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Vic Park Tunnel Project - Section 92 Response Report 3

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By
Beca Infrastructure Ltd

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Revision History

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A	Carron Blom	Draft Response: Transit Review	31 July 2006

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Action	Name	Signed	Date
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on behalf of	Beca Infrastructure Ltd		

Introduction

Transit New Zealand (Transit) lodged resource consent applications for the Vic Park Tunnel (VPT) Project with the Auckland Regional Council (ARC) in March 2006. Pursuant to Section 92 of the Resource Management Act 1991 (RMA), the ARC has issued Transit with a request for further information (dated 6th July, 2006). This is the ARC's third request and relates to contaminated land aspects of the project.

The responses to the questions posed by the ARC are set out below. The ARC questions and numbering have been repeated (and are in bold and italics) for clarity.

Environmental Framework

Prior to responding to the specific matters raised by the ARC below, we consider it to be worthwhile to first provide an overview of the proposed environmental framework for this project, and some revisions that are now being proposed. To summarise the existing framework:

- An environmental framework has been provided for the project.
- This comprises two key consent holder (or Principal's) documents; the Environmental Management Plan (EMP; refer to Appendix H of the Assessment of Environmental Effects (AEE)), and the Environmental Monitoring Guidelines (EMG; refer to Appendix I of the AEE).
- These plans establish requirements for the management of contaminated materials in line with the Proposed Auckland Regional Plan: Air, Land, and Water (PARP: ALW).
- Transit is proposing that these documents be referred to as a condition of consent.
- The documents will also be included as a contract requirement within the Principal's requirements for the Design Construct Team (DCT).
- The EMP also requires the preparation of a Construction Environmental Management Plan (CEMP) by the DCT.
- The CEMP is to set out how, where, and when the various elements of the EMP and EMG will be implemented by the DCT during construction. This includes a requirement to dispose of materials appropriately and to document the disposal trail.
- It is proposed that the CEMP be submitted to the ARC for approval prior to construction (refer to EMP section 3.2).

We consider this framework to be a well used and appropriate framework for managing environmental issues during construction projects. However in reviewing the above framework as part of this section 92 response, we have found that some of the references to the Preliminary Environmental Assessment (PEA; refer to Appendix C of the AEE) have been replaced with more recent reports. Unfortunately this has removed references to previously established investigation methods and handling process flow diagrams. Consequently, some of the process detail you will be familiar with from management plans produced on other Transit projects (eg the North Shore Busway), is not immediately obvious.

In order to assist subsequent users, and also to clarify matters relating to the questions set out below, we propose to revise the EMP (and possibly EMG) to incorporate the methodology / process related matters included within the earlier documents. Marked up changes to these documents will follow under separate cover.

We have also taken the opportunity to prepare an additional flow diagram, which is aimed at explaining the relationship of contaminated materials to the project's environmental framework (refer to Appendix 1 to this document). This will be incorporated into the EMP and EMG. In addition, we have also revised the material handling / process flow diagram previously included within the PEA (refer to Appendix 2 to this document). Again, this will be included within the EMP and EMG to assist with the appropriate management of contaminated materials.

Section 92 Response

Assessment of Contaminants Report

1. *The report documents only a preliminary investigation of soil contamination. The first stage of the preliminary investigation (carried out in 2001/2002) indicated that some soil contamination could be expected along parts of the proposed project route. Subsequent preliminary sampling and analysis confirmed that contamination of soil was present. However, because the samples from each borehole were composited, it has not been possible to determine the depth of penetration of soil contamination nor the actual contaminant concentrations in zones of soil contamination. The report suggests that further soil sampling would be carried out during excavation of the proposed tunnel but this would not allow appropriate time for analysis of the samples and interpretation of the results.*

Please provide more information on the depth of penetration of soil contamination along the full length of the proposed route and the concentrations of contaminants in zones of contaminated soil.

We agree that further information on the extent of contamination (if any) beneath the proposed works would be useful and we have proposed some additional wording for inclusion within the EMP (refer to Section 1.6 below). However we consider the amount of information on the nature of contamination within the works area (and this relates predominantly to the tunnel excavations) to be sufficient for consenting purposes. In our opinion the existing level of information is also adequate to enable Transit to appropriately manage and dispose of the excavated materials. Notwithstanding this, Transit and / or the DCT may choose to quantify this further for the purposes of refining costs, project risk, and disposal options. As further information becomes available, it would be made available to the ARC upon request. This is discussed further below (refer to Section 1.4).

In its preamble to this question the ARC also raises a number of points, which we consider need a response as some of the underlying principles are raised by the ARC in subsequent questions. These are also discussed below.

1.1 Initial Investigation / Approach

The assessment of contamination has been based upon a staged approach. The first investigation was undertaken in 2002, and was predicated on the basis that the project would involve west-side widening of the existing viaduct. It was aimed at answering the following questions:

- Are the materials to be excavated contaminated (ie does the material need to go to landfill)?
- Does Transit need a resource consent?

A secondary question, to provide context and scale of existing issues was "are the materials acceptable for the current land use?". Consequently initial investigations looked at the criteria relating to the various existing land uses along the route.

In developing the initial investigation approach, we had regard for the following:

- The works through St Mary's Bay comprised limited excavation for lane widening:
 - The extent of disturbance was anticipated as being approximately 1 - 1.5m in depth over the identified footprint;
 - The excavated materials would comprise some of the existing shoulder (ie asphalt and basecourse materials plus a limited amount of the underlying subgrade);
 - The project scope did not include the investigation or management of contaminants beyond the extent of construction disturbance. However:
 - Whilst St Mary's Bay has been filled, the fill was understood to largely comprise Waitemata series sandstones and mudstones;
 - The area was assessed as having a 'low' risk of being contaminated;
 - Whilst it was likely that the granular pavement materials would /could be separated during the works, the underlying 500mm - 1m of material would likely be mixed as this was excavated.
- The works within Victoria Park comprised piling only (see below re the tunnel):
 - Materials would have been 'retrieved' in a mixed state as a consequence of piling techniques;
 - The remaining Park area was not to be disturbed and is not owned by Transit.

Whilst compositing can result in an averaging of the concentrations, and a range of soil contaminant concentrations were detected along the route, the initial investigation indicated the materials to be excavated could not be classified as cleanfill. Consequently this material is classified, by definition, as 'contaminated'. This statement makes no assessment as to whether the material is only marginally contaminated or hazardous, but the consequence of this classification is that the excavated materials must be disposed of to a consented landfill or disposal facility (see section 1.5, below).

Given the relatively minor volumes of excavated materials, the likelihood that excavation would result in 'mixing', and, through St Mary's Bay, the limited ability to stockpile, it was assumed that the materials would all be removed to landfill. Further, the 'statutory' thresholds had been exceeded, indicating the works would require resource consent.

Consequently the level of investigation was considered to be appropriate in order to answer the abovementioned questions. The need for additional testing was however recognised in the PEA (refer to Section 5 of the PEA) and reinforced within the EMP (refer to section 4.7.2.2 of the EMP; Appendix H to the AEE). Additional testing is identified as follows:

- Additional testing to refine 'hot spots' through St Mary's Bay. It was recognised that costs may be able to be refined by further testing in this area, due to the likely presence of some cleanfill materials. However given the small volumes, the likelihood of mixing (etc), it was (and is) considered most appropriate to be left to the DCT.

The EMP sets out the management requirements in relation to the different 'classes' of materials (at section 4.7). Additional text around these 'classes' is proposed but will reflect the processes outlined in the flow diagram attached in Appendix 2 to this section 92 response.

This project is somewhat unusual in that the bulk of the excavations are being carried out in materials with a high risk of being contaminated. This material is required to be disposed of to a controlled disposal facility. The sensitivity of analysis needed for the management of these materials is therefore considered to be less than projects in lesser risk areas and / or with a cut to fill imbalance.

- Toxicity characteristic leaching potentials (TCLPs). These are used by the landfills to assess wastes against landfill acceptance criteria and to determine disposal costs and do not relate to the management of on site effects; and
- Verification testing. Industry standard is to test 1 sample every 1,000m³ during landfilling to check the materials disposed of fall within the initial assessment. This is typically a landfill requirement and as such does not relate to the management of on site effects. Some landfills may require more than this, but this will be landfill specific.

