YIELD	

Site Details (top)

REGION	20 - HUNTER
RIVER-BASIN	
AREA-DISTRICT	
CMA-MAP	
GRID-ZONE	
SCALE	
ELEVATION	
ELEVATION-SOURCE	
NORTHING	6371368.00
EASTING	358105.00
LATITUDE	32 47' 11"
LONGITUDE	151 29' 5"
GS-MAP	

AMG-ZONE	56
COORD-SOURCE	
REMARK	

Form-A (top)

no details

Licensed (top)

no details

Water Bearing Zones (top)

no details

Drillers Log (top)

no details

Groundwater Works Summary

For information on the meaning of fields please see Glossary
Document Generated on Monday, January 6, 2014

Print Report

Works Details Site Details Form A Licensed Construction Water Bearing Zones Drillers Log

Work Requested -- GW079092

Works Details (top)

GROUNDWATER NUMBER	GW079092
LIC-NUM	
AUTHORISED-PURPOSES	
INTENDED-PURPOSES	MONITORING BORE
WORK-TYPE	Bore
WORK-STATUS	(Unknown)
CONSTRUCTION-METHOD	(Unknown)
OWNER-TYPE	(Unknown)
COMMENCE-DATE	
COMPLETION-DATE	
FINAL-DEPTH (metres)	
DRILLED-DEPTH (metres)	
CONTRACTOR-NAME	
DRILLER-NAME	
PROPERTY	
GWMA	
GW-ZONE	
STANDING-WATER-LEVEL	
SALINITY	
YIELD	

Site Details (top)

REGION	20 - HUNTER
RIVER-BASIN	
AREA-DISTRICT	
CMA-MAP	
GRID-ZONE	
SCALE	
ELEVATION	
ELEVATION-SOURCE	
NORTHING	6371429.00
EASTING	358078.00
LATITUDE	32 47' 9"
LONGITUDE	151 29' 4"
GS-MAP	

AMG-ZONE	56
COORD-SOURCE	
REMARK	

Form-A (top)

no details

Licensed (top)

no details

Water Bearing Zones (top)

no details

Drillers Log (top)

no details

Groundwater Works Summary

For information on the meaning of fields please see Glossary
Document Generated on Monday, January 6, 2014

Print Report

Works Details Site Details Form A Licensed Construction Water Bearing Zones Drillers Log

Work Requested -- GW079093

Works Details (top)

GROUNDWATER NUMBER	GW079093
LIC-NUM	
AUTHORISED-PURPOSES	
INTENDED-PURPOSES	MONITORING BORE
WORK-TYPE	Bore
WORK-STATUS	(Unknown)
CONSTRUCTION-METHOD	(Unknown)
OWNER-TYPE	(Unknown)
COMMENCE-DATE	
COMPLETION-DATE	
FINAL-DEPTH (metres)	
DRILLED-DEPTH (metres)	
CONTRACTOR-NAME	
DRILLER-NAME	
PROPERTY	
GWMA	
GW-ZONE	
STANDING-WATER-LEVEL	
SALINITY	
YIELD	

Site Details (top)

REGION	20 - HUNTER
RIVER-BASIN	
AREA-DISTRICT	
CMA-MAP	
GRID-ZONE	
SCALE	
ELEVATION	
ELEVATION-SOURCE	
NORTHING	6371460.00
EASTING	358078.00
LATITUDE	32 47' 8"
LONGITUDE	151 29' 4"
GS-MAP	

AMG-ZONE	56
COORD-SOURCE	
REMARK	

Form-A (top)

no details

Licensed (top)

no details

Water Bearing Zones (top)

no details

Drillers Log (top)

no details

Groundwater Works Summary

For information on the meaning of fields please see Glossary
Document Generated on Monday, January 6, 2014

Print Report

Works Details Site Details Form A Licensed Construction Water Bearing Zones Drillers Log

Work Requested -- GW079094

Works Details (top)

GROUNDWATER NUMBER	GW079094
LIC-NUM	
AUTHORISED-PURPOSES	
INTENDED-PURPOSES	MONITORING BORE
WORK-TYPE	Bore
WORK-STATUS	(Unknown)
CONSTRUCTION-METHOD	(Unknown)
OWNER-TYPE	(Unknown)
COMMENCE-DATE	
COMPLETION-DATE	
FINAL-DEPTH (metres)	
DRILLED-DEPTH (metres)	
CONTRACTOR-NAME	
DRILLER-NAME	
PROPERTY	
GWMA	
GW-ZONE	
STANDING-WATER-LEVEL	
SALINITY	
YIELD	

Site Details (top)

REGION	20 - HUNTER
RIVER-BASIN	
AREA-DISTRICT	
CMA-MAP	
GRID-ZONE	
SCALE	
ELEVATION	
ELEVATION-SOURCE	
NORTHING	6371462.00
EASTING	358234.00
LATITUDE	32 47' 8"
LONGITUDE	151 29' 10"
GS-MAP	

AMG-ZONE	56
COORD-SOURCE	
REMARK	

Form-A (top)

no details

Licensed (top)

no details

Water Bearing Zones (top)

no details

Drillers Log (top)

no details

Groundwater Works Summary

For information on the meaning of fields please see Glossary
Document Generated on Monday, January 6, 2014

Print Report

Works Details Site Details Form A Licensed Construction Water Bearing Zones Drillers Log

Work Requested -- GW079096

Works Details (top)

