

**PRELIMINARY SITE
INVESTIGATION (PFAS)
Lot 4873 and Lot 9370
Lee Point, NT**



Prepared for: Defence Housing Australia
Date: 30 July 2021
Reference No: JC0808
Report Version: JC0808_PSI/01

CONTENTS

AGON DOCUMENT CONTROL	iii
1.0 INTRODUCTION	1
1.1 Overview	1
1.2 Objective	1
1.3 Scope of Work	2
1.4 Legislative Framework	2
2.0 SITE DETAILS	3
2.1 Site Identification	3
2.2 Description, Physical Setting, and Current Land Use	4
2.3 Site Zoning	5
2.4 Surrounding Land Use	6
2.5 Geology and Hydrogeology	7
3.0 HISTORICAL INFORMATION	8
3.1 Historical Use of AFFF	8
3.2 Historical Aerial Imagery	8
3.3 Historical Title Search	10
3.4 NT EPA Records	11
3.5 Previous Contamination Assessments	11
3.6 Interviews	12
4.0 SITE INSPECTION	13
5.0 SITE INFORMATION SUMMARY AND DISCUSSION	14
5.1 Lot 4873	14
5.2 Lot 9730	14
5.3 Potential for PFAS Contamination	14
6.0 LIMITED SOIL INVESTIGATION	16
6.1 Sampling Plan and Rationale	16
6.2 Sampling Methodology	18
6.3 Analytical Program	18
6.4 Assessment Criteria and Investigation Levels	18
6.5 Laboratory Test Results	18
6.5 Quality Assurance and Quality Control	19
7.0 CONCLUSIONS	20
8.0 LIMITATIONS OF THIS REPORT	22
9.0 REFERENCES	23

APPENDIX A: 2015-7591-Decision Notice..... A
APPENDIX B: Certificates of Title and Survey Plans..... B
APPENDIX C: Historical Aerial Imagery..... C
APPENDIX D: NATA Certificates of Analysis.....D

TABLES

Table 1: Site Identification 3
Table 2: Surrounding Land Use 6
Table 3: Historical Aerial Imagery 9
Table 4: Historical Title Search Summary..... 11
Table 5: Sample Location Rationale 16
Table 6: Soil Duplicate Analyses..... 19

FIGURES

Figure 1: Site Location 1
Figure 2: Cadastral Plan..... 4
Figure 3: Area Zoning Plan 6
Figure 4: Sample Location Plan, Lot 4873 17
Figure 5: Sample Location Plan, Lot 9370 17

AGON DOCUMENT CONTROL

Report Title:			Project Reference	
PRELIMINARY SITE INVESTIGATION (PFAS) Lot 4873 and Lot 9370 Lee Point, NT			JC0808_PSI	
Written:			Approved:	
Jack Pilkington Environmental Scientist			Chris Gamble NT Manager	
Rev No	Status	Date	Author	Reviewer
01	DRAFT	30/07/2021	JP	C.G

Rev No	Copies	Recipient
01	1 electronic	Defence Housing Australia

1.0 INTRODUCTION

1.1 Overview

Agon Environmental Pty Ltd (Agon) was engaged by Defence Housing Australia (DHA) to undertake a Preliminary Site Investigation (PSI) for per- and poly-fluoroalkyl substances (PFAS) for Lot 4873 and Lot 9370, Lee Point Northern Territory (NT) (the site, see **Figure 1**).

DHA have an approved proposal (*2015-7591-Decision Notice* [provided as **Appendix A**]) in accordance with Part 9 of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) to construct a master-planned urban residential development on Lot 4873 and Lot 9370 at Lee Point, subject to conditions. Condition 6 of the approval states that the approval holder must determine if PFAS are known or likely to be present on the project area using the procedures outlined in the National Environment Protection (Assessment of Site Contamination) Measure 1999 (amended 2013) (the NEPM), which must include a desktop historical review of past fire suppression practices. If PFAS is known or likely to be present, the approval holder must submit a PFAS Management Plan for written approval, prior to project works commencing.

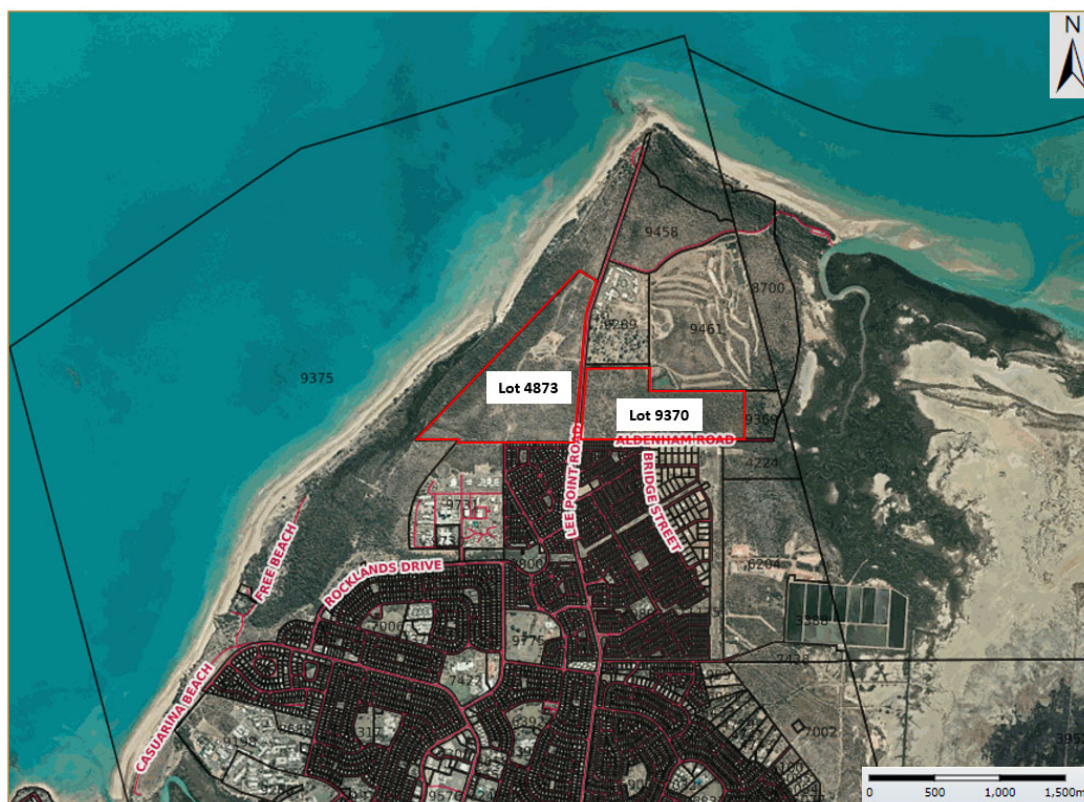


Figure 1: Site Location

Source: NR Maps, nrmaps.nt.gov.au (Dept of Environment, Parks and Water Security, viewed 27/07/2021)

1.2 Objective

The objective of this PSI is to fulfill the requirements of condition 6 of the *2015-7591-Decision Notice*, by identifying if PFAS are known or likely to be present on the project area. No consideration of other site contamination issues has been made.

