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27 May 2013

Resource Consents Department
Auckland Council
Private Bag 92300
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Attention: Graeme Michie

Dear Graeme

Central Interceptor Main Project Works
Section 92 RMA Response Report May 2013

On 8 April 2013, Auckland Council requested further information under Section 92 of the Resource Management Act 1991 (RMA). Watercare's response to that request was provided on 13 May 2013 in the report titled "***Central Interceptor Main Project Works – Section 92 Response Report to Auckland Council***" dated 13 May 2013. As noted in that report, there were some matters still requiring a response. These are addressed in this letter and the attachments.

This letter and the attachments also include further information in response to specific requests from you at recent meetings. In particular, we have attached further information on:

- The proposed access to Roma Road
- Alternative sites considered at Mount Albert War Memorial Reserve (MAWMR), Lyon Avenue, Keith Hay Park and Kiwi Esplanade
- Consultation undertaken since lodgement in mid 2012
- Information on the Mangere Wastewater Treatment Plant (WWTP) and Manukau Harbour.

Our response to the various matters raised by Auckland Council has been prepared with assistance from our technical and environmental consultants at AECOM and Tonkin & Taylor.

1. Earthworks

Attachment 2 to the Auckland Council letter of 8 April 2013 ("the Section 92 Request"), a memo from Campbell Stewart, stated:

Without a draft CMP to assess and comment on we will be left with no choice but to prepare a detailed consent condition outlining the specific details to be provided in the CMP and the specific approval process that will apply so that Auckland Council can have confidence in the

robustness of the management plan approach. This very prescriptive approach will be necessary to support a recommendation that the likely adverse effects will be no more than minor.

So in summary, either the applicant provides a draft CMP or we adopt that very prescriptive approach in the consent recommendation.

Further to our earlier response on this (refer letter dated 13 May 2013), we have discussed this item with Mr Stewart and understand that he is wishing to see some certainty in the standards that will be applied to site discharges. Accordingly, we propose that the following condition be included in the construction discharges consent:

> The standards for construction discharges to receiving environments shall be: turbidity of 50NTU and pH of 7.5.
>
> Alternative discharge quality standards for turbidity and pH may be implemented if:
>
> - A receiving environment monitoring programme is submitted to and approved by the Manager;
> - The receiving environment monitoring programme is implemented for a sufficient period of time to demonstrate that alternative standards for turbidity and pH are appropriate for the site; and
> - Written approval is provided by the Manager.

We have updated our suggested draft consent conditions (as forwarded to you on 9 May) to include this. The updated conditions for the construction discharges consent are included in **Attachment 1**.

We have also discussed with Mr Stewart his comment below:

The CTMP [Chemical Treatment Management Plan] does not meet best practice...In the absence of a satisfactory Draft CTMP consent conditions could be developed detailing the requirements and expectations of the CTMP that would meet Auckland Council's expectations.

As noted in our letter of 13 May 2013, the details of the final treatment methods for tunnel dewatering and site discharges will be developed as part of the Construction Management Plan (CMP) once detailed designs have been developed and construction methods confirmed. Subsequent to our discussion with Mr Stewart, the draft Chemical Treatment Management Plan previously provided to Auckland Council has been updated to revise the section relating to batch dosing following rainfall events. Consequent amendments have also been made to the Construction Discharges Management Plan. The updated draft Chemical Treatment Management Plan and Construction Discharges Management Plan are contained in **Attachment 2** (changes are highlighted).

2. Emergency Pressure Relief (EPR) Discharge

Our responses to Question 7 of the Section 92 Request (8 April 2013) are set out below. Auckland Council's question is quoted in full, followed by the response to each question.

7.1 Combination of Events

Please advise the combination of events that could lead to the discharge for which consent is sought. The AEE includes an estimate of the combined probabilities of events leading to the EPR activating, showing that it is unlikely to activate more than once every 50 years. Please describe the events and combination of events taken into account in estimating the probability of a discharge.

As stated in Section 5.11.5 of Part A of the August 2012 Central Interceptor Main Project Works AEE (the AEE), activation of the proposed EPR at the proposed Mangere Pump Station requires a combination of events to occur. The AEE summarises the key events that, in combination, would lead to a potential activation of the EPR. The conclusion presented in the AEE is that the "EPR is unlikely to activate more than say once in every 50 years". We expand on that analysis below.

Activation of the EPR will only occur if there is failure of the Mangere Pump Station due to power loss or mechanical failure and it is not possible to bring the pump station back into service before the tunnel is full. A number of elements have been included in the concept design of the Central Interceptor to minimise the likelihood of the EPR activating (e.g. control gates to restrict inflows to the tunnel, pump redundancy in the pump station, tunnel sizing to provide for storage) and Watercare has measures in place to ensure continuity of power supply. These items are discussed below.

