FREMANTLE PORTS

ENVIRONMENTAL MANAGEMENT

Soil and Groundwater Assessment (SGA) Guidelines for Fremantle Ports' Tenants

November 2016

FREMANTLE PORTS

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ABBREVIATIONS

Abbreviation	Description
ACM	Asbestos containing materials
AHD	Australian Height Datum
bgl	below ground level
BTEX	Benzene, toluene, ethylbenzene and xylenes
CAT	Cable avoidance tools
COC	Chain of Custody
COPC	Chemicals of potential concern
CS	Contaminated Sites
DBYD	Dial Before You Dig
DA	Development Application
DER	Department of Environment Regulation
DO	Dissolved oxygen
EC	Electrical conductivity
ha	Hectares
HSEP	Health Safety and Environmental Plan
GME	Groundwater Monitoring Event
GPR	Ground Penetrating Radar
JSA	Job Safety Analyses
L	Litre
m	Metres
NATA	National Association of Testing Authorities
NEPM	National Environment Protection Measure
PAH	Polycyclic aromatic hydrocarbons
PID	Photo-ionisation detector
PPE	Personal Protection Equipment
PSH	Phase separated hydrocarbons
QA	Quality Assurance
QC	Quality Control
SAQP	Sampling and Analysis Quality Plan
SGA	Soil and Groundwater Assessments
TDS	Total Dissolved Solids
TRH	Total recoverable hydrocarbons
uPVC	Unplasticised Poly Vinyl Chloride
URS	URS Australia Pty Ltd
UST	Underground Storage Tank
VOC	Volatile organic compounds
WA	Western Australia

1 INTRODUCTION

1.1 Purpose

These guidelines aim to provide Lessees with a framework of responsibilities and scope requirements for undertaking Soil and Groundwater Assessments (SGAs) upon commencement, during occupation and at the exit of a lease at Fremantle Ports' sites.

The purpose of a SGA is to characterise soil and groundwater conditions at a lease site to:

1. provide both Fremantle Ports and the Lessee comfort that site conditions at the commencement of the lease are understood
2. determine whether any contamination of soil or groundwater has occurred during the lease by comparison of impacts from Commencement and Exit SGAs
3. confirm that the site is suitable for commercial/industrial use.

1.2 Legislative Framework

The management of soil and groundwater contamination must be undertaken in accordance with the following State legislation:

- *Environmental Protection Act 1986*
- *Contaminated Sites Act 2003*.

There are also several State and National guidelines that may be applied but are not limited to:

- *National Environment Protection (Assessment of Site Contamination) Measure 2013* (NEPM)
- *DER (WA), Assessment and Management of Contaminated Sites*, December 2014
- *Australian Standard – Guide to the investigation and sampling of sites with potentially contaminated soil – Non-volatile and semi volatile compounds*, November 2005 (AS 4482.1-2005)
- *Australian Standard – Guide to the sampling and investigation of potentially contaminated soil – Volatile substances*, September 1999 (AS 4482.2-1999)
- *Australian/New Zealand Standards for Water Quality – Sampling parts 1, 6, and 11 (numbers 5667.1:1998; 5667.6:1998; and 5667.11:1998*)
- *Australian Standard, 1726, Geotechnical site investigations*, 1993.

2 MANAGEMENT OF SOIL AND GROUNDWATER CONTAMINATION PROCESS

2.1 Definitions of SGAs

In this document, the term 'Commencement SGA' is used to reflect that the SGAs are undertaken at the commencement of a lease.

An 'Exit SGA' is used to describe SGAs which are undertaken at the end of the lease at the time the site is vacated by the Lessee and before the site is occupied by a new Lessee.

'Combined' SGAs refer to assessments on sites where no previous SGA has been completed or where an arrangement to share information between exiting and incoming tenants is agreed with Fremantle Ports.

'Additional' SGAs may be required by Fremantle Ports if an emission to the environment occurs at a site during the period of the lease.

2.2 Commencement SGAs

Commencement SGAs are to be undertaken and reported prior to the Lessee taking occupation of the site.

It is the responsibility of the Lessee to organise and fund a commencement SGA when entering a lease. The Lessee must seek review and agreement from Fremantle Ports of the scope of the SGA prior to the works being undertaken. Where a development is proposed at a site by the Lessee, the proposed scope of the Commencement SGA should be provided with an application to Fremantle Ports for planning approval to enable Fremantle Ports to review the proposed layout of the site in parallel with the proposed sampling locations. Information on how to make an application for planning approval is provided in the *Fremantle Ports Planning Guidelines*. Where no development is proposed the scope of the commencement SGA will need to be agreed and approved by Fremantle Ports and implemented and reported prior to lease commencement or occupation (whichever is sooner).

Should Fremantle Ports have groundwater monitoring wells onsite then, subject to approval from Fremantle Ports, the Lessee's consultants may be provided access to them to gain samples for an SGA.