1.3 Scope of Work

The scope of work for this PSI comprised:

- A review of property details and a description of the features of the sites.
- A review of current zoning and land use on and surrounding the sites.
- A review of regional geology and hydrogeology.
- An inspection of the sites and their surrounds.
- Interviews with personnel in relation to their knowledge of the area of interest.
- A review of historical aerial photographs of the sites and surrounding areas.
- A review of historical land titles ownership.
- A review of readily available and provided contamination reports for the sites.
- A review of publicly available information, including a search of Section 14 incidents, Pollution Abatement Notices, Contaminated Land Audits, and Environmental Protection Approvals and Licenses maintained by the NT EPA.
- The conduct of a limited soil sampling and analysis program with regard to PFAS.
- Compilation of the above information presented in this PSI report.

1.4 Legislative Framework

The PSI has been prepared in general accordance with the National Environment Management (Assessment of Site Contamination) Measure 1999 (amended 2013) (the NEPM).

2.0 SITE DETAILS

2.1 Site Identification

The sites comprise Lot 4873 and Lot 9370, described by Certificates of Title (CTs) Volume 788 Folio 729, and Volume 836 Folio 339, respectively. Details are provided in **Table 1**, with the CTs, inclusive of survey plans, provided as **Appendix B**. A cadastral plan of the site and surrounds is shown as **Figure 2**.

Table 1: Site Identification

	Lot 4873	Lot 9370
Site Address	577 Lee Point Road	544 Lee Point Road
Suburb	Lee Point	Lee Point
Allotment Description	Lot 4873	Lot 9370
Survey Plan	S 78/107	S2016/091
Tenure Volume Type	CUFT	CUFT
Tenure Volume	788	836
Tenure Folio	729	339
Land Zoning	FUTURE DEVELOPMENT & CONSERVATION	FUTURE DEVELOPMENT
NT Portion Area	813,300 m ²	511,700 m ²
Site Area	1,325,000 m ²	

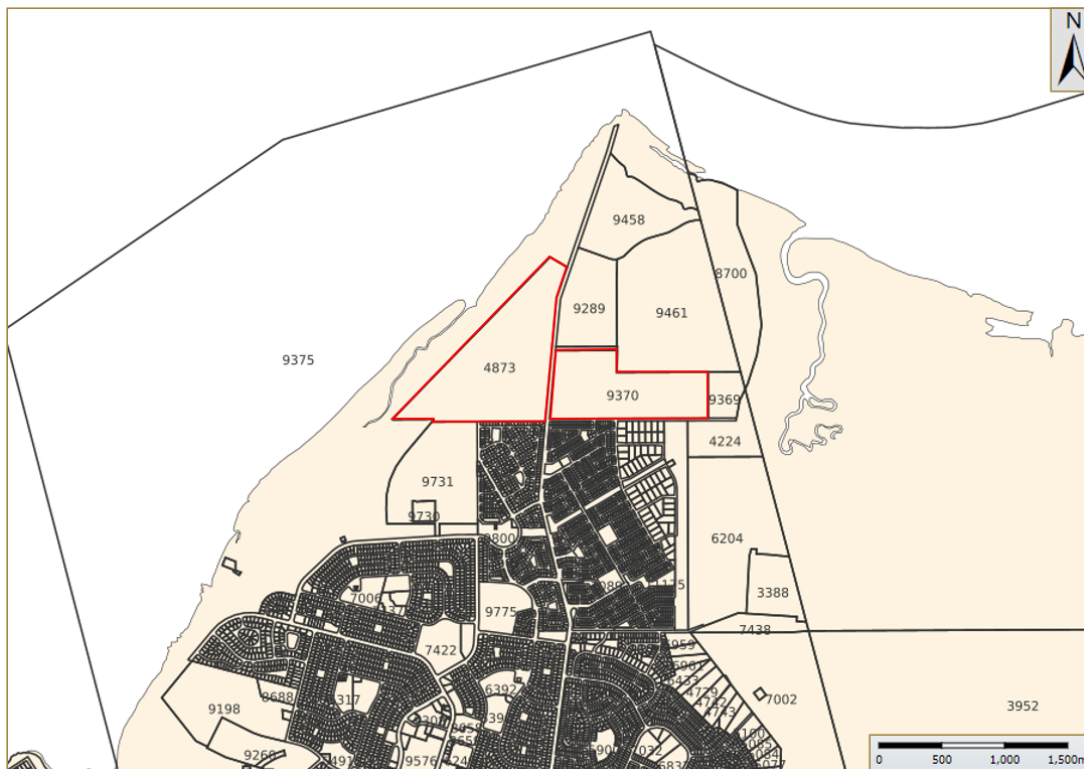


Figure 2: Cadastral Plan

Source: NR Maps, nrmaps.nt.gov.au (Dept of Environment, Parks and Water Security, viewed 27/07/2021)

2.2 Description, Physical Setting, and Current Land Use

The sites are situated on the Lee Point Peninsula approximately 17 km north of the Darwin Central Business District (CBD) and on the northern edge of residential suburbs, Lyons and Muirhead. Lot 4873 and Lot 9370 are divided by Lee Point Road. The Lots have a combined surface area of approximately 1,325,000 m² (132.5 hectares).

2.2.1 Lot 4873

Lot 4873 (also commonly known as the 2 Control and Reporting Unit [2 CRU]) is triangular in shape, bounded by the Casuarina Coastal Reserve to the west and north, and Lee Point Road to the east. At the time of Agon’s investigation, the Lot was vacant, not in use, and with the exception of historical remnant Defence infrastructure, was void of built form.

Historical military bunkers/ suspected ammunition stores are situated within the northern portion of the Lot, immediately adjacent to the Lee Point Road boundary. Remnant concrete foundations, assumed to be three sites of historical missile batteries, including concrete huts and earthen mounds with bitumen seal, are located on the northern portion. An elevated water tank is present adjacent to the southernmost battery site.

A historical cruciform anti-aircraft battery, comprising scattered 44-gallon drums, is located within the central southern portion of the Lot.

