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ASBESTOS ASSESSMENT AND PRELIMINARY MANAGEMENT PLAN – WEDGE AND GREY SETTLEMENTS, SHIRE OF DANDARAGAN



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GLOSSARY OF TERMS

ACM	Asbestos-containing material
AF	Asbestos Fines (soils assessments as per DoH, 2009) - includes free asbestos fibres, small fibre bundles and also ACM fragments that can pass through a 7 mm x 7 mm sieve
FA	Fibrous Asbestos (soils assessments as per DoH, 2009) - includes friable asbestos materials, such as severely weathered or disturbed ACM and asbestos in the form of loose fibrous material such as insulation products. Friable asbestos is in a condition such that it can be broken or crumbled by hand pressure.
ARCP	Asbestos Removal Control Plan
Asbestos	The asbestiform varieties of mineral silicates belonging to the serpentine or amphibole groups of rock-forming minerals, including actinolite, grunerite (or amosite) (brown asbestos), anthophyllite, chrysotile (white asbestos), crocidolite (blue asbestos) and tremolite.
Asbestos-containing material	Any material, object, product or debris that contains asbestos.
Asbestos dust	airborne dust consisting of or containing a time-weighted average fibre concentration of asbestos that is in excess of the exposure standard when measured in accordance with the Guidance Note on the Membrane Filter Method for Estimating Airborne Asbestos Fibres 2 nd Edition [NOHSC:3003 (2005)]
Asbestos removal license	restricted license means a restricted asbestos license granted under regulation 5.45B for work with non-friable ACM in quantities >10m ² unrestricted license means an unrestricted asbestos license granted under regulation 5.45A for work with all ACM including friable.
CEO	The chief executive officer of the Department of the Public Service of the State through which the <i>Environmental Protection Act</i> is administered
DER	Department of Environment Regulation, Western Australia
DOH	Department of Health, Western Australia
Parks and Wildlife	Department of Parks and Wildlife, Western Australia
f/mL	Fibres per milliliter of air
Friable asbestos	Asbestos-containing material which when dry, is in a crumbled, pulverised or powder form, or can be crumbled, pulverised or reduced to powder by hand pressure.
Non-friable asbestos	asbestos-containing material that is not friable asbestos-containing material;
ha	Hectares
NOHSC	National Occupational Health and Safety Commission (reformed as the Australian Safety and Compensation Council, then Safe Work Australia).
NATA	National Association of Testing Authorities, Australia
PPE/RPE	Personal/Respiratory Protection Equipment
QC	Quality Control
SWP	Safe Work Procedure

EXECUTIVE SUMMARY

Aurora Environmental (Aurora) was commissioned by the Department of Parks and Wildlife (Parks and Wildlife) to develop an asbestos management plan (AMP) for Wedge and Grey Crown Reserves (Reserve 43283 and 43284 respectively). Both reserves are currently managed by Parks and Wildlife on behalf of the State Government and contain 409 Licenced shack sites which are currently occupied and used in the main for holiday purposes. There are 463 buildings associated with the shacks and a total of 496 former and current shack sites were to be investigated. The shacks are constructed of various and often recycled materials and some date back to the 1950's. Both Wedge and Grey settlements are known to have building elements of shacks and outbuildings which contain asbestos. However no previous detailed assessment had been conducted into asbestos-containing materials throughout all sites and shacks.

Also on the basis of information indicating that a potential health risk pathway existed at the Wedge and Grey sites via inhalation and ingestion of asbestos, the sites were reported under Section 11 of the *Contaminated Sites Act 2003* (WA) to the Department of Environment and Conservation (DEC). As a consequence, the DEC classified the sites as being 'Possibly Contaminated - Investigation Required' in December 2009.

Asbestos is a carcinogen (cancer causing) and as such requirements for its use are extensively regulated in Western Australia in the form of legislation and guidance for both workplaces and generally.

In order to develop the AMP an asbestos register was produced following a site assessment and laboratory analysis of samples taken. A total of 490 sites (including former and current shack sites) were inspected by Aurora with the remaining six sites being inaccessible. Asbestos-containing material (ACM) was identified or suspected at 259 of the sites. A total of 854 products were confirmed or suspected as containing ACM with a total quantity of confirmed or suspected ACM exceeding an estimated 7000m². Only 17 shacks were accessed internally with 11 found to contain ACM and therefore it is assumed that the above numbers would increase significantly if all shacks were inspected internally.

A range of ACM was identified including friable materials but predominantly non-friable (bonded) ACM. As a result the risk of fibre release from the ACM identified ranged from very low to high but with only 10 materials out of a total 854 assessed as having a high fibre release potential, with 4 potentially being routinely accessible. Additionally, over 400 ACM items were assessed as having a moderate fibre release potential, many of which were instances of asbestos cement debris, and 25 being in locations which are likely to be routinely accessed.

A preliminary asbestos in soil assessment, conducted during the survey of ACM at shack and tip sites, revealed that 206 shack locations were found to have ACM debris with a total number of records on the asbestos register relating to potential asbestos in soil. Also analysis of a limited number of soil samples showed the presence of asbestos fines in soil. A preliminary risk assessment showed that a potentially unacceptable health risk was identified in relation to asbestos in soils. However further assessment is recommended to fully understand the risk profile as this was not part of the current scope.

Personal airborne fibre monitoring conducted during the asbestos survey work at Wedge and Grey settlements gave results for all monitoring events which were below the detectable limit of the

analysis method and therefore well below the exposure standard for airborne asbestos fibres. However the monitoring conducted consisted of a relatively small number of samples in an occupational setting during Autumn/Winter and therefore may not be representative of general public health risk, although this is likely to be very low.

There are legal obligations for the identification, treatment and management of asbestos-containing materials for workplaces and generally for the protection of public health. The Code of Practice for the Management and Control of Asbestos in Workplaces [NOHSC: 2018 (2005)], sets out what should be included in an asbestos management plan.

It is recommended that Parks and Wildlife develop an implementation plan which addresses the following recommendations in addition to the elements of the preliminary asbestos management plan as detailed in section 7.

Based on the findings of the asbestos assessment, the preliminary asbestos in soils assessment and the rationale for the treatment of ACM contained in the report; the following recommendations are made for consideration:

1. All known or potential friable ACM should be removed, by an asbestos removalist holding a current unrestricted asbestos removal licence, with a priority allocated to those materials with the highest fibre release potential and in most regularly accessible locations;
2. Asbestos cement debris should be targeted for removal with the asbestos register used to assist in prioritisation on the basis of accessibility of ACM and its condition;
3. Removing ACM in 1 and 2 above removes all materials in the category of 'high fibre release potential' within the register (apart from gutter and tank deposits and asbestos fines in soil). Materials in the 'moderate fibre release potential' category should then be considered for removal in priority of accessibility and then condition. This process should be repeated until the next review of the register and then reassessed in order to determine whether further actions are required;
4. Guidance material should be provided to shack owners in relation to the risks associated with ACM along with its assessment, safe treatment, removal and disposal. Some good guidance documents and fact sheets available from the Department of Health are recommended in addition to the preparation of new guidance developed specifically to address the ACM and its inherent risk at Wedge and Grey settlements;
5. All stored or disused asbestos products should be removed from in and around shacks, such as stored asbestos cement panels, old electrical mounting boards, soak wells etc.;
6. Unsealed asbestos cement materials internal to shacks should be considered for sealing or painting, particularly if not in good condition or have exposed broken edges;
7. Asbestos roofs should be removed if in poor condition and if not in poor condition either be removed or have gutters installed to deliver water to tanks or soak wells and not cause a drip line with the potential for asbestos fibres to impact adjacent soils;
8. Shacks in the possession of Parks and Wildlife and confirmed as containing ACM should be considered for removal to reduce the likelihood of ACM becoming a health risk as a result of further degradation or vandalism;

9. Where dismantling or removal of shacks is to be carried out, either all fibre cement materials should be suspected as containing asbestos or individually sampled and analysed for confirmation (due to the limitations of the survey methodology described in Section 4.1). Also once shacks have been removed, the soils in the vicinity of the shack should be validated (by a competent and experienced person) as being free of visible asbestos impacts;
10. In accordance with the Health (Asbestos) Regulations, 1992, reasonable precautions must be taken to prevent asbestos fibres entering the atmosphere whilst handling asbestos-containing material. Also asbestos removal from workplaces must be conducted in accordance with the Code of Practice for the Safe Removal of Asbestos, 2nd Edition [NOHSC:2002(2005)] and by the following licensed removalists;
 - I. An *Unrestricted* or *Restricted* removal license - where more than 10m² of non-friable asbestos is to be removed;
 - II. An *Unrestricted* removal license - where friable ACM is to be removed;
11. All removed ACM must be wrapped and disposed of in accordance with legislative requirements and at a facility which is licensed to accept asbestos waste;
12. Positional occupational airborne fibre monitoring in selected shacks should be considered to assist in the assessment of risk during their occupancy;
13. Additional personal airborne fibre monitoring should be conducted in dry conditions on personnel working in close proximity to shacks or other areas where ACM may be prevalent;
14. Signage should be positioned to warn occupants and visitors to the reserves of the potential to come into contact with ACM and advise not to disturb it;
15. Shack owners should be advised to independently have an internal inspection, by a competent asbestos surveyor, of their individual buildings as it is expected that many more ACM will be identified, some of which will potentially be friable;
16. Conduct regular Emu picking (including raking) programmes to reduce the overall amount of ACM on surface soils, prioritising high access/trafficked areas; and
17. Conduct a detailed site assessment of asbestos impacts in soils to improve confidence in determining final remedial measures.

1 INTRODUCTION

1.1 BACKGROUND

The recreational shacks at the Wedge and Grey settlements are located approximately 150 km and 170 km north of Perth, respectively (Figure 1). The shacks are located on two Crown Reserves; Reserve 43283 (Wedge) and Reserve 43284 (Grey) which are currently managed by the Department of Parks and Wildlife (Parks and Wildlife) on behalf of the State Government.

The first shacks at Wedge and Grey were developed by fishermen and pastoralists in the 1950's. Additional shacks were developed over time for recreational use in an unplanned and unmanaged manner using a range of recycled, reused and repurposed building materials. Most of the shack settlements along the Midwest coastline were removed during the 1990's with the Wedge and Grey settlements remaining under temporary leasing arrangements.

On the basis of information indicating that a potential health risk pathway existed at the Wedge and Grey sites via inhalation and ingestion of asbestos the sites were reported under Section 11 of the *Contaminated Sites Act 2003* (WA) to the Department of Environment and Conservation (DEC). As a consequence, the DEC classified the sites as being 'Possibly Contaminated - Investigation Required' in December 2009.

An application by the DEC Moora District Office in 2012 was successful in obtaining funding from the Contaminated Sites Management Account (CSMA) with the funds to initially be used to undertake a preliminary site investigation (PSI) of suspected contaminated sites at the Wedge and Grey settlements. Funding was primarily to be applied to undertaking initial groundwater investigations on the down gradient impact of areas used for waste disposal and landfill purposes. A PSI report was completed by GHD in 2013 which detected low levels of heavy metal contamination that slightly exceeded the relevant groundwater investigations levels. The PSI recommended that a second phase of groundwater investigations be undertaken, including installation of bores within the areas occupied by shacks. However, on the basis of PSI results and following advice from the Department of Environment Regulation (DER; formerly DEC) it was considered that the residual funds were inadequate to conduct the recommended investigations and that no further groundwater investigation be undertaken as it was not a priority.

As part of ongoing planning and assessment by the State Government in June 2014, Parks and Wildlife prepared the Wedge and Grey Preliminary Planning Report to the Minister for Environment detailing the current opportunities and constraints associated with the use of the Reserves. Amongst the (numerous) constraints requiring assessment and management, is the potential health issue related to the presence of asbestos-containing materials (ACM) used in the development of the shacks.

1.2 SCOPE OF WORK

Aurora Environmental was engaged by Parks and Wildlife to develop an asbestos management plan (AMP) for Wedge and Grey reserves (the site) in consultation with relevant state and local government bodies. In brief the scope required Aurora to identify ACM on site, assess asbestos risk in buildings and structures in addition to a preliminary assessment into potential asbestos in soil impacts at the site, and then provide direction and guidance to mitigate the associated health risk.

A desk top study and provision of a draft investigation report which addresses the current classification for the Wedge and Grey reserves under Section 15 of the *Contaminated Sites Act, 2003* was also required.

The report was to be delivered as a draft for consultation with relevant state and local government bodies with feedback to be included in the final report.

1.3 THE SITE

The Wedge reserve covers an area of approximately 213ha and contains 361 shack sites in addition to two tip sites; an expired tip site in one location and a waste transfer station at another location. A heritage site, which is contained within the Wedge Settlement, does not have any shacks located in it but there are at least 3 separate locations where illegal dumping of asbestos cement sheeting has occurred. Figure 2 - Wedge settlement.

The Grey settlement covers an area of approximately 193ha and contains 135 shacks in addition to one expired tip site which also contains the waste transfer station. Figure 3 – Grey Settlement.

Both reserves are currently managed by Parks and Wildlife on behalf of the State Government and contain 409 Licenced shack sites which are currently occupied and used in the main for holiday purposes. There are 463 buildings associated with the shacks and a total of 496 former and current shack sites were to be investigated. The shacks are constructed of various and often recycled building materials which were cheap and easily transportable on the original rough four-wheel drive tracks. Wooden and metal structures are typically clad with either metal, wood or fibre cement materials using basic building techniques and some date back to the 1950's.

Both Wedge and Grey settlements are known to have building elements of shacks and outbuildings which contain asbestos. Many shacks have water catchment facilities as roof run-off and many have battery power supplies. Most shacks are locked when not in use and some are also secured with fencing.

1.4 STUDY TEAM

The project team included senior personnel from two of Aurora's technical groups; Colin Outhwaite, Manager - OHS Group, Greg Milner, Manager - Contaminated Sites Group, and Brad Dermody, Senior Environmental Scientist. Whilst the scope of services most substantially involved an asbestos survey of shacks and related structures, a preliminary assessment of potential asbestos in soil impacts was also intended and therefore the project warranted expertise from both technical areas. The main site assessment was conducted by personnel from Aurora's Inspection Body which is accredited to ISO/IEC: 17020¹ by NATA² for asbestos surveys.

1.5 SITE ASSESSMENTS

Site visits conducted as part of this project included the following:

- Initial one day tour of Wedge and Grey and key stakeholder engagement, attended by two senior project staff from Aurora;

¹ ISO/IEC 17020 Conformity assessment -- Requirements for the operation of various types of bodies performing inspection

² National Association of Testing Authorities, Australia

- Heritage site visit on 25th May 2015, attended by two asbestos surveyors from Aurora – to inspect three areas of asbestos dumping;
- Asbestos survey and preliminary soil impact assessment of all shacks from 31st May to 30th June 2015, attended by two asbestos surveyors and one environmental scientist from Aurora.

1.6 ACCESS RESTRICTIONS

During the site assessments the following access restrictions may have impacted on the completeness of the investigation in terms of locating all potential ACM on site:

- No access to the internals of most shacks due to absence of owners or refusal of entry;
- Potential concealed situations which could not be accessed whilst employing non-destructive survey techniques;
- A number of shacks were not accessed during the survey due to the following:
 - Wedge 172, 222, 223 and 227 - access prevented by locked gates or overgrown vegetation;
 - Wedge 48 - refused access by shack owner;
 - Wedge 336 – not located by Aurora’s surveyor (appears to be a small outbuilding according to the satellite image).
- No excavation or raking of surface soils was conducted at this preliminary stage and therefore buried ACM would not be detected;
- Close inspection of many areas of surface soils was made difficult due to the density of the coastal heath vegetation in close proximity to many shacks;
- The assessment of surface soils was limited to the immediate 10m radius to shack locations and tip sites.

2 DESK TOP REVIEW

To assist with the overall assessment and allow for the consideration of other information that maybe relevant a review of documentation made available by Parks and Wildlife was undertaken. The desktop review was restricted to the following documents provided to Aurora:

- Report to Steve Meyerkort (Parks and Wildlife) from Wayne Jolley (Building Surveyor/Environmental Health Officer) with subject line 'Assessment of Shacks at Wedge Settlement', 15th February 2015;
- Summary table for Wedge and Grey asbestos investigation and management – Parks and Wildlife File 2007/000549-1 and 2007/000549-2;
- Sandy Cape Asbestos Management Plan prepared by Shire of Dandaragan, 2012; and
- Wedge and Grey Preliminary Planning Report (June 2014) prepared by Parks and Wildlife as a Report to the Minister for Environment.

