

Before the Board of Inquiry  
Waterview Connection Project

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*in the matter of:* the Resource Management Act 1991

*and*

*in the matter of:* a Board of Inquiry appointed under s 149J of the Resource Management Act 1991 to decide notices of requirement and resource consent applications by the NZ Transport Agency for the Waterview Connection Project

Statement of evidence of Terry Widdowson (Land and Groundwater Contamination) on behalf of the **NZ Transport Agency**

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Dated: 12 November 2010

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**STATEMENT OF EVIDENCE OF TERRY WIDDOWSON ON BEHALF OF  
THE NZ TRANSPORT AGENCY**

**INTRODUCTION**

- 1 My full name is Terence Widdowson.
- 2 I am a geoscientist and leader of the Contaminated Land Team at Beca Infrastructure Ltd. I have 19 years' experience in the contaminated land sector which includes site investigation and monitoring, risk assessment, contaminant hydrogeology, and soil and groundwater remediation. This experience has been gained in the UK and New Zealand working for environmental consultants and environmental regulators.
- 3 I have a Bachelor's degree in Earth Science (Geology and Geography) and a Master's degree in Applied Environmental and Engineering Geology – both obtained in the UK.
- 4 I have experience in the investigation and assessment of a wide range of contaminated sites. I have supervised numerous investigations to assess resource (discharge) consent requirements. I have also been involved in Environment Court mediation. I have worked on the SH20 element of the Waterview Connection Project for three years. Other roading projects I have been involved in are:
  - 4.1 Christchurch Southern Motorway;
  - 4.2 Tauranga Eastern Link;
  - 4.3 Hairini Link (Tauranga);
  - 4.4 Mackays to Peka Peka (Kapiti Coast);
  - 4.5 Manukau Harbour Crossing;
  - 4.6 Victoria Park Tunnel;
  - 4.7 Additional Waitemata Harbour Crossing.
- 5 My evidence is given in support of notices of requirement and applications for resource consents lodged with the Environmental Protection Authority (*EPA*) by the NZ Transport Agency (*NZTA*) on 20 August 2010 in relation to the Waterview Connection Project (*Project*). The Project comprises works previously investigated and developed as two separate projects, being:
  - 5.1 The State Highway 16 (*SH16*) Causeway Project; and
  - 5.2 The State Highway 20 (*SH20*) Waterview Connection Project.

- 6 I am familiar with the area that the Project covers, and the State highway and roading network in the vicinity of the Project.
- 7 I have read the Code of Conduct for Expert Witnesses as contained in the Environment Court Consolidated Practice Note (2006), and agree to comply with it. In preparing my evidence, I have not omitted to consider material facts known to me that might alter or detract from my opinions expressed.

### **SCOPE OF EVIDENCE**

- 8 My evidence will deal with the following:
- 8.1 Executive summary;
  - 8.2 Background and role;
  - 8.3 Summary of assessment of Land and Groundwater Contamination effects;
  - 8.4 Post-lodgement events;
  - 8.5 Comments on submissions; and
  - 8.6 Proposed land and groundwater contamination conditions.

### **EXECUTIVE SUMMARY**

- 9 This evidence relates to the assessment of land and groundwater contamination for the Waterview Connection Project. The assessment has established the baseline quality of soils and groundwater within the construction footprint of the Project (Sectors 1 to 9). Environmental effects (human health risk and resource consent requirements) have also been assessed.
- 10 Land contamination above Permitted Activity criteria triggers the requirement for resource (discharge) consent in Sectors 2 to 6 and 9. Human health criteria are exceeded in Sectors 1, 5 and 6. Fill materials (construction and demolition waste and household waste) have been identified in Sectors 5, 6, 8 and 9. Groundwater contamination above water quality criteria was identified in Sector 8.
- 11 Mitigation of effects relating to the potential discharge of soil and groundwater contaminants can be achieved via compliance with resource consent conditions (which includes excavation and disposal of contaminated soils) and adherence to the Contaminated Soils Management Plan (*CSMP*) and Contractor Health and Safety Plan.

- 12 Submissions have predominantly focused on issues relating to the content and adoption of the CSMP, settlement and groundwater drawdown effects on the landfills within the Project footprint, and leachate migration.
- 13 I consider that the issues raised within submissions are adequately addressed by the assessment of land and groundwater contamination and the associated CSMP. Conditions of consent have been proposed which provide appropriate environmental monitoring to verify that mitigation measures are being effective.

### **BACKGROUND AND ROLE**

- 14 The NZTA retained Beca as consultants to assist with the engineering and planning of the Project and to prepare the assessment of land and groundwater contamination. Ms Emily Sadlier and Ms Genevieve Smith, Environmental Scientists of Beca, prepared an Assessment of Land and Groundwater Contamination Report (*Report*). As Beca's Contaminated Land Team Leader, I reviewed and had input on the Report.
- 15 The Report was lodged with the EPA in August 2010 as part of the overall Assessment of Environmental Effects (*AEE*) (specifically, Part G, Report No. G.9, Volumes 1 and 2).

### **SUMMARY OF ASSESSMENT OF LAND AND GROUNDWATER CONTAMINATION EFFECTS**

- 16 In this section of my evidence I will outline the methodology used in the assessment and describe the key points of the Report.