Large stockpiles of imported fill are located within the central portion of the Lot, which until 2015 was the location of a disused Defence communication facility, comprising a fenced compound with sheds,

communication, amenities and storage areas, and communication equipment platforms ¹. None of these infrastructures exist today. A formal vehicle track connects the former communications facility to Lee Point Road.

There are numerous unsealed informal vehicle tracks within the Lot, along with firebreaks along the eastern and southern boundaries.

The remainder of the Lot generally comprises degraded remnant vegetation cover, dominated by Eucalyptus and Acacia woodlands. The western portion of the Lot, being the coastal bounded by the Casuarina Coastal Reserve, is dominated by semi-deciduous coastal monsoon vine thicket, of high ecological value ².

The eastern portion of the Lot generally slopes east, with a ridge line running north-south. West from the ridge line falls sharply from an escarpment to the coast. Erosion gullies are evident along the western and south-western boundaries.

2.2.2 Lot 9370

Lot 9370 (also commonly known as Muirhead North) is an irregular rectangular shape, located to the east of Lee Point Road. At the time of Agon’s investigation, the Lot was vacant, not in use, and with the exception of a telecommunications tower and associated equipment shelter located on the western portion, is void of built form.

A series of earth-filled 44-gallon drums, likely used by the military as a machine gun emplacement during the Indonesia – Malaysia Confrontation (*Konfrontasi*) between 1963 and 1966 ³, is located on the western boundary adjacent to Lee Point Road and the telecommunications tower.

There are numerous unsealed informal vehicle tracks within the western portion of the Lot.

Lot 09370 generally slopes towards the east, with localised undulations. There are no permanent water courses, though a naturally formed drainage channel runs from the north-west through to the south-east towards Leanyer Swamp. There is some seasonal inundation in the very eastern extent.

The majority of the Lot comprises degraded remnant vegetation cover, dominated by Eucalyptus and Acacia woodlands. At the time of Agon’s investigation, much of the southern, western and northern portions of the Lot had recently been burnt.

2.3 Site Zoning

Lot 4873 is largely zoned Future Development, with a Conservation zone on the western boundary. Lot 9370 is zoned Future Development. **Figure 3** shows the current zoning plan.

The purpose of each of these Zones are as follows, as per the NT Planning Scheme 2020:

Conservation (CN): *Conserve and protect the flora, fauna, and character of natural areas.*

¹ Northern Planning Consultants (2014). Planning Scheme Amendment. Lee Point Area Plan Lots 04873 and 09370 Town of Nightcliff. November 2014.

² GHD (2010b). Department of Defence. Report for Lee Point Road Defence Site, NT. Ecology Assessment. December 2010. Revision 0.

³ Crassweller, C. (2010). Heritage and archaeological investigations over Lot 4873 Lee Point Road, Darwin Draft report for GHD on behalf of the Department of Defence. Begnaze Pty Ltd, 8 Wanguri Tce, Wanguri NT 0810.

Future Development (FD): Identify an area that is intended for future rezoning and development in accordance with the Strategic Framework. Development is limited to a level that will not prejudice future development or is compatible with planned future purposes.

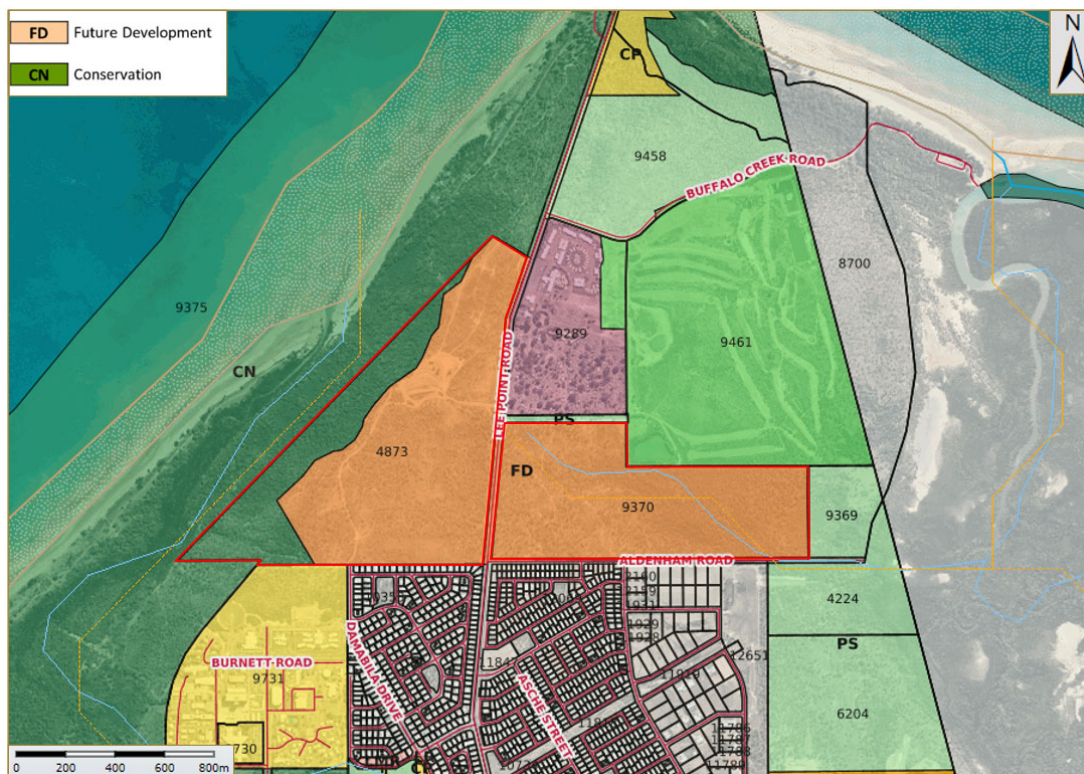


Figure 3: Area Zoning Plan

Source: NR Maps, nrmaps.nt.gov.au (Dept of Environment, Parks and Water Security, viewed 27/07/2021)

2.4 Surrounding Land Use

The immediate surrounding land uses to the site are summarised below in **Table 2**.

