10.5 Ex situ Stabilisation Trials

EPS conducted a series of Ex situ Stabilisation Trials to assess the feasibility of treating the PAH and TPH impacted material from the Site to a standard which would facilitate either disposal to landfill or beneficial reuse at Headland Park. These works are detailed in the *Ex situ Stabilisation Trials – DECC Declaration Area, Barangaroo* (EPS, 14 March 2012).

As discussed in **Section 7.3**, it is understood that the Authority has determined that no material from the Declaration Area will be accepted for reuse within Headland Park (*Headland Park RAP* [Rev 3], JBS, 2011). Therefore the summary presented following is focused on the suitability of stabilised material for disposal to landfill.

The stabilisation trials were conducted on bulk soil samples obtained from test pits excavated in Blocks 4 and 5 and a coal tar collected from the Hickson Road tar tank (BH53) in February 2010. The test pits were excavated in areas identified by historic investigations as containing gasworks contamination.

Four types of material were targeted for the *Ex situ Stabilisation Pilot Trial* based on field observations:

- Lightly impacted material (LI);
- Moderately impacted material (MI);
- Heavy impacted material (HI); and
- Coal tar material (CT).

The main contaminants of concern considered by the trial were PAH and TPH. PAH, including benzo(a)pyrene (BaP), and TPH are also the contaminants on which waste classification of the material is determined as per the DECCW (2009) *Waste Classification Guidelines*.

10.5.1 Methodology

After collection, the bulk soil samples within each material type were composited, air-dried and mechanically mixed in order to achieve a homogeneous starting material for the stabilisation trials.

The laboratory analysis (total concentrations) indicated that all untreated material (LI, MI, HI and CT) would be classified as hazardous waste, according to the DECCW (2009) *Waste Classification Guidelines*. This classification is based largely on exceedances of the specific contaminant concentration 2 (SCC 2) criteria of 23 mg/kg for BaP. The material types were identified as: LI = 29.6 mg/kg, MI = 70.6 mg/kg, HI = 234 mg/kg, CT = 194 mg/kg). The analytical results indicate that total BaP concentrations in the coal tar sample are lower than in the highly impacted material, which may be a result of the higher water content of the coal tar sample.

Leachate tests were also performed on the untreated soil samples. The leachate tests included:

- Toxicity Characteristic Leaching Procedure (TCLP);
- Australian Standard Leaching Procedure (ASLP); and
- Multiple Extraction Procedure (MEP).

The four material types were subjected to a range of treatment regimes. The treated samples were then subject to leachate testing (TCLP, ASLP and MEP) as well as being assessed for unconfined compressive strength (UCS).

10.5.2 Discussion of Results

The general effect of treatment on contaminant leachate concentrations (compared to untreated soil leachate concentrations) and UCS are summarised following:

- Addition of Portland cement (PC) - leachate contaminant concentrations either showed no reduction or an increase. The UCS showed an increase to > 1 MPa with 5% PC (LI, MI) and with 10% PC (HI);
- Addition of 10% fly-ash - no significant effect on leachate concentrations was reported. An UCS of 3.1 MPa was achieved with the addition of 10% PC (the UCS was not determined on the fly-ash alone treatment); and

- Addition of the chemical fixative, RemBind-FO11 - a significant reduction in leachate contaminant concentrations was reported (5% RemBind-FO achieved an 80% reduction in ASLP concentrations and a 50% reduction in TCLP concentrations). The UCS of the RemBind-FO/PC blend was significantly lower than PC alone (HI material treated with 5% RemBind-FO 10% PC had a UCS of 0.4 MPa compared to a USC of 1.1 MPa for HI material treated with 10% PC alone).

The treatment trials indicated that the optimum pre-treatment with respect to leachate contaminant reduction would be the addition of 5% RemBind-FO. RemBind-FO treatment was only trialled on the HI material, however, a reduction in leachate concentrations would be expected similarly with the LI and MI material.

Conversely, the optimum pre-treatment for achieving the NSW EPA General Immobilisation Approval specification for UCS of greater than 1 MPa would be 5%PC for LI and MI materials and 10%PC for HI material.

10.5.3 Conclusions and Recommendations

Waste can be disposed of to a DECCW Licensed Landfill subject to classification of the material in accordance with the DECCW (2009) *Waste Classification Guidelines*. Based on the SCC BaP criteria the material would be classified as Hazardous Waste, however, the NSW EPA General Immobilisation Approval # 2005/14 (IA) provides specific requirements for the stabilisation of coal tar contaminated soil for the purpose of disposal to an off-site NSW EPA licensed landfill facility.

The IA specifies that if the total concentrations are within specified criteria and a UCS of greater than 1 MPa is achieved, the treated soil can be assessed on TCLP leachability alone. Of the key contaminants of concern, the waste guidelines include a TCLP leachability criterion for BaP only. Based on the TCLP BaP concentrations (below the analytical detection limit for all material), the material (LI, MI, HI and CT) would be classified as General Solid Waste, providing the minimum UCS requirement is met. A UCS of greater than 1 MPa, could be achieved by the following treatments:

- Material classified as LI and MI: 5% cement;
- Material classified as HI: 10% cement; and
- Material classified as CT: 40% - 80% fly-ash, 10% cement.

As described above, the TCLP BaP concentrations were all reported below the laboratory LOR. Therefore, these treatments would also be expected to achieve the required leachate criteria prescribed by the NSW DECCW (2009) *Waste Classification Guidelines*.

The final fly-ash percentage for the treatment of coal tar impacted material will depend on the consistency of the material and the amount of fly-ash required to achieve a spadeable consistency. EPS anticipated that the UCS requirement for CT would likely be met with a 40% -50% fly-ash treatment.

[11] RemBind-FO is a proprietary product developed by Ziltek Pty Ltd for the chemical fixation and stabilisation of hazardous waste.

11.0 Preferred Remediation Option

Based on the available information, as described above, AECOM has identified that the preferred remediation option for: (a) removal of the NSW EPA Declaration (Declaration Number 21122); and (b) to ensure that Block 4 is remediated to a standard suitable for the proposed development in Block 4, should be focussed on the remediation of material identified as SPGWT and CIM (as detailed in **Section 8.5** and **9.1.5**).

The preferred remediation options for each of Block 4 (both VMP Remediation Works and Development Remediation Works), Block 5 (VMP Remediation Works) and Hickson Road (VMP Remediation Works) (as appropriate) are detailed in the following Sections and are summarised as follows:

- Block 4 VMP Remediation Works - excavation of contaminated materials as required to facilitate removal of the NSW EPA Declaration from Block 4, followed by on-site treatment (where required) and off-site landfill disposal (refer to **Section 11.1**);
- Block 4 Development Remediation Works - excavation of contaminated materials as required to make the site suitable for the proposed future land use including construction of the basement groundwater retention wall system (refer to **Section 11.2**). It is noted that the Block 4 Development Remediation Works are not required to enable the NSW EPA Declaration to be revoked. However, completion of the Block 4 Development Remediation Works (if undertaken) will also achieve the objectives of the VMP Remediation Works and thereby also facilitate removal of the NSW EPA Declaration from Block 4; and
- Block 5 VMP Remediation Works and Hickson Road (within the Declaration Area) VMP Remediation Works (refer to **Section 11.3** and **11.4** respectively):
    - Option 1 - completion of a S-ISCO® and SEPR™ Pilot Trial and, if successful, full-scale remediation using S-ISCO® and SEPR™; and
    - Option 2 - if the Pilot Trial are unsuccessful, excavation of required contaminated materials, followed by on-site treatment (where required) and off-site landfill disposal.

It is possible that, depending on the outcome of the S-ISCO® and SEPR™ Proving Phase and/or the Pilot Trial and project requirements, the preferred remediation option adopted for the Block 5 and Hickson Road VMP Remediation Works will be a combination of Option 1 (full scale S-ISCO® and SEPR™ treatment) and Option 2 (excavation and onsite treatment). Selection of which preferred remediation option will be adopted in each part of Block 5 and Hickson Road will be undertaken in consultation with the NSW EPA Accredited Site Auditor (refer to **Section 19.2.1**).

Alternative remediation options are also considered for the VMP Remediation Works (refer to **Section 11.1.3**, **11.3.3** and **Section 11.4.3**). In particular, S-ISCO® and SEPR™ are included as an alternative options for the Block 4 VMP Remediation Works should there be significant changes to the Block 4 Development Works proposed (e.g. if basement works were no longer proposed).

It is possible that remediation of the various areas within the Site (i.e. Block 4, Block 5 and Hickson Road) may occur in separate stages (as detailed in **Section 1.8**). Consequently, the remediation options for Block 4 and Block 5 and Hickson Road are detailed individually in the following sections. It is intended that this approach will facilitate sequential remediation, validation and NSW EPA Accredited Site Auditor signoff of these site areas (if required). The following sections also serve to demonstrate that both Option 1 (subject to the outcomes of the Pilot Trial) and Option 2 are feasible approaches to remediation of Block 5/Hickson Road in accordance with the Remediation Objectives (refer to **Section 1.1**).

11.1 Block 4 VMP Remediation Works - Preferred Remediation Option

As discussed in **Section 8.5.1**, SPGWT and CIM has been identified in Block 4 and will require remediation to facilitate removal of the NSW EPA Declaration.

The preferred remediation strategy for the Block 4 VMP Remediation Works involves:

- Site establishment and preparatory works (refer to **Section 13.0**);
- Installation of an excavation retention wall as required to facilitate excavation;

- Excavation as required to achieve the VMP Remediation Goals (refer to **Section 7.1.4**). This will include removal of identified SPGWT and CIM per **Section 8.5.1** and **Figure F10** and **Figure F11** in **Appendix B** in order to address the NSW EPA Declaration (refer to **Section 1.1.1**); and
- Reuse of excavated material (where possible) (as detailed in **Section 7.3**);
- Treatment of excavated material (if required) (refer to **Section 15.0**) to facilitate off-site disposal to licensed landfill (subject to classification in accordance with the DECCW (2009) *Waste Classification Guidelines*); and
- Validation of the resultant excavation as per **Section 19.5**.

This preferred option of ex situ remediation is proposed because: (a) it is consistent with excavation that is also required for future development works in Block 4 (i.e. basement bulk excavation and construction works); and (b) it is a proven remediation technology for gasworks contamination (including SPGWT) known to be present within Block 4 in association with historic subsurface gasworks infrastructure. However, it is noted that while the preferred remediation strategy for Block 4 VMP Remediation Works would benefit from synergies associated with future development, it is not reliant on any such development proceeding. That is, the excavation strategy proposed for the Block 4 VMP Remediation Works can be undertaken independently of any future development works.

Only material that is free of SPGWT will be considered for reuse.

It is understood that the Authority has determined that no material from the Declaration Area will be accepted for reuse within Headland Park (*Headland Park RAP* [Rev 3], JBS, 2011). Therefore, the option for reuse of material from the Declaration Area within Headland Park has not been considered.

The potential for the reuse of material within other areas of Barangaroo South will be subject to the SSTC developed in relation to those areas (refer to **Section 7.3**).

For clarity, remediation of SPGWT and/or CIM undertaken as part of the bulk excavation and development of Block 4 is considered VMP Remediation Works to the extent that it would have been required in any event to remove the NSW EPA Declaration.

11.1.1 Preferred Strategy Summary

The preferred strategy for Block 4 VMP Remediation Works is summarised following:

- Excavation as required to achieve the VMP Remediation Goals (refer to **Section 7.1.4**), including selective excavation of SPGWT and CIM that is considered to represent a risk to human health or the environment as described by **Section 8.5.1**, to the extent practicable;
- Full time supervision of the remediation works will be undertaken including visual and olfactory observations of excavated material to confirm that it is consistent with that anticipated based on previous investigations;
- Physical separation of recyclable and oversize material, including timber, rock, concrete, steel and brick, from other material;
- Stockpiling of material for processing and reuse (where required or appropriate, refer to **Section 7.3**);
- Excavated material that meets the applicable reuse criteria, may be reused within the Barangaroo South development or Barangaroo Central development – subject to capacity limitations (refer to **Section 7.3**);
- If excavated materials require treatment for off-site disposal or reuse, treatment via ex situ stabilisation/ solidification and/or S-ESCO™ will be undertaken and the material's suitability assessed via validation testing. Selection of the final treatment approach (that is ex situ stabilisation / solidification or S-ESCO™) will be dependent on a range of considerations including:
    - the type of contamination that requires treatment (for example, S-ESCO™ is not suitable for remediation of heavy metals contamination);
    - the quantity of material requiring treatment; the end use of the treated material (for example, off-site disposal to landfill or reuse onsite); and
    - the timing of the material treatment.

It is anticipated that a decision regarding selection of the preferred treatment approach will be made during detailed excavation planning for the various stages of remediation works and/or as part of any applications that may be required for off-site landfill disposal (eg. Immobilisation Approval);

- Off-site disposal will be undertaken of material that exceeds the available capacity for reuse within the Barangaroo site and/or is considered unsuitable for reuse (refer to **Section 7.3**); and
- Validation of the resultant excavation as per **Section 19.5**.

It is considered likely that the SPGWT excavated as part of the remedial works will require stabilisation or S-ESCO™ prior to its offsite disposal to a NSW EPA licensed landfill facility. An Immobilisation Approval will need to be obtained from NSW EPA prior to commencement of these works (refer to **Section 14.7.10**).

It should also be noted that off-site disposal of material (including excavation spoil which is essentially "clean") under the DECCW (2009) *Waste Classification Guidelines* will require that the material be classified as a waste. Further, if treatment of the waste is required prior to off-site disposal to landfill, it will be necessary to apply for and receive an Immobilisation Approval from the NSW EPA prior to treatment and disposal of the waste.

11.1.2 Reasons for Preferred Option Selection

Feasibility

- The proposed option of ex situ remediation is consistent with the proposal to excavate a large basement within Block 4 as part of the Barangaroo South development being undertaken by Lend Lease. It is noted that while the preferred remediation strategy for Block 4 VMP Remediation Works would benefit from synergies associated with future development, it is not reliant on any such development proceeding. That is, the excavation strategy proposed for the Block 4 VMP Remediation Works can be undertaken independently of any future development works;
- The reuse and placement of treated non-SPGWT material (where possible), in accordance with the applicable SSTCs is technically sound and feasible (refer to **Section 7.3**);
- Contamination in Block 4 is expected to primarily be gas works related contamination (SPGWT, PAHs, BTEX, and TPH). Treatment of gas works related contamination using stabilisation technologies is an established remediation technology which was successfully applied as part of the adjacent Bond development in Hickson Road. The capacity of stabilisation to appropriately treat Site contamination was demonstrated by the *Ex situ Stabilisation Trial* (EPS, 2012, refer to **Section 10.5**);
- Either ex situ stabilisation/solidification and/or S-ESCO™ is likely to be the most practical, cost-effective, and established ex situ remediation technology for treatment of the excavated material prior to off-site disposal, based on the type of contaminants which have been identified at the Site;
- The reuse of treated material has been successfully implemented as part of remediation projects at a number of former industrial sites within Sydney (including the Allied Feeds and Lednez sites at Rhodes, with which AECOM personnel have had direct involvement as the NSW EPA Accredited Site Auditor); and
- The supervision of all excavation works to selectively separate the SPGWT/CIM (based on visual and olfactory observations and the sample analysis results), may enable some unimpacted material to be reused within the remediated areas.

Sustainability

The nominated option of ex situ remediation in parallel with proposed basement construction is considered a sustainable solution due to the following considerations:

- It will minimise earthworks and materials handling requirements, therefore minimising emissions from diesel operated equipment and machinery - noting that a basement is to be constructed within Block 4 as part of the Barangaroo South development;
- It maximises the opportunity for recycling and reuse of material through segregation of oversize materials, timber and steel, etc; and
- It will minimise the carbon footprint of the remediation project.

11.1.3 Alternative Block 4 VMP Remediation Option

As an alternative, and subject to the results of the Pilot Trial, S-ISCO® could be undertaken to treat the identified SPGWT/CIM in Block 4 to achieve the VMP Remediation Goals (refer to **Section 7.1.4**). If adopted, the option will be as follows:

- Confirm, based on the results of the Pilot Trial, that:
  - S-ISCO® is effective at remediating Site contamination to meet the relevant soil and groundwater remediation standards;
  - The Pilot Trial has provided sufficient information required to facilitate the conduct of full scale remediation; and
  - The Pilot Trial did not result in an unacceptable risk to human health or the environment.
- S-ISCO® treatment of SPGWT and CIM that is considered to represent a risk to human health or the environment under current land use as described by **Section 16.0**.

Consideration of whether the alternative remediation option will be implemented for the Block 4 VMP Remediation Works may be based on the following factors:

- Changes to the proposed future development requirements in Block 4;
- Practical and commercial considerations; and
- Staging and sequencing of the remediation works in other Barangaroo site areas as part of the broader development works.

11.2 Block 4 Development Remediation Works - Preferred Remediation Option

As discussed in **Section 9.2.2**, SPGWT and CIM has been identified in Block 4 and will require remediation to facilitate the proposed future development works.

It is proposed that a large basement may be excavated within Block 4 as part of the Barangaroo South development being undertaken by Lend Lease (refer to **Section 4.2**, subject to planning approval). Accordingly, the preferred remediation strategy for the Block 4 Development Remediation Works involves ex situ remediation works as follows:

- Site establishment and preparatory works (refer to **Section 13.0**);
- Install permanent, basement groundwater retention wall system (refer to **Section 4.3**). It is noted that these walls could also serve as the excavation retention wall referenced in **Section 11.1** for the Block 4 VMP Remediation Works;
- Excavation as required to remove identified SPGWT and CIM that is considered to represent a risk to human health in order to render the area suitable for the Block 4 Development Works (refer to **Section 14.0**);
- Reuse of excavated material (where possible) (as detailed in **Section 7.3**);
- Treatment of excavated material (if required) (refer to **Section 15.0**) to facilitate off-site disposal to licensed landfill (subject to classification in accordance with the DECCW (2009) *Waste Classification Guidelines*);
- Validation of the excavation as per **Section 19.5**; and
- Complete relevant basement construction elements per the *Declaration Site HHERA* (AECOM, 2011a) and *Declaration Site HHERA Letter* (AECOM, 2012d) as per **Section 19.3**.

It is noted that the remediation extent required for the VMP Remediation Works is within the boundary of the area considered by the Block 4 Development Remediation Works. Further, as described by **Section 4.3**, the basement groundwater retention wall system will effectively prevent groundwater migration from the remediated Block 4 therefore protecting the environment. Consequently, completion of the Block 4 Development Remediation Works will also achieve the objectives of the VMP Remediation Works and thereby facilitate removal of the NSW EPA Declaration from Block 4.

Only material that is free of SPGWT will be considered for reuse.

It is understood that the Authority has determined that no material from the Declaration Area will be accepted for reuse within Headland Park (*Headland Park RAP* [Rev 3], JBS, 2011). Therefore, the option for reuse of material from the Declaration Area within Headland Park has not been considered.

The potential for the reuse of material within other areas of Barangaroo South will be subject to the SSTC developed in relation to those areas. An Addendum to this RAP would be prepared and submitted to the NSW EPA Accredited Site Auditor for approval should this option be adopted (as detailed in **Section 7.3**).

11.2.1 Preferred Strategy Summary

The preferred strategy for the Block 4 Development Remediation Works is summarised following:

- Selective excavation of SPGWT and CIM that is considered to represent a risk to human health or the environment under the proposed future land use as described by **Section 9.2.2**, to the extent practicable. The excavation of SPGWT and CIM that is considered to represent a risk to human health or the environment may be undertaken as part of the bulk excavation works for basement construction within Block 4;
- Full time supervision of the remediation works will be undertaken including visual and olfactory observations of excavated material to confirm that it is consistent with that anticipated based on previous investigations;
- Physical separation of recyclable and oversize material, including timber, rock, concrete, steel and brick, from other material;
- Stockpiling of material for processing and reuse (where required or appropriate, refer to **Section 7.3**);
- Excavated material that meets the applicable reuse criteria, may be reused within the Barangaroo South development or Barangaroo Central development – subject to capacity limitations (refer to **Section 7.3**);
- If excavated materials require treatment for off-site disposal or reuse, treatment via ex situ stabilisation/ solidification and/or S-ESCO™ will be undertaken and the material's suitability assessed via validation testing. Selection of the final treatment approach (that is ex situ stabilisation / solidification or S-ESCO™) will be dependent on a range of considerations including:
  - the type of contamination that requires treatment (for example, S-ESCO™ is not suitable for remediation of heavy metals contamination);
  - the quantity of material requiring treatment; the end use of the treated material (for example, off-site disposal to landfill or reuse onsite); and
  - the timing of the material treatment.

  It is anticipated that a decision regarding selection of the preferred treatment approach will be made during detailed excavation planning for the various stages of remediation works and/or as part of any applications that may be required for off-site landfill disposal (eg. Immobilisation Approval); and
- Off-site disposal will be undertaken of material that exceeds the available capacity for reuse within the Barangaroo site and/or, are considered unsuitable for reuse (refer to **Section 7.3**); and
- Validation of the resultant excavation as per **Section 19.5**.

It is considered likely that the SPGWT excavated as part of the remedial works will require stabilisation or S-ESCO™ prior to its offsite disposal to a NSW EPA licensed landfill facility. An Immobilisation Approval will need to be obtained from NSW EPA prior to commencement of these works (refer to **Section 14.7.10**).

It should also be noted that off-site disposal of material (including excavation spoil which is essentially "clean") under the DECCW (2009) *Waste Classification Guidelines* will require that the material be classified as a waste. Further, if treatment of the waste is required prior to off-site disposal to landfill, it will be necessary to apply for and receive an Immobilisation Approval from the NSW EPA prior to treatment and disposal of the waste.

11.2.2 Reasons for Preferred Option Selection

Feasibility

- The proposed option of ex situ remediation is consistent with the proposal to excavate a large basement within Block 4 as part of the Barangaroo South development being undertaken by Lend Lease;

- The reuse and placement of treated non-SPGWT material (where possible), in accordance with the applicable SSTCs is technically sound and feasible (refer to **Section 7.3**);
- Contamination in Block 4 is expected to primarily be gas works related contamination (SPGWT, PAHs, BTEX, and TPH). Treatment of gas works related contamination using stabilisation technologies is an established remediation technology which was successfully applied as part of the adjacent Bond development in Hickson Road. The capacity of stabilisation to appropriately treat Site contamination was demonstrated by the *Ex situ Stabilisation Trial* (EPS, 2012, refer to **Section 10.5**);
- Either ex situ stabilisation/solidification and/or S-ESCO™ is likely to be the most practical, cost-effective, and established ex situ remediation technology for treatment of the excavated material prior to off-site disposal, based on the type of contaminants which have been identified at the Site;
- The reuse of treated material has been successfully implemented as part of remediation projects at a number of former industrial sites within Sydney (including the Allied Feeds and Lednez sites at Rhodes, with which AECOM personnel have had direct involvement as the NSW EPA Accredited Site Auditor); and
- The supervision of all excavation works to selectively separate the SPGWT/CIM (based on visual and olfactory observations and the sample analysis results), may enable some unimpacted material to be reused within the remediated areas.

Sustainability

The nominated option of ex situ remediation in parallel with proposed basement construction is considered a sustainable solution due to the following considerations:

- It will minimise earthworks and materials handling requirements, therefore minimising emissions from diesel operated equipment and machinery - noting that a basement is to be constructed within Block 4 as part of the Barangaroo South development;
- It maximises the opportunity for recycling and reuse of material through segregation of oversize materials, timber and steel, etc; and
- It will minimise the carbon footprint of the remediation project.

11.2.3 Alternative Block 4 Development Remediation Option

As an alternative, and subject to the results of the Pilot Trial, S-ISCO® could be undertaken to treat the identified SPGWT/CIM in Block 4 prior to excavation of the future basement. If adopted, the option will be as follows:

- Confirm, based on the results of the Pilot Trial, that:
  - S-ISCO® is effective at remediating Site contamination to meet the relevant soil and groundwater remediation standards;
  - The Pilot Trial has provided sufficient information required to facilitate the conduct of full scale remediation; and
  - The Pilot Trial did not result in an unacceptable risk to human health or the environment.
- S-ISCO® treatment of SPGWT and CIM that is considered to represent a risk to human health or the environment as described by **Section 16.0**.

Consideration of whether the alternative remediation option will be implemented in Block 4 may be based on the following factors:

- Changes to the proposed future development requirements in Block 4;
- Practical and commercial considerations; and
- Staging and sequencing of the remediation works in other Barangaroo site areas as part of the broader development works.

11.3 Block 5 VMP Remediation Works – Preferred Remediation Option

As discussed in **Section 8.5.2**, SPGWT and CIM has been identified in Block 5 and will require remediation to facilitate removal of the NSW EPA Declaration.

Planning of the Block 5 development works is currently in its preliminary stage and the nature of the development has not been defined. Therefore, remediation of Block 5 using an *in* situ approach, specifically S-ISCO®, is preferred. Accordingly, the preferred remediation option for Block 5 involves the following:

- Completion of the Pilot Trial to demonstrate the effectiveness of the S-ISCO® and SEPR™ treatment processes as well as enabling optimisation of the full scale treatment process (refer to **Section 16.1**); and
- If the Pilot Trial is successful – Option 1:
    - Site establishment and preparatory works (refer to **Section 13.0**); and
    - Full scale S-ISCO® and SEPR™ treatment of the SPGWT and CIM that is considered to represent a risk to human health or the environment to render the Declaration Area suitable for current land use and to facilitate removal of the NSW EPA Declaration (refer to **Section 16.0**).
- If the Pilot Trial is unsuccessful - Option 2:
    - Site establishment and preparatory works (refer to **Section 13.0**); and
    - Excavation to remove identified SPGWT and CIM that is considered to represent a risk to human health or the environment to render the Declaration Area suitable for current land use and to facilitate removal of the NSW EPA Declaration (refer to **Section 14.0**);
    - Treatment of excavated material (if required) (refer to **Section 15.0**) to facilitate off-site disposal to licensed landfill (subject to classification in accordance with the DECCW (2009) *Waste Classification Guidelines*).

It is possible that, depending on the outcome of the S-ISCO® and SEPR™ Proving Phase and/or the Pilot Trial and project requirements, the preferred remediation option adopted for the Block 5 VMP Remediation Works will be a combination of Option 1 (full scale S-ISCO® and SEPR™ treatment) and Option 2 (excavation and onsite treatment). Selection of the preferred remediation option that will be adopted in each part of Block 5 will be undertaken in consultation with the NSW EPA Accredited Site Auditor.

The majority of SPGWT in Block 5 is expected to be encountered within relatively shallow fill material at the interface with the underlying marine sediments (if present) and bedrock.

It is noted that the Sydney Water Pumping Station (SPS1129) located on the eastern Block 5 boundary will be retained for the future land use. As described by **Section 8.5.2** remediation beneath the pumping station structure is unlikely to be required. However, remediation works to be undertaken adjacent to this area will need to consider appropriate protection measures for the structure.

11.3.1 Preferred Option Summary - Option 1 (S-ISCO®)

The Preferred option for the remediation of Block 5 is summarised following:

- Conduct Pilot Trial to:
    - demonstrate the effectiveness of S-ISCO® at remediating contamination within the Declaration Area to meet the relevant soil and groundwater remediation standards;
    - provide sufficient information to facilitate the conduct of full scale remediation; and
    - demonstrate that the Pilot Trial did not result in an unacceptable risk to human health or the environment (refer to **Section 16.1** and **16.2** respectively).
- Site establishment and preparatory works (refer to **Section 13.0**); and
- Full scale S-ISCO® and SEPR™ remediation works to treat/destroy SPGWT and/or CIM that is considered to represent a risk to human health or the environment under the current land use (refer to **Section 16.0**).

11.3.2 Reasons for Preferred Option Selection - Option 1 (S-ISCO®)

Feasibility

- The required scope of work is focussed on removal of the NSW EPA Declaration in parallel with development of Barangaroo. Given the preliminary stage of planning for the Block 5 development works, the nature of the development has not been defined. Therefore, *in situ* remediation technologies are appropriate;

- S-ISCO® has been demonstrated to be capable of successfully remediating SPGWT and other contaminant residues associated with former gas works sites;
- Subject to the outcome of the Pilot Trial, S-ISCO® will have been specifically demonstrated as capable of the required remediation within the Declaration Area;
- S-ISCO® can be applied to remediation of soils in the unsaturated zone by adjusting the chemical oxidants used to provide for greater retention time within the unsaturated zone;
- S-ISCO® can be implemented without negative impact on water and sediment quality within the adjacent Harbour;
- S-ISCO® delivery systems can be designed to target specific contamination and can more readily accommodate the presence of debris associated with historic filling activities or former gas works infrastructure when compared to other *in situ* remediation technologies (such as *in situ* stabilisation);
- S-ISCO® is more readily able to achieve complete treatment of target contamination when compared to other *in situ* remediation technologies (such as *in situ* stabilisation);
- S-ISCO® can be implemented around existing underground services without the need for resource intensive and costly service disruption, diversion and relocation; and
- S-ISCO® is considered to a practical and cost effective remediation technology based on the type of contaminants identified in Block 5 and the specific Remediation Goals for these areas.

Sustainability

The preferred option of conducting S-ISCO® within Block 5 is considered a sustainable solution due to the following considerations:

- S-ISCO® is considered an innovative and sustainable solution to the *in situ* remediation of Block 5, whereas the ex situ remediation of tar associated with former gas works would be resource intensive and costly;
- It will minimise earthworks, materials handling, separation, dewatering and drying requirements, therefore minimising emissions from diesel operated equipment and machinery and the overall carbon footprint for the development;
- It will minimise fugitive emissions and odours from handling of contaminated material, therefore minimising the risk of adverse stakeholder concerns. This is a particular concern given the proximity of Block 5 to residences and office buildings;
- It will minimise the quantities of material that requires off-site disposal to landfill;
- It will directly remediate both soil and groundwater contamination. Ex situ remediation technologies will remove the source soil contamination and rely on natural attenuation and/or other amendments/active remediation to improve groundwater quality; and
- Resources required to implement S-ISCO® are generally limited to power and water. This is particularly relevant with respect to some other *in situ* remediation technologies which require a large energy input (for example steam stripping or thermal conductive heating).

11.3.3 Alternative Option Summary - Option 2 (Ex situ)

Subject to the results of the Pilot Trial, the Alternative Option for the remediation of materials in Block 5 is summarised following:

- Excavation as required to achieve the VMP Remediation Goals (refer to **Section 7.1.4**), including selective excavation of SPGWT and CIM that is considered to represent a risk to human health or the environment under current land use as described by **Section 8.5.2** to the extent practicable;
- Full time supervision of the remediation works will be undertaken including visual and olfactory observations of excavated material to confirm that it is consistent with that anticipated based on previous investigations;
- Physical separation of recyclable and oversize material, including timber, rock, concrete, steel and brick, from other material;
- Stockpiling of material for processing and reuse (where required or appropriate, refer to **Section 7.3**);

- Excavated material that meets the applicable reuse criteria, may be reused within the Barangaroo South development or Barangaroo Central development – subject to capacity limitations (refer to **Section 7.3**);
- If excavated materials require treatment for off-site disposal or reuse, treatment via ex situ stabilisation/ solidification and/or S-ESCO™ will be undertaken and the material's suitability assessed via validation testing. Selection of the final treatment approach (that is ex situ stabilisation / solidification or S-ESCO™) will be dependent on a range of considerations including:
    - the type of contamination that requires treatment (for example, S-ESCO™ is not suitable for remediation of heavy metals contamination);
    - the quantity of material requiring treatment; the end use of the treated material (for example, off-site disposal to landfill or reuse onsite); and
    - the timing of the material treatment.

  It is anticipated that a decision regarding selection of the preferred treatment approach will be made during detailed excavation planning for the various stages of remediation works and/or as part of any applications that may be required for off-site landfill disposal (eg. Immobilisation Approval);
- Off-site disposal will be undertaken of material that exceeds the available capacity for reuse within the Barangaroo site and/or, are considered unsuitable for reuse (refer to **Section 7.3**);
- Validation of the resultant excavation as per **Section 19.5**; and
- Backfilling of excavation with suitable fill.

It is considered likely that the SPGWT excavated as part of the remedial works will require stabilisation or S-ESCO™ prior to its offsite disposal to a NSW EPA licensed landfill facility. An Immobilisation Approval will need to be obtained from NSW EPA prior to commencement of these works (refer to **Section 14.7.10**).

A component of the Alternative remediation option for Block 5 would be to maximise the reuse of materials excavated as part of any remediation works to the extent practicable (refer to **Section 7.3**).

11.3.3.1 Reasons for Alternative Option Selection - Option 2 (Ex situ)

Feasibility

- *Ex situ Stabilisation Trials* (refer to **Section 10.5**) have demonstrated that the ex situ remediation option is an appropriate and effective alternative to remediate Block 5;
- Based on the available information, it is anticipated that contamination in Block 5 will primarily be gas works residues (tar, PAHs, BTEX, and TPH). Treatment of gas works residues using stabilisation technologies is an established remediation technology which was successfully applied as part of the adjacent Bond development in Hickson Road. The capability of stabilisation to appropriately treat the Site contamination was demonstrated by the *Ex situ Stabilisation Trial* (EPS, 2012, refer to **Section 10.5**); and
- Either ex situ stabilisation/solidification and/or S-ESCO™ is likely to be the most practical, cost-effective, and established ex situ remediation technology for treatment of the excavated material prior to off-site disposal, based on the type of contaminants which have been identified at the Site.

11.4 Hickson Road VMP Remediation Works – Preferred Remediation Option

As discussed in **Section 8.5.3**, SPGWT and CIM that is considered to represent a risk to human health or the environment under current land use has been identified in Hickson Road and will require remediation to facilitate removal of the NSW EPA Declaration.

As excavation of Hickson Road is not required, remediation of these areas using an *in situ* approach, specifically S-ISCO®, is preferred. Accordingly, the preferred remediation option for Hickson Road involves the following:

- Completion of the Pilot Trial to demonstrate the effectiveness of the S-ISCO® and SEPR™ treatment processes as well as enabling optimisation of the full scale treatment process (refer to **Section 16.1** and **16.2**); and
- If the Pilot Trial are successful – Option 1:

- Site establishment and preparatory works (refer to **Section 13.0**); and
- Full scale S-ISCO® and SEPR™ treatment of the SPGWT and CIM that is considered to represent a risk to human health or the environment to render the Declaration Area suitable for the current land use and to facilitate removal of the NSW EPA Declaration (refer to **Section 16.0**).

- If the Pilot Trial are unsuccessful – Option 2:
  - Site establishment and preparatory works (refer to **Section 13.0**);
  - Excavation to remove identified SPGWT and CIM that is considered to represent a risk to human health or the environment to render the Declaration Area suitable for the current land use and to facilitate removal of the NSW EPA Declaration (refer to **Section 14.0**); and
  - Treatment of excavated material (if required) (refer to **Section 15.0**) to facilitate off-site disposal to licensed landfill (subject to classification in accordance with the DECCW (2009) *Waste Classification Guidelines*).

It is possible that, depending on the outcome of the S-ISCO® and SEPR™ Proving Phase and/or the Pilot Trial and project requirements, the preferred remediation option adopted for the Hickson Road VMP Remediation Works will be a combination of Option 1 (full scale S-ISCO® and SEPR™ treatment) and Option 2 (excavation and onsite treatment). Selection of the preferred remediation option that will be adopted in each part of Hickson Road will be undertaken in consultation with the NSW EPA Accredited Site Auditor.

The majority of SPGWT in Hickson Road is expected to be encountered in association with the former gas works infrastructure in Hickson Road (in particular the main gas holder annulus, tar tank area and small gas holder, refer to **Section 8.5.3**). Hickson Road is known to contain a large number of services and currently provides access to the adjacent residential and commercial buildings. Therefore excavation in Hickson Road is not preferred, as it would be difficult, costly and potentially increase the risk of negative impacts to stakeholders in properties adjacent to the Site.

It is noted that some excavation work may be required in specific parts of Hickson Rd, in advance of the Hickson Road VMP Remediation Works, to allow for potential stormwater diversion work. If required, these works would be undertaken in consideration of the requirements of this RAP.

11.4.1 Preferred Option Summary - Option 1 (S-ISCO®)

The Preferred option for the remediation of Hickson Road is summarised following:

- Conduct Pilot Trial to:
  - demonstrate the effectiveness of S-ISCO® at remediating Site contamination to meet the relevant soil and groundwater remediation standards ;
  - provide sufficient information to facilitate the conduct of full scale remediation; and
  - demonstrate that the Pilot Trial did not result in an unacceptable risk to human health or the environment (refer to **Section 16.1**); and
- Site establishment and preparatory works (refer to **Section 13.0**); and
- Full scale S-ISCO® and SEPR™ remediation works to treat/destroy SPGWT and/or CIM demonstrate that the Pilot Trial did not result in an unacceptable risk to human health or the environment (refer to **Section 16.0**).

11.4.2 Reasons for Preferred Option Selection - Option 1 (S-ISCO®)

Feasibility

- The required scope of work is focussed on removal of the NSW EPA Declaration in parallel with development of Barangaroo. Excavation of Hickson Road is not required. Therefore, *in situ* remediation technologies are appropriate;
- Hickson Road contains a high density of below ground services and utilities. Therefore, *in situ* remediation technologies that do not necessitate relocation of these services are appropriate;
- Hickson Road is located immediately adjacent to a number of sensitive receptors including residential and commercial premises and a childcare centre. Therefore, *in situ* remediation technologies that will minimise

the potential for odorous or other fugitive emissions (i.e. during ex situ bulk excavation works) are appropriate;

- S-ISCO® has been demonstrated to be capable of successfully remediating SPGWT and other contaminant residues associated with former gas works sites;
- Subject to the outcome of the Pilot Trial, S-ISCO® will have been specifically demonstrated as capable of the required remediation within the Declaration Area;
- S-ISCO® can be applied to remediation of soils in the unsaturated zone by adjusting the chemical oxidants used to provide for greater retention time within the unsaturated zone;
- S-ISCO® can be implemented without negative impact on water and sediment quality within the adjacent Harbour;
- S-ISCO® delivery systems can be designed to target specific contamination and can more readily accommodate the presence of debris associated with historic filling activities or former gas works infrastructure when compared to other *in situ* remediation technologies (such as *in situ* stabilisation);
- S-ISCO® is more readily able to achieve complete treatment of target contamination when compared to other *in situ* remediation technologies (such as *in situ* stabilisation);
- S-ISCO® can be implemented around existing underground services without the need for resource intensive and costly service disruption, diversion and relocation; and
- S-ISCO® is considered to a practical and cost effective remediation technology based on the type of contaminants identified in Hickson Road and the specific Remediation Goals for these areas.

Sustainability

The preferred option of conducting S-ISCO® within Hickson Road is considered a sustainable solution due to the following considerations:

- S-ISCO® is considered an innovative and sustainable solution to the *in situ* remediation of Hickson Road, whereas the ex situ remediation of tar associated with former gas works would be resource intensive and costly;
- It minimises earthworks, materials handling, separation, dewatering and drying requirements, therefore minimising emissions from diesel operated equipment and machinery and the overall carbon footprint for the development;
- It minimises fugitive emissions and odours from handling of contaminated material, therefore minimising the risk of adverse stakeholder concerns. This is a particular concern given the proximity of Block 4 to residences and office buildings;
- It minimises the quantities of material that requires off-site disposal to landfill;
- It will directly remediate both soil and groundwater contamination. Ex situ remediation technologies will remove the source soil contamination and rely on natural attenuation and/or other amendments/active remediation to improve groundwater quality; and
- Resources required to implement S-ISCO® are generally limited to power and water. This is particularly relevant with respect to some other *in situ* remediation technologies which require a large energy input (for example steam stripping or thermal conductive heating).

11.4.3 Alternative Option Summary - Option 2 (Ex situ)

Subject to the results of the Pilot Trial, the Alternative Option for the remediation of materials in Hickson Road is summarised following:

- Excavation as required to achieve the VMP Remediation Goals (refer to **Section 7.1.4**), including selective excavation of SPGWT and CIM that is considered to represent a risk to human health or the environment under current land use as described by **Section 8.5.3** to the extent practicable;
- Full time supervision of the remediation works will be undertaken including visual and olfactory observations of excavated material to confirm that it is consistent with that anticipated based on previous investigations;

- Physical separation of recyclable and oversize material, including timber, rock, concrete, steel and brick, from other material;
- Stockpiling of material for processing and reuse (where required or appropriate, refer to **Section 7.3**);
- Excavated material that meets the applicable reuse criteria, may be reused within Hickson Road – subject to capacity limitations (refer to **Section 7.3**);
- If excavated materials require treatment for off-site disposal or reuse, treatment via ex situ stabilisation/ solidification and/or S-ESCO™ will be undertaken and the material's suitability assessed via validation testing. Selection of the final treatment approach (that is ex situ stabilisation / solidification or S-ESCO™) will be dependent on a range of considerations including:
    - the type of contamination that requires treatment (for example, S-ESCO™ is not suitable for remediation of heavy metals contamination);
    - the quantity of material requiring treatment; the end use of the treated material (for example, off-site disposal to landfill or reuse onsite); and
    - the timing of the material treatment.

  It is anticipated that a decision regarding selection of the preferred treatment approach will be made during detailed excavation planning for the various stages of remediation works and/or as part of any applications that may be required for off-site landfill disposal (eg. Immobilisation Approval);
- Off-site disposal will be undertaken of material that exceeds the available capacity for reuse within Hickson Road and/or, are considered unsuitable for reuse (refer to **Section 7.3**);
- Validation of the resultant excavation as per **Section 19.5**; and
- Backfilling the excavated areas with suitable fill and reinstating the excavated portion of Hickson Road.

It is considered likely that the SPGWT excavated as part of the remedial works will require stabilisation or S-ESCO™ prior to its offsite disposal to a NSW EPA licensed landfill facility. An Immobilisation Approval will need to be obtained from NSW EPA prior to commencement of these works (refer to **Section 14.7.10**).

A potential component of the alternative Option 2 remediation works for Hickson Road would be to facilitate the reuse of materials excavated from other Site remediation works (outside Hickson Road) to the extent practicable. In consideration of this there may be opportunity to reuse some of the excavated material (eg. overburden or rock removed to facilitate deep excavation as part of the Block 4 Development Works within Hickson Road, refer to **Section 7.3**).

It should also be noted that for the purpose of waste classification under the DECCW (2009) *Waste Classification Guidelines* Hickson Road is considered off-site from Block 4 and Block 5. Therefore, the reuse of material from Block 4 or Block 5 within Hickson Road would require that the material be classified as a waste or receipt of a Resource Recovery Exemption under clauses 51 and 51A of the *Protection of the Environment Operations (Waste) Regulation* (2005).

11.4.3.1 Reasons for Alternative Option Selection - Option 2 (Ex situ)

Feasibility

- Ex situ Stabilisation Trials (refer to **Section 10.5**) have demonstrated that the ex situ remediation option is an appropriate and effective alternative to remediate Hickson Road.
- Based on the available information, it is anticipated that contamination in Block 5 and Hickson Road will primarily be gas works residues (tar, PAHs, BTEX, and TPH). Treatment of gas works residues using stabilisation technologies is an established remediation technology which was successfully applied as part of the adjacent Bond development in Hickson Road. The capability of stabilisation to appropriately treat the Site contamination was demonstrated by the *Ex situ Stabilisation Trial* (EPS, 2012, refer to **Section 10.5**; and
- Either ex situ stabilisation/solidification and/or S-ESCO™ is likely to be the most practical, cost-effective, and established ex situ remediation technology for treatment of the excavated material prior to off-site disposal, based on the type of contaminants which have been identified at the Site.

11.5 Groundwater Contamination and the Adjacent ORWS Retention Wall System

A groundwater basement retention wall system has been constructed around the perimeter of the basement to be constructed within Barangaroo South Blocks 1 to 3 (also referred to as the ORWS Area or Stage 1a basement). The approximate alignment of the wall is shown on **Figure F4** in **Appendix B**. The groundwater basement retention wall system comprises a diaphragm wall constructed to and keyed into bedrock and is designed to effectively isolate material within it from the surrounding environment. The northern boundary of the ORWS Area corresponds (in part) with the southern boundary of the Site.

As discussed in **Section 4.3** and detailed in **Figure F4** in **Appendix B**, a perimeter retention wall system is proposed to be constructed around Block 4 should the proposed Block 4 Development proceed.

Based on the groundwater monitoring data available for Barangaroo South and surrounding areas (as provided in various reports by AECOM, ERM and others), groundwater contamination within the Site will not be impacted by the presence of the adjacent ORWS perimeter retention wall system (and Block 4 basement groundwater retention wall system, if constructed) because:

- Groundwater flow in and around the area is tidally influenced. The amount of seawater infiltrating into the Site twice per day with the incoming tide is far greater than the amount of terrestrial groundwater flowing onto the Site from up gradient areas in the fill material, natural sediments and sandstone bedrock;
- Terrestrial groundwater flow around the ORWS and proposed Block 4 retention wall system from the east will be low because the limiting factors are the nature of the up gradient urban catchment for groundwater recharge and the sandstone bedrock. The majority of rainfall becomes surface water runoff due to the presence of pavements and buildings, leaving little water to infiltrate and recharge the groundwater system; and
- The highest concentrations of contamination in groundwater at the Site exist cross gradient to the ORWS retention wall system. The migration of groundwater contamination at the Site will not change because of the construction of the ORWS retention wall system for the following reasons:
    - Overall groundwater flow is towards Darling Harbour, not towards the ORWS retention wall system;
    - Although terrestrial groundwater flow around the ORWS retention wall system may flow into the Site, the flux will be low as discussed above and will therefore not cause additional appreciable migration of contamination; and
    - Contamination present in the ORWS basement area will be removed and managed in accordance with the *ORWS Amended Remedial Action Plan* (AECOM, 2011b) and will therefore not impact on Darling Harbour or the surrounding residential premises.

12.0 Remediation Works Overview

12.1 General Works Program Overview

The following sections provide an overview of the remediation approach for both the VMP Remediation Works and Block 4 Development Remediation Works. Where there is a distinction between the two, the difference is highlighted in the text.

The following sections do not include consideration of planning requirements which are described in **Section 2.2.2**. The planning process will necessarily be concluded prior to execution of the full scale remediation works.

12.2 Project Schedule

12.2.1 Block 4 VMP Remediation Works

The proposed Block 4 VMP Remediation Works will be scheduled under the following tasks:

- Approvals process, including concept, project and development approval and Immobilisation Approval, (if required) for off-site disposal of excavated material to landfill (refer to **Section 14.7.10**);
- Site Establishment and construction of treatment plant (if required);
- Installation of an excavation retention wall as required to facilitate excavation works. Note that if Block 4 Development Remediation Works are conducted along with the VMP Remediation Works, this would comprise the basement perimeter retaining wall described in **Section 4.3**);
- Construction of odour control structures (refer to **Section 15.1**) including associated piling works (if required);
- Excavation and treatment (as required);
- Tracking of all excavated materials in accordance with the Materials Tracking Procedure (refer to **Section 14.7.2**);
- Validation to demonstrate compliance with the requirements of this RAP;
- Reporting;
- Decommissioning and demobilisation; and
- Groundwater monitoring will be undertaken and the groundwater results compared to the Remediation Goals developed by the *VMP Remediation Extent Report* (AECOM, 2013c) in accordance with the Groundwater Monitoring Plan (GMP) to be prepared for the Site (refer to **Section 17.4**).

12.2.2 Block 4 Development Remediation Works

The proposed Block 4 Development Remediation Works will be scheduled under the following tasks:

- Approvals process, including concept, project and development approval and Immobilisation Approval, (if required) for off-site disposal of excavated material to landfill (refer to **Section 14.7.10**);
- Installation of the Block 4 basement groundwater retention wall system (refer to **Section 4.3**);
- Construction of odour control structures (refer to **Section 15.1**) including associated piling works (if required) and construction of additional structures (if required) for further basement excavation;
- Excavation and treatment (as required);
- Tracking of all excavated materials in accordance with the Materials Tracking Procedure (refer to **Section 14.7.2**);
- Validation to demonstrate compliance with the requirements of this RAP;
- Reporting;
- Decommissioning and demobilisation; and

- Groundwater monitoring, if required, in accordance with the GMP to be prepared for the Site (refer to **Section 17.4**).

12.2.3 Block 5 and Hickson Road VMP Remediation Works

The proposed Block 5 and Hickson Road VMP Remediation Works will be scheduled under the following tasks:

- Completion of the S-ISCO® and SEPR™ Pilot Trial and the related S-ISCO® and SEPR™ Pilot Trial Report which will be issued to the Site Auditor and NSW EPA for review (refer to **Section 13.1.3**, **16.1** and **16.2**); and
- If the Pilot Trial is successful – Option 1:
    - Approvals process, including concept, project and development approval;
    - Preparation of the S-ISCO® and SEPR™ Detailed Work Plan (refer to **Section 13.1.3**) and issue to the Site Auditor and NSW EPA for review;
    - Site Establishment and construction of the required support equipment;
    - *In Situ* remediation, to the extent practical, of SPGWT and CIM using S-ISCO® and SEPR™ that is considered to represent a risk to human health or the environment under the current land use;
    - Tracking of all materials in accordance with a Materials Tracking Procedure (refer to **Section 14.7.2**);
    - Validation to demonstrate compliance with the requirements of this RAP;
    - Reporting;
    - Decommissioning and demobilisation; and
    - Groundwater monitoring will be undertaken and the groundwater results compared to the Remediation Goals developed by the *VMP Remediation Extent Report* (AECOM, 2013c) in accordance with the GMP to be prepared for the Site (refer to **Section 17.4**).
- If the Pilot Trial is unsuccessful – Option 2:
    - Approvals process, including concept, project and development approval;
    - Site Establishment and construction of the required plant;
    - Installation of an excavation retention wall as required to facilitate excavation works;
    - Construction of odour control structures (refer to **Section 15.1**) including associated piling works (if required);
    - Excavation and treatment (as required);
    - Tracking of all materials in accordance with a Materials Tracking Procedure (refer to **Section 14.7.2**);
    - Validation to demonstrate compliance with the requirements of this RAP;
    - Reporting;
    - Decommissioning and demobilisation; and
    - Groundwater monitoring will be undertaken and the groundwater results compared to the Remediation Goals developed by the *VMP Remediation Extent Report* (AECOM, 2013c) in accordance with the GMP to be prepared for the Site (refer to **Section 17.4**).

12.3 Remediation Works

12.3.1 Block 4 VMP Remediation Works

Summary detail of the proposed Block 4 VMP Remediation Works via ex situ stabilisation (and possibly S-ESCO™ if proven viable) is described following:

- Installation of an excavation retention wall as required to facilitate excavation works. Note that if Block 4 Development Remediation Works are conducted along with the VMP Remediation Works, this would comprise the basement groundwater retention wall system described in **Section 4.3**).
- Construction of odour control structures (refer to **Section 15.1**) including associated piling works (if required);
- Excavation as required to achieve the VMP Remediation Goals (refer to **Section 7.1.4**), including selective excavation of SPGWT and CIM that is considered to represent a risk to human health or the environment as described by **Section 8.5.1**, to the extent practicable (refer to **Section 7.1.4**). The SPGWT and CIM will be identified through a combination of:
    - assessment of the soil analytical results against the Remediation Goals;
    - visual and olfactory observations during excavation; and
    - correlation with analytical data to facilitate visual confirmation of materials characterisation.
- Physical separation of recyclable and oversize material, including timber, rock, concrete, steel and brick from contaminated material;
- Characterisation of excavated SPGWT and CIM to confirm treatment requirements and appropriate end use (including consideration of reuse options, refer to **Section 7.3**);
- Tracking of all excavated materials in accordance with the Materials Tracking Procedure (refer to **Section 14.7.2**);
- Validation (progressive and concurrent with remediation excavation and treatment) to demonstrate compliance with the requirements of this RAP; and
- Groundwater monitoring and assessment of groundwater CoPC concentrations against the Remediation Goals developed by the *VMP Remediation Extent Report* (AECOM, 2013c) in accordance with the GMP to be prepared for the Site (refer to **Section 17.4**).

12.3.2 Block 4 Development Remediation Works

Summary detail of the proposed Block 4 Development Remediation Works via ex situ stabilisation (and possibly S-ESCO™ if proven viable) is described following:

- Installation of the Block 4 basement groundwater retention wall system (refer to **Section 4.3**);
- Construction of odour control structures (refer to **Section 15.1**) including associated piling works (if required) and construction of additional structures (if required) for further basement excavation;
- Selective excavation of SPGWT and CIM that is considered to represent a risk to human health or the environment under the proposed future land use as described by **Section 9.2.2**, to the extent practicable. The excavation of SPGWT and CIM that is considered to represent a risk to human health or the environment will likely be undertaken as part of the bulk excavation works for basement construction within Block 4. The SPGWT and CIM will be identified through a combination of:
    - assessment of the soil analytical results against the Remediation Goals;
    - visual and olfactory observations during excavation; and
    - correlation with analytical data to facilitate visual confirmation of materials characterisation.
- Physical separation of recyclable and oversize material, including timber, rock, concrete, steel and brick from contaminated material;
- Characterisation of excavated SPGWT and CIM to confirm treatment requirements and appropriate end use (including consideration of reuse options, refer to **Section 7.3**);

- Tracking of all excavated materials in accordance with the Materials Tracking Procedure (refer to **Section 14.7.2**);
- Validation (progressive and concurrent with remediation excavation and treatment) to demonstrate compliance with the requirements of this RAP; and
- Groundwater monitoring, if required, in accordance with the GMP to be prepared for the Site (refer to **Section 17.4**).

12.3.3 Block 5 and Hickson Road VMP Remediation Works

12.3.3.1 Option 1 - S-ISCO®

Pending the results of the proposed Pilot Trial, implementation of the Block 5 and Hickson Road VMP Remediation Works using S-ISCO® are described following while further detail is provided in **Section 16.0**:

- Based on the identified presence of SPGWT and CIM that represents a risk to human health or the environment under current land use in Block 5 and Hickson Road it is likely that the works will be conducted as follows:
  - Mobilisation and establishment of Site facilities;
  - Service location of underground services in the remediated areas;
  - Installation of injection wells, groundwater monitoring wells and related infrastructure. Extraction wells will also be installed within the Hickson Road former gasworks infrastructure to facilitate SEPR™; and
  - Injection of surfactants and oxidants at optimal rates, volumes and durations based on the findings of the full scale pilot trial.
- Groundwater monitoring, and soil gas and soil sampling will be conducted prior to and during all stages of the works to ensure the S-ISCO® is operating within optimal working conditions;
- The SEPR™ works within the Hickson Road former gasworks infrastructure will consist of injections and subsequent extractions aimed at removing the SPGWT present;
- Soil validation (progressive and concurrent with remediation) to demonstrate compliance with the requirements of this RAP; and
- Groundwater monitoring and assessment of groundwater CoPC concentrations against the Remediation Goals developed by the *VMP Remediation Extent Report* (AECOM, 2013c) (refer to **Section 17.4**).

12.3.3.2 Option 2 - Ex situ Stabilisation

Summary detail of the proposed Block 5 and Hickson Road VMP Remediation Works using ex situ stabilisation (and possibly S-ESCO™ if proven viable) is described following:

- Based on the identified presence of SPGWT and CIM that represents a risk to human health or the environment under current land use in Block 5 and Hickson Road, selective excavation, to the extent practicable, to achieve the VMP Remediation Goals (refer to **Section 7.1.4**);
- Identification of CIM during excavations and selective over-excavation through a combination of:
  - assessment of the soil analytical results against the Remediation Goals;
  - visual and olfactory observations during excavation; and
  - correlation with analytical data to facilitate visual confirmation of materials characterisation.
- Physical separation of recyclable and oversize material, including timber, rock, concrete, steel and brick from contaminated material;
- Characterisation of excavated SPGWT and CIM to confirm treatment requirements and appropriate end use (for possible backfilling of remediated areas);
- Tracking of all excavated materials in accordance with the Materials Tracking Procedure (refer to **Section 14.7.2**);
- Validation (progressive and concurrent with remediation excavation and treatment) to demonstrate compliance with the requirements of this RAP; and

- Groundwater monitoring and assessment of groundwater CoPC concentrations against the Remediation Goals developed by the *VMP Remediation Extent Report* (AECOM, 2013c) (refer to **Section 17.4**).

13.0 Site Establishment

13.1 Work to be Completed Prior to Site Establishment

13.1.1 Planning Approvals

The assessment and approvals process for the proposed S-ISCO® and SEPR™ Pilot Trial and remediation works are described by **Section 2.0**.

13.1.2 Project Approvals

Approvals and licenced required to facilitate both the VMP Remediation Works and Block 4 Development Remediation Works will include:

- An Immobilisation Approval from the NSW EPA, if the ex situ treatment of soils is required prior to off-site disposal (if required);
- A variation to the existing Environment Protection License (EPL, as required, refer to **Appendix E**) to facilitate the proposed remediation works, for example:
  - discharge of treated groundwater from the wastewater treatment system to Darling Harbour (refer to **Section 17.3**);
  - emissions from odour control structures required as part of ex situ stabilisation (refer to **Section 15.1**);
  - emissions from the selected remediation approach (for example vapour emissions from the SVE system required as part of S-ISCO); or
  - if treatment of material is required - refer to **Section 2.2**.
- A Trade Waste Licence from Sydney Water for disposal to sewer (if required); and
- Consent from an appropriately licenced landfill(s) to receive waste generated by the remediation works.

13.1.3 Project Documentation

Prior to site establishment, all plans, programs, certificates and other documents necessary for the commencement of work will be completed. These documents will include, but not be limited to the following:

Table 14 Project Documentation

Report Title	Approval Party	Approval Prerequisite	Relevant Section of this Report
Occupational Health and Safety (OH&S) Plan	Lend Lease	Site Establishment	Section 21
Community Consultation Plan	Lend Lease	Site Establishment	Section 22
Environmental Management Plan	Lend Lease and NSW DoPI	Site Establishment	Section 20
Project Management Plan	Lend Lease	Site Establishment	-
Quality Management Plan	Lend Lease	Site Establishment	-
Asbestos Management Plan	Lend Lease	Site Establishment	Section 7.2.4.2 and new Section 14.8
Emergency Response and Contingency Plan	Lend Lease	Site Establishment	Section 13.4.7
Excavation Plans	Lend Lease	Site Establishment	Section 9.3 and 14.3
S-ISCO®/SEPR™ Pilot Trial Report	Site Auditor and NSW EPA	S-ISCO® and SEPR™	Section 16.2
Reuse Materials Management Plan (to be prepared by the BDA)	BDA	Reuse of material elsewhere on Barangaroo	Section 7.3 and 14.7.2
S-ISCO®/SEPR™ Detailed Work Plan	Site Auditor and NSW EPA	S-ISCO® and SEPR™	Section 16.3

Report Title	Approval Party	Approval Prerequisite	Relevant Section of this Report
Validation SAQP	Site Auditor	VMP Remediation Works / Block 4 Development Remediation Works	Section 19.2.3
VMP Remediation Works Groundwater Monitoring Plan	Site Auditor and NSW EPA (if required)	VMP Remediation Works	Section 17.4.2
Block 4 Development Remediation Works GMP	Site Auditor	Block4 Development Remediation Works	Section 17.4.3

In addition, the following will be undertaken:

- Preparation of a detailed work program and logic diagram (including Excavation Plans);
- Submission of all WorkCover Authority notifications;
- Commissioning and Mobilisation of Plant;
- An Immobilisation Approval from the NSW EPA, if the treatment of soils is required prior to off-site disposal; and
- Preparatory works required for utilities connections and supply agreements.

13.2 Site Preparation

Works to be undertaken prior to remediation works include:

- Establishment of site offices;
- Demolition of existing infrastructure and removal of concrete pavements, where required;
- Installation of excavation retention walls, as required to facilitate excavation works. In the case of the Block 4 Development Remediation Works, installation of the basement groundwater retention wall system;
- Establishment of exclusion zones;
- Establishment of an Excavation Enclosure (EE) and related Emissions Control System (ECS) (if required for Option 2 works) for those areas where excavation within an enclosure is required to manage odorous materials; and
- Establishment of the Remediation Enclosure (RE) (if required, refer to **Section 15.1**) and Ex situ Treatment Facility and related ECS, where required.
- Establishment of the plant and supporting infrastructure as required for the S-ISCO® and SEPR™ works, where required.

13.3 Site Facilities and Procedures

Site facilities required for the remediation works (either *in situ* and/or ex situ and both VMP Remediation Works and Block 4 Development Remediation Works) will be established in compliance with the relevant regulations. These facilities will be connected to appropriate utilities as required. All connections and reticulations will be carried out by licensed and qualified personnel in accordance with statutory requirements and standards.

The following facilities will be established for the remediation works at the Site:

- Ex situ treatment facility (if required);
- EE and related ECS (if required) for the management of odours and volatile emissions associated with the excavation of SPGWT and CIM and any other odorous materials; and
- RE and related ECS (if required) for the ex situ treatment facilities (if required).

It is intended that the ex situ treatment facility will be established in a suitable location on Barangaroo, potentially adjacent to Block 5. Material excavated from the Site requiring treatment will be transferred to this facility or

transferred to a licensed offsite facility for treatment in accordance with applicable regulations and NSW EPA requirements.

Other activities will involve set-up of site offices adjacent to the RE, fencing, decontamination stations, environmental control measures and other associated facilities include:

- Wheel wash zones at the entrance and exit points to the EE and RE;
- Stores, work sheds, lunchrooms and changing areas for the use of subcontractors and consultants;
- Temporary site sheds, first aid and emergency facilities, bathroom facilities and decontamination units, and

Any additional site facilities, to facilitate work in other areas of the Site, or in areas requiring additional safety measures.

The following S-ISCO® related tasks would also be conducted:

- Set-up of injection system and associated equipment;
- Installation of monitoring and injection wells, and soil vapour monitoring points;
- Installation of trenches for the injection system (i.e. as required for Hickson Road);
- Connection of injection wells to the injection system;
- Connection of soil vapour monitoring points to the soil vapour extraction system; and
- Collection of pre-injection monitoring data.

13.3.1 Exclusion Zone

Exclusion Zones are areas of the Site that will be outlined in the occupational health and safety plan (OHSP) that either require additional protective measures or may require the adoption of additional OH&S requirements and work practices. Exclusion Zones may also include other areas affected by emissions from the works being undertaken at any point in time. All Exclusion Zones will incorporate a buffer area along the boundary of the zone.

The boundaries of the Exclusion Zones will be defined by fencing and safety signs erected at regular intervals around each exclusion zone warning of the boundary of the exclusion zone, the nature of the hazard associated with it and access restrictions that apply for entry into the zone. Access of personnel into and out of the Exclusion Zones, will be controlled at a Decontamination Station, and will depend on the personnel classification. The location and extent of Exclusion Zones will be detailed in the OHSP and outlined in the Site-Specific Safety Induction.

The EE, ex situ treatment facility and RE will be nominated as an Exclusion Zone at the Site.

13.4 Site Access and Security

13.4.1 General

Only authorised personnel and equipment will be allowed into the exclusion zones and other areas associated with the remediation works. Access will be strictly controlled throughout the course of the remediation works using the following procedures.

13.4.2 Working Hours

It is anticipated that construction and demobilisation hours would be between the hours of 7am and 6pm Monday to Friday, and 7am to 5pm Saturdays. No construction work would occur on Sundays and Public Holidays.

Operation hours for the excavation activities would be between 7am to 5pm, six days per week. Operation hours for the ECS would be 24 hours per day, seven days a week.

13.4.3 Site Haul Roads & Parking Areas

Existing concreted areas will be utilised as haul roads to the extent practicable. Traffic movements on-site will be directed around areas that are the subject of remediation works.

13.4.4 Site Access

The primary access route to the Site will be either via Hickson Road (to be confirmed as part of the application process and determined as part of the site staging). The entry point will control access to and around the Site during the remediation works.

All site personnel entering and leaving the Remediation works will be required to pass through the clean/dirty zone and the decontamination station.

13.4.5 OHS Signage

Signage will be installed at the site entrance detailing the location of the site offices, Remediation works, decontamination units, first aid facilities and parking. Traffic restrictions will be installed to limit access further into the Site to the north and ensure the safety of site visitors.

Signage at the main gate will include after-hours contact details.

As detailed in **Section 13.3.1**, additional signage will be erected along Exclusion Zone boundaries to restrict access to these areas to authorised personnel only.

13.4.6 Fencing

Security fencing will be established around the remediation works areas. Additional fencing will be erected where necessary to secure portions of the Site.

13.4.7 Control of Site Entry and Exit

Entry to any designated remediation works areas will be controlled through the use of a sign-on/sign-off log system at the main gate. Only authorised personnel will be allowed into the remediation works area.

Personnel will gain access to the remediation works area only after they have:

- Attended and completed a site safety induction briefing (applicable to all site workers and visitors);
- Are wearing all applicable PPE as detailed in the OHSP; and
- Been inducted into the OHSP.

All construction vehicles and delivery vehicles will enter the Site through the nominated main gate.

In the event of an emergency on-site and the need for emergency services personnel to access the site works, the site access process may be expedited. In these situations, which require the need to minimise delays in accessing injured site personnel, prior arrangement will be made for special site access procedures. However, given the nature of the remediation works, all PPE and decontamination protocols will remain in effect at all times.

An Emergency Response Plan will be developed prior to site establishment detailing the specific procedures relating to site emergencies.

14.0 General Remediation Excavation and Materials Management (Ex situ Remediation)

14.1 Background

This section addresses works associated with the excavation of SPGWT and CIM that represents a risk to human health and/or the environment (ex situ remediation works) under either:

- In the case of the VMP Remediation Works, current land uses (refer to **Section 7.1**); and
- In the case of the Block 4 Development Remediation Works, future land uses following the proposed development (refer to **Section 4.0**).

SPGWT and CIM that require treatment will be transferred to the ex situ treatment facility and treated in accordance with the processes outlined in **Section 15.3** and/or **Section 15.4**. If S-ESCO™ is proven to be an effective technology in treating the SPGWT or CIM; this treatment would also be undertaken at the ex situ treatment facility.

Materials requiring treatment may also be transferred to a licensed offsite facility for treatment in accordance with applicable regulations and NSW EPA requirements.

The following general remediation excavation and material management activities are described as part of the following sections:

- Control and minimisation of emissions from the excavation area (refer also to **Section 20.3**);
- Control and treatment of water from the remedial excavations (**Section 14.5** and **Section 17.0**);
- Excavation of the SPGWT and CIM (**Section 14.3** and **Section 14.4**); and
- Loading of excavated materials for transport (**Section 14.7**).

It is noted that any potentially contaminated spoil removed as part of the construction of excavation retention walls required to facilitate excavation works (including the basement groundwater retention wall system required as part of the Block 4 development works) or piling works would also be managed in accordance with this RAP.

14.2 Pre Treatment of Materials

Prior to excavation of materials, some preparation and pre-treatment of material may be necessary as summarised in **Section 14.7.3**.

14.3 Excavation Planning

The materials to be excavated comprise heterogeneous fill materials, soil, bedrock, SPGWT, as well other potential gas works related waste (for example ash). Therefore, prior to commencement of excavations, detailed Excavation Plans will be prepared outlining the anticipated classification of materials and the results of the site investigations. Correlations between field observations (both visual and olfactory) and analytical data will also be used to guide the visual characterisation of fill materials during excavation.

All remediation excavation works will be undertaken in accordance with the following procedures, in sequence:

- Prior to commencement of excavations on each work shift, all necessary environmental, OH&S measures and related equipment will be established and all worker PPE and respiratory controls will be checked to ensure they are in full working order in accordance with the OH&S Management Plans;
- All excavation plant operators, haulage operators and supervisors will be made familiar with the excavation strategy, and all workers will be made aware of their responsibilities prior to the commencement of each shift;
- Stockpile areas will be prepared with adequate capacity to receive the contaminated materials after excavation prior to the commencement of excavation;
- Exclusion zones will be set up around the active remediation works areas and as required;
- All truck haulage roads will be made suitable for transportation and haulage of the excavated materials;

- All haulage trucks will be covered prior to exiting the exclusion zone/excavation area and will be decontaminated at the end of each shift of haulage operations in accordance with the Environmental Management Plan (EMP). All haulage trucks will be fitted with liquid seals which will be inspected daily to ensure their integrity; and

All personnel, vehicles and equipment leaving the excavation enclosure will be properly decontaminated in accordance with the EMP.

14.4 Excavation Operations

Where SPGWT and CIM requiring remediation is identified, excavation operations will commence by the removal of overburden material. The overlying material will be classified based on the available soil analytical data set to determine whether it meets the applicable SSTCs for reuse onsite (refer to **Section 19.5.6**).