2.3 Exit SGAs

It is the responsibility of the Lessee to organise and fund an Exit SGA when exiting a lease. The Lessee must seek review and agreement from Fremantle Ports of the scope of work prior to the works being undertaken.

Where a Commencement SGA has not been previously undertaken, an Exit SGA will be required to determine any contamination of the soil or groundwater attributable to activities undertaken by the Lessee during the previous lease term. The Exit SGA together with any further environmental assessment, remediation and settlement of the Lessee financial security must be conducted prior to termination or assignment of the lease unless otherwise agreed with Fremantle Ports. Any requirements for additional works must be discussed and agreed with Fremantle Ports.

2.4 Combined SGAs

2.4.1 Existing lessee continuing at the site

A Commencement and Exit SGA must be combined (Combined SGA) where a Lessee seeks renewal of their lease, or a new lease, and a Commencement SGA has not been previously undertaken. The Combined SGA will determine any contamination of the site attributable to activities undertaken by the Lessee during their previous lease term and also provide a reference for direct comparison of an Exit SGA at the end of the new lease term. The Lessee would be required to consider a scope that accounts for the objectives of both an Exit SGA and a Commencement SGA to account for past and proposed future uses of the site.

2.4.2 Existing lessee exiting and new lessee entering the site

Where a new lessee and new lease is proposed for a site and the existing tenant is exiting the site, a Combined SGA may be considered by Fremantle Ports.

The Combined SGA would meet the objectives of both an Exit SGA and a Commencement SGA and be delivered as a single project with the objective of realising cost efficiencies to the lessees. Payment of costs associated with a Combined SGA are to be negotiated and paid for by the outgoing and incoming lessees. A development application (if required) and a scope of work for the Combined SGA must be provided to Fremantle Ports for approval.

The timing and scope of work must satisfy Fremantle Ports' and each company's requirements and each party must be afforded reliance on the SGA report without limitation.

2.5 Additional SGAs

An Additional SGA may be required prior to assignment of an existing lease to a new tenant or at any stage Fremantle Ports has reason to suspect an emission has occurred with the potential to cause contamination of the site.

Where an Additional SGA is required prior to assignment of an existing lease sufficient time must be allowed by the lessee to prepare, agree and implement the Additional SGA scope of work and to discuss and finalise the Additional SGA report prior to the transfer of the lease and improvements. Fremantle Ports suggests at least (3) months is allowed to complete this process.

As the purpose of any Additional SGA is to update existing site information it must be referred to and incorporated into an Exit SGA. The Lessee must seek review and agreement from Fremantle Ports of the scope of an Additional SGA prior to the works being undertaken.

The findings of an Additional SGA must be provided to Fremantle Ports to determine any requirement for further works (i.e. site investigation, risk assessment, remediation or management) and notification of the DER (if required).

2.6 Remedial Action Plans

Remedial Action Plans shall meet the requirements of the Assessment and Management of Contaminated Sites Contaminated Sites Guidelines (WA DER, 2014). Fremantle Ports and most tenants would prefer a permanent solution for site contamination to limit ongoing liability and

ensure protection of the land, water and air quality of Fremantle Ports' lands. This typically requires the removal or treatment of contaminated soil, groundwater and sediment.

While tenanted lands may presently be industrial use, lands that are adjacent to existing or future commercial, residential or park uses may require more stringent clean up standards depending on the original condition of the site. The remediation standards will be defined based on discussions with Fremantle Ports.

2.7 Use of Previous Reports

Previous reports (including reports that contain information or data) commissioned or prepared by Fremantle Ports (including Fremantle Ports' consultants) ('**Previous Reports**') may be provided to the Lessee by Fremantle Ports and may be considered by the Lessee as generic information only which may give some guidance to the Lessee in the preparation of its SGA. It should be noted that Previous Reports are generally produced to address objectives different to those objectives of a SGA, may contain information, data, observations and recommendations that is outdated, does not include information reflective of the land use and site operations subsequent to the date of the Previous Reports and may not include other site information that may be relevant to a SGA.

Previous Reports containing site sampling and analysis information may have also been prepared using sampling and analysis protocols that have changed or there may be limitations to the circumstances in which that the information was collected.

Previous Reports must be critically examined by the Lessee's Approved Environmental Consultant to determine the relevance of historical data and to assess the quality of the compiled data so that it is compliant or aligned with current generally accepted contaminated sites quality control and quality assessment protocols prior to using, referencing or extrapolating any content, information, data, observations and recommendations from any Previous Reports in the SGA.

2.8 Reliance

Any SGA report prepared by a Lessee (or the Lessee's consultant) must expressly permit the Lessee and Fremantle Ports to rely on the content, information, data, observations and recommendations set out in the SGA.