- Approximately 70% of the flows into the tunnel can be controlled with inlet flow gates. If a problem occurs at the Mangere Pump Station, Watercare will have the ability to divert all but about 30% of the tributary flows away from the tunnel, either into the existing trunk sewer system or to existing overflow locations. These gates will have fail safe features which means they can be activated without power should the power loss event be wide spread. Diversion of flows from the tunnel by gate closure will reduce the rate of tunnel filling, the likelihood of EPR activation, and the magnitude of any flow at the EPR if it was to activate.

- The concept design for the proposed Mangere Pump Station includes mechanical redundancy such that if one pump fails other pumps are in place and will automatically come on line. The pump station structure will also be designed to prevent flooding of the mechanical and electrical areas. The combination of these elements minimise the likelihood of a total mechanical failure of the pump station.

- If pump station failure occurs during a 10 year storm event it would take approximately 12 hours for the storage in the tunnel to fill. The EPR would only activate once the tunnel is full. In dry weather conditions it would take closer to 48 hours for the tunnel to fill if the pump station is out of service.

- If pump station failure occurs due to power outage, Watercare has backup generator services on standby. Based on current operational performance, the time taken to return power supply to the pump station using backup generators is expected to be within four hours, minimising the likelihood of EPR activation and the magnitude of any flow at the EPR if it was to activate.

- Further, the Mangere WWTP has a dual power supply feed which will be used to provide power to the Mangere Pump Station. This greatly reduces the chance of a power supply failure, and in particular, an extended power supply failure.

Numerous factors require consideration to estimate the probability of the EPR activating. These include an assessment of the combined probability of weather conditions, power loss to the Mangere Pump Station, and the time taken to implement measures that return the pump station to service. Each of these events has an independent likelihood of occurrence, and a combination of all (i.e. large storm event, pump station power loss and delays to mobilise backup power in sufficient time) is required to activate the EPR discharge.

Probability calculations for selected scenarios that would lead to activation of the EPR are set out below. The combined probability has been assessed as being in the order of 1 in 50 years or higher. The estimate of the combined probability is on the basis of multiplying the individual independent probabilities together.

1. Combined probability of power loss to pump station plus 10-year storm event plus delays to mobilise backup power in sufficient time.

- The probability of total power loss at Mangere is estimated at 1 event per 5 years
- The probability of a 10 year storm event is 1 event in 10 years
- The probability of Watercare not being able to mobilise backup power within 12 hours is estimated 1 event per 5 years.

Therefore the combined probability of these events occurring together leading to an activation of the EPR is 1/5 X 1/10 X 1/5 = 1/250 or 1 event every 250 years (> 1 in 50 year probability).

2. Combined probability of power loss to tunnel pump station plus 1 year storm event plus delays to mobilise backup power in sufficient time:
   - The probability of total power loss at Mangere is estimated at 1 event per 5 years
   - The probability of a 1 year storm event 1 event in 1 year
   - The probability of Watercare not being able to mobilise backup power within 24 hours is estimated 1 event per 10 years.

   Therefore the combined probability of these events occurring together leading to an activation of the EPR is 1/5 X 1/1 X 1/10 = 1/50 or 1 event every 50 years (=1 in 50 year probability).

7.2 Discharges

(a) Please confirm if under any of those events and combined event scenarios, the discharges upstream in the network are different to discharge scenarios modelled for 2027 and 2062 and considered in the assessment of effects.

Under the events described above the discharges in the upstream network modelled for the 2027 and 2062 conditions are not significantly different than during normal operating conditions in larger wet weather events. The reason for this is that under normal operating conditions the inlet flow control gates to the tunnel are designed to close when the tunnel reaches the full storage capacity. This is estimated to occur approximately 6 to 8 times per average year of rain. As noted above, if activation of the EPR discharge occurs, the inlet flow control gates would also be closed and accordingly, the network discharges would be similar to those modelled under normal operating conditions.

(b) Please provide further information in relation to the effects on the environment from the emergency discharge of wastewater to the coastal marine area of the Manukau Harbour in the event the discharge does occur. In particular:

(i) Please provide a targeted assessment of effects of the potential discharge from the proposed EPR structure with particular regard to with regard to effects on public health, recreational use areas, ecological values and on any areas with identified cultural values. As an example, a risk assessment based on likely consequences of the discharge on the environment and identifying short, medium and any long term risks to any of the identified values can satisfy this requirement.

Response to this question is set out in two parts:

- The first part addresses the range of factors which determine the extent of any potential environmental effects; and

- The second part sets out a qualitative risk assessment of potential short, medium and long term effects of an EPR discharge on public health / recreational, ecological and cultural values.