Table 2: Surrounding Land Use

	Lot 4873	Lot 9370
Direction	Land Use	
North	Undeveloped natural Eucalypt dominated woodland and coastal monsoon vine thicket of the Casuarina Coastal Reserve. Several walking paths exist within the reserve.	A small, sealed road separates the Lot from the southern boundary of the Lee Point Village Resort. Land clearing and ground improvement works are evident to the east of Lee Point Village Resort, indicative of land development.
East	Sealed bitumen road (Lee Point Road), with Lot 9370 situated on the opposite side of the road, in addition to the Lee Point Village Resort to the north-east.	Undeveloped and generally undisturbed, natural Eucalypt dominated woodland, with a hinterland margin and mangrove forest of Buffalo Creek/ Leanyer Swamp further to the east.
South	The northern edge of the Lyons residential suburb and Royal Darwin Hospital grounds are adjacent to the southern fence line of the Lot. Undeveloped natural Eucalypt dominated woodland of the Casuarina	The northern edge of the Muirhead residential suburb is immediately adjacent to the southern boundary of the Lot. The basin for the Muirhead residential suburb is situated south-east of Lot 9370.

Lot 4873		Lot 9370
	Coastal Reserve also exists on the south-west border of the Lot.	
West	Undeveloped natural coastal monsoon vine thicket, and Sandy Creek, of the Casuarina Coastal Reserve.	Sealed bitumen road (Lee Point Road), with Lot 4873 situated on the opposite side of the road.

2.5 Geology and Hydrogeology

Geological surveys^{4 5} indicate the sites are underlain by the Cretaceous Darwin Formation, comprising fractured and weathered rock of claystone, shale, greywacke and sandstones, with more recent Tertiary Laterite Gravel and Quaternary Coastal Alluvial (comprising mud, silt, clay, and sand) deposits potentially present.

Bore data obtained from the Department of Environment, Parks and Water Security NR Maps database, indicates an upper sand and silt unconsolidated formation of brown, yellow or red colour, recorded up to 4.5 m depth. Small gravels of ferricrete (refer as rock chip in bore log) or layers of ferricrete (refer as laterite topsoil in bore log) were recorded in the first couple of metres (RN008655, RN008656). The underlying clay formation is brown and white but was also found to be red and grey in some layers. This layer is continuing down to 33 m in depth and is reported in bore RN0022618.

NR maps bore database shows a number of bores located within the site area and adjacent Lots. The site hydrogeology is characterized by an upper quaternary sand, silt clay and sand formation of up to 33 m depth (RN0022618) which could be the potential water bearing layer during the wet season months. Groundwater was encountered at depths of 50 m and 68.5 to 70.0 m (RN0022618) but standing water level is not recorded in any bore constructed around site area.

⁴ 1:250,000 Geological Survey of the Northern Territory (2006 edition) (Northern Territory Geological Survey)

⁵ 1:100,000 Geological Map GM-5073, Northern Territory Geological Survey.

3.0 HISTORICAL INFORMATION

3.1 Historical Use of AFFF

Defence and other organisations in Australia have used Aqueous Film Forming Foams (AFFF) since the 1970s to suppress/ extinguish Class B fires that involve flammable liquid fuels. AFFF acts quickly by smothering fuel when a thin film of foam forms on the fuel, stopping contact with oxygen.

AFFF, namely the PFAS containing 3M Lightwater™ product, was used on Darwin Defence bases from 1983 for fire suppression activities, for testing and training in fire training areas and fire stations, and in fire suppression systems associated with aircraft hangar facilities and fuel storage systems.

It is further understood PFAS containing AFFF has been historically used by NT Police and the NT Fire and Rescue Service (NTFRS) for flammable liquid training exercises and emergency suppression response activities.

The use of PFAS containing AFFF in Australia has been gradually phased out since 2004, and the 3M Lightwater™ product was completely removed from use at RAAF Base Darwin by 2009⁶.

It is important to note that the use of AFFF is not typically associated with bushfire control, as its application is associated with the control of liquid fuel fires.

NT PFAS contaminated legacy sites are typically associated with the following activities, listed in order of investigation priority by the NT PFAS Interagency Working Group (PFASIWG) (PFASIWG, 2016):

Category 1 Sites: Sites where there has been known significant use of PFAS containing AFFF, primarily associated with fire training exercises. These include three Defence sites (namely, RAAF Base Darwin [including the joint civil-military airport], RAAF Base Tindal, and to a lesser extent, Robertson Barracks), NT Police and NTFRS stations, and other airports.

Category 2 Sites: Sites that may have had PFAS containing AFFF deluge installations or have been associated with fire training exercises or incidents. These include current and former power stations, current and former large petrochemical facilities, and major hydrocarbon fire incident sites.

Category 3 Sites: Point source users and/ or handlers of PFAS containing AFFF and may include major hazard facilities, port facilities, bulk fuel and chemical storage facilities, and mine sites.

Category 4 Sites: Potential diffuse sources of PFAS contamination. These include sites that receives and/ or processes wastes including waste transfer stations and landfills, and sewage treatment plants (STPs).

3.2 Historical Aerial Imagery

Aerial photographs were reviewed from 1944 to present, to investigate the former land uses and activities at the site, as provided in **Appendix C**, with the approximate Lot boundaries outlined in pink. A summary of observations within the Sites and surrounds are provided in **Table 3**.

⁶ Coffey (2018). Department of Defence. RAAF Base Darwin. Detailed Site Investigation – Per- and Poly-fluoroalkyl Substances (PFAS). 5 February 2018.

Table 3: Historical Aerial Imagery

		Lot 4873	Lot 9370
Year	Description		
1944	<p>Site: Vegetation clearance on the north-east side of the site, immediately adjacent Lee Point Road is evident. Several access tracks exist throughout the central and southern portions of the site. The site is void of any built form.</p> <p>Surrounds: Lee Point Road exist on the eastern boundary to the site. Remaining surrounding areas comprise undeveloped natural bushland, with several unsealed vehicle access tracks extending through the bushland.</p>	<p>Site: The site comprises undeveloped natural bushland, void of access tracks and built form.</p> <p>Surrounds: Lee Point Road exist on the western boundary to the site. Remaining surrounding areas comprise undeveloped natural bushland.</p>	
1955	<p>Site: With the exception of further vegetation clearing conducted on the north-east side of the site, immediately adjacent Lee Point Road, no notable changes are evident since 1944.</p> <p>Surrounds: Vegetation clearing, across Lee Point Road, north-east of the site, has occurred with an access track connecting this clearing to that on Site.</p>	<p>Site: No notable changes.</p> <p>Surrounds: No notable changes, aside from the establishment of a vehicle access track adjacent to the southern boundary.</p>	
1973	<p>Site: Built forms are first evident, including the historical military bunkers and suspected ammunition stores, missile batteries, concrete huts, cruciform anti-aircraft battery, the elevated water tank, and the Defence communication facility compound. Vegetation clearing across the central and northern portion of the Lot, including formed access tracks, has occurred to support the establishment of these infrastructure and facilities.</p> <p>Surrounds: Significant vegetation clearing, across Lee Point Road, north-east of the site has occurred. Land development, relating to the construction of the new Royal Darwin Hospital facility has commenced on the southern side of the site.</p>	<p>Site: Vegetation clearing and the establishment of vehicle access tracks through the western side of the site has occurred.</p> <p>Surrounds: Establishment of a radar facility south of Lot 9370. Significant vegetation clearing, north of the site, has occurred.</p>	
1985	<p>Site: Further vegetation clearing, including additional access tracks, is evident across the site particularly in the southern portion of the site and surrounding the communication facility compound.</p> <p>Surrounds: Land development, relating to the construction of the new Royal Darwin Hospital facility has further progressed on the southern side of the site. Ground improvement works for the Lee Point Village Resort has commenced to the east.</p>	<p>Site: Further vegetation clearing and establishment of vehicle access tracks through the western portion of the site.</p> <p>Surrounds: Ground improvement works for the Lee Point Village Resort has commenced to the north.</p>	
1988	<p>Site: No notable changes, aside from the widening of vehicle access tracks, including one which extends from the communication facility compound, through to the southern boundary, and fire breaks along the Lot boundaries.</p> <p>Surrounds: Land development, relating to the construction of the Lee Point Village Resort, has further progressed to the east.</p>	<p>Site: No notable changes.</p> <p>Surrounds: Land development, relating to the construction of the Lee Point Village Resort, has further progressed to the north.</p>	

