Fire & Rescue NSW

Armidale PFAS Investigation

Preliminary Site Investigation and Sampling & Analysis Quality Plan

August 2016

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1. Introduction

GHD Pty Ltd (GHD) was commissioned by Fire and Rescue NSW (FRNSW) to undertake a combined preliminary and detailed site investigation at a land parcel identified within Lot 2 DP 1068131 located at 2-16 Mann Street Armidale, NSW 2350 (the 'site'). The site has previously been used for the training of firefighters, which has potentially included the use of aqueous film forming foams (AFFF). The foams used may have contained perfluoro alkyl substances (PFASs) including perfluorooctane sulfonate (PFOS) and perfluorooctanoic acid (PFOA), which are potentially harmful to human health and the environment.

1.1 Background

The site is approximately 170 000 m^2 and comprises of Lot 2 DP1068131. The approximate site boundaries are presented in Figure 1, Appendix A.

The site is owned by Armidale Dumaresq Council. It is currently used as a firefighting training facility. The investigation area is part of wider training facility of approximately 200 000 m^2 (Figure 1, Appendix A). The site is bound by residential properties to the north and west, vacant land to the south and buildings and car park spaces to the east.

GHD understands the use of AFFF and other firefighting foams potentially containing PFASs were used at a number of FRNSW locations in NSW for firefighting training purposes. For this reason PFAS may have been released to the environment, which may have resulted in contamination.

The NSW Environmental Protection Authority (NSW EPA) is currently undertaking an investigation program to assess the historical legacy of PFAS use across NSW. As part of this program they have identified impact in surface water down gradient of the site and have requested further investigation to understand potential contamination issues be undertaken by FRNSW.

The investigation includes a number of preliminary tasks to inform field investigations. These preliminary investigations included a desktop-based preliminary site investigation (PSI) and a site inspection to develop a preliminary conceptual site model (CSM) for contamination issues at the site. This information has then been used to develop a field strategy, via a sampling analysis and quality plan (SAQP), for characterising and delineating the potential impacts and risks at the site.

This report documents the findings of the preliminary site investigation and the SAQP that has been prepared to address potential firefighting training impacts at the site.

It is expected that the SAQP development will also be provided to the NSW EPA for consideration prior to implementation of the investigations at the site.

1.2 Objectives

The overall objective of the investigation is to characterise impacts and subsequently assess the potential risks to human health and the environment from historical firefighting training activities at the site.

The specific objectives of this PSI and SAQP are to:

- Use available information to describe the site (including boundaries and title descriptions)
- Use available information to document the history of the site
- Identify potential on and off-site sources of contamination

- Characterise pathways for impact migration
- Identify potentially sensitive receptors/environment
- Develop a CSM using the preliminary investigation data on which a SAQP can be developed.
- Outline the strategy for assessing the nature and extent of contamination at the site using an SAQP approach (outlined within this document).

1.3 Scope of work

The scope of works completed by GHD for this stage of the investigation comprised a desktop study and site inspection to understand the potential for contamination and to inform subsequent field investigation requirements.

The scope of work completed is in accordance with the proposed scope of work outlined in GHD proposal 214723 dated 30 March 2016, which was approved for completion by Fire and Rescue NSW on 16 May 2016.

Limitations associated with GHD's work are provided in **Section 4.**

A summary of the scope of work undertaken is provided below.

1.3.1 Task 1 - Information and Data Review (preliminary site investigation)

A detailed review of relevant information and data sources was undertaken to identify property details and potentially contaminating sources and activities.

The information reviewed was in general accordance with that recommended in *Contaminated Sites: Guidelines for Consultants Reporting on Contaminated Sites* (OEH, 2011) and included:

- Local Council (heritage register, Local Environment Plans (LEPs), zoning and permissible land use).
- Department of Lands (aerial photographs).
- Office of Environment and Heritage (including notices under *Contaminated Land Management* (CLM) *Act 1997*, *Pollution of the Environment Operations* (POEO) *Act 1997* Environment Protection License Register, environmental incidents and State Heritage Register).
- NSW Department of Primary Industries (DPI) Water (local and regional groundwater information, including groundwater bore search).

Further to this, a review of historical investigation reports provided by FRNSW was completed. This included a review of the NSW EPA investigation at the site.

The data reviewed was used to:

- Characterise the environmental setting for the site (see Section 2.3) to understand potential contaminant migration pathways and sensitive receptors in the receiving environment.
- Understand the site history and potential sources of impact (see Section 2.4)
- Review regulatory information pertaining to previous contaminating activities undertaken at the site to characterise potential sources of impact (See Section 2.5)
- Develop a preliminary CSM highlighting the pollutant linkages between sources and receptors. This was used to inform development of the SAQP (see Section 2.5.1).

1.3.2 Task 2 – Preparation of SAQP

The CSM developed from the preliminary site investigation was used to prepare a SAQP. The SAQP outlines the strategy for assessing the nature and extent of contamination at the site.

The SAQP includes the following:

- Data Quality Objectives (DQO'S) which have been prepared in accordance with Appendix IV of the *Guidelines for the NSW Site Auditor Scheme* and the National Environment Protection (Assessment of Site Contamination) Measure (NEPM) (as amended 2013 – NEPC, 2013) to ensure that field investigations and analyses are undertaken in a way that enables the collection and reporting of reliable data on which to base the site assessment and remediation requirements (if required) – See Section 3.1.
- The basis if the assessment including details of the guidelines, policies and legislation that the investigation has been developed for (See Section 3.2)
- The requirements for sampling and assessment at the site (see Section 3).
- Assessment of potential sources of contamination and contaminants of concern including presentation of the preliminary CSM (see Section 2.6).
- Assessment of potential groundwater impacts (see Section 3).
- Proposed sampling and analytical program (see Section 3).
- Proposed sampling methodology (see Section 3).
- Quality Assurance and Control protocols (see Sections 3).

1.3.3 Reporting

GHD has prepared this report to present the preliminary site investigation and SAQP.

1.4 Report Structure

The report includes the following key sections:

- Section 2 – Preliminary Site Investigation
- Section 3 – Sampling and analytical program

1.5 Limitations

GHD's limitations to the assessment are provided in Section 4.

2. Preliminary site investigation

2.1 Site identification

A summary of site identification details is provided in Table 1. The site location is presented in Figure 1 in Appendix A.

Table 1 – Site identification summary

Information	Details
Street Address	2-16 Mann Street, Armidale NSW 2350
Lot and DP number	Lot 2 DP 1068131
Site Area	Approximately 170 000 m^2
Local Government Area	Armidale Regional Council
Local Land Use Zoning	SP2 – Infrastructure: Emergency Services Facility & Educational
Current Land Use	Training site
Surrounding Land Use	Residential properties to the north and west, vacant land to the south and buildings and car park spaces to the east

2.2 Site inspection

Prior to undertaking site investigations, a questionnaire was forwarded to FRNSW staff to prompt collation of relevant information from appropriate personnel prior to the site visit. A field questionnaire was then taken to the site by GHD site staff to populate during the site visit. The completed GHD field questionnaire is provided in Appendix B.

The site inspection was completed on 30 June 2016 by an experienced environmental professional from GHD's contamination and environmental management team. The site inspection included a site walkover with site staff to identify areas of potential contamination based on surface conditions and evidence of current or former potentially contaminating activities or site operations. Further observations of AFFF impacts/use will be made during preparation and completion of field works, using visual observations of site conditions in previously uninspected areas.

The site inspection works provided the following information. The site features discussed are presented in Figures 2 and 3 of Appendix A. A photographic log is presented in Plate A.

- The site is owned by the Armidale Regional Council. Prior to FRNSW leasing the site, the site was used as a driver training course and prior to that as a drive in movie theatre. The site has remained relatively unchanged since FRNSW has leased it. Some additional buildings have been developed but there has been no major earth works.
- The site has been occupied by FRNSW since 1997.
- The site has an inner perimeter fencing that immediately surrounds the FRNSW site and a second perimeter fence that includes soil stockpiles, the Rural Fire Service and a former driver training area.
- The locations of former fire training activities include the main fire training area and the skid pan.
- The main fire training area is located to the west of the main driveway into the site. The area is on a hardstand of concrete and asphalt with the concrete being laid approximately 5 – 10 years ago. The area slopes and drains to the north of the site with the main wash area flowing to a surface water retention pond immediately down-gradient (to the north) of the area. The main use of AFFF was at the fire training props (i.e. small tanks or buildings) at the north of the hardstand, which were ignited from gas lines. The area

would have included the use of ignition chemicals such as petroleum hydrocarbons and firefighting foams for fire training exercises. The retention pond area is unlined. The pond was designed to capture the runoff from the training ground.

- The skid pan is located outside the inner perimeter of the FRNSW site in the former driver training centre. According to onsite interviews AFFF was used on the skid pan. Water in a surface water retention pond that is located to the north west of the skid pan is used, via a pump and sprinkler system to wet down the concrete skid pan area. Surface water run-off is then recaptured in the retention pond. However, there is a drainage channel located in the north eastern corner which may allow some surface water run-off to the north east.
- In addition to the retention ponds located at the main fire training area and the skid pan, a third retention pond is located in the north eastern area of the outer perimeter of the site. This retention pond receives water draining from the skid pan through the site. All surface water leaving the site drains into one channel at Mann Street before being diverted under the road into the neighbouring property to the north. There is some underground drainage but they all appear to drain to the same location at Mann Street.
- Vegetation on site appeared to be in good condition and frogs and ducks were evident in and around the surface water bodies.
- FRNSW site personnel indicated that:
  - The storage of AFFF was limited on the site.
  - The product was usually brought onto site for fire training and usually composed of 1 or 20 L containers of concentrate. This was immediately mixed in a drum and used for the training procedure.
  - The product had a short shelf life and therefore was never stored for long periods of time.
  - The site currently has approximately 20 weeks of the year that it is used for training exercises. The majority of current training exercises use 'Trainol' Training Foam. This product contains no PFASs and is readily biodegradable.
- There is one above ground storage tank for liquefied petroleum gas located on site.
- The surrounding landuse immediately west is used by the Council to stockpile clean material for road works. Further to the west is the NSW Rural Fire Service then residential properties. The landuses adjoining other boundaries of the site are generally rural/residential properties.
- Hydraulically down gradient from Mann Street, the surface water flows to a surface dam located within a residential property (3-5 Mann Street). The dam is located approximately 50 m from the Street. There is then a drainage line that continues to flow north through a neighbouring property (20 Castledoyle Road) and into another property where there is another surface dam (76-94 Grafton Road). The drainage line then flows to a culvert before being directed underneath Grafton Road. On the other side of Grafton Road, the drainage line continues onto private property. The drainage line north of Grafton Road, when compared to previous historical photos seems to have been realigned and two surface water dams have been removed. The site is in the process of being redeveloped and there are several soil stockpiles located to the north of the property. The drainage line eventually drains to the Dumaresq Creek approximately 900 m to the north.

The findings of the site inspection are summarised in Table 2.

Table 2 – Site inspection summary

Items		Comments
General	Site use	The site is currently used a training facility by the FRNSW. There is one office block and several other buildings that are used for storage and training props (scenarios).
	Fencing	There are two perimeter fences with the inner perimeter for FRNSW purposes. The site is signposted at the entrance as authorised entry only. The internal area consists of all buildings, the fire training area, and retention pond down gradient of the fire training area. The outer perimeter fencing is around the entire Lot 2 DP 1068131 that includes council soil stockpiles and the Rural Fire Service and the rest of the former driver training centre. This area also includes the skid pan and the retention pond associated with the skid pan. The Rural Fire Service also has its own perimeter fencing. The third surface water body located in the north eastern corner is located in the outer perimeter but is divided by Lot 1 and 2 DP 1068131.
Ground surface	Ground cover	The ground cover across the site is mostly grassed with some larger trees present. The main driveway where the trucks park is sealed with concrete. The training ground where most of the AFFF has previously and currently been used is asphalted. The skid pan located in the south eastern corner is concrete hardstand.
	Topography	The investigation area generally slopes to the north. Surface water is directed to the north through drainage channels with two main drainage lines coming from the site and a third from the outer perimeter from the skid pan. All three drainage lines follow the topography and converge in the nature strip along the southern side of Mann Street before being diverted underneath Mann Street through a culvert.
	Vegetation	Grass of variable health was present across the majority of the site. Some mature trees and vegetation were present around the western and north-western boundary.
	Surface water	Stormwater grates located within asphalt and concrete sealed areas suggested the presence of a stormwater line. These drains are expected to direct surface water down gradient and connect to other site surface water drainage features. There are three main surface water bodies associated with the greater site, which include: - The surface water retention pond located inside FRNSW boundary to the north of the training area. - The surface water retention pond located to the north of the skid pan. - The surface water retention pond located to the north east which are associated with low elevations in the landscape.
Evidence of contamination	Litter	No extensive litter was observed in and around the site.
	Waste drums or bulk storage facilities	AFFF is not stored onsite. It is usually brought into the site just prior to fire training and usually as 1 or 20 L containers of concentrate.
	Fill	There were small soil bunding areas located across the site. No major earth works have occurred at the site since FRNSW has occupied the site.

Plate A - Photographic record

▲**Photograph 1:** Upper fire training area in foreground, car park in the background and a storage / garage on the right.

▲**Photograph 2:** Lower fire training area with props.

▲**Photograph 3:** Western area of the site with a training scenario room in the foreground.

▲ **Photograph 4:** Mechanical area in the background with water collection tank in the mid and foreground. Concrete lined drainage channel.

▲**Photograph 5:** Concrete line stormwater channel draining into the grassed area adjacent to the main fire training ground.

▲**Photograph 6:** Facing east to the main fire training area where most of the AFFF has been used in the past.

▲**Photograph 7:** Down gradient of the fire training area, where the surface water runoff flows to the retention pond. This retention pond has been taped off.

▲**Photograph 8:** Facing south towards the main fire training area with the retention pond in the foreground..

▲**Photograph 9:** Culvert for surface water draining from the eastern area of the site.

▲**Photograph 10:** Surface water drainage line adjacent to boundary fencing.

▲**Photograph 11:** Fire training area in the south eastern corner of the site. The area only uses water and particle board is set alight. The smoke can have formaldehyde associated with the burning of the particle board. .

▲**Photograph 12:** The skid pan in the background with the former driver training road in the mid ground..

▲**Photograph 13:** Drainage line from the skid pan in the south eastern corner.

▲**Photograph 14:** The culvert on the southern side of Mann Street where all surface water draining from the site and greater site area converges before flowing underneath the road.

▲**Photograph 15:** The main entrance to the site.

▲**Photograph 16:** The southern drainage channel of Mann Street.

▲**Photograph 17:** The retention pond associated with the skid pan in the south eastern corner of the greater site

▲**Photograph 18:** The retention pond located on the eastern side of the greater site near Mann Street.

	
▲**Photograph 19:** The development on the northern side of Grafton Road with some visible stockpiles in the background.	▲**Photograph 20:** The surface water and culvert on the southern side of Grafton Road

2.3 Environmental Setting

2.3.1 Topography

The site has an elevation of approximately 990 m Australian Height Datum (AHD), according to *NSW Globe* from Land and Property Information. The regional topography appears to gently fall to the north from the site towards Mann Street and then toward the Dumaresq Creek.

2.3.2 Soils

General

According to eSPADE from Office of Environment & Heritage, the site is within the Kellys Plains 'kp' soil landscape. The Kellys Plains soil landscape has the following characteristics:

- **Landscape:** gently undulating lower slopes, footslopes and colluvial fans on basalt and basalt-related colluvium and some other sediments (Armidale Beds/Sandon Beds). Local relief mostly 0–30 m, slopes 1–8%, elevation 960–1210 m. Broadly concave to flat transferral slopes. Extensively cleared open woodland.
- **Soils:** moderately deep, deep (>80 cm) to occasionally very deep (>150 cm), moderately well drained Haplic Eutrophic Black and Red Chromosols and Ferrosols (Chocolate Soils) are widespread. Yellow and Grey Chromosols (Lateritic Podzolic Soils) occur in some areas in association with metasediments. Black Vertosols/Black Dermosols (Black Earths/Weisenbodens) occur on the sometimes flatter, lower portions of slopes. Minor Ferrosols/Dermosols (Krasnozems) occur on some upper footslopes.
- **Limitations:** mass movement (localised), productive arable land (with appropriate land management techniques), high run-on, sheet erosion risk, gully erosion risk, engineering hazard, rock outcrop (localised), dieback. Stoniness (localised), low wet bearing strength (localised), high organic matter (localised), acidity (localised), high shrink-swell potential, slow permeability (localised), high permeability (localised).

Acid Sulphate Soils

The acid sulphate soil class at the site is Class Bn(p4) (ASRIS, 2013), which indicates a low potential for the presence of acid sulphate containing soils. There are no other soil classes located within 500 m of the site.

2.3.3 Hydrology

Surface water flow is expected to follow the local topography on-site and flow north. Dial before you dig underground utilities information presented in Appendix F did not provide an indication of stormwater infrastructure through the site. However, it appeared during the site visit that the majority of onsite drainage was aboveground in man-made channels.

The closest water bodies are Black Gully and Dumaresq Creek, which are both located approximately 1 km away to the north and north east of the site. The site does not appear to be within the Black Gully catchment, which is a tributary of Dumaresq Creek. However, there is a small tributary (drainage channel) that flows through the site and enters the Dumaresq Creek approximately 1 km north of the site. The general catchment hydrology and slope is presented in Figure 3, Appendix A.

2.3.4 Geology

The 1:250,000 geological sheet series for Dorrigo-Coffs Harbour suggests that regional geology of the area includes Sandon Beds from the Carboniferous Period. Sandon Bed consists of greywacke, argilillite, chert, jasper and basic volcanics. Tertiary Cainozoic Group sediments that include theoleiitic and alkaline basalts with minor trachyte and dolerite, conglomerate, greybilly, sandstone and claystone are located immediately to the south of the site.

2.3.5 Hydrogeology

Existing Groundwater Bores

GHD conducted a review of existing groundwater borehole records using the NSW Department of Primary industries, Office of Water, groundwater database. The search was conducted to identify registered groundwater boreholes in close proximity to the site and to record information such as use and standing water level. As shown in Table 3, only one groundwater bore was identified within a 500 metre radius of the site. Two further bores were identified at distances that may be in hydraulic connection with groundwater migrating from the site. No groundwater boreholes were identified within the site boundary. Additional information obtained from the groundwater borehole search is presented in Appendix C.

Table 3 – Review of existing groundwater data

Borehole ID	Purpose	Depth (m)	Standing Water Level (m)	Approx. Distance from Site	Drillers Log
GW966477	Stock	20	6	320 m north	Fill underlain by basalt with a screen depth of 14 – 17 m bgl.
GW047498	Irrigation, domestic, industrial	45.7	3.7	640 m north west at Pembroke Caravan park	Clay underlain by shale to 8.8 m followed by Basalt to 45.7. Screened and open hole from 8.8 m bgl.
GW301016	Stock, Domestic	30.5	9	833 m west	Topsoil, underlain by clay to 12 m followed by shale to 30.5 m. Screened depth is 26 – 35 m bgl

Groundwater risk map

The *1:2,000,000 Groundwater in New South Wales, Assessment of Pollution Risk Map* indicates the site is likely to be underlain by fractured mainly igneous and metamorphic rocks with a low to moderate potential for groundwater movement. Groundwater salinity is expected to range

from 0 – 1000 mg/L, which is considered suitable for stock, domestic and some irrigation purposes.