Factors to consider in assessment of potential environmental effects

In the unlikely event that a discharge from the EPR structure occurs, the potential extent of any environmental effect will be determined by a range of factors, as summarised below:

- **The quality of the discharge** – discharge at the EPR structure will effectively comprise very dilute wastewater, mixed with a high proportion of stormwater. Organic, nutrient and microbiological pathogen and virus levels would all be similar to levels in the diluted wastewater overflows currently experienced in the urban streams within the Central Interceptor catchment area. It is highly unlikely that the discharge would comprise less dilute or raw wastewater as there are many hours of storage available in the tunnel under dry weather flow conditions. Design of the EPR would likely include some provision for coarse debris screening.

- **The duration of any discharge** – this would be determined by the rate of inflow and the time taken to repair and return the Mangere Pump Station to service. A worst case scenario would be a combination of an extreme storm event (e.g. a 10 year storm) coinciding with the pump station being out of service for the duration of the storm. In this scenario, discharge could occur for several hours after the tunnel has filled. In less intense storm events the duration of discharge would be shorter. Ultimately, the duration of discharge would be determined by the rate of inflow to the tunnel and the time taken to return the pump station to service.

- **The rate of discharge** – the same range of factors affecting the duration of any potential discharge will also determine the rate of discharge. Any discharge occurring following the combination of an extreme storm event and pump station outage would be at a higher rate than discharge in a less extreme storm. Any discharge from the EPR structure would display an initial peak rate of discharge, which would then subside, reflecting the restriction of inflows to the tunnel. In extreme conditions the maximum rate of discharge could occur at a rate of some 10 – 20 m3/s. As previously noted, the likelihood of this occurring is very low.

- **Dilution and dispersion conditions in the receiving environment** – the primary determinant for discharge dilution and dispersion in the harbour will be tidal conditions. The EPR discharge will occur at the coastal margin adjacent to the Mangere Pump Station. As the use of the EPR would only be in an emergency event, there would be very little ability to limit or restrict the timing of any discharge to coincide with any particular tidal conditions (refer later response to Question 7.2 b (iv)). The discharge could occur under any tidal condition.

  Watercare has previously completed studies of discharge dispersion in the Manukau Harbour for discharge from the tidal storage basin under a range of tidal conditions. Based on those previous studies, discharge from the EPR occurring during outgoing tidal conditions would see the discharge disperse in a westerly direction past Puketutu Island and into the main Purukau Channel, from where it would be transported towards the south west. Incoming tidal conditions would then disperse the discharge back up the harbour in the Purukau Channel and the Wairopa Channel towards and onto the Hillsborough coast, impinging on the shoreline from about Cape Horn and the series of bays and beaches to the east (Waikowhai, Faulkner Bay, Granny's Bay, and Hillsborough Bay). These locations are shown in Figure 1 below.

Figure 1: Manukau Harbour

Discharge occurring on the incoming tide would see dispersion restricted to the north of Puketutu Island, and the discharge water being dispersed towards the Hillsborough coast and Mangere inlet, and as the tide rises, against the Ambury shoreline also.

At low tide and for a period either side of low tide, discharge would drain across the intertidal flats until it reaches the Purukau Channel, while under high tide conditions, and for a period either side of high tide, discharge would be direct to tidal waters, but with limited additional mixing and dispersion.

Overall, until dispersed into the Purukau Channel and beyond, the discharge will see only limited dilution, but then tidal mixing will provide rapid dilution.

Receiving environment areas that could encounter the dispersing discharge will include the contact recreation and bathing beaches along the Hillsborough coast, and the areas along the shoreline of Puketutu Island and at the Nga Kuia e Toru Reef.

Potential effects

Setting aside the very low likelihood of an EPR discharge occurring (addressed in response to Question 7.1), a qualitative assessment of potential effects of the discharge is summarised in Table 1 below. The assessment takes into account the factors outlined on the previous page and considers the potential short term effects (hours), medium term effects (days) and long term effects (weeks) of an EPR discharge on public health / contact recreation values, ecological values and cultural values. A overall effect assessment has been identified for each environmental value.

Table 1: Qualitative assessment of potential environmental effects of EPR discharge

