

Table 1.1: Documents Reviewed

Document Type	Title	Date	Author	Relevance	Reference
	Marine Sediments, EPA Declaration Area 21122 and adjacent areas of Barangaroo South and Barangaroo Central'			determining required remediation extent	
Report	'S-ISCO & SEPR Pilot Trial Proving Phase, Addendum to Revised Work Plan and Trial Management Plan'	July 2012	VeruTEK	Describes the proving phase trial of in situ remediation technologies	VeruTEK, 2012
Letter	'Re: Human Health and Ecological Risk Assessment - Declaration Site, Barangaroo. Assessment of the Implications of the Revised Basement Design'	3 July 2012	AECOM	Amended risk assessment to reflect changes to proposed building basement design and use	AECOM, 2012c <i>(the Declaration Site HHERA Letter)</i>
Report	'Data Gap Investigation, Barangaroo Central, Hickson Road, Sydney, NSW'	21 August 2012 (and draft dated 17 July 2012)	JBS Environmental Pty Ltd (JBS)	Investigation data, offsite and down gradient	JBS, 2012 <i>(the Central DGI)</i>
Report	'Human Health and Ecological Risk Assessment, VMP Remediation Works Area (Addressing the NSW EPA Remediation Site Declaration 21122, Millers Point)'	25 October 2012 (and drafts dated 21 March 2012, 16 August 2012, 9 October 2012)	AECOM	Development of SSTC for removal of NSW EPA Declaration	AECOM, 2012d <i>(the VMP HHERA)</i>
Report	'Tree Root Mass Investigation, Hickson Road, Millers Point, NSW'	23 November 2012	AECOM	Investigation data, tree roots along Hickson Road	AECOM, 2012e
Report	'The Use of Asbestos-Contaminated Soils on Barangaroo'	March 2013	Associate Professor Tim Driscoll, Sydney School of Public Health, Sydney Medical	Reviewed for relevance – not applicable	Driscoll, 2013

Table 1.1: Documents Reviewed

Document Type	Title	Date	Author	Relevance	Reference
			School, University of Sydney		
Memorandum	'Additional Groundwater Modelling to Supplement Contaminant Flux and Discharge Estimates for Natural Soils and Marine Sediments for EPA Declaration Area 21122'	12 Mach 2013 (and draft dated 21 January 2013)	AECOM	Further analysis of contaminant flux for determining required remediation extent	AECOM, 2013a
Report	'VMP Remediation Extent, VMP Remediation Works Area, (Parts of Barangaroo and Hickson Road), Millers Point NSW (Privileged & Confidential)'	23 July 2013 (and drafts dated 3 September 2012, 12 October 2012, 13 March and 11 July 2013)	AECOM	Defines the extent of remediation required to remove the NSW EPA Declaration	AECOM, 2013b (the VMP Extent Report)
Report	'Remedial Action Plan, NSW EPA Declared Remediation Site 21122 and Block 4 (Stage 1b) Development Works, Barangaroo, Millers Point, NSW'	24 July 2013 (and drafts dated 6 November 2012, 21 March and 12 July 2013)	AECOM	Proposed remediation of declaration area and Block 4	AECOM, 2013c (the RAP)

- Review of the following Office of Environment and Heritage (OEH), EPA and Department of Planning (DOP) documents:
 - DOP 'Barangaroo Concept Plan' (Concept plan 06_0162) as approved on 9 February 2007 and modified on 25 September 2007, 16 February 2009 and 16 December 2010.
 - EPA 'Declaration of Remediation Site (Section 21 of the *Contaminated Land Management Act 1997*), Declaration Number 21122; Area Number 3221' dated 6 May 2009 (the declaration).
 - EPA 'Notice of Approval of Voluntary Management Proposal (Section 17 of the *Contaminated Land Management Act 1997*), Approval No.: 20101719, Approval Date: 23 July 2010, Area No.: 3221' (the VMP).

- DOP 'Project Approval (Section 75J of the *Environmental Planning and Assessment Act 1979*)', Application No.: 10_0087 dated 3 March 2011, for SISCO and SEPR remediation pilot trial.
 - OEH Letter dated 11 July 2011 to Lend Lease Barangaroo South (Ref DOC11/30893) re human health and environmental risk assessments.
 - EPA Letter dated 23 May 2012 to BDA (Ref DOC12/20618) re 'Barangaroo VMP Draft HHERA for area of EPA Declaration Number 21122'.
- Site visits by the Auditor on 18 March 2010 and subsequently.
 - Discussions with LLMP, BDA, and with AECOM, who undertook the recent works (since 2010). The ERM and Coffey investigations were completed prior to the Auditor's engagement and no discussion with ERM was undertaken.

