



**BETTER BY DEFINITION**

**REPORT**

**POST ACTIVITY REPORT  
UNEXPLODED ORDNANCE  
ASSESSMENT  
RECEIVER STATION SITE  
LEE POINT, NT**

***G-tek Australia Pty Limited***  
[ABN 47 099 519 034]

Project Ref: 06016ADOD

Prepared For: Property Disposal Task Force

Date of Issue: 31 May 2006



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A handwritten signature in black ink, appearing to read "Max Verrier".

Prepared by:

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Max Verrier  
Senior Project Manager

A handwritten signature in black ink, appearing to read "Greg Guthrie".

Reviewed by:

\_\_\_\_\_  
Greg Guthrie  
Chief Operating Officer

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Issued To

Department of Defence (Electronic Version)  
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The following Definitions apply within this Report:

**Ammunition:** A device charged with explosives, propellants, pyrotechnics, initiating composition, or nuclear, biological or chemical material for use in connection with defence or offence including demolitions. Certain ammunition can be used for training, ceremonial or other non-operational purposes.

**Ammunition Produce:** Non-explosive stores and components used in the assembly or the initiation of ammunition.

**Explosive Ordnance (EO):** All munitions containing explosives, nuclear fission and fusion materials and biological and chemical agents. This includes bombs and warheads; guided and ballistic missiles; artillery, mortar, rocket and small arms ammunition; all mines, torpedoes and depth charges; demolition charges; pyrotechnics; clusters and dispensers; cartridges and propellant actuated devices; electro-explosive devices; clandestine and improvised explosive devices; and all similar or related items or components explosive in nature.

**Explosive Ordnance Waste (EOW):** Inert material remnant from the initiation or functioning of explosive ordnance.

**Fragmentation:** Metallic fragments of the fractured casing of EO resultant from the initiation of high explosive filling and often projected at high velocities over considerable distances from the point of initiation.

**Hazard Reduction Operation (HRO):** An operation designed to reduce the EO hazard within the boundaries of an affected area.

**Military Produce:** Any item identified as military in origin that is not ammunition-related.

**Small Arms:** All arms, including automatic weapons of less than 20 mm in calibre and all gauges of shotguns.

**Small Arms Ammunition (SAA):** Ammunition for small arms, ie all ammunition of less than 20 mm in calibre, and all gauges of shotgun cartridges.

**Small Arms Ammunition Waste (SAAW):** Inert material remnant from the transport, packaging, preparation, and use of SAA.

**Unexploded Ordnance (UXO):** Explosive ordnance that has been primed, fused, armed or otherwise prepared for action and which has been fired, dropped, launched, projected or placed in such a manner as to constitute a hazard to operations, installations, personnel or material but remains unexploded either by malfunction or design or for any cause. UXO includes items of military ammunition or explosives removed from their original resting-place for any reason, including souveniring by members of the public.

**UXO Assessment:** An activity designed to determine whether an area is affected by UXO, the boundaries of any affected area, the location of impact points within any affected area and the nature and concentration of UXO within any affected area.



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## **1.0 INTRODUCTION**

### **1.1 General**

Lot 9737, the Receiver Station Site, is located on Lee Point Road within the greater Darwin City Area, Northern Territory. The owners, the Department of Defence (Defence), are currently considering disposal options for this property.

As part of the normal due diligence process undertaken prior to potential disposal of Defence properties, HLA conducted an environmental site assessment. This assessment identified that there was potential for UXO contamination to be remnant on the property.

G-tek Australia Pty Limited (G-tek) was contracted to conduct an UXO assessment of Lot 9737, the Receiver Station Site on Lee Point Road (the Site).

### **1.2 Authority to Undertake Task**

Property Disposal Task Force Purchase Order Number 4500515731.

### **1.3 Objectives**

The objectives of this UXO assessment were to determine:

- Whether the Site is affected by UXO.
- The boundaries of any affected areas within the Site.
- The location of impact points within any affected area in the Site.
- The nature and potential concentration of UXO within any affected area of the Site.

### **1.4 Nature of Report**

This report details, in Defence standard UXO format, the activities conducted as part of this assessment, and the results obtained. This assessment included a review of provided reports, a review of additional historical material and systematic on-site surface and sub surface search. All relevant documentation, maps, diagrams and photographs are included as parts of this report.

### **1.5 Dates of Conduct**

Planning, preparation and administration for the task commenced on receipt of the Purchase Order details and the assessment team were mobilised to Darwin on 15 May 06. Fieldwork was conducted during the period 16 May and 26 May 2006. Demobilisation from Darwin occurred on the 26 May 06 and reporting was commenced.

### **1.6 Previous Investigations**

G-tek Australia Pty Limited has not conducted any previous UXO investigation on this Site. However an UXO assessment, for Defence Housing Authority (DHA), was undertaken during 2005 on Lot 9774, which is located to the immediate west of this Site.

## **2.0 UXO CONTRACTOR DETAILS**

The contracting firm is G-tek Australia Pty Limited (G-tek) ABN 47 099 519 034.

## 2.1 G-tek Staff

The following G-tek staff was directly involved in this operation:

Project Manager/UXO Technician –	Max Verrier
Field Operators –	Terry Foot
	Bill Sadleir
	Jenny Verrier

The Project Manager is a Defence trained Ammunition Technical Officer and a Member of the Institute of Explosive Engineers (MIExpE); he is deemed a competent professional on UXO related matters. A short CV is included at Appendix 1.