GROUNDWATER NUMBER	GW079096
LIC-NUM	
AUTHORISED-PURPOSES	
INTENDED-PURPOSES	MONITORING BORE
WORK-TYPE	Bore
WORK-STATUS	(Unknown)
CONSTRUCTION-METHOD	(Unknown)
OWNER-TYPE	(Unknown)
COMMENCE-DATE	
COMPLETION-DATE	
FINAL-DEPTH (metres)	
DRILLED-DEPTH (metres)	
CONTRACTOR-NAME	
DRILLER-NAME	
PROPERTY	
GWMA	
GW-ZONE	
STANDING-WATER-LEVEL	
SALINITY	
YIELD	

Site Details (top)

REGION	20 - HUNTER
RIVER-BASIN	
AREA-DISTRICT	
CMA-MAP	
GRID-ZONE	
SCALE	
ELEVATION	
ELEVATION-SOURCE	
NORTHING	6371707.00
EASTING	358152.00
LATITUDE	32 47' 0"
LONGITUDE	151 29' 7"
GS-MAP	

AMG-ZONE	56
COORD-SOURCE	
REMARK	

Form-A (top)

no details

Licensed (top)

no details

Water Bearing Zones (top)

no details

Drillers Log (top)

no details

Groundwater Works Summary

For information on the meaning of fields please see Glossary
Document Generated on Monday, January 6, 2014

Print Report

Works Details Site Details Form A Licensed Construction Water Bearing Zones Drillers Log

Work Requested -- GW079097

Works Details (top)

GROUNDWATER NUMBER	GW079097
LIC-NUM	
AUTHORISED-PURPOSES	
INTENDED-PURPOSES	MONITORING BORE
WORK-TYPE	Bore
WORK-STATUS	(Unknown)
CONSTRUCTION-METHOD	(Unknown)
OWNER-TYPE	(Unknown)
COMMENCE-DATE	
COMPLETION-DATE	
FINAL-DEPTH (metres)	
DRILLED-DEPTH (metres)	
CONTRACTOR-NAME	
DRILLER-NAME	
PROPERTY	
GWMA	
GW-ZONE	
STANDING-WATER-LEVEL	
SALINITY	
YIELD	

Site Details (top)

REGION	20 - HUNTER
RIVER-BASIN	
AREA-DISTRICT	
CMA-MAP	
GRID-ZONE	
SCALE	
ELEVATION	
ELEVATION-SOURCE	
NORTHING	6371679.00
EASTING	358335.00
LATITUDE	32 47' 1"
LONGITUDE	151 29' 14"
GS-MAP	

AMG-ZONE	56
COORD-SOURCE	
REMARK	

Form-A (top)

no details

Licensed (top)

no details

Water Bearing Zones (top)

no details

Drillers Log (top)

no details

Groundwater Works Summary

For information on the meaning of fields please see Glossary
Document Generated on Monday, January 6, 2014

Print Report

Works Details Site Details Form A Licensed Construction Water Bearing Zones Drillers Log

Work Requested -- GW079099

Works Details (top)

GROUNDWATER NUMBER	GW079099
LIC-NUM	
AUTHORISED-PURPOSES	
INTENDED-PURPOSES	
WORK-TYPE	Bore
WORK-STATUS	(Unknown)
CONSTRUCTION-METHOD	(Unknown)
OWNER-TYPE	(Unknown)
COMMENCE-DATE	
COMPLETION-DATE	
FINAL-DEPTH (metres)	
DRILLED-DEPTH (metres)	
CONTRACTOR-NAME	
DRILLER-NAME	
PROPERTY	
GWMA	
GW-ZONE	
STANDING-WATER-LEVEL	
SALINITY	
YIELD	

Site Details (top)

REGION	20 - HUNTER
RIVER-BASIN	
AREA-DISTRICT	
CMA-MAP	
GRID-ZONE	
SCALE	
ELEVATION	
ELEVATION-SOURCE	
NORTHING	6371003.00
EASTING	358448.00
LATITUDE	32 47' 23"
LONGITUDE	151 29' 18"
GS-MAP	

AMG-ZONE	56
COORD-SOURCE	
REMARK	

Form-A (top)

no details

Licensed (top)

no details

Water Bearing Zones (top)

no details

Drillers Log (top)

no details

Groundwater Works Summary

For information on the meaning of fields please see Glossary
Document Generated on Monday, January 6, 2014

Print Report

Works Details Site Details Form A Licensed Construction Water Bearing Zones Drillers Log

Work Requested -- GW079101

Works Details (top)

GROUNDWATER NUMBER	GW079101
LIC-NUM	
AUTHORISED-PURPOSES	
INTENDED-PURPOSES	
WORK-TYPE	Bore
WORK-STATUS	(Unknown)
CONSTRUCTION-METHOD	(Unknown)
OWNER-TYPE	(Unknown)
COMMENCE-DATE	
COMPLETION-DATE	
FINAL-DEPTH (metres)	
DRILLED-DEPTH (metres)	
CONTRACTOR-NAME	
DRILLER-NAME	
PROPERTY	
GWMA	
GW-ZONE	
STANDING-WATER-LEVEL	
SALINITY	
YIELD	

Site Details (top)

REGION	20 - HUNTER
RIVER-BASIN	
AREA-DISTRICT	
CMA-MAP	
GRID-ZONE	
SCALE	
ELEVATION	
ELEVATION-SOURCE	
NORTHING	6371680.00
EASTING	358387.00
LATITUDE	32 47' 1"
LONGITUDE	151 29' 16"
GS-MAP	

AMG-ZONE	56
COORD-SOURCE	
REMARK	

Form-A (top)

no details

Licensed (top)

no details

Water Bearing Zones (top)

no details

Drillers Log (top)

no details

Groundwater Works Summary

For information on the meaning of fields please see Glossary
Document Generated on Monday, January 6, 2014