Salient information from these documents relating to the presence, distribution, access to and management of asbestos at the settlements are summarised below. It should be noted that the information contained in the following subsections has been reproduced from the above documents supplied to Aurora and is not based on, nor does it necessarily concur with, Aurora's findings which are detailed subsequent sections.

2.1 ASSESSMENT OF SHACKS AT WEDGE SETTLEMENT

- Shacks located along the oceanfront are affected by ocean surges and flooding. Shacks in low lying areas are prone to flooding from heavy rainfall and ocean surges during winter.
- Shacks located in the eastern portion of the settlement are in a significant bushfire risk area. A Fire Management Plan has been developed and is currently being implemented.
- Majority of drinking water supplied via roof runoff into rainwater tanks.
- During preliminary inspection of buildings there was at least one occasion where roof and wall cladding was likely to contain asbestos fibre.

2.2 SUMMARY TABLE FOR WEDGE AND GREY ASBESTOS INVESTIGATION AND MANAGEMENT

- September 2009: The DER Contaminated Sites Branch (CSB) advised DoH of ACM found at Wedge and Grey. A system of recycling ACM is evident at Grey. The CSB suggested that DoH further investigate and take appropriate action under the Health (Asbestos) Regulations 1992.
- RPS provided the DER with a final report on Wedge Metal Dump. This report recommended three options for remediation of existing stockpiles of waste materials. Report also states that there is evidence of fragments and small stockpiles of ACM. Weathered fragments of ACM have been found in soil and will continue to deteriorate and have the potential to impact on the reserve, residents and visitors through inhalation.
- The CSB prepared a report on Wedge reserve and a report on Grey reserve following site inspection on 20 August 2009. CSB suggested Wedge and Grey be reported as suspected contaminated sites in accordance with section 11 of the *Contaminated Sites Act* 2003. The

CSB identified that a health risk pathway exists via inhalation of asbestos, with a medium to high risk and potential for exposure to people camping in shacks.

- December 2009 – CSB notifies DER Moora District that Wedge and Grey are known or suspected contaminated sites under Section 15 of the *Contaminated Sites Act 2003* and classified as ‘Possibly Contaminated – Investigation Required’.
- May 2012 – \$100,000 grant from Contaminated Sites Management Account (CSMA) to conduct a PSI at Wedge and Grey obtained by the DER’s Moora District. The funding was to for undertaking an ‘initial groundwater investigation on the down gradient impact of areas used for waste disposal and landfill purposes’.
- Dec 2012 – advice from the DER CSB:
 - The condition of shacks and the materials they are made of (i.e. asbestos) are ‘not of concern to CSB, as the *Contaminated Sites Act 2003* excludes materials used in buildings and structures from the definition of contaminated’.
 - Therefore asbestos in existing buildings is not the subject of the CSMA funding.
- June 13: GHD undertook a PSI for potential water contamination only.

2.3 SANDY CAPE ASBESTOS MANAGEMENT PLAN (SHIRE OF DANDARAGAN)

- Former shacks were constructed of asbestos and after their removal ACM was found in area.
- Shacks were demolished and two lined burial rubbish sites were used to store waste ACM in area.
- There is an annual inspection process to count amount of ACM at camp sites and to record the condition, size, condition & likelihood of disturbance.

2.4 WEDGE AND GREY – PRELIMINARY PLANNING REPORT, 2014

- There are 331 shacks at Wedge and 127 shacks at Grey (with shacks estimated to have been constructed between the 1950’s and 1990’s).
- All shacks were constructed in an uncontrolled setting, material transported along 4WD tracks. Recycled and reused materials were used.
- Planning has progressive with management zones/ prescriptions that identify and delineate areas for potential shack retention, environmental and cultural protection, recreation and tourism development areas with physical site development constraints.
- Large volumes of waste which have been covered by shifting sands including asbestos waste and potentially uncontrolled shack refuse and waste at informal waste disposal areas.
- Report states that further technical assessments and remedial action will be required before any further development occurs at the sites to avoid potential health risks to the public as well as potential liabilities to the State. The cost of undertaking this work is potentially very large and may present a significant impediment to any development of the sites.

3 ASBESTOS - HEALTH RISK

Asbestos is the term given to a group of naturally occurring mineral silicates which are prevalent in the earth's crust, are composed of fibres that do not readily break down within the human body and are resistant to fire and chemical corrosion. These include chrysotile (white asbestos), amosite (or grunerite) (brown asbestos), crocidolite (blue asbestos), anthophyllite, tremolite and actinolite. Chrysotile, amosite and crocidolite are the three main types encountered in other than naturally occurring situations due to their widespread extraction and production, and use in a wide variety of products throughout the world. Until the mid-1980's Australia was a producer of asbestos and one of the world's highest users per capita of asbestos.

Asbestos-containing materials (ACM) were used extensively in Australia due to their qualities of durability, and fire and chemical resistance. Examples of ACM include thermal insulation, floor coverings, wall and roof sheeting, brake linings, textiles, electrical mounting boards, oven door seals, fire proofing, pipes, lagging and many others.

Asbestos is a known carcinogen (cancer causing agent); inhaling asbestos fibres may cause asbestos-related disease and death. The human health effects from exposure to asbestos are well documented and therefore not reproduced in detail in this report. In brief, however, the risk of developing asbestos-related diseases, such as mesothelioma or lung cancer, from exposure to airborne asbestos fibres is known to be associated with the level and duration of exposure, length of time since first exposure, the fibre type, and also concurrent exposure to tobacco smoke. Not all factors are well understood, and it is not yet known why some people develop an asbestos-related disease and others, having experienced apparently similar exposures, do not. However, the risk increases with increased exposure to airborne asbestos fibres in what is termed a dose-response relationship.

The general population is exposed to very low 'background' levels of airborne asbestos fibres contained in ambient air. Many people are also exposed to higher levels of asbestos at some time in their lives; for example, in their workplace, community or home. For most people, this kind of infrequent exposure is also unlikely to result in any ill effects. However Australia has one of the highest incidence rates of malignant mesothelioma which has been linked to both occupational and non-occupational exposures. All exposures should, therefore, be avoided where possible.

Whilst asbestos fibres can cause cancer when inhaled, there is currently no evidence that asbestos fibres present in drinking water cause cancer when ingested³. Similarly inhalation of aerosols from such as showers or irrigation systems are unlikely to present a risk from asbestos in water.

3.1 ACM – FIBRE RELEASE POTENTIAL

For there to be a health risk from asbestos, respirable fibres i.e. those small enough to enter and be retained in the lungs, must be released from the material containing asbestos, become airborne and be inhaled. The potential for an ACM to release fibres depends on a number of material properties such as asbestos content, the type of matrix used for binding the fibres together, how the exposed surface of the material is sealed and its condition. An asbestos-containing material's friability, which is related to all of these properties, is a term used to describe the potential for such material to release fibres.

³ Australian Drinking Water Guidelines 6, 2011, version 3.1 March 2015, Australian Government

Friable ACM is defined⁴ as:

Any asbestos-containing material that, when dry:

- Is in a crumbled, pulverised or powder form; or
- Can be crumbled, pulverised or reduced to powder by hand pressure.

Friable products, such as thermal or acoustic insulation, usually have a high asbestos content (usually greater than ~30% and up to 100% w/w) and will readily release fibres upon minimal disturbance. Conversely non-friable products often have a much lower asbestos content (mostly less than ~15% w/w) with the fibres bound within a matrix of some other material such as vinyl tiles, bitumen based products and fibre cement and are often referred to as 'bonded' ACM.

Some products such as asbestos textiles and gaskets maybe non-friable or friable depending on their asbestos content and condition. This is also applicable to asbestos cement products which, when in good or average condition, are non-friable (or bonded) materials, but when heavily weathered or fire damaged to the point where the matrix which binds the fibres breaks down or erodes; then the material becomes friable.

Friable asbestos products have been commonly used in commercial and industrial settings since the late 1800's for fireproofing, soundproofing and insulation. Some friable products were also used in houses.

In Australia, asbestos cement materials were first manufactured in the 1920's and were commonly used in the manufacture of residential building materials from the mid-1940's until the late 1980's. Many residential properties built before 1990 therefore contain ACM. During the 1980's asbestos cement materials were phased out in favour of asbestos-free products. From 31 December 2003, the total ban on manufacture, use, reuse, import, transport, storage or sale of all forms of asbestos came into force.

Materials used for the construction of shacks and associated structures would have been sourced or recycled from products used in residential, commercial and industrial settings and therefore the occurrence of ACM is expected. It also follows that, particularly in relation to fibre cement materials such as flat and corrugated sheets; many instances of non-asbestos building materials are expected due to construction of shacks or extensions and refurbishment carried out after the late 1980's.

⁴ Regulation 5.42(1) - Occupational Safety and Health Regulations 1996, Government of Western Australia

4 ASBESTOS SURVEY – BUILDINGS AND STRUCTURES

The asbestos survey involved a site assessment for the presence of ACM including collection and analysis of a number of samples from suspect materials. Also the assessment of a number of properties associated with the materials inspected, was conducted, for the purpose of assessing the potential for fibre release. A preliminary assessment of potential asbestos in soils impacts was also undertaken as described in Section 5.

Representative personal airborne fibre monitoring was conducted during the site assessment as a value-add to the project and discussed in section 4.4.

4.1 SITE ASSESSMENT METHODOLOGY

The site assessment involved an onsite inspection looking for the presence of ACM in an around shacks and associated outbuildings. Suspect materials were identified through visual recognition by experienced and qualified asbestos surveyors and, where necessary, sampled for analysis. Samples collected were representative of the material sampled, individually identified, transported under chain of custody procedures and analysed at a laboratory which is accredited by NATA for the analysis method.

Samples were taken at situations known, or suspected, to contain asbestos provided that such sampling didn't compromise the purpose of the material or increase its risk of future fibre release.

Sampling was undertaken on a limited representative basis. For example, the sampling of only a limited number of wall panels of the same type was undertaken in order to minimise analysis costs (i.e. not every 'matching' wall panel throughout the site was sampled). Sample collection was performed in a non-destructive and non-invasive manner by competent persons. Following the sampling of a particular material type, visibly same materials as those sampled but identified in other locations were recorded as being suspected to be the same material by referencing the relevant sample number. This method is commonly used during asbestos surveys as a means of restricting sample numbers and therefore cost but relies on the experience of the surveyor in the absence of confirmative sample analysis.

It should be noted that there is an inevitable margin of error with the methodology of referencing samples which have been analysed to other materials which haven't been analysed. For this reason such items are indicated in the register as 'suspect asbestos' or 'suspect non-asbestos' and it is recommended to conduct confirmatory sampling should items be planned for disturbance.

An assessment of materials was conducted on the basis of the condition, type and location of the materials at the time of inspection. As non-intrusive survey techniques were employed, which is the standard methodology for occupied premises, it is possible that further ACM may be revealed during demolition or refurbishment as areas which were concealed at the time of the assessment become accessible. This point is particularly relevant where the internal rooms of shacks could not be accessed.

The assessment was conducted in accordance with Aurora's NATA accredited procedures and in accordance with the Code of Practice for the Management and Control of Asbestos in the Workplace [NOHSC: 2018 (2005)];

4.2 ASBESTOS REGISTER DEVELOPMENT METHODOLOGY

The following risk algorithm has been used in the investigation, including site observations and sample analysis results, and transferred into the asbestos register in order to assess the fibre release potential associated with individual ACM identified.

The risk algorithm is based on the one described in HSG 64⁵ and allows for a quantitative material assessment which can then be used in the assessment of health risk. A number of variables are used in this risk algorithm which are related to the properties of the ACM assessed at the time of the inspection. In addition to the material property variables, an assessment based on Aurora’s understanding of the occupancy of the location where the material is situated, has been included. Tables 1 – 6 below list the variables and scoring system used.

4.2.1 Material Assessment

TABLE 1: ASBESTOS FIBRE TYPE

	Score	Description Examples
Asbestos Fibre Type	1	Chrysotile only
	2	Includes Amosite
	3	Includes Crocidolite

TABLE 2: SURFACE PROPERTIES

	Score	Description Examples
Surface Properties	0	Composite materials (e.g., vinyl floor coverings, reinforced plastics, bitumen products, mastics & resins)
	1	Enclosed friable material/thermal insulation, sealed low density board/millboard, asbestos cement in good condition
	2	Unsealed low density board/millboard, gaskets, deteriorated asbestos cement
	3	Unsealed friable material/thermal insulation

TABLE 3: PRODUCT TYPE

	Score	Description Examples
Product Type	1	Composite materials, asbestos cement
	2	Lower density ACM (e.g. millboard, woven textiles, gaskets, ropes, paper and felts) and gutter deposits, originally bonded but matrix compromised, AF in soil
	3	Thermal insulation, lagging, sprayed coatings, asbestos mattresses and packing, loose asbestos, FA in soil

⁵ Asbestos: The Survey Guide (HSG264), Health and Safety Executive, UK

TABLE 4: CONDITION

	Score	Description Examples
Condition	0	No visible damage/deterioration. Good condition.
	1	Low Damage/deterioration (Few scratches / marks broken edges etc. Minor damage/deterioration).
	2	Moderate damage/deterioration (Significant breakage / damage, many areas of damage/deterioration revealing loose asbestos fibres).
	3	High damage/deterioration, delamination of matrix, visible asbestos debris.

From the above table variables a total score is determined for each ACM from the addition of all individual scores. The total score obtained as a result of this calculation is then compared to the ratings in table 5 below and shown in the register.

TABLE 5: FIBRE RELEASE POTENTIAL

	Total Score	Fibre Release Potential categories
Fibre Release Potential	2 - 4	Very Low
	5 - 6	Low
	7 - 9	Moderate
	10 - 12	High

The above rating score is in relation to the potential for fibre release only, given the circumstances seen at the time of the assessment. Should changes occur, for example the condition of the materials in question change due to damage or deterioration; then the fibre release potential should be reassessed.

4.2.2 Disturbance Potential

The following terms are used in the register to describe the potential for ACM to be disturbed, based on Aurora’s understanding of the accessibility and occupancy of ACM locations.

TABLE 6: DISTURBANCE POTENTIAL

	Potential	Description Examples
Disturbance Potential	Rare	Usually inaccessible, e.g. isolated or inaccessible location
	Unlikely	Occasionally accessed, e.g. accessible but only occasional occupancy
	Likely	Routinely accessed, e.g. externals of residences, well trafficked areas
	Almost Certain	Accessed through occupancy, e.g. internals of Residences

4.3 RESULTS AND DISCUSSION – ACM IDENTIFIED

The following is a summary of the results of the investigation into ACM in shacks and associated structures, which is contained in the asbestos register for Wedge and Grey. The asbestos register is supplied as an electronic spreadsheet with a filtering facility as it contains a large amount of data (over 1500 line items). An example page of the asbestos register is shown at Appendix 1 for reference.

4.3.1 Sites Inspected for ACM Presence

In total 355 shacks and shack sites were inspected at Wedge. Of these 169 shacks contained confirmed or suspect ACM and 186 had no asbestos identified, although the vast majority of these shacks were only inspected externally. Only 12 shacks were made available for internal inspections at Wedge.

Two tip sites (one expired and one waste transfer station) were inspected at Wedge in addition to 3 ACM dumping locations within the boundaries of the heritage site. ACM debris was noted at all locations (see more detail in Section 5).

At Grey 135 shacks were inspected; with 90 having confirmed or suspected ACM and 45 with no asbestos identified although the vast majority of these shacks were only inspected externally. Only 5 shacks were made available for internal inspections at Grey.

The Grey expired tip site (current waste transfer station) and surrounds were also inspected and found to have ACM debris present (see more detail in Section 5).

4.3.2 Sample Analysis

Over 130 material samples and 21 soil samples were collected during the survey but numbers for submission to the laboratory were reduced to save on analysis costs, with the remainder held in storage at Aurora Environmental. However the samples held and not analysed were chosen on the basis of Aurora's asbestos consultants being confident that they contain asbestos which, overall, would equate to about 50% of all samples taken being likely to contain asbestos. A total of 90 samples of suspect materials were submitted for asbestos fibre identification analysis plus 4 samples taken from the drip lines of asbestos roofs were submitted for asbestos in soils analysis. From the 90 material samples analysed a total of 38 were found to contain the various common types of asbestos.

Analytical reports for asbestos fibre identification and soil samples can be found at Appendix 5. Of the 4 soil samples analysed, 3 contained asbestos cement fines (AF) (discussed in section 5).