## 3.0 OWNERSHIP / CLIENT DETAILS

The Department of Defence is the owner of the property and the client for the assessment. Their contact details are:

Mr Bob Brinckley  
Assistant Director  
Property Disposal Task Force  
Strategic Planning and Estate Development  
Department of Defence  
BP3-2-A017 26 Brindabella Circuit  
Brindabella Business Park  
Telephone: 02 6266 8220

## 4.0 SITE DETAILS

The Site details are as follows:

- The street address is Lee Point Road, Muirhead, NT.
- The real property description is Lot 9737 Town of Nightcliff, Northern Territory.
- The Site is located within the City of Darwin Local Government Area.
- The property is zoned for Military purposes (MZ).



Photograph 1. Existing Receiver Station buildings.

A map showing the Site location is at Appendix 2.

## 5.0 BACKGROUND

### 5.1 Military History Overview

The Defence National UXO Office (NUXOO) identifies and records Australian sites where there is potential for UXO contamination and this information is then passed to the relevant stakeholders. NUXOO gathers sufficiently accurate information on contaminated sites to enable their safe and effective management by the appropriate authorities.

A review of records held by NUXOO has determined that UXO, both artillery and grenades, has been found in the generic Lee Point area. In addition, a dumpsite containing SAA has been previously found near Buffalo Creek. All UXO reports occurred a number of years ago, with no recent reports of UXO within this area.

The only information held by NUXOO is that Lee Point was used as an air gunnery and bombing range during WWII and the actual target/impact sites are listed as being in the “water approaches to Port Darwin”. This information is consistent with Commonwealth Gazette 16 of 1941 and various air gunnery and bombing range diagrams located.

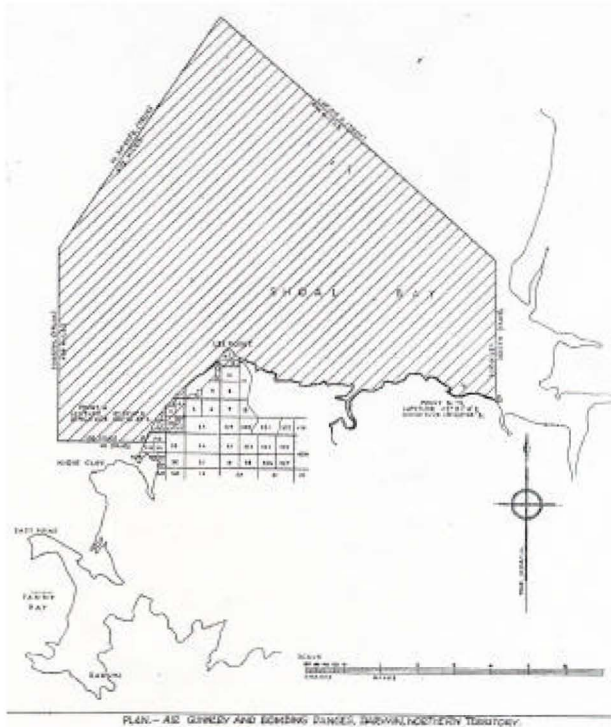


Figure 1 – Commonwealth Gazette 16 of 1941

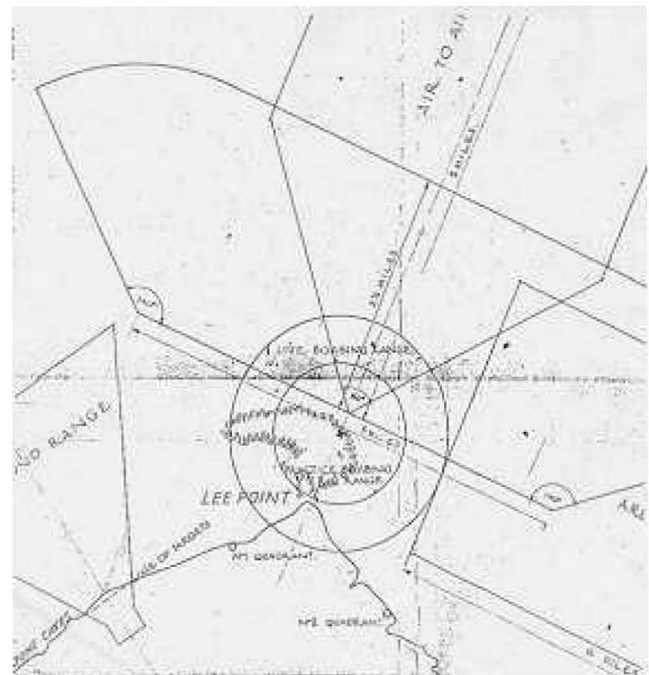


Figure 2 – RAAF Range Templates

Graham McKenzie Smith, in his book “Australia’s Forgotten Army Volume 2” included maps of the Darwin World War II Defence Plans, which show the location of units and defences at that time. The maps and diagrams do not delineate or indicate the presence of firing ranges or impact areas within the defended locality. His overview of the placement of a defensive line across Lee Point during World War II are included at figures 3 and 4. From the review, there is no doubt that Lee Point was a locality defended by fully armed and equipped troops awaiting a probable Japanese landing, particularly during 1942 as regular air raids were occurring on Darwin and surrounding areas.