Print Report

Works Details Site Details Form A Licensed Construction Water Bearing Zones Drillers Log

Work Requested -- GW079102

Works Details (top)

GROUNDWATER NUMBER	GW079102
LIC-NUM	
AUTHORISED-PURPOSES	
INTENDED-PURPOSES	
WORK-TYPE	Bore
WORK-STATUS	(Unknown)
CONSTRUCTION-METHOD	(Unknown)
OWNER-TYPE	(Unknown)
COMMENCE-DATE	
COMPLETION-DATE	
FINAL-DEPTH (metres)	
DRILLED-DEPTH (metres)	
CONTRACTOR-NAME	
DRILLER-NAME	
PROPERTY	
GWMA	
GW-ZONE	
STANDING-WATER-LEVEL	
SALINITY	
YIELD	

Site Details (top)

REGION	20 - HUNTER
RIVER-BASIN	
AREA-DISTRICT	
CMA-MAP	
GRID-ZONE	
SCALE	
ELEVATION	
ELEVATION-SOURCE	
NORTHING	6371685.00
EASTING	358725.00
LATITUDE	32 47' 1"
LONGITUDE	151 29' 29"
GS-MAP	

AMG-ZONE	56
COORD-SOURCE	
REMARK	

Form-A (top)

no details

Licensed (top)

no details

Water Bearing Zones (top)

no details

Drillers Log (top)

no details

Groundwater Works Summary

For information on the meaning of fields please see Glossary
Document Generated on Monday, January 6, 2014

Print Report

Works Details Site Details Form A Licensed Construction Water Bearing Zones Drillers Log

Work Requested -- GW079103

Works Details (top)

GROUNDWATER NUMBER	GW079103
LIC-NUM	
AUTHORISED-PURPOSES	
INTENDED-PURPOSES	
WORK-TYPE	Bore
WORK-STATUS	(Unknown)
CONSTRUCTION-METHOD	(Unknown)
OWNER-TYPE	(Unknown)
COMMENCE-DATE	
COMPLETION-DATE	
FINAL-DEPTH (metres)	
DRILLED-DEPTH (metres)	
CONTRACTOR-NAME	
DRILLER-NAME	
PROPERTY	
GWMA	
GW-ZONE	
STANDING-WATER-LEVEL	
SALINITY	
YIELD	

Site Details (top)

REGION	20 - HUNTER
RIVER-BASIN	
AREA-DISTRICT	
CMA-MAP	
GRID-ZONE	
SCALE	
ELEVATION	
ELEVATION-SOURCE	
NORTHING	6371530.00
EASTING	358675.00
LATITUDE	32 47' 6"
LONGITUDE	151 29' 27"
GS-MAP	

AMG-ZONE	56
COORD-SOURCE	
REMARK	

Form-A (top)

no details

Licensed (top)

no details

Water Bearing Zones (top)

no details

Drillers Log (top)

no details

Appendix B

Site Photographs

Photo 1: Photograph of the cleared area at the location of the former hobby farm on Lot 15, facing north west.

Photo 2: Photograph of hummocky ground with surface metal scrap on Lot 15.

Photo 3: Photograph of the dam in the south eastern corner of Lot 15.

Photo 4: Photograph of hummocky ground on Lot 13.

Photo 5: Photograph of bricks on the surface of Lot 15.

Appendix C

Field Information Sheets

Site Walkover Checklist

Project No.: AS130348	**Date and Time:** 31/10/13
Land Parcel: ELP 6	**Weather:** sunny / hot
Lot and DP: Lot 15 pt 1	**Environ Personnel:** KW / Glen Hydro

Site Description

Topography	creekline dissects pt 1 → ~~runs~~ east / west & gentle slope of land towards this creek
Surface Geology	
Fill evident?	possibly
Hummocky ground?	yes
Structures on site?	no but cleared areas & 1 with brick footings?
Location of structures	as per notes below
Building materials used in structures	–
Asbestos debris on site?	none sighted
Location of asbestos debris?	–
Volume of asbestos debris?	–

GPS Locations of Interest

Point of Interest	Easting	Northing
Clearing, grass covered with bricks @ surface	151.46295°E	32.78623°S
dam near 2nd clearing	151.46344°E	32.78555°S
small soil mounds → all along Western boundary fenceline to creekline → grass covered	151.46196°E	32.78554°S ← 4m accuracy

Description of Photographs Taken

✓ creekline near old fence posts & old fence line

hummocky ground but old tree limbs only? → 32.78486°S 151.46154°E

NW boundary fenceline → mounds but look natural with some large trees growing from them → 32.78-370°S

S boundary fenceline along Grahams Lane → natural soil mound? → 151.4611-6°E

✓ 32.78812°S 151.46[illegible]°E

Miscellaneous Comments

F sample taken - SF4 → 32.78629°S 151.46301°E

topsoil, silt, brown, smoist, with small cobbles

F sample taken - SF5 → 32.78557°S 151.46433°E

0-01 ~0.02m

topsoil, sandy silt, light brown, slightly moist

F sample taken - SF6 → 32.78862°S 151.46458°E (4m accuracy)

topsoil, Sandy silt, light brown, with small cobbles, slightly moist

Site Walkover Checklist

Project No.: AS130348	**Date and Time:** 31/10/15
Land Parcel: ELP 6	**Weather:** sunny / warm
Lot and DP: Lot 15 pt 2	**Environ Personnel:** EW (environ) Glen (Hydro)

Site Description

Topography	
Surface Geology	–
Fill evident?	yes
Hummocky ground?	
Structures on site?	dam
Location of structures	see aerial
Building materials used in structures	–
Asbestos debris on site?	potentially
Location of asbestos debris?	noted below
Volume of asbestos debris?	in stockpile