4.3.3 Asbestos Products Identified

At both Wedge and Grey 259 shack sites, out of a total 490 assessed, contained confirmed or suspected ACM with 11 out of 17 shacks inspected internally containing ACM. As a consequence, it is considered possible that many of the 231 shacks, which were not found to contain ACM externally, could contain ACM internally, as most were not accessed during the survey for internal inspection. It is also likely that shacks containing ACM externally, and not accessed internally, will also contain it internally. A total of 854 of 1347 materials assessed in the site survey were confirmed or suspected as containing asbestos. The total quantity of confirmed or suspected asbestos cement panels/sheets listed on the asbestos register exceeds an estimated 7000m².

There were 54 asbestos roofs identified to various shacks and outbuildings with 12 noted to deliver roof run-off into water tanks. Settled sludge in water tanks and soak wells from asbestos roofs should be considered as potentially containing asbestos fragments and fibres. Many asbestos roofs deposit roof run-off directly onto soils/sand below. All gutters to asbestos roofs should be considered as containing asbestos fragments or fibres in gutter deposits.

Asbestos-containing materials identified on site and detailed in the asbestos register include:

- Asbestos cement products including:
 - Corrugated roof, wall, formwork and fence panels;
 - Moulded products such as ridge, gable, fence capping, soak well and gutters;
 - Moulded support columns;
 - Water pipes;
 - Flat wall panels;
 - Shadowline/profiled cladding panels;
 - Indeterminate debris.
- ironing board insulation pad; Bitumen electrical mounting boards;
- Vinyl floor tiles and sheet (asbestos paper backed);
- Low density board/millboard insulation gaskets;
- Rope seals to wood burner and oven doors;
- Loose textile/membrane material;
- Bitumen adhesive and sound dampener membranes to underside of sinks;
- Asbestos containing gutter deposits from asbestos roofs;
- Asbestos in soil; and
- Suspected asbestos roof deposits in rainwater tank sediment.

Photographs of typical ACM in shack buildings are presented in Appendix 2 with some examples of less common asbestos products shown below:

PHOTOGRAPHS: ACM EXAMPLES - LESS COMMON ITEMS



Thermal insulation pad to ironing board, containing chrysotile asbestos. External to Shack W264.



Asbestos cement soak well. External to Shack W41.



Moulded asbestos cement support columns. Shack G100.



Bitumen sound dampener membrane to underside of sink. Shack W76.



Chrysotile rope seal to oven door. Shack G120



Bitumen adhesive under external wall panels. Shack W313

4.3.4 Friability of ACM Identified

The vast majority of the ACM identified is non-friable (or bonded material). However there are a number of products (13 from 854 confirmed or suspected instances of ACM) which were either friable when manufactured or have become friable due to the material matrix degrading to the point where exposed fibres could readily be released upon minimal disturbance. The local environment exposing such materials to windblown sand, rain, salt and UV light no doubt accelerates the process of degradation of the matrix of originally bonded ACM.

4.3.5 Condition of ACM Identified

From 854 recorded items of confirmed or suspect ACM on the register, 466 (~55%) were assessed as in good condition or of minor damage/deterioration; 105 (~12%) of moderate damage/deterioration and 283 (~33%) with high damage or deterioration. However 266 of the 283 were instances of confirmed or suspect asbestos cement debris.

4.3.6 Fibre Release Risk

Within the register, and based on the risk algorithm described in section 4.2, a total of 10 materials (~1.2% of total ACM numbers) were in the category of high fibre release potential. These were all friable materials (including some heavily degraded, but originally non-friable materials) or asbestos fines in soil or gutter deposits from asbestos roofs. These can be seen at Appendix 3 which is a filtered excerpt from the asbestos register. One example is shown in the photograph below. This is external wall cladding to Shack W253. A soil sample (W253) was taken approximately 1.5m from this wall and found to contain asbestos fines, as reported in Section 5.3.2. Photograph 6 of Appendix 4 also refers.



PHOTO: Heavily weathered asbestos cement external wall cladding to shack W253.

The remaining materials were in the moderate (~50%), low (~30.5%) and very low (~18%) 'fibre release potential' categories.

4.3.7 Disturbance Potential

The potential for an ACM to be disturbed was assessed based on Aurora's understanding of the accessibility and occupancy of ACM locations. The disturbance potential should be used in combination with the material fibre release potential to get an understanding of the relative health risk associated with the materials in the relevant locations.

These two variables can be used as in the examples below:

- None of the 10 materials in the high ‘fibre release potential’ category were assessed as being ‘almost certain’ of being accessed (i.e. not located internal to shacks) but are ‘likely’ of being accessed; also
- From the 426 materials with a moderate ‘fibre release potential’; only 2 were assessed as being ‘almost certain’ of being accessed with a further 23 are ‘likely’ of being accessed.

The resultant information is only semi quantitative and therefore is best used for allocating priorities to the treatment or removal of ACM.

4.4 AIRBORNE FIBRE MONITORING

Airborne Fibre Monitoring (AFM) was conducted on two Aurora personnel during shack surveys between 30th May and 19th June 2015. This was conducted by Aurora as part of a periodic testing programme for its employees who regularly work with ACM. The monitoring involved the collection of air samples from the breathing zone of the individual for periods of approximately 4.5 – 5 hours per day during normal asbestos survey operations on site. On completion of the AFM, the samples were analysed at Aurora’s laboratory in Perth.

Varied weather was experienced during the sampling days from fairly still to gusty wind conditions and mainly fine with some light showers on two occasions.

4.4.1 Methodology

The air sample collection and analysis were conducted in accordance with the Guidance Note on the Membrane Filter Method for Estimating Airborne Asbestos Fibres 2nd Edition [NOHSC:3003(2005)], by competent personnel. Whilst Aurora is not yet accredited by NATA to ISO/IEC: 17025⁶ for this analysis method; Aurora’s analysts are experienced in this method, have previously conducted this analysis within NATA accredited laboratories and participate in National Asbestos Programme (NAP) administered by Proficiency Testing Australia (PTA).

4.4.2 Results and Discussion

Analytical laboratory reports are included at Appendix 5. A total of 13 samples, including one field blank⁷, were collected during shack surveys. All results were below the limit of detection for the test of 0.01 fibres per millilitre (f/mL). The occupational exposure standard for all forms of asbestos fibres, as applicable to occupational exposures to Parks and Wildlife personnel conducting work on site, is 0.1 f/mL⁸. However the asbestos air-quality limit for protecting the public around contaminated sites is 0.01 (f/ml) as recommended by the Department of Health⁹ (for periods of up to 6 months) and as endorsed by the enHealth Council¹⁰. This air quality concentration of 0.01f/mL is also the limit of detection for the membrane filter method which is the only recognised methodology in use.

⁶ General requirements for the competence of testing and calibration laboratories

⁷ QC process where an unused filter from a batch is subjected to the same conditions and analysis as sample filters but having had no air drawn through it

⁸ the Adopted National Exposure Standards for Atmospheric Contaminants in the Occupational Environment [NOHSC:1003(1995)]

⁹ Guidelines for the Assessment Remediation and Management of Asbestos-Contaminated Sites in Western Australia, DOH, 2009

¹⁰ Management of asbestos in the non-occupational environment, enHealth, 2005

Ambient conditions at the time of sampling were mainly dry. However the general moisture levels in air and the sandy soils at this time of year would not be considered worst case scenario for sampling airborne dust/fibre levels.

On the basis of the airborne fibre monitoring conducted the risk of exposure for Parks and Wildlife employees would be low. However, the personal monitoring was conducted in autumn when sand/soil would not be as dry as at the height of summer when there would also be greater activity around the site.

The monitoring conducted was representative of someone spending a day moving around the site and not concentrated in a particular area as may be the case for shack owners or other members of the public. This considered in addition to the public health limit mentioned above being applicable for up to 6 months, therefore does not rule out health risk although in practice this is likely to be very low.

4.5 CONTROL ACTIONS AND MANAGEMENT

A large number of ACM, in various conditions and presenting a wide range of risks, has been identified on the Wedge and Grey reserves, as detailed in this report and listed in the asbestos register.

A risk management approach, with due consideration of the legal requirements and available guidance; should be used to make decisions regarding the treatment of ACM on site.

4.5.1 Manage ACM In-Situ or Remove

There is no strict requirement to remove ACM other than when it poses an unacceptable health risk and prior to demolition or refurbishment which could disturb ACM (Occupational Safety and Health Regulations 1996 (WA)). With all ACM that is identified, decisions must be made as to whether it should be removed or managed in-situ. Friable ACM exhibits the greatest risk to human health if handled or disturbed as fibres are released upon minimal disturbance. As such removal and replacement would be the preferred option particularly if such materials were found in locations where disturbance is likely.

Alternatively, removal and replacement may not be the preferred option for non-friable ACM particularly when in a good and stable condition as the risk associated with removal could be much higher than managing the material in-situ.

The following general principles, based upon the standard OHS hierarchy of controls, should be considered to assist in the decision process:

- If the ACM is friable, in a poor/unstable condition and accessible, removal should be carried out as soon as practicable;
- If the ACM is friable and accessible but in a stable condition, removal is preferred. However, if removal is not immediately practicable, short to medium -term control measures (i.e. restrict access, sealing, enclosure etc.) should be employed until removal can be facilitated;
- If the ACM is non-friable and in a poor/unstable condition such that encapsulation would not improve the surface properties; removal would be required;

- For non-friable ACM in a good and stable condition, ongoing maintenance and periodic inspection would be appropriate controls until removal in line with planned refurbishment work;
- Whilst not usually essential from an occupational hygiene risk perspective; the serviceable life, and rate of deterioration, of some non-friable ACM such as asbestos cement products, can be improved by sealing or painting exposed surfaces;
- Non-friable debris such as fibre cement where the cement matrix is still intact, whilst a relatively low risk material; should be planned for removal to prevent further deterioration and spread. However the treatment of asbestos contamination in soils should be based on a case-by-case assessment. Section 5 refers.

4.6 FURTHER ASSESSMENT

Only 17 shacks were inspected internally with 11 having identified ACM, and 2 containing friable ACM. Many shacks have asbestos roofs and/or external wall cladding where the inside surfaces of these materials are potentially exposed to internal rooms, unless enclosed behind a non-asbestos internal wall or ceiling lining. All shacks which haven't been inspected internally should therefore be considered as potentially containing ACM. It is therefore recommended that further inspections be conducted to include as many internals of shacks as possible, as the current register contains too much uncertainty in that regard.

Additionally, it is recommended that consideration be given to the following:

- Positional occupational airborne fibre monitoring in selected shacks to assist in the assessment of risk during their occupancy; and
- More personal airborne fibre monitoring in dry conditions on personnel that need to spend significant portions of their working day on the reserves.

5 PRELIMINARY ASBESTOS IN SOIL ASSESSMENT

Given that it has been identified that ACM were commonly used as construction materials in the Wedge and Grey settlements in an unregulated manner it was considered likely that there will be at least some situations where ACM will have impacted soils at these sites. These situations are generally a result of buildings and structures being subject to maintenance and/or demolition with the resultant asbestos debris remaining on the site surface (as well as deliberate burial) or being dumped at other locations. These situations can pose a risk or community concern, particularly where they are located in areas that are subject to continued trafficking and weathering which breaks up the material thereby increasing the risk of fibre release. It is also understood that ACM has been disposed at and around the waste disposal areas at the Wedge and Grey settlements in an uncontrolled manner.

On this basis it was considered appropriate to undertake an initial limited assessment of the presence and extent of ACM impacts to soils at the settlements to inform the need for additional more detailed assessment and subsequent implementation of management strategies as appropriate. This assessment was undertaken in concert with a comprehensive survey of the buildings at the Wedge and Grey settlements.

5.1 SCOPE OF WORK SUMMARY

The objectives of the asbestos in soil assessment were to:

- Identify situations around the Wedge and Grey settlements where asbestos is present (or likely present) in soils at levels which possibly pose an unacceptable health risk to the community;
- Provide guidance to Parks and Wildlife and/or the community to remediate and/or manage asbestos impacted soils;
- Make recommendations for further detailed assessments as necessary;
- Be consistent with relevant guidelines from the Department of Health (DoH) for assessing and managing asbestos in soils.

5.2 METHODOLOGY

5.2.1 Definitions

The DoH (2009) has defined three main forms of asbestos as:

- **Asbestos Containing Material (ACM)** – Which is in sound condition, although possibly broken or fragmented, where asbestos is bound in a matrix. ACM is restricted to material that cannot pass through a 7 mm x 7 mm sieve.
- **Fibrous Asbestos (FA)** – Includes friable asbestos materials, such as severely weathered or disturbed ACM and asbestos in the form of loose fibrous material such as insulation products. Friable asbestos is in a condition such that it can be broken or crumbled by hand pressure.
- **Asbestos Fines (AF)** – Includes free asbestos fibres, small fibre bundles and also ACM fragments that can pass through a 7 mm x 7 mm sieve.

ACM usually represents a low risk to human health, however both FA and AF have the potential to generate or be associated with free asbestos fibres, which pose a greater risk of inhalation if made airborne.

5.2.2 Assessment Criteria

The DoH assessment criterion for concentrations of asbestos in ACM in soil for recreational land use is 0.02% w/w (DoH, 2009). For fibre cement sheet fragments with an assumed asbestos content of 15% and thickness of approximately 7 mm, this equates to 20cm² of ACM per m² (DoH, 2011). The potential for the Wedge and Grey settlements to be used for residential land use in a traditional manner was considered in terms of receptors and possible exposure duration and frequency in Section 5.4.3. Whilst a limited number of people may reside in the settlements, the use of the recreational land use criteria consistent with DoH guidance was considered appropriate to achieve the objectives of the assessment.

A single assessment criterion of 0.001% w/w has been established by the DoH (2009) for asbestos fibres in soil (AF and/or FA) for all land uses in Western Australia, in line with national governmental guidance. Where sampling and analysis of soils are undertaken in accordance with the DoH guidelines, any laboratory identification of AF in soil will be considered to exceed the assessment criterion of 0.001% w/w.

5.2.3 Inspections

The visual examination of soils around the Wedge and Grey settlements focused on the areas immediately surrounding shacks and the waste disposal areas (current and historical) where it was considered there was the greatest likelihood for asbestos to be present in soils. The perimeter of the shacks and the area approximately 10m surrounding each shack was examined following the completion of the survey of the shack itself. The apparently disturbed but somewhat hidden areas around the vegetated edges of the Grey waste disposal area were inspected to gain an appreciation of the actual extent of possible ACM impacts around this area.

The surveys were undertaken by members of Aurora's Occupational Health and Safety Team, who are qualified and competent at identifying materials containing or possibly containing asbestos. These personnel often assist in asbestos in soil investigation and validation exercises for Aurora's Contaminated Sites Team and are considered suitably experienced to assess the nature and extent of asbestos in soil. Members of the Contaminated Sites Team provided guidance on the methodology and recording of observations and estimations of asbestos extents.

Where ACM (either large particles such as sheets or smaller fragments) was observed at estimated concentrations above or around the DoH assessment criterion (as defined below), the location was recorded in the asbestos register with reference to the closest shack and a description of the location (e.g. south side of shack) and/or co-ordinate data (GPS easting and northing). The entry was assigned a description in the register indicating that it was debris, for example 'fibre cement debris'. Observations of the ACM relevant to understanding the potential health risks were also recorded, including the surface properties, product type, extent of damage and likelihood of disturbance. The descriptions used have been defined in Section 4.2 of this AMP.

The area impacted by ACM was estimated (by pacing the extents) and it was noted whether ACM was likely present only at the surface or if it appeared possibly present beneath the surface as well. The DoH's publication "*Guidance Note on Identification, Assessment and Management of Asbestos*

Contamination in Regional Public Areas” (DoH, 2011) describes the method to estimate the concentration of asbestos in soil for ACM fragments scattered across a surface. Aurora personnel adopted this approach and estimated the combined area of ACM fragments over the area of impact. Both the estimated area of ACM and the impacted area were recorded in the asbestos register. Aurora personnel used a 20 cm² sized piece of paper during the assessment to provide a contextual understanding of ACM impacts, with areas considered to have about or more than 20 cm² of ACM per m² (the assessment criterion) recorded in the asbestos register as previously described.

In order to provide a preliminary assessment of the possible presence of Asbestos Fines (AF) or Fibrous Asbestos (FA), soil samples were collected at selected locations around the Wedge and Grey settlements. Soils were not sampled at all shacks, rather locations were selected based on them being typical of ACM impacted areas or areas where AF or FA may be present. These included soils:

- Where a high number of ACM fragments were observed;
- Where degraded ACM (either as fragments or as building materials) were observed; and
- Beneath drip lines from suspect asbestos roofs.