2.4 Site history

2.4.1 Summary of previous investigations

Limited targeted sampling was undertaken by the NSW EPA at the site in January 2016 (NSW EPA, 2016). This was part of a broader investigation of other sites undertaken by the NSW EPA to assess the potential for PFAS contamination in areas where these chemicals may have been used. A letter detailing the investigation is provided in Appendix D.

The site was inspected by NSW EPA on 20 January 2016, and during the visit one water sample was collected from the retention pond at the base of the fire training area and one soil sample was collected from a topographical low point near this retention. A soil sample and a water sample were also collected from an off-site area within a creek located down gradient of the training facility.

The analytical results of the samples demonstrated that PFASs were present both within the on-site collection pond (PFOS 5.2 ug/L) and off-site within the creek (PFOS 0.8 ug/L). PFASs were detected in the soil sample collected from onsite (PFOS 0.42 mg/kg), but were not detected in the soil sample collected from the off-site creek.

Based on the outcomes of the site inspection and initial sampling, the EPA letter provided recommendations for further investigation. This included further delineation of the extent of soil contamination and whether there is an ongoing source, understanding and characterising the groundwater in the area, sampling creeks and ponds on private land to the north of the site, development of a conceptual site model and the completion of any further investigations to characterise the risks.

2.4.2 Aerial photographs

A selection of historical aerial photographs was examined in order to assist in assessing past activities and land uses at the site. A review of historical aerial photography is provided in Table 4.

The aerial photographs are presented in Appendix E.

Table 4 – Review of historical aerial photographs

Year	Site	Surrounds
1956 (black and white)	The site is vacant land with scattered bushes/trees throughout in the middle.	There appears to be private properties to the north and west of the site. The surrounding area to the south is cleared un-vegetated land. The area to the east is vacant with low density bushes/trees.
1970 (black and white)	The site has remained mostly unchanged from the previous aerial photograph.	The areas surrounding the site appears to have remained mostly unchanged from the previous aerial photograph.
1987 (black and white)	The site appears to be undergoing some development. There are newly constructed tracks throughout the site with a looped track on the northern area of the site.	There appears to be some development occurring to the north west of the site. The other surrounding areas have remained unchanged from the previous aerial photograph.
1994 (colour)	The site appears to have undergone substantial development. A newly	The areas surrounding the site appears to have remained mostly

Year	Site	Surrounds
	constructed track and a large concrete surface on the southern area of the site appear. New buildings and car park spaces have been constructed on the north western area of the site. Gravelled surfaces on the north western site may be an indication of designated training areas.	unchanged from the previous aerial photograph.
2006 (colour)	More vegetation in the form of trees/bushes can be found throughout the site.	The areas surrounding the site appears to have remained mostly unchanged from the previous aerial photograph.
2016 (colour)	The site has remained mostly unchanged from the previous aerial photograph.	The areas surrounding the site appears to have remained mostly unchanged from the previous aerial photograph.

In summary, the following observations were made:

- The site has undergone substantial development between 1987 to 1994 in the form of constructed buildings and infrastructure.
- The site has remained mostly unchanged since 1994 with the exception of additional vegetation such as trees/bushes
- The surrounding areas have remained mostly unchanged since 1956, with the exception of minor development from 1970 to 1987.

2.5 Regulatory information review

2.5.1 Overview

As part of the desk based review, information was obtained from a number of sources to enable a greater understanding of the historical land use at the site, including former site practices which may have the potential to cause contamination. The desk based review considered the following sources of information:

- Council information including land zoning and permissible use.
- NSW EPA contaminated sites register (notifications or incidents.
- NSW EPA Protection of the Environment Operations (POEO) licence register.

2.5.2 Council information

Local Environment Plan (LEP)

The site is located in the Armidale Dumaresq Council. Reference to the Armidale Dumaresq Local Environmental Plan 2014 indicates that the site is zoned as SP2 – Infrastructure: Emergency Services Facility & Educational.

2.5.3 Environment Protection Authority

GHD reviewed datasets maintained by the Environment Protection Authority (EPA) including notices under *Contaminated Land Management Act 1997*, POEO Environment Protection License Register and State Heritage Register. Results are presented in Appendix C, where applicable and summarised below.

Contaminated sites register

A site will be on the Contaminated Land: Record of Notices only if the EPA has issued a regulatory notice in relation to the site under the *Contaminated Land Management Act* 1997. GHD undertook a search of the register on 17 June 2016. No contaminated lands records are listed for the site. The search did not list any premises within a one kilometre radius of the site.

POEO environment protection license register

GHD undertook a search of the register on 17 June 2016. No record was found for the site.

The search found one premises at or within a one kilometre radius of the site, which is detailed in Table 5.

Table 5 – Summary of POEO license register

Licence holder	Site Address	Activity Type	Licence Status	Proximity to the site
Armidale Dumaresq Council	Armidale Solid Waste Facility, Long Swamp Road	Composting. Non thermal treatment of general waste. Waste storage –hazardous, restricted solid, liquid, clinical and relates waste and asbestos waste	current	1 km south of the site

List of NSW contaminated sites notified to EPA

The sites appearing on the EPA "List of NSW contaminated sites notified to the EPA" indicate that the notifiers consider that the sites are contaminated and warrant reporting to EPA.

However, the contamination may or may not be significant enough to warrant regulation by the EPA. The EPA needs to review information before it can make a determination as to whether the site warrants regulation.

GHD undertook a search of the listing on 17 June 2016. The search showed one location within a one kilometre radius of the site. The listing is summarised in Table 6.

Table 6 – Summary of contaminated sites notified to EPA

Site Description	Site Address	Contamination Type	Proximity to the Site	EPA Assessment and Management
Armidale Dumaresq Council Grafton Road Depot	15-25 Grafton Road	Other Petroleum	960 m North West	Under Assessment by the EPA

State heritage register

GHD undertook a search of the register on 27 June 2016. The search showed one property within a one kilometre radius of the site. The listings are summarised in Table 7.

Table 7 – Summary of state heritage register

Item name	Address	Proximity to the site	Owner
Site of Saint George's Church	15-23 Mann Street, Armidale, NSW 2350	677 m north west	Unknown

2.6 Preliminary conceptual site model

Based on the outcomes of the investigation, a CSM has been developed in order to identify and understand the links between potential contamination sources, pathways and receptors. The objective of the CSM is to identify potential pollutant linkages which will form the basis for the assessment of risk and the scope for subsequent stages of investigation.

2.6.1 Sources

Based on anecdotal evidence, historical aerial photographs and the history of the Armidale Fire and Rescue NSW site, the following historical contamination sources could have affected the investigation area:

- The site has historically been used as a firefighting training site since at least 1994. The primary contaminants of concern associated with these activities include:
  - PFAS contaminants including perfluorooctane sulfonate (PFOS) and perfluorooctanoic acid (PFOA).
  - Fire accelerants including fuels and oils (total recoverable hydrocarbons – TRH; benzene, toluene, ethylbenzene and toluene – BTEX; PAH; and metals (particularly lead)).
- The areas of concern with regard to fire-fighting activities include:
  - The concrete skid pad on the southern area of the site and on gravelled surfaces on the north western area of the site, where most firefighting foams and fuel for ignition are likely to have been used.
  - Designated storage locations for AFFF liquids and locations where extinguishers were filled.
  - Drainage or containment components receiving AFFF contaminated wastewater at designated equipment wash down areas after foam was used for fire training.
- Oils from vehicles in car park spaces. The primary contaminants of concern are expected to include petroleum hydrocarbons and polycyclic aromatic hydrocarbons.
- Minor spills of petroleum hydrocarbons and oils from vehicles traversing the site and the shed behind the office that is a mechanical workshop on cars.

The site is currently occupied by FRNSW and is used by staff as office space, meeting areas for crewing staff, storage and fire training. AFFF containing PFASs are no longer used at the site.

It is noted that the primary objective of this investigation is to assess the historical impacts from fire training activities. While other minor sources of contamination have been identified, based on our review, fire training activities are the key issue of concern for the site warranting further investigation. The primary chemicals of concern associated with those activities are:

- AFFF compounds including PFASs (such as PFOS and PFOA). The US EPA (2014) note that PFASs, are chemically and biologically stable in the environment and resist typical environmental degradation processes. As a result, these chemicals are extremely persistent in the environment. The collected samples potentially containing AFFF compounds will also be tested using the Australian Standard Leaching Procedure (ALSP) to assess the leaching potential of soils into nearby water receptors.
- Fire-fighting ignition sources:
  - Total recoverable hydrocarbons – TRH
  - Benzene, toluene, ethylbenzene and toluene – BTEX
  - Polycyclic aromatic hydrocarbons – PAH

– Metals (primarily lead).

Based on the review of information, PFAS contamination is considered to be the contamination risk driver for the site and will be the primary focus for further investigations.

2.6.2 Pathways

The primary pathways by which receptors could be exposed to the sources of contamination outlined above are considered to be:

- Dermal contact with contaminated shallow soil and concrete dust.
- Incidental ingestion of contaminated soils and dust.
- Direct contact or ingestion of groundwater.
- Inhalation of contaminated soils or dust.

  Schedule B2 of the NEPM (2013) states that "*As a preliminary screening measure, the potential for a vapour intrusion risk should be considered where the Henry's law constant for a substance is greater than 1 x 10^{-5} atm/m^3/mol and its vapour pressure is > 1 mm Hg at room temperature*"

  US EPA (2014) list Henry's law constants for PFOS and PFOA of 3.05 x10^{-9} atm/m^3/mo and 'not measurable' respectively, which based on the NEPM (2013) recommendation suggest inhalation of vapours from these contaminants is unlikely to represent a human health risk at the site.

  US EPA (2014) notes that once PFOS and PFOA are released to the atmosphere they are expected to absorb on to particles and settle to the ground through wet and dry deposition.
- Vertical and horizontal migration of contamination through the unsaturated zone into the saturated zone and subsequent horizontal migration within the groundwater and subsequent discharge to surface waters. The US EPA (2014) notes that PFASs are water soluble and can migrate readily from soil to groundwater, where they can be transported long distances.
- Surface runoff and sediment transport into storm water drainage and subsequent transport and discharge to surface waters.

2.6.3 Receptors

When evaluating potential adverse health / environmental effects from exposure to a contaminated site, all potentially exposed populations should be considered. For this site, the key populations or receptors of interest are considered to include:

- Current and future onsite workers being exposed to dust from impacted surfaces.
- Current and future construction/intrusive maintenance (utility) workers (on-site and off-site).
- Human health and ecological receptors in groundwater and surface water. The closest surface water is the three main surface water bodies on the greater site, including the retention pond immediately north of the training ground, the retention pond associated with the skid pan and the pond located in the north western side of the training centre. Off-site receptors include the tributary/drainage channel running off-site to the north into neighbouring properties that have dams/ponds on the channel. These ponds have the potential to be used as stock watering. There is also a groundwater bore located hydraulically down gradient of the site. This tributary continues underneath Grafton road

and continues north into Dumaresq Creek, which is located approximately 1 km away north of the site.

2.6.4 Potential source-pathway-receptor linkages

Based on the current information, the following preliminary contamination conceptual site model (CSM) has been developed for potential on site sources of contamination in Table 8 below and presented in **Figure 4, Appendix A**.

Table 8 – Preliminary Conceptual Site Model

Potential Source	Potential Contaminants	Potential Pathway	Potential Receptor
Previous: Firefighting training activities Main training ground Skid Pan Other fire training areas on the site	*Primary contaminants of concern:* • PFASs *Other potential contaminants:* • TRH • BTEX • PAHs • Heavy Metals (primarily lead)	Human exposure: ● Ingestion of surface water, groundwater, soils and dust. ● Indoor and outdoor inhalation of dust. ● Dermal contact with surface water, groundwater, soil and dust. ● Inhalation of contaminated soils or dust.	Human: ● On-site current and future workers and visitors ● Construction/ intrusive maintenance workers on and off site (ie the new development north of Grafton Street). ● Nearby residents and livestock.
Previous: Chemical spills			
Previous: Contaminated equipment cleaning and wash down		Environmental exposure: ● Surface Water runoff. ● Vertical migration through the unsaturated zone into the saturated zone and horizontal migration within the groundwater.	Environmental: ● Groundwater on and off site. ● Surface water ponds and Dumaresq Creek. ● Sediment / soil.

TRH – Total Recoverable Hydrocarbons; BTEX – Benzene, Toluene, Ethyl benzene and Xylene; PAH – Polycyclic Aromatic Hydrocarbons.

3. Sampling and analytical program

3.1 Overview

A process for establishing data quality objectives for an investigation-site has been defined by the NSW DEC *Guidelines for the NSW site Auditor Scheme (2nd edition,* 2006). The Data Quality Objective (DQO) process will be applied to the site investigation, as described below, to ensure that data collection activities are appropriate and achieve the project objectives. The DQO process involves seven steps as follows:

- Step 1: State the problem
- Step 2: Identify the decision
- Step 3: Identify inputs to the decision
- Step 4: Define the study boundaries
- Step 5: Develop a decision rule
- Step 6: Specify limits on decision errors
- Step 7: Optimise the design for obtaining data

The seven DQO steps for this project are defined in Table 9.

Table 9 – Data Quality Objectives

Step		Description
1	**State the problem to be resolved**	What is the likelihood that PFAS sources have contaminated the environment and what risks does it pose?
2	**Identify the decision/s to be made**	To address the problem set out in Step 1, the following decisions are required to achieve the task objective and to identify data gaps and additional information that may be required: • What are the potential sources of PFAS contamination at the site? • Do the concentrations of PFASs in the samples collected exceed adopted guideline criteria? • Do the results of the sampling and analysis indicate there is a potential risk to human health and ecological receptors on-site and off-site?
3	**Identify the inputs to the decision**	To inform the decisions and identify key data gaps and needs, the following information is considered necessary: • The location of potential PFAS contamination sources. • The concentrations of PFAS in soil, groundwater and surface water from laboratory analysis. • Identify potential exposure routes and contamination migration pathways. • The likelihood of PFAS migrating to groundwater and thence off-site.

Step		Description
4	**Define the boundaries of the study**	The study boundary comprises soil, groundwater and surface water within the on-site areas in the vicinity of the identified potential PFAS sources as shown in Figure 1, Appendix A. The study boundaries also extend to surface water impacts between the site and Dumaresq Creek. The EPA has also raised concerns of impacted sediment from water ways being used as fill on a residential development down gradient of the site.
5	**Develop a decision rule**	The key decision rules are: Is PFAS contamination present in soil, sediment, groundwater or surface water? • If NO – risks to receptors is low. Further assessment is not supported. • If YES – assess the risks to on-site and off-site receptors; AND: Do the concentrations of PFASs in samples exceed the adopted guideline criteria considered to be protective of the receptors potentially at risk? • If NO – risks to receptors is low. Assess the adequacy of the investigations to quantify risk. • If YES – conduct further (more detailed and site-specific) assessment of the risks to receptors.
6	**Specify the tolerable limits on decision errors**	A detailed assessment of potential for sampling and measurement errors will be undertaken based on the investigation scope, methodology and results. Data quality will be assessed as detailed in Schedules B2 and B3 of the NEPM (2013). Implications for data quality with respect to the task objective will be identified and discussed. Due to the margin of error associated with analytical methods, any results close to the threshold (within the margin of error either over or under) are more likely to be incorrectly considered either “contaminated” or “uncontaminated”. As targeted samples are to be collected as part of a judgemental approach, greater confidence in results will be achieved through knowledge of the site and the likely location of PFAS sources. As such, the following tolerable limits on decision making are proposed for targeted sampling locations: • For results *within* the margin of error (either above or below the threshold) the initial classification would be considered valid (unless for a chemical not considered to be a contaminant of potential concern). • Any results *above* the threshold would require further investigation and delineation to determine the size of the impact identified.
7	**Optimise the design for obtaining the data**	The sample design will be optimised through:

Step	Description
	• Identification of potential PFAS sources from existing information and investigations conducted by GHD and others i.e. results of PSI. • A review of the surface water pathways across and leaving the site. • Collection of soil, groundwater and surface water samples. • Appropriate laboratory analysis methodologies. • Evaluation and interpretation of results with respect to relevant guidelines.

3.2 Basis for assessment

3.2.1 Relevant guidelines

The framework for the contamination assessment made herein, was developed in accordance with guidelines "made or approved", by the NSW EPA under Section 105 of the *Contaminated Land Management Act, 1997*. These guidelines include, but are not limited to the following:

- NSW EPA (1995) *Contaminated Sites: Sampling Design Guidelines*
- NSW DEC (2006) *Contaminated Sites: Guidelines for NSW Site Auditor Scheme*
- NSW DECC (2015) *Guidelines on the Duty to Report Contamination under the Contaminated Land Management Act 1997*
- NSW EPA (2011) *Contaminated Sites: Guidelines for Consultants Reporting on Contaminated Sites*
- NEPM (2013) *National Environment Protection (Assessment of Site Contamination) Amendment Measure (No.1)*, National Environment Protection Council (NEPC)

3.2.2 Potential contaminants of concern

Based on the findings of the PSI and the key aims of this investigations the following contaminants of concern have been identified for the investigation:

- Primary potential contaminants of concern:
  - PFASs
- Other potential contaminants of concern:
  - Total recoverable hydrocarbons (TRH)
  - Benzene, toluene, ethylbenzene and xylene (BTEX)
  - Polycyclic aromatic hydrocarbons (PAHs)
  - Metals (primarily lead)

The assessment criteria selected for these chemicals are discussed below.

3.2.3 Contamination assessment criteria

Screening levels – PFAS

There are no approved screening levels for concentrations of PFASs in soil, groundwater or surface water in Australian guidance. Recent documentation released by the Government of the Western Australia Department of Environment Regulations (DER, 2016) provides some interim

guidance screening values. The Australian Department of Defence has also developed interim guidance based on a review of available literature on PFOS and PFOA toxicity to human and aquatic ecosystems, however, while this information has been viewed it is not currently in the public domain.

GHD has also undertaken a review of available PFOS and PFOA information from Australia and overseas and developed interim screening levels (ISLs) which have been adopted for this investigation. The ISLs are presented in Table 10 below.