Excavations will be regularly inspected by a suitably experienced environmental engineer or scientist to confirm that the visual and olfactory characteristics of the excavated materials are consistent with expectations. These regular inspections will also serve to identify additional hotspots of SPGWT or CIM that may not otherwise have been identified by the previous site investigations.

Odorous materials will be managed as per the requirements of **Section 15.0** and **20.3**.

All excavated CIM will be kept separate from other materials. Depending on the level of contamination in excavated material (relative to the SSTCs for reuse onsite), excavated CIM will be either:

- Designated for reuse within remediated areas (refer to **Section 7.3**);
- transferred to the RE for treatment; or
- removed directly offsite to a licensed landfill facility.

All SPGWT excavated will be similarly kept separate from other materials. All SPGWT will be transferred to the RE for treatment prior to disposal offsite to a licensed landfill facility.

14.5 Dewatering of Excavations

De-watering during the remediation, excavation & construction works will be undertaken for any ex situ remediation works. Management of water and groundwater within excavations will be undertaken in accordance with the procedures outlined in **Section 17.0**.

14.6 Excavation Support

14.6.1 VMP Remediation Works

As part of any bulk earthworks required as part of the VMP Remediation Works, excavation retention walls will be installed around the proposed remediation areas as required to facilitate excavation. The walls will be constructed to a specification which prevents significant groundwater ingress to the proposed remediated areas and prevents the cross contamination of remediated areas from adjacent un-remediated areas. Final wall structure details will be finalised during the detailed design phase of the project so may be subject to adjustment and change.

The excavation retention walls will also be designed with due consideration for: (a) the sequencing/staging of the VMP Remediation Works (across Block 4, Block 5 and Hickson Road); and (b) the final selected remediation strategy. The perimeter walls will connect with the existing ORWS basement groundwater retention wall system as appropriate.

14.6.2 Block 4 Development Remediation Works

As described by **Section 4.3**, a basement groundwater retention wall will be constructed around the perimeter of Block 4 as a precursor to the Block 4 Development Remediation Works. The groundwater retention wall will connect with the existing ORWS basement groundwater retention wall system and will be designed to facilitate excavation within it.

14.6.3 Eastern Site Boundary

While it is proposed to remediate contaminated soil and groundwater within the main gasholder annulus and tar tank on the eastern side of Hickson Road, the position of this underground infrastructure (which may extend

beyond the Site boundary to the east) may result in residual contamination remaining offsite, directly to the east of the Site (refer to **Section 10.3.2**). Consequently, permanent perimeter walls will be installed in areas where there is potential for the future remediated Site to be impacted by potential SPGWT or CIM in the offsite area directly to the east. The wall will be constructed to be resistant to degradation by SPGWT.

14.7 Materials Handling

14.7.1 Background

This section outlines the procedures for materials handling following excavation, specific procedures relating to materials tracking and the required environmental controls.

14.7.2 Materials Tracking

All materials handled during the remediation works will be tracked in order to allow verification of the correct movement and handling. The system will track materials from cradle-to-grave, and will provide detailed information on the location and quantity of all material movements both on and off-site, so that the material being handled can be identified and accounted for. The tracking system shall include accurate tracking of stockpiles throughout the entire material handling stage and will included confirmation of stockpile locations via registered survey. This is to reduce the risk of cross-contamination between stockpiles.

As part of this process, accurate records shall be kept to ensure that backfilling of excavations (where required) and reuse of material only occurs following the successful validation of the subject materials. Plans will be made with respect to the extent of each excavation. A register of all analytical results for stockpiles and excavations will be maintained throughout the validation works.

Standard forms shall be prepared as part of the Materials Tracking Procedure. The forms and their function shall include, but not be limited to:

- **Off-site Transport/Disposal Form** - Providing a record of materials removed from the Site and including the material type, quantity, origin, shipping destination and an approval by the nominated environmental consultant that the material meets the disposal requirements;
- **Imported Fill Form** - Providing a record of materials imported to the Site including the date, material type, quantity, point of origin, intended use and the suitability of the material for use as backfill at the Site;
- **Material Excavation Form** - Providing a record of excavated materials for each excavation on the Site including the date, material type, excavated quantity, origin and intended destination;
- **Material Treatment Form** – Providing a record of material treatment including the date, material type, treatment regime, stockpile of origin and destination stockpile;
- **Material Stockpiling Form** - Provides a record of all materials placed in stockpiles. The form will include the date, material type, stockpiled quantity, origin and intended end use; and
- **Material Placement Form** - This form provides a record of all materials backfilled on the Site and includes the date, material type, quantity backfilled and origin.

Each form shall be completed on a weekly basis and collated into a cumulative log for each process on a weekly basis.

The movement of materials from the Site for reuse within Barangaroo Central will be managed in accordance with the *Reuse Materials Management Plan* to be prepared for the Authority (as recommended by the *Barangaroo Independent Remediation Review Panel Report* (Barangaroo Independent Remediation Review Panel, 2011).

14.7.3 Material Preparation

Excavated materials may require preparation prior to transport to stockpiles and the RE.

Material preparation may include, but not be limited to:

- Mixing of saturated material *in situ* to make the material spadeable prior to excavation. This may be achieved by either mixing with other soils or by addition of fly ash, lime or cement;
- Drainage and drying of saturated excavated materials. This will require installation of appropriate measures to control run off; and

- Screening of material to separate oversize and/or materials suitable for recycling (e.g. steel, concrete footings/historic sea walls, brick and rock fill, timber piles, construction and demolition waste). Physical separation will be achieved by a combination of:
    - Manual separation using excavators fitted with grabs or skeleton buckets; and
    - Power screens.

Odorous materials will be managed as per the requirements of **Section 15.0** and **20.3**.

It is recognised that the proposed approach to material preparation (in particular the addition of lime and or cement) may result in increased volatile emissions and/or odour generation. In consideration of this, where preparation of materials with potential for volatile or odorous emissions is required, the management and mitigation measures described in **Section 15.0** and **20.3** will be implemented. Specific management and mitigation measures may include:

- preparation of materials within an EE (refer to **Section 15.0**);
- minimisation of the quantity or surface area of materials;
- conduct of activities during favourable weather conditions;
- use of surface covers (soil and / or tarps); and/or
- use of odour suppressant sprays or foams (refer **Section 20.3**).

14.7.4 Crushing/Shredding of Materials

The crushing of oversize excavated materials may be necessary to ensure that the excavated materials can either be reused on-site or can be treated.

14.7.5 On-site Transportation of Materials

Materials at the Site will be excavated, handled, moved, treated and stockpiled in a manner designed to minimise exposure to the environment. The following materials handling requirements will be developed for trucks transporting materials within the Site:

- Trucks carrying excavated materials will be covered and decontaminated in the wheel wash facility within the excavation area before exiting the area;
- Trucks will proceed directly to the on-site RE or soil stockpile area, as appropriate, along the predetermined haul roads;
- Trucks carrying contaminated materials will not be permitted to drive over areas of the Site which have previously been excavated, validated or reinstated;
- Trucks carrying contaminated materials will remain covered until authorised to unload within the RE. The trucks will be decontaminated at the RE and the truck body covered before exiting the area;
- Empty trucks will return directly to the excavation are along predetermined haul roads; and
- The validated excavation will be effectively isolated from contaminated areas of the Site by the use of physical means such as the placement of clean material bunds, temporary fences and by use of signage.

14.7.6 Off-site Transportation of Materials

The following materials handling requirements will be developed for trucks transporting materials off the Site:

- Trucks carrying excavated materials will be covered and decontaminated in the wheel wash facility before exiting the excavation area and exiting the Site;
- Trucks carrying contaminated materials will be covered prior to exiting the Site and will remain covered until authorised to unload at the destination;
- Trucks will be fitted with seals to ensure that the movement of potentially saturated materials is undertaken appropriately. The integrity of the seals will be inspected and tested prior to commencement of each day's haulage works;
- Trucks will not wait in the streets surrounding the Site or within the CBD; and

- Trucks will exit the Site through predetermined exit points on Hickson Road and will follow a predetermined transport route to the destination (landfill or other) via Sussex Street, Anzac Bridge and the City West Link or across the Harbour Bridge.

14.7.7 Stockpiling of Materials

14.7.7.1 Stockpile Locations

Treated and validated soil materials will be stockpiled within a designated stockpile area. The stockpiled soil will then be transported directly from the stockpile area to the remediated areas for placement and compaction as backfill (as appropriate) or removed offsite to a licensed landfill facility. The location of stockpiles will be confirmed via registered survey as part of the Materials Tracking System.

Where possible and if required, further *in situ* testing of material may be undertaken prior to excavation, to pre-classify materials and minimise interim stockpiling requirements.

14.7.7.2 Stockpile Area Preparation

During site establishment, stockpile areas will be prepared using the following methods:

- Noting that the majority of the Barangaroo Stage 1b Development site is covered by an existing hardstand surface, works will be undertaken initially to clear the area of rubbish, rubble, infrastructure and vegetation;
- Diversion drains and bunds will be constructed around the perimeter of the stockpile areas. Additional sediment and erosion control measures including silt fencing and hay bales will be installed where necessary (refer to **Section 17.1**);
- Signs will be erected at the entrance to the stockpile area and at locations around the stockpile specifying individual stockpile numbers and the type of materials stored; and
- Buffer zones will be established around each stockpile area to enable access to the stockpiles and minimise impacts of the stockpile area on the surrounding facilities.

14.7.7.3 Stockpile Construction and Maintenance

The drainage, sediment and erosion control measures installed within stockpiling areas at the commencement of the project will be maintained, repaired and replaced where necessary for the duration of the stockpiling activities.

Where necessary, all long term soil stockpiles on-site will be covered or stabilised with spray grass seeding or other suitable measures to reduce dust generation and erosion.

Measures will be taken to reduce the generation of dust from stockpiles through the use of wetting and covers (refer to **Section 20.3**). Run-off will be managed by the use of surface bunding, silt fences and drainage diversions (refer to **Section 17.1**).

If stockpiling of SPGWT or odorous CIM is required, the stockpiles will be managed as follows:

- The SPGWT will be stockpiled separately to all other materials and clearly identified with signage;
- If required, odour suppressant sprays or foams will be sprayed onto stockpile surfaces to mitigate odours during construction of the stockpile;
- The SPGWT will be securely covered with a high density polyethylene (HDPE) liner and surface water controls will be constructed around the perimeter (as required for all stockpiled materials); and
- Daily monitoring of the SPGWT stockpile will be undertaken and will include qualitative assessment of odour around the perimeter of the stockpile.

All stockpiles will be maintained in a tidy and safe condition with stable batter slopes.

14.7.8 Classification of Treated Materials

Following treatment of materials within the RE, materials will be classified for off-site disposal in accordance with the DECCW (2009) *Waste Classification Guidelines* and the requirements of the Immobilisation Approval (if any, refer to **Section 14.7.10**).

14.7.9 Classification for On-site Reuse

Stockpiled and treated material will be assessed for its suitability for reuse on-site by collection of representative samples and chemical analysis for the relevant CoPC (refer to **Section 19.6**).

Where possible/practicable, *in situ* testing of material may be undertaken prior to excavation, to pre-classify materials directly for on-site reuse and minimise stockpiling requirements.

The analytical results will be assessed against the relevant SSTCs referenced by this RAP, for materials to be reused (refer to **Section 7.3**).

14.7.10 Waste Classification for Off-site Disposal

Materials deemed not suitable for reuse at the Site (refer to **Section 7.3**) will be assessed for off-site disposal in accordance with the DECCW (2009) *Waste Classification Guidelines* or Part 4 of those guidelines in the case of potential acid sulphate soils (PASS) and acid sulphate soils (ASS).

If required, *in situ* testing of material may be undertaken prior to excavation, to pre-classify materials directly for off-site disposal and minimise stockpiling requirements. If treatment of excavated material is required to facilitate offsite disposal, an Immobilisation Approval will be sought from the NSW EPA prior to offsite disposal.

14.8 Management of Asbestos Containing Materials

Based on information obtained during the ORWS bulk excavation works (located directly south of the Site) the identification of ACM during ex situ remediation excavation works is considered probable. Consequently, ACM impacted material will be managed in accordance with an Asbestos Management Plan (refer to **Section 1.7** and **13.1.3**).

Identified ACM which requires removal under the Asbestos Management Plan will be collected and disposed of by a licensed Asbestos Removal Contractor (ARC) in accordance with the requirements of the following:

- *NSW Work Health and Safety Act* 2011;
- *NSW Work Health and Safety Regulation* 2011;
- *Code of Practice: How to Safely Remove Asbestos,* Safe Work Australia 2011; and
- *Code of Practice: How to manage and control asbestos in the workplace,* Safe Work Australia 2011.

The ACM removal works, where required by the Asbestos Management Plan, would be undertaken as follows:

- The remediation contractor would establish appropriate barriers and signage around the area where ACM has been identified;
- The ACM will be suitably removed from the Site by an ARC;
- Airborne asbestos fibre monitoring will be undertaken around the working area during the works to confirm that the ACM is being removed in an appropriately controlled manner;
- Validation soil samples will be collected at 10 m lineal intervals along the walls and base of any identified ACM impacted excavation areas and analysed for asbestos. Should the soils beneath the ACM be impacted with asbestos fibres, the impacted soils will be excavated for appropriate off-site disposal; and
- An ARC will conduct a visual inspection of the affected area to confirm that it is free of all visible ACM fragments. A clearance certificate will be prepared to document these works.

If ACM is encountered and removed during the remediation works, residual soils must not contain asbestos (bonded or otherwise) as determined by the following:

- A visual inspection of the remediated area to confirm the removal of all visible ACM fragments; and
- No detection of asbestos in samples collected from the residual soils and submitted for analysis.

The requirements for validation of materials to remain *in situ* below the proposed Block 4 basement are described by **Section 19.5.3**. The additional works (including over-excavation if required) for management of ACM identified in residual soils for the protection of construction workers will be determined by the Asbestos Management Plan.

The requirements for validation of materials in the base of excavations completed as part of the VMP Remediation Works are described by **Section 19.5.1**. The additional works required (if any) for management of ACM for the protection of construction workers will be determined by the Asbestos Management Plan.

The Asbestos Management Plan and any associated ACM removal works will include consideration of construction worker protection and the following independent report commissioned and endorsed by the NSW EPA:

- Associate Professor Tim Driscoll, Sydney School of Public Health, Sydney Medical School, University of Sydney (March 2013). *The Use of Asbestos-Contaminated Soils on Barangaroo, Report to the Environment Protection Authority.*

14.9 Material Fate

14.9.1 Recycling

The remediation contractor will endeavour to maximise recycling of all excavated materials to the extent practicable. Where practicable, materials won from the screening of excavated materials will be assessed for their recycling suitability as follows:

- Steel materials will be transported to appropriate off-site steel recyclers;
- Concrete, brick and rock may be crushed to create fill for use in other areas of the development (as required) and for construction of haul roads or recycled off-site; and
- Timber will be recycled off-site, where possible.

14.9.2 Reuse of Materials On-Site

Materials deemed suitable for reuse on-site will be either stockpiled for future use or used directly (refer to **Section 7.3**).

14.9.3 Reinstatement

Where material is used for reinstatement purposes (as part of the VMP Remediation Works), it will be placed in accordance with specific geotechnical requirements which will be dependent on the area of reinstatement.

14.9.4 General Solid Waste

If off-site disposal is required, materials classified as General Solid Waste in accordance with the DECCW (2009) *Waste Classification Guidelines* will be transported off-site and disposed of at a landfill licensed to accept General Solid Waste.

14.9.5 Restricted Solid Waste

If off-site disposal is required, materials classified as Restricted Solid Waste in accordance with the DECCW (2009) *Waste Classification Guidelines* will be transported off-site and disposed of at a landfill licensed to accept Restricted Solid Waste.

If treatment of excavated material is required to facilitate offsite disposal, an Immobilisation Approval will be sought from the NSW EPA prior to off-site disposal.

15.0 Ex situ Remediation

In addition to the general excavation and materials management outlined in **Section 14.0**, any works related to the treatment of SPGWT and/or CIM at the Site will be subject to particular controls due to the nature of the contamination.

This section outlines the proposed additional controls that will be implemented to manage materials that require treatment at the Site as well as outlining the proposed methodology.

15.1 Excavation Enclosure and Emissions Control System

Part of the proposed odour management system for works will include a Remediation Enclosure (RE) for an onsite treatment area and, if required, an Excavation Enclosure (EE). An Emissions Control System (ECS) will be used to manage volatile emissions within both the RE and EE (if required). An EE may be used, where practical, during excavation of particularly odorous areas or areas where it is anticipated that fugitive emissions will be significant.

Given the potentially odorous nature of the materials to be excavated at the Site, significant SPGWT/CIM excavation works will be undertaken within an EE, where practical. The purpose of the EE will be to mitigate, to the extent practical, uncontrolled emissions during excavation and truck loading processes and to ensure these emissions are vented to atmosphere through an ECS.

It is noted that an EE may not be practical in all excavation areas, particularly in areas where CIM may have been identified in a series of discontinuous hotspots. In the event that an EE is not considered practical, additional, alternative rigorous odour control measures will be implemented as described by **Section 15.2**.

Operation of the EE and associated ECS will be in accordance with operation and maintenance management systems developed on completion of the final design of the system. An overview of the controls to be designed into the system is provided below.

- The EE will be a temporary structure that can be erected over relevant parts of the SPGWT / CIM excavation area. The final design of the EE will be developed prior to the start of the remediation works. The structure is likely to include a negative pressure working enclosure with an air-lock doorway and an air extraction system for the control of odours and diesel exhaust;
- Where practical, excavations for remediation of identified SPGWT / CIM will be undertaken within the EE. Excavated material will be placed into temporary stockpiles within the EE by use of tracked excavator and a rubber tyred loader prior to be hauled to the RE for treatment (as required). The structure will be equipped with personnel entrances and a truck entrance. The truck entrance will comprise an automated door to minimise any impact on negative air pressure whilst the truck exits and enters the EE. The negative air pressure will be maintained for the duration of the excavation works;
- The ECS for the EE and RE will consist of a ductwork system, induced draft fan, particulate control device, activated carbon adsorption system and stack. The ECS would be designed with sufficient capacity to provide a safe working environment within the EE and RE. The ductwork system will consist of a central header that will be suspended along the centreline of the EE and RE. There will be hoods located along the length of the header;
- The air exhausted from the EE and RE will first pass through a particulate control device (bag-house or pleated paper filter system) to remove fugitive dust. The particulate control system will include a system to remove particulates from the filter media. Dust removed will be collected in enclosed drums or hoppers;
- After the exhaust gas exits the particulate filter, it will pass through an activated carbon adsorption system;
- The activated carbon system will be equipped with a number of monitoring ports;
- A monitoring protocol will be developed for the various ports along the activated carbon adsorption system. This protocol will form the basis for deciding when activated carbon beds need to be replaced. Air would be exhausted to the atmosphere via a stack; and
- Emissions from the ECS stack will be required to be licensed as part of the EPL for the Barangaroo site (refer to **Section 13.1.2** and **Appendix E**).

15.2 Excavation Operations

To the extent practical, excavation of SPGWT / CIM will be conducted within an EE with an associated ECS. As above, the plant operating within the EE is likely to comprise a tracked excavator and a loader for excavation, interim stockpiling and truck loading purposes.

Excavation operations will commence by the removal of the overburden material (if present). The overburden material will be classified based on the available analytical data to determine whether it meets the SSTCs for reuse.

The management of odours is recognised as a critical aspect of the management of the proposed remediation works. Based on the results of historical investigations at the Site, it is considered likely that odorous materials will be encountered across much of the Site.

Specific management and mitigation measures for odorous materials may include (refer to **Section 20.3**):

- excavation within an EE (refer to **Section 15.1**);
- minimisation of the quantity or surface area of exposed odorous materials;
- covering of exposed odorous materials progressively or at the completion of each work period;
- conduct of activities during favourable weather conditions; and/or
- the use of odour suppressant sprays or foams.

Selection of the appropriate management and mitigation measures will be based on consideration of:

- the quantity of odorous materials that require remediation;
- the duration of the required remediation works;
- the proximity of the proposed remediation works to sensitive receptors;
- the prevailing and forecast weather conditions; and/or
- other activities being undertaken at the Site in parallel with the remediation work.

As above, it is noted that an EE may not be practical in all excavation areas where odorous materials are encountered; for example, in areas where CIM has been identified in a series of discontinuous hotspots. In the event that an EE is not practical, additional and/or alternative rigorous odour control measures will be implemented over and above the environment control measures provided during excavation of non-odorous materials. As described above, additional measures may include: minimisation of exposed excavation surfaces, limiting excavation to favourable weather conditions; and the use of odour suppressants and covers (refer to **Section 20.3** for further details).

Anchors which extend into the Site have been constructed to support the ORWS groundwater basement retention wall system and which is present at the southern end of Block 4. These anchors are temporary in nature and are programmed to be destressed following construction of sufficient structural works in the adjacent ORWS basement (scheduled for early 2014). It is proposed that the Block 4 excavation works in areas where the anchors are present would only occur after the anchors have been distressed and are no longer required (and would not constrain Block 4 excavation works).

15.3 Ex situ Treatment - Stabilisation

15.3.1 Background

As detailed in **Section 10.5**, ex situ stabilisation is one of the preferred remedial technologies for ex situ treatment of SPGWT / CIM which requires treatment prior its offsite disposal.

This section describes the methodologies to be employed for preparing and treating the nominated materials using ex situ stabilisation onsite. Materials requiring treatment may also be treated at an offsite licensed facility in accordance with applicable regulations and NSW EPA requirements.

The suitability of ex situ stabilisation was assessed by a treatability study undertaken by EnviroPacific Services (2010) (refer to **Section 10.5**).

15.3.2 Pre-Treatment of Materials

The pre-treatment of SPGWT / CIM, if required, will be undertaken in two stages.

- Initially, the excavated material may be blended at the excavation face to make the material 'spadeable' (as detailed in **Section 14.7.3**); and
- SPGWT / CIM requiring treatment will be transported to the RE, where further screening and testing of this material will take place.

The SPGWT / CIM will be stockpiled in the RE using a front end loader before undergoing secondary screening through a screen to achieve a grade of 40 mm minus. This is the minimum size requirement for material to feed into a pug mill. All screened overburden material will be set aside into type for potential crushing/recycling. The screening of the contaminated material will achieve a relatively homogenous feed material prior to being loaded into the feed hopper of the pug mill and minimise the quantity of material which requires treatment.

15.3.3 Remediation Enclosure and Emission Control System

The ex situ stabilisation equipment will be enclosed within a RE. The purpose of the RE is to control emissions during remediation treatment activities and ensure these emissions are vented to atmosphere through an ECS. Operation of the RE and associated ECS will be in accordance with operation and maintenance management systems developed on completion of the final design of the system. An overview of the controls to be designed into the system is provided below.

- The RE will be a clear span shed constructed of a steel frame with metal sheeting (or equivalent). The building will be sized to contain the powerscreen and pugmill and have sufficient room for truck access, machinery and stockpiles. It will include doors, lights, electrical, adjustable louvers and other ancillary facilities that are required for safe and efficient operation.
- The building will contain approximately a 2-3 day working inventory of feed soil plus a sufficient buffer for soil curing and other pre-treatment activities. This inventory volume is designed to provide adequate storage capacity to feed the treatment plant during periods when unforeseen conditions interfere with normal excavation activities.
- ECS will consist of a ductwork system, induced draft fan, particulate control device, activated carbon adsorption system and stack. The ECS would be designed with sufficient capacity to provide a safe working environment within the RE. The ductwork system will consist of a central header that will be suspended along the centreline of the RE. There will be hoods located along the length of the header.
- The final design of the RE will be developed prior to the start of the remediation works. The structure is likely to include a negative pressure working enclosure with an air-lock doorway and an air extraction system for the control of odours and diesel exhaust.
- The air exhausted from the RE will first pass through a particulate control device (bag-house or pleated paper filter system) to remove fugitive dust. The particulate control system will include a system to remove particulates from the filter media. Dust removed will be collected in enclosed drums or hoppers.
- After the exhaust gas exits the particulate filter, it will pass through an activated carbon adsorption system. The activated carbon system will be equipped with a number of monitoring ports. A monitoring protocol will be developed for the various ports along the activated carbon adsorption system. This protocol will form the basis for deciding when activated carbon beds need to be replaced. Air would be exhausted to the atmosphere via a stack.
- The ECS for the RE will operate in the same way as the system for the EE, as described in **Section 15.1**.

15.3.4 Pug Mill Treatment Plant

Ex situ stabilisation of SPGWT / CIM during the full scale remediation phase is intended to be accomplished by using a pugmill fed by a loader/excavator. The nature and quantity of agents used for stabilisation was the subject of a stabilisation trial (refer to **Section 10.5**).

The pugmill mixing chamber and computer controlled weight cells will allow the complete mixing of the additives with the soil matrix. A pugmill has been selected in recognition that the NSW EPA prefers aggressive mixing techniques (such as a pugmill) because they provide for complete mixing of the materials.

Analytical results will be used to demonstrate that the treated material is suitable for disposal to an appropriately licensed off-site landfill (in accordance with the NSW EPA (2009) *Waste Classification Guidelines*).

Pug mill plants typically have a rated capacity of 600-1,000 tons per hour. This rate will vary depending on the physical properties of the soil, amount and type of additive, and the desired production rate.

The type of treatment plant will be based on the final design by the treatment contractor. Below is a description of the potential major components that may comprise a plant system.

Self-erecting Silo

The silo is filled pneumatically from bulk tankers. Additives such as cement, fly ash, lime and bentonite are blown into the silo.

The silo is equipped with a dust control system.

Material feed hopper

This hopper is fed with the soil(s) to be processed. It may be divided so as to accommodate two types of soil or aggregate. The hopper and may be fed one of three ways. First, a front-end loader can feed the hopper directly by building a ramp perpendicular to the hopper. Second, material may be conveyed into the hopper. Third, a screen can process directly into the hopper.

Twin shaft paddle pugmill

The pugmill is designed to achieve a violent mixing action throughout its length resulting in a well-mixed homogeneous product. This type of mixing, with no slump or low moisture products, is more effective than a drum type mixer that merely folds the product.

Hydrostatic cleated belt additive feeder

The additive is fed to the pugmill at the beginning of the mixing operation by means of the computer controlled cleated belt. Accuracies of better than plus/minus 2% of the design proportioning of the additive are achieved.

Water tank

The water requirement is determined by the mix design and the native water in the material to be mixed. Water is fed from an outside source into the plant's onboard water tanks. This water is fed at the design rate into the mixing chamber by two hydraulic pumps which are computer controlled.

Discharge belt

The mixed product is discharged from the pugmill on this conveyor belt. The finished product is continuously and cumulatively weighted on a Ramsey belt scale.

Gob Hopper

The gob hopper is utilized to interrupt the continuous flow of mixed material allowing trucks to enter and exit the loading area. If trucks are used to transport the mixed material away from the plant, the direction of travel of the trucks should be with the driver's side closest to the plant so that he/she may see the plant operator. The gob hopper maybe left open continuously so that a conveyor may be used to remove the finished product from the mixing plant.

Particulate Additive

Fine particulate additives such as cement, fly ash, lime and bentonite are pneumatically transferred from bulk tankers and stored in the self-erecting silo. If more than one type of additive is required, an optional self-erecting auxiliary silo may be set up next to the plant. The silos are equipped with negative pressure dust control systems, which filter and evacuate the pressurized air entering the silo. This process maintains constant silo pressure so as not to affect the consistency of the feeder.

Mixing Chamber

All ingredients enter simultaneously at the beginning of the mixing chamber allowing them maximum mixing time. The mixing chamber houses an interlaced twin shaft variable speed paddle pugmill designed to achieve a violent mixing action throughout its length resulting in a well-mixed homogeneous product. This type of mixing, with no slump or low moisture products, is greatly more effective and efficient than a drum type mixer that merely folds the product.

Control System

The Programmable Logic Controller and colour active matrix Operator Interface is directed by control software. Designed for harsh industrial environments, this versatile and reliable system has extensive self-diagnostics and is completely modular, making diagnosing and repairing problems as easy as plugging in a new module.

The software provides fully automated plant control and monitoring of all plant systems including engine, flow meters, sensors and switches. Displays indicate all flow rates, set points, feeder speeds, totals and status of all feeds and processes. All critical mechanical systems are monitored to alleviate damage and prevent down time. Inventory of fine particulate and admixture are computed and tracked.

15.3.5 Treated Soil

The RE will have a base capacity to stockpile between 2-3 days of treated soils from the pug mill. Treated materials stored in this area will undergo validation testing and classification to determine whether the treatment process has been effective. Materials that have not been treated to an acceptable level will be retreated.

Stockpiles would be then moved outside of the RE to a main stockpile area. Where required, stockpiles will be covered with suitable material or wetted to control dust.

15.4 Ex situ Treatment - Surfactant Enhanced Ex situ Chemical Oxidation (S-ESCO™)

15.4.1 Background

As detailed in **Section 11.0**, surfactant enhanced ex situ chemical oxidation (S-ESCO™) is an alternative treatment technology of SPGWT / CIM for excavated material, which may be adopted for treatment of material prior to landfill disposal (where required).

This section describes the methodologies to be employed for preparing and treating the nominated materials using S-ESCO™.

The suitability of S-ESCO™ was assessed by a bench scale treatability trial undertaken by VeruTEK (2011) (refer to **Section 10.4**).

15.4.2 Pre-treatment of Materials

The pre-treatment of CIM, if required as a precursor to S-ESCO™ would be as described for ex situ stabilisation in **Section 15.3.2**.

15.4.3 Remediation Enclosure (RE) and Emission Control System (ECS)

As for the ex situ stabilisation option, the S-ESCO™ ex situ treatment equipment will be enclosed within a RE that will control emissions during remediation the treatment and ensure that these emissions are vented to atmosphere through an ECS.

The design and operation of the RE and ECS for S-ESCO™ will be generally as described for ex situ stabilisation in **Section 15.3.2.**

15.4.4 Treatment Plant

As for the ex situ stabilisation treatment option, S-ESCO™ treatment will be affected using a pugmill.

The design and operation of the pugmill is expected to be generally similar to that described in **Section 15.3.2** for ex situ stabilisation with the exception that additives (surfactants, oxidants and catalysts) will be dosed in liquid form using specially designed injection equipment.

The rate of chemical dosing will be adjusted to accommodate variations in the feed material quality and contaminant concentration.

15.4.5 Treated Soil

Soil treated by S-ESCO™ will be generally managed in accordance with the procedures described in **Section 15.3.2** for ex situ stabilisation.

16.0 In situ Remediation (S-ISCO® and SEPR™)

As described by **Section 11.2** and **11.4**, S-ISCO® (and SEPR™) is considered to be the preferred remediation approach for SPGWT / CIM requiring remediation in Block 5 and Hickson Road.

The suitability of S-ISCO® and SEPR™ were considered by the bench scale trial summarised in **Section 10.4**. Selection of S-ISCO® and SEPR™ as the preferred remediation approach will be subject to the outcomes of an onsite Pilot Trial. The findings of the Pilot Trial and the resultant preferred remediation strategy will be detailed in the S-ISCO® and SEPR™ Pilot Trial Report (refer to **Section 13.1.3**).

S-ISCO® (and SEPR™) may also be considered for remediation of SPGWT / CIM requiring remediation in Block 4 as an alternative approach to ex situ treatment. Any proposed use of S-ISCO® (and SEPR™) in Block 4 would be dependent on the future development requirements, the outcome of the Proving Phase and/or the Pilot Trial and agreement with the NSW EPA Accredited Site Auditor.

16.1 Proving Phase

A Proving Phase is proposed in a portion of Block 4 (i.e. the BH55 area) to demonstrate the efficacy of S-ISCO® and SEPR™ as a remediation approach in the Declaration Area and as a precursor to the Pilot Trial described by **Section 16.2**.

16.1.1 Objectives

The objective of the Proving Phase is to demonstrate that the combined S-ISCO® and SEPR™ treatment process can remediate the gasworks related contamination within the Proving Trial treatment area to meet the risk-based criteria developed by the *VMP HHERA* (AECOM, 2012c, refer to **Section 7.1.2**) for both soil and groundwater in the Declaration Area. Specifically, the Proving Phase will:

- Evaluate the effectiveness of the S-ISCO® and SEPR™ remedy to reduce CoPC concentrations in the soil within the Proving Trial treatment area;
- Evaluate the effectiveness of the S-ISCO® and SEPR™ remedy to reduce CoPC concentrations in groundwater within the Proving Trial treatment area;
- Acquire data to inform the optimal design of further S-ISCO® and SEPR™ Pilot Trials; and
- Evaluate environmental impacts resulting from implementation of the S-ISCO® and SEPR™ treatment process within the Proving Trial treatment area.

16.1.2 Scope of Work

The Proving Phase will be undertaken by VeruTEK. It is proposed that the Proving Phase will be undertaken as follows:

- Early works:
  - Well installation (2 clustered injection wells, 1 extraction well, 7 monitoring wells, 2 soil vapour monitoring points);
  - Collection of baseline soil & groundwater samples; and
  - Baseline environment monitoring.
- Mobilisation:
  - System compound establishment;
  - Equipment & chemical delivery;
  - SEPR™ injection & extraction system set-up, including the soil vapour extraction (SVE) system; and
  - S-ISCO® injection system set-up.
- SEPR™:
  - Injections & extraction. Specifically, injections will comprise:

  - a proprietary blend of plant-based surfactants and co-solvents (VeruSOL) designed to form weak emulsions with NAPL to enable ready separation of SPGWT from extracted groundwater following recovery; and
  - hydrogen peroxide at concentrations of between 2 and 4%;
- Treatment of extracted fluid; and
- Groundwater and soil vapour monitoring.

- S-ISCO®:
  - S-ISCO® injections with sodium persulfate and S-ISCO® injections with hydrogen peroxide. The S-ISCO® portion of the treatment will consist of injections of VeruSOL and alkaline-activated sodium persulfate, followed by injections of VeruSOL and peroxide activated by VeruTEK's patented Green Nano Activation; and
  - Groundwater and soil vapour monitoring.
- Post-injection Monitoring:
  - One week of daily monitoring, followed by weekly monitoring;
  - Collection of interim soil & groundwater samples after 2 weeks;
  - Optional contingency injections (up to 3 weeks);
  - Collection of final soil and groundwater samples when the S-ISCO® chemistry has completed reactions in the subsurface; and
  - Site demobilisation.
- Validation reporting.

16.1.3 Evaluation of Proving Phase Success

A *S-ISCO® and SEPR™ Proving Phase SAQP* (AECOM, 2013a) has been prepared to document the criteria against which success of the Proving Phase will be assessed. The Proving Phase success criteria will be based on the VMP Remediation Goals detailed in **Section 7.1.4**.

At the time this RAP was prepared, the Proving Phase had been completed and a separate report describing the results of the Proving Phase was being prepared. Final evaluation of the Proving Phase results will inform a decision to proceed with or optimise design of further Pilot Trials (refer to **Section 16.2**). If the S-ISCO® and SEPR™ treatment approach is not preferred in all or parts of Block 5 or Hickson Rd, the ex situ remediation approach (as described by **Section 15.0**) will be implemented as described by this RAP.

16.2 Pilot Trial

If the Proving Phase is demonstrated to be successful, a Pilot Trial is proposed demonstrate the efficacy of S-ISCO® and SEPR™ as a remediation approach in Block 5 and Hickson Road. As above, selection of S-ISCO® and SEPR™ as the preferred remediation approach will be subject to the outcomes of an onsite Pilot Trial.

16.2.1 Objectives

The objectives of the proposed Pilot Trial are:

- Field verification of the effectiveness of S-ISCO® and SEPR™ at achieving SPGWT removal and reducing contaminant concentrations in soil and groundwater to achieve the Remediation Goals at the Site and in the context of the actual physical and chemical conditions at the Site;
- Demonstrate that S-ISCO® and SEPR™ can be implemented at the Site without impact to sensitive receptors including Darling Harbour and the basements of adjacent buildings;
- Acquiring data for design of the full scale implementation (if appropriate);
- Evaluate the effectiveness of risk mitigation measures implemented to control chemical migration and volatile emissions from the trial; and

- Evaluation the effectiveness of proposes, performance and groundwater monitoring programs.

16.2.2 Scope of Work

The Pilot Trial will be undertaken by VeruTEK. It is proposed that the Pilot Trial will be undertaken in two parts:

- A S-ISCO® Pilot Trial at a location within Block 5 that is:
  - representative of typical contaminant and lithological conditions,
  - is proximate to utilities and Hickson Road, and
  - is away from Darling Harbour.
- A SEPR™ and S-ISCO® Pilot Trial within the historic tar tank located below Hickson Road. This location was selected as it:
  - Contains material that is considered to be representative of SPGWT contamination;
  - It is a semi confined / confined structure; and
  - It is proximate to adjacent basements.

The scope of the Pilot Trial is described by the *S-ISCO® and SEPR™ Revised Work Plan and Trial Management Plan* (WPTMP, VeruTEK, 2011). The *Pilot Trial WPTMP* has been reviewed and accepted by the NSW EPA Accredited Auditor and the NSW EPA. It should be noted that the *Pilot Trial WPTMP* may be revised based on the outcomes of the Proving Phase (refer to **Section 16.1**).

In summary:

- Block 5:
  - Primary Phase S-ISCO® (6 weeks) using VeruSOL-3® (as the surfactant); hydrogen peroxide (as the oxidant) and iron-tetra-amido macrocyclic ligand (Fe-TAML, as the catalyst);
  - Secondary Phase S-ISCO® (2 weeks) using VeruSOL-3® (as the surfactant, sodium persulfate (as the oxidant), and high pH (using sodium hydroxide as the catalyst); and
  - Process, performance, groundwater and environmental monitoring (surface water quality, air quality and noise and vibration).
- Hickson Road:
  - Primary Phase SEPR™ (2 weeks) using VeruSOL-3® (as the surfactant); hydrogen peroxide (as the oxidant) and extraction of the emulsified tar (and injected chemicals);
  - Secondary Phase S-ISCO® (4 weeks) using VeruSOL-3® (as the surfactant); hydrogen peroxide (as the oxidant) and Fe-TAML (as the catalyst); and
  - Process, performance, groundwater and environmental monitoring (surface water quality, air quality and noise and vibration).

16.2.3 Evaluation of Pilot Trial Success

The success of the Pilot Trial will be independently assessed by AECOM (and other stakeholders including the Authority and EPA) against the following criteria:

- Block 5:
  - Post injection soil analysis results are less than the SSTCs described by the *VMP HHERA*; or
  - There is a trend in reducing contaminant concentrations in soil and groundwater that can be extrapolated to demonstrate that S-ISCO® can achieve the Remediation Goals.
- Hickson Road:
  - Emulsified tar is present in extracted SEPR™ fluids (based on visual inspection and analytical results); and
  - The estimated reduction in contaminant mass in the tar tank is approximately 25% based on the post-injection sampling regime described by the revised WPTMP (VeruTEK, 2011); or

- There is a trend in mass reduction that can be extrapolated to demonstrate that SEPR™ / S-ISCO® can achieve the target mass reduction of at least 25%.

- General objectives applying to both Pilot Trial locations:
  - Demonstrate control of injection front in accordance with the parameters described by the Pilot Trial WPTMP;
  - Confirm that the Pilot Trial does not result in any unexpected / uncontrolled by-products; and
  - Confirm that environmental monitoring results demonstrate low impact to the environment and community.

At the completion of the Pilot Trial, and prior to full-scale remediation, a S-ISCO® and SEPR™ Pilot Trial Report (refer to **Section 13.1.3**) will be prepared and issued to the NSW EPA and NSW EPA Accredited Site Auditor for their review, to confirm if any modifications to the preferred remediation strategy are required.

16.2.4 Independent Review of Revised WPTMP

It is noted that the City of Sydney (2011) and the Barangaroo Independent Remediation Review Panel (2011) have reviewed the *S-ISCO® and SEPR™ Revised WPTMP* (VeruTEK, 2011). Comments from this review process were considered and incorporated into the document as appropriate.

16.3 Full Scale S-ISCO® and SEPR™ Treatment Process

S-ISCO® is an innovative technology which has successfully been implemented at former gas works sites. The key design considerations are: which surfactants and oxidants work best in combination; whether they should be added simultaneously or in sequence; and, what conditions, such as might be provided by the addition of a catalyst, will enhance the reaction.

The Block 5 and Hickson Road S-ISCO® works are likely to be implemented with the following phases:

- Preparation of the S-ISCO® and SEPR™ Detailed Work Plan (refer to **Section 13.1.3**). The S-ISCO® and SEPR™ Detailed Work Plan will describe the processes to be implemented during the S-ISCO® and SEPR™ treatment process including:
  - the enabling works requried to facilitate full scale S-ISCO® and SEPR™ treatment works;
  - the design and operation of the injection system;
  - the design and operation of the soil vapour extraction system;
  - the monitoring program (including process monitoring, performance monitoring, soil and groundwater monitoring and soil vapour monitoring); and
  - the plans and procedures to be implemented for the protection of human health and the environment.
- Mobilisation and set-up, including installation of the following on site:
  - A treatment compound incorporating reagent storage, injection pumps, safety shower and eyewash stations and extraction pumps;
  - monitoring wells; and
  - soil vapour extraction systems.
- Pre-injection baseline monitoring;
- S-ISCO® and SEPR™ injections/extractions (as appropriate);
- Process and performance monitoring during the course of the post-injection performance monitoring; and
- Reporting.

16.3.1 Treatment Compound

A treatment compound will be established to house the infrastructure required to support the S-ISCO® implementation. The treatment compound will incorporate:

- Site office;

- On-site laboratory;
- Storage for dilute and pure surfactant,
- Storage for oxidant - peroxide;
- Storage for oxidant - persulfate solid and solution;
- Storage for catalyst;
- Batching equipment for making up the required oxidant solutions;
- Soil vapour extraction (SVE) / multiphase extraction (MPE) systems;
- Injection system;
- Waste storage facilities; and
- Safety shower/eyewash station.

Chemical storage tanks required in support of S-ISCO® will be located within a lined containment bund. Areas used to contain and treat (as appropriate) liquid wastes including fluid extracted as part of the SEPR™ process and potentially contaminated surface water will be similarly contained within lined containment bunds. Containment bunds will be designed in accordance with the requirements of NSW DECCW (2007) *Storing and Handling Liquids: A guide to managing environmental risks associated with the storage and handling of liquid substances.*

The Treatment Compound and the equipment contained within it will be secured and locked to minimise the risk of vandalism. All equipment will be chemically compatible with the required oxidants, surfactants and catalysts. Chemical storage containers and equipment will be inspected on a regular basis to confirm their integrity.

Prior to injection, chemicals will be batched to create stock solutions that will be added to the water stream that will be injected at the well heads. The batching will be conducted within the bermed areas of the Treatment Compound. Where batching operations will require use of dry chemicals (for example, in the case of sodium persulfate) the operations will be undertaken with appropriate enclosures to prevent the dispersion of dust. Personnel conducting the batching operations will wear appropriate personnel protective equipment (PPE) including respiratory protection as required.

Surfactants, oxidants and catalyst will be dosed using high accuracy metering pumps placed directly into the water feed line leading to the injection wells.

A SVE/MPE system for use in the SEPR™ phase of treatment (principally in Hickson Road) will also be located within the Treatment Compound. This system will include a liquid ring pump that will be used primarily to extract the SEPR™ fluid generated during treatment in Hickson Road, but will also be able to be mobilised at additional wells as a mitigation and contingency measure. During set-up, the wells for use in extraction will be connected to the extraction system. The extracted fluid will be collected and carefully measured.

16.3.2 Enabling Works

From the injection system within the treatment compound, the combined chemical feed stream will travel through PVC pipe located:

- above ground to injection wells located within Block 5 (or Block 4); or
- within a below ground trench network to injection wells located within Hickson Road.

The below ground trench network within Hickson Road will be constructed such that traffic flow within Hickson Road can continue during the full scale S-ISCO® and SEPR™ treatment works. The trench network will contain:

- the injection lines, conveying the surfactant and oxidant to injection wells;
- the lines connecting monitoring wells to the MPE pump (to enable extraction of SEPR™ fluid or in the case of contingency actions); and
- the lines connecting the soil vapour monitoring points to the SVE system.

Where the trenches are located in trafficable areas (including both vehicle and pedestrian traffic) they will be backfilled to grade and finished with asphalt (or equivalent) to remove any potential tripping hazards or obstructions to users of the road or footpath. As for the road, the footpath will remain open and accessible to the

public (with the exception of short term disruption necessary to construct the soil vapour monitoring points, monitoring wells, injection wells and associated trenches). All trenches and well heads will be routinely monitored for evidence of leaks. Appropriate erosion control and mitigation measures will be applied during construction of the trench.

Groundwater monitoring wells will be used both to track the SEPR™ and S-ISCO® chemicals as they disperse through the treatment area to:

- analyse the effectiveness of the planned injection program in treating the contamination;
- track that the chemistry does not reach such sensitive receptors as Darling Harbour or neighbouring buildings; and
- track its movement relative to subsurface assets.

Groundwater monitoring wells will be installed and developed to accomplish these objectives. Monitoring wells in Hickson Road will also function as extraction wells during SEPR™. All monitoring wells will be able to function as extraction wells if needed.

Soil vapour monitoring points will be installed to augment the points already existing in the vicinity of the treatment areas. The depths of the screens in the soil vapour monitoring points will be selected to enable monitoring of the vapour in the shallow fill materials as well as the vapour being generated from the shallow groundwater. The points will be installed and sampled in general accordance with guidance from the Interstate Technology & Regulatory Council (ITRC, 2007), *Vapour Intrusion Pathway: A Practical Guideline*.

16.3.3 Injection Wells

Design of an oxidant delivery system that provides for the most efficient and effective distribution of surfactants, oxidising agent and catalyst within the soil is an important consideration and will be a key outcome of the S-ISCO® and SEPR™ Pilot Trial.

The oxidant will likely be delivered to the contaminant through a network of injection wells. The spacing of the injection wells will be a function of the pilot trial. An important consideration in design of the network will also be the presence of below ground obstructions which may locally influence the groundwater flow regime.

Based on experience at other former gas works sites, the injection well spacing is likely to be in the order of 3 to 10 m, and will likely vary across the treatment areas based on:

- Contaminant concentrations;
- Contaminant depth;
- Groundwater flow direction (taking into consideration changes that may occur as a result of the proposed groundwater control system); and
- The presence of below ground obstructions.

Depending on the impact to the local hydrogeology of the groundwater control infrastructure proposed in association with the Barangaroo South development, it may be necessary to include extraction wells (over and above those required in relation to SEPR™) in addition to injection wells. Extraction wells would be used in combination with injection wells to establish flow cells to facilitate delivery of the required chemicals to the contamination at the most efficient and optimal rates.

Based on the available information, and subject to confirmation following the proposed S-ISCO® and SEPR™ Pilot Trial, it is expected that the below ground infrastructure that will be required in support of S-ISCO® within Block 5 will include:

- Injection wells installed at 39 locations (with up to 17 containing injection ports at two elevations);
- Extraction wells installed a 9 locations (down hydraulic gradient of the target treatment areas);
- Monitoring wells installed at 19 locations (with up to 12 containing multiple monitoring ports for a total of between 30 and 40 individual monitoring wells); and
- Soil vapour monitoring wells installed at 14 locations.

Based on the available information, and subject to confirmation following the proposed S-ISCO® and SEPR™ Pilot Trial, it is expected that the below ground infrastructure that will be required in support of SEPR™ and S-ISCO® within Hickson Road will include:

- Injection wells installed at 40 locations (with up to 12 containing injection ports at two elevations) and which, in some instances, will also serve as extraction wells;
- Monitoring wells installed at 20 locations; and
- Soil vapour monitoring wells installed at 34 locations.

16.3.4 Surfactant and Oxidant Injection

S-ISCO® and SEPR™ works during the proposed full scale S-ISCO® and SEPR™ will be facilitated by an injection system with a continuous injection schedule of approximately 10 to 12 hours each day, 6 days per week. The purpose of the injection system will be to deliver individual chemical streams to injection wells to optimally contact the contaminants in the subsurface. Each injection well will have a dedicated pumping system to deliver the S-ISCO® chemicals. The injection system will be designed to deliver oxidant, activator, and surfactant to the subsurface with control of flow rates and chemical concentration. Chemical delivery from the system to each injection well will be independent of other wells, allowing for great flexibility in chemical delivery. This flexibility will allow for optimisation of chemical delivery to the contaminated soil zones by varying flow rates and density, and consequently maximising the contact time during which chemical reactions will take place.

For the purpose of S-ISCO® chemicals injections, the treatment area will be divided into a series of zones or areas. Injections will be undertaken in each of the areas or zones, in turn. Following a period of injection, the subject area will be monitored to confirm the success of the treatment process. Additional injections will be undertaken as required. Depending on commercial considerations, it is possible that more than one injection system will operate at any one time and that multiple areas or zones will be treated in parallel. The duration of the treatment process will depend on the chemical mass, the number of injection systems operating and their capacity. The selected injection location and strategy will be based on staging plans, the number of systems, system capacity and groundwater monitoring data. Monitoring data in particular will inform dosage and sequencing in each area.

Injections in a given area will begin slowly and gradually reach the desired parameters. This format will enable the effectiveness of the monitoring program and the safety of the implementation process to be demonstrated. During start-up, injection amounts, concentrations and rates will be reduced, and the monitoring program will be assiduously followed to develop a comprehensive understanding of where and how fast the chemistry moves.

16.3.5 Soil Vapour Extraction

A series of independent soil vapour extraction (SVE) units will be utilised for the full scale implementation. As above, the units will be located in the treatment compound and used to extract soil vapour from various treatment areas independently. Each SVE system unit will consist of pumps that extract, condense and treat vapours that may be displaced by peroxide decomposition in the subsurface. Two granular activated carbon (GAC) filters arranged in series will be used to treat the vapours prior their release from each unit. Emissions from the SVE treatment system will be required to be licensed as part of the EPL for the Barangaroo site (refer to **Section 13.1.2** and **Appendix E**).

Hoses will run from the pumps to the soil vapour monitoring points to be installed on the Site.

The SVE system will be operated continually to extract from these locations, throughout the duration of the S-ISCO® and SEPR™ injections and extractions. Soil vapour extraction will continue during the post-injection monitoring period until the results of monitoring indicate that its operation can be scaled back.

It should be noted that the purpose of the SVE system is not to actively draw soil vapour from the ground, as is the case when a SVE system is used for remediation. The SVE system is a risk mitigation measure designed to manage the generation of soil vapour that might occur during the trial, rather than actively remediate the soil. To achieve this mitigation objective, the flow rate of the system can be adjusted as needed based on the results of field and laboratory analyses of soil vapour monitoring and sampling, to ensure that any soil vapour that is generated by the trial is subsequently extracted and treated. The SVE system is designed and will be operated in order to create a gradient that draws soil vapour from the injection areas toward the system where it can be safely and effectively treated and released. The system will function as a contingency measure that will minimise the risk that soil vapour that might be generated as a result of the full scale treatment works.

16.3.6 Monitoring

An important component of S-ISCO® and SEPR™ is monitoring. Monitoring will be undertaken in three phases:

- Pre-Injection Monitoring;
- Concurrent-Injection Monitoring; and
- Post-Injection Monitoring.

These phases will be comprised of five components:

- Process monitoring;
- Performance monitoring;
- Groundwater sampling;
- Soil gas sampling; and
- Soil sampling.

An overview of the various components of the proposed monitoring program is provided below.

16.3.6.1 Process Monitoring

Process monitoring consists of monitoring the S-ISCO® and SEPR™ chemistry at the system and in the injection wells. This monitoring data is used to track the parameters of the system and subsequently to inform modifications to the operational parameters, including injection rate, concentration and pressure, in order to optimise treatment.

16.3.6.2 Performance Monitoring

Monitoring of the injected chemicals in monitoring wells provides information as to where the injected chemicals are travelling and the nature of their reactions. This is a critical component to the success of S-ISCO® and SEPR™. Monitoring data collected is used to understand the success of contacting the contaminant mass with the injection chemicals and to document the chemical reactions taking place. In addition it will be used to inform and refine the injection regime being employed for full-scale implementation.

Using laboratory equipment and *in situ* water quality data logger devices, groundwater and process water parameters such as pH, oxidation reduction potential (ORP), Dissolved Oxygen (DO), conductivity, head, temperature, oxidant concentrations, TPH (C_{10}-C_{36}) (using a Site Lab Fluorescence Analyser[12]) and inter facial tension (IFT) will be measured from groundwater and various locations in the injection system.

Measured parameters of pH, ORP and DO provide witness to the presence of the chemical reactions. During the course of oxidation reactions pH is expected to decrease slightly in the short term and in the immediate vicinity of the injected chemistry as protons are generated by the destruction of the oxidant. ORP, an indication of the capacity of an environment to undergo redox reactions, is expected to increase, providing a direct indication of the presence of reactions, specifically with peroxide. Because this relationship is stronger when hydrogen peroxide rather than sodium persulfate is used, ORP is most significant in tracking the peroxide front. ORP may be detected much earlier than peroxide at a given location since the oxygen released from decomposition of hydrogen peroxide diffuses throughout the groundwater at a much faster rate than the injected oxidant. Similarly, DO is expected to increase in response to peroxide treatment, and its increase may also significantly precede the arrival of the peroxide front.

The significance of pH depends on the S-ISCO® system. For example:

- During alkaline-activated S-ISCO® with sodium persulfate, elevated pH (alkaline conditions) will indicate that sodium hydroxide is adequately dosed to create alkaline conditions that will activate the persulfate oxidant.
- During Fe-TAML activated S-ISCO® with hydrogen peroxide pH is monitored to ensure that it is elevated sufficiently to optimise the catalyst (approximately pH 9).

[12] Specific Technical Requirements for Northwest Growth Centres Initial Release Infrastructure Package 1, Design and Construct Contract to Deliver Water Related Infrastructure

- In S-ISCO® systems in which peroxide is being used and in which there is a possibility for pH levels to become acidic (in a localised area and over a short time period), pH measurements will indicate that monitoring should increase and/or that injection parameters may need to be modified.
- Finally, pH measurements also play a role in selection of weekly groundwater performance monitoring samples for metals and TPH analysis.

Measured parameters of conductivity, Interfacial Tension (IFT), pH, TPH (C_{10}-C_{36}) and concentrations of oxidant are good indicators of chemical transport and allow for adjustment in system flow rates and chemical delivery concentrations based on monitoring well results. Conductivity is a conservative tracer that indicates where chemistry is present, specifically persulfate, since it is directly related to the total dissolved solids in solutions, including sulfates. Measured concentrations of oxidant (persulfate) lag behind the conductivity front because it is reacting and being consumed during transport. IFT indicates the presence of VeruSOL-3®. As mentioned above, during S-ISCO® with alkaline-activated persulfate, pH will be used to track that sodium hydroxide is being adequately dosed and transported to activate the persulfate.

Measurements of the hydraulic head and depth-to-groundwater will indicate the impact of injections on the water level in the treatment area and also will provide data relating the movement and transport of the injected chemistry to the tides in Darling Harbour. This data will also be used to regulate fluid levels in the tar tank and other historical infrastructure within Hickson Road to confine the injected chemistry to this area.

Finally, temperature in groundwater samples is expected to increase as a result of S-ISCO® injections. During S-ISCO® with peroxide, specifically, since reactions of peroxide, with contaminants are exothermic, heat will be produced that elevates groundwater temperature. Although temperature is expected to increase in response to the S-ISCO® treatment and can indicate chemical reactions, the extent to which temperature increases is affected by numerous factors, including: the temperature of the injected fluid; and the heat capacity of the groundwater and subsurface. Therefore, temperature is not an extremely strong or direct indicator of the treatment front. Notwithstanding, it is essential to monitor to ensure that increases do not threaten the groundwater system or subsurface materials / services.

Performance monitoring also plays a pivotal role in the mitigating risks to the environment and sensitive receptors.

16.3.6.3 Soil and Groundwater Sampling

Soil and groundwater collected during the full scale S-ISCO® and SEPR™ treatment works will be analysed for CoPCs, including TPH, VOCs and SVOCs. Groundwater will also be sampled for metals, total organic carbon (TOC), sulphates and total residual chlorine analysis. Sampling of groundwater and soil for CoPCs enables a comparison of conditions before and after the full scale S-ISCO® and SEPR™ treatment works that will ultimately be used to assess the effectiveness of the treatment. The final objectives of the full scale S-ISCO® and SEPR™ treatment works are to reduce soil concentrations of identified CoPCs, specifically TPH, PAHs and BTEX, below the relevant SSTC, and to also reduce the groundwater flux of CoPCs leaving the treatment area to concentrations below the relevant SSTC.

Soil sampling for CoPCs after the full scale S-ISCO® and SEPR™ treatment works, in particular, provides an estimate as to the magnitude of contaminant reduction at the Site.

The final analysis of the effectiveness of the application also involves the sampling and analysis of groundwater to develop CoPC flux comparisons before and after the S-ISCO® and SEPR application.

Groundwater sampling for PAHs, TPH and metals throughout the S-ISCO® and SEPR™ injections will take place to confirm both that the treatment is proceeding and also that neither contaminants nor metals are mobilised by the treatment. In addition groundwater sampling a for TOC and sulphates will take place to demonstrate that increased biological oxygen demand isn't a risk for Darling Harbor due to the injection of surfactants and oxidants and that significant chlorinated hydrocarbons won't be generated due to the reaction of persulphate with saline groundwater.

16.3.6.4 Soil Vapour Sampling

Soil vapour sampling will be conducted to monitor the presence and safety of soil vapours generated as a result of S-ISCO® and SEPR™ oxidation reactions. Soil vapour monitoring is a significant component the environmental monitoring and risk mitigation strategies for S-ISCO®.

Soil vapour monitoring will target areas near: the basements of the nearby buildings that are both close to the soil and accessed by people; the sewerage pumping station SP1129 in Block 5 (to be retained for the future land

use); underground service pits and service access points, particularly those within Hickson Road. This monitoring will be used to evaluate the success of the SVE system in extracting vapours to mitigate exposure, as well as whether the system needs to be extended to locations in addition to those in use.

Soil vapour monitoring will be conducted before injections, to establish baseline conditions, as well as during and after injections. Further detail regarding the proposed soil vapour monitoring works will be detailed in the S-ISCO®/SEPR™ Detailed Work Plan (refer to **Section 13.1.3**).

17.0 Management of Water

17.1 Surface Water Management Methods

17.1.1 Surface Water Management from Undisturbed Areas

Clean water will be generated from surface water collected from remediated and undisturbed areas of the Site. Undisturbed surface water runoff will continue to follow existing drainage patterns, unless diversion from active site areas is warranted. Surface water drainage will also be arranged so that surface water run-off from disturbed or contaminated areas does not enter remediated or undisturbed areas.

Clean water collected from undisturbed areas will be retained on-site and used to the maximum extent possible for dust suppression. Excess clean water will be discharged to stormwater or sewer in accordance with the discharge conditions for the site. Formal discharge criteria for surface waters will be negotiated with Council and the NSW EPA as part of the remediation works and likely included as a condition of the POEO license and Trade Waste License for the project. It is anticipated that the discharge criteria will be based on the contaminant concentrations, sediment and turbidity levels of existing surface water runoff from the site.

To assist in the collection of surface waters from undisturbed areas of the site, a sediment basin may be constructed in a suitable location to be determined during site establishment. The location of the basin will be selected to provide for the whole remediation works.

17.1.2 Surface Water Management from Disturbed Areas

Surface water management is critical to successful remediation of the Site and reduction of cross contamination issues and to prevent impact to the Harbour. Successful management of site water is also essential for materials handling and management.

Surface water flows and stormwater will be managed by segregating clean water from impacted water and preventing the inflow of surface water to excavation areas using surface bunds, silt fences and drainage diversions. The preferred hierarchy for management of water on-site is as follows:

- Minimise volume of contaminated water during the works wherever possible by directing surface water away from excavations, depressions, pits and stockpiles by the construction of drainage works such as bunds and diversion drains. These measures will minimise the flow of clean water into other areas of the Site that contain contaminated materials;
- Recycling water where possible by using on-site as dust suppression for other site operations including wheel washing and truck washing. To ensure that the use of recycled water does not impact on surrounding areas, the following data will be obtained prior to undertaking these activities:
- Chemical data which demonstrates that the water to be recycled complies with the reuse criteria, including consideration of potential for odour generation;
- Definition of the area where the water is to be discharged;
- Details of environmental protection measures installed to ensure that the use of recycled water will have no adverse environmental impact;
- Appropriate tracking of recycled water reused at the Site; and
- Discharge to stormwater or sewer, with or without treatment, as per regulatory guidelines and in accordance with an EPL and Trade Waste License (refer to **Section 13.1.2**) to be obtained for the project.

17.2 Groundwater Management Methods

Groundwater encountered during excavation (as part of remedial works) will require management.

Control walls will be installed to minimise groundwater infiltration into excavations, where required. Dewatering and control of groundwater seepages will also be required.

Groundwater collected from the excavations will be transferred to the on-site water treatment plant (where required), prior to discharge to Darling Harbour with appropriate approvals. If required, limited contaminated water may be disposed off-site with use of truck tankers.

If required, limited contaminated water may be disposed off-site with use of truck tankers and/or disposed of to sewer (with or without treatment) in accordance with a Sydney Water trade waste licence.

17.3 Wastewater Treatment System

A wastewater treatment system will be established for the remediation works and is likely to consist of at least the following process units:

- Pumps and a buffer storage for transferring flows to the plant;
- Dissolved Air Flotation unit for the removal of fats, oils, greases and hydrocarbons which might also include a coagulant and surfactant dosing to assist with solids removal;
- A chemical dosing step to adjust the pH and promote chelation and precipitation of heavy metal complexes;
- Reaction & mixing vessels to facilitate the metals removal process providing flow buffering and adequate reaction times;
- Activated carbon filtration, as required to polish specific residual or trace contaminants from the groundwater and ensure compliance with specific trade waste requirements;
- Sludge handling and/or sludge thickening equipment (or at least a tank, sludge separator) to minimise the residuals that require disposal off-site; and
- Effluent balancing storage (in holding tank) prior to pumping to the transfer sump.

Duty / standby pumps (variable speed drives) will control the pumped outflow to Darling Harbour, following approval of a variation to the existing EPL (refer to **Appendix E**) to the Sydney Water sewerage system or stormwater if appropriate testing is conducted and approvals obtained (refer to **Section 13.1.2**).

17.4 Groundwater Management

17.4.1 Groundwater Monitoring Plan(s)

A GMP will be prepared to detail the required groundwater monitoring works during and after completion of the remediation works. The requirement, or otherwise, for a GMP will be dependent on the remediation option adopted. In particular:

- for the VMP Remediation Works, a GMP will be required in areas where:
  - *in situ* remediation is adopted (i.e. Block 5 and Hickson Road if the preferred remediation option is adopted and Block 4 if the alternate remediation option is adopted); and
  - ex situ remediation is adopted (i.e. Block 4 if the preferred remediation option is adopted and Block 5 and Hickson Road if the alternate remediation option is adopted).
- for the Block 4 Development Remediation Works, a GMP:
  - will not be required where the preferred ex situ remediation option is adopted; and
  - may be required where the alternate *in situ* remediation is adopted, depending on whether or not the basement groundwater retention wall system has been constructed (which will negate the need for groundwater monitoring).

It is expected that some of the existing groundwater monitoring well network will be removed as part of the remediation works. Therefore, a groundwater monitoring well network will be installed at the Site to confirm the validation requirements of **Section 19.8**.

The GMP will include the following information:

- Monitoring objectives;
- Scope of works;
- The groundwater monitoring schedule and network;
- The construction details required for the groundwater monitoring wells (including the required screen intervals);

- Groundwater sampling methodology;
- QA/QC assessment;
- DQO/DQI assessment; and
- Reporting requirements.

17.4.2 VMP Remediation Works GMP

For the purpose of the VMP Remediation Works GMP, the point of compliance will be considered to the down-hydraulic boundary of the Declaration Area (refer to **Section 7.1.3**). Existing monitoring wells will be retained for ongoing monitoring wherever possible.

The objectives of the GMP will be to:

- measure the effectiveness of the remedial works that have been undertaken (specifically source removal and subsequent groundwater quality improvement) with respect to groundwater quality migrating from the Declaration Area boundary and the associated risk to aquatic ecosystems (i.e. ultimately groundwater migrating to Darling Harbour);
- make provision for any necessary management measures (contingency measures) that may be required to respond to the monitoring results (refer to **Section 23.9**); and
- Comply with legislative requirements and the appropriate requirements of NSW EPA (i.e. NSW DEC, 2007) including the requirement for implementation of a GMP in cases where the extent of remediation is based on CUTEP.

It is noted that if Block 4 Development Remediation Works proceed, it would not be possible to monitor groundwater quality at the down-hydraulic boundary of the Declaration Area. If this was the case, groundwater monitoring required for the VMP Remediation Works would be undertaken adjacent to the Block 4 basement wall (i.e. outside the alignment of the basement wall to the west).

17.4.2.1 During Remediation Works

Groundwater monitoring will be undertaken from the groundwater monitoring well network (along the Declaration Area boundary) in accordance with the GMP on a quarterly basis during the remediation works to build a robust data set for groundwater quality at the down hydraulic gradient Declaration Area boundary and to demonstrate that the continuing remediation works are not having a detrimental impact on the environment.

All groundwater samples will be analysed for the relevant groundwater CoPCs and compared to the applicable groundwater SSTCs and MWQCs (as required). The methodology for the groundwater sampling is detailed in **Section 19.10**.

17.4.2.2 Post-Remediation Works

Following completion of the remediation works, the groundwater monitoring discussed in **Section 17.4.1** will be continued at the Site to assess whether CoPC concentrations in groundwater are consistent with the applicable groundwater SSTCs and MWQCs (as required, refer to **Table T2**).

The post-remediation groundwater monitoring program at the Site will consist of quarterly groundwater monitoring of the monitoring well network (refer to **Section 17.4.1**) for a period of 6 months (i.e. three sampling rounds) following completion of the remediation works. It is noted that, as described by the Contingency measures detailed in **Section 23.9**, further monitoring may be required to demonstrate that the remedial goals have been achieved.

Specific details of the post-remediation groundwater monitoring program (including the groundwater monitoring network) will be detailed in the GMP that will be developed prior to commencement of the remediation works and in consultation with the NSW EPA Accredited Site Auditor and the NSW EPA.

17.4.3 Block 4 Development Remediation Works GMP

As described by **Section 17.4.1**, if the preferred ex situ remediation option is adopted for the Block 4 Development Remediation Works a GMP will not be required.

If the alternate *in situ* remediation option is adopted for the Block 4 Development Remediation Works, the requirement for a GMP will be determined based on the presence (or otherwise) of the basement groundwater retention wall system. In particular, if the retention wall system:

- has been constructed, a GMP will not be required;
- has not been constructed, a GMP similar to that described in **Section 17.4.2** will be required.

17.4.4 Groundwater Monitoring Plan Reporting

A groundwater monitoring report will be prepared within 8 weeks of completing each monitoring event for provision to the NSW EPA Accredited Site Auditor. If the groundwater monitoring relates to VMP Remediation Works, the document would also be submitted to the NSW EPA for review and approval (if required). The report will include the following:

- Details of groundwater monitoring program methodology and scope of works;
- Construction details and logs of any new or replaced groundwater monitoring wells;
- Results of groundwater monitoring well levels, field parameters and laboratory analysis, including NATA certified laboratory reports and chain of custody records;
- Comment on laboratory and field quality assurance / quality control program and analytical data validation;
- Interpretation of the data, including quality of groundwater with respect to the applicable SSTC and MWQCs;
- Interpretation of groundwater elevation contours across the Declaration Area/Site;
- Conclusions and recommendations with respect to continuation or otherwise of the groundwater monitoring program; and
- Conclusions and recommendations on whether Groundwater Monitoring Plan or other related documents/programs need to be updated.

18.0 Imported Materials

18.1 VMP Remediation Works

Due to the extent of excavations required for the proposed VMP Remediation Works, it is possible that materials will need to be imported to the Declaration Area for backfilling of the remediated areas. Materials imported to the Declaration will be required to meet the environmental and geotechnical requirements specified for the particular end use.

It is expected that materials imported to the Declaration Area as part of the VMP Remediation Works will generally meet the requirements of:

- Virgin Excavated Natural Material (VENM) in accordance with the DECCW (2009) *Waste Classification Guidelines*;
- Excavated Natural Material (ENM) in accordance with the *Protection of the Environment Operations (Waste Regulation 2005 – General Exemption under part 6, Clause 51 and 51A* (2012); and
- the relevant soil SSTC (refer to **Table T1**).

