



Fire & Rescue NSW
Albion Park PFAS Investigation
Preliminary Site Investigation and Sampling & Analysis
Quality Plan

August 2016

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1. Introduction

Fire and Rescue NSW (FRNSW) commissioned GHD Pty Ltd (GHD) to undertake a combined preliminary and detailed site investigation at a land parcel identified within Lot 1000 LP 880969 located at Airport Road, Albion Park Rail NSW 2527 (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 AFFF 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 area is approximately 15,000 m² (1.5 hectares) and comprises a portion of Lot 10 LP 1157377. The approximate site boundaries are presented in Figure 1, Appendix A.

GHD understands AFFF and other firefighting foams potentially containing PFASs have historically been 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 of works, NSW EPA have identified impact in surface water on the site and have requested further investigation be undertaken by FRNSW, to understand the potential extent of contamination, if any.

In response to the request by the EPA, GHD have conducted 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 (refer to Section 2.6). This information was used to develop a sampling analysis and quality plan (SAQP), for assessing the potential impacts and risks at the site (refer to Section 3).

This report documents the findings of the PSI and presents a preliminary CSM and SAQP. The SAQP has been prepared to assess potential impacts from the use of PFAS at the site and its potential impacts off-site. It is understood that the SAQP will 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 and the likelihood of impacts off-site.

The specific objectives of this PSI and SAQP are to:

- Describe the site (including boundaries and title descriptions)
- 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 preliminary CSM using the preliminary investigation data to assess potential source, receptor linkages

- Develop a SAQP to define future intrusive investigations to obtain quantitative data on contamination.

1.3 Scope of work

The scope of works undertaken by GHD to address the project objectives is described below.

The works were completed in accordance with GHD proposal 214723 dated 30 March 2016, which was approved for completion by FRNSW on 16 May 2016.

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

1.3.1 Task 1 - Information and Data Review (PSI)

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, 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 2.6).

1.3.2 Task 2 – Preparation of SAQP

The CSM developed from the PSI 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 – NEPM, 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 of 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 PSI 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 boundary is presented in Figure 1 in Appendix A.

Table 1 – Site identification summary

Information	Details
Street Address	Airport Road, Albion Park Rail NSW 2527
Lot and DP number	Part of Lot 10, LP 1157377
Site Area	Approximately 15,000 m ² (1 ha), with a perimeter of approximately 1 km
Local Government Area	Shellharbour City Council
Local Land Use Zoning	IN1 - General Industrial
Current Land Use	Training site
Surrounding Land Use	Illawarra regional airport to the west and south Trees then Hargraves Avenue to the east. Illawarra Rural Fire Service then vacant land to the north. The trees to the east of the site are identified as Environmentally Sensitive Land in the Terrestrial Biodiversity Map from the Shellharbour City Council Online Mapping system.

2.2 Site inspection

Prior to undertaking site investigations, a questionnaire was issued to FRNSW staff to prompt collation of relevant information from appropriate personnel prior to the site visit.

The site inspection was completed on 1 July 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 future intrusive field works, using visual observations of site conditions in previously uninspected areas.

The site inspection provided the following information. The site features discussed are presented in Figures 2 and 3 of Appendix A: Selected photographs depicting the site are provided as Plate A.

- The site has reportedly been used as a fire training area for approximately 20 years with limited AFFF use. Interviews were held onsite and limited information was known on the historical usage and storage of AFFF at the site. GHD understands that the site has not undergone any major changes in layout during FRNSW occupation of the site.
- The site is entirely fenced and access to the site is restricted to site personnel only.
- The fire training area was primarily covered with asphalt and GHD understands that the area has not been re-surfaced for at least five years.
- The training area included four gas training props which were previously set alight using a gas ignition and AFFF was subsequently used to extinguish the fire. The training props were situated on concrete, adjacent to an unsealed grassed area in the north-eastern portion of the broader fire training area. Some superficial cracks were noted on the

concrete. Run off drains were located towards the western side of the gas training prop area, draining directly into a retention pond.

- The retention pond located to the east of the gas training props is unlined and collects water from the fire training area. This is either through the drains from the fire training prop area, some surface runoff from the site and on the southern side, there is an old hose that collects water from the asphalt area to the retention pond.
- The main building located in the north western corner of the site comprised a garage / storage shed and office block. The other structures on site were either open covered areas, storage shed and two buildings that were reportedly used for fire training exercises. There is one area of the site that is fenced off and a concrete pad located within the fenced area This area is shown in photographs 3 and 4 in Plate A. Based on discussions with onsite personnel, the former use of the area is unknown however, there was a suggestion that it could have been used for storage of trailers and chainsaw use.
- Electricity poles and wires were located in the mid southern boundary of the site, reportedly used for fire training purposes only.
- The historical use of AFFF in other training areas of the site is unknown. However, these areas have the potential to have been subject to the use of AFFF based on their historical use for training activities.
- The surrounding land use includes the Illawarra airport located to the west and south of the site. The Rural Fire Service are located to the north of the site followed by vacant lot. To the west is a small area of bushland followed by Hargraves Avenue and residential properties.

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 occupied by FRNSW used as a fire training facility. The site provides training to nearby fire stations for different scenario training. The site has been used for training for approximately 20 years. According to site interviews, there was limited training with AFFF, most of which was undertaken in the vicinity of four training props located in the north eastern portion of the fire training area.
	Fencing	The site is completely fenced around the site boundary. The fence is cyclone fencing with barbed wire at the top of the fence.
Ground surface	Ground cover:	The ground surface comprises a mixture of sealed and unsealed areas, including asphalt in the fire training areas and roads, some concrete areas, building cover and unsealed grassed areas surrounding. The general ground cover relative to site areas is presented in Figure 2, Appendix A.
	Topography	The investigation area is relatively flat with a slope slightly to the north east.
	Vegetation	Grass of variable health was present across the site with mature trees scattered around the site. No vegetation was observed to be in ill health.
	Surface water	There are stormwater grates located within the asphalted area and larger concrete drains located around the site with all potentially underground stormwater pipes draining to a central pit before leaving the site. The pit is located in

Items		Comments
		<p>the north eastern corner of the site. The predicted underground flow of the site and where the surface water is draining to is presented in Figure 2, Appendix A.</p> <p>The only surface water on site is the retention pond located in the north eastern corner of the site. The pond has the potential to overflow during heavy rainfall periods. This overflow could potentially go offsite to the grassed area immediately east of the site or the grated pit (stormwater) in the north eastern corner of the site.</p>
Evidence of contamination	Litter	<p>No litter was observed in and around the site area. Skip bins were located at the site entrance.</p> <p>Some concrete rubble and other debris was located near a gated entry/exit at Boomerang Avenue.</p>
	Waste drums or bulk storage facilities	There was no evidence of waste drum storage on site.
	Fill	<p>There were no obvious signs of fill across the site area. However, three soil stockpiles were present on site. Two stockpiles were located in the south western corner of the site near the inner fenced off area. The third stockpile was located near the entry/exit to Boomerang Avenue. All stockpiled material is of unknown origin. There is also expected to be some form of fill material beneath asphalt and buildings present across the investigation area.</p>

Plate A – Photographic record



▲ **Photograph 1:** Stormwater drain in between the carpark and the main training area.



▲ **Photograph 2:** Facing west towards the Illawarra Regional Airport with the car and truck carpark.



▲ **Photograph 3:** Two soil stockpiles located in the south western corner of the site.



▲ **Photograph 4:** Fenced off area in the middle of the south western corner. Possible trailer / chainsaw compound previously.



▲ **Photograph 5:** Area in the middle of the site with a large concrete surface water draining point.



▲ **Photograph 6:** Facing south with the fire training structures.



▲ **Photograph 7:** Facing north west towards the office building with the fire training prop in the foreground.



▲ **Photograph 8:** Facing north towards the fire training props with the retention pond on the far right.



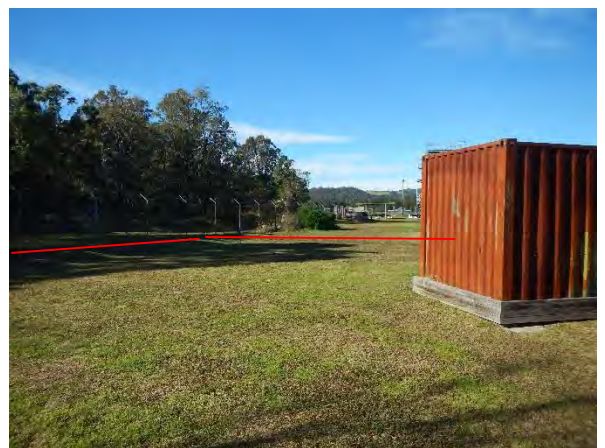
▲ **Photograph 9:** Facing east at the fire training props with the concrete drain which directs surface runoff into the retention pond.



▲ **Photograph 10:** Facing east with the site drainage being directed towards the north eastern corner of the site.



▲ **Photograph 11:** The retention pond with foam that had been used for a fire training exercise the day before. Dry compress foam was used.



▲ **Photograph 12:** Facing south with buried surface water drains as indicated by the red lines.



▲ **Photograph 13:** Facing west from the retention pond with the arrow showing a hose pipe entry where surface water is collected from the fire training ground.



▲ **Photograph 14:** Buildings located to the south of Area 7 viewing south-west from the fence running through Area 4.



▲ **Photograph 15:** Facing north at the retention pond towards the stormwater pit in the north eastern corner of the site.



▲ **Photograph 16:** The north eastern stormwater pit in the corner of the site near the retention pond.



▲ **Photograph 17:** Facing west with the sewage and water mains visible for the site.



▲ **Photograph 18:** Large concrete drain collecting surface water on the eastern boundary of the site.



▲ **Photograph 19:** A close up of the stormwater drain in photograph 18 which shows the pipe direction to the north along the site boundary.



▲ **Photograph 20:** Training area for power poles and wires. These are not connected.



▲ **Photograph 21:** Facing south at the grassed strip offsite. The area is very water logged and there is a slight mounding of the ground before the forested area trapping surface water in this area.



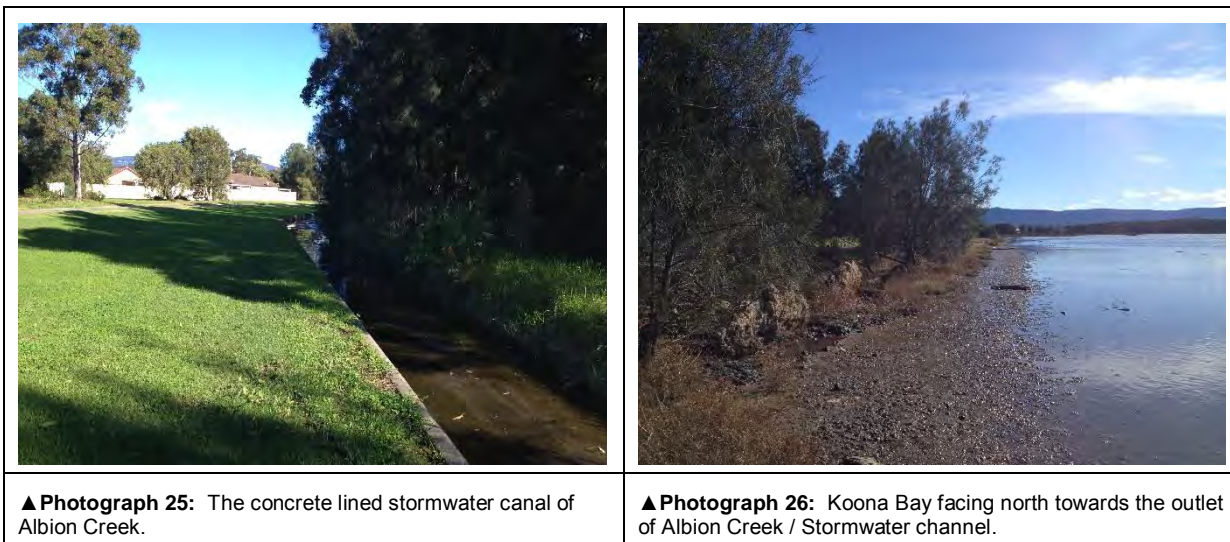
▲ **Photograph 22:** Facing north with the rural fire service site to the left of the photo within the grassed area before the forested area.



▲ **Photograph 23:** The area behind the north eastern stormwater pit.



▲ **Photograph 24:** Facing south on Hargraves Avenue with the forested area to the right. The photo shows that there is a mounding beside the forested area trapping any surface water flows leaving that area.



2.3 Environmental Setting

This section outlines relevant information relating to the environmental setting of the site. According to the Shellharbour City Council Online Mapping system, the site lies within a bushfire prone area.

2.3.1 Topography

The site has an approximate elevation at 6 m above Australian Height Datum (m AHD), according to the *NSW Globe* from Land and Property Information and the Shellharbour City Council Online Mapping system. This information suggests that the natural ground level across the investigation area is relatively flat.

The regional topography appears to rise to the north, west and south and fall to the east towards Lake Illawarra approximately 600 m east of site. Lake Illawarra is used commercially for recreational activities and fishing purposes.

2.3.2 Soils

General

According to eSPADE from Office of Environment & Heritage the site is within the Fairy Meadow 'fa' landscape. The Fair Meadow soil landscape has the following characteristics:

- **Landscape:** Alluvial plains, floodplains, valley flats and terraces below the Illawarra Escarpment. Local Relief <10 m. Slopes usually <5%. Almost completely cleared low open-forest and woodland.
- **Soils:** moderately deep (50-100 cm). Alluvial Loams and Siliceous Sands on terraces. Prairie Soils and Yellow Podzolic Soils occur on the drainage plains.
- **Limitations:** flood hazard, low wet bearing strength, highly permeable topsoils, high water tables.

Acid Sulfate Soils

The acid sulfate soil class at the site has a low probability of occurrence and at depths greater than 3 metres below the ground surface (reference from the Department of Land and Water Conservation, Albion Park, Acid Sulfate Soil risk map, Edition 2, 1997).

The site is situated in AP4 (alluvial plains elevation of >4 m AHD). Around the stormwater channel located to the north of the site there is a zone of AP2 (*low probability depths of 2 meters below ground surface*) and AP1 (*high probability at depths of 1 metre below ground surface*) which means the chance of encountering acid sulfate soils increases at these areas.

2.3.3 Hydrology

Surface water flow is expected to follow the local topography on-site and flow east towards Lake Illawarra, which is used for recreational activities and fishing purposes. A ‘Dial-before-you-dig’ search (Appendix E) did not provide an indication of stormwater infrastructure through the site. However, it appeared during the site inspection that the site drained to a stormwater pit in the north east corner of the site that then runs north until it reaches Albion Creek which then drains to Lake Illawarra. The general catchment hydrology and slope is presented in Figure 3, Appendix A.

The closest water body is Albion Creek, located approximately 420 m north of the investigation area, which discharges in Lake Illawarra 600 m east of site Lake Illawarra is used commercially for recreational activities and fishing purposes.

The site and Lake Illawarra are known to experience frequent flooding.

2.3.4 Geology

The 1:250,000 geological map series for Wollongong (Department of Mines, 1966) suggests that the regional geology of the area is Berry Formation. This lithology is part of the Permian *Shoalhaven* Group that is characteristic of siltstone, shale and sandstone, including lenticular development of the Megalong Conglomerate.

The following Table 3 describes the geology underlying the site.

Table 3 – Geology

Geological period	Group	Description
Quaternary	-	Alluvium, gravel swamp deposits and sand dunes
Permian	Shoalhaven Group, Berry Formation undifferentiated	Siltstone, shale, sandstone.
Permian	Shoalhaven Group, Megalong Conglomerate	Quartz sandstone followed by siltstone, silty sandstone pebbly in part and then conglomerate, sandstone to silty sandstone
Upper Devonian	Bindook Porphyry	Quartzite, sandstone, siltstone and shale.

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 and to record information such as use and standing water level. No groundwater bores were identified within a 500 metre radius of the site.

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 sandstone in sedimentary basins, which potentially have low hydraulic conductivities. Groundwater salinity is expected to range from 0 – 1000 mg/L, which is suitable for stock, domestic and some irrigation purposes.

2.4 Site history

2.4.1 Summary of previous investigations

A previous investigation was undertaken by the EPA on 13 January 2016 *to investigate the potential of significant amounts of PFASs to have been released to the environment as a consequence of historic firefighting activities* (NSW EPA, 2016). A sample of pond water and a sample of soil from site were collected for laboratory analysis. A letter detailing the investigation is provided in Appendix C.

Due to the absence of guidelines at the time of the investigation, the EPA applied scientific studies for the minimum threshold of 0.1 µg/L of PFOS in surface water and groundwater leaving site and 10 µg/L in surface water and groundwater on site. Laboratory analysis showed a PFOS concentration of 51 µg/L in the pond water and 0.16 mg/kg in the soil.