Value	Potential Discharge Effect		
	Short Term Effects (hours)	**Medium Term Effects (days)**	**Long Term Effects (weeks)**
Public health / contact recreation	Public health risk to contact recreational use of waters along shoreline from Waikowhai Bay to Hillsborough Bay. Closure of beaches and deployment of warning signage. Public health risk associated with shellfish gathering from Nga Kuia e Toru Reef. **Effect assessment: High**	Public health risk to contact recreational use significantly reduced. Monitoring implemented to assess risk and determine need for ongoing beach closures. No shellfish gathering from Nga Kuia e Toru Reef. **Effect assessment: High / Medium**	Very low residual risk associated with contact recreation. Restrictions on shellfish gathering from Nga Kuia e Toru Reef remain in place until testing confirms safe. **Effect assessment: Medium**
Ecological value	Potential for formation of scour channel between shoreline discharge point and the point where the discharge mixes with tidal waters. Reduced water quality in zone between discharge location and point of mixing in Purakau Channel. Localised ecological effects in area where dilution is limited. **Effect assessment: Medium**	Tidal mixing disperses diluted discharge into north eastern part of harbour, but at levels that are unlikely to have adverse ecological effects. **Effect assessment: Medium / Low**	Tidal mixing dilutes discharge to background water quality levels and any ecological effects less than minor. Scour channel starts to infill through tidal and wave processes **Effect assessment: Negligible**
Cultural	Discharge impinges along Puketutu shoreline, in area affected by treated wastewaterdischarge, and on Nga Kuia e Toru Reef. **Effect assessment: Medium / High**	Shellfish quality at Nga Kuia e Toru Reef remains affected. **Effect assessment: Medium / High**	Shellfish quality returns to acceptable after a period of weeks. **Effect assessment: Medium**
Effects assessment: High = widespread effect; **Medium** = effects generally in area where limited mixing occurs; **Low** = very localised effect; **Negligible** = less than minor effect			

Overall the assessment presented in Table 1 shows that some level of effect, lasting for a period of hours to days, is likely to result should an EPR discharge occur. This effect would reduce with time, with the main residual longer term issue being risks associated with shellfish gathering from waters affected by the discharge, and in particular from the Nga Kuia e Toru Reef.

As described in the response to Question 7.1, there is a very low likelihood of an EPR discharge occurring, and therefore a low likelihood of the effects summarised above occurring. Watercare's incident response procedures for an EPR discharge are described in the response to Question 7.2 b(iii) below.

In considering the potential effects of an EPR discharge, Watercare's permitted discharge from the Mangere WWTP provides some useful context. The existing permitted discharge includes the normal daily discharge of treated effluent from the tidal storage basin, along with occasional partially treated discharges which occur when high levels of inflow to the plant result in bypassing of the secondary treatment. While bypass discharges receive UV treatment to reduce pathogens and viruses, they are comparable to an EPR discharge in terms of duration and rate. Typically, however, bypass discharges occur several times in any given year associated with storm events and high levels of inflow, which is significantly more frequent than the EPR discharge.

(ii) Please clarify whether such effects are unavoidable or whether there are any measures that would need to be implemented to avoid, remedy or mitigate any adverse effects in the coastal environment, particularly with regard to effects on public health, high recreational use areas, high ecological values and any areas with identified cultural values.

The scenarios which would lead to discharge from the EPR structure are described in the response to Question 7.1. The EPR structure is required in order to provide pressure relief in the event of a failure of the Mangere Pump Station combined with the tunnel being full. It ensures that a safe discharge can occur in a way that minimises risk to people and the environment, and prevent damage to the tunnel and associated structures. This approach represents best practice engineering design. In this regard, while the risk of discharge is very low, should pump station failure occur and it is not possible to return it to service before the tunnel fills, discharge from the EPR structure is unavoidable and the effects described above will result.

Watercare has developed procedures for responding to overflow incidents across the wastewater network. These are set out in the Wastewater Overflows Incident Controllers Manual. The procedures were developed in collaboration with Auckland Council and the Auckland Regional Public Health Service and are documented the "Wastewater Overflow Regional Response Manual" which was issued earlier in May 2013. The procedures include response to overflow events on both the transmission network and the local network, including pump station overflow events. These procedures, and any future update to them, will form the basis for responses should discharge from the EPR structure occur.

A key element of the Wastewater Overflow Regional Response Manual is to reduce risk to people and the environment. The procedures focus on both repairing the fault as quickly as possible, while at the same time, responding to public health and environmental risk. The procedures include a process for advising Auckland Council and the Auckland Regional Public Health Service of overflows and a process for the deployment of appropriate warning signage by Auckland Council on affected bathing beaches, along with key performance indicators for response and reporting.

Any discharge from the EPR structure would be managed under the procedures as a "Level 4 Incident" (Major Overflow). Incident levels range from Level 1 to Level 5, with Level 1 being for a routine type incident and Level 5 being a civil defence emergency. As an EPR discharge would present a contact recreation risk at beaches along the Hillsborough coast, and to shellfish gathering at Nga Kuia e Toru Reef, deployment of signage at these areas, along with wider public communications, would form part of the early response process.

The response process defined in the Wastewater Overflow Regional Response Manual is set out in **Attachment 3**.

(iii) In respect of the above, please identify measures consistent with the level of risk. Are there any measures required in addition to Watercare's standard overflow response procedures?

As noted above, the Wastewater Overflow Regional Response Manual involves a process of incident escalation. Discharge from the EPR structure would be considered a Level 4 Incident, and responsibility for incident control and response is escalated to Watercare's second tier management. In this regard, the standard operating procedures already contain a process for escalation to reflect the significance of an incident. No additional measures would be proposed in addition to those already established in the procedures.