1.5 Audit Team

The Audit was completed by Graeme Nyland with the assistance of a site audit team.

Internal (ENVIRON) support was provided by the following staff:

- Rowena Salmon – analysis of field and laboratory data and review of proposed remediation
- Emma Struik – review of risk based remediation criteria
- Tom Onus – review of laboratory data quality.

External support was provided by the following person/organisation:

- Therese Manning and Jackie Wright, Environmental Risk Services Pty Ltd (EnRisks)– review of human health and environmental risk assessments (HHERAs) and contributed to preparation of Section 10 of this SAR. Ms Wright has also prepared a separate detailed report supporting the summary provided in Section 10 with respect to the Declaration Site HHERA (for development).

2 Site Details

2.1 Location

The site locality is shown on Attachment 1, Appendix A.

The site details are as follows:

Street address:	Hickson Road (Sussex Street), Barangaroo, NSW 2000
Identifier:	Part Lot 3 and part Lot 5 in DP 876514 and part of Hickson Road adjacent to 30-34, 36 and 38 Hickson Road. (refer Attachment 2, Appendix A)
Local Government:	City of Sydney
Owner:	Barangaroo Delivery Authority
Site Area:	2.476 ha

The site boundary is defined to the east by the eastern side of Hickson Road (refer Attachment 3, Appendix A). The northern, southern and western boundaries are not readily identifiable as they are proposed development boundaries, and not based on current site features or usage.

A site survey from 2010 showing the extent of the declaration area is included as Attachment 4, Appendix A.

The site area comprises 'Area 1', 'Area 3' and a small portion of 'Area 2' (Attachment 5, Appendix A) as referenced in previous investigations and the Overarching RAP (ERM, 2010).

2.2 Zoning

The current zoning of the site was identified in the RAP (AECOM, 2013c) as 'part zone B4 Mixed Use and Public Recreation RE1' within Barangaroo and 'Maritime and Transport Zone' within Hickson Road.

2.3 Adjacent Uses

The site is located within an area of mixed uses (Attachment 3, Appendix A):

- North: Barangaroo (Central), currently open space concrete/hardstand.
- South: Barangaroo (ORWS), currently being developed for commercial, residential and open space use.
- East: Commercial and residential buildings.
- West: Barangaroo (ORWS and Central), currently open space concrete/hardstand, then Darling Harbour.

Occupants of commercial and residential premises along Hickson Road and the general public using Hickson Road are potential receptors from any contamination migrating from the site. Site Audit Statements have been prepared for the properties at 30-34, 36 and 38

Hickson Road (dated 10 March 2003, 16 March 2004 and 30 June 2003, respectively), and state that these sites are suitable for their current land use, variously subject to conditions.

Darling Harbour is a nearby environmental receptor.

2.4 Site Condition

The site is flat, at an elevation a few metres above Darling Harbour water level. AECOM noted the following site features in their DGI report (AECOM, 2010b):

- A two story 'amenities' building in the east of the site
- A portion of the 'former maintenance building' was located within the south of the site
- Sewerage pumping station SP1129
- Majority of site was covered by a hardstand including concrete and bitumen
- Mature trees along the eastern and western side of Hickson Road.

Based on the Auditor's most recent inspections, and as reported by AECOM in the RAP (2013c), the sewerage pumping station is the only permanent building remaining onsite. Temporary/ demountable site sheds are present and hardstand remains at the site. The trees along Hickson Road remain.

2.5 Proposed Development

2.5.1 Block 4

Based on current development plans described in the RAP (AECOM, 2013c), Block 4 is to be redeveloped for mixed commercial and high density residential usage overlying a basement, with associated public open space area (incorporating community and related land uses). The car park basement will cover the entirety of Block 4 to a depth of 8 m below ground level (BGL), equivalent to a relative level of -5.6m Australian Height Datum (AHD) . The basement excavation will be supported by a basement groundwater retention wall system around the perimeter, to be keyed into bedrock. Attachment 6, Appendix A, illustrates a cross section of the proposed Block 4 development. It can be seen that the basement will be excavated into bedrock in the eastern portion while fill material and natural soils will be retained below the western portion of the basement and behind (to the east of) the groundwater retention wall system.