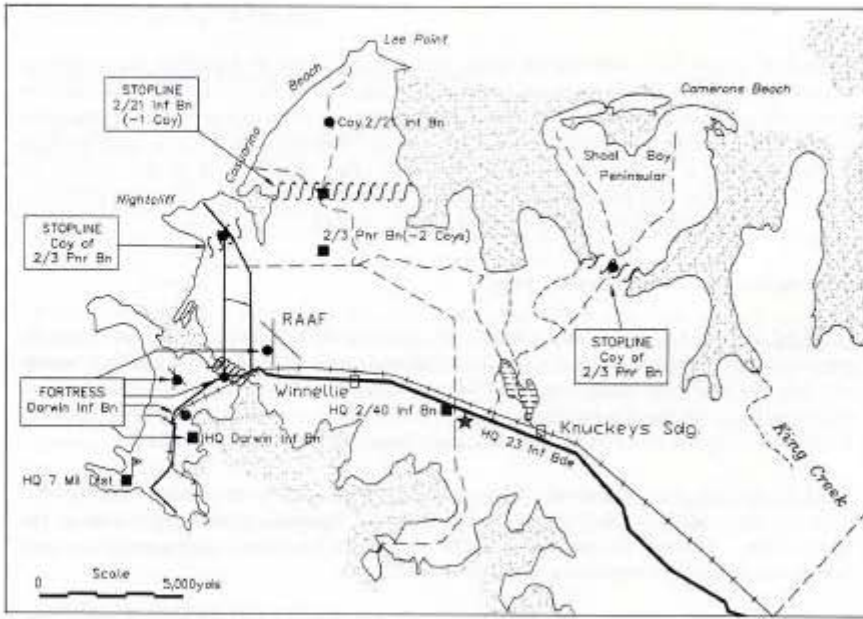


Figure 3 – Darwin Defence Plan  
 11 June 1941

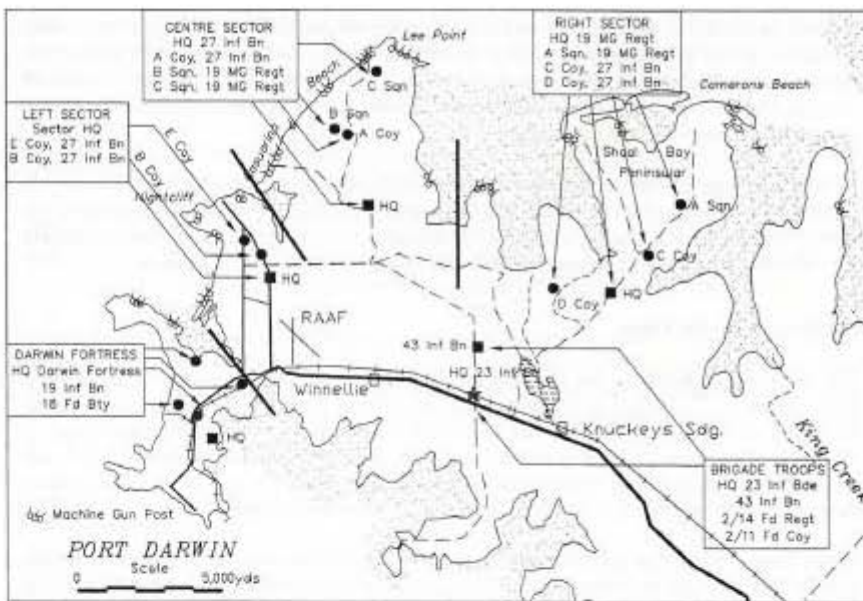


Figure 4 – Darwin Defence Plan  
 26 January 1942

Subsequent to World War II, Defence maintained its presence in the Lee Point area with the establishment of a new RAAF Firing Range in the adjacent Leanyer Swamp, to the east of Lee Point and RAAF communications presence on this Site.

Historical data indicates that Lee Point again became part of Darwin's defence plan during the Indonesian Confrontation of Malaysia "Konfrontasi" between 1963 and 1966, with the positioning of 40mm Light Anti-Aircraft Guns in the area, including at least one identified location within Lot 9774 to the immediate west of this Site.

It is also understood from the data reviewed that there is the potential for Bloodhound Surface to Air Missiles to have been deployed within this Site. The Bloodhound missile was introduced into Australian service in January 1961 with the establishment of No 30 Squadron RAAF, based at Williamstown, NSW. A detachment of 30 Squadron was deployed to Darwin in 1965 and remained there until the Bloodhound missile was declared obsolete and 30 Squadron was disbanded in November 1968.





Photograph 2. RAAF Bloodhound Missile and Launcher (*Photo - RAAF Museum, Point Cook*)

While the exact location of Bloodhound launchers has not been confirmed, it is not considered that this system would have any UXO implication for this Site, even if any had been stationed within it.

## 5.2 UXO Implications from Military History

From the historical information reviewed and the information held by the NUXOO, it does not appear that the Receiver Station Site has ever been used as an impact area for large calibre high explosive ordnance. Past military usage, however, would indicate that occupancy and other military activity within the area could leave a potential for misplaced, destroyed or discarded items of explosive ordnance from personal and crew served weapons to be remnant within the Site.