Reliance can be provided in a number of ways which may be acceptable to Fremantle Ports and the Lessee:

a) The SGA could include a provision with the effect of permitting the Lessee and Fremantle Ports to rely on the content, information, data, observations and recommendations set out in the SGA, or

b) The Lessee or its consultant or both, may enter into a Deed of Use or other contract with Fremantle Ports on terms acceptable to Fremantle Ports. Costs associated with the drafting, preparation and review of a Deed of Use or other contract will be payable by the Lessee.

The objective of the express consent given by the Lessee and its consultant is to enable Fremantle Ports to rely on any content, information, data, observations and recommendations set out in the SGA without any limitation or liability.

2.9 Financial Security

Additional security may be applied to a contract with a Lessee to cover any potential costs associated with land contamination which may have occurred during the lease, i.e. between SGAs.

The value of the security will be set by Fremantle Ports on a case-by-case basis taking into consideration:

- the contamination caused by the tenant
- the extent to which contamination has or has not been delineated, assessed and managed, and
- the size of the site (See Table 3-1).

The security may be returned to the Lessee following completion of the Exit SGA where the condition of the land is deemed to be satisfactory by Fremantle Ports.

Should an SGA conclude that contamination has occurred during the course of the lease then Fremantle Ports may:

- hold the security until the lessee has completed the site assessment and any remediation and management of the site
- calculate indicative site assessment, remediation and management costs for the identified impacts to restore the land to pre-lease conditions e.g. conditions that were reported in the Commencement SGA. Costs will depend on contaminant type(s), impacted media (e.g. soil, groundwater or both) and extent of contamination. Fremantle Ports may engage an independent environmental expert to calculate the costs and deduct these from the security.

2.10 Liaison with Department of Environmental Regulation

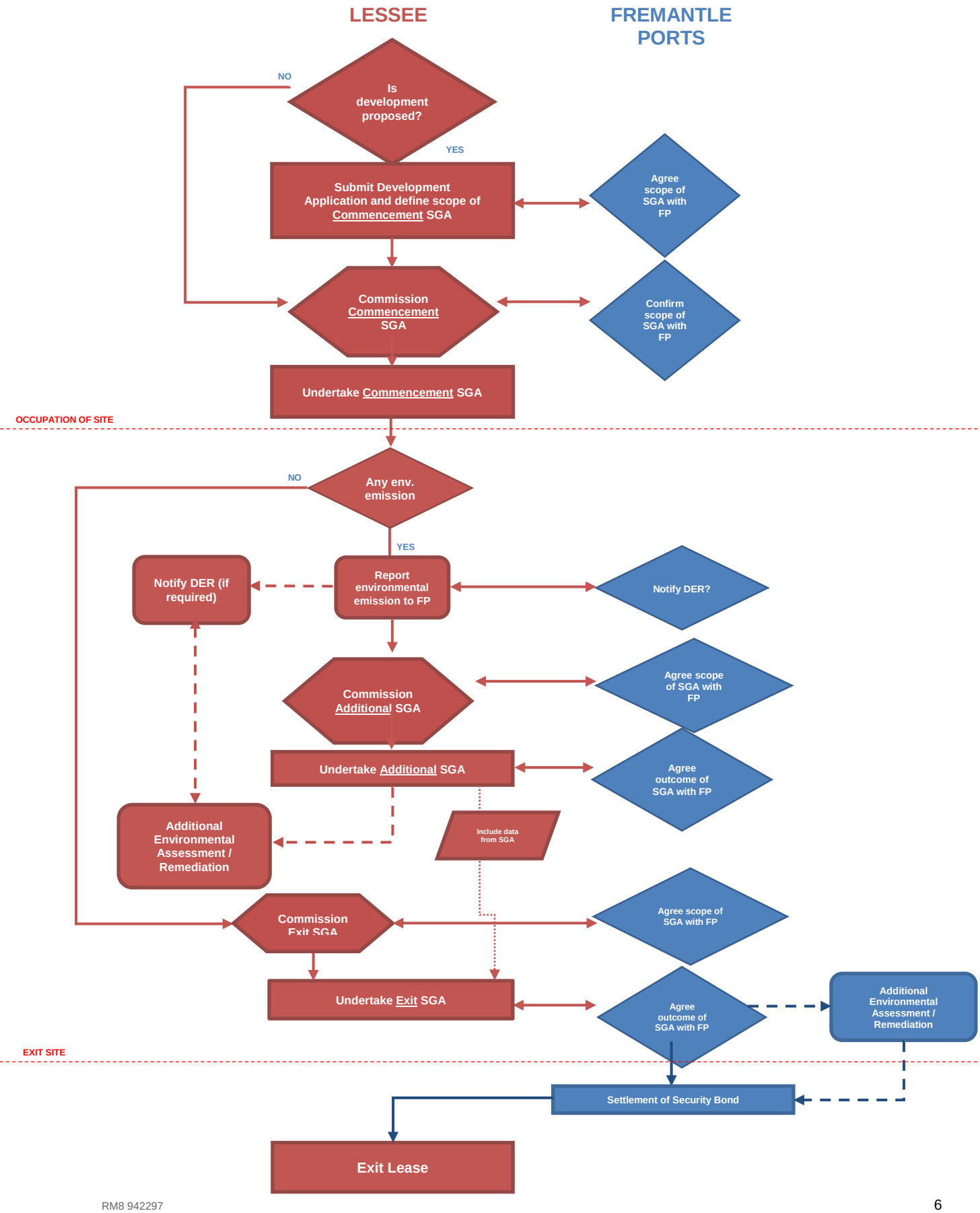
Should an emission to the environment occur the Lessee should notify Fremantle Ports and the DER (if required) to enable the emissions to be discussed within the broader context of contaminated sites management at the port. A Form 1 (Report of a Known or Suspected Contaminated Site) should not be lodged with DER following the preparation of any SGA without first consulting with Fremantle Ports. This guideline does not limit the lessee's responsibilities with respect to the *CS Act 2003*.