GPS Locations of Interest

Point of Interest	Easting	Northing
Fill mound ① (metal scrap at surface) (8m accuracy)	151.46711°E	32.78875°S
fill mound cleared area (metal scrap & grass covered mounds)	151.46745°E,	32.78896°S
hummocky ground, cleared area (built up earth + building footprint?)	151.46764°E,	32.79023°S
fill mound near dam (metal scrap near here)	151.46780°E,	32.79030°S

ACM 2 taken

Description of Photographs Taken

fill mound ① & cleared area mounds dam → photo of

ACM mound ② 32.78796°S, 151.46636°E end of Graham lane → on roadside RHS

concrete surface rubble → 32.78943°S 151.46808°E (4m accuracy)

mound with potential ACM fragments (ACM 1 taken here) → 32.78911°S, 151.46770°E

Soil Sample ID and Comments

① F sample taken SF1 & QA1 → 32.79021°S 151.46766°E → topsoil, silt, brown, moist with gravel

② F sample taken SF2 → 32.78835°S 151.46719°E (4m accuracy)

③ F sample taken SF3 → topsoil, silt, light brown, dry to twigs, grass roots

32.79186°S 151.46818°E → topsoil, silty clay, light brown, orange, grey mottled, slightly moist with cobbles

2x fill mounds along graham lane midway RHS 32.78851°S 151.46537°E appears to be soil & gravel!

PTO

fill mound (3) along Grahams lane

→ 32.78861°S, 151.46506°E
grass covered
mounds in this vicinity ~~&~~ travelling
back toward the start of grahams lane
on the ~~fen~~ dirt track along the lot fenceline
SW direction Lot 15 pt 2

→ mounds all along from above point to

32.78960°S, 151.46372°E

→ Southern fenceline Lot 15 pt 2
some small grass covered soil mounds
all along this boundary e.g photos taken
at 32.790 ~~42~~ 42°S, 151.4654~~2~~2°E
(4m accuracy)

→ fill mound 4 (small) → 32.79141°S 151.467~~0~~39°E

→ fill mound 5 (small) →
East fenceline lot 15 pt 2 – 32.79147°S
151.46885°E

Appendix D

Results Tables

TABLE A: Soil Analytical Results - Grid Sampling

Sample Depth: 0.0m - 0.01m

Sampling Date: 31/10/13

Laboratory PQL: 0.5 mg/kg

Site Specific HIL - Fluoride: 17000mg/kg

Sample Identification	Soluble Fluoride mg/kg (1:5 soil:water)
SF1	2
SF2	3
SF3	4
SF4	5
SF5	<2
SF6	3

TABLE B: Soil Quality Assurance/ Quality Control Result

Sample Identification	SF1	QA1	
Sample Depth (m)	0.0-0.01		
Duplicate Type	Intralaboratory		RPD %
Sample Profile	TOPSOIL		
Sample collected by	KW		
Non Metallic Inorganics			
Fluoride	2	3	40

Appendix E

Laboratory Reports

CERTIFICATE OF ANALYSIS

Work Order	: **ES1323784**	Page	: 1 of 4
Client	: **ENVIRON AUSTRALIA PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: MR STEVE CADMAN	Contact	: Client Services
Address	: PO BOX 560 NORTH SYDNEY NSW, AUSTRALIA 2060	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: scadman@environcorp.com	E-mail	: sydney@alsglobal.com
Telephone	: +61 02 99548114	Telephone	: +61-2-8784 8555
Facsimile	: ----	Facsimile	: +61-2-8784 8500
Project	: AS130348	QC Level	: NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Order number	: ----		
C-O-C number	: ----	Date Samples Received	: 04-NOV-2013
Sampler	: KW	Issue Date	: 14-NOV-2013
Site	: ----		
		No. of samples received	: 9
Quote number	: SY/285/10	No. of samples analysed	: 9

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Descriptive Results

NATA Accredited Laboratory 825

Accredited for compliance with ISO/IEC 17025.

Signatories

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

Signatories	*Position*	*Accreditation Category*
Ashesh Patel	Inorganic Chemist	Sydney Inorganics
Christopher Owler	Team Leader - Asbestos	Newcastle - Asbestos
Nanthini Coilparampil	Laboratory Manager - Inorganics	Sydney Inorganics

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

- **EA200 Legend**
- **EA200 'Am' Amosite (brown asbestos)**
- **EA200 'Ch' Chrysotile (white asbestos)**
- **EA200 'Cr' Crocidolite (blue asbestos)**
- **EA200 'Trace' - Asbestos fibres detected by trace analysis per AS4964. The result can be interpreted that the sample contains detectable 'respirable' asbestos fibres**
- **EA200: 'UMF' Unknown Mineral Fibres. "-" indicates fibres detected may or may not be asbestos fibres. Confirmation by alternative techniques is recommended.**
- **EA200: Asbestos Identification Samples were analysed by Polarised Light Microscopy including dispersion staining.**
- **EA200: Negative results for vinyl tiles should be confirmed by an independent analytical technique.**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	ALP6LOT15 ACM2	ALP6LOT15 ACM1	ALP6LOT15 SF6	ALP6LOT15 SF4	ALP6LOT15 SF5
			Client sampling date / time	31-OCT-2013 15:00	31-OCT-2013 15:00	31-OCT-2013 15:00	31-OCT-2013 15:00	31-OCT-2013 15:00
Compound	CAS Number	LOR	Unit	ES1323784-001	ES1323784-002	ES1323784-003	ES1323784-004	ES1323784-005
EA055: Moisture Content								
Moisture Content (dried @ 103°C)	----	1.0	%	----	----	3.9	5.4	4.6
EA200: AS 4964 - 2004 Identification of Asbestos in bulk samples								
Asbestos Detected	1332-21-4	0.1	g/kg	Yes	Yes	----	----	----
Asbestos Type	1332-21-4	0.1	--	Ch	Ch	----	----	----
Sample weight (dry)	----	0.01	g	23.6	25.0	----	----	----
APPROVED IDENTIFIER:	----	-	--	S.SPOONER	S.SPOONER	----	----	----
EK040: Fluoride								
Fluoride	16984-48-8	1	mg/kg	----	----	2	3	4