## 5.2 Other Historical Factors

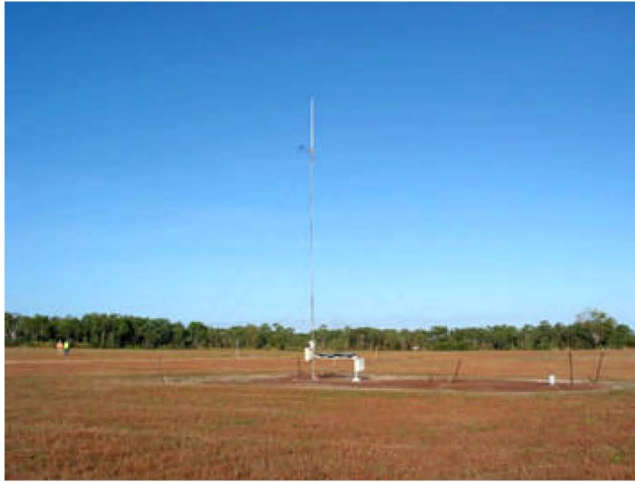
The northeast portion of the site has been subjected to a reasonably large amount of earthworks. It appears that the soil has been quarried and transported either to the remainder of this site and/or to other sites. This has resulted in a large number of earth mounds being remnant within this area. Some depressions have filled with water creating ponds.

The vegetation was removed in a 70-hectare portion of the north western sector to allow construction and operation of the Receiver Station site. This has operated from the time of RAAF occupation until the present day. While some of the aerials and antennae have been removed, the underground services to these facilities are still present.



Photograph 3. A dismantled antenna or aerial.

In addition a Weather Station is present on Site and is currently operational.



Photograph 4. Weather Station.

Dumping of unwanted building materials, vehicles and rubbish has occurred in portions of the Site.

The Site has been subjected to surveys, soil testing, historical research, as well as flora and fauna studies; these activities have involved a large number of people and, throughout these activities over a long period of time, no reports of UXO or items of military origin that may cause fear or alarm to the public have been recorded by the Department of Defence from within this Site.

### 5.3 Site Characteristics

The Site covers approximately 170 hectares and has a maximum length (North-South) of 1.63 kilometres and a maximum width (East-West) of 1.12 kilometres; it is bordered to the west by Lee Point Road, to the east by the Power and Water Facility, while Fitzmaurice Drive forms the southern boundary and a fence delineates the northern edge of the Site.

The Site slopes gently downwards in all directions from its highest point, which is in the vicinity of the Receiver Station. There is a low-lying swamp area in the north east. Other portions of the north eastern sector are low lying possibly due to quarrying activities. These low lying areas are at times inundated. There are no features that would be obvious visible targets and/or impact areas for weapon firing.

The eastern and southern portions of the site are heavily vegetated. The north western sector, which has been cleared of vegetation, is regularly slashed. Fire breaks have been established and maintained and the vegetation on site has been regularly burnt.



Photograph 5. Operator working in southern portion of site.

The natural soil is predominantly laterite based with some alluvial deposits in the low-lying areas, while the natural vegetation is a mix of eucalypt forest and turkey bush, interspersed with pandanus, cycads and palms.

## 6.0 ASSESSMENT METHODOLOGY

### 6.1 Preparation

During the preparation stage, a base map derived from information supplied by the client was prepared using MapInfo Graphical Information System (GIS). Search lanes at the specified spacing and appropriate control points were developed within the GIS and the survey program was fully planned. The base map was transferred into a Differential Global Positioning System (DGPS) for on-site use.

On deployment of personnel into Darwin, all staff were inducted for the task and communication and liaison protocols established. The DGPS base map was confirmed on the ground and equipment was tested.

### 6.2 Site Assessment

Assessment was conducted in a linear grid pattern by having trained Field Operators applying Minelab metal detectors over the individual lanes covering a swathe a minimum of 1 metre wide. Three lanes, spaced 20 metres apart, were searched simultaneously. Minelab metal detectors were selected for this assessment as the most appropriate tool for this soil type.

One field operator, using the DGPS for guidance, was positioned in front of one of the lanes and continuously recorded the position of this control lane. A map showing the position of recorded lanes is included at Appendix 3.

Three Field Operators, one 20 metres each side of the DGPS operator and one immediately behind the DGPS operator, simultaneously searched the three lanes. The northern portion of the site was searched in an east-west, west-east alignment and the southern portion was searched in a north-south, south-north alignment. The Minelab metal detector emits an aural cue to the operator in the presence of metal; each cue was isolated and investigated to confirm the identity of the metal. Significant (EO/military) items identified were recorded immediately into the DGPS Data Logger.



Photograph 6. Assessment Methodology.

### **6.3 Data Recording**

Search lane and finds data was stored in Trimble Data Logger utilising Asset Surveyor 5.22 software and subsequently transferred into GPS Pathfinder Office 2.80 where it was converted into Trimble Standard Survey Format (.ssf) files. These files were then exported utilising MapInfo Interchange Format (.mif) and imported into MapInfo Professional 6.5 where they were saved as MapInfo (.tab) files using MGA (GDA 94) Zone 56.

The Defence UXO Project Custom Symbol set was used to plot all ammunition related finds.

### **6.4 Search Quality Control**

Quality control checks performed during the assessment included:

- Supervision and spot-checking of operators.
- Testing detection equipment prior to work each day in accordance with the manufacturer's procedures.
- Use of DGPS to maintain spatial integrity.

### **6.5 Limits and Exclusions**

Search lanes were deviated around heavy vegetation and difficult terrain however, through on-site management, the efficacy and percentage of the sample survey was not diminished.

In some areas the vegetation, buildings and underground services hindered search and adjustment to lane locations was required.

Detection equipment was regularly rebalanced to compensate for the varying magnetic qualities of the soil.

## **7.0 EQUIPMENT**

### **7.1 Detection Equipment**

The detection equipment used during the operation were Minelab electromagnetic detectors. Technical specifications for this equipment are included at Appendix 4.



Photograph 7. Detector Operator using Minelab F1A4.