Soil samples were collected from the surface and placed directly into laboratory supplied bags with a minimum volume of 500 mL collected. A total of 23 soil samples were collected with 4 of these analysed by the laboratory in accordance with AS4964-2004 and DoH guidelines (2009). The analysed samples were from:

- Surface soil beneath drip line of fibre cement sheet roof (western side) of Shack W110;
- Surface soil approximately 1.6 m away from visibly weathered degraded suspected ACM external wall panel, northern side of Shack W253;
- Surface soil beneath drip line of fibre cement sheet roof (western side) of Shack G73; and
- Surface soil beneath gutter outfall from fibre cement sheet roof (western side) of Shack G107.

The remaining soil samples have been retained for future possible analysis.

The asbestos register was reviewed for instances where ACM debris/fragments were observed in soil. Details of the estimated concentrations of ACM, extents of ACM impacted areas and photographs of the relevant shacks or areas were reviewed to provide a summary of the results and to consider the typical ‘situations’ of asbestos in soil. Consistent with DoH guidelines (2009) and the broader contaminated site assessment approach, a conceptual site model (CSM) was developed to describe the situations and understand their relative risk profiles for the purpose of considering appropriate actions. These actions included remediation, management and further assessment with these discussed in Section 5.6 making reference to the DoH guideline (2011) for regional public areas and the overarching principle to remove asbestos and reduce potential public health risks in a practical manner.

5.3 RESULTS

5.3.1 Asbestos Register

Of the ~1,500 records in the asbestos register for the Wedge and Grey settlements, 369 relate to asbestos in soil (plus 23 soil sample locations). There were multiple locations of ACM impacted soils around some shacks and multiple entries for the waste disposal areas. There were 206 shack

locations with at least one identified area of ACM impacted soil. There are 155 records which relate to the Grey settlement and 214 records which relate to the Wedge settlement. The observations made during the inspections and these results indicate that the issue of asbestos in soil is widespread with the estimated asbestos in ACM in soil at numerous locations exceeding the DoH criterion and requiring some form of management or remediation.

Further findings considered relevant to the objectives of the assessment and useful for considering remediation, management and/or further assessment are listed below. Examples of some of these findings are illustrated in photographs contained in Appendix 4.

- ACM impacted areas of approximately 100m² were identified within the driveways of shacks G079 and G115.
- There were five other ACM impacted areas greater than 50m² in size; at W025, W284, G063, G079 (additional to driveway) and G130.
- There were 279 (approximately 76%) ACM impacted areas approximately 10m² or less in size and 83 (approximately 22%) ACM impacted areas 10-50m² in size.
- The current Wedge waste disposal area was variably impacted with multiple types of ACM debris identified across four areas. This included friable low density board and bitumen/paper debris near the bottles and batteries disposal area. It was estimated that the area approximately 15 m surrounding the Wedge waste disposal area was asbestos impacted.
- Three areas at and around the current Grey waste disposal area were found to have ACM impacts. It was estimated that the area approximately 20 m surrounding the Grey waste disposal area was asbestos impacted.
- Three areas understood from anecdotal evidence to have been used historically for waste disposal located within the Aboriginal Heritage area were found to be impacted by a range of ACM debris in soil.
- There are 181 instances (approximately 49%) where ACM impacts were considered as possibly being present beneath the surface. If fragments were semi-buried, they were considered to represent possible soil disturbance and therefore possible impacts beneath surface. Given the loose, sandy nature of soils and their propensity to be easily transported by strong coastal winds it is expected that smaller ACM fragments can easily be covered (and uncovered) by soils overtime. This point is considered relevant for the proposed remediation and management measures.
- There are 142 instances (approximately 38%) where more than 500cm² of ACM was observed in an impacted area. This area of ACM is considered potentially significant compared to the DoH assessment criterion of 20cm² of ACM per m² of area, noting that ACM was often spread over a large area.

It was noted that there is also situations where ACM fragments in soil were possibly concealed by surface features which if removed in the future may uncover ACM in the future. These situations include:

- Where shack occupiers had placed carpet down over sand around shacks;

- Piles of unused building materials (e.g. metal sheets, timber, cement sheets, etc.) and domestic waste (e.g. tyres, rope, old household goods);
- Fringing vegetation around shacks and the Grey waste disposal area.

Other situations not observed in this limited assessment may also exist.

5.3.2 Soil Sampling and Analysis

Of the four soil samples analysed by the laboratory, three (from Shacks W253, G073 and G107) contained asbestos above the reporting limit and therefore at concentrations considered to exceed the DoH criterion of 0.001% w/w. In each of these samples, small fragments of cement debris were identified representing the form of AF. Chrysotile, amosite and crocidolite asbestos were identified, with chrysotile identified in all three samples and amosite and crocidolite each present in one sample only.

The soil samples from shack locations G073 and G107 were collected adjacent to the shacks where rainfall runoff from ACM roofs lands on the soil surface (i.e. a drip line and gutter outfall). The presence of AF in these samples indicates soils around shacks with ACM roofs are likely contain AF.

The presence of AF in the soil sample from Shack W253 adjacent to a highly weathered ACM wall panel suggests soils adjacent to ACM product structures *may* contain AF. The likelihood of this at other locations is presumed to depend upon the level of weathering of the ACM and the surrounding surface features. At Shack W253, AF is likely to have been deposited in soil by wind or surface water runoff across concrete pavers away from the weathered ACM wall panel which is close by, features which will be different between shack locations. The lower density FA was not identified in the soil sample from W253. This may be due to this form of asbestos being too light to be deposited at identifiable concentrations close to the weathered ACM wall panel with strong coastal winds considered likely to disperse FA further away from the wall panel and dilute FA concentrations in both soil and air (with temporal changes in air concentrations).

Overall, the soil analytical results indicate that surface soils around shacks are either likely or possibly impacted by AF above the DoH assessment criterion.

5.4 PRELIMINARY CONCEPTUAL SITE MODEL

A CSM has been developed to describe the key elements relating to the presence of asbestos in soil at the Wedge and Grey Settlements for understanding the potential health risks and considering appropriate remediation and management measures consistent with relevant guidance from the DoH (2009) and DER (2014).

5.4.1 Sources

The potential sources of harm or adverse health effects relating to asbestos in soils are:

- Identified locations of ACM impacted near surface soils (shacks and waste disposal areas);
- Other possibly but not yet identified locations of ACM impacted soils;
- Weathered ACM currently part of shacks including roofs which may liberate AF (and although not detected, presumably FA) into soils;
- AF in surface soils around shacks.

Airborne asbestos fibres may potentially be generated from each of these identified sources given that ACM and AF were identified at concentrations in excess of DoH assessment criteria.

5.4.2 Pathways

The possible transport pathways of asbestos at the Site are considered to include:

- Fragmentation of ACM through sawing, cutting and breakage during shack construction or refurbishment;
- Historical placement (dumping) and spreading out of ACM across soils surrounding shacks and at waste disposal areas;
- Subsequent disturbance through vehicle movements and digging;
- Entrainment in water runoff from roofs or areas of hardstand;
- Light particles of AF (and possibly FA) becoming wind-blown and being either saltated or lifted to the atmosphere depending on size and wind strength.

Asbestos may also be covered or concealed by other materials such as building and domestic waste, vegetation and wind-blown sand. It is expected that time and local conditions around each area of impact will influence the manner asbestos may be transported around the settlements.

It is recognised that the only significant exposure pathway to asbestos in terms of human health effects is the inhalation of respirable asbestos fibres. Out of the forms of asbestos defined by the DoH, ACM is least likely to release free asbestos fibres which may be respirable if they become airborne. AF and FA are considered by the DoH to have the same potential to generate airborne asbestos fibres.

5.4.3 Receptors

The primary potential receptors at the Site are adults and children using the settlements in a recreational manner. This includes people who may use the shacks for accommodation and people who may visit on a day, weekend or fortnightly basis. It is understood that some people may live in shacks as permanent residents, however given that these people are likely to be adults only as there are no public services to support children residents, the use of recreational assessment criteria is considered suitable and consistent with DoH (2011) guidance. Parks and Wildlife personnel, contractors and other people who may visit the settlement to conduct occupational type activities (e.g. waste collection, maintenance) are other types of secondary receptors to asbestos in soil, considered to be less sensitive than primary receptors.

5.4.4 Situations

Based on the results and observations from the inspections and the CSM, the following typical situations, whereby people may be exposed to asbestos in soils and a potentially unacceptable health risk, have been identified at the Wedge and Grey settlements.

- *Situation 1 - Asbestos in ACM fragments scattered on surface soils around shacks*
- *Situation 2 - Asbestos in ACM fragments at the surface and in shallow sub-surface soils around shacks*
- *Situation 3 - Asbestos in AF in surface soils around shacks*

- *Situation 4 – Asbestos in ACM fragments in scattered on surface soils around waste disposal areas*
- *Situation 5 – Asbestos in ACM fragments in shallow sub-surface soils around waste disposal areas*

In addition to the above situations where asbestos has been identified at specific locations during inspections, it is expected that there will be other locations where asbestos is present in similar situations (such as where asbestos materials may have been fly tipped in the past and subsequently concealed by sand and/or vegetation). There is also the possibility that asbestos may be present in a situation not currently identified, such as deposits of FA in soil or significant volumes of ACM buried beyond near surface soils. A sixth situation has therefore been considered for the purposes of this conceptual site model, i.e. *Situation 6 – Unidentified asbestos/unexpected finds*.

The estimated numbers of locations of each situation are presented in Table 7.

TABLE 7: ACM IN SOIL – LOCATION NUMBERS

SITUATION	NUMBER OF IDENTIFIED LOCATIONS	COMMENT
Situation 1 - Asbestos in ACM fragments scattered on surface soils around shacks	188	-
Situation 2 - Asbestos in ACM fragments at surface and in shallow sub-surface soils around shacks	181	-
Situation 3 - Asbestos in AF in surface soils around shacks	3 confirmed	Possibly/likely there are more locations around shacks
Situation 4 – Asbestos in ACM fragments scattered on surface soils around waste disposal areas	2	At and around the current Wedge and Grey waste disposal areas
Situation 5 – Asbestos in ACM fragments in shallow sub-surface soils around waste disposal areas	2	At and around the current Wedge and Grey waste disposal areas
Situation 6 – Unidentified asbestos/unexpected finds	Unknown	Not expected to be none but difficult to quantify

5.5 PRELIMINARY RISK ASSESSMENT

An initial assessment of the acceptability of the potential human health risks for each situation was made using the DoH assessment criteria shown in Table 8 below. The relative risk priority for each situation has been shown to provide a general understanding/context of which situations may pose the greatest risk to the identified receptors. The information should not be considered to represent the actual risk, for example a risk priority of ‘high’ is only meant to indicate the situation whereby the likelihood of asbestos fibres becoming airborne is greatest (and nothing else).

TABLE 8: PRELIMINARY RISK ASSESSMENT SUMMARY

SITUATION	HEALTH RISK ACCEPTABILITY?	RELATIVE RISK PRIORITY
Situation 1 - Asbestos in ACM fragments scattered on surface soils around shacks	Potentially unacceptable	Moderate, on the basis of asbestos being present in large fragments and in bonded form
Situation 2 - Asbestos in ACM fragments at surface and in shallow sub-surface soils around shacks	Potentially unacceptable	Moderate, on the basis of asbestos being present in bonded form
Situation 3 - Asbestos in AF in surface soils around shacks	Potentially unacceptable	Moderately High, on the basis of AF being bonded but having a greater potential to release fibres than ACM
Situation 4 – Asbestos in ACM fragments scattered on surface soils around waste disposal areas	Potentially unacceptable	Low, on the basis of area being less frequently used
Situation 5 – Asbestos in ACM fragments in shallow sub-surface soils around waste disposal areas	Potentially unacceptable	Low, on the basis of area being less frequently used
Situation 6 – Unidentified asbestos/unexpected finds	Unknown	Low, on the basis of not being identified during inspections

As identified in the results section, there are some areas of ACM impact which are relatively large compared to other identified areas (i.e. greater than 50m²) and areas with relatively large amounts of ACM (i.e. greater than 500cm²). The likelihood for asbestos to become airborne in these areas, and therefore potential exposure risk, will be higher than for other areas.

In addition to the estimated health risks, the visual presence of asbestos is not considered to be acceptable in terms of public aesthetics and perceived risks.

5.6 PRELIMINARY REMEDIATION AND MANAGEMENT

As potentially unacceptable health risks have been identified, remediation and management measures are required to reduce risks. Consistent with DoH guidelines (2009 and 2011), the general focus of risk mitigation measures is to remove asbestos and/or reduce likelihood for potential exposure in a practical manner and to make people aware of the issue. A preliminary consideration of possible measures is described below. The selection of final remediation and management measures would benefit from further assessment of asbestos in soils and liaison with the DoH,

particularly in relation to Situation 3 where it is apparent that AF is likely present in surface soils surrounding shacks.

5.6.1 Initial Raking and Handpick

This measure involves removing fragments of ACM visible at the surface manually by hand in accordance with a safe work procedure including the wearing of a minimum P2 half face respirators due to possible presence of AF or FA. Fragments are to be contained in thick polythene bags no more than half filled, securely closed (taped), labelled as asbestos waste and disposed of to an appropriately licensed landfill. The area should be raked to uncover any ACM at the near surface and re-picked until no ACM is visible. Consideration should be given to having a competent person(s) validate handpicking exercises.

5.6.2 Periodic Handpicking

Handpicking to be repeated where ACM is observed to have emerged from the subsurface or prior to anticipated periods of increased visitation, such as before events, long weekends and holiday periods. This is considered to be particularly relevant at the Wedge and Grey sites due to the generally windy conditions and consequent movement of sand that will be covering and exposing ACM on an ongoing basis.

5.6.3 Stock Brochure, Warning Signs and DoH Public Factsheet

These measures are designed to inform people of the presence and forms/situations of asbestos in the settlements and to provide general advice on how to prevent or manage potential exposure. These materials should cover both asbestos in buildings and asbestos in soil.

The stock brochure and DoH public Factsheet should be made freely available by various means (e.g. hard copies at the settlement, Parks and Wildlife offices, Parks and Wildlife visitor website). The stock brochure should be developed in consultation with the DoH so that it is consistent with the DoH Public Factsheet and DoH policies.

Warning signs should be erected in clear view of people accessing the settlements. There are existing warning signs prohibiting the disposal of asbestos at the dedicated waste disposal areas at Wedge and Grey.

5.6.4 Disposal Service

A service to dispose of ACM fragments collected during handpicking exercises and ACM waste from buildings should be made available to discourage uncontrolled and illegal disposal of asbestos waste amongst the settlements or elsewhere. There are several factors which Parks and Wildlife may need to consider when planning such a service (e.g. temporary storage facilities, cost to users, cost to Parks and Wildlife, ongoing management, procurement of waste transport contractor, etc.). All asbestos waste should be disposed of to landfill facility licensed by the DER to accept Special Waste Type 1 – Asbestos Waste.

5.6.5 Contact DoH

It is expected that the DoH will continue to be a stakeholder engaged by Parks and Wildlife and will therefore be generally aware of asbestos management at the settlements. However, it is recommended that the DoH be informed specifically of instances where AF or FA is identified in soil to seek advice/clarification on the appropriate remediation/management measures (including use of

surface covers). It is also advised that the DoH be provided with any air quality data collected at the settlements so that it can consider the results and assess public health risks.

5.6.6 Surface Cover

Surface covers to reduce the potential for asbestos to become airborne are not currently recommended for the identified situations. Surface covers may be required for *Situation 6 – Unidentified asbestos/unexpected finds* for AF and FA or where ACM cannot be effectively removed. Surface covers may be in the form of clean fill, hardstand, or mulch with the appropriate material and thickness to depend on the nature of impacts, the location and the long term stability. Advice is to be sought from the DoH on surface covers.

5.6.7 Maintain on Register

All locations of asbestos should be recorded in the asbestos register. The asbestos register will require updating if the nature and extent of asbestos is found to exceed the details presented in the current version of the register. Unless remediated areas have been validated by a competent person to no longer contain asbestos, it is advised that entries in the register should not be removed after handpicking. A competent person is defined as person who is suitably experienced to investigate and assess asbestos in soil consistent with DoH expectations.

Table 9 summarises the recommended remediation and management measures for each situation adopting DoH guidance (2011).