#### **Methodology<sup>1</sup>**

- 17 The purpose of the contamination assessment was to establish the baseline quality of both soil and groundwater within the construction footprint of the Project and to determine the likely environmental effects of the Project. This involved the assessment of: soil and groundwater contamination, human health risk, and resource consent requirements. In addition, a preliminary soil classification exercise was carried out to assess soil re-use or disposal options.
- 18 Criteria were adopted for the assessment of resource consent requirements, groundwater quality, and human health risks. In the Auckland region, discharge of contaminants is controlled by the Auckland Regional Council Proposed Auckland Regional Plan: Air, Land and Water (*ALWP*). For groundwater quality assessment, the Ministry for the Environment (*MfE*) hierarchy of guidelines were used. For human health risk assessment, Auckland City Council soil screening criteria were used.

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<sup>1</sup> See pages 1-4 and 17 of Report G.9, Volume 1 (*AEE*, Part G).

- 19 Intrusive investigations were carried out across the Project footprint (an investigation location plan is attached as **Annexure A**<sup>2</sup>). These investigations utilised a wide range of drilling/excavation methods and field sampling/testing techniques. The intrusive contamination investigations for the whole Project comprised the excavation of test pits, the drilling of boreholes and the completion of auger holes. In addition, samples of soil and groundwater were collected for chemical laboratory analysis. Field testing of groundwater and monitoring of landfill gas was also carried out. Intrusive investigations and sampling were carried out in general accordance with *Contaminated Land Management Guidelines No.5 – Site Investigation and Analysis of Soils*, MfE, 2004.
- 20 The alignment of the cut and cover tunnel in Sector 7 was not investigated as this mainly coincides with Great North Road. Intrusive investigation along this section would have caused significant disruption on this very busy commuter route. However, soil and groundwater investigations in Sector 7 will be carried out prior to construction works commencing.<sup>3</sup>

#### **Conclusions in my assessment<sup>4</sup>**

- 21 The proposed works associated with the Project will involve land disturbance within Sectors 1 to 7 and 9. Permitted Activity criteria for soils have been exceeded in Sectors 2 to 6 and 9 thereby triggering the requirement for resource (discharge) consent under Rule 5.5.44 of the ALWP.
- 22 Human health assessment criteria have been exceeded in Sectors 1, 5 and 6. Notwithstanding the exceedance of human health assessment criteria, the human health risks from contaminated soils can be mitigated by adherence to a Contaminated Soils Management Plan (*CSMP*) and Contractor Health and Safety Plan (*CHSP*). This will control the off site migration of identified and any, as yet, unidentified contaminants and minimise the exposure of construction workers to actually or potentially contaminated soils.
- 23 Fill materials comprising construction and demolition waste (bricks, concrete, metal, plastic, glass, timber, wire, asbestos etc) and household waste were identified in Sectors 5, 6, 8 and 9 (the areas of waste identified in Sectors 8 and 9 are shown on the plans attached as **Annexure B**<sup>5</sup>).

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<sup>2</sup> Contamination Assessment Location Plan, sourced from Technical Report G.9, Appendix D.

<sup>3</sup> See proposed consent condition CL.2.

<sup>4</sup> See pages 1-4 and 89-93 of Report G.9, Volume 1 (AEE, Part G).

<sup>5</sup> Figures 32 and 33, Areas of Potentially Hazardous Materials, sourced from Technical Report G.9, Appendix P.

- 24 The preliminary soil classification exercise is an indicative assessment (for disposal or re-use purposes) of the type and extent of soil/fill in the categories of cleanfill, managed fill or contaminated fill. It is acknowledged that this classification will require refinement prior to the main construction works commencing and this is addressed in the CSMP<sup>6</sup> and in proposed consent conditions<sup>7</sup>.
- 25 The groundwater investigations comprised the assessment of:
- 25.1 Waitemata Group Aquifer baseline water quality;
  - 25.2 Presence and quality of groundwater and leachate within Phyllis Street and Harbutt Reserves;
  - 25.3 Incidental perched groundwater quality where encountered.
- 26 Only groundwater within Phyllis Street and Harbutt Reserves contained contaminants in excess of their water quality criteria.
- 27 Contaminated discharges from Phyllis Street Reserve to surrounding land and water are currently consented by the Auckland Regional Council. However, as there is no proposed disturbance of the landfill, it is considered that the Project will have no measurable impact on the existing contamination or the conditions of the associated resource consent held by the Auckland City Council. Therefore resource consent will not be required in relation to any Project activities in the vicinity of Phyllis Street Reserve.
- 28 The discharges in Harbutt Reserve would also require consent under Rule 5.5.43 of the ALWP. However, as there is no proposed disturbance of the landfill, it is considered that the Project will have no measurable impact on existing contaminants or discharges within Harbutt Reserve. Therefore resource consent will not be required in relation to any Project activities in the vicinity of Harbutt Street Reserve.
- 29 During tunnel construction, shotcrete will be used to seal the tunnel walls. The shotcrete is likely to raise the pH of groundwater coming into contact with it.

### **Mitigation**

- 30 The assessment has identified contaminated soils and potentially hazardous materials within the Project footprint. However, these occur in relatively localised areas.<sup>8</sup> The environmental effects of the Project relate to the potential discharge of soil and groundwater contaminants during earthworks and construction worker exposure

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<sup>6</sup> See Section 4 of the CSMP.

<sup>7</sup> See proposed conditions CL.1(c), CL.3 and CL.4.