Our suggested consent conditions for the EPR discharge were provided to you on 9 May 2013. These are set out below:

9.1 The Consent Holder shall take all reasonable steps to manage the operation of the Central Interceptor tunnel and Mangere Pump Station to minimise the frequency and volume of any discharge from the Emergency Pressure Relief Structure to the CMA.

9.2 The Consent Holder shall respond to discharge incidents from the Emergency Pressure Relief Structure in general accordance with the Wastewater Overflow Regional Response Manual (Version 1.0 – May 2013) and any updates to this Manual.

9.3 In the event of a discharge occurring from the Emergency Pressure Relief Structure, the Consent Holder shall notify the Auckland Council Pollution Control Hotline and the Auckland Regional Public Health Service within six hours of the discharge, and shall include the following information in the notification:

a) The duration (if known);

b) An explanation of the cause of the discharge;

c) The response time to attend to the discharge; and

d) Details of remedial actions undertaken.

We note that reference to the recently released Wastewater Overflow Regional Response Manual has been updated in the proposed condition above.

(iv) Will procedures be in place to ensure (as far as practicable) that any emergency discharge will be limited to an outgoing tide.

As activation of the EPR would only occur in an emergency event, there is little ability to control discharge from the EPR to coincide with an outgoing tide as the factors that would combine to cause a discharge are outside of Watercare's control (i.e. weather and timing of power failures). While Watercare will incorporate measures to reduce the likelihood of EPR activation into the design and operation of the tunnel and Mangere Pump Station (refer response to Question 7.1), it is not possible to completely eliminate the chance that EPR activation may occur. Any discharge from the EPR would encounter the tidal conditions at that time.

(v) Please advise of likely reporting procedures likely to be instigated following an emergency discharge event (i.e. identification of events leading to the emergency discharge, estimated volume and characteristics of the discharge and any remedial measures undertaken, and monitoring of effects).

The Wastewater Overflow Regional Response Manual contains procedures for reporting. This includes formal reporting very early in the incident to advise Auckland Council and the Auckland Regional Public Health Service of the incident, and again at closeout of the incident to confirm the repair is complete, and the results of any monitoring. In addition, as noted above, Watercare has proposed additional reporting requirements in the proposed consent conditions.

(c) Please provide further information with respect to the operational linkages and staging of planned improvements at the Mangere WWTP in respect of the Central Interceptor and other network upgrades referenced in the application. In this regard please provide a description of the linkages between the Disinfection Facility and the Wet Weather Treatment Facility with the Central Interceptor and the Mangere Pump

Station implementation and operation. Please also describe linkages between secondary treatment improvements at the WWTP and other network upgrades referenced in the application documents (Northern Diversion, potential extension of Central Interceptor to the CBD, etc).

The following provides an overview of the planned improvements and associated linkages with the proposed Central Interceptor main project works.

Mangere Pump Station

- The proposed Mangere Pump Station will be constructed as part of the Central Interceptor main project works. The pump station is an essential element of the Central Interceptor and must be completed and operational in order to commission and operate the main tunnel. The intention is that the proposed Mangere Pump Station will be constructed and on line to facilitate commissioning of the Central Interceptor main project works upon completion in 2023. The Central Interceptor and Mangere Pump Station have been designed to operate within the current consent limits of the Mangere WWTP.

Mangere WWTP

- Upgrading of the Mangere WWTP is planned to ensure continued compliance with the conditions of the existing discharge permit, particularly in terms of the protection of public health and the management of nitrogen. Staged upgrading is provided for in the Mangere WWTP designation, with areas designated for future expansion.
- The Mangere WWTP upgrades include construction of a proposed wet weather treatment facility, which is planned to be implemented and fully operational prior to the Central Interceptor coming on line in 2023. The wet weather treatment facility is being implemented to provide enhanced treatment and disinfection of peak wet weather flows which exceed the capacity of the biological treatment system. The facility will be designed to provide wet weather treatment for all peak inflows to the Mangere WWTP, including those from the Central Interceptor. The wet weather facility will be operated within existing discharge permit limits.

Northern Interceptor

- Watercare is planning a new Northern Interceptor, which will be designed to divert flows from West Auckland from the Mangere WWTP to the Rosedale WWTP. Stage 1 of the Northern Interceptor is currently scheduled to be in use by 2022.

Extension to Central Business District (CBD)

- As noted in Part A of the August 2012 AEE, Watercare has designed the Central Interceptor main project works so that the tunnel could be extended upstream into the Auckland CBD at some point in the future. Details of the project and timing have yet to be finalised. Wastewater flows from the affected area are already treated at the Mangere WWTP, and any decisions relating to a CBD extension will have no effect on Watercare's ability to comply with the conditions of the existing Mangere WWTP discharge permit.