The EPA study recommended further investigation including the assessment of soil samples through the Australian Standard Leaching Procedure (ASLP). This will aim to assess the leaching potential of soils into nearby water receptors. The EPA also recommended an investigation of hydrocarbons due to the historic use of petroleum hydrocarbon in firefighting foams.

2.4.2 Aerial photographs

A selection of historical aerial photographs was examined in order to assess past activities and land uses in the investigation area. A review of historical aerial photography is provided in Table 4.

The aerial photographs are presented in Appendix D.

Table 4 – Review of historical aerial photographs

Year	Site	Surrounds
1963	The site consisted entirely of trees. The site appeared to be part of the adjacent northern and eastern lots.	The site was bound by trees along the northern and eastern boundaries. Vacant land was located to the south of the investigation area, adjacent to which a runway was located. West of the site comprised vacant land and a road connected to the airplane runway.
1980	The trees on site appeared to have been cleared and the site comprised cleared un-vegetated vacant land.	The site was bound by vacant land along the north boundary. East of the site comprised scattered bush and trees. The other surrounding areas remained unchanged from the previous aerial photograph.
1993	The site remained mostly unchanged from the previous aerial photograph.	The areas surrounding the site appeared to have remained mostly unchanged from the previous aerial photograph.

Year	Site	Surrounds
2006	The site appeared to have undergone substantial development. A development, most likely of commercial nature, appeared in the north western portion of the site. The commercial development was bound to the west and south by an asphalt surface. A carpark appeared in the asphalt section to the south of the development. A concrete pad and a pond were located in the north eastern corner of site, consistent with the current location of the surface water retention dam. The southern section of site consisted of a number of smaller developments, with the addition of two asphalt lanes, some trees and grass. The site was bound by trees along its north and south western corners and western boundary	North of the site appeared to have remained vacant. Land to the west of the site remained covered with trees. The site was bound by a street to the west and south, beyond which developments related to the airport were located.
2016	No substantial changes were observed to the site since the previous aerial photograph. The layout of the site appeared consistent with that observed on site during the site inspection.	A number of buildings, most likely of commercial nature appear to the north of site. The buildings are surrounded by carparks and a combination of grass and asphalt surfaces. A new large development appears attached to the helicopter shed to the south of site. The other surrounding areas have remained unchanged from the previous aerial photograph.

In summary, the following observations were made:

- In 1963, the site consisted of dense vegetation. At some point prior to 1980, the site was cleared and remained undeveloped until some time between 1993 and 2006.
- Sometime between 1993 and 2006, the site underwent substantial development. The layout of the site has remained unchanged since this time. The development includes a number of buildings, asphalt surfaces, carparks, a concrete surface and a pond, consistent with the current site layout at the time of this investigation.
- The areas surrounding the site underwent substantial commercial and airport-related development excluding east of site, which remained as trees.

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 historical land use at the site, including former site practices, which may have the potential to cause contamination. The desk based review included 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 Shellharbour City Council. Reference to the Shellharbour Local Environmental Plan 2013 indicates that the site is zoned as IN1 - General Industrial'.

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 B 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 21 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 21 June 2016.

No record was found for the site. The search showed one property within a 500 metre radius of the site. Table 5 provides a summary of the licence.

Table 5 – Summary of POEO license register

Applicant	Site Address	Activity Type	Licence Status	Proximity to the site
Touchdown Helicopters Pty Ltd	Hangar 1, 32 Airport Road, Albion Park Rail, NSW 2527	Helicopter-related activity	Surrendered 10 July 2008	150 m northwest
			Issued 31 July 2008	
			Issued 20 February 2012	

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 July 2016. The search showed one property 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
Caltex Service Station	172-174 Princes Highway, Albion Park Rail, NSW 2527	Service Station	415 m south east	Under assessment

State heritage register

GHD undertook a search of the register on 28 June 2016. The search showed three premises 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
Albion Park Railway Station Group	Princes Highway, Albion Park Rail, NSW 2527	650 m south east	RailCorp / State Government
Illawarra Cooperative Central Dairy Factory (Former)	Creamery Road (cnr Bateman Avenue), Albion Park Rail, NSW 2527	400 m east	No details
Illawarra Regional Airport	Airport Road off Princes Highway, Albion Park Rail, NSW 2527	30 m west	Shellharbour Council

2.6 Preliminary conceptual site model (CSM)

Based on the current information, a preliminary CSM has been developed for the site.

The primary contaminants of potential concern (CoPC) are PFAS, notably PFOS and PFOA, which were components of AFFF. Other CoPCs include components of fuels and oils used as ignition sources such as total recoverable hydrocarbons (TRH), benzene, toluene, ethylbenzene and toluene (BTEX), polycyclic aromatic hydrocarbons (PAHs) and metals (notably lead).

The CSM concentrates mainly on PFAS as the main CoPC for the site and likely to be the key driver for any additional work at the site. The other CoPCs will be considered in the SAQP.

2.6.1 Sources

Based on anecdotal evidence, historical aerial photographs and the history of the Albion Park FRNSW site, the following historical contamination sources could have affected the investigation area:

- The site has historically been used as a firefighting training site for approximately 20 years.
- Potential source areas include:
 - The concrete pad and asphalt surface in the north eastern area of site, where most AFFF and fuel for ignition are likely to have been used.
 - The retention pond in the north eastern area of site which showed elevated PFOS concentration after EPA sampling.
 - The grassed area immediately off-site where overflow of the retention pond would occur.

- All other areas of the site where different fire training scenarios have historically taken place. Based on discussions with site personnel, the historical use of AFFF in these areas cannot be discounted.
- Minor spills of petroleum hydrocarbons and oils from vehicles traversing the asphalt surfaces within the investigation area.

2.6.2 PFAS fate and transport

PFAS forms a component of AFFF which is sprayed onto fires during training events. The mode of use of AFFF through roof monitors and hoses allows for it to spread through airborne dispersion beyond the training area. Typically, this results in diffuse low levels of PFAS over a wider area. Generally, the highest soil concentrations tend to be at the point source.

PFAS are stable and persistent compounds that do not readily degrade in the environment.

Once in soil, PFAS can leach from soil to water (due to its solubility in water) as water migrates downward through soil to the water table, resulting in contaminated groundwater. Generally, the shorter chain PFAS species are more soluble than the longer chain PFAS. Groundwater will migrate and discharge into the nearest downgradient surface water body – in the case of the site the main discharge area is likely to be Lake Illawarra 600 m east of site, as well as through stormwater drainage to Albion Creek which drains to Lake Illawarra. Lake Illawarra is used commercially for recreational activities and fishing purposes.

If the groundwater in the area is shallow, groundwater and PFAS may ‘daylight’ during high rainfall events and result in overland flow to surface drains and creeks.

Studies have indicated that as fresh water contacts sea water, PFAS’s can partition into sediments suggesting a significant mass of dissolved phase PFAS’s may partition into the sediment rather than become dissolved in sea water (You et al 2010, Zhang and Lerner 2012). This, combined with tidal effects, makes the discharge mechanisms in coastal regions very complex. Benthic organisms living in the sediment may then be impacted through ingestion of the sediments.

Migration through the soil will depend on the attenuation properties of the soil. Some components of the soil (notably organic carbon) can sorb PFAS components. Generally, the longer chain PFAS species will sorb more readily. This, combined with the lower solubility of the longer PFAS species, can result in mainly shorter chain PFAS species being dissolved in water while the large molecules remain in the soil.

The surface water on-site collects in the stormwater pit in the north eastern corner of the site. This then connects to the stormwater pipe that meets Albion Creek 400 m north of the site. The main surface water receptors considered to be Lake Illawarra located approximately.

Plants (including aquatic plants) have the ability to uptake PFAS in through impacted soil water. Grasses and other flora can be consumed by micro- and macro-fauna which may in turn be predated.

The main risks to human health mainly arise through ingestion of impacted media i.e. soil, water or organisms.

In terms of risks to ecological receptors, while contamination can give rise to direct toxic effects on ecosystems, the limiting factor can be the bioaccumulation of contaminants in fish or other species affecting persons or other animals that consume these fish or other species.

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.
- Current and future construction/intrusive maintenance (utility) workers (on-site and off-site).
- Residential properties down gradient of the site.
- Users of off-site water bodies for recreational and fishing purposes.
- Users of groundwater. GHD understands that groundwater is not extracted at the site for any purpose suggesting this may be a low risk. However, the potential for extraction remains both on-site and off-site.
- Aquatic ecological receptors – invertebrates, molluscs, fish, eels etc.
- Terrestrial ecological receptors – local invertebrates (worms, insects etc), mammals, birds, reptiles that might consume impacted animals, plants and surface water.

2.6.4 Exposure 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 soil, surface water and groundwater.
- Incidental ingestion of contaminated soils, surface water and groundwater.
- Ingestion of groundwater and impacted plant and animal material.
- Terrestrial animal consumption of impacted animals, water, soils and plants.
- Inhalation of contaminated soils or dust and water (aquatic animals). (PFAS are not considered to be a vapour hazard due to their low volatility).
- Extraction and use of groundwater.
- Surface runoff and sediment transport into storm water drainage and subsequent transport and discharge to surface waters. This may be enhanced during significant rain events and flooding.

2.6.5 Potential source-pathway-receptor linkages

Based on the current information, the following preliminary 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 CSM

Potential Source	Potential Contaminants	Potential Pathway	Potential Receptor
Former use of AFFF during training	<i>Primary contaminants of concern:</i>	Human exposure:	Human:
Cleaning and wash down of contaminated equipment	<ul style="list-style-type: none"> • PFASs <i>Other potential contaminants:</i>	<ul style="list-style-type: none"> • 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. 	<ul style="list-style-type: none"> • Site users and visitors; • Persons undertaking construction, demolition and maintenance works. Nearby
Disposal of contaminated media	<ul style="list-style-type: none"> • TRH • BTEX • PAHs 		<ul style="list-style-type: none"> • Residents and commercial/industrial users; • Users of groundwater; • Recreational users of Lake Illawarra
Accidental spills	Heavy Metals (primarily lead)	Environmental exposure:	Ecological:
		<ul style="list-style-type: none"> • Surface Water runoff. • Vertical migration through the unsaturated zone into the saturated zone and horizontal migration within the groundwater. 	<ul style="list-style-type: none"> • Ecology of Albion Creek and Lake Illawarra • Terrestrial organisms on-site and off-site

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	<p>State the problem to be resolved</p> <p>What is the likelihood that PFAS sources have contaminated the environment and what risks does it pose?</p>
2	<p>Identify the decision/s to be made</p> <p>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:</p> <ul style="list-style-type: none"> • What are the potential sources of PFAS contamination at the site? • Do the concentrations of PFAS 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	<p>Identify the inputs to the decision</p> <p>To inform the decisions and identify key data gaps and needs, the following information is considered necessary:</p> <ul style="list-style-type: none"> • 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	<p>Define the boundaries of the study</p> <p>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 2, Appendix A. The study boundaries also extend to surface water impacts between the site and Lake Illawarra.</p>
5	<p>Develop a decision rule</p> <p>The key decision rules are:</p> <p>Is PFAS present at concentrations above laboratory level of reporting (LOR) in soil and surface water?</p> <ul style="list-style-type: none"> • If NO – risks to on-site receptors is low and the potential for PFAS contamination to migrate off-site is low. Further assessment is not supported. • If YES – Do the concentrations of PFAS in on-site samples exceed the adopted guideline criteria? <ul style="list-style-type: none"> – If NO – risks to on-site receptors is low and off-site impact is less likely. Assess the adequacy of the investigations to quantify risk. – If YES – conduct further assessment of risks to on-site receptors. Assess the likelihood of contamination migrating to groundwater and thence off-site.
6	<p>Specify the tolerable limits on decision errors</p> <p>A detailed assessment of potential for sampling and measurement errors will be undertaken based on 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.</p> <p>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”.</p> <p>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:</p> <ul style="list-style-type: none"> • For results <i>within</i> 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 <i>above</i> the threshold would require further investigation and delineation to determine the size of the impact identified.

Step	Description
7	<p data-bbox="375 215 614 297">Optimise the design for obtaining the data</p> <p data-bbox="646 226 1129 253">The sample design will be optimised through:</p> <ul data-bbox="722 277 1517 589" style="list-style-type: none"> <li data-bbox="722 277 1517 349">• Identification of potential PFAS sources from existing information and investigations conducted by GHD and others i.e. results of PSI. <li data-bbox="722 367 1517 394">• A review of the surface water pathways across and leaving the site. <li data-bbox="722 421 1517 448">• Collection of soil, groundwater and surface water samples. <li data-bbox="722 474 1517 501">• Appropriate laboratory analysis methodologies. <li data-bbox="722 528 1517 589">• 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 investigation 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, xylene and naphthalene (BTEXN)
 - 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 general industrial, 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 objective

The objective of the intrusive investigation is to provide information on the contamination status of the soil, groundwater and surface water and whether human and ecological receptors on the site and in the surrounding area may be at risk from site impact.

The investigation will also consider mechanisms that might enhance or inhibit contamination migration such as soil type, grain size, sorption capacity, hydraulic conductivity and water salinity. This site-specific information will inform our understanding of contaminant fate and transport which is essential to understanding risks. To achieve this samples of the soil will also be analysed for cation exchange capacity (CEC), total organic carbon and leachability. Aquifer slug tests will be performed on newly installed wells to assess the hydraulic conductivity of the aquifer.

Given the potential for other sources in the area, sampling will also consider site boundary conditions.

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 contaminant sources, notably those associated with former firefighting activities to help FRNSW understand the residual issues to human health and the environment including site workers.
- Surface water impacts in order to assess risks to down gradient receiving surface water users and ecosystems.
- Groundwater to assess potential impacts to current and future down gradient groundwater users (if any).

3.5 Scope of intrusive investigations

The scope of the intrusive investigation is summarised as follows:

- Soil sampling at 15 locations (SB01 to SB15) with five of these locations being completed as groundwater wells (GW01 to GW05) .
- Surface water (SW01 to SW05) and sediment sampling (SS01 to SS05) at five locations.

- Groundwater sampling at five locations (GW01 to GW05).
- Slug testing of five newly installed wells (GW01 to GW05).

The sample locations are provided on Figure 5 in Appendix A. Details of the investigation methodology are outlined below.

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

Table 11 – Sampling Program

Media	Location	Rationale	Laboratory Analysis
Site boundary			
Soil bores / Groundwater wells	GW01 and GW02	Upgradient site boundary adjacent to airport Assess groundwater quality entering the site from the airport.	PFAS, TRH, BTEX, metals, pH, TDS, major ions, alkalinity
		Opportunistic soil sampling of locations.	PFAS, TRH, BTEX, PAHs, TOC, CEC, pH ASLP – PFAS **
Surface water retention dam and fire training area			
Soil bore / Groundwater	GW03	Assess contamination adjacent to a known source of PFAS	PFAS, TRH, BTEX, metals, pH, TDS, major ions, alkalinity
		Opportunistic soil sampling of locations	PFAS, TRH, BTEX, PAHs, TOC, CEC, pH ASLP – PFAS **
Soil	SB06 to SB09	Soil quality around known PFAS source area	PFAS, TRH, BTEX, PAHs, TOC, CEC, pH ASLP - PFAS
Surface water	SW05	Assess water quality within the on-site retention dam	PFAS, TRH, BTEX, metals, pH, TDS, major ions, alkalinity
Potential former area of foam usage			
Soil	SB10	Soil quality around potential former PFAS source area	PFAS, TRH, BTEX, PAHs, TOC, CEC, pH ASLP – PFAS **
Off-site			
Soil bores / Groundwater wells	GW04	Assess groundwater quality down gradient of Rural Fire Service site.	PFAS, TRH, BTEX, metals, pH, TDS, major ions, alkalinity
	GW05	Assess groundwater quality down gradient of the site near the inferred discharge boundary from the broader land parcel	
		Opportunistic soil sampling of well locations	PFAS, TRH, BTEX, PAHs, TOC, CEC, pH ASLP – PFAS **
Soil	SB11 and SB12	Assess soil quality in highly wooded area adjacent to the site	PFAS, TRH, BTEX, PAHs, TOC, CEC, pH ASLP – PFAS **
	SB13	Assess background soil quality	
	SB14 and SB15	Assess soil quality in cleared area to the north of the site to evaluate the potential for dispersion of PFAS	
Surface water / sediment	SS01, SW01	Assess surface water and sediments within discharge area to the north of the site	Sediment - PFAS, TRH, BTEX, PAHs, TOC, pH Surface water – PFAS, TRH, BTEX, metals, pH, TDS, major ions, alkalinity
	SS02 to SS04 SW02 to SW04	Assess surface water and sediment quality along the length of Albion Creek	

** Selected samples only to be submitted for ASLP

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 locator will be commissioned to clear all proposed intrusive locations prior to the commencement of drilling.