Lot 4873		Lot 9370	
Year	Description		
2001	<p>Site: No notable changes, aside from vegetative renewal across the site.</p> <p>Surrounds: No notable changes.</p>	<p>Site: No notable changes.</p> <p>Surrounds: A settling pond had been constructed on the north side of the Lot (south-west of Lee Point Village Resort).</p>	
2006	<p>Site: No notable changes, aside from further vegetative renewal across the site.</p> <p>Surrounds: No notable changes.</p>	<p>Site: No notable changes.</p> <p>Surrounds: No notable changes.</p>	
2010	<p>Site: No notable changes.</p> <p>Surrounds: The Lyons residential suburb is under construction (well established) on the south-east side of the Lot.</p>	<p>Site: No notable changes.</p> <p>Surrounds: The radar facility, south of Lot 9370, appears to have been decommissioned/ demolished. Land clearing activities have also occurred to the north-east.</p>	
2015	<p>Site: No notable changes.</p> <p>Surrounds: Further construction works have occurred on the Royal Darwin Hospital campus, to the south. Construction of the Lyons residential suburb is complete.</p>	<p>Site: The telecommunications tower has been established in the north-west corner. No other notable changes, aside from the natural renewal of trees within previously cleared site areas.</p> <p>Surrounds: The Muirhead residential suburb is under construction on the south side of the Lot.</p>	
2020	<p>Site: The communications facility compound has been demolished. Large soil stockpiles are situated on this area of the site. Natural renewal of trees within previously cleared site areas has occurred.</p> <p>Surrounds: No notable changes.</p>	<p>Site: No notable changes, aside from the natural renewal of trees within previously cleared site areas.</p> <p>Surrounds: Construction of the Muirhead residential suburb is near completion. A rainwater basin, servicing Muirhead, has been constructed on the south-east side of Lot 9370. The basin drains to the east.</p>	

3.3 Historical Title Search

An historical ownership search was conducted for the current CTs, undertaken by the Northern Territory Land Titles Office. A copy of the results is provided as **Appendix B** and are summarised below and in **Table 4**.

The historical titles search relating to Lot 4873 indicates the first CT available was Volume 614 Folio 82, with the land encompassing the Lot acquired by the Commonwealth of Australia for Defence Purposes in December 1978. Parcel comments, as included on the Administrative Interests Report, notes *Former Hundred of Bagot Portion 1381 S72/235/25 S72/235/25 RAAF Radar Site S78/107/4 Acquired by Commonwealth of Australia Gazette dated 19th December 1978*. CT Volume 614 Folio 82 was transferred to CT Volume 786 Folio 001 in February 1999, with the Commonwealth of Australia (of Director of Property Services, Defence Estate Organisation, R4-2-008 Canberra ACT 2600) remaining the Registered Proprietor. The land encompassing the Lot was acquired by Defence Housing Australia in May 2015 under the current CT Volume 788 Folio 729.

The historical title search relating to Lot 9370 indicates the first CT available is the current CT Volume 836 Folio 339, acquired by Defence Housing Australia in October 2019 under Crown Lease Term 2643. Survey Plan B 131 (circa 1959) includes the notation *National Broadcasting Station Site* but has since been struck out from the Plan.

Table 4: Historical Title Search Summary

Date of Acquisition (Term Held)	Registered Proprietor(s)	Title Reference at Acquisition and Sale
Lot 4873		
19/12/1978	Acquired by the Commonwealth of Australia for Defence purposes	-
22/02/1999 (1999 to 2014)	Commonwealth of Australia (of Director of Property Services, Defence Estate Organisation)	Vol 614 Folio 082 Now Vol 786 Folio 001
29/05/2014 (2014 to present)	Defence Housing Australia	Vol 786 Folio 001 Now Vol 788 Folio 729
Lot 9370		
31/10/2019	Defence Housing Australia	Vol 836 Folio 339

3.4 NT EPA Records

There are no records of Section 14 incident reports relating to the Sites or within the immediate vicinity of the Sites, Section 14 incidents being notifications of pollution incidents that have potential to be more than trivial or negligible and maintained by the NT EPA since 2006.

There are no records of Pollution Abatement Notice(s) for the Sites or within the immediate vicinity of the Sites.

There are no records of previous Contaminated Land Audits for the site.

There are no records of Environmental Protection Approvals (EPAs) or Environmental Protection Licences (EPLs) for the site.

3.5 Previous Contamination Assessments

3.5.1 GHD (2010)

GHD, on behalf of the Department of Defence, undertook a Stage 1 and Stage 2 Contamination Assessment, Heritage Study and Ecological Assessment (Flora and Fauna) for Lot 4873 between August and November 2010 (*Report for Lee Point Road Defence Site, NT Environmental Site Assessment* [GHD, 2010]). The specific objectives of the contamination assessment were to assess the potential for contamination at the Site from current or historical land uses, assess the extent and magnitude of any identified contamination, and establish requirements for any applicable contamination management or remediation, with an overarching objective of providing Defence with information to support decisions relating to future land use options.

The scope of works for the contamination investigation included:

1. A desktop assessment, comprising a broad scale whole of site review and historical study including site history, natural environment, and interviews.
2. A Site inspection.
3. A soil, surface sediment and groundwater sampling and analysis program at areas identified via the desktop review as a contamination concern.