Should contamination be caused by the Lessee during occupation of a site then the Lessee will be responsible for liaison with the Department of Environmental Regulation (DER) and any costs associated with complying with the requirements of the *CS Act 2003* until termination of the lease at a time agreed by Fremantle Ports.

2.11 Timings

An indication of the timings for a lease arrangement when the Lessee is responsible for undertaking the Commencement SGA is shown in the flow chart in **Drawing 2-1**.

Drawing 2-1 Timings for Implementing SGAs



3 SGA SCOPE

3.1 Introduction

Commencement and Exit SGAs must provide a characterisation of soil and groundwater conditions at a site by way of a review of background information, a description of site conditions and operations and laboratory analysis of soil and groundwater samples collected from the site.

The SGA must be conducted in line with specific requirements laid out in the NEPM and its amendment (NEPM, 1999 and 2013) and DER guidance *Assessment and management of contaminated sites* (DER, 2014).

3.2 Approved Environmental Consultants

SGAs must be undertaken by an environmental consultant with demonstrated experience of the assessment of contaminated sites and specific legislative requirements (see **Section 1.2**).

As stated in Schedule B9 of NEPM *Competencies & Acceptance of Environmental Auditors and Related Professionals* (NEPM, 2013), environmental consultants must be able to demonstrate relevant qualifications and experience to a level appropriate to the contamination issues relevant to the site under investigation. Environmental consultants must be able to demonstrate:

- appropriate qualifications (e.g. a relevant bachelor's degree from a recognised institution)
- competencies relevant to the work to be undertaken
- demonstrated relevant experience in site assessment
- comprehensive knowledge of relevant legislation and guidelines
- knowledge of relevant scientific literature for assessment of the impacts of site contamination on human health and the environment
- a demonstrated commitment to training and professional development
- relevant memberships and/or accreditation with professional societies.

Environmental consultants must provide evidence that addresses these factors as part of a proposal for undertaking a SGA. A list of pre-qualified environmental consultants can be provided to the Lessee if requested.

3.3 Data Review

A data review must be undertaken to identify any potential sources of contamination and chemicals of potential concern (COPCs). The review of information will be from a variety of publically available databases including, but not limited to:

- historical and current aerial and ground photographs of the site and its surroundings
- dangerous goods information
- published geological and hydrogeological maps and records
- groundwater abstraction licences
- historical site plans (if available)
- previous site investigation and monitoring data (if available).

A site inspection must be completed and documented with photographic evidence to describe the current condition of the lease area and operations undertaken and interviews with current

and past occupiers of the site. By way of summary, the following specific aspects should be investigated and recorded:

- a description of current and past operations at the site
- a description of the proposed operations at the site (if applicable)
- a description of the condition of the site surfacing including the presence or absence of potential asbestos containing materials (ACM) on the ground surface
- housekeeping
- types, quantities and storage of chemicals at the site (storage tanks, secondary containment, spills, etc.)
- product spills, losses, emissions, incidents and accidents
- discharges to land and water
- wastes produced
- available information on the site wastewater and stormwater drainage systems, including quality / quantity of current / historical discharges and the reported integrity of the drainage system
- adjacent land uses.

An Exit SGA would not normally require the historical review components on the assumption that this information was provided during the Commencement SGA. A historical review would however be required in the event a Commencement SGA was not carried out.

3.4 Site Investigation

Because of the long industrial history of Fremantle Ports' land, an intrusive site investigation will be required as part of a SGA. The environmental consultant must design a suitable site investigation based on the nature of any potential contamination identified during the data review from **past, current or potential future activities** (refer to **Section 3.3**). The site investigation must comprise the excavation of soil bores to enable the sampling of soils and the installation of groundwater monitoring wells to enable the sampling of groundwater.

3.4.1 Ground Conditions

When designing a site investigation it is important to understand the local ground conditions to enable the appropriate investigation techniques to be used. An understanding of groundwater flow behaviour is important to ensure monitoring wells are positioned to enable the sampling of in-flowing and out-flowing groundwater at the site.