<sup>8</sup> See Tables 17.1 to 17.3 on pages 90 to 93 of the Report.

to soil contaminants and potentially hazardous materials. These effects can be mitigated by compliance with resource consents, excavation of contaminated soils and waste materials and disposal off-site, and adherence to the CSMP<sup>9</sup> and a CHSP<sup>10</sup>. The proposed mitigation measures include:

- 30.1 Pre-construction delineation of soil contamination and waste materials.
  - 30.2 Management procedures for the excavation, stockpiling and disposal of contaminated soils and potentially hazardous materials.
  - 30.3 Procedures for identifying and managing unexpected discovery of contamination.
  - 30.4 Verification testing of excavated soils to confirm their contamination classification prior to re-use or off site disposal.
  - 30.5 Validation testing of soils that remain in situ to confirm that contamination has been adequately removed or to record the levels of any contamination not removed.
  - 30.6 Containment of excavations and stockpiles to restrict off site discharges.
  - 30.7 Surface treatment of groundwater from tunnel excavations to remove suspended solids and balance pH.<sup>11</sup>
- 31 It is considered that implementation of the proposed mitigation detailed above will render the effects of the Project less than minor.

## **POST-LODGEMENT EVENTS**

### **Addendum to the Report**

- 32 An addendum to the Report was lodged with the EPA on 15 September 2010, as Appendix 5 to the Technical Addendum Report<sup>12</sup> (*the Addendum*). The Addendum provides details of a further contamination assessment that investigated areas of the Project that were not assessed during the initial investigation as documented in the Report. These areas relate to the Jack Colvin Wetland (Sector 1) and the Oakley Creek Realignment (Sector 9). The Addendum also addresses the re-sampling and testing of soils to resolve laboratory limit of detection issues (Sectors 1, 5 and 9)

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<sup>9</sup> See Appendix O to Report G.9, Volume 2 (AEE, Part G).

<sup>10</sup> The CHSP will be produced by the contractor prior to commencement of construction works as detailed in Section 4.1 of the CSMP.

<sup>11</sup> See Technical Report G.22 (Section 6).

<sup>12</sup> See Technical Addendum Report G.31, September 2010.

and further characterisation of groundwater quality within Phyllis Street Reserve (Sector 8).

- 33 In relation to the investigation of areas not previously assessed, Permitted Activity and human health assessment criteria were not exceeded and there were no additional adverse effects beyond those identified in the Report. For the re-testing of soils, none of the samples tested contained relevant contaminants in excess of the Permitted Activity or human health criteria. The additional groundwater assessment in Phyllis Street Reserve showed contaminants in excess of their water quality criteria, but the results did not affect the conclusion from the original Report – that is, the Project will have no measurable impact on the existing contamination or the conditions of the associated resource consent held by the Auckland City Council.

#### **COMMENTS ON SUBMISSIONS**

- 34 I have read submissions lodged on the Project that raise land and groundwater contamination or related issues relevant to my area of expertise. In this section of my evidence I will address these submissions.

#### **William T H P Woods<sup>13</sup>**

- 35 Mr Woods expressed concern that leachate trapped within contaminated soil/fill could escape during construction earthworks.

- 36 Leachate has only been identified in Phyllis Street Landfill and this landfill is not being disturbed during the Project. The route of the motorway passes some 50m beneath Phyllis Street Landfill. It is possible but not likely that pockets of leachate could be encountered during earthworks within Alan Wood Reserve. Measures have been put in place as detailed in the Contaminated Soils Management Plan to contain and dispose of leachate in the event that any is encountered. In my opinion, these measures appropriately address the issue raised by Mr Woods.

#### **Auckland Regional Council (ARC)<sup>14</sup>**

- 37 The ARC's submission states that the ARC is generally satisfied with what is proposed with respect to contaminated land management for the Project, and acknowledges that the CSMP (and broader Construction Environmental Management Plan) are satisfactory mechanisms to manage the excavation, handing and disposal of contaminated soil<sup>15</sup>. The submission does however request that:

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<sup>13</sup> Submitter No. 16.

<sup>14</sup> Submitter No. 207.

<sup>15</sup> See section 4.8.1 of the ARC submission.

- 37.1 The management of soil contaminants is carried out as per the Contaminated Soils Management Plan and the Construction Environmental Management Plan.
- 37.2 The management plans are regularly updated.
- 37.3 These matters are a condition of the consent.
- 37.4 The management plans be submitted to the Auckland Council for approval.
- 37.5 Monitoring of the integrity of the Phyllis Street Landfill earth cap and groundwater contamination be the subject of consent conditions with measures in place to mitigate adverse environmental effects.
- 38 The first four points in relation to the Contaminated Soils Management Plan are incorporated in the proposed consent conditions<sup>16</sup>. In response to the ARC's concerns, a consent condition is now also proposed to include monitoring of groundwater quality within and surrounding Phyllis Street Landfill<sup>17</sup>.

**Auckland City Council (ACC)<sup>18</sup>**

- 39 The ACC's submission raises concerns associated with the migration of contaminants from landfills, leachate conditions within the landfills, the contamination of regional groundwater, the effects of dewatering on Alan Wood Reserve and the characterisation of fill materials. By way of relief, ACC requests that their concerns be addressed by various conditions as discussed below.

***Groundwater contamination***

- 40 ACC's submission seeks the further investigation of the potential for contaminants to enter the in-situ soils below landfills and to then be available for later migration within the regional groundwater. I assume that the ACC is referring to the Phyllis Street and Harbutt Reserve landfills, and to the potential for later migration during dewatering.
- 41 The soils below the landfills comprise Tauranga Group sediments and weathered Waitemata Group residual soils with a combined thickness of between 7m and 21m. Both of these geological units have low permeability compared to the overlying basalt and the underlying Waitemata Group (regional) aquifer. Under the existing steady state conditions, groundwater and leachate from the landfill will be (and has been for approximately 25 years) migrating vertically through the fill and upon reaching the low permeability

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<sup>16</sup> See proposed conditions CL.1.