TABLE 9: PRELIMINARY REMEDIATION AND MANAGEMENT MEASURES

Situation	MEASURE									
	Initial Raking and Handpick	Periodic Handpick	Stock Brochure	Contact DoH	Warning Signs	DoH Public Factsheet	Disposal Service	Limited Surface Cover	Deep Surface Cover	Maintain on register
Situation 1 - Asbestos in ACM fragments scattered on surface soils around shacks	Y	Y	Y	N	Y	Y	Y	N	N	Y
Situation 2 - Asbestos in ACM fragments at surface and in shallow sub-surface soils around shacks	Y	Y	Y	N	Y	Y	Y	N	N	Y
Situation 3 - Asbestos in AF in surface soils around shacks	N	N	Y	Y	Y	Y	Y	TBC	TBC	Y
Situation 4 – Asbestos in ACM fragments scattered on surface soils around waste disposal areas	Y	N	Y	N	Y	Y	Y	N	N	Y
Situation 5 – Asbestos in ACM fragments in shallow sub-surface soils around waste disposal areas	Y	N	Y	N	Y	Y	Y	N	N	Y
Situation 6 – Unidentified asbestos/unexpected finds	TBC	TBC	Y	Y	N	N	Y	TBC	TBC	Y

Y – Yes N- No TBC – To Be Confirmed after further assessment

5.7 FURTHER ASSESSMENT

The primary active response to the identification of asbestos in soils should be the remediation and management measures outlined above. However, two items of further assessment are considered to be warranted based on the findings of this initial assessment which may also inform future remediation and management measures in consultation with the DoH.

The identification of AF in surface soils at three out of four locations where samples were collected from around shacks and analysed suggest it is possible/likely that AF is present in soils around other shacks at the settlements. Consideration should be given to requesting analysis of other samples collected and retained by Aurora during this assessment and collection and analysis of additional samples to gain a more comprehensive understanding on the character and extent of AF impacted soils.

Whilst no FA was identified in soils, the presence of frequent and at some locations large amounts of ACM in buildings and soils including friable external ACM building materials in an aggressive weathering environment, could result in airborne asbestos fibres. Collection of air quality samples and examination for asbestos fibres should therefore be considered. This information may be conducted in conjunction with air sampling inside shacks.

6 LEGISLATIVE FRAMEWORK

In brief, legislation defines asbestos (and asbestos containing material - ACM), declares it a hazardous substance and bans any new use, re-use or import of ACM into Australia.

The Wedge and Grey reserves are both workplaces for Parks and Wildlife personnel and others such as waste collection contractors. They are also public open spaces in addition to holding temporary leases for current shack owners at the location of each shack. The general duty of care requirements of the *Occupational Safety and Health Act 1984* (WA) are considered to apply in this case whereby a safe place of work must be provided and exposure to hazards controlled.

The Occupational Safety and Health Regulations 1996 (WA) require a person who is an employer or controller of a workplace to identify the presence and location of asbestos-containing materials (ACM) in the workplace, record this in a register and assess the risk arising from its presence in accordance with the Code of Practice for the Management and Control of Asbestos in Workplaces [NOHSC: 2018 (2005)].

NOHSC: 2018 (2005) requires that the ACM be appropriately managed to ensure that the risks of exposure to airborne fibres are minimised using control measures which may include the management of ACM in-situ or its removal. It also requires that an asbestos management plan be implemented and maintained as long as ACM remain in the workplace.

For ACM already in-situ legislation requires that those employers, main contractors, self-employed persons or persons having control of the workplace identify ACM in workplaces and assess the risk that arises from its presence, in accordance with NOHSC:2018(2005)¹¹, and implement measures to manage the risk so that people are not exposed to airborne asbestos fibres. It is also an offence to do any work with ACM without taking reasonable measures to prevent asbestos fibres entering the atmosphere and to carry out demolition work without first removing ACM.

Licensing requirements for persons conducting asbestos removal work, based on the type and quantity of ACM, are set out in legislation in addition to requiring that such work is conducted in accordance with relevant parts of the asbestos removal code¹² and that persons are not exposed to asbestos dust.

In addition to the requirements in relation to workplaces, the Health (Asbestos) Regulations 1992 (WA), in brief, make it an offence for the supply or new uses of asbestos cement products, in addition to handling such products without taking reasonable measures to prevent fibre release. It is also an offence to move a dwelling built using asbestos cement unless it is not divided into more than 3 sections and parts containing asbestos cement are not substantially dismantled or asbestos cement products deliberately broken. The regulations also give powers to authorised persons to serve notices on the owner of asbestos containing material or premises containing it to maintain, repair, remove dispose or handle asbestos containing material in such a manner and time as specified in the direction.

Control of disposal of ACM by such actions as separating, wrapping, labelling and informing the receiver are also requirements of the Health (Asbestos) Regulations, the Occupational Safety and

¹¹ Code of Practice for the Management and Control of Asbestos in Workplaces [NOHSC:2018(2005)]

¹² The Code of Practice for the Safe Removal of Asbestos 2nd Edition [NOHSC:2002(2005)]

Health Regulations (via PART 11 of NOHSC:2018(2005)) and the Environmental Protection (Controlled Waste) Regulations 2004 (WA).

6.1 ACTS AND REGULATIONS

In Western Australia the following legislation, codes of practice and relevant guidance are applicable in relation to this Asbestos Management Plan:

- *The Occupational Safety and Health Act 1984*, Government of Western Australia;
- *The Environmental Protection Act 1986*, Government of Western Australia;
- *The Contaminated Sites Act 2003*, Government of Western Australia;
- The Occupational Safety and Health Regulations 1996, Government of Western Australia;
- The Environmental Protection (Controlled Waste) Regulations 2004, Government of Western Australia;
- The Health (Asbestos) Regulations 1992, Government of Western Australia;
- The Contaminated Sites Regulations 2006, Government of Western Australia.

6.2 APPROVED CODES OF PRACTICE AND GUIDANCE NOTES

- The Code of Practice for the Management and Control of Asbestos in Workplaces [NOHSC:2018(2005)], National Occupational Health and Safety Commission, (now Safe Work Australia);
- The Code of Practice for the Safe Removal of Asbestos 2nd Edition [NOHSC:2002(2005)], National Occupational Health and Safety Commission, (now Safe Work Australia);
- The Guidance Note on the Membrane Filter Method for Estimating Airborne Asbestos Fibres 2nd Edition [NOHSC:3003(2005)], National Occupational Health and Safety Commission, (now Safe Work Australia);
- Guidelines for Assessment, Remediation and Management of Asbestos-Contaminated sites in Western Australia 2009, Department of Health (WA);
- Guidance Note on Identification, Assessment and Management of Asbestos Contamination in Regional Public Areas 2011, Department of Health (WA);
- Assessment and Management of Contaminated Sites, Contaminated Site Guidelines 2014; Department of Environment Regulation (WA).
- Landfill Waste Classification and Waste Definitions (as amended 2009), Department of Environment and Conservation (WA).

6.3 UPCOMING LEGISLATION AND REVIEWS

At the time of preparing this report the model harmonised WHS laws (which aim to harmonise OHS legislation across Australia) had not been enacted by the Government of Western Australia. However draft legislation (the Health and Safety Bill 2014) has been tabled and opened for public comment (comment period now closed).

Also the Health (Asbestos) Regulations are currently being revised and a new asbestos code of practice to support them has been tabled for public comment (comment period now closed) with the plan to finalise it in the 2015-16 financial year.

7 PRELIMINARY ASBESTOS MANAGEMENT PLAN

An asbestos management plan should be a strategic document to assist duty holders in complying with legislative requirements and duty of care to its employees and the general public. The following subsection details the general principles of an AMP according to the Code of Practice for the Management and Control of Asbestos in Workplaces¹³. Subsequent subsections recommend actions to address the findings of the asbestos assessment in addition to suggested elements of an asbestos management plan. These should be considered by Parks and Wildlife in developing an implementation plan.

7.1 GENERAL PRINCIPLES

According to NOHSC:2018(2005) the following general principles must be applied in developing an asbestos management plan:

- The ultimate goal is for all workplaces to be free from ACM.

Accordingly;

- Reasonable steps must be taken to label all identified ACM. Where ACM are identified or presumed, the locations must be recorded in a register of ACM;
- A risk assessment must be conducted for all identified or presumed ACM;
- Control measures must be established to prevent exposure to airborne asbestos fibres and should take into account the results of risk assessments conducted for the identified or presumed ACM;
- If ACM are identified or presumed, there must be full consultation with site personnel as appropriate, involvement and information sharing during each step of the development of the asbestos management plan – i.e. during the identification, risk assessment and establishment of control measures;
- The identification of ACM and associated risk assessments should only be undertaken by competent persons;
- All workers and contractors on premises where ACM are present or presumed to be present, and all other persons who may be exposed to ACM as a result of being on the premises, must be provided with full information on the occupational health and safety consequences of exposure to asbestos and appropriate control measures. The provision of this information should be recorded.

The general principals of an AMP are summarised in Figure 4 which sets out the three main phases including the **Identification Phase, Assessment Phase and Control Phase**. With regard to the Wedge and Grey reserves it could be considered that the identification and assessment phases have been substantially completed, notwithstanding the recognised data gaps and recommendations made in this report.

The following sections provide recommendations for implementing the *Control Phase* of the AMP. Recommended actions for the removal or treatment of ACM at Wedge and Grey are followed by

¹³ The Code of Practice for the Management and Control of Asbestos in Workplaces [NOHSC:2018(2005)]

recommendations for implementing and maintaining the AMP for the ongoing management of ACM remaining in-situ.

7.2 RECOMMENDED ACTIONS – ACM IN BUILT FORM (SHACKS AND BUILDINGS)

Based on the findings of the asbestos assessment as described in Section 4 and the rationale for the treatment of ACM in Section 4.5 the following recommendations are made for consideration:

1. All known or potential friable ACM should be removed, by an asbestos removalist holding a current unrestricted asbestos removal licence, with a priority allocated to those materials with the highest fibre release potential and in most regularly accessible locations;
2. Asbestos cement debris should be targeted for removal with the asbestos register used to assist in prioritisation on the basis of accessibility of ACM and its condition;
3. Removing ACM in 1 and 2 above removes all materials in the category of ‘high fibre release potential’ within the register (apart from gutter and tank deposits and asbestos fines in soil). Materials in the ‘moderate fibre release potential’ category should then be considered for removal in priority of accessibility and then condition. This process should be repeated until the next review of the register and then reassessed in order to determine whether further actions are required;
4. Guidance material should be provided to shack owners in relation to the risks associated with ACM along with its assessment, safe treatment, removal and disposal. Some good guidance documents and fact sheets available from the Department of Health are recommended in addition to the preparation of new guidance developed specifically to address the ACM and its inherent risk at Wedge and Grey settlements;
5. All stored or disused asbestos products should be removed from in and around shacks, such as stored asbestos cement panels, old electrical mounting boards, soak wells etc.;
6. Unsealed asbestos cement materials internal to shacks should be considered for sealing or painting, particularly if not in good condition or have exposed broken edges;
7. Asbestos roofs should be removed if in poor condition and if not in poor condition either be removed or have gutters installed to deliver water to tanks or soak wells and not cause a drip line with the potential for asbestos fibres to impact adjacent soils;
8. Shacks in the possession of Parks and Wildlife and confirmed as containing ACM should be considered for removal to reduce the likelihood of ACM becoming a health risk as a result of further degradation or vandalism;
9. Where dismantling or removal of shacks is to be carried out, either all fibre cement materials should be suspected as containing asbestos or individually sampled and analysed for confirmation (due to the limitations of the survey methodology described in Section 4.1). Also once shacks have been removed, the soils in the vicinity of the shack should be validated (by a competent and experienced person) as being free of visible asbestos impacts;
10. In accordance with the Health (Asbestos) Regulations, 1992 reasonable precautions must be taken to prevent asbestos fibres entering the atmosphere whilst handling asbestos-containing material. Also asbestos removal from workplaces must be conducted in accordance with the

Code of Practice for the Safe Removal of Asbestos, 2nd Edition [NOHSC:2002(2005)] and by the following licensed removalists;

- I. An *Unrestricted* or *Restricted* removal license - where more than 10m² of non-friable asbestos is to be removed;
 - II. An *Unrestricted* removal license - where friable ACM is to be removed;
11. All removed ACM must be wrapped and disposed of in accordance with legislative requirements and at a facility which is licensed to accept asbestos waste;
 12. Positional occupational airborne fibre monitoring in selected shacks should be considered to assist in the assessment of risk during their occupancy;
 13. Additional personal airborne fibre monitoring should be conducted in dry conditions on personnel working in close proximity to shacks or other areas where ACM may be prevalent;
 14. Signage should be positioned to warn occupants and visitors to the reserves of the potential to come into contact with ACM and advise not to disturb it;
 15. Shack owners should be advised to independently have an internal inspection, by a competent asbestos surveyor, of their individual buildings as it is expected that many more ACM will be identified, some of which will potentially be friable.

7.3 RECOMMENDED ACTIONS – SOIL IMPACTS

Based on the findings of the preliminary asbestos in soils assessment as described in Section 5 and the rationale for the treatment of ACM in Section 5.6; the following recommendations are made for consideration:

1. Conduct regular Emu picking (including raking) programmes to reduce the overall amount of ACM on surface soils, prioritising high access/trafficked areas;
2. Conduct a detailed assessment of asbestos impacts in soils to improve confidence for determining final remedial measures.

7.4 RESPONSIBILITIES

As with any management plan developed to control health and safety risks; clear lines of responsibility should be set out to ensure that the objectives of the plan are met.

Table 10 is an example of how responsibilities under the plan could be set out. Competencies of personnel required to carry out various responsibilities should be considered in addition to clearly communicating these to relevant personnel.

TABLE 10: AMP - KEY RESPONSIBILITIES

POSITION / NAME	RESPONSIBILITY
	Custody of the overall AMP and Asbestos Register
	Maintaining and updating the asbestos register
	Arrange/conduct annual review of AMP and Asbestos Register
	Maintain asbestos related records on file
	Provide information on ACM to shack owners
	Maintain asbestos warnings and signage
	Organise training/awareness for relevant staff/shack owners
	Organising asbestos removal work
	Providing the current Asbestos Register to visiting workers as necessary
	Review Asbestos Removal Control Plans (ARCP) produced by asbestos removalists
	Respond to queries relating to asbestos
	Initial incident response lead

7.5 COMMUNICATION

For the AMP to be a working document, responsibilities understood and its requirements to be implemented; effective communication is a key aspect of meeting this objective.

Communication of the contents of the asbestos register and plan should be approached in a number of ways and through various media which are considered effective in the context of both Parks and Wildlife personnel, contractors and key stakeholders at Wedge and Grey.

Communication to shack owners on the findings of the assessment, understanding the risks and how to control them should be prioritised as they are likely most at risk due to occupancy of shacks containing ACM. Fact sheets, such as those available on the DoH website, should be provided to shack owners to assist in this regard.

Guidance to shack owners on sample collection and analysis should be provided and typical situations found so far to encourage testing of materials within shacks. Such sampling and analysis would be best controlled through a central point in Parks and Wildlife so that the register can be updated, advice provided and some control maintained. A reduced analysis cost rate could be negotiated if samples are controlled from one location.

7.5.1 Signs and notices

Warning signs and notices should be considered where necessary to warn workers and the public of ACM presence. Based on the assessment of risk, fences or barriers to access may be required for example where an assessment identifies asbestos fibres in soil. Such signage should comply with the

Australian Standard, AS 1319: Safety Signs for the Occupational Environment. The Code of Practice for the Management and Control of Asbestos in Workplaces [NOHSC:2018(2005)] sets out requirements for the labelling of ACM in workplaces.

7.6 COMPETENCIES

It is important that the AMP considers the competencies of anyone who may come into contact with ACM or make decisions affecting its management.

Where in-house competencies are inadequate to understand the risk, provide advice and guidance on the management of asbestos this should be sourced from outside, whether this be from other government departments such as DOH and DER or consultants.

Competencies of asbestos removal workers is managed through Worksafe (WA) licensing. However consideration of 'track record' is also recommended. For asbestos in soils remediation it is important that such work is supervised by a competent environmental consultant (as described in DoH, 2009) or under the advice of DER and DOH. Competencies of Parks and Wildlife personnel who may regularly come into contact with ACM at Wedge and Grey should be considered and any gaps filled through asbestos awareness training tailored specifically to typical situations located on site.

Awareness of ACM, its identification and treatment amongst shack owners should also be considered as many may be in contact with ACM during every day of occupancy, possibly inadvertently for some less well known products.

Useful information in the public domain through such sources as the DOH and Worksafe websites should be provided to all concerned.

7.7 SAFE WORK PROCEDURES

For asbestos removal work conducted by contractors, an asbestos removal control plan must be developed by the contractor prior to conducting such work. It may be necessary to develop safe work procedures (SWP's) if Parks and Wildlife staff or shack owners are to conduct work which could potentially disturb ACM. Some example SWP's are provided in NOHSC:2018(2005).

7.8 INCIDENTS AND NEW FINDS

A procedure for responding to new finds of ACM should be implemented to ensure that the register is updated and its assessment and treatment is not delayed and such that untrained personnel are not put at risk.