The frequency of validation sampling will be dependent on the source of the fill material. If the material is brought onto the Declaration Area from a quarry, and the material is homogeneous, validation will consist of:

- a certificate warranting that the material is VENM or demonstrating the physical and chemical quality of the fill, including supporting test data; and
- visual confirmation that the material is free from contamination as it is imported to the Declaration Area.

If the imported material (including landscaping materials such as mulch) cannot be certified as VENM or clean quarry material, the following works will occur:

- Site inspection of the source site and the reporting of these findings in the relevant validation reports; and
- Inspection of the imported material upon arrival/stockpiling at the Site to confirm it is consistent with the material observed at the source site;
- One sample per $100m^3$ will be collected and analysed or a minimum of 3 samples per source. This sampling density may be decreased depending on the quantity of material to be imported from a given source and the initial laboratory analytical results. Any change in sampling density will be determined in consultation with the NSW EPA Accredited Site Auditor; and
- Visual confirmation that the material is free from contamination as it is imported to the Declaration Area.

Whenever possible, samples will be collected from the source location, prior to import of the material to the Declaration Area.

All soil samples will be analysed for the following suite of potential contaminants as a conservative measure to ensure that only suitable materials are imported to the Declaration Area:

- Metals (As, Cd, Cr, Cu, Ni, Pb, Zn and Hg);
- PAHs and phenols;
- TPH/BTEX;
- OPPs and OCPs;
- PCBs; and
- Asbestos.

18.2 Block 4 Development Remediation Works

It is considered unlikely that the Block 4 Development Remediation Works will require the import of material to Block 4. This is because the Block 4 Development Works will include excavation of the entire Block 4 footprint to facilitate construction of a future basement.

In the event that the import of material to Block 4 is required, the procedures described by **Section 18.1** will be implemented.

19.0 Validation Strategy

This section outlines the proposed validation strategy and protocols required to demonstrate that the remedial action has met the remediation objectives.

19.1 Remediation Goals

19.1.1 VMP Remediation Works

The Remediation Goals developed by the *VMP Remediation Extent Report* (AECOM, 2013c) for the protection of human health and the environment based on the recommendations of the *VMP HHERA* (AECOM, 2012c) are:

- As a primary goal, removal / remediation of SPGWT to the extent practicable as required by the NSW DEC (2007) *Guidelines for the Assessment and Management of Groundwater Contamination* (refer to **Section 6.6.1**); and
- As a secondary goal, removal / remediation of soil, to the extent practicable:
    - That is representative of CIM, which is defined as:
        - Unsaturated soil concentrations exceeding the soil SSTC; and/or
        - Unsaturated or saturated soil concentrations that are considered to be the source of groundwater concentrations exceeding the groundwater SSTCs in fill material; and
    - Such that groundwater quality within fill material leaving the Declaration Area (measured at the down hydraulic gradient Declaration Area boundary) approaches the MWQC (refer to **Section 7.1.3**).

The standard of remediation (as developed by the *VMP Remediation Extent* report [AECOM, 2013c]) to be achieved within the proposed Remediation Extent should equal the higher of:

- Removal of SPGWT to the extent practicable, for the protection of human health and the environment;
- Removal/remediation of soil and groundwater concentrations present within fill material exceeding the relevant $SSTC^{VMP}$, to the extent practicable; and
- Removal/remediation of contaminated fill materials such that the contaminant mass within the Remediation Extent fill material is reduced, on average, by 90%, to the extent practicable (calculated based on the estimated mass of naphthalene and TPH C_{10} - C_{14}).

If the standard of remediation can not be practicably achieved, the Contingency measures detailed in **Section 23.0** of this RAP will be considered.

19.1.2 Block 4 Development Works

As described by **Section 9.2**, the Remediation Goals required to be achieved to remediate Block 4 to be protective of human health are based on:

- As a primary goal, removal/remediation of SPGWT to the extent practicable; and
- As a secondary goal, removal/remediation of identified CIM (as detailed in **Section 9.1**), to the extent practicable based the removal of soil contamination that is considered to be the source of groundwater concentrations exceeding the groundwater $SSTC^{DEV}$.

19.2 Validation Principles

Both the *VMP HHERA* (AECOM, 2012c) and *Declaration Site HHERA* (AECOM, 2011a) recommend that soil validation data be assessed in accordance with the *National Environment Protection (Assessment of Site Contamination) Measure*, *National Environment Protection Council, 1999*. This will involve demonstrating that relevant SSTCs for either VMP Remediation Works or Block 4 Development Remediation Works have been achieved through the:

- use of systematic sampling patterns;

- collection of an appropriate number of samples for estimation of the arithmetic average concentration of contaminant(s) within relevant environmental media and exposure areas; and
- estimation of the 95% upper confidence limit (UCL) of the arithmetic average concentration for soils.

Where applicable, the above statistical analysis will be applied to separate areas of the Site if staged remediation and validation works are to be conducted. This will also apply if different strata (i.e. fill materials, natural soils and bedrock) are excavated and are proposed to be reused onsite as part of the remediation works. Consequently, the analytical data obtained from the validation of materials to be reused onsite will be assessed separately as per the requirements of the *National Environment Protection* (Assessment *of Site Contamination) Measure*, *National Environment Protection Council (1999)*.

It is noted that the use of statistics will not be used in the assessment of groundwater analytical data sets obtained during the validation works.

19.2.1 Staging of the Remediation Works

As discussed in **Section 1.2** and **Section 1.8** the sequence of remediation works may vary. That is, the staging and sequencing of the remediation works (specifically: VMP Remediation Works in each of the Block 4, Block 5 and Hickson Road portions of the Declaration Area; and Block 4 Development Remediation Works) may vary depending on final logistical and other requirements associated with the broader Barangaroo development. Staged remediation works may also be required within key site areas (for example within Block 4) to accommodate the required development and construction sequence and methodology.

Final validation requirements for the remediation works will be dependent on:

a) the outcomes of the S-ISCO® and SEPR™ Proving Phase and Pilot Trial;

b) which of the preferred remediation options is adopted; and

c) the sequence of remediation works in the various Site areas as described above.

It is possible that, depending on the above factors, the preferred remediation option adopted for the Block 5 and Hickson Road VMP Remediation Works will be a combination of Option 1 (full scale S-ISCO® and SEPR™ treatment) and Option 2 (excavation and onsite treatment). Selection of which preferred remediation option will be adopted in each part of Block 5 and Hickson Road will be undertaken in consultation with the NSW EPA Accredited Site Auditor. A Validation Sampling Analysis and Quality Plan (SAQP, refer to **Section 19.2.3**) will be prepared, based on the actual sequence of remediation works and preferred remediation option that is implemented, to detail specific requirements for demonstrating that the remediation works have been undertaken in accordance with the requirements of this RAP.

Similarly, Site Audit Statements will also be staged to progressively validate the various stages of remediation in Block 4, Block 5 and Hickson Road Site areas against the applicable Remediation Goals.

It should be noted that depending on the sequence of remediation works, validation of particular Site areas may require consideration of contamination concentrations both within the subject area and in adjacent areas. For example, if the Block 4 Development Remediation Works are undertaken in advance of remediation works in Block 5 and Hickson Road, the validation process would be required to demonstrate that both:

- Contaminant concentrations within Block 4 are consistent with the Block 4 Development Remediation Works goals; and
- Groundwater contaminant concentrations adjacent to and outside the Block 4 groundwater retention wall system are also consistent with the Block 4 Development Remediation Works goals.

19.2.2 Validation of Mass Removal

A recommendation of the *VMP Remediation Extent report* (AECOM, 2013c) was that removal/remediation of contaminated soil such that the contaminant mass within fill material is reduced, on average, by 90% within the Remediation Extent (calculated based on the estimated mass of naphthalene and TPH C_{10}-C_{14}) was considered to be protective of the environment to the extent practicable.

Mass removal will be demonstrated as follows:

- Ex situ remediation works – based on confirmation that removal of all material within the nominated remediation extent has been accomplished; and

- In situ remediation works – by calculation of the mass of contaminant (specifically naphthalene and TPH C_{10}-C_{14}) removed based on comparison of the average concentration reported before and after completion of the remediation (based on relevant data obtained from the previous investigations and from the S-ISCO® validation sampling as described in the following sections).

Additional details specifying how mass removal will be demonstrated will be included in the Validation SAQP to be prepared (refer to **Section 19.2.3)**.

It is noted that Block 4 Development Remediation Works (which will include construction of the basement groundwater retention wall system around Block 4) will provide close to a 100% mass removal from Block 4 because:

- the development works will include excavation to a depth of approximately 8 m bgl (refer to **Section 4.2**) which will remove the majority of fill material and all of the contamination identified as requiring remediation; and
- the groundwater retention wall will effectively prevent the migration groundwater from within Block 4 to the receiving environment, effectively removing pathway for the migration of any residual contaminant mass.

19.2.3 Validation Planning

As discussed in **Section 1.2** and **Section 19.2.1**, a Validation SAQP will be prepared by a suitably qualified environmental consultant for each of the remediation stages (as required) and will be implemented for the duration of the soil validation testing program (i.e. for either *in situ* or ex situ validation works). The Validation SAQP will include a description of how the statistical analysis recommended by the *VMP HHERA* (AECOM, 2012c) and *Declaration Site HHERA* (AECOM, 2011a) will be adopted by the soil validation testing program.

The GMP (refer to **Section 17.4.1**) will also be prepared for the duration of the required groundwater monitoring works.

Both Plans will be endorsed by NSW EPA Accredited Site Auditor each remediation stage (as required).

If new guidelines/legislation are introduced or endorsed by NSW EPA during the course of the remediation and validation works, consideration will be given to modifying the validation program in consultation with the NSW EPA Accredited Site Auditor.

The NSW EPA Accredited Site Auditor will be invited to undertake regular site inspections during the excavation works.

19.3 Validation of HHERA Assumptions - Block 4 Development Remediation Works

An important element of the validation process for the Block 4 Development Remediation Works will be confirmation that the key assumptions regarding the proposed development and on which the *Declaration Site HHERA* (AECOM, 2011a) and *Declaration Site HHERA Letter* (AECOM, 2012d) are based (as described by **Section 7.2.3**) have been or will be implemented.

To this end, validation will include review of appropriate documentation confirming that the key assumptions either have been or will be constructed. Appropriate documentation may include:

- “Issue for Construction” Drawings that verify that the key elements of the Block 4 Development Works relied on by the *Declaration Site HHERA* (AECOM, 2011a) and *Declaration Site HHERA Letter* (AECOM, 2012d) will be constructed; and/or
- “As Constructed” Drawings that document that the key elements of the Block 4 Development Works relied on by the *Declaration Site HHERA* (AECOM, 2011a) and *Declaration Site HHERA Letter* (AECOM, 2012d) have been constructed.

This review will also assess any potential implications of changes to the design of the depth of the Block 4 basement and/or the final alignment of the basement groundwater retention wall system (refer to **Section 4.2** and **4.3**. Any significant changes to the final development plans will require confirmation that:

- the analytical data set and sampling density for the materials of potential concern (specifically additional soil which may remain below basements [as appropriate]) are adequate for assessing the suitability of the materials affected by the design changes;

- any required additional site investigations are suitable to supplement the current analytical data set. If required, the scope of these works will be endorsed by the NSW EPA Accredited Site Auditor; and
- confirmation that the assumptions of the *Declaration Site HHERA* (AECOM, 2011a) and *Declaration Site HHERA Letter* (AECOM, 2012d) are still valid (refer to **Section 7.2.3**).

As discussed previously, the basement groundwater retention wall system is subject to ongoing refinement and development as part of the design process. Consequently, minor changes to the depth of basements and/or the final alignment of the basement groundwater retention wall system may be required. If the final development design is changed which affects the assumptions of the *Declaration Site HHERA* (AECOM, 2011a) and *Declaration Site HHERA Letter* (AECOM, 2012d) and this RAP, an Addendum will be prepared, as required, and submitted to the NSW EPA Accredited Site Auditor for approval.

19.4 Soil Validation (*In situ* Remediation)

Collection and analysis of soil samples will be undertaken prior to and following completion of *in situ* remediation works to validate the effectiveness of S-ISCO® and SEPR™ in reducing the CoPC concentrations to achieve the remediation criteria (refer to **Section 7.1**) and to confirm the requirements of this RAP have been met.

The soil sampling and analysis events will be conducted at the following times:

- **Round 1**: Prior to initiation of the S-ISCO® and SEPR™ injections; and
- **Round 2**: Approximately one month after the completion of the S-ISCO® and SEPR™ injection processes or when the Remediation Contractor has evaluated the *in situ* data trends during post-injection performance monitoring and determined that the S-ISCO® chemistry is no longer reacting with contaminants in the subsurface.

The details of the soil validation works provided herein will be subject to confirmation based on the outcomes of the proposed S-ISCO® Pilot Trial Proving Phase (refer to **Section 16.1**)and Pilot Trial (refer to **Section 16.2**). Any refinement of the approach described following will be detailed in the SAQP (refer to **Section 19.2.3**).

Validation will also include collection and analysis of groundwater samples which is described in **Section 19.8**.

19.4.1 Round 1 Soil Validation Testing

If required, prior to the S-ISCO® and SEPR™ injections, additional validation soil samples will be collected across each of the proposed remediation areas to ensure that a sampling frequency of at least one borehole per 20 m grid interval has been achieved and that soil samples have been analysed for the CoPC at appropriate vertical intervals based on the identified vertical extent of SPGWT or CIM. Therefore, a full data set will be obtained from each borehole across the depth range where SPGWT and/or CIM has been identified by the site investigations (either within the unsaturated or saturated fill materials). Soil samples collected within the unsaturated zone will be sampled at depths of 0.5 and 1.5 m bgl. Soil samples will be collected from within the saturated zone at depths of 1.0 m. If required, a final 'base sample' will also be collected within the top 0.5 m of natural residual material (unless sandstone bedrock is encountered).

Soil samples will be collected and analysed from zones of highest impacts based on field observations (including visual/olfactory observations and PID readings). In all cases the depth interval selected for sampling will not exceed 1.0 m.

All soil samples will be analysed for the CoPC detailed in per **Section 19.6**.

As detailed in **Section 19.1**, a statistical assessment approach will be adopted in validating specific remediated areas and different material types (as required) and will be detailed in the SAQP to be prepared. That is, statistical analysis will be conducted for all samples collected and analysed from fill materials within each remediated areas to allow assessment against the relevant SSTCs to either the unsaturated or saturated fill materials/soils. This will include all existing data from the environmental site investigations collected within each remediation area to enable statistical analysis of all materials of the same material type (i.e. either unsaturated or saturated fill material).

19.4.2 Round 2 Soil Validation Testing

Once the Remediation Contractor has assessed *in situ* data trends during post-injection performance monitoring and determined that the S-ISCO® chemistry is no longer reacting with contaminants in the subsurface, the Round 2 soil validation testing will be undertaken.

This will involve soil sampling at similar locations and in accordance with the same requirements as the Round 1 soil sampling event. However, to increase the likelihood that the validation sampling is representative of CoPC concentrations within the treated Remediation Area, the positioning of the Round 2 soil validation boreholes will be as follows:

- The borehole will be located approximately 500 mm from any original site investigation borehole and Round 1 soil validation boreholes to avoid sampling disturbances from re-instated boreholes; and
- The borehole will be located at least 5 m away from any S-ISCO® and SEPR™ injection points. It is anticipated that S-ISCO® and SEPR™ injection points will be installed on a 10 m (approximately) grid (subject to the outcomes of the proposed S-ISCO® Pilot Trial, refer to **Section 16.2**).

Statistical analysis of post-treatment CoPC concentrations within each Remediation Area will be undertaken, as detailed in the SAQP, to confirm that the *in situ* remediation works have meet the requirements of this RAP. This statistical data set will include the same data set as per the Round 1 soil validation event with the exception of Round 2 sample results replacing the Round 1 results (i.e. obtained from the same borehole location and depth).

19.5 Soil Validation (Ex situ Remediation)

Ex situ remediation works will require the validation of:

- remediated areas - excavation walls and bases (if data gaps are present in the current data set);
- stabilised materials for off-site disposal;
- excavated materials for reuse; and
- the treatment area and stockpiling areas.

The NSW EPA Accredited Site Auditor will be invited to undertake regular site inspections during the excavation works.

19.5.1 Remedial Excavation Bases – VMP Remediation Works

If ex situ remediation works are undertaken, any residual soil remaining in the excavation base following completion of the proposed vertical remediation extent will be validated / characterised by a combination of visual observations and representative sampling with analytical testing.

The frequency and type of sampling will be dependent on the exposed material on the base of the excavation (e.g. bedrock, natural soil, fill, etc). The current analytical data set from previous site investigations will also be used to validate excavation bases to the extent that they are representative of the conditions observed in the base of the excavation. These works will be conducted in the remediation areas (as detailed in **Figure F10** to **Figure F12** in **Appendix B**, as required).

All remedial excavation bases founded in fill or residual soils/bedrock will be inspected by a qualified environmental engineer/scientist to confirm that the excavated surface is visually free from:

- SPGWT; and
- ACM to ensure residual soils are suitably validated for the protection of construction workers.

Where the excavation is founded in rock, the excavation base will be validated by visual observation and photographic documentation.

If there is visual evidence of potential SPGWT being present at the base of the bulk excavation, validation samples will be collected. If required, excavation base samples (discrete only) will be collected and analysed at a frequency of one sample per 20 m grid intervals across the base of the remedial excavation, within footprint of the potential SPGWT. Excavation base validation samples will be collected using a trowel below a depth of 100 mm (to minimise the potential loss of volatiles). All soil samples will be analysed for PAHs to allow comparison to the TCM criteria (as defined in **Section 6.6.1**). The analytical results from excavation base validation samples will be used to confirm the absence of SPGWT at the base of the excavation.

Validated areas will be clearly marked and identified to ensure that cross contamination is mitigated.

If SPGWT is encountered within fill material at the base of the Remediation Area, it will be over excavated to the extent practicable or until marine sediment or bedrock is encountered. For the purpose of the VMP Remediation Works, over excavation to the extent practicable will be limited to an increase in vertical extent of remediation of:

- 2 m if permeable fill is used to reinstate the over excavation area; or
- 1 m if clay will be used to reinstate the over excavation area.

The increase to the vertical extent of remediation required is based on consideration of:

- the practicabilities of increasing the depth of remediation including:
  - the depth that can be reasonably achieve by a single excavation lift; and
  - minimising the requirement for increased excavation shoring, dewatering and associated water management; and
- the requirement to demonstrate (as required by DEC 2007) that SPGWT has been remediated to the extent practicable (noting that it would be expected that the contaminant mass within the remediation extent would have already been reduced by 90% as required by the Remediation Goals).

If ACM is identified in the base of the excavation, it will be managed as described by **Section 14.8**.

If required, the contingency actions detailed in **Section 23.11** will also be considered.

19.5.2 Remedial Excavation Walls – VMP Remediation Works

If ex situ remediation works are undertaken, excavation walls in soil will typically be supported (and effectively retained) by excavation retention cut-off walls. As a consequence, it will not be possible to directly sample materials remaining in excavation walls. The approach to validation of these residual materials will be as follows:

- Where the excavation wall is comprised of rock (which will be unsupported), the excavation wall will be validated by visual observation and photographic documentation; and
- Where the excavation wall is comprised of fill or natural soil (supported behind a cut-off wall such that visual observation or validation sampling will not be possible):
  - if the cut-off wall is located on the Site boundary, such that there is effectively no Site material remaining behind it, the excavation wall will not be subject to any validation testing; and
  - if the cut-off wall is located within the Site boundary such that it is retaining Site material behind it, the excavation wall and the material it retains will be validated using the available groundwater data set and field observations reported on borehole logs relating to the potential for SPGWT to be present in proximity to both the inside and outside of the excavation wall.

This approach to validation of excavation walls is considered appropriate because, as detailed in **Section 7.1.4**:

- There are no Remediation Goals ($SSTC^{VMP}$) for saturated soil. Therefore, even if soil samples were collected from the walls of the excavation, there would be no criteria to compare the results against; and
- The standard of remediation to be achieved is (among other things) remediation / removal of 90% of the contaminant mass from within the extent of remediation, to the extent practicable (calculated based on the estimated mass of naphthalene and TPH C_{10}-C_{14}). As described by **Section 19.2.2**, validation that this remediation goal has been achieved will not require reference to analytical data outside the extent of remediation.

As detailed in **Section 19.2**, a statistical assessment approach will be adopted in validating excavation walls and different material types (as required).

All excavation walls founded in bedrock will be inspected by a qualified environmental engineer/scientist to confirm that the excavated surface is visually free of ACM to ensure residual materials are suitably validated for the protection of construction workers. If ACM is encountered during these works, removal and validation works will be undertaken to the extent practicable as per **Section 14.8**.

19.5.3 Validation of Materials to Remain *In Situ* Below Basements – Block 4 Development Remediation Works

The groundwater and fill material to remain *in situ* below the proposed Block 4 basement is considered to have been adequately characterised and validated by the site investigations detailed in **Section 5.0**. Further, as described by **Section 7.2.3**, the standard of remediation within the groundwater basement retention wall system is based on achieving the groundwater $SSTC^{DEV}$ only. As such, the collection of soil validation samples within the saturated zone is not required.

Reliance on the existing groundwater data set for material to remain *in situ* below the proposed Block 4 basement is considered appropriate because:

- As described by **Section 9.2.2.3**, groundwater concentrations exceeding the groundwater $SSTC^{DEV}$ were reported in only two of the six groundwater monitoring wells located within Block 4, but outside the proposed extent of remediation. Both of these the exceedances (BH405/IT03 and MW40) were reported within the marine sediment from which contaminant flux has been shown to be negligible. All other sampling ports, located within the fill material reported CoPC concentrations less than the $SSTC^{DEV}$;
- As described by **Section 9.2.2.3**, the existing groundwater monitoring data has demonstrated that exceedances of the $SSTC^{DEV}$ are typically associated with the presence of SPGWT. The proposed approach to validation of materials to remain *in situ* below the Block 4 basement is based on visual identification of SPGWT in fill (as described following); and
- Contaminant flux modelling undertaken by AECOM in support of the *VMP Remediation Extent* report (AECOM [2013c] refer to **Section 6.6.5**) has demonstrated that the reduction in contaminant mass that is expected to occur as a result of the proposed VMP remediation works will result in a significant improvement to groundwater quality (between 250% and 380%) in fill. A similar improvement in groundwater quality in fill would be expected to be realised by the proposed Block 4 Development Works extent of remediation.

The *Declaration Site HHERA* (AECOM, 2011a) assumes that SPGWT will be removed from the immediate vicinity of the outer basement walls to the extent practicable.

In consideration of this, all bulk excavation bases founded in fill or residual soils/bedrock will be inspected by a qualified environmental engineer/scientist to confirm that the excavated surface is visually free from:

- SPGWT; and
- ACM to ensure residual soils are suitably validated for the protection of construction workers.

If there is visual evidence of potential SPGWT being present at the base of the bulk excavation, validation samples will be collected. If required, excavation base samples (discrete only) will be collected and analysed at a frequency of one sample per 20 m grid intervals across the base of the remedial excavation, within footprint of the potential SPGWT. Excavation base validation samples will be collected using a trowel below a depth of 100 mm (to minimise the potential loss of volatiles). All soil samples will be analysed for PAHs to allow comparison to the TCM criteria (as defined in **Section 6.6.1**). The analytical results from excavation base validation samples will be used to confirm the absence (or otherwise) of SPGWT at the base of the excavation.

In areas where SPGWT or CIM is known to be present at depths greater than depth of the basement excavation (which is currently proposed to be 8 m bgl) (i.e. BH49 and BH119), or where SPGWT is observed in the base of the completed basement excavation, the vertical extent of remediation will be increased in the vicinity of the impact to the depths following:

- 2 m from the underside of the basement floor slab if permeable fill will be used to backfill the over excavation area; or
- 1 m from the underside of the basement floor slab if clay will be used to backfill the over excavation area.

The increase to the vertical extent of remediation required is based on consideration of:

- the practicabilities of increasing the depth of remediation including:
  - the depth that can be reasonably achieved by a single excavation lift; and
  - minimising the requirement for increased excavation shoring, dewatering and associated water management; and
- provision of adequate separation between the underside of the basement slab and any SPGWT or CIM remaining *in situ* beneath it such that there is no unacceptable risk to occupants of the basement.

Removal of the additional material shall be validated through visual observations and validation documented via field notes and photographs.

If ACM is encountered during these works, it will be managed as described by **Section 14.8**.

Where the basement excavation is founded in rock, the excavation base will be validated visually. In particular, visual validation will be based on observations that:

- the final surface is generally free of SPGWT, specifically:
    - any SPGWT present is contained within rock defects;
    - any SPGWT present is not mobile (that is it does not migrate out of the defects under normal weather conditions); and
    - the area of SPGWT impacted defects is less than 5% of the exposed rock face; and/or
- surface waters are free of a sheen associated with contamination.

These observations will be confirmed via visual observation and photographic documentation. Where the above requirements are not met, the contingency measures detailed in **Section 23.11** will be considered.

All soil and groundwater analytical data relevant to characterising materials to remain below the Block 4 basement will be included in the Block 4 Validation report (refer to **Section 19.12**).

19.5.4 Validation of Basement Excavation Walls – Block 4 Development Remediation Works

It is expected that excavation walls in soil required for construction of the Block 4 basement will be supported (and effectively retained) by excavation retention cut-off walls. As a consequence, it will not be possible to directly sample materials remaining in excavation walls. Notwithstanding, the *Declaration Site HHERA* (AECOM, 2011a) assumes that SPGWT will be removed from the immediate vicinity of the outer basement walls to the extent practicable.

Figure F6 of the RAP indicates that there is potential for SPGWT to be present in the vicinity of the currently proposed Block 4 basement walls. In particular, SPGWT has been identified in the vicinity (i.e. within 30m) of the wall at the following locations:

- Within Hickson Road:
    - BH15/MW15 - DNAPL was observed in the groundwater at this location. This borehole is located within the proposed extent of VMP Remediation Works in Hickson Road;
    - BH10/MW10 - DNAPL and TCM were reported at a depth of 4.9-9.4 m bgl. This borehole is located within the former gasholder annulus and within the proposed extent of Remediation Works in Hickson Road.
    - DNAPL and TCM identified reported at the above locations will be addressed as part of the VMP Remediation Works.
- Outside the proposed alignment of the Block 4 basement wall:
    - BH403 - TCM was observed in the marine sediments at a depth of 9-17 m bgl. This borehole is located approximately 20 m north of the proposed Block 4 basement. TCM reported at this location is not considered to pose an unacceptable risk to human health because of:
        - its location relative to the wall;
        - its limited extent (noting that TCM was not reported at adjacent locations); and
        - its presence within the underlying marine sediment (refer to **Section 6.6.5**).
- Within the proposed alignment of the Block 4 basement well:
    - BH404 - TCM was observed in the marine sediments at a depth of 15-16 m bgl. This borehole is located approximately 10 m south of the proposed Block 4 basement wall alignment. The TCM is approximately 7 m below the currently proposed Block 4 basement;
    - BH406 - TCM was observed in the fill and marine sediments between depths of 14.3 and 16.8 m bgl. This borehole is located approximately 15 m east of the proposed Block 4 basement wall alignment. These impacts are approximately 6.3 m below the currently proposed Block 4 basement;
    - BH48 - TCM was observed in the marine sediments at a depth of 14.5 m bgl. This borehole is located approximately 10 m east of the proposed Block 4 basement wall alignment. These impacts are approximately 6.5 m below the currently proposed Block 4 basement; and
    - TCM reported at the above locations is not considered to pose an unacceptable risk to human health because of:

- its location within the basement extent (noting that TCM identified within the base of the excavation will be removed as per **Section 19.5.3**);
- its limited extent (TCM was not reported at adjacent investigation locations – with the exception of BH406 and BH48); and
- its presence at significant depth below the proposed Block 4 basement and largely within the underlying marine sediment (refer to **Section 6.6.5**).

As described above, the occurrence of SPGWT in the vicinity (i.e. within 30m) of the excavation retention cut-off wall is not considered to represent an unacceptable risk to human health and remediation of the soils in these areas is not considered to be warranted.

It is noted that the alignment of the currently proposed Block 4 basement walls passes through the inferred location of the 1870 gasholder annulus (refer to **Figure F3** in **Appendix B**). The timing of remediation of the 1870 gasholder annulus relative to construction of the Block 4 groundwater retention wall system is yet to be confirmed. However, it is possible that the gasholder will not have been remediated prior to installing the Block 4 retention wall. The timing of remediation within the 1870 gasholder relative to construction of the retention wall will be considered as part of the Validation SAQP (refer to **Section 19.2.3**). In the event that remediation and validation of Block 4 is required prior to remediation and validation of Hickson Road, the following options will be considered:

1) Remediation of SPGWT within the 1870 gasholder in Hickson Rd prior to validation of Block 4; or
2) Further assessment of whether the presence of SPGWT within the 1870 gasholder in Hickson Road represents an unacceptable risk to human health or the environment. This assessment would be undertaken in consultation with the Site Auditor and may consider:
    - the outcomes of additional investigations undertaken to more accurately delineate the presence of SPGWT within the gasholder and the gasholder design (for example, the gasholder is thought to consist of an annulus excavated into rock); and,
    - the design and construction methodology of the retention wall (including how the retention wall will be constructed within the gasholder annulus).

19.5.5 Validation of Stabilised Materials for Off-site Disposal

Materials requiring stabilisation (or treatment using S-ESCO™) will be tested and validated in accordance with NSW EPA General Immobilisation Approval (approval number 2005/14 or a specific approval for the Site, where required). This will involve the collection and analysis of validation samples from treated and untreated materials at a rate of 1 sample per 500 m^3. The validation samples will be analysed for the following:

- Untreated materials:
    - Heavy metals;
    - PAH and phenols;
    - TPH/BTEX;
    - Cyanide; and
    - Asbestos.
- Treated materials:
    - TCLP (Heavy metals)
    - TCLP (PAH and phenols);
    - TCLP (Cyanide); and
    - Unconfined Compressive Strength.

In addition to the above laboratory analysis:

- the composition of the reagent and ratio of reagent to untreated waste (mass/mass) used during the treatment works will be monitored and reported appropriately; and
- material requiring stabilisation will be inspected by a qualified environmental engineer/scientist to confirm whether it contains SPGWT and/or ACM and the results of this inspection documented.

If ACM is identified, it will be managed in accordance with **Section 14.8**.

19.5.6 Validation for Reuse On-site

Based on the available analytical data some excavated materials may require validation to facilitate reuse (refer to **Section 7.3**). Any overburden material which requires excavation to enable the excavation and remediation of impacted materials will be selectively excavated for potential reuse based on excavation plans. The excavation plans will be based on:

- the findings of the site investigations detailed in **Section 5.0**;
- the remediation extent as described in **Section 8.0** and **9.0** (as applicable to either the VMP Remediation Works or Block 4 Development Remediation Works); and
- field observations during the remediation works (visual and olfactory).

All material excavated for reuse must be inspected by a qualified environmental engineer/scientist to confirm that the excavated material is visually free of SPGWT and ACM.

If ACM is encountered, removal and validation works will be undertaken as per **Section 14.8**.

Wherever possible, the excavated material will be taken directly to a designated area for stockpiling. If field observations during the excavation works indicate that the excavated material is significantly different from that anticipated by the available analytical data, the material will be stockpiled and additional discrete validation samples collected and analysed from each stockpile at a sampling frequency of 1 sample per 400 m^3.

The adequacy of the proposed sample density will be confirmed once the material proposed to be reused has been identified, and the relevant available analytical data set for the subject material reviewed. This assessment will be undertaken in consultation with the NSW EPA Accredited Site Auditor and the outcome documented in the Validation Report (refer to Section **19.12**).

All soil samples will be analysed as per **Section 19.6**.

19.5.7 Validation of Treatment Area and Stockpiling Areas

Activities within the RE, including the treatment and stockpiling works, will be undertaken on appropriately sealed hardstand areas in a designated area, with diversion drains and bunding constructed around the perimeter of the area. Consequently, the soil beneath the hardstand is unlikely to be impacted by the stockpiling activities and subsequently, validation testing of these areas, once the hardstand is removed, is not proposed.

As a precautionary measure, before removal of hardstand is commenced, a careful inspection of these areas will be undertaken to identify the presence of contamination. If this inspection indicates the visual presence of any contamination relating to treatment operations, validation of the soil beneath the hardstand will be undertaken. These works will comprise the collection and analysis of validation samples on a 20 m sampling grid. Validation samples will be collected from the soil surface (0.0 to 0.15m depth) underlying the hardstand and analysed as per **Section 19.6**.

19.6 Validation Laboratory Analysis

All soil and groundwater validation samples will be analysed by National Association of Testing Authorities (NATA) accredited laboratories. The suite of analysis required for will be as follows:

- VMP Remediation Works:
  - Remediated areas – analysis for the relevant soil SSTCs (refer to **Table T1**, **Appendix A**);
  - Material proposed to be reused at the Site - analysis for the relevant soil SSTCs (refer to **Table T1**, **Appendix A**); and
  - Groundwater monitoring on the down hydraulic gradient Declaration Area boundary - determined by the relevant groundwater SSTCs and MWQCs detailed in **Section 7.1**.
- Block 4 Development Remediation Works:
  - Remediated areas – analysis for the relevant soil SSTCs (refer to **Table T1**, **Appendix A**);
  - Material proposed to be reused - analysis for the relevant soil SSTCs (refer to **Table T1**, **Appendix A**); and

- Groundwater monitoring on the down hydraulic gradient Block 4 boundary (if required, refer to **Section 17.4.3**) - determined by the relevant groundwater SSTCs detailed in **Section 7.2.4.3**.

- VMP and Block 4 Remediation Works:
  - Validation of treatment area and stockpiling areas - analysis for the relevant soil SSTCs (refer to **Table T1**, **Appendix A**).

If field observations during the remediation works indicate that ACM are present within the Site's fill materials, validation soil samples will also be analysed for asbestos in appropriate areas and in accordance with **Section 14.7.8**.

19.6.1 Analytical Methods

Two laboratories will analyse original, duplicate and triplicate soil samples using NATA registered methods. Both laboratories must undertake the required analytical testing in accordance with the requirements of the *NEPM* (1999). Details regarding the analytical methods to be used will be discussed with the NSW EPA Accredited Site Auditor and the appropriate analytical laboratory engaged to undertake the works.

19.7 Soil Sampling Methodology

Fieldwork will be conducted in accordance with written standard operating procedures, copies of which will be maintained in a register on-site during the remedial works. This will ensure that representative samples of materials are collected and the sampling methodology remains consistent throughout the duration of the remedial works.

19.7.1 Soil Sampling Methodology

Sample collection will be by:

- split spoon sampler (or equivalent) for:
  - validation of S-ISCO® treated material to remain *in situ* (refer to **Section 19.4.1** and **19.4.2**); and
  - *in situ* characterisation / validation of fill materials (if required).
- sampling trowel from excavation bases and walls (refer to **Section 19.5.1** and **19.5.2**); and
- grab samples directly from the centre of an excavator bucket from the centre of stockpiles for validation of treated material (refer to **Section 19.5.5**).

All validation sample points will be surveyed.

Materials will be described in accordance with the Unified Soil Classification System (USCS), with soil type, descriptive properties (colour, particle size, moisture content, sorting), as well as discolouration, staining, odours and other indications (if any) being noted. The information will be recorded on field logs completed for each location.

On-site screening of samples for volatile organic compounds (VOCs) in the field will be undertaken using a portable photoionisation detector (PID). The PID will be calibrated at least once daily (at the start of each sampling day) with a known concentration of isobutylene.

Soil samples will be placed into laboratory supplied glass jars as soon as practicable after collection. The jar size will be sufficient to meet the laboratory requirements for the requested analysis. All sample containers will be filled completely using a method such that the loss of volatile components is minimised. All sample containers will be clearly labelled with information such as sample number, sample location, depth, date collected and sampler's identification. After filling, sample containers will then be transferred to a chilled esky for sample preservation prior to and during shipment to the testing laboratory. The sample preservation requirements are listed in **Table 15** below.

Table 15 Soil Sample Preservation and Storage

Analyte	Preservation	Storage
Inorganics		
Metals (General)	Unpreserved, glass jar with Teflon lined lid.	Store at <4°C, analysis within 6 months.
Metals (Chromium VI by alkali digestion)	Unpreserved, glass jar with Teflon lined lid.	Store at <4°C, extract within 28 days, analyse within 7 days.
Metals (inorganic Mercury)	Unpreserved, glass jar with Teflon lined lid.	Store at <4°C, analysis within 28 days.
Cyanide	Unpreserved, glass jar with Teflon lined lid.	Store at <4°C, extraction within seven days, analyse within 14 days.
Organics		
TPH C_6-C_9	Unpreserved, glass jar with Teflon lined lid.	Store at <4°C, nil headspace, analysis within 14 days.
TPH C_{10}-C_{36}	Unpreserved, glass jar with Teflon lined lid.	Store at <4°C, extraction within 14 days, analysis within 40 days.
BTEX	Unpreserved, glass jar with Teflon lined lid.	Store at <4°C, nil headspace, analysis within 14 days.
PAHs	Unpreserved, glass jar with Teflon lined lid.	Store at <4°C, extraction within 14 days, analysis within 40 days

A sample register will be updated daily to manage and track the validation process.

19.7.2 Sampling Equipment Decontamination

Equipment decontamination will be undertaken as described below. The following equipment will be needed for the detergent wash and water rinse decontamination process:

- laboratory (phosphate-free) detergent or Decon 90;
- tap water and deionised water;
- buckets or tubs (sufficient for size of equipment to be cleaned); and
- stiff brushes for cleaning.

Equipment that cannot be thoroughly decontaminated using the detergent wash and water rinse should be steam cleaned, or if a steam cleaner is not available, not used for further sampling (and marked clearly "not decontaminated") or discarded. Equipment decontaminated using the high pressure steam cleaner will be further decontaminated as described above.

19.7.3 Quality Control samples

The following quality control (QC) samples will be collected as part of the field quality control procedures:

- Intra-Laboratory Duplicates – are identical to field samples, but both samples are sent anonymously to the primary laboratory. Blind duplicates provide an indication of the analytical precision of the main testing laboratory, but may also be affected by sampling techniques and inherent heterogeneity in the sample medium;
- Inter-Laboratory Duplicates – are identical to blind duplicates, but the duplicate sample is sent to the second (check) laboratory. Split duplicates provide an indication of the accuracy of the main testing laboratory;
- Trip Blanks/Spikes – are samples of soil or water prepared by the laboratory with either zero or known anolyte concentration. Trip blanks/spikes are a check on the sample contamination originating or lost from sample transport and handling, and shipping. One Trip Blank/Spike will be analysed per sample batch;
- Field Blanks – are similar to trip blanks except the water is transferred to sample containers on-site. Field blanks are a check on sample contamination originating from sample transport, handling, shipping, site conditions or sample containers. One Field Blank will be analysed per water sample batch; and

- Rinsate blanks - one rinsate blank sample (from an item of sampling equipment) will be collected per day of sampling by running distilled water over the selected item and decanting directly into the sample bottle. The rinsate will be taken from the final rinse of the equipment after decontamination.

Procedures for duplicate sampling will be identical to those used for routine sampling and duplicate samples will be despatched for analysis for the same parameters using the same methods as the routine sample. Duplicate soil samples will be collected from directly adjacent to original samples (i.e., from the adjacent area of the excavation base or wall). No homogenisation of samples will occur to reduce the loss of volatile compounds.

Duplicates and equipment blank samples will be collected as follows:

- Intra-Laboratory duplicate samples will be collected at a rate of approximately 1 in 10 soil samples and analysed for the full analyte suite. At least one blind duplicate sample will be included in each batch of samples;
- Inter-Laboratory duplicates samples will be collected at a rate of approximately 1 in 20 soil samples and analysed for the full analyte suite. At least one split duplicate sample will be included in each batch of samples; and
- One equipment blank of soil sampling equipment will be collected for every day of sampling and analysed for the full analyte suite. At least one equipment blank will be included in each batch of samples.

19.7.4 Laboratory QA/QC

The laboratories will undertake the analyses utilising their internal procedures and their test methods (for which they are NATA, or equivalent, registered) and in accordance with their quality assurance (QA) system which forms part of their registration.

Laboratory quality control procedures, which will be used during the project, will comprise the following:

- Laboratory Duplicate Samples – these are sub-samples taken from one sample submitted for analytical testing in a batch. A laboratory duplicate provides data on analytical precision. The rate of duplicate analysis will be according to the requirements of the laboratory's accreditation but will be at least one per batch;
- Matrix Spiked Samples – the purpose of the matrix spike is to monitor the performance of the analytical methods used, and to determine whether matrix interferences exist. A sample is spiked by adding an aliquot of known concentration of the target analyte(s) to the sample matrix prior to sample extraction and analysis. A spike documents the effect of the sample matrix on the extraction and analytical techniques. These will be analysed at a rate of approximately 5% of all analyses. At least one per batch will be reported;
- Laboratory Blank – this is usually an organic or aqueous solution that is as free of analyte as possible and contains all the reagents in the same volume as used in the processing of the samples. The reagent blank must be carried through the complete sample preparation procedure and contains the same reagent concentrations in the final solution as in the sample solution used for analysis. The reagent blank is used to correct for possible contamination resulting from the preparation or processing of the sample. Blanks will be analysed at a rate of once per process batch, and typically at a rate of 5% of all analyses;
- Laboratory Control Samples – these comprise either a standard reference material or a control matrix fortified with analytes representative of the analyte class. Recovery check portions should be fortified at concentrations that are easily quantified but within the range of concentrations expected for real samples. These will be analysed at a rate of one per process batch, and typically at a rate of 5% of analyses; and
- Surrogates – surrogate spikes are known additions to each sample, blank and matrix spike or reference sample analysis, of compounds which are similar to the analytes of interest in terms of:
    - extraction;
    - recovery through clean-up procedures; and
    - response to chromatography or other determination;

    but which:

    - are not expected to be found in real samples;
    - will not interfere with quantification of any analyte of interest; and

- may be separately and independently quantified by virtue of, for example, chromatographic separation or production of ions of different mass in a GC/MS analyser.

Surrogate spikes are added to the analysis before extraction. The purpose of surrogates is to provide a means of checking, for every analysis, that no gross errors have occurred at any stage of the procedure leading to significant analyte losses. Other internal laboratory quality control procedures, as required for NATA, or equivalent, registration, will also be performed.

Results of the QC analyses for both laboratories will be reported with each batch.

19.8 Groundwater Validation - VMP Remediation Works

19.8.1 GMP Compliance Monitoring

As detailed in **Section 17.4.1**, a GMP will be prepared to detail groundwater monitoring requirements for the Declaration Area both during and following the remediation works. The groundwater monitoring will be undertaken to assess groundwater quality migrating from the Declaration Area against:

- the relevant groundwater $SSTC^{VMP}$ across the Declaration Area; and
- the MWQCs on the down hydraulic gradient boundary of the Declaration Area (in accordance with NSW EPA policy, refer to **Section 7.1.3**).

As per the *VMP Remediation Extent Report* (AECOM, 2013c), the VMP Remediation Works groundwater monitoring will include the following identified SSTCs CoPCs (refer to **Section 7.1.1**):

- Benzene;
- TPH C_{10}-C_{28};
- naphthalene and acenaphthylene; and
- cPAHs; and
- ammonia.

Groundwater monitoring to confirm whether groundwater quality at the down hydraulic gradient Declaration Area boundary is approaching the MWQC (in accordance with NSW EPA policy, refer to **Section 7.1.3**) will include the following CoPCs (refer to **Section 7.1**):

- PAHs – acenaphthene, acenaphthylene, anthracene, fluorene, naphthalene and phenanthrene;
- Phenols;
- Benzene, Toluene, Ethylbenzene and Xylene;
- TPH C_6 –C_9, C_{10} -C_{14}, C_{15}-C_{28} and C_{29}-C_{36}; and
- Ammonia.

The validation program included in the GMP will serve to validate that the remediation (either S-ISCO® or ex situ) has achieved the remediation objectives with respect to groundwater quality at the Declaration Area boundary.

19.8.2 Groundwater Validation (*In situ* Remediation)

If S-ISCO® remediation works are undertaken within the remediation areas, the following groundwater validation works will be undertaken:

- Compliance groundwater monitoring wells will be installed at 40 m intervals (or existing wells used if appropriate) across the S-ISCO® treatment areas;
- The groundwater monitoring well network may include monitoring wells required for the S-ISCO® treatment and new wells installed to provide the required minimum coverage (as required);
- Groundwater monitoring wells will be installed at 40 m intervals (or existing wells used if appropriate) along the down hydraulic gradient Declaration Area boundary;
- Groundwater monitoring wells may be constructed with multiple screen intervals to allow sampling from various depths. The required screen intervals will be informed by the findings of the S-ISCO® and SEPR™ Pilot Trial Report (refer to **Section 16.2**) and will be detailed in the GMP (refer to **Section 17.4.1**);

- Groundwater samples collected from groundwater monitoring wells:
    - within the Declaration Area will be analysed for analytes corresponding with the groundwater SSTCs (refer to **Section 7.1.2**); and
    - at the down gradient Declaration Area boundary will be analysed for analytes corresponding with the MWQCs (refer to **Table T2**, **Appendix A**); and
- Groundwater samples will be collected using the methodologies detailed in **Section 19.10**.

In accordance with the approach outlined in the *VMP Remediation Extent report* (AECOM, 2013c) upon completion of the VMP Remediation Works, final groundwater CoPC concentrations:

- within the S-ISCO® treatment area(s) should:
    - not exceed the relevant groundwater SSTCs; and
    - demonstrate an asymptotic decrease relative to the baseline and interim CoPC concentrations reported from monitoring during the remediation works; and
- at the down hydraulic gradient Declaration Area boundary should approach the MWQC.

The details of the groundwater validation works provided herein will be subject to confirmation based on the outcomes of the proposed S-ISCO® Pilot Trial Proving Phase (refer to **Section 16.1**)and Pilot Trial (refer to **Section 16.2**). Any refinement of the approach described following will be detailed in the GMP (refer to **Section 17.4.2**).

19.8.3 Groundwater Validation (ex situ remediation)

It is considered that the groundwater analysis undertaken as part of the GMP compliance monitoring (refer to **Section 19.8.1**) will demonstrate validation of ex situ remediation works should they be implemented as part of the VMP Remediation Works.

19.9 Groundwater Validation – Block 4 Development Remediation Works

19.9.1 Groundwater Validation (ex situ remediation)

If the preferred ex situ remediation option is adopted, groundwater monitoring will not be required within Block 4 for the following reasons:

- As detailed in **Section 9.2.2**, the proposed extent of remediation works includes removal of the identified SPGWT and CIM from the eastern portion of Block 4. This approach is consistent with the remediation strategy of removing the source of potential groundwater contamination;
- The required bulk excavation works (extending to a depth of 8 m bgl) will include removal of a significant depth of bedrock. Consequently, much of the basement excavation will be founded directly in bedrock where groundwater flows are very low;
- Engineering mitigation measures will be considered to address residual SPGWT identified in the excavated bedrock surface as per the contingency requirements detailed in **Section 23.11**;
- The basement groundwater retention wall system (refer to **Section 4.3**) will largely prevent groundwater flow from Block 4 to other site areas; and
- It will not be practical to install and monitor groundwater monitoring wells within Block 4 once the basement has been constructed.

19.9.2 Groundwater Validation (*In situ* Remediation)

If the alternative remediation strategy of *in situ* remediation is undertaken in Block 4 (refer to **Section 11.1.3**), the groundwater validation works will be undertaken in accordance with **Section 19.8.2**.

19.10 Groundwater Sampling Methodology

Groundwater sampling will be conducted in accordance with written standard operating procedures, copies of which will be maintained in a register on-site during the remedial works. This will ensure that representative

groundwater samples are collected and the sampling methodology remains consistent throughout the duration of the remedial works.

A summary of the groundwater monitoring methodology is provided in **Table 16** following. Further details of the groundwater sampling methodology will be detailed in the GMP (refer to **Section 17.4.1**).

Table 16 Groundwater Sampling Methodology

Activity/Item	Details
Monitoring Parameters	Monitoring should include the following: - Groundwater depth (converted to m Australian Height Datum); and - Field parameters (including temperature, electrical conductivity, pH, dissolved oxygen and redox potential). Laboratory Analysis for the groundwater SSTCs detailed in **Table T2** and the MWQCs.
Well Gauging	Monitoring wells should be gauged using a calibrated water level probe. The probe should be decontaminated between each measurement. Water levels should be gauged from the surveyed point on the casing. Details of the gauging dates and depths recorded are to be provided as part of reporting requirements.
Well Surveying	A licensed surveyor will be engaged to survey the location and elevation of the groundwater monitoring network to Australian Height Datum (m AHD).
Well Purging and Sampling Process	All groundwater monitoring wells should be purged using low flow (such as Micropurge) pumping prior to sampling, using new disposable low-density polyethylene (LDPE) bladders, in conjunction with flow cells as necessary and dedicated LDPE tubing. The GMP will detail the length of screen to be installed within monitoring wells and the depth of the sampling inlet tubing in each well to standardise validation conditions. The LDPE tubing will be disposed of appropriately after each sampling event. Measurement of field water parameters should be conducted continuously and purging continued until groundwater field quality parameters have stabilised. An appropriately experienced environmental consultant should be engaged to carry out these activities.
Decontamination Procedure	Monitoring and sampling equipment should be decontaminated according to the following procedure: - Wash with Decon 90 or similar decontaminant / water solution and rinse. - Triple wash with laboratory supplied clean deionised water.
Sample Method and Preservation	Following stabilisation of field parameters, samples should be placed into laboratory-supplied bottles containing appropriate preservatives for the selected analytical testing. Samples should be immediately chilled and stored at a temperature of 4°C or less prior to transit to the laboratory.
Disposal of Purged Groundwater	If required, purged groundwater should be disposed of at the on-site water treatment plant or off-site to a licensed waste receiving facility. Purged groundwater may be placed in drums for characterisation and disposed in accordance with the DECCW (2009) *Waste Classification Guidelines* or any subsequent revision. If required, a licensed contractor should be engaged to dispose of the water to an appropriately licensed facility.
Analytical Laboratories	Both a primary laboratory and secondary (QC) laboratory should be used. Both laboratories should be accredited by NATA for the analyses undertaken.
Quality Assurance / Quality Control (QA/QC)	QA/QC samples collected for quality control purposes during each round of groundwater sampling will be consistent with the requirements of **Section 19.7.3** and **19.7.4**. Discussion of the laboratory and field quality assurance/quality control and analytical data validation should be included in the reporting requirements.
Sample Nomenclature	Sample nomenclature will be consistent between sampling events.

19.11 Validation Data Quality Objectives

The Data Quality Objectives (DQO) process is a systematic, seven-step process that defines the criteria that an investigation should satisfy. DQOs for the validation works have been developed based on the iterative DQO

process developed by the USEPA (2000) *Guidance for the Data Quality Objectives Process* – EPA QA/G-4 and adopted by DEC (2006a). The guidelines incorporate field quality control and laboratory analysis, methods and information on laboratory quality control data and have been used to validate the field and analytical data for the validation works.

The DQO approach follows the general guidance provided in Appendix IV of DEC (2006a) with respect to setting the DQOs and assessing their achievement by reference to the Data Quality Indicators (DQIs) set out in Appendix V of DEC (2006a). The approach has been modified to focus on setting appropriate objectives and ensuring the reliability of data from both field and laboratory procedures. The approach puts more emphasis on Step 5 (Developing the analytical approach to assessing data), which assesses the reliability of both the field and laboratory data and on demonstrating achievement of the objectives of the validation works. The approach assesses achievement of Step 6 (performance or acceptance criteria that data need to achieve) by reference to DQIs for both field and laboratory procedures.

The DQOs are detailed in the following Sections.

19.11.1 Step 1 – State the problem

Parts of the Site have been impacted by the historic gas works located across most of the Site (refer to **Section 3.2**). The reclamation of the Site with fill materials (refer to **Section 3.2**) is also likely to have impacted soil and groundwater quality. The discussed activities' has caused metals, BTEX, PAH, phenols and TPH contamination in the soils and groundwater in some areas of the Site.

The *VMP HHERA* (AECOM, 2012c) and *Declaration Site HHERA* (AECOM, 2011a) has concluded that some chemicals are present in the Site soils and groundwater at concentrations which may pose a risk to human health or the environment. Consequently, remediation or management of soils and groundwater in some areas of the Site is required.

A validation program is required to demonstrate that the remedial works required to mitigate the risks to human health and the environment have achieved the objectives of this RAP.

19.11.2 Step 2 – Identify the decisions

The decisions to be made relate to whether the validation program has demonstrated that the remedial works have achieved the objectives of this RAP:

- Is the remediated Declaration Area protective of human health in the context of the Site's current land use in its current form?
- Is the remediated Block 4 protective of human health in the context of the proposed Block 4 Development Works?
- Has the remediated Declaration Area been remediated to a standard that will be protective of the environment (specifically groundwater down hydraulic gradient of the Declaration Area and ultimately Darling Harbour)?
- Do the completed remediation works comply with applicable legislative requirements including the appropriate requirements of the NSW DoPI and NSW EPA?
- Has the remediated Declaration Area been remediated to a standard which enables the NSW EPA's declaration of the Site as a Remediation Site (Declaration Number 21122; Area Number 3221) to be revoked (to be determined by the NSW EPA)?

19.11.3 Step 3 - Identify the decision inputs

Inputs to the decision that need to be made with respect to whether the proposed remediation works at the Site have achieved the stated objectives are:

- The results of previous investigations (refer to **Section 5.0**);
- The use of appropriate remediation criteria (refer to **Section 7.0**) as described in the *VMP HHERA* (AECOM, 2012c), *VMP Remediation Extent* report (AECOM, 2013c) and *Declaration Site HHERA* (AECOM, 2011a);
- The development and implementation of remedial options;
- The data to be obtained during soil sampling during the validation testing discussed in **Section 19.4** and **19.5**;

- The data to be obtained during groundwater sampling during the monitoring discussed in **Section 17.4.1** and **19.8**;
- The use of appropriate validation field methods, including sampling and preservation of soil and groundwater samples;
- The use of NATA registered methods for all analysis; and
- Confirmation that the DQIs have been achieved.

19.11.4 Step 4 – Definition of the boundaries of the remedial works

This is clearly defined by reference to the Site address and surveyed site areas (including the Declaration Area, refer to **Section 3.1** and **Figure F2** in **Appendix B**).

19.11.5 Step 5 – Develop decision rules

The quality of data from field and laboratory procedures will be achieved by assessing data with reference to DQIs. The criteria will be as follows:

Table 17 Field and Laboratory Data Quality Indicators

Data	Data Quality Indicators
Field	
Field Personnel	Use appropriately trained field personnel.
Field data collection	Site conditions and sample locations properly described. All soil sample and groundwater monitoring well locations will be surveyed. Information to be recorded in field notes. Field notes are appropriately completed.
Sample handling (storage and transport)	Soil and water samples will be collected will be collected in accordance with **Section 19.7** and **19.10**.
Field duplicates	As per the requirements of **Section 19.7.3**.
Field blanks	As per the requirements of **Section 19.7.3**.
Calibration of Field Equipment	On-site screening of samples for volatile organic compounds (VOCs) in the field will be undertaken using a portable photoionisation detector (PID). The PID will be calibrated at least once daily (at the start of each sampling day) with a known concentration of isobutylene. Water quality meters will be calibrated prior to the commencement of field activities with relevant solutions. The calibration will be in accordance with manufacturer's instructions or NATA publications *General Requirements for Registration: Supplementary Requirement: Chemical Testing (NATA 1993) and Technical Note N0. 19* (NATA 1994). Where satisfactory calibration cannot be achieved, the equipment will not be used. Calibration details will be recorded on field sheets, which will be included in the final report.
Laboratory	
Sample Analysis	All sample analyses to be conducted using National Association of Testing Authorities (NATA) certified laboratory using *NEPM* (1999) procedures. Use NATA certified check laboratory.
Holding times	Maximum acceptable sample holding time will be as follows: - BTEX - 14 days; - TPH C_6-C_9 - 14 days; - TPH C_{10}-C_{36} - extract within 7 days, analyse within 40 days; - PAHs - extract within 7 days, analyse within 40 days; - Phenols - extract within 7 days, analyse within 40 days; and - Ammonia - 28 days.
QA/QC samples	As per the requirements of **Section 19.7.4**.
Practical Quantitation Limits (PQLs)	All PQLs to be less than the remediation criteria.

Data	Data Quality Indicators
Laboratory Relative Percentage Difference (RPD)	The RPDs of replicates will be determined and compared to the following criteria (from tender brief) for acceptability: - Less than 20 percent for laboratory duplicates where the detection is greater than 20 times the PQL; - Less than 50 percent for laboratory duplicates where the detection is greater than 10 times the PQL and less than 20 times the PQL; and - No limit where concentration less than 10 times PQL
Control Spike Duplicate RPDs	RPDs for Control Spike Duplicates will be compared to an acceptable limit of 20% and undertaken at 1 in 20 samples or a minimum of 1 per batch.
Matrix Spike Duplicates RPD	RPDs for Matrix Spike Duplicates will be compared to an acceptable limit of 20% and undertaken at a minimum of 1 in 20 samples.
Control Spike and Matrix Spike Recoveries	Percent recoveries of control spikes and matrix spikes will be compared to an acceptable range of 75–130 % and/or the laboratories internal DQI limits.

Corrective Actions

Analytical data that fails to meet the predetermined DQIs listed in **Table 17** above will be managed using the following corrective actions on a case-by-case basis:

- Inspect samples to determine heterogeneity;
- Reanalyse suspect samples;
- Evaluate and amend sampling and/or analytical procedures;
- Re-sampling and re-analysis;
- Accept the data with an acknowledged level of bias and imprecision; and
- Discard the data.

In the event that data of questionable reliability are used, then it is essential that any restrictions and limitations associated with the use of such data are clearly identified. Failure to meet the DQIs will be reported and the implications to data quality will be assessed.

If the DQIs are considered to have been achieved satisfactorily then it will be concluded that the data is suitable for use for validation purposes. If the DQIs are not achieved, the significance of possible errors will be assessed to decide whether the data is useable.

19.11.6 Step 6 – Specification of the acceptable limits on decision errors

Specification of the acceptable limits on decision errors will be achieved by reference to the DQIs outlined below:

Precision

Precision measures the reproducibility of measurements under a given set of conditions. The precision of the laboratory data and sampling techniques will be assessed by calculating the Relative Percent Difference (RPD) of duplicate (laboratory and field) samples. The criteria to be used for the assessment of RPD will be based on guidelines given in AS4482.1 1997. These criteria listed in **Table 18** below.

Table 18 RPD Assessment Criteria

Sample Type	Typical Acceptable RPD [a]
Intra-Laboratory Duplicate	30-50% [b]
Inter-Laboratory Duplicate	30-50% [b]

Notes: a) The significance of RPDs of results should be evaluated on the basis of sampling technique, sample variability, absolute concentration relative to criteria and laboratory performance.

b) This variation can be expected to be higher for organic analysis than for inorganics and for low concentrations of analytes which are close to the laboratory LOR.

If duplicate results are not within the acceptable RPD range, investigation into the cause will be initiated. The results of the investigations will be written up and filed, and followed up with the laboratories to achieve resolution. Thus the precision of the laboratory will be assessed by the acceptability of the RPD of laboratory duplicate samples, which should be within the acceptable RPD limits as established for intra-laboratory and inter-laboratory duplicates.

Accuracy

Accuracy measures the bias in measurement. Accuracy can be impacted by factors such as field contamination of samples, poor preservation of samples, poor sample preparation techniques and poor selection of analysis techniques by the analysing laboratory and improper analyses.

The accuracy of the laboratory data that will be generated during the project is a measure of the closeness of the analytical results obtained by a method to the 'true' value. For reference laboratory methods (e.g. USEPA methods), the following levels of accuracy should generally be achievable within ± 15 % of:

- the expected value of a certified reference material of similar matrix; or
- the value obtained by a separately validated and recognised quantitative method for the sample matrix.

Accuracy will be assessed by:

- reference to the analytical results of laboratory control samples;
- use of trip, equipment and field blanks to check the accuracy of sampling techniques; and
- evaluating the results of laboratory spikes and analyses against reference standards.

Analytical results of these should be sufficient to establish that accuracy has been achieved in the work of the sampling team.

Representativeness

Representativeness expresses the degree to which sample data accurately and precisely represents a characteristic of a population or an environmental condition. Representativeness will be achieved by collecting samples on a grid basis from an adequate number of sample locations, to validate the subject area to the required accuracy and ensuring that an appropriate number of reliable analyses have been reported for each population or environmental condition, and that the concentrations of CoPC have been maintained in the samples during and after their collection. Consistent techniques and methods using written procedures will be utilised throughout the sampling program.

Completeness

Completeness is defined as the percentage of measurements made which are judged to be valid measurements. The completeness goal is set at there being a sufficient amount of valid data generated during the validation works. If there are insufficient valid data, as determined by the other DQIs, then additional data will be required to be collected.

Comparability

Comparability is a qualitative parameter expressing the confidence with which one data set can be compared with another. This will be achieved through maintaining a level of consistency in techniques used to collect samples, and ensuring the selected laboratories use consistent analytical techniques and reporting methods. Reporting of results will be done in consistent units and nomenclatures, and comparability will be achieved by ensuring that precision and accuracy objectives are met.

19.11.7 Step 7 – Optimisation of the design of the collection of data

This will be achieved by meeting the DQOs detailed in Steps 1 to 6 to confirm that the data generated from the remedial works is from appropriate locations, that analytical testing is undertaken for the identified CoPC, in appropriate quantities and of acceptable quality to confirm that the objectives of the remedial works have been achieved.

19.12 Validation Reporting

Following completion of the remediation and validation works, validation reports will be prepared. Depending on the final staging of the remediation works (as discussed in **Section 1.8**), it is anticipated that separate validation reports will be required for each of the Site areas as follows:

- Block 4;
- Block 5 (within the Declaration Area); and
- Hickson Road (within the Declaration Area).

The reporting requirements for the different areas will be confirmed with the various stakeholders including, but not limited to the Lend Lease, the NSW EPA Accredited Site Auditor, NSW EPA and the Authority.

Due to the potential staging of the remediation works in the above Site areas, separate Validation reports may also be prepared for the Declaration Area to enable the NSW EPA's Declaration to be progressively revoked (as required).

It is anticipated that the validation reporting will be undertaken in a manner which enables the NSW EPA Accredited Site Auditor to prepare Site Audit Statements confirming whether:

- the Declaration Area (or parts thereof) has been remediated to a standard to enable the NSW EPA Declaration to be revoked (i.e. the VMP Remediation Works); and/or
- Block 4 has been remediated to a standard suitable for the proposed post development land uses (i.e. the Block 4 Development Remediation Works).

The validation reports will be prepared in accordance with the requirements of the NSW EPA (2011) *Guidelines for Consultants Reporting on Contaminated Sites* and will include the following information:

- An overview of the remediation works carried out for each validation area;
- A summary of the site history and basis for the remediation approach for the validation areas;
- Surveyed figures outlining the extent of the remediation works;
- The location of validation and characterisation samples;
- Descriptions of sampled materials (including visual and olfactory observations);
- Field Equipment calibration certificates/records;
- Photographic documentation of the bedrock validation works;
- Details of imported material used at the Site;
- Waste classification certificates and landfill waste disposal information;
- Summary tables for soil and groundwater analytical results;
- Confirmation that the project DQO's and DQIs have been appropriately met;
- NATA registered laboratory analytical certificates;
- Summary of the tracking and fate of materials including materials excavated for on-site treatment, reuse on-site or off-site disposal;
- Landfill weighbridge dockets (if required);
- Conclusions as to the suitability of the Site, specifically:
    - for the VMP Remediation Works, that the remediated Declaration Area is appropriate to enable the NSW EPA's declaration of the Declaration Area as a Remediation Site to be revoked; and
    - for the Block 4 Development Remediation Works, that Block 4 is remediated to a standard suitable for the proposed development in Block 4.
- Recommendations (if required) for further works.

20.0 Environment Management Plan – During Remediation

20.1 General

This section of the RAP describes the minimum standards to be adopted to protect the environment during the remediation works. The Remediation Contractor will develop and implement a suitable Environmental Management System in compliance with legislative and regulatory requirements. A site-specific Environmental Management Plan (EMP) will be developed prior to commencement of the works. The EMP will detail the appropriate information and mitigation measures necessary to conduct the remediation works in a manner that will minimise the risk to the environment.

20.2 Water Management

The Environment Management Plan for the works will include procedures for the management of surface and groundwater during the works as outlined in **Section 17.0**.

20.3 Air Quality Management

An Air Quality Impact Assessment will be prepared in accordance with the Approved Methods for the Modelling and Assessment of Air Pollutants in NSW (DEC, 2005) to assess potential air and odour issues generated during the remediation works. This assessment will make reference to the following guidance documents:

- *Assessment and Management of Odour from Stationary Sources in NSW: Technical Framework* (DEC 2006c); and
- *Management of Odour from Stationary Sources in NSW: Technical Notes* (DEC 2006d).

20.3.1 Odours

Odour management is recognised as a critical aspect of site environmental management and will need to be given high priority in the planning of all excavation and stockpiling of contaminated soil at the Site. Odours are expected during the soil excavation, and consequently, management procedures will need to be developed within the EMP to address odour issues during all remediation works involving excavation.

Primarily, odours at the Site will be associated with the excavation of hydrocarbon impacted materials. Odour generation at the Site will be influenced by weather conditions, the extent of open excavations stockpiles, and the quality of material exposed.

A detailed odour management system will be developed as part of the EMP incorporate the use of various management options as deemed appropriate for particular areas. The odour management system will include the following options:

- investigation as to the source of odours including odour monitoring;
- minimisation of the quantity or surface area of exposed odorous materials;
- implementation of odour management response procedures (as specified in the EMP);
- implementation of progressive contingency measures (as specified in the EMP);
- excavation within an EE (odorous soils), where practical;
- stockpiling in the RE (odorous soils);
- covering of exposed odorous materials progressively or at the completion of each work period;
- minimising exposed/excavation areas;
- apply odour suppressant sprays or foams to excavation surfaces; and
- undertake activities during favourable weather conditions.

The management of odours is recognised as a critical aspect of the environmental management of the proposed remediation works. Selection of the appropriate management and mitigation measures, including those summarised above, will be based on consideration of:

- the quantity of odorous materials that require remediation;

- the duration of the required remediation works and associated management of odorous materials;
- the proximity of the proposed remediation works to sensitive receptors;
- the prevailing and forecast weather conditions; and/or
- other activities being undertaken at the Site in parallel with the remediation work.

20.3.2 Dust

Care should be taken to manage wind-blown dust at the Site during excavation and earthworks activities. Dust can be generated through a range of means and activities:

- Wind action:
  - Exposed soil surfaces will generate dust during winds;
- Agitation and movement:
  - Excavation, mixing and placement of soil will generate dust;
  - Transfer of soil in uncovered trucks may result in dust generation;
- Vehicle Movements:
  - Vehicles' wheels on exposed soil surfaces (such as unsealed roadways) will generate dust.

Appropriate management of dust is required to ensure that it is minimised and/or prevented. Dust management will include the following:

- Excavation in the excavation enclosure for the contaminated areas;
- Covering surfaces;
- Minimising exposed/excavation areas;
- Wetting down; and
- Dust monitoring.

20.4 Noise and Vibration Management

An assessment of noise and vibration impacts potentially generated during the remediation works will be prepared in consultation with the NSW EPA. The assessment will be prepared in accordance with the *Interim Construction Noise Guideline* DECC (2009)*, Industrial Noise Policy* (NSW EPA 2000) and *Application Notes, Environmental Criteria for Road Traffic Noise* (NSW EPA 1999) *and Assessing Vibration: A Technical Guide* (DEC 2006b).

The potential for noise and vibration impacts from the remediation works will result from:

- Works associated with preparation of the Site;
- Movement of construction vehicles around the Site;
- Operation of plant and activities on the Site; and
- Operation of the proposed ECS associated with the EE and RE (which will necessarily operate 24 hours per day, 7 days per week).

20.5 Long Term Environmental Management Plan

It is anticipated that a Site Management Plan may be required to describe contingency management methods which may need to be applied by future land owners if they wish to re-develop the Site for any other land use different to its current site condition or as per the proposed Block 4 Development Works (refer to **Section 4.0**).

The Site Management Plan will be prepared as an outcome of the Soil Validation Program and in consultation with the NSW EPA Accredited Site Auditor.

On the basis that both the key assumptions and requirements of this RAP and the *VMP HHERA* (AECOM, 2012c) and *Declaration Site HHERA* (AECOM, 2011a) are successfully delivered and implemented during the execution

of the works, and validated accordingly upon completion, no other form of Long Term Management Plan is envisaged as a requirement of this RAP.