Table 10 – Adopted PFOS/PFOA ISLs – Soil and Groundwater

Media	Exposure Scenario	PFOS [1]	PFOA	Source	Comments
Soil	Human Health Interim Screening Level (HISL) – Industrial Commercial (mg/kg)	100	240	USEPA Region 4 2009 (in USEPA 2014) - PFOA DER (2016) - PFOS	A scaling factor of 15 applied to residential criteria for PFAS
	Human Health Interim Screening Level (HISL) – Residential (mg/kg)	4	-	DER (2016) - PFOS	
	Ecological Interim Screening Level (EISL) – terrestrial (mg/kg)	0.373	3.73	UK Environment Agency 2009	
Water	Human Health Interim Screening Level (HISL) – Drinking water (µg/L)	0.5	0.4	USEPA Region 4 2009 (in USEPA 2014) – PFOA DER (2016) - PFOS	
	Human Health Interim Screening Level (HISL) – Secondary contact (µg/L)	5	0.4	USEPA Region 4 2009 (in USEPA 2014) DER (2016) - PFOS	Conservative values based on values for drinking water (PFOA only)
	Ecological Interim Screening Level (EISL) – Fresh/Marine water (µg/L)	0.13	220	DER (2016)	For protection of slightly disturbed ecological systems

[1] Enhealth

Soil assessment criteria – other CoPCs

Site investigation levels have been adopted from assessment criteria presented in NEPM (2013) Given the site zoning is Infrastructure emergency services facility and educational (Commercial), health screening levels (HSL) and health investigation levels (HILs) for commercial / industrial will be used as the investigation screening criteria. Ecological investigation levels (EILs) and ecological screening levels (ESL) for commercial / industrial use are also used.

Assessment criteria – groundwater – other CoPCs

The NEPM (2013) Groundwater Investigation Levels (GILs) are based on the Australian Drinking Water Quality Guidelines 2015 and the Guidelines for Managing Risk in Recreational Waters (NHMRC, 2008). The guidelines provide a framework for risk-based assessment of groundwater contamination.

Groundwater beneath the site is not used for drinking (the surrounding area is serviced by a reticulated potable water supply) but is used for domestic purposes. There is the potential for the underlying aquifer to be in hydraulic continuity with surface water features to the north of the site. Therefore, ecological receptors could come into contact with groundwater discharging from the site. Risks to these receptors will be assessed based on screening groundwater results against the NEPM (2013) GILs for marine waters.

The HSLs, presented in NEPM (2013) are based on CRC CARE 2011, HSL D (for sand soils), adopted for this investigation are consistent with the soil investigation criterion detailed previously.

3.3 Field Investigation

3.3.1 Objective of the intrusive investigation

The objective of the intrusive investigation is to:

(a) Test for the presence of contamination at targeted locations in order to evaluate the relevance of potential source, pathway and receptor linkages identified through the CSM; and

(b) Quantify the magnitude of potential contamination impacts within various on and off-site media to assess the potential risk to on and off site receptors.

3.4 Sampling rationale

To address the investigation objectives outlined above and based on the key risk identified in the preliminary CSM (see Section 2.6) the investigation has been designed to target:

- On site contamination status associated with former firefighting activities to help FRNSW understand the residual issues to human health and the environment.
- Understand the risks to onsite employees and intrusive maintenance workers.
- Characterise surface water impacts in order to understand risks to down gradient farm dams receiving surface water run-off from the site.
- Characterise the potential impacts to down gradient domestic groundwater users.
- A tiered approach is proposed for field investigations, with initial works focusing on areas of most likely impact and characterising key on-site and offsite migration pathways. Information from these studies will be used to inform the requirement for further site

investigations and to target residual data gaps in the CSM identified by initial the investigations.

3.5 Scope of intrusive investigations

The scope of the on-site and off-site investigations is summarised below and shown in Figure 5 of Appendix A:

On (and in the immediate vicinity) of the site:

- Collection of **soil** samples from the surface and depth at nine (9) locations targeting areas where fire training has previously occurred in order to characterise the contamination status of potential source areas.
- Collection of **surface water** samples from four (4) locations and **sediment** samples from eight (9) locations to test for the presence of contamination within retention dams and drainage lines receiving runoff from potentially contaminated areas of the site.
- Installation, development and sampling of **groundwater** from four (4) groundwater monitoring wells placed hydraulically down gradient of potential source areas - including along the site's northern boundary – to assess the groundwater contamination status on-site and to establish the likelihood of off-site impacts.

Off-site and hydraulically down-gradient on land north of Mann Street:

- Collection of **soil** samples from the surface and depth at three (3) locations targeting areas north of Grafton Road where soil from the former drainage channel has been moved for the construction of the housing development.
- Collection of **surface water** samples from four (4) locations and **sediment** samples from seven (7) locations to test for the presence of contamination within private dams and drainage lines receiving runoff from potentially contaminated areas of the site.
- Collection of groundwater from one private bore (GW966477) located on a private property hydraulically downgradient of the site to test for the presence of contamination in the groundwater.

The rationale for the proposed sampling program is outlined in Table 11.

Table 11 – Sampling Program

Media	No. Locations	Sample location identification	Sample Depth Intervals	Objective	Laboratory Analysis						
					PFCs (full suite)	PFCs (full suite) leachability	PFC (Pathway Parameters - TOC, Total Iron, K, Al, Si)	TRH, BTEX, PAHs	Metals	TDS	Major Cations and Anions
NW FTA											
Soil	4	SB01 – SB04	0.0, 0.1, 0.5, 1.0 m	Source delineation	8	4	2	2	2	0	0
Sediment	2	SS01 – SS02	Surface	Quantify impact to drainage lines and potential for secondary sources	2	1	1	1	1	0	0
Surface Water	1	SW01	NA	Assess impact to on-site surface water receiving environments and delineate potential secondary sources	1	0	0	1	1	1	1
Groundwater	1	MW01	NA	Assess impact to groundwater at source	1	0	0	1	1	1	1

Media	No. Locations	Sample location identification	Sample Depth Intervals	Objective	Laboratory Analysis						
					PFCs (full suite)	PFCs (full suite) leachability	PFC (Pathway Parameters - TOC, Total Iron, K, Al, Si)	TRH, BTEX, PAHs	Metals	TDS	Major Cations and Anions
SW FTA											
Soil	3	SB05 – SB08	0.0, 0.1, 0.5, 1.0 m	Source delineation	6	3	1	3	3	0	0
Groundwater	1	MW02	NA	Assess impact to groundwater at source	1	0	0	1	1	1	1
Skid pan and former FTA											
Soil	2	SB09 – SB10	0.0, 0.1, 0.5, 1.0 m	Source delineation	4	2	1	1	1	0	0
Sediment	2	SS03 – SS04	Surface	Quantify impact to drainage lines and potential for secondary sources	1	1	1	1	1	0	0
Surface Water	1	SW02	NA	Assess impact to on-site surface water receiving environments and delineate potential secondary sources	1	0	0	1	1	1	1

Media	No. Locations	Sample location identification	Sample Depth Intervals	Objective	Laboratory Analysis						
					PFCs (full suite)	PFCs (full suite) leachability	PFC (Pathway Parameters - TOC, Total Iron, K, Al, Si)	TRH, BTEX, PAHs	Metals	TDS	Major Cations and Anions
Assessment of other surface water and groundwater pathways on land south of Mann Street											
Sediment	5	SS05 – SS09	Surface	Quantify impact to drainage lines and potential for secondary sources	5	2	3	5	5	0	0
Surface Water	2	SW03 – SW04	NA	Assess impact to on-site surface water receiving environments and delineate potential secondary sources	2	0	0	2	2	2	2
Groundwater	2	MW03 – MW04	NA	Assess impact to groundwater at site boundary	2	0	0	2	2	2	2

Media	No. Locations	Sample location identification	Sample Depth Intervals	Objective	Laboratory Analysis						
					PFCs (full suite)	PFCs (full suite) leachability	PFC (Pathway Parameters - TOC, Total Iron, K, Al, Si)	TRH, BTEX, PAHs	Metals	TDS	Major Cations and Anions
Assessment of off-site impacts to land north of Mann Street											
Soil	3	SB10 – SB12	0.0, 0.1, 0.5, 1.0 m	Test for contamination in soil - potentially sourced from contaminated drainage lines - within the new development footprint	8	4	2	0	0	0	0
Sediment	8	SS10 – SS17	Surface	Assess potential impact to off-site drainage lines	8	4	4	0	0	0	0
Surface Water	4	SW04 – SW07	NA	Assess impact to off-site dams and surface water receiving environments	4	0	0	0	0	4	4
Groundwater	1	Private Bore	NA	Assess impact to off-site domestic bore	4	0	0	1	1	1	1

3.6 Sampling Methods

3.6.1 Field work preparations

Health safety and environmental management

Prior to the commencement of field works a health, safety and environmental management plan will be prepared in accordance with GHD's health safety and environmental management policies and procedures.

Underground service location

A qualified service location will be commissioned to clear all proposed intrusive locations prior to the commencement of drilling.

Dial before you dig information will also be obtained for the site and surrounding areas.

Hardstand coring

Hardstand coring is likely to be required at the four locations (skid pan and fire training ground). A qualified subcontractor will be engaged to conduct these works. Each location will be reinstated with cement.

3.6.2 Concrete Core Locations

A small diameter (100 mm) concrete corer will be used to collect surficial concrete core samples. The concrete will be collected to depths of 10 cm or as required to obtain a suitable sample size.

All concrete core samples will be reinstated with 20 MpA concrete.

3.6.3 Hand Auger Locations

All hand augers locations will be checked against services plans and cleared by a service locator prior to commencement of augering.

Hand augers will be advance to depths of 1 metres below ground level (m bgl).

The soil profile will be described in general accordance with the Unified Soil Classification System (USCS) and GHD's standard logging procedures, with features such as seepage, discolouration, staining, odours and other indications of contamination being noted on the borehole log, as well as soil sampling information.

All auger holes will be re-instated with spoil from the auger hole and packed down to ground surface.

3.6.4 Borehole drilling

Based on previous investigations at the site (however not within the current investigation area), there are a number of water bearing zones identified and are expected to be between 8.5 and 27 m bgl. Therefore, it is proposed to drill boreholes to depths of approximately 15 m bgl, or at least 1.5 m below the first water bearing unit (whichever is shallower).

The selected drilling technique will be dependent on the underlying geology and is likely to comprise concrete coring of the hardstand surface (where required) followed by hand augering in soils to a maximum depth of 1.0 m bgl, followed by push tube/hollow stem auger to the desired depth.

The soil profile will be described in general accordance with the Unified Soil Classification System (USCS) and GHD's standard logging procedures, with features such as seepage, discolouration, staining, odours and other indications of contamination being noted on the borelog, as well as soil sampling information.

3.6.5 Groundwater well installation

The monitoring wells will be installed in accordance with industry standards, including guidance provided in the Minimum Construction Requirements for Water Bores in Australia (NUDLC, 2011). Groundwater wells will be designed to ensure that the potential presence of light non aqueous phase liquid (LNAPL) can be measured.

Wells will be constructed using 50 mm, Class 18 uPVC flush jointed, threaded well screen and blank casing, a gravel pack surrounding the screened zone extending 0.5 m above the screened interval, a bentonite plug above the screen as a seal and cement grout to the surface. Wells will be completed with flush mounted, traffic rated, cast iron gatic covers. Following installation, the well will be developed using a submersible pump to remove silt introduced during drilling and for alignment of the gravel pack surrounding the well screens.

Following installation, the monitoring wells will be professionally surveyed according to the Australian Height Datum (AHD) and the location will be plotted on a plan.

A borehole log will be prepared for the monitoring well locations showing the geology and well construction details.

3.6.6 Soil sampling

Soil and sediment samples will be collected using the following methodology:

- All sampling will be undertaken by an appropriately experienced GHD environmental scientist in general accordance with GHD's Standard Field Operating Procedures to allow representative samples to be collected, information accurately recorded and quality control is maintained throughout the investigation.
- Soil samples will be collected directly from the push tube liners (that do not include Teflon) or auger, using dedicated disposable gloves, at the surface (0.0 to 0.2 m bgl), 0.5 m bgl, 1.0 m bgl and every metre thereafter to the base of the borehole. Additional samples will be collected should visual or olfactory evidence of contamination be identified. A PID will be used to assess for the presence of VOCs at each sampling interval.
- Two soil samples will be selected for analysis from the borehole.
- Sample jars will be filled to minimise headspace. The containers will be labelled with the job number, sample identification and date collected. All sampling equipment will be Teflon free as this is understood to potentially interact with and impact PFAS concentrations in samples media.
- Following the collection of each sample, the jars will be placed immediately into ice filled coolers for preservation prior to and during transportation to the project laboratory.
- Samples will be accompanied with chain of custody documentation to the project laboratory and will be submitted within holding times appropriate to the analysis required.
- Decontamination procedures will be used during the soil sampling including the use of new disposable gloves for the collection of each sample, decontamination of sampling equipment between each sampling location (using DECON 90/N) and the use of dedicated sampling containers provided by the laboratory.

3.6.7 Groundwater sampling

Groundwater sampling will be carried out as follows:

- First round – the newly installed wells (MW01 to MW05) will be sampled approximately one week following installation.

The groundwater wells will be sampled as follows:

- Prior to gauging the standing water level (SWL) in each monitoring well. The well will be allowed to stand for a few minutes to allow the SWL to stabilise under atmospheric conditions.
- The depth of the SWL and LNAPL, if present, will be measured at each monitoring well using an electronic interface meter, along with the total well depth with all measures recorded from the top of casing.
- Representative groundwater samples will be collected from the monitoring wells using the following sampling techniques:
  - Each well will be purged using low-flow sampling techniques with dedicated tubing, that is Teflon free. The depth of placement of the groundwater sample inlet tube will be recorded during sampling and will be consistent across monitoring locations.
  - Field parameters (pH, electrical conductivity (EC), oxygen redox potential, dissolved oxygen (DO) and temperature) will be measured and recorded during purging to ensure that extracted groundwater is representative of the surrounding groundwater conditions. When field parameters reach equilibrium, i.e. consecutive measurements are within 10% of each other for EC, redox and pH, groundwater will be deemed to be representative and groundwater samples will be collected.
  - Visual observations will be recorded, in particular, the absence or presence of a hydrocarbon sheen or odour will be recorded during purging.
  - Retrieved groundwater samples will immediately be placed into laboratory prepared bottles suitable for the requested analyses.
  - Sample bottles will be filled directly from the pump with a minimal amount of air contact and vials for volatile organic analysis will be filled to minimise headspace. Samples that are to be analysed for dissolved metals will be field filtered with a dedicated filter prior to placing the sample into the sample bottle.
  - The containers will be labelled with the job number, sample identification and date collected.
  - Following the collection of each sample, the bottles will be placed immediately into ice-filled coolers for preservation prior to and during transportation to the project laboratory.
  - Samples will be accompanied with chain of custody documentation to the project laboratory and will be submitted within holding times appropriate to the analysis required.
  - Dedicated sampling equipment (i.e. tubing, bailers, filters etc.) will be disposed of after each well is sampled with other sampling equipment decontaminated using a mixture of Decon 90 solution and potable water and then rinsed with potable tap water between each well location.

3.6.8 Surface water sampling

Surface water sampling will be undertaken as follows:

- Surface water samples will be collected by grab sampling with a dedicated sample bottle attached to an extendable arm.
- Samples from drainage channels will be collected from the centre of the drain and centre of the water column to the extent practicable.
- Samples from larger water bodies (such as wetlands and ponds) will be collected from the edge of the pond, approximately 1 metre from the edge and below the water surface as much as practicable.
- Surface water samples will be placed in laboratory supplied bottles appropriate for the particular analyte. The bottles will be immediately stored in chilled insulated containers. All samples will be transferred to the nominated laboratory and accompanied by chain of custody documents which will specify the tests required and the appropriate levels of reporting (LOR).
- Dedicated sample bottles will be used to collect surface water samples, eliminating the need for decontamination of equipment and rinsate samples.
- Collection of Quality Assurance (QA) / Quality Control (QC) samples for groundwater including duplicate and split samples as discussed in Section 7.

3.7 Laboratory Analysis

The analytical schedule proposed for each sampling location is presented in Table 11.

Analysis of groundwater samples will be undertaken by a NATA accredited for the required analysis.

3.8 Waste handling

Waste generated onsite will be stored in 40 gallon drums in a suitable location on site until such time as the waste can be characterised and transported off-site to an appropriately licenced waste facility.

A combination of in situ soil and water data and further soil analysis of generated waste will be used for characterising drilling waste and groundwater sampling generated.

3.9 Contingency plan

A contingency plan is outlined below, listing potential unexpected events that may arise during the fieldwork and actions that will be undertaken if unexpected conditions occur:

- Stakeholder engagement processes are expected to facilitate off-site investigations on private property, however, if an incidents of conflict occur with site owners or the public, GHD will cease works and vacate the site, until further direction from the stakeholder engagement team and FRNSW.
- Environmental controls will be implemented at all sites to migration of potentially impacted material to the surrounding environment.
- If evidence of contamination other than that expected is encountered, additional samples will be collected for assessment pending discussion with FRNSW.
- If friable asbestos is encountered, works will cease and the area made safe in consultation with GHD's licensed asbestos assessors and FRNSW. This will be undertaken as an addition to the existing scope and cost.

3.10 Reporting

The findings of the works documented in this PSI and SAQP will be combined with the site investigations report and presented as a site investigation report summarising the results of the investigation in general accordance with the *NSW Guidelines for Consultants Reporting on Contaminated Sites* (OEH, 2011). The report will include the following:

- The preliminary site investigation findings.
- Data quality objectives for the works, including a description of the basis for the additional investigations.
- Description of the works undertaken.
- Results of the desktop assessment (information and data review)
- Assessment of potential areas of concern and chemicals of concern including a Tier 1 Risk Assessment for ongoing industrial/commercial use.
- Refined CSM.
- Provision of recommendations on remediation, site management or further investigation, as required.

The report will also contain figures illustrating results of sampling, highlighting exceedances against the adopted guidelines, groundwater flow contours and direction (if possible), and diagrammatic presentation of contaminant results where required.

4. Limitations

This report has been prepared by GHD Pty Ltd (GHD) for Fire & Rescue NSW and may only be used and relied on by Fire & Rescue NSW for the purpose agreed between GHD and Fire & Rescue NSW as set out in Section 1 of this report.

GHD otherwise disclaims responsibility to any person other than Fire & Rescue NSW arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

GHD was commissioned to undertake a preliminary site investigation and develop a SAQP for the site as outlined in Section 1.3.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

GHD has prepared this report on the basis of information provided by Fire & Rescue NSW and others who provided information to GHD (including Government authorities), which GHD has not independently verified or checked beyond the agreed scope of work. GHD does not accept liability in connection with such unverified information, including errors and omissions in the report which were caused by errors or omissions in that information.