<sup>17</sup> See proposed condition CL.9.

<sup>18</sup> Submitter No. 111.

soils will flow preferentially in a horizontal direction (taking the easiest flow path) discharging into Oakley Creek. There is evidence for this from historical investigations and remediation works carried out by ACC where it has been documented that leachate was 'breaking out' the sides of the landfill, along the former base of the basalt, and discharging into Oakley Creek.

- 42 It is possible that some contaminants are present in the upper centimetres of the in-situ soils below the landfills. However, the chances of contaminants being mobilised and vertically transported through 7m to 21m of low permeability soils during dewatering are considered to be low. The predicted vertical velocity of groundwater within these soils (under maximum drawdown) is 0.02 m/d, which would mean that contaminants travelling at the same velocity as the groundwater would take 650 days to reach the Waitemata Group aquifer (using the mean thickness of overlying deposits). This is conservative as it is more usual for contaminants to travel at velocities which are less than that of the groundwater due to attenuation processes such as sorption, ion exchange and degradation which effectively slow and restrict contaminant movement. The period of maximum drawdown is based on the timeframe that the tunnels will be unlined and therefore inducing the greatest drawdown. Once the tunnels are lined, groundwater levels will begin to recover. The period of drawdown beneath the landfill is expected to be very much less than 650 days as discussed in the evidence of Ann Williams. Therefore, the predicted time period needed for contaminants to migrate to the regional aquifer under maximum drawdown conditions is greater than the time period for which the drawdown conditions will be in effect. Accordingly I do not consider that the further investigation sought by the ACC is necessary.

***Phyllis Street Reserve landfill - leachate***

- 43 The ACC requests further investigation of current groundwater (leachate) conditions within the Phyllis Street Reserve landfill.
- 44 The investigation of Phyllis Street Landfill took place during the dry summer of 2009/2010, though groundwater level monitoring has been carried out monthly since February 2010. The results of groundwater level monitoring from seven boreholes screened within the landfill has consistently recorded groundwater in only two boreholes (even through the wet winter of 2010). The other boreholes have been consistently dry or have contained groundwater intermittently. This is consistent with the conceptualisation of the groundwater regime within the fill as being perched, discontinuous and ephemeral.
- 45 Monitoring of groundwater within the Phyllis Street Landfill will continue during and following completion of the Project, see proposed consent condition CL.9. Changes to the established

baseline groundwater conditions will be picked up by the monitoring. Mitigation of adverse changes is outlined in the Groundwater Management Plan.<sup>19</sup> I therefore consider that the proposed conditions and management plan adequately address the issue raised by the ACC.

***Phyllis Street Reserve Landfill - settlement***

- 46 The ACC requests further investigation of the potential effect on the Phyllis Street landfill of the predicted settlement trough, particularly the potential for greater surface infiltration, increased leachate leaks and landfill gas issues.
- 47 The effects of settlement are covered in the evidence provided by Mr Gavin Alexander. Monitoring of landfill gas is proposed<sup>20</sup> during the construction works. Whilst increased discharge of leachate is not expected (as discussed in the evidence from Ann Williams), in response to the ACC's submission monitoring of groundwater / leachate within and surrounding Phyllis Street Landfill is now proposed<sup>21</sup>.

***Alan Wood Reserve dewatering***

- 48 The ACC requests further investigation of the potential effects of dewatering on the Alan Wood Reserve fills.
- 49 This would only apply to the Southern Portal area as most of Alan Wood Reserve would contain the at grade motorway where dewatering is not required. Contaminant levels identified within Alan Wood Reserve are low and localised as described in the Report (Section 15). In addition, groundwater within the fill is discontinuous and ephemeral (with recharge predominantly from surface infiltration). The low levels of contaminants in combination with the lack of a permanent and continuous water table indicate that the potential for contaminants to be mobilised as a result of localised dewatering within Alan Wood Reserve is low. Therefore it is considered that further investigation is not required.

***Groundwater drawdowns***

- 50 The ACC requests further investigation of the potential migration of contaminants as a result of long term groundwater drawdowns adjacent to the tunnel portals and approach ramps.
- 51 Potential contamination migration associated with the Southern Portal is discussed in paragraph 49 above. The area around the Northern Portal lies within Sector 7 and this has yet to be investigated, but will be investigated prior to construction work

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<sup>19</sup> See Technical Report G.7, Appendix H.

<sup>20</sup> See proposed condition CL.10.

<sup>21</sup> See proposed condition CL.9.

commencing<sup>22</sup>. I therefore consider that potential contamination migration is appropriately addressed by the proposed conditions.

***Material testing***

- 52 The ACC requests further characterisation and testing of materials for removal from within the Alan Wood Reserve areas.
- 53 In response to the ACC's submission, this is now covered in proposed consent condition CL.3.