Photograph 8. DGPS in Operation.

## 7.2 Differential Global Positioning System (DGPS)

Spatial control and spatial accuracy was achieved through utilising a Trimble Pathfinder Pro XR (S) DGPS. This is a twelve channel integrated GPS which utilises differential corrections from RTCM beacon radio transmissions. Root mean square (RMS) accuracy with this system is better than 1 metre.

## 8.0 ASSESSMENT OF CONFIDENCE LEVELS

When an item of explosive ordnance (EO) such as an artillery projectile or mortar bomb functions components such as fuze and body fragments are scattered over a large area. These fragments can be either composed of ferrous or non-ferrous material. Some of these fragments will be buried and the remainder will be remnant on the surface. Usually more than one item of EO is fired into an area, and, with each additional fired item there is a proportional increase in the number of remnant fragments. Consequently the presence and number of fragments on or near the surface confirms that EO has functioned in the area and the quantity found indicates the usage rate. The higher the usage rate, the more likely it is that one or more items will have failed to function and that there will be remnant UXO.

To achieve the objectives of the assessment, UXO, EO or EO related material needed to be detected on or near the surface. Factors used to determine the confidence level included:

- Use of state of the art EM detectors that have the ability to detect ferrous and non-ferrous material.
- The detection equipment used during this task detected small ferrous and non-ferrous items to a depth of approximately 200 mm across the Site.
- The detection equipment performed within manufacturer specification during all daily tests.
- Ongoing supervision and QC checking revealed no faults in operator performance.
- DGPS position testing showed no degradation of positional accuracy within the task.

In view of the competence of the operators, the capabilities of the equipment, the results of regular equipment testing and the outcomes of QC checks, it is considered that search methodology applied to conduct assessment within this Site was appropriate and that a high confidence level was achieved.

## 9.0 RESULTS

### 9.1 Finds

No large calibre UXO or EO were found during the assessment. Twenty-five fragments from exploded artillery projectiles and three components of a functioned artillery fuze were found.



Photograph 9. Finds - Fragments from exploded military projectiles.



Photograph 10. Finds – Portions of projectile driving bands and components from functioned military fu zes.

Projectiles and cartridge cases from military and civilian small arms weapons were found evenly spread across the site.



Photograph 11. Finds – Military small arms ammunition (SAA) components found during the assessment.

The rusted remains of a military rifle, possibly of WWII vintage was found in the north east of the site.



Photograph 12. Rusted remains of a military rifle found in the north east corner of the site.

Steel pegs used to set up barbed wire structures during defensive operations were found over the site. This is consistent with known military activities that have occurred in this area.



Photograph 13. A selection of steel pegs found during the assessment.

A map showing the location of finds is at Appendix 5.



## 9.2 Analysis of Results

One of the fuze components identified is consistent with the characteristics of a time fuze used in 3.7 in high explosive (HE) anti-aircraft projectiles. The types of anti-aircraft projectiles to which these fuzes are attached are generally fired against aircraft and are designed to function on striking the target or at a predetermined time. This results in airbursts with fragments being scattered over a large area. The other two fuze components were unable to be positively identified.

The fragments are consistent with those likely to be formed when a projectile explodes. The condition of the fragments found prevents them from being further classified, for example as being from anti aircraft or land targeted artillery. The number and type of components from exploded artillery projectiles is very low and indicates that the site has not been used as an impact area.

The number of military small arms cartridges and components was low and indicates that the level of live firing of small arms weapons was potentially also low within the Site. Brass cartridge cases, however, are generally attractive to fossickers and other interested parties, as well as the general public, and can be easily transported off-site, leading to a potential distortion of assessment results.

The non-military SAA found during the assessment indicate legal or illegal civilian activities within the area, and are not considered relevant to the assessment of the Site for potential remnant UXO.

The majority of the site has been subjected to earthworks or other soil movement since the time of military use.

## 10.0 CONCLUSIONS

No large calibre or UXO or EO were found during this assessment.

The number of components of exploded artillery projectiles found during the assessment confirms the NUXOO information that the site was not an impact area for large calibre weapons, but that impact ranges existed around the Site.

The overall ordnance related findings across the Site generally conform to the known history of the Site.

The likelihood of UXO being remnant on site is considered negligible.

Remnant SAA and cartridge cases provide negligible safety hazard within the Site.

## 11.0 RECOMMENDATIONS

As a result of this UXO Assessment, it is recommended that no further UXO works be conducted within this Site.





## **APPENDIX 1**

### **SHORT CV – MAX VERRIER**



## SHORT CV MAX VERRIER

### Qualifications

Australian Army trained Ammunition Technical Officer (ATO) with various Australian and US EOD and IED qualifications including: theory of design with topics such as ballistics, chemical constituents and components; Depot operations in particular repair modification, testing, storage and transport; disposal by demolition burning and burial; Identification, hazards, safeguarding and disposal of military warlike chemicals. Short courses in Integrated Logistic Support, Accrual Accounting, Business Process Re-engineering, Hazard Analysis, Effects of Blast and Shockwave, OSHA 40 hour Occupational Health and Safety Course and a Northern Territory Shot Firers Licence for Military Ordnance.

### Fields of Special Competence

Project Management. Ammunition and Explosives - safety, repair, maintenance, management of storage and handling operations and procurement. Explosive Ordnance Disposal (EOD), Range Assessment and Clearance.