21.0 Occupational Health and Safety – During Remediation

21.1 General

This section of the RAP describes the minimum standards to be adopted to protect the health and safety of all persons involved in the remediation works. The Remediation Contractor will develop and implement a suitable Health and Safety Management System in compliance with legislative and regulatory requirements. A site-specific Occupational Health and Safety Plan (OHSP) will be developed prior to commencement of the works. The OHSP will detail the appropriate health and safety information necessary to conduct the remediation works in a safe manner. The OHSP will be endorsed by a suitably qualified occupational hygienist.

21.2 Occupational Health & Safety Plan

The purpose of the site-specific OHSP is to present all relevant health and safety information for the works. The information presented in the OHSP will include:

- Assignment of responsibilities for management personnel and workers;
- An outline of the existing Site conditions;
- Details of all work to be conducted;
- An evaluation of hazards and risks;
- Details of the proposed measures to be implemented to manage the identified hazards and risks;
- Establishment of personnel protection standards and mandatory safe work procedures;
- Establishment of OHS monitoring protocols;
- Training requirements for emergency team members;
- Communication protocols and training procedures;
- Evacuation procedures, emergency contacts and emergency drills to be implemented; and
- Provision for contingencies and changes in work practices.

21.2.1 Responsibilities

The responsibilities and duties of the Remediation Contractor in relation to OHS will include:

- Ensuring all work undertaken is performed in accordance with relevant legislation and regulations, and directions issued by regulatory authorities;
- Developing and documenting safe working practices for all employees and subcontractors;
- Ensuring workers are adequately trained to undertake their work tasks using the adopted work practices;
- Ensuring that work is performed in strict adherence to the adopted work practices;
- Appointing a suitably qualified and experienced Site Safety Officer (SSO) to supervise and control safety matters;
- Supplying and maintaining first aid kits, first aid facilities and ensuring first aid attendants are present in accordance with statutory requirements;
- Ensuring that all workers are inducted prior to their commencement of work. This will include site-specific training in regard to the site conditions, works procedures, emergency and evacuation procedures, first aid procedures, decontamination procedures and other relevant matters detailed in the OHSP;
- Ensuring that copies of the OHSP are readily available;
- Establishment and maintenance of a record of all hazardous substances on the Site including provision of Material Safety Data Sheets (MSDSs);
- Ensuring that all personnel who work with contaminated materials undergo a medical examination prior to and at the completion of their work on-site;

- Reporting all site incidents and accidents to the WorkCover Authority;
- Ensuring that the SSO is on-site during all site works to monitor compliance with the OHSP;
- Ensuring that regular documented OHS inspections are conducted, including the use of a documented follow-up system to monitor improvements and measures introduced to rectify any observations made;
- Supplying and maintaining the required personal protective equipment (PPE);
- Ensuring all workers are trained in the use of the PPE and correctly use PPE; and
- Ensuring that all electrical equipment, plant and tools comply with appropriate statutory requirements and are maintained in a good, serviceable and safe condition.

21.2.2 OH&S Legislation, Regulations and Standards

The remediation works will be conducted in compliance with applicable OH&S legislation, regulations and standards. In addition, the remediation works will comply with relevant industry codes of practice, guidelines and other publications that have been developed by the WorkCover Authority. These may include:

- *The Work Health and Safety Act* 2011 and *Regulation* 2011;
- *The Dangerous Good Act* 1975 and *General Regulation* 1999;
- *Guide for Riggers* (November 1995);
- *Electrical Practices for Construction Work* (February 1992); and
- *Exposure Standards for Atmospheric Contaminants in the Occupational Environment* (May 1995);

A number of Australian Standards have been identified relating to OH&S issues for the works proposed at the Site. These standards include:

- AS 1319 -1994 Safety Signs for the Occupational Environment;
- AS 1336 -1997 Recommended Practices for Occupational Eye Protection;
- AS 1470 -1986 Health and Safety at Work - Principles and Practices;
- AS 1715 -1994 Selection, Use and Maintenance of Respiratory Protective Devices;
- AS 1716 -2003 Respiratory Protective Devices;
- AS 1801 -1997 Occupational Protective Helmets;
- AS 1885.1 -1990 Measurements of Occupational Health and Safety Performance - Describing and Reporting Occupational Injuries and Disease (known as the National Standard for Workplace Injury and Disease Recording);
- AS 2161 - 2000 Occupational Protective Gloves;
- AS 2210 - 2000 Occupational Protective Footwear;
- AS 2436 -1981 Guide to Noise Control on Construction, Maintenance and Demolition Sites;
- AS 2601 -2001 The Demolition of Structures;
- AS/NZS 2865-2001 Safe Working in a Confined Space;
- AS 2986 -1987 Workplace Atmospheres - Organic vapours - Sampling by Solid Adsorption Techniques;
- AS/NZS 3012 -1995 Electrical Installations – Construction and Demolition Sites;
- AS 3640 -1989 Workplace Atmospheres - Method for Sampling and Gravimetric Determination of Inspirable Dust; and
- AS/NZS 4576 -1995 Guidelines for Scaffolding.

21.3 Risk Assessment

A hazard analysis should be conducted prior to site establishment to identify the OHS hazards expected during the course of the remediation works. A Risk Management Plan will be developed to identify hazards associated with the proposed remediation works, evaluate the associated risks and determine the necessary measures to reduce or mitigate those risks. This section of the RAP outlines some of the hazards expected over the course of the project. Hazard identification and risk assessment will be conducted and documented on an ongoing basis as the project works proceed.

21.3.1 Chemical Hazards

Based on the information provided in previous investigations at the Site, the presence of asbestos, metals, BTEX, phenols, TPH and PAHs has been confirmed within the Sites soils and groundwater. The hazard posed by these materials will be evaluated and the associated risks assessed in the Risk Management Plan.

21.3.2 Atmospheric Exposure Limits and Recognition Qualities

The exposure limits and recognition qualities of the chemicals likely to be encountered in the remediation works will be taken from the following guidelines (listed in order of precedence) and detailed in the OHSP:

- NOHSC, Exposure Standards for Atmospheric Contaminants in the Occupational Environment, 1995. The most up-to-date Australian exposure standards are located on the Safe Work Australia Hazardous Substances Information System (http://hsis.ascc.gov.au/SearchHS.aspx); and
- National Institute for Occupational Safety and Health (NIOSH) 2007, Pocket Guide to Chemical Hazards. Also refer to http://www.cdc.gov/niosh/npg/.

21.3.3 Additional Hazards and Risks

The OHSP will identify and describe a range of other hazards anticipated during the remediation works. These hazards will include:

- Heat stress;
- Explosive atmospheres in areas dealing with contaminated materials;
- Oxygen deficient atmospheres and confined spaces (as defined under AS/NZS 2865 - 2001 Safe Working in a Confined Space);
- Underground utilities;
- Underground pipelines, pits, and other obstructions;
- Above ground electrical and utility hazards;
- Traffic hazards (particularly noting that Hickson Road will remain operational during the remedial works);
- Instability of excavation batters and stockpiled material;
- Hazards associated with the construction and decontamination of the EE, RE and ECS;
- Hazards associated with operation of the treatment works;
- Hazards associated with the airlock and decontamination operations in the EE and RE; and
- Physical hazards such as trip hazards and mobile plant.

Specific minimum standards for these hazards will be outlined within the Risk Management Plan.

21.4 Work Zones

The Site will be divided into a number of work zones, as follows:

- Exclusion Zones – the RE (as detailed in **Section 15.1**);
- Decontamination Zones – decontamination stations located in the Remediation Area; and
- Support Zones – the site office and site facilities areas within the Remediation Area.

Movement of personnel and equipment between these zones will be minimised and restricted to specific access control points and decontamination stations to prevent cross contamination to clean areas.

21.4.1 Decontamination Stations

The decontamination stations will be the only entry and exit points to Exclusion Zones. The stations will be located to minimise the transportation of contaminants between the various areas of the Site, and to ensure that the Support Zone does not become contaminated or affected by other site hazards.

As discussed in **Section 13.3.1**, clean and dirty zones will be established at all decontamination stations. All workers will be required to pass through the Decontamination Stations when entering and exiting the Exclusion Zones.

These stations will also house the PPE stock rooms and change rooms, so that when entering the Exclusion Zones workers are able to apply the necessary PPE.

21.4.2 Support Zone

The Support Zone refers to the site office and other support facilities involved in administering the remediation works. Site personnel may wear normal work clothes within this zone, leaving any potentially contaminated clothing, equipment and materials in the decontamination station until decontaminated or appropriately disposed of.

In the event of an emergency, support zone personnel are responsible for alerting the correct authorities. All emergency telephone numbers, evacuation route maps, vehicle keys and site safety information would be held within the Support Zone.

22.0 Community Engagement

Community engagement is critical to the success of remediation at Barangaroo. Over the past two years, Lend Lease, in conjunction with the Authority, have embarked on an extensive program of community engagement on the remediation activities associated with Barangaroo South and the NSW EPA Declaration Area. This engagement has been aimed at educating the community and key stakeholders about the historic nature of the contamination at the Site and the importance of remediation works, the type of works proposed and to provide a forum for community feedback. Consultation activities have also specifically addressed in detail the proposed Pilot Trials which are proposed to be undertaken prior to full scale remediation activities.

A number of consultation avenues have been utilised during this engagement program including:

- presentations to interested stakeholders;
- face to face meetings with key community groups and stakeholders to provide one-on-one briefings about the remediation;
- holding large scale community information sessions jointly between Lend Lease and the Authority;
- issue of Fact Sheets on remediation to relevant stakeholders and included on the Authority website - www.barangaroo.com; and
- newsletter updates and letterbox notifications.

All of these communications tools provided an opportunity to present factual information about the nature of the contamination and remediation works, along with ensuring the community could raise any issues of concern.

Lend Leases community engagement program for the project has also included establishing a Business Construction Liaison Group (BCLG) and a Community Construction Liaison Group (CCLG), in conjunction with the Authority. The purpose of these groups is to brief key representatives from both the local commercial and residential communities on key aspects of the project, relating to construction, as early as possible in the planning process. To date, both of these forums have received extensive briefings on the proposed remediation activities at Barangaroo and remain keenly interested in further progress updates in the future. Representatives of these groups then assist in actively disseminating information back to their respective networks on the status of the project. It is intended that further presentations will be given to these two groups as the plans for remediation activities progress.

All consultation has been carried out in line with the principals and methodologies outlined in the Lend Lease Community & Stakeholder Engagement Strategy (May 2012). Prior to undertaking full scale remediation works, Lend Lease will develop a Remediation Community Engagement Sub Plan, which will summarise ongoing engagement to be undertaken with the community. Engagement will continue, both prior to and during remediation activities, to ensure the community are fully informed of the remediation activities at the Site, and have an opportunity to provide feedback.

Table 10 below provides a summary of the Lend Lease communication strategy adopted for the community to date:

Table 19 Summary of Lend Lease Communication Strategy

Communication Channel	Purpose
1300 Community Enquiry Line	A key channel for the community to raise issues, ask questions and speak directly to a member of the Community Relations team. A 24 hour after hours service will also be provided to ensure any issues occurring outside of business hours are addressed in a timely manner.
Barangaroo South Website (www.barangaroo.com)	This is the central portal for all information about the project. It is the one-stop-shop for everything the community and stakeholders will need to know about the remediation works including electronic copies of all newsletters, notifications, press releases and links to the Department of Planning website and submissions.
Barangaroo South Blog (link on website)	An opportunity for open communication between the community, stakeholders and general public about the project.

Communication Channel	Purpose
Newsletters	To provide ongoing updates about the planning process and progress of works on site. This will be a key means of ensuring information transparently flows to the community and stakeholders about the remediation work.
Community Information Sessions	Used to convey key messages to the local stakeholders and proactively work to address specific concerns.
Stakeholder one-on-one briefings	To discuss concerns raised by key stakeholders face-to face and provide more detailed information and assurances about the project.
Public displays	To effectively raise greater awareness of the project and the progress, particularly during the design phase.
Notifications	To ensure all residents and businesses potentially impacted by Site works are informed in advance of key work commencing. Notifications will be used to inform the community of key issues such as the timing of noisy work, out of hours construction and traffic impacts.
Door knocking	To personally discuss concerns raised by the local business community (particularly the businesses along King Street Wharf and local cafes in the high rise commercial buildings) face-to-face on a one-on-one basis, proactively address any issues and provide assurances about the work.
Signage	To inform the community about who is responsible for the Site activities and the contact details for further information about the work.
Advertising	To provide regular updates to a large audience and direct them to the website for further information. To raise greater awareness about the project in the wider community.
Commercial Property Notice Boards	When appropriate, general information about the overall project will be included on the notice boards in commercial properties. This will also contain the contact details of the Lend Lease Barangaroo South Community Relations team should they require any further information about the work.
Hoardings	Hoardings will be used as a strategic communication tool to ensure the community and public are up to date with information regarding the construction and key marketing elements of the project (such as leasing enquiries). The relevant contact numbers (including the 24 hours Community Information Line) will be displayed on the hoarding at all times.

23.0 Contingency Planning

23.1 Approach

The purpose of this contingency plan is to outline procedures for the identification and management of unexpected issues or events that may occur during the works. The contingency plan will detail the following information:

- The assignment of responsibilities to nominated key personnel;
- The assessment of hazards associated with such situations, and the potential off-site impacts;
- Contingency responses; and
- Procedures for reporting relevant issues to regulatory authorities.

23.2 Potential Unexpected Events

The following table summarises the unexpected events which have the potential to occur during the remediation works, the likelihood of such an event occurring and the associated control measure which will mitigate such an event:

Table 20 Potential Unexpected Events and Related Control Measure

Potential Unexpected Event	Likelihood	Contingency Measure
Identification of greater volumes of SPGWT / CIM than presently anticipated	Medium	**Section 23.3**
Potential change in the approved land use(s) for the Site	Low	**Section 23.4**
Identification of SPGWT / CIM at depths greater than presently anticipated	Medium	**Section 23.5**
Variation of contaminant characteristics or identification of unanticipated contaminants and materials	Low	**Section 23.6**
Failure of the preferred treatment approach (i.e. either *in situ* or ex situ) to achieve the soil SSTCs (if required) or treatment standard required for off-site disposal of excavated material	Low	**Section 23.7**
Insufficient storage capacity to stockpile all required materials (*ex situ* remediation works)	Low	**Section 23.8**
The groundwater monitoring program detailed in **Section 17.4** may report an increase in CoPC concentrations in the Site's groundwater rather than a decreasing trend	Low	**Section 23.9**
An alternative remediation option may be required for practical and commercial reasons	Low	**Section 23.10**
SPGWT and/or surface water sheens are encountered during visual validation of exposed rock surfaces	Medium	**Section 23.11**
Further development of the basement and groundwater retention wall system designs	Medium	**Section 23.12**
S-ISCO® operational contingencies including potential impact: - to an Aquatic Ecosystem (Darling Harbour) - S-ISCO® Chemistry; - to an Aquatic Ecosystem (Darling Harbour) - Mobilisation of Metals; - to Subsurface Infrastructure; - to Buildings; - of Soil Vapours on Humans; and - due to Day-lighting.	 Low Low Medium Low Low Low	**Section 23.13**

Potential Unexpected Event	Likelihood	Contingency Measure
Operational issues during the remediation works including but not limited to:		**Section 20.14**
- Flooding of the Site;	Low	
- Generation of unacceptable levels of dust during excavation and reinstatement works;	Medium	
- Release of unacceptable levels of fugitive emissions during the excavation works;	Medium	
- Generation of unacceptable odours from the excavation works;	Medium	
- Generation of unacceptable noise levels during site works;	Low	
- Generation of unacceptable vibration levels during excavation and reinstatement works; and	Low	
- Spills and leaks of hazardous materials.	Low	

Contingency mitigations for the above items are described in the following sections.

23.3 Increased Volumes of Contaminated Material

The remediation strategy is to undertake remediation works to the extent practicable such that the Site is suitable for its current use with no change in site conditions. Soil SSTCs have been used to define CIM and to identify the extent of remediation required to accomplish the remediation objectives (refer to **Section 1.1**).

The environmental site investigations have been conducted to adequately characterise material within the Site and therefore minimise the risk of increased volumes of SPGWT or CIM requirement management during the remediation works.

Excavated and reused materials will be managed on-site using the Materials Tracking System described in **Section 14.7.2**. The quantities of materials excavated will be regularly compared to the estimated quantities.

In addition to unanticipated increased volumes of SPGWT or CIM, increased volumes of foreign materials in the form of steel reinforcement, scrap steel and pipe work may have the potential to adversely impact on the project. Depending on the magnitude of the changes of anticipated volumes of excavated materials, and the extent of contamination, changes to the depth of excavation and to the final reinstatement levels may be made during the project.

These changes may require revision of the *VMP HHERA* (AECOM, 2012c). Changes to the *VMP HHERA* (if required) will be issued to the NSW EPA Accredited Site Auditor and the NSW EPA, unless otherwise advised, for review and approval.

23.4 Changes to the Approved Land Uses(s)

The approved land use(s) for the Site envisaged in this RAP may change as a consequence of the planning approvals associated with the Barangaroo South and Barangaroo central development processes. If this occurs, the land use(s) that would require consideration for removal of the NSW EPA Declaration would also change.

If required, an Addendum to this RAP would be and submitted to the NSW EPA Accredited Site Auditor for approval to reflect the change in land use(s) and any changes in the extent of remediation that may be required to ensure Site suitability.

23.5 Variation of Contaminant Depth

Should SPGWT or CIM be identified at greater depths than can be practicably excavated, the following approach will be adopted:

- Review the identified SPGWT or CIM in accordance with the process described by **Section 8.4** and **Section 8.3**) to assess whether the subject material represents an unacceptable risk and thus requires remediation;
- Consider *in situ* remediation techniques;

- Consider the principles of CUTEP and ESD to assess whether the material can be practically removed in the light of: for example, its depth below both ground surface and the water table; and proximity to existing infrastructure and the Harbour;
- Additional or modified groundwater monitoring to assess potential impacts to the environment (as discussed in **Section 17.4**); and
- Review of the *VMP HHERA* (AECOM, 2012c) to assess whether the identified CIM represents an unacceptable risk to human health or the environment.

23.6 Variation of Contaminant Characteristics

The range of contaminants analysed in the environmental site investigations is considered to be appropriate for development of the soil SSTCs and determination of the extent of remediation. However, there is the potential for occurrence of as-yet unidentified contaminants, and for variation in the concentrations or distribution of known contaminants.

Should any significant changes to the nature or types of contaminants be identified during the works a variation to the *VMP HHERA* (AECOM, 2012c) and this RAP and the soil SSTCs may be required. Variations will be issued to the NSW EPA Accredited Site Auditor for review and approval. If the variation to the *VMP HHERA* (AECOM, 2012c) relates to VMP Remediation Works, the document would also be submitted to the NSW EPA for approval.

It is noted that Lend Lease is familiar with potential site conditions based on its experience on areas adjacent to the Site, which at the time of this RAP included:

- Excavation and remediation of the adjacent Bond site; and
- Constructed the basement groundwater perimeter retention wall and a number of piled foundations within the adjacent ORWS Area.

Notwithstanding this, it is considered that any different materials encountered can be adequately addressed by AECOM and Lend Lease following assessment and refinement of any required remediation design.

23.7 Failure of the preferred treatment approach(es)

23.7.1 *In situ* Remediation

If remediation of the treatment areas using S-ISCO® cannot be completed to a standard which achieves the Remediation Goals (refer to **Section 7.1** with respect to VMP Remediation Works and **Section 7.2** with respect to Block 4 Development Remediation Works), the following will be undertaken:

- The residual impacts will be assessed to determine whether they represent a significant risk to human health or the environment (i.e. is the residual material considered to be a CIM which warrants further remediation);
- If required, a detailed area- and CoPC-specific human health risk assessment may be undertaken to assess the significance of specific exceedances of the soil and groundwater SSTC or MWQCs (as required); and
- If, following the above risk assessment, the CIM is considered to represent an unacceptable risk to human health and/or the environment, another remediation strategy and/or engineering mitigation measure will be considered in consultation with the NSW EPA Accredited Site Auditor.

23.7.2 Ex situ Remediation

Two preferred ex situ treatment approaches have been identified by this RAP and selection of the preferred treatment approach will be based on consideration of:

- The ability to obtain an Immobilisation Approval for the stabilisation of material require disposal to an off-site licensed landfill; and
- Consideration of treatment rates, stockpile and curing requirement, programming of the remediation works and commercial efficacy.

Should the eventually selected treatment approach prove to be unsuccessful in achieving the Remediation Goals (refer to **Section 7.1** with respect to VMP Remediation Works and **Section 7.2** with respect to Block 4 Development Remediation Works):

- Consideration will be given to refinement of the treatment approach including use of different quantities of additives or different additives; and/or
- Implementation of the alternative ex situ treatment will be considered.

23.8 Insufficient Storage Capacity for Stockpiles (ex situ remediation)

The proposed ex situ remediation strategy is to minimise the requirement for on-site stockpiling by direct transfer of material either for reuse or for off-site disposal. Further, the site investigation works conducted to date have generally been conducted to adequately characterise material within the Site and therefore minimise the requirement for interim stockpiling. Notwithstanding, variations in quantities or contaminant characteristics or delays in establishment of treatment infrastructure may result in the requirement for additional stockpiling.

If there is insufficient storage capacity for the stockpiling of material in designated areas within Barangaroo, the following options will be assessed:

- Consider collection of additional *in situ* samples to facilitate characterisation of material (where contaminant quantities or contaminant characteristics may be different from those expected) for either reuse or off-site disposal before it is excavated;
- Explore options for temporary stockpiling of material outside of Barangaroo South; and
- Off-site disposal of materials classified as VENM for reuse on other sites outside Barangaroo. It is likely that VENM will be produced during the excavation of sandstone as required for the bulk excavation works.

23.9 Groundwater Quality

In the event that the groundwater monitoring program detailed in **Section 17.4** indicates that groundwater CoPC concentrations are not: a) achieving the groundwater SSTCs across the Site; and b) statistically/significantly[13] decreasing towards the MWQCs at the down hydraulic gradient Site boundary for the identified CoPCs for the duration of the monitoring, contingency measures will be assessed to reduce impacts to the groundwater system. The following contingency actions will be considered:

- The relevant GMP (refer to **Section 17.4.1**) may be modified to include more detailed, extended and/or more frequent groundwater monitoring. Additional groundwater monitoring wells may be installed if more detailed groundwater assessment is considered to be warranted. If required, the GMP would be modified in consultation with the NSW EPA Accredited Site Auditor. If modifications to the GMP relate to VMP Remediation Works, the document would also be submitted to the NSW EPA for approval;
- A detailed area- and CoPC-specific human health risk assessment may be undertaken to assess the significance of specific exceedances of the groundwater SSTCs;
- An quantitative ecological risk assessment may be undertaken to assess the significance of specific exceedances of the relevant groundwater MWQCs; and
- Active groundwater remediation works would be considered as an option.

23.10 Changes to the Development Strategy

The development strategy for Barangaroo may develop during the course of the planning approval process associated with Barangaroo South and Barangaroo Central. If changes resulting from this process affect the preferred remediation option identified by the RAP, the remediation strategy may require amendment.

Any change to the remediation strategy required may be based on consideration of:

[13] Significance will be determined estimating confidence intervals for each of the CoPC using the existing dataset for the Site. Concentrations falling outside of the confidence interval by greater than 3x will be considered significant.

- The requirement for, or changes to, development plans;
- Practical and commercial considerations; and
- Staging and sequencing of the remediation and development works in other Barangaroo site areas as part of the broader development works.

If required, an Addendum to this RAP would be issued to reflect any change to the remediation strategy. The Addendum would be issued to the NSW EPA Accredited Site Auditor for approval.

23.11 Failure of Visual Validation (SPGWT)

If SPGWT is encountered in rock exposed as part of ex situ remediation excavation works (refer to **Section 19.5.1**), the following contingency measures will be considered:

- Engineering mitigation measures to prevent the ingress of SPGWT to the excavation, potentially including:
  - Local over-excavation of bedrock to remove SPGWT ;
  - Grouting of the rock defect to seal the SPGWT within the rock matrix; or
  - Shotcreting (200 mm thick) of the rock surface to seal the SPGWT within the rock matrix.

If SPGWT is encountered in fill material/marine sediments exposed as part of ex situ remediation excavation works, the overexcavation works described following will be undertaken:

- In the case of VMP Remediation Works, as described by **Section 19.5.1**; and
- In the case of Block 4 Development Works Remediation, as described by **Section 19.5.3**.

23.12 Further Development of the Basement and Groundwater Retention Wall System Designs – Block 4 Development Remediation Works

As discussed previously, the Block 4 basement and retention wall system are subject to ongoing refinement and development as part of the Lend Lease design process. Consequently, changes to the depth of Block 4 basement and/or the final alignment of the basement groundwater retention wall system may be required. If the design is changed such that it affects the assumptions in the *Declaration Site HHERA* (AECOM, 2011a) and *Declaration Site HHERA Letter* (AECOM, 2012d), an Addendum to this RAP will be issued, as required, and submitted to the NSW EPA Accredited Site Auditor for approval.

It is noted that the contingency measures described by this Section are specific to the Block 4 Development Remediation Works only. As such, they will not impact on the VMP Remediation Works, which are not dependant on construction of either the basement or the basement groundwater retention wall system.

For each of the contingency measures described following, the Auditor would be consulted to confirm agreement with the strategy to be adopted prior to implementation of the proposed measures.

23.12.1 Increase in basement depth

The Block 4 basement may be subject to further design development which may increase the basement depths below those detailed in **Section 4.2** and **Section 4.3**.

The additional bulk excavation works that would be required to facilitate construction of basements to greater depths is not considered to affect the preferred remediation strategy. This is because the depth of identified SPGWT/CIM requiring remediation in the Block 4 area (typically present at depths shallower than 8 m bgl) is already less than the proposed basement depth. Further in areas where the depth of remediation required is greater than the proposed basement depth, remediation below the depth of the proposed basement will be locally required to achieve the required extent of remediation (refer to **Section 9.2.2.3**). Therefore, the extent of remediation and the remediation strategy proposed by this RAP will not be impacted by increasing the depth of the basement.

It should be noted that bulk excavation works associated with a basement with an increased depth may generate contaminated material that, while not considered by this RAP to require remediation, may still require additional management to mitigate risks to human health or the environment. Such materials will require management in accordance with the environmental control measures detailed in **Section 14.0** and **Section 20.3**.

23.12.2 Reduction in basement depth

As above, the Block 4 basement may be subject to further design development which may reduce the basement depths to less than those detailed in **Section 4.2**.

As described by **Section 9.2.2.3**, the depth of the proposed Block 4 basement is already less than the proposed remediation extent in some areas within Block 4. In these areas, remediation to a depth extending below the proposed basement depth will be required to achieve the requisite Remediation Extent. If the depth of the Block 4 basement is reduced further, the extent of remediation required below the proposed basement depth would increase further, as necessary to facilitate removal of identified SPGWT and CIM to the extent practicals described by the required lateral and vertical Remediation Extent (refer to **Figure F12** in **Appendix B**). In addition, the data set for the additional material that would remain below the revised basement would be reassessed to confirm:

- whether the sampling density from previous investigations suitably characterises the additional material that will remain below the revised basement; and
- whether the additional material that will remain below the revised basement represents CIM or SPGWT that requires remediation.

If the additional material that will remain below the revised basement has not been adequately characterised, additional sampling will be conducted in consultation with the NSW EPA Accredited Site Auditor. If the additional material that will remain below the revised basement requires remediation, the depth of the excavation will be locally increased to include removal of the identified CIM or SPGWT. In considering whether the material requires remediation, consideration will be given to the extent and significance of the contamination in the context of other material to remain below the car park basement. This assessment will be conducted in consultation with the NSW EPA Accredited Site Auditor.

It is noted that the validation of fill or residual soils/bedrock below the proposed Block 4 basement will be based on the validation requirements detailed in **Section 19.5.3**.

23.12.3 Changes to the Lateral Alignment of the Basement Groundwater Retention Wall System

As for the Block 4 basement depth, the alignment of the basement groundwater retention wall system may be subject to further design development.

Realignment of the Western Block 4 Retention Wall to the West

- If the alignment of the western Block 4 retention wall system moves to the west by greater than 10m, the additional material that would be included as part of Block 4 (i.e. present within the footprint of the basement groundwater retention wall) would be assessed to determine:
    - whether the sampling density from previous investigations suitably characterises the additional material that will now be within Block 4; and
    - whether the additional material that will now be within the Site represents CIM or SPGWT that requires remediation.
- If the additional material that will now be included in Block 4 has not been adequately characterised, additional sampling will be conducted in consultation with the NSW EPA Accredited Site Auditor.
- If the additional material that will now be included in Block 4 requires remediation, the extent of remediation required will be increased to include remediation / removal of the identified CIM or SPGWT. This assessment will be conducted in consultation with the NSW EPA Accredited Site Auditor.

It should be noted that bulk excavation works within the expanded Block 4 basement may generate contaminated material that, while not considered by this RAP to require remediation, may still require additional management to mitigate risks to human health or the environment. Such materials will require management in accordance with the environmental control measures detailed in **Section 14.0** and **Section 20.3**.

Realignment of the Western Block 4 Retention Wall to the East

- If the alignment of the western Block 4 retention wall system moves to the east but remains outside or coincides with the Declaration Area boundary, there would be no impact to the preferred remediation strategy for the area remaining within the Block 4 groundwater retention wall system. With respect to the

residual Block 4 area between the current and amended retention wall alignments, the following mitigation measures would be required:

- The area would be subject to remediation and validation in accordance with the RAP to be developed for the ORWN Area; or
- Additional remediation criteria will be developed that are protective of the environment to ensure that soil and groundwater remaining within Block 4 outside the groundwater retention wall system is protective of the environment. Development of the additional remediation criteria would be undertaken in consultation with the NSW EPA Accredited Site Auditor; and
- Material within Block 4 outside the groundwater retention wall system, will be assessed against these additional remediation criteria to determine whether it represents CIM that requires remediation. This assessment would be conducted in consultation with the NSW EPA Accredited Site Auditor. If remediation is required it would be conducted in accordance with this RAP.

- If the alignment of the western Block 4 retention wall system moves to the east such that it is within the Declaration Area boundary, the following mitigation measures would be required:
  - Additional remediation criteria will be developed that are protective of the environment to ensure that soil and groundwater remaining within Block 4 (that is within the Declaration Area) but outside the groundwater retention wall system is protective of the environment. Development of the additional remediation criteria would be undertaken in consultation with the NSW EPA Accredited Site Auditor; and
  - Material remaining within Block 4, but outside the groundwater retention wall system, will be assessed against these additional remediation criteria to determine whether it represents CIM that requires remediation. This assessment would be conducted in consultation with the NSW EPA Accredited Site Auditor.

23.12.4 Changes to the Alignment of the Basement Groundwater Retention Wall between Block 4 and Block 5 (Northern Block 4 Wall)

It is possible that the alignment of the northern Block 4 basement groundwater perimeter retention wall system may be revised as part of the final design development. This could be due to changes in basement design and/or to accommodate a future roadway constructed at grade in that area, as discussed in **Section 4.2**. Design finalisation could result in the Block 4 northern retention wall being moved south of the Block 4 / Block 5 boundary (e.g. by 10-15m).

If the location of the northern Block 4 retention wall is moved to the south (i.e. such that a future basement does not extend to the current Block 4 boundary), the following measures would be undertaken to address soil and groundwater that would remain outside the northern retention wall:

- Additional remediation criteria will be developed to ensure that soil and groundwater remaining within Block 4, but outside the groundwater retention wall system, is protective of human health (for the proposed future land use in the area) and the environment. Development of the additional remediation criteria would be undertaken in consultation with the NSW EPA Accredited Site Auditor. Development of the additional remediation criteria would consider:
  - The remediation criteria for the VMP Remediation Works (refer to **Section 7.1**);
  - Noting that the remediation criteria for the VMP Remediation Works only addresses those CoPCs that are prescribed by the NSW EPA Declaration and current land uses, whether:
    - the remediation criteria for the VMP Remediation Works are also protective of the proposed future land use; and
    - the concentrations of other contaminants reported in the soil and groundwater remaining within Block 4, but outside the groundwater retention wall system, are protective of the environment (noting that the material will be outside the groundwater retention wall system and therefore have the potential to impact on the environment).
- Material remaining within Block 4, but outside the groundwater retention wall system, will be assessed against these additional remediation criteria to determine whether it represents CIM that requires

remediation. This assessment would be conducted in consultation with the NSW EPA Accredited Site Auditor;

- CIM that requires remediation would be remediated appropriately in accordance with this RAP using either S-ISCO® or an ex situ methodology; and
- As a guide, the extent of remediation would be expected to be similar to that described by **Figure F10** and **Figure F11** in **Appendix B** of this RAP.

23.12.5 Construction of a new Basement Groundwater Retention Wall between Block 4 and Block 3 (Southern Block 4 Wall)

It is possible that an additional groundwater retention wall will be required to be installed to form the southern boundary of the Block 4 basement. This retention wall would either be installed directly adjacent to the existing northern ORWS retention wall (such that there is no gap between the two walls), or it could be off-set from the existing retention wall (i.e. constructed to the north of the current alignment, within Block 4).

If the new southern Block 4 wall is:

- constructed immediately adjacent to the existing northern ORWS retention wall, there would be no impact to the preferred remediation strategy; and
- off-set from the existing ORWS northern retention wall (i.e. such that a future basement does not extend to the current Block 4 / Block 3 boundary), the measures described by **Section 23.12.4** in relation to changes to the alignment of the northern Block 4 Wall would be undertaken.

23.13 S-ISCO® Operational Contingencies

The following sub sections describe the *in situ* remediation risks as well as the mitigation measures that will be implemented to prevent these adverse impacts and contingency measures that will be enacted in the unlikely event that impacts are observed. A more detailed assessment of potential risks and description of specific mitigation measures including action levels for implementation of the mitigation measures based on observations from the performance monitoring program will be set out in the S-ISCO® and SEPR™ Detailed Work Plan (refer to **Section 13.1.3**).

23.13.1 Impact to an Aquatic Ecosystem (Darling Harbour) - S-ISCO® Chemistry

Darling Harbour is the nearest receptor for groundwater and surface water migrating from the Site.

No material, treated or otherwise, will enter Darling Harbour and impact either water quality or sediment as a result of the S-ISCO® and/or SEPR™ works. During the course of S-ISCO® and SEPR™ injections, the progression and extent of the S-ISCO® treatment front will be followed closely through *in situ* and ex situ monitoring and laboratory analysis of groundwater from monitoring wells on the Site (as part of the Performance Monitoring Program), specifically those installed in the area between the treatment area and the Harbour.

In addition, the rate of reactions between the S-ISCO® chemistry and subsurface contaminants will be closely monitored to track that the injected reagents are being consumed. In the event that monitoring results indicate that the treatment front becomes too close to the Harbour, a program of extraction will be initiated from monitoring wells that will be monitored as part of the monitoring plan. The contents of the injected front will be extracted from the subsurface using groundwater extraction pumps, the un-reacted S-ISCO® chemicals will be intercepted and adverse impacts on the Harbour will be minimised.

23.13.2 Impact to an Aquatic Ecosystem (Darling Harbour) – Mobilisation of Metals

In one of the column tests (Column 4) undertaken as part of the laboratory treatability study (refer to **Section 10.4**) in which hydrogen peroxide, VeruSOL-3® and Fe-TAML were used, the pH of the effluent reduced to as low as pH 1. This result raised questions about the potential for S-ISCO® treatment with the same chemistry, peroxide, VeruSOL-3® and Fe-TAML, to produce a low-pH environment in the treatment area, and, as a consequence, mobilise metals present in the subsurface that could eventually discharge into Darling Harbour. The following section describes how such low pH conditions will not occur, as well as the specific mitigation and contingency plans that will be in place to monitor pH and metals mobilisation.

The application of peroxide, VeruSOL-3® and Fe-TAML in the field will take place within a significantly larger mass and volume of soil (when compared to that of the laboratory treatability study), providing a largely expanded buffering capacity over what was furnished by soil in the laboratory treatability study. The chemistry will have a

greatly increased duration of contact with both the soil as well as contaminants, enabling more complete reactions. In addition, the chemistry used in the field will be altered to specifically maintain more alkaline conditions. Through groundwater monitoring, pH conditions will be closely monitoring and the pH will be adjusted with the injection of sodium hydroxide. In contrast to the imprecise metering pumps used during the column tests that cannot easily be modified in response to conditions measured in the effluent, that is, at only one point, the injection pumps used in the field can be easily adjusted to respond to conditions measured in the field at multiple sampling locations. During S-ISCO® with peroxide, the pH will be maintained between 8.5 and 9 in order to optimize the performance of the Fe-TAML activator. In addition, where persulfate is used as the oxidant, sodium hydroxide will also be used to create the alkaline conditions required to activate sodium persulfate.

Finally, the full scale implementation will include continuous monitoring of pH which will facilitate adjustment of pH (if needed) to: (a) demonstrate that low pH conditions do not develop away from the immediate vicinity of the injection wells; and (b) help both the hydrogen peroxide and sodium persulfate S-ISCO® reactions to occur optimally.

23.13.3 Impact to Subsurface Infrastructure

There is a possibility that subsurface infrastructure in the vicinity of the treatment areas, particularly within Hickson Road, may be subject to physical impacts, from well drilling, soil sampling and trenching, for example, and/or chemical impacts, from the injection and subsequent movement of the injected treatment chemistry, for example.

Subsurface assets in Hickson Road are composed of polyethylene, polyvinyl chloride, concrete, asbestos, reinforced concrete pipe, cast iron, and cast iron concrete-lined. Technical guidelines for trenched pipelines[14] indicate that the following materials can also be used in the construction of trenched pipelines, and may be present in the subsurface: ductile-iron cement lined, steel concrete-lined, PVC-lined concrete, vitrified clay, glass-reinforced plastic, polypropylene, fibre-reinforced concrete or high-density polyethylene.

Peroxide Compatibility

Hydrogen peroxide is a short-lived (on the scale of hours) oxidant. The short life of peroxide, along with the fact that it will typically be injected between 3 and 5 m bgl, a depth below identified assets, will mitigate the risk of it contacting subsurface assets. Water levels in the vicinity of subsurface assets will be closely controlled through extraction, thereby further reducing the risk of contact of the oxidant with subsurface assets. Finally, the majority of the known materials of which these assets are composed are not incompatible with peroxide, especially at the low (<8%) concentrations that will be used and in the presence of VeruSOL-3®, a surfactant that is known to mitigate corrosive impacts of oxidants.

Alkaline-Activated Persulfate Compatibility

Data indicates that alkaline-activated sodium persulfate (activated using sodium hydroxide) does not have corrosive effects on plastics, concrete or metallic materials including cast iron and carbon steel.

Physical Impacts

With respect to physical impacts to assets as a result of drilling, boring and trenching, the following measures will be taken to mitigate any potential impacts:

- All underground assets will be identified prior to intrusive work;
- Well drilling and placement will be modified as needed to avoid drilling near identified assets;
- After machine-drilling the surface concrete and pavement, hand-augering and/or air-knifing will be used in the vicinity of shallow services to a depth of 1.2 m bgl (or to the depth of hand auger/air knife refusal); and
- Coordinating the layout of the treatment with asset access and emergency access routes.

Finally, with respect to trenching, the trench will be shallow, approximately 200 mm deep, and therefore above the depth of known assets. Nevertheless, before any trenching begins, all assets in the vicinity of intrusive activities will be identified.

Other Chemicals

With respect to the other chemicals that will be injected, including VeruSOL-3®, water, sodium hydroxide and Fe-TAML, none of these materials are known to have corrosive impacts.

23.13.4 Impacts to Buildings

There is a potential risk of adverse impacts to the buildings at 30 and 38 Hickson Road. Adverse impacts to the basement groundwater treatment system at 38 Hickson Road will be monitored and mitigated. Any impact will be detected by monitoring wells before it reaches the basement. In the unlikely event that peroxide reaches the basement, peroxide will not impact but rather likely improve the water treatment process.

During the SEPR™ phase of the treatment, all injected fluid will subsequently be extracted. During S-ISCO®, liquid levels will be closely monitored to track their confinement within historic infrastructure – where appropriate. Subject to the results of the performance monitoring program, groundwater monitoring wells will also function as emergency recovery wells from which groundwater can be extracted to establish hydraulic control.

23.13.5 Impact of Soil Vapours on Humans

There is the risk of impacts from soil vapours to the following:

- the users and inhabitants of the Bond Building at 30 Hickson Road and the basement water treatment system at 38 Hickson Road;
- workers conducting construction, road or other sub-surface works in the vicinity of the Site, particularly in Sydney Water assets, EA assets, cable pits, utility pits, service access points and monitoring well heads;
- workers at the adjacent sewage pumping station SP1129 (to be retained for the future land use); and
- pedestrian, bicycle and vehicular users of Hickson Road and its footpaths.

Users of the Bond and 38 Hickson Road

To prevent the possibility that vapours generated by the SEPR™ or S-ISCO® enter the adjacent buildings or the sub-surface parking garages, soil vapour monitoring points will be installed: immediately adjacent to the basements of the building; and, between the treatment area and the buildings. These points will be connected to the SVE system that will be operated throughout the duration of the remediation. The SVE system will capture and treat gases displaced by peroxide decomposition and will be carefully monitored.

Construction and Maintenance Workers

There is the potential for workers conducting subsurface intrusive work in the vicinity of the treatment areas, including utility workers who must access below ground assets, to be exposed to soil vapours generated by S-ISCO® and/or SEPR™ injections. This includes service utility personnel who must access their assets in Hickson Road. In addition, there is the potential for users of Hickson Road in the vicinity of the treatment area to also be exposed to vapours generated by the remediation works. To mitigate this risk soil vapour extraction points will be installed in publically accessible areas in the vicinity of the Site. These points will be connected to the SVE system to intercept vapours and will be monitored regularly.

In addition, vapours will be monitored daily with a Photoionization Detector (PID) in utility pits, service access points and monitoring well heads, that is, areas with the potential for preferential migration of vapours. In the event that unsafe vapours are detected, additional soil vapour extraction may be implemented.

Pedestrian, Bicycle and Vehicular Users of Hickson Road and its Footpaths

To prevent the possibility that vapours generated by the SEPR™ or S-ISCO® are present in the footpath of Hickson Road that is accessed by pedestrians and cyclists, soil vapour monitoring points will be installed. All points will be connected to the SVE system which will extract continuously from them to mitigate any potential soil vapour exposure. In addition they will be monitored daily with a PID and weekly at a NATA-certified laboratory to confirm that the SVE system is adequately extracting and whether the system needs to be expanded.

23.13.6 Impact due to Day-lighting

Over the course of injections there exists the possibility that injected chemicals may leak upwards, on the outside of a well's casing or appear at the ground surface, an occurrence referred to as "day-lighting". Day-lighting has the potential to pose a hazard to the environment, and to the health and safety of site workers and other persons

in the vicinity of the injection area. Day-lighting events will be treated as a spill and managed according to the EMP (refer to **Section 1.7**).

In addition, day-lighting will trigger a temporary suspension of system operation in the area in which it occurs. This will enable the Site Manager to determine the cause of the day-lighting and alter operational parameters, such as injection rate and chemical concentration, to prevent it from recurring. When operations resume, injections will be begin slowly and gradually increase to the desired levels, accompanied by diligent monitoring.

As a preventative measure, all injection wells will be inspected daily for evidence of day-lighting so that this occurrence can be dealt with immediately to prevent risks to human health or the environment. Evidence of day-lighting includes liquid emerging from the ground in the vicinity of an injection well. The liquid may bubble, if hydrogen peroxide is being used, and a faint citrus odour may be noticeable (due to the VeruSOL-3®).

23.14 Other Operational Contingencies

23.14.1 Flooding of the Site

The EMP for the remediation works will be developed to control the impact of site works in order to minimise and mitigate against any impacts to off-site waters (Darling Harbour). As outlined in **Section 17.0**, the implementation and maintenance of a variety of environmental control measures will be undertaken during the project to manage water encountered during the works. Measures such as the installation of drains to divert clean water from up gradient areas to on-site stormwater drains, recycling of water and off-site water treatment will be conducted to manage and control water.

In extreme situations such as flooding or heavy rainfall, the discharge of treated water may be permitted to the sewer system in accordance with the conditions of a Sydney Water licence. All water intended for discharge will be stored on-site and tested prior to discharge to confirm compliance.

Records of all discharges will be kept describing the estimated volume of water discharged, the time period over which the discharge occurred, and the water quality results of water samples collected prior to discharge.

These control measures will be monitored during significant rainfall events to confirm their integrity and suitability.

23.14.2 Control of Dust

Should unacceptable levels of dust be detected during the remediation works, an investigation will be conducted to determine the source of the dust, and evaluate the appropriate measures to be implemented.

These measures may include the following:

- Increased use of a water cart or water sprays to suppress dust in open areas;
- Installation of temporary sheeting to cover localised exposed areas and stockpiles;
- Installation of dust screens around the Remediation Area;
- Covering stockpiles of contaminated soil which will remain on the Site for more than 24 hours (where practical);
- Alteration of the works program to minimise the extent of disturbed open areas;
- Consolidation of material stockpiles;
- Use of chemical dust-suppressants provided the chemicals do not pose a contamination or OHS hazard;
- Use of alternative coverings such as hydro-mulch to stabilise the surface of open disturbed areas;
- Use of additional dust suppression features on items of dust generating plant and equipment;
- Securely covering all loads entering or exiting the Site; and
- Use of alternate work practices such as modified equipment to minimise dust generation.

23.14.3 Fugitive Emissions and Odours

Should unacceptable levels of fugitive emissions be detected at the Site boundaries or in the surrounding area during the project, an investigation will be conducted to determine the source of the emissions, and to evaluate the appropriate measures to be implemented.

These measures may include the following:

- Alteration in the works program to minimise in the extent of disturbed open areas;
- Prompt removal and treatment of heavily contaminated materials that have been exposed and are identified to have caused the emissions;
- Use of fine mist sprays around the Remediation Area;
- Conducting the work in more favourable weather conditions;
- Use of alternate work practices to minimise the period of impact of the emissions;
- Use of additional features to control emissions from plant and equipment;
- Use of alternate work practices such as using modified equipment;
- Relocation of offending plant and equipment to less sensitive on-site areas;
- Reducing the number of plant and equipment items on-site; and
- Use of a deodorant within water sprays at locations on-site and at Site boundaries provided the chemicals do not pose a contamination or OHS hazard.

23.14.4 Noise and Vibration

Should unacceptable noise and/or vibration levels be detected during the remediation works the following measures may be implemented:

- Modify the works program to minimise the impact of noisy or vibratory operations, including:
  - Modify the timing of the works to appropriate times of the day; and
  - Accelerate the works program to complete the works quickly and minimise the period of disturbance;
- Install additional noise suppression features on plant and equipment;
- Construct additional noise attenuation measures such as stockpile barriers, works area enclosures; and
- Use of different items of plant and equipment that generate less noise or vibration.

23.14.5 Spills and Leaks

A spill response plan will be developed and implemented as part of the Emergency Response Plan (ERP) detailing the procedures for responding to spills and leaks. The procedures outlined in the plan will be aimed at minimising the impact of any contaminant releases that may occur during the works.

The following actions will be taken in preparation for spills or leaks:

- Training of site personnel in appropriate spill response techniques;
- Allocation of spill response materials and equipment on-site (such as oil absorbent pads, booms and bio-dispersants);
- Containment of all storage tanks and drums inside bunded areas with a capacity of 110% of the largest container, or 25% of the total volume of all containers, whichever is greater;
- Initial assessment of the spill;
- Notification of the appropriate authorities if necessary;
- Following a spill or leak, an investigation to determine the root cause of the incident will be undertaken; and
- Corrective and preventative actions implemented to prevent future incidents.

23.14.6 Emergency Response Plan

An ERP will be prepared prior to the commencement of the site remediation works. The plan will outline the process for identifying possible emergency situations and detailing the procedures necessary to ensure the safety of both on-site and off-site personnel in the event of an emergency.

The plan should include the following general information:

- Assignment of responsibilities to nominated key personnel;
- Assessment of the potential on and off-site impacts of hazards;
- Emergency reporting procedures including on-site reporting and reporting to the appropriate authorities;
- Emergency response procedures including, but not limited to, the following:
    - On-site fires or explosions;
    - Chemical spills;
    - Rupture of buried services;
    - Hazardous gas releases and emissions;
    - Confined spaces situations;
    - Traffic accidents both involving the transportation of "Dangerous Goods";
    - First aid for injured personnel;
    - Evacuation of on-site personnel; and
    - Managing unknown/uncertain situations.
- Incident investigation procedures to determine the root cause of the incident, and to identify the appropriate corrective and preventative actions to prevent future incidents.

24.0 Key Personnel

The contractual framework of delivery of the remediation works has not yet been determined by Lend Lease. Potential contractual structures include:

- Turnkey deliver of the remediation works by a remediation contractor;
- Supervision of the remediation works by a superintendent and validation team engaged separately for the remediation contractor; and
- A variation on the above.

Notwithstanding the contractual framework initially adopted by Lend Lease, the key roles and responsibilities associated with the remediation works are as discussed following. Depending on the contract structure the various roles and responsibilities may be discharged by one or more entities.

24.1 Project Director

The Project Director is responsible for ensuring that the remedial works undertaken on-site are in accordance with this RAP, the EMP, the OHSP and other relevant documentation, and that the objectives stated within the RAP are ultimately met. The Project Director will generally also be responsible for ensuring that the project occurs within the timeframe nominated and within the financial budget allocated, and is completed safely. The Project Director assumes ultimate responsibility for the project.

24.2 Project Manager

The Project Manager is responsible for daily operations and directs the site operations to ensure effective planning, verification, documentation and management of operational and environmental and safety issues in accordance with this RAP. This includes maintaining a liaison with regulatory authorities to ensure that the necessary work is undertaken to satisfy the NSW EPA and NSW EPA Accredited Site Auditor that the remediation achieves the objectives of this RAP.

The Project Manager is responsible for the implementation of all Project Plans including the RAP, EMP, OHSP Plan, Quality Plan and other relevant contractual documents associated with the remediation works. This includes responsibility for:

- any design that may be required during the work;
- implementation and scheduling of the remedial works in accordance with the abovementioned documents; and
- ensuring compliance with relevant legislation and regulations.

The Project Manager is also responsible for ensuring that human health and the environment are protected at all times, including the provision of training and site inductions to all appropriate subcontractors and workers.

The Project Manager will be a primary community contact and the first point of contact for sub-contractor issues.

24.3 Validation Team

A suitably qualified consultant will undertake the supervision and validation of the remedial works under the direction of a Validation Project Director (VPD). The VPD is responsible for ensuring that all required validation systems are fully functional, and that staff are trained in the requirements of the validation requirements as detailed in **Section 19.0** of this RAP.

Daily validation management will be from an on-site project office. A site-based administrative system will be established to ensure that the project is fully documented. A daily fieldwork summary will be prepared and filed. All job-related incoming and outgoing communications will be logged in a register.

Decisions related to validation will be made in accordance with relevant guidelines endorsed by the NSW EPA and NSW EPA Accredited Site Auditor. Copies of relevant guidelines will be kept in the Site office. All fieldwork will be undertaken by qualified environmental engineer(s)/scientist(s) with experience working on contaminated sites.

A member of the Consultant's field team will be the Site Validation Manager (SVM) responsible for making all validation decisions and directing all routine site fieldwork. Prior to commencement of the project, the SVM will prepare a project manual containing all required procedures and forms. The manual will be updated, in conformance with the VP, on an as needed basis. It is the responsibility of the SVM to ensure that the validation requirements detailed in **Section 19.0** are followed.

Site meetings will be convened, as required, to discuss fieldwork procedures. At least one meeting per week will be held with the SVM and the Project Manager to plan work for the following week and to resolve outstanding issues.

Where, because of an unforseen circumstance, the SVM considers that a departure from the validation requirements is required, this must be discussed with the VPD and NSW EPA Accredited Site Auditor before any other related action is taken. If the departure is approved it will be documented in site files. If urgent action is required, the VPD will be responsible for deciding the particular issue. The NSW EPA Accredited Site Auditor will be sent written confirmation as soon as practicable, but in any case within 5 working days of the reasons for making the changes to the validation procedures detailed in **Section 19.0** and feedback and endorsement of the changes will be requested in writing from the NSW EPA Accredited Site Auditor.

24.4 Site Foreman

The Site Foreman implements day-to-day operations as directed by the Project Manager.

24.5 Safety/Quality Officer and Environment

The Safety / Quality Officer is responsible for implementation of the quality and safety management systems. This person assists the Project Manager with day-to-day tasks that arise, reports activities undertaken, directs the subcontractors, maintains accurate records of works such as safety checklists, and maintains a photographic record of works undertaken. This will include review and update of the OH&S Plan and EMP plus health and safety manuals, rules and procedures.

The Safety / Quality Officer ensures personnel and visitors to the site are inducted and has responsibility for emergency response and training in accordance with the Emergency Plan. The Safety / Quality Officer has the authority and independence to require reasonable steps to be taken to avoid or minimise unintended or adverse work safety impacts, and can direct relevant actions to be ceased should any adverse impact on worker safety be likely to occur.

The Safety / Quality Officer ensures all H&S monitoring devices are operating in accordance with the RAP, EMP and OHSP and also keeps the incident and accident register up to date with notification given to Work Cover NSW as necessary.

The Safety / Quality Officer will provide advice and recommendations, when appropriate, with regards to:

- legal requirements;
- changes in legislation;
- dealings with Work Cover New South Wales;
- prevention of injury or damage;
- accident and injury investigations and reports;
- work methods, equipment, or materials which could reduce risk; and
- selection, suitability and application of safety equipment.

The Safety/Quality Officer will be responsible for holding regular 'toolbox' safety meetings with all site personnel and will ensure meeting minutes are appropriately documented.

24.6 Subcontractors

All work, irrespective of whom it is completed by will be undertaken, as specified by the Project Manager, and per the requirements stated within this RAP and the EMP, the OHSP and relevant management plans.

Subcontractors will be advised of required work procedures through induction, training, and meetings provided by the Contractor. Maintenance of subcontractor equipment will be the responsibility of the subcontractors.

The Subcontractor is responsible for ensuring that all works executed by the subcontractor complies with relevant WorkCover NSW as necessary.

24.6.1 S-ISCO® Personnel

In addition to the key roles described previously, key personnel required for implementing the S-ISCO® and SEPR™ soil remediation program are listed below. The actual staffing plan for these works will depend on conditions encountered in the field and are subject to the outcomes of the proposed S-ISCO® Pilot Trial.

- Site Manager;
- Plant Operator;
- Plant Support / Assistant Operator;
- Field Technician; and
- Laboratory Technician.

25.0 Conclusions

Based on the information detailed in this RAP the following conclusions can be made.

Remediation Extent - VMP Remediation Works

The Remediation Goals developed by the *VMP Remediation Extent* report (AECOM, 2013c) for the protection of human health and the environment based on the recommendations of the *VMP HHERA* (AECOM, 2012c) were derived to enable the enable the NSW EPA Declaration to be revoked. The Remediation Goals are:

- As a primary goal, removal / remediation of SPGWT to the extent practicable as required by the NSW DEC (2007) *Guidelines for the Assessment and Management of Groundwater Contamination*; and
- As a secondary goal, removal / remediation of soil, to the extent practicable:
    - That is representative of CIM, which is defined as:
        - Unsaturated soil concentrations exceeding the soil SSTC; and/or
        - Unsaturated or saturated soil concentrations that are considered to be the source of groundwater concentrations exceeding the groundwater SSTCs in fill material.
    - Such that groundwater quality within fill material leaving the Declaration Area (measured at the down hydraulic gradient Declaration Area boundary) approaches the MWQC.

The standard of remediation (as developed by the *VMP Remediation Extent* report [AECOM, 2013c]) to be achieved within the proposed Remediation Extent should equal the higher of:

- Removal of SPGWT to the extent practicable, for the protection of human health and the environment;
- Removal/remediation of soil and groundwater concentrations present within fill material exceeding the relevant $SSTC^{VMP}$, to the extent practicable; and
- Removal/remediation of contaminated fill materials such that the contaminant mass within the Remediation Extent fill material is reduced, on average, by 90%, to the extent practicable (calculated based on the estimated mass of naphthalene and TPH C_{10} - C_{14}).

If the standard of remediation can not be practicably achieved, the Contingency measures detailed in **Section 23.7** of this RAP will be considered.

The lateral extent of remediation required in the unsaturated and saturated zones for the protection of human health and the environment as recommended by the *VMP Remediation Extent* report (AECOM, 2013c) is presented on **Figure F10** and **Figure F11** in **Appendix B**, respectively. As detailed in the *VMP Remediation Extent* report (AECOM, 2013c), remediation to the extent practicable has been determined based on consideration of:

- The presence of historic gasworks infrastructure, the distribution of SPGWT and CIM within the respective Site areas; and
- The extent of remediation that can be practicably accomplished for the protection of the environment based on:
    - The standard of remediation that can be practically achieved by the remediation technologies that are most likely to be implemented;
    - Regulatory policy requirements including: source removal, removal of NAPL to the extent practicable, and clean-up to the extent practicable as contemplated by the NSW DEC (2007) *Guidelines for the Assessment and Management of Groundwater Contamination*; the principles of ESD as required by Section 9 of the *CLM Act* (1997); and, the principles of the *Waste Avoidance and Resource Recovery Act* (2001)..

The vertical extent of remediation has been broadly defined as remediation to the depth of the underlying natural bedrock to a maximum depth of 10 m below ground level (bgl). The vertical extent of remediation is based on consideration of:

- locations where SPGWT has been reported;
- locations where exceedances of the groundwater SSTC and unsaturated soil SSTC have been reported;

- the footprint of historical gasworks structures and infrastructure; and
- the depth to bedrock (noting that the depth to bedrock steadily increases to the west beyond the 10 m bgl rock contour).

It is noted that SPGWT and CIM have been reported in the natural marine sediments both within the Site and in some hydraulically down gradient areas to the west of the Site. However, the negligible contaminant flux from these natural materials is not considered to pose a significant risk to human health or the environment. As such, the proposed extent of remediation works includes remediation of fill material and marine sediments to 10 m bgl (unless bedrock is encountered at shallower depths) and will generally exclude remediation of natural marine sediments which are present below a depth of 10 m bgl.

Remediation Extent - Block 4 Development Remediation Works

The Block 4 Development Works remediation criteria (as developed by the *Declaration Site HHERA* (AECOM, 2011a) and *Declaration Site HHERA Letter* (AECOM, 2012d), to be achieved within the Block 4 basement area requires that remediation should be undertaken as follows:

- As a primary goal, removal/remediation of SPGWT to the extent practicable, for the protection of human heath; and
- As a secondary goal, removal/remediation of identified CIM, to the extent practicable based on remediation of soil contamination that is considered to be the source of groundwater concentrations exceeding the groundwater $SSTC^{DEV}$.

The extent of remediation required to facilitate the Block 4 Development Works as recommended by the *Declaration Site HHERA* (AECOM, 2011a) is presented in **Figure F12** in **Appendix B**.

It is noted that the proposed design for the Block 4 Development includes construction of a basement groundwater retention wall system around the perimeter of Block 4 that will extend to and be keyed into bedrock. In consideration of this, the development of remediation criteria for Block 4 (within the retention wall system) for ecological protection is therefore not required for the Block 4Development Remediation Works.

Preferred Remediation Option

The preferred remediation option for each of Block 4, Block 5 and Hickson Road (as appropriate) is summarised as follows:

- Block 4 VMP Remediation Works - excavation of contaminated materials as required to facilitate removal of the NSW EPA Declaration from Block 4, followed by on-site treatment (where required) and off-site landfill disposal;
- Block 4 Development Remediation Works - excavation of contaminated materials as required to make the site suitable for the proposed future land use including construction of the basement groundwater retention wall system;
- Block 5 and Hickson Road (within the Declaration Area) VMP Remediation Works:
    - Completion of a S-ISCO® and SEPR™ Proving Phase and Pilot Trial to demonstrate the effectiveness of the treatment processes and enable optimisation of the full scale treatment process; and
    - If the Proving Phase and Pilot Trial are successful - Option 1:
        - Full scale S-ISCO® and SEPR™ treatment of the SPGWT and CIM in accordance with the Remediation objectives; or
    - If the Proving Phase and/or the Pilot Trial are unsuccessful - Option 2:
        - Excavation of required contaminated materials, followed by on-site treatment (where required) and off-site landfill disposal.

    It is possible that, depending on the outcome of the S-ISCO® and SEPR™ Proving Phase and/or the Pilot Trial and project requirements, the preferred remediation option adopted for the Block 5 and Hickson Road VMP Remediation Works will be a combination of Option 1 (full scale S-ISCO® and SEPR™ treatment) and Option 2 (excavation and onsite treatment). Selection of the preferred remediation option that will be adopted in each part of Block 5 and Hickson Road will be undertaken in consultation with the NSW EPA Accredited Site Auditor.

It is noted that, any remediation of SPGWT and/or CIM undertaken as part of the bulk excavation and Block 4 Development Works is considered VMP Remediation Works to the extent that it would have been required in any event to remove the NSW EPA Declaration.

Closure

This RAP has generally been prepared to meet the requirements of the DUAP and NSW EPA (1998) *Managing Land Contamination - Planning Guidelines SEPP 55 - Remediation of Land* and relevant NSW EPA endorsed guidelines including the NSW EPA (2011) *Contaminated Sites: Guidelines for Consultants Reporting on Contaminated Sites*.

It is concluded that the preferred remediation strategy described by this RAP, upon successful implementation will:

- enable the NSW EPA's declaration of the Declaration Area as a Remediation Site to be revoked; and
- if the Block 4 Development Works proceed, ensure that Block 4 is remediated to a standard suitable for the proposed development (i.e. suitable for the proposed land uses including a mixture of commercial, retail and high density residential and public open space).