***Landfill references***

- 54 The ACC requests specific reference to landfills as part of mitigation measures.
- 55 This is included in the proposed consent conditions which relate to landfills.<sup>23</sup>

**PROPOSED GROUNDWATER AND CONTAMINATED LAND/DISCHARGE CONDITIONS**

- 56 In the documentation lodged with the AEE, the NZTA included a set of Proposed Consent Conditions (see Part E, Appendix E.1). This included proposed groundwater conditions and proposed contaminated land and contaminated discharges conditions which I recommend would be appropriate to attach as conditions to the resource consents sought.
- 57 Since lodgement, these proposed consent conditions have been amended in response to submissions, particularly that from the ACC. A copy of the proposed conditions is contained in **Annexure C** to my evidence (with the revisions shown clearly in underline and strikethrough).
- 58 I consider that those conditions (as amended) are appropriate.




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**Terry Widdowson**  
**November 2010**

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<sup>22</sup> See proposed condition CL.2.

<sup>23</sup> See for example proposed conditions CL.9 and CL.10.

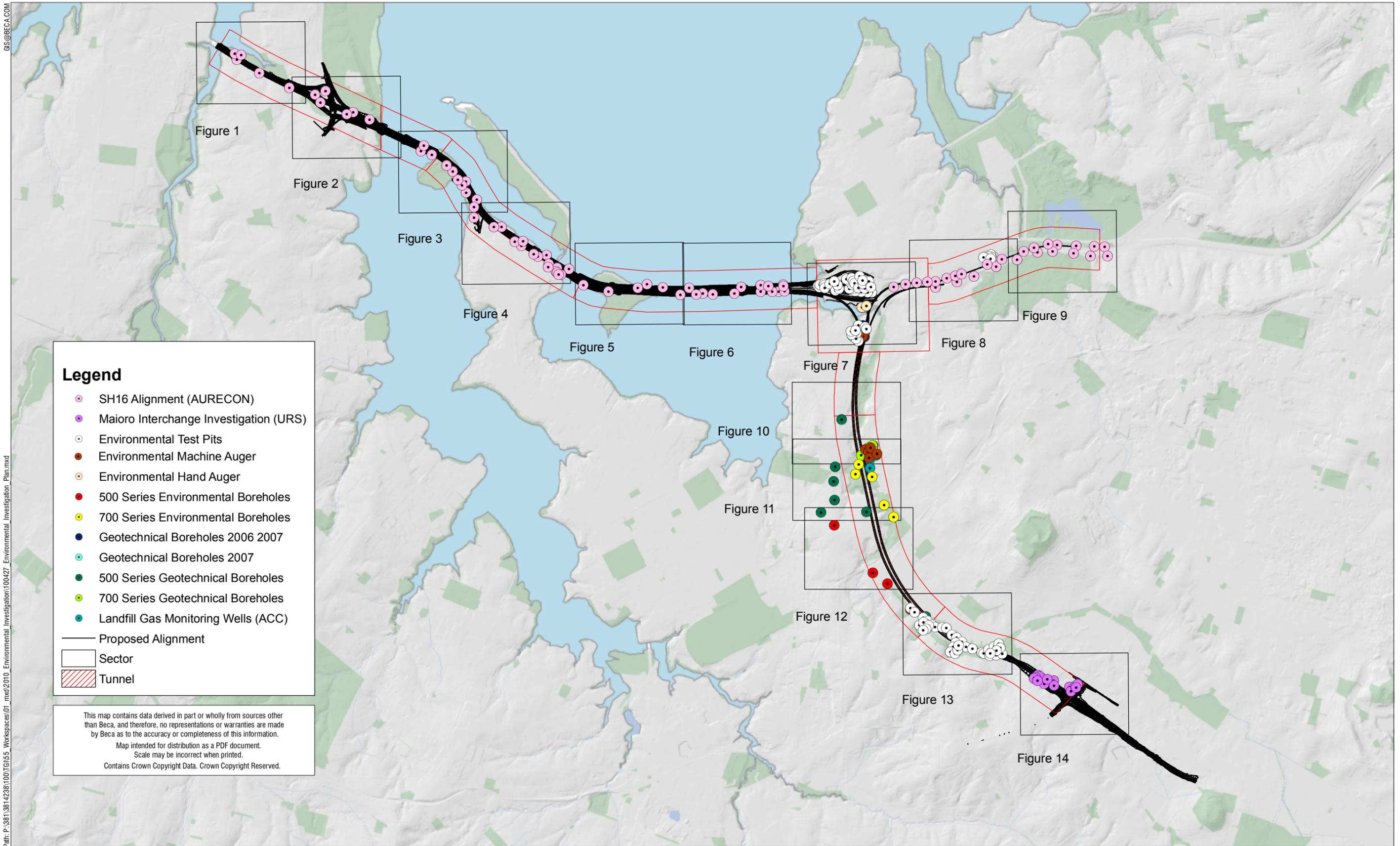
**List of Annexures:**

A – Investigation Location Plan

B – Areas of Potentially Hazardous Materials

C – Proposed Groundwater Conditions and Proposed Contaminated Land  
and Contaminated Discharges Conditions

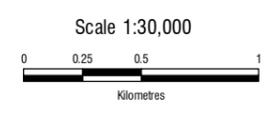
**ANNEXURE A: INVESTIGATION LOCATION PLAN**



**Legend**

- SH16 Alignment (AURECON)
- Maioiro Interchange Investigation (URS)
- Environmental Test Pits
- Environmental Machine Auger
- Environmental Hand Auger
- 500 Series Environmental Boreholes
- 700 Series Environmental Boreholes
- Geotechnical Boreholes 2006 2007
- Geotechnical Boreholes 2007
- 500 Series Geotechnical Boreholes
- 700 Series Geotechnical Boreholes
- Landfill Gas Monitoring Wells (ACC)
- Proposed Alignment
- Sector
- ▨ Tunnel