### Experience Summary

Mr Verrier has held ammunition and EOD positions at all levels within the Australian Army over 19 years. Within Australia, positions included Chief Ammunition Officer, Senior Ammunition Officer EOD, Instructor at the RAAOC Ammunition Centre, SATO Ammunition and Explosives procurement (\$70m Budget), Senior Ammunition Technical Adviser, In-service Surveillance and within the Defence UXO Project. In these positions he has been responsible for the development of ammunition, explosives and EOD policies, procedures and training at both regional and national levels. In addition to this considerable experience and training in Australia, Mr Verrier has attended EOD courses at the Naval EOD School, Indian Head, and the US Army Missile and Munition School and Centre, Huntsville, has qualified at the FBI IED course, Huntsville, qualified in Chemical Munitions Disposal at Huntsville, and has attended the RCMP IED course in Ottawa. Mr Verrier has also served, on secondment or exchange as an ATO with the Papua New Guinea Defence Force and the British Army.

Max joined ADI Limited in March 1995 as a Senior EOD Technician and transferred to Enterra in April 2000 with the purchase of the ADI Environment Division and became the Senior UXO Project Manager. G-tek Australia acquired the personnel and equipment from Enterra where Max is currently the Senior UXO Manager. Within these positions he has been responsible for UXO consultancy, assessment, clearance and hazard reduction operations. He has extensive experience gained from a wide range of tasks which includes tasks for the UN in East Timor, the Canadian Defence Force in Tracadie Canada and tasks throughout Australia. Max has provided UXO services to environmental assessment and audit tasks at current and former Defence facilities including Ashgrove, Canungra, Greenbank, Jennings, Mangalore, Marrangaroo, Myambat, Oakey, Richmond, Somerton, St Marys, Toowoomba and Werribee. Max has managed UXO assessment, hazard reduction operations and clearance tasks at: Noosa, Caloundra, Ravenshoe, Tinnaroo, Redbank, Clear Mountain, Rockhampton, Toowoomba, Wongle Pong, and Coomera in Queensland; Singleton, Holsworthy, Stockton Beach, Narrabeen, Albury in NSW; Portsea, Puckapunyal, Werribee and Epping in Victoria; Byford, Rockingham and Lancelin in WA; Wickham Point, Mt Bundy, Lee Point, Gove and Kangaroo Flats in NT. He was the safety manager for a major explosives demolition task at Woomera, SA and for a major UXO clearance task in Leanyer, NT where he also managed the demolition of UXO.

### Professional Affiliations

Member of the Institute of Explosives Engineers



## **APPENDIX 2**

### **AREA AND SITE MAPS**



UXO Assessment  
Receiver Station Site  
Lee Point, NT

### AREA MAP

Text and graphics are from  
data obtained during an operation  
by G-tek Australia Pty Limited