The majority of North Quay and Victoria Quay has been built up with reclaimed material dredged from the Inner Harbour and comprises primarily sandy material. At a depth of approximately 2 metres to 3 metres below ground level (m bgl), calcareous sand derived from the underlying Tamala Limestone is present beneath the reclaimed material comprising medium-grained, sub-angular, quartz and feldspar, well-sorted, abundant whole and broken bivalve and gastropod shells.

Information from previous investigations have identified that unconfined groundwater is present at approximately 2.0 to 3.0 m bgl at both North Quay and Victoria Quay within the superficial sands and made ground. A south-westerly component of groundwater flow is interpreted beneath the north-eastern part of North Quay with groundwater also flowing radially towards the

Inner Harbour. Groundwater beneath Victoria Quay also flows towards the Inner Harbour with groundwater beneath the south-westernmost portion of the site discharging to the Indian Ocean. Local groundwater gradients can also be affected by nearby groundwater abstractions. Groundwater flow is affected by the ocean tides particularly in areas closest to the Inner Harbour or Indian Ocean with a reversal in hydraulic gradient observed at high tide indicating that some ocean water flows back into the subsurface. The interpreted groundwater flow direction during low tide at both quays is provided in **Appendix A**.

3.4.2 Soil Bores

Soil bores must be advanced to approximately 3 m bgl (i.e. the approximate distance to the groundwater table). As a guide, two soil samples must be collected for laboratory analysis at approximately:

- 0 – 1 m bgl (i.e. near surface)
- 2 – 3 m bgl (i.e. at the groundwater interface).

There are two main categories of sampling design as described below:

- **judgemental sampling** will involve selection of sampling locations based on findings from the data review, e.g. targeting a potential point source of contamination
- **probability-based sampling** will involve random sampling locations, e.g. to characterise made ground or fill material across the site.

3.4.3 Groundwater Monitoring Wells

For the installation of groundwater monitoring wells, deeper soil bores will be required to a depth of approximately 5.0 to 6.0 m bgl. Monitoring wells must be installed up-hydraulic gradient and down-hydraulic gradient of the site to determine groundwater quality flowing onto and off the site. A minimum of three monitoring wells is therefore required at any site.

For an Exit SGA, the resampling of existing monitoring wells (which may be an artefact from the Commencement SGA) would normally be suitable assuming that the wells are serviceable and they continue to provide sufficient site coverage of up-gradient and down-gradient groundwater conditions.

3.4.4 Sampling Design

Each intrusive investigation scope must be considered on a site-specific basis i.e. depending on the potential contaminant sources derived from the data review and the dimensions of the site. For example, a site may have multiple potential point sources of contamination which require investigating or the dimensions of the site may require that additional monitoring wells are installed to determine down-hydraulic gradient groundwater quality. This section is intended to act as a guide on typical expectations for scopes of SGAs.

Table 3-1 below provides an indication of number of soil bores and monitoring wells required with associated estimated costs of producing a SGA based on the size of the site and the combined scope of works described above and the laboratory analysis and reporting requirements described in **Section 5** and **Section 6** respectively.