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Revision	By	Verified	Appd	Date
1	ISD	AYF	AH4	27/04/2010

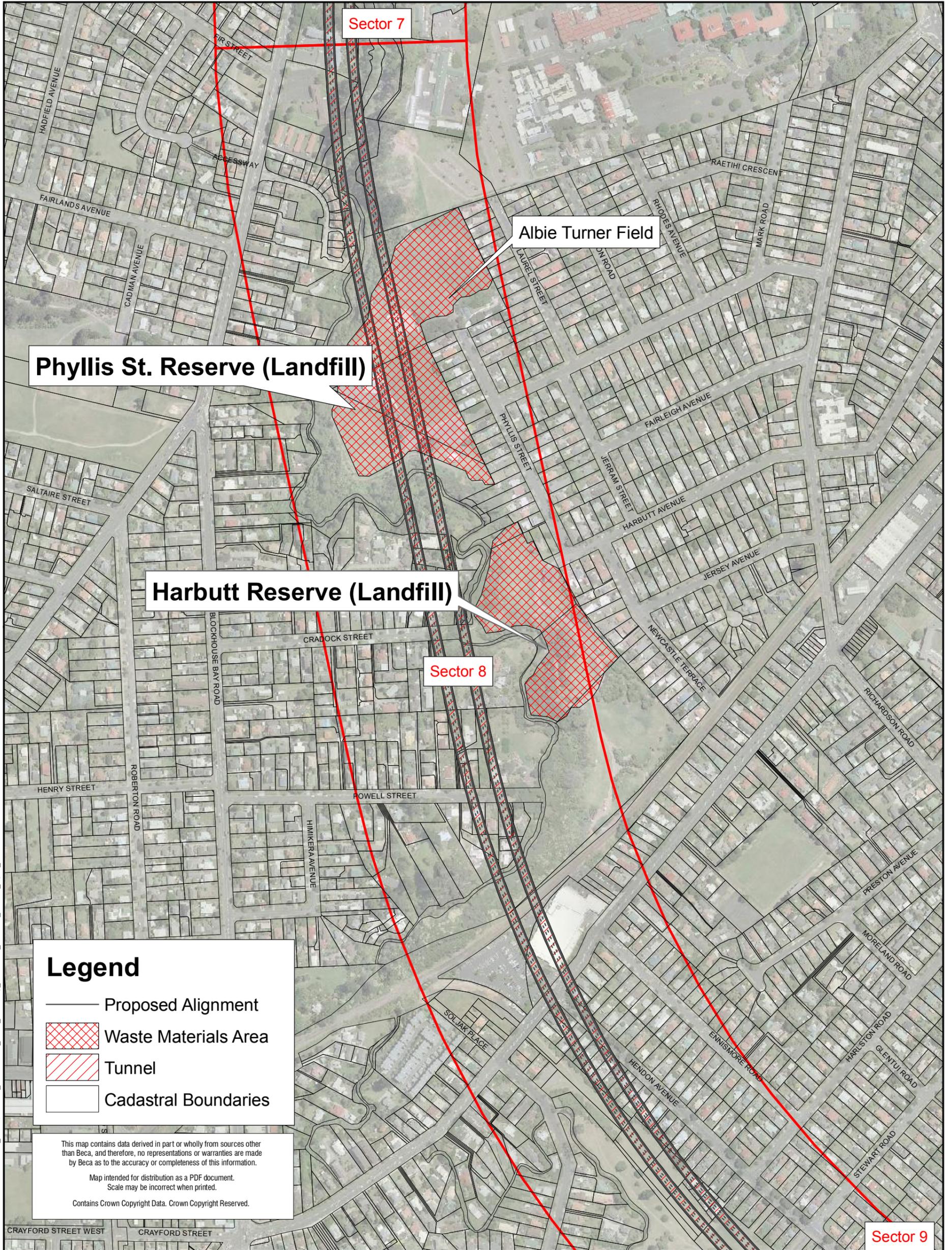
**Title:**  
**Waterview Connection**  
**Contamination Assessment Location Plan**

**Client:** NZTA  
**Project:** SH16/SH20 Waterview Connection Combined Surface Tunnel

**Discipline:** GIS  
**Drawing No:** GIS-3814238-8



**ANNEXURE B: AREAS OF POTENTIALLY HAZARDOUS MATERIALS**



**Phyllis St. Reserve (Landfill)**

**Albie Turner Field**

**Harbutt Reserve (Landfill)**

**Sector 7**

**Sector 8**

**Sector 9**

**Legend**

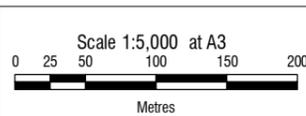
-  Proposed Alignment
-  Waste Materials Area
-  Tunnel
-  Cadastral Boundaries

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Path: P:\3814238\100\TGI\55\_Workspaces\01\_mxd\100506\_Potentially\_Hazardous\_Materials\_Sector5\_Fig32\_Rev1.mxd



Revision	By	Verified	Appd	Date
1	ISD	AYF	AH4	06/05/2010

**Waterview Connection**  
**Areas of Potentially Hazardous**  
**Materials: Sector 8 - Figure 32**

Client: NZTA  
 Project: SH16/SH20 Waterview Connection Combined Surface Tunnel



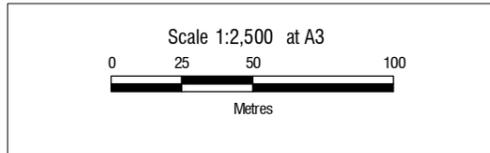
Discipline: GIS  
 Drawing No: GIS-31814238-16