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Appendix A

Tables

Appendix A Tables

TABLE T1

SOIL REMEDIATION CRITERIA

VMP/BLOCK 4 REMEDIAL ACTION PLAN

BARANGAROO, NSW

	SOIL REMEDIATION CRITERIA	
CoPC	**SRC**	**Land Use Scenario**
Relevant Site Area	**VMP Area - Unsaturated Soil**	
Relevant Land Use Scenarios	**mg/kg**	**Scenarios 1 and 2**
Benzene	380	SSTC (Scenario 2)
TPH C_{10}-C_{14} aliphatic	54,000	SSTC (Scenario 2)
TPH C_{10}-C_{14} aromatic		
TPH C15-C28 aliphatic	72,000	SSTC (Scenario 2)
TPH C15-C28 aromatic		
TPH C29-C36 aliphatic	21,000	SSTC (Scenario 2)
TPH C29-C36 aromatic		
CPAH**	67	SSTC (Scenario 2)

Notes:
All soil criteria in mg/kg
SSTC - Site Specific Target Criteria
TPH - Total Petroleum Hydrocarbons
CPAH= Sum of 8 carcinogenic PAH Compounds (Benz(a)anthracene Benzo(a) pyrene; Benzo(b)fluoranthene; Benzo(g,h,i)perylene; Benzo(k)fluoranthene; Chrysene; Dibenz(a,h)anthracene; Indeno(1,2,3-c,d)pyrene)

Land Use Scenarios:
Scenario 1: Paved Recreation
Scenario 2: Intrusive Maintenance Worker

TABLE T2

GROUNDWATER REMEDIATION CRITERIA

VMP/BLOCK 4 REMEDIAL ACTION PLAN

BARANGAROO, NSW

	GROUNDWATER REMEDIATION CRITERIA			
CoPC	**GRC**	**VMP Remediation Works**	**GRC**	**Block 4 Development Works**
Relevant Site Area(s)	**VMP Area**		**Block 4**	
Relevant Land Use Scenarios	**mg/L**	**VMP Scenarios 1 and 2**	**mg/L**	**Development Scenarios 1 and 2**
Acenaphthylene	47	$SSTC^{VMP}$ (Scenario 2)	80	$SSTC^{DEV}$ (Scenario 1)
Aniline			180000	$SSTC^{DEV}$ (Scenario 1)
Benzene	2.1	$SSTC^{VMP}$ (Scenario 2)	7.7	$SSTC^{DEV}$ (Scenario 1)
Ethylbenzene			750	$SSTC^{DEV}$ (Scenario 1)
Fluorene			13	$SSTC^{DEV}$ (Scenario 1)
2-methylnapthalene			4.5	$SSTC^{DEV}$ (Scenario 1)
3&4-methylphenol			130	$SSTC^{DEV}$ (Scenario 1)
Naphthalene	1.3	$SSTC^{VMP}$ (Scenario 2)	0.24	$SSTC^{DEV}$ (Scenario 1)
Phenanthrene			5.8	$SSTC^{DEV}$ (Scenario 1)
Styrene			840	$SSTC^{DEV}$ (Scenario 1)
Toluene			4,000	$SSTC^{DEV}$ (Scenario 1)
Ammonia	150	$SSTC^{VMP}$ (Scenario 2)	630	$SSTC^{DEV}$ (Scenario 1)
TPH C_6-C_9 aliphatic			7,300	$SSTC^{DEV}$ (Scenario 1)
TPH C_{10}-C_{14} aliphatic	17	$SSTC^{VMP}$ (Scenario 2)	1.8	$SSTC^{DEV}$ (Scenario 1)
TPH C_{10}-C_{14} aromatic				
TPH C_{15}-C_{28} aliphatic	220	$SSTC^{VMP}$ (Scenario 2)		
TPH C_{15}-C_{28} aromatic				
TPH C_{29}-C_{36} aliphatic	250	$SSTC^{VMP}$ (Scenario 2)		
TPH C_{29}-C_{36} aromatic				
1,2,4-trimethylbenzene			22	$SSTC^{DEV}$ (Scenario 1)
Xylenes (total)			176	$SSTC^{DEV}$ (Scenario 1)
CPAH**	1	$SSTC^{VMP}$ (Scenario 2)		

Notes:
All groundwater criteria in mg/L
SSTC - Site Specific Target Criteria
TPH - Total Petroleum Hydrocarbons
CPAH= Sum of 8 carcinogenic PAH Compounds (Benz(a)anthracene Benzo(a) pyrene; Benzo(b)fluoranthene; Benzo(g,h,i)perylene; Benzo(k)fluoranthene; Chrysene; Dibenz(a,h)anthracene; Indeno(1,2,3-c,d)pyrene)

VMP Land Use Scenarios:
$SSTC^{VMP}$ Scenario 1: Public area with concrete/hardstand paving
$SSTC^{VMP}$ Scenario 2: Short term intrusive maintenance worker

Development Scenarios:
$SSTC^{DEV}$ Scenario 1: Lower Basement
$SSTC^{DEV}$ Scenario 2: Upper Basement

						PAHs																				
						CPAH (TEF)	PAH (Total)	2-chloronaphthalene	2-methylnaphthalene	3-methylcholanthrene	Acenaphthene	Acenaphthylene	Anthracene	Benz(a)anthracene	Benzo(a) pyrene	Benzo(b)&(k)fluoranthene	Benzo(b)fluoranthene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-c,d)pyrene	Naphthalene	Phenanthrene	Pyrene
						mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL								0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	1	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
SSTC [VMP]						67																				
Tar Containing Material (TCM) Criteria							**2000**								**150**											
Location	**Sample Depth**	**Field ID**	**Sample Date**	**Matrix**	**Area**																					
BH001	1	BH001	1/05/06	Fill	VMP & PDA - Block 5	67.03	699.1				1.1	14.4	19.2	65.9	33.4		98.6	25.5	29.6	70.5	10.4	104	3.6	28.6	11.5	84.4	98.4
BH019	1.5-1.95	BH019 1.5-1.95	8/05/06	Fill	VMP & PDA - Block 4	<1.21	38.2				<0.5	<0.5	1	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	1.3	1.4	<0.5	29.3	4.1	1.1
BH020	0.3-0.5	BH020 0.3-0.5	9/05/06	Fill	VMP & PDA - Block 4	9.621	80.3				0.6	1.6	2.5	6.2	6.8		7.7	3.7	2.3	5.4	0.8	14.6	1.2	3.1	0.8	7.8	15.2
BH020	1.5-2.1	BH020 1.5-2.1	9/05/06	Fill	VMP & PDA - Block 4	6.351	50				<0.5	1.3	1.6	3.9	4.4		5	2.5	1.9	3.6	0.6	8.5	0.7	2.1	0.5	4.7	8.7
BH021	0.3-0.5	BH021 0.3-0.5	9/05/06	Fill	VMP & PDA - Block 4	3.06	27.3				<0.5	0.9	0.9	2.2	2.3		2.8	1.2	1.1	1.8	<0.5	4.5	<0.5	1.2	0.8	2.8	4.8
BH028	0.3-0.5	BH028_0.3-0.5	12/05/06	Fill	VMP & PDA - Block 5																						
BH058	1.5-1.95	BH058-1.5-1.95	31/05/06	Fill	VMP & PDA - Block 5	39.542	368.6				1.2	8.4	11.1	29	25.3		37.9	19.3	11.8	26.9	4.3	65.3	5.1	16.1	5.7	39.5	61.7
BH059	1.5-1.95	BH059-1.5-1.95	31/05/06	Fill	VMP & PDA - Block 5	5.742	52.6				<0.5	2.1	2.1	4.3	3.9		4.6	2.5	1.9	3.7	0.5	8.5	0.6	2	1	6.4	8.5
BH060	1.7-2	BH060-1.7-2.0	31/05/06	Fill	VMP & PDA - Block 5	6.082	44				<0.5	1.2	1.3	3.6	3.6		6.3	3.5	2.3	3.7	0.9	5.4	<0.5	2.9	0.6	3.2	5.5
BH062	1.5-1.95	BH062-1.5-1.95	31/05/06	Fill	VMP & PDA - Block 5	30.902	228.3				<0.5	6.6	5.1	17.1	19.9		29.7	14.4	10.1	16.8	3.6	38.2	1.1	14	4	17.1	30.6
BH065	0.3-0.5	BH065-0.3-0.5	1/06/06	Fill	VMP & PDA - Block 4	4.098	35.4				<0.5	1.1	1.2	3	3.1		3.6	2.1	1.3	2.7	<0.5	5.9	<0.5	1.6	<0.5	3.6	6.2
BH065	1.5-1.95	BH065-1.5-1.95	1/06/06	Fill	VMP & PDA - Block 4	1.134	11.7				<0.5	<0.5	0.6	1.1	0.9		1.1	0.6	<0.5	0.8	<0.5	2.4	<0.5	<0.5	<0.5	1.9	2.3
BH067	1.5-1.95	BH067-1.5-1.95	1/06/06	Fill	VMP & PDA - Block 5	1.711	18.6				<0.5	<0.5	0.8	1.2	1.3		1.4	0.9	0.6	1.2	<0.5	3.1	0.7	0.7	0.8	2.9	3
BH070	0.3-0.5	BH070_0.3-0.5	2/05/06	Fill	VMP & PDA - Block 4	1.828	17.7				<0.5	0.5	0.6	1.3	1.4		1.6	0.7	0.6	1.1	<0.5	3	<0.5	0.6	0.9	2.3	3.1
BH070	1.5-1.95	BH070_1.5-1.95	2/05/06	Fill	VMP & PDA - Block 4	3.349	30				<0.5	0.7	1.2	2.5	2.5		3.1	1.5	1.2	2.4	<0.5	4.9	<0.5	1.3	<0.5	3.7	5
BH071	1.5-1.95	BH071_1.5-1.95	2/05/06	Fill	VMP & PDA - Block 4	<1.21	<8				<0.5	<0.5	<0.5	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
BH072	0.3-0.5	BH072_0.3-0.5	2/05/06	Fill	VMP & PDA - Block 4	<1.21	<8				<0.5	<0.5	<0.5	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
BH073	1.5-1.95	BH073_1.5-1.95	2/05/06	Fill	VMP & PDA - Block 4	140.147	1451.6				20.6	87.8	77.3	107	100		99.3	44	33.5	88.7	10.7	252	56.5	41.4	14.8	190	228
BH074	1.5-1.95	BH074_1.5-1.95	2/05/06	Fill	VMP & PDA - Block 5	1.239	11.3				<0.5	0.6	0.5	1.2	1		1.1	<0.5	<0.5	0.9	<0.5	2.4	<0.5	<0.5	<0.5	1.4	2.2
BH075	0.3-0.5	BH075_0.3-0.5	6/06/06	Fill	VMP & PDA - Block 4	27.657	242.1				0.5	8.4	7.9	19.4	19		21.2	11.3	9.4	16.4	2.4	42.7	2.2	9.8	2.8	25.7	43
BH087	**1.5-1.95**	**BH087 1.5-1.95**	**8/06/06**	**Fill**	**VMP & PDA - Block 4**	114.535	**2982.2**				21.6	177	136	114	78.5		83.6	34	35.2	69.5	8.6	325	182	31.2	925	496	265
BH089	0.3-0.5	BH089 0.3-0.5	9/06/06	Fill	VMP & PDA - Block 4	<1.21	2.2				<0.5	<0.5	<0.5	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	0.8	<0.5	<0.5	<0.5	0.7	0.7
BH089	1.5-1.95	BH089 1.5-1.95	9/06/06	Fill	VMP & PDA - Block 4	4.367	57.4				<0.5	2.5	2.3	3.7	3.3		3.4	1.6	1.7	3.1	<0.5	7.7	2	1.4	9	8.3	7.4
BH090	1.5-1.95	BH090 1.5-1.95	9/06/06	Fill	VMP & PDA - Block 4	0.845	5.6				<0.5	<0.5	<0.5	0.6	0.7		0.8	<0.5	<0.5	0.5	<0.5	1.1	<0.5	<0.5	<0.5	0.8	1.1
BH109 0.3	0.3-0.5	BH109 0.3_0.5	27/06/06	Fill	VMP & PDA - Block 4	<1.21	<8				<0.5	<0.5	<0.5	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
BH113 1.5	1.5-1.95	BH113 1.5_1.95	27/06/06	Fill	VMP & PDA - Block 4	<1.21	<8				<0.5	<0.5	<0.5	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
BH114 0.3	0.3-0.5	BH114 0.3_0.5	28/06/06	Fill	VMP & PDA - Block 4	2.225	15				<0.5	<0.5	<0.5	1.2	1.7		2	1.3	0.9	1.2	<0.5	2.3	<0.5	0.9	<0.5	1	2.5
BH115 0.8	0.8-1	BH115 0.8_1.0	28/06/06	Fill	VMP & PDA - Block 4																						
BH115 1.5	1.5-1.95	BH115 1.5_1.95	28/06/06	Fill	VMP & PDA - Block 4	0.877	7.4				<0.5	<0.5	<0.5	0.8	0.7		0.9	<0.5	<0.5	0.7	<0.5	1.7	<0.5	<0.5	<0.5	1	1.6
BH119 1.6	1.6-2.05	BH119 1.6_2.05	30/06/06	Fill	VMP & PDA - Block 4	0.962	6				<0.5	<0.5	<0.5	0.6	0.8		0.9	0.6	<0.5	0.6	<0.5	1	<0.5	<0.5	<0.5	0.5	1
BH132	1.5-1.95	BH132_1.5-1.95	6/07/06	Fill	VMP & PDA - Block 4	25.386	189.2				0.9	3.5	5.4	19.5	17.1		21.9	8.8	9	14.8	2.3	29.5	2	7.1	3.8	16.1	27.5
BH133	0.3-0.5	BH133_0.3-0.5	6/07/06	Fill	VMP & PDA - Block 4	2.803	26				<0.5	1	0.9	2.2	2.1		2.6	1.4	0.9	1.9	<0.5	4	<0.5	1	1.3	2.7	4
BH133 1.5	1.5-1.95	BH133 1.5_1.95	6/07/06	Fill	VMP & PDA - Block 4	<1.21	<8				<0.5	<0.5	<0.5	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
BH135A	0.4-0.6	BH135A-0.4-0.6	11/07/06	Fill	VMP & PDA - Block 4	<1.21	<8				<0.5	<0.5	<0.5	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
BH141	1.5-1.95	BH141_1.5-1.95	7/07/06	Fill	VMP & PDA - Block 4	34.823	350.5				1.8	11.8	14.6	28.2	24.6		25.2	12.2	10.6	24.1	2.5	72.2	4.5	9.6	2.3	38.4	67.9
BH145	0.3-0.5	BH145-0.3-0.5	11/07/06	Fill	VMP & PDA - Block 5	109.996	849.7				1.5	22	24.1	81.4	72.4		91.3	45.6	36.4	72	11.9	130	5.6	36.1	8.8	61.6	149
BH146	1.5-1.95	BH146-1.5-1.95	11/07/06	Fill	VMP & PDA - Block 4	<1.21	<8				<0.5	<0.5	<0.5	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
BH156	0.4-0.5	BH156_0.4-0.5	14/08/06	Fill	VMP & PDA - Block 4	<1.21	<8				<0.5	<0.5	<0.5	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
BH156	0.9-1	BH156_0.9-1.0	14/08/06	Fill	VMP & PDA - Block 4	<1.21	<8				<0.5	<0.5	<0.5	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
BH160	0.3-0.4	BH160_0.3-0.4	14/08/06	Fill	VMP & PDA - Block 4	<1.21	<8				<0.5	<0.5	<0.5	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
BH161	0.3-0.4	BH161_0.3-0.4	14/08/06	Fill	VMP & PDA - Block 4	<1.21	<8				<0.5	<0.5	<0.5	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
BH197	0.4	BH197/0.4	3/03/08	Fill	VMP & PDA - Block 5	0.125	12.1				<0.5	<0.5	0.5	0.6	<0.5		0.6	0.5	<0.5	<0.5	<0.5	3.5	0.6	<0.5	<0.5	2.9	2.9
BH200	1	BH200/1.0	7/04/08	Fill	VMP & PDA - Block 4	166.044	1781.5				5.2	54.8	75.7	158	113		158	30.4	48.2	128	11.6	320	14.8	34.4	64.4	269	296
BH203	1.9	BH203/1.9	10/03/08	Fill	VMP & PDA - Block 4	7.675	57.4				<0.5	1.4	2.2	5	5.1		5.3	3.4	2.3	4.1	0.9	9.3	<0.5	3.4	<0.5	5.9	9.1
BH204S	**1**	**BH204/1.0**	**18/03/08**	**Fill**	**VMP & PDA - Block 4**	119.443	**3702.1**				45.2	194	187	128	78.6		68.8	39.8	59	83.5	9.9	373	295	41.3	1180	673	246
BH204D	**1.5**	**BH204D/1.5**	**7/04/08**	**Fill**	**VMP & PDA - Block 4**	921.56	**20,934**				222	605	1200	823	**652**		587	305	231	631	71.4	1550	1190	247	8410	2700	1510
BH206	0.5	BH206/0.5	7/03/08	Fill	VMP & PDA - Block 4	11.321	98.2				<0.5	4.2	3.9	8.4	7.8		7.7	3.6	3.6	7.5	1.1	15.6	0.9	3.4	1.9	11.8	16.8
BH206	1.8	BH206/1.8	17/04/08	Fill	VMP & PDA - Block 4	<1.21	0.5				<0.5	<0.5	<0.5	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.5
BH210	1.5	BH210/1.5	18/03/08	Fill	VMP & PDA - Block 4	<1.21	<8				<0.5	<0.5	<0.5	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
BH34	1.8-2.2	BH34_1.8-2.2	25/02/10	Fill	VMP & PDA - Block 4	<1.21	<8				<0.5	<0.5	<0.5	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
BH4	0.4-0.5	BH4_0.4-0.5	21/02/08	Fill	VMP & PDA - Hickson Road	<1.11	<7	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1		<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
BH42	1-1.1	BH42_1.0-1.1	23/02/10	Fill	VMP & PDA - Block 4	2.115	17.2				<0.5	<0.5	<0.5	2	1.5		2.3	0.8	1	1.7	<0.5	2.9	<0.5	0.6	<0.5	1.2	3.2
BH44	1.9-2	BH44_1.9-2.0	23/02/10	Fill	VMP & PDA - Block 4	<1.21	<8				<0.5	<0.5	<0.5	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
BH49	1.5-1.7	BH49_1.5-1.7	22/02/10	Fill	VMP & PDA - Block 4	36.552	428.1				1.1	11	18.1	35.8	22.7		37	13.2	11.8	32	3.8	76.7	4.5	11.4	9.7	61.4	77.9
BH5	0.4-0.5	BH5 0.4-0.5	23/02/08	Fill	VMP & PDA - Hickson Road	8.491	82.9	<0.5	<0.5	<0.5	<0.5	6.4	4.4	11.8	6.9	20		2.2		4.9	<0.5	15.9	<0.5	3.4	0.7	11.6	14.7
BH5	1.2-1.3	BH5 1.2-1.3	23/02/08	Natural Clayey Sand	VMP & PDA - Hickson Road	0.06	4.6	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	<0.5	<1		<0.5		<0.5	<0.5	0.8	<0.5	<0.5	1.6	0.7	0.9

						PAHs																				
						CPAH (TEF)	PAH (Total)	2-chloronaphthalene	2-methylnaphthalene	3-methylcholanthrene	Acenaphthene	Acenaphthylene	Anthracene	Benz(a)anthracene	Benzo(a) pyrene	Benzo(b)&(k)fluoranthene	Benzo(b)fluoranthene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-c,d)pyrene	Naphthalene	Phenanthrene	Pyrene
						mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL								0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	1	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
SSTC [VMP]						67																				
Tar Containing Material (TCM) Criteria							**2000**								**150**											
Location	**Sample Depth**	**Field ID**	**Sample Date**	**Matrix**	**Area**																					
BH50	1.3-1.5	BH50_1.3-1.5	26/02/10	Natural Sandstone	VMP & PDA - Block 4	0.06	1.1		<0.5		<0.5	<0.5	<0.5	0.6	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.5
BH51	0.4-0.5	BH51_0.4-0.5	6/03/10	Fill	VMP & PDA - Hickson Road	1.256	10.6		<0.5		<0.5	<0.5	<0.5	1.3	0.9		1.4	0.5	0.7	1.1	<0.5	1.9	<0.5	<0.5	<0.5	0.8	2
BH52	1-1.2	BH52_1.0-1.2	22/02/10	Fill	VMP & PDA - Block 4																					
BH53	1.1-1.5	BH53_1.1-1.5	6/03/10	Fill	VMP & PDA - Hickson Road	56.149	668.3		<0.5		5.4	13	25.7	52.3	38.1		50.4	16.8	13.8	36.1	4.4	142	15.6	14.7	20.8	91.2	128
BH54	**1-1.4**	**BH54_1.0-1.4**	**23/02/10**	**Fill**	**VMP & PDA - Block 4**	842.57	**20,627**				273	1000	1070	912	**533**		824	248	324	549	72.5	2130	1290	231	6370	3130	1670
BH55	**1-1.2**	**BH55_1.0-1.2**	**25/02/10**	**Fill**	**VMP & PDA - Block 4**	372.05	**12,143**		<4		80.7	473	482	425	252		300	123	107	282	23.3	1280	460	95	4510	2030	1220
BH58	1-1.2	BH58_1.0-1.2	22/02/10	Fill	VMP & PDA - Block 4	19.668	205.8				0.6	8.2	8.5	16.2	12.7		19	9.8	6.9	14	1.8	36.1	1.5	7.2	2.3	23.4	37.6
BH59	1.9-2	BH59_1.9-2.0	22/02/10	Fill	VMP & PDA - Block 4	40.933	1264.5				10.3	58.8	60.3	45.9	26.5		35.8	13.1	14.3	32.2	3.2	121	68.3	11.8	453	206	104
BH61	0.3-0.4	BH61_0.3-0.4	6/03/10	Fill	VMP & PDA - Hickson Road																					
BH62	1-1.2	BH62_1.0-1.2	26/02/10	Fill	VMP & PDA - Block 5	0.1	4.4		<0.5		<0.5	<0.5	<0.5	0.5	<0.5		0.5	<0.5	<0.5	<0.5	<0.5	0.9	<0.5	<0.5	0.7	0.9	0.9
BH64	1-1.2	BH64_1.0-1.2	1/03/10	Fill	VMP & PDA - Block 5	107.979	1463.6		1		7.5	51.9	70.8	95.5	69.8		104	37.2	29.4	79.7	10.8	246	31.1	33.2	76.7	261	259
BH67	0.4-0.43	BH67_0.4-0.43	6/03/10	Fill	VMP & PDA - Hickson Road	12.389	131.2		<0.5		<0.5	3.2	3.4	16.2	5.5		20.3	6.3	8.7	17.6	1.6	17.7	<0.5	5.3	0.9	7.9	16.6
BH8	0.26-0.4	BH8 0.26-0.4	19/02/08	Fill	VMP & PDA - Hickson Road	21.841	136.7	<0.5	<0.5	<0.5	<0.5	7.4	5.9	24	16.1	34		4.5		7.6	2.5	23	0.8	7.2	0.9	12.6	24.2
BH8	0.6-0.7	BH8 0.6-0.7	19/02/08	Fill	VMP & PDA - Hickson Road	37.753	274.5	<0.5	1.4	<0.5	<0.5	17.1	11.5	33.5	31.3	57		4.8		10.5	2	62	1.9	9.5	2.3	24.8	63.3
BH9	0.4-0.5	BH9 0.4-0.5	21/02/08	Fill	VMP & PDA - Hickson Road	0.06	1.7	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	<0.5	<1		<0.5		<0.5	<0.5	0.5	<0.5	<0.5	<0.5	<0.5	0.6
BH9	0.9-1	BH9 0.9-1.0	21/02/08	Natural Sandstone	VMP & PDA - Hickson Road	1.546	14.1	<0.5	<0.5	<0.5	<0.5	0.6	0.5	2.6	1.2	2		0.6		1	<0.5	2.6	<0.5	0.7	<0.5	1.6	2.7
MW10	1.9-2	MW10 1.9-2.0	21/02/08	Fill	VMP & PDA - Hickson Road	12.023	87.2	<0.5	<0.5	<0.5	<0.5	1.6	2.4	21.1	8.6	14		1.2		7.1	1	16.8	<0.5	2.3	<0.5	7.6	17.5
MW15	0.4-0.5	MW15 0.4-0.5	10/04/08	Fill	VMP & PDA - Hickson Road	<1.11	<7	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1		<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
MW15	1.4-1.5	MW15 1.4-1.5	10/04/08	Fill	VMP & PDA - Hickson Road	<1.11	<7	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1		<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
MW3	0.4-0.5	MW3 0.4-0.5	23/02/08	Fill	VMP & PDA - Hickson Road	0.16	5.1	<0.5	<0.5	<0.5	<0.5	0.6	<0.5	0.8	<0.5	1		1		<0.5	<0.5	0.7	<0.5	0.7	<0.5	0.5	0.8
MW3	0.9-1	MW3 0.9-1.0	23/02/08	Fill	VMP & PDA - Hickson Road	19.996	468.5	<0.5	<0.5	<0.5	1.7	42.5	13.8	44.6	11.7	62		4.2		23.4	2.7	91.1	8.5	8.6	2.5	120	93.2
MW6	0.8-0.9	MW6 0.8-0.9	20/02/08	Fill	VMP & PDA - Hickson Road	<1.11	<7	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1		<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
MW7	1.4-1.5	MW7 1.4-1.5	25/02/08	FILL	VMP & PDA - Hickson Road	38.745	218	<0.5	0.7	<0.5	0.7	7.7	9.6	41.2	32.1	49		1.4		16.1	1.7	36.6	2	6.5	1.6	24.9	35.9
SV09	0.2-0.4	SV09_0.2-0.4	26/02/10	Fill	VMP & PDA - Block 5	42.044	495.4		<0.5		1.4	9.9	18.5	45.3	25.4		43.7	14.5	18	33.9	4.2	97.5	3.4	12.6	5.8	69.1	92.2
TBH01	0.43-0.5	TBH01_0.43-0.5	5/02/11	Fill	VMP & PDA - Hickson Road	2.22	16.5				<0.5	<0.5	0.5	1.9	1.7		1.8	0.6	0.7	1.4	<0.5	3.1	<0.5	0.6	<0.5	1.2	3
TBH03	1.2-1.3	TBH03_1.2-1.3	5/02/11	Fill	VMP & PDA - Hickson Road	<1.21	<8				<0.5	<0.5	<0.5	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
TBH03	1.5-1.6	TBH03_1.5-1.6	5/02/11	Fill	VMP & PDA - Hickson Road	<1.21	<8				<0.5	<0.5	<0.5	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
TBH05	0.6-0.7	TBH05_0.6-0.7	12/02/11	Fill	VMP & PDA - Hickson Road	<1.21	<8				<0.5	<0.5	<0.5	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
TBH05	1.3-1.7	TBH05_1.3-1.7	12/02/11	Fill	VMP & PDA - Hickson Road	0.85	4.1				<0.5	<0.5	<0.5	0.7	0.7		0.8	<0.5	<0.5	<0.5	<0.5	1	<0.5	<0.5	<0.5	<0.5	0.9
TBH05	1.8-2	TBH05_1.8-2.0	12/02/11	Fill	VMP & PDA - Hickson Road	28.753	161.8				0.6	0.9	3.1	15.6	18.8		23.8	15.1	9.3	13.2	3.4	19.1	<0.5	14	0.6	8.3	16
TBH06	0.55-0.6	TBH06_0.55-0.6	5/02/11	Fill	VMP & PDA - Hickson Road	0.967	7.3				<0.5	<0.5	<0.5	0.9	0.8		0.7	<0.5	<0.5	0.7	<0.5	1.7	<0.5	<0.5	<0.5	0.6	1.9
TBH06	1.5-2	TBH06_1.5-2.0	12/02/11	Fill	VMP & PDA - Hickson Road	<1.21	<8				<0.5	<0.5	<0.5	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
TBH07	0.1-0.15	TBH07_0.1-0.15	4/02/11	Fill	VMP & PDA - Hickson Road	10.663	58.6				<0.5	1.4	1.4	4.7	7.8		8	6.5	2.7	4.8	0.8	6.4	<0.5	4.1	<0.5	1.4	8.6
TBH08	0.13-0.25	TBH08_0.13-0.25	4/02/11	Fill	VMP & PDA - Hickson Road	1.828	12.3				<0.5	<0.5	<0.5	1.3	1.5		1.3	0.7	0.5	1.1	<0.5	2.8	<0.5	<0.5	<0.5	<0.5	3.1

Notes
mg/kg = milligrams per kilogram
EQL = Estimated Quantitation Limit
< denotes result less than EQL
SSTC[VMP] - Site Specific Target Criteria for the VMP Area
shading denotes concentration greater than criteria
CPAH= Sum of 8 carcinogenic PAH Compounds
(Benz(a)anthracene Benzo(a) pyrene; Benzo(b)fluoranthene;
Benzo(g,h,i)perylene; Benzo(k)fluoranthene; Chrysene;
Dibenz(a,h)anthracene and Indeno(1,2,3-c,d)pyrene)

TEF - Toxicity Equivalent Factor
TPH - Total Petroleum Hydrocarbons
PAH - Polycyclic Aromatic Hydrocarbons (PAH)
* TPH C6-C9 aliphatic
* *TPH C10-C14 aliphatic and aromatic
note TPH in table not speciated
BOLD = Sample classified as TCM based on PAH (>2000 mg/kg) and Benzo(a)pyrene (>150 mg/kg) results

						Phenols									TPH						BTEX					
						2,4-dimethylphenol	2,4-dinitrophenol	2-methylphenol	2-nitrophenol	3-&4-methylphenol	4-chloro-3-methylphenol	4-methylphenol	4-nitrophenol	Phenol	TPH C15-C36	TPH C10 - C14	TPH C15-C28	TPH C29-C36	TPH C6 - C9	TPH+C10 - C36 (Sum of total)	Total Xylene	Benzene	Ethylbenzene	Toluene	Xylene (m & p)	Xylene (o)
						mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL						0.5		0.5	0.5	0.5	0.5	0.5		0.5		50	100	100	10	100	0.15	0.2	0.2	0.2	0.2	0.2
SSTC [VMP]																54000	72000	21,000				380				
Tar Containing Material (TCM) Criteria																										
Location	**Sample Depth**	**Field ID**	**Sample Date**	**Matrix**	**Area**																					
BH001	1	BH001	1/05/06	Fill	VMP & PDA - Block 5										4470	2360	3280	1190	3	6830	0.2	0.5	<0.2	0.4	0.2	<0.2
BH019	1.5-1.95	BH019 1.5-1.95	8/05/06	Fill	VMP & PDA - Block 4										<200	100	<100	<100	50	100						
BH020	0.3-0.5	BH020 0.3-0.5	9/05/06	Fill	VMP & PDA - Block 4										810	<50	460	350	<2	810						
BH020	1.5-2.1	BH020 1.5-2.1	9/05/06	Fill	VMP & PDA - Block 4										620	<50	280	340	<2	620						
BH021	0.3-0.5	BH021 0.3-0.5	9/05/06	Fill	VMP & PDA - Block 4										230	<50	130	100	<2	230						
BH028	0.3-0.5	BH028_0.3-0.5	12/05/06	Fill	VMP & PDA - Block 5										340	<50	200	140	<2	340	<0.01	<0.2	<0.2	<0.2	<0.2	<0.2
BH058	1.5-1.95	BH058-1.5-1.95	31/05/06	Fill	VMP & PDA - Block 5										3030	120	1960	1070	8	3150	<0.4	0.3	0.3	0.2	<0.2	<0.2
BH059	1.5-1.95	BH059-1.5-1.95	31/05/06	Fill	VMP & PDA - Block 5										550	<50	290	260	<2	550	<0.4	<0.2	<0.2	<0.2	<0.2	<0.2
BH060	1.7-2	BH060-1.7-2.0	31/05/06	Fill	VMP & PDA - Block 5										140	<50	<100	140	<2	140	<0.4	<0.2	<0.2	<0.2	<0.2	<0.2
BH062	1.5-1.95	BH062-1.5-1.95	31/05/06	Fill	VMP & PDA - Block 5										1120	100	610	510	8	1220	0.3	<0.2	<0.2	0.4	0.3	<0.2
BH065	0.3-0.5	BH065-0.3-0.5	1/06/06	Fill	VMP & PDA - Block 4										530	<50	180	350	<2	530	<0.4	<0.2	<0.2	<0.2	<0.2	<0.2
BH065	1.5-1.95	BH065-1.5-1.95	1/06/06	Fill	VMP & PDA - Block 4										<200	<50	<100	<100	<2	<250	<0.4	<0.2	<0.2	<0.2	<0.2	<0.2
BH067	1.5-1.95	BH067-1.5-1.95	1/06/06	Fill	VMP & PDA - Block 5										1100	<50	480	620	<2	1100	<0.4	<0.2	<0.2	<0.2	<0.2	<0.2
BH070	0.3-0.5	BH070_0.3-0.5	2/05/06	Fill	VMP & PDA - Block 4										810	<50	600	210	<2	810	<0.4	<0.2	<0.2	<0.2	<0.2	<0.2
BH070	1.5-1.95	BH070_1.5-1.95	2/05/06	Fill	VMP & PDA - Block 4										570	<50	230	340	<2	570	<0.4	<0.2	<0.2	<0.2	<0.2	<0.2
BH071	1.5-1.95	BH071_1.5-1.95	2/05/06	Fill	VMP & PDA - Block 4										<200	<50	<100	<100	<2	<250	<0.4	<0.2	<0.2	<0.2	<0.2	<0.2
BH072	0.3-0.5	BH072_0.3-0.5	2/05/06	Fill	VMP & PDA - Block 4										<200	<50	<100	<100	<2	<250	<0.4	<0.2	<0.2	<0.2	<0.2	<0.2
BH073	1.5-1.95	BH073_1.5-1.95	2/05/06	Fill	VMP & PDA - Block 4										830	<50	560	270	<2	830	<0.4	<0.2	<0.2	<0.2	<0.2	<0.2
BH074	1.5-1.95	BH074_1.5-1.95	2/05/06	Fill	VMP & PDA - Block 5										<200	<50	<100	<100	<2	<250	<0.4	<0.2	<0.2	<0.2	<0.2	<0.2
BH075	0.3-0.5	BH075_0.3-0.5	6/06/06	Fill	VMP & PDA - Block 4										1010	<50	570	440	<2	1010	<0.4	<0.2	<0.2	<0.2	<0.2	<0.2
BH087	**1.5-1.95**	**BH087 1.5-1.95**	**8/06/06**	**Fill**	**VMP & PDA - Block 4**										7340	2230	5820	1520	20	9570	10.5	0.7	1.2	0.8	7.3	3.2
BH089	0.3-0.5	BH089 0.3-0.5	9/06/06	Fill	VMP & PDA - Block 4										<200	<50	<100	<100	<2	<250	<0.4	<0.2	<0.2	<0.2	<0.2	<0.2
BH089	1.5-1.95	BH089 1.5-1.95	9/06/06	Fill	VMP & PDA - Block 4										610	70	440	170	<2	680	<0.4	<0.2	<0.2	<0.2	<0.2	<0.2
BH090	1.5-1.95	BH090 1.5-1.95	9/06/06	Fill	VMP & PDA - Block 4										<200	<50	<100	<100	<2	<250	<0.4	<0.2	<0.2	<0.2	<0.2	<0.2
BH109 0.3	0.3-0.5	BH109 0.3_0.5	27/06/06	Fill	VMP & PDA - Block 4										<200	<50	<100	<100	<2	<250	<0.4	<0.2	<0.2	<0.2	<0.2	<0.2
BH113 1.5	1.5-1.95	BH113 1.5_1.95	27/06/06	Fill	VMP & PDA - Block 4										<200	<50	<100	<100	<2	<250	<0.4	<0.2	<0.2	<0.2	<0.2	<0.2
BH114 0.3	0.3-0.5	BH114 0.3_0.5	28/06/06	Fill	VMP & PDA - Block 4										340	<50	130	210	<2	340	<0.4	<0.2	<0.2	<0.2	<0.2	<0.2
BH115 0.8	0.8-1	BH115 0.8_1.0	28/06/06	Fill	VMP & PDA - Block 4										900	<50	560	340	<2	900	<0.4	<0.2	<0.2	<0.2	<0.2	<0.2
BH115 1.5	1.5-1.95	BH115 1.5_1.95	28/06/06	Fill	VMP & PDA - Block 4										<200	<50	<100	<100	<2	<250	<0.4	<0.2	<0.2	<0.2	<0.2	<0.2
BH119 1.6	1.6-2.05	BH119 1.6_2.05	30/06/06	Fill	VMP & PDA - Block 4										<200	<50	<100	<100	<2	<250	<0.4	<0.2	<0.2	<0.2	<0.2	<0.2
BH132	1.5-1.95	BH132_1.5-1.95	6/07/06	Fill	VMP & PDA - Block 4										890	<50	500	390	<2	890	<0.4	0.5	<0.2	<0.2	<0.2	<0.2
BH133	0.3-0.5	BH133_0.3-0.5	6/07/06	Fill	VMP & PDA - Block 4										<200	<50	<100	<100	<2	<250	<0.4	<0.2	<0.2	<0.2	<0.2	<0.2
BH133 1.5	1.5-1.95	BH133 1.5_1.95	6/07/06	Fill	VMP & PDA - Block 4										<200	<50	<100	<100	<2	<250	<0.4	<0.2	<0.2	<0.2	<0.2	<0.2
BH135A	0.4-0.6	BH135A-0.4-0.6	11/07/06	Fill	VMP & PDA - Block 4										<200	<50	<100	<100	<2	<250	<0.4	<0.2	<0.2	<0.2	<0.2	<0.2
BH141	1.5-1.95	BH141_1.5-1.95	7/07/06	Fill	VMP & PDA - Block 4										2190	70	1600	590	<2	2260	<0.4	<0.2	<0.2	<0.2	<0.2	<0.2
BH145	0.3-0.5	BH145-0.3-0.5	11/07/06	Fill	VMP & PDA - Block 5										3390	80	2120	1270	4	3470	0.3	0.2	<0.2	0.4	0.3	<0.2
BH146	1.5-1.95	BH146-1.5-1.95	11/07/06	Fill	VMP & PDA - Block 4										<200	<50	<100	<100	2	<250	<0.4	<0.2	<0.2	<0.2	<0.2	<0.2
BH156	0.4-0.5	BH156_0.4-0.5	14/08/06	Fill	VMP & PDA - Block 4										<200	<50	<100	<100	<2	<250	<0.4	<0.2	<0.2	<0.2	<0.2	<0.2
BH156	0.9-1	BH156_0.9-1.0	14/08/06	Fill	VMP & PDA - Block 4	<0.5		<0.5	<0.5	<1	<0.5			<0.5	<200	<50	<100	<100	<2	<250	<0.4	<0.2	<0.2	<0.2	<0.2	<0.2
BH160	0.3-0.4	BH160_0.3-0.4	14/08/06	Fill	VMP & PDA - Block 4	<0.5		<0.5	<0.5	<1	<0.5			<0.5	<200	<50	<100	<100	<2	<250	<0.4	<0.2	<0.2	<0.2	<0.2	<0.2
BH161	0.3-0.4	BH161_0.3-0.4	14/08/06	Fill	VMP & PDA - Block 4										<200	<50	<100	<100	<2	<250	<0.4	<0.2	<0.2	<0.2	<0.2	<0.2
BH197	0.4	BH197/0.4	3/03/08	Fill	VMP & PDA - Block 5	<0.5		<0.5	<0.5	<1	<0.5			<0.5	600	<50	150	450	<10	600	<1	<0.2	<0.5	<0.5	<0.5	<0.5
BH200	1	BH200/1.0	7/04/08	Fill	VMP & PDA - Block 4	<0.5		3.8	<0.5	8.5	<0.5			6.7	14,930	520	10,200	4730	<10	15,450	2.8	1.6	<0.5	2.2	2	0.8
BH203	1.9	BH203/1.9	10/03/08	Fill	VMP & PDA - Block 4	<0.5		<0.5	<0.5	<1	<0.5			<0.5	690	<50	330	360	<10	690	<1	<0.2	<0.5	<0.5	<0.5	<0.5
BH204S	**1**	**BH204/1.0**	**18/03/08**	**Fill**	**VMP & PDA - Block 4**	1.5		<0.5	<0.5	<1	<0.5			<0.5	12,690	2890	9620	3070	20	15,580	8.6	0.6	3.5	1.4	4.2	4.4
BH204D	**1.5**	**BH204D/1.5**	**7/04/08**	**Fill**	**VMP & PDA - Block 4**	754		1160	<8	2290	<8			1720	93,000	54,200	72,400	20,600	226	147,200	94.1	61	7	69.2	67.2	26.9
BH206	0.5	BH206/0.5	7/03/08	Fill	VMP & PDA - Block 4	<0.5		<0.5	<0.5	<1	<0.5			<0.5	490	<50	310	180	<10	490	<1	<0.2	<0.5	<0.5	<0.5	<0.5
BH206	1.8	BH206/1.8	17/04/08	Fill	VMP & PDA - Block 4	<0.5		<0.5	<0.5	<1	<0.5			<0.5	530	<50	190	340	<10	530	<1	<0.2	<0.5	<0.5	<0.5	<0.5
BH210	1.5	BH210/1.5	18/03/08	Fill	VMP & PDA - Block 4	<0.5		<0.5	<0.5	<1	<0.5			<0.5	<200	<50	<100	<100	<10	<250	<1	<0.2	<0.5	<0.5	<0.5	<0.5
BH34	1.8-2.2	BH34_1.8-2.2	25/02/10	Fill	VMP & PDA - Block 4	<0.5		<0.5	<0.5	<1	<0.5			<0.5	<200	<50	<100	<100	<10	<50	<1	<0.2	<0.5	<0.5	<0.5	<0.5
BH4	0.4-0.5	BH4_0.4-0.5	21/02/08	Fill	VMP & PDA - Hickson Road	<0.5		<0.5	<0.5	<0.5	<0.5			<0.5	<200	<50	<100	<100	<10	<250	<1	<0.2	<0.5	<0.5	<0.5	<0.5
BH42	1-1.1	BH42_1.0-1.1	23/02/10	Fill	VMP & PDA - Block 4	<0.5		<0.5	<0.5	<1	<0.5			<0.5	110	<50	110	<100	<10	110	<1	<0.2	<0.5	<0.5	<0.5	<0.5
BH44	1.9-2	BH44_1.9-2.0	23/02/10	Fill	VMP & PDA - Block 4	<0.5		<0.5	<0.5	<1	<0.5			<0.5	<200	<50	<100	<100	10	<50	<1	<0.2	<0.5	<0.5	<0.5	<0.5
BH49	1.5-1.7	BH49_1.5-1.7	22/02/10	Fill	VMP & PDA - Block 4	0.8		0.8	<0.5	2.1	<0.5			1.9	2250	80	1460	790	11	2330	<1	<0.2	<0.5	<0.5	<0.5	<0.5
BH5	0.4-0.5	BH5 0.4-0.5	23/02/08	Fill	VMP & PDA - Hickson Road	0.8		0.5	<0.5	1.9	<0.5			0.7	1700	<50	1060	640	<10	1700	<1	<0.2	<0.5	<0.5	<0.5	<0.5
BH5	1.2-1.3	BH5 1.2-1.3	23/02/08	Natural Clayey Sand	VMP & PDA - Hickson Road	<0.5		<0.5	<0.5	<0.5	<0.5			<0.5	<200	<50	<100	<100	<10	<250	0.8	2	<0.5	0.7	0.8	<0.5

						Phenols									TPH						BTEX					
						2,4-dimethylphenol	2,4-dinitrophenol	2-methylphenol	2-nitrophenol	3-&4-methylphenol	4-chloro-3-methylphenol	4-methylphenol	4-nitrophenol	Phenol	TPH C15-C36	TPH C10 - C14	TPH C15-C28	TPH C29-C36	TPH C6 - C9	TPH+C10 - C36 (Sum of total)	Total Xylene	Benzene	Ethylbenzene	Toluene	Xylene (m & p)	Xylene (o)
						mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL						0.5		0.5	0.5	0.5	0.5	0.5		0.5		50	100	100	10	100	0.15	0.2	0.2	0.2	0.2	0.2
SSTC VMP																54000	72000	21,000				380				
Tar Containing Material (TCM) Criteria																										
Location	**Sample Depth**	**Field ID**	**Sample Date**	**Matrix**	**Area**																					
BH50	1.3-1.5	BH50_1.3-1.5	26/02/10	Natural Sandstone	VMP & PDA - Block 4	<0.5		<0.5	<0.5	<1	<0.5			<0.5	<200	<50	<100	<100	<10	<50	<1	<0.2	<0.5	<0.5	<0.5	<0.5
BH51	0.4-0.5	BH51_0.4-0.5	6/03/10	Fill	VMP & PDA - Hickson Road	<0.5		<0.5	<0.5	<1	<0.5			<0.5	<200	<50	<100	<100	<10	<50	<1	<0.2	<0.5	<0.5	<0.5	<0.5
BH52	1-1.2	BH52_1.0-1.2	22/02/10	Fill	VMP & PDA - Block 4										950	<50	580	370	78	950	28.9	0.2	2.7	3.9	20.2	8.7
BH53	1.1-1.5	BH53_1.1-1.5	6/03/10	Fill	VMP & PDA - Hickson Road	0.7		0.8	<0.5	1.6	<0.5			1.2	3250	<50	1920	1330	<10	3250	<1	0.4	<0.5	<0.5	<0.5	<0.5
BH54	**1-1.4**	**BH54_1.0-1.4**	**23/02/10**	**Fill**	**VMP & PDA - Block 4**	22.8		7	<4	<8	<4			5	15,260	4380	11,700	3560	72	19,600 - 19,640	35.5	2.5	3.5	7.3	25	10.5
BH55	**1-1.2**	**BH55_1.0-1.2**	**25/02/10**	**Fill**	**VMP & PDA - Block 4**	41.3		28.3	<4	33.2	<4			23.5	24,950	11,300	19,400	5550	109	36,200 - 36,250	34.9	7.8	2.8	14	24.1	10.8
BH58	1-1.2	BH58_1.0-1.2	22/02/10	Fill	VMP & PDA - Block 4	<0.5		<0.5	<0.5	<1	<0.5			<0.5	1010	<50	550	460	<10	1010	<1	<0.2	<0.5	<0.5	<0.5	<0.5
BH59	1.9-2	BH59_1.9-2.0	22/02/10	Fill	VMP & PDA - Block 4	<0.5		<0.5	<0.5	<1	<0.5			<0.5	3150	980	2290	860	<10	4130	<1	<0.2	<0.5	<0.5	<0.5	<0.5
BH61	0.3-0.4	BH61_0.3-0.4	6/03/10	Fill	VMP & PDA - Hickson Road										<200	<50	<100	<100	<10	<50	<1	<0.2	<0.5	<0.5	<0.5	<0.5
BH62	1-1.2	BH62_1.0-1.2	26/02/10	Fill	VMP & PDA - Block 5	<0.5		<0.5	<0.5	<1	<0.5			<0.5	<200	<50	<100	<100	<10	<50	<1	<0.2	<0.5	<0.5	<0.5	<0.5
BH64	1-1.2	BH64_1.0-1.2	1/03/10	Fill	VMP & PDA - Block 5	2.4		1.9	<0.5	5.3	<0.5			3.8	2970	260	1970	1000	<10	3230	<1	0.2	<0.5	<0.5	<0.5	<0.5
BH67	0.4-0.43	BH67_0.4-0.43	6/03/10	Fill	VMP & PDA - Hickson Road	<0.5		<0.5	<0.5	<1	<0.5			<0.5	1270	<50	700	570	<10	1270	<1	<0.2	<0.5	<0.5	<0.5	<0.5
BH8	0.26-0.4	BH8 0.26-0.4	19/02/08	Fill	VMP & PDA - Hickson Road	<0.5		<0.5	<0.5	0.5	<0.5			<0.5	510	<50	310	200	<10	510	<1	<0.2	<0.5	<0.5	<0.5	<0.5
BH8	0.6-0.7	BH8 0.6-0.7	19/02/08	Fill	VMP & PDA - Hickson Road	<0.5		<0.5	<0.5	1.7	<0.5			0.7	2370	<50	1380	990	<10	2370	<1	<0.2	<0.5	<0.5	<0.5	<0.5
BH9	0.4-0.5	BH9 0.4-0.5	21/02/08	Fill	VMP & PDA - Hickson Road	<0.5		<0.5	<0.5	<0.5	<0.5			<0.5	<200	<50	<100	<100	<10	<250	<1	<0.2	<0.5	<0.5	<0.5	<0.5
BH9	0.9-1	BH9 0.9-1.0	21/02/08	Natural Sandstone	VMP & PDA - Hickson Road	<0.5		<0.5	<0.5	<0.5	<0.5			<0.5	<200	<50	<100	<100	<10	<250	<1	<0.2	<0.5	<0.5	<0.5	<0.5
MW10	1.9-2	MW10 1.9-2.0	21/02/08	Fill	VMP & PDA - Hickson Road	<0.5		<0.5	<0.5	<0.5	<0.5			<0.5	830	<50	370	460	<10	830	<1	<0.2	<0.5	<0.5	<0.5	<0.5
MW15	0.4-0.5	MW15_0.4-0.5	10/04/08	Fill	VMP & PDA - Hickson Road	<0.5		<0.5	<0.5	<0.5	<0.5			<0.5	<200	<50	<100	<100	<10	<250	<1	<0.2	<0.5	<0.5	<0.5	<0.5
MW15	1.4-1.5	MW15_1.4-1.5	10/04/08	Fill	VMP & PDA - Hickson Road	<0.5		<0.5	<0.5	<0.5	<0.5			<0.5	<200	<50	<100	<100	<10	<250	<1	<0.2	<0.5	<0.5	<0.5	<0.5
MW3	0.4-0.5	MW3 0.4-0.5	23/02/08	Fill	VMP & PDA - Hickson Road	<0.5		<0.5	<0.5	<0.5	<0.5			<0.5	<200	<50	<100	<100	<10	<250	<1	<0.2	<0.5	<0.5	<0.5	<0.5
MW3	0.9-1	MW3 0.9-1.0	23/02/08	Fill	VMP & PDA - Hickson Road	<0.5		<0.5	<0.5	2.2	<0.5			<0.5	3270	1010	2510	760	<10	4280	<1	<0.2	<0.5	<0.5	<0.5	<0.5
MW6	0.8-0.9	MW6 0.8-0.9	20/02/08	Fill	VMP & PDA - Hickson Road	<0.5		<0.5	<0.5	<0.5	<0.5			<0.5	<200	<50	<100	<100	<10	<250	<1	<0.2	<0.5	<0.5	<0.5	<0.5
MW7	1.4-1.5	MW7 1.4-1.5	25/02/08	FILL	VMP & PDA - Hickson Road	<0.5		<0.5	<0.5	1.4	<0.5			0.9	2660	<50	1400	1260	<10	2660	<1	0.2	<0.5	<0.5	<0.5	<0.5
SV09	0.2-0.4	SV09_0.2-0.4	26/02/10	Fill	VMP & PDA - Block 5	<0.5		<0.5	<0.5	1.4	<0.5			<0.5	3160	120	1920	1240	<10	3280	<1	0.5	<0.5	<0.5	<0.5	<0.5
TBH01	0.43-0.5	TBH01_0.43-0.5	5/02/11	Fill	VMP & PDA - Hickson Road										<200	<50	<100	<100	<10	<50	<1	<0.2	<0.5	<0.5	<0.5	<0.5
TBH03	1.2-1.3	TBH03_1.2-1.3	5/02/11	Fill	VMP & PDA - Hickson Road										<200	<50	<100	<100	<10	<50	<1	<0.2	<0.5	<0.5	<0.5	<0.5
TBH03	1.5-1.6	TBH03_1.5-1.6	5/02/11	Fill	VMP & PDA - Hickson Road										<200	<50	<100	<100	<10	<50	<1	<0.2	<0.5	<0.5	<0.5	<0.5
TBH05	0.6-0.7	TBH05_0.6-0.7	12/02/11	Fill	VMP & PDA - Hickson Road										<200	<50	<100	<100	<10	<50	<1	<0.2	<0.5	<0.5	<0.5	<0.5
TBH05	1.3-1.7	TBH05_1.3-1.7	12/02/11	Fill	VMP & PDA - Hickson Road										<200	<50	<100	<100	<10	<50	<1	<0.2	<0.5	<0.5	<0.5	<0.5
TBH05	1.8-2	TBH05_1.8-2.0	12/02/11	Fill	VMP & PDA - Hickson Road										1210	<50	600	610	<10	1210	<1	<0.2	<0.5	<0.5	<0.5	<0.5
TBH06	0.55-0.6	TBH06_0.55-0.6	5/02/11	Fill	VMP & PDA - Hickson Road										<200	<50	<100	<100	<10	<50	<1	<0.2	<0.5	<0.5	<0.5	<0.5
TBH06	1.5-2	TBH06_1.5-2.0	12/02/11	Fill	VMP & PDA - Hickson Road										<200	<50	<100	<100	<10	<50	<1	<0.2	<0.5	<0.5	<0.5	<0.5
TBH07	0.1-0.15	TBH07_0.1-0.15	4/02/11	Fill	VMP & PDA - Hickson Road										700	<50	280	420	<10	700	<1	<0.2	<0.5	<0.5	<0.5	<0.5
TBH08	0.13-0.25	TBH08_0.13-0.25	4/02/11	Fill	VMP & PDA - Hickson Road										370	<50	110	260	<10	370	<1	<0.2	<0.5	<0.5	<0.5	<0.5

Notes
mg/kg = milligrams per kilogram
EQL = Estimated Quantitation Limit
< denotes result less than EQL
SSTC^{VMP} - Site Specific Target Criteria for the VMP Area
shading denotes concentration greater than criteria
CPAH= Sum of 8 carcinogenic PAH Compounds
(Benz(a)anthracene Benzo(a) pyrene; Benzo(b)fluoranthene;
Benzo(g,h,i)perylene; Benzo(k)fluoranthene; Chrysene;
Dibenz(a,h)anthracene and Indeno(1,2,3-c,d)pyrene)

TEF - Toxicity Equivalent Factor
TPH - Total Petroleum Hydrocarbons
PAH - Polycyclic Aromatic Hydrocarbons (PAH)
* TPH C6-C9 aliphatic
* *TPH C10-C14 aliphatic and aromatic
note TPH in table not speciated
BOLD = Sample classified as TCM based on PAH (>2000 mg/kg) and Benzo(a)pyrene (>150 mg/kg) results

						PAHs																							
						CPAH (TEF)	PAH (Total)	2-chloronaphthalene	2-methylnaphthalene	3-methylcholanthrene	Acenaphthene	Acenaphthylene	Acetophenone	Anthracene	Benz(a)anthracene	Benzo(a) pyrene	Benzo(b)&(k)fluoranthene	Benzo(b)fluoranthene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-c,d)pyrene	Naphthalene	PAHs (Sum of total)	Phenanthrene	Pyrene
						mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL								0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	1	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
SSTC[VMP]						67																							
Tar Containing Material (TCM) Criteria							**2000**									**150**													
Location	**Sample Depth**	**Consultant**	**Sample Date**	**Matrix**	**Area**																								
BH001	4	ERM	2/05/2006	Fill	VMP & PDA - Block 5	3.531	30.7				<0.5	0.5		0.8	3.3	2.6		3.3	1	1.3	3.1	<0.5	5	<0.5	1	1.3		2.4	5.1
BH019	2.5-3	ERM	8/05/2006	Fill	VMP & PDA - Block 4	82.897	1994.2				24.3	82		79.3	70.3	58.2		56.9	22.6	25.5	54.1	6.4	208	110	22.6	700		295	179
BH019	**3-3.45**	ERM	**8/05/2006**	**Fill**	**VMP & PDA - Block 4**	122.038	**2733.9**				31.6	120		114	103	86.3		85.3	32.2	37.2	77.6	8.8	295	157	32.9	891		407	255
BH020	1.5-2.1	ERM	9/05/2006	Fill	VMP & PDA - Block 4	6.351	50				<0.5	1.3		1.6	3.9	4.4		5	2.5	1.9	3.6	0.6	8.5	0.7	2.1	0.5		4.7	8.7
BH028	13-13.5	ERM	12/05/2006	Natural Clayey Sand	VMP & PDA - Block 5	12.142	470.5				6.7	38.6		20.4	13.2	8.4		9	3.1	3.2	11.1	0.8	28.2	32.3	2.6	183		76	33.9
BH058	6-6.5	ERM	31/05/2006	Natural Clayey Sand	VMP & PDA - Block 5	2.618	154.1				2.7	15.6		6.9	3.6	2		1.6	0.6	0.6	3.2	<0.5	6.6	12.3	<0.5	59.5		28.9	10
BH059	3-3.45	ERM	31/05/2006	Fill	VMP & PDA - Block 5	3.224	27.9				<0.5	0.7		1	2.5	2.4		3	1.4	1.2	2	<0.5	4.4	0.5	1.2	<0.5		2.6	5
BH059	8.5-9	ERM	31/05/2006	Natural Clayey Sand	VMP & PDA - Block 5	<1.21	10.9				<0.5	1.4		0.6	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	0.8	1.2	<0.5	2.7		3	1.2
BH060	9.5-10	ERM	31/05/2006	Natural Clayey Sand	VMP & PDA - Block 5	<1.21	1.4				<0.5	<0.5		<0.5	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		0.9	0.5
BH062	3-3.45	ERM	31/05/2006	Fill	VMP & PDA - Block 5	6.023	47.4				<0.5	1		1.8	3.5	4.2		5	3	1.8	3.3	0.5	7.4	0.6	2.3	<0.5		4.9	8.1
BH065	3-3.45	ERM	1/06/2006	Fill	VMP & PDA - Block 4	11.332	176.3				7	1.4		9.7	9.5	7.7		9.4	4.5	3.5	8.7	0.9	28.3	7.8	3.6	13.9		34.6	25.8
BH067	3-3.45	ERM	1/06/2006	Fill	VMP & PDA - Block 5	6.064	63.1				<0.5	1.1		1.8	5.1	4.5		5.7	2.1	2.4	4.3	<0.5	12.5	0.9	1.8	1.5		7.5	11.9
BH071	3-3.45	ERM	2/05/2006	Fill	VMP & PDA - Block 4	<1.21	<8				<0.5	<0.5		<0.5	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		<0.5	<0.5
BH072	3-3.45	ERM	2/05/2006	Fill	VMP & PDA - Block 4	<1.21	<8				<0.5	<0.5		<0.5	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		<0.5	<0.5
BH072	9.5-10	ERM	2/05/2006	Fill	VMP & PDA - Block 4	<1.21	<8				<0.5	<0.5		<0.5	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		<0.5	<0.5
BH073	2-2.4	ERM	2/05/2006	Fill	VMP & PDA - Block 4	21.659	383.1				4.4	24.4		18.7	19	15.3		15.6	6.3	6.2	14.6	1.5	48.8	20.8	5.7	80.5		58.3	43
BH074	3-3.45	ERM	2/05/2006	Fill	VMP & PDA - Block 5	3.729	45.5				<0.5	1.5		2.6	3.7	2.8		3	1.1	1.2	2.8	<0.5	8.2	1.3	1	<0.5		8.6	7.7
BH074	9.5-10	ERM	2/05/2006	Natural Sandy Clay	VMP & PDA - Block 5	45.766	1222.9				10.5	80.5		60	41.3	32.7		30.6	11.5	12.9	30.1	3.1	112	71.6	10.7	435		184	96.4
BH075	3-3.45	ERM	6/06/2006	Fill	VMP & PDA - Block 4	1.063	9.3				<0.5	<0.5		<0.5	0.9	0.8		1.1	0.6	0.5	0.7	<0.5	1.8	<0.5	<0.5	<0.5		1	1.9
BH087	**3-3.45**	ERM	**8/06/2006**	**Fill**	**VMP & PDA - Block 4**	113.187	**2895.7**				24.4	158		120	97.4	79.6		79.6	34	31.9	70.7	8.6	285	160	30.5	1030		439	247
BH087	**7-7.5**	ERM	**8/06/2006**	**Fill**	**VMP & PDA - Block 4**	69.75	**2418.5**				23.7	135		104	64.5	49		45.7	20	19.9	50	5.3	163	125	17.4	1090		333	173
BH089	3-3.45	ERM	9/06/2006	Fill	VMP & PDA - Block 4	7.99	76.8				<0.5	2.3		3.4	6.2	5.6		5.9	2.6	2.7	5.4	0.6	13.5	1.1	2.3	0.7		11.5	13
BH090	3-3.45	ERM	9/06/2006	Fill	VMP & PDA - Block 4	4.337	41.6				<0.5	1		2	3.5	3.3		3.3	1.6	1.7	3.1	<0.5	7.1	<0.5	1.4	<0.5		6.3	7.3
BH109	3-3.45	ERM	27/06/2006	Fill	VMP & PDA - Block 4	<1.21	<8				<0.5	<0.5		<0.5	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		<0.5	<0.5
BH109	9.5-10	ERM	27/06/2006	Fill	VMP & PDA - Block 4	<1.21	<8				<0.5	<0.5		<0.5	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		<0.5	<0.5
BH113	3-3.45	ERM	27/06/2006	Fill	VMP & PDA - Block 4	0.878	9.2				<0.5	<0.5		0.6	0.9	0.7		0.8	<0.5	<0.5	0.8	<0.5	1.8	<0.5	<0.5	<0.5		1.8	1.8
BH114	3-3.45	ERM	28/06/2006	Fill	VMP & PDA - Block 4	<1.21	<8				<0.5	<0.5		<0.5	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		<0.5	<0.5
BH115	3-3.45	ERM	28/06/2006	Fill	VMP & PDA - Block 4	0.756	6.5				<0.5	<0.5		<0.5	0.7	0.6		0.8	<0.5	<0.5	0.6	<0.5	1.6	<0.5	<0.5	<0.5		0.8	1.4
BH119	1.6-2.05	ERM	30/06/2006	Fill	VMP & PDA - Block 4	0.962	6				<0.5	<0.5		<0.5	0.6	0.8		0.9	0.6	<0.5	0.6	<0.5	1	<0.5	<0.5	<0.5		0.5	1
BH119	**7.5-8**	ERM	**30/06/2006**	**Fill**	**VMP & PDA - Block 4**	217.559	**5173.3**				53.5	273		236	152	149		113	59.9	71.3	121	27.4	550	313	57.2	1620		880	497
BH119	**9.5-10**	ERM	**30/06/2006**	**Fill**	**VMP & PDA - Block 4**	111.363	**3325.3**				39.7	240		163	88.9	80		55.5	23.5	43.5	69.8	9	289	239	26.4	1210		504	244
BH132	8-8.5	ERM	6/07/2006	Natural Clayey Sand	VMP & PDA - Block 4	40.715	1700.3				18.4	148		57	45	28		27.4	11	11.6	37.5	3	77.6	76.9	8.3	825		228	97.6
BH135	3-3.45	ERM	11/07/2006	Fill	VMP & PDA - Block 4	<1.21	<8				<0.5	<0.5		<0.5	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		<0.5	<0.5
BH141	**3-3.45**	ERM	**7/07/2006**	**Fill**	**VMP & PDA - Block 4**	489.37	**13659**				127	600		499	429	**344**		359	149	140	328	35.4	1160	725	124	5840		1820	980
BH145	3-3.45	ERM	11/07/2006	Fill	VMP & PDA - Block 5	<1.21	1.4				<0.5	<0.5		<0.5	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	0.7	<0.5	<0.5	<0.5		<0.5	0.7
BH146	3-3.33	ERM	11/07/2006	Fill	VMP & PDA - Block 4	99.1	951.4				8.8	58.8		35.4	89.7	67.3		72.8	33	28.9	69	8.5	184	10.9	31.4	28.3		26.6	198
BH146	4.1-4.6	ERM	11/07/2006	Fill	VMP & PDA - Block 4	48.479	1274.6				16	78.8		58.6	43.5	32.9		37.2	16.2	14.8	34.7	4.1	107	71.6	14.2	454		186	105
BH159		ERM	14/08/2006	Fill	VMP & PDA - Block 4	<1.21	<8				<0.5	<0.5		<0.5	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		<0.5	<0.5
BH197	11.5	ERM	9/04/2008	Natural Clayey Sand	VMP & PDA - Block 5	1.587	91.3				1.7	9.9		3.6	2.7	1.2		1	<0.5	<0.5	1.7	<0.5	3.8	9.2	<0.5	31.1		19.3	6.1
BH197	15.9	ERM	10/04/2008	Natural Sandstone	VMP & PDA - Block 5	0.06	10.5				<0.5	1		0.7	0.6	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	1.3	1	<0.5	2		2.7	1.2
BH197	18.6	ERM	10/04/2008	Natural Sandstone	VMP & PDA - Block 5	<1.21	<8				<0.5	<0.5		<0.5	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		<0.5	<0.5
BH197	5	ERM	9/04/2008	Fill	VMP & PDA - Block 5	49.087	546.8				5.1	27		19.2	57.7	34.2		31.4	9.2	15.7	36.5	3	86.6	10.1	9.5	83		23.6	95
BH197	6.5	ERM	9/04/2008	Natural Sandy Clay	VMP & PDA - Block 5	0.05	10				<0.5	<0.5		0.5	0.5	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	1	0.6	<0.5	4.8		1.6	1
BH198	3	ERM	6/03/2008	Fill	VMP & PDA - Block 5	37.064	274.8				3.4	16.3		12.7	13.3	26.3		26.5	12.7	10.5	12.7	4.3	26.6	4.7	11.8	17.2		21	54.8
BH198	4.5	ERM	6/03/2008	Natural Sandy Clay	VMP & PDA - Block 5	<1.21	1				<0.5	<0.5		<0.5	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	1		<0.5	<0.5
BH198	6.9	ERM	6/03/2008	Natural Clayey Sand	VMP & PDA - Block 5	<1.21	<8				<0.5	<0.5		<0.5	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		<0.5	<0.5
BH199	2.7	ERM	11/03/2008	Fill	VMP & PDA - Block 5	20.52	217.2				2	11.6		9	20.3	14.4		14.6	5.4	6.5	14.6	1.3	42.7	3.8	4.8	1.5		25.3	39.4
BH199	3.7	ERM	11/03/2008	Natural Silty Clay	VMP & PDA - Block 5	39.473	1158.9				14.2	47.2		44.7	39.8	27.4		29.8	10.3	11.9	28	2.5	122	69	10.4	439		164	98.7
BH199	5.6	ERM	11/03/2008	Natural Clayey Sand	VMP & PDA - Block 5	1.454	25.2				<0.5	1.4		1.3	1.8	1.1		1	<0.5	0.6	1.4	<0.5	4.8	1	<0.5	3.5		2.9	4.4
BH199	6	ERM	17/03/2008	Natural Sandstone	VMP & PDA - Block 5	<1.21	<8				<0.5	<0.5		<0.5	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		<0.5	<0.5
BH200	2.5	ERM	7/04/2008	Fill	VMP & PDA - Block 4	19.759	220.1				1	6.7		9.9	16.9	12.4		18.2	8.3	7.3	14.6	2.2	34.7	5.4	6.9	10.1		32.4	33.1
BH200	6.53	ERM	7/04/2008	Natural Sandstone	VMP & PDA - Block 4	<1.21	<8				<0.5	<0.5		<0.5	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		<0.5	<0.5
BH201	2.4	ERM	4/03/2008	Fill	VMP & PDA - Block 5	<1.21	<8				<0.5	<0.5		<0.5	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		<0.5	<0.5
BH201	10.3	ERM	18/03/2008	Fill	VMP & PDA - Block 5	21.747	160.4				1.5	6.5		5.5	13.1	15.6		16.7	6.7	4.7	11	1.9	21.9	4.3	6.2	5		16.2	23.6
BH201	11	ERM	18/03/2008	Natural Clayey Sand	VMP & PDA - Block 5	0.72	4.4				<0.5	<0.5		<0.5	0.6	0.6		0.6	<0.5	<0.5	<0.5	<0.5	1.1	<0.5	<0.5	<0.5		<0.5	1.5
BH202	2.3	ERM	10/03/2008	Fill	VMP & PDA - Block 4	9.474	66.6				<0.5	1		1.6	6.5	6.5		6.4	3.9	3	5.5	0.9	11.4	<0.5	3.9	1		3.4	11.6
BH202	4.7	ERM	10/03/2008	Fill	VMP & PDA - Block 4	4.748	47.6				1.1	0.8		2	4	3.6		3.5	1.7	1.8	3.1	<0.5	8.9	0.8	1.7	<0.5		4.8	9.8
BH202	6.8	ERM	10/03/2008	Natural Sandstone	VMP & PDA - Block 4	<1.21	<8				<0.5	<0.5		<0.5	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		<0.5	<0.5
BH203	7.3	ERM	10/03/2008	Fill	VMP & PDA - Block 4	3.394	31.5				<0.5	0.8		1.3	2.9	2.6		2.4	1.2	1.1	2.2	<0.5	5.5	0.6	1.2	0.7		3.4	5.6
BH204D	**3**	ERM	**7/04/2008**	**Fill**	**VMP & PDA - Block 4**	265.142	**6223.3**				85.6	234		283	255	**195**		210	38.2	40.4	184	13.3	655	384	40.8	1970		1090	545
BH204D	**4**	ERM	**7/04/2008**	**Fill**	**VMP & PDA - Block 4**	305.575	**7972.5**				73.4	336		338	299	**224**		239	42.5	41	212	16.3	777	462	48.3	2930		1290	644
BH205	7.8	ERM	27/03/2008	Natural Sandy Clay	VMP & PDA - Block 4	<1.21	1.2				<0.5	<0.5		<0.5	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.7		0.5	<0.5
BH205	9.3	ERM	27/03/2008	Natural Clayey Sand	VMP & PDA - Block 4	22.484	738.1				11	57.6		30.7	25.2	15.5		14.3	5.6	6.7	20.8	1.6	42.4	42.9	5	291		117	50.8
BH205	13	ERM	1/04/2008	Natural Sandstone	VMP & PDA - Block 4	2.566	81.5				1.2	3.8		3.9	2.9	1.9		2.1	0.6	0.8	2	<0.5	7.5	6	0.6	28.8		13.1	6.3
BH205	13.8	ERM	1/04/2008	Natural Sandstone	VMP & PDA - Block 4	<1.21	<8				<0.5	<0.5		<0.5	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		<0.5	<0.5
BH205	19.2	ERM	2/04/2008	Natural Sandstone	VMP & PDA - Block 4	<1.21	4				<0.5	0.7		<0.5	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	0.5	<0.5	<0.5	0.7		1.4	0.7