The RAP (AECOM, 2013c) describes the potential for the final details and configuration of land uses within the site to be revised from time to time by LLMP as part of the continued development design. The Declaration Site HHERA (AECOM, 2011) and Declaration Site HHERA Letter (AECOM, 2012c) assume a number of development concepts and controls in developing risk-based acceptance criteria. These are required to be implemented at the site for the risk-based criteria to remain valid. AECOM (2013c) state that "... the proposed land uses ... will remain generally consistent with that described within this RAP". AECOM (2013c) notes that "If the final development design is changed in a way which affects the assumptions of the Declaration Site HHERA ... and Declaration Site HHERA Letter ... and this RAP, an Addendum will be prepared...". This is discussed further in Section 13.5 of this SAR.

The general land use scenarios applicable to the audit of Block 4 are 'residential with minimal access to soil' and 'commercial/ industrial'. The general land use scenario for recreational usage is not relevant since the entire area will be underlain by a basement. The Declaration Site HHERA (AECOM, 2011) derived criteria for the following scenarios, representing the range of potential development land uses for the larger declaration area (not specifically Block 4) as discussed in Section 10 of this SAR:

- Scenario 1 – lower-most basement car park level below water.
- Scenario 2 – upper-most basement car park level partially above water.
- Scenario 3 – unpaved public domain / open space.
- Scenario 4 – paved public domain / open space.
- Scenario 5 – commercial slab on ground.
- Scenario 6 – short term ground-intrusive maintenance.
- Scenario 7 – residential above basement construction.

2.5.2 Declaration Area

Development of the declaration area outside Block 4 is not currently proposed and is not contemplated in the RAP. The land use considered for removal of the declaration from the declaration area is the existing land use – being use of Hickson Road and the site area, in its current state, by the public. The general land use scenario applicable to removal of the declaration is 'parks, recreational, open space'. The VMP HHERA (AECOM, 2012d) derived criteria for the following scenarios, as discussed in Section 10 of this SAR:

- Scenario 1 – paved public domain / open space.
- Scenario 2 – short term ground-intrusive maintenance.

The RAP notes that if the proposed Block 4 development works do not occur, the VMP remediation works will still be undertaken.

3 Site History

AECOM provided a site history summarised from information in previous reports prepared by ERM (2007 and 2008) and Broomham (2007). Information relevant to the site is summarised in Table 3.1 based on the DGI (AECOM, 2010b) and the Auditor's review of Broomham (2007).

Table 3.1: Site History	
Date	Activity
Pre 1839	The original shoreline ran approximately along the western edge of Hickson Road
1839-1920s	Gasworks operated by The Australian Gas Light Company on the site, including what is now Hickson Road and offsite on the eastern side of Hickson Road. The remainder of Barangaroo was used for commercial and wharf use during this period. The original gasworks was located in the south of the declaration area. Significant expansions occurred as follows: • 1882: AGL acquired additional land to the north of former gasworks, constructed retort house and replaced smaller gas holders. Installed tramway system and hydraulic lift for transport of coke. • 1897: Gasworks waterfront extended 40 feet to north by acquisition of additional land. • 1899: Construction of building to house carburetted water gas plant. Gasworks demolished in mid 1920s, new finger wharves constructed; area subsequently used for various workshop facilities.
1925	Part of site became Hickson Road.
1930s	Maritime Services Board (MSB) painted creosote on the wharf piles to protect them against insects.
1961-68	Finger wharves demolished. New sea walls and new longshore wharves constructed. Filling undertaken behind (east of) sea walls. Site and remainder of Barangaroo filled with the exception of Southern Cove. Southern Cove was in the south of the site and Other Remediation Works North (ORWN) area to west, and was previously located between the Wharf 6 and 7 buildings.
Late 1980s/ early 1990s	Southern Cove filled in (Broomham reports 1990-1993, AECOM report 1986-1988)
1995-2006	Longshore wharves leased to Patrick Stevedores. Port related activities.
1999	Overseas passenger terminal constructed at Wharf 8 (offsite to south), requiring demolition of two previous buildings.
2007, 2009	Declaration of Investigation Area then Remediation Site for Wharfs 5 and 7 and Hickson Road by NSW EPA.
2008-2011	Wharf vacated, buildings demolished.

The summary indicates that the site was operated as a gasworks until the 1920s and was used for wharf/ port related activities after that time. Original finger wharves were removed and the site was largely filled in 1961-1968 for the construction of longshore berthage, with some additional filling in the south of the site (area of former Southern Cove) in the late 1980s or early 1990s.