**Legend**

- Proposed Alignment
- Asbestos containing materials
- Waste Materials Area
- Sectors
- Cadastral Boundaries

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Revision	By	Verified	Appd	Date
1	ISD	AYF	AH4	05/06/2010
2	ISD	AYF	AH4	05/07/2010

**Title:**  
**Waterview Connection**  
**Areas of Potentially Hazardous Materials:**  
**Sectors 8 & 9 Figure - 33**

**Client:**  
 NZTA

**Project:** SH16/SH20 Waterview Connection  
 Combined Surface Tunnel



**Discipline:**  
 GIS

**Drawing No.:**  
 GIS-3814238-8

**ANNEXURE C: PROPOSED GROUNDWATER CONDITIONS AND PROPOSED CONTAMINATED LAND AND CONTAMINATED DISCHARGES CONDITIONS (AMENDED)<sup>24</sup>**

**Proposed Groundwater Conditions**

G.1	<p>The NZTA shall finalise, and implement through the CEMP, the Groundwater Management Plan (GWMP), submitted with this application and provide it to the [Auckland Council] prior to commencement of tunnelling. The GWMP shall include, but not be limited to:</p> <ul style="list-style-type: none"> <li>(a) The location of the groundwater monitoring bores;</li> <li>(b) The location of the continuous monitoring stations on Oakley Creek;</li> <li>(c) The methods and frequency for groundwater monitoring;</li> <li>(d) The groundwater trigger levels;</li> <li>(e) Procedures to follow in the event of trigger levels being exceeded;</li> <li>(f) Reporting requirements;</li> </ul>
G.2	<p>The NZTA shall install and maintain the groundwater monitoring boreholes shown in Appendix A of the GWMP, for the period of monitoring specified in this Consent.</p>
G.3	<p>The NZTA shall monitor groundwater levels in the groundwater monitoring boreholes shown in Appendix A of the GWMP and keep records of the water level measurement and corresponding date in accordance with the GWMP. These records shall be compiled and submitted to the [Auckland Council] at three monthly intervals.</p>
G.4	<p>The NZTA shall monitor groundwater levels monthly in existing boreholes and in newly installed monitoring boreholes shown in Appendix A of the GWMP (required as part of this consent, as far as practicable) for a period of at least 12 months before the commencement of tunnelling. The variability in groundwater levels over this period, together with the monitoring trends obtained during the investigation and detailed design phases, will be used to establish seasonal groundwater level variability and establish trigger levels.</p>
G.5	<p>Prior to the commencement of tunnelling, and then at 3 monthly intervals while tunnelling, the NZTA shall review the results of monitoring as compared with expected effects on groundwater levels due to tunnelling. This review will consider the final tunnel alignment construction methodology and progress at the time of the review.</p> <p>The output of the first review shall be used to define the expected range of groundwater levels at each borehole during tunnelling activities and check the potential for damage to structures due to ground settlement. A factor for natural seasonal variability shall be allowed for in this review based on the monitoring completed under Condition G.4.</p>
G.6	<p>From commencement of tunnelling, the NZTA shall monitor groundwater levels in each borehole at a minimum of monthly intervals and records shall be kept of each monitoring date and the corresponding water level in each borehole. In addition, all boreholes located within 100 metres of the tunnel excavation face shall be monitored for groundwater level at least twice weekly. These records shall be compiled and submitted to the [Auckland Council] at three monthly intervals.</p>

<sup>24</sup> Contained in Appendix E.1, pages 44-49, with revisions shown in underlining and strikethrough.

### Proposed Groundwater Conditions

G.7	<p>All monitoring data obtained pursuant to Condition G.6 shall be compared to the predicted groundwater levels for each borehole. Where groundwater levels are exceeded the appropriate actions as set out in the GWMP shall be undertaken and the [Auckland Council] shall be notified, forthwith, advising of the exceedance, the risk of settlement that might cause damage to structures or adverse effects in Oakley Creek, and details of the actions undertaken.</p>
G.8	<p>The NZTA shall continue to monitor groundwater levels in each borehole at monthly intervals for a period of up to 12 months following completion of tunnelling, then 3 monthly thereafter for a further 24 months, or for a lesser period if groundwater levels in any particular borehole show either:</p> <ul style="list-style-type: none"> <li>(a) Recovery of the groundwater level to within 2 metres of the pre-tunnelling groundwater level as recorded in accordance with Condition G.5; or,</li> <li>(b) A trend of increasing groundwater level in at least 3 consecutive monthly measurements; or,</li> <li>(c) An equilibrium in the groundwater level, allowing for the seasonal variation, has been reached,</li> </ul> <p>In which case monitoring at that borehole may cease, subject to the written approval of the [Auckland Council].</p>
G.9	<p>The NZTA shall establish continuous flow monitoring stations at the following approximate locations within Oakley Creek:</p> <ul style="list-style-type: none"> <li>(a) Chainage 1900 (Waterview Connection Operational Plan, Drawing No: 20.1.11-3-D-C-910-117);</li> <li>(b) Chainage 2550 (Waterview Connection Operational Plan, Drawing No: 20.1.11-3-D-C-910-116);</li> <li>(c) Chainage 3500 (Waterview Connection Operational Plan, Drawing No: 20.1.11-3-D-C-910-114);</li> <li>(d) Between Chainage 3800 to 4200 ((Waterview Connection Operational Plan, Drawing No: 20.1.11-3-D-C-910-113).</li> </ul> <p>The NZTA shall continue to monitor the flow monitoring station installed at CH2900 (Waterview Connection Operational Plan, Drawing No: 20.1.11-3-D-C-910-116).</p> <p>The exact location of the gauges shall be determined based on stream bed conditions such that they record the full range of flows, with the locations detailed in the GWMP.</p>
G.10	<p>The continuous monitoring required by Condition G.9, shall record in-stream flows, at 15 minute intervals, for a period of:</p> <ul style="list-style-type: none"> <li>(a) At least 12 months prior to tunnelling commencing;</li> <li>(b) During tunnelling; and</li> <li>(c) Up to 12 months following completion of tunnelling, or a shorter period if no effects on base flows are recorded.</li> </ul>
G.11	<p>The continuous monitoring results shall be reviewed on a monthly basis to determine if there is any effect of the tunnelling on base flows in Oakley Creek. The results shall be included in the 3 monthly groundwater reports, and provided to the [Auckland Council].</p>
G.12	<p>The NZTA shall, within 10 working days of completion of tunnelling, advise the Manager [Auckland Council], in writing, of the date of completion.</p>