						PAHs																					
						CPAH (TEF)	PAH (Total)	2-chloronaphthalene	2-methylnaphthalene	3-methylcholanthrene	Acenaphthene	Acenaphthylene	Acetophenone	Anthracene	Benz(a)anthracene	Benzo(a) pyrene	Benzo(b)&(k)fluoranthene	Benzo(b)fluoranthene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-c,d)pyrene	Naphthalene	PAHs (Sum of total)	Phenanthrene	Pyrene
						mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL								0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	1	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
SSTC[VMP]						67																					
Tar Containing Material (TCM) Criteria							**2000**									**150**											
Location	**Sample Depth**	**Consultant**	**Sample Date**	**Matrix**	**Area**																						
BH205	22.2	ERM	2/04/2008	Natural Sandstone	VMP & PDA - Block 4	<1.21	<8				<0.5	<0.5		<0.5	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		<0.5	<0.5
BH206	4.6	ERM	17/04/2008	Fill	VMP & PDA - Block 4	1.658	18.7				<0.5	0.6		0.7	1.7	1.2		1.5	0.7	0.6	1.1	<0.5	4	<0.5	0.6	<0.5		2.4	3.6
BH206	7.1	ERM	17/04/2008	Natural Clayey Sand	VMP & PDA - Block 4	2.862	110.1				1.4	10		5.6	4.1	2.1		1.9	0.7	0.7	2.5	<0.5	6.7	8.3	0.6	39.8		16.9	8.8
BH207	7.45	ERM	3/04/2008	Fill	VMP & PDA - Block 4	<1.21	<8				<0.5	<0.5		<0.5	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		<0.5	<0.5
BH206	10.7	ERM	21/04/2008	Natural Sandstone	VMP & PDA - Block 4	0.909	21.7				<0.5	1.9		1.6	1.2	0.7		0.8	<0.5	<0.5	0.9	<0.5	2.1	1.4	<0.5	3.5		5.1	2.5
BH207	12	ERM	3/04/2008	Fill	VMP & PDA - Block 4	6.811	53.6				<0.5	2.2		1.9	4.4	4.8		5.2	2.5	1.7	3.6	0.6	8.8	0.7	2.2	1.2		4.3	9.5
BH207	13.1	ERM	3/04/2008	Fill	VMP & PDA - Block 4	1.525	33				<0.5	2.4		2	1.8	1.2		1.3	<0.5	<0.5	1.5	<0.5	3.5	2.4	<0.5	6.1		6.5	4.3
BH207	15	ERM	3/04/2008	Natural Sandstone	VMP & PDA - Block 4	<1.21	0.6				<0.5	<0.5		<0.5	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6		<0.5	<0.5
BH208	2.25	ERM	4/04/2008	Fill	VMP & PDA - Block 4	<1.21	<8				<0.5	<0.5		<0.5	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		<0.5	<0.5
BH208	9.5	ERM	4/04/2008	Fill	VMP & PDA - Block 4	<1.21	<8				<0.5	<0.5		<0.5	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		<0.5	<0.5
BH208	13.5	ERM	4/04/2008	Natural Sandy Clay	VMP & PDA - Block 4	13.108	109.8				<0.5	1.8		3.2	9.4	9.3		11.4	4.9	3	8.9	0.9	20.5	0.7	3.9	0.7		8.4	22.8
BH209	2.3	ERM	22/04/2008	Fill	VMP & PDA - Block 4	23.217	168				0.7	7.5		4.8	10.8	16.5		19.8	7.7	6.4	8	2.2	20.1	1.9	6.6	2.6		7.6	44.8
BH209	4.5	ERM	22/04/2008	Natural Clay	VMP & PDA - Block 4	16.094	497				5.9	33.8		19.1	17.7	11.2		11.4	4.5	2.7	12.9	1.2	28.3	24.8	3.4	203		75.5	41.6
BH209	6.1	ERM	22/04/2008	Natural Sandstone	VMP & PDA - Block 4	12.992	814				6.8	54.9		22.3	15.4	9.1		7	3.2	2.9	11	1	24.6	27	2.2	498		86.5	42.1
BH209	9.4	ERM	23/04/2008	Natural Sandstone	VMP & PDA - Block 4	<1.21	<8				<0.5	<0.5		<0.5	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		<0.5	<0.5
BH210	15.9	ERM	27/03/2008	Natural Sandstone	VMP & PDA - Block 4	<1.21	<8				<0.5	<0.5		<0.5	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		<0.5	<0.5
BH211	14	ERM	26/03/2008	Fill	VMP & PDA - Block 4	<1.21	<8				<0.5	<0.5		<0.5	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		<0.5	<0.5
BH211	15.5	ERM	26/03/2008	Natural Clayey Sand	VMP & PDA - Block 4	0.086	17.7				<0.5	1.9		1.4	0.8	<0.5		<0.5	<0.5	<0.5	0.6	<0.5	1.2	1.2	<0.5	5.2		3.6	1.8
BH211	16.05-16.15	ERM	26/03/2008	Natural Sandstone	VMP & PDA - Block 4	<1.21	<8				<0.5	<0.5		<0.5	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		<0.5	<0.5
BH34	1.8-2.2	AECOM	25/02/2010	Fill	VMP & PDA - Block 4	<1.21	<8				<0.5	<0.5		<0.5	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		<0.5	<0.5
BH34	6-6.2	AECOM	25/02/2010	Fill	VMP & PDA - Block 4	<1.21	<8				<0.5	<0.5		<0.5	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		<0.5	<0.5
BH34	11-11.2	AECOM	25/02/2010	Natural Sandstone	VMP & PDA - Block 4	<1.21	<8				<0.5	<0.5		<0.5	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		<0.5	<0.5
BH35	4.9-5	AECOM	22/02/2010	Fill	VMP & PDA - Block 4	<1.21	<8				<0.5	<0.5		<0.5	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		<0.5	<0.5
BH35	9.9-10	AECOM	22/02/2010	Fill	VMP & PDA - Block 4	<1.21	<8				<0.5	<0.5		<0.5	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		<0.5	<0.5
BH4	2.3-2.4	Coffey	21/02/2008	Fill	VMP & PDA - Hickson Road	17.265	139.5	<1.2	7.2	<1.2	<1.2	52.8		12.3	9.4	11.4	23		8.4		8.1	3.9	10.1	<1.2	8.6	4.6		5.3	4.6
BH4	4.2-4.3	Coffey	21/02/2008	Fill	VMP & PDA - Hickson Road	<1.11	<7	<0.5	<0.5	<0.5	<0.5	<0.5		<0.5	<0.5	<0.5	<1		<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		<0.5	<0.5
BH405	4-4.3	AECOM	10/02/2011	Fill	VMP & PDA - Block 4	7.736	58.5				<0.5	0.9		1.2	5	5.9		8	2.6	2.4	5	<0.5	6.8	<0.5	2.2	<0.5		1.4	17.1
BH405	7-7.3	AECOM	10/02/2011	Fill	VMP & PDA - Block 4	<1.21	<8				<0.5	<0.5		<0.5	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		<0.5	<0.5
BH405	13-13.2	AECOM	11/02/2011	Natural Sand	VMP & PDA - Block 4	31.691	750.2				11.2	45.2		40.9	30.2	21.6		25.7	7.5	14.3	23.6	2	72.9	46.5	7.6	208		130	63
BH405	**14-14.4**	AECOM	**11/02/2011**	**Natural Sandy Clay**	**VMP & PDA - Block 4**	129.201	**3296.3**				44.9	221		182	130	86.2		96.3	49.1	44.5	93	10.3	301	236	42	1040		470	250
BH408	2-2.4	AECOM	14/02/2011	Fill	VMP & PDA - Block 4	9.097	74.5				<0.5	2.2		3.5	6.2	6.3		7.1	4.5	3.1	5.2	0.7	12.6	<0.5	3.6	<0.5		6.6	12.9
BH408	8-8.3	AECOM	15/02/2011	Natural Sandy Clay	VMP & PDA - Block 4	1.695	62.2				1.8	6.1		6.2	2.6	1.3		1.1	0.6	<0.5	1.9	<0.5	4.3	7	<0.5	13		9.4	6.9
BH408	9-9.4	AECOM	15/02/2011	Natural Clayey Sand	VMP & PDA - Block 4	8.162	252.6				4.2	22.9		12.5	9.7	5.6		4.6	2.6	2.3	7.6	0.6	14.5	16.6	2	89.8		38.8	18.3
BH409	3.7-4	AECOM	14/02/2011	Fill	VMP & PDA - Block 4	<1.21	<8				<0.5	<0.5		<0.5	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		<0.5	<0.5
BH409	5-5.3	AECOM	14/02/2011	Natural Sand	VMP & PDA - Block 4	0.06	56.7				5.6	2.8		1.9	0.6	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	1.2	2.2	<0.5	33.8		6.8	1.8
BH409	6-6.4	AECOM	15/02/2011	Natural Sandy Clay	VMP & PDA - Block 4				<0.5																				
BH409	7-7.3	AECOM	15/02/2011	Natural Clayey Sand	VMP & PDA - Block 4	<1.21	5.2				<0.5	0.7		<0.5	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	2.8		1.1	0.6
BH42	**3.2-3.3**	AECOM	**23/02/2010**	**Fill**	**VMP & PDA - Block 4**	140.429	**3497.6**	<1.2	431	<1.2	35	250	<1.2	217	157	113	136		22.9		122	7.9	369	243	23.8	926		660	351
BH42	3.5-3.6	AECOM	23/02/2010	Natural Sandstone	VMP & PDA - Block 4	<1.21	6.4				<0.5	0.8		<0.5	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	0.8	0.6	<0.5	1		2.4	0.8
BH44	4.9-5	AECOM	23/02/2010	Natural Sandstone	VMP & PDA - Block 4	18.96	962.7	<1.2	204	<1.2	11.3	90	<1.2	41.9	27.6	15.6	18		3.2		22.8	<1.2	59.2	54.5	3.4	410		156	67.2
BH45	3.2-3.4	AECOM	23/02/2010	Fill	VMP & PDA - Block 4	<1.21	1				<0.5	<0.5		<0.5	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.5		0.5	<0.5
BH45	7.2-7.4	AECOM	23/02/2010	Fill	VMP & PDA - Block 4	<1.21	<8				<0.5	<0.5		<0.5	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		<0.5	<0.5
BH49	4.2-4.4	AECOM	22/02/2010	Fill	VMP & PDA - Block 4	29.264	374.2				4.1	23.8		16	23.2	19.2		27.6	9.2	13.4	16.2	2.6	38.8	12.5	7.9	64.7		41.7	53.3
BH49	6.2-6.4	AECOM	22/02/2010	Fill	VMP & PDA - Block 4	2.91	50.1	<0.5	4	<0.5	0.8	2.3	<0.5	1.7	3.1	2.5	3		0.6		2.4	<0.5	4.4	2.7	0.7	19.5		5.7	3.7
BH49	8.2-8.4	AECOM	22/02/2010	Fill	VMP & PDA - Block 4	25.723	946.5				11.2	55.1		43.6	30.9	16.4		21.4	6.7	12	22.6	2	83.3	62	6	373		130	70.3
BH49	10.2-10.4	AECOM	22/02/2010	Fill	VMP & PDA - Block 4	17.52	813.1				5.3	32.6		25.8	23.1	11.4		14.8	4.7	6.5	15.3	1.1	54.6	33.4	3.8	343		191	46.7
BH49	12.2-12.4	AECOM	22/02/2010	Natural Clayey Sand	VMP & PDA - Block 4	45.485	1760.5	<1.2	211	<1.2	16.5	132	<1.2	59.1	48.4	35.8	45		8.7		37.8	3.4	161	125	9.8	703		283	137
BH45	13.2-13.4	AECOM	23/02/2010	Natural Sandstone	VMP & PDA - Block 4	<1.21	3.3				<0.5	<0.5		<0.5	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	1.1	<0.5	<0.5	<0.5		1.2	1
BH52	2.2-2.6	AECOM	22/02/2010	Fill	VMP & PDA - Block 4	2.288	23.3				<0.5	1		1	2.4	1.6		2.4	0.9	1	1.9	<0.5	4.1	<0.5	0.8	<0.5		2.3	3.9
BH52	4.2-4.4	AECOM	22/02/2010	Fill	VMP & PDA - Block 4	127.752	1994.9				36.1	85.7		115	140	82.2		93.8	43.2	52.9	109	11.6	306	123	37.6	55.8		412	291
BH53	2-2.4	AECOM	6/03/2010	Fill	VMP & PDA - Hickson Road	100.803	1510.3		<0.5		11.4	28.3		84.8	92.8	70.7		77.8	23.9	27.5	63.4	7.1	316	56.1	23.2	48.3	1510	302	277
BH53	**4-4.4**	AECOM	**6/03/2010**	**Fill**	**VMP & PDA - Hickson Road**	338.605	**9566.6**	<2.5	757	<2.5	108	657	<2.5	343	275	**291**	305		53.5		257	12.1	747	344	49	4330		1390	710
BH54	2.8-3	AECOM	23/02/2010	Natural Sand	VMP & PDA - Block 4	27.593	678.1	<1.2	41.8	<1.2	11.1	29.3	<1.2	32.6	27.5	21.7	28		5.8		22.5	2.2	66.1	40.2	6.6	227		131	54.5
BH55	**2.2-2.4**	AECOM	**25/02/2010**	**Fill**	**VMP & PDA - Block 4**	102.892	**3476.4**	<1.2	308	<1.2	25.3	149	<1.2	119	107	84	102		17.2		87	5.4	274	151	17.5	1740		463	237
BH55	**2.7-2.9**	AECOM	**25/02/2010**	**Fill**	**VMP & PDA - Block 4**	242.28	**10435**		<4		67.1	386		341	294	**160**		187	65	117	200	14.5	783	440	53.3	4810	10,400	1840	677
BH58	3.2-3.4	AECOM	22/02/2010	Fill	VMP & PDA - Block 4	2.979	50.8				1.6	1.1		2.2	2.8	2.1		3.6	1.4	1	2.5	<0.5	6.6	1.3	1	10.9		5.9	6.8
BH58	5.2-5.4	AECOM	22/02/2010	Fill	VMP & PDA - Block 4	3.688	45.6				1.2	0.9		2	3.3	2.6		3.8	1.7	1.9	3.1	<0.5	7.5	1.3	1.4	1.3		6.2	7.4
BH58	8.6-8.8	AECOM	22/02/2010	Fill	VMP & PDA - Block 4	6.05	47.5	<0.5	<0.5	<0.5	<0.5	2.1	<0.5	2.2	5.6	5.3	7		1.4		4.6	<0.5	7.9	0.7	1.3	1.2		4.6	10.6
BH58	10.8-11.2	AECOM	22/02/2010	Fill	VMP & PDA - Block 4	3.161	39.8				0.8	0.9		1.3	3.3	2.2		3.2	1.3	1.7	2.8	<0.5	7.3	0.7	1	1.2		3.6	8.5
BH59	**3.4-3.5**	AECOM	**22/02/2010**	**Fill**	**VMP & PDA - Block 4**	245.605	**8362.4**	<1.2	967	<1.2	104	404	<1.2	368	271	**189**	232		44.5		214	21.7	669	462	52.2	3560		1400	603
BH59	4.2-4.3	AECOM	22/02/2010	Fill	VMP & PDA - Block 4	4.859	147.6				1.4	9.1		8.3	6.2	3.4		4.6	1.4	2	4.5	<0.5	14.2	8.8	1.2	46.4		23.5	12.6
BH61	**2-2.4**	AECOM	**7/03/2010**	**Fill**	**VMP & PDA - Hickson Road**	223.905	**2168.2**		2		4.8	47.6		91.6	217	**162**		182	41.5	28	164	13.2	423	23.8	39.5	51.2	2170	267	412
BH61	3-3.4	AECOM	7/03/2010	Natural Clayey Sand	VMP & PDA - Hickson Road	18.103	728.4	<1.2	81.2	<1.2	7.3	47.8	<1.2	30.1	18.9	14.3	17		4.7		14.6	1.3	60.1	38.4	4.2	318		113	55.7
BH62	3.4-3.8	AECOM	26/02/2010	Fill	VMP & PDA - Block 5	<1.21	<8		<0.5		<0.5	<0.5		<0.5	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
BH62	5.4-5.6	AECOM	26/02/2010	Fill	VMP & PDA - Block 5	4.247	52.5		<0.5		<0.5	0.6		2.2	5.1	2.9		4.3	1.7	2.2	4	<0.5	10.8	0.5	1.3	0.5	52.5	6.1	10.3
BH62	11.8-12	AECOM	26/02/2010	Fill	VMP & PDA - Block 5	<1.11	<7	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1		<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		<0.5	<0.5

						PAHs																					
						CPAH (TEF)	PAH (Total)	2-chloronaphthalene	2-methylnaphthalene	3-methylcholanthrene	Acenaphthene	Acenaphthylene	Acetophenone	Anthracene	Benz(a)anthracene	Benzo(a) pyrene	Benzo(b)&(k)fluoranthene	Benzo(b)fluoranthene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-c,d)pyrene	Naphthalene	PAHs (Sum of total)	Phenanthrene	Pyrene
						mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL								0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	1	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
SSTC[VMP]						67																							
Tar Containing Material (TCM) Criteria							**2000**									**150**													
Location	**Sample Depth**	**Consultant**	**Sample Date**	**Matrix**	**Area**																								
BH64	2.5-2.7	AECOM	1/03/2010	Fill	VMP & PDA - Block 5																								
BH64	5.5-5.7	AECOM	1/03/2010	Fill	VMP & PDA - Block 5																								
BH64	10-10.3	AECOM	1/03/2010	Natural Sandstone	VMP & PDA - Block 5																								
BH65	3.4-3.6	AECOM	24/02/2010	Fill	VMP & PDA - Block 5	41.546	532.8				5.2	13.8		28.1	40.6	27		32.3	17.4	17.2	30.2	3.7	82.9	29.1	13.6	10.1		98.8	82.8
BH65	8.2-8.6	AECOM	24/02/2010	Fill	VMP & PDA - Block 5	12.071	115				0.8	3		5	9.2	7.9		9.5	4.7	3.9	7.4	1.4	17.1	5	3.9	2.3		15.6	18.3
BH65	11.2-11.4	AECOM	24/02/2010	Natural Clayey Sand	VMP & PDA - Block 5	3.415	216.8	<0.5	57.6	<0.5	3.1	24.9	<0.5	11.7	4.7	2.9	3		<0.5		4.5	<0.5	10.8	20.8	<0.5	65		51.5	16.9
BH65	13.4-13.6	AECOM	24/02/2010	Natural Sandy Clay	VMP & PDA - Block 5	2.755	114.4				2.4	7.3		6.6	3.8	2.1		1.8	0.5	0.6	3	<0.5	6.4	10.8	<0.5	34.6		25.1	9.4
BH66	2.3-2.4	AECOM	24/02/2010	Fill	VMP & PDA - Block 5	16.292	105				0.8	1.5		3.5	8.8	10.9		11.9	7.3	4.2	6.9	2.2	12.4	1.5	5.6	5.3		9.2	13
BH66	3.2-3.6	AECOM	24/02/2010	Fill	VMP & PDA - Block 5	<1.21	<8				<0.5	<0.5		<0.5	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		<0.5	<0.5
BH66	7-7.2	AECOM	24/02/2010	Natural Sandstone	VMP & PDA - Block 5	<1.21	1.4				<0.5	<0.5		<0.5	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	0.7	<0.5	<0.5	<0.5		<0.5	0.7
BH68	2.5-2.9	AECOM	2/03/2010	Fill	VMP & PDA - Block 5																								
BH68	4-4.3	AECOM	2/03/2010	Fill	VMP & PDA - Block 5	<1.21	<8		<0.5		<0.5	<0.5		<0.5	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
BH68	7-7.1	AECOM	2/03/2010	Natural Silty Sand	VMP & PDA - Block 5																								
MW3	2.9-3	Coffey	23/02/2008	Natural Clayey Sand	VMP & PDA - Hickson Road	14.51	312	<0.5	22.6	<0.5	3.2	20		25.3	15.8	10.9	26		4.4		10.6	1.3	35.8	20.9	5.8	55		65.8	37.2
MW6	2.5-2.6	Coffey	20/02/2008	Fill	VMP & PDA - Hickson Road	2.181	24.4	<0.5	<0.5	<0.5	<0.5	1.9		1.2	3.8	1.7	3		0.6		1.5	<0.5	5	<0.5	0.8	<0.5		2.7	5.2
MW6	4.4-4.5	Coffey	20/02/2008	Fill	VMP & PDA - Hickson Road	<1.11	<7	<0.5	<0.5	<0.5	<0.5	<0.5		<0.5	<0.5	<0.5	<1		<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		<0.5	<0.5
MW7	3.5-3.6	Coffey	25/02/2008	FILL	VMP & PDA - Hickson Road	71.045	696	<0.5	92.7	<0.5	33.7	48.7		28.7	86.7	59.7	70		2.9		8.6	1.7	62.3	39.6	8.6	150		116	48.8
MW7	**4.5-4.6**	Coffey	**25/02/2008**	**FILL**	**VMP & PDA - Hickson Road**	486.608	**21670**	<1.2	3680	<1.2	210	3060		800	863	**359**	608		59.8		341	22.9	1470	1160	144	7800		3350	2030
MW7	**5-5.1**	Coffey	**25/02/2008**	**FILL**	**VMP & PDA - Hickson Road**	884.497	**30782**	<1.2	5130	<1.2	282	4140		1200	1240	**677**	1170		87.7		582	57.2	2160	1980	196	10,200		4870	3110
MW10	**4.9-5**	Coffey	**21/02/2008**	**Fill**	**VMP & PDA - Hickson Road**	386.828	**7282.2**	<1.2	102	<1.2	212	652		523	934	**278**	698		21.8		61	9.4	966	662	52	224		1740	947
MW10	**8.6-8.7**	Coffey	**22/02/2008**	**Fill**	**VMP & PDA - Hickson Road**	590.52	**29653**	<1.2	7650	<1.2	511	1700		2150	1470	**412**	968		26		771	20.3	2440	2100	32.5	10,200		5180	2640

Notes
mg/kg = milligrams per kilogram
EQL = Estimated Quantitation Limit
< denotes result less than EQL
SSTC[VMP] - Site Specific Target Criteria for the VMP Area
Shading denotes concentration greater than criteria
CPAH= Sum of 8 carcinogenic PAH Compounds (Benz(a)anthracene Benzo(a) pyrene; Benzo(b)fluoranthene; Benzo(g,h,i)perylene; Benzo(k)fluoranthene; Chrysene; Dibenz(a,h)anthracene and Indeno(1,2,3-c,d)pyrene)

TEF - Toxicity Equivalent Factor
TPH - Total Petroleum Hydrocarbons
PAH - Polycyclic Aromatic Hydrocarbons (PAH)
* TPH C6-C9 aliphatic
* *TPH C10-C14 aliphatic and aromatic
note TPH in table not speciated
BOLD = Sample classified as TCM based on PAH (>2000 mg/kg) and Benzo(a)pyrene (>150 mg/kg) results

Table T4
Site wide
Soil Analytical Results (Declaration Area) - Saturated

						TPH						BTEX						
						TPH C15-C36	TPH C10 - C14	TPH C15-C28	TPH C29-C36	TPH C6 - C9	TPH+C10 - C36 (Sum of total)	Benzene	Ethylbenzene	Toluene	Xylene (m & p)	Xylene (o)	Ammonia as N	Total Xylene
						mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL							50	100	100	10	100	0.2	0.2	0.2	0.2	0.2	20	0.15
SSTC[VMP]							54000	72000	21,000			380						
Tar Containing Material (TCM) Criteria																		
Location	**Sample Depth**	**Consultant**	**Sample Date**	**Matrix**	**Area**													
BH001	4	ERM	2/05/2006	Fill	VMP & PDA - Block 5	160	<50	160	<100	<2	160	<0.2	<0.2	<0.2	<0.2	<0.2		<0.4
BH019	2.5-3	ERM	8/05/2006	Fill	VMP & PDA - Block 4	4900	2180	3840	1060	354	7080							
BH019	**3-3.45**	ERM	**8/05/2006**	**Fill**	**VMP & PDA - Block 4**	7320	3160	5450	1870	210	10,480							
BH020	1.5-2.1	ERM	9/05/2006	Fill	VMP & PDA - Block 4	620	<50	280	340	<2	620							
BH028	13-13.5	ERM	12/05/2006	Natural Clayey Sand	VMP & PDA - Block 5	1620	780	1370	250	119	2400	8.2	2.7	14.8	15.4	6.9		22.3
BH058	6-6.5	ERM	31/05/2006	Natural Clayey Sand	VMP & PDA - Block 5	510	220	510	<100	40	730	3.1	5.9	0.4	8.5	4.3		12.8
BH059	3-3.45	ERM	31/05/2006	Fill	VMP & PDA - Block 5	290	<50	170	120	<2	290	<0.2	<0.2	<0.2	<0.2	<0.2		<0.4
BH059	8.5-9	ERM	31/05/2006	Natural Clayey Sand	VMP & PDA - Block 5	<200	<50	<100	<100	<2	<250	<0.2	<0.2	<0.2	<0.2	<0.2		<0.4
BH060	9.5-10	ERM	31/05/2006	Natural Clayey Sand	VMP & PDA - Block 5	<200	<50	<100	<100	<2	<250	<0.2	<0.2	<0.2	<0.2	<0.2		<0.4
BH062	3-3.45	ERM	31/05/2006	Fill	VMP & PDA - Block 5	830	<50	420	410	<2	830	<0.2	<0.2	<0.2	<0.2	<0.2		<0.4
BH065	3-3.45	ERM	1/06/2006	Fill	VMP & PDA - Block 4	1760	90	1040	720	3	1850	<0.2	<0.2	<0.2	0.5	0.3		0.8
BH067	3-3.45	ERM	1/06/2006	Fill	VMP & PDA - Block 5	4510	<50	1490	3020	2	4510	<0.2	<0.2	<0.2	<0.2	<0.2		<0.4
BH071	3-3.45	ERM	2/05/2006	Fill	VMP & PDA - Block 4	<200	<50	<100	<100	<2	<250	<0.2	<0.2	<0.2	<0.2	<0.2		<0.4
BH072	3-3.45	ERM	2/05/2006	Fill	VMP & PDA - Block 4	120	<50	120	<100	<2	120	<0.2	<0.2	<0.2	<0.2	<0.2		<0.4
BH072	9.5-10	ERM	2/05/2006	Fill	VMP & PDA - Block 4	<200	<50	<100	<100	<2	<250	<0.2	<0.2	<0.2	<0.2	<0.2		<0.4
BH073	2-2.4	ERM	2/05/2006	Fill	VMP & PDA - Block 4	1600	260	1340	260	8	1860	<0.2	2.1	<0.2	3.4	2.1		5.5
BH074	3-3.45	ERM	2/05/2006	Fill	VMP & PDA - Block 5	260	<50	260	<100	3	260	<0.2	<0.2	<0.2	<0.2	<0.2		<0.4
BH074	9.5-10	ERM	2/05/2006	Natural Sandy Clay	VMP & PDA - Block 5	3350	1510	2480	870	122	4860	14.9	1.6	21.1	20.7	7.6		28.3
BH075	3-3.45	ERM	6/06/2006	Fill	VMP & PDA - Block 4	<200	<50	<100	<100	<2	<250	<0.2	<0.2	<0.2	<0.2	<0.2		<0.4
BH087	**3-3.45**	ERM	**8/06/2006**	**Fill**	**VMP & PDA - Block 4**	8980	4560	7310	1670	271	13,540	15	47.5	24.9	79.9	38.6		118.5
BH087	**7-7.5**	ERM	**8/06/2006**	**Fill**	**VMP & PDA - Block 4**	8270	4360	6720	1550	442	12,630	82.7	24.3	149	116	57.1		173.1
BH089	3-3.45	ERM	9/06/2006	Fill	VMP & PDA - Block 4	170	<50	170	<100	<2	170	<0.2	<0.2	<0.2	<0.2	<0.2		<0.4
BH090	3-3.45	ERM	9/06/2006	Fill	VMP & PDA - Block 4	140	<50	140	<100	<2	140	<0.2	<0.2	<0.2	<0.2	<0.2		<0.4
BH109	3-3.45	ERM	27/06/2006	Fill	VMP & PDA - Block 4	130	<50	<100	130	<2	130	<0.2	<0.2	<0.2	<0.2	<0.2		<0.4
BH109	9.5-10	ERM	27/06/2006	Fill	VMP & PDA - Block 4	<200	<50	<100	<100	<2	<250	<0.2	<0.2	<0.2	<0.2	<0.2		<0.4
BH113	3-3.45	ERM	27/06/2006	Fill	VMP & PDA - Block 4	1010	70	540	470	<2	1080	<0.2	<0.2	<0.2	<0.2	<0.2		<0.4
BH114	3-3.45	ERM	28/06/2006	Fill	VMP & PDA - Block 4	980	60	620	360	<2	1040	<0.2	<0.2	<0.2	<0.2	<0.2		<0.4
BH115	3-3.45	ERM	28/06/2006	Fill	VMP & PDA - Block 4	<200	<50	<100	<100	<2	<250	<0.2	<0.2	<0.2	<0.2	<0.2		<0.4
BH119	1.6-2.05	ERM	30/06/2006	Fill	VMP & PDA - Block 4	<200	<50	<100	<100	<2	<250	<0.2	<0.2	<0.2	<0.2	<0.2		<0.4
BH119	**7.5-8**	ERM	**30/06/2006**	**Fill**	**VMP & PDA - Block 4**	17,690	6750	13,000	4690	1140	24,440	82.4	63	118	182	69.8		251.8
BH119	**9.5-10**	ERM	**30/06/2006**	**Fill**	**VMP & PDA - Block 4**	10,050	5320	7940	2110	1060	15,370	97.8	14.7	124	152	53		205
BH132	8-8.5	ERM	6/07/2006	Natural Clayey Sand	VMP & PDA - Block 4	4230	1870	3040	1190	1050	6100	140	44.7	232	225	120		345
BH135	3-3.45	ERM	11/07/2006	Fill	VMP & PDA - Block 4													
BH141	**3-3.45**	ERM	**7/07/2006**	**Fill**	**VMP & PDA - Block 4**	5920	1800	4490	1430	325	7720	41.8	49.1	17.3	86.5	60.3		146.8
BH145	3-3.45	ERM	11/07/2006	Fill	VMP & PDA - Block 5	<200	<50	<100	<100	<2	<250	<0.2	<0.2	<0.2	<0.2	<0.2		<0.4
BH146	3-3.33	ERM	11/07/2006	Fill	VMP & PDA - Block 4													
BH146	4.1-4.6	ERM	11/07/2006	Fill	VMP & PDA - Block 4	4610	3020	3750	860	222	7630	15.2	13.9	25.3	56	31		87
BH159		ERM	14/08/2006	Fill	VMP & PDA - Block 4	1230	<50	270	960	<2	1230	<0.2	<0.2	<0.2	0.3	<0.2		0.3
BH197	11.5	ERM	9/04/2008	Natural Clayey Sand	VMP & PDA - Block 5	400	160	400	<100	<10	560	<0.2	<0.5	<0.5	<0.5	<0.5		<1
BH197	15.9	ERM	10/04/2008	Natural Sandstone	VMP & PDA - Block 5	<200	<50	<100	<100	<10	<250	<0.2	<0.5	<0.5	<0.5	<0.5		<1
BH197	18.6	ERM	10/04/2008	Natural Sandstone	VMP & PDA - Block 5	<200	<50	<100	<100	<10	<250	<0.2	<0.5	<0.5	<0.5	<0.5		<1
BH197	5	ERM	9/04/2008	Fill	VMP & PDA - Block 5	5300	560	3820	1480	26	5860	4.8	1.9	8	4.2	1.9		6.1
BH197	6.5	ERM	9/04/2008	Natural Sandy Clay	VMP & PDA - Block 5	<200	<50	<100	<100	<10	<250	0.5	<0.5	0.8	0.6	<0.5		0.6
BH198	3	ERM	6/03/2008	Fill	VMP & PDA - Block 5	8130	1360	6690	1440	<10	9490	<0.2	<0.5	<0.5	0.7	<0.5		0.7
BH198	4.5	ERM	6/03/2008	Natural Sandy Clay	VMP & PDA - Block 5	<200	<50	<100	<100	<10	<250	<0.2	<0.5	<0.5	<0.5	<0.5		<1
BH198	6.9	ERM	6/03/2008	Natural Clayey Sand	VMP & PDA - Block 5	<200	<50	<100	<100	<10	<250	<0.2	<0.5	<0.5	<0.5	<0.5		<1
BH199	2.7	ERM	11/03/2008	Fill	VMP & PDA - Block 5	1120	<50	740	380	<10	1120	<0.2	<0.5	<0.5	<0.5	<0.5		<1
BH199	3.7	ERM	11/03/2008	Natural Silty Clay	VMP & PDA - Block 5	3540	950	2620	920	96	4490	6.4	16.3	2.6	22.4	22.9		45.3
BH199	5.6	ERM	11/03/2008	Natural Clayey Sand	VMP & PDA - Block 5	<200	<50	<100	<100	<10	<250	<0.2	<0.5	<0.5	<0.5	<0.5		<1
BH199	6	ERM	17/03/2008	Natural Sandstone	VMP & PDA - Block 5	<200	<50	<100	<100	<10	<250	<0.2	<0.5	<0.5	<0.5	<0.5		<1
BH200	2.5	ERM	7/04/2008	Fill	VMP & PDA - Block 4	1560	110	1060	500	<10	1670	<0.2	<0.5	<0.5	<0.5	<0.5		<1
BH200	6.53	ERM	7/04/2008	Natural Sandstone	VMP & PDA - Block 4	<200	<50	<100	<100	<10	<250	<0.2	<0.5	<0.5	<0.5	<0.5		<1
BH201	2.4	ERM	4/03/2008	Fill	VMP & PDA - Block 5	<200	<50	<100	<100	<10	<250	<0.2	<0.5	<0.5	<0.5	<0.5		<1
BH201	10.3	ERM	18/03/2008	Fill	VMP & PDA - Block 5	3280	<50	1930	1350	<10	3280	<0.2	0.7	<0.5	<0.5	<0.5		<1
BH201	11	ERM	18/03/2008	Natural Clayey Sand	VMP & PDA - Block 5	<200	<50	<100	<100	<10	<250	<0.2	<0.5	<0.5	<0.5	<0.5		<1
BH202	2.3	ERM	10/03/2008	Fill	VMP & PDA - Block 4	510	<50	240	270	<10	510	<0.2	<0.5	<0.5	<0.5	<0.5		<1
BH202	4.7	ERM	10/03/2008	Fill	VMP & PDA - Block 4	620	<50	280	340	<10	620	<0.2	<0.5	<0.5	<0.5	<0.5		<1
BH202	6.8	ERM	10/03/2008	Natural Sandstone	VMP & PDA - Block 4	<200	<50	<100	<100	<10	<250	<0.2	<0.5	<0.5	<0.5	<0.5		<1
BH203	7.3	ERM	10/03/2008	Fill	VMP & PDA - Block 4	1010	<50	560	450	<10	1010	<0.2	<0.5	<0.5	<0.5	<0.5		<1
BH204D	**3**	ERM	**7/04/2008**	**Fill**	**VMP & PDA - Block 4**	25,740	11,600	19,400	6340	289	37,340	36.8	34.9	49.3	112	39.9		151.9
BH204D	**4**	ERM	**7/04/2008**	**Fill**	**VMP & PDA - Block 4**	29,420	12,600	22,400	7020	215	42,020	44.3	15.1	53	72.8	26.7		99.5
BH205	7.8	ERM	27/03/2008	Natural Sandy Clay	VMP & PDA - Block 4	<200	<50	<100	<100	<10	<250	1.4	<0.5	0.7	<0.5	<0.5		<1
BH205	9.3	ERM	27/03/2008	Natural Clayey Sand	VMP & PDA - Block 4	3350	1500	2710	640	138	4850	7.5	5.4	34.7	42.4	21.9		64.3
BH205	13	ERM	1/04/2008	Natural Sandstone	VMP & PDA - Block 4	<200	<50	<100	<100	13	<250	2.5	<0.5	3.3	2.8	1.2		4
BH205	13.8	ERM	1/04/2008	Natural Sandstone	VMP & PDA - Block 4	<200	<50	<100	<100	<10	<250	0.7	<0.5	0.5	<0.5	<0.5		<1
BH205	19.2	ERM	2/04/2008	Natural Sandstone	VMP & PDA - Block 4	<200	<50	<100	<100	<10	<250	<0.2	<0.5	<0.5	0.5	<0.5		0.5

Table T4
Site wide
Soil Analytical Results (Declaration Area) - Saturated

						TPH						BTEX						
						TPH C15-C36	TPH C10 - C14	TPH C15-C28	TPH C29-C36	TPH C6 - C9	TPH+C10 - C36 (Sum of total)	Benzene	Ethylbenzene	Toluene	Xylene (m & p)	Xylene (o)	Ammonia as N	Total Xylene
						mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL							50	100	100	10	100	0.2	0.2	0.2	0.2	0.2	20	0.15
SSTC[VMP]							54000	72000	21,000			380						
Tar Containing Material (TCM) Criteria																		
Location	**Sample Depth**	**Consultant**	**Sample Date**	**Matrix**	**Area**													
BH205	22.2	ERM	2/04/2008	Natural Sandstone	VMP & PDA - Block 4	<200	<50	<100	<100	<10	<250	<0.2	<0.5	<0.5	<0.5	<0.5		<1
BH206	4.6	ERM	17/04/2008	Fill	VMP & PDA - Block 4	460	<50	230	230	<10	460	<0.2	<0.5	<0.5	<0.5	<0.5		<1
BH206	7.1	ERM	17/04/2008	Natural Clayey Sand	VMP & PDA - Block 4	350	200	350	<100	15	550	<0.2	1	<0.5	2.7	2.2		4.9
BH207	7.45	ERM	3/04/2008	Fill	VMP & PDA - Block 4	<200	<50	<100	<100	<10	<250	<0.2	<0.5	<0.5	<0.5	<0.5		<1
BH206	10.7	ERM	21/04/2008	Natural Sandstone	VMP & PDA - Block 4	110	<50	110	<100	<10	110	<0.2	<0.5	<0.5	<0.5	<0.5		<1
BH207	12	ERM	3/04/2008	Fill	VMP & PDA - Block 4	770	<50	430	340	<10	770	<0.2	<0.5	<0.5	<0.5	<0.5		<1
BH207	13.1	ERM	3/04/2008	Fill	VMP & PDA - Block 4	140	<50	140	<100	<10	140	<0.2	<0.5	<0.5	<0.5	<0.5		<1
BH207	15	ERM	3/04/2008	Natural Sandstone	VMP & PDA - Block 4	<200	<50	<100	<100	<10	<250	<0.2	<0.5	<0.5	<0.5	<0.5		<1
BH208	2.25	ERM	4/04/2008	Fill	VMP & PDA - Block 4	<200	<50	<100	<100	<10	<250	<0.2	<0.5	<0.5	<0.5	<0.5		<1
BH208	9.5	ERM	4/04/2008	Fill	VMP & PDA - Block 4	<200	<50	<100	<100	<10	<250	<0.2	<0.5	<0.5	<0.5	<0.5		<1
BH208	13.5	ERM	4/04/2008	Natural Sandy Clay	VMP & PDA - Block 4	5840	80	3320	2520	<10	5920	<0.2	<0.5	<0.5	<0.5	<0.5		<1
BH209	2.3	ERM	22/04/2008	Fill	VMP & PDA - Block 4	1460	<50	880	580	<10	1460	<0.2	<0.5	0.5	<0.5	<0.5		<1
BH209	4.5	ERM	22/04/2008	Natural Clay	VMP & PDA - Block 4	2410	1190	1950	460	227	3600	15.5	37.2	4.3	36	50		86
BH209	6.1	ERM	22/04/2008	Natural Sandstone	VMP & PDA - Block 4	2780	2280	2350	430	929	5060	88.2	34.8	213	165	94.8		259.8
BH209	9.4	ERM	23/04/2008	Natural Sandstone	VMP & PDA - Block 4	<200	<50	<100	<100	<10	<250	<0.2	<0.5	<0.5	<0.5	<0.5		<1
BH210	15.9	ERM	27/03/2008	Natural Sandstone	VMP & PDA - Block 4	<200	<50	<100	<100	<10	<250	<0.2	<0.5	<0.5	<0.5	<0.5		<1
BH211	14	ERM	26/03/2008	Fill	VMP & PDA - Block 4	<200	<50	<100	<100	<10	<250	<0.2	<0.5	<0.5	<0.5	<0.5		<1
BH211	15.5	ERM	26/03/2008	Natural Clayey Sand	VMP & PDA - Block 4	<200	<50	<100	<100	19	<250	3.4	0.6	5.5	3.3	1.8		5.1
BH211	16.05-16.15	ERM	26/03/2008	Natural Sandstone	VMP & PDA - Block 4	<200	<50	<100	<100	<10	<250	<0.2	<0.5	<0.5	<0.5	<0.5		<1
BH34	1.8-2.2	AECOM	25/02/2010	Fill	VMP & PDA - Block 4	<200	<50	<100	<100	<10	<50	<0.2	<0.5	<0.5	<0.5	<0.5		<1
BH34	6-6.2	AECOM	25/02/2010	Fill	VMP & PDA - Block 4	<200	<50	<100	<100	<10	<50	<0.2	<0.5	<0.5	<0.5	<0.5		<1
BH34	11-11.2	AECOM	25/02/2010	Natural Sandstone	VMP & PDA - Block 4	<200	<50	<100	<100	<10	<50	<0.2	<0.5	<0.5	<0.5	<0.5		<1
BH35	4.9-5	AECOM	22/02/2010	Fill	VMP & PDA - Block 4	<200	<50	<100	<100	<10	<50	<0.2	<0.5	<0.5	<0.5	<0.5		<1
BH35	9.9-10	AECOM	22/02/2010	Fill	VMP & PDA - Block 4	<200	<50	<100	<100	<10	<50	<0.2	<0.5	<0.5	<0.5	<0.5		<1
BH4	2.3-2.4	Coffey	21/02/2008	Fill	VMP & PDA - Hickson Road	8660	200	5700	2960	<10	8860	<0.2	<0.5	<0.5	<0.5	<0.5		<1
BH4	4.2-4.3	Coffey	21/02/2008	Fill	VMP & PDA - Hickson Road	<200	<50	<100	<100	<10	<250	<0.2	<0.5	<0.5	<0.5	<0.5		<1
BH405	4-4.3	AECOM	10/02/2011	Fill	VMP & PDA - Block 4	1020	<50	400	620	<10	1020	<0.2	<0.5	<0.5	<0.5	<0.5		<1
BH405	7-7.3	AECOM	10/02/2011	Fill	VMP & PDA - Block 4	<200	<50	<100	<100	<10	<50	<0.2	<0.5	<0.5	<0.5	<0.5		<1
BH405	13-13.2	AECOM	11/02/2011	Natural Sand	VMP & PDA - Block 4	2320	510	1760	560	<10	2830	0.7	0.6	0.6	3	1.3		4.3
BH405	**14-14.4**	AECOM	**11/02/2011**	**Natural Sandy Clay**	**VMP & PDA - Block 4**	9030	3390	7020	2010	156	12,400 - 12,420	5.9	4	33	57.2	19.4		76.6
BH408	2-2.4	AECOM	14/02/2011	Fill	VMP & PDA - Block 4	450	<50	190	260	<10	450	<0.2	<0.5	<0.5	<0.5	<0.5		<1
BH408	8-8.3	AECOM	15/02/2011	Natural Sandy Clay	VMP & PDA - Block 4	350	100	350	<100	<10	450	0.6	0.7	<0.5	0.7	0.6		1.3
BH408	9-9.4	AECOM	15/02/2011	Natural Clayey Sand	VMP & PDA - Block 4	860	360	710	150	24	1220	2.1	4.6	<0.5	5.1	3.8		8.9
BH409	3.7-4	AECOM	14/02/2011	Fill	VMP & PDA - Block 4	<200	<50	<100	<100	<10	<50	<0.2	<0.5	<0.5	<0.5	<0.5		<1
BH409	5-5.3	AECOM	14/02/2011	Natural Sand	VMP & PDA - Block 4	180	150	180	<100	12	330	1.8	3.5	<0.5	1.1	1.8		2.9
BH409	6-6.4	AECOM	15/02/2011	Natural Sandy Clay	VMP & PDA - Block 4		<50			<10	<50	0.3	<0.5	<0.5	<0.5	<0.5	<20	<1
BH409	7-7.3	AECOM	15/02/2011	Natural Clayey Sand	VMP & PDA - Block 4	<200	<50	<100	<100	106	<50	2.8	3.5	22.3	17.8	8.9		26.7
BH42	**3.2-3.3**	AECOM	**23/02/2010**	**Fill**	**VMP & PDA - Block 4**	17,350	4680	13,200	4150	234	22,000 - 22,030	1	40.8	1.5	39.9	83.6		123.5
BH42	3.5-3.6	AECOM	23/02/2010	Natural Sandstone	VMP & PDA - Block 4	<200	<50	<100	<100	<10	<50	<0.2	<0.5	<0.5	<0.5	<0.5		<1
BH44	4.9-5	AECOM	23/02/2010	Natural Sandstone	VMP & PDA - Block 4	3300	1040	2650	650	147	4340	2.1	18.1	5.4	25.7	20.9		46.6
BH45	3.2-3.4	AECOM	23/02/2010	Fill	VMP & PDA - Block 4	<200	<50	<100	<100	10	<50	<0.2	<0.5	<0.5	<0.5	<0.5		<1
BH45	7.2-7.4	AECOM	23/02/2010	Fill	VMP & PDA - Block 4	<200	<50	<100	<100	12	<50	<0.2	<0.5	<0.5	<0.5	<0.5		<1
BH49	4.2-4.4	AECOM	22/02/2010	Fill	VMP & PDA - Block 4	2690	250	1610	1080	13	2940	<0.2	<0.5	<0.5	<0.5	<0.5		<1
BH49	6.2-6.4	AECOM	22/02/2010	Fill	VMP & PDA - Block 4	600	160	450	150	<10	760	1.6	<0.5	1.8	2	0.8		2.8
BH49	8.2-8.4	AECOM	22/02/2010	Fill	VMP & PDA - Block 4	3440	1160	2650	790	348	4600	49.7	5.2	74.6	61.5	22.6		84.1
BH49	10.2-10.4	AECOM	22/02/2010	Fill	VMP & PDA - Block 4	1660	670	1240	420	56	2330	5.5	1.4	10.8	9.9	4.7		14.6
BH49	12.2-12.4	AECOM	22/02/2010	Natural Clayey Sand	VMP & PDA - Block 4							10.2	2	16.6	21.2	7.7		28.9
BH45	13.2-13.4	AECOM	23/02/2010	Natural Sandstone	VMP & PDA - Block 4	<200	<50	<100	<100	<10	<50							
BH52	2.2-2.6	AECOM	22/02/2010	Fill	VMP & PDA - Block 4	<200	<50	<100	<100	<10	<50	<0.2	<0.5	<0.5	<0.5	<0.5		<1
BH52	4.2-4.4	AECOM	22/02/2010	Fill	VMP & PDA - Block 4	8970	<50	6600	2370	10	8970	1.7	1	1.1	1.4	0.7		2.1
BH53	2-2.4	AECOM	6/03/2010	Fill	VMP & PDA - Hickson Road	6970	260	4540	2430	<10	7230	2.7	<0.5	1.4	0.8	<0.5		0.8
BH53	**4-4.4**	AECOM	**6/03/2010**	**Fill**	**VMP & PDA - Hickson Road**	57,800	28,400	46,800	11,000	3000	86,200	678	50.7	670	470	197		667
BH54	2.8-3	AECOM	23/02/2010	Natural Sand	VMP & PDA - Block 4	3980	900	2980	1000	13	4880	<0.2	0.8	<0.5	3.2	1.6		4.8
BH55	**2.2-2.4**	AECOM	**25/02/2010**	**Fill**	**VMP & PDA - Block 4**	14,340	6420	10,600	3740	304	20,760 - 20,800	22.2	29.6	2.3	48.8	51.6		100.4
BH55	**2.7-2.9**	AECOM	**25/02/2010**	**Fill**	**VMP & PDA - Block 4**	19,550	9150	14,800	4750	104	28,700	9.4	8.9	2	19.8	21.1		40.9
BH58	3.2-3.4	AECOM	22/02/2010	Fill	VMP & PDA - Block 4	830	80	450	380	<10	910	<0.2	<0.5	<0.5	<0.5	<0.5		<1
BH58	5.2-5.4	AECOM	22/02/2010	Fill	VMP & PDA - Block 4	620	<50	320	300	<10	620	<0.2	<0.5	<0.5	<0.5	<0.5		<1
BH58	8.6-8.8	AECOM	22/02/2010	Fill	VMP & PDA - Block 4	1150	<50	640	510	<10	1150	<0.2	<0.5	<0.5	<0.5	<0.5		<1
BH58	10.8-11.2	AECOM	22/02/2010	Fill	VMP & PDA - Block 4	850	<50	420	430	<10	850	<0.2	<0.5	<0.5	<0.5	<0.5		<1
BH59	**3.4-3.5**	AECOM	**22/02/2010**	**Fill**	**VMP & PDA - Block 4**	25,340	9120	19,200	6140	459	34,460 - 34,500	82.4	88.3	32.5	103	51.2		154.2
BH59	4.2-4.3	AECOM	22/02/2010	Fill	VMP & PDA - Block 4	510	140	380	130	14	650	3.4	<0.5	2.9	2.4	0.9		3.3
BH61	**2-2.4**	AECOM	**7/03/2010**	**Fill**	**VMP & PDA - Hickson Road**	12,790	450	8130	4660	67	13,200 - 13,240	32.7	<0.5	9.5	5.4	1.4		6.8
BH61	3-3.4	AECOM	7/03/2010	Natural Clayey Sand	VMP & PDA - Hickson Road	1680	320	1220	460	75	2000	11.2	5.9	14.7	16.2	5.8		22
BH62	3.4-3.8	AECOM	26/02/2010	Fill	VMP & PDA - Block 5	380	<50	140	240	<10	380	<0.2	<0.5	<0.5	<0.5	<0.5	<20	<1
BH62	5.4-5.6	AECOM	26/02/2010	Fill	VMP & PDA - Block 5	720	<50	390	330	<10	720	<0.2	<0.5	<0.5	<0.5	<0.5		<1
BH62	11.8-12	AECOM	26/02/2010	Fill	VMP & PDA - Block 5	<200	<50	<100	<100	<10	<50	<0.2	<0.5	<0.5	<0.5	<0.5		<1

Table T4
Site wide
Soil Analytical Results (Declaration Area) - Saturated

						TPH						BTEX						
						TPH C15-C36	TPH C10 - C14	TPH C15-C28	TPH C29-C36	TPH C6 - C9	TPH+C10 - C36 (Sum of total)	Benzene	Ethylbenzene	Toluene	Xylene (m & p)	Xylene (o)	Ammonia as N	Total Xylene
						mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL							50	100	100	10	100	0.2	0.2	0.2	0.2	0.2	20	0.15
SSTC[VMP]							54000	72000	21,000			380						
Tar Containing Material (TCM) Criteria																		
Location	**Sample Depth**	**Consultant**	**Sample Date**	**Matrix**	**Area**													
BH64	2.5-2.7	AECOM	1/03/2010	Fill	VMP & PDA - Block 5	1230	<50	640	590	<10	1230	<0.2	<0.5	<0.5	<0.5	<0.5		<1
BH64	5.5-5.7	AECOM	1/03/2010	Fill	VMP & PDA - Block 5	<200	<50	<100	<100	<10	<50	<0.2	<0.5	<0.5	<0.5	<0.5		<1
BH64	10-10.3	AECOM	1/03/2010	Natural Sandstone	VMP & PDA - Block 5	<200	<50	<100	<100	<10	<50	<0.2	<0.5	<0.5	<0.5	<0.5		<1
BH65	3.4-3.6	AECOM	24/02/2010	Fill	VMP & PDA - Block 5	13,260	710	7500	5760	<10	13,970 - 14,000	<0.2	<0.5	<0.5	<0.5	<0.5		<1
BH65	8.2-8.6	AECOM	24/02/2010	Fill	VMP & PDA - Block 5	1030	<50	560	470	<10	1030							
BH65	11.2-11.4	AECOM	24/02/2010	Natural Clayey Sand	VMP & PDA - Block 5	1330	450	1110	220	14	1780	<0.2	0.8	<0.5	3.5	2.3		5.8
BH65	13.4-13.6	AECOM	24/02/2010	Natural Sandy Clay	VMP & PDA - Block 5	380	100	380	<100	<10	480	<0.2	<0.5	<0.5	1.1	0.7		1.8
BH66	2.3-2.4	AECOM	24/02/2010	Fill	VMP & PDA - Block 5	810	<50	420	390	<10	810	<0.2	<0.5	<0.5	<0.5	<0.5		<1
BH66	3.2-3.6	AECOM	24/02/2010	Fill	VMP & PDA - Block 5	<200	<50	<100	<100	<10	<50	<0.2	<0.5	<0.5	<0.5	<0.5		<1
BH66	7-7.2	AECOM	24/02/2010	Natural Sandstone	VMP & PDA - Block 5	<200	<50	<100	<100	<10	<50							
BH68	2.5-2.9	AECOM	2/03/2010	Fill	VMP & PDA - Block 5	770	<50	320	450	<10	770							
BH68	4-4.3	AECOM	2/03/2010	Fill	VMP & PDA - Block 5	<200	<50	<100	<100	<10	<50	<0.2	<0.5	<0.5	<0.5	<0.5		<1
BH68	7-7.1	AECOM	2/03/2010	Natural Silty Sand	VMP & PDA - Block 5	<200	<50	<100	<100	<10	<50							
MW3	2.9-3	Coffey	23/02/2008	Natural Clayey Sand	VMP & PDA - Hickson Road	8840	1100	6760	2080	<10	9940	0.4	0.9	<0.5	1.1	0.7		1.8
MW6	2.5-2.6	Coffey	20/02/2008	Fill	VMP & PDA - Hickson Road	<200	<50	<100	<100	<10	<250	<0.2	<0.5	<0.5	<0.5	<0.5		<1
MW6	4.4-4.5	Coffey	20/02/2008	Fill	VMP & PDA - Hickson Road	<200	<50	<100	<100	<10	<250	<0.2	<0.5	<0.5	<0.5	<0.5		<1
MW7	3.5-3.6	Coffey	25/02/2008	FILL	VMP & PDA - Hickson Road	7770	2140	5680	2090	227	9910	87.7	10.3	57.5	49.8	19		68.8
MW7	**4.5-4.6**	Coffey	**25/02/2008**	**FILL**	**VMP & PDA - Hickson Road**	74,600	31,500	61,000	13,600	7710	106,100	2080	147	1930	1210	502		1712
MW7	**5-5.1**	Coffey	**25/02/2008**	**FILL**	**VMP & PDA - Hickson Road**	80,400	45,900	65,200	15,200	7890	126,300	1980	154	1990	1300	563		1863
MW10	**4.9-5**	Coffey	**21/02/2008**	**Fill**	**VMP & PDA - Hickson Road**	55,600	4600	41,400	14,200	64	60,200	12.4	4.1	2.2	4.1	1.5		5.6
MW10	**8.6-8.7**	Coffey	**22/02/2008**	**Fill**	**VMP & PDA - Hickson Road**	112,400	69,400	93,200	19,200	7590	181,800	1510	261	2650	1830	746		2576

Notes

mg/kg = milligrams per kilogram
EQL = Estimated Quantitation Limit
< denotes result less than EQL
SSTC[VMP] - Site Specific Target Criteria for the VMP Area
Shading denotes concentration greater than criteria
CPAH= Sum of 8 carcinogenic PAH Compounds (Benz(a)anthracene Benzo(a) pyrene; Benzo(b)fluoranthene; Benzo(g,h,i)perylene; Benzo(k)fluoranthene; Chrysene; Dibenz(a,h)anthracene and Indeno(1,2,3-c,d)pyrene)

TEF - Toxicity Equivalent Factor
TPH - Total Petroleum Hydrocarbons
PAH - Polycyclic Aromatic Hydrocarbons (PAH)
* TPH C6-C9 aliphatic
* *TPH C10-C14 aliphatic and aromatic
note TPH in table not speciated
BOLD = Sample classified as TCM based on PAH (>2000 mg/kg) and Benzo(a)pyrene (>150 mg/kg) results

						PAHs																
						CPAH (TEF)	PAH (Total)	2-methylnaphthalene	Acenaphthene	Acenaphthylene	Anthracene	Benz(a)anthracene	Benzo(a) pyrene	Benzo(b)fluoranthene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-c,d)pyrene	Naphthalene
						mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL								0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
SSTC[VMP]						67																
Tar Containing Material (TCM) Criteria							**2000**						**150**									
Location	**Sample Depth**	**Consultant**	**Sample Date**	**Matrix**	**Area**																	
BH001	1	ERM	1/05/06	Fill	VMP & PDA - Block 5	67.03	699.1		1.1	14.4	19.2	65.9	33.4	98.6	25.5	29.6	70.5	10.4	104	3.6	28.6	11.5
BH019	1.5-1.95	ERM	8/05/06	Fill	VMP & PDA - Block 4	<1.21	38.2		<0.5	<0.5	1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	1.3	1.4	<0.5	29.3
BH020	0.3-0.5	ERM	9/05/06	Fill	VMP & PDA - Block 4	9.621	80.3		0.6	1.6	2.5	6.2	6.8	7.7	3.7	2.3	5.4	0.8	14.6	1.2	3.1	0.8
BH020	1.5-2.1	ERM	9/05/06	Fill	VMP & PDA - Block 4	6.351	50		<0.5	1.3	1.6	3.9	4.4	5	2.5	1.9	3.6	0.6	8.5	0.7	2.1	0.5
BH021	0.3-0.5	ERM	9/05/06	Fill	VMP & PDA - Block 4	3.06	27.3		<0.5	0.9	0.9	2.2	2.3	2.8	1.2	1.1	1.8	<0.5	4.5	<0.5	1.2	0.8
BH028	0.3-0.5	ERM	12/05/06	Fill	VMP & PDA - Block 5																	
BH058	1.5-1.95	ERM	31/05/06	Fill	VMP & PDA - Block 5	39.542	368.6		1.2	8.4	11.1	29	25.3	37.9	19.3	11.8	26.9	4.3	65.3	5.1	16.1	5.7
BH059	1.5-1.95	ERM	31/05/06	Fill	VMP & PDA - Block 5	5.742	52.6		<0.5	2.1	2.1	4.3	3.9	4.6	2.5	1.9	3.7	0.5	8.5	0.6	2	1
BH060	1.7-2	ERM	31/05/06	Fill	VMP & PDA - Block 5	6.082	44		<0.5	1.2	1.3	3.6	3.6	6.3	3.5	2.3	3.7	0.9	5.4	<0.5	2.9	0.6
BH062	1.5-1.95	ERM	31/05/06	Fill	VMP & PDA - Block 5	30.902	228.3		<0.5	6.6	5.1	17.1	19.9	29.7	14.4	10.1	16.8	3.6	38.2	1.1	14	4
BH065	0.3-0.5	ERM	1/06/06	Fill	VMP & PDA - Block 4	4.098	35.4		<0.5	1.1	1.2	3	3.1	3.6	2.1	1.3	2.7	<0.5	5.9	<0.5	1.6	<0.5
BH065	1.5-1.95	ERM	1/06/06	Fill	VMP & PDA - Block 4	1.134	11.7		<0.5	<0.5	0.6	1.1	0.9	1.1	0.6	<0.5	0.8	<0.5	2.4	<0.5	<0.5	<0.5
BH067	1.5-1.95	ERM	1/06/06	Fill	VMP & PDA - Block 5	1.711	18.6		<0.5	<0.5	0.8	1.2	1.3	1.4	0.9	0.6	1.2	<0.5	3.1	0.7	0.7	0.8
BH070	0.3-0.5	ERM	2/05/06	Fill	VMP & PDA - Block 4	1.828	17.7		<0.5	0.5	0.6	1.3	1.4	1.6	0.7	0.6	1.1	<0.5	3	<0.5	0.6	0.9
BH070	1.5-1.95	ERM	2/05/06	Fill	VMP & PDA - Block 4	3.349	30		<0.5	0.7	1.2	2.5	2.5	3.1	1.5	1.2	2.4	<0.5	4.9	<0.5	1.3	<0.5
BH071	1.5-1.95	ERM	2/05/06	Fill	VMP & PDA - Block 4	<1.21	<8		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
BH072	0.3-0.5	ERM	2/05/06	Fill	VMP & PDA - Block 4	<1.21	<8		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
BH073	1.5-1.95	ERM	2/05/06	Fill	VMP & PDA - Block 4	140.147	1451.6		20.6	87.8	77.3	107	100	99.3	44	33.5	88.7	10.7	252	56.5	41.4	14.8
BH074	1.5-1.95	ERM	2/05/06	Fill	VMP & PDA - Block 5	1.239	11.3		<0.5	0.6	0.5	1.2	1	1.1	<0.5	<0.5	0.9	<0.5	2.4	<0.5	<0.5	<0.5
BH075	0.3-0.5	ERM	6/06/06	Fill	VMP & PDA - Block 4	27.657	242.1		0.5	8.4	7.9	19.4	19	21.2	11.3	9.4	16.4	2.4	42.7	2.2	9.8	2.8
BH087	**1.5-1.95**	**ERM**	**8/06/06**	**Fill**	**VMP & PDA - Block 4**	114.535	**2982.2**		21.6	177	136	114	78.5	83.6	34	35.2	69.5	8.6	325	182	31.2	925
BH089	0.3-0.5	ERM	9/06/06	Fill	VMP & PDA - Block 4	<1.21	2.2		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.8	<0.5	<0.5	<0.5
BH089	1.5-1.95	ERM	9/06/06	Fill	VMP & PDA - Block 4	4.367	57.4		<0.5	2.5	2.3	3.7	3.3	3.4	1.6	1.7	3.1	<0.5	7.7	2	1.4	9
BH090	1.5-1.95	ERM	9/06/06	Fill	VMP & PDA - Block 4	0.845	5.6		<0.5	<0.5	<0.5	0.6	0.7	0.8	<0.5	<0.5	0.5	<0.5	1.1	<0.5	<0.5	<0.5
BH109	0.3-0.5	ERM	27/06/06	Fill	VMP & PDA - Block 4	<1.21	<8		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
BH113	1.5-1.95	ERM	27/06/06	Fill	VMP & PDA - Block 4	<1.21	<8		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
BH114	0.3-0.5	ERM	28/06/06	Fill	VMP & PDA - Block 4	2.225	15		<0.5	<0.5	<0.5	1.2	1.7	2	1.3	0.9	1.2	<0.5	2.3	<0.5	0.9	<0.5
BH115	0.8-1	ERM	28/06/06	Fill	VMP & PDA - Block 4																	
BH115	1.5-1.95	ERM	28/06/06	Fill	VMP & PDA - Block 4	0.877	7.4		<0.5	<0.5	<0.5	0.8	0.7	0.9	<0.5	<0.5	0.7	<0.5	1.7	<0.5	<0.5	<0.5
BH119	1.6-2.05	ERM	30/06/06	Fill	VMP & PDA - Block 4	0.962	6		<0.5	<0.5	<0.5	0.6	0.8	0.9	0.6	<0.5	0.6	<0.5	1	<0.5	<0.5	<0.5
BH132	1.5-1.95	ERM	6/07/06	Fill	VMP & PDA - Block 4	25.386	189.2		0.9	3.5	5.4	19.5	17.1	21.9	8.8	9	14.8	2.3	29.5	2	7.1	3.8
BH133	1.5-1.95	ERM	6/07/06	Fill	VMP & PDA - Block 4	<1.21	<8		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
BH133	0.3-0.5	ERM	6/07/06	Fill	VMP & PDA - Block 4	2.803	26		<0.5	1	0.9	2.2	2.1	2.6	1.4	0.9	1.9	<0.5	4	<0.5	1	1.3
BH135A	0.4-0.6	ERM	11/07/06	Fill	VMP & PDA - Block 4	<1.21	<8		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
BH141	1.5-1.95	ERM	7/07/06	Fill	VMP & PDA - Block 4	34.823	350.5		1.8	11.8	14.6	28.2	24.6	25.2	12.2	10.6	24.1	2.5	72.2	4.5	9.6	2.3
BH145	0.3-0.5	ERM	11/07/06	Fill	VMP & PDA - Block 5	109.996	849.7		1.5	22	24.1	81.4	72.4	91.3	45.6	36.4	72	11.9	130	5.6	36.1	8.8

						PAHs																
						CPAH (TEF)	PAH (Total)	2-methylnaphthalene	Acenaphthene	Acenaphthylene	Anthracene	Benz(a)anthracene	Benzo(a) pyrene	Benzo(b)fluoranthene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-c,d)pyrene	Naphthalene
						mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL								0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
SSTC[VMP]						67																
Tar Containing Material (TCM) Criteria							**2000**						**150**									
Location	**Sample Depth**	**Consultant**	**Sample Date**	**Matrix**	**Area**																	
BH146	1.5-1.95	ERM	11/07/06	Fill	VMP & PDA - Block 4	<1.21	<8		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
BH156	0.4-0.5	ERM	14/08/06	Fill	VMP & PDA - Block 4	<1.21	<8		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
BH156	0.9-1	ERM	14/08/06	Fill	VMP & PDA - Block 4	<1.21	<8		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
BH159		ERM	14/08/06	Fill	VMP & PDA - Block 4	<1.21	<8		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
BH160	0.3-0.4	ERM	14/08/06	Fill	VMP & PDA - Block 4	<1.21	<8		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
BH161	0.3-0.4	ERM	14/08/06	Fill	VMP & PDA - Block 4	<1.21	<8		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
BH197	0.4	ERM	3/03/08	Fill	VMP & PDA - Block 5	0.125	12.1		<0.5	<0.5	0.5	0.6	<0.5	0.6	0.5	<0.5	<0.5	<0.5	3.5	0.6	<0.5	<0.5
BH200	1	ERM	7/04/08	Fill	VMP & PDA - Block 4	166.044	1781.5		5.2	54.8	75.7	158	113	158	30.4	48.2	128	11.6	320	14.8	34.4	64.4
BH203	1.9	ERM	10/03/08	Fill	VMP & PDA - Block 4	7.675	57.4		<0.5	1.4	2.2	5	5.1	5.3	3.4	2.3	4.1	0.9	9.3	<0.5	3.4	<0.5
BH204S	**1**	**ERM**	**18/03/08**	**Fill**	**VMP & PDA - Block 4**	119.443	**3702.1**		45.2	194	187	128	78.6	68.8	39.8	59	83.5	9.9	373	295	41.3	1180
BH204D	**1.5**	**ERM**	**7/04/08**	**Fill**	**VMP & PDA - Block 4**	921.56	**20,934**		222	605	1200	823	**652**	587	305	231	631	71.4	1550	1190	247	8410
BH206	0.5	ERM	7/03/08	Fill	VMP & PDA - Block 4	11.321	98.2		<0.5	4.2	3.9	8.4	7.8	7.7	3.6	3.6	7.5	1.1	15.6	0.9	3.4	1.9
BH206	1.8	ERM	17/04/08	Fill	VMP & PDA - Block 4	<1.21	0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
BH210	1.5	ERM	18/03/08	Fill	VMP & PDA - Block 4	<1.21	<8		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
BH34	1.8-2.2	AECOM	25/02/10	Fill	VMP & PDA - Block 4	<1.21	<8		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
BH42	1-1.1	AECOM	23/02/10	Fill	VMP & PDA - Block 4	2.115	17.2		<0.5	<0.5	<0.5	2	1.5	2.3	0.8	1	1.7	<0.5	2.9	<0.5	0.6	<0.5
BH44	1.9-2	AECOM	23/02/10	Fill	VMP & PDA - Block 4	<1.21	<8		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
BH49	1.5-1.7	AECOM	22/02/10	Fill	VMP & PDA - Block 4	36.552	428.1		1.1	11	18.1	35.8	22.7	37	13.2	11.8	32	3.8	76.7	4.5	11.4	9.7
BH50	1.3-1.5	AECOM	26/02/10	Natural Sandstone	VMP & PDA - Block 4	0.06	1.1	<0.5	<0.5	<0.5	<0.5	0.6	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
BH52	1-1.2	AECOM	22/02/10	Fill	VMP & PDA - Block 4																	
BH54	**1-1.4**	**AECOM**	**23/02/10**	**Fill**	**VMP & PDA - Block 4**	842.57	**20,627**		273	1000	1070	912	**533**	824	248	324	549	72.5	2130	1290	231	6370
BH55	**1-1.2**	**AECOM**	**25/02/10**	**Fill**	**VMP & PDA - Block 4**	372.05	**12,143**	<4	80.7	473	482	425	**252**	300	123	107	282	23.3	1280	460	95	4510
BH58	1-1.2	AECOM	22/02/10	Fill	VMP & PDA - Block 4	19.668	205.8		0.6	8.2	8.5	16.2	12.7	19	9.8	6.9	14	1.8	36.1	1.5	7.2	2.3
BH59	1.9-2	AECOM	22/02/10	Fill	VMP & PDA - Block 4	40.933	1264.5		10.3	58.8	60.3	45.9	26.5	35.8	13.1	14.3	32.2	3.2	121	68.3	11.8	453
BH62	1-1.2	AECOM	26/02/10	Fill	VMP & PDA - Block 5	0.1	4.4	<0.5	<0.5	<0.5	<0.5	0.5	<0.5	0.5	<0.5	<0.5	<0.5	<0.5	0.9	<0.5	<0.5	0.7
BH64	1-1.2	AECOM	1/03/10	Fill	VMP & PDA - Block 5	107.979	1463.6	1	7.5	51.9	70.8	95.5	69.8	104	37.2	29.4	79.7	10.8	246	31.1	33.2	76.7
SV09	0.2-0.4	AECOM	26/02/10	Fill	VMP & PDA - Block 5	42.044	495.4	<0.5	1.4	9.9	18.5	45.3	25.4	43.7	14.5	18	33.9	4.2	97.5	3.4	12.6	5.8

Notes
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* *TPH C10-C14 aliphatic and aromatic
note TPH in table not speciated
BOLD = Sample classified as TCM based on PAH (>2000 mg/kg) and Benzo(a)pyrene (>150 mg/kg) results