Hardstand coring

Where hardstand coring is likely to be required, a qualified subcontractor will be engaged to conduct these works. Each location will be reinstated with cement.

3.6.2 Soil Locations

Soil locations will be advanced by hand auger to approximately 1.5 m deep or until refusal. Each location will be checked against services plans and cleared by a service locator prior to commencement of augering.

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.

3.6.3 Borehole drilling

The water bearing zone is expected to be shallow although no site-specific data is available. GHD proposes to install groundwater wells based on field observations so as to enable the well screen to intercept the water table. It is envisaged that groundwater will be no deeper than 5 m below ground surface. Therefore, it is proposed to drill boreholes to nominal depths of 6 metres below ground level (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 borehole log, as well as soil sampling information.

3.6.4 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 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.

3.6.5 Soil and sediment 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 hand 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 photo ionisation detector (PID) will be used to assess for the presence of volatile organic compounds at each sampling interval.
- Two soil samples will be selected for analysis from each borehole, based on the results of PID screening and visual/olfactory evidence of contamination.
- 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 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.

3.6.6 Groundwater sampling

Groundwater sampling will be carried out as follows:

- First round – the newly installed wells (GW01 to GW05) 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.

3.6.7 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). Further detail on sample preservation, handling and transport is provided in 6.
- 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.

3.6.8 Slug testing

A slug test is conducted by instantaneously removing or introducing a known volume (or slug) to a well that displaces (either decreases or increases) the water level in the well. The slug could comprise a known volume of water or a solid object of a known volume into a well. Slug tests are often classified as either rising-head tests or falling-head tests, depending on the direction of water level recovery being monitored.

The resulting recovery to equilibrium conditions (either rise or fall) of the water level in the well is then monitored and the data analysed by one of several methods to determine the horizontal hydraulic conductivity (K). The water level readings are taken by an automatic data logger and pressure transducer. This device is used to automatically measure and record changes in water level and split second frequencies.

3.7 Laboratory Analysis

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

In summary, soil samples will be analysed as follows:

- Two soil samples from each borehole will be submitted for laboratory analysis of COPC including PFAS, TRH, BTEXN, PAH, 8 heavy metals, cation exchange capacity (CEC), total organic carbon (TOC), pH.
- QA/QC sampling will include one intra-laboratory duplicate sample, one inter laboratory duplicate sample and one trip spike sample.

A selection of five samples will be submitted for Australian Standard Leaching Procedure (ASLP) analysis specifically for PFAS to assess the potential for PFAS species to leach into the groundwater. This will also add to our understanding of the attenuation capacity of the soil.

Analysis of soil samples will be undertaken by a national association of testing authorities (NATA) accredited for the required analysis.

Groundwater and surface water samples will be analysed as follows:

- All groundwater samples (five) will be submitted for laboratory analysis of COPC including PFAS, TRH, BTEXN, PAH and eight heavy metals (standard laboratory limit of reporting), major ions, alkalinity, pH and total dissolved solids (TDS).
- QA/QC sampling will include one inter-laboratory duplicates, one intra-laboratory duplicate and one trip spike per round. The duplicates will be analysed for TRH and BTEXN and the trip spike will be analysed for vTRH (TRH C6-C10) and BTEX.

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 200 L drums 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.

5. References

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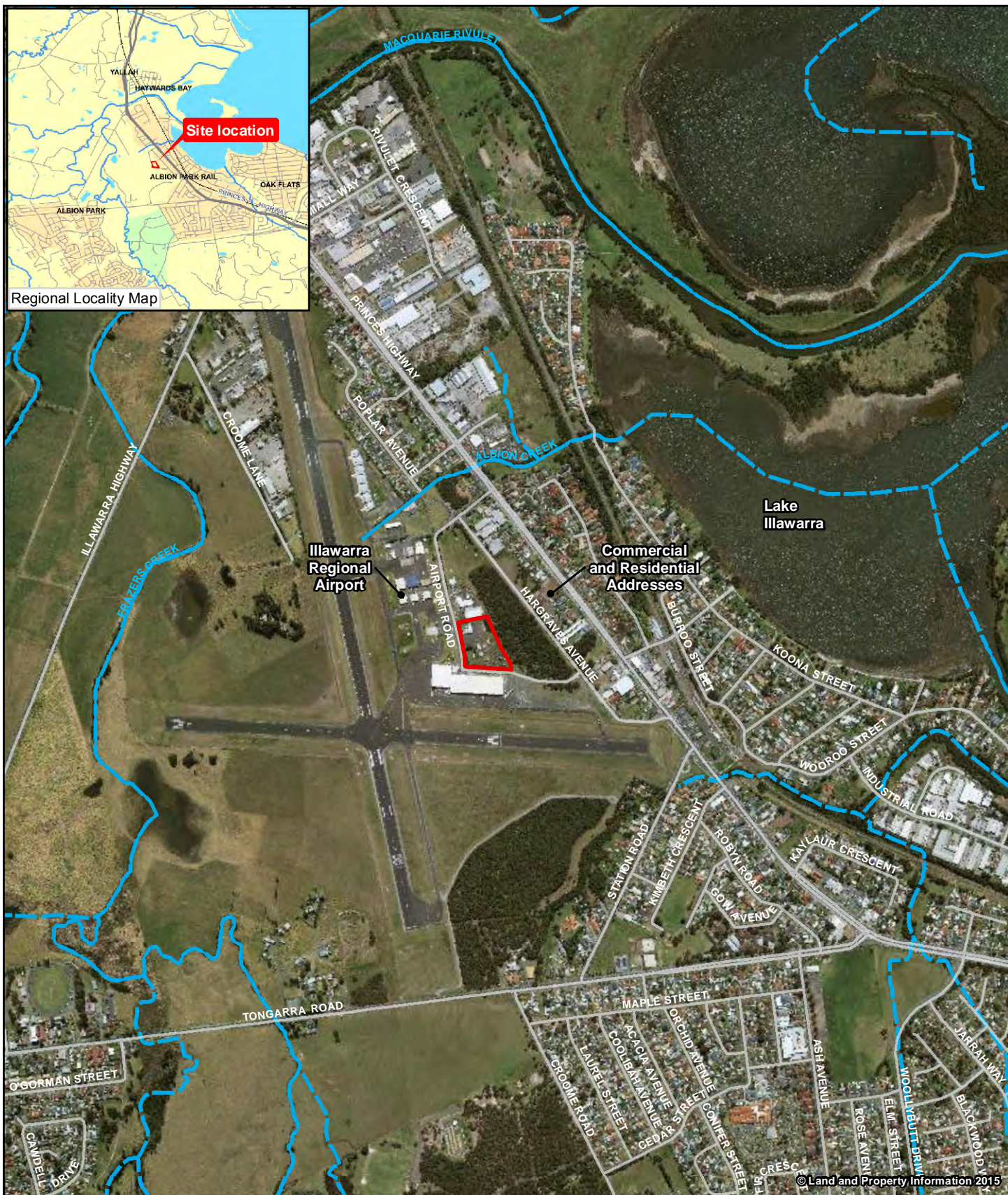
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US EPA, 2014b; *Health Effects Document for Perfluorooctane Sulfonate (PFOS)*; US EPA Washington DC, United States

Appendices

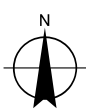
Appendix A – Figures



LEGEND

- Site Boundary
- 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



Fire & Rescue NSW
 Albion Park Site Investigation

Job Number | 21-25583
 Revision | A
 Date | 09 Aug 2016

**Site Location and Key
 Off-site Receptors**

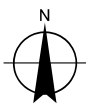
Figure 1



LEGEND

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

Paper Size A4
 0 15 30 60 90 120
 Metres
 Map Projection: Transverse Mercator
 Horizontal Datum: GDA 1994
 Grid: GDA 1994 MGA Zone 56

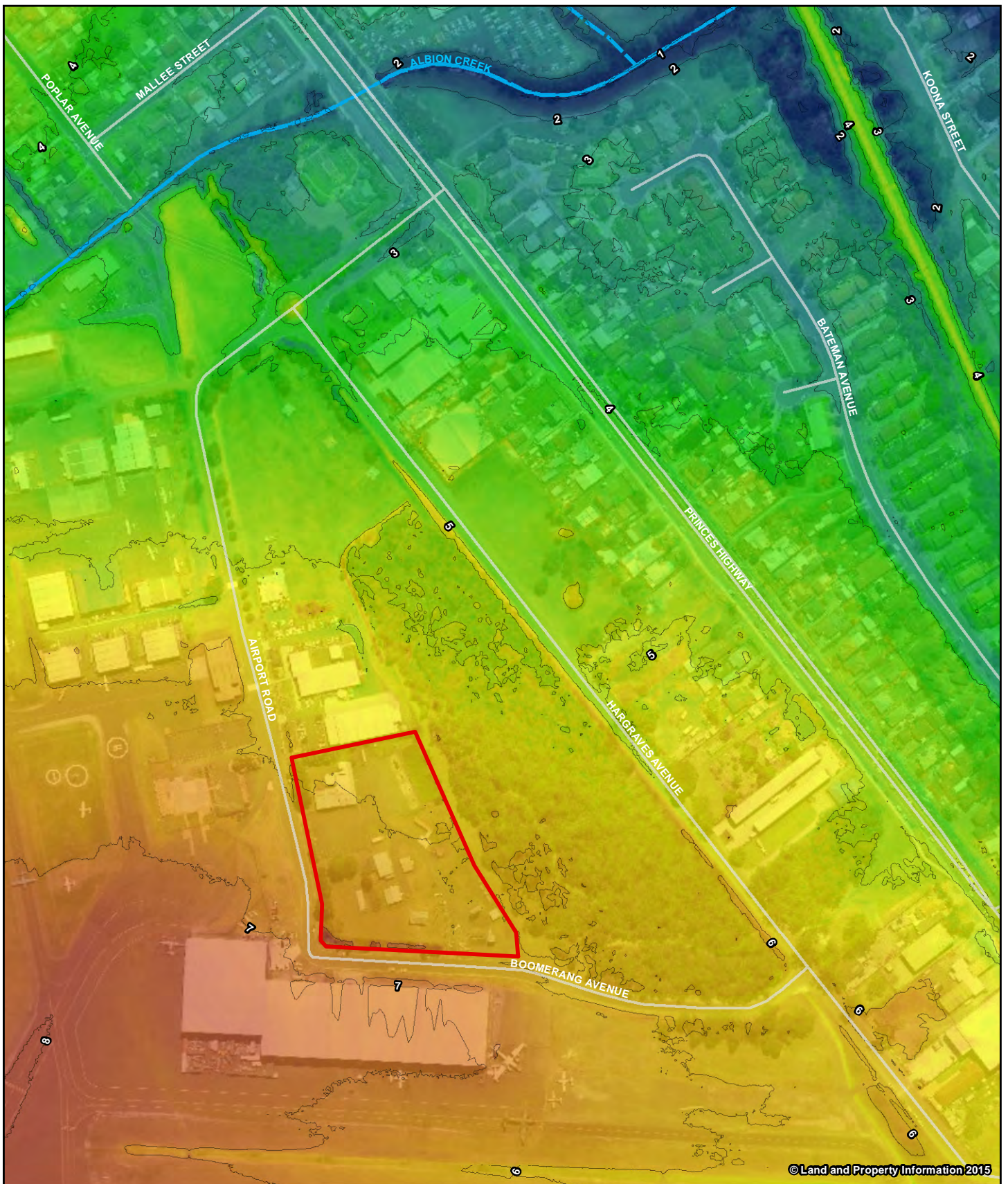


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 Revision | A
 Date | 09 Aug 2016

Site Layout

Figure 2



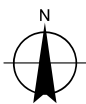
LEGEND

- Site Boundary
 - Streets
 - Contours
 - Major Waterways
 - Minor Waterways
- Elevation (mAHD)**

High : 8.185

Low : 0.696

Paper Size A4
 0 12.5 25 50 75 100
 Metres
 Map Projection: Transverse Mercator
 Horizontal Datum: GDA 1994
 Grid: GDA 1994 MGA Zone 56

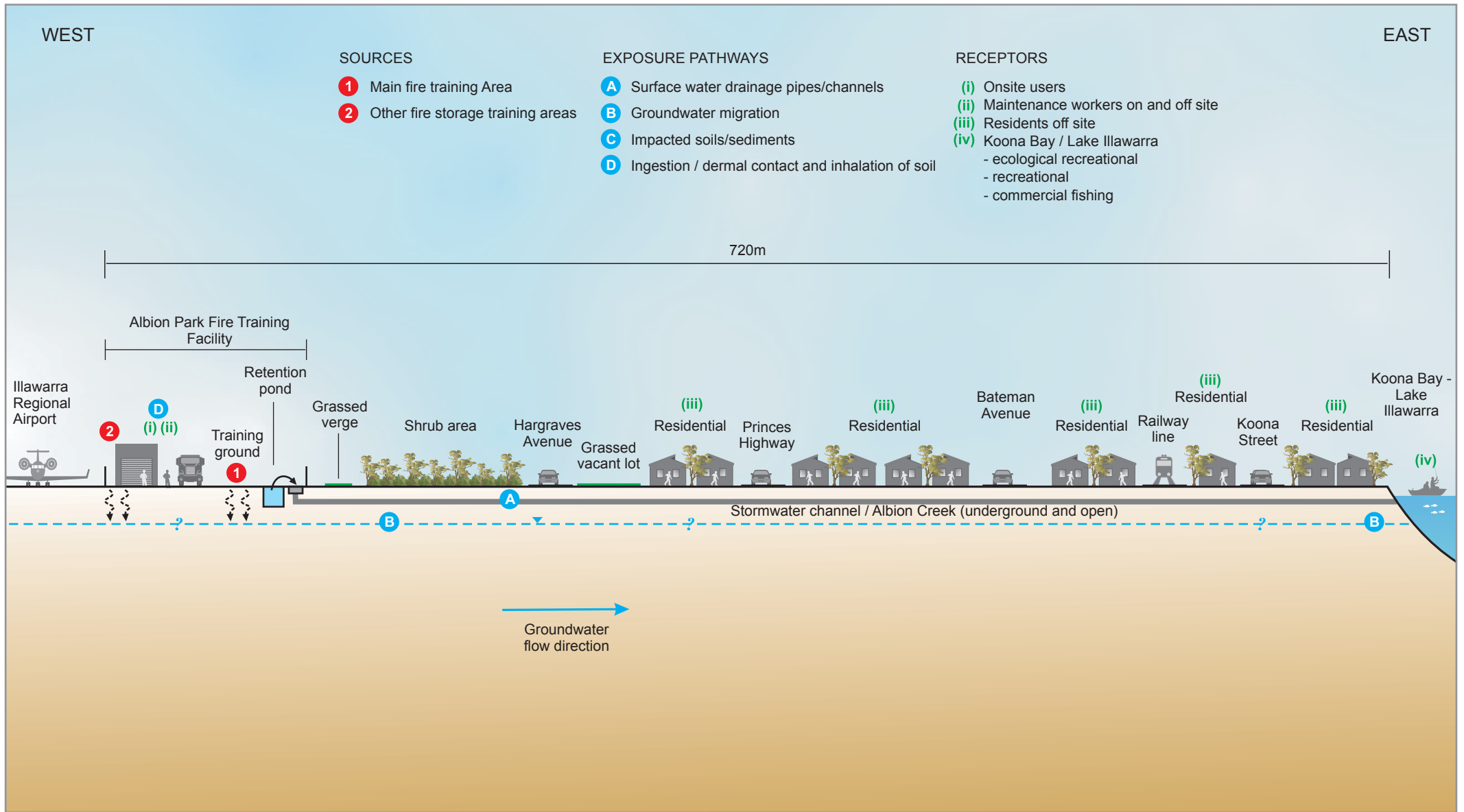


Fire & Rescue NSW
 Albion Park Site Investigation

Job Number | 21-25583
 Revision | A
 Date | 09 Aug 2016

Elevation

Figure 3



Conceptual diagram only - not to scale

LEGEND

- Alluvium
- Groundwater table



Fire & Rescue NSW
Albion Park Fire Training Centre

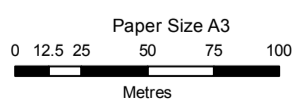
Conceptual Site Model

Job Number	21-25583
Revision	A
Date	3 Aug 2016

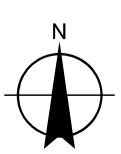
Figure 4



- LEGEND**
- Site Boundary
 - ◆ Proposed Monitoring Well (5)
 - Streets
 - Proposed Soil Bore (10)
 - Major Waterways
 - ★ Proposed Sediment Sample (4)
 - - - Minor Waterways
 - Proposed Surface Water Sample (5)



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



Fire & Rescue NSW
Albion Park Site Investigation

Job Number | 21-25583
Revision | A
Date | 09 Aug 2016

Proposed Sample Locations

Figure 5

Appendix B – Desk Study Information



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All Groundwater [find a site](#)

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bandwidth high low

[glossary and metadata](#)

All Groundwater

All Groundwater Map

All data times are Eastern Standard Time

Map Info





[Home](#) [Contaminated land](#) [Record of notices](#)

Search results

Your search for: Suburb: ALBION PARK

did not find any records in our database.