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NSW EPA, 1995; *Contaminated Sites: Sampling Design Guidelines*

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UK EA, 2009; *Review of human health and environmental risks associated with land application of mechanical – biological treatment outputs (Revision 1) ReportSC030144/R5 Environment Agency*

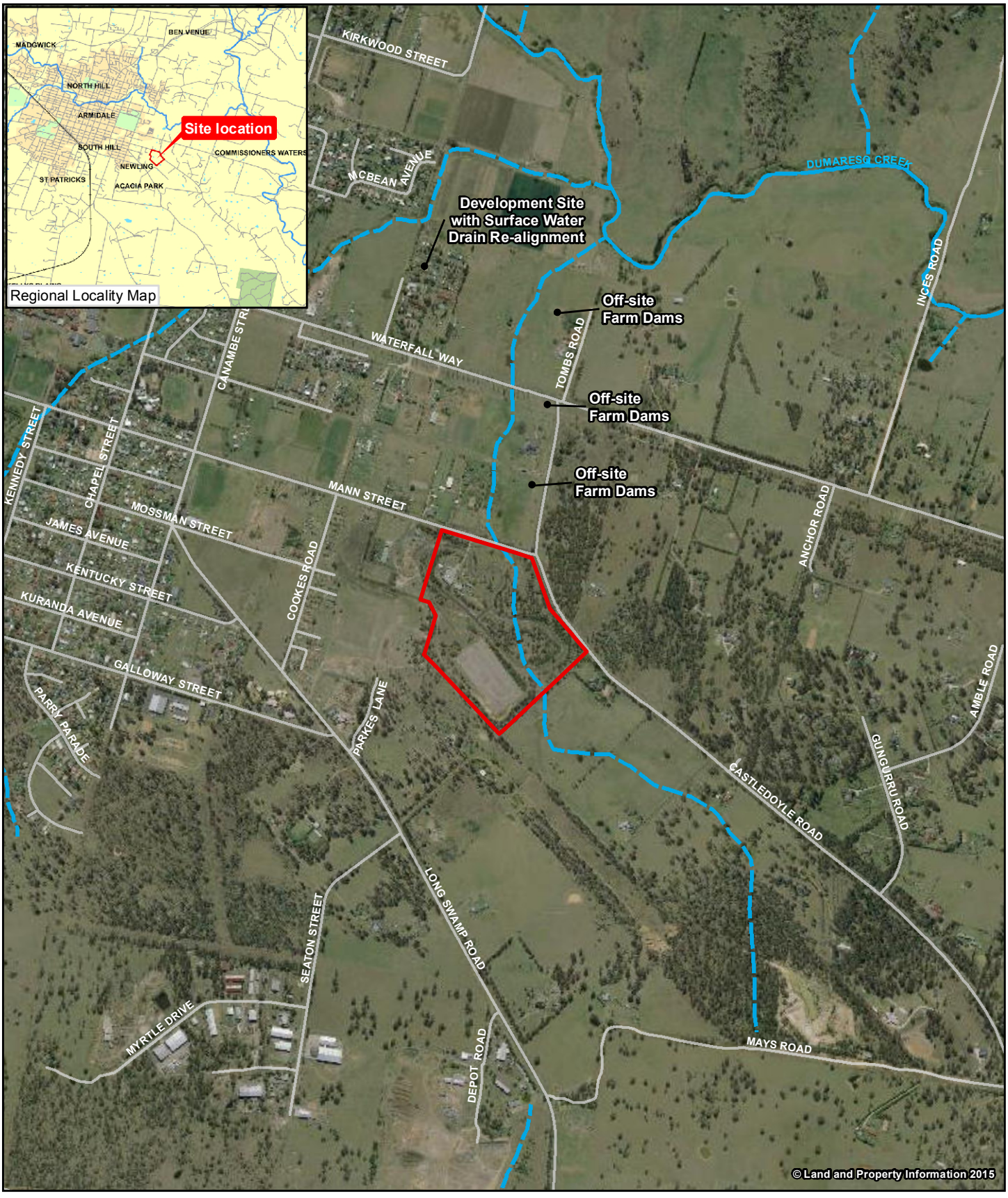
US EPA, 2014; *Emerging Contaminants – Perfluorooctane Sulfonate (PFOS) and Perfluoroactanoic Acid (PFOA), Emerging Contaminants Fact Sheet – PFOS and PFOA*

US EPA, 2014a; *Health Effects Document for Perfluorooctanoic Acid (PFOA);* US EPA Washington DC, United States.

US EPA, 2014b; *Health Effects Document for Perfluorooctane Sulfonate (PFOS);* US EPA Washington DC, United States

Appendices

Appendix A – Figures



LEGEND

- Site Boundary (Approximate)
- Streets
- Major Waterways
- Minor Waterways

Paper Size A4

0 55 110 220 330 440

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

GHD

Fire & Rescue NSW
Armidale Site Investigation

Site Location and Key Off-site Receptors

Job Number	21-25583
Revision	A
Date	05 Aug 2016

Figure 1

G:\21\25583\GIS\Maps\Deliverables\Armidale\21_25583_Z001_Armidale_SiteLocation.mxd

Level 15, 133 Castlereagh Street Sydney NSW 2000 **T** 61 2 9239 7100 **F** 61 2 9239 7199 **E** sydmail@ghd.com.au **W** www.ghd.com.au

Data source: Imagery - ©Land and Property Information (Extracted: 05/08/16); Streets, Waterways - NSW LPI 2012 DTDB. Created by:mweber

LEGEND

- Site Boundary
- Cadastre
- Streets
- Inferred Surface Drainage
- Major Waterways
- Minor Waterways

Paper Size A4

0 20 40 80 120 160

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

GHD

Fire & Rescue NSW
Armidale Site Investigation

Job Number 21-25583
Revision A
Date 05 Aug 2016

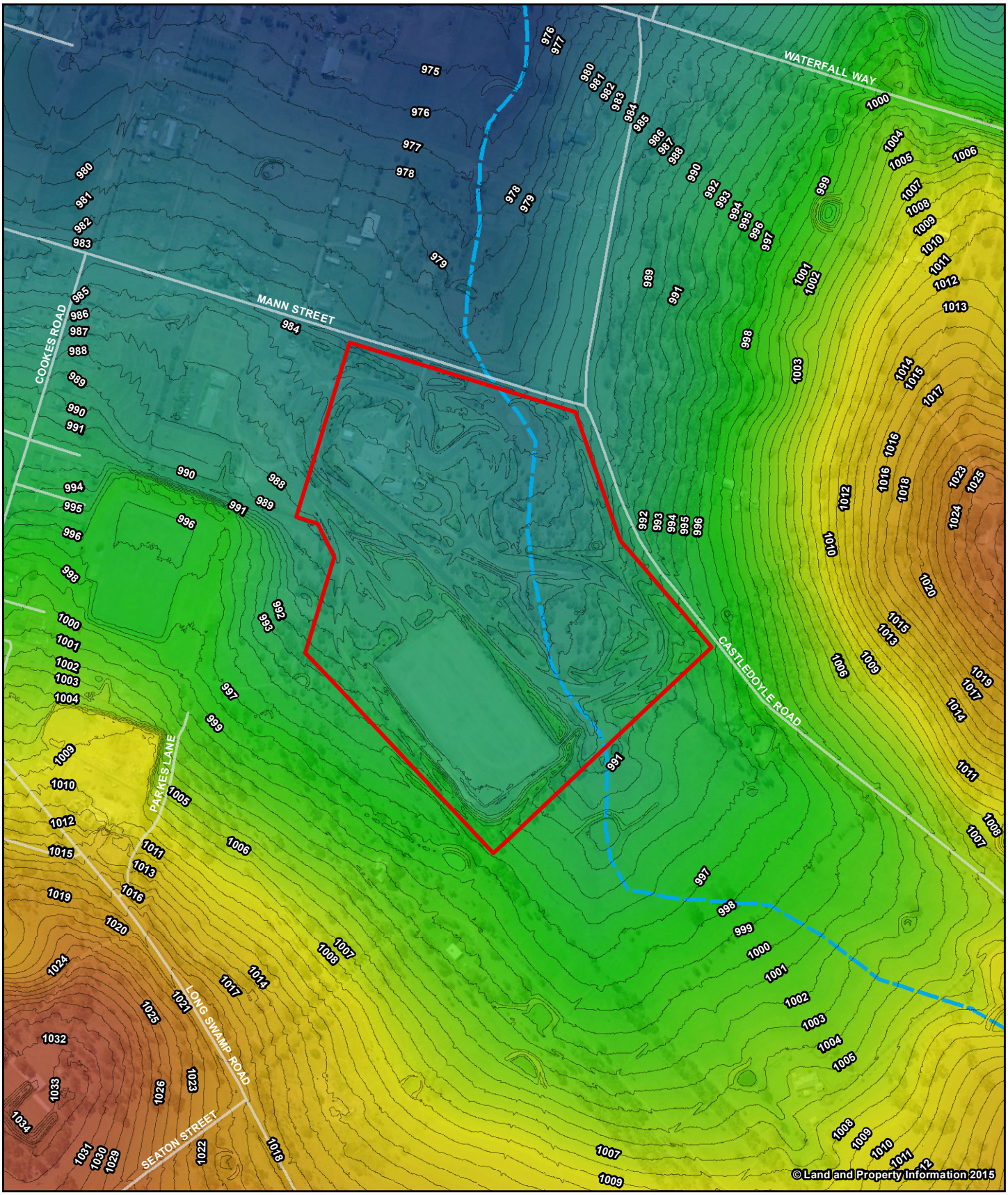
Site Layout

Figure 2

G:\21\25583\GIS\Maps\Deliverables\Armidale\21_25583_Z002_Armidale_SiteLayout.mxd

Level 15, 133 Castlereagh Street Sydney NSW 2000 **T** 61 2 9239 7100 **F** 61 2 9239 7199 **E** sydmail@ghd.com.au **W** www.ghd.com.au

Data source: Imagery - ©Land and Property Information (Extracted: 05/08/16); Streets, Waterways - NSW LPI 2012 DTDB. Created by:mweber



LEGEND

- Site Boundary
- Streets
- Contours
- Major Waterways
- Minor Waterways

Elevation (mAHD)

High : 1037.02

Low : 973.242

Paper Size A4

0 20 40 80 120 160

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

GHD

Fire & Rescue NSW
Armidale Site Investigation

Job Number 21-25583
Revision A
Date 05 Aug 2016

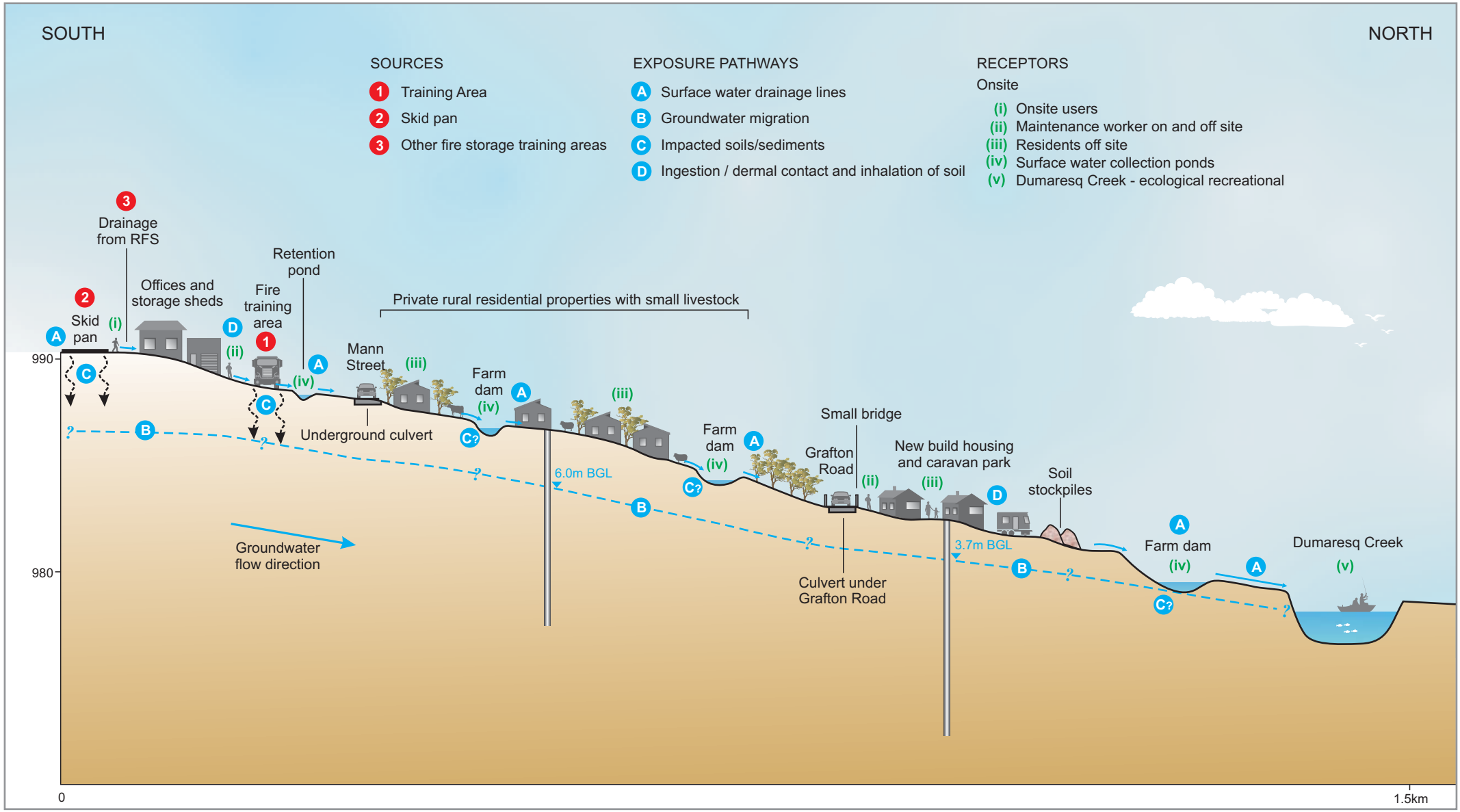
Elevation

Figure 3

G:\21\25583\GIS\Maps\Deliverables\Armidale\21_25583_Z003_Armidale_Elevation.mxd

Level 15, 133 Castlereagh Street Sydney NSW 2000 **T** 61 2 9239 7100 **F** 61 2 9239 7199 **E** sydmail@ghd.com.au **W** www.ghd.com.au

Data source: Imagery - ©Land and Property Information (Extracted: 05/08/16); Streets, Waterways - NSW LPI 2012 DTDB; LIDAR - NSW LPI. Created by:mweber



Conceptual diagram only - not to scale

LEGEND
- Basalt
- Groundwater table
- Groundwater bore

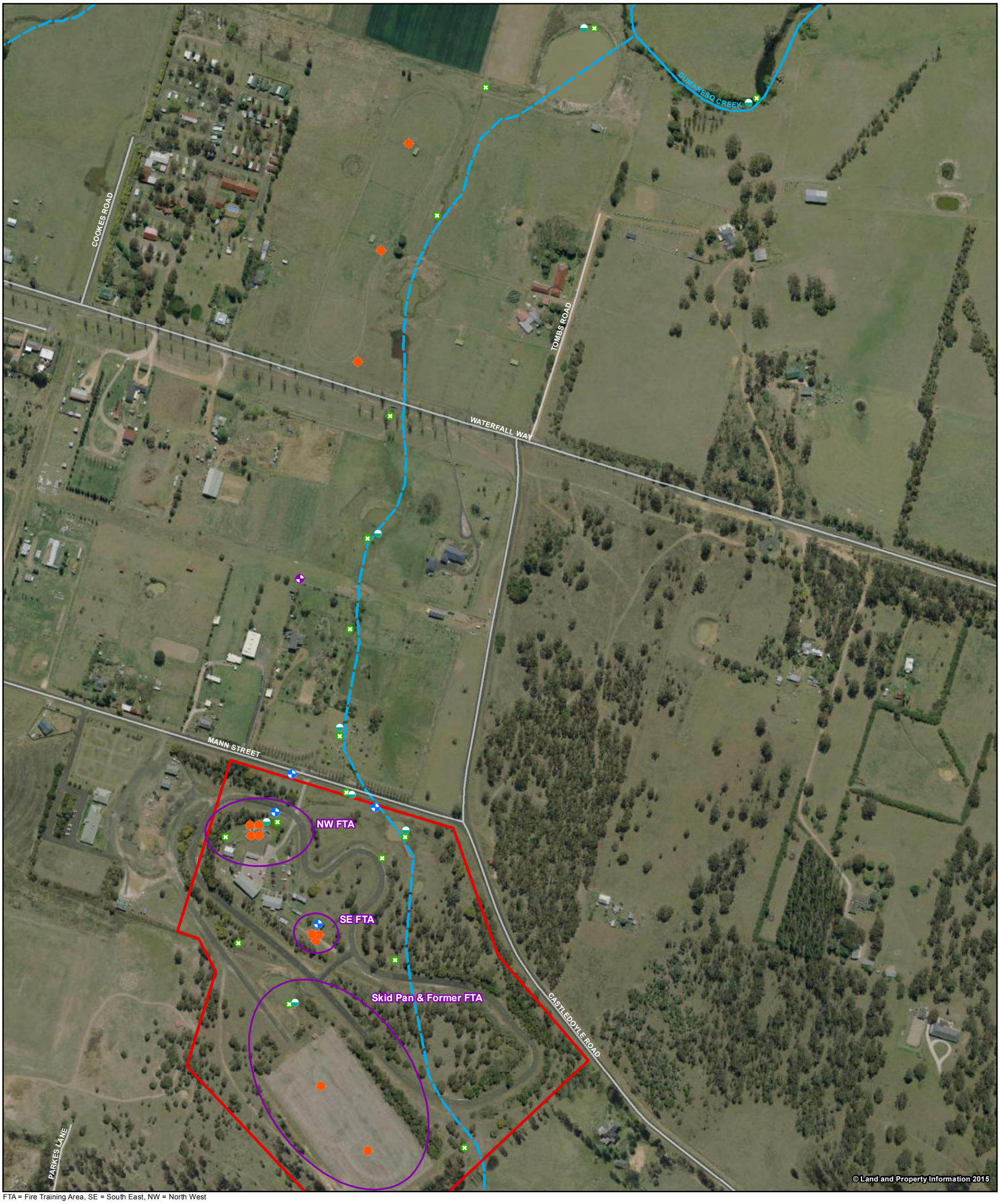
Fire & Rescue NSW
Armidale Training Centre

Conceptual Site Model

Job Number	21-25583
Revision	A
Date	29 July 2016

Figure 4

Level 15, 133 Castlereagh Street Sydney NSW 2000 **T** 61 2 9239 7100 **F** 61 2 9239 7199 **E** sydmail@ghd.com **W** www.ghd.com



FTA = Fire Training Area, SE = South East, NW = North West

LEGEND

- Site Boundary
- Streets
- Major Waterways
- Minor Waterways
- Proposed Monitoring Well (4)
- Proposed Sample of Existing Private Groundwater Well (1)
- Proposed Soil Bore (12)
- Proposed Sediment Sample (17)
- Proposed Surface Water Sample (8)

Paper Size A3

0 20 40 80 120 160

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

Fire & Rescue NSW
Armidale Site Investigation

Job Number 21-25583
Revision A
Date 05 Aug 2016

Proposed Sample Locations

Figure 5

G:\21\25583\GIS\Maps\Deliverables\Armidale\21_25583_Z004_Armidale_SampleLocations_A3.mxd

Level 15, 133 Castlereagh Street Sydney NSW 2000 **T** 61 2 9239 7100 **F** 61 2 9239 7199 **E** sydmail@ghd.com.au **W** www.ghd.com.au

Data source: Imagery - ©Land and Property Information (Extracted: 05/08/16); Streets, Waterways - NSW LPI 2012 DTDB. Created by:mweber

Appendix B – Site Inspection Questionnaire

Memorandum

24 June 2016

To	Fire & Rescue NSW		
Copy to	Stefan Charteris		
From	Ben Anderson	Tel	+61 2 9239 7100
Subject	Site inspections - pre-inspection questionnaire	Job no.	21/25583

The following is the draft preliminary questionnaire for nominated FRNSW site representatives assisting with the current PFC investigations. Its purpose is to provide GHD with preliminary information prior to actual site inspections. We request that the FRNSW, where possible, include responses with specific information, such as, but not limited to:

- Specific locations in context of local features or assets and where available with reference to FRNSW
- Drawings/figures
- The date(s) or duration of the activity
- Volumes of chemicals or liquids as applicable, and type of foam, e.g. Class A, Class B, brands etc – brands etc.
- Reference to FRNSW documentation such as incident reports, specific training events etc ...