7.3 Determination of Discharge Location

Please provide further information in relation to the assessment and criteria used in the determination of the location of the point of discharge. In particular:

(a) Please provide the rationale behind the alternative selected and the full range of alternatives considered.

A number of alternative locations for the EPR structure were assessed during development of the Central Interceptor main project works design. As noted earlier, the EPR structure is required to

provide pressure relief in the event of pump station failure combined with the tunnel being full, and to ensure that safe discharge can occur in a way that minimises risk to people and the environment, and that prevents damage to the tunnel and associated structures. The EPR needs to be at a low point in the system to operate simply by gravity and provide a "fail safe" back up that is not reliant on any form of mechanical or electrical equipment. This approach represents best practice engineering design.

The options considered for the location of the EPR included:

- Mangere Pump Station
- Kiwi Esplanade
- Pump Station 23
- Pump Station 25
- Motions Road
- Rawalpindi Reserve

These sites are all connection points to the Central Interceptor main project works and are described in the August 2012 AEE.

The Mangere Pump Station, Kiwi Esplanade and Pump Station 23 locations were the only sites that proved to be hydraulically viable for the EPR and all would discharge into the Manukau Harbour. Of these three sites the Mangere Pump Station location was identified as the preferred site. The site is adjacent the Mangere WWTP, with site staffing offering better support than other locations in the event of activation, along with better access for any maintenance requirements. The site is also remote from the public, reducing safety and public health risks, and any discharge would be to a receiving environment where dilution and dispersion would minimise potential environmental effects.

(b) Clarify whether providing disinfection to the emergency discharge at the treatment plant is feasible, providing the reasons for this alternative having been discounted.

Disinfection of discharge from the EPR structure is not practicable. This is due to hydraulic constraints at the Mangere WWTP site and the fact that the EPR is predicted to activate not more than once every fifty years. Hydraulic constraints mean that pumping would be required to convey flow from the EPR structure to the existing Mangere WWTP UV disinfection facility. This would require another pump station of greater capacity than the proposed Mangere Pump Station, which would essentially sit on standby until required, and as it would be subject to the same power failure risk as the Mangere Pump Station, it would be unable to operate. This scenario would not be practicable.

A new disinfection facility to treat EPR flows (if one was practicable) would likely involve chemical disinfection. This facility would be significant in scale given possible discharge flow rates, and would sit on standby until required. As noted above, this facility would be subject to the same power failure risk as the Mangere Pump Station. Given the low likelihood of operation, it is possible that disinfection equipment would exceed its design life (and require upgrading) before actually being used. For these reasons this scenario is also not practicable. It is noted that chemical disinfection results in residual chemicals and formation of disinfection by-products which can have additional environmental effects in receiving waters.

(c) Clarify whether discharging to the outgoing tide using the existing WWTP discharge channel and outfall structure is feasible, providing the reasons for this alternative having been discounted.

Use of the existing Mangere WWTP discharge channel and tidal storage basin was considered for the EPR discharge. This option is not feasible as the discharge channel does not have the required hydraulic conveyance capacity.

7.4 Reference to Permit 30083

Please provide details of any recommendations or feedback made by the various groups (Audit Group, the Microbiological Review Group, and, or the Disinfection Review Group Community Liaison Group) established under permit 30083 (Mangere WWTP discharge consent) regarding the emergency discharge location, the alternatives, effects on the environment and any monitoring or mitigation recommendations.

The Central Interceptor Project has been presented to the Audit Group and the Community Liaison Group. These presentations have been primarily to update the groups on the Project and to present an outline of construction and operational issues. Information on the EPR structure and the frequency of discharge were included in presentations, however there has been no feedback on this issue.

As details of the Central Interceptor main project works develop through the detailed design process, Watercare will consult further with the groups established under Permit 30083, including presenting further detail on the operation of the Central Interceptor.

3. Roma Road Access

Site access to the May Road site is proposed via Roma Road. The access is currently unformed and physical works will be required to form this access so that it is suitable for use by construction traffic. The details of these physical works will be developed during the detailed design phase and will be provided with the Outline Plan of Works for the site.

A preliminary design has been developed to indicate how the access may be formed (refer **Attachment 4**). This indicates a timber retaining wall being constructed along the southern length of the access and a sealed access with suitable sub base and seal being formed. The works will require earthworks to form the required grade. Currently the elevation difference across the width of the access is around 1.5 m and there is a fall from Roma Road along the length of the access of around 4 m. Earthworks will involve removal of top soil and any unsuitable materials and placement of engineered fill.

The retaining wall and roadway would be designed to meet engineering standards and to avoid effects on neighbouring properties, and would be subject to the usual design checks and approval process set out under the Building Act.