If a site does not appear on the record it may still be affected by contamination. For example:

- Contamination may be present but the site has not been regulated by the EPA under the Contaminated Land Management Act 1997 or the Environmentally Hazardous Chemicals Act 1985.
- The EPA may be regulating contamination at the site through a licence or notice under the Protection of the Environment Operations Act 1997 (POEO Act).
- Contamination at the site may be being managed under the [planning process](#).

More information about particular sites may be available from:

- The [POEO public register](#)
- The appropriate planning authority: for example, on a planning certificate issued by the local council under [section 149 of the Environmental Planning and Assessment Act](#).

See [What's in the record and What's not in the record](#).

If you want to know whether a specific site has been the subject of notices issued by the EPA under the CLM Act, we suggest that you search by Local Government Area only and carefully review the sites that are listed.

This public record provides information about sites regulated by the EPA under the Contaminated Land Management Act 1997, including sites currently and previously regulated under the Environmentally Hazardous Chemicals Act 1985. Your inquiry using the above search criteria has not matched any record of current or former regulation. You should consider searching again using different criteria. The fact that a site does not appear on the record does not necessarily mean that it is not affected by contamination. The site may have been notified to the EPA but not yet assessed, or contamination may be present but the site is not yet being regulated by the EPA. Further information about particular sites may be available from the appropriate planning authority, for example, on a planning certificate issued by the local council under section 149 of the Environmental Planning and Assessment Act. In addition the EPA may be regulating contamination at the site through a licence under the Protection of the Environment Operations Act 1997. You may wish to search the POEO public register. [POEO public register](#)

[Search Again](#)

[Refine Search](#)

Search TIP

To search for a specific site, search by LGA (local government area) and carefully review all sites listed.

... [more search tips](#)

Connect

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17 June 2016

ALBION PARK	Caltex Service Station 222 Tongarra ROAD	Service Station	Under assessment
ALBION PARK RAIL	Caltex Service Station 172-174 Princes HIGHWAY	Service Station	Under assessment
ALBION PARK RAIL	Caltex Service Station 31 Princes HIGHWAY	Service Station	Under assessment
ALBION PARK RAIL	Former Timber Storage Area 36 Rivulet CRESCENT	Other Industry	Regulation under CLM Act not required



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Albion Park Railway Station Group

Item details

Name of item:	Albion Park Railway Station Group
Type of item:	Complex / Group
Group/Collection:	Transport - Rail
Category:	Railway Platform/ Station
Location:	Lat: -34.56261468070 Long: 150.79846051200
Primary address:	Princes Highway, Albion Park Rail, NSW 2527
Local govt. area:	Shellharbour
Local Aboriginal Land Council:	Illawarra

North: 5m north of the platform ends

East: the boundary of RailCorp property fronting Burroo Street and the park on the western side of Burroo Street;

South: 5m south of the platform ends

West: the boundary of RailCorp property (including the car park accessed off the Princes Highway).

Boundary:

All addresses

Street Address	Suburb/ town	LGA	Parish	County	Type
Princes Highway	Albion Park Rail	Shellharbour			Primary Address
Burroo Street	Albion Park Rail	Shellharbour			Alternate Address
Illawarra railway	Albion Park Rail	Shellharbour			Alternate Address

Owner/s

Organisation Name	Owner Category	Date Ownership Updated
RailCorp	State Government	21 Oct 98

Statement of significance:

Albion Park Rail Station - including its 1887 platform building, lamp room, out-of-room and original Platform 1, 1890 signal box, and movable items - is of State heritage significance. Albion Park Railway Station is of State historical significance as a railway station which was a major goods yard servicing the dairy and pastoral industry, retaining structures built from 1887-1890, constructed prior to the standardisation of railway design and being among the last "old" design station buildings built.

The station retains its physical association with the Central Co-operative Dairy Company factory built in 1913 with a siding, and with the extant station masters residence at 197 Princes Highway (residence no longer in RailCorp ownership). The weatherboard station buildings are of State aesthetic significance as a rare collection of vernacular weatherboard late Victorian period railway station buildings dating from 1887-1890, the platform building being one of the two most intact (with Bulli) of four extant examples of weatherboard platform buildings of a design known as "third class station buildings" on the Illawarra line. Early signalling equipment within the signal box (signal levers, staff instrument) is representative of historical railway signalling technology.

Date significance updated: 18 Apr 13

Note: There are incomplete details for a number of items listed in NSW. The Heritage Division intends to develop or upgrade statements of significance and other information for these items

as resources become available.

Description

Designer/ Maker: NSW Government Railway
 Builder/ Maker: William Monie & Company (Station) D. Proudfoot & T Logan (Single rail line)
 Construction years: 1887-1887
 Physical description: PRECINCT ELEMENTS

Platform building (1887) (Type 4 - 3rd class)

Lamp Room (1887)

Signal box (1890)

Out of Room (aka parcels office, aka Museum Waiting Room) (1887)

Platform 1 (1887)

Platform 2 (2001)

Moveable items: Signal levers, staff instrument in signal box; framed historic photographs in out-of-room (aka Museum Waiting Room).

Toilet block (c. 1970s)

Platform 2 Platform Shelter (2001)

CONTEXT:

The station is located to the east of the Princes Highway at Albion Park Rail, accessed off the Princes Highway via a road and station car park on the western side of the station. On the eastern side, there is pedestrian access to the station from The Strand and Burroo Street, through a park and across a pedestrian level crossing. The station perimeter is defined by white powder coated aluminium fencing.

PLATFORM BUILDING (1887)

Exterior: A single storey weatherboard building with a corrugated steel gabled roof with skillion corrugated steel platform awning. The roof has two brick chimneys. The awning to the railway (east) side of the building has decorative timber valances and timber posts, and later ceiling with timber battens. The building has two painted brick chimneys. There are some aluminium framed windows, including in the current storeroom. The platform building has a later skillion roofed canopy with weatherboard wall to the west (railway) side, blocked up windows, steps to north and south, modern steel posts to the awning with skillion roof to north side of porch. The building has a brick base on the west (Princes Highway) side.

Interior (Partially accessed 2009): The building originally contained (from south to north) a booking office, general waiting room, ladies room and toilets. It has retained a central waiting room (the original general waiting room), open to the platform, a station masters office and a ladies waiting room. The storeroom retains a chimney breast. There is a modern ticket window, and modern tiles to the entry area, and some modern timber flush doors.

LAMP ROOM (1887)

Exterior: This is a small weatherboard building with corrugated steel skillion roof, located at the southern end of the Platform 1 group. There is a door on the west side (opening into the car park).

Interior: Not accessed 2009.

SIGNAL BOX (1890)

Exterior: The signal box is located between the platform building and the out-of-room, and is

joined on either side to these two buildings. It is a weatherboard signal box with a corrugated steel skillion roof.

Interior: carpeted floor, weatherboard walls and ceiling. The interior contains an early staff instrument and signals.

OUT OF ROOM (1887)

Exterior: Located at the north end of Platform 1, this is a weatherboard single storey building with a corrugated steel skillion roof. The building features timber tongue & grooved double sliding doors to both the east (platform) and west elevations.

Interior: The Out-of-room interior has been clad in timber veneer and converted to a "Museum Waiting Room" with a gallery of historical photographs framed and hung around the walls.

PLATFORMS

Platform 1 (1887): asphalt surface, brick faces with concrete capping, to central section and street side of platform, open concrete faces to south end.

Platform 2 (2001): asphalt surface, concrete face.

TOILET BLOCK (c. 1970s)

Exterior: This is a small freestanding blond texture brick building at the south end of Platform 1. The building has a flat metal deck roof.

Interior: Not accessed 2009.

PLATFORM 2 PLATFORM SHELTER (2001):

Exterior: This is a modern shelter structure, open on the platform side, with metal mesh side and clear perspex panel and aluminium framed wall to the rear, with a gabled corrugated iron roof.

Interior: contains two seats and a modern ticket machine.

LANDSCAPE/NATURAL FEATURES

The railway station is located in a parkland setting, with a park on the eastern side of the station and also a park on the western side at the southern end of the car park.

MOVEABLE ITEMS

Signal levers and staff instrument in signal box; framed historic photographs in out of room (aka Museum Waiting Room).

Platform building (1887): Good

Lamp Room (1887): Moderate.

Signal box (c. 1910): Good

Out of Room (aka Museum Waiting Room) (1887): Good

Platform 1 (1887): good

Platform 2 (2001): Very good

Physical condition
and/or
Archaeological
potential:

Moveable items: Very good

Toilet block (c. 1970s): Good

Date condition updated: 23 May 09

Modifications and dates:

1890: Signal box built between platform building and out of room

1926: brick extension to Platform 1

c. 1970s: construction of brick toilet block, replacing an earlier separate toilet block near the lamp room

1993: The gang shed at Albion Park was destroyed by fire

2001: Platform 2 and Platform 2 shelter built for electrification of the line.

N.d: awning addition to west side of platform building (modern).

Current use: Railway Station

Former use: Railway Station

History

Historical notes: The township of Shellharbour was laid out in 1851 around the port of Shellharbour. Shellharbour (Municipal) Council was constituted on 4 June 1859 and the chambers, built in 1865 were located in Shellharbour. The Council relocated to Albion Park in 1897, coinciding with the decline of Shellharbour (Village) and the growth of Albion Park as a lucrative beef and dairy cattle district. (Our History page on www.shellharbour.nsw.gov.au).

The present station at this site was built as Oak Flats Station and opened on 9 November 1887 as part of the isolated Wollongong to Bombo (North Kiama) line. In 1888 it was renamed Albion Park Station, at the same time Yallah Station relinquished its original Albion Park name. A separate small town centre developed near the railway line.

The site had a substantial yard arrangement making it one of the more significant locations south of Wollongong. The site was developed just prior to the railway design standardisation that took place around 1890 and the buildings were some of the last of the 'old' design station buildings to be built. At the opening of the station there was a crossing loop and goods siding branching to the horse dock and standard side loading shed (since demolished). In 1885 a brick station master's residence (J2 design) was built.

In 1890 a weatherboard signal box was constructed between the 1887 platform building and 1887 out of room and in 1913 a siding was provided for the Central Co-operative Dairy Company factory, which still exists and was purchased by RailCorp in 1993.


New housing estates in 1921 and the distance from the main town centre resulted in the station receiving the Albion Park Rail name.

With electrification of the line from Dapto to Kiama in 2001 a concrete Platform No. 2 was built on the loop with a small steel and glass shelter. Also in 2001, the station master's residence (197 Princes Highway) was sold.

Historic themes

Australian theme (abbrev)	New South Wales theme	Local theme
3. Economy-Developing local, regional and national economies	Transport-Activities associated with the moving of people and goods from one place to another, and systems for the provision of such movements	Railway Station-

Assessment of significance

SHR Criteria a) [Historical significance]	Albion Park Railway Station is of State historical significance as a railway station which was a major goods yard servicing the dairy and pastoral industry, retaining structures built from 1887-1890, constructed prior to railway design standardisation and being among the last "old" design station buildings built. The station retains its physical association with the Central Co-operative Dairy Company factory built in 1913 with a siding, and with the extant Station Master's residence at 197 Princes Highway (residence no longer in RailCorp ownership).
SHR Criteria c) [Aesthetic significance]	The weatherboard station buildings are of State aesthetic significance as a collection of vernacular late Victorian period railway station buildings dating from 1887-1890. The platform building retains both original chimneys, and is one of the two most intact (with Bulli) of four extant examples of a weatherboard 3rd class platform building on the Illawarra line. The early signalling equipment and staff instrument within the signal box are of technical significance as early NSW Railways operational equipment.
SHR Criteria d) [Social significance]	The place has the potential to contribute to the local community's sense of place, and can provide a connection to the local community's past.
SHR Criteria e) [Research potential]	Early signalling equipment within the signal box (signal levers, staff instrument) are of research significance as historical railway operational technology.
SHR Criteria f) [Rarity]	The collection of weatherboard station buildings including lamp room, out of room and signal box at Albion Park dating from 1887 to 1890 are rare, being one of a few Illawarra line railway stations to retain late 19th century weatherboard station buildings (along with Dapto, Thirroul, Bulli, Shellharbour, Bombo and Berry). The platform building is one of only four 3rd class weatherboard platform buildings on the Illawarra line.
SHR Criteria g) [Representativeness]	The platform building is a good representative weatherboard 3rd class platform building, one of only 4 weatherboard examples of this platform building type on the Illawarra line (others at Bulli, Dapto and Thirroul), of which Albion Park, along with Bulli, are the two most intact examples. Early signalling equipment within the signal box (signal levers, staff instrument) is representative of historical railway operational technology.
Integrity/ Intactness :	While the yard has been removed, the platform building, lamp room, signal box and out-of-room are externally relatively intact, with some internal features intact despite alterations. The station as a whole is remarkably intact and retains its physical association with historically significant structures nearby (Dairy Co-operative Factory and former Station Master's residence, no longer in RailCorp ownership). The signal box is intact with signalling equipment remaining.
Assessment criteria:	Items are assessed against the  State Heritage Register (SHR) Criteria to determine the level of significance. Refer to the Listings below for the level of statutory protection.

Procedures /Exemptions

Section of act	Description	Title	Comments	Action date
57(2)	Exemption to allow work	Standard Exemptions	<p>SCHEDULE OF STANDARD EXEMPTIONS</p> <p>HERITAGE ACT 1977</p> <p>Notice of Order Under Section 57 (2) of the Heritage Act 1977</p> <p>I, the Minister for Planning, pursuant to subsection 57(2) of the Heritage Act 1977, on the recommendation of the Heritage Council of New South Wales, do by this Order:</p> <p>1. revoke the Schedule of Exemptions to subsection 57(1) of the Heritage Act made under subsection 57(2) and published in the Government Gazette on 22 February 2008; and</p> <p>2. grant standard exemptions from subsection 57(1) of the Heritage Act 1977, described in the Schedule attached.</p> <p>FRANK SARTOR</p> <p>Minister for Planning</p> <p>Sydney, 11 July 2008</p>	Sep 5 2008

To view the schedule click on the Standard Exemptions for Works Requiring Heritage Council Approval link below.

 [Standard exemptions](#) for works requiring Heritage Council approval

Listings

Heritage Listing	Listing Title	Listing Number	Gazette Date	Gazette Number	Gazette Page
Heritage Act - State Heritage Register		01072	02 Apr 99	27	1546
Heritage Act - s.170 NSW State agency heritage register					

References, internet links & images

None

Note: internet links may be to web pages, documents or images.



(Click on thumbnail for full size image and image details)

Data source

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Illawarra Cooperative Central Dairy Factory (Former)

Item details

Name of item:	Illawarra Cooperative Central Dairy Factory (Former)
Other name/s:	Albion Park Dairy Co-operative Building, The Creamery
Type of item:	Built
Group/ Collection:	Manufacturing and Processing
Category:	Other - Manufacturing & Processing
Primary address:	Creamery Road (cnr Bateman Avenue), Albion Park Rail, NSW 2527
Local govt. area:	Shellharbour

All addresses

Street Address	Suburb/ town	LGA	Parish	County	Type
Creamery Road (cnr Bateman Avenue)	Albion Park Rail	Shellharbour			Primary Address

Statement of significance:

This Edwardian era building, with Interwar era additions represents 86 years of an industrial dairy processing complex. It illustrates the relationship between a cooperative, the dairy industry, the railway, processing technologies, and the supply of Sydney markets with perishable products.

The building is a graphic symbol of the dependence of Albion Park, the Illawarra and NSW generally on the dairy industry for the bulk of the 20th century. It is representative of the dairy cooperative movement of 1900, and has strong links with the economic development of the region.

The building is the last remaining example of an industrial building of its era which displays an individual design. Historic, aesthetic, exporting, technical and social value at a local level.

Date significance updated: 19 Jun 15

Note: There are incomplete details for a number of items listed in NSW. The Heritage Division intends to develop or upgrade statements of significance and other information for these items as resources become available.

Description

Designer/ Maker: C.D. Meares

Builder/ Maker: Mr Brown

Physical description: This building is a purpose built dairy factory and was used to process milk and manufacture cream, butter and ice. The floors are constructed at various different levels to allow for gravity feed of products.

The roof is gable design and the walls are of brick construction with some weatherboard. Roof of corrugated iron has four gable sections plus one skillion section, and flat roof over loading dock.