Table 1 Questionnaire

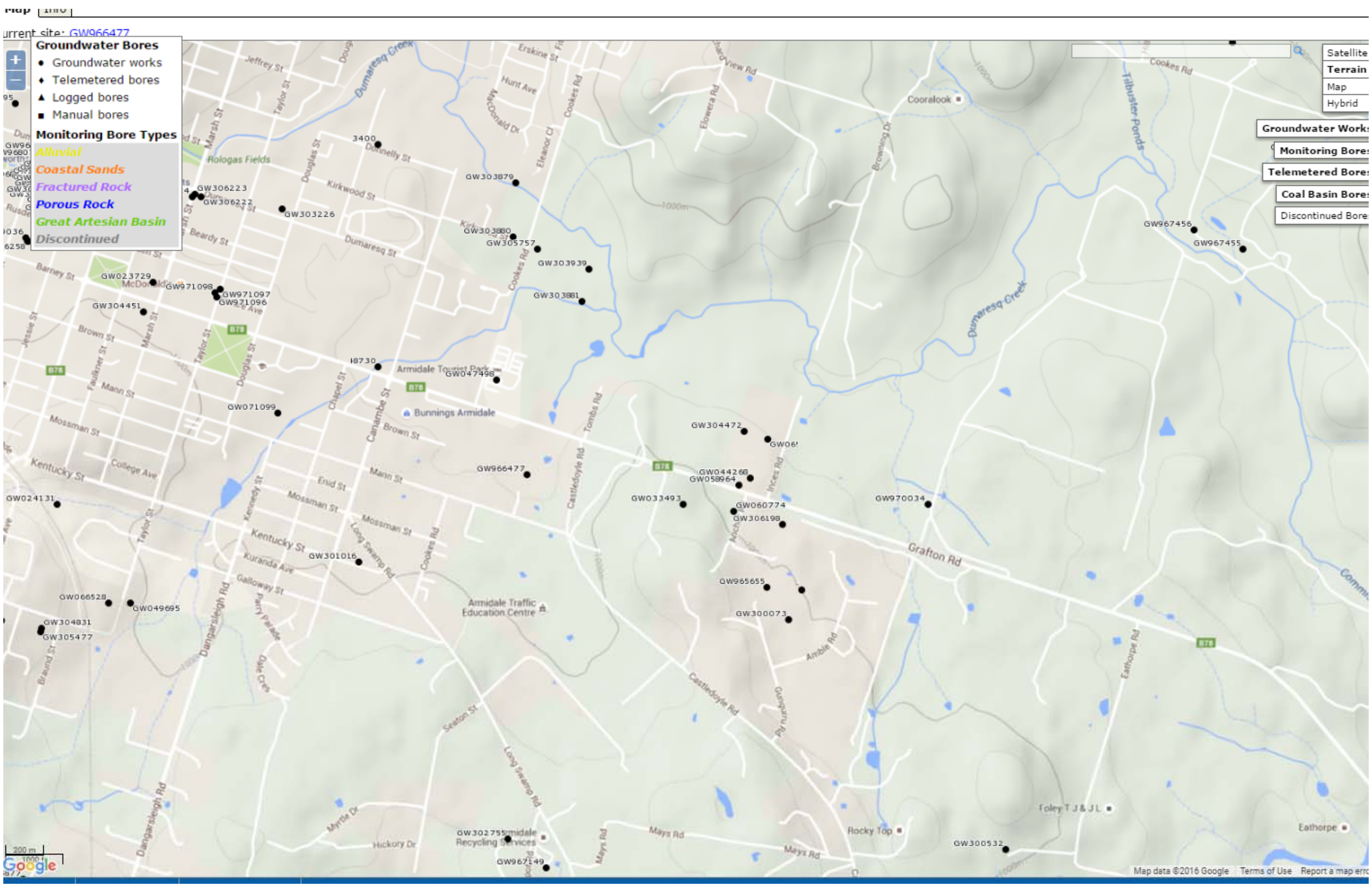
Number	Question	FRNSW response
1	*Please describe the specific location(s) of known activities that were subject to form storage, training areas, or areas subject to foam release during training.*	Yard area in front of Gas Bays.

GHD
Level 15, 133 Castlereagh Street Sydney NSW 2000 Australia
T 61 2 9239 7100 **F** 61 2 9239 7199 **E** sydmail@ghd.com **W** www.ghd.com

2	*Are there other areas at the site where foam (or PFC chemical) storage or release may have occurred?*	Not to my Knowledge.
3	*Are you aware of any specific foam (or chemical) spills that may have occurred (i.e. outside of training purposes)? If yes, please describe.*	No
4	*Are there areas of the site(s) where training activities historically occurred that are now unused or have been built on?*	Not to my Knowledge
5	*Are there any groundwater monitoring records available for the site (current or historical)?*	No

6	*When was the date of the last training event that included the use of foam?*	Foam extinguisher Drill - 24-03-16
7	*Is there an inventory of foam use or can you estimate the total volume of foam used on site?*	No Inventory. For extinguisher drill - approx ½ a 9L extinguisher used.
8	*How was waste water managed following training events? e.g. Is there a recycling system, storage pond or drains etc.*	Storage Pond
9	*Other comments or notes.*	I was appointed to this position in May 2017, so can only provide firsthand information from that time.

Appendix C – Desk Study Information


Map
Info
urrent site: GW966477
Groundwater Bores
Groundwater works
Telemetered bores
Logged bores
Manual bores
Monitoring Bore Types
Alluvial
Coastal Sands
Fractured Rock
Porous Rock
Great Artesian Basin
Discontinued
Satellite
Terrain
Map
Hybrid
Groundwater Work
Monitoring Bore
Telemetered Bore
Coal Basin Bore
Discontinued Bore
GW306223
GW306222
GW303226
GW303879
GW303880
GW305757
GW303939
GW303881
GW023729
GW971098
GW971097
GW971096
GW304451
GW047498
GW071099
GW304472
GW966477
GW044268
GW058964
GW033493
GW060774
GW306198
GW970034
GW967456
GW967455
GW024131
GW301016
GW965655
GW300073
GW066528
GW049695
GW304831
GW305477
GW302755
GW967149
GW300532
Armidale Tourist Park
Bunnings Armidale
Armidale Traffic Education Centre
Grafton Rd
Dumaresq Creek
Map data ©2016 Google
Terms of Use

NSW Office of Water
Work Summary

GW966477

Licence: 90BL251746 **Licence Status:** CONVERTED

Authorised Purpose(s): STOCK
Intended Purpose(s): STOCK

Work Type: Bore
Work Status:
Construct.Method: Rotary - Air/Foam
Owner Type:

Commenced Date:
Completion Date: 20/12/2003
Final Depth: 20.00 m
Drilled Depth: 20.00 m

Contractor Name: FRED RANDALL
Driller: Francis Arthur Randall
Assistant Driller:

Property: 5 MANN STREET ARMIDALE 2350
GWMA: 024 - MISCELLANEOUS FRACTURED ROCK OF THE BARWON REGION
GW Zone: -
Standing Water Level: 6.000
Salinity:
Yield: 1.890

Site Details

Site Chosen By:

	County	Parish	Cadastre
Form A:	SANDO	SANDO.003	LT217 DP755808
Licensed:	SANDON	ARMIDALE	Whole Lot 2//876769

Region: 90 - Barwon
River Basin: - Unknown
Area/District:
CMA Map:
Grid Zone:
Scale:

Elevation: 0.00 m (A.H.D.)
Elevation Source: (Unknown)
Northing: 6622340.0
Easting: 373929.0
Latitude: 30°31'28.8"S
Longitude: 151°41'09.4"E

GS Map: -
MGA Zone: 0
Coordinate Source: Unknown

Construction

Negative depths indicate Above Ground Level; C-Cemented; SL-Slot Length; A-Aperture; GS-Grain Size; Q-Quantity; PL-Placement of Gravel Pack; PC-Pressure Cemented; S-Sump; CE-Centralisers

Hole	Pipe	Component	Type	From (m)	To (m)	Outside Diameter (mm)	Inside Diameter (mm)	Interval	Details
1		Hole	Hole	0.00	20.00	165			Rotary - Air/Foam
1	1	Casing	Pvc Class 9	-0.30	20.00	135			Seated on Bottom, Screwed and Glued
1	1	Opening	Slots - Diagonal	14.00	17.00	135		1	Casing - Machine Slotted, PVC Class 9, SL: 100.0mm, A: 0.30mm

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
14.00	17.00	3.00	Unknown	6.00		1.89		02:00:00	

Geologists Log
Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments
0.00	2.00	2.00	topsoil	Topsoil	

2.00	10.00	8.00	basalt	Basalt	
10.00	15.00	5.00	water bearing basalt	Invalid Code	
15.00	20.00	5.00	basalt	Basalt	

Remarks

***** End of GW966477 *****

NSW Office of Water
Work Summary

GW047498

Licence: 30BL109418
Licence Status: ACTIVE

Authorised Purpose(s): IRRIGATION,DOMESTIC,INDUSTRIAL
Intended Purpose(s): IRRIGATION

Work Type: Bore
Work Status:
Construct.Method: Rotary Air
Owner Type: Private

Commenced Date:
Completion Date: 01/05/1979
Final Depth: 45.70 m
Drilled Depth: 45.70 m

Contractor Name:
Driller:
Assistant Driller:

Property: PEMBROKE CARAVAN PARK BARNEY STREET ARMIDALE 2350 NSW
GWMA: -
GW Zone: -
Standing Water Level (m):
Salinity Description: 501-1000 ppm
Yield (L/s):

Site Details

Site Chosen By:

	County	Parish	Cadastre
Form A:	SANDO	SANDO.003	29
Licensed:	SANDON	ARMIDALE	Whole Lot 30//859769

Region: 30 - North Coast
River Basin: 206 - MACLEAY RIVER
Area/District:
CMA Map: 9236-4N
Grid Zone:
Scale:

Elevation: 0.00 m (A.H.D.)
Elevation Source: (Unknown)
Northing: 6622785.0
Easting: 373779.0
Latitude: 30°31'14.3"S
Longitude: 151°41'04.0"E

GS Map: -
MGA Zone: 0
Coordinate Source:

Construction

Negative depths indicate Above Ground Level; C-Cemented; SL-Slot Length; A-Aperture; GS-Grain Size; Q-Quantity; PL-Placement of Gravel Pack; PC-Pressure Cemented; S-Sump; CE-Centralisers

Hole	Pipe	Component	Type	From (m)	To (m)	Outside Diameter (mm)	Inside Diameter (mm)	Interval	Details
1	1	Casing	Welded Steel	-0.30	14.90	165			Driven into Hole
1	1	Opening	Slots - Vertical	8.80	14.90	165		1	Oxy-Acetylene Slotted, A: 2.00mm

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
8.80	14.90	6.10	Fractured	3.70		0.51			
23.20	23.50	0.30	Fractured	3.70		0.76			
31.40	31.70	0.30	Fractured	3.70		1.01			
38.70	39.30	0.60	Fractured	3.70		1.52			

Geologists Log
Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments
0.00	4.90	4.90	Clay	Clay	
4.90	8.80	3.90	Shale	Shale	
8.80	14.90	6.10	Basalt Broken Water Supply	Basalt	
14.90	45.70	30.80	Basalt Water Supply	Basalt	

Remarks

***** End of GW047498 *****

NSW Office of Water
Work Summary

GW301016

Licence: 30BL152558 **Licence Status:** ACTIVE

Authorised Purpose(s): STOCK,DOMESTIC
Intended Purpose(s): DOMESTIC

Work Type: Bore
Work Status:
Construct.Method: Rotary Air
Owner Type:

Commenced Date: **Final Depth:**
Completion Date: 17/06/1993 **Drilled Depth:** 30.50 m

Contractor Name: Coastal Drilling
Driller: Robert Leslie Tanner
Assistant Driller:

Property: N/A NSW **Standing Water Level:** 9.000
GWMA: - **Salinity:** Good
GW Zone: - **Yield:** 0.252

Site Details

Site Chosen By:

	County	Parish	Cadastre
Form A:	SANDO	SANDO.003	LOT 10 D.P.605913
Licensed:	SANDON	ARMIDALE	Whole Lot 10//605913

Region: 30 - North Coast **CMA Map:**
River Basin: - Unknown **Grid Zone:** **Scale:**
Area/District:

Elevation: 0.00 m (A.H.D.) **Northing:** 6621923.0 **Latitude:** 30°31'42.1"S
Elevation Source: Unknown **Easting:** 373139.0 **Longitude:** 151°40'39.6"E

GS Map: - **MGA Zone:** 0 **Coordinate Source:** Map Interpretation

Construction

Negative depths indicate Above Ground Level; C-Cemented; SL-Slot Length; A-Aperture; GS-Grain Size; Q-Quantity; PL-Placement of Gravel Pack; PC-Pressure

Cemented; S-Sump; CE-Centralisers

Hole	Pipe	Component	Type	From (m)	To (m)	Outside Diameter (mm)	Inside Diameter (mm)	Interval	Details
1		Hole	Hole	0.00	30.50	140			Rotary
1	1	Casing	Pvc Class 9	-0.30	30.50	125			Seated on Bottom, Glued
1	1	Opening	Slots - Vertical	26.00	30.50			1	Sawn, PVC Class 9, SL: 100.0mm, A: 2.60mm

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
26.00	30.50	4.50	Unknown	9.00		0.25	30.50	01:00:00	

Geologists Log
Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments
0.00	0.30	0.30	topsoil - grey	Unknown	
0.30	3.00	2.70	clay - grey	Clay	
3.00	12.00	9.00	clay - grey	Clay	
12.00	26.00	14.00	shale -brown	Shale	
26.00	30.50	4.50	shale - cracky brown & greywacke	Shale	

Remarks

***** End of GW301016 *****

Healthy Environment, Healthy Community, Healthy Business

Search results

Your search for:Suburb: ARMIDALE

Matched 19 notices relating to 5 sites.

Search Again

Refine Search

Suburb	Address	Site Name	Notices related to this site
ARMIDALE	132 Niagara STREET	Former Mobil Depot	4 former
ARMIDALE	Corner of Beardy Street and Allingham STREET	Gasworks and portion of Harris Park	1 current
ARMIDALE	Martin STREET	Martin Street Estate	6 former
ARMIDALE	Lot 3 Martin STREET	Martin Street Estate, Lot 3	2 former
ARMIDALE	adjoining Martin STREET	RTA land adjoining Martin Street estate	6 former

Page 1 of 1

17 June 2016

Healthy Environment, Healthy Community, Healthy Business

Search results

Your search for: **POEO Licences** with the following criteria

Suburb - Armidale

returned 8 results

Export to excel 1 of 1 Pages Search Again

Number	Name	Location	Type	Status	Issued date
2821	ARMIDALE DUMARESQ COUNCIL	ARUNDEL DRIVE, ARMIDALE, NSW 2350	POEO licence	Issued	21 Jun 2000
5907	ARMIDALE DUMARESQ COUNCIL	186 DUMARESQ STREET, ARMIDALE, NSW 2350	POEO licence	Issued	11 Sep 2000
1722	ARMIDALE DUMARESQ COUNCIL	631 CAFFERIES RD, ARMIDALE, NSW 2350	POEO licence	Issued	10 Nov 2000
5860	ARMIDALE DUMARESQ COUNCIL	LONG SWAMP ROAD, ARMIDALE, NSW 2350	POEO licence	Issued	09 Jan 2001
12123	ARMIDALE DUMARESQ COUNCIL	10541 New England Highway, ARMIDALE, NSW 2350	POEO licence	Surrendered	13 May 2004
10811	ARMIDALE LIVESTOCK SELLING AGENTS PTY. LIMITED	BUNDARRA ROAD, ARMIDALE, NSW 2350	POEO licence	Issued	11 Dec 2002
11319	HUNTER AND NEW ENGLAND AREA HEALTH SERVICE	RUSDEN STREET, ARMIDALE, NSW 2350	POEO licence	No longer in force	12 Jun 2001
3556	ROSS WARDLAW-ATTN. STEPHEN HALL - FORSYTHS	387 TULLOCH ROAD, ARMIDALE, NSW 2350	POEO licence	Surrendered	17 Aug 2000

Connect Fe

20 June 2016

We
Pub

Results of search of List of NSW contaminated sites notified to EPA

Search completed 17 June 2016

Suburb	Site Name	Address	Contamination Activity Type	Management Class
ARMIDALE	Former Mobil Depot	132 Niagara STREET	Other Petroleum	Contamination formerly regulated under the CLM Act
ARMIDALE	Former Shell Depot	134 Niagara STREET	Other Petroleum	Regulation under CLM Act not required
ARMIDALE	Caltex Service Station	144 Marsh STREET	Service Station	Under assessment
ARMIDALE	Caltex Service Station	146 Miller STREET	Service Station	Under assessment
ARMIDALE	Armidale Dumaresq council Grafton Road Depot	15-25 Grafton ROAD	Other Petroleum	Under assessment
ARMIDALE	Caltex North Hill Service Station	2-4 Marsh STREET	Service Station	Under assessment
ARMIDALE	Shell Service Station	93 Marsh STREET	Service Station	Regulation under CLM Act not required
ARMIDALE	RTA land adjoining Martin Street estate	adjoining Martin STREET	Other Industry	Contamination formerly regulated under the CLM Act
ARMIDALE	Gasworks and portion of Harris Park	Corner of Beardy Street and Allingham STREET	Gasworks	Contamination formerly regulated under the CLM Act
ARMIDALE	Martin Street Estate, Lot 3	Lot 3 Martin STREET	Other Industry	Regulation under CLM Act not required
ARMIDALE	Martin Street, Crown Land	Martin STREET	Other Industry	Contamination formerly regulated under the CLM Act
ARMIDALE	Martin Street Estate	Martin STREET	Other Industry	Regulation under CLM Act not required

Suburb	Site Name	Address	Contamination Activity Type	Management Class
ARMIDALE	Mobil Armidale Service Station and Former Depot	McLennan STREET	Service Station	Under assessment
ARMIDALE	Caltex Service Station	New England HIGHWAY	Service Station	Under assessment
ARMIDALE	Caltex Girraween	Queen Elizabeth DRIVE	Service Station	Under assessment
ARMIDALE	Caltex Service Station	Queen Elizabeth DRIVE	Service Station	Under assessment

Appendix D – NSW EPA Letter Report

Our reference: DOC16/107502

Mr Greg Mullins AFSM
Commissioner
Fire and Rescue NSW
PO Box A249
Sydney South NSW 1232

Dear Commissioner

RE: Fire & Rescue NSW Firefighting Training Site – 2-16 Mann Street, Armidale

As you are aware the Environment Protection Authority (EPA) is undertaking an investigation program to assess the historical legacy of perfluorinated compound (PFC) use across NSW. We are focussing on sites where these chemicals may have been used in large quantities in the past. This includes firefighting training facilities.