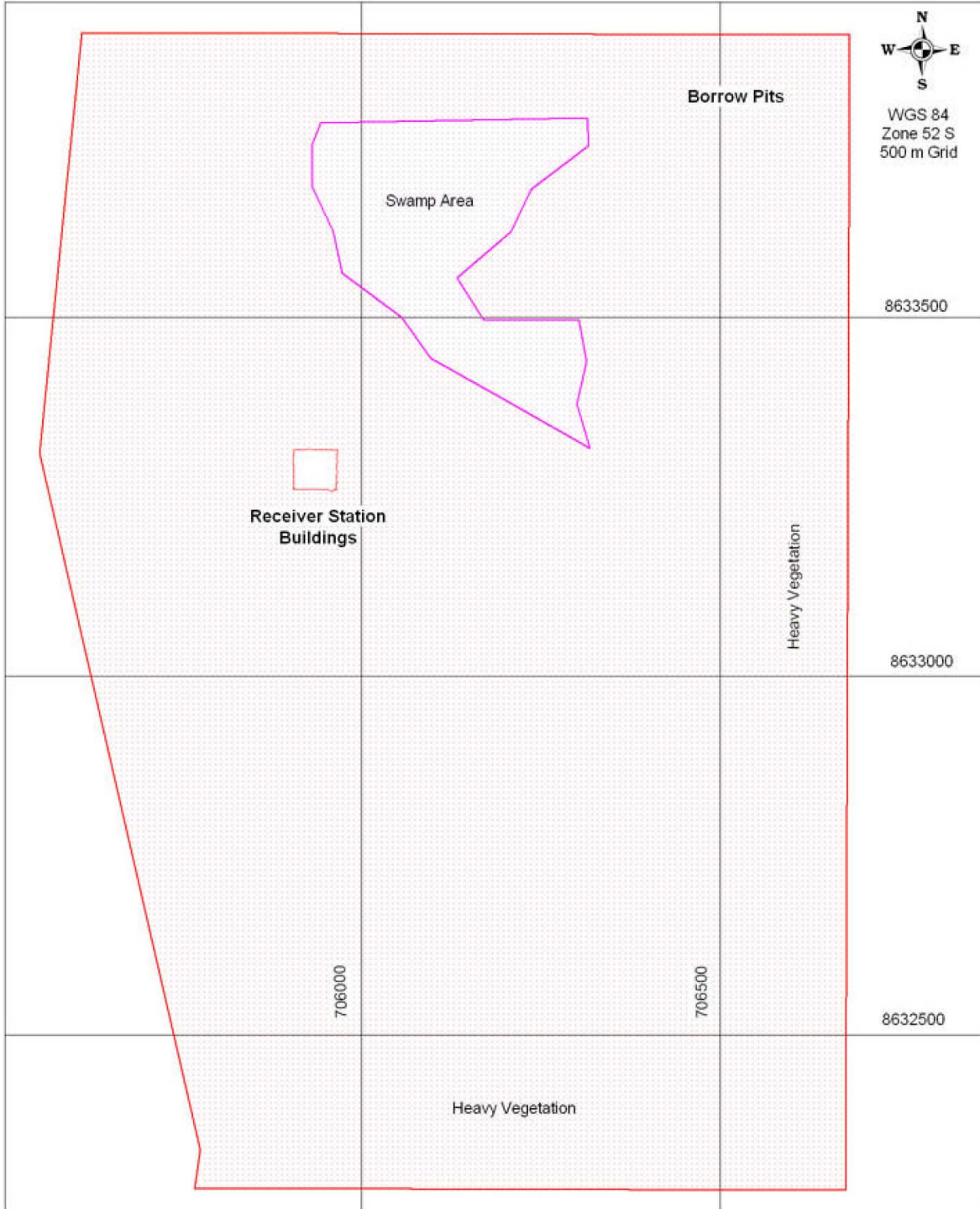




UXO Assessment  
Receiver Station Site  
Lee Point, NT

### SITE MAP

Text and graphics are from  
data obtained during an operation  
by G-tek Australia Pty Limited



 Receiver Station Site





## **APPENDIX 3**

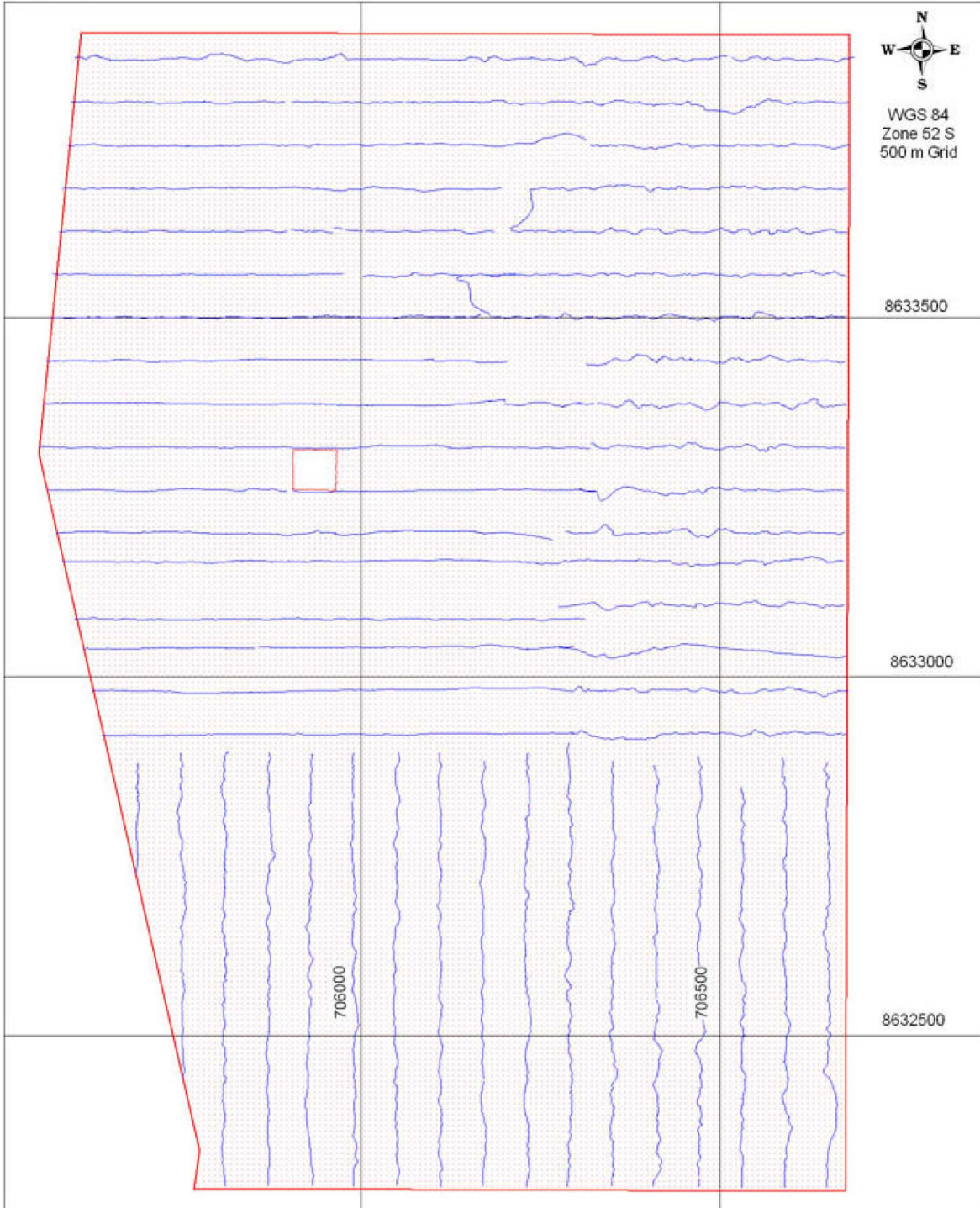
## **DGPS LINES**



UXO Assessment  
Receiver Station Site  
Lee Point, NT

### DGPS LINES

Text and graphics are from  
data obtained during an operation  
by G-tek Australia Pty Limited