The butter room has steel roof trusses and the remainder of building has timber trusses. A separate rooms exist which was originally designed for milk receival and pasteurisation. There is a butter cold room, an engine room and two boiler rooms.

A railway siding/platform extends along most of the eastern elevation, with a brick coal and oil bunker on the northern end. Interior photographs show walls, roof structures, building lining floor levels etc.

The interior walls in the milk handling areas are tiled to varying heights with rectangular white glazed tiles, some with plain edges fixed with overlapping vertical joints. Other tiles are square with rounded edges.

Upper walls and raked ceilings are lined with fibro and cover strips painted white.

Lot curtilage of 2339 m2 is enclosed with a chain wire boundary fence on all sides, excluding the loading dock.

Interior interpretative paintings undertaken on closing by former employees.

See also State Heritage Register nomination - Tongarra Heritage Society Inc.

Physical condition
and/or
Archaeological
potential:

Good.

Date condition updated: 01 May 12

Modifications and
dates:

Major upgrade with additions to comply with industry standards in 1926. Since closure - adapted for general commercial use.

Further information:

The I.C.C.D. factory is noted in a thematic study of the Illawarra Dairy Industry by Museums Australia (NSW) Southern Highlands & Illawarra Chapter.

Former use:

Manufacturing Dairy products and Dairy Farmers Country Store

History

Historical notes:

The Illawarra Cooperative Central Dairy (ICCD) factory was originally built to assist farmers who were often at a loss with milk 'souring' in the butter trade. Entering early into the milk trade enhanced the success of the cooperative. At its height, 20 tons of butter and 140,000 gallons of pasteurised milk were manufactured per week, with milk sourced from Unanderra in the north to Gerringong in the south.

The ICCD produced butter continuously for 86 years; under the ICCD brand name of 'Allowrie' until 1955, and then the brand 'Warrilla' (correct spelling), a derivative of the word Illawarra.

Provisional Directors of the ICCD included J Fraser, MJ Hindmarsh, L Raison, CED Meares, J James, CW Craig, G Couch, and H Graham. The Secretary was F Fredericks. The first meeting of provisional directors was held in Kiama on 4 October 1898, and resolved to register the company under the name of Illawarra Cooperative Central Dairy Company Limited. This operating name continued until the 1920's when changed to Illawarra Cooperative Central Dairy Society Limited.

The company was registered 5 December 1898. Following this, meetings were held at Willam Raftery's Commercial Hotel at Albion Park. On 12 April 1899 the first general meeting of shareholders was held at the building with 51 persons present. Directors elected included J Fraser, MJ Hindmarsh, G Couch, H Graham and Willam Beach (William Beach (1850-1935) was also an international rowing champion and defended his title 6 times at home and overseas, a blacksmith by trade his name is included in the Shellharbour Hall of Fame).

Operations commenced 1 September 1899 with CW Wood as Manager. Mrs Fraser officially opened the Cooperative 27 September 1899 by breaking a bottle of milk instead of the

customary champagne.

Lack of refrigeration forced closure of smaller private butter factories and creameries at Tongarra, Dunmore and Yellow Rock.

The present ICCD building has been upgraded over the years with the addition of an underwater tank with water pumped from Macquarie Rivulet.

In 1903, the ICCD was one of the first industries to use electricity by installing the dairy's own steam driven electricity generator. In September 1925 alterations were made to the Butter Department, and further alterations were made to the interior to comply with new laws at that time.

Operations ceased in 1985, though milk manufacturing continued as Australian Country Farmers (A.C.F) Supply Store until 1994.

Historic themes

Australian theme (abbrev)	New South Wales theme	Local theme
3. Economy-Developing local, regional and national economies	Industry-Activities associated with the manufacture, production and distribution of goods	(none)-
3. Economy-Developing local, regional and national economies	Pastoralism-Activities associated with the breeding, raising, processing and distribution of livestock for human use	(none)-
3. Economy-Developing local, regional and national economies	Pastoralism-Activities associated with the breeding, raising, processing and distribution of livestock for human use	Dairy farming in Shellharbour-
5. Working-Working	Labour-Activities associated with work practises and organised and unorganised labour	(none)-

Assessment of significance

SHR Criteria a)
[Historical significance] Historic significance demonstrating the success of one of the earliest cooperative efforts in the dairying industry. Previously, dairy distribution was caught up in privatisation, and in 1897 cooperation began to fight back.

C.D.Meares widely known as 'the father of cooperation', put forward a strategic plan to rally on defence of cooperative distribution and export, by a state wide conference of dairy cooperatives.

In 1899 the Illawarra Cooperative Central Dairy Company was the first cooperative to turn the tide of South Coast cooperatives in new direction.

SHR Criteria b)
[Associative significance] Historic association with various influential persons. Charles Devenish Meares was a Provisional Director and designer of the Illawarra Cooperative Central Dairy building in 1898, and an advisor to governments all around Australia on the dairy industry in general.

John Fraser, pioneer farmer of Albion Park was Chairman of the First Board of Directors of the I.C.C.D. and Provisional Chairman of the Dairy Farmers Company Ltd formed in 1900.

Other First Board Directors were William Beach, farmer and famous international champion

sculler, George Couch and M.J. Hindmarsh, pioneer dairy farmers.

Strong links with George Laurence Fuller, who was of great significance in the development of dairying in the area and offered land for the site.

SHR Criteria c) [Aesthetic significance]	An archetype for dairy factories around 1900, and one of the few remaining examples of an industrial building from this period relating to milk processing. The building also reflects periodic upgrades consistent with hygienic requirements. Floors are constructed at various levels to allow for gravity feed of the product. The importance of the factory's proximity to the railway siding for milk transportation to Sydney.
SHR Criteria d) [Social significance]	Shellharbour and the Illawarra generally remain strongly influenced by dairying. Many forefathers were shareholders, factory workers and clerical staff in the ICCD. Many of these people continue to have strong links to the spiritual, social, and dairy activities which continue today and in related activities. e.g. The Agricultural Horticultural and Industrial (AH&I) annual local shows, churches, and links with education, all of which remain sought after.
SHR Criteria e) [Research potential]	The building has research potential in its physical layout, use of materials and finishes throughout.

A heritage monument (signage) to the factory's operation remains on the site.


Also clearly demonstrated is the relationship with rail and road commuters. The building is prominent being situated on a busy rail and road crossing.

SHR Criteria f) [Rarity]	This building is the last remaining example of an industrial building from this period and displays an individual architectural style. The ICCD is the oldest Illawarra dairy building intact on it's original site and spanning 103 years.
SHR Criteria g) [Representativeness]	1898 Illawarra Cooperative Central Dairy Company, renamed Illawarra Cooperative Central Dairy Society in 1926, was the major factory processing milk and butter from Unanderra to Gerringong.

Professor Jim Hagen, Wollongong University, in "A History of Wollongong" summed up the ICCD as the 'major dairy factory in Illawarra producing 60% of the district's butter'. It became the model for other such operations.

Integrity/ Intactness :	High level of intactness and integrity. The building fabric remains as it was as cessation of dairy production in 1985, with no alterations to the work spaces other than the removal of the machinery.
----------------------------	---

Present use has not impacted on the original layout..

Assessment criteria:	Items are assessed against the  State Heritage Register (SHR) Criteria to determine the level of significance. Refer to the Listings below for the level of statutory protection.
----------------------	---

Recommended management:

(i) Liaise with DUAP regarding inclusion in IREP No.1 (ii) Include in SLEP No.16 (iii) Include in Heritage DCP (iv) Include in educational package (v) Include in Tourist Drive of the area (1)

Recommendations

Management Category	Description	Date Updated
Statutory Instrument	Nominate for State Heritage Register (SHR)	17 Mar 16
Statutory Instrument	Nominate for State Heritage Register (SHR)	17 Mar 16
Statutory Instrument	Nominate for State Heritage Register (SHR)	17 Mar 16

Listings

Heritage Listing	Listing Title	Listing Number	Gazette Date	Gazette Number	Gazette Page
Local Environmental Plan			05 Apr 13	66	

Study details

Title	Year	Number	Author	Inspected by	Guidelines used
Shellharbour European Heritage Study	1995	APR 2.1	Shellharbour Council		N o
Illawarra Regional Heritage Study Review	1994	SH03-21	Department of Planning		Y e s
Shellharbour Heritage Study	2004		A Humphreys & A London		N o

References, internet links & images

Type	Author	Year	Title	Internet Links
Written	Albion Park Agricultural Horticultural and Industrial Association	1986	Through the Century	
Written	Illawarra Family History Group	1995	Shellharbour Valuation Books 1911-1913, 1914-1916, 1917-1919	
Written	Tamara Hynd (compiler)	2004	Historic and Archaeological Map Shellharbour 1830-1930	
Written	Tongarra Heritage Society Inc	2001	State Heritage Register Nomination Illawarra Cooperative Central Dairy Society Ltd 1899-1985	
Written	William A Bayley	1959	Green Meadows	

Note: internet links may be to web pages, documents or images.



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Data source

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Illawarra Regional Airport

Item details

Name of item:	Illawarra Regional Airport
Other name/s:	Albion Park Airstrip
Type of item:	Built
Group/Collection:	Transport - Air
Category:	Other - Transport - Air
Primary address:	Airport Road off Princes Highway, Albion Park Rail, NSW 2527
Local govt. area:	Shellharbour

All addresses

Street Address	Suburb/town	LGA	Parish	County	Type
Airport Road off Princes Highway	Albion Park Rail	Shellharbour			Primary Address

Statement of significance:

Illawarra Airport is historically significant for the part it played during World War Two, protecting Port Kembla and for RAAF training.

It has historic associations with the early 'Waterloo' land grant, c1876 house 'Marks Villa', dairy farming, and with various events and persons during the 20th century.

The site contains ecological flora communities, 'Endangered Ecological Community - Illawarra lowland grassy woodland' assigned with a very high conservation priority, native paperbark forest trees are major local landmarks and provide visual separation between the airport 's southern boundary and around the knoll containing 'Ravensthorpe', its workers cottages and the c1876 'Marks Villa' (relocated) Johnston farm complex.

Date significance updated: 08 May 15

Note: There are incomplete details for a number of items listed in NSW. The Heritage Division intends to develop or upgrade statements of significance and other information for these items as resources become available.

Description

Builder/ Maker:	Civil Construction Corps
Construction years:	1942-
Physical description:	Relatively flat triangular shaped site located on the Macquarie Rivulet flood plain. Bounded by the Princes Highway, Tongarra Road and Frazers Creek.

The Historical Aircraft Restoration Society is located in a hanger near the terminal building.

Along its southern perimeter are remnant 'Endangered Ecological Communities', having very high conservation values, and riparian communities along Frazer's Creek. Flora corridors include remnant Illawarra Lowland Grassy Woodland. The redgum paperbark tree forest (*Melaleuca decora*) also provides visual separation along Tongarra Road and contributes to the setting on the small knoll of 'Ravensthorpe', its workers cottages and 'Marks Villa' (SHI188).

Current use:	Airport
Former use:	Agriculture, dairy farm

History

Historical notes: On 24 January 1817 Andrew Allan was granted 700 acres on Portion C, which he called 'Waterloo' - later becoming part of the Terry's Meadows estate.

Samuel Marks obtained 247 acres of this 700 acres. In 1881 the property passed to J. Marks, and in 1882 John Russell was owner and occupier.

John Johnston Snr. purchased 90 acres at the John Russell land sale of February 1916 which included the existing homestead 'Marks Villa'. He began dairy farming and successive generations of the Johnston family continued to farm the land.

In 1942 Marks Villa was resumed from the government for the building of an airstrip for emergency and RAAF training purposes. 30 acres of the Orange family farm were also acquired to construct the emergency air strip. Marks Villa was relocated 2 kilometres to the south. The home now sits behind 'Ravensthorpe' on Tongarra Road.

The Civil Construction Corps requisitioned local tractors for the work and blue metal came from the Dunmore quarry. The strip was used for RAAF pilot training as part of the defence of the Illawarra, in particular the steelworks at Port Kembla.

The Duke of Gloucester landed at the airfield in the late 1940's in his capacity as Governor General of Australia (1945-47).

In 1952 South Coast Airways inaugurated a service flying between Sydney and Melbourne. By 1960 Shellharbour Council had care of the airstrip. In the 1970's Southbank Aviation commenced operations to Canberra and Newcastle. On 10th April 1970 Shellharbour Mayor, Ald. A Beaton welcomed Queen Elizabeth II and Prince Phillip when they landed at Albion Park during their tour for the 200th Anniversary of the landing of Captain Cook at Botany Bay.

The Airport was officially transferred to Shellharbour Council in 1992 under the Commonwealth Aerodrome Local Ownership Plan. A new passenger terminal and restaurant was built in 1993. Portions were leased to pilot training schools, aircraft maintenance operations, patrol flight training plus regional air shows, including the 'Roulettes' in 1997.

In 2002 the Historical Aircraft Restoration Society (HARS) relocated from Bankstown and its collection housed in a new hanger built 2005. Upgrades have occurred since 2002 for regional air services, including main north-south runway reconstructed in 2005.

The site contains remnant indigenous flora and two museums: The Historical Aircraft Restoration Society (H.A.R.S.) was formed in 1979 by a volunteer-based group of aviation enthusiasts interested in the preservation of Australian Aviation History. The Illawarra Light Railway Museum accessed via Tongarra Road is also a volunteer based group of enthusiasts interested in the preservation of local railway and tram history and artefacts.

Historic themes

Australian theme (abbrev)	New South Wales theme	Local theme
3. Economy-Developing local, regional and national economies	Commerce-Activities relating to buying, selling and exchanging goods and services	(none)-
3. Economy-Developing local, regional and national economies	Communication-Activities relating to the creation and conveyance of information	Communication-


7. Governing-Governing	Defence-Activities associated with defending places from hostile takeover and occupation	(none)-
9. Phases of Life-Marking the phases of life	Events-Activities and processes that mark the consequences of natural and cultural occurrences	(none)-
9. Phases of Life-Marking the phases of life	Persons-Activities of, and associations with, identifiable individuals, families and communal groups	other-

Assessment of significance

SHR Criteria a) [Historical significance]	History is linked to one of the first land grants in the Illawarra, 'Marks Villa' homestead, World War defence strategies and general aviation industry continuing into 21st century.
SHR Criteria b) [Associative significance]	Numerous historic associations, including the first Waterloo land grant, various 20th century events and persons including Queen Elizabeth II, the Duke of Gloucester, Governor General of Australia (1945-47), renowned RAAF pilots and various air carrier companies.
SHR Criteria c) [Aesthetic significance]	The remnant indigenous bushland is a well known local landmark and contributes to the general scenic qualities of the area.
SHR Criteria d) [Social significance]	Highly valued by the local community and its multiple users.
SHR Criteria e) [Research potential]	Multiple aspects of the site have the ability to educate about aviation and earlier historic landscapes.
SHR Criteria f) [Rarity]	The Illawarra Regional Airport is the only example of its type in the Illawarra Region.
SHR Criteria g) [Representativeness]	Representative of its type.

Integrity/ Intactness High level of integrity.

:

Assessment criteria: Items are assessed against the  State Heritage Register (SHR) Criteria to determine the level of significance. Refer to the Listings below for the level of statutory protection.

Recommended management:

- NSW Heritage Office World War Two Aerodromes Thematic Study recommendations.
- 2.14.1 State Heritage Register listing: Due to the important role that 'parent' aerodromes had in the events of the RAAF in the Second World War, ... all 'parent' aerodromes listed in Table 1 be considered for listing on the State Heritage Register'. * each will need to be investigated individually and a Conservation Management Plan.
- 2.14.2 Local Environmental Plan listing: 'Satellite aerodrome had a meaningful role in RAAF operations during the war by being ancillary to 'parent' aerodromes'.
- 2.14.3 Landing Ground listings: Recommended be considered for LEP listing

Recommendations

Management Category	Description	Date Updated
Statutory Instrument	Nominate for State Heritage Register (SHR)	17 Mar 16
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Listings

Heritage Listing	Listing Title	Listing Number	Gazette Date	Gazette Number	Gazette Page
Local Environmental Plan			05 Apr 13		

Study details

Title	Year	Number	Author	Inspected by	Guidelines used

Shellharbour Heritage Study	2004		A Humphreys & A London		N o
World War Two Aerodromes and associated sites thematic study	2001		NSW Heritage Office		Y e s

References, internet links & images

Type	Author	Year	Title	Internet Links
Written	Dorothy Gillis	2005	150 Years of Shellharbour	
Written	Tongarra Heritage Society Inc		Airport Folder	

Note: internet links may be to web pages, documents or images.



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Appendix C – NSW EPA Letter Report



Our reference: DOC16/107497

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 – Airport Road, Albion Park

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 William Dove (Illawarra - Metro) undertook a site inspection at the Fire & Rescue NSW (FRNSW) firefighting training site at Airport Road, Albion Park on 13 January 2016 with NSW Fire and Rescue officer Superintendent Paul Johnstone. I write to inform you of the EPA's findings of the inspection. This letter takes into account advice provided to the EPA following our site inspection and supersedes any previous advice provided to you on this matter.