As a part of this program EPA officers Luke Formosa (Chemicals Regulation) and Angus Adair (Armidale office) undertook a site inspection at the Fire and Rescue NSW (FRNSW) firefighting training site at 2-16 Mann Street Armidale on 20 January 2016 with FRNSW officer Mr Chris Ridley. I write to inform you of the EPA's findings of the inspection.

Inspection

The fire training site is about 0.5 hectares in area, part of a larger training facility of about 20 hectares and is owned by Armidale Dumaresq Council. Aqueous film-forming foam (AFFF) and other firefighting foams potentially containing PFCs were used for training firefighters from Newcastle, Moree, Tweed and other areas of the state at the training pad. Due to the nature of the training conducted at the site there is the potential for significant amounts of PFCs to have been released to the environment.

One sample of water from a collection pond and one sample of soil from the lowest point on the premises were collected by the EPA during the inspection, as well as one soil sample and one water sample from a creek downslope from the training facility. The samples were submitted for laboratory analysis for certain PFCs (see results in table below). The perfluorooctane sulfonate (PFOS) concentration detected in the onsite collection pond was **5.2 µg/L**. Water from the creek downslope from the training facility contained PFOS at **0.8 µg/L**.

There are presently no guidelines established in Australia for assessing PFC contamination in the environment. Several national working groups are currently working towards finalisation of guidelines in mid 2016. In the interim the NSW EPA has commissioned Environmental Risk Sciences Pty Ltd to prepare a decision tree and screening criteria based on draft drinking water guidelines and draft guidelines for the protection of freshwater ecosystems. The screening criteria document has been provided to you under separate cover.

PO Box A290 Sydney South NSW 1232
59-61 Goulburn St Sydney NSW 2000
Tel: (02) 9995 5000 Fax: (02) 9995 5999
TTY (02) 9211 4723
ABN 43 692 285 758
www.epa.nsw.gov.au

Results

Fire & Rescue NSW Training Site - **Armidale - 20.01.16**				
Sample ID	PFOA	PFOS	6:2 FTS (C2H4-perfluorooctane sulfonate)	8:2 FTS (C2H4-perfluorodecane sulfonate)
Creek Water downslope from Armidale NSW Fire site	**0.029 µg/L**	**0.8 µg/L**	<0.01 µg/L	<0.01 µg/L
Creek Soil downslope from Armidale NSW Fire site	<0.002 mg/kg	<0.002 mg/kg	<0.002 mg/kg	<0.002 mg/kg
Armidale NSW Fire site Collection Pond	**0.22 µg/L**	**5.2 µg/L**	**0.49 µg/L**	**0.88 µg/L**
Armidale NSW Fire site Soil Sample	**0.0085 mg/kg**	**0.42 mg/kg**	<0.005 mg/kg	<0.005 mg/kg

Based on current scientific advice and in accordance with the decision tree we have adopted the screening guideline of **0.1 µg/L** for PFOS in surface waters or groundwater leaving a site as the threshold above which priority investigation is warranted. Concentrations of PFOS above **10 µg/L** in surface waters or groundwater at a site indicate elevated contamination that requires priority investigation.

Additionally, we have not adopted a screening guideline for soil samples, due to the way that PFCs behave in soils. Instead, we recommend subjecting soil samples to the Australian Standard Leaching Procedure (ALSP) to assess the degree to which PFCs will leach from the soils into nearby surface water or groundwater. We have requested ASLP analysis of the soil samples taken at Armidale and will provide you with the results in several weeks when they are available.

We understand that petroleum hydrocarbon contamination may be present in areas where firefighting foams were used in the past. Where PFC and hydrocarbon contamination is intermingled the risk profile can change. It is therefore important that any assessment also includes an investigation for hydrocarbons.

Recommendations

On the basis of the detection of PFOS in creek water downslope from the training site at a concentration of 0.8 µg/L we recommend that priority further investigation be undertaken into the nature, extent, fate and transport of PFCs on the site and off-site. This investigation should include consideration of the following matters:

a. Lateral and vertical soil sampling with ASLP analysis for PFCs and hydrocarbons with the objective of delineating the extent of soil contamination and assessing whether soil contamination may present an ongoing source of contamination to waters.
b. Installation and sampling of groundwater wells with the objective of delineating the extent of PFC contamination in the unconfined aquifer.
c. Sampling of creeks and ponds on private land to the north of the site.
d. Identification of any sensitive receptors and preferential pathways for exposure to the contamination.
e. Construction of a written and visual conceptual site model.
f. Recommendations for further investigation.

The above works will require notification of several properties to the north of the training site. The EPA has advised Armidale Dumaresq Council of the potential contamination. We ask that you work with Council in planning an appropriate scope for the next phase of the investigation.

Thank you for your proactive and open approach to addressing this legacy contamination matter. The EPA will continue to work closely with FRNSW and other stakeholders to ensure an appropriate, scientific and risk-based resolution.

If you have any queries relating to this matter please contact me on 02 9995 5995 or Mr Lindsay Fulloon, Manager Armidale Region on 6773 7016.

Yours sincerely

15 March 2016

ANDREW MITCHELL
Manager Hazardous Incidents
Environment Protection Authority

Attachment: Sampling Locations

Copy Greg Myers, Armidale Dumaresq Council

Watercourse

symbolname

STORMWATER_STRUCTURE_POINT

symbolname

STORMWATER_CHANNEL_LINE

MAP 1

FRNSW Training Site - 2-16 Mann Street, Armidale

PFOS SAMPLING

N

0 0.035 0.07 0.105 0.14 km

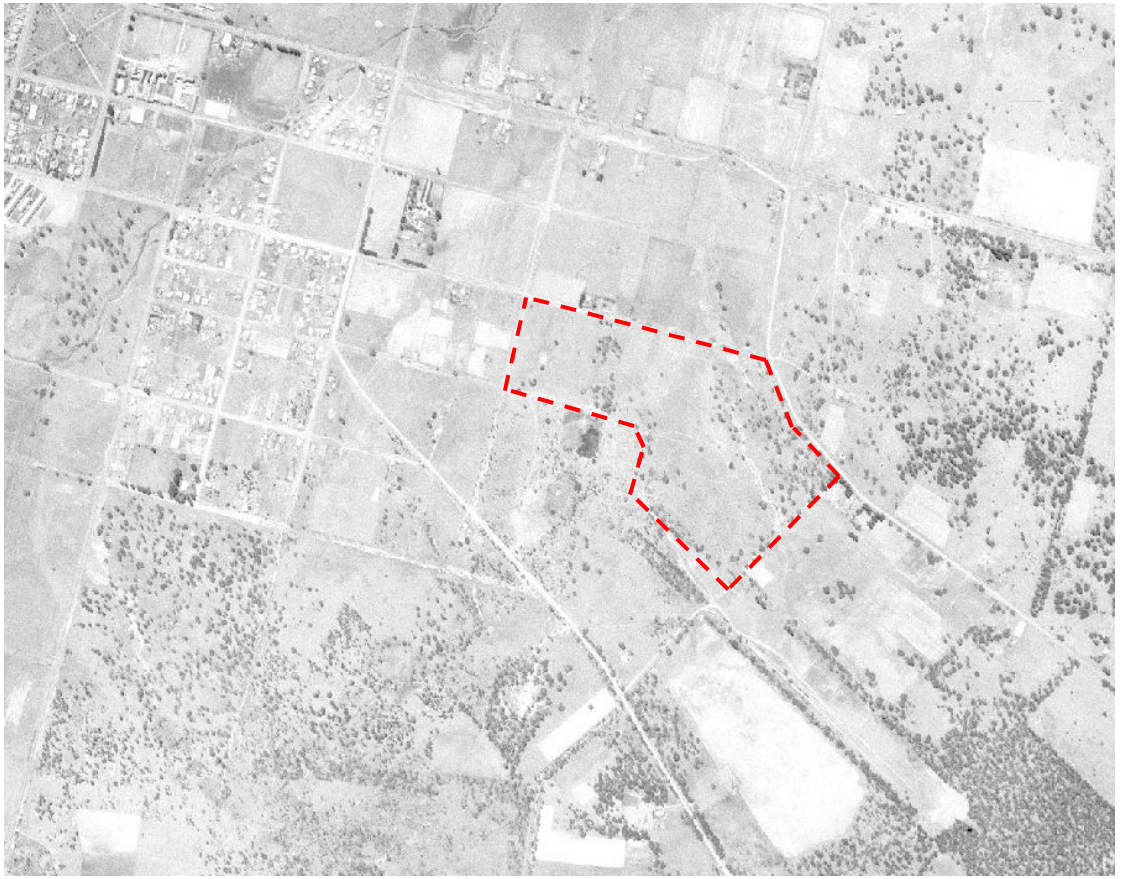
Datum/Projection: GCS GDA 1994

NSW EPA
ENVIRONMENT PROTECTION AUTHORITY

Appendix E – Aerial Photo Log

1956

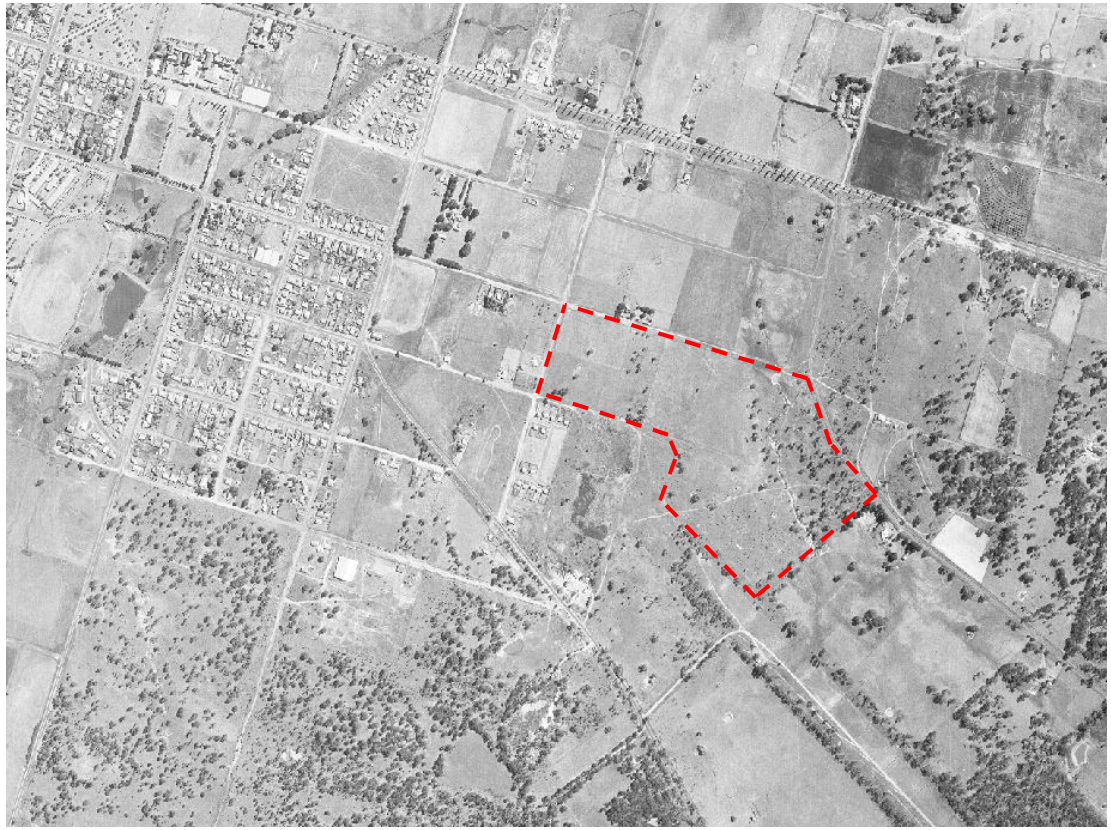
Approximate location of investigation area



North

1970

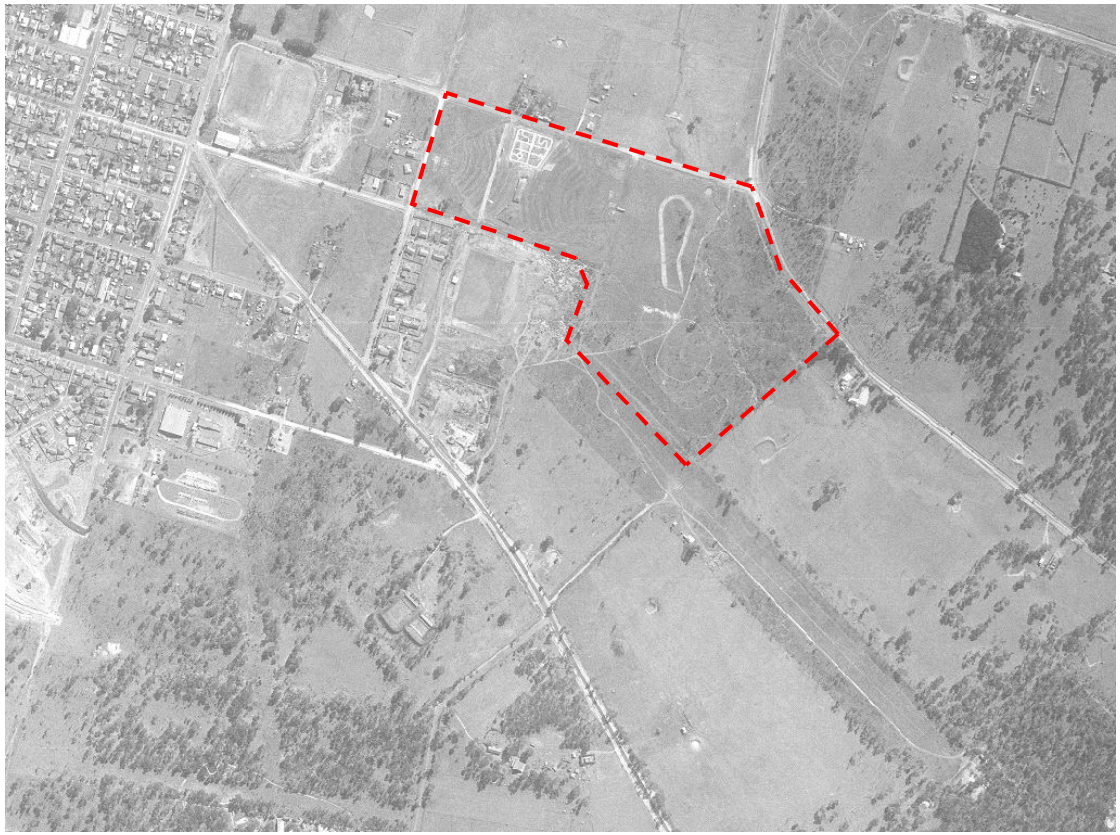
Approximate location of investigation area



North

1987

Approximate location of investigation area



North

1994

Approximate location of investigation area

North

2006

Approximate location of investigation area

North

2016

Approximate location of investigation area

North

Appendix F – Dial Before You Dig Utility Search

To:	Mr Fabrice Cheong
Phone:	0431515240
Fax:	Not Supplied
Email:	fabrice.cheong@ghd.com

Dial before you dig Job #:	10848215	
Sequence #	53664222	
Issue Date:	06/20/2016	
Location:	16 Mann Street,Armidale,NSW-2350	

Location of Underground Telecommunications Facilities

We thank you for your enquiry. In relation to your enquiry at the above address:

- **nbn's** records indicate that there **ARE** underground fibre optic/telecommunications facility/facilities (owned or controlled by **nbn**) in the vicinity of the location identified above ("Location").
- **nbn** indicative plan/s are attached with this notice ("Indicative Plans").
- The Indicative Plans show general depth and alignment information only and are not an exact scale or accurate depiction of the location, depth and alignment of the fibre optic/ telecommunications facilities shown on the Indicative Plans.
- In particular, the fact that the Indicative Plans show that a facility is installed in a straight line, or at uniform depth along its length cannot be relied upon as evidence that the facility is, in fact, installed in a straight line or at uniform depth.
- You should read the Indicative Plans in conjunction with this notice and in particular, the notes below.
- The information contained in the Indicative Plans is valid for 28 days from the date of issue set out above. You are expected to make your own inquiries and perform your own investigations (including engaging appropriately qualified plant locators at your expense to locate **nbn** telecommunications facilities during any activities you carry out on site).

We thank you for your enquiry and appreciate your continued use of the Dial Before You Dig Service. If you are planning to excavate or require further information, please contact **nbn** on 1800 626 762. For any enquiries related to moving assets or Planning and Design activities, please email **nbn** at RelocationWorks@nbnco.com.au.

Notes:

1. You are now aware that there are items of telecommunications and/or power facilities in the vicinity of the above property that could be damaged as a result of activities carried out (or proposed to be carried out) by you in the vicinity of the Location.
2. You should have regard to section 474.6 and 474.7 of the *Criminal Code Act 1995* (Cth) which deals with the consequences of interfering or tampering with a telecommunications facility. Only persons authorised by **nbn** can interact with **nbn's** network facilities.
3. Any information provided is valid only for **28 days** from the date of issue set out above.