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	ALP6LOT15 SF2	ALP6LOT15 SF3	ALP6LOT15 SFQA1	ALP6LOT15 SF1	----
			Client sampling date / time	31-OCT-2013 15:00	31-OCT-2013 15:00	31-OCT-2013 15:00	31-OCT-2013 15:00	----
Compound	CAS Number	LOR	Unit	ES1323784-006	ES1323784-007	ES1323784-008	ES1323784-009	----
EA055: Moisture Content								
Moisture Content (dried @ 103°C)	----	1.0	%	2.5	7.4	6.7	5.8	----
EK040: Fluoride								
Fluoride	16984-48-8	1	mg/kg	5	<2	3	3	----

Analytical Results

Descriptive Results

Sub-Matrix: SOIL

Method: Compound	Client sample ID - Client sampling date / time	Analytical Results
EA200: AS 4964 - 2004 Identification of Asbestos in bulk samples		
EA200: Description	ALP6LOT15 ACM2 - 31-OCT-2013 15:00	Three pieces of bonded asbestos cement sheeting approximately 50 x 45 x 5 mm.
EA200: Description	ALP6LOT15 ACM1 - 31-OCT-2013 15:00	Several pieces of bonded asbestos cement sheeting approximately 35 x 30 x 4 mm plus several pieces of cement sheeting.

QUALITY CONTROL REPORT

Work Order	: **ES1323784**	Page	: 1 of 4
Client	: **ENVIRON AUSTRALIA PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: MR STEVE CADMAN	Contact	: Client Services
Address	: PO BOX 560 NORTH SYDNEY NSW, AUSTRALIA 2060	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: scadman@environcorp.com	E-mail	: sydney@alsglobal.com
Telephone	: +61 02 99548114	Telephone	: +61-2-8784 8555
Facsimile	: ----	Facsimile	: +61-2-8784 8500
Project	: AS130348	QC Level	: NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Site	: ----		
C-O-C number	: ----	Date Samples Received	: 04-NOV-2013
Sampler	: KW	Issue Date	: 14-NOV-2013
Order number	: ----		
		No. of samples received	: 9
Quote number	: SY/285/10	No. of samples analysed	: 9

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

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

NATA Accredited Laboratory 825

Accredited for compliance with ISO/IEC 17025.

Signatories

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

Signatories	*Position*	*Accreditation Category*
Ashesh Patel	Inorganic Chemist	Sydney Inorganics
Christopher Owler	Team Leader - Asbestos	Newcastle - Asbestos
Nanthini Coilparampil	Laboratory Manager - Inorganics	Sydney Inorganics

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.

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: 3143719)									
ES1323782-002	Anonymous	EA055-103: Moisture Content (dried @ 103°C)	----	1.0	%	5.0	6.1	20.0	No Limit
ES1323929-001	Anonymous	EA055-103: Moisture Content (dried @ 103°C)	----	1.0	%	11.3	12.3	8.6	0% - 50%
EK040S: Fluoride Soluble (QC Lot: 3144606)									
ES1323625-008	Anonymous	EK040S: Fluoride	16984-48-8	1	mg/kg	6	6	0.0	No Limit
ES1323784-005	ALP6LOT15 SF5	EK040S: Fluoride	16984-48-8	1	mg/kg	4	4	0.0	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 Sample (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
EK040S: Fluoride Soluble (QCLot: 3144606)								
EK040S: Fluoride	16984-48-8	1.0	mg/kg	<1	25.0 mg/kg	116	69	117

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
EK040S: Fluoride Soluble (QCLot: 3144606)							
ES1323625-008	Anonymous	EK040S: Fluoride	16984-48-8	50 mg/kg	108	70	130

Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report

The quality control term Matrix Spike (MS) and Matrix Spike Duplicate (MSD) refers to intralaboratory split samples spiked with a representative set of target analytes. The purpose of these QC parameters are 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) and Matrix Spike Duplicate (MSD) Report						
				Spike	Spike Recovery (%)		Recovery Limits (%)		RPDs (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	MSD	Low	High	Value	Control Limit
EK040S: Fluoride Soluble (QCLot: 3144606)										
ES1323625-008	Anonymous	EK040S: Fluoride	16984-48-8	50 mg/kg	108	----	70	130	----	----

INTERPRETIVE QUALITY CONTROL REPORT

Work Order	: **ES1323784**	Page	: 1 of 5
Client	: ENVIRON AUSTRALIA PTY LTD	Laboratory	: Environmental Division Sydney
Contact	: MR STEVE CADMAN	Contact	: Client Services
Address	: PO BOX 560 NORTH SYDNEY NSW, AUSTRALIA 2060	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: scadman@environcorp.com	E-mail	: sydney@alsglobal.com
Telephone	: +61 02 99548114	Telephone	: +61-2-8784 8555
Facsimile	: ----	Facsimile	: +61-2-8784 8500
Project	: AS130348	QC Level	: NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Site	: ----		
C-O-C number	: ----	Date Samples Received	: 04-NOV-2013
Sampler	: KW	Issue Date	: 14-NOV-2013
Order number	: ----		
		No. of samples received	: 9
Quote number	: SY/285/10	No. of samples analysed	: 9