A bushfire response plan should be prepared and communicated as fire damaged asbestos is likely to become friable and requires a precautious approach from first responders through to final clearance. DoH (2014) provides guidance on the management of fire damaged asbestos and should be consulted in this regard.

7.9 ASBESTOS REMOVAL

If removal of any ACM is planned, it must be conducted in accordance with an asbestos removal control plan (ARCP¹⁴) developed by the person who is to carry out such work.

¹⁴ Developed in accordance with the Code of Practice for the Safe Removal of Asbestos 2nd Edition [NOHSC: 2002(2005)].

An asbestos removal company holding a minimum of an **Unrestricted Asbestos Removal Licence** must be used to conduct the removal of friable ACM. Such asbestos removal work must be conducted in accordance with the Code of Practice for the Safe Removal of Asbestos 2nd Edition [NOHSC: 2002(2005)] in addition to any specific requirements of the removalists licence.

An asbestos removal company holding a minimum of a **Restricted Asbestos Removal Licence** must be used to conduct the removal of greater than 10m² of non-friable ACM. Such asbestos removal work must be conducted in accordance with PART 9 of NOHSC: 2002(2005) in addition to any specific requirements of the removalists licence.

Asbestos removal involving small amounts of non-friable ACM of less than or equal to 10m² must be conducted by competent persons in accordance with PART 9 of NOHSC: 2002(2005).

Removal of asbestos in soils in consultation with DoH (2009) and should be managed on a case by case basis and supervised by a competent person, such as a suitably qualified environmental consultant with experience in the assessment, remediation and management of asbestos in soils.

Parks and Wildlife should ensure that safe work procedures produced by contractors for asbestos removal work are reviewed by a competent person prior to authorising the work to commence.

Advice should be sought from a competent person as to whether supervision of asbestos removal work should be conducted by or on behalf of Parks and Wildlife in addition to airborne fibre monitoring and clearance inspections during and on completion of such works.

7.10 ONGOING MONITORING AND REVIEW

Further assessments are recommended as described in Sections 4.6 and 5.7.

A review of the AMP and asbestos register should be considered on an annual basis or sooner if there are significant changes affecting its accuracy or relevance. The asbestos register should be updated following any remedial or removal work to ensure its ongoing completeness and accuracy.

A review of the following should be considered as part of the AMP annual review to determine whether any changes are required:

- New legislative requirements or guidance;
- Results of any further assessments conducted including airborne fibre monitoring;
- The asbestos register;
- Incident reports and outcomes;
- Outcomes of remedial work conducted under SWP's and any changes required to SWP's;
- Competency gaps for further training requirements; and
- Review of the action plan for the next 12 months.

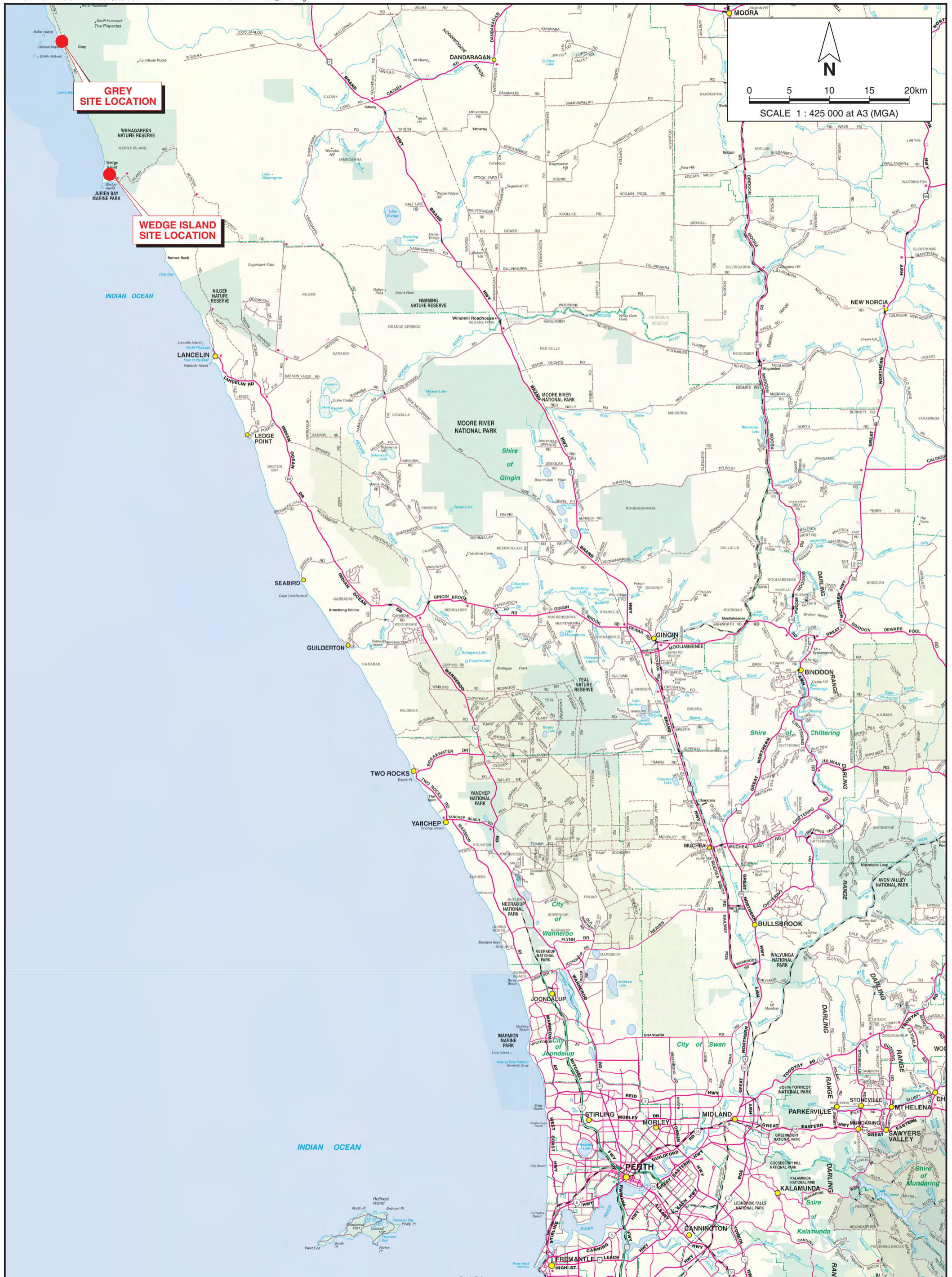
7.11 IMPLEMENTATION PLAN

Actions required under the AMP should be listed and allocated to responsible persons. This allows for prioritising, budgeting and programing in addition to clearly communicating responsibilities under the plan for remedial or strategic actions.

8 REFERENCES

- *The Occupational Safety and Health Act 1984*, Government of Western Australia;
- *The Environmental Protection Act 1986*, Government of Western Australia;
- *The Contaminated Sites Act 2003*, Government of Western Australia;
- *The Occupational Safety and Health Regulations 1996*, Government of Western Australia;
- *The Environmental Protection (Controlled Waste) Regulations 2004*, Government of Western Australia;
- *The Health (Asbestos) Regulations 1992*, Government of Western Australia;
- *The Contaminated Sites Regulations 2006*, Government of Western Australia;
- *The Code of Practice for the Management and Control of Asbestos in the Workplace [NOHSC: 2018 (2005)]*;
- *Code of Practice, How to Manage and Control Asbestos in the Workplace*, Safe Work Australia;
- *The Code of Practice for the Safe Removal of Asbestos 2nd Edition [NOHSC: 2002 (2005)]*;
- *Guidance Note on the Membrane Filter Method for Estimating Airborne Asbestos Fibres 2nd Edition [NOHSC:3003(2005)]*;
- *Guidelines for Assessment, Remediation and Management of Asbestos-Contaminated sites Western Australia*, Department of Health, Western Australia, 2009;
- *Management of asbestos in the non-occupational environment*, Environmental Health Standing Committee (enHealth), 2005, Government of Australia;
- *Guidance Note on Identification, Assessment and Management of Asbestos Contamination in Regional Public Areas*, Department of Health, Western Australia, 2011;
- *Guidance Note on the Management of Fire Damaged Asbestos*, Department of Health, Western Australia,
- *Assessment and Management of Contaminated Sites, Contaminated Site Guidelines 2014*; Department of Environment Regulation, Western Australia;
- *Asbestos: The Survey Guide (HSG264)*, Health and Safety Executive, UK;
- *Adopted National Exposure Standards for Atmospheric Contaminants in the Occupational Environment [NOHSC:1003(1995)]*;
- *Australian Drinking Water Guidelines 6, 2011, Version 3.1, March 2015*, Government of Australia.

FIGURES



Department of Parks and Wildlife
 ASBESTOS MANAGEMENT PLAN
 WEDGE ISLAND AND GREY SETTLEMENTS, SHIRE OF DANDARAGAN

Figure 1

REGIONAL LOCATION

Drawn: G. Milner

Date: 13 Aug 2015

Job: DPW2015-002



- Legend**
- Wedge spur road
 - Main vehicle thoroughfare
 - Major vehicle tracks
 - Minor vehicle tracks
 - Walking tracks
 - Rubbish tip
 - Rubbish tip (closed)
 - Metal dump (closed)
 - Car tip (closed)
 - Shacks
- 162** Shack identification numbers
- 48** Shacks associated with professional fishermen
- Unidentified shacks
- ⊕ First aid point
- F Fire tenders
- W Water fill
- H Helipad

Information Sources:

This map is based on 2012 Aerial and mapping produced by the GIS Branch, Department of Parks and Wildlife.

Shack and track locations derived from Wedge Point - DIA 20051_Produced 8 February 2012_GIS Branch_DEC (MGA Zone 50, Datum: GDA94 / Job Ref: G:\Projects\Wedge Pt_GreyPt_Brabazon_Shacks\MXD\Wedge_point_DIA.mxd).

Shack identification numbers transposed from 2012 Shack Lease Plan showing shack identification numbers. Shacks not picked up on survey transposed from aerial information.

Professional Fishing Boat Mooring Zone transposed from onsite information map. Water fill, fire tenders and first aid points transposed from onsite information map. Labels derived from onsite information available.

This map was transposed from mapping undertaken as part of the planning process for the Wedge and Grey Master Plan 2000.

Access information derived from Wedge Recreation Area Site Analysis_Existing Land Use / October 1998 / CALM Recreation Planning and Design Section (NB This plan is not based on accurate survey data. Information is interpreted from aerial photography. (WA3497, Run no. 5248-January 1995).

Closed track points transposed from Waypoint information received from the Shaw Family.

Infrastructure features derived from Wedge Point - DIA 20051_Produced 8 February 2012_GIS Branch_DEC (MGA Zone 50, Datum: GDA94 / Job Ref: G:\Projects\Wedge Pt_GreyPt_Brabazon_Shacks\MXD\Wedge_point_DIA.mxd). Track and shack locations need to be verified as they do not all correspond with 2008 aerial data and shack numbering plans.

Dune edge line transposed from 2008 Aerial and contour base information.

DPW2015-002-AMP-001_co-02.dgn



0 50 100 150 200 250m
SCALE 1 : 8 000 at A3 (MGA)

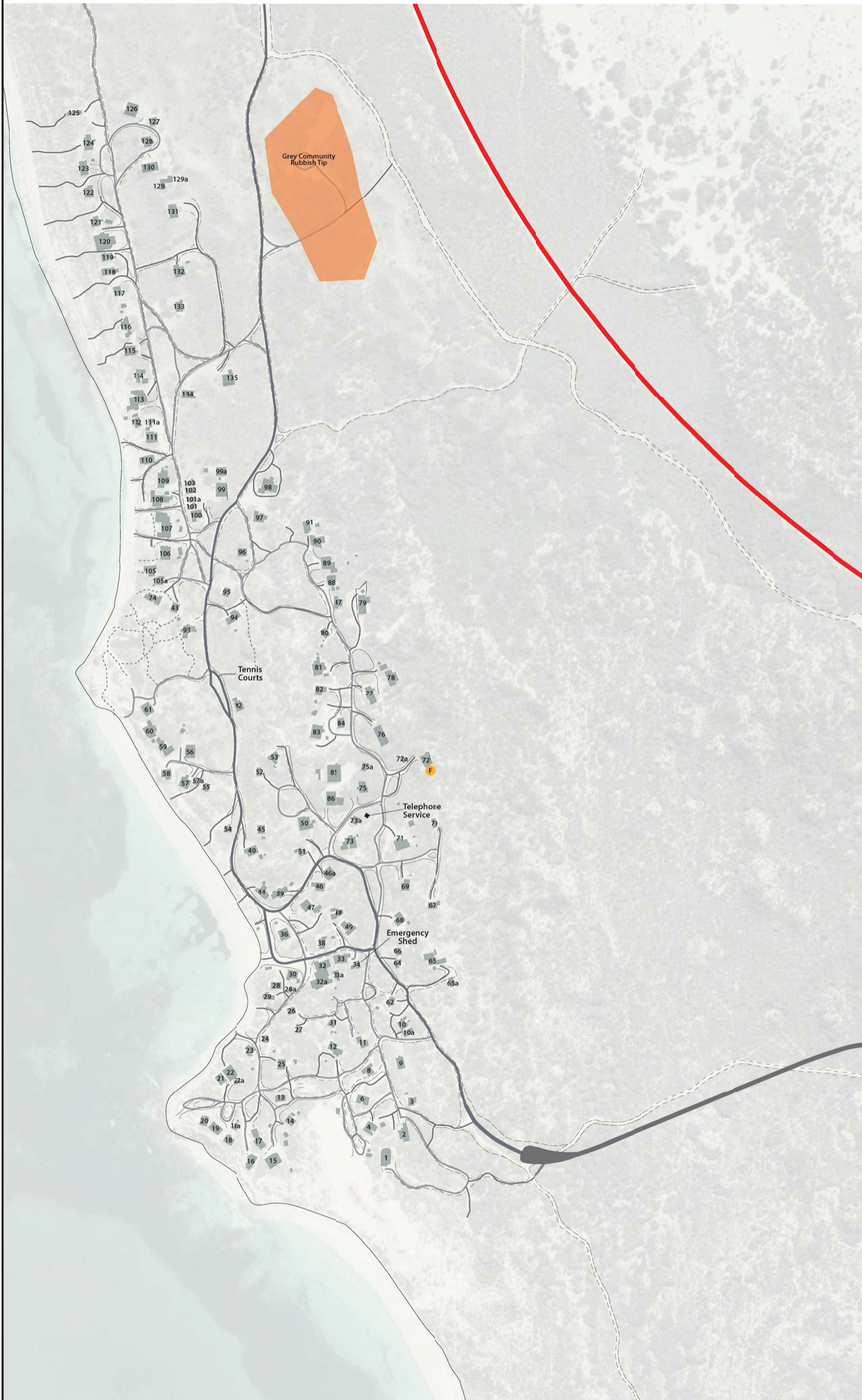


Department of Parks and Wildlife
ASBESTOS MANAGEMENT PLAN
WEDGE ISLAND AND GREY SETTLEMENTS, SHIRE OF DANDARAGAN

WEDGE ISLAND SETTLEMENT LAYOUT

Figure 2

Job: DPW2015-002



- Legend**
- Indian Ocean Drive
 - Grey Spur Road
 - Main Vehicle Thoroughfare
 - Major Vehicle Tracks
 - Minor Vehicle Tracks
 - - - Walking Tracks
 - Fences
 - Rubbish Tip
 - Shacks
 - 72** Shack Identification Numbers
 - Fire tender

Information Sources:

This map is based on 2012 Aerial and mapping produced by the GIS Branch, Department of Parks and Wildlife.

This map was transposed from mapping undertaken as part of the planning process for the Wedge and Grey Master Plan 2000.

Shacks not picked up on survey transposed from aerial information.

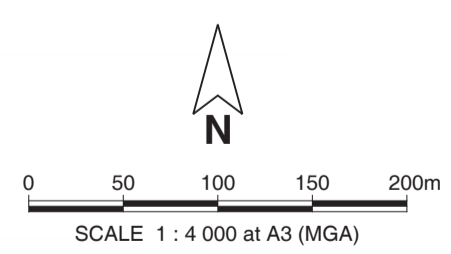
Shack Identification taken from a 2012 shack lease plan Dune edge line transposed from 2008 aerial and contour information.

Labels derived from onsite information

Access information derived from Grey_Recreation Area_Site Analysis_Land Use / October 1998 / CALM_Recreation Planning and Design Section (NB This plan is not based on accurate survey data. Information is interpreted from aerial photography. (WA3380, Run no. 5050-April 1994). Indian Ocean Drive_Dec GIS_Midwest Sealed Roads layer.