The former AGL (now Jemena) gasworks historically occupied the eastern portions of Block 4 and Block 5 and extended to the area now occupied by Hickson Road and properties to the east (Attachment 2, Appendix A). The gasworks comprised the following infrastructure:

- Retort house
- Meter house
- Tar tank
- Engine house
- Gasholders (cut into bedrock up to 10 mBGL)
- Purifying sheds
- Purifier beds.

Previous investigations and remediation works undertaken at 30-34 Hickson Road (Attachment 3, Appendix A) identified gasworks infrastructure extending across Hickson Road, including part of the annulus of the former main gasholder, a smaller secondary gas holder and part of a tar tank (Coffey, 2008). Portions of these features remain within 36 Hickson Road, and the basement of a building at 38 Hickson Road is known to have experienced inflow of gasworks-contaminated groundwater.

In the Auditor's opinion, the site history provides an adequate indication of past activities, with the primary potential for contamination being the operation of the former gasworks, disposal of gasworks waste and uncontrolled fill used in various stages of site reclamation.

4 Contaminants Of Concern

The DGI (AECOM, 2010b) provided a list of the contaminants of concern and potentially contaminating activities. These have been tabulated in Table 4.1.

Table 4.1: Contaminants of Concern		
Area	Activity	Potential Contaminants
Whole of site	Former gasworks	Gasworks waste – could include HM, TPH, BTEX, PAHs, phenols, sulphate, cyanide, ammonia
Whole of site	Importation of fill materials to reclaim land	Unknown, could include HM, TPH, BTEX, PAHs, PCBs, OCPs, VOCs, SVOCs, asbestos
Whole of site	Demolition of buildings	Unknown, could include lead, PCBs, asbestos
Whole of site	Land reclamation	Acid sulphate soils (ASS)

HM heavy metals: arsenic, copper, chromium, cadmium, lead, mercury, nickel, zinc

TPH total petroleum hydrocarbons

BTEX benzene, toluene, ethylbenzene and xylenes

PAHs polycyclic aromatic hydrocarbons

PCBs polychlorinated biphenyls

OCPs organochlorine pesticides

VOCs volatile organic compounds

SVOCs semivolatile organic compounds

The contaminants identified in the VMP comprise TPH, BTEX, PAHs, ammonia, phenol and cyanide.

The Auditor considers that the analyte lists used by ERM, Coffey and AECOM in the investigations undertaken are generally appropriate for the site history and condition. Details of the soil and groundwater analyses performed are provided in Section 8 and 9, respectively.

The majority of soil samples were analysed for the primary contaminants of concern, being TPH, BTEX and PAH (over 200 samples analysed), phenol and cyanide (over 100 samples analysed). Between 16 and 60 samples were also analysed for the extended suite of potential organic contaminants, including phenols, OCP, OPP, PCBs and other VOCs. This sampling density is considered acceptable since very few detections were made, and when they did occur, they were generally of low concentration and occurred in conjunction with other more significant concentrations of the primary contaminants. A lower sampling density was also completed for asbestos and ammonia. Asbestos is discussed in Section 8.3.6. Potential contamination by ammonia has been considered primarily through the assessment of groundwater.

Groundwater samples from between one to five rounds of monitoring (depending on location of monitoring well) were analysed for the primary contaminants of concern - heavy metals, TPH/BTEX and PAH. Cyanide (either total, free or weak acid dissociable (WAD)) was also analysed in each round. Selected samples were also analysed for phenols. Additional

analytes included during the earlier monitoring rounds undertaken by ERM and Coffey included chlorinated hydrocarbons and PCBs. These sampling densities are considered adequate.

The individual substances included in each suite of analytes are listed in Appendix D.

5 Stratigraphy and Hydrogeology

Following a review of the referenced reports, a summary of the site stratigraphy and hydrogeology was compiled as follows.

5.1 Stratigraphy

The 1:100,000 Geological Survey of NSW (Sydney) Sheet 9130 indicates the site to be underlain by Hawkesbury Sandstone and man-made fill, where man-made fill may consist of *"dredged estuarine sand and mud, demolition rubble, industrial and household waste"*. The sub-surface profile of the site is summarised in Table 5.1.

Table 5.1: Stratigraphy	
Depth (mBGL)	Subsurface Profile
Surface	Hardstand, comprising asphalt or concrete pavement
Occurs below hardstand To between 3 and 19 m Thickness increases from east to west.	Fill, highly heterogeneous, comprises gravel, sand, silt and clay, with sandstone, bricks, concrete, timber, steel, slag, ash and tar.
Occurs between fill and bedrock Thickness varies from 0 to 10 m	Alluvial sediments, clayey sand, sandy clay, clayey silt and clay, some shell fragments and organic matter Residual soils weathered from sandstone bedrock, clayey sand and sand
Occurs below natural soil or directly below fill From between 3 and >27.5 m	Sandstone bedrock with shale bands.