Inspection

The site is about 1 hectare in area, located adjacent to Wollongong airport and about 600m away from Lake Illawarra, a recreational fishing and water sports area. We understand that the site is owned by Shellharbour City Council. Aqueous film-forming foam (AFFF) and other firefighting foams potentially containing PFCs were used for training firefighters from the south coast regions at the training pad for a period in the 1990s. 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 collection pond water and one sample of soil were obtained by the EPA during the inspection and submitted for laboratory analysis for certain PFCs (see results in table below). The perfluorooctane sulfonate (PFOS) concentration detected in the onsite collection pond was **51 µg/L**. The soil sample recorded a PFOS concentration of **0.16 mg/kg**.

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 is developing screening criteria based on draft drinking water guidelines and draft guidelines for the protection of freshwater ecosystems. The screening criteria document will soon be provided to you under separate cover, following its finalisation.

Results

Fire & Rescue NSW Training Site - Albion Park - 13.01.16				
Sample ID	PFOA	PFOS	6:2 FTS (C ₂ H ₄ -perfluorooctane sulfonate)	8:2 FTS (C ₂ H ₄ -perfluorodecane sulfonate)
Onsite collection pond water sample	2.3 µg/L	51 µg/L	0.33 µg/L	0.25 µg/L
Soil sample near collection pond	<0.002 mg/kg	0.16 mg/kg	<0.002 mg/kg	<0.002 mg/kg

Based on current scientific advice 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 further investigation is warranted. Concentrations of PFOS above **10 µg/L** in surface waters or groundwater at a site indicate elevated contamination that requires further investigation.

Similarly, based on evolving scientific advice 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 (ASLP) to assess the degree to which PFCs will leach from the soils into nearby surface water or groundwater. This was not undertaken in our inspection of Albion Park.

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 above we recommend further investigation into the nature, extent, fate and transport of PFCs on the site and off-site. This investigation should include consideration of the following matters:

- 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
- Installation and sampling of groundwater wells with the objective of delineating the extent of PFC contamination in the unconfined aquifer
- Sampling of any receiving waters including assessing background levels
- Identification of any sensitive receptors and preferential pathways
- Construction of a written and visual conceptual site model
- Recommendations for further 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.

Yours sincerely



26 February 2016

ANDREW MITCHELL
Manager Hazardous Incidents
Environment Protection Authority

Copy: Donna Flanagan – Manager Property & Recreation, Shellharbour City Council
 Attachment: Sampling Locations




Aerial Photograph 1 with sample locations



Aerial photograph 2 with stormwater and drainage line overlays

Appendix D – Aerial Photo Log




1963 Approximate location of investigation area 





1980

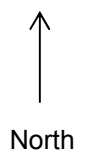
Approximate location of investigation area 





1993

Approximate location of investigation area





2006

Approximate location of investigation area





2016

Approximate location of investigation area



Appendix E – Dial Before You Dig Utility Search

WARNING

- **All electrical apparatus shall be regarded as live until proved de-energised.** Contact with live electrical apparatus will cause severe injury or death.
- In accordance with the *Electricity Supply Act 1995*, you are obliged to report any damage to Endeavour Energy Assets immediately by calling **131 003**.
- The customer must obtain a new set of plans from Endeavour Energy if work has not been started or completed within twenty (20) working days of the original plan issue date.
- The customer must contact Endeavour Energy if any of the plans provided have blank pages, as some underground asset information may be incomplete.
- Endeavour Energy underground earth grids may exist and their location **may not** be shown on plans. Persons excavating are expected to exercise all due care, especially in the vicinity of padmount substations, pole mounted substations, pole mounted switches, transmission poles and towers.
- Endeavour Energy plans **do not** show any underground customer service mains or information relating to service mains within private property.
- Asbestos or asbestos-containing material may be present on or near Endeavour Energy's underground assets.
- Organo-Chloride Pesticides (OCP) may be present in some sub-transmission trenches.
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INFORMATION PROVIDED BY ENDEAVOUR ENERGY

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- Depth of underground assets may vary significantly from information provided on plans as a result of changes to road, footpath or surface levels subsequent to installation.
- Such plans have been prepared solely for use by Endeavour Energy staff for design, construction and maintenance purposes.
- All enquiry details and results are kept in a register.

DISCLAIMER

Whilst Endeavour Energy has taken all reasonable steps to ensure that the information contained in the plans is as accurate as possible it will accept no liability for inaccuracies in the information shown on such plans.

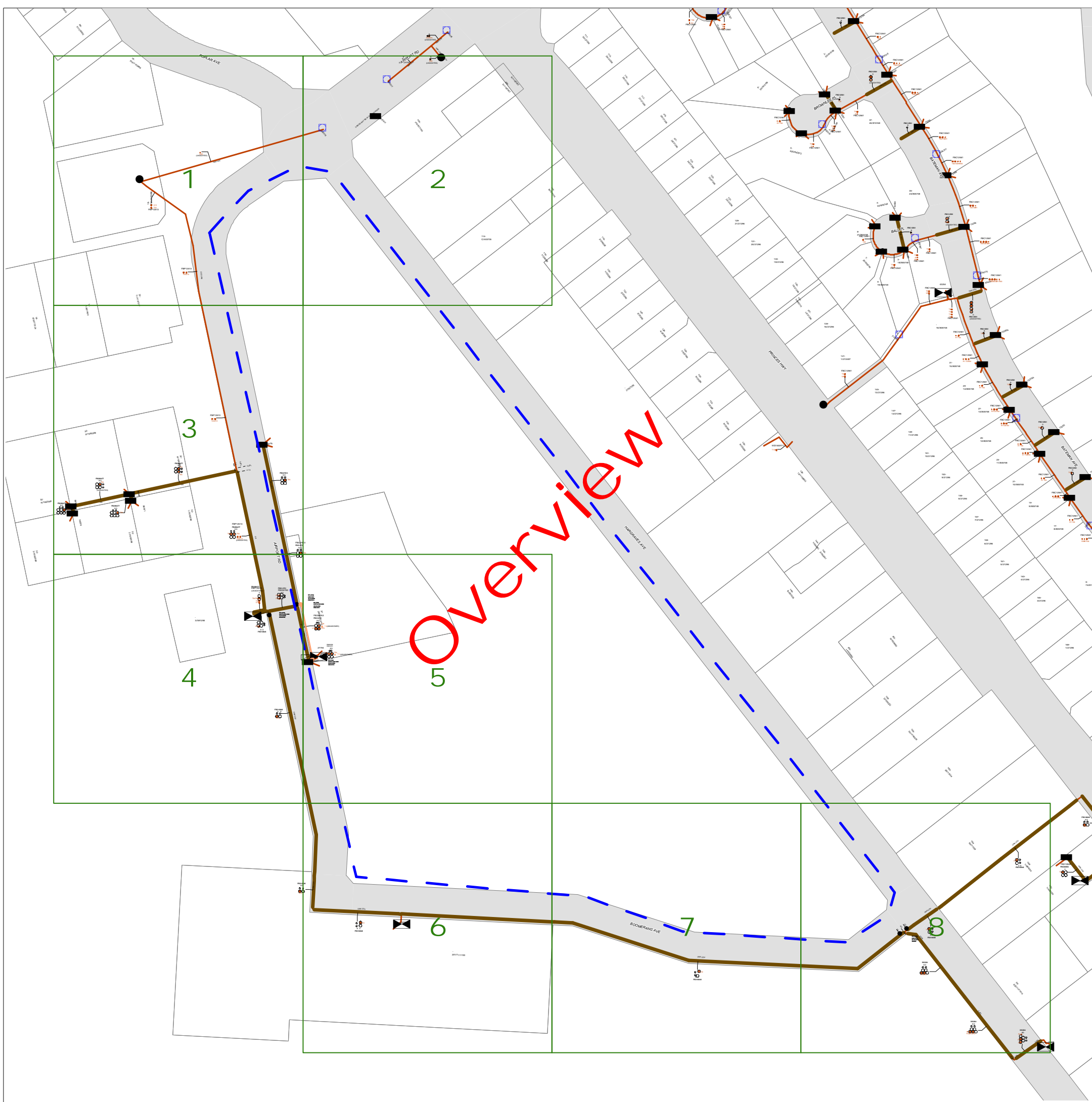
LEGEND

- OR ■ Street light column
- ▭ Padmount substation
- OR ■ Overground pillar (O.G.Box)
- ▭ Underground pit
- ▬ Duct run
- ▬ Cable run
- ⊙ Typical duct section
- ▲ Asbestos warning



NOT TO SCALE

DBYD Sequence No.:	53665506
Issued Date:	20/06/2016



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


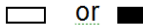






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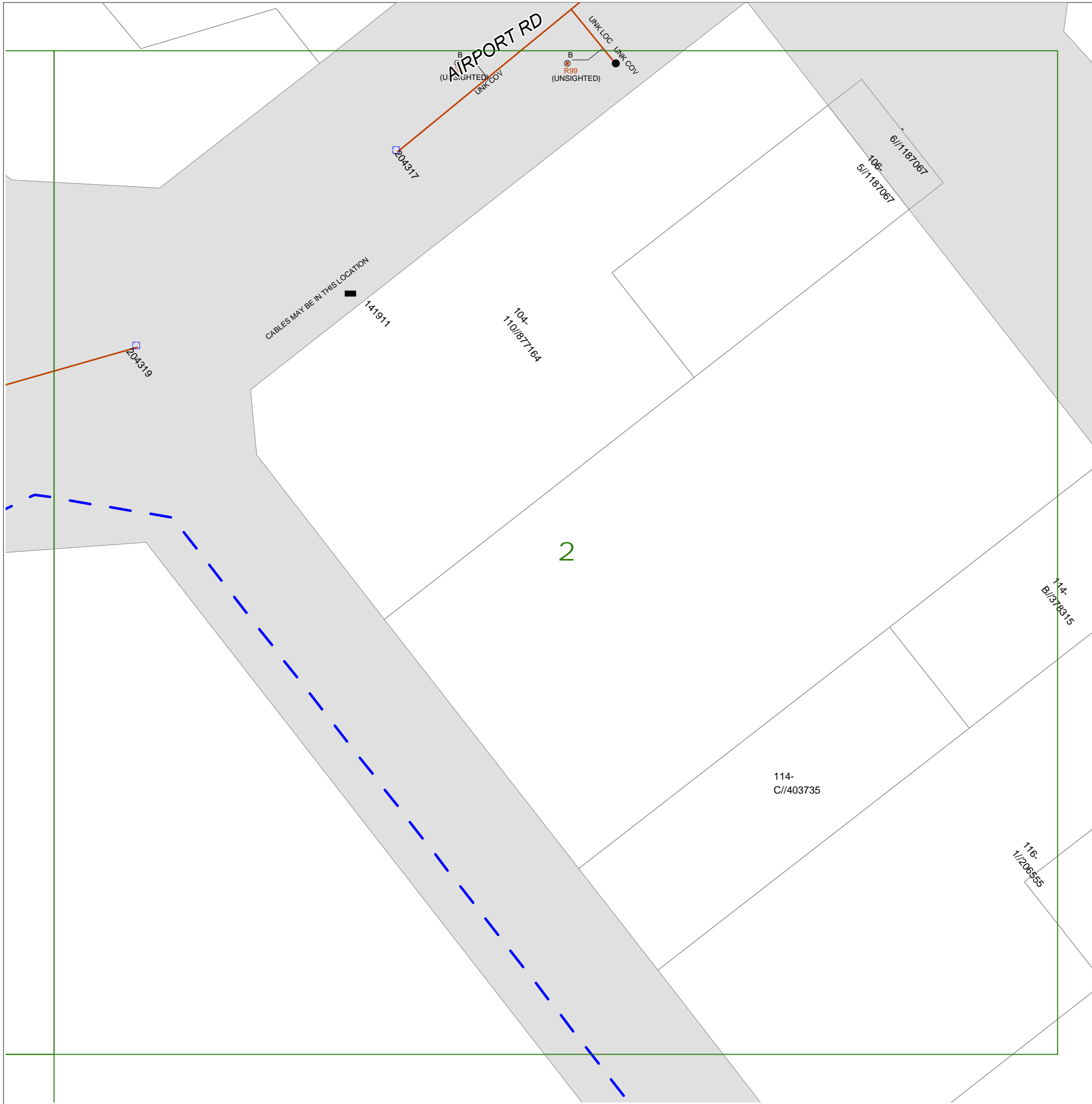
LEGEND

-  or  Street light column
-  Padmount substation
-  or  Overground pillar (O.G.Box)
-  Underground pit
-  Duct run
-  Cable run
-  Typical duct section
-  Asbestos warning



NOT TO SCALE

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








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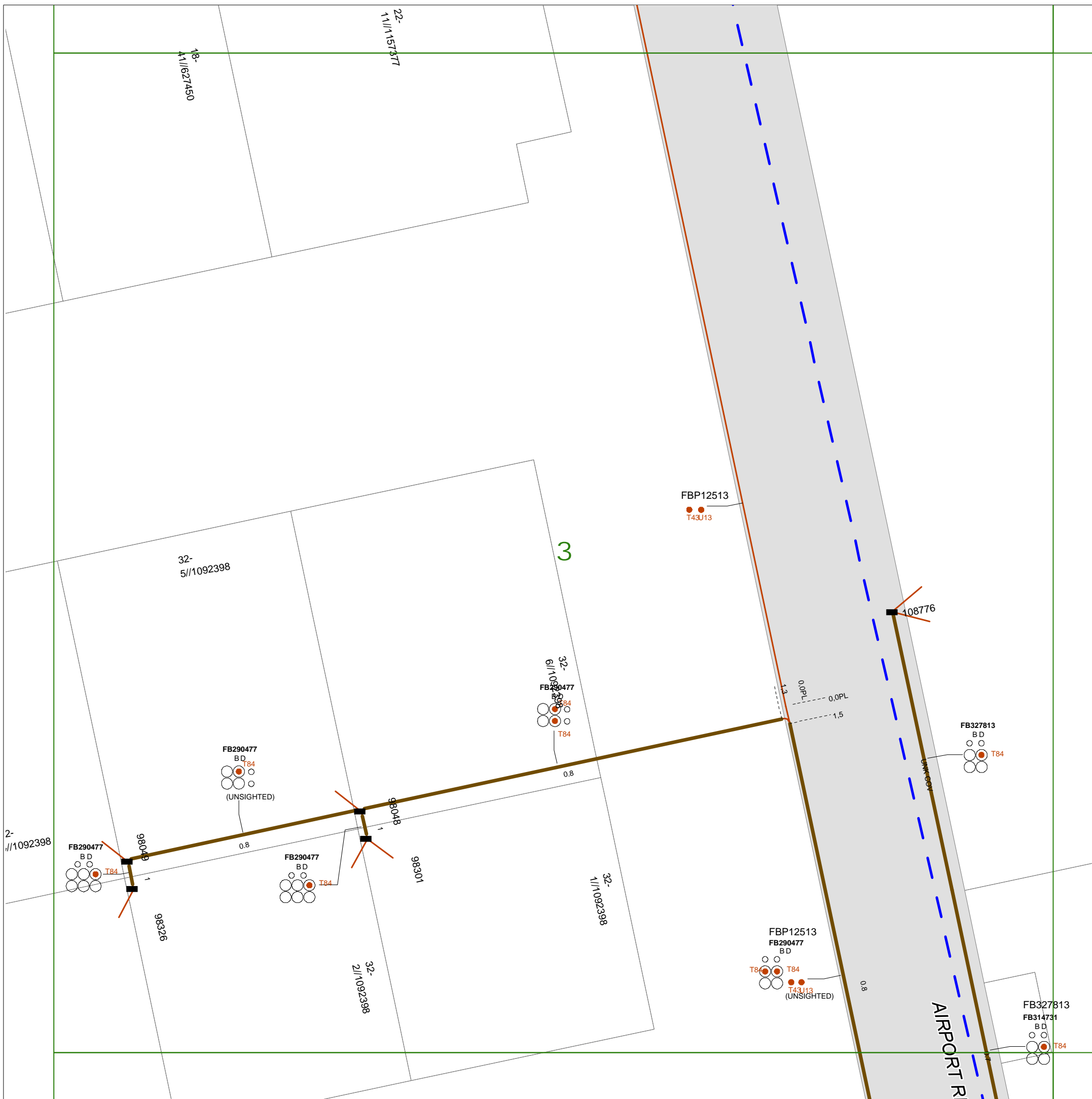
LEGEND

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-  Padmount substation
-  OR  Overground pillar (O.G.Box)
-  Underground pit
-  Duct run
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