					TPH								BTEX						
					Phenanthrene	Pyrene	TPH C15-C36	TPH C10 - C14	TPH C15-C28	TPH C29-C36	TPH C6 - C9	TPH+C10 - C36 (Sum of total)	Benzene	Ethylbenzene	Toluene	Xylene (m & p)	Xylene (o)	Ammonia as N	Total Xylene
					mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL					0.5	0.5		50	100	100	10	50	0.2	0.2	0.2	0.2	0.2	20	
SSTC[VMP]								54000	72000	21,000			380						
Tar Containing Material (TCM) Criteria																			
Location	**Sample Depth**	**Consultant**	**Sample Date**	**Matrix**															
BH001	1	ERM	1/05/06	Fill	84.4	98.4	4470	2360	3280	1190	3	6830	0.5	<0.2	0.4	0.2	<0.2		0.2
BH019	1.5-1.95	ERM	8/05/06	Fill	4.1	1.1	<200	100	<100	<100	50	100							
BH020	0.3-0.5	ERM	9/05/06	Fill	7.8	15.2	810	<50	460	350	<2	810							
BH020	1.5-2.1	ERM	9/05/06	Fill	4.7	8.7	620	<50	280	340	<2	620							
BH021	0.3-0.5	ERM	9/05/06	Fill	2.8	4.8	230	<50	130	100	<2	230							
BH028	0.3-0.5	ERM	12/05/06	Fill			340	<50	200	140	<2	340	<0.2	<0.2	<0.2	<0.2	<0.2		<0.01
BH058	1.5-1.95	ERM	31/05/06	Fill	39.5	61.7	3030	120	1960	1070	8	3150	0.3	0.3	0.2	<0.2	<0.2		<0.4
BH059	1.5-1.95	ERM	31/05/06	Fill	6.4	8.5	550	<50	290	260	<2	550	<0.2	<0.2	<0.2	<0.2	<0.2		<0.4
BH060	1.7-2	ERM	31/05/06	Fill	3.2	5.5	140	<50	<100	140	<2	140	<0.2	<0.2	<0.2	<0.2	<0.2		<0.4
BH062	1.5-1.95	ERM	31/05/06	Fill	17.1	30.6	1120	100	610	510	8	1220	<0.2	<0.2	0.4	0.3	<0.2		0.3
BH065	0.3-0.5	ERM	1/06/06	Fill	3.6	6.2	530	<50	180	350	<2	530	<0.2	<0.2	<0.2	<0.2	<0.2		<0.4
BH065	1.5-1.95	ERM	1/06/06	Fill	1.9	2.3	<200	<50	<100	<100	<2	<250	<0.2	<0.2	<0.2	<0.2	<0.2		<0.4
BH067	1.5-1.95	ERM	1/06/06	Fill	2.9	3	1100	<50	480	620	<2	1100	<0.2	<0.2	<0.2	<0.2	<0.2		<0.4
BH070	0.3-0.5	ERM	2/05/06	Fill	2.3	3.1	810	<50	600	210	<2	810	<0.2	<0.2	<0.2	<0.2	<0.2		<0.4
BH070	1.5-1.95	ERM	2/05/06	Fill	3.7	5	570	<50	230	340	<2	570	<0.2	<0.2	<0.2	<0.2	<0.2		<0.4
BH071	1.5-1.95	ERM	2/05/06	Fill	<0.5	<0.5	<200	<50	<100	<100	<2	<250	<0.2	<0.2	<0.2	<0.2	<0.2		<0.4
BH072	0.3-0.5	ERM	2/05/06	Fill	<0.5	<0.5	<200	<50	<100	<100	<2	<250	<0.2	<0.2	<0.2	<0.2	<0.2		<0.4
BH073	1.5-1.95	ERM	2/05/06	Fill	190	228	830	<50	560	270	<2	830	<0.2	<0.2	<0.2	<0.2	<0.2		<0.4
BH074	1.5-1.95	ERM	2/05/06	Fill	1.4	2.2	<200	<50	<100	<100	<2	<250	<0.2	<0.2	<0.2	<0.2	<0.2		<0.4
BH075	0.3-0.5	ERM	6/06/06	Fill	25.7	43	1010	<50	570	440	<2	1010	<0.2	<0.2	<0.2	<0.2	<0.2		<0.4
BH087	**1.5-1.95**	**ERM**	**8/06/06**	**Fill**	496	265	7340	2230	5820	1520	20	9570	0.7	1.2	0.8	7.3	3.2		10.5
BH089	0.3-0.5	ERM	9/06/06	Fill	0.7	0.7	<200	<50	<100	<100	<2	<250	<0.2	<0.2	<0.2	<0.2	<0.2		<0.4
BH089	1.5-1.95	ERM	9/06/06	Fill	8.3	7.4	610	70	440	170	<2	680	<0.2	<0.2	<0.2	<0.2	<0.2		<0.4
BH090	1.5-1.95	ERM	9/06/06	Fill	0.8	1.1	<200	<50	<100	<100	<2	<250	<0.2	<0.2	<0.2	<0.2	<0.2		<0.4
BH109	0.3-0.5	ERM	27/06/06	Fill	<0.5	<0.5	<200	<50	<100	<100	<2	<250	<0.2	<0.2	<0.2	<0.2	<0.2		<0.4
BH113	1.5-1.95	ERM	27/06/06	Fill	<0.5	<0.5	<200	<50	<100	<100	<2	<250	<0.2	<0.2	<0.2	<0.2	<0.2		<0.4
BH114	0.3-0.5	ERM	28/06/06	Fill	1	2.5	340	<50	130	210	<2	340	<0.2	<0.2	<0.2	<0.2	<0.2		<0.4
BH115	0.8-1	ERM	28/06/06	Fill			900	<50	560	340	<2	900	<0.2	<0.2	<0.2	<0.2	<0.2		<0.4
BH115	1.5-1.95	ERM	28/06/06	Fill	1	1.6	<200	<50	<100	<100	<2	<250	<0.2	<0.2	<0.2	<0.2	<0.2		<0.4
BH119	1.6-2.05	ERM	30/06/06	Fill	0.5	1	<200	<50	<100	<100	<2	<250	<0.2	<0.2	<0.2	<0.2	<0.2		<0.4
BH132	1.5-1.95	ERM	6/07/06	Fill	16.1	27.5	890	<50	500	390	<2	890	0.5	<0.2	<0.2	<0.2	<0.2		<0.4
BH133	1.5-1.95	ERM	6/07/06	Fill	<0.5	<0.5	<200	<50	<100	<100	<2	<250	<0.2	<0.2	<0.2	<0.2	<0.2		<0.4
BH133	0.3-0.5	ERM	6/07/06	Fill	2.7	4	<200	<50	<100	<100	<2	<250	<0.2	<0.2	<0.2	<0.2	<0.2		<0.4
BH135A	0.4-0.6	ERM	11/07/06	Fill	<0.5	<0.5	<200	<50	<100	<100	<2	<250	<0.2	<0.2	<0.2	<0.2	<0.2		<0.4
BH141	1.5-1.95	ERM	7/07/06	Fill	38.4	67.9	2190	70	1600	590	<2	2260	<0.2	<0.2	<0.2	<0.2	<0.2		<0.4
BH145	0.3-0.5	ERM	11/07/06	Fill	61.6	149	3390	80	2120	1270	4	3470	0.2	<0.2	0.4	0.3	<0.2		0.3

					TPH								BTEX						
					Phenanthrene	Pyrene	TPH C15-C36	TPH C10 - C14	TPH C15-C28	TPH C29-C36	TPH C6 - C9	TPH+C10 - C36 (Sum of total)	Benzene	Ethylbenzene	Toluene	Xylene (m & p)	Xylene (o)	Ammonia as N	Total Xylene
					mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL					0.5	0.5		50	100	100	10	50	0.2	0.2	0.2	0.2	0.2	20	
SSTC[VMP]								54000	72000	21,000			380						
Tar Containing Material (TCM) Criteria																			
Location	**Sample Depth**	**Consultant**	**Sample Date**	**Matrix**															
BH146	1.5-1.95	ERM	11/07/06	Fill	<0.5	<0.5	<200	<50	<100	<100	2	<250	<0.2	<0.2	<0.2	<0.2	<0.2		<0.4
BH156	0.4-0.5	ERM	14/08/06	Fill	<0.5	<0.5	<200	<50	<100	<100	<2	<250	<0.2	<0.2	<0.2	<0.2	<0.2		<0.4
BH156	0.9-1	ERM	14/08/06	Fill	<0.5	<0.5	<200	<50	<100	<100	<2	<250	<0.2	<0.2	<0.2	<0.2	<0.2		<0.4
BH159		ERM	14/08/06	Fill	<0.5	<0.5	1230	<50	270	960	<2	1230	<0.2	<0.2	<0.2	0.3	<0.2		0.3
BH160	0.3-0.4	ERM	14/08/06	Fill	<0.5	<0.5	<200	<50	<100	<100	<2	<250	<0.2	<0.2	<0.2	<0.2	<0.2		<0.4
BH161	0.3-0.4	ERM	14/08/06	Fill	<0.5	<0.5	<200	<50	<100	<100	<2	<250	<0.2	<0.2	<0.2	<0.2	<0.2		<0.4
BH197	0.4	ERM	3/03/08	Fill	2.9	2.9	600	<50	150	450	<10	600	<0.2	<0.5	<0.5	<0.5	<0.5		<1
BH200	1	ERM	7/04/08	Fill	269	296	14,930	520	10,200	4730	<10	15,450	1.6	<0.5	2.2	2	0.8		2.8
BH203	1.9	ERM	10/03/08	Fill	5.9	9.1	690	<50	330	360	<10	690	<0.2	<0.5	<0.5	<0.5	<0.5		<1
BH204S	**1**	**ERM**	**18/03/08**	**Fill**	673	246	12,690	2890	9620	3070	20	15,580	0.6	3.5	1.4	4.2	4.4		8.6
BH204D	**1.5**	**ERM**	**7/04/08**	**Fill**	2700	1510	93,000	54,200	72,400	20,600	226	147,200	61	7	69.2	67.2	26.9		94.1
BH206	0.5	ERM	7/03/08	Fill	11.8	16.8	490	<50	310	180	<10	490	<0.2	<0.5	<0.5	<0.5	<0.5		<1
BH206	1.8	ERM	17/04/08	Fill	<0.5	0.5	530	<50	190	340	<10	530	<0.2	<0.5	<0.5	<0.5	<0.5		<1
BH210	1.5	ERM	18/03/08	Fill	<0.5	<0.5	<200	<50	<100	<100	<10	<250	<0.2	<0.5	<0.5	<0.5	<0.5		<1
BH34	1.8-2.2	AECOM	25/02/10	Fill	<0.5	<0.5	<200	<50	<100	<100	<10	<50	<0.2	<0.5	<0.5	<0.5	<0.5		<1
BH42	1-1.1	AECOM	23/02/10	Fill	1.2	3.2	110	<50	110	<100	<10	110	<0.2	<0.5	<0.5	<0.5	<0.5		<1
BH44	1.9-2	AECOM	23/02/10	Fill	<0.5	<0.5	<200	<50	<100	<100	10	<50	<0.2	<0.5	<0.5	<0.5	<0.5		<1
BH49	1.5-1.7	AECOM	22/02/10	Fill	61.4	77.9	2250	80	1460	790	11	2330	<0.2	<0.5	<0.5	<0.5	<0.5		<1
BH50	1.3-1.5	AECOM	26/02/10	Natural Sandstone	<0.5	0.5	<200	<50	<100	<100	<10	<50	<0.2	<0.5	<0.5	<0.5	<0.5		<1
BH52	1-1.2	AECOM	22/02/10	Fill			950	<50	580	370	78	950	0.2	2.7	3.9	20.2	8.7		28.9
BH54	**1-1.4**	**AECOM**	**23/02/10**	**Fill**	3130	1670	15,260	4380	11,700	3560	72	19,600 - 19,640	2.5	3.5	7.3	25	10.5		35.5
BH55	**1-1.2**	**AECOM**	**25/02/10**	**Fill**	2030	1220	24,950	11,300	19,400	5550	109	36,200 - 36,250	7.8	2.8	14	24.1	10.8		34.9
BH58	1-1.2	AECOM	22/02/10	Fill	23.4	37.6	1010	<50	550	460	<10	1010	<0.2	<0.5	<0.5	<0.5	<0.5		<1
BH59	1.9-2	AECOM	22/02/10	Fill	206	104	3150	980	2290	860	<10	4130	<0.2	<0.5	<0.5	<0.5	<0.5		<1
BH62	1-1.2	AECOM	26/02/10	Fill	0.9	0.9	<200	<50	<100	<100	<10	<50	<0.2	<0.5	<0.5	<0.5	<0.5		<1
BH64	1-1.2	AECOM	1/03/10	Fill	261	259	2970	260	1970	1000	<10	3230	0.2	<0.5	<0.5	<0.5	<0.5		<1
SV09	0.2-0.4	AECOM	26/02/10	Fill	69.1	92.2	3160	120	1920	1240	<10	3280	0.5	<0.5	<0.5	<0.5	<0.5		<1

Notes
mg/kg = milligrams per kilogram
EQL = Estimated Quantitation Limit
< denotes result less than EQL
SSTC[VMP] - Site Specific Target Criteria for the VMP Area
shading denotes concentration greater than criteria
CPAH= Sum of 8 carcinogenic PAH Compounds (Benz(a)anthracene Benzo(a) p
Benzo(g,h,i)perylene; Benzo(k)fluoranthene; Chrysene; Dibenz(a,h)anthracene an

TEF - Toxicity Equivalent Factor
TPH - Total Petroleum Hydrocarbons
PAH - Polycyclic Aromatic Hydrocarbons (PAH)
* TPH C6-C9 aliphatic
* *TPH C10-C14 aliphatic and aromatic
note TPH in table not speciated
BOLD = Sample classified as TCM based on PAH (>2000 mg/kg) and Benzo(

					PAHs																							
					CPAH (TEF)	PAH (Total)	2-chloronaphthalene	2-methylnaphthalene	3-methylcholanthrene	Acenaphthene	Acenaphthylene	Acetophenone	Anthracene	Benz(a)anthracene	Benzo(a) pyrene	Benzo(b)&(k)fluoranthene	Benzo(b)fluoranthene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-c,d)pyrene	Naphthalene	Phenanthrene	Pyrene	TPH C15-C36
					mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL							0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	1	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	
SSTC[VMP]					67																							
TCM Criteria						**2000**									**150**								-					
Location	**Sample Depth**	**Sample Date**	**Matrix Description**	**Area**																								
BH 199	6	17/03/2008	Natural Sandstone	VMP & PDA - Block 5	<1.21	<8	-	-	-	<0.5	<0.5	-	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<200
BH001	4	2/05/2006	Fill	VMP & PDA - Block 5	3.531	30.7	-	-	-	<0.5	0.5	-	0.8	3.3	2.6	-	3.3	1	1.3	3.1	<0.5	5	<0.5	1	1.3	2.4	5.1	160
BH019	2.5-3	8/05/2006	Fill	VMP & PDA - Block 4	82.897	1994.2	-	-	-	24.3	82	-	79.3	70.3	58.2	-	56.9	22.6	25.5	54.1	6.4	208	110	22.6	700	295	179	4900
BH019	**3-3.45**	**8/05/2006**	**Fill**	**VMP & PDA - Block 4**	122.038	**2733.9**	-	-	-	31.6	120	-	114	103	86.3	-	85.3	32.2	37.2	77.6	8.8	295	157	32.9	891	407	255	7320
BH028	13-13.5	12/05/2006	Natural Clayey Sand	VMP & PDA - Block 5	12.142	470.5	-	-	-	6.7	38.6	-	20.4	13.2	8.4	-	9	3.1	3.2	11.1	0.8	28.2	32.3	2.6	183	76	33.9	1620
BH058	6-6.5	31/05/2006	Natural Clayey Sand	VMP & PDA - Block 5	2.618	154.1	-	-	-	2.7	15.6	-	6.9	3.6	2	-	1.6	0.6	0.6	3.2	<0.5	6.6	12.3	<0.5	59.5	28.9	10	510
BH059	3-3.45	31/05/2006	Fill	VMP & PDA - Block 5	3.224	27.9	-	-	-	<0.5	0.7	-	1	2.5	2.4	-	3	1.4	1.2	2	<0.5	4.4	0.5	1.2	<0.5	2.6	5	290
BH059	8.5-9	31/05/2006	Natural Clayey Sand	VMP & PDA - Block 5	<1.21	10.9	-	-	-	<0.5	1.4	-	0.6	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	0.8	1.2	<0.5	2.7	3	1.2	<200
BH060	9.5-10	31/05/2006	Natural Clayey Sand	VMP & PDA - Block 5	<1.21	1.4	-	-	-	<0.5	<0.5	-	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.9	0.5	<200
BH062	3-3.45	31/05/2006	Fill	VMP & PDA - Block 5	6.023	47.4	-	-	-	<0.5	1	-	1.8	3.5	4.2	-	5	3	1.8	3.3	0.5	7.4	0.6	2.3	<0.5	4.9	8.1	830
BH065	3-3.45	1/06/2006	Fill	VMP & PDA - Block 4	11.332	176.3	-	-	-	7	1.4	-	9.7	9.5	7.7	-	9.4	4.5	3.5	8.7	0.9	28.3	7.8	3.6	13.9	34.6	25.8	1760
BH067	3-3.45	1/06/2006	Fill	VMP & PDA - Block 5	6.064	63.1	-	-	-	<0.5	1.1	-	1.8	5.1	4.5	-	5.7	2.1	2.4	4.3	<0.5	12.5	0.9	1.8	1.5	7.5	11.9	4510
BH071	3-3.45	2/05/2006	Fill	VMP & PDA - Block 4	<1.21	<8	-	-	-	<0.5	<0.5	-	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<200
BH072	3-3.45	2/05/2006	Fill	VMP & PDA - Block 4	<1.21	<8	-	-	-	<0.5	<0.5	-	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	120
BH072	9.5-10	2/05/2006	Fill	VMP & PDA - Block 4	<1.21	<8	-	-	-	<0.5	<0.5	-	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<200
BH073	2-2.4	2/05/2006	Fill	VMP & PDA - Block 4	21.659	383.1	-	-	-	4.4	24.4	-	18.7	19	15.3	-	15.6	6.3	6.2	14.6	1.5	48.8	20.8	5.7	80.5	58.3	43	1600
BH074	3-3.45	2/05/2006	Fill	VMP & PDA - Block 5	3.729	45.5	-	-	-	<0.5	1.5	-	2.6	3.7	2.8	-	3	1.1	1.2	2.8	<0.5	8.2	1.3	1	<0.5	8.6	7.7	260
BH074	9.5-10	2/05/2006	Natural Sandy Clay	VMP & PDA - Block 5	45.766	1222.9	-	-	-	10.5	80.5	-	60	41.3	32.7	-	30.6	11.5	12.9	30.1	3.1	112	71.6	10.7	435	184	96.4	3350
BH075	3-3.45	6/06/2006	Fill	VMP & PDA - Block 4	1.063	9.3	-	-	-	<0.5	<0.5	-	<0.5	0.9	0.8	-	1.1	0.6	0.5	0.7	<0.5	1.8	<0.5	<0.5	<0.5	1	1.9	<200
BH087	**3-3.45**	**8/06/2006**	**Fill**	**VMP & PDA - Block 4**	113.187	**2895.7**	-	-	-	24.4	158	-	120	97.4	79.6	-	79.6	34	31.9	70.7	8.6	285	160	30.5	1030	439	247	8980
BH087	**7-7.5**	**8/06/2006**	**Fill**	**VMP & PDA - Block 4**	69.75	**2418.5**	-	-	-	23.7	135	-	104	64.5	49	-	45.7	20	19.9	50	5.3	163	125	17.4	1090	333	173	8270
BH089	3-3.45	9/06/2006	Fill	VMP & PDA - Block 4	7.99	76.8	-	-	-	<0.5	2.3	-	3.4	6.2	5.6	-	5.9	2.6	2.7	5.4	0.6	13.5	1.1	2.3	0.7	11.5	13	170
BH090	3-3.45	9/06/2006	Fill	VMP & PDA - Block 4	4.337	41.6	-	-	-	<0.5	1	-	2	3.5	3.3	-	3.3	1.6	1.7	3.1	<0.5	7.1	<0.5	1.4	<0.5	6.3	7.3	140
BH109	3-3.45	27/06/2006	Fill	VMP & PDA - Block 4	<1.21	<8	-	-	-	<0.5	<0.5	-	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	130
BH109	9.5-10	27/06/2006	Fill	VMP & PDA - Block 4	<1.21	<8	-	-	-	<0.5	<0.5	-	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<200
BH113	3-3.45	27/06/2006	Fill	VMP & PDA - Block 4	0.878	9.2	-	-	-	<0.5	<0.5	-	0.6	0.9	0.7	-	0.8	<0.5	<0.5	0.8	<0.5	1.8	<0.5	<0.5	<0.5	1.8	1.8	1010
BH114	3-3.45	28/06/2006	Fill	VMP & PDA - Block 4	<1.21	<8	-	-	-	<0.5	<0.5	-	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	980
BH115	3-3.45	28/06/2006	Fill	VMP & PDA - Block 4	0.756	6.5	-	-	-	<0.5	<0.5	-	<0.5	0.7	0.6	-	0.8	<0.5	<0.5	0.6	<0.5	1.6	<0.5	<0.5	<0.5	0.8	1.4	<200
BH119	**7.5-8**	**30/06/2006**	**Fill**	**VMP & PDA - Block 4**	217.559	**5173.3**	-	-	-	53.5	273	-	236	152	149	-	113	59.9	71.3	121	27.4	550	313	57.2	1620	880	497	17,690
BH119	**9.5-10**	**30/06/2006**	**Fill**	**VMP & PDA - Block 4**	111.363	**3325.3**	-	-	-	39.7	240	-	163	88.9	80	-	55.5	23.5	43.5	69.8	9	289	239	26.4	1210	504	244	10,050
BH132	8-8.5	6/07/2006	Natural Clayey Sand	VMP & PDA - Block 4	40.715	1700.3	-	-	-	18.4	148	-	57	45	28	-	27.4	11	11.6	37.5	3	77.6	76.9	8.3	825	228	97.6	4230
BH135A	3-3.45	11/07/2006	Fill	VMP & PDA - Block 4	<1.21	<8	-	-	-	<0.5	<0.5	-	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-
BH141	**3-3.45**	**7/07/2006**	**Fill**	**VMP & PDA - Block 4**	489.37	**13,659**	-	-	-	127	600	-	499	429	344	-	359	149	140	328	35.4	1160	725	124	5840	1820	980	5920
BH145	3-3.45	11/07/2006	Fill	VMP & PDA - Block 5	<1.21	1.4	-	-	-	<0.5	<0.5	-	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	0.7	<0.5	<0.5	<0.5	<0.5	0.7	<200
BH146	3-3.33	11/07/2006	Fill	VMP & PDA - Block 4	99.1	951.4	-	-	-	8.8	58.8	-	35.4	89.7	67.3	-	72.8	33	28.9	69	8.5	184	10.9	31.4	28.3	26.6	198	-
BH146	4.1-4.6	11/07/2006	Fill	VMP & PDA - Block 4	48.479	1274.6	-	-	-	16	78.8	-	58.6	43.5	32.9	-	37.2	16.2	14.8	34.7	4.1	107	71.6	14.2	454	186	105	4610
BH197	5	9/04/2008	Fill	VMP & PDA - Block 5	49.087	546.8	-	-	-	5.1	27	-	19.2	57.7	34.2	-	31.4	9.2	15.7	36.5	3	86.6	10.1	9.5	83	23.6	95	5300
BH197	6.5	9/04/2008	Natural Sandy Clay	VMP & PDA - Block 5	0.05	10	-	-	-	<0.5	<0.5	-	0.5	0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	1	0.6	<0.5	4.8	1.6	1	<200
BH197	11.5	9/04/2008	Natural Clayey Sand	VMP & PDA - Block 5	1.587	91.3	-	-	-	1.7	9.9	-	3.6	2.7	1.2	-	1	<0.5	<0.5	1.7	<0.5	3.8	9.2	<0.5	31.1	19.3	6.1	400
BH197	15.9	10/04/2008	Natural Sandstone	VMP & PDA - Block 5	0.06	10.5	-	-	-	<0.5	1	-	0.7	0.6	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	1.3	1	<0.5	2	2.7	1.2	<200
BH197	18.6	10/04/2008	Natural Sandstone	VMP & PDA - Block 5	<1.21	<8	-	-	-	<0.5	<0.5	-	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<200
BH198	3	6/03/2008	Fill	VMP & PDA - Block 5	37.064	274.8	-	-	-	3.4	16.3	-	12.7	13.3	26.3	-	26.5	12.7	10.5	12.7	4.3	26.6	4.7	11.8	17.2	21	54.8	8130
BH198	4.5	6/03/2008	Natural Sandy Clay	VMP & PDA - Block 5	<1.21	1	-	-	-	<0.5	<0.5	-	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	1	<0.5	<0.5	<200
BH198	6.9	6/03/2008	Natural Clayey Sand	VMP & PDA - Block 5	<1.21	<8	-	-	-	<0.5	<0.5	-	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<200
BH199	2.7	11/03/2008	Fill	VMP & PDA - Block 5	20.52	217.2	-	-	-	2	11.6	-	9	20.3	14.4	-	14.6	5.4	6.5	14.6	1.3	42.7	3.8	4.8	1.5	25.3	39.4	1120
BH199	3.7	11/03/2008	Natural Silty Clay	VMP & PDA - Block 5	39.473	1158.9	-	-	-	14.2	47.2	-	44.7	39.8	27.4	-	29.8	10.3	11.9	28	2.5	122	69	10.4	439	164	98.7	3540
BH199	5.6	11/03/2008	Natural Clayey Sand	VMP & PDA - Block 5	1.454	25.2	-	-	-	<0.5	1.4	-	1.3	1.8	1.1	-	1	<0.5	0.6	1.4	<0.5	4.8	1	<0.5	3.5	2.9	4.4	<200
BH199	6	17/03/2008	Natural Sandstone	VMP & PDA - Block 5	<1.21	<8	-	-	-	<0.5	<0.5	-	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<200
BH200	2.5	7/04/2008	Fill	VMP & PDA - Block 4	19.759	220.1	-	-	-	1	6.7	-	9.9	16.9	12.4	-	18.2	8.3	7.3	14.6	2.2	34.7	5.4	6.9	10.1	32.4	33.1	1560
BH200	6.53	7/04/2008	Natural Sandstone	VMP & PDA - Block 4	<1.21	<8	-	-	-	<0.5	<0.5	-	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<200
BH201	2.4	4/03/2008	Fill	VMP & PDA - Block 5	<1.21	<8	-	-	-	<0.5	<0.5	-	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<200

					PAHs																							
					CPAH (TEF)	PAH (Total)	2-chloronaphthalene	2-methylnaphthalene	3-methylcholanthrene	Acenaphthene	Acenaphthylene	Acetophenone	Anthracene	Benz(a)anthracene	Benzo(a) pyrene	Benzo(b)&(k)fluoranthene	Benzo(b)fluoranthene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-c,d)pyrene	Naphthalene	Phenanthrene	Pyrene	TPH C15-C36
					mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL							0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	1	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	
SSTC[VMP]					67																							
TCM Criteria						**2000**									**150**								-					
Location	**Sample Depth**	**Sample Date**	**Matrix Description**	**Area**																								
BH202	2.3	10/03/2008	Fill	VMP & PDA - Block 4	9.474	66.6	-	-	-	<0.5	1	-	1.6	6.5	6.5	-	6.4	3.9	3	5.5	0.9	11.4	<0.5	3.9	1	3.4	11.6	510
BH202	4.7	10/03/2008	Fill	VMP & PDA - Block 4	4.748	47.6	-	-	-	1.1	0.8	-	2	4	3.6	-	3.5	1.7	1.8	3.1	<0.5	8.9	0.8	1.7	<0.5	4.8	9.8	620
BH202	6.8	10/03/2008	Natural Sandstone	VMP & PDA - Block 4	<1.21	<8	-	-	-	<0.5	<0.5	-	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<200
BH201	10.3	18/03/2008	Fill	VMP & PDA - Block 5	21.747	160.4	-	-	-	1.5	6.5	-	5.5	13.1	15.6	-	16.7	6.7	4.7	11	1.9	21.9	4.3	6.2	5	16.2	23.6	3280
BH201	11	18/03/2008	Natural Clayey Sand	VMP & PDA - Block 5	0.72	4.4	-	-	-	<0.5	<0.5	-	<0.5	0.6	0.6	-	0.6	<0.5	<0.5	<0.5	<0.5	1.1	<0.5	<0.5	<0.5	<0.5	1.5	<200
BH203	7.3	10/03/2008	Fill	VMP & PDA - Block 4	3.394	31.5	-	-	-	<0.5	0.8	-	1.3	2.9	2.6	-	2.4	1.2	1.1	2.2	<0.5	5.5	0.6	1.2	0.7	3.4	5.6	1010
BH204D	**3**	**7/04/2008**	**Fill**	**VMP & PDA - Block 4**	265.142	**6223.3**	-	-	-	85.6	234	-	283	255	**195**	-	210	38.2	40.4	184	13.3	655	384	40.8	1970	1090	545	25,740
BH204D	**4**	**7/04/2008**	**Fill**	**VMP & PDA - Block 4**	305.575	**7972.5**	-	-	-	73.4	336	-	338	299	**224**	-	239	42.5	41	212	16.3	777	462	48.3	2930	1290	644	29,420
BH205	13	1/04/2008	Natural Sandstone	VMP & PDA - Block 4	2.566	81.5	-	-	-	1.2	3.8	-	3.9	2.9	1.9	-	2.1	0.6	0.8	2	<0.5	7.5	6	0.6	28.8	13.1	6.3	<200
BH205	13.8	1/04/2008	Natural Sandstone	VMP & PDA - Block 4	<1.21	<8	-	-	-	<0.5	<0.5	-	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<200
BH205	19.2	2/04/2008	Natural Sandstone	VMP & PDA - Block 4	<1.21	4	-	-	-	<0.5	0.7	-	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	0.5	<0.5	<0.5	0.7	1.4	0.7	<200
BH205	22.2	2/04/2008	Natural Sandstone	VMP & PDA - Block 4	<1.21	<8	-	-	-	<0.5	<0.5	-	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<200
BH205	7.8	27/03/2008	Natural Sandy Clay	VMP & PDA - Block 4	<1.21	1.2	-	-	-	<0.5	<0.5	-	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.7	0.5	<0.5	<200
BH205	9.3	27/03/2008	Natural Clayey Sand	VMP & PDA - Block 4	22.484	738.1	-	-	-	11	57.6	-	30.7	25.2	15.5	-	14.3	5.6	6.7	20.8	1.6	42.4	42.9	5	291	117	50.8	3350
BH206	4.6	17/04/2008	Fill	VMP & PDA - Block 4	1.658	18.7	-	-	-	<0.5	0.6	-	0.7	1.7	1.2	-	1.5	0.7	0.6	1.1	<0.5	4	<0.5	0.6	<0.5	2.4	3.6	460
BH206	7.1	17/04/2008	Natural Clayey Sand	VMP & PDA - Block 4	2.862	110.1	-	-	-	1.4	10	-	5.6	4.1	2.1	-	1.9	0.7	0.7	2.5	<0.5	6.7	8.3	0.6	39.8	16.9	8.8	350
BH206	10.7	21/04/2008	Natural Sandstone	VMP & PDA - Block 4	0.909	21.7	-	-	-	<0.5	1.9	-	1.6	1.2	0.7	-	0.8	<0.5	<0.5	0.9	<0.5	2.1	1.4	<0.5	3.5	5.1	2.5	110
BH207	7.45	3/04/2008	Fill	VMP & PDA - Block 4	<1.21	<8	-	-	-	<0.5	<0.5	-	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<200
BH207	12	3/04/2008	Fill	VMP & PDA - Block 4	6.811	53.6	-	-	-	<0.5	2.2	-	1.9	4.4	4.8	-	5.2	2.5	1.7	3.6	0.6	8.8	0.7	2.2	1.2	4.3	9.5	770
BH207	13.1	3/04/2008	Fill	VMP & PDA - Block 4	1.525	33	-	-	-	<0.5	2.4	-	2	1.8	1.2	-	1.3	<0.5	<0.5	1.5	<0.5	3.5	2.4	<0.5	6.1	6.5	4.3	140
BH207	15	3/04/2008	Natural Sandstone	VMP & PDA - Block 4	<1.21	0.6	-	-	-	<0.5	<0.5	-	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	<0.5	<0.5	<200
BH208	2.25	4/04/2008	Fill	VMP & PDA - Block 4	<1.21	<8	-	-	-	<0.5	<0.5	-	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<200
BH208	9.5	4/04/2008	Fill	VMP & PDA - Block 4	<1.21	<8	-	-	-	<0.5	<0.5	-	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<200
BH208	13.5	4/04/2008	Natural Sandy Clay	VMP & PDA - Block 4	13.108	109.8	-	-	-	<0.5	1.8	-	3.2	9.4	9.3	-	11.4	4.9	3	8.9	0.9	20.5	0.7	3.9	0.7	8.4	22.8	5840
BH209	2.3	22/04/2008	Fill	VMP & PDA - Block 4	23.217	168	-	-	-	0.7	7.5	-	4.8	10.8	16.5	-	19.8	7.7	6.4	8	2.2	20.1	1.9	6.6	2.6	7.6	44.8	1460
BH209	4.5	22/04/2008	Natural Clay	VMP & PDA - Block 4	16.094	497	-	-	-	5.9	33.8	-	19.1	17.7	11.2	-	11.4	4.5	2.7	12.9	1.2	28.3	24.8	3.4	203	75.5	41.6	2410
BH209	6.1	22/04/2008	Natural Sandstone	VMP & PDA - Block 4	12.992	814	-	-	-	6.8	54.9	-	22.3	15.4	9.1	-	7	3.2	2.9	11	1	24.6	27	2.2	498	86.5	42.1	2780
BH209	9.4	23/04/2008	Natural Sandstone	VMP & PDA - Block 4	<1.21	<8	-	-	-	<0.5	<0.5	-	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<200
BH210	15.9	27/03/2008	Natural Sandstone	VMP & PDA - Block 4	<1.21	<8	-	-	-	<0.5	<0.5	-	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<200
BH211	14	26/03/2008	Fill	VMP & PDA - Block 4	<1.21	<8	-	-	-	<0.5	<0.5	-	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<200
BH211	15.5	26/03/2008	Natural Clayey Sand	VMP & PDA - Block 4	0.086	17.7	-	-	-	<0.5	1.9	-	1.4	0.8	<0.5	-	<0.5	<0.5	<0.5	0.6	<0.5	1.2	1.2	<0.5	5.2	3.6	1.8	<200
BH211	16.05-16.15	26/03/2008	Natural Sandstone	VMP & PDA - Block 4	<1.21	<8	-	-	-	<0.5	<0.5	-	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<200
BH34	6-6.2	25/02/2010	Fill	VMP & PDA - Block 4	<1.21	<8	-	-	-	<0.5	<0.5	-	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<200
BH34	11-11.2	25/02/2010	Natural Sandstone	VMP & PDA - Block 4	<1.21	<8	-	-	-	<0.5	<0.5	-	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<200
BH35	4.9-5	22/02/2010	Fill	VMP & PDA - Block 4	<1.21	<8	-	-	-	<0.5	<0.5	-	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<200
BH35	9.9-10	22/02/2010	Fill	VMP & PDA - Block 4	<1.21	<8	-	-	-	<0.5	<0.5	-	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<200
BH405	4-4.3	10/02/2011	Fill	VMP & PDA - Block 4	7.736	58.5	-	-	-	<0.5	0.9	-	1.2	5	5.9	-	8	2.6	2.4	5	<0.5	6.8	<0.5	2.2	<0.5	1.4	17.1	1020
BH405	7-7.3	10/02/2011	Fill	VMP & PDA - Block 4	<1.21	<8	-	-	-	<0.5	<0.5	-	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<200
BH405	13-13.2	11/02/2011	Natural Sand	VMP & PDA - Block 4	31.691	750.2	-	-	-	11.2	45.2	-	40.9	30.2	21.6	-	25.7	7.5	14.3	23.6	2	72.9	46.5	7.6	208	130	63	2320
BH405	**14-14.4**	**11/02/2011**	**Natural Sandy Clay**	**VMP & PDA - Block 4**	129.201	**3296.3**	-	-	-	44.9	221	-	182	130	86.2	-	96.3	49.1	44.5	93	10.3	301	236	42	1040	470	250	9030
BH408	2-2.4	14/02/2011	Fill	VMP & PDA - Block 4	9.097	74.5	-	-	-	<0.5	2.2	-	3.5	6.2	6.3	-	7.1	4.5	3.1	5.2	0.7	12.6	<0.5	3.6	<0.5	6.6	12.9	450
BH408	8-8.3	15/02/2011	Natural Sandy Clay	VMP & PDA - Block 4	1.695	62.2	-	-	-	1.8	6.1	-	6.2	2.6	1.3	-	1.1	0.6	<0.5	1.9	<0.5	4.3	7	<0.5	13	9.4	6.9	350
BH408	9-9.4	15/02/2011	Natural Clayey Sand	VMP & PDA - Block 4	8.162	252.6	-	-	-	4.2	22.9	-	12.5	9.7	5.6	-	4.6	2.6	2.3	7.6	0.6	14.5	16.6	2	89.8	38.8	18.3	860
BH409	3.7-4	14/02/2011	Fill	VMP & PDA - Block 4	<1.21	<8	-	-	-	<0.5	<0.5	-	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<200
BH409	5-5.3	14/02/2011	Natural Sand	VMP & PDA - Block 4	0.06	56.7	-	-	-	5.6	2.8	-	1.9	0.6	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	1.2	2.2	<0.5	33.8	6.8	1.8	180
BH409	6-6.4	15/02/2011	Natural Sandy Clay	VMP & PDA - Block 4	-	-	-	<0.5	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-
BH409	7-7.3	15/02/2011	Natural Clayey Sand	VMP & PDA - Block 4	<1.21	5.2	-	-	-	<0.5	0.7	-	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	2.8	1.1	0.6	<200
BH42	**3.2-3.3**	**23/02/2010**	**Fill**	**VMP & PDA - Block 4**	140.429	**3497.6**	<1.2	431	<1.2	35	250	<1.2	217	157	113	136	-	22.9	-	122	7.9	369	243	23.8	926	660	351	17,350
BH42	3.5-3.6	23/02/2010	Natural Sandstone	VMP & PDA - Block 4	<1.21	6.4	-	-	-	<0.5	0.8	-	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	0.8	0.6	<0.5	1	2.4	0.8	<200
BH44	4.9-5	23/02/2010	Natural Sandstone	VMP & PDA - Block 4	18.96	962.7	<1.2	204	<1.2	11.3	90	<1.2	41.9	27.6	15.6	18	-	3.2	-	22.8	<1.2	59.2	54.5	3.4	410	156	67.2	3300
BH45	3.2-3.4	23/02/2010	Fill	VMP & PDA - Block 4	<1.21	1	-	-	-	<0.5	<0.5	-	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.5	0.5	<0.5	<200
BH45	7.2-7.4	23/02/2010	Fill	VMP & PDA - Block 4	<1.21	<8	-	-	-	<0.5	<0.5	-	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<200

					PAHs																							
					CPAH (TEF)	PAH (Total)	2-chloronaphthalene	2-methylnaphthalene	3-methylcholanthrene	Acenaphthene	Acenaphthylene	Acetophenone	Anthracene	Benz(a)anthracene	Benzo(a) pyrene	Benzo(b)&(k)fluoranthene	Benzo(b)fluoranthene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-c,d)pyrene	Naphthalene	Phenanthrene	Pyrene	TPH C15-C36
					mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL							0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	1	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	
SSTC[VMP]					67																							
TCM Criteria						**2000**									**150**													
Location	**Sample Depth**	**Sample Date**	**Matrix Description**	**Area**																								
BH45	13.2-13.4	23/02/2010	Natural Sandstone	VMP & PDA - Block 4	<1.21	3.3	-	-	-	<0.5	<0.5	-	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	1.1	<0.5	<0.5	<0.5	1.2	1	<200
BH49	4.2-4.4	22/02/2010	Fill	VMP & PDA - Block 4	29.264	374.2	-	-	-	4.1	23.8	-	16	23.2	19.2	-	27.6	9.2	13.4	16.2	2.6	38.8	12.5	7.9	64.7	41.7	53.3	2690
BH49	6.2-6.4	22/02/2010	Fill	VMP & PDA - Block 4	2.91	50.1	<0.5	4	<0.5	0.8	2.3	<0.5	1.7	3.1	2.5	3	-	0.6	-	2.4	<0.5	4.4	2.7	0.7	19.5	5.7	3.7	600
BH49	8.2-8.4	22/02/2010	Fill	VMP & PDA - Block 4	25.723	946.5	-	-	-	11.2	55.1	-	43.6	30.9	16.4	-	21.4	6.7	12	22.6	2	83.3	62	6	373	130	70.3	3440
BH49	10.2-10.4	22/02/2010	Fill	VMP & PDA - Block 4	17.52	813.1	-	-	-	5.3	32.6	-	25.8	23.1	11.4	-	14.8	4.7	6.5	15.3	1.1	54.6	33.4	3.8	343	191	46.7	1660
BH49	12.2-12.4	22/02/2010	Natural Clayey Sand	VMP & PDA - Block 4	45.485	1760.5	<1.2	211	<1.2	16.5	132	<1.2	59.1	48.4	35.8	45	-	8.7	-	37.8	3.4	161	125	9.8	703	283	137	-
BH52	2.2-2.6	22/02/2010	Fill	VMP & PDA - Block 4	2.288	23.3	-	-	-	<0.5	1	-	1	2.4	1.6	-	2.4	0.9	1	1.9	<0.5	4.1	<0.5	0.8	<0.5	2.3	3.9	<200
BH52	4.2-4.4	22/02/2010	Fill	VMP & PDA - Block 4	127.752	1994.9	-	-	-	36.1	85.7	-	115	140	82.2	-	93.8	43.2	52.9	109	11.6	306	123	37.6	55.8	412	291	8970
BH54	2.8-3	23/02/2010	Natural Sand	VMP & PDA - Block 4	27.593	678.1	<1.2	41.8	<1.2	11.1	29.3	<1.2	32.6	27.5	21.7	28	-	5.8	-	22.5	2.2	66.1	40.2	6.6	227	131	54.5	3980
BH55	**2.2-2.4**	**25/02/2010**	**Fill**	**VMP & PDA - Block 4**	102.892	**3476.4**	<1.2	308	<1.2	25.3	149	<1.2	119	107	84	102	-	17.2	-	87	5.4	274	151	17.5	1740	463	237	14,340
BH55	**2.7-2.9**	**25/02/2010**	**Fill**	**VMP & PDA - Block 4**	242.28	**10,435**	-	<4	-	67.1	386		341	294	160	-	187	65	117	200	14.5	783	440	53.3	4810	1840	677	19,550
BH58	3.2-3.4	22/02/2010	Fill	VMP & PDA - Block 4	2.979	50.8	-	-	-	1.6	1.1		2.2	2.8	2.1	-	3.6	1.4	1	2.5	<0.5	6.6	1.3	1	10.9	5.9	6.8	830
BH58	5.2-5.4	22/02/2010	Fill	VMP & PDA - Block 4	3.688	45.6	-	-	-	1.2	0.9		2	3.3	2.6	-	3.8	1.7	1.9	3.1	<0.5	7.5	1.3	1.4	1.3	6.2	7.4	620
BH58	8.6-8.8	22/02/2010	Fill	VMP & PDA - Block 4	6.05	47.5	<0.5	<0.5	<0.5	<0.5	2.1	<0.5	2.2	5.6	5.3	7	-	1.4	-	4.6	<0.5	7.9	0.7	1.3	1.2	4.6	10.6	1150
BH58	10.8-11.2	22/02/2010	Fill	VMP & PDA - Block 4	3.161	39.8	-	-	-	0.8	0.9		1.3	3.3	2.2	-	3.2	1.3	1.7	2.8	<0.5	7.3	0.7	1	1.2	3.6	8.5	850
BH59	**3.4-3.5**	**22/02/2010**	**Fill**	**VMP & PDA - Block 4**	245.605	**8362.4**	<1.2	967	<1.2	104	404	<1.2	368	271	**189**	232		44.5	-	214	21.7	669	462	52.2	3560	1400	603	25,340
BH59	4.2-4.3	22/02/2010	Fill	VMP & PDA - Block 4	4.859	147.6	-	-	-	1.4	9.1	-	8.3	6.2	3.4	-	4.6	1.4	2	4.5	<0.5	14.2	8.8	1.2	46.4	23.5	12.6	510
BH62	3.4-3.8	26/02/2010	Fill	VMP & PDA - Block 5	<1.21	<8	-	<0.5	-	<0.5	<0.5	-	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	380
BH62	5.4-5.6	26/02/2010	Fill	VMP & PDA - Block 5	4.247	52.5	-	<0.5	-	<0.5	0.6	-	2.2	5.1	2.9	-	4.3	1.7	2.2	4	<0.5	10.8	0.5	1.3	0.5	6.1	10.3	720
BH62	11.8-12	26/02/2010	Fill	VMP & PDA - Block 5	<1.11	<7	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1	-	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<200
BH64	2.5-2.7	1/03/2010	Fill	VMP & PDA - Block 5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1230
BH64	5.5-5.7	1/03/2010	Fill	VMP & PDA - Block 5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<200
BH64	10-10.3	1/03/2010	Natural Sandstone	VMP & PDA - Block 5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<200
BH65	3.4-3.6	24/02/2010	Fill	VMP & PDA - Block 5	41.546	532.8	-	-	-	5.2	13.8	-	28.1	40.6	27	-	32.3	17.4	17.2	30.2	3.7	82.9	29.1	13.6	10.1	98.8	82.8	13,260
BH65	8.2-8.6	24/02/2010	Fill	VMP & PDA - Block 5	12.071	115	-	-	-	0.8	3	-	5	9.2	7.9	-	9.5	4.7	3.9	7.4	1.4	17.1	5	3.9	2.3	15.6	18.3	1030
BH65	11.2-11.4	24/02/2010	Natural Clayey Sand	VMP & PDA - Block 5	3.415	216.8	<0.5	57.6	<0.5	3.1	24.9	<0.5	11.7	4.7	2.9	3	-	<0.5	-	4.5	<0.5	10.8	20.8	<0.5	65	51.5	16.9	1330
BH65	13.4-13.6	24/02/2010	Natural Sandy Clay	VMP & PDA - Block 5	2.755	114.4	-	-	-	2.4	7.3	-	6.6	3.8	2.1	-	1.8	0.5	0.6	3	<0.5	6.4	10.8	<0.5	34.6	25.1	9.4	380
BH66	2.3-2.4	24/02/2010	Fill	VMP & PDA - Block 5	16.292	105	-	-	-	0.8	1.5	-	3.5	8.8	10.9	-	11.9	7.3	4.2	6.9	2.2	12.4	1.5	5.6	5.3	9.2	13	810
BH66	3.2-3.6	24/02/2010	Fill	VMP & PDA - Block 5	<1.21	<8	-			<0.5	<0.5	-	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<200
BH66	7-7.2	24/02/2010	Natural Sandstone	VMP & PDA - Block 5	<1.21	1.4	-			<0.5	<0.5	-	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	0.7	<0.5	<0.5	<0.5	<0.5	0.7	<200
BH68	2.5-2.9	2/03/2010	Fill	VMP & PDA - Block 5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	770
BH68	4-4.3	2/03/2010	Fill	VMP & PDA - Block 5	<1.21	<8	-	<0.5	-	<0.5	<0.5	-	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<200
BH68	7-7.1	2/03/2010	Natural Silty Sand	VMP & PDA - Block 5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<200

Notes
mg/kg = milligrams per kilogram
EQL = Estimated Quantitation Limit
< denotes result less than EQL
SSTC[VMP] - Site Specific Target Criteria for the VMP Area
Shading denotes concentration greater than criteria
CPAH= Sum of 8 carcinogenic PAH Compounds (Benz(a)anthracene Benzo(a) pyrene; Benzo(b)fluoranthene; Benzo(g,h,i)perylene; Benzo(k)fluoranthene; Chrysene; Dibenz(a,h)anthracene and Indeno(1,2,3-c,d)pyrene)

TEF - Toxicity Equivalent Factor
TPH - Total Petroleum Hydrocarbons (note TPH in table not speciated)
PAH - Polycyclic Aromatic Hydrocarbons (PAH)
* TPH C6-C9 aliphatic
* *TPH C10-C14 aliphatic and aromatic
BOLD = Sample classified as TCM based on PAH (>2000 mg/kg) and Benzo(a)pyrene (>150 mg/kg) results

					TPH					BTEX						Inorganics
					TPH C10 - C14	TPH C15-C28	TPH C29-C36	TPH C6 - C9	TPH+C10 - C36 (Sum of total)	Benzene	Ethylbenzene	Toluene	Xylene (m & p)	Xylene (o)	Total Xylene	Ammonias N
					mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL					50	100	100	10	50	0.2	0.2	0.2	0.2	0.2		1
SSTC[VMP]					54000	72000	21,000			380						
TCM Criteria																
Location	**Sample Depth**	**Sample Date**	**Matrix Description**	**Area**												
BH 199	6	17/03/2008	Natural Sandstone	VMP & PDA - Block 5	<50	<100	<100	<10	<250	<0.2	<0.5	<0.5	<0.5	<0.5	<1	-
BH001	4	2/05/2006	Fill	VMP & PDA - Block 5	<50	160	<100	<2	160	<0.2	<0.2	<0.2	<0.2	<0.2	<0.4	-
BH019	2.5-3	8/05/2006	Fill	VMP & PDA - Block 4	2180	3840	1060	354	7080	-	-	-	-	-	-	-
BH019	**3-3.45**	**8/05/2006**	**Fill**	**VMP & PDA - Block 4**	3160	5450	1870	210	10,480	-	-	-	-	-	-	-
BH028	13-13.5	12/05/2006	Natural Clayey Sand	VMP & PDA - Block 5	780	1370	250	119	2400	8.2	2.7	14.8	15.4	6.9	22.3	-
BH058	6-6.5	31/05/2006	Natural Clayey Sand	VMP & PDA - Block 5	220	510	<100	40	730	3.1	5.9	0.4	8.5	4.3	12.8	-
BH059	3-3.45	31/05/2006	Fill	VMP & PDA - Block 5	<50	170	120	<2	290	<0.2	<0.2	<0.2	<0.2	<0.2	<0.4	-
BH059	8.5-9	31/05/2006	Natural Clayey Sand	VMP & PDA - Block 5	<50	<100	<100	<2	<250	<0.2	<0.2	<0.2	<0.2	<0.2	<0.4	-
BH060	9.5-10	31/05/2006	Natural Clayey Sand	VMP & PDA - Block 5	<50	<100	<100	<2	<250	<0.2	<0.2	<0.2	<0.2	<0.2	<0.4	-
BH062	3-3.45	31/05/2006	Fill	VMP & PDA - Block 5	<50	420	410	<2	830	<0.2	<0.2	<0.2	<0.2	<0.2	<0.4	-
BH065	3-3.45	1/06/2006	Fill	VMP & PDA - Block 4	90	1040	720	3	1850	<0.2	<0.2	<0.2	0.5	0.3	0.8	-
BH067	3-3.45	1/06/2006	Fill	VMP & PDA - Block 5	<50	1490	3020	2	4510	<0.2	<0.2	<0.2	<0.2	<0.2	<0.4	-
BH071	3-3.45	2/05/2006	Fill	VMP & PDA - Block 4	<50	<100	<100	<2	<250	<0.2	<0.2	<0.2	<0.2	<0.2	<0.4	-
BH072	3-3.45	2/05/2006	Fill	VMP & PDA - Block 4	<50	120	<100	<2	120	<0.2	<0.2	<0.2	<0.2	<0.2	<0.4	-
BH072	9.5-10	2/05/2006	Fill	VMP & PDA - Block 4	<50	<100	<100	<2	<250	<0.2	<0.2	<0.2	<0.2	<0.2	<0.4	-
BH073	2-2.4	2/05/2006	Fill	VMP & PDA - Block 4	260	1340	260	8	1860	<0.2	2.1	<0.2	3.4	2.1	5.5	-
BH074	3-3.45	2/05/2006	Fill	VMP & PDA - Block 5	<50	260	<100	3	260	<0.2	<0.2	<0.2	<0.2	<0.2	<0.4	-
BH074	9.5-10	2/05/2006	Natural Sandy Clay	VMP & PDA - Block 5	1510	2480	870	122	4860	14.9	1.6	21.1	20.7	7.6	28.3	-
BH075	3-3.45	6/06/2006	Fill	VMP & PDA - Block 4	<50	<100	<100	<2	<250	<0.2	<0.2	<0.2	<0.2	<0.2	<0.4	-
BH087	**3-3.45**	**8/06/2006**	**Fill**	**VMP & PDA - Block 4**	4560	7310	1670	271	13,540	15	47.5	24.9	79.9	38.6	118.5	-
BH087	**7-7.5**	**8/06/2006**	**Fill**	**VMP & PDA - Block 4**	4360	6720	1550	442	12,630	82.7	24.3	149	116	57.1	173.1	-
BH089	3-3.45	9/06/2006	Fill	VMP & PDA - Block 4	<50	170	<100	<2	170	<0.2	<0.2	<0.2	<0.2	<0.2	<0.4	-
BH090	3-3.45	9/06/2006	Fill	VMP & PDA - Block 4	<50	140	<100	<2	140	<0.2	<0.2	<0.2	<0.2	<0.2	<0.4	-
BH109	3-3.45	27/06/2006	Fill	VMP & PDA - Block 4	<50	<100	130	<2	130	<0.2	<0.2	<0.2	<0.2	<0.2	<0.4	-
BH109	9.5-10	27/06/2006	Fill	VMP & PDA - Block 4	<50	<100	<100	<2	<250	<0.2	<0.2	<0.2	<0.2	<0.2	<0.4	-
BH113	3-3.45	27/06/2006	Fill	VMP & PDA - Block 4	70	540	470	<2	1080	<0.2	<0.2	<0.2	<0.2	<0.2	<0.4	-
BH114	3-3.45	28/06/2006	Fill	VMP & PDA - Block 4	60	620	360	<2	1040	<0.2	<0.2	<0.2	<0.2	<0.2	<0.4	-
BH115	3-3.45	28/06/2006	Fill	VMP & PDA - Block 4	<50	<100	<100	<2	<250	<0.2	<0.2	<0.2	<0.2	<0.2	<0.4	-
BH119	**7.5-8**	**30/06/2006**	**Fill**	**VMP & PDA - Block 4**	6750	13,000	4690	1140	24,440	82.4	63	118	182	69.8	251.8	-
BH119	**9.5-10**	**30/06/2006**	**Fill**	**VMP & PDA - Block 4**	5320	7940	2110	1060	15,370	97.8	14.7	124	152	53	205	-
BH132	8-8.5	6/07/2006	Natural Clayey Sand	VMP & PDA - Block 4	1870	3040	1190	1050	6100	140	44.7	232	225	120	345	-
BH135A	3-3.45	11/07/2006	Fill	VMP & PDA - Block 4	-	-	-	-	-	-	-	-	-	-	-	-
BH141	**3-3.45**	**7/07/2006**	**Fill**	**VMP & PDA - Block 4**	1800	4490	1430	325	7720	41.8	49.1	17.3	86.5	60.3	146.8	-
BH145	3-3.45	11/07/2006	Fill	VMP & PDA - Block 5	<50	<100	<100	<2	<250	<0.2	<0.2	<0.2	<0.2	<0.2	<0.4	-
BH146	3-3.33	11/07/2006	Fill	VMP & PDA - Block 4	-	-	-	-	-	-	-	-	-	-	-	-
BH146	4.1-4.6	11/07/2006	Fill	VMP & PDA - Block 4	3020	3750	860	222	7630	15.2	13.9	25.3	56	31	87	-
BH197	5	9/04/2008	Fill	VMP & PDA - Block 5	560	3820	1480	26	5860	4.8	1.9	8	4.2	1.9	6.1	-
BH197	6.5	9/04/2008	Natural Sandy Clay	VMP & PDA - Block 5	<50	<100	<100	<10	<250	0.5	<0.5	0.8	0.6	<0.5	0.6	-
BH197	11.5	9/04/2008	Natural Clayey Sand	VMP & PDA - Block 5	160	400	<100	<10	560	<0.2	<0.5	<0.5	<0.5	<0.5	<1	-
BH197	15.9	10/04/2008	Natural Sandstone	VMP & PDA - Block 5	<50	<100	<100	<10	<250	<0.2	<0.5	<0.5	<0.5	<0.5	<1	-
BH197	18.6	10/04/2008	Natural Sandstone	VMP & PDA - Block 5	<50	<100	<100	<10	<250	<0.2	<0.5	<0.5	<0.5	<0.5	<1	-
BH198	3	6/03/2008	Fill	VMP & PDA - Block 5	1360	6690	1440	<10	9490	<0.2	<0.5	<0.5	0.7	<0.5	0.7	-
BH198	4.5	6/03/2008	Natural Sandy Clay	VMP & PDA - Block 5	<50	<100	<100	<10	<250	<0.2	<0.5	<0.5	<0.5	<0.5	<1	-
BH198	6.9	6/03/2008	Natural Clayey Sand	VMP & PDA - Block 5	<50	<100	<100	<10	<250	<0.2	<0.5	<0.5	<0.5	<0.5	<1	-
BH199	2.7	11/03/2008	Fill	VMP & PDA - Block 5	<50	740	380	<10	1120	<0.2	<0.5	<0.5	<0.5	<0.5	<1	-
BH199	3.7	11/03/2008	Natural Silty Clay	VMP & PDA - Block 5	950	2620	920	96	4490	6.4	16.3	2.6	22.4	22.9	45.3	-
BH199	5.6	11/03/2008	Natural Clayey Sand	VMP & PDA - Block 5	<50	<100	<100	<10	<250	<0.2	<0.5	<0.5	<0.5	<0.5	<1	-
BH199	6	17/03/2008	Natural Sandstone	VMP & PDA - Block 5	<50	<100	<100	<10	<250	<0.2	<0.5	<0.5	<0.5	<0.5	<1	-
BH200	2.5	7/04/2008	Fill	VMP & PDA - Block 4	110	1060	500	<10	1670	<0.2	<0.5	<0.5	<0.5	<0.5	<1	-
BH200	6.53	7/04/2008	Natural Sandstone	VMP & PDA - Block 4	<50	<100	<100	<10	<250	<0.2	<0.5	<0.5	<0.5	<0.5	<1	-
BH201	2.4	4/03/2008	Fill	VMP & PDA - Block 5	<50	<100	<100	<10	<250	<0.2	<0.5	<0.5	<0.5	<0.5	<1	-

					TPH					BTEX						Inorganics
					TPH C10 - C14	TPH C15-C28	TPH C29-C36	TPH C6 - C9	TPH+C10 - C36 (Sum of total)	Benzene	Ethylbenzene	Toluene	Xylene (m & p)	Xylene (o)	Total Xylene	Ammonias N
					mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL					50	100	100	10	50	0.2	0.2	0.2	0.2	0.2		1
SSTC[VMP]					54000	72000	21,000			380						
TCM Criteria																
Location	**Sample Depth**	**Sample Date**	**Matrix Description**	**Area**												
BH202	2.3	10/03/2008	Fill	VMP & PDA - Block 4	<50	240	270	<10	510	<0.2	<0.5	<0.5	<0.5	<0.5	<1	-
BH202	4.7	10/03/2008	Fill	VMP & PDA - Block 4	<50	280	340	<10	620	<0.2	<0.5	<0.5	<0.5	<0.5	<1	-
BH202	6.8	10/03/2008	Natural Sandstone	VMP & PDA - Block 4	<50	<100	<100	<10	<250	<0.2	<0.5	<0.5	<0.5	<0.5	<1	-
BH201	10.3	18/03/2008	Fill	VMP & PDA - Block 5	<50	1930	1350	<10	3280	<0.2	0.7	<0.5	<0.5	<0.5	<1	-
BH201	11	18/03/2008	Natural Clayey Sand	VMP & PDA - Block 5	<50	<100	<100	<10	<250	<0.2	<0.5	<0.5	<0.5	<0.5	<1	-
BH203	7.3	10/03/2008	Fill	VMP & PDA - Block 4	<50	560	450	<10	1010	<0.2	<0.5	<0.5	<0.5	<0.5	<1	-
BH204D	**3**	**7/04/2008**	**Fill**	**VMP & PDA - Block 4**	11,600	19,400	6340	289	37,340	36.8	34.9	49.3	112	39.9	151.9	-
BH204D	**4**	**7/04/2008**	**Fill**	**VMP & PDA - Block 4**	12,600	22,400	7020	215	42,020	44.3	15.1	53	72.8	26.7	99.5	-
BH205	13	1/04/2008	Natural Sandstone	VMP & PDA - Block 4	<50	<100	<100	13	<250	2.5	<0.5	3.3	2.8	1.2	4	-
BH205	13.8	1/04/2008	Natural Sandstone	VMP & PDA - Block 4	<50	<100	<100	<10	<250	0.7	<0.5	0.5	<0.5	<0.5	<1	-
BH205	19.2	2/04/2008	Natural Sandstone	VMP & PDA - Block 4	<50	<100	<100	<10	<250	<0.2	<0.5	<0.5	0.5	<0.5	0.5	-
BH205	22.2	2/04/2008	Natural Sandstone	VMP & PDA - Block 4	<50	<100	<100	<10	<250	<0.2	<0.5	<0.5	<0.5	<0.5	<1	-
BH205	7.8	27/03/2008	Natural Sandy Clay	VMP & PDA - Block 4	<50	<100	<100	<10	<250	1.4	<0.5	0.7	<0.5	<0.5	<1	-
BH205	9.3	27/03/2008	Natural Clayey Sand	VMP & PDA - Block 4	1500	2710	640	138	4850	7.5	5.4	34.7	42.4	21.9	64.3	-
BH206	4.6	17/04/2008	Fill	VMP & PDA - Block 4	<50	230	230	<10	460	<0.2	<0.5	<0.5	<0.5	<0.5	<1	-
BH206	7.1	17/04/2008	Natural Clayey Sand	VMP & PDA - Block 4	200	350	<100	15	550	<0.2	1	<0.5	2.7	2.2	4.9	-
BH206	10.7	21/04/2008	Natural Sandstone	VMP & PDA - Block 4	<50	110	<100	<10	110	<0.2	<0.5	<0.5	<0.5	<0.5	<1	-
BH207	7.45	3/04/2008	Fill	VMP & PDA - Block 4	<50	<100	<100	<10	<250	<0.2	<0.5	<0.5	<0.5	<0.5	<1	-
BH207	12	3/04/2008	Fill	VMP & PDA - Block 4	<50	430	340	<10	770	<0.2	<0.5	<0.5	<0.5	<0.5	<1	-
BH207	13.1	3/04/2008	Fill	VMP & PDA - Block 4	<50	140	<100	<10	140	<0.2	<0.5	<0.5	<0.5	<0.5	<1	-
BH207	15	3/04/2008	Natural Sandstone	VMP & PDA - Block 4	<50	<100	<100	<10	<250	<0.2	<0.5	<0.5	<0.5	<0.5	<1	-
BH208	2.25	4/04/2008	Fill	VMP & PDA - Block 4	<50	<100	<100	<10	<250	<0.2	<0.5	<0.5	<0.5	<0.5	<1	-
BH208	9.5	4/04/2008	Fill	VMP & PDA - Block 4	<50	<100	<100	<10	<250	<0.2	<0.5	<0.5	<0.5	<0.5	<1	-
BH208	13.5	4/04/2008	Natural Sandy Clay	VMP & PDA - Block 4	80	3320	2520	<10	5920	<0.2	<0.5	<0.5	<0.5	<0.5	<1	-
BH209	2.3	22/04/2008	Fill	VMP & PDA - Block 4	<50	880	580	<10	1460	<0.2	<0.5	0.5	<0.5	<0.5	<1	-
BH209	4.5	22/04/2008	Natural Clay	VMP & PDA - Block 4	1190	1950	460	227	3600	15.5	37.2	4.3	36	50	86	-
BH209	6.1	22/04/2008	Natural Sandstone	VMP & PDA - Block 4	2280	2350	430	929	5060	88.2	34.8	213	165	94.8	259.8	-
BH209	9.4	23/04/2008	Natural Sandstone	VMP & PDA - Block 4	<50	<100	<100	<10	<250	<0.2	<0.5	<0.5	<0.5	<0.5	<1	-
BH210	15.9	27/03/2008	Natural Sandstone	VMP & PDA - Block 4	<50	<100	<100	<10	<250	<0.2	<0.5	<0.5	<0.5	<0.5	<1	-
BH211	14	26/03/2008	Fill	VMP & PDA - Block 4	<50	<100	<100	<10	<250	<0.2	<0.5	<0.5	<0.5	<0.5	<1	-
BH211	15.5	26/03/2008	Natural Clayey Sand	VMP & PDA - Block 4	<50	<100	<100	19	<250	3.4	0.6	5.5	3.3	1.8	5.1	-
BH211	16.05-16.15	26/03/2008	Natural Sandstone	VMP & PDA - Block 4	<50	<100	<100	<10	<250	<0.2	<0.5	<0.5	<0.5	<0.5	<1	-
BH34	6-6.2	25/02/2010	Fill	VMP & PDA - Block 4	<50	<100	<100	<10	<50	<0.2	<0.5	<0.5	<0.5	<0.5	<1	-
BH34	11-11.2	25/02/2010	Natural Sandstone	VMP & PDA - Block 4	<50	<100	<100	<10	<50	<0.2	<0.5	<0.5	<0.5	<0.5	<1	-
BH35	4.9-5	22/02/2010	Fill	VMP & PDA - Block 4	<50	<100	<100	<10	<50	<0.2	<0.5	<0.5	<0.5	<0.5	<1	-
BH35	9.9-10	22/02/2010	Fill	VMP & PDA - Block 4	<50	<100	<100	<10	<50	<0.2	<0.5	<0.5	<0.5	<0.5	<1	-
BH405	4-4.3	10/02/2011	Fill	VMP & PDA - Block 4	<50	400	620	<10	1020	<0.2	<0.5	<0.5	<0.5	<0.5	<1	-
BH405	7-7.3	10/02/2011	Fill	VMP & PDA - Block 4	<50	<100	<100	<10	<50	<0.2	<0.5	<0.5	<0.5	<0.5	<1	-
BH405	13-13.2	11/02/2011	Natural Sand	VMP & PDA - Block 4	510	1760	560	<10	2830	0.7	0.6	0.6	3	1.3	4.3	-
BH405	**14-14.4**	**11/02/2011**	**Natural Sandy Clay**	**VMP & PDA - Block 4**	3390	7020	2010	156	12420	5.9	4	33	57.2	19.4	76.6	-
BH408	2-2.4	14/02/2011	Fill	VMP & PDA - Block 4	<50	190	260	<10	450	<0.2	<0.5	<0.5	<0.5	<0.5	<1	-
BH408	8-8.3	15/02/2011	Natural Sandy Clay	VMP & PDA - Block 4	100	350	<100	<10	450	0.6	0.7	<0.5	0.7	0.6	1.3	-
BH408	9-9.4	15/02/2011	Natural Clayey Sand	VMP & PDA - Block 4	360	710	150	24	1220	2.1	4.6	<0.5	5.1	3.8	8.9	-
BH409	3.7-4	14/02/2011	Fill	VMP & PDA - Block 4	<50	<100	<100	<10	<50	<0.2	<0.5	<0.5	<0.5	<0.5	<1	-
BH409	5-5.3	14/02/2011	Natural Sand	VMP & PDA - Block 4	150	180	<100	12	330	1.8	3.5	<0.5	1.1	1.8	2.9	-
BH409	6-6.4	15/02/2011	Natural Sandy Clay	VMP & PDA - Block 4	<50	-	-	<10	<50	0.3	<0.5	<0.5	<0.5	<0.5	<1	<20
BH409	7-7.3	15/02/2011	Natural Clayey Sand	VMP & PDA - Block 4	<50	<100	<100	106	<50	2.8	3.5	22.3	17.8	8.9	26.7	-
BH42	**3.2-3.3**	**23/02/2010**	**Fill**	**VMP & PDA - Block 4**	4680	13,200	4150	234	22030	1	40.8	1.5	39.9	83.6	123.5	-
BH42	3.5-3.6	23/02/2010	Natural Sandstone	VMP & PDA - Block 4	<50	<100	<100	<10	<50	<0.2	<0.5	<0.5	<0.5	<0.5	<1	-
BH44	4.9-5	23/02/2010	Natural Sandstone	VMP & PDA - Block 4	1040	2650	650	147	4340	2.1	18.1	5.4	25.7	20.9	46.6	-
BH45	3.2-3.4	23/02/2010	Fill	VMP & PDA - Block 4	<50	<100	<100	10	<50	<0.2	<0.5	<0.5	<0.5	<0.5	<1	-
BH45	7.2-7.4	23/02/2010	Fill	VMP & PDA - Block 4	<50	<100	<100	12	<50	<0.2	<0.5	<0.5	<0.5	<0.5	<1	-