## **APPENDIX 4**

# **DETECTION EQUIPMENT SPECIFICATIONS**





Frequency - Sinewave Transmission	Multi-period sensing
Search Modes	Motion
Controls	Ground Balance Noise Cancel Audio Reset On/Off
Search coils	Size – 200 mm Windings - Double D Weight - 475 gm Interchangeable - Yes Cable length - 1.2m
Audio output	Speaker - 51 mm Headphone jack
Power source	4 x D Cells
Battery low alert	Automatic
Weight	
Complete (excluding batteries)	3094 g
Control Box (excluding batteries)	1073 g
Shaft and search coil	890 g
Length - extended	1200 mm (min) 1450 mm (max)
- un- assembled	710 mm
NATO Stock Number	Awaiting Information



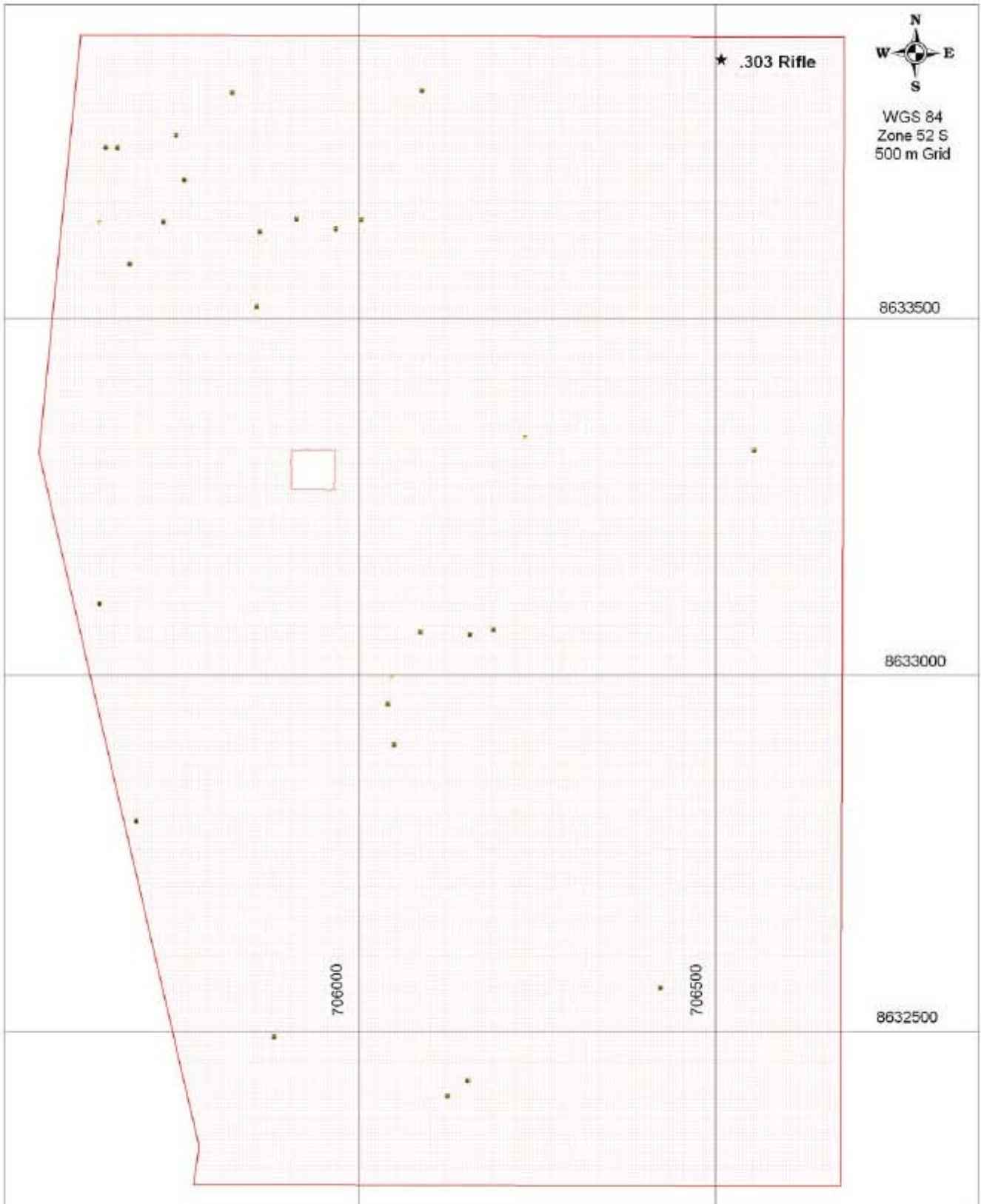
Weight	Complete (excluding battery) 1620g Control Box (excluding battery) 620g Shaft and search coil 925g
Frequency - VLF search	9.825 kHz
Ground Rejection	Automatic with no loss of sensitivity in all modes Tracking ground balance, Motion with threshold, Fixed ground balance, Non-motion with threshold
Search Modes	Threshold adjustment (tuning)
Controls	Normal/Difficult Volume Ground Balance
Search coil	Type - Double D Size (diameter) - 230mm (8in) Weight - 475g Interchangeable - Yes Cable length - 1.3m
Audio output	Audio Booster Speaker 51mm (2in) Headphone jack 1/4in, 8 ohms, stereo/mono Tone - preset
Power source	8 x AA penlight batteries Life - Alkaline - 35 - 5- hrs approx Rechargeable NiCads 5 - 8 hrs approx
Battery low alert	Automatic
Length	Extended - 1350mm (53in) Un-assembled - 840mm (33in)



## **APPENDIX 5**

### **FINDS**

# FINDS MAP



- Fragment from an Artillery Projectile
- Fuze Component