Key potential contamination issues identified by GHD was limited to those related to possible land filling and dumping outside the fenced compound at the Site as well as bulk fuel storage (one underground storage tank [UST]) present inside the fenced compound, with hydrocarbons, heavy

metals, and asbestos containing materials (ACM) the associated contaminants of potential concern (COPC). Notably, fire suppression and the use of PFAS containing AFFF were not identified as PCAs or COPCs, and as such PFAS were not considered as part of the sampling and analysis program.

3.5.2 SMEC Australia (2014)

SMEC Australia (SMEC), on behalf of DHA, conducted a Contaminated Land Review (CLR) for Lot 4873 (*Contaminated Land Review Report – DOD Site, Lee Point Road, NT* [SMEC Australia, 2014]). The CLR objectives were to determine the nature and extent of soil and groundwater contamination (if any) at the Site and assess any associated human health and environmental risks, with an overarching objective of assisting DHA identify and manage contamination risks.

The scope of works for the CLR included:

1. A review of existing documentation relating to past and present land use including an assessment of the GHD, 2010 report for completeness and representativeness of current site conditions, data gaps, and impacts of regulatory changes.
2. A Site inspection.
3. A soil, groundwater, and buildings materials sampling analysis program targeting potential contamination identified via the documentation review.

The most likely potential sources of contamination identified by SMEC included presence of unexploded ordnance (UXO), abandoned USTs and associated infrastructure, a redundant transformer, potential past stockpiling activities, potential use of fill across the site, uncontrolled landfilling or other dumping at the site, hazardous building materials (e.g., ACM, polychlorinated biphenyls [PCBs], and lead)), and potential spills or absorption trenches associated with an above ground Sewage Treatment Plant (STP). The COPCs associated with the identified PCAs included hydrocarbon related compounds, heavy metals, PCBs, and ACM.

Similar to GHD, 2010, fire suppression and the use of PFAS containing AFFF were not identified as PCAs or COPCs, and as such PFAS were not considered as part of the targeted sampling and analysis program.

3.5.3 Commonwealth of Australia, Department of Defence (2013)

The Commonwealth of Australia Department of Defence factsheet (Version 1, 1 October 2013) notes that the only activity identified on the Lee Point Radar Station (the 2CRU site) that relates to potential site contamination is the use of two USTs and one above ground storage tank to store diesel.

3.6 Interviews

As part of the PSI, Agon contacted Neal Adamson, employed by Department of Defence in the capacity of Regional Environment and Sustainability Officer – Northern Territory, in relation to his knowledge of Defence related fire training, equipment testing, and suppression activities in the areas of interest. In summary, Defence did not use the Sites for fire training activities or equipment testing, with these activities confined to dedicated fire training grounds at the major Defence facilities comprising RAAF Base Darwin and RAAF Base Tindal, and potentially and to a lesser extent, Robertson Barracks. To his knowledge, there were no Defence related incident response fire suppression requirements at the Sites.

4.0 SITE INSPECTION

An inspection of the sites was undertaken by Agon on 20 and 22 July 2021. In addition to identifying key site features and physical settings, as described in **Section 2.2** of this report, the objective of the site inspection was to identify evidence of potential PFAS contaminating activities and indicators, including former fire training areas, areas of stressed/ dead vegetation, and potential NTFRS flammable liquid fire response incidents.

Both Lots have been subject to illegal dumping activities including domestic, commercial, and construction and demolition (C&D) wastes. A number of dumped vehicle bodies and parts are present, with some having been burnt. Large, imported fill stockpiles are present on the central portion of Lot 4873, on the former location of the communication facility compound.

With the exception of potential fire incident responses associated with burning vehicles, there was no evidence of potential PFAS contaminating activities or indicators identified.

5.0 SITE INFORMATION SUMMARY AND DISCUSSION

5.1 Lot 4873

A review of the documentation suggests Lot 4873 has been used by the Commonwealth of Australia for Defence Purposes since the 1950s but was formerly acquired by the Commonwealth in December 1978.

Built forms are first evident on the Lot in the 1973 aerial photograph, including the historical military bunkers and suspected ammunition stores, missile batteries, concrete huts, cruciform anti-aircraft battery, an elevated water tank, and the Defence communication facility compound. However, available information indicates works to establish the radar and receiving station on the Lot commenced in 1959 and became operational in March 1961. The radar facility operations were reportedly relocated to RAAF Base Tindal in the early 2000s.

The military defence infrastructure (bunkers, and batteries) was likely to have been established on the Lot during the *Konfrontasi*, between 1963 and 1966, with their remnants remaining on site to the current day.

Lot 4873 was acquired by DHA in 2014, with the then redundant communication facility compound decommissioned/ demolished post 2015.

Previous environmental investigations have not identified any significant contamination concerns on the Lot, with the use of AFFF for fire suppression and PFAS not considered as PCAs or COPCs.

There are no publicly available records of pollution incidents or notifications, waste management activities, or contaminated land audits for the Lot or its immediate surrounds.

The Lot has been subject to illegal dumping activities.

5.2 Lot 9730

A review of the documentation suggests a small portion of Lot 9370 was utilised for Defence purposes during the *Konfrontasi*, between 1963 and 1966, with the establishment of a machine gun emplacement on the western boundary adjacent to Lee Point Road, remnants of which remain to the current day. A telecommunications tower has more recently been constructed/ placed on the north-west corner of the Lot, post 2010.

The Lot was acquired by DHA in October 2019, and prior to which the Lot was identified as vacant Crown Land. With the exception of the military remnants and telecommunication tower, the Lot has not been subject to any form of development.

Agon is not aware of any contamination related investigations relevant to Lot 9730. There are no publicly available records of pollution incidents or notifications, waste management activities, or contaminated land audits for the Lot or its immediate surrounds.

The Lot has been subject to illegal dumping activities.

5.3 Potential for PFAS Contamination

The site information review, and site inspections have not indicated either Lot has been used by Defence for fire training, equipment testing, and suppression activities, with these activities reportedly confined to dedicated fire training grounds at the major NT RAAF bases, namely RAAF Base Darwin and RAAF Base Tindal. Further, the historical records confirm there were no fire or police

stations established on the subject sites, and the likelihood that the Defence communications facility on Lot 4873 contained AFFF deluge installations is extremely low as these are typically installed at sites considered at significant risk of liquid fires (large petrochemical facilities, and major hazard facilities, for example).

Both Lots are likely to have been subject to bushfire control activities, with the land located within the NTFRS Casuarina Emergency Area. However, the use of AFFF is not typically associated with bushfire control, with its application intended for the control of Class B flammable liquid fuels fires.