Attachment 7, Appendix A, presents indicative bedrock and marine sediment contours prepared by AECOM. The difference between these contours can be used to determine the local thickness of natural soils (alluvial sediments and residual soil), which is generally thicker moving to the west, where bedrock is deeper.

Based on review of the site history (refer Section 3) the Auditor considers that there were three main stages representing the filling history:

- original filling of the eastern portion for development, including construction of finger wharves, in 1800s
- demolition of finger wharves and filling of the majority of the western portion of the site in 1961-1968 for the construction of longshore berthage
- filling of southern cove (previously located in the south of the site) in late 1980s/ early 1990s.

The filling of the majority of the site would have occurred during the second stage. AECOM (2013c) reported that based on observations from the various investigations undertaken, distinct differences in fill type relative to the historical filling sequence of the site are difficult to identify.

5.2 Hydrogeology

Groundwater at the site is within 2-3 mBGL, varying due to tidal fluctuation. The amplitude of fluctuation in groundwater due to tidal effect decreases with distance from the Darling Harbour (western) boundary, however, fluctuation is still noted as far east (inland) as Hickson Road (AECOM, 2010b). A caisson (sea) wall is present along the western boundary of Barangaroo. This wall has been found to be highly permeable and does not prevent the tidal flow of groundwater (AECOM, 2010d).

Hydraulic conductivity of fill at the site was assessed by ERM (2008a) using tidal lag response equations based on site tidal fluctuation data, and by AECOM (2010b) using rising head permeability tests in four wells (two onsite and two downgradient). AECOM (2010b) reported that testing indicated a wide range of hydraulic conductivity depending on the local fill type. Further hydraulic testing was performed as part of the Groundwater Discharge Study (AECOM, 2010d), discussed below.

Groundwater quality at the site is saline, approaching seawater composition (AECOM, 2010b). A few exceptions were wells located in the east of the site which had fresh to brackish conditions.

A Groundwater Discharge Study (AECOM, 2010d) was conducted to investigate the interaction between site groundwater and Darling Harbour. Transects of multilevel piezometers were installed to the west (downgradient) of the site and a range of hydraulic and analytical testing was performed. Key findings from this study were:

- Significant changes in water level in the unconfined fill aquifer (>1 m in some cases) suggested significant quantities of water are exchanged across the aquifer – harbour interface.
- Relative to the fill, groundwater discharge volumes and therefore contaminant mass flux from the marine sediments and basal sandstone was considered to be negligible.
- The proportion of groundwater to seawater discharging during the low tide cycle to Darling Harbour was derived from a connate water displacement model. The results suggest that much of the water discharged during ebb tides comprises seawater which infiltrated during the previous flood tide. The mixing analysis indicates that the groundwater component of any discharge is likely to be 10-20% of the total.
- Contaminant mass flux is difficult to estimate on a site wide basis due to the heterogeneity of the fill, but mass flux is likely to be strongly limited by dilution occurring up-gradient of the tidal exchange prism (the portion of fill adjacent to the harbour, estimated at extending 10m from the sea wall). A five-fold dilution factor was estimated for dissolved phase contamination migrating from an upgradient source zone into Darling Harbour.

The flux of contaminants in marine sediments was considered by AECOM in two further studies (2012b and 2013a). The studies concluded that there is negligible flux of contaminants from the natural soil and marine sediments underlying the site into Darling Harbour or into the overlying fill material. These studies are discussed further in Section 11.5.

Based on the Auditor's review, the hydrogeological conditions at the site are reasonably well understood.

6 Evaluation of Quality Assurance and Quality Control

The Auditor has assessed the overall quality of the investigation data by review of the information presented in the referenced reports, supplemented by field observations. The initial investigations by ERM included parts of Barangaroo that are not included within the site. Information relevant to the declaration area and Block 4 was reviewed for this audit. In addition to the site specific data, information relating to the downgradient (western) areas adjacent to the site was considered in defining the remediation extent required to address the VMP (refer Section 11). Investigation locations are shown on Attachment 8, Appendix A. The primary information reviewed comprised soil and groundwater well logs, and field and analytical methods and results for the following investigations:

- **ERM (2007):** environmental site assessment comprising approximately thirty nine boreholes, installation of one groundwater well (BH087/EMW15) and sampling of one well within the site. This investigation also included installation and sampling of five offsite wells (BH046/MW08, BH129/MW24, BH53/MW11, BH76/MW14 & BH116/MW22) located on the Barangaroo Central and ORWN sites, which were also considered as part of the scope for this review.
- **ERM (2008a):** additional investigations comprising fifteen boreholes and eight groundwater wells (MW198, MW200, MW204S/D, MW205, MW206, MW209, MW210). This investigation also included installation of three offsite wells (BH213/MW213, BH057/MW12 & BH212/MW212) located on the Barangaroo Central and ORWN sites, which were also considered as part of the scope for this review.
- Rock core logs for the above ERM investigations were reported in J&K (2006).
- **Coffey (2008):** environmental site assessment in Hickson Road comprising fifteen boreholes, installation and sampling of five onsite wells (BH3/MW3, BH6/MW6, BH7/MW7, BH10/MW10 & MW15) (an additional well BH2/MW2 was installed to the north [outside the current audit area and this was not considered as part of the scope for the current audit]).
- **AECOM (2010b):** Declaration Area DGI comprising twenty five boreholes, installation of nine onsite groundwater wells (MW45, MW52, MW53, MW54, MW58, MW61, MW62, MW64, MW68), installation of seven soil vapour wells, and sampling of twenty wells and seven soil vapour sampling points. Data from the soil vapour sampling is not relevant to the RAP and is therefore not included in this assessment. This investigation also included seven offsite wells (MW40, MW56, MW60, MW69, MW74, IT01 and IT02) located on the Barangaroo Central and ORWN sites, which were also considered as part of the scope for this review.
- **AECOM (2012a):** Supplementary DGI comprising fourteen boreholes, installation of six groundwater wells, of which four offsite wells (MW401, IT03, IT04 and IT05) were considered to be relevant to the current audit area.
- **AECOM (2012e):** investigation of root mass zone of trees along Hickson Road comprising nine boreholes and three inspection pits.
- **JBS (2012):** Central DGI comprising ten offsite wells located on part Block 5 (MW518, MW539, MW540D, MW541S/D, MW542) and Barangaroo Central (MW529D, MW543, MW544S/D).

Comments specific to 'offsite' data are made by the Auditor where relevant, however, a detailed review for these investigations is not documented in this SAR.

The AECOM investigations were performed following appointment of the Auditor, and were undertaken in general accordance with SAQP documents reviewed by the Auditor.

The Auditor's assessment of the data QA/QC follows in Tables 6.1 and 6.2.

Table 6.1: QA/QC – Sampling and Analysis Methodology Assessment

Sampling and Analysis Plan and Sampling Methodology	Auditor's Summary and Comments
Sampling Pattern and Locations	Soil: The initial investigations by ERM (2007) comprised low density "strategic" sampling to support a design competition and identify any further work needed to complete the development approval, rather than full characterisation of the site. Investigation locations were restricted by the presence of buildings as well as operational constraints of the stevedoring business on the site. Additional investigations by ERM (2008a) and AECOM (2010b, 2012a and 2012e) aimed to fill data gaps from the preceding investigation, to support remediation planning. Key data gaps included: • Characterisation of deep fill • Delineation of previously identified impacts • Assessment of acid sulphate soils (ASS). Localised sources of contamination associated with the former gasworks were targeted by the soil investigation locations. In the Auditor's opinion, the investigation locations performed adequately target the main areas of concern and provide reasonable coverage of the remainder of the site to allow for remediation planning. Groundwater: Within the declaration area, monitoring wells are concentrated in the Hickson Road and Block 4 areas, with additional wells located in Block 5. A series of wells is located immediately downgradient of the Block 5 (northern) portion of the declaration area. Although there are no wells immediately downgradient of the Block 4 (southern) portion of the declaration area, downgradient wells are located further to the west in the ORWN RAP area. There is also a well (BH40/MW40) located downgradient of and adjacent to the Block 4 boundary. Given the variability of the fill encountered, the full range of groundwater conditions are not likely to have been assessed by the wells installed. However, wells have been placed in proximity to the highest soil contaminant detections, therefore, they should be reasonably representative of the upper range of potential contamination. Groundwater wells are not placed in a regular fashion and well coverage is limited in Block 5, the west of Block 4 and immediately downgradient of Block 4. However, comparison of groundwater results with field observations from boreholes (which have more regular coverage than groundwater wells) indicates a strong correlation between field indicators of gasworks impact and