No validation testing was proposed for the following reasons (this is also discussed below at sections 5.1 and 5.4):

- Transit was initially proposing another viaduct (west side widening). For this solution piling was proposed through Victoria Park only, residual matters were considered to relate to the Park as a whole (Auckland City); and
- It was not practicable to investigate or respond to residual contamination (if any) through St Mary's Bay. Again, the up gradient area is owned by Auckland City, the remaining Transit land is currently covered by motorway and is inaccessible (further, the assessment of the existing motorway is not within the project scope nor is it necessarily practicable to investigate).

1.2 Further Investigation of Victoria Park

When the project scope changed from west-side widening to include the tunnel through Victoria Park, the previous environmental investigations were reviewed. Additional investigations were undertaken, but with a focus on gathering groundwater quality data. No additional information was considered necessary through St Mary's Bay (see section 1.1 above).

As noted above, the area through Victoria Park had already been assessed as being contaminated, and therefore it was assumed that the excavated materials would need to be disposed of to landfill. The possibility of re-using some of the materials was set aside early due to the timeframes, quantity of materials, and the ability to stockpile immediate to the works area. Stockpiling of hazardous material is however provided for as a contingency in the EMP (refer to section 4.15) and consent has been applied for to provide for this stockpiling as necessary.

The additional soil data that was obtained as a consequence of the groundwater investigations, was used in refining project risk. The additional soils information did not affect the overall conclusions and management strategy for this area, as it had already been assessed as having a high risk of being contaminated, and required consent. In this regard, the following points are of note:

- In our opinion, as the materials within Victoria Park are heterogeneous, clearly identifiable zones (with respect to contamination) are not expected.
- Individual analyses were carried out on some of the samples (refer to Appendix B of the Assessment of Contamination Report which is Appendix F to the AEE).
- Although the results do show differing concentrations in the individual analyses, the use of compositing did not affect the above conclusions or management strategy.

1.3 Cleanfill versus Contaminated / Effect of Compositing

With regard to this last point, and the issues raised by the ARC in relation to compositing, one of the key points of consideration is the 'boundary' between what may be defined as cleanfill, and what is, by default defined as contaminated. Cleanfill is considered to be any materials at background concentrations¹.

This is commonly defined on the site by the establishment of a control. However the ARC has, for inorganic substances (ie including heavy metals), undertaken a study Technical Publication 153 (TP153), which presents commonly used / accepted criteria for these analytes. TP153 provides values for typical volcanic and non-volcanic soils as volcanic soils often contain naturally elevated heavy metals. Whilst the fill could have included volcanically sourced materials, a conservative approach was taken, and the non-volcanic values were used.

By contrast organic substances such as hydrocarbons and pesticides are not typically expected to occur naturally. Consequently, any of these substances detected at above laboratory detection limits are not classified as cleanfill.

¹ Note that this is a more onerous benchmark when compared with the current definition of contaminated materials provided within the Resource Management Act (RMA). That definition defines contaminated material as that which is above a National Environmental Standard (NES; of which there is none at present), or that results or could result in a significant adverse environmental effect. As the Ministry for the Environment (MfE) environmental criteria are based upon a risk based approach, this threshold will therefore vary by land use and should consequently relate to the remediation criteria. The remediation criteria for a site are not the same as the statutory criteria provided within the PARP:ALW.

By defining the cleanfill / contaminated material boundary relative to background levels, Transit is taking a conservative approach. This is however based upon current MfE Guidance, industry practice, and current PARP:ALW Rules. This is important to recall when considering the significance (or otherwise) of potential contaminants (if any) left in situ after the works are complete.

As noted above, this 'boundary' does not distinguish effect, but does necessitate controlled disposal (refer Ministry for the Environment (MfE) Cleanfill Guidelines, Proposed Auckland Regional Plan: Air, Land, and Water (PARP:ALW)). Therefore whilst the individual analyses do show differing concentrations (as would be expected), the presence of organic substances (relative to presence / absence 'test') confirm Victoria Park as having a high risk of being contaminated (ie virtually no cleanfill is expected through this zone).

In our opinion the compositing of samples has no material bearing on matters relating to the Rules or matters of control as defined within the PARP:ALW. Neither does compositing affect the assessment of environmental effects in this instance as the works proposed will remove a large volume of contaminated materials and is therefore anticipated as having a net positive environmental outcome provided appropriate mitigation is achieved via the environment management processes established within the EMP and the EMG (refer to Appendices H and I to the AEE).

1.4 Zones of Contamination

The materials within Victoria Park are expected to be heterogeneous, with limited potential for zones of contamination within the fill. The materials beneath the fill may however have different characteristics, and it has been assumed that the underlying Waitemata series would be unlikely to be contaminated (the need to understand contaminant concentrations in these materials has been discussed in section 1.6 below).

Nonetheless it is acknowledged that there is limited information at this stage of the project establishing the distribution of the different 'class' of contaminants within the excavations. This is not unusual in our experience for major projects such as Grafton Gully, State highway 20-1 link, Americas Cup, and the Westfield Freezing Works Redevelopment. It is our opinion that additional information would not assist the assessment of environmental effects in this instance for the following reasons:

- The contamination exists already as a result of historic activities. Consequently there is the potential for an existing level of adverse environmental effect from these materials.
- The project is not proposing to relocate the contaminated materials within the project site (whereby a better understanding might be more relevant).
- The materials within the tunnel area and contaminated materials encountered elsewhere within the project are to be removed off site for appropriate disposal.
- The removal of these materials will result in the removal of a potential contamination source for the area.
- The quantum of any benefit derived from this depends on the proportions of the different 'class' of contaminants finally found and the level of implementation of the proposed environmental framework (refer to the EMP and the EMG; Appendices H and I of the AEE respectively). There is at least some beneficial effect expected (refer to section 7.2.3c of the AEE).

Subsequently we consider the amount of information on the 'classes' or nature of contamination within the works area to be sufficient for consenting purposes. Notwithstanding this, Transit and / or the DCT may choose to quantify this further for the purposes of refining costs, project risk, and disposal options. As further information becomes available, would be made available to the ARC upon request.

1.5 Disposal

Because disposal to landfill is proposed for all contaminated material, additional testing is not warranted at this stage of the consenting process. However, verification testing of materials during excavation will be undertaken (refer to section 4.4 of the EMG; Appendix I of the AEE). Further, based on our practical experience of managing contaminated materials during major infrastructure works, requiring a further understanding of the 'zones' of contamination (not withstanding the heterogeneity of the fill) will not assist Transit refining management options at this stage of the project for the following reasons:

- All materials are proposed to be disposed of to landfill.
- Landfill acceptance criteria is typically based around TCLP results (yet to be undertaken).
- Verification testing is required (refer to the EMG Section 4.4; Appendix I to the AEE) as the materials are excavated, the pattern of which will depend on:
 - Staging;
 - Construction methodology;
 - Ability to stockpile;
 - Time for analysis;
 - Who does the testing (sometimes stockpiling and verification testing is undertaken at the landfill); and
 - The landfill criteria and disposal pricing structure.

Further information may assist in refining risk and costs; however this is not related to the PARP:ALW provisions and the management of adverse environmental effects (other than in regards to the Best Practicable Option (BPO)).

To provide the ARC with more certainty, it is anticipated that resource consent conditions will require the implementation and compliance with the EMP and the EMG (refer to the EMP section 1.2). To this end, a condition of consent is proposed (draft conditions of consent for consideration by the ARC will be forwarded under separate cover). A condition re-iterating the need for verification testing will also be included within the draft conditions to be forwarded to the ARC.