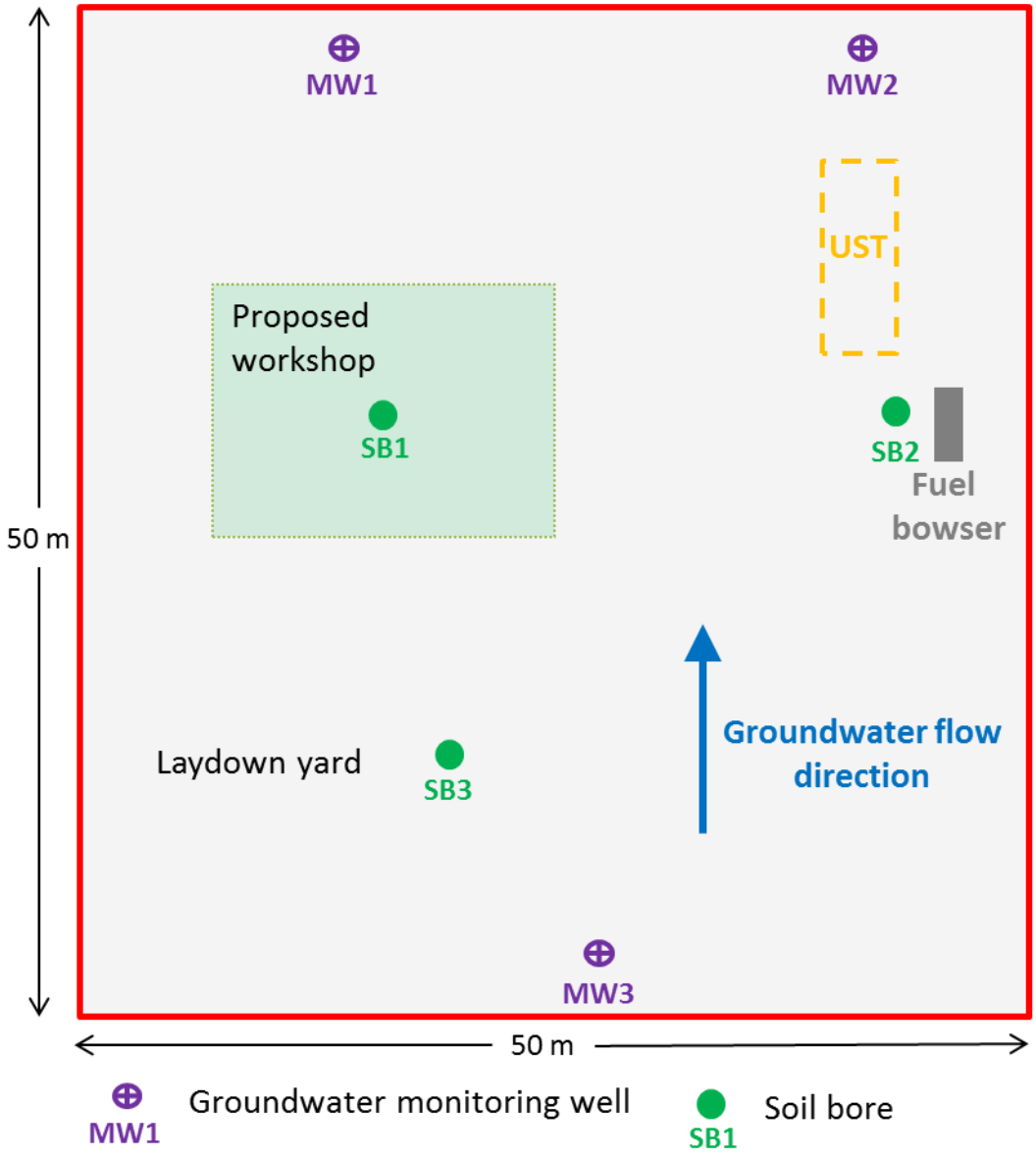
Table 3-1 Indications of Scope and Costs of Typical SGAs

Size of Site	Approx. Number of Monitoring Wells	Approx. Number of Additional Soil Bores	Approx. Cost
<0.1 ha	3 (minimum)	3 - 4	$20,000 - $30,000
0.1 ha – 1 ha	3 - 5	3 - 5	$25,000 - $40,000
1 ha – 5 ha	5 - 7	3 - 7	$30,000 - $45,000
5 ha – 10 ha	7 - 10	3 - 8	$35,000 - $50,000
>10 ha	10 – 15+	3 - 8	$40,000 - $60,000

An example of a typical site investigation design of a 0.25 hectares (ha) site is shown in **Figure 3-1**. The scope of work comprises the excavation of three soil bores (SB1 – SB3) and the installation of three groundwater monitoring wells (MW1 – MW3). The rationale of the sampling locations is provided below:

- **SB1** - Proposed location of workshop (potential future source of contamination)
- **SB2** - Current fuel bowser (potential point source of contamination)
- **SB3** - Probability-based sampling location (laydown yard)
- **MW1** - Down-hydraulic gradient of proposed location of workshop
- **MW2** - Down-hydraulic gradient of underground storage tank (UST)
- **MW3** - Up-hydraulic gradient of site (influent groundwater quality).

Figure 3-1 Example of Investigation Design for Typical Commencement SGA



4 SITE INVESTIGATION METHODOLOGY

4.1 Health, Safety and Environment Requirements

All works undertaken onsite by any personnel, including contractors, must be undertaken in accordance with a site specific Health Safety and Environmental Plan (HSEP), which addresses the following:

- minimum Personal Protection Equipment (PPE) required for the works
- safety risk assessment including relevant Job Safety Analyses (JSAs)
- work methods
- site induction process
- contingency plans and procedures
- decontamination procedures.

Prior to mobilising to site, relevant information from Fremantle Ports and Dial Before You Dig (DBYD) for the site and the immediate surrounding area must be obtained and reviewed. Underground service clearance must be conducted utilising a competent contractor using a Ground Penetrating Radar (GPR) and cable avoidance tools (CAT) prior to any commencement of intrusive site investigation.

An Excavation Permit is also required to be obtained from Fremantle Ports prior to the commencement of work.

4.2 Soil Bores

Relatively undisturbed soil samples must be obtained from direct push drilling techniques for inspection and laboratory analysis.

All soil samples must be collected and screened for volatile organic compounds (VOCs) using a calibrated photo-ionisation detector (PID) with samples collected during soil bore advancement at near surface, then approximately every 1.0 m to and at the base of the bore. Additional samples must be collected where changes in lithology occur and where indications of contamination are observed.

Soil bores must be logged in the field in accordance with the accordance with *Geotechnical site investigations*, AS 1726-1993 and must include field observations of colour, odour, field-screening PID results and details of any unusual material encountered.