Infrastructure features derived from Grey Point_Point_Produced 21 February 2012_GIS Branch_DEC (MGA Zone 5, Datum: GDA94 / Job Ref: G:\Projects\12011G01_WedgeGreyPts\MXD\Grey_Point.mxd.

Shack and track locations derived from Grey Point_Point_Produced 21 February 2012_GIS Branch_DEC (MGA Zone 5, Datum: GDA94 / Job Ref: G:\Projects\12011G01_WedgeGreyPts\MXD\Grey_Point.mxd. Track and shack location: need to be verified as they do not all correspond with 2008 aerial data and shack numbering plans.

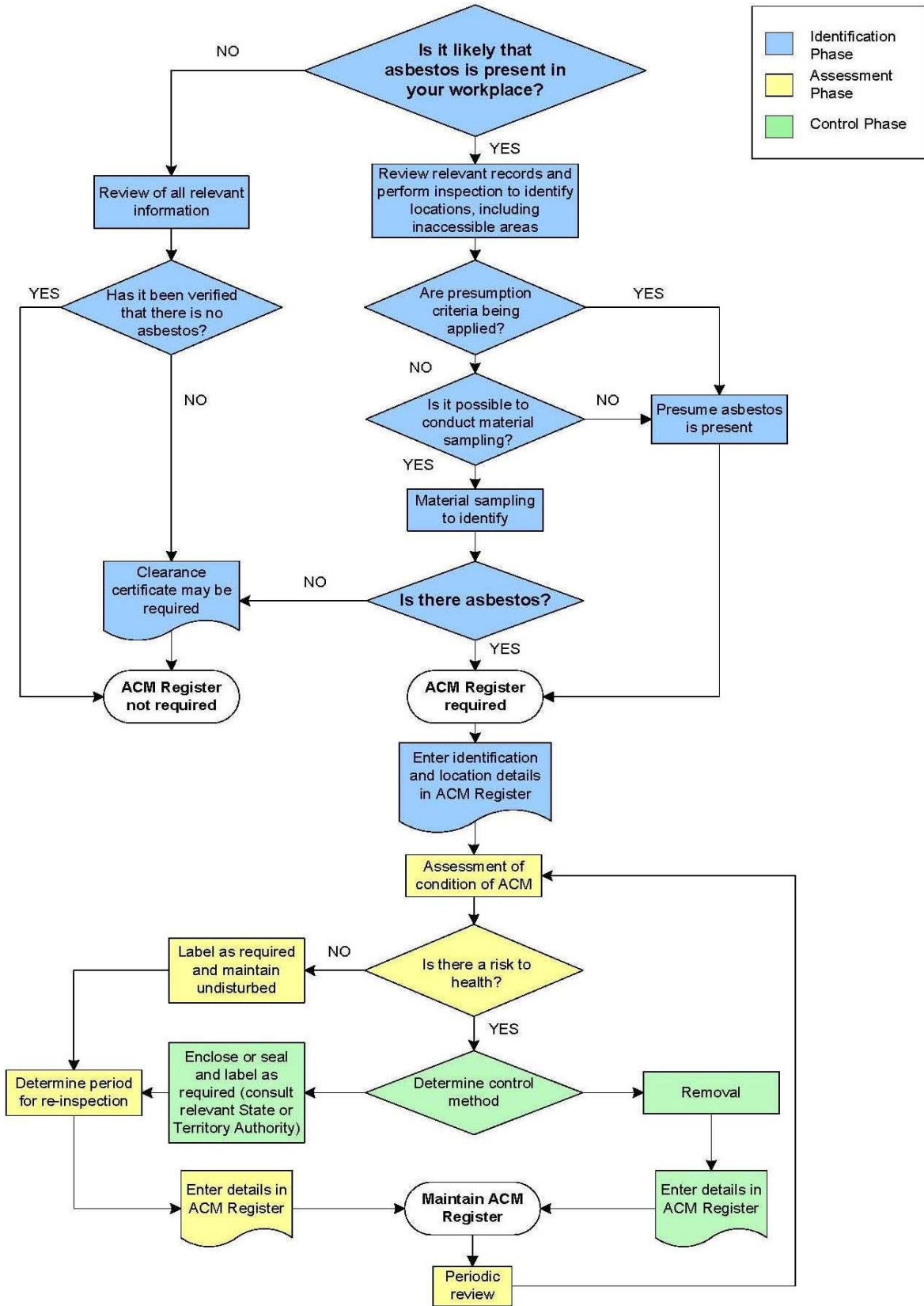


Department of Parks and Wildlife
 ASBESTOS MANAGEMENT PLAN
 WEDGE ISLAND AND GREY SETTLEMENTS, SHIRE OF DANDARAGAN

GREY SETTLEMENT LAYOUT

Figure 3

General Principles of an Asbestos Management Plan [Source: NOHSC:2018(2005)].











APPENDIX 1

Asbestos Register – Example Page

Item No.	Shack/Site	Location	Material Location	Material Description	Extent of Material (m ² / m-lin)	Sample Number	Asbestos Type(s)	Friability	Surface Properties	Product Type	Condition	Fibre Release Risk	Disturbance Potential	Recommended Action	Comments
168	G047	External	South east of shack - East of shed - Ground	Corrugated fibre cement panels	7m ²	Ref A11619	Suspect Crocidolite Included	Non-friable	Deteriorating asbestos cement	Fibre Cement Products	Low damage / deterioration	Moderate	Unlikely - Occasionally accessed	Remove or Manage as per AMP	-
169	G048	External	South of shack - Stone shuttering	Corrugated fibre cement panels	1m ²	Ref A11619	Suspect Crocidolite Included	Non-friable	Deteriorating asbestos cement	Fibre Cement Products	Moderate damage / deterioration	Moderate	Unlikely - Occasionally accessed	Remove or Manage as per AMP	-
170	G048	External	South of shack - Stone shuttering - Ground	Corrugated fibre cement debris	70cm ²	Ref A11619	Suspect Crocidolite Included	Non-friable	Deteriorating asbestos cement	Fibre Cement Products	High Damage, delamination, debris	Moderate	Unlikely - Occasionally accessed	Remove or Manage as per AMP	6m ² impacted - sub surface
171	G048	External	South of shack - Internal panel (above press metal section)	Fibre cement panels	1m ²	Ref A11521	Suspect Crocidolite Included	Non-friable	Deteriorating asbestos cement	Fibre Cement Products	Low damage / deterioration	Moderate	Unlikely - Occasionally accessed	Remove or Manage as per AMP	-
172	G048	External	South east side of shack - Ceiling	Fibre cement panels	1.5m ²	Ref A11536	Suspect Not Asbestos	-	-	-	-	-	-	Remove or Manage as per AMP	-
173	G048	External	North east side of shack - Garden bed	Fibre cement debris	1.2m ²	Ref A11578	Suspect Crocidolite Included	Non-friable	Deteriorating asbestos cement	Fibre Cement Products	High Damage, delamination, debris	Moderate	Unlikely - Occasionally accessed	Remove or Manage as per AMP	4m ² impacted - sub surface
174	G048	External	North west of shack - Fence	Corrugated fibre cement panels	10m ²	Ref A11579	Suspect Chrysotile	Non-friable	Deteriorating asbestos cement	Fibre Cement Products	Low damage / deterioration	Low	Unlikely - Occasionally accessed	Remove or Manage as per AMP	-
175	G048	External	North of shack - Under cover area - Ground	Fibre cement debris	1m ²	Ref A11536	Suspect Not Asbestos	-	-	-	-	-	-	Remove or Manage as per AMP	8m ² impacted - surface
176	G048	External	North of shack - Entrance door - Infill panel	Fibre cement panels	2m ²	Ref A11536	Suspect Not Asbestos	-	-	-	-	-	-	Remove or Manage as per AMP	-
177	G049	-	-	No asbestos identified	-	-	No Asbestos Detected	-	-	-	-	-	-	None	-
178	G050	External	South of shack - Ground	Fibre cement debris	2m ²	Ref A11536	Suspect Not Asbestos	-	-	-	-	-	-	Remove or Manage as per AMP	24m ² impacted - sub surface
179	G050	External	South east of shack - Ground	Corrugated fibre cement panels	14m ²	Ref A11579	Suspect Chrysotile	Non-friable	Asbestos cement - good condition	Fibre Cement Products	Good condition, no damage	Very Low	Rare - Usually Inaccessible	Remove or Manage as per AMP	-
180	G050	External	East of shack - Driveway / ground	Bitumen sound dampener membrane	0.5m ²	Ref A11618	Suspect Chrysotile	Non-friable	Composite Material	Composite, bitumen, vinyl	Low damage / deterioration	Very Low	Unlikely - Occasionally accessed	Remove or Manage as per AMP	3m ² impacted - surface DEBRIS
181	G050	External	North east of shack - Trailer and ground	Fibre cement debris	0.8m ²	Ref A11536	Suspect Not Asbestos	-	-	-	-	-	-	Remove or Manage as per AMP	2m ² impacted - sub surface

APPENDIX 2

Photographs - Typical ACM in Shack Buildings

<p>Photograph 1: Corrugated fibre cement roof</p>	<p>Photograph 2: Corrugated fibre cement fence</p>
	
<p>Photograph 3: Fibre cement ridge and gable end capping</p>	<p>Photograph 4: Fibre cement gutter capping</p>
	
<p>Photograph 5: Millboard insulation gasket to boiler door</p>	<p>Photograph 6: Fibre cement water pipe</p>
	
<p>Photograph 7: Fibre cement shadowline / profiled cladding panels</p>	<p>Photograph 8: Bitumen electrical mounting board</p>
	

Photograph 9: Vinyl floor sheet (asbestos paper backed)



Photograph 10: Rope seal to wood burners



Photograph 11: Loose fibrous membrane material



Photograph 12: Bitumen adhesive sound dampener membrane to underside of sink



Photograph 13: Vinyl floor tiles installed on table top



Photograph 14: Cement packers to water tank



APPENDIX 3

ACM – High Fibre Release Potential

Item No.	Shack/Site	Location	Material Location	Material Description	Extent of Material (m ² / m-lin)	Sample Number	Asbestos Type(s)	Friability	Surface Properties	Product Type	Condition	Fibre Release Risk	Disturbance Potential	Recommended Action	Comments
106	G028	External	East of shack - Gutter	Gutter deposit sample	-	A11621	Amosite Chrysotile	FA	Asbestos cement fragments	Fibre cement roof deposits	High Damage, delamination, debris	High	Unlikely - Occasionally accessed	Remove or Manage as per AMP	-
259	G073	External	North of shack - Gutter	Gutter deposit sample	-	A11624	Amosite Chrysotile	FA	Asbestos cement fragments	Fibre cement roof deposits	High Damage, delamination, debris	High	Unlikely - Occasionally accessed	Remove or Manage as per AMP	-
408	G107	External	West of shack - Gutter run off	Soil sample	-	G107	Crocidolite Chrysotile	AF	Asbestos cement fragments	Asbestos cement in soil	High Damage, delamination, debris	High	Likely - Routinely accessed	Remove or Manage as per AMP	At DOH reporting limit
678	W041	External	South side of shack - Alfresco area (south and west walls)	Fibre cement panels	16m ²	Ref A11578	Suspect Crocidolite Included	Friable	Deteriorating asbestos cement	Fibre cement - matrix degraded	High Damage, delamination, debris	High	Unlikely - Occasionally accessed	Remove or Manage as per AMP	Heavily degraded matrix
809	W073	External	West of shack - Gutter to water tank	Gutter deposit sample	-	A11586	Crocidolite	FA	Asbestos cement fragments	Fibre cement roof deposits	High Damage, delamination, debris	High	Unlikely - Occasionally accessed	Remove or Manage as per AMP	-
943	W107	External	South east of shack - Shed (low level) Infill panel	Fibre cement panels	2m ²	Ref A11605	Suspect Amosite Included	Friable	Deteriorating asbestos cement	Fibre cement - matrix degraded	High Damage, delamination, debris	High	Unlikely - Occasionally accessed	Remove or Manage as per AMP	Heavily degraded matrix
1195	W220	External	North west of shack - on floor	Loose/stored corrugated fibre cement panels	4.5m ²	Ref A11583	Suspect Amosite Included	Friable	Deteriorating asbestos cement	Fibre cement - matrix degraded	High Damage, delamination, debris	High	Unlikely - Occasionally accessed	Remove or Manage as per AMP	Heavily degraded matrix
1238	W253	External	East side of shack - Walls	Fibre cement panels	23m ²	A6891	Amosite Chrysotile	Friable	Deteriorating asbestos cement	Fibre cement - matrix degraded	High Damage, delamination, debris	High	Likely - Routinely accessed	Remove or Manage as per AMP	Heavily degraded matrix
1271	W264	External	North east side of shack - Shed - Ironing board	Thermal Insulation pad	60cm ²	A11609	Chrysotile	Friable	Unsealed thermal insulation	Thermal insulation materials (not textiles)	High Damage, delamination, debris	High	Likely - Routinely accessed	Remove or Manage as per AMP	-
1383	W323	External	East side of shack - Fence	Corrugated fibre cement panels	13m-lin	Ref A11619	Suspect Crocidolite Included	Friable	Deteriorating asbestos cement	Fibre cement - matrix degraded	High Damage, delamination, debris	High	Likely - Routinely accessed	Remove or Manage as per AMP	Heavily degraded matrix

APPENDIX 4

Preliminary Soils Assessment Photographs



Photograph 1

Example of fibre cement fragments in driveway of Shack G115 (impacted area approximately 100 m²).



Photograph 2

Example of fibre cement fragments in driveway of Shack G079 (impacted area approximately 100 m²).

DPW2015-002

Wedge Island and Grey Asbestos in Soil Assessment





Photograph 3

ACM fragments at Shack G063. An example of fragments at the surface but also possibly present just beneath the surface.



Photograph 4

Example of domestic refuse and other materials possibly (temporarily) concealing ACM.

DPW2015-002

Wedge Island and Grey Asbestos in Soil Assessment





Photograph 5

Example of ACM at the surface only (Shack W017).



Photograph 6

Location of surface soil sample at Shack W253. Highly weathered ACM wall panel located 1.6 m away.

DPW2015-002

Wedge Island and Grey Asbestos in Soil Assessment





Photograph 7

Surface soil sample at Shack G107 collected beneath outfall from gutter.

APPENDIX 5

Analytical Reports

LABORATORY REPORT

Job Number: 15-5058
Revision: 01
Date: 5 August 2015

ADDRESS: **Aurora Environmental**
 Dilhorn House
 2 Bulwer Street
 PERTH WA 6000

ATTENTION: Mark Frith

DATE RECEIVED: 14/07/2015

YOUR REFERENCE: DPW2015_002

PURCHASE ORDER: -13/P248v1

APPROVALS:



Reagan Neal
Approved Identifier



Kim Rodgers
Approved Signatory



SAMPLING COMMENTS:

Samples are analysed on an "as received" basis

METHOD:

ASBID Qualitative identification of fibre type in bulk samples by Stereo Microscope Examination and Polarised Light Microscopy, including Dispersion Staining, using ARL in-house method ASBID and in accordance with AS4964-2004.