1.6 Depth of Contamination

The management of potential areas beyond the excavation works is not part of the VPT project (see below). Notwithstanding this:

- As noted above, it is not considered to be practicable to investigate or respond to residual contamination (if any) through St Mary's Bay inclusive of the area under the widening works. However this is considered to have a low risk of contamination within the works zone (whilst there is limited testing, information on the establishment of this reclamation points to the use of materials from nearby cliffs, and hydraulically placed marine sediments).
- It is understood that the tunnel excavations will result in the removal of materials down to the in situ Waitemata series materials (ie inclusive of the removal of the Tauranga Group materials under the tunnel). The Waitemata series has been assumed as having a lower risk of being contaminated due to the characteristics of the material. However an area of potential contamination has been acknowledged at the interface (refer to previous discussion, in 1.3 above, regarding the cleanfill / contaminated material 'boundary').
- Where works extend through this zone, the different 'class' of materials will need to be determined in accordance with the existing EMP 'contaminated materials' definitions.
- Some residual contamination may exist. However:
 - Transit will be removing a large quantity of contaminated materials through these works (thus having a positive effect);
 - The surrounding ground and groundwater is known to be contaminated and therefore any 'clean' materials placed at depth are likely to become cross contaminated; and
 - The (existing) materials are located at depth with limited exposure or change to existing pathways (refer to the Hydrogeological Assessment; Appendix B of the AEE).

It is however acknowledged that it would be useful for Transit and the ARC to understand the concentration of contaminants that might be left (if any) beneath the works; in at least as a matter of record. Consequently the following additional provision is suggested for inclusion within Section 4.4 of the EMG:

- *"The DCT shall collect samples from the beneath the excavation works, along the length of the project.*
- *Samples shall be collected from a depth of at least 500mm below the excavations and analysed for the parameters listed in clause xxx².*
- *Samples shall be collected at 50m intervals along the alignment and will be staggered across the width of the worked area.*

² This was previously included within the PEA and cross referenced in the EMP. For simplicity the list of analytes will be included in the EMP. A revised document will be forwarded to the ARC under separate cover. Consequential changes to numbering is therefore expected.

- *If contaminated materials are present, the DCT shall develop a Long Term Management Plan (LTMP) for this material. The LTMP shall be submitted to the Consent Holder and subsequently to the ARC for approval.*
- *The LTMP, shall be included in the Project Operations and Management Plan³ and forwarded to the consent holder to implement. If, in the event that the results do not show the presence of contaminants, then the results shall be included within the Project Operations and Management Plan as a matter of record."*

Transit and/ or the DCT may consider it beneficial to undertake a preliminary assessment of the underlying soils in advance of construction. The results from any such investigation would be made available to the ARC upon request and / or as part of the above referenced LTMP.

2. *Environmental criteria for soil and groundwater contamination have been introduced in the report but the environmental criteria are not necessary because the tested soil is not going to remain onsite. Therefore, it is not necessary to determine whether the soil would meet commercial/industrial land use acceptance criteria. Only two soil and groundwater criteria are required. The first criteria would allow the separation of clean soil (cleanfill) from contaminated soil and this would determine the appropriate offsite disposal location for the different classes of soil. The second criteria are the criteria listed in the Proposed Auckland Regional Plan: Air, Land & Water (PARPALW) that determine whether a consent for discharge of contaminants from the site are required. The consent process would then determine the future appropriate management of contaminated soil and groundwater in the project area.*

Please provide more information on the applicability of the environmental criteria or whether the environmental criteria should be deleted from the report.

The land use criteria were used to provide an indication of relative contamination levels. The presence of these guidelines does not impact on the assessment of effects provided, nor the management strategy. Consequently we do not consider it necessary to re-issue the report.

3. *Non-volcanic soil criteria have been used to differentiate contaminated and non-contaminated soil. It is possible that some of the fill had a volcanic origin. If so this would increase the background contaminant concentrations.*

Please provide more information on the potential presence of fill with a volcanic origin and the implications of any such fill on the soil sampling carried out to date.

It is agreed that volcanically sourced soils might have been included within the fill through the project area. The Preliminary Environmental Assessment report (Appendix C and C1 to the AEE) documents the overview of available historic information and this level of detail was not available.

³ Note that this is a Transit project requirement and is not proposed to be included or managed as part of the consents process. Should specific operational plans be required as a consequence of the statutory process, then these will be included in the overall Transit document.

We do not agree that the presence of volcanic soils would have increased the background concentrations. The definition of cleanfill (refer to MfE Cleanfill Guidelines) is that contaminants do not exceed background conditions and this is applicable at the disposal site. Technically any volcanic material (with elevated metals) imported onto the site would have been above background as the site surrounds are predominantly Waitemata based. Therefore, whilst some of the material imported could be of volcanic origin, strictly speaking because the site is non-volcanic in general origin, the more stringent criteria apply⁴.

Beca has therefore applied a conservative approach consistent with what the ARC has required on other sites in the region. Should a cleanfill site be identified for the project within a volcanic area, then the proportions of cleanfill will need to be reassessed, as higher concentrations of metals will be considered within background. Whilst an assessment could be made at this point, most of the materials are excluded by the presence of organic pollutants, and therefore this would be of limited benefit, particularly as no disposal sites have been identified at this stage of the project.

4. *The assumption: "Contamination (if present) beyond the extent of excavation is not within the scope of the project and no validation testing is therefore necessary." is not a valid assumption. The project excavations will almost certainly disturb contaminated soil and will also divert groundwater that could mobilize contamination in the vicinity of the tunnel. Validation testing would be necessary to document the extent of contamination in the immediate vicinity of the tunnel alignment and to document the presence of contamination that may be disturbed by diverted groundwater.*

Please provide more information on the extent of proposed validation testing and how the testing will be planned on the basis of more detailed environmental and groundwater investigations. More detail is also required on how the diversion of groundwater may affect contaminated soil in the vicinity of the tunnel alignment.

There are several matters raised within this question. These are discussed separately below.

4.1 Extent of Contamination

It is maintained that contamination beyond the extent of the project is not within the scope of the project. As noted above, Transit is not responsible for land on either side of the tunnel itself including through Victoria Park. The St Mary's Bay portion of the project is confined by the existing highway and is considered to have a lower risk of being contaminated than the tunnel area.

⁴ However from a practical basis, most cleanfills with in the Auckland area (the Victoria Park section of the project is not one of these), regardless of their age and location, could include mixed source material. Consequently it would make sense to raise 'accepted background' to the volcanic levels. This is however a separate discussion and relates to appeals on the PARP:ALW.

As noted within the consents application, the Assessment of Environmental Effect (AEE), and the Assessment of Contamination Report (eg refer Section 7.3 of the Assessment of Contamination Report Appendix F to the AEE), excavated materials will be removed off site. The removal of contaminated materials from the project area is expected to result in a beneficial effect, particularly within Victoria Park. It is therefore acknowledged that contaminated materials will be disturbed. However as noted in the previous paragraph, the excavation (and therefore any disturbance) of contaminated materials beyond the project works is not being proposed within the scope of either the project and / or the associated resource consents.

4.2 Mobilisation of Contamination / Effect of Groundwater Diversion

On the basis of the assessment made within the Hydrogeological and Engineering Issues Report (refer to Appendix B of the AEE) significant changes in groundwater quality are not expected as a consequence of the works. Groundwater is already contaminated, and impacts upon groundwater are proposed to be mitigated (refer to the separate hydrogeological assessment). The possibility of localised effects from groundwater 'splitting' is discussed in response to Question 16, below (refer to 16.4).

4.3 Validation Testing

As set out in response to Question 1 (refer to section 1.1), validation testing is now being proposed. This would be reinforced through the proposed conditions of consent.

4.4 Detailed Investigations of Contaminated Soils and Groundwater

We are of the opinion that no additional investigations to further characterise the total concentrations of contaminants within either soils or groundwater are required at this stage of the project (ie to further characterise the total concentrations within either soils or groundwater) as there are no adverse effects that would arise that cannot be adequately mitigated. Some additional testing may be undertaken by Transit and /or the DCT, however this is expected to be aimed at further refining commercial aspects of the project and disposal requirements (refer to sections 1.1 and 1.4 above).