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Interpretive Quality Control Report contains the following information:

- Analysis Holding Time Compliance
- Quality Control Parameter Frequency Compliance
- Brief Method Summaries
- Summary of Outliers

Analysis Holding Time Compliance

This report summarizes extraction / preparation and analysis times and compares each with recommended holding times (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							
Pulp Bag (EA055-103)							
ALP6LOT15 SF6, ALP6LOT15 SF4, ALP6LOT15 SF5, ALP6LOT15 SF2, ALP6LOT15 SF3, ALP6LOT15 SFQA1, ALP6LOT15 SF1	**31-OCT-2013**	**----**	----	----	**06-NOV-2013**	14-NOV-2013	✓
EA200: AS 4964 - 2004 Identification of Asbestos in bulk samples							
Snap Lock Bag (EA200)							
ALP6LOT15 ACM2, ALP6LOT15 ACM1	**31-OCT-2013**	**---**	29-APR-2014	----	**12-NOV-2013**	11-MAY-2014	✓
EK040: Fluoride							
Pulp Bag (EK040S)							
ALP6LOT15 SF6, ALP6LOT15 SF4, ALP6LOT15 SF5, ALP6LOT15 SF2, ALP6LOT15 SF3, ALP6LOT15 SFQA1, ALP6LOT15 SF1	**31-OCT-2013**	**06-NOV-2013**	07-NOV-2013	✓	**08-NOV-2013**	04-DEC-2013	✓

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(where) 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)							
Fluoride - Soluble	EK040S	2	19	**10.5**	**10.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Moisture Content	EA055-103	2	20	**10.0**	**10.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Laboratory Control Samples (LCS)							
Fluoride - Soluble	EK040S	1	19	**5.3**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Method Blanks (MB)							
Fluoride - Soluble	EK040S	1	19	**5.3**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Matrix Spikes (MS)							
Fluoride - Soluble	EK040S	1	19	**5.3**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement

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	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).
Asbestos Identification in bulk solids	EA200	SOIL	AS 4964 - 2004 Method for the qualitative identification of asbestos in bulk samples
Fluoride - Soluble	EK040S	SOIL	APHA 21st ed., 4500 F--C Soluble Fluoride is determined after a 1:5 soil/water extract using an ion selective electrode.

Preparation Methods	Method	Matrix	Method Descriptions
1:5 solid / water leach for soluble analytes	EN34	SOIL	10 g of soil is mixed with 50 mL of distilled water and tumbled end over end for 1 hour. Water soluble salts are leached from the soil by the continuous suspension. Samples are settled and the water filtered off for analysis.

Summary of Outliers

Outliers : Quality Control Samples

The following report highlights outliers flagged in the Quality Control (QC) Report. Surrogate recovery limits are static and based on USEPA SW 846 or ALS-QWI/EN/38 (in the absence of specific USEPA limits). This report displays QC Outliers (breaches) only.

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

- **For all matrices, no Method Blank value outliers occur.**
- **For all matrices, no Duplicate outliers occur.**
- **For all matrices, no Laboratory Control outliers occur.**
- **For all matrices, no Matrix Spike outliers occur.**

Regular Sample Surrogates

- **For all regular sample matrices, no surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

This report displays Holding Time breaches only. Only the respective Extraction / Preparation and/or Analysis component is/are displayed.

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

Outliers : Frequency of Quality Control Samples

The following report highlights breaches in the Frequency of Quality Control Samples.

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

CHAIN OF CUSTODY

ALS Laboratory: please tick →

Sydney 277 Woodpark Rd Smithfield NSW 2176 Ph 02 8784 8555 E samples.sydney@alsenviro.com
Brisbane 32 Shand St, Stafford QLD 4053 Ph 07 3243 7222 E samples.brisbane@alsenviro.com
Melbourne 2-4 Westall Rd Springvale VIC 3171 Ph 03 8549 9600 E samples.melbourne@alsenviro.com
Perth 10 Hod Way, Malaga WA 6090 Ph 08 9209 7555 E samples.perth@alsenviro.com
Newcastle: 5 Rosegum Rd Wmabrook NSW 2304 Ph 02 4968 9433 E samples.newcastle@alsenviro.com
Townsville: 14-15 Desma Ct, Bohle QLD 4818 Ph 07 4796 0600 E townsville.environmental@alsenviro.com
Adelaide: 2-1 Burma Rd Pooraka SA 5095 Ph 08 8359 0890 E adelaide@alsenviro.com
Launceston: 27 Wellington St, Launceston TAS 7250 Ph 03 6331 2158 E launceston@alsenviro.com

CLIENT: ENVIRON	TURNAROUND REQUIREMENTS: ☑ Standard TAT (List due date):	FOR LABORATORY USE ONLY (Circle)	
OFFICE: The Junction	(Standard TAT may be longer for some tests e.g., Ultra Trace Organics) ☐ Non Standard or urgent TAT (List due date):	Custody Seal Intact?	Yes No N/A
PROJECT: AS130348 PROJECT NO.:	ALS QUOTE NO.:	COC SEQUENCE NUMBER (Circle)	Free Ice / frozen ice bricks present upon receipt? Yes No N/A
ORDER NUMBER: PURCHASE ORDER NO.:	COUNTRY OF ORIGIN:	COC: 1 2 3 4 5 6 7	Random Sample Temperature on Receipt: °C
PROJECT MANAGER: Steve Cadman CONTACT PH: 0249625444		OF: 1 2 3 4 5 6 7	Other comments:
SAMPLER: Kate Woods SAMPLER MOBILE:	RELINQUISHED BY: KWoods	RECEIVED BY: KE	RELINQUISHED BY: KE
COC Emailed to ALS? (YES / NO) EDD FORMAT (or default):	DATE/TIME: 4/11/13 10:30am	DATE/TIME: 4/11/13 1030	DATE/TIME: 4/11/13 1700
Email Reports to (will default to PM if no other addresses are listed): scadman@environcorp.com			RECEIVED BY: FAST
Email Invoice to (will default to PM if no other addresses are listed): "			DATE/TIME: 5/11/13 10:30am