### Proposed Contaminated Land and Contaminated Discharges Conditions

CL.1	<p>The NZTA shall finalise and implement through the CEMP, the Contaminated Soil Management Plan (CSMP) submitted with this application. The CSMP shall be provided to the [Auckland Council] prior to commencement of any site works. The CSMP shall include, but not be limited to:</p> <ul style="list-style-type: none"> <li>(a) Measures to be undertaken in the handling, storage and disposal of all material excavated during the construction works;</li> <li>(b) Soil validation testing and groundwater testing;</li> <li>(c) Soil verification testing to be undertaken to determine the nature of the excavated spoil and potential reuse or disposal options;</li> <li>(d) Measures to be undertaken in the event of unexpected contamination being identified during construction activities; and</li> <li>(e) Measures to be undertaken for the handling of asbestos containing material.</li> </ul>
CL.2	<p>Prior to the main construction works commencing, the baseline quality of soils and groundwater within Sector 7 (particularly in relation to works in the vicinity of Great North Road) shall be investigated and established. The investigations shall be carried out in accordance with appropriate MfE and Auckland Council guidelines. The findings of the soil and groundwater investigations shall be used to determine any likely environmental effects in relation to the Project and the need for specific construction methods during work in this area.</p>
<u>CL.3</u>	<p><u>Prior to the main construction works commencing, soils and fill materials within Alan Wood Reserve (Sector 9) shall be further classified so as to determine the distribution and extent of cleanfill, managed fill and contaminated/hazardous fill materials.</u></p>
<del>CL.3</del> <u>CL.4</u>	<p>All excavated soil shall be tested by the NZTA in general accordance with the CSMP, prior to either reuse on site or disposal off site. The testing regime shall be submitted for approval by the [Auckland Council].</p>
<del>CL.4</del> <u>CL.5</u>	<p>The NZTA shall notify the [Auckland Council] within 5 working days of identification of any contamination at the site which was not identified in the reports submitted in support of this application, including contaminated soil, surface water or groundwater.</p>
<del>CL.5</del> <u>CL.6</u>	<p>The NZTA shall remove contaminated soil and remove and dispose of any contaminated groundwater/surface water from the site in accordance with the CSMP.</p>
<del>CL.6</del> <u>CL.7</u>	<p>The NZTA shall engage a suitably qualified contaminated land specialist to supervise the works, excavation and removal of any contaminated soils from the site and undertake sampling (if required) of imported material.</p>
<del>CL.7</del> <u>CL.8</u>	<p>All testing / sampling techniques shall be carried out in accordance with the MfE Contaminated Land Management Guidelines or other equivalent standards approved in writing by the [Auckland Council].</p>
<del>CL.8</del> <u>CL.9</u>	<p><u>During and following the tunnel construction works beneath Sector 8, groundwater quality monitoring shall be carried out at locations within and down hydraulic gradient of Phyllis Street Landfill. Monitoring shall be undertaken on at least a monthly basis, for a period of up to 12 months following completion of the tunnelling works. The monitoring programme shall be submitted for approval by the Auckland Council as landowners.</u></p>

### Proposed Groundwater Conditions

<p><del>CL.9</del>CL.10</p>	<p><u>Prior to, during and following tunnel construction works beneath Phyllis Street Landfill (Sector 8), monitoring for landfill gas shall be carried out from existing monitoring boreholes within the landfill. Monitoring shall be undertaken on at least a monthly basis, for a period of no less than 6 months prior to, and up to 12 months following completion of the tunnelling works. The monitoring programme shall be submitted for approval by the Auckland Council as landowners.</u></p>
<p><del>CL.10</del>CL.11</p>	<p>The NZTA shall submit to the [Auckland Council], a Site Closure Report no later than three (3) months after the completion of the earthworks. The Report shall be prepared in accordance with Schedule 13 (Schedules for Reporting on Contaminated Land) of the Proposed Auckland Regional Plan: Air Land and Water and include:</p> <ul style="list-style-type: none"> <li>(a) Results of any soil reuse and imported material testing carried out to ensure compliance with the CSMP;</li> <li>(b) Volumes of soil removed from site;</li> <li>(c) Copies of the waste disposal receipts; and</li> <li>(d) Reports of any non-compliance with the CSMP procedures or complaints received while undertaking the site works.</li> </ul>