5. *The assumption: "Routine testing of the excavated material will be undertaken (including excavated 'natural' materials expected to be cleanfill), to validate initial results and check disposal requirements." is not a valid assumption. Because, according to the report, the excavated material will not be stockpiled (minimal stockpiling) any sampling and testing results will not be available in time to make any decisions about levels of contamination. Detailed sampling and testing needs to be carried out prior to any excavation to fully characterize the extent and depths of contamination that might be affected by the project. As the report notes "unidentified patches of contamination may be present and "underlying in-situ sediments should be cleanfill, however a zone of cross-contamination may exist at the filling interface...". This contamination interface needs to be determined before the excavation of the tunnel commences.*

Please provide more information on how testing could be successfully carried out during excavation works without stockpiling potentially contaminated soil, or provide an alternative proposal for testing needs to be developed.

Ultimately the ability to manage this process will depend on the amount of additional testing undertaken prior to construction to refine project risk (refer to Section 1.4 above), the construction methodology, trucking and haulage logistics, and landfill disposal requirements:

- Some transitional 'stockpiling'⁵ within the tunnel excavations may occur (which contains existing contamination) to assist with handling (ie to lift the materials out of the trench and into trucks), to allow for truck stacking and movement efficacy; and / or
- Sampling may occur at the landfill.

Depending on the disposal site selected, the results of the verification testing is not required prior to the materials being disposed (usual practice) as the information is used as a check and / or to adjust pricing. In our opinion therefore, this is not a risk to the management of adverse environmental effects.

In answering this question in more detail, there are several points within this question that need to be addressed and these are set out below.

5.1 Validation versus Verification Testing

Please note that for clarity we changed references within the report so that the following distinction can be made:

- Validation testing: Testing undertaken beneath the works / after contaminated materials have been removed.
- Verification testing: Testing undertaken during the works to enable the sorting of materials and to assess the range of contaminant concentrations / leachability relative to landfill requirements. This is the testing referred to in question 5 above.

The use of these terms through the EMP and EMG will be checked so that the correct terms are used.

5.2 Unidentified Contamination

The management of 'unknown' contamination⁶ is a matter that is therefore dealt with within any project. The EMP does include guidance as to how various classes of contaminated materials may be used (refer EMP Section 4.7). This will be supported by additional text and the flow chart attached as Appendix 2 to this response.

⁵ ie a (double) handling pile. The materials may be moved as part of the excavation / handling process but not actually relocated to a 'formal' stockpile per sé. The materials may be located within or on the edge of the tunnel trench, and may form a pile temporarily.

⁶ There is a risk of unidentified contamination no matter the extent of the sampling, as this is a matter of statistical certainty.

Whilst a process for managing 'unknowns' has been provided, the applicability for this project is, in our opinion, limited as either the works are limited (eg St Mary's Bay), or the materials are to be removed regardless of the contaminant concentrations (Victoria Park tunnel). In our experience this should be adequate to enable these materials to be appropriately managed.

5.3 Underlying Contamination

This has already been addressed above (refer to section 1.1) and validation testing has been proposed.

5.4 Verification Testing

Please refer to the previous points made in relation to Question 1 (refer to 1.5). As is noted in section 1.5 verification testing is provided for within the EMP.

6. *It appears that the analytical results for composite soil/fill samples have been compared with adopted acceptance criteria. However, it is important that the actual contaminant concentrations at each discrete location are compared with the adopted acceptance criteria to provide an accurate picture of the significance of contamination in different areas and at different depths. Also, for the composite analytical results to be compared with the criteria, the criteria need to be divided by four (or the number of component samples making up the composite sample).*

Please provide more information on how the composite analytical results were compared with the adopted acceptance criteria and how the acceptance criteria can be applied to discrete sampling locations.

6.1 Extent of Compositing

No compositing of groundwater was undertaken as part of the investigations. Therefore we note that this discussion relates only to soil sampling.

Some individual samples were taken and analysed (refer to Appendix B of the Assessment of Contamination Report which is Appendix F to the AEE) to enable an understanding of the range of concentrations underlying the composite results. As noted above (refer to section 1.3, above), these did not change the overall conclusions, assessed effects, or the proposed management strategy.

6.2 Comparison against Criteria / Modification of Criteria

The ARC has indicated that it does not consider the comparison against the land use criteria to be necessary. Therefore the following discussion relates only to the adopted background and statutory criteria (soils).

The PARP:ALW sets out both background and other Statutory Criteria. The Rules do not provide for the modification of the criteria to suit, say compositing, or certainty, and nor do these provide for discretion (ie if only one result exceeds the statutory criteria, then strictly, a consent is required). Therefore it was considered inappropriate to modify these values in any way.

6.3 Relevance

In practice, the sampling techniques used include the collection of very small samples proportional to the surrounding ground. Compositing was used as a screening technique, and was considered appropriate given the heterogeneity of the materials encountered, staging, the cost of the investigations, and the level of detail required to actually provide an assessment relative to the study questions (see Question 1; section 1.1). The limitations and appropriateness of compositing was however recognised, particularly with respect to the organic substances⁷.

Nonetheless, the results have indicated that both the background and statutory triggers have been exceeded by composites. The project works required the excavation and off site removal of most, if not all the materials worked on this project, and therefore this was considered to be an appropriate, and conservative approach.

7. *The report indicates that fill consists mainly of “sandy gravel, silt-clay, silty sand, and clay...” The presence of significant sandy gravel could affect the selection of criteria listed in Table 1.*

Please provide more information on the applicability of the adopted acceptance criteria to sandy gravel deposits and also the significance of extensive sandy gravel deposits to the mobility of contaminants in groundwater.

We refer back to the definitions of cleanfill / contaminated fill and the ‘presence / absence test’ (as referred to at section 1.3 above). Therefore this discussion relates only to the use of the statutory criteria (however the same points would also apply to the land use / environmental criteria.

The fill material was acknowledged as being heterogeneous from the start of the investigation due to the assessed history. For simplicity, the most conservative value was selected (ie with the lowest threshold). Whilst different soil types could affect contaminant mobility (etc), in our opinion this is not considered to be a significant issue as:

- The materials within the project / works are being removed from the site so this is not relevant over the longer term;
- Contaminants or different fill materials encountered as part of the investigations but beyond the works are not part of the project;
- Groundwater quality is already degraded, and the hydrogeological assessment has already taken such factors into account and concluded that there will not be a significant adverse environmental effect.

⁷ Please note that the MfE Contaminated Land Management Guidelines do recognise the appropriateness and usefulness of compositing in certain circumstances (with the application of professional judgment).

8. *The PID results indicate that there may be significant contamination of fill in the St Marys Bay area. However, the fill analytical testing did not confirm the PID results. Is it possible that the composite samples did not include samples from the layers with high PID readings?*

Please provide more information on whether samples for analytical testing were collected from locations at which high PID readings had been recorded. Also, because contamination at one location could be masked by the other components of a composite sample, please indicate whether additional samples will be collected that target the discrete locations with high PID readings.

8.1 Comparison between PID and Analysis

Separate samples were collected in order to obtain the PID results and there could be some intrinsic variability. However, it is our understanding that the collected samples included materials close to the samples with high PID results.

8.2 Additional Sampling

Additional sampling will be undertaken by Transit and / or the DCT (see sections 1.1 and 1.4 above). This requirement is included within the EMP (refer clauses 4.7.2.2, and 4.7.2.4; Appendix H of the AEE), and the EMG (refer section 4.4; Appendix I of the AEE). A flow diagram is attached as Appendix 2 to this Section 92 response, which summarises the overall approach to the investigation and management of the contaminated soils on the site.

9. *It is noted in the report that the ARC exercises control over "The levels of contaminants remaining onsite." To exercise this control ARC will need to have information on the levels of contamination remaining after excavation of the tunnel.*

Please provide more information on the proposed validation testing to be carried out after excavations along the full length of the proposed alignment.

Refer to our response to Question 1 above (refer to section 1.5) where validation testing is now being proposed.

Assessment of Environmental Effects Report

10. *The report notes that "The St Marys Bay marine environment is not considered to have any significant biological or conservation values."*

Please provide more information to support this statement in the context of the project.

The statement recognises that the St Mary's Bay marine environment has been modified by the motorway construction during the 1950s and the Westhaven marina.