Indicative Plans

1	5
2	6
3	7
4	8

LEGEND

Assets

IN-SERVICE:
Cable/ Duct/ Trench

DESIGNED/CONSTRUCTED:
Cable/ Duct/ Trench

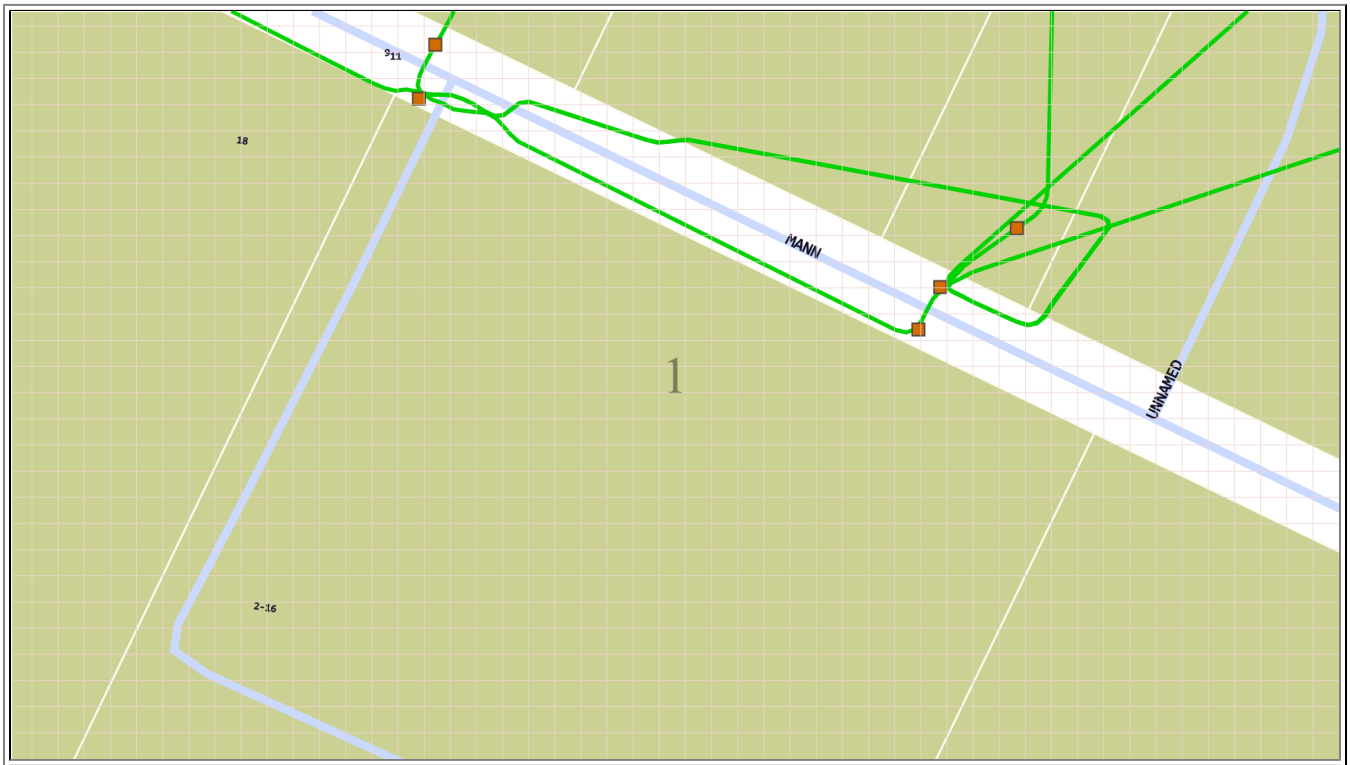
Pit/Manhole

Scale

0 20 40 60 Meters

1:2000
1 cm equals 20 m

Email info@nbn.com.au Web nbn.com.au



N
W
E
S

LEGEND

Assets

IN-SERVICE:
Cable/ Duct/ Trench

DESIGNED/CONSTRUCTED:
Cable/ Duct/ Trench

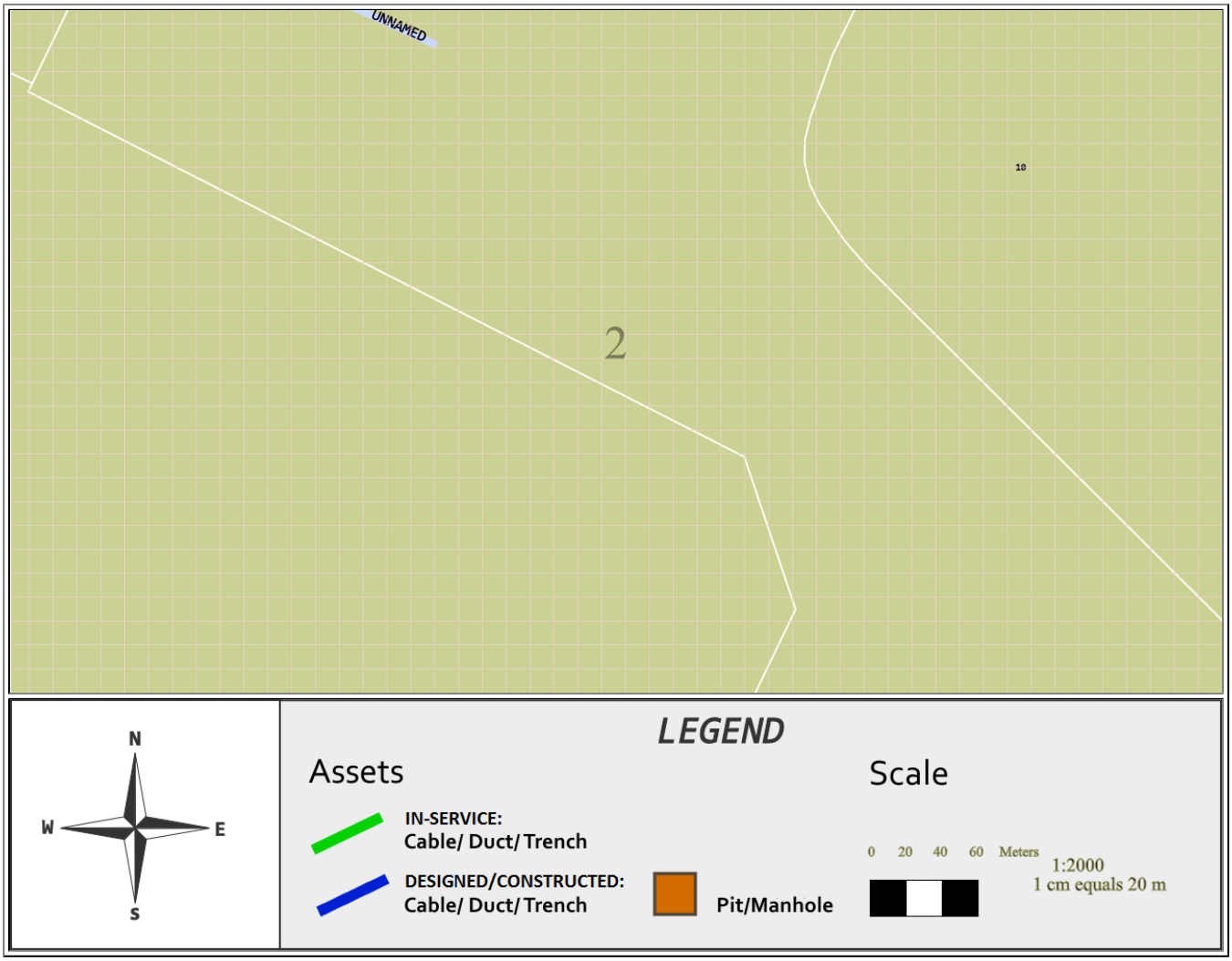
Pit/Manhole

Scale

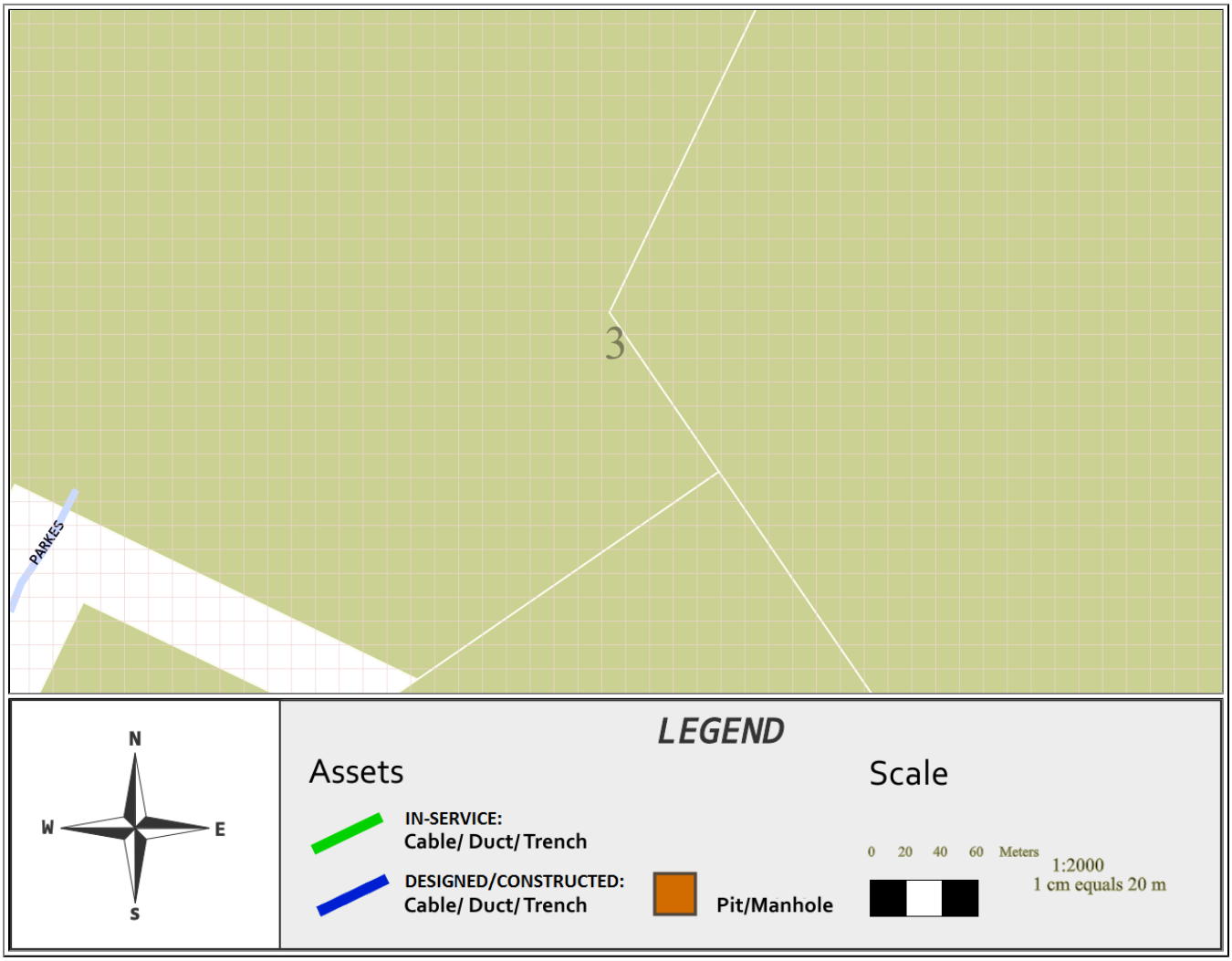
0 20 40 60 Meters

1:2000
1 cm equals 20 m

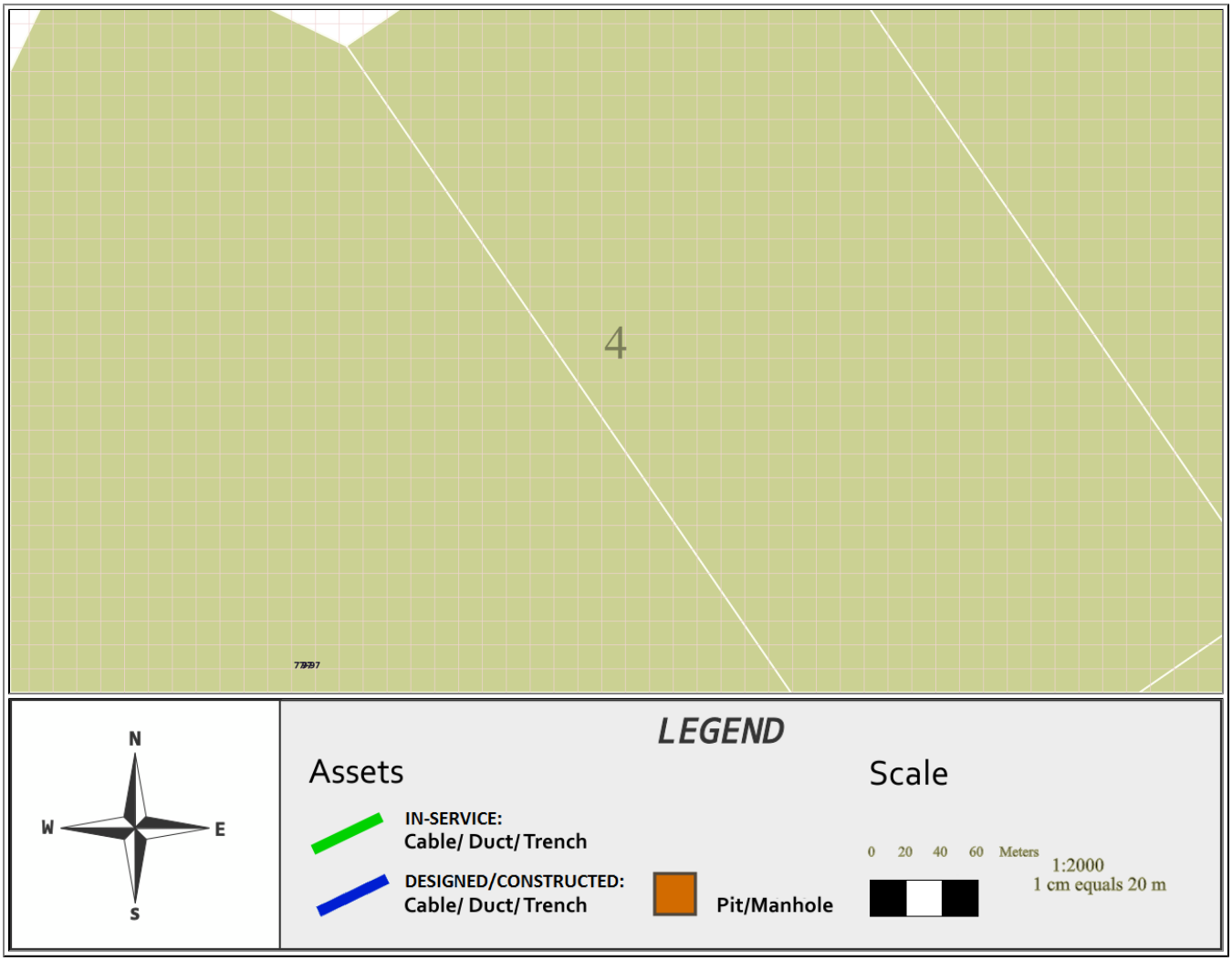
Email info@nbn.com.au Web nbn.com.au



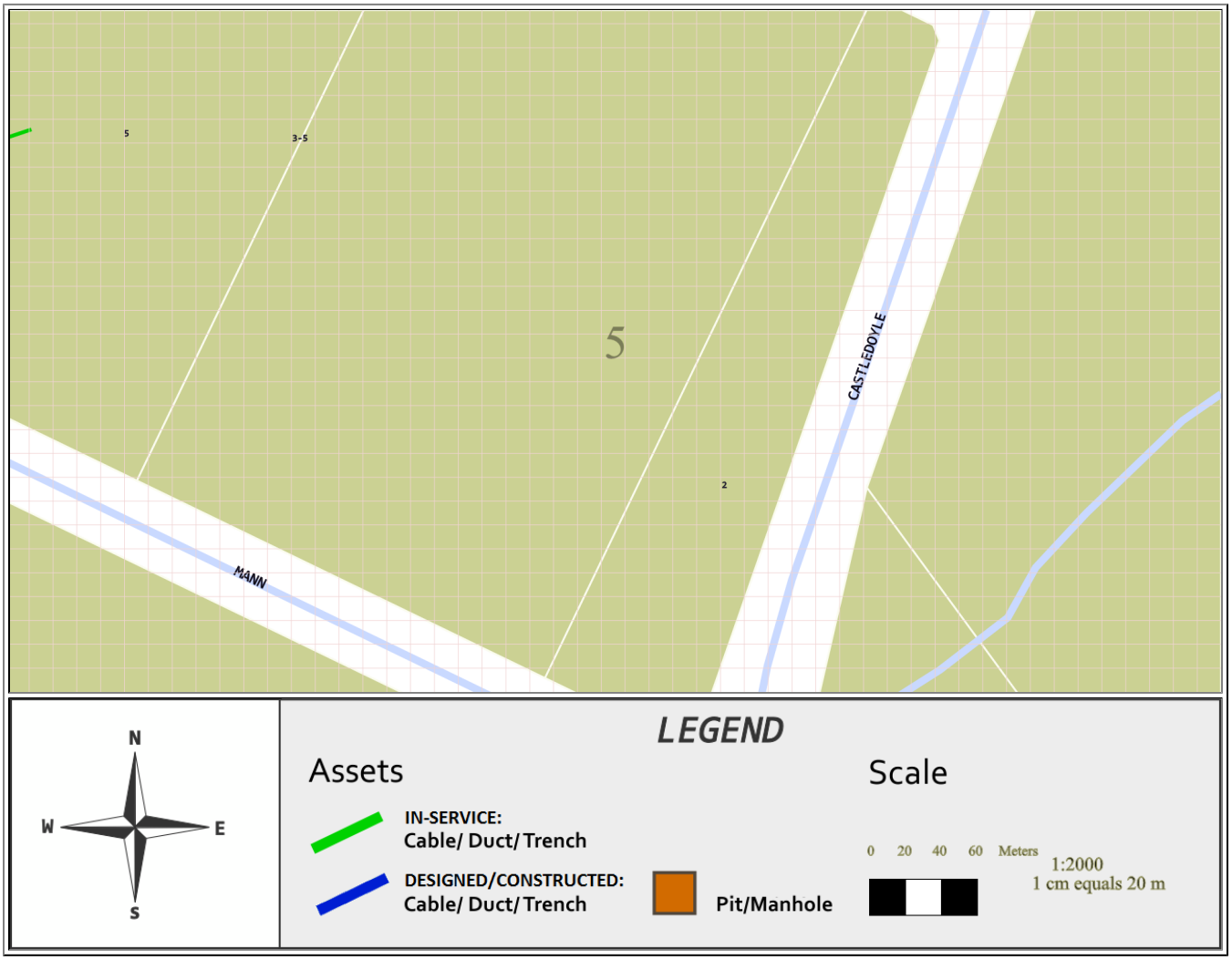
Email info@nbn.com.au Web nbn.com.au



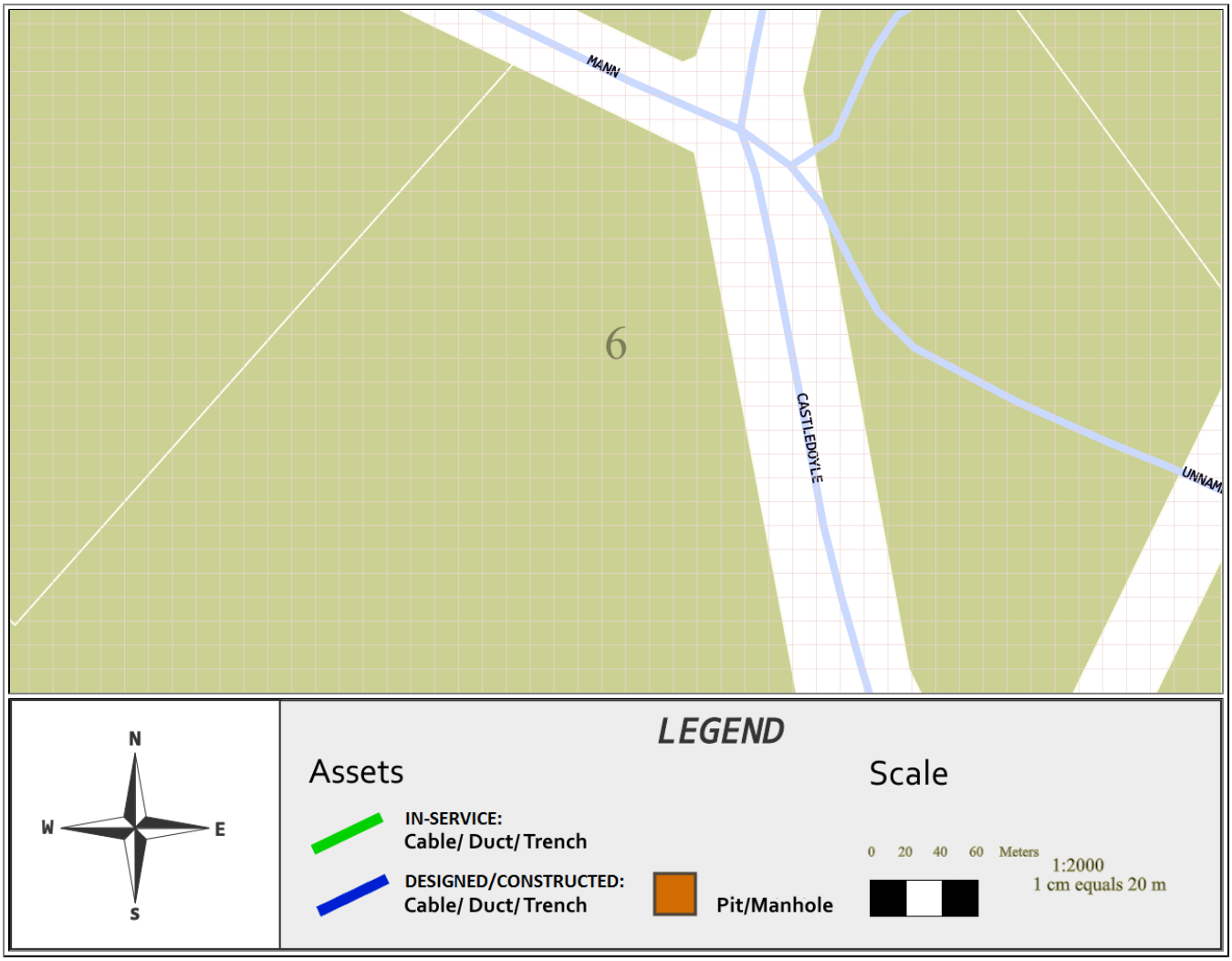
Email info@nbn.com.au Web nbn.com.au

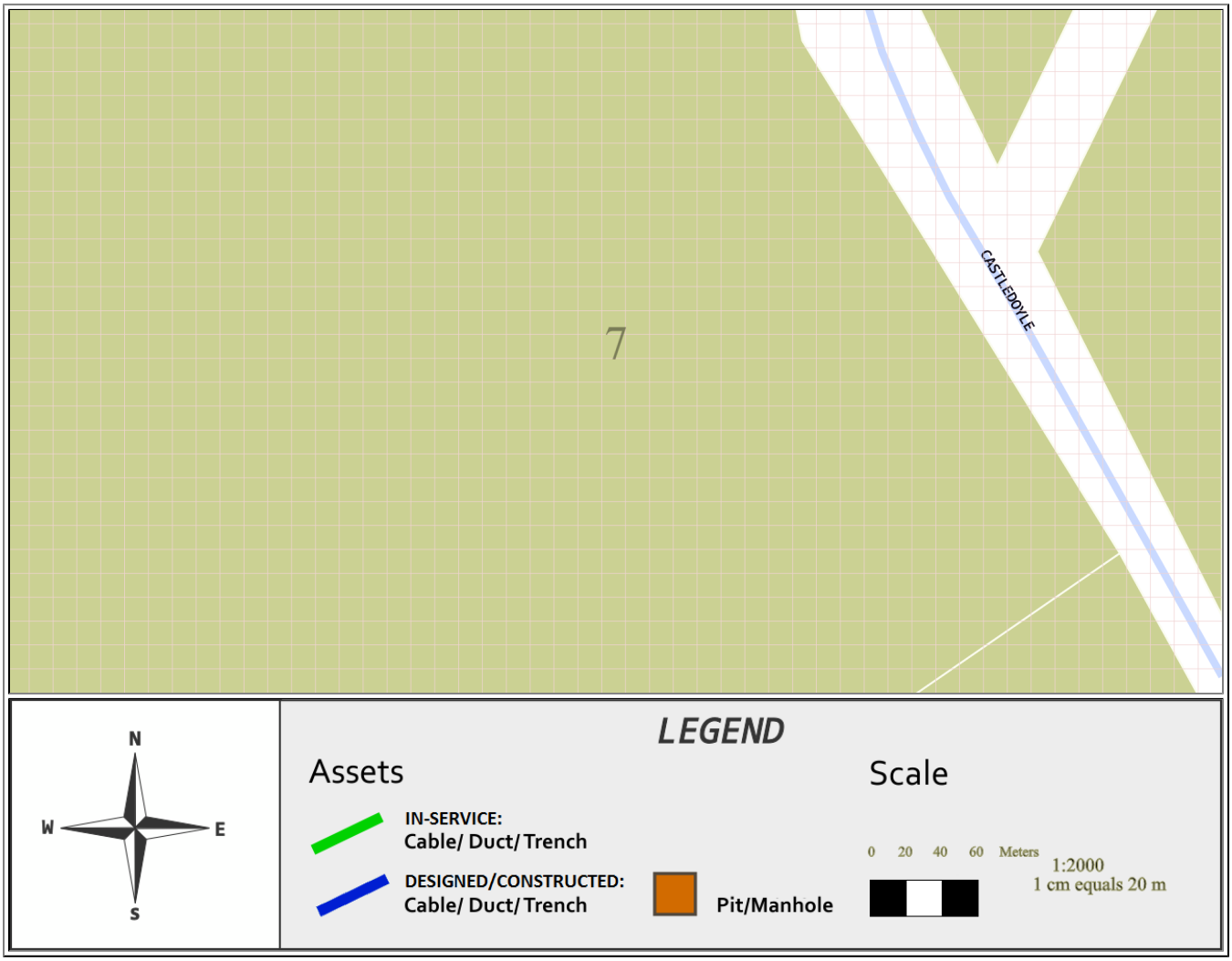


Email info@nbn.com.au Web nbn.com.au



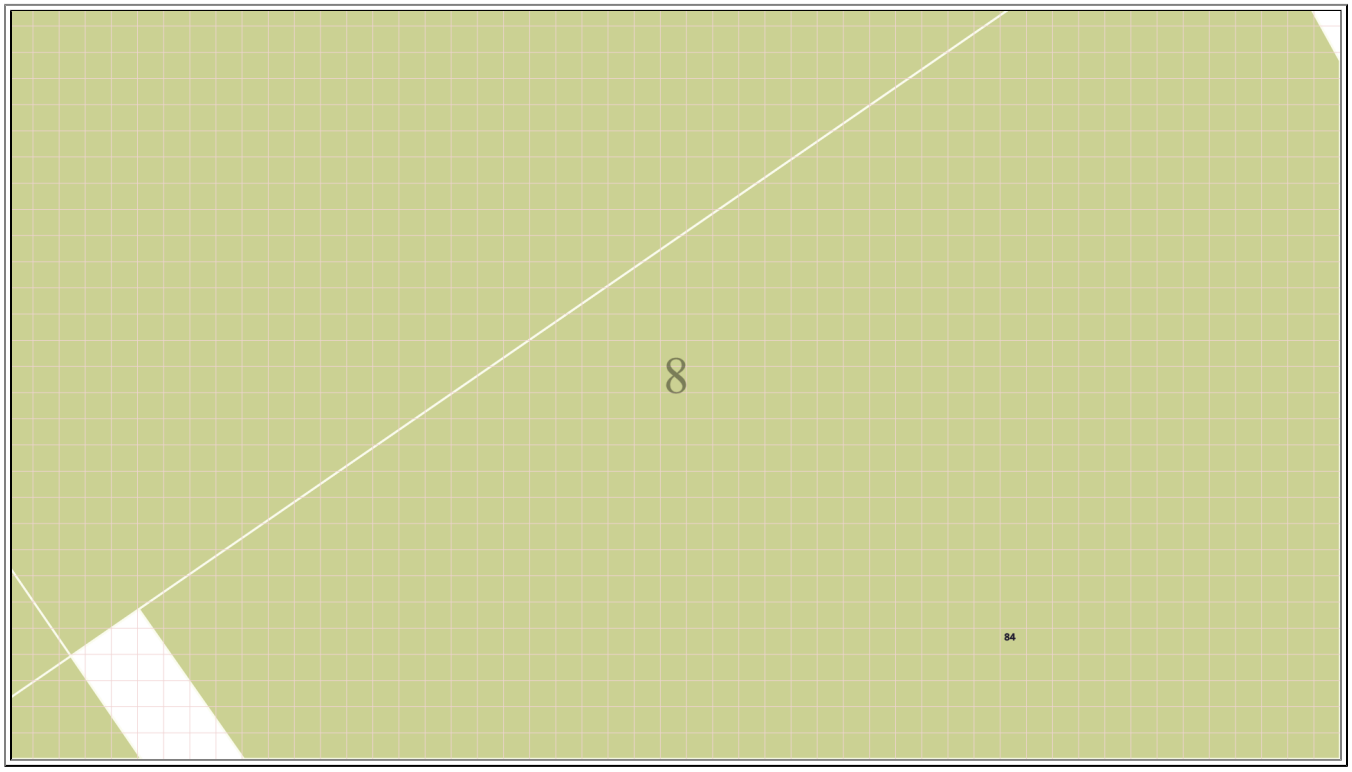
Email info@nbn.com.au Web nbn.com.au





Level 11, 100 Arthur Street, North Sydney NSW 2060

Email info@nbn.com.au Web nbn.com.au



Referral Conditions

The following are conditions on which **nbn** provides you with the Indicative Plans. By receiving, accepting or relying upon the plans (including the Indicative Plans), you are agreeing to these conditions. These conditions are in addition to (and not in replacement of) any duties and obligations you have under applicable law.

1. **nbn** does not accept any responsibility for any inaccuracies of its plans including the Indicative Plans. You are expected to make your own inquiries and perform your own investigations (including engaging appropriately qualified plant locators at your cost to locate **nbn** telecommunications facilities during any activities you carry out on site).
2. You should not assume that **nbn** cables and assets follow straight lines or are installed at uniformed depths along their lengths, even if they are indicated on plans provided to you. Careful onsite investigations are essential to locate the exact position of cables.
3. In carrying out any works in the vicinity of **nbn** facilities, you must maintain the following minimum clearances:
    - 300mm when laying assets inline, horizontally or vertically
    - 500mm when operating vibrating equipment, for example: jackhammers or vibrating plates;and
    - 1000mm when operating mechanical excavators.
    - Adherence to clearances as directed by other asset owner's instructions
4. You are aware that there are inherent risks and dangers associated with carrying out work in the vicinity of underground facilities (such as **nbn** fibre optic,copper and coaxial

cables,and power cable feed to **nbn** assets).Damage to underground electric cables may result in:

- Injury from electric shock or severe burns, with the possibility of death.
- Interruption of the electricity supply to wide areas of the city.
- Damage to your excavating plant.
- Responsibility for the cost of repairs.

5. You must take all reasonable precautions to avoid damaging **nbn** facilities. These precautions may include ,but not limited to, the following:
    - All excavation sites should be examined for underground cables by careful hand excavation. Cable cover slabs if present must not be disturbed. Hand excavation needs to be undertaken with extreme care to minimise the likelihood of damage to the cable, for example, the blades of hand equipment should be aligned parallel to the line of the cable rather than digging across the cable.
    - If any undisclosed underground cables are located, notify **nbn** immediately.
    - All personnel must be properly briefed, particularly those associated with the use of earth-moving equipment, trenching, boring and pneumatic equipment.