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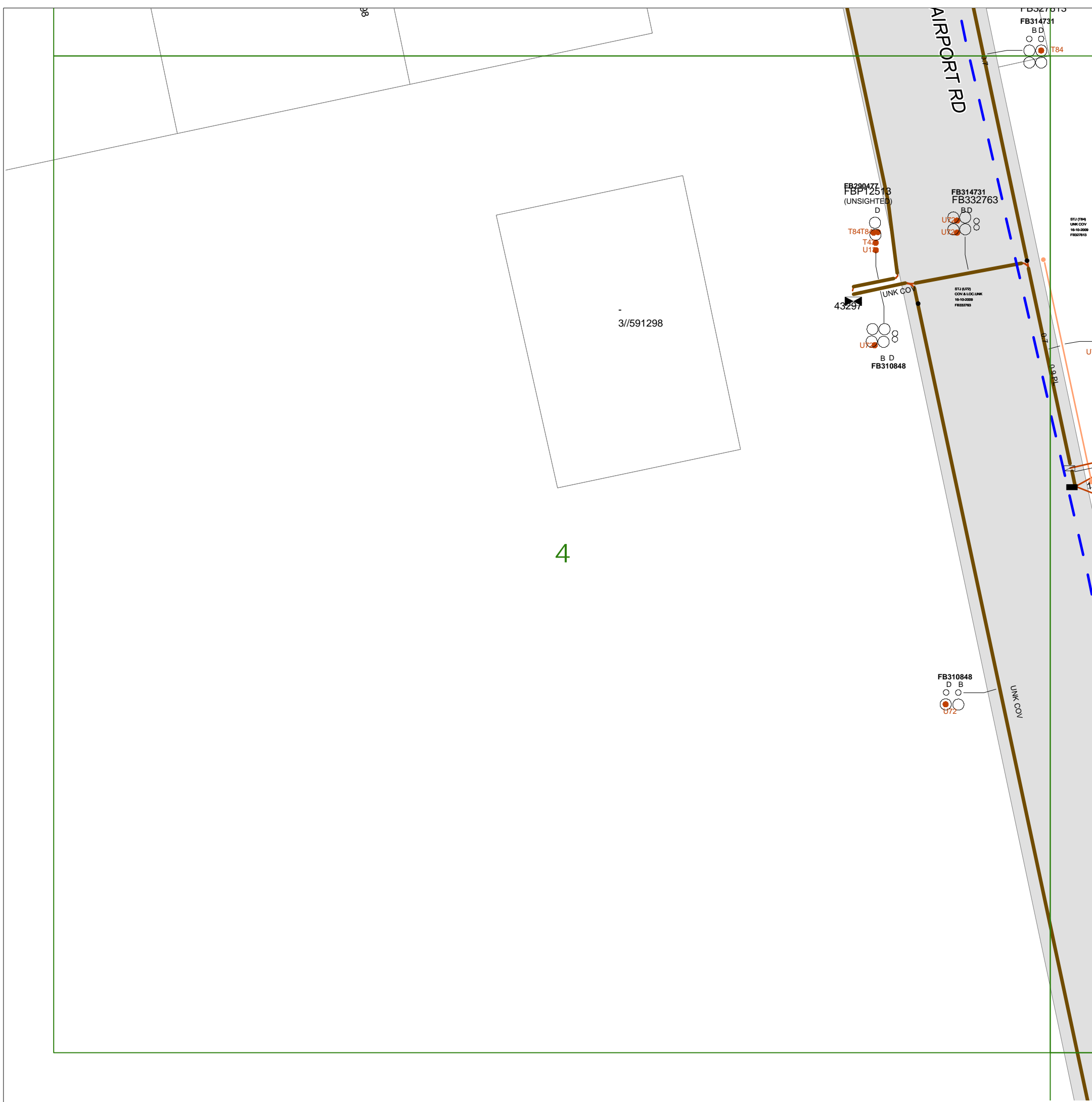
LEGEND

-  or  Street light column
-  Padmount substation
-  or  Overground pillar (O.G.Box)
-  Underground pit
-  Duct run
-  Cable run
-  Typical duct section
-  Asbestos warning



NOT TO SCALE

DBYD Sequence No.:	53665506
Issued Date:	20/06/2016



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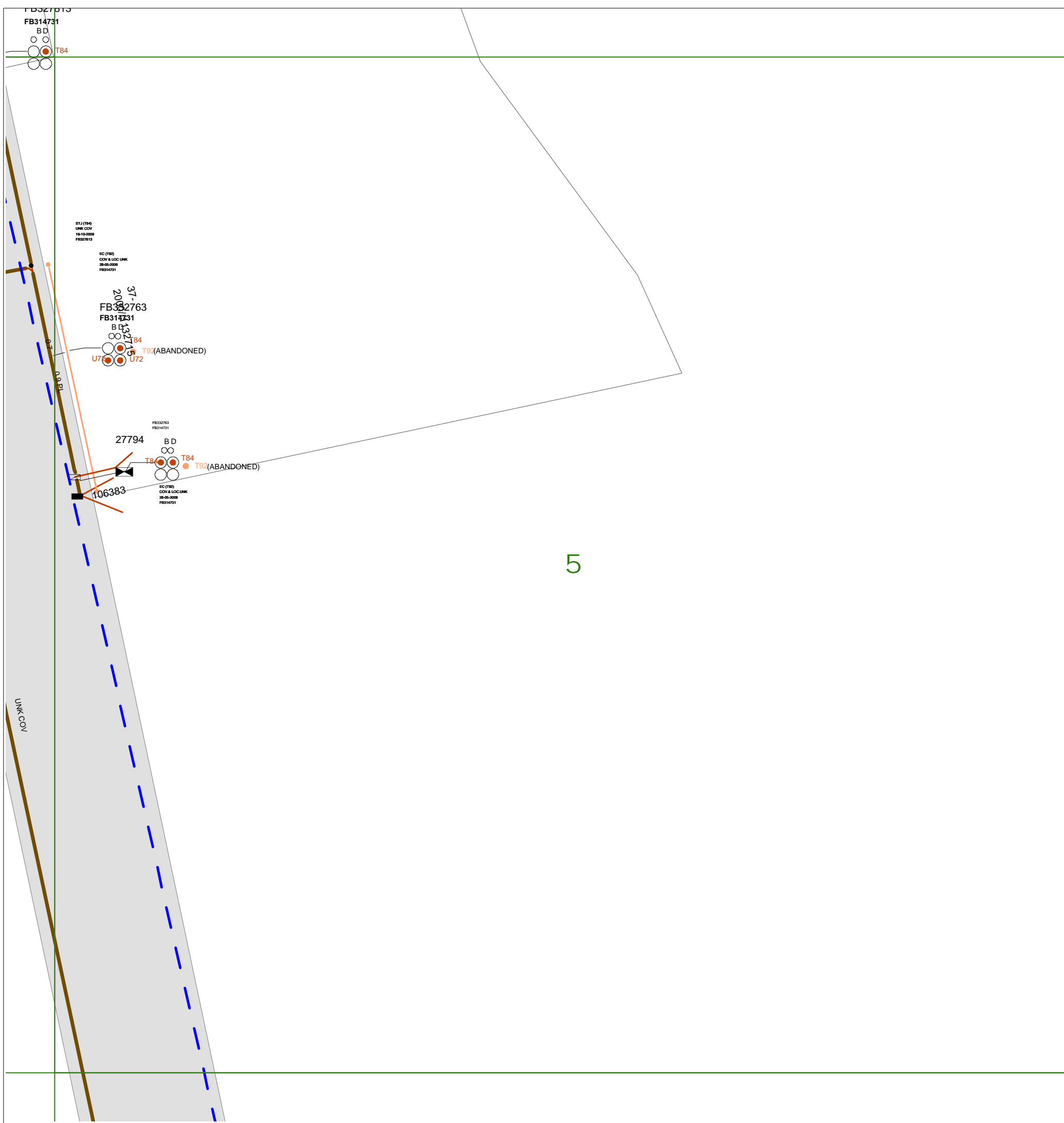
LEGEND

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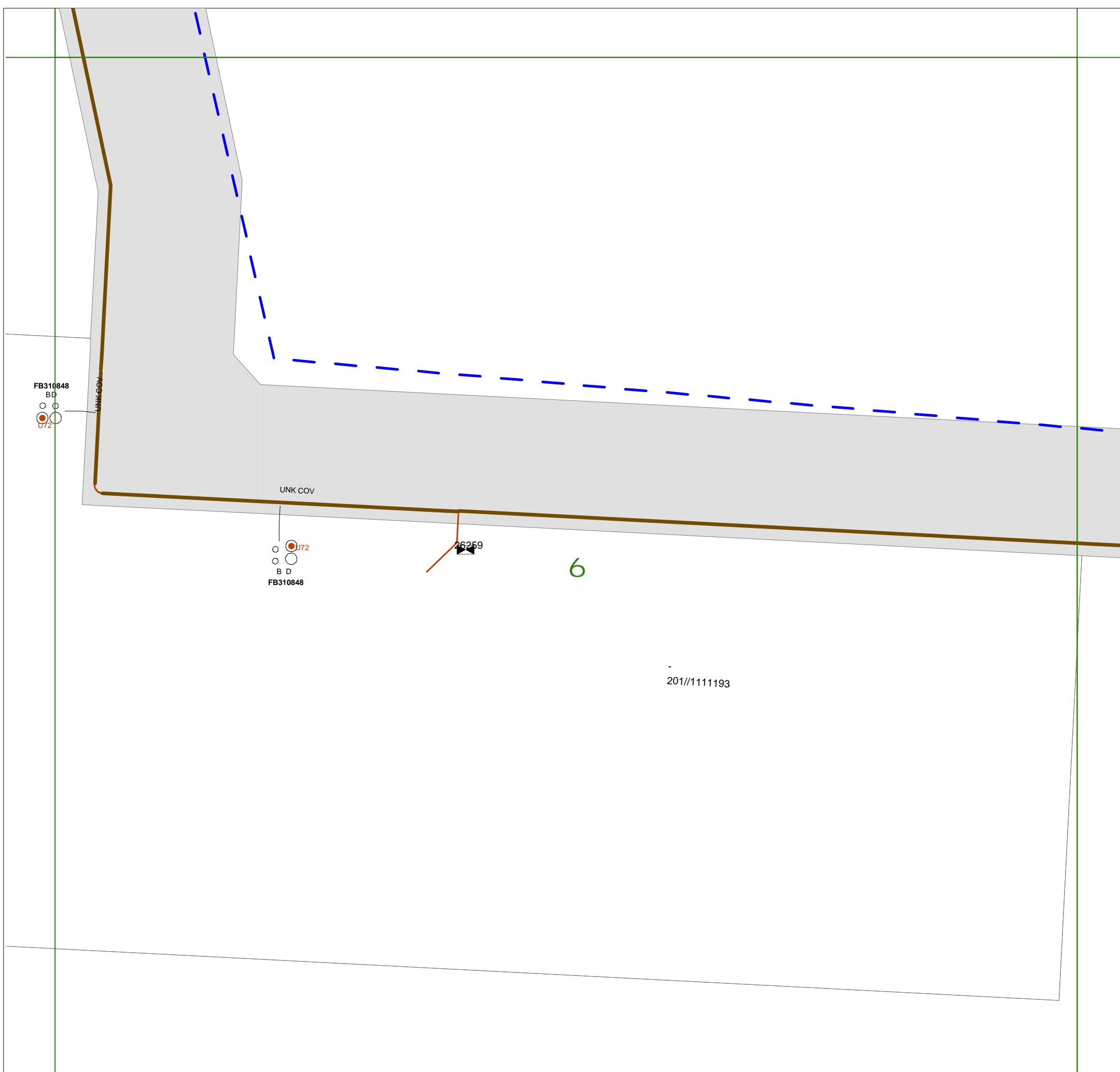
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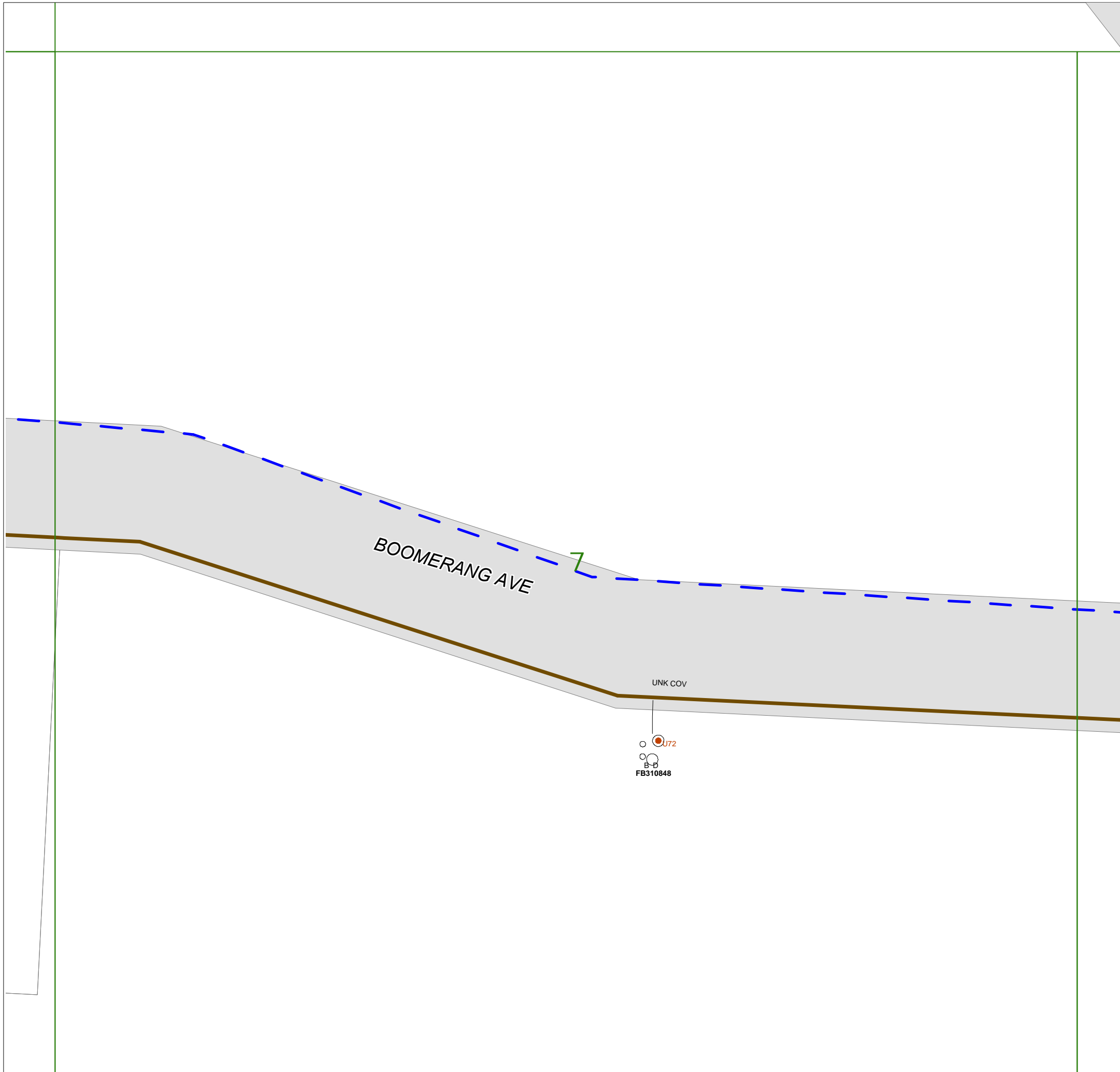
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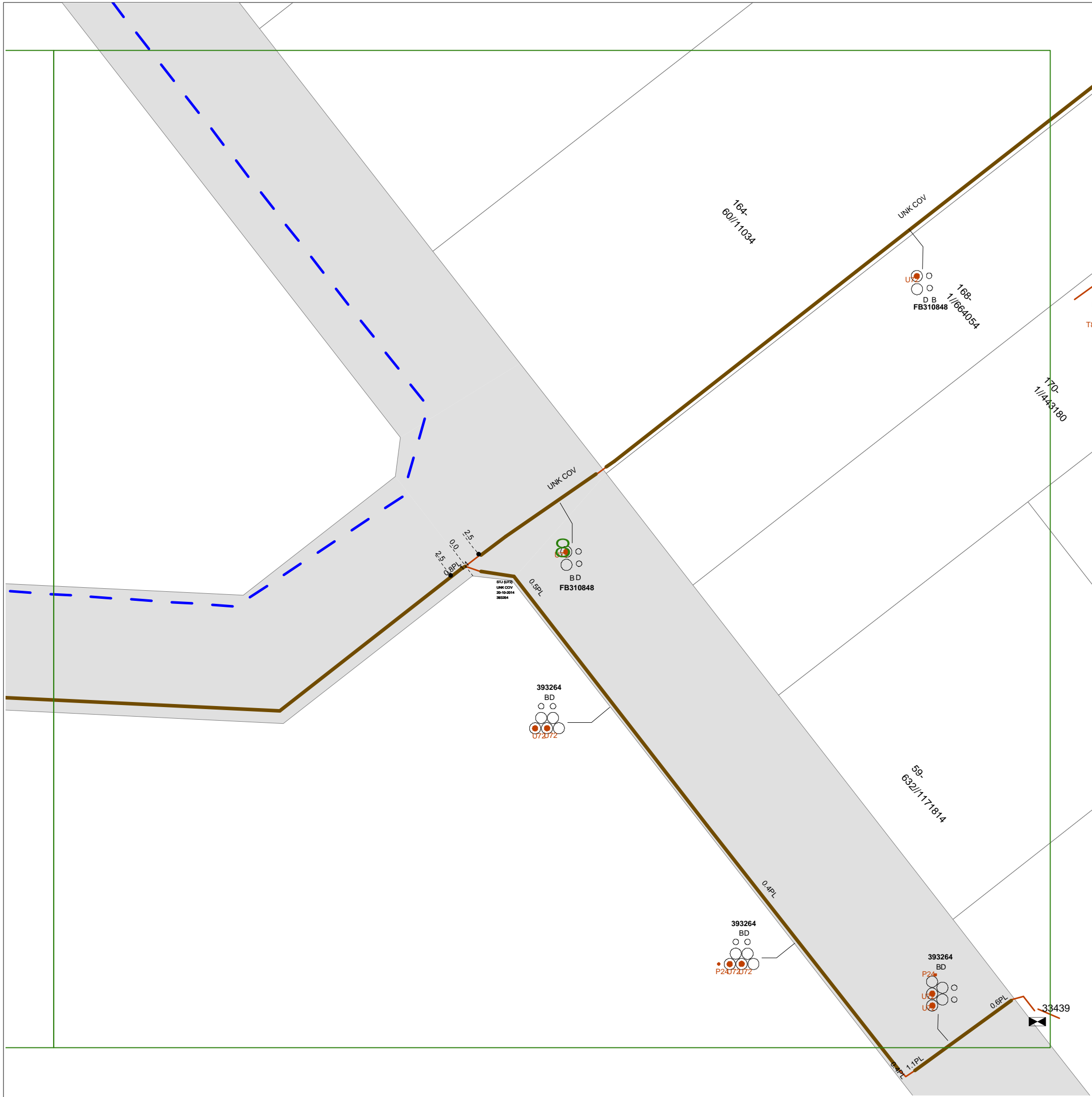
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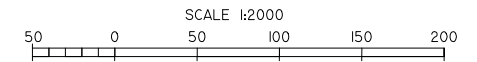