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL: Asbestos @ EN

ALS USE ONLY	SAMPLE DETAILS MATRIX: Solid(S) Water(W)			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).			Additional Information
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL BOTTLES	Asbestos ID only	Soluble Fluoride		Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
SNR	ELP6 Lot#15ACM2	31/10/13	S	unpreserved ziplock	1	X			log as EA200B
SNR	ELP6 Lot15ACM1	31/10/13	S	↓	1	X			
3	ELP6 Lot15 SF6	↓	S	unpreserved paper	1		X		
4	ELP6 Lot15 SF4	↓	S	↓	1		X		
5	ELP6 Lot15 SF5	↓	↓	↓	1		X		
6	ELP6 Lot15 SF2	↓	↓	↓	1		X		
7	ELP6 Lot15 SF3	↓	↓	↓	1		X		
8	ELP6 Lot15 SFQA1	↓	↓	↓	1		X		
9	ELP6 Lot15 SF1	↓	↓	↓	1		X		
				TOTAL	9	2	7		

Environmental Division
Sydney
Work Order
ES1323784

Telephone : +61-2-8784 8555

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP = Airfreight Unpreserved Plastic; V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass; Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag; LI = Lugols Iodine Preserved Bottles; STT = Sterile Sodium Thiosulfate Preserved Bottles.

OK

Appendix F

QA/QC Assessment

APPENDIX F

DATA QUALITY OBJECTIVES

To ensure that reliable data of adequate type was collected and assessed for the investigation, the seven-step Data Quality Objective (DQO) approach, endorsed in the NSW DEC (2006) Guidelines for the NSW Site Auditor Scheme 2nd Edition, will be adopted. The DQOs set quality assurance and quality control parameters for the field and laboratory programs to ensure data of appropriate reliability will be used to assess the environmental conditions at Parcel 6.

ENVIRON has developed DQOs in accordance with the seven-step process, which is presented below.

Step 1 – State the Problem

Based on the information available from the Phase 1 ESA, uses of Parcel 6 appear to be limited to a hobby farm, which was demolished in the 1980s. The remainder of Parcel 6 has not been developed and remains dense bushland. These uses of Parcel 6 require confirmation via a site walkover and judgemental sampling. In addition, the potential for fluoride in surface soils from dust deposition from the Hydro smelter requires assessment.

Step 2 – Identification of the Goals (Decisions) of the Study

The following decisions are to be made from this study:

- Are the current and former uses of Parcel 6 consistent with site observations?
- Has Parcel 6 been impacted by fluoride from dust deposition from the Hydro smelter?
- Has Parcel 6 been impacted by other contaminants from historical site uses?
- Is Parcel 6 suitable for the purposes of environmental conservation (E2) landuse?

Step 3 – Identify Information Inputs to the Decision or Goal of the Study

The inputs required to make the above decisions are listed below:

- A site walkover, including collection of field notes and photographs;
- Results of surface soil samples collected for fluoride analysis;
- Results of other soil samples from fill/ hummocky ground collected for suitable analysis during the site walkover;
- Proposed land use;
- Appropriate NSW contamination guidelines.

Step 4 – Define the Study Boundaries

Spatial boundaries - the study boundaries have been defined as the spatial boundary of Parcel 6, as shown on Figure 1.

Vertical boundaries – as areas of concern at Parcel 6 are restricted to surface soils, the vertical boundary of the study is the top 200mm unless subsurface contamination issues are identified during the site walkover.

Temporal boundaries – the temporal boundary is limited to the data collected during the investigation works.

Constraints within the study boundaries – This investigation does not require investigation of subsurface soils or groundwater unless impacts to subsurface soils or groundwater are considered likely to have occurred from the historical site activities.

Step 5 – Develop a Decision Rule

The decision rules for this investigation are as follows:

- If it is determined that the data generated through this investigation is reliable for use in producing a site conceptual model and assessing the suitability of Parcel 6 for environmental conservation landuse, then an assessment of the suitability of Parcel 6 for environmental conservation landuse will be made;

- If it is determined that the data generated through this investigation is not suitable, comprehensive or reliable for use in producing a site conceptual model, then further investigations may be recommended prior to the development of a site conceptual model and assessment of the suitability of Parcel 6 for environmental conservation landuse.

Step 6 – Specify Performance or Acceptance Criteria that the Data need to Achieve

Acceptable limits on decision errors have been developed based on the Data Quality Indicators (DQIs) of precision, accuracy, representativeness, comparability and completeness. The DQIs for this investigation are outlined below.

The potential for significant decision errors were minimized by:

- Completion of a QA/QC assessment of the investigation data to assess if the data satisfies the DQIs;

- Assessment of whether appropriate sampling and analytical densities were completed for the purpose of the investigation; and

- Ensuring that the criteria set for the investigation were appropriate for the proposed use of Parcel 6.

Minimization of the potential for significant decision errors limits the potential that a conclusive statement may be incorrect.