There is the potential the Sites have been subject to fire incident responses associated with burning vehicles however, based on the vehicle bodies not previously encountered by GHD during their 2010 investigations, the vehicles are likely to have been dumped more recently and post the nationwide phase out of PFAS containing AFFF products. Regardless, any contamination resulting from incident response activities associated with suppressing burning vehicles using PFAS containing AFFF would be limited in extent.

Based on the available information, the potential for PFAS contamination on the Sites is considered low.

6.0 LIMITED SOIL INVESTIGATION

To supplement the site history review, Agon undertook a limited soil investigation for quantitative assessment of potential PFAS impacts. In the absence of the identification of any significant potential point PFAS contamination sources on the sites, sampling locations targeted both areas of interest, and surface water drainage pathways/ erosion gullies that represent potential PFAS contamination migration pathways from an unknown source or sources. The soil sampling was conducted on 22 July 2021, details are provided in the following sections.

The soil sampling works were undertaken with reference to relevant industry standards and guidelines including:

- *The National Environment Protection (Assessment of site Contamination) Measure 1999* (as amended 2013) (the ASC NEPM);
- *The PFAS National Environmental Management Plan* (Version 2.0) (Heads of EPA, 2020) (the PFAS NEMP); and
- Australian Standard (AS) 4482.1:2005 - *Guide to the Investigation and Sampling of Potentially Contaminated Soil* (AS 4482.1).

6.1 Sampling Plan and Rationale

Ten representative soil samples were collected across Lots 4873 and Lot 9370, with the sample location rationale provided in **Table 5** and shown on **Figure 4** and **Figure 5**.

Table 5: Sample Location Rationale

Sample No.	Location Description	Rationale
1	Lot 9370, centre, adjacent burnt-out car / imported soil	Potential point PFAS contamination source associated with AFFF fire suppression response.
2	Lot 9370, natural drainage line where surface water flows offsite	Potential diffuse contamination pathway from an unknown source.
3	Lot 4873, east boundary, drainage line	Potential diffuse contamination pathway from an unknown source.
4	Lot 4873, within location of former communications facility compound, adjacent to imported fill stockpiles	Communications facility compound and newly imported fill stockpiles considered an area of interest.
5	Lot 4873, within an erosion gully west of and immediately adjacent to the location of former communications facility compound	Potential diffuse contamination pathway from an unknown source within the former communications facility compound.
6	Lot 4873, west portion, erosion gully	Potential diffuse contamination pathway from an unknown source.
7	Lot 4873, south boundary, erosion gully	Potential diffuse contamination pathway from an unknown source.
8	Lot 4873, south-west boundary, erosion gully	Potential diffuse contamination pathway from an unknown source.
9	Lot 4873, north portion, adjacent concrete hardstands / bunker of the old Missile Launching facility	Redundant concrete foundations considered an area of interest.

Sample No.	Location Description	Rationale
10	Lot 4873, north portion, adjacent concrete hardstands / bunker of the old Missile Launching facility	Redundant concrete foundations considered an area of interest.



Figure 4: Sample Location Plan, Lot 4873



Figure 5: Sample Location Plan, Lot 9370

6.2 Sampling Methodology

One sub-surface sample was collected at each test location, from a depth to 0.1 metres below ground level (m bgl) using a stainless steel hand trowel, with surface/ sub-surface soils considered most receptive to contamination associated with AFFF application.

Quality assurance and quality control (QA/QC) measures adopted during field works were based on AS4482.1 and were in general accordance with recommendations specified in the PFAS NEMP, and included:

- Decontamination of the hand trowel between sample locations using laboratory grade and certified PFAS-free detergent (Liquinox®) and deionised water;
- Hands were washed with soap and rinsed with drinking water before donning clean disposal nitrile gloves prior to sample collection and between sample locations;
- Soil samples were placed directly into laboratory prepared Teflon® free polypropylene sampling containers for PFAS analysis;
- QA/QC samples including blind duplicate samples were also collected for analysis; and
- Sample containers were systematically labelled, immediately stored in a chilled portable container and accompanied by completed Chain of Custody (CoC) forms for dispatch to National Association of Testing Authorities (NATA) accredited laboratories within acceptable holding times for the scheduled analyses.

The laboratories used for the soil investigation were Eurofins (Primary Laboratory) and ALS Laboratory Group (ALS) (Secondary Laboratory). Both laboratories are approved NATA and the analyses conducted are within their NATA registration.

6.3 Analytical Program

Samples were submitted to the NATA accredited laboratories under chain of custody protocols for analysis for the 30 PFAS suite (including PFOA, PFOS and PFHxS).

6.4 Assessment Criteria and Investigation Levels

The PFAS concentrations have been compared with human health and ecological criteria and guideline values from the PFAS NEMP. The following screening criteria have been adopted in line with the site's future use as a Residential setting:

- Health investigation levels (HIL) A.
- Ecological Guidance Values for Soil (Direct and Indirect Exposure) for all land uses.

6.5 Laboratory Test Results

Concentrations of PFAS from all collected samples (inclusive of the inter-laboratory blind duplicate) were reported below laboratory Limits of Reporting (LOR), and below adopted human health and ecological guideline levels.

The NATA laboratory certificates are provided as **Appendix D**.

6.5 Quality Assurance and Quality Control

The QA/QC measures for this investigation were based on AS4482.1, and generally in accordance with recommendations outlined in the PFAS NEMP. The following sections detail the QA /QC analyses and consider the analytical data quality.

6.5.1 Internal Laboratory Quality Assurance

The results of the internal quality assurance programs of the laboratory are presented with the NATA laboratory certificates as **Appendix D**. According to the ASC NEPM, the quality of data supplied by the analytical laboratory must meet the objectives of the testing laboratory’s quality plan for at least 95% of test results for duplicates. The primary and secondary laboratory QA/QC reviews indicate all method blanks, duplicates, controls, and matrix spikes passed internal laboratory testing. No analysis holding time outliers were reported.

6.5.2 Field Duplicates

Field duplicate samples were collected and analysed at the primary and secondary laboratories. The field duplicate testing and frequency are summarised in **Table 6**.

Table 6: Soil Duplicate Analyses

Primary Sample	Intra-Laboratory Duplicate Sample (Eurofins)	Inter-Laboratory Duplicate Sample (ALS)
S8: PFAS (extended suite)	QA101: PFAS (short suite)	QA201: PFAS (short suite)

The frequency of field intra- and inter-laboratory duplicate analyses for analytical schedule is acceptable when compared to the 1 per 20 (5%) analyses recommended in AS4482.1 and the 1 per 10 (10%) analyses recommended in the PFAS NEMP.