    - The safety of the public and other workers must be ensured.
    - All excavations must be undertaken in accordance with all relevant legislation and regulations.
6. You will be responsible for all damage to **nbn** facilities that are connected whether directly, or indirectly with work you carry out (or work that is carried out for you or on your behalf) at the Location. This will include,without limitation, all losses expenses incurred by **nbn** as a result of any such damage.
7. You must immediately report any damage to **nbn™** network that you are/become aware of. Notification may be by telephone - 1800 626 762.
8. Except to the extent that liability may not be capable of lawful exclusion, **nbn** and its servants and agents and the related bodies corporate of **nbn** and their servants and agents shall be under no liability whatsoever to any person for any loss or damage (including indirect or consequential loss or damage) however caused (including, without limitation, breach of contract negligence and/or breach of statute) which may be suffered or incurred from or in connection with this information sheet or any Plans attached hereto. Except as expressly provided to the contrary in this information sheet or the attached Indicative Plans, all terms, conditions, warranties, undertakings or representations (whether expressed or implied) are excluded to the fullest extent permitted by law.

All works undertaken shall be in accordance with all relevant legislations, acts and regulations applicable to the particular state or territory of the Location. The following table lists all relevant documents that shall be considered and adhered to.

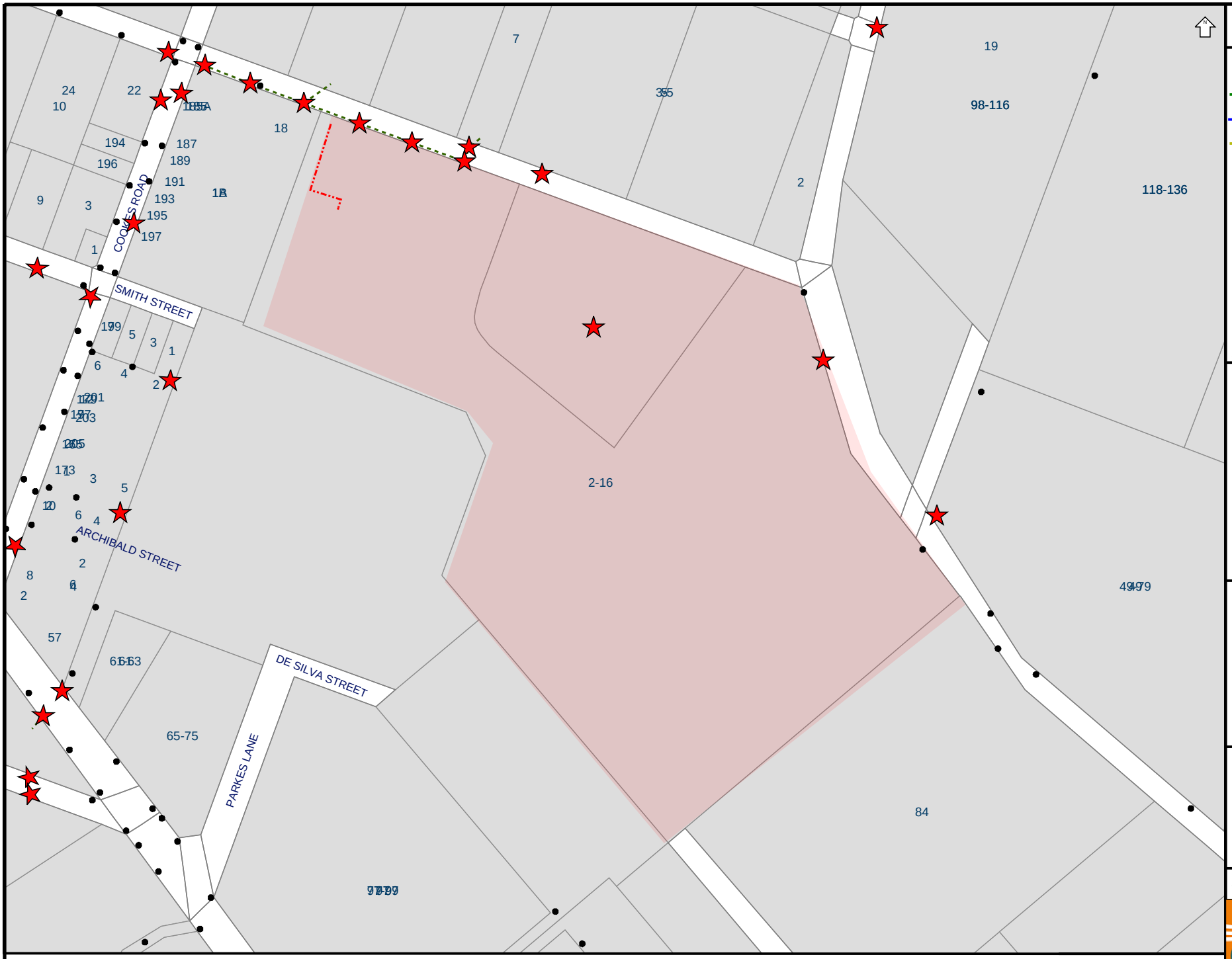
State/Territory	Documents
National	Work Health and Safety Act 2011
	Work Health and Safety Regulations 2011
	Safe Work Australia - Working in the Vicinity of Overhead and Underground Electric Lines (Draft)

	Occupational Health and Safety Act 1991
NSW	Electricity Supply Act 1995
	Work Cover NSW - Work Near Underground Assets Guide
	Work Cover NSW - Excavation Work: Code of Practice
VIC	Electricity Safety Act 1998
	Electricity Safety (Network Asset) Regulations 1999
QLD	Electrical Safety Act 2002
	Code of Practice for Working Near Exposed Live Parts
SA	Electricity Act 1996
TAS	Tasmanian Electricity Supply Industry Act 1995
WA	Electricity Act 1945
	Electricity Regulations 1947
NT	Electricity Reform Act 2005
	Electricity Reform (Safety and Technical) Regulations 2005
ACT	Electricity Act 1971

Thank You,

Network Operations Centre - Assurance

Date: 06/20/2016



LEGEND

- LV Underground Cable
- HV Underground Cable
- Underground Pipe
- Underground Earth or Wires
- Ground Substation
- Pole
- Cubicle
- Pit
- Area of Interest

Critical Assets

Contact Essential Energy on 13 23 91

- Zone Substation
- Underground Cable
- Underground Fibre

Proposed Works

- Area of proposed works

Proposed assets are shown as orange symbols

THE INFORMATION ON THIS MAP MAY NOT BE ACCURATE.
If details are incorrect, please notify Essential Energy on 13 23 91 (or fax 1800 354 636)

ISSUE DATE: 20/06/2016

You must resubmit your request if you have not started work within 4 weeks of the 'Issue Date' above

A4 | SCALE: 1:4492

Job Number: 10848215 Sequence number: 53664220 Job location: 16 Mann Street, Armidale

Map Centre: 151° 41' 10.1", -30° 31' 43.8"

essential energy

GHD

133 Castlereagh St Sydney NSW 2000

-

T: +61 2 9239 7100 F: +61 2 9239 7199 E: sydmail@ghd.com.au

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Document Status

Revision	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
Final	L. Gedge	A. Porter	On file	S. Charteris	On file	05/08/2016

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