Step 7 – Optimisation of the Design of Collection of Data

The collection of data was optimized by the completion of a Phase 1 ESA, data gap review and development of a sampling design, which is included in Section 4.3. Attainment of the DQOs has been assessed by reference to the DQIs, presented below.

DATA QUALITY INDICATORS

The project Data Quality Indicators (DQIs) have been established to set acceptance limits on field and laboratory data collected as part of this investigation. Field and laboratory procedures acceptance limits are set at different levels for different projects and by different laboratories. Non-compliances with acceptance limits are to be documented and discussed in the report. The DQIs are presented in Table A.

Table A: Data Quality Indicators

DQI	Field	Laboratory	Acceptability Limits
Completeness	All critical locations sampled, including targeted sampling of areas of environmental concern identified during the site walkover. Fluoride soil sampling completed on a reduced density to identify if fluoride in surface soils is an issue. All samples collected Experienced sampler Documentation correct	All critical samples analysed and all analytes analysed according to Standard Operating Procedures (SOPs) Appropriate Practical Quantitation Limits (PQLs) Sample documentation complete Sample holding times complied with	As per NEPM (2013)
Comparability	Experienced sampler In the event of multiple sampling events: Same types of samples collected Same sampling methodologies used Climatic conditions	Same analytical methods used Same PQLs Same units Same primary and secondary laboratories	As per NEPM (2013)
Representativeness	Appropriate media sampled Relevant media sampled	All samples analysed according to SOPs	
Precision	Collection of duplicate samples Sampling methodologies appropriate and complied with	Analysis of: Blind duplicate samples at rate of 1 in 10 samples Split duplicate samples at rate of 1 in 20 samples Laboratory duplicate samples	 RPD of 30 to 50% RPD of 30 to 50% RPD of 30 to 50%

Accuracy	Sampling methodologies appropriate and complied with.	Analysis of: Method blanks Matrix spikes Surrogate spikes Laboratory control samples Reagent blanks Reference material	 Non-detect 70 to 130% 70-130% 70 to 130%

QUALITY ASSURANCE AND QUALITY CONTROL

A quality assurance assessment for this report is presented in Table A and B below. An assessment was made of data completeness, comparability, representativeness, precision and accuracy based on field and laboratory considerations, as outlined in NSW DEC (2006) and NSW EPA (2007) guidelines.

Table A: QA/QC – Sampling and Analysis Methodology Assessment

Sampling Methodology	ENVIRON Assessment
Sampling Pattern and Locations	Surface soil sampling was undertaken on a grid pattern across Parcel 6 to assess the impact of particulate fallout from Hydro Aluminium Smelter.
Sampling Density	Six soil samples were collected from a grid across the entire of Parcel 6 which is approximately 31.5 ha. The purpose of the sampling was to assess for impacts from smelter particulate fallout and therefore is considered suitable in density and spatial layout.
Sample depths	Surface soil samples were collected from a grid across the entire of Parcel 6 from the ground surface.
Sample Collection Method	Surface soil samples across Parcel 6 were collected directly from the ground surface using using dedicated disposable gloves and a hand trowel. The hand trowel was brushed clean prior to sample collection. Soil samples were collected into laboratory supplied, acid rinsed glass jars.
Decontamination Procedures	Surface soil samples across Parcel 6 were collected directly from the ground surface using using dedicated disposable gloves and a hand trowel. The hand trowel was brushed clean prior to sample collection.
Sample handling and containers	All soil samples were placed into laboratory-supplied paper bags. Soil and water samples were placed on ice following collection and during transportation to the laboratory.
Chain of Custody	Samples were transported to the laboratory under chain of custody conditions. The chain of custody forms were signed by the laboratory on receipt of the samples.
Detailed description of field screening protocols	Field screening for volatiles was not completed during soil sampling as volatile contaminants were not the main chemical of concern.
Calibration of field equipment	No field equipment requiring calibration was used during this

Table A: QA/QC – Sampling and Analysis Methodology Assessment	
Sampling Methodology	**ENVIRON Assessment**
	investigation.
Sampling Logs	The lithology of surface soil samples was documented on the field information sheets, which are included in Appendix C.

Table B: QA/QC – Field and Lab Quality Assurance and Quality Control	
Field and Lab QA/QC	**ENVIRON Comments**
Field quality control samples	Intra-laboratory duplicate soil samples were analysed at a ratio of 1:6 for fluoride analysed for the grid samples across the entire of Parcel 6. No rinsate blank samples were collected.
Field quality control results	Intra-laboratory duplicate results are presented in Table B. There were no RPD exceedences for the intra-laboratory duplicates collected for this assessment.
NATA registered laboratory and NATA endorsed methods	ALS was used as the primary laboratory. ALS laboratory certificates are NATA stamped and the lab is accredited for the analyses performed for this assessment.
Analytical methods	A summary of analytical methods were included in the laboratory test certificates.
Holding times	Review of the COCs and laboratory certificates indicate that holding times were met.
Practical Quantitation Limits (PQLs)	PQLs for all soil analytes were below Parcel 6 assessment criteria.
Laboratory quality control samples	Laboratory quality control samples including duplicates, laboratory control samples, matrix spikes, surrogate spikes and blanks were undertaken by the laboratories at appropriate frequencies.
Laboratory quality control results	All results for laboratory soil duplicates, laboratory control samples, matrix spikes and surrogates were acceptable and no detections were made in blank samples.

Overall it is considered that the completed investigation works and the data obtained adequately complied with the requirements of NSW DEC (2006) and NSW EPA (2007) guidelines and that the data is of suitable quality to meet the project objectives.