Sample Number	Sample Description	Sample Type	Approximate Sample Weight (g)	Asbestos in Bulk Sample
15-5058-1	A6891	Cement	Approx 4.8g	Chrysotile Asbestos Detected Amosite Asbestos Detected Organic Fibres Detected
15-5058-2	A11500	Bitumen	Approx 1.2g	No Asbestos Detected Organic Fibres Detected
15-5058-3	A11501	Fibrous Mass	Approx 0.1g	No Asbestos Detected Synthetic Mineral Fibres Detected
15-5058-4	A11502	Board	Approx 0.2g	No Asbestos Detected Organic Fibres Detected
15-5058-5	A11504	Board	Approx 0.3g	No Asbestos Detected Organic Fibres Detected
15-5058-6	A11505	Mastic	Approx 1.6g	No Asbestos Detected
15-5058-7	A11506	Fibrous Mass	Approx 0.2g	No Asbestos Detected Synthetic Mineral Fibres Detected

Aurora Environmental
ARL Job No: 15-5058
5 August 2015

Sample Number	Sample Description	Sample Type	Approximate Sample Weight (g)	Asbestos in Bulk Sample
15-5058-8	A11507	Vinyl Tile	Approx 0.4g	No Asbestos Detected Organic Fibres Detected
15-5058-9	A11508	Cement	Approx 0.1g	No Asbestos Detected Organic Fibres Detected
15-5058-10	A11509	Mastic	Approx 0.3g	No Asbestos Detected Organic Fibres Detected
15-5058-11	A11511	Lino	Approx 0.6g	No Asbestos Detected
15-5058-12	A11513	Cement	Approx 0.2g	Chrysotile Asbestos Detected Organic Fibres Detected
15-5058-13	A11514	Mastic	Approx 0.7g	Chrysotile Asbestos Detected
15-5058-14	A11515	Lino	Approx 1.6g	No Asbestos Detected Organic Fibres Detected
15-5058-15	A11516	Cement	Approx 0.2g	Chrysotile Asbestos Detected Organic Fibres Detected
15-5058-16	A11517	Rope	Approx 1.2g	Chrysotile Asbestos Detected
15-5058-17	A11519	Bitumen	Approx 0.2g	No Asbestos Detected
15-5058-18	A11521	Cement	Approx 0.2g	Chrysotile Asbestos Detected Crocidolite Asbestos Detected
15-5058-19	A11523	Bitumen	Approx 2.1g	No Asbestos Detected Organic Fibres Detected
15-5058-20	A11524	Cement	Approx 4.2g	No Asbestos Detected Organic Fibres Detected
15-5058-21	A11526	Cement	Approx 0.3g	No Asbestos Detected Organic Fibres Detected
15-5058-22	A11529	Cement	Approx 0.2g	No Asbestos Detected Organic Fibres Detected
15-5058-23	A11530	Cement	Approx 4.3g	No Asbestos Detected Organic Fibres Detected
15-5058-24	A11531	Cement	Approx 1.2g	No Asbestos Detected Organic Fibres Detected
15-5058-25	A11532	Cement	Approx 1.2g	No Asbestos Detected Organic Fibres Detected
15-5058-26	A11533	Cement	Approx 0.7g	No Asbestos Detected Organic Fibres Detected
15-5058-27	A11535	Mastic	Approx 0.9g	No Asbestos Detected
15-5058-28	A11536	Cement	Approx 6.2g	No Asbestos Detected Organic Fibres Detected
15-5058-29	A11537	Cement	Approx 10g	Chrysotile Asbestos Detected Amosite Asbestos Detected
15-5058-30	A11538	Mastic	Approx 12g	Chrysotile Asbestos Detected Organic Fibres Detected
15-5058-31	A11539	Rope	Approx 1.3g	Chrysotile Asbestos Detected
15-5058-32	A11543	Vinyl Tile	Approx 4.3g	No Asbestos Detected Organic Fibres Detected
15-5058-33	A11544	Vinyl Tile	Approx 10g	No Asbestos Detected **
15-5058-34	A11546	Bitumen	Approx 1.4g	No Asbestos Detected Organic Fibres Detected
15-5058-35	A11547	Cement	Approx 4.2g	Chrysotile Asbestos Detected Amosite Asbestos Detected
15-5058-36	A11548	Cement	Approx 1.3g	Chrysotile Asbestos Detected Organic Fibres Detected

Aurora Environmental
ARL Job No: 15-5058
5 August 2015

Sample Number	Sample Description	Sample Type	Approximate Sample Weight (g)	Asbestos in Bulk Sample
15-5058-37	A11549	Cement	Approx 0.7g	Chrysotile Asbestos Detected
15-5058-38	A11550	Bitumen	Approx 2.3g	Chrysotile Asbestos Detected Organic Fibres Detected
15-5058-39	A11551	Debris	Approx 1.1g	No Asbestos Detected Organic Fibres Detected
15-5058-40	A11552	Cement	Approx 3.6g	Chrysotile Asbestos Detected Amosite Asbestos Detected Crocidolite Asbestos Detected
15-5058-41	A11553	Mastic	Approx 8.3g	No Asbestos Detected
15-5058-42	A11554	Cement	Approx 4.4g	Chrysotile Asbestos Detected
15-5058-43	A11555	Cement	Approx 0.9g	No Asbestos Detected Organic Fibres Detected
15-5058-44	A11556	Cement	Approx 0.7g	Chrysotile Asbestos Detected Organic Fibres Detected
15-5058-45	A11558	Bitumen	Approx 0.6g	No Asbestos Detected Organic Fibres Detected
15-5058-46	A11559	Cement	Approx 0.2g	No Asbestos Detected Organic Fibres Detected
15-5058-47	A11560	Bitumen	Approx 2.3g	No Asbestos Detected Organic Fibres Detected
15-5058-48	A11561	Cement	Approx 1.2g	Chrysotile Asbestos Detected Amosite Asbestos Detected
15-5058-49	A11564	Cement	Approx 1.2g	No Asbestos Detected Organic Fibres Detected
15-5058-50	A11567	Vinyl Tile	Approx 6.2g	Chrysotile Asbestos Detected
15-5058-51	A11569	Bitumen	Approx 6.2g	No Asbestos Detected Organic Fibres Detected
15-5058-52	A11570	Cement	Approx 0.3g	No Asbestos Detected Organic Fibres Detected
15-5058-53	A11572	Lino	Approx 1.9g	No Asbestos Detected Synthetic Mineral Fibres Detected
15-5058-54	A11576	Cement	Approx 0.5g	Chrysotile Asbestos Detected Organic Fibres Detected
15-5058-55	A11578	Cement	Approx 3.3g	Chrysotile Asbestos Detected Crocidolite Asbestos Detected
15-5058-56	A11579	Cement	Approx 14g	Chrysotile Asbestos Detected
15-5058-57	A11580	Board	Approx 1.4g	No Asbestos Detected Organic Fibres Detected
15-5058-58	A11581	Board	Approx 0.4g	No Asbestos Detected Organic Fibres Detected
15-5058-59	A11582	Board	Approx 2.1g	No Asbestos Detected Organic Fibres Detected
15-5058-60	A11583	Cement	Approx 1.0g	Chrysotile Asbestos Detected Amosite Asbestos Detected
15-5058-61	A11586	Fibrous Mass	Approx 21g	Crocidolite Asbestos Detected Synthetic Mineral Fibres Detected Organic Fibres Detected
15-5058-62	A11587	Cement	Approx 0.5g	Chrysotile Asbestos Detected Organic Fibres Detected
15-5058-63	A11588	Fibrous Mass	Approx 0.6g	No Asbestos Detected Organic Fibres Detected

Aurora Environmental
ARL Job No: 15-5058
5 August 2015

Sample Number	Sample Description	Sample Type	Approximate Sample Weight (g)	Asbestos in Bulk Sample
15-5058-64	A11590	Cement	Approx 14g	No Asbestos Detected Organic Fibres Detected
15-5058-65	A11591	Cement	Approx 0.2	No Asbestos Detected Organic Fibres Detected
15-5058-66	A11593	Board	Approx 0.4g	No Asbestos Detected Organic Fibres Detected
15-5058-67	A11594	Fibrous Mass	Approx 6.7g	Chrysotile Asbestos Detected Synthetic Mineral Fibres Detected Organic Fibres Detected
15-5058-68	A11596	Cement	Approx 1.7g	No Asbestos Detected Organic Fibres Detected
15-5058-69	A11598	Board	Approx 0.8g	Chrysotile Asbestos Detected Organic Fibres Detected
15-5058-70	A11601	Cement	Approx 2.0g	Chrysotile Asbestos Detected Crocidolite Asbestos Detected
15-5058-71	A11603	Rope	Approx 1.2g	Chrysotile Asbestos Detected Organic Fibres Detected
15-5058-72	A11604	Mastic	Approx 5.5g	No Asbestos Detected
15-5058-73	A11605	Cement	Approx 0.6g	Chrysotile Asbestos Detected Amosite Asbestos Detected
15-5058-74	A11608	Cement	Approx 20g	Chrysotile Asbestos Detected
15-5058-75	A11609	Fibrous Mass	Approx 5.5g	Chrysotile Asbestos Detected
15-5058-76	A11610	Vinyl Tile	Approx 2.2g	No Asbestos Detected
15-5058-77	A11611	Board	Approx 18g	No Asbestos Detected Organic Fibres Detected
15-5058-78	A11612	Board	Approx 0.7g	Chrysotile Asbestos Detected Amosite Asbestos Detected Organic Fibres Detected
15-5058-79	A11616	Board	Approx 0.4g	No Asbestos Detected Organic Fibres Detected
15-5058-80	A11618	Bitumen	Approx 0.5g	Chrysotile Asbestos Detected
15-5058-81	A11619	Cement	Approx 2.4g	Chrysotile Asbestos Detected Crocidolite Asbestos Detected
15-5058-82	A11620	Board	Approx 0.2g	No Asbestos Detected Organic Fibres Detected
15-5058-83	A11621	Fibrous Mass	Approx <0.1g	Chrysotile Asbestos Detected Amosite Asbestos Detected Organic Fibres Detected
15-5058-84	A11623	Lino	Approx 3.0g	No Asbestos Detected Synthetic Mineral Fibres Detected
15-5058-85	A11624	Fibrous Mass	Approx 8.4g	Chrysotile Asbestos Detected Amosite Asbestos Detected Organic Fibres Detected
15-5058-86	A11625	Lino	Approx 0.3g	No Asbestos Detected Synthetic Mineral Fibres Detected
15-5058-87	A11628	Cement	Approx 0.1g	Chrysotile Asbestos Detected Amosite Asbestos Detected
15-5058-88	A11629	Lino	Approx 0.1g	No Asbestos Detected Synthetic Mineral Fibres Detected
15-5058-89	A11630	Bitumen	Approx 0.7g	No Asbestos Detected

Aurora Environmental
ARL Job No: 15-5058
5 August 2015



Sample Number	Sample Description	Sample Type	Approximate Sample Weight (g)	Asbestos in Bulk Sample
15-5058-90	A11631	Lino	Approx 2.1g	Chrysotile Asbestos Detected Organic Fibres Detected

REPORT COMMENTS:

** Confirmation by another independent analytical technique is advised due to the nature of the sample.

LABORATORY REPORT

Job Number: 15-5143
Revision: 01
Date: 27 July 2015

ADDRESS: **Aurora Environmental**
Dilhorn House
2 Bulwer Street
PERTH WA 6000

ATTENTION: Peter Shades

DATE RECEIVED: 16/07/2015

YOUR REFERENCE: DPW2015_002

PURCHASE ORDER:

APPROVALS:


Reagan Neal
Approved Identifier


Kim Rodgers
Approved Signatory


SAMPLING COMMENTS:

Samples are analysed on an "as received" basis

METHOD:

ASBID Qualitative identification of fibre type in bulk samples by Stereo Microscope Examination and Polarised Light Microscopy, including Dispersion Staining, using ARL in-house method ASBID and in accordance with AS4964-2004.

Sample Number	Sample Description	Sample Type	Approximate Sample Weight (g)	Asbestos in Soil Sample
15-5143-1	W110	Soil	Total ~ 1400 Sub ~ 170	No Asbestos Detected at Reporting Limit of 0.1g/kg Organic Fibres Detected
15-5143-2	W235	Soil	Total ~ 1300 Sub ~ 160	Chrysotile Asbestos Detected Amosite Asbestos Detected 2x Cement Fragments ~ 3600mg Organic Fibres Detected
15-5143-3	G73	Soil	Total ~ 990 Sub ~ 110	Chrysotile Asbestos Detected 1x Cement Fragment ~ 1200mg Organic Fibres Detected
15-5143-4	G107	Soil	Total ~ 1100 Sub ~ 190	Chrysotile Asbestos Detected Crocidolite Asbestos Detected 1x Cement Fragment ~ 4500mg Organic Fibres Detected

Aurora Environmental
ARL Job No: 15-5143
27 July 2015



REPORT COMMENTS:

This report is consistent with the analytical procedures in the Western Australia "Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia - May 2009".

All soil samples received were sieved and the greater than 2mm fraction analysed, and the less than 2mm fraction sub-sampled and analysed.

Analytical Report - Airborne Fibre Monitoring

Project Reference: DPW2015_002

Certificate Number: MF2015_001

Client Name & Address: Department of Parks and Wildlife
17 Dick Perry Avenue
Kensington WA 6151

Site Address: Wedge and Grey

Location Slides Analysed: Aurora Environmental
Perth Office
2 Bulwer Street Perth WA 6000

Sample Number	Slide Number	Test Type*	Date Sampled	Date Analysed	Location	Fibres	Fields	Fibres/mL
1	MF15029	Ex	30/05/2015	8/07/2015	P Shades - Conducting shack surveys	NIL	100	<0.01
2	MF15030	Ex	2/06/2015	8/07/2015	M Frith - Conducting shack surveys	NIL	100	<0.01
3	MF15031	Ex	4/06/2015	8/07/2015	P Shades - Conducting shack surveys	NIL	100	<0.01
4	MF15032	Ex	5/06/2015	8/07/2015	M Frith - Conducting shack surveys	NIL	100	<0.01
5	MF15033	Ex	8/06/2015	8/07/2015	P Shades - Conducting shack surveys	NIL	100	<0.01
6	MF15034	Ex	10/06/2015	8/07/2015	M Frith - Conducting shack surveys	2.0	100	<0.01

* Test Types: **CO:** Control Monitoring; **Ex:** Personal Exposure Monitoring; **CL:** Clearance Monitoring; **FB:** Field Blank; **LB:** Laboratory Blank

Test Method: Dust particulates collected and filters examined in accordance with The Guidance Note on the Membrane Filter Method for Estimating Airborne Asbestos Fibres NOHSC:3003 (2005). Fibres counted may include various substances i.e. not necessarily asbestos.

Key: *POV:* Sample rejected due to particulate overload *FDA:* Sample rejected due to Filter Damage *NA:* Not Available
PFA: Sample rejected due to Pump Failure *UPD:* Sample rejected due to uneven particulate deposition

Signed: 

Authorised Analyst

Analytical Report - Airborne Fibre Monitoring



Project Reference: DPW2015_002

Certificate Number: MF2015_001

Client Name & Address: Department of Parks and Wildlife
17 Dick Perry Avenue
Kensington WA 6151

Site Address: Wedge and Grey

Location Slides Analysed: Aurora Environmental
Perth Office
2 Bulwer Street Perth WA 6000

Sample Number	Slide Number	Test Type*	Date Sampled	Date Analysed	Location	Fibres	Fields	Fibres/mL
7	MF15035	Ex	12/06/2015	8/07/2015	P Shades - Conducting shack surveys	NIL	100	<0.01
8	MF15036	Ex	16/06/2015	8/07/2015	P Shades - Conducting shack surveys	NIL	100	<0.01
9	MF15037	Ex	17/06/2015	8/07/2015	P Shades - Conducting shack surveys	1.0	100	<0.01
10	MF15038	Ex	18/06/2015	8/07/2015	P Shades - Conducting shack surveys	NIL	100	<0.01
11	MF15039	FB	18/06/2015	8/07/2015	Field Blank	NIL	100	-
12	MF15040	Ex	3/06/2015	8/07/2015	M Frith - Conducting shack surveys	NIL	100	<0.01

* Test Types: **CO:** Control Monitoring; **Ex:** Personal Exposure Monitoring; **CL:** Clearance Monitoring; **FB:** Field Blank; **LB:** Laboratory Blank

Test Method: Dust particulates collected and filters examined in accordance with The Guidance Note on the Membrane Filter Method for Estimating Airborne Asbestos Fibres NOHSC:3003 (2005). Fibres counted may include various substances i.e. not necessarily asbestos.

Key: *POV:* Sample rejected due to particulate overload *FDA:* Sample rejected due to Filter Damage *NA:* Not Available
PFA: Sample rejected due to Pump Failure *UPD:* Sample rejected due to uneven particulate deposition

Signed: 

Authorised Analyst

Analytical Report - Airborne Fibre Monitoring



Project Reference: DPW2015_002

Certificate Number: MF2015_001

Client Name & Address: Department of Parks and Wildlife
17 Dick Perry Avenue
Kensington WA 6151

Site Address: Wedge and Grey

Location Slides Analysed: Aurora Environmental
Perth Office
2 Bulwer Street Perth WA 6000

Sample Number	Slide Number	Test Type*	Date Sampled	Date Analysed	Location	Fibres	Fields	Fibres/mL
13	MF15041	Ex	9/06/2015	8/07/2015	M Frith - Conducting shack surveys	NIL	100	<0.01

* Test Types: **CO:** Control Monitoring; **Ex:** Personal Exposure Monitoring; **CL:** Clearance Monitoring; **FB:** Field Blank; **LB:** Laboratory Blank

Test Method: Dust particulates collected and filters examined in accordance with The Guidance Note on the Membrane Filter Method for Estimating Airborne Asbestos Fibres NOHSC:3003 (2005). Fibres counted may include various substances i.e. not necessarily asbestos.

Key: *POV:* Sample rejected due to particulate overload *FDA:* Sample rejected due to Filter Damage *NA:* Not Available
PFA: Sample rejected due to Pump Failure *UPD:* Sample rejected due to uneven particulate deposition

Signed: 

Authorised Analyst