The only effect on the St Mary's Bay marine environment from the project is a minor increase in stormwater flow into the Westhaven Marina. As part of the project it is proposed to treat some of the stormwater from the motorway through St Mary's Bay which will result in a reduction in the contaminant discharge into the marine environment.

11. Any sediment ponds developed during construction will potentially contain chemically contaminated sediment that will need to be managed post-construction.

Please provide more information on the post-construction management of contaminated sediment trapped in sediment ponds or other sediment collection structures. If flocculent dosing is likely to be applied then further information is required on the potential effects of the dosing on chemical levels in the stormwater.

11.1 Management of Contaminated Sediment

The management of potentially or actually contaminated sediments in temporary sediment control devices is covered within the EMP (Appendix H of the AEE), which in our opinion, adequately addresses this aspect as follows:

■ Tunnel Works - clause 4.13.2.7:

"The sludge from the sediment control system will be disposed of off-site to an approved disposal area. ..."

■ Remaining (surface) works – clause 4.13.3.16:

"All material excavated from treatment ponds is to be disposed appropriately. Any excavated pond material disposed of on site shall be cleanfill only and shall be disposed of in areas that are subject to these sediment controls or otherwise removed from site and appropriately disposed. As these devices could receive runoff from contaminated areas, this is to be validated by testing."

In addition, the ARC has raised several other matters in the above questions which are addressed below.

11.2 Flocculation

Flocculation is being required by both the ARC's sediment control and contaminated sites teams (refer to section 2.4 of the section 92 response report dated 12 June 2006). However at this stage it is proposed to discharge to sewer in the first instance, and therefore flocculation may not be used (or necessary).

In the event that flocculation becomes necessary (eg if it is not possible to discharge to sewer), a flocculation methodology has been proposed (refer to the abovementioned section 92 response 12 June 2006) in accordance with ARC guidelines (*TP90 Flocculation Guidelines (Draft)*). Further, it is usual practice to undertake some benchtop trials to assess an appropriate chemical for the given site, sediments, and conditions.

In our opinion, the potential for adverse environmental effects would be limited as the discharge would be into a piped stormwater system, and the ARC flocculation dispensing unit is designed to deliver proportionally to rainfall (ie 'over dosing' in our opinion should not be a high risk).

12. *It is noted that chemical spills in the tunnel are proposed to be contained by manually operated valves.*

Please indicate whether the response time to close manual valves will be sufficient to contain a spill quickly enough?

For this situation, both manual and automated valve types have been designed for recent Transit projects, including CMJ Stage 1, and the Auckland Harbour Bridge drainage projects.

It is envisaged that the tunnel will be supervised centrally (at Auckland's Traffic Management Centre 'ATTOMS') by trained operators. The drainage sump which received spills would need level sensing that will trigger responses by the operators, or invoke predetermined actions automatically. This means it will be possible to have a graded response to incidents. The development of dangerous situations (such as from a fuel spill) will need to be monitored with a means of achieving this potentially being to fit the sump with gas sensors. These requirements are currently being developed further by Transit.

13. *The management plans at this stage of the project are generic in nature and there is little to be gained trying to finalise the plans until the results of more detailed investigations are available. There is insufficient information available on groundwater behaviour and both soil and groundwater contamination to finalise details on management and monitoring requirements.*

It may be appropriate to have a separate detailed contamination plan that would deal specifically with the contamination issues and contamination monitoring. Please comment.

An overview of the proposed environmental management framework is provided within the EMP (refer to Figure 1 of the EMP; Appendix H of the AEE). Further detail on how contaminated materials handling specifically fits into that structure is provided within Appendix 1 of this response. Additional detail is provided in Appendix 2 to this response, by way of an overview flow diagram of the investigation and testing regime for the project.

13.1 Generic Nature of the Management Plans

The proposed plans, whilst building on an industry standard, have been tailored for this particular project. In our experience (having both written and implemented these plans), these are adequate and appropriate to enable the management of environmental aspects of the project. We note that a separate Construction Environmental Management Plan (CEMP) is required, and that this is required to provide additional management and process details in respect to the contaminated materials (see also below).

13.2 Insufficient Information on Groundwater Behaviour

Groundwater management and monitoring requirements have been set out within the EMP (refer Sections 4.8 - 4.11; Appendix H of the AEE) and EMG (refer Sections 4.2 - 4.3; Appendix I of the AEE). In addition, the EMP requires the preparation of a CEMP (refer to section 3.2 of the EMP; Appendix H of the AEE).

13.3 Insufficient Information on Soil / Groundwater Contamination

Please refer to previous discussions in sections 1.1, 1.6, and 4.4. We do not consider the existing level of information to be insufficient for consenting purposes. However we note that as part of the processes moving forward, additional testing will be undertaken. This has been overviewed within the flow diagram attached as Appendix 2 to this response.

13.4 Need for Separate Plan

The EMP and EMG are intended as high level management planning documents. A CEMP is proposed and is to include aspects relating to contaminated materials management (including the retention of disposal receipts – see EMP 3.2.1.31). The EMP currently requires the CEMP to be submitted the ARC and ACC for approval (refer EMP 3.2.1.38). We would also expect a condition of consent to require significant changes to these documents to also be approved by the ARC.

In our opinion, this is an appropriate and adequate framework through which these matters can be managed. Consequently, we do not see the merit in adding an additional plan into the framework.

We do note however that changes are being proposed to both the EMP and EMG in order to incorporate methodology and process related ‘controls’ that were included in earlier documents; most notably the PEA. The revised documents are to be forwarded to the ARC under separate cover. After ARC has had the chance to consider the changes, there may be some merit in work shopping the documents with the ARC in order to align any outstanding issues.

14. *Odour could be a significant issue if areas of contamination similar to MB08 are encountered during excavation works anywhere along the project alignment.*

Please provide more information on odour management (detection and mitigation) from areas of potential soil and/or groundwater contamination.

MB08 is not located within the project works. Notwithstanding this, it is our opinion that the opportunity for offensive odours (if any) arising from the works can be ameliorated by the proposed construction methodology of the tunnel, with one option including the construction of the tunnel roof ahead of the excavation works.

In addition to this, the EMP (refer to Appendix H to the AEE) includes the following requirements:

■ General Requirements:

4.2.1.11: [The DCT shall] *“Manage the construction activities such that there shall be not adverse effects due to dust, noise or odour beyond the site boundary.”*

■ CEMP requirements:

- Complaints Register (refer EMP 3.2.1.27); and
- Emergency Response (refer EMP 3.2.1.28).

Should mitigation or a response be required, then this will be developed on an issue by issue basis. However there are standard practices that are available to mitigate odour issues. These range from:

- Managing the work face / exposed area;
- Windbreaks;
- Lime dosing; or
- Odour masking techniques.

Such practices can be incorporated within the CEMP and applied, where necessary, to manage potential odour impacts.

Chemical Treatment of Sediment Control Devices

15. *Beca have [sic] proposed the following procedures for management of contaminated stormwater that is not discharged to the sewer:*

- *sediment retention ponds in two areas to be flocculated according to TP90; and*
- *standard stormwater control devices (mainly sand filters) to be used in all other areas.*

Beca propose that the contaminated stormwater discharge will be directed to sewer where contaminated soils exceeding commercial/industrial environmental acceptance criteria are exposed in a catchment contributing to a sediment retention pond.

A conceptual layout of the proposed stormwater retention ponds and stormwater control devices has been provided in the "Indicative Erosion and Sediment Control Plan". No information has been presented on the testing and monitoring that would need to be carried out to ensure that contaminated stormwater was not discharged to the stormwater system.

Please provide further information on:

- a) Proposed testing of exposed soil in the catchments of the two stormwater retention ponds throughout the construction period;*
- b) Trial results to demonstrate that the proposed flocculation is likely to reduce stormwater contamination levels sufficiently to allow discharge to the stormwater system;*
- c) Trial results to show that the proposed sediment control devices (sand filters) is likely to reduce stormwater contamination levels sufficiently to allow discharge to the stormwater system; and*
- d) Proposed chemical monitoring that will be carried out during the construction period to demonstrate that contaminated stormwater is not discharged from the stormwater retention ponds and control devices.*

15.1 Sediment Control versus stormwater treatment

We note that the above are two separate issues. Sediment control relates to construction, where as stormwater treatment to the long term discharge of stormwater from the site. There are differing design and statutory requirements relating to each.