4.3 Groundwater Monitoring Wells

The monitoring wells must be installed utilising the following the methods:

- Drilling will be progressed to 2.0 m below the water table utilising push tube and hollow stem auger techniques. Groundwater monitoring wells will be installed with 50 mm unplasticised poly vinyl chloride (uPVC) pipe, with a minimum 3.0 m of screen length.
- A gravel pack is used to minimise the entry of fine-grained material into the well screen and installed in the bore annular space to approximately 0.5 m above the well screen. The filter pack must be chemically inert and matched to the aquifer particle size and to the screen slot size.

- The annular space from the top of the filter pack to ground level must be backfilled with bentonite or a non-shrinking bentonite-based grout.
- Each well must be fitted with a well cap and flush gatic cover.
- The groundwater monitoring wells must be developed to remove any drilling water and fines from the installation process before groundwater sampling is undertaken.
- All groundwater monitoring well locations must be surveyed for location and elevation to Australian Height Datum (AHD) by a licensed surveyor to obtain accurate groundwater elevation levels and determine localised groundwater flow direction.

After development, monitoring wells must be left for a period until groundwater chemistry can be demonstrated to have stabilised (generally seven days after installation) before a groundwater monitoring event (GME) of the monitoring wells is completed.

The groundwater monitoring wells must be purged using low-flow peristaltic techniques in accordance with AS/NZS 5667.11:1998 *Water Quality – Sampling, Part 11: Guidance on Sampling of Groundwaters*. The key procedures that must be undertaken in the field are described below:

- measurement of the depth to water and depth to the base of the well with an interface probe
- identification of phase separated hydrocarbons (PSH), if present, and measurement of thickness
- groundwater purging from each well using a peristaltic low-flow pump system while recording groundwater level measurements to confirm that drawdown within the sampled well was being maintained at a minimum
- groundwater quality measurements (pH, Total Dissolved Solids [TDS], electrical conductivity [EC], dissolved oxygen [DO], temperature and redox potential) must be undertaken continually during the micro-purging process of each well using a multi-parameter instrument fitted with a dedicated flow-through-cell
- decontamination of all sampling equipment between sample locations.

4.4 Waste Disposal

Excess soils and waste water must be appropriately stored on site and later disposed of at a registered waste facility by an accredited waste disposal contractor.

5 LABORATORY ANALYSIS

5.1 Laboratory Selection

The laboratories selected to conduct the analysis of soil and groundwater must be:

- accredited by the National Association of Testing Authorities (NATA)
- certified by NATA to conduct the specific tests required
- able to demonstrate that it can achieve the required analytical limits of reporting (typically an order of magnitude below the respective assessment criteria for the matrix and parameter).

Further information relating to sample handing is provided in **Appendix B**.

5.2 Quality Control Samples

As detailed below, quality control (QC) procedures must be followed in accordance with guidelines for sampling presented within NEPM (2013).

5.2.1 Soil QC Samples

Soil QC samples will be collected at the following frequencies:

- field duplicate samples at 1 per 20 soil samples or 1 per batch if the batch is less than 20 samples
- field triplicate samples at 1 per 20 soil samples must be sent to a secondary laboratory;
- rinsate blank samples at 1 per day (Rinsate blanks must be collected by contacting sampling equipment with laboratory provided deionised water.)
- field blank samples at 1 per day. (Field blanks must be collected by pouring laboratory provided deionised water into a sample container.)

5.2.2 Groundwater QC Samples

Groundwater QC samples must be collected at the following frequencies:

- field duplicate samples at 1 per 20 water samples or 1 per batch if the batch is less than 20 samples
- field triplicate samples at 1 per 20 water samples must be sent to a secondary laboratory
- rinsate blank samples at 1 per day per equipment used (Rinsate blanks must be collected by contacting sampling equipment with laboratory provided deionised water.)
- field blank samples at 1 per day (Field blanks must be collected by pouring laboratory provided deionised water into a sample container.)
- trip blank samples at 1 per laboratory batch. (Trip blanks must consist of a clean sample provided by the laboratory and transported back to the laboratory with the primary samples without having been exposed to sampling procedures.)

5.3 Chemicals of Potential Concern

Soil and groundwater samples must be submitted for a suite of COPCs defined during the Data Review (**Section 3.3**). It is also recommended that Appendix B of DER (2014) *Potentially Contaminating Activities, Industries, and Landuses* is referred to for additional guidance.

A typical suite of COPCs for Fremantle Ports' land may be defined (although not limited to) as follows:

- total recoverable hydrocarbons (TRH)
- benzene, toluene, ethylbenzene and xylenes (BTEX)
- VOCs
- polycyclic aromatic hydrocarbons (PAHs)
- metals
- pesticides
- herbicides.