4. Alternative Sites Consideration

The August 2012 AEE provides a summary of the alternatives considered for each of the construction sites, and the March 2013 AEE prepared to support the new Notice of Requirement at the Mt Albert War Memorial Reserve car park site summarises alternatives at that site also. At recent meetings Auckland Council has requested additional information on the consideration of alternative sites at Mount Albert War Memorial Reserve, Lyon Avenue, Keith Hay Park and Kiwi Esplanade. A comparative summary assessment table for each of these sites is included in **Attachment 5.**

5. Consultation Update

Consultation undertaken as part of the Central Interceptor main project works to the end of June 2012 is summarised in Section 8 of Part A of the August 2012 AEE. Further consultation that has taken place between 1 July 2012 and 24 May 2013 is summarised in the table in **Attachment 6**, using the same headings and order as set out in the AEE report. The consultation process will continue during the detailed design, pre-construction and construction phases of the project.

6. Amendment to the designation boundary at the Lyon Ave Site.

In response to recent consultation with the directly affected landowner at the Lyon Avenue site, we propose to make a minor amendment to our proposed designation boundary. The proposed designation at Lyon Avenue included a number of privately owned car parks on Morning Star Place. A minor adjustment to the boundary of the proposed designation is now proposed so that it no longer includes these car parks. The proposed designation (as amended) and the works to be undertaken are shown on the following updated drawings included in **Attachment 7**:

- AEE-NOR1-3 Issue B. Amended designation plan showing the revised proposed designation.
- AEE-MAIN-3.1 Issue B. Amended permanent works drawing.
- AEE-MAIN-3.2 Issue B. Amended construction works drawing.

The only parties affected by the amendment to the designation are the car park owners and St Lukes Gardens Apartments. By removing the designation from these car parks the effect on these parties is less than previous, therefore we do not consider that any parties need to be notified. The schedule of land included in the designation at Lyon Avenue remains as identified on Attachment 2 of Notice of Requirement 1 lodged in August 2012.

Accordingly, please amend Plan Modification 332 on Sheet E06 Planning Map No. 2 of the Auckland Council District Plan (Auckland City Isthmus Section) as shown on the attached drawing AEE-NOR1-3 Issue B (Attachment 7).

7. Drawing Updates

7.1 Mount Albert War Memorial Reserve

The original construction layout for the Mount Albert War Memorial Reserve (as set out in Notice of Requirement 1) included noise barriers around the site, but not along the construction access road from Wairere Avenue. We now proposed to include noise barriers along the construction access road. The updated drawing AEE-MAIN-2.2 Issue B is included in **Attachment 8**.

7.2 Haverstock Road

As summarised in Attachment 5, Watercare has been in discussion with Plant and Food Research, the main landowner at the Haverstock Road site. A concept drawing for the reinstatement of the site has been prepared and a copy of this is included in **Attachment 9** for your information. We note that due to hydraulic requirements, the control chamber will need to be located partly above ground. This is noted in the Section 4.4.1 of Part B of the August 2012 AEE , but colour coded blue (flush with ground) on Drawing AEE-MAIN-4.1 instead of green (above ground). Revised drawings (Drawings AEE-MAIN-4.1 Issue C and AEE-MAIN-4.2 Issue C) are included in Attachment 8. This information forms part of the Notice of Requirement and consent application package for the Central Interceptor main project works.

7.3 Updated Drawing Index

As we have amended a number of drawings since lodgement of the three Notices of Requirement, an updated drawing index is included in **Attachment 10** to ensure the most recent drawings are being assessed by Council staff.

8. Mangere WWTP and the Manukau Harbour

As part of the consultation process referred to in Item (5) above, we have provided further written information to the Mangere Bridge Residents and Ratepayers Association (MBRRA) in response to some of their key areas of concern. A copy of each of the following reports is included in **Attachment 11** for your information:

- "Preliminary Response to Mangere Bridge Residents and Ratepayers Association Submissions on Central Interceptor – Existing Resource Consent Conditions" – draft report provided to MBRRA on 12 March 2013
- "The Mangere Wastewater Treatment Plant and the North East Manukau Harbour Status Report – March 2013" – draft report provided to MBRRA on 27 March 2013

These reports are not directly relevant to your statutory consideration of the Notices of Requirement and consent applications (any relevant aspects have been provided to you as part of the original documentation and in response to your Section 92 requests), but they may assist your understanding of the wider context for the proposed Central Interceptor Project.