We understand from further discussion with the ARC that this question relates only to construction (sediment control) ponds, and has been answered accordingly.

15.2 Direction of discharges

After further discussion with the ARC, the previously proposed new EMP requirement 4.13.3.2⁸ (refer to section 2.4 of the section 92 response report dated 12 June 2006), will be amended to read as follows:

4.13.3.4 *Should soils within areas 2 and 3 (as defined in the Assessment of Contamination Report. Beca, 2006) be exposed within the catchment contributing to a temporary sediment retention pond, then the discharge shall be directed to sewer until the materials have been removed, or the site is otherwise stabilised, or it can be demonstrated that the materials exposed are able to be classified as 'cleanfill'.*

In our opinion, this should address any concerns regarding the 'use' of the industrial land use criteria and the need for additional sampling. No testing of discharges or soils is therefore proposed or considered to be required (other than what may be required by WaterCare, which is a separate matter).

15.3 Efficiency of flocculation (Question b)).

Refer to Question 11 above. Please also note that the flocculation efficiency will depend on a number of factors including sediment loading / characteristics, chemistry, pond size, attenuation time, etc. We have therefore suggested a pilot trial be undertaken (and a clause will be added to the EMP to this effect) to ascertain an appropriate chemical for this particular site:

4.13.1.5 *In the event that discharges from temporary sediment controls (ie during construction) are unable to be discharged to sewer, then prior to construction commencing, the DCT shall undertake bench trials to determine an appropriate flocculant and dosage.*

Several different chemicals may eventually be used (eg the tunnel may require a different system from the 'at grade' ponds). Also as noted in response to question 11 above, the efficiency will be affected by a number of factors. Furthermore, the discharge may not necessarily achieve the ANZECC water quality standards, and we do not consider these to be appropriate in any event (refer to the Transit appeal on the PARP:ALW). We therefore suggest the use of flocculation to be a Best Practicable Option (BPO) type approach, the efficiency of which will be the result of the a number of constraints (see above).

⁸ Note sequential numbering change.

In discussions, the ARC contaminated land team has indicated that changes to pond designs may be required, such as attenuation. We note that this could require liaison with the ARC sediment control team and changes to the EMP (which reflect TP90, particularly with respect to pond size and discharge rates). This is however only relevant in the event that discharges to sewer are not possible. Consequently it is considered appropriate to review and if appropriate revise the EMP once the construction discharge location and the results of the flocculation trials are known.

15.4 Efficiency of Long Term Stormwater Devices (Question c)).

In our opinion, this is not considered to be relevant to contamination aspects as, other than 'negligible' discharges of groundwater within the tunnel (see section 19.2, below), there should be no discharges of contaminated groundwater to the long term stormwater system.

15.5 Chemical Monitoring During Construction (Question d)).

This matter is linked closely to the points set out in respect of question b), above, but we note only applies in the instance that discharges to sewer would not be possible⁹.

In our opinion, it is not practicable or appropriate to meet ANZECC water quality criteria, a flocculation system will be designed, but will always operate within the efficacy of the underlying chemistry and physical constraints (site and sediment characteristics etc).

Provided a pilot trial is established, there is little merit in undertaking monitoring of pond discharges during construction as there is no means of establishing 'compliance'.

The EMP (refer to Appendix H of the AEE) and EMG (refer to Appendix I of the AEE) do however propose 'monitoring' by way of field observation and auditing against the management plans with the aim of improving site performance, source controls, and construction 'wear and tear' on controls. In our experience, this is the most effective means of improving discharge outcomes in the first instance.

16. Details of Diversion, Take and Re-injection of Groundwater

Beca have [sic] provided further information on likely inflow rates to the tunnel excavation and conceptual details of an artificial groundwater recharge system. The discussion of inflow rates to the tunnel excavation refers to the construction period but not to any post-construction tunnel drainage and how the post-construction drainage would be managed. It is likely that any post-construction drainage would be contaminated and consideration needs to be given to the on-going management of contaminated drainage.

⁹ It is important to note that there will be limitations on the storm size of discharges being managed under any system. Larger events may pass through treatment systems, but the devices themselves will not be operating under optimal conditions. Similarly any discharge to sewer may also be limited in storm events.

The information provided on the artificial groundwater recharge system refers to options for recharging either with potable water or with drainage collected in the tunnel. Any recharge from shallow trenches has the potential to mobilize contamination in reclamation fill and to transport the contamination to groundwater. Recharging the system with drainage collected in the tunnel has the additional issue that contaminated drainage would be discharged to groundwater.

To date, no information has been received on the potential for the tunnel to divert contaminated groundwater to deeper levels or in directions where groundwater is not currently contaminated.

Please provide further information on:

- a) Potential post-construction tunnel drainage volumes and quality and options for on-going management of potentially contaminated drainage;*
- b) The potential mobilization of contamination in reclamation fill by water recharged in shallow trenches including details of the spatial extent of the effects of recharged water on groundwater quality;*
- c) The effects of recharging contaminated tunnel drainage on groundwater quality including details of the spatial extent of the effects on groundwater quality; and*
- d) The effects of the tunnel, during and post-construction, on the diversion of contaminated groundwater to deeper levels and/or into areas where groundwater is not currently contaminated. This would include consideration of the potential for saline intrusion if groundwater drawdown occurs during the tunnel construction period.*

16.1 Post - Construction drainage volumes (Question a)).

In our opinion post-construction volumes are expected to be very small and result from leakage at secant pile/diaphragm wall construction joints . Post-construction grouting/sealing of construction joints would be carried out to limit this inflow but we may allow for say 1m³/day, or limit design to require no more than 1m³/day. The AEE (refer section 7.1.3.d of the AEE as well as Appendix B to the AEE (Hydrogeological and Engineering Issues Report, Section 10.1)), previously described likelihood of post-construction leakage and requirements for the collection, treatment and disposal (probably to sewer), with collection details at tunnel walls presented in tunnel cross-sections drawing #C233. The current preliminary design indicates no separation of groundwater inflow and tunnel sourced water with all flow to be treated (eg through a sand filter, oil separator or similar) and pumped to sewer. Temporary discharges (or seepage) resulting in the exceedance of the storage capacity of the treatment / containment device (which will be in the order of a few cubic metres) will overflow to a holding tank sized to retain the unlikely event of a tanker spill.

16.2 Post - Construction drainage volumes (Question b)).

The current design indicates groundwater drawdown is limited and a recharge system would not be required. Modelling has not examined groundwater flow paths from surface recharge trenches, or conducted any contaminant migration modelling. As discussed with the ARC, until the systems are known, there is little merit in responding at this point. We understand that the ARC accepts this position.

16.3 Groundwater Recharge (Question c)).

As per the preceding response.

16.4 Long Term Diversion of Groundwater (Question d)).

Figure 13 of the Hydrogeological and Engineering Issues Report (refer to Appendix B of the AEE) presents modelling results of long-term groundwater flowpaths for one tunnel section and indicates flow splitting at about 5.5m depth in the Waitemata Group upstream and recombining at about 6m depth in the Waitemata Group downstream. The latter therefore provides for potential contaminant introduction to new 'clean fill' above the tunnel roof and also downstream to a depth of about 6m.