5.4 Investigation Levels

Soil and groundwater data must be assessed by comparison with appropriate current Tier 1 screening criteria referenced in *Assessment and management of contaminated sites*, DER (2014). The investigation levels must be appropriate for the potential receptor they intend to protect and appropriate for the environmental setting of Fremantle Ports' land, namely:

- human health (via vapour intrusion, direct contact and exposure from potential groundwater abstraction)
- the marine environment (i.e. the Indian Ocean, the Inner Harbour and the Rous Head Harbour).

6 REPORTING REQUIREMENTS

The following section provides an anticipated outline of a typical factual SGA report which is generally in line with reporting requirements laid out in DER (2014):

- **Executive Summary** – summary of major findings
- **Introduction** – purpose, scope and objectives
- **Site Description** – site identification, findings of site walkover
- **Site History** – review of historical documents / photographs
- **Environmental Setting** – review of environmental databases and maps
- **Sampling and Analysis Quality Plan (SAQP)** – investigation design and rationale, methods of sample collection, monitoring well installation, quality assurance (QA)/QC
- **QA/QC Assessment** – review of QC samples and laboratory QA/QC, field procedures
- **Results** – Field results, screening of analytical results against investigation levels in tables and discussion
- **Summary of Findings** – Summary of key findings, statement of site suitability.

Exit and Additional SGAs must include direct comparisons with results obtained from Commencement SGAs and highlight:

1. magnitude of any increase in potential contaminant concentrations compared to the Commencement SGA
2. analytical results exceeding investigation levels that did not exceed investigation levels in the Commencement SGA.

The report must include field survey sheets, field data sheets, logs for soil bores and monitoring wells, laboratory reports including QA/QC reports, data validation sheets, tables of results and figures (including site location, soil bore and groundwater well locations, groundwater potentiometric levels and flow direction, soil/groundwater results for key locations).

One draft copy of the report must be submitted to Fremantle Ports for review prior to issuing one hard copy and old electronic copy in final.

7 INFORMATION SOURCES

Australian Standard, *Guide to the investigation and sampling of sites with potentially contaminated soil – Non-volatile and semi volatile compounds*, November 2005 (AS 4482.1-2005).

Australian Standard, *Guide to the sampling and investigation of potentially contaminated soil – volatile substances*, September 1999.

Australian/New Zealand Standards for Water Quality – *Sampling parts 1, 6, and 11* (numbers 5667.1:1998; 5667.6:1998; and 5667.11:1998).

Australian Standard, 1726, *Geotechnical site investigations*, 1993.

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CRC Care (2013), *Technical Report No. 23: Petroleum hydrocarbon vapour intrusion assessment: Australian guidance*.

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National Environment Protection (Assessment of Site Contamination) Measure, 2013. Volume 2, Schedule B(2). *Site Characterisation*, May 2013.

National Environment Protection (Assessment of Site Contamination) Measure, 2013. Volume 2, Schedule B(9). *Competencies & Acceptance of Environmental Auditors and Related Professionals*, May 2013.

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Western Australia Government, *Contaminated Sites Act 2003*.

APPENDIX A Groundwater Flow Direction

APPENDIX B Sample Handling Methodology

Sample Preservation

The selection of the appropriate sample containers, preservation procedures, sample storage requirements and holding times must be undertaken in accordance with those recommended by Standards Australia (AS/NZS 5667.1:1998 and AS 4482.1 as appropriate). All primary samples and associated QA/QC samples must be shipped to the laboratory within required holding times and under URS chain of custody (COC) documentation. The laboratory must be notified of the shipment of samples and their expected arrival.

All samples must be refrigerated during the course of the working day prior to dispatch to the laboratory in eskies packed with ice or cooling blocks.

Field Records

At each soil and groundwater sampling location, field records will include the minimum of the following information:

- sampling time, date and name of the sampler
- weather conditions
- sample collection method
- sampling equipment decontamination procedures where non-disposable sampling equipment is utilised.

Sample Labels

Each sample label will include the following information:

- environmental consultant's name
- unique sample number
- date
- time of sampling
- name or initials of the sampler
- sequence within a batch number such as 1 of 7, 2 of 7, etc.

Chain of Custody

A COC form must be completed to accompany the samples to the laboratory for submission for analysis. In each instance the following must be undertaken:

- The COC form must be completed in blue or black ink pen.
- All information requirements must be completed on the form.
- The COC form must convey analysis instructions to the laboratory.
- COC forms must be presented with the original laboratory certificates in the completed SGA report.

Holding Times

All holding times will comply with the requirements set out in *Australian Standard AS/NZS 5567.1:1998* and *AS 4482.1*.

Laboratory Reports

Laboratory reports must be issued in accordance with the requirements of NATA endorsement and will include the following information appended within the SGA report:

- test results for the samples
- test results for the laboratory's in-house duplicates
- test results for the laboratory's in-house surrogate and matrix spike recovery determinations
- extraction (where applicable) and analysis dates which would be used to determine compliance with the permitted holding times.

Sample Documentation

All sample documentation including field notebooks, reporting records, COC and equipment calibration certificates and procedures must be retained by the environmental consultant.

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