All comparable intra- and inter-laboratory duplicate soil analyses had relative percentage difference (RPD) values within acceptable criteria.

6.5.3 Data Quality Conclusions

The internal Quality Control procedures reported by the laboratories and the field duplicate analyses indicate the analytical data is of acceptable quality for the purposes of this investigation.

7.0 CONCLUSIONS

Agon has undertaken a Preliminary Site Investigation (PSI) of Lots 4873 and 9370 Lee Point, Northern Territory (NT) to identify if per- and poly-fluoroalkyl substances (PFAS) are known or likely to be present on the subject land. The investigation works have been undertaken to fulfill the requirements of condition 6 of the *2015-7591-Decision Notice* for the construct a master-planned urban residential development.

To supplement the PSI, a limited soil investigation was undertaken for the quantitative assessment of potential PFAS impacts across the subject land.

Based on the results of the scope of works undertaken and presented in this PSI report, the following conclusions are made:

- Lot 4873 has been utilised for Defence purposes since at least 1959, when works to establish a Defence communications facility (radar and receiving station) commenced. Military defence infrastructure including bunkers and suspected ammunition stores, missile batteries, and a cruciform anti-aircraft battery, were likely established during the *Konfrontasi*, between 1963 and 1966. The land was acquired by DHA in 2014, with the then redundant communications facility compound decommissioned/ demolished post 2015. Prior to 2014 the land was held by the Commonwealth of Australia (of Director of Property Services, Defence Estate Organisation). The Lot has not been subject to any form of additional development.
- Lot 9370 was likely utilised for Defence purposes less extensively when compared to Lot 4873, with use limited to the establishment of a machine gun emplacement on the western boundary during the *Konfrontasi*, between 1963 and 1966. A telecommunications tower has more recently (post 2010) been constructed/ placed on the north-west corner of the Lot. The Lot was acquired by DHA in October 2019, prior to which it was identified as vacant Crown Land. With the exception of the military remnants and telecommunication tower, the Lot has not been subject to any form of development.
- Previous contamination investigations, which Agon understands have concentrated on Lot 4873 only, have not identified any significant contamination concerns and PFAS has not been considered as contaminants of potential concern.
- There are no publicly available records of pollution incidents or notifications, waste management activities, or contaminated land audits for either Lot or their immediate surrounds.
- PFAS are not known to be present, nor are they likely to be present on the subject land, based on the following:
 - The subject land has reportedly not been used by Defence for fire training, equipment testing, and suppression activities, with these activities undertaken within dedicated fire training grounds at the major NT RAAF bases.
 - There have not been fire or police stations established on the subject sites.
 - It is considered highly unlikely that any existing or former site infrastructure, including the communications facility on Lot 4873, contained AFFF deluge installations.
 - It is considered unlikely that any bushfire control activities conducted on the subject land involved the application of AFFF, with AFFF intended for the control of Class B flammable liquid fuels fires.

- Burnt out vehicles identified on the Lots are likely to have been dumped more recently and post the nationwide phase out of PFAS containing AFFF products.
- The limited soil sampling and analysis program, targeting point source areas of interest and potential diffuse contamination pathways, did not identify PFAS concentrations above laboratory limits of reporting (LOR).
- In the absence of any identified significant point or diffuse PFAS contamination sources and given PFAS concentrations in soils have been reported below detection, there is no need to further investigate Source – Pathway – Receptor linkages as part of a Conceptual Site Model (CSM).

8.0 LIMITATIONS OF THIS REPORT

This report has been prepared in accordance with industry recognised standards and procedures current at the time of the work. The report presents the results of the assessment based on the quoted scope of works (unless otherwise agreed in writing) for the specific purposes of the engagement by the Client. No warranties expressed or implied are offered to any third parties and no liability will be accepted for use of this report by third parties.

The assessment of environmental and human health risk included in this report relate to the whole site as described in the report. If the site is subject to demolition works or redevelopment, the risk profile of the site will change and the conclusions of this report will no longer be valid. If the site is subject to subdivision, the risk profile of each division of the site will change and the conclusion of this report will no longer be valid.

Consideration of the aesthetic and geotechnical suitability of site soils has been excluded from this report. Aesthetic and geotechnical suitability may need to be addressed in subsequent assessments.

All information provided by third parties has been assumed to be correct and complete. Agon does not assume any liability for misrepresentation of information by third parties or for matters not visible, accessible or present on the subject site.

Opinions and judgements expressed herein are based on Agon's understanding of current regulatory standards and should not be construed as legal opinions.

No responsibility is accepted for use of any part of this report in any other context or for any other purpose or by third parties other than those listed above.

This report should be read in full.

9.0 REFERENCES

Australia Bureau of Mineral Resources, Geology and Geophysics. Geological Maps 1:100,000. GM-5073. Northern Territory Geological Survey. Geological Maps 1:100,000. GM-5073.

Coffey (2018). Department of Defence. RAAF Base Darwin. Detailed Site Investigation – Per- and Poly-fluoroalkyl Substances (PFAS). 5 February 2018.

Crassweller, C. (2010). Heritage and archaeological investigations over Lot 4873 Lee Point Road, Darwin Draft report for GHD on behalf of the Department of Defence. Begnaze Pty Ltd, 8 Wanguri Tce, Wanguri NT 0810.

Department of Environment, Parks and Water Security (2021). Natural Resources Maps: <https://nrmaps.nt.gov.au/nrmmaps.html> (accessed on 26/07/2021).

GHD (2010a). Department of Defence. Report for Lee Point Road Defence Site, NT. Environmental Site Assessment. December 2010.

GHD (2010b). Department of Defence. Report for Lee Point Road Defence Site, NT. Ecology Assessment. December 2010. Revision 0.

Heritage Branch (2010). “Bunkers” Lee Point Road Heritage Assessment Report. Unpublished report, Heritage Branch, Northern Territory Government, Darwin.

Northern Planning Consultants (2014). Planning Scheme Amendment. Lee Point Area Plan Lots 04873 and 09370 Town of Nightcliff. November 2014.

NT EPA (2021). Public Registers: <https://ntepa.nt.gov.au/your-business/public-registers> (accessed on 30/07/2021).

SMEC Australia (2014). Defence Housing Australia. Contaminated Land Review Report – DOD Site, Lee Point Road, NT. April 2014.

APPENDIX A: 2015-7591-Decision Notice

APPENDIX B: Certificates of Title and Survey Plans

APPENDIX C: Historical Aerial Imagery

APPENDIX D: NATA Certificates of Analysis