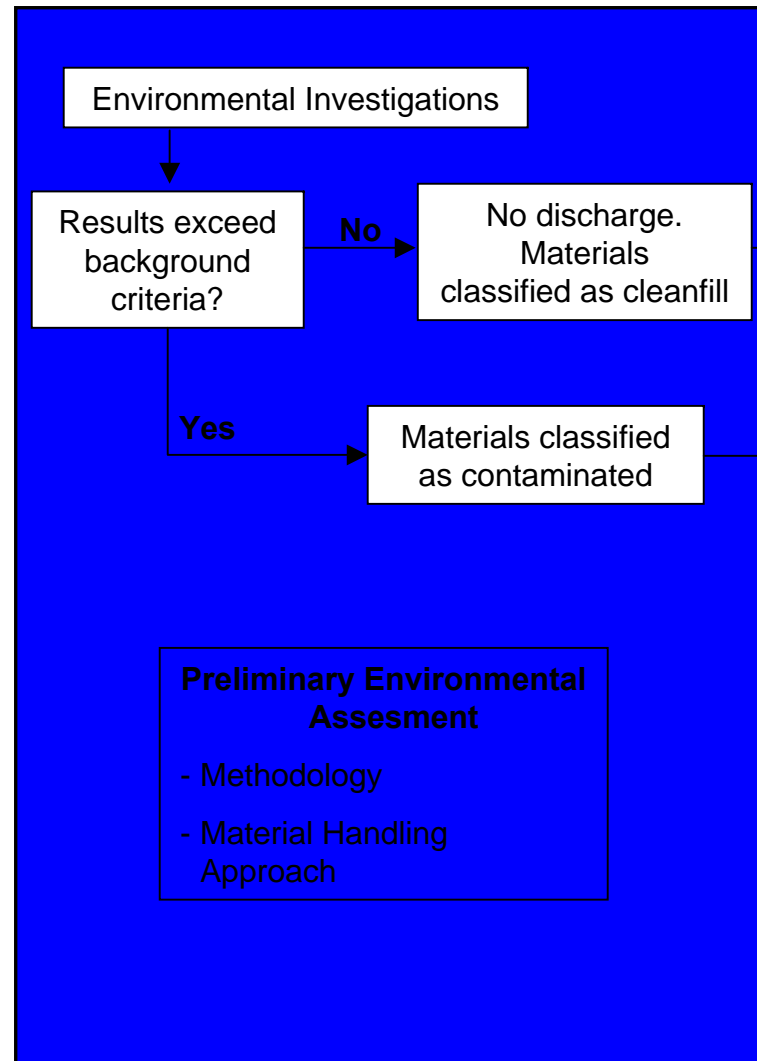
Contaminant migration to 'deeper' levels would therefore be restricted to a depth of approximately 6m based on modelling. As noted within previous documentation (eg Assessment of Contamination), it is unlikely that the contaminants found in the shallower groundwater environment will be mobile enough to migrate downwards against the natural groundwater circulation. Whilst the current effect is assessed as being 'minor', the current design incorporates by-pass drainage systems to reduce the likelihood of cross contamination and / or diversion of contaminated groundwater.

Saline intrusion during construction was addressed in the AEE (Section 7.1.1) and Appendix B of the AEE (Hydrogeological and Engineering Issues Report, Section 8.3.2). Modelling indicated limited potential at the northern portal if NO mitigation to limit groundwater drawdown was adopted. Whilst time related movements were not conducted specifically for construction of the undrained tunnel, assessment for a long term drainage condition indicated it may take a period of years for saline water to reach the tunnel. On this basis, even if drawdown resulted in a potential reversal of the groundwater gradient, the length of duration of construction drawdown is considered too short to allow development of significant intrusion of saline water.

- Appendix 1:
**Overview of
Contaminated Materials
Management within the
Overarching
Environmental
Framework**

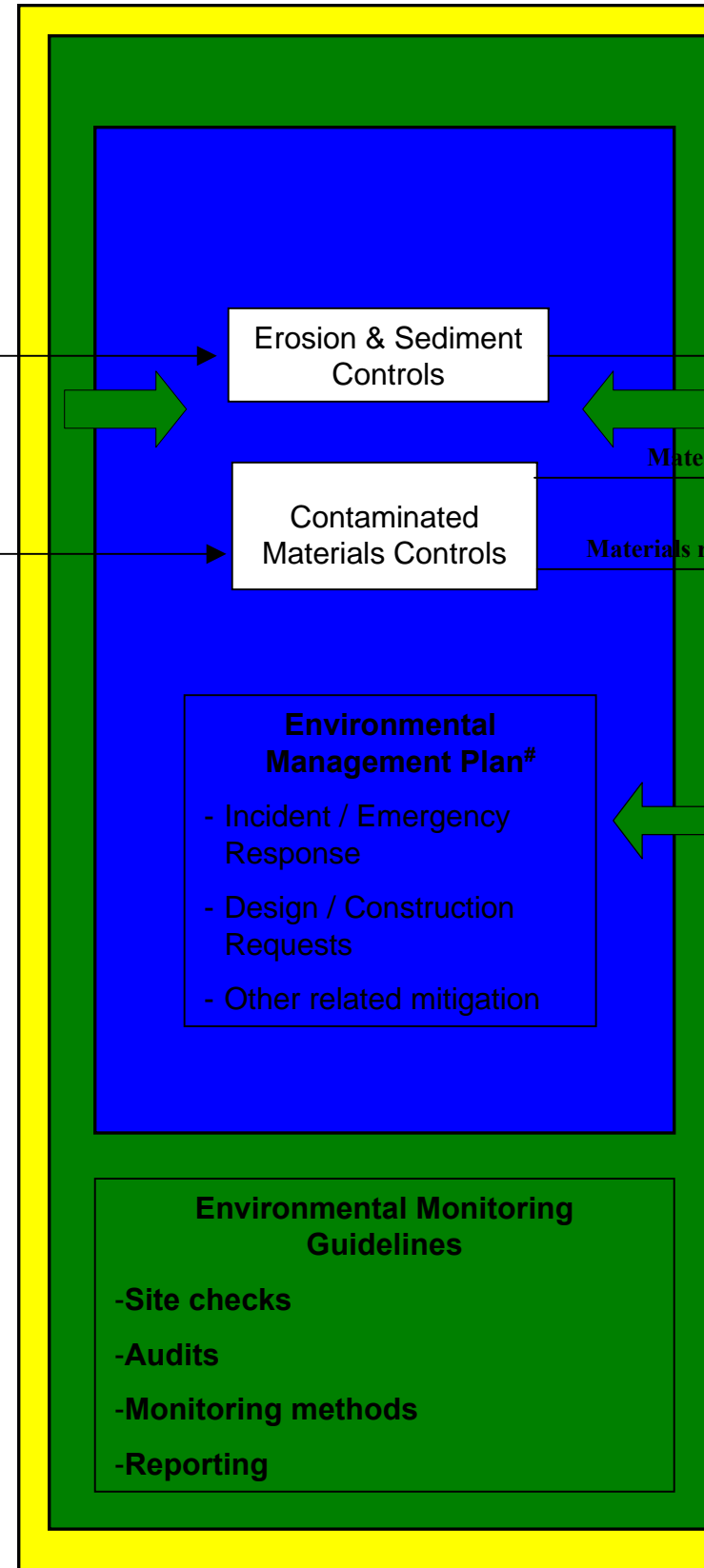
Contaminated Materials Management Framework