					TPH					BTEX						Inorganics
					TPH C10 - C14	TPH C15-C28	TPH C29-C36	TPH C6 - C9	TPH+C10 - C36 (Sum of total)	Benzene	Ethylbenzene	Toluene	Xylene (m & p)	Xylene (o)	Total Xylene	Ammonias N
					mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL					50	100	100	10	50	0.2	0.2	0.2	0.2	0.2		1
SSTC[VMP]					54000	72000	21,000			380						
TCM Criteria																
Location	**Sample Depth**	**Sample Date**	**Matrix Description**	**Area**												
BH45	13.2-13.4	23/02/2010	Natural Sandstone	VMP & PDA - Block 4	<50	<100	<100	<10	<50	-	-	-	-	-	-	-
BH49	4.2-4.4	22/02/2010	Fill	VMP & PDA - Block 4	250	1610	1080	13	2940	<0.2	<0.5	<0.5	<0.5	<0.5	<1	-
BH49	6.2-6.4	22/02/2010	Fill	VMP & PDA - Block 4	160	450	150	<10	760	1.6	<0.5	1.8	2	0.8	2.8	-
BH49	8.2-8.4	22/02/2010	Fill	VMP & PDA - Block 4	1160	2650	790	348	4600	49.7	5.2	74.6	61.5	22.6	84.1	-
BH49	10.2-10.4	22/02/2010	Fill	VMP & PDA - Block 4	670	1240	420	56	2330	5.5	1.4	10.8	9.9	4.7	14.6	-
BH49	12.2-12.4	22/02/2010	Natural Clayey Sand	VMP & PDA - Block 4	-	-	-	-	-	10.2	2	16.6	21.2	7.7	28.9	-
BH52	2.2-2.6	22/02/2010	Fill	VMP & PDA - Block 4	<50	<100	<100	<10	<50	<0.2	<0.5	<0.5	<0.5	<0.5	<1	-
BH52	4.2-4.4	22/02/2010	Fill	VMP & PDA - Block 4	<50	6600	2370	10	8970	1.7	1	1.1	1.4	0.7	2.1	-
BH54	2.8-3	23/02/2010	Natural Sand	VMP & PDA - Block 4	900	2980	1000	13	4880	<0.2	0.8	<0.5	3.2	1.6	4.8	-
BH55	**2.2-2.4**	**25/02/2010**	**Fill**	**VMP & PDA - Block 4**	6420	10,600	3740	304	20760	22.2	29.6	2.3	48.8	51.6	100.4	-
BH55	**2.7-2.9**	**25/02/2010**	**Fill**	**VMP & PDA - Block 4**	9150	14,800	4750	104	28,700	9.4	8.9	2	19.8	21.1	40.9	-
BH58	3.2-3.4	22/02/2010	Fill	VMP & PDA - Block 4	80	450	380	<10	910	<0.2	<0.5	<0.5	<0.5	<0.5	<1	-
BH58	5.2-5.4	22/02/2010	Fill	VMP & PDA - Block 4	<50	320	300	<10	620	<0.2	<0.5	<0.5	<0.5	<0.5	<1	-
BH58	8.6-8.8	22/02/2010	Fill	VMP & PDA - Block 4	<50	640	510	<10	1150	<0.2	<0.5	<0.5	<0.5	<0.5	<1	-
BH58	10.8-11.2	22/02/2010	Fill	VMP & PDA - Block 4	<50	420	430	<10	850	<0.2	<0.5	<0.5	<0.5	<0.5	<1	<20
BH59	**3.4-3.5**	**22/02/2010**	**Fill**	**VMP & PDA - Block 4**	9120	19,200	6140	459	34460	82.4	88.3	32.5	103	51.2	154.2	-
BH59	4.2-4.3	22/02/2010	Fill	VMP & PDA - Block 4	140	380	130	14	650	3.4	<0.5	2.9	2.4	0.9	3.3	-
BH62	3.4-3.8	26/02/2010	Fill	VMP & PDA - Block 5	<50	140	240	<10	380	<0.2	<0.5	<0.5	<0.5	<0.5	<1	-
BH62	5.4-5.6	26/02/2010	Fill	VMP & PDA - Block 5	<50	390	330	<10	720	<0.2	<0.5	<0.5	<0.5	<0.5	<1	-
BH62	11.8-12	26/02/2010	Fill	VMP & PDA - Block 5	<50	<100	<100	<10	<50	<0.2	<0.5	<0.5	<0.5	<0.5	<1	-
BH64	2.5-2.7	1/03/2010	Fill	VMP & PDA - Block 5	<50	640	590	<10	1230	<0.2	<0.5	<0.5	<0.5	<0.5	<1	-
BH64	5.5-5.7	1/03/2010	Fill	VMP & PDA - Block 5	<50	<100	<100	<10	<50	<0.2	<0.5	<0.5	<0.5	<0.5	<1	-
BH64	10-10.3	1/03/2010	Natural Sandstone	VMP & PDA - Block 5	<50	<100	<100	<10	<50	<0.2	<0.5	<0.5	<0.5	<0.5	<1	-
BH65	3.4-3.6	24/02/2010	Fill	VMP & PDA - Block 5	710	7500	5760	<10	13970	<0.2	<0.5	<0.5	<0.5	<0.5	<1	-
BH65	8.2-8.6	24/02/2010	Fill	VMP & PDA - Block 5	<50	560	470	<10	1030	-	-	-	-	-	-	-
BH65	11.2-11.4	24/02/2010	Natural Clayey Sand	VMP & PDA - Block 5	450	1110	220	14	1780	<0.2	0.8	<0.5	3.5	2.3	5.8	-
BH65	13.4-13.6	24/02/2010	Natural Sandy Clay	VMP & PDA - Block 5	100	380	<100	<10	480	<0.2	<0.5	<0.5	1.1	0.7	1.8	-
BH66	2.3-2.4	24/02/2010	Fill	VMP & PDA - Block 5	<50	420	390	<10	810	<0.2	<0.5	<0.5	<0.5	<0.5	<1	-
BH66	3.2-3.6	24/02/2010	Fill	VMP & PDA - Block 5	<50	<100	<100	<10	<50	<0.2	<0.5	<0.5	<0.5	<0.5	<1	-
BH66	7-7.2	24/02/2010	Natural Sandstone	VMP & PDA - Block 5	<50	<100	<100	<10	<50	-	-	-	-	-	-	-
BH68	2.5-2.9	2/03/2010	Fill	VMP & PDA - Block 5	<50	320	450	<10	770	-	-	-	-	-	-	-
BH68	4-4.3	2/03/2010	Fill	VMP & PDA - Block 5	<50	<100	<100	<10	<50	<0.2	<0.5	<0.5	<0.5	<0.5	<1	-
BH68	7-7.1	2/03/2010	Natural Silty Sand	VMP & PDA - Block 5	<50	<100	<100	<10	<50	-	-	-	-	-	-	-

Notes
mg/kg = milligrams per kilogram
EQL = Estimated Quantitation Limit
< denotes result less than EQL
SSTC[VMP] - Site Specific Target Criteria for the VMP Area
Shading denotes concentration greater than criteria
CPAH= Sum of 8 carcinogenic PAH Compounds (Benz(a)anthracene Benzo(a) pyrene; Benzo(b)fluoranthene; Benzo(g,h,i)perylene; Benzo(k)fluoranthene; Chrysene; Dibenz(a,h)anthracene and Indeno(1,2,3-c,d)pyrene)

TEF - Toxicity Equivalent Factor
TPH - Total Petroleum Hydrocarbons (note TPH in table not speciated)
PAH - Polycyclic Aromatic Hydrocarbons (PAH)
* TPH C6-C9 aliphatic
* *TPH C10-C14 aliphatic and aromatic
BOLD = Sample classified as TCM based on PAH (>2000 mg/kg) and Benzo(a)pyrene (>150 mg/kg) results

					Asbestos Identification in Bulk Solids	Type
					Asbestos fibres	
Consultant	Field_ID	Sampled_Date	Batch	Area	Yes/No	
ERM	BH198/3.0	06/03/2010	-	Declaration Area - Block 5	No	-
ERM	BH198/5.2	06/03/2010	-	Declaration Area - Block 5	No	-
ERM	BH199/2.7	11/03/2008	-	Declaration Area - Block 5	No	-
ERM	BH200/1.0	07/04/2008	-	Declaration Area - Block 4	No	-
ERM	BH201/2.2	04/03/2008	-	Declaration Area - Block 5	No	-
ERM	BH201/5.5	18/03/2008	-	Declaration Area - Block 4	No	-
ERM	BH202/4.7	10/03/2008	-	Declaration Area - Block 4	No	-
ERM	BH203/1.5	10/03/2008	-	Declaration Area - Block 4	Yes	amosite and chrysotile
ERM	BH204D/1.5	07/04/2008	-	Declaration Area - Block 4	No	-
ERM	BH206/1.8	17/04/2008	-	Declaration Area - Block 4	No	-
ERM	BH207/7.45	03/04/2008	-	Declaration Area- Block 4	No	-
ERM	BH208/1.5	04/04/2008	-	Declaration Area - Block 4	No	-
AECOM	BH42_2.0-2.1	23/02/2010	ES1003672	Declaration Area - Block 4	No	-
AECOM	BH66_1.9-2.0	24/02/2010	ES1003672	Declaration Area - Block 5	No	-
AECOM	BH68_1.0-1.3	02/03/2010	ES1004018	Declaration Area - Block 5	No	-
AECOM	BH405_12.0-12.2	11/02/2011	ES1103042	Declaration Area - Block 4	Yes	chrysotile

					Location	BH4	BH5	BH5	BH8	BH8	BH9	BH9	MW10_Coffey	MW15_Coffey	MW15_Coffey
					Field ID	BH4 0.4-0.5	BH5 0.4-0.5	BH5 1.2-1.3	BH8 0.26-0.4	BH8 0.6-0.7	BH9 0.4-0.5	BH9 0.9-1.0	MW10 1.9-2.0	MW15 0.4-0.5	MW15 1.4-1.5
					Sample Date	21/02/2008	23/02/2008	23/02/2008	19/02/2008	19/02/2008	21/02/2008	21/02/2008	21/02/2008	10/04/2008	10/04/2008
					Consultant	Coffey	Coffey	Coffey	Coffey	Coffey	Coffey	Coffey	Coffey	Coffey	Coffey
					Matrix	Fill	Fill	Natural Clayey Sand	Fill	Fill	Fill	Natural Sandstone	Fill	Fill	Fill
					Area	VMP & PDA - Hickson Road	VMP & PDA - Hickson Road	VMP & PDA - Hickson Road	VMP & PDA - Hickson Road	VMP & PDA - Hickson Road	VMP & PDA - Hickson Road	VMP & PDA - Hickson Road	VMP & PDA - Hickson Road	VMP & PDA - Hickson Road	VMP & PDA - Hickson Road
Chemical Group	**Chemical Name**	**Units**	**EQL**	**Tar Containing Material (TCM) Criteria**	**SSTC^{VMP}**										
PAHs	CPAH (TEF)	mg/kg			67	<1.11	8.491	0.06	21.841	37.753	0.06	1.546	12.023	<1.11	<1.11
	PAH (Total)	mg/kg		**2000**		<7	82.9	4.6	136.7	274.5	1.7	14.1	87.2	<7	<7
	2-chloronaphthalene	mg/kg	0.5			<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	2-methylnaphthalene	mg/kg	0.5			<0.5	<0.5	<0.5	<0.5	1.4	<0.5	<0.5	<0.5	<0.5	<0.5
	3-methylcholanthrene	mg/kg	0.5			<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	Acenaphthene	mg/kg	0.5			<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	Acenaphthylene	mg/kg	0.5			<0.5	6.4	<0.5	7.4	17.1	<0.5	0.6	1.6	<0.5	<0.5
	Anthracene	mg/kg	0.5			<0.5	4.4	<0.5	5.9	11.5	<0.5	0.5	2.4	<0.5	<0.5
	Benz(a)anthracene	mg/kg	0.5			<0.5	11.8	0.6	24	33.5	0.6	2.6	21.1	<0.5	<0.5
	Benzo(a) pyrene	mg/kg	0.5	**150**		<0.5	6.9	<0.5	16.1	31.3	<0.5	1.2	8.6	<0.5	<0.5
	Benzo(b)&(k)fluoranthene	mg/kg	1			<1	20	<1	34	57	<1	2	14	<1	<1
	Benzo(b)fluoranthene	mg/kg	0.5												
	Benzo(g,h,i)perylene	mg/kg	0.5			<0.5	2.2	<0.5	4.5	4.8	<0.5	0.6	1.2	<0.5	<0.5
	Benzo(k)fluoranthene	mg/kg	0.5												
	Chrysene	mg/kg	0.5			<0.5	4.9	<0.5	7.6	10.5	<0.5	1	7.1	<0.5	<0.5
	Dibenz(a,h)anthracene	mg/kg	0.5			<0.5	<0.5	<0.5	2.5	2	<0.5	<0.5	1	<0.5	<0.5
	Fluoranthene	mg/kg	0.5			<0.5	15.9	0.8	23	62	0.5	2.6	16.8	<0.5	<0.5
	Fluorene	mg/kg	0.5			<0.5	<0.5	<0.5	0.8	1.9	<0.5	<0.5	<0.5	<0.5	<0.5
	Indeno(1,2,3-c,d)pyrene	mg/kg	0.5			<0.5	3.4	<0.5	7.2	9.5	<0.5	0.7	2.3	<0.5	<0.5
	Naphthalene	mg/kg	0.5			<0.5	0.7	1.6	0.9	2.3	<0.5	<0.5	<0.5	<0.5	<0.5
	PAHs (Sum of total)	mg/kg	0.5												
	Phenanthrene	mg/kg	0.5			<0.5	11.6	0.7	12.6	24.8	<0.5	1.6	7.6	<0.5	<0.5
	Pyrene	mg/kg	0.5			<0.5	14.7	0.9	24.2	63.3	0.6	2.7	17.5	<0.5	<0.5
TPH	TPH C15-C36	mg/kg				<200	1700	<200	510	2370	<200	<200	830	<200	<200
	TPH C10 - C14	mg/kg	50		54000	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50
	TPH C15-C28	mg/kg	100		72000	<100	1060	<100	310	1380	<100	<100	370	<100	<100
	TPH C29-C36	mg/kg	100		21,000	<100	640	<100	200	990	<100	<100	460	<100	<100
	TPH C6 - C9	mg/kg	10			<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
	TPH+C10 - C36 (Sum of total)	mg/kg	50			<250	1700	<250	510	2370	<250	<250	830	<250	<250
BTEX	Total Xylene (ESDAT)	mg/kg	0.15			<1	<1	0.8	<1	<1	<1	<1	<1	<1	<1
	Benzene	mg/kg	0.2		380	<0.2	<0.2	2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
	Ethylbenzene	mg/kg	0.5			<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	Toluene	mg/kg	0.5			<0.5	<0.5	0.7	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	Xylene (m & p)	mg/kg	0.5			<0.5	<0.5	0.8	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	Xylene (o)	mg/kg	0.5			<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5

Notes
mg/kg = milligrams per kilogram
EQL = Estimated Quantitation Limit
< denotes result less than EQL
SSTC^{VMP} - Site Specific Target Criteria for the VMP Area
Shading denotes concentration greater than criteria
CPAH= Sum of 8 carcinogenic PAH Compounds (Benz(a)anthracene Benzo(a) pyrene; Benzo(b)fluoranthene; Benzo(g,h,i)perylene; Benzo(k)fluoranthene; Chrysene; Dibenz(a,h)anthracene and Indeno(1,2,3-c,d)pyrene)
TEF - Toxicity Equivalent Factor
TPH - Total Petroleum Hydrocarbons
PAH - Polycyclic Aromatic Hydrocarbons (PAH)
* TPH C6-C9 aliphatic
* *TPH C10-C14 aliphatic and aromatic
note TPH in table not speciated

					Location	MW15_Coffey	MW3	MW3	MW6	MW7	AECOM_BH51	AECOM_BH43	AECOM_BH53	AECOM_BH61	AECOM_BH67	TBH01
					Field ID	QC1A	MW3 0.4-0.5	MW3 0.9-1.0	MW6 0.8-0.9	MW7 1.4-1.5	BH51_0.4-0.5	BH43_0.4-0.5	BH53_1.1-1.5	BH61_0.3-0.4	BH67_0.4-0.43	TBH01_0.43-0.5
					Sample Date	21/02/2008	23/02/2008	23/02/2008	20/02/2008	25/02/2008	6/03/2010	6/03/2010	6/03/2010	6/03/2010	6/03/2010	5/02/2011
					Consultant	Coffey	Coffey	Coffey	Coffey	Coffey	AECOM	AECOM	AECOM	AECOM	AECOM	AECOM
					Matrix	Fill	Fill	Fill	Fill	FILL	Fill	Fill	Fill	Fill	Fill	Fill
					Area	VMP & PDA - Hickson Road	VMP & PDA - Hickson Road	VMP & PDA - Hickson Road	VMP & PDA - Hickson Road	VMP & PDA - Hickson Road	VMP & PDA - Hickson Road	VMP & PDA - Hickson Road	VMP & PDA - Hickson Road	VMP & PDA - Hickson Road	VMP & PDA - Hickson Road	VMP & PDA - Hickson Road
Chemical Group	**Chemical Name**	**Units**	**EQL**	**Tar Containing Material (TCM) Criteria**	**SSTC^{VMP}**											
PAHs	CPAH (TEF)	mg/kg			67		0.16	19.996	<1.11	38.745	1.256		56.149		12.389	2.22
	PAH (Total)	mg/kg		**2000**			5.1	468.5	<7	218	10.6		668.3		131.2	16.5
	2-chloronaphthalene	mg/kg	0.5				<0.5	<0.5	<0.5	<0.5						
	2-methylnaphthalene	mg/kg	0.5				<0.5	<0.5	<0.5	0.7	<0.5		<0.5		<0.5	
	3-methylcholanthrene	mg/kg	0.5				<0.5	<0.5	<0.5	<0.5						
	Acenaphthene	mg/kg	0.5				<0.5	1.7	<0.5	0.7	<0.5		5.4		<0.5	<0.5
	Acenaphthylene	mg/kg	0.5				0.6	42.5	<0.5	7.7	<0.5		13		3.2	<0.5
	Anthracene	mg/kg	0.5				<0.5	13.8	<0.5	9.6	<0.5		25.7		3.4	0.5
	Benz(a)anthracene	mg/kg	0.5				0.8	44.6	<0.5	41.2	1.3		52.3		16.2	1.9
	Benzo(a) pyrene	mg/kg	0.5	**150**			<0.5	11.7	<0.5	32.1	0.9		38.1		5.5	1.7
	Benzo(b)&(k)fluoranthene	mg/kg	1				1	62	<1	49						
	Benzo(b)fluoranthene	mg/kg	0.5								1.4		50.4		20.3	1.8
	Benzo(g,h,i)perylene	mg/kg	0.5				1	4.2	<0.5	1.4	0.5		16.8		6.3	0.6
	Benzo(k)fluoranthene	mg/kg	0.5								0.7		13.8		8.7	0.7
	Chrysene	mg/kg	0.5				<0.5	23.4	<0.5	16.1	1.1		36.1		17.6	1.4
	Dibenz(a,h)anthracene	mg/kg	0.5				<0.5	2.7	<0.5	1.7	<0.5		4.4		1.6	<0.5
	Fluoranthene	mg/kg	0.5				0.7	91.1	<0.5	36.6	1.9		142		17.7	3.1
	Fluorene	mg/kg	0.5				<0.5	8.5	<0.5	2	<0.5		15.6		<0.5	<0.5
	Indeno(1,2,3-c,d)pyrene	mg/kg	0.5				0.7	8.6	<0.5	6.5	<0.5		14.7		5.3	0.6
	Naphthalene	mg/kg	0.5				<0.5	2.5	<0.5	1.6	<0.5		20.8		0.9	<0.5
	PAHs (Sum of total)	mg/kg	0.5								10.6		668		131	
	Phenanthrene	mg/kg	0.5				0.5	120	<0.5	24.9	0.8		91.2		7.9	1.2
	Pyrene	mg/kg	0.5				0.8	93.2	<0.5	35.9	2		128		16.6	3
TPH	TPH C15-C36	mg/kg					<200	3270	<200	2660	<200		3250	<200	1270	<200
	TPH C10 - C14	mg/kg	50		54000		<50	1010	<50	<50	<50		<50	<50	<50	<50
	TPH C15-C28	mg/kg	100		72000		<100	2510	<100	1400	<100		1920	<100	700	<100
	TPH C29-C36	mg/kg	100		21,000		<100	760	<100	1260	<100		1330	<100	570	<100
	TPH C6 - C9	mg/kg	10				<10	<10	<10	<10	<10		<10	<10	<10	<10
	TPH+C10 - C36 (Sum of total)	mg/kg	50				<250	4280	<250	2660	<50		3250	<50	1270	<50
BTEX	Total Xylene (ESDAT)	mg/kg	0.15			<1.5	<1	<1	<1	<1	<1		<1	<1	<1	<1
	Benzene	mg/kg	0.2		380	<0.5	<0.2	<0.2	<0.2	0.2	<0.2		0.4	<0.2	<0.2	<0.2
	Ethylbenzene	mg/kg	0.5			<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5
	Toluene	mg/kg	0.5			<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5
	Xylene (m & p)	mg/kg	0.5				<0.5	<0.5	<0.5	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5
	Xylene (o)	mg/kg	0.5				<0.5	<0.5	<0.5	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5

Notes
mg/kg = milligrams per kilogram
EQL = Estimated Quantitation Limit
< denotes result less than EQL
SSTC^{VMP} - Site Specific Target Criteria for the VMP Area
Shading denotes concentration greater than criteria
CPAH= Sum of 8 carcinogenic PAH Compounds (Benz(a)anthracene Benzo(a) pyrene; Benzo(b)fluoranthene; Benzo(g,h,i)perylene; Benzo(k)fluoranthene; Chrysene; Dibenz(a,h)anthracene and Indeno(1,2,3-c,d)pyrene)
TEF - Toxicity Equivalent Factor
TPH - Total Petroleum Hydrocarbons
PAH - Polycyclic Aromatic Hydrocarbons (PAH)
* TPH C6-C9 aliphatic
* *TPH C10-C14 aliphatic and aromatic
note TPH in table not speciated

					Location	TBH03	TBH03	TBH05	TBH05	TBH05	TBH06	TBH06	TBH07	TBH08
					Field ID	TBH03_1.2-1.3	TBH03_1.5-1.6	TBH05_0.6-0.7	TBH05_1.3-1.7	TBH05_1.8-2.0	TBH06_0.55-0.6	TBH06_1.5-2.0	TBH07_0.1-0.15	TBH08_0.13-0.25
					Sample Date	5/02/2011	5/02/2011	12/02/2011	12/02/2011	12/02/2011	5/02/2011	12/02/2011	4/02/2011	4/02/2011
					Consultant	AECOM	AECOM	AECOM	AECOM	AECOM	AECOM	AECOM	AECOM	AECOM
					Matrix	Fill	Fill	Fill	Fill	Fill	Fill	Fill	Fill	Fill
					Area	VMP & PDA - Hickson Road	VMP & PDA - Hickson Road	VMP & PDA - Hickson Road	VMP & PDA - Hickson Road	VMP & PDA - Hickson Road	VMP & PDA - Hickson Road	VMP & PDA - Hickson Road	VMP & PDA - Hickson Road	VMP & PDA - Hickson Road
Chemical Group	**Chemical Name**	**Units**	**EQL**	**Tar Containing Material (TCM) Criteria**	**SSTC^{VMP}**									
PAHs	CPAH (TEF)	mg/kg			67	<1.21	<1.21	<1.21	0.85	28.753	0.967	<1.21	10.663	1.828
	PAH (Total)	mg/kg		**2000**		<8	<8	<8	4.1	161.8	7.3	<8	58.6	12.3
	2-chloronaphthalene	mg/kg	0.5											
	2-methylnaphthalene	mg/kg	0.5											
	3-methylcholanthrene	mg/kg	0.5											
	Acenaphthene	mg/kg	0.5			<0.5	<0.5	<0.5	<0.5	0.6	<0.5	<0.5	<0.5	<0.5
	Acenaphthylene	mg/kg	0.5			<0.5	<0.5	<0.5	<0.5	0.9	<0.5	<0.5	1.4	<0.5
	Anthracene	mg/kg	0.5			<0.5	<0.5	<0.5	<0.5	3.1	<0.5	<0.5	1.4	<0.5
	Benz(a)anthracene	mg/kg	0.5			<0.5	<0.5	<0.5	0.7	15.6	0.9	<0.5	4.7	1.3
	Benzo(a) pyrene	mg/kg	0.5	**150**		<0.5	<0.5	<0.5	0.7	18.8	0.8	<0.5	7.8	1.5
	Benzo(b)&(k)fluoranthene	mg/kg	1											
	Benzo(b)fluoranthene	mg/kg	0.5			<0.5	<0.5	<0.5	0.8	23.8	0.7	<0.5	8	1.3
	Benzo(g,h,i)perylene	mg/kg	0.5			<0.5	<0.5	<0.5	<0.5	15.1	<0.5	<0.5	6.5	0.7
	Benzo(k)fluoranthene	mg/kg	0.5			<0.5	<0.5	<0.5	<0.5	9.3	<0.5	<0.5	2.7	0.5
	Chrysene	mg/kg	0.5			<0.5	<0.5	<0.5	<0.5	13.2	0.7	<0.5	4.8	1.1
	Dibenz(a,h)anthracene	mg/kg	0.5			<0.5	<0.5	<0.5	<0.5	3.4	<0.5	<0.5	0.8	<0.5
	Fluoranthene	mg/kg	0.5			<0.5	<0.5	<0.5	1	19.1	1.7	<0.5	6.4	2.8
	Fluorene	mg/kg	0.5			<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	Indeno(1,2,3-c,d)pyrene	mg/kg	0.5			<0.5	<0.5	<0.5	<0.5	14	<0.5	<0.5	4.1	<0.5
	Naphthalene	mg/kg	0.5			<0.5	<0.5	<0.5	<0.5	0.6	<0.5	<0.5	<0.5	<0.5
	PAHs (Sum of total)	mg/kg	0.5											
	Phenanthrene	mg/kg	0.5			<0.5	<0.5	<0.5	<0.5	8.3	0.6	<0.5	1.4	<0.5
	Pyrene	mg/kg	0.5			<0.5	<0.5	<0.5	0.9	16	1.9	<0.5	8.6	3.1
TPH	TPH C15-C36	mg/kg				<200	<200	<200	<200	1210	<200	<200	700	370
	TPH C10 - C14	mg/kg	50		54000	<50	<50	<50	<50	<50	<50	<50	<50	<50
	TPH C15-C28	mg/kg	100		72000	<100	<100	<100	<100	600	<100	<100	280	110
	TPH C29-C36	mg/kg	100		21,000	<100	<100	<100	<100	610	<100	<100	420	260
	TPH C6 - C9	mg/kg	10			<10	<10	<10	<10	<10	<10	<10	<10	<10
	TPH+C10 - C36 (Sum of total)	mg/kg	50			<50	<50	<50	<50	1210	<50	<50	700	370
BTEX	Total Xylene (ESDAT)	mg/kg	0.15			<1	<1	<1	<1	<1	<1	<1	<1	<1
	Benzene	mg/kg	0.2		380	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
	Ethylbenzene	mg/kg	0.5			<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	Toluene	mg/kg	0.5			<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	Xylene (m & p)	mg/kg	0.5			<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	Xylene (o)	mg/kg	0.5			<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5

Notes
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Shading denotes concentration greater than criteria
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TEF - Toxicity Equivalent Factor
TPH - Total Petroleum Hydrocarbons
PAH - Polycyclic Aromatic Hydrocarbons (PAH)
* TPH C6-C9 aliphatic
* *TPH C10-C14 aliphatic and aromatic
note TPH in table not speciated

						PAHs																				
						CPAH (TEF)	2-chloronaphthalene	2-methylnaphthalene	3-methylcholanthrene	Acenaphthene	Acenaphthylene	Acetophenone	Anthracene	Benz(a)anthracene	Benzo(a) pyrene	Benzo(b)&(k)fluoranthene	Benzo(b)fluoranthene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-c,d)pyrene	Naphthalene	PAHs (Sum of total)	Phenanthrene	Pyrene
						mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL							0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	1	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
SSTC[VMP]						67																					
Tar Containing Material (TCM) Criteria															**150**												
Location	**Field ID**	**Sample Depth**	**Sample Date**	**Matrix**	**Area**																						
BH4	BH4 2.3-2.4	2.3-2.4	21/02/08	Fill	VMP & PDA - Hickson Road	17.265	<1.2	7.2	<1.2	<1.2	52.8		12.3	9.4	11.4	23		8.4		8.1	3.9	10.1	<1.2	8.6	4.6		5.3	4.6
BH4	BH4 4.2-4.3	4.2-4.3	21/02/08	Fill	VMP & PDA - Hickson Road	<1.11	<0.5	<0.5	<0.5	<0.5	<0.5		<0.5	<0.5	<0.5	<1		<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		<0.5	<0.5
BH53	BH53_2.0-2.4	2-2.4	6/03/10	Fill	VMP & PDA - Hickson Road	100.803		<0.5		11.4	28.3		84.8	92.8	70.7		77.8	23.9	27.5	63.4	7.1	316	56.1	23.2	48.3	1510	302	277
BH53	**BH53_4.0-4.4**	**4-4.4**	**6/03/10**	**Fill**	**VMP & PDA - Hickson Road**	338.605	<2.5	757	<2.5	108	657	<2.5	343	275	**291**	305		53.5		257	12.1	747	344	49	4330		1390	710
BH61	**BH61_2-2.4**	**2-2.4**	**7/03/10**	**Fill**	**VMP & PDA - Hickson Road**	223.905		2		4.8	47.6		91.6	217	**162**		182	41.5	28	164	13.2	423	23.8	39.5	51.2	2170	267	412
BH61	BH61_3-3.4	3-3.4	7/03/10	Natural Clayey Sand	VMP & PDA - Hickson Road	18.103	<1.2	81.2	<1.2	7.3	47.8	<1.2	30.1	18.9	14.3	17		4.7		14.6	1.3	60.1	38.4	4.2	318		113	55.7
MW10	**MW10 4.9-5.0**	**4.9-5**	**21/02/08**	**Fill**	**VMP & PDA - Hickson Road**	386.828	<1.2	102	<1.2	212	652		523	934	**278**	698		21.8		61	9.4	966	662	52	224		1740	947
MW10	**MW10 8.6-8.7**	**8.6-8.7**	**22/02/08**	**Fill**	**VMP & PDA - Hickson Road**	590.52	<1.2	7650	<1.2	511	1700		2150	1470	**412**	968		26		771	20.3	2440	2100	32.5	10,200		5180	2640
MW3	MW3 2.9-3.0	2.9-3	23/02/08	Natural Clayey Sand	VMP & PDA - Hickson Road	14.51	<0.5	22.6	<0.5	3.2	20		25.3	15.8	10.9	26		4.4		10.6	1.3	35.8	20.9	5.8	55		65.8	37.2
MW6	MW6 2.5-2.6	2.5-2.6	20/02/08	Fill	VMP & PDA - Hickson Road	2.181	<0.5	<0.5	<0.5	<0.5	1.9		1.2	3.8	1.7	3		0.6		1.5	<0.5	5	<0.5	0.8	<0.5		2.7	5.2
MW6	MW6 4.4-4.5	4.4-4.5	20/02/08	Fill	VMP & PDA - Hickson Road	<1.11	<0.5	<0.5	<0.5	<0.5	<0.5		<0.5	<0.5	<0.5	<1		<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		<0.5	<0.5
MW7	MW7 3.5-3.6	3.5-3.6	25/02/08	FILL	VMP & PDA - Hickson Road	71.045	<0.5	92.7	<0.5	33.7	48.7		28.7	86.7	59.7	70		2.9		8.6	1.7	62.3	39.6	8.6	150		116	48.8
MW7	**MW7 4.5-4.6**	**4.5-4.6**	**25/02/08**	**FILL**	**VMP & PDA - Hickson Road**	486.608	<1.2	3680	<1.2	210	3060		800	863	**359**	608		59.8		341	22.9	1470	1160	144	7800		3350	2030
MW7	**MW7 5.0-5.1**	**5-5.1**	**25/02/08**	**FILL**	**VMP & PDA - Hickson Road**	884.497	<1.2	5130	<1.2	282	4140		1200	1240	**677**	1170		87.7		582	57.2	2160	1980	196	10,200		4870	3110

Notes
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* TPH C6-C9 aliphatic
* *TPH C10-C14 aliphatic and aromatic
note TPH in table not speciated
BOLD = Sample classified as TCM based on PAH (>2000 mg/kg) and Benzo(a)pyrene (>150 mg/kg) results

						TPH						BTEX					
						TPH C15-C36	TPH C10 - C14	TPH C15-C28	TPH C29-C36	TPH C6 - C9	TPH+C10 - C36 (Sum of total)	Benzene	Ethylbenzene	Toluene	Xylene (m & p)	Xylene (o)	Total Xylene
						mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL							50	100	100	10	50	0.2	0.5	0.5	0.5	0.5	
SSTC[VMP]							54,000	72,000	21,000			380					
Tar Containing Material (TCM) Criteria																	
Location	**Field ID**	**Sample Depth**	**Sample Date**	**Matrix**	**Area**												
BH4	BH4 2.3-2.4	2.3-2.4	21/02/08	Fill	VMP & PDA - Hickson Road	8660	200	5700	2960	<10	8860	<0.2	<0.5	<0.5	<0.5	<0.5	<1
BH4	BH4 4.2-4.3	4.2-4.3	21/02/08	Fill	VMP & PDA - Hickson Road	<200	<50	<100	<100	<10	<250	<0.2	<0.5	<0.5	<0.5	<0.5	<1
BH53	BH53_2.0-2.4	2-2.4	6/03/10	Fill	VMP & PDA - Hickson Road	6970	260	4540	2430	<10	7230	2.7	<0.5	1.4	0.8	<0.5	0.8
BH53	**BH53_4.0-4.4**	**4-4.4**	**6/03/10**	**Fill**	**VMP & PDA - Hickson Road**	57,800	28,400	46,800	11,000	3000	86,200	678	50.7	670	470	197	667
BH61	**BH61_2-2.4**	**2-2.4**	**7/03/10**	**Fill**	**VMP & PDA - Hickson Road**	12,790	450	8130	4660	67	13,240	32.7	<0.5	9.5	5.4	1.4	6.8
BH61	BH61_3-3.4	3-3.4	7/03/10	Natural Clayey Sand	VMP & PDA - Hickson Road	1680	320	1220	460	75	2000	11.2	5.9	14.7	16.2	5.8	22
MW10	**MW10 4.9-5.0**	**4.9-5**	**21/02/08**	**Fill**	**VMP & PDA - Hickson Road**	55,600	4600	41,400	14,200	64	60,200	12.4	4.1	2.2	4.1	1.5	5.6
MW10	**MW10 8.6-8.7**	**8.6-8.7**	**22/02/08**	**Fill**	**VMP & PDA - Hickson Road**	112,400	69,400	93,200	19,200	7590	181,800	1510	261	2650	1830	746	2576
MW3	MW3 2.9-3.0	2.9-3	23/02/08	Natural Clayey Sand	VMP & PDA - Hickson Road	8840	1100	6760	2080	<10	9940	0.4	0.9	<0.5	1.1	0.7	1.8
MW6	MW6 2.5-2.6	2.5-2.6	20/02/08	Fill	VMP & PDA - Hickson Road	<200	<50	<100	<100	<10	<250	<0.2	<0.5	<0.5	<0.5	<0.5	<1
MW6	MW6 4.4-4.5	4.4-4.5	20/02/08	Fill	VMP & PDA - Hickson Road	<200	<50	<100	<100	<10	<250	<0.2	<0.5	<0.5	<0.5	<0.5	<1
MW7	MW7 3.5-3.6	3.5-3.6	25/02/08	FILL	VMP & PDA - Hickson Road	7770	2140	5680	2090	227	9910	87.7	10.3	57.5	49.8	19	68.8
MW7	**MW7 4.5-4.6**	**4.5-4.6**	**25/02/08**	**FILL**	**VMP & PDA - Hickson Road**	74,600	31,500	61,000	13,600	7710	106,100	2080	147	1930	1210	502	1712
MW7	**MW7 5.0-5.1**	**5-5.1**	**25/02/08**	**FILL**	**VMP & PDA - Hickson Road**	80,400	45,900	65,200	15,200	7890	126,300	1980	154	1990	1300	563	1863

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* TPH C6-C9 aliphatic
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note TPH in table not speciated
BOLD = Sample classified as TCM based on PAH (>2000 mg/kg) and Benzo(a)pyrene (>150 mg/kg) results

					PAHs																								
					CPAH (Total)	CPAH (TEF)	PAH (Total)	2-chloronaphthalene	2-methylnaphthalene	3-methylcholanthrene	Acenaphthene	Acenaphthylene	Acetophenone	Anthracene	Benz(a)anthracene	Benzo(a) pyrene	Benzo(b)&(k)fluoranthene	Benzo(b)fluoranthene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-c,d)pyrene	Naphthalene	PAHs (Sum of total)	Phenanthrene	Pyrene
					µg/L	ug/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
EQL								0.5	0.1	0.1	0.1	0.1	0.5	0.1	0.1	0.05	1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.5	0.1	0.1
Groundwater SSTC[VMP]						1000						47,000														1300			
Well																													
Wells screened within fill material																													
IT3S	BH405	25/02/2011	Fill	VMP & PDA - Block 4	19.9	5.014	26.3				<1	<1		<1	2.2	3.8		4.8	3	2.5	1.4	<1	1.9	<1	2.2	<1		<1	4.5
IT3M	BH405	25/02/2011	Fill	VMP & PDA - Block 4	<7.5	<1.92	1				<1	<1		<1	<1	<0.5		<1	<1	<1	<1	<1	<1	<1	<1	<1		<1	1
MW15	BH087A	15/03/2010	Fill	VMP & PDA - Block 4	<54	<19.98	8226	<9	541	<9	49	155	13	18	<9	<9	<19		<9		<9	<9	18	83	<9	7800	8230	87	16
MW52	AECOM_BH52	19/03/2010	Fill	VMP & PDA - Block 4	<12	<4.44	12	<2	<2	<2	<2	<2	<2	<2	<2	<2	<4		<2		<2	<2	4	<2	<2	4	12	<2	4
MW58	AECOM_BH58	17/03/2010	Fill	VMP & PDA - Block 4	<12	<4.44	<28	<2	<2	<2	<2	<2	<2	<2	<2	<2	<4		<2		<2	<2	<2	<2	<2	<2	<2	<2	<2
MW62	AECOM_BH62	24/02/2011	Fill	VMP & PDA - Block 5	<7.5	<1.92	<15.5				<1	<1		<1	<1	<0.5		<1	<1	<1	<1	<1	<1	<1	<1	<1		<1	<1
MW64	AECOM_BH64	20/03/2010	Fill	VMP & PDA - Block 5	<12	<4.44	57	<2	5	<2	3	11	<2	2	<2	<2	<4		<2		<2	<2	2	10	<2	11	57	15	3
Wells screened within marine sediments																													
MW198	BH198	25/02/2011	Fill + Marine Sediments	VMP & PDA - Block 5	<7.5	<1.92	1.4				<1	1.4		<1	<1	<0.5		<1	<1	<1	<1	<1	<1	<1	<1	<1		<1	<1
MW68	AECOM_BH68	24/02/2011	Fill + Marine Sediments	VMP & PDA - Block 5	<7.5	<1.92	<15.5				<1	<1		<1	<1	<0.5		<1	<1	<1	<1	<1	<1	<1	<1	<1		<1	<1
MW206	BH206	19/03/2010	Marine Sediments	VMP & PDA - Block 4	1523	371.81	21,097	<47	4040	<47	274	1380	<47	680	592	299	362		89		462	<47	1250	1030	81	10,600	21,400	2840	1520
MW54	AECOM_BH54	19/03/2010	Marine Sediments	VMP & PDA - Block 4	5	0.32	9072	<2	294	<2	72	113	<2	19	3	<2	<4		<2		2	<2	19	92	<2	8640	9070	98	14
IT3D	BH405	25/02/2011	Marine Sediments	VMP & PDA - Block 4	56.1	16.113	3048.8				25	158		25.7	19.6	12.8		12.4	<10	<10	11.3	<10	28.6	75.9	<10	2560		77.7	41.8
MW45	AECOM_BH45	19/03/2010	Fill + Marine Sediments + Sandstone	VMP & PDA - Block 4	<12	<4.44	8	<2	<2	<2	<2	<2	<2	<2	<2	<2	<4		<2		<2	<2	<2	<2	<2	8	8	<2	<2
MW209	BH209	28/02/2011	Fill + Marine Sediments + Sandstone	VMP & PDA - Block 4	1.8	0.9	26.6				1.8	6.2		1	1	0.8		<1	<1	<1	<1	<1	1.2	<1	<1	10.8		2	1.8
MW200	BH200	28/02/2011	Sandstone	VMP & PDA - Block 4	<784	<237.16	5450				<98	<98		<98	<98	<98		<98	<98	<98	<98	<98	<98	<98	<98	5450		<98	<98
MW204S	BH204	25/02/2011	Sandstone	VMP & PDA - Block 4	<80	<24.2	8846.1				85.5	45.4		<10	<10	<10		<10	<10	<10	<10	<10	<10	80.6	<10	8580		54.6	<10
MW205	BH205	17/03/2010	Sandstone	VMP & PDA - Block 4	36,188	11,556	530,568	<74	105,000	131	4480	43,200	<74	15,400	12,600	9260	9860		1910		9780	728	25,200	21,100	1910	283,000	540,000	74,100	27,900
MW210	BH210	24/02/2011	Sandstone	VMP & PDA - Block 4	2	1.01	11.9				<1	3.1		<1	1.1	0.9		<1	<1	<1	<1	<1	2.6	<1	<1	<1		<1	4.2

Notes

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* TPH C6-C9 aliphatic
**TPH C10-C36 aliphatic and aromatic
note TPH in table not speciated

					TPH						BTEX						Inorganics
					TPH C15-C36	TPH C10 - C14	TPH C15-C28	TPH C29-C36	TPH C6 - C9	TPH+C10 - C36 (Sum of total)	Total Xylene	Benzene	Ethylbenzene	Toluene	Xylene (m & p)	Xylene (o)	Ammonia as N
					mg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L
EQL						50	100	50	20	50		1	2	2	10	2	0.01
Groundwater SSTC[VMP]						17,000	220,000	250,000				2100					150
Well																	
Wells screened within fill material																	
IT3S	BH405	25/02/2011	Fill	VMP & PDA - Block 4	0.65	<50	410	240	<20	650	<4	<1	<2	<5	<2	<2	
IT3M	BH405	25/02/2011	Fill	VMP & PDA - Block 4	<0.15	<50	<100	<50	<20	<50	<4	<1	<2	<5	<2	<2	
MW15	BH087A	15/03/2010	Fill	VMP & PDA - Block 4	14.87	41,000	14,400	470	46,200	55,870	6100	13,100	3010	5030	3920	2180	37.2
MW52	AECOM_BH52	19/03/2010	Fill	VMP & PDA - Block 4	<0.15	<50	<100	<50	<20	<50	<4	<1	<2	<5	<2	<2	<0.1
MW58	AECOM_BH58	17/03/2010	Fill	VMP & PDA - Block 4	<0.15	<50	<100	<50	<20	<50	<4	<1	<2	<5	<2	<2	13.6
MW62	AECOM_BH62	24/02/2011	Fill	VMP & PDA - Block 5	0.39	<50	390	<50	<20	390	<4	<1	<2	<5	<2	<2	
MW64	AECOM_BH64	20/03/2010	Fill	VMP & PDA - Block 5	2.39	270	1850	540	<20	2660	10	4	3	6	6	4	2.66
Wells screened within marine sediments																	
MW198	BH198	25/02/2011	Fill + Marine Sediments	VMP & PDA - Block 5	<0.15	<50	<100	<50	<20	<50	<4	<1	<2	<5	<2	<2	
MW68	AECOM_BH68	24/02/2011	Fill + Marine Sediments	VMP & PDA - Block 5	<0.15	<50	<100	<50	<20	<50	<4	<1	<2	<5	<2	<2	
MW206	BH206	19/03/2010	Marine Sediments	VMP & PDA - Block 4	85.4	68,000	70,600	14,800	13,300	153,400	2770	5450	1250	101	1230	1540	
MW54	AECOM_BH54	19/03/2010	Marine Sediments	VMP & PDA - Block 4	11.3	28,000	10,900	400	3730	39,300	954	621	206	502	626	328	10.8
IT3D	BH405	25/02/2011	Marine Sediments	VMP & PDA - Block 4	3.23	5590	2970	260	2120	8820	461	595	51	465	325	136	
MW45	AECOM_BH45	19/03/2010	Fill + Marine Sediments + Sandstone	VMP & PDA - Block 4	<0.15	<50	<100	<50	<20	<50	<4	<1	<2	<5	<2	<2	<0.1
MW209	BH209	28/02/2011	Fill + Marine Sediments + Sandstone	VMP & PDA - Block 4	0.22	100	220	<50	100	320	18	56	15	5	8	10	
MW200	BH200	28/02/2011	Sandstone	VMP & PDA - Block 4	17.2	47,400	17,200	<50	37,600	64,600	1910	17,900	659	1660	1350	560	
MW204S	BH204	25/02/2011	Sandstone	VMP & PDA - Block 4	2.82	8430	2690	130	2380	11250	695	237	169	440	466	229	
MW205	BH205	17/03/2010	Sandstone	VMP & PDA - Block 4	1852	1,730,000	1,520,000	332,000		3,582,000							
MW210	BH210	24/02/2011	Sandstone	VMP & PDA - Block 4	0.8	80	730	70	<20	880	<4	2	3	<5	<2	<2	

Notes

mg/L - milligrams pre litre
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< denotes result less than EQL
SSTC [VMP]- Site Specific Target Criteria for the VMP Area
Shading denotes concentration greater than criteria
CPAH= Sum of 8 carcinogenic PAH Compounds (Benz(a)anthracene Benzo(a) pyrene; Benzo(b)fluoranthene; Benzo(g,h,i)perylene; Benzo(k)fluoranthene; Chrysene; Dibenz(a,h)anthracene and Indeno(1,2,3-c,d)pyrene)

TEF - Toxicity Equivalent Factor
TPH - Total Petroleum Hydrocarbons
PAH - Polycyclic Aromatic Hydrocarbons (PAH)
* TPH C6-C9 aliphatic
**TPH C10-C36 aliphatic and aromatic
note TPH in table not speciated

				PAHs																						
				CPAH (TEF)	PAH (Total)	2-chloronaphthalene	2-methylnaphthalene	3-methylcholanthrene	Acenaphthene	Acenaphthylene	Acetophenone	Anthracene	Benz(a)anthracene	Benzo(a) pyrene	Benzo(b)&(k)fluoranthene	Benzo(b)fluoranthene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-c,d)pyrene	Naphthalene	Phenanthrene	Pyrene
				ug/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
EQL						0.5	0.1	0.1	0.1	0.1	0.5	0.1	0.1	0.05	1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Groundwater SSTC[VMP]				1000						47,000														1300		
Well	**Location**	**Sample Date**	**Area**																							
IT3S	BH405	25/02/2011	VMP & PDA - Block 4	5.014	26.3				<1	<1		<1	2.2	3.8		4.8	3	2.5	1.4	<1	1.9	<1	2.2	<1	<1	4.5
IT3M	BH405	25/02/2011	VMP & PDA - Block 4	<1.92	1				<1	<1		<1	<1	<0.5		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	1
IT3D	BH405	25/02/2011	VMP & PDA - Block 4	16.113	3048.8				25	158		25.7	19.6	12.8		12.4	<10	<10	11.3	<10	28.6	75.9	<10	2560	77.7	41.8
MW015	BH087	25/07/2006	VMP & PDA - Block 4	59.106	23,350				80.1	376		94.7	54.6	41.1		27.8	12.9	29.3	47.7	4.9	135	236	13.3	21,700	367	130
MW15	BH087	14/08/2006	VMP & PDA - Block 4	133.678	15,287				112	696		161	145	91		118	37.5	31.3	97.3	8.4	480	491	35	11,400	932	451
MW15	BH087	15/08/2007	VMP & PDA - Block 4	64.95	5152.9				60.8	227		66.3	53.5	45.4		37.1	20.2	26.8	42.8	5.2	116	150	19.8	3930	242	110
MW15	BH087	12/05/2008	VMP & PDA - Block 4	<44.286	2525.7				<18.3	51.5		<18.3	<18.3	<18.3		<18.3	<18.3	<18.3	<18.3	<18.3	<18.3	25	<18.3	2430	19.2	<18.3
MW15	BH087	15/03/2010	VMP & PDA - Block 4	<19.98	8226	<9	541	<9	49	155	13	18	<9	<9	<19		<9		<9	<9	18	83	<9	7800	87	16
MW198	BH198	9/05/2008	VMP & PDA - Block 5	<1.92	24.5				2.2	9.7		<1	<1	<0.5		<1	<1	<1	<1	<1	1.1	1.6	<1	6.5	2.1	1.3
MW198	BH198	16/03/2010	VMP & PDA - Block 5	<4.44	14	<2	<2	<2	2	12	<2	<2	<2	<2	<4		<2		<2	<2	<2	<2	<2	<2	<2	<2
MW198	BH198	25/02/2011	VMP & PDA - Block 5	<1.92	1.4				<1	1.4		<1	<1	<0.5		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
MW200	BH200	13/05/2008	VMP & PDA - Block 4	<46.464	2350.9				<19.2	39.1		<19.2	<19.2	<19.2		<19.2	<19.2	<19.2	<19.2	<19.2	<19.2	21.8	<19.2	2290	<19.2	<19.2
MW200	BH200	16/03/2010	VMP & PDA - Block 4	<19.98	8028	<9	209	<9	15	40	<9	<9	<9	<9	<19		<9		<9	<9	<9	11	<9	7950	12	<9
MW200	BH200	28/02/2011	VMP & PDA - Block 4	<237.16	5450				<98	<98		<98	<98	<98		<98	<98	<98	<98	<98	<98	<98	<98	5450	<98	<98
MW204D	BH204D	13/05/2008	VMP & PDA - Block 4	205.028	11,241				122	334		476	254	145		185	63.8	80.9	210	<39	767	508	53	5920	1390	732
MW204S	BH204	15/03/2010	VMP & PDA - Block 4	<19.98	7080	<9	314	<9	96	55	<9	<9	<9	<9	<19		<9		<9	<9	<9	92	<9	6740	97	<9
MW204S	BH204	25/02/2011	VMP & PDA - Block 4	<24.2	8846.1				85.5	45.4		<10	<10	<10		<10	<10	<10	<10	<10	<10	80.6	<10	8580	54.6	<10
MW205	BH205	9/05/2008	VMP & PDA - Block 4	<46.222	1656.8				<19.1	66.8		<19.1	<19.1	<19.1		<19.1	<19.1	<19.1	<19.1	<19.1	<19.1	<19.1	<19.1	1590	<19.1	<19.1
MW205	BH205	17/03/2010	VMP & PDA - Block 4	11,556	530,568	<74	105,000	131	4480	43,200	<74	15,400	12,600	9260	9860		1910		9780	728	25,200	21,100	1910	283,000	74,100	27,900
MW206	BH206	12/05/2008	VMP & PDA - Block 4	<2.32	945.1				6.3	42.6		2.2	<1	<0.9		<1	<1	<1	<1	<1	1.2	11.6	<1	870	10	1.2
MW206	BH206	19/03/2010	VMP & PDA - Block 4	371.81	21,097	<47	4040	<47	274	1380	<47	680	592	299	362		89		462	<47	1250	1030	81	10,600	2840	1520
MW209	BH209	12/05/2008	VMP & PDA - Block 4	<4.356	281.3				8.1	50		5.6	<1.8	<1.8		<1.8	<1.8	<1.8	<1.8	<1.8	3.2	18.9	<1.8	175	17	3.5
MW209	BH209	16/03/2010	VMP & PDA - Block 4	3.2	753	<2	14	<2	7	26	<2	4	2	3	<4		<2		<2	<2	4	10	<2	677	14	6
MW209	BH209	28/02/2011	VMP & PDA - Block 4	0.9	26.6				1.8	6.2		1	1	0.8		<1	<1	<1	<1	<1	1.2	<1	<1	10.8	2	1.8
MW210	BH210	8/05/2008	VMP & PDA - Block 4	0.594	1589.7				24.4	156		15.4	3.5	<2		2.2	<2	<2	2.4	<2	15.6	73.8	<2	1220	63.8	12.6
MW210	BH210	16/03/2010	VMP & PDA - Block 4	<4.44	42	<2	<2	<2	7	12	<2	2	<2	<2	<4		<2		<2	<2	6	<2	<2	6	5	4
MW210	BH210	24/02/2011	VMP & PDA - Block 4	1.01	11.9				<1	3.1		<1	1.1	0.9		<1	<1	<1	<1	<1	2.6	<1	<1	<1	<1	4.2
MW45	AECOM_BH45	19/03/2010	VMP & PDA - Block 4	<4.44	8	<2	<2	<2	<2	<2	<2	<2	<2	<2	<4		<2		<2	<2	<2	<2	<2	8	<2	<2
MW52	AECOM_BH52	19/03/2010	VMP & PDA - Block 4	<4.44	12	<2	<2	<2	<2	<2	<2	<2	<2	<2	<4		<2		<2	<2	4	<2	<2	4	<2	4
MW54	AECOM_BH54	19/03/2010	VMP & PDA - Block 4	0.32	9072	<2	294	<2	72	113	<2	19	3	<2	<4		<2		2	<2	19	92	<2	8640	98	14
MW58	AECOM_BH58	17/03/2010	VMP & PDA - Block 4	<4.44	<28	<2	<2	<2	<2	<2	<2	<2	<2	<2	<4		<2		<2	<2	<2	<2	<2	<2	<2	<2
MW62	AECOM_BH62	17/03/2010	VMP & PDA - Block 5	0.7	18.7	<0.9	2	<0.9	1	<0.9	<0.9	1	<0.9	0.7	<2		<0.9		<0.9	<0.9	2	1	<0.9	7	4	2
MW62	AECOM_BH62	24/02/2011	VMP & PDA - Block 5	<1.92	<15.5				<1	<1		<1	<1	<0.5		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
MW64	AECOM_BH64	20/03/2010	VMP & PDA - Block 5	<4.44	57	<2	5	<2	3	11	<2	2	<2	<2	<4		<2		<2	<2	2	10	<2	11	15	3
MW68	AECOM_BH68	18/03/2010	VMP & PDA - Block 5	<1.998	4	<0.9	<0.9	<0.9	<0.9	<0.9	<0.9	<0.9	<0.9	<0.9	<2		<0.9		<0.9	<0.9	<0.9	<0.9	<0.9	3	1	<0.9
MW68	AECOM_BH68	24/02/2011	VMP & PDA - Block 5	<1.92	<15.5				<1	<1		<1	<1	<0.5		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1

Notes

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TPH - Total Petroleum Hydrocarbons
PAH - Polycyclic Aromatic Hydrocarbons (PAH)
* TPH C6-C9 aliphatic
**TPH C10-C36 aliphatic and aromatic
note TPH in table not speciated

				TPH						BTEX						Inorganics
				TPH C15-C36	TPH C10 - C14	TPH C15-C28	TPH C29-C36	TPH C6 - C9	TPH+C10 - C36 (Sum of total)	Total Xylene	Benzene	Ethylbenzene	Toluene	Xylene (m & p)	Xylene (o)	Ammonia as N
				mg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L
EQL					50	100	50	20	50		1	1	1	10	1	0.01
Groundwater SSTC[VMP]					17,000	220,000	250,000				2100					150
Well	**Location**	**Sample Date**	**Area**													
IT3S	BH405	25/02/2011	VMP & PDA - Block 4	0.65	<50	410	240	<20	650	<4	<1	<2	<5	<2	<2	
IT3M	BH405	25/02/2011	VMP & PDA - Block 4	<0.15	<50	<100	<50	<20	<50	<4	<1	<2	<5	<2	<2	
IT3D	BH405	25/02/2011	VMP & PDA - Block 4	3.23	5590	2970	260	2120	8820	461	595	51	465	325	136	
MW015	BH087	25/07/2006	VMP & PDA - Block 4	20.36	46,000	19,600	760	31,500	66,360	6700	14,400	3020	5740	4490	2210	
MW15	BH087	14/08/2006	VMP & PDA - Block 4	24.04	50,500	22,700	1340	23,200	74,540	5510	8890	2590	3980	3670	1840	
MW15	BH087	15/08/2007	VMP & PDA - Block 4	25.99	48,200	23,800	2190	14,500	74,190	3140	7270	1470	2330	1990	1150	
MW15	BH087	12/05/2008	VMP & PDA - Block 4	15.65	104,000	15,500	150	10,100	119,650	667	4140	68	1760	443	224	
MW15	BH087	15/03/2010	VMP & PDA - Block 4	14.87	41,000	14,400	470	46,200	55,870 - 55,900	6100	13,100	3010	5030	3920	2180	
MW198	BH198	9/05/2008	VMP & PDA - Block 5	1.27	550	1200	70	190	1820	11	85	30	<5	3	8	
MW198	BH198	16/03/2010	VMP & PDA - Block 5	0.59	120	590	<50	<20	710	<4	<1	<2	<5	<2	<2	13.6
MW198	BH198	25/02/2011	VMP & PDA - Block 5	<0.15	<50	<100	<50	<20	<50	<4	<1	<2	<5	<2	<2	
MW200	BH200	13/05/2008	VMP & PDA - Block 4	22.12	97,200	22,000	120	28,500	119,320	1987	12,900	473	1620	1380	607	
MW200	BH200	16/03/2010	VMP & PDA - Block 4	22.65	100,000	22,500	150	22,400	122,650 - 123,000	2336	16,200	686	1820	1800	536	
MW200	BH200	28/02/2011	VMP & PDA - Block 4	17.2	47,400	17,200	<50	37,600	64,600	1910	17,900	659	1660	1350	560	8.47
MW204D	BH204D	13/05/2008	VMP & PDA - Block 4	85.64	422,000	75,800	9840	27,900	507,640	2944	7700	411	3650	2030	914	<0.1
MW204S	BH204	15/03/2010	VMP & PDA - Block 4	7.85	19,600	7400	450	890	27,400 - 27,450	254	92	60	180	172	82	10.8
MW204S	BH204	25/02/2011	VMP & PDA - Block 4	2.82	8430	2690	130	2380	11,200 - 11,250	695	237	169	440	466	229	<0.1
MW205	BH205	9/05/2008	VMP & PDA - Block 4	8.18	72,800	8100	80	73,600	80,980	5140	27,800	745	17,600	3140	2000	2.66
MW205	BH205	17/03/2010	VMP & PDA - Block 4	1852	1,730,000	1,520,000	332,000	3,580,000 - 3,582,000								5.46
MW206	BH206	12/05/2008	VMP & PDA - Block 4	1.5	6940	1500	<50	8380	8440	1419	2960	306	430	807	612	
MW206	BH206	19/03/2010	VMP & PDA - Block 4	85.4	68,000	70,600	14,800	13,300	153,000 - 153,400	2770	5450	1250	101	1230	1540	
MW209	BH209	12/05/2008	VMP & PDA - Block 4	1.9	7980	1900	<50	8150	9880	655	2370	118	1700	380	275	6.56
MW209	BH209	16/03/2010	VMP & PDA - Block 4	1.16	2230	1000	160	1380	3390	180	772	149	48	76	104	110
MW209	BH209	28/02/2011	VMP & PDA - Block 4	0.22	100	220	<50	100	320	18	56	15	5	8	10	42.8
MW210	BH210	8/05/2008	VMP & PDA - Block 4	4.61	14,800	4400	210	2650	19,410	619	511	69	617	401	218	5.72
MW210	BH210	16/03/2010	VMP & PDA - Block 4	0.73	210	730	<50	30	940	6	12	8	<5	3	3	3.84
MW210	BH210	24/02/2011	VMP & PDA - Block 4	0.8	80	730	70	<20	880	<4	2	3	<5	<2	<2	6.7
MW45	AECOM_BH45	19/03/2010	VMP & PDA - Block 4	<0.15	<50	<100	<50	<20	<50	<4	<1	<2	<5	<2	<2	12
MW52	AECOM_BH52	19/03/2010	VMP & PDA - Block 4	<0.15	<50	<100	<50	<20	<50	<4	<1	<2	<5	<2	<2	103
MW54	AECOM_BH54	19/03/2010	VMP & PDA - Block 4	11.3	28,000	10,900	400	3730	39,300	954	621	206	502	626	328	87
MW58	AECOM_BH58	17/03/2010	VMP & PDA - Block 4	<0.15	<50	<100	<50	<20	<50	<4	<1	<2	<5	<2	<2	37.2
MW62	AECOM_BH62	17/03/2010	VMP & PDA - Block 5	1.46	<50	1260	200	<20	1460	<4	<1	<2	<5	<2	<2	27.4
MW62	AECOM_BH62	24/02/2011	VMP & PDA - Block 5	0.39	<50	390	<50	<20	390	<4	<1	<2	<5	<2	<2	5.36
MW64	AECOM_BH64	20/03/2010	VMP & PDA - Block 5	2.39	270	1850	540	<20	2660	10	4	3	6	6	4	<0.01
MW68	AECOM_BH68	18/03/2010	VMP & PDA - Block 5	<0.15	<50	<100	<50	<20	<50	<4	<1	<2	<5	<2	<2	5.24
MW68	AECOM_BH68	24/02/2011	VMP & PDA - Block 5	<0.15	<50	<100	<50	<20	<50	<4	<1	<2	<5	<2	<2	7.48

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* TPH C6-C9 aliphatic
**TPH C10-C36 aliphatic and aromatic
note TPH in table not speciated

						PAHs																					Phenols									
						CPAH (TEF)	PAH (Total)	2-chloronaphthalene	2-methylnaphthalene	3-methylcholanthrene	Acenaphthene	Acenaphthylene	Acetophenone	Anthracene	Benz(a)anthracene	Benzo(a) pyrene	Benzo(b)&(k)fluoranthene	Benzo(b)fluoranthene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-c,d)pyrene	Naphthalene	PAHs (Sum of total)	Phenanthrene	Pyrene	2,4-dimethylphenol	2-methylphenol	2-nitrophenol	3-&4-methylphenol	3-Methylphenol	4-chloro-3-methylphenol	4-methylphenol	4-nitrophenol	Phenol
						ug/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
EQL								0.5	0.1	0.1	0.1	0.1	0.5	0.1	0.1	0.05	1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.5	0.1	0.1	0.1	0.1	0.1	0.5	0.1	0.05	0.1	0.1	0.1
SSTC[VMP]						1000						47,000														1300											
MWQC									2.1		5.8	5.8		0.01	0.01	0.1	0.01	0.01	0.001	0.01	0.001	0.1	1	3	0.01	70		0.6	0.025	2	13		13	13		13000		400
Well	**Field ID**	**Location**	**Sample Date**	**Screened Lithology**	**Area**																																
Wells screened within fill material																																					
IT3S	IT3S	BH405	25/02/11	Fill	VMP & PDA - Block 4	5.014	26.3				<1	<1		<1	2.2	3.8		4.8	3	2.5	1.4	<1	1.9	<1	2.2	<1		<1	4.5	<1	<1	<1	<2		<1			<1
IT3S	IT3S FILTRATE	BH405	25/02/11	Fill	VMP & PDA - Block 4	<0.192	0.5		<0.1	<0.1	<0.1	<0.1		<0.1	<0.1	<0.05		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.5		<0.1	<0.1	<0.2	0.3	<0.2		0.5	<0.1	<0.2	<0.2	1
IT3M	IT3M	BH405	25/02/11	Fill	VMP & PDA - Block 4	<1.92	1				<1	<1		<1	<1	<0.5		<1	<1	<1	<1	<1	<1	<1	<1	<1		<1	1	<1	<1	<1	<2		<1			<1
IT3M	IT3M FILTRATE	BH405	25/02/11	Fill	VMP & PDA - Block 4	<0.192	0.2		<0.1	<0.1	<0.1	<0.1		<0.1	<0.1	<0.05		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.2		<0.1	<0.1	<0.2	<0.2	<0.2		<0.2	<0.1	<0.2	<0.2	0.2
MW62	MW62	AECOM_BH62	17/03/10	Fill	VMP & PDA - Block 5	0.7	18.7	<0.9	2	<0.9	1	<0.9	<0.9	1	<0.9	0.7	<2		<0.9		<0.9	<0.9	2	1	<0.9	7	19	4	2	<0.9	<0.9	<0.9	<2		<0.6			<0.9
MW62	MW62	AECOM_BH62	24/02/11	Fill	VMP & PDA - Block 5	<1.92	<15.5				<1	<1		<1	<1	<0.5		<1	<1	<1	<1	<1	<1	<1	<1	<1		<1	<1	<1	<1	<1	<2		<1			<1
MW62	MW62 FILTRATE	AECOM_BH62	24/02/11	Fill	VMP & PDA - Block 5	<0.192	0.4		<0.1	<0.1	<0.1	<0.1		<0.1	<0.1	<0.05		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.4		<0.1	<0.1	<0.2	0.3	<0.2		0.4	<0.1	<0.2	<0.2	0.3
Wells screened within marine sediments																																					
MW40	MW40	AECOM_BH40	20/03/10	Fill + Marine Sediments	Block 4	<1.998	297	<0.9	36	<0.9	4	16	<0.9	3	<0.9	<0.9	<2		<0.9		<0.9	<0.9	2	12	<0.9	244	297	14	2	69	15	<0.9	20		<0.9			2
MW69	MW69	AECOM_BH69	19/03/10	Fill + Sandstone	Block 5	7.52	2444	<2	326	<2	35	158	5	28	14	6	6		<2		12	<2	34	64	<2	1920	2450	126	47	138	20	<2	20		<2			2
MW69	MW69	AECOM_BH69	25/02/11	Fill + Sandstone	Block 5	<12.1	320				11.7	37.2		8.9	<5	<5		<5	<5	<5	<5	<5	7.4	5.7	<5	202		32	15.1	<5	<5	<5	<10		<5			<5
MW69	MW 69 FILTRATE	AECOM_BH69	25/02/11	Fill + Sandstone	Block 5	<0.192	5		<0.1	<0.1	<0.1	<0.1		<0.1	<0.1	<0.05		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	5		<0.1	<0.1	0.3	0.3	<0.2		0.5	<0.1	<0.2	<0.2	0.5
MW401	MW401	BH401	24/02/11	Marine Sediments	Block 5	<11.858	249.2				10.5	12.8		<4.9	<4.9	<4.9		<4.9	<4.9	<4.9	<4.9	<4.9	<4.9	9.4	<4.9	195		16.3	5.2	108	63.4	<4.9	111		<4.9			15
MW401	MW401 FILTRATE	BH401	24/02/11	Marine Sediments	Block 5	<0.192	49.9		2.1	<0.1	1.2	1		<0.1	<0.1	<0.05		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	47.7		<0.1	<0.1	50	27.8	<0.2		31.1	<0.1	18.7	<0.2	6.6

Notes
mg/L - milligrams pre litre
µg/L - micrograms per litre
EQL = Estimated Quantitation Limit
< denotes result less than EQL
SSTC [VMP]- Site Specific Target Criteria for the VMP Area
shading denotes concentration greater than criteria
CPAH= Sum of 8 carcinogenic PAH Compounds (Benz(a)anthracene Benzo(a) pyrene; Benzo(b)fluoranthene; Benzo(g,h,i)perylene; Benzo(k)fluoranthene; Chrysene; Dibenz(a,h)anthracene and Indeno(1,2,3-c,d)pyrene)
TPH - Total Petroleum Hydrocarbons
PAH - Polycyclic Aromatic Hydrocarbons (PAH)
* TPH C6-C9 aliphatic
**TPH C10-C36 aliphatic and aromatic
note TPH in table not speciated
FILTRATE = Sample analysed following double filtration in laboratory

							TPH						BTEX						Inorganics											
							TPH C15-C36	TPH C10 - C14	TPH C15-C28	TPH C29-C36	TPH C6 - C9	TPH+C10 - C36 (Sum of total)	Total Xylene (ESDAT)	Benzene	Ethylbenzene	Toluene	Xylene (m & p)	Xylene (o)	Alkalinity as CaCO3	Ammonia as N	Anions Total	Bicarbonate as CaCO3	Alkalinity (Bicarbonate as CaCO3)	Alkalinity (Carbonate as CaCO3)	Carbonate	Cations Total	Chloride	Cyanide (Free)
							mg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L	mg/L	meq/L	mg/L	mg/L	mg/L	mg/L	meq/L	mg/L	mg/L
EQL								50	100	50	20	50		1	2	2	2	2	1	0.01	0.01	1	1	1	1	0.01	0.5	0.004
SSTC[VMP]								17,000	220,000	250,000				2100						150								
MWQC								40			110			700	80	180	75	75		0.91								0.004
Well	**Field ID**	**Location**	**Sample Date**	**Screened Lithology**	**Area**																									
Wells screened within fill material																														
IT3S	IT3S	BH405	25/02/11	Fill	VMP & PDA - Block 4	0.65	<50	410	240	<20	650	<4	<1	<2	<5	<2	<2											<0.004
IT3S	IT3S FILTRATE	BH405	25/02/11	Fill	VMP & PDA - Block 4																									
IT3M	IT3M	BH405	25/02/11	Fill	VMP & PDA - Block 4	<0.15	<50	<100	<50	<20	<50	<4	<1	<2	<5	<2	<2											<0.004
IT3M	IT3M FILTRATE	BH405	25/02/11	Fill	VMP & PDA - Block 4																									
MW62	MW62	AECOM_BH62	17/03/10	Fill	VMP & PDA - Block 5	1.46	<50	1260	200	<20	1460	<4	<1	<2	<5	<2	<2	96	8.47	398	96	96	<1	<1	438	13,700	<0.004
MW62	MW62	AECOM_BH62	24/02/11	Fill	VMP & PDA - Block 5	0.39	<50	390	<50	<20	390	<4	<1	<2	<5	<2	<2											<0.004
MW62	MW62 FILTRATE	AECOM_BH62	24/02/11	Fill	VMP & PDA - Block 5																									
Wells screened within marine sediments																														
MW40	MW40	AECOM_BH40	20/03/10	Fill + Marine Sediments	Block 4							38	52	2	46	26	12	556	9.7	434	556			<1	456	14,500	
MW69	MW69	AECOM_BH69	19/03/10	Fill + Sandstone	Block 5	4.26	7200	3900	360	3400	11,460 - 11,500	384	868	77	804	240	144	761	90.4	333	761			<1	335	9520	0.004
MW69	MW69	AECOM_BH69	25/02/11	Fill + Sandstone	Block 5	0.33	530	330	<50	210	860	26	52	16	9	13	13										<0.004
MW69	MW 69 FILTRATE	AECOM_BH69	25/02/11	Fill + Sandstone	Block 5																							
MW401	MW401	BH401	24/02/11	Marine Sediments	Block 5	1.07	790	1070	<50	350	1860	42	127	<5	108	27	15										<0.004
MW401	MW401 FILTRATE	BH401	24/02/11	Marine Sediments	Block 5																							

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