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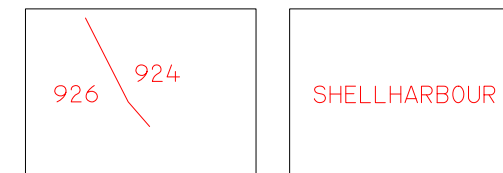
ALBION PARK 6B



THIS MAP UPDATED ON 10/12/2014
 THIS PLAN IS DIAGRAMATIC ONLY. DISTANCES
 SCALED FROM THIS PLAN MAY NOT BE ACCURATE.
 DATE ALTERED:..... BY:.....

AL3C	AL3D	LILIC
AL6A	AL6B	LIL4A
AL6C	AL6D	LIL4C

ADJOINING MAPS



NETWORK AREA MUNICIPALITY AREA

Jemena

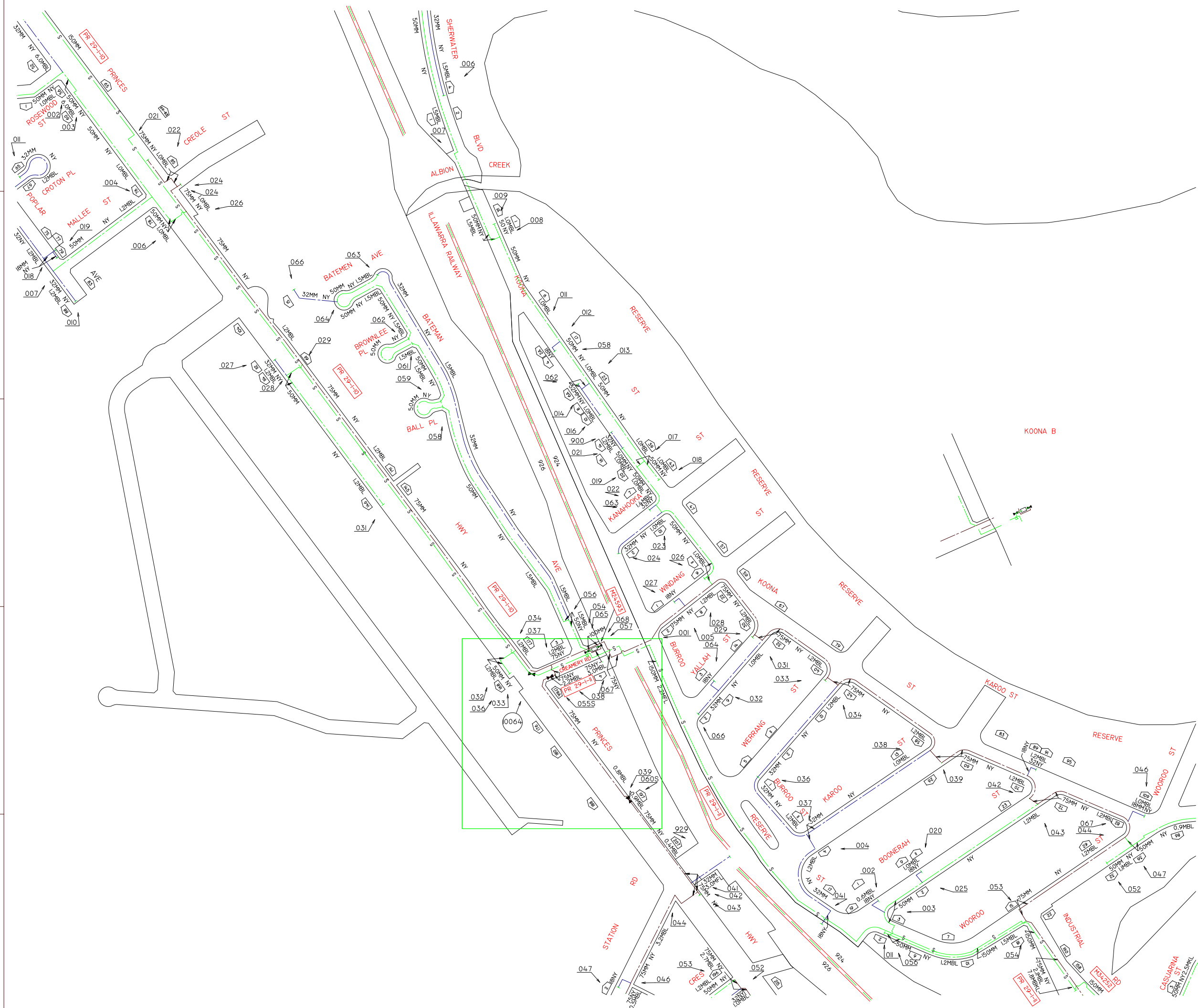
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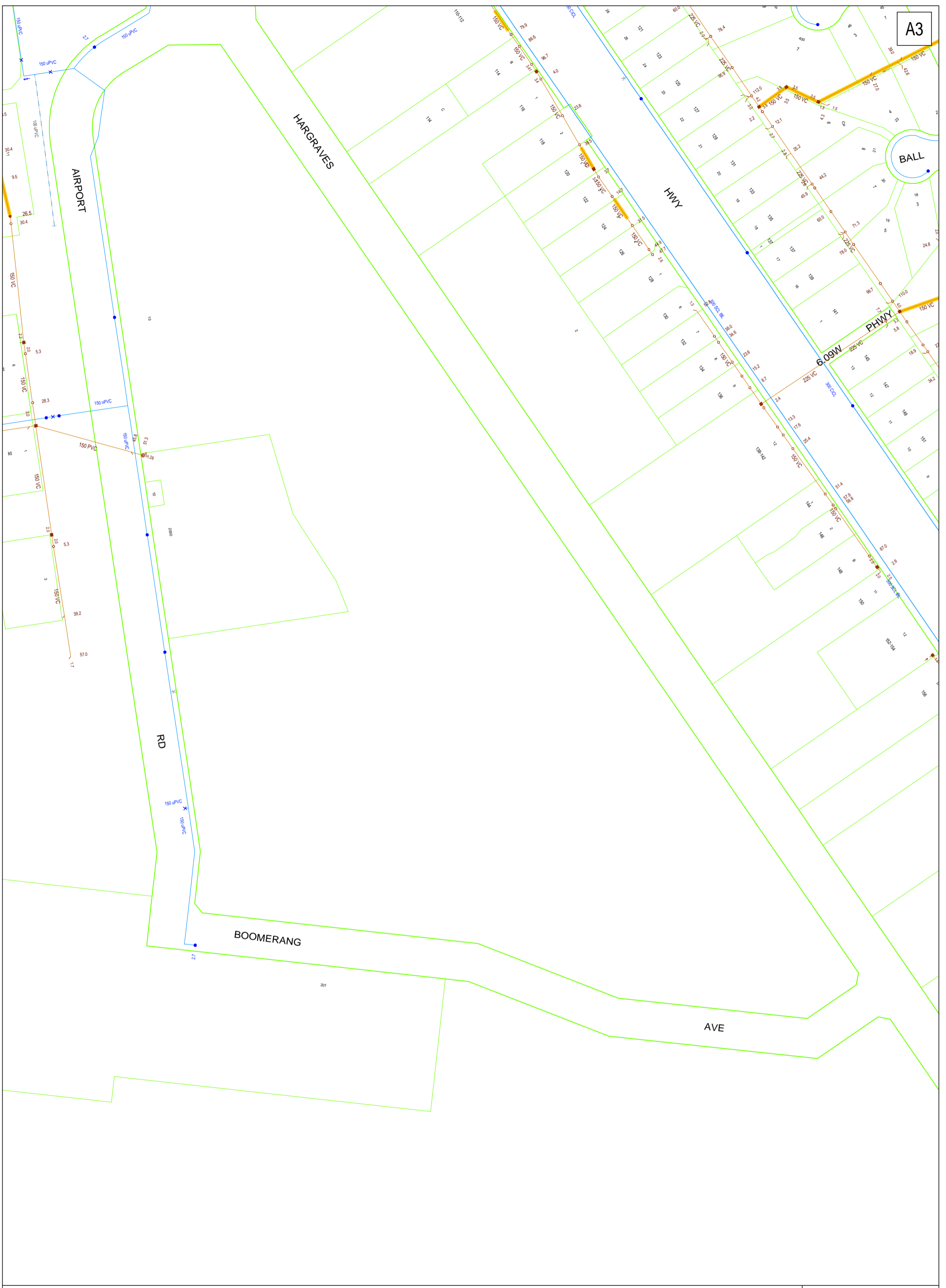
MAX ALLOWABLE OPERATING PRESSURE

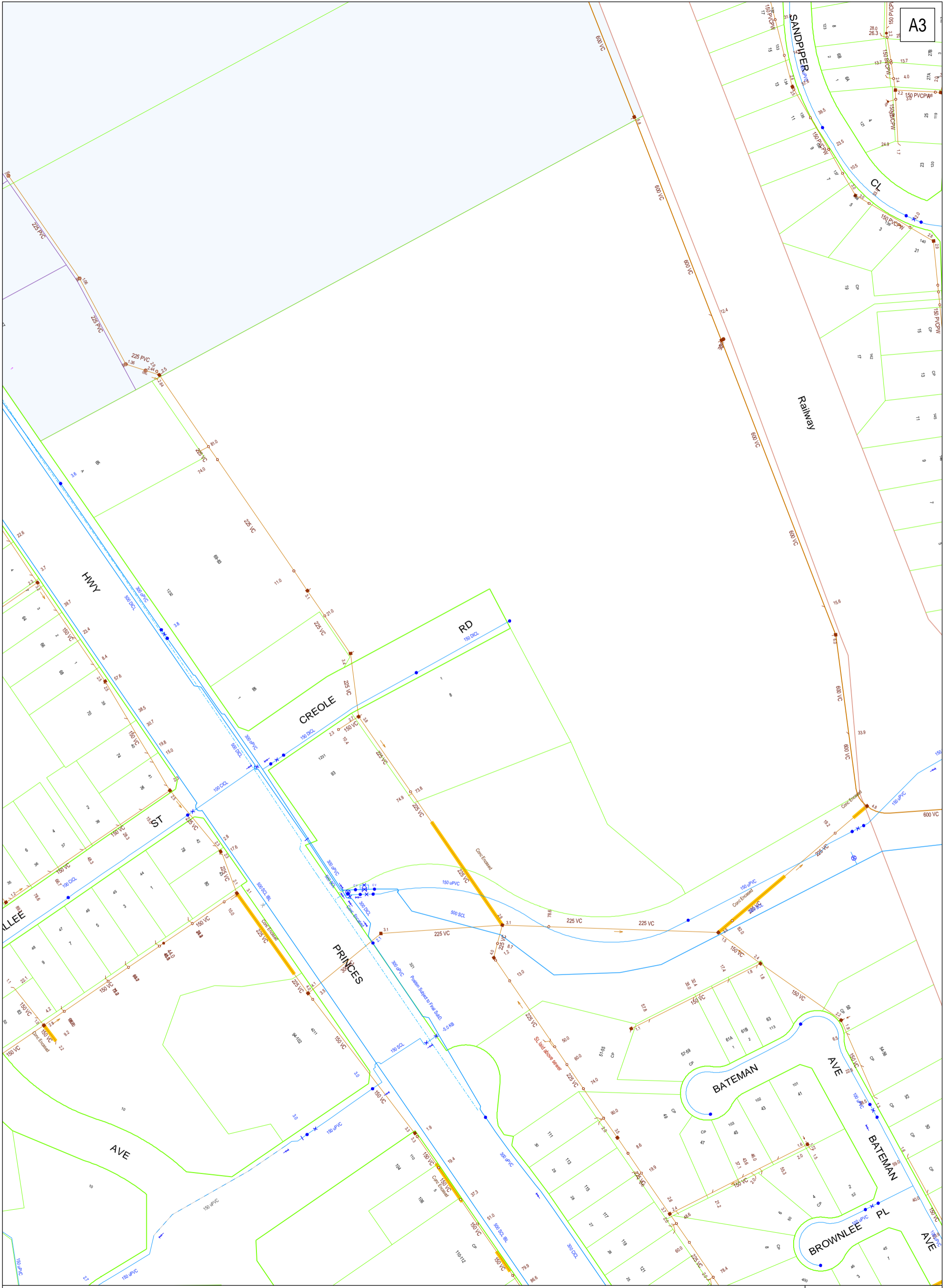
T	TRUNK PIPELINE	7000 kPa
P	PRIMARY MAIN	3500 kPa
S	SECONDARY MAIN	1050 kPa
400	NETWORK MAIN	400 kPa
300	NETWORK MAIN	300 kPa
210	NETWORK MAIN	210 kPa
100	NETWORK MAIN	100 kPa
30	NETWORK MAIN	30 kPa
7	NETWORK MAIN	7 kPa
2	NETWORK MAIN	2 kPa
← - - - - - →	PROPOSED MAINS	

PR 11-2 3	STEEL MAIN PROJECT NUMBER
⊕	PRESSURE MONITORING STATION
⊕	VALVE
□	SYSTEM PRESSURE REGULATOR
•	SIPHON
123	NETWORK NODE
123S	NETWORK VALVE NODE
024	VALVE NUMBER
6NB	6 INCH CAST IRON MAIN
150MM	150MM STEEL MAIN
110MM PE/NY	110MM POLYETHYLENE/NYLON MAIN
50MM NY	50MM NYLON INSERTED INTO
6NB	6NB MAIN CAST IRON MAIN
1.2MBL	DISTANCE IN METRES OF MAIN FROM BOUNDARY LINE
1957	YEAR LAID
- + + + -	MUNICIPALITY BOUNDARY
— — — — —	NETWORK BOUNDARY
82	HOUSE NUMBER

ALBION PARK 6B







DBYD Address:
n/a Airport Road
Albion Park Rail NSW 2527

DBYD Job No: 10848444
DBYD Sequence No: 53665509

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SYDNEY WATER CORPORATION

Scale: 1:1500
Date of Production: 20/06/2016



GHD

133 Castlereagh St Sydney NSW 2000

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Document Status

Revision	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
Final	M Clough	J. Hallchurch	review on file	S. Charteris	on file	09/08/2016

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