INVESTIGATION Transit

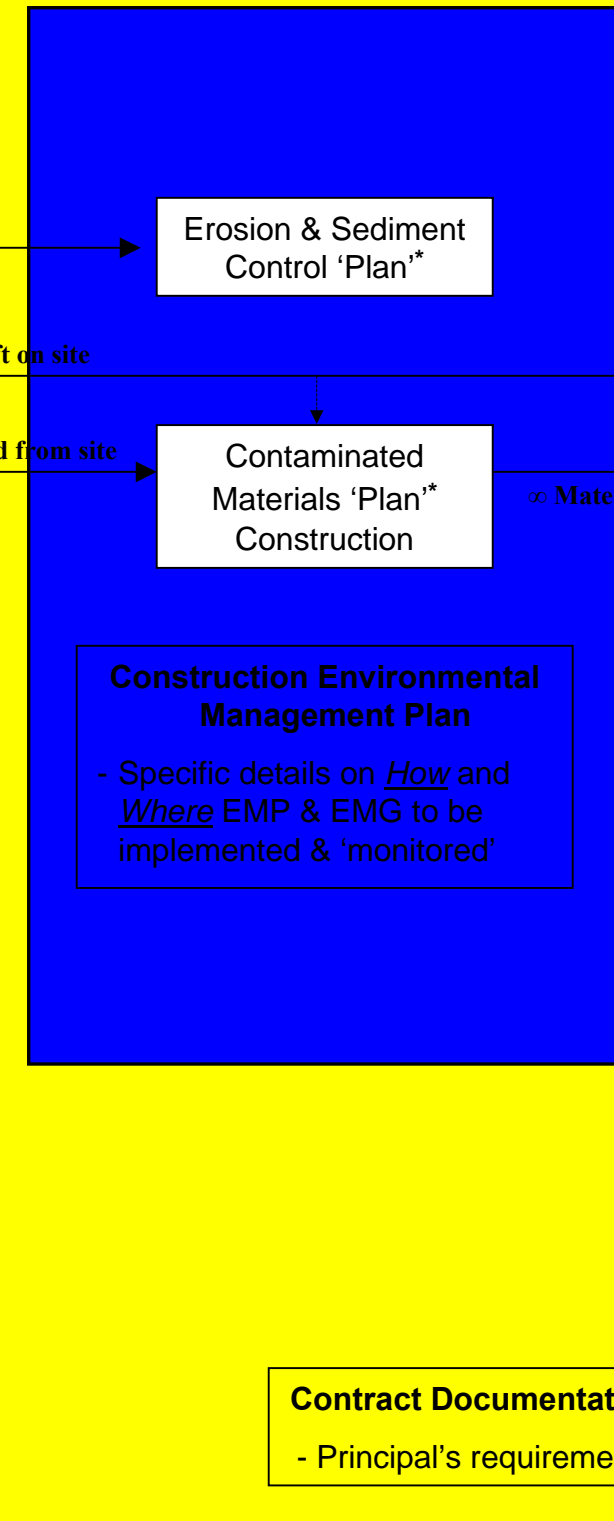


CONSTRUCTION

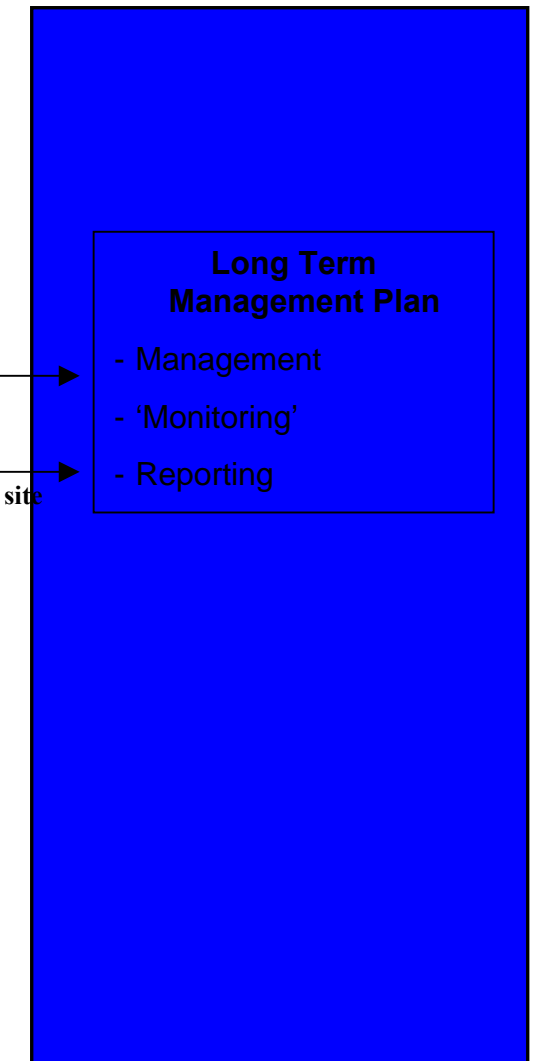
Transit



Design & Construct Team



OPERATION Transit

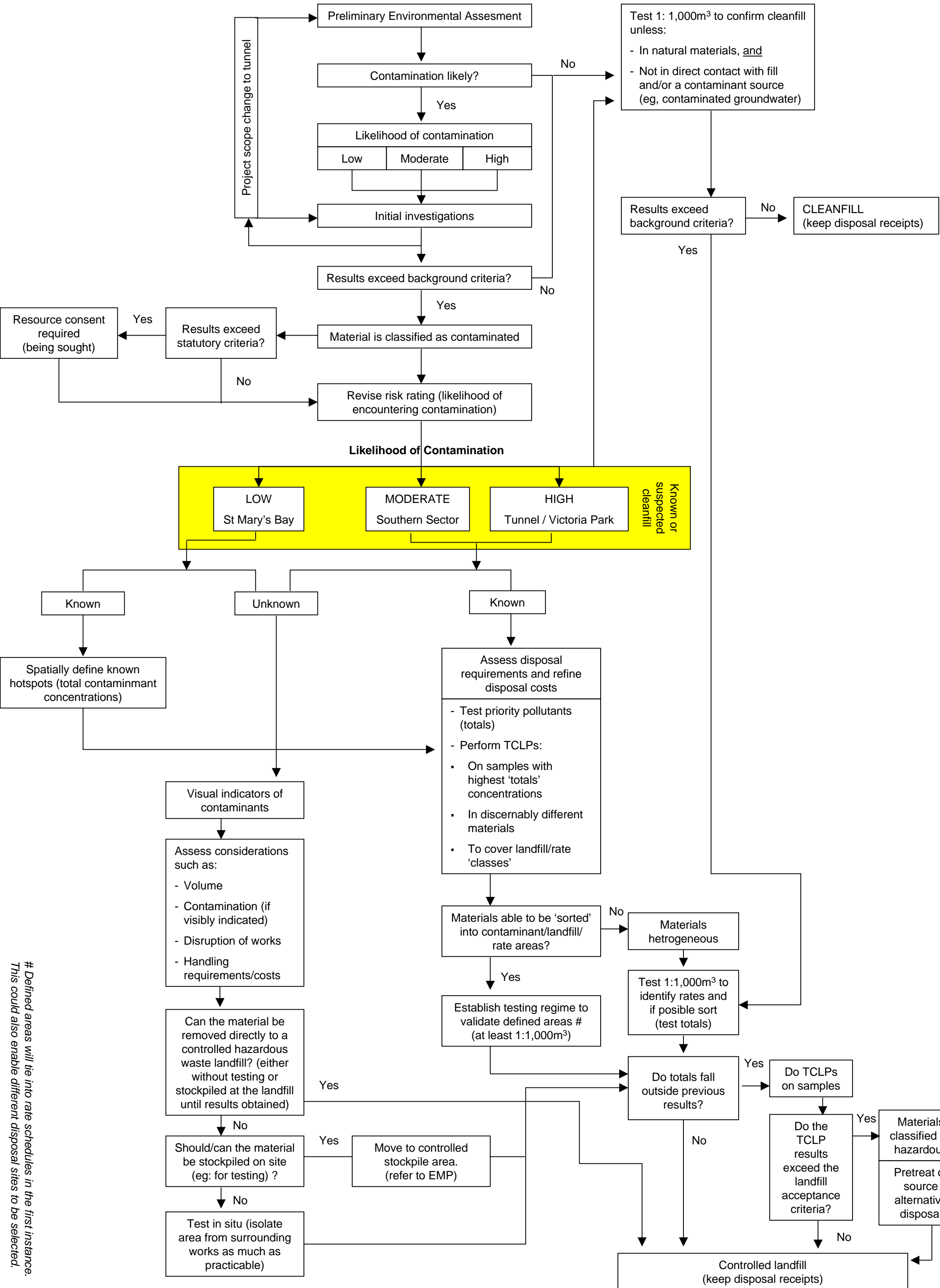


Other environmental aspects also covered by the Plan but not listed here.

* Part of the Construction Environmental Management Plan

∞ Unlikely to be part of this project

- Appendix 2:
**Overview of
Contaminated Materials
Investigation and
Handling**



Defined areas will tie into rate schedules in the first instance. This could also enable different disposal sites to be selected.