Yours sincerely

Belinda Petersen
Resource Consents Manager
Watercare Services Limited

Attachment 1

Amended Construction Discharges Condition

CENTRAL INTERCEPTOR MAIN PROJECT WORKS – RESOURCE CONSENT CONDITIONS

Draft Conditions Provided to Auckland Council for Review on 9 May 2013, amended 27 May 2013

Auckland Council Regional Plan (Air Land and Water) – Construction discharges

	CONSENT 40835 (construction discharges)
	PURPOSE Construction site related activities (e.g. tunnel dewatering, wheel wash, application of grout and concrete to land etc) [PROJECT WIDE]
	GENERAL CONDITIONS The works shall be undertaken in accordance with the following general conditions: General 1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 1.7, 1.8, 1.9, 1.10
	SPECIFIC CONDITIONS
	Discharges
	The Consent Holder shall ensure that all discharges from tunnel dewatering activities, wheel washes and other occasional construction site related discharges are treated to an appropriate standard prior to discharge to stormwater drainage systems, watercourses or other receiving waters. A Discharges Management Plan (DMP) shall be prepared which describes how these discharges will be managed to avoid, remedy or mitigate potential adverse effects on receiving environments. The DMP shall be submitted to the Manager for approval (such approval not to be unreasonably withheld) prior to any discharges occurring.
	The standards for construction discharges to receiving environments shall be: turbidity of 50NTU and pH of 7.5. Alternative discharge quality standards for turbidity and pH may be implemented if: • A receiving environment monitoring programme is submitted to and approved by the Manager; • The receiving environment monitoring programme is implemented for a sufficient period of time to demonstrate that alternative standards for turbidity and pH are appropriate for the site; and • Written approval is provided by the Manager.

Attachment 2

Updated Chemical Treatment Management Plan and Construction Discharges Management Plan

(amendments highlighted)

Central Interceptor Main Project Works

Draft Construction Discharge Management Plan

22 May 2013

CONTENTS

DOCUMENT HISTORY AND STATUS

Revision 01 s92 response	***Date***	***Name***	***Signature***	***Status***
Author	23/5/13	A Gough		
Reviewed by				
Approved by				

1. INTRODUCTION

1.1 Project overview

Watercare Services Limited (Watercare) is proposing to construct a new underground interceptor within the Auckland Isthmus to collect, store, and convey wastewater to the Mangere Wastewater Treatment Plant (WWTP). This new interceptor is called the Central Interceptor. The Central Interceptor main project works comprise a 13 km gravity tunnel from Western Springs to the Mangere WWTP, four link sewers extending from the main tunnel, a series of connections to the existing Watercare wastewater network, and a new pumping station at the Mangere WWTP to pump wastewater from the tunnel to the plant. These works will provide the network capacity required for future growth within the Auckland Isthmus will duplicate the southern section of the Western Interceptor and will provide overflow mitigation at a number of Watercare's largest wastewater overflow points.

1.2 Purpose

The main project works involve a number of construction sites of varying sizes. This draft Construction Discharge Management Plan (CDMP) addresses discharge activities associated with construction, including those by subcontractors or suppliers and describes how surface water and groundwater associated with construction works will be managed to avoid, remedy, or mitigate adverse effects on the environment. The draft CDMP establishes the general principles for the management of site discharges.

The project documentation has been developed to a concept design stage and it is likely that design and construction details will change as the project is optimised in the detailed design and construction stages. This draft CDMP will be updated and finalised prior to commencement of construction.

This draft CDMP sets out information on construction and construction sequencing, along with management approaches for the potential site related discharges set out in Section 1.4 below.

1.3 Key contacts

[to be completed when contractor appointed]

1.4 Potential discharges to the environment

Water discharged from the construction sites may contain contaminants arising from the physical activity of construction and the use of equipment to complete the project. Potential discharge sources include:

- Sediment from unstabilised excavations and earthworks, eroded and discharged from the site in storm events.
- Sediment picked up on trucks, plant and other vehicles which is tracked out of the site onto the road network, where it is washed into the natural environment.
- Groundwater pumped from excavations, particularly from shafts and tunnels, which entrain sediment from the excavated soils and potentially contain material from the liner installation works (e.g. cement, grout).
- Spoil excavated from shaft and tunnel operations may be very wet and there is a risk of sediment from such material being discharged to the environment.

- Discharges of wet concrete or water containing cement particles that have a high pH, associated with activities undertaken on site.
- Discharges of polymers and other additives used to assist excavation and removal of cuttings from the work face. The discharges could potentially include bentonite where this is required in tunnelling operations.
- Discharges of oils and other hydrocarbons from vehicles, plant and refuelling activities on site.

The management of these potential discharges is addressed in Section 3.

2. WORKS DESCRIPTION

2.1 Overview

The Central Interceptor main project works will be constructed by tunnelling methods with construction largely occurring underground. This will be facilitated by surface construction sites where associated construction activities, such as spoil removal; storage of tunnel lining segments; and treatment of construction discharges will occur. The construction sites (shown on Figure 1-1) are at 19 locations along the main tunnel and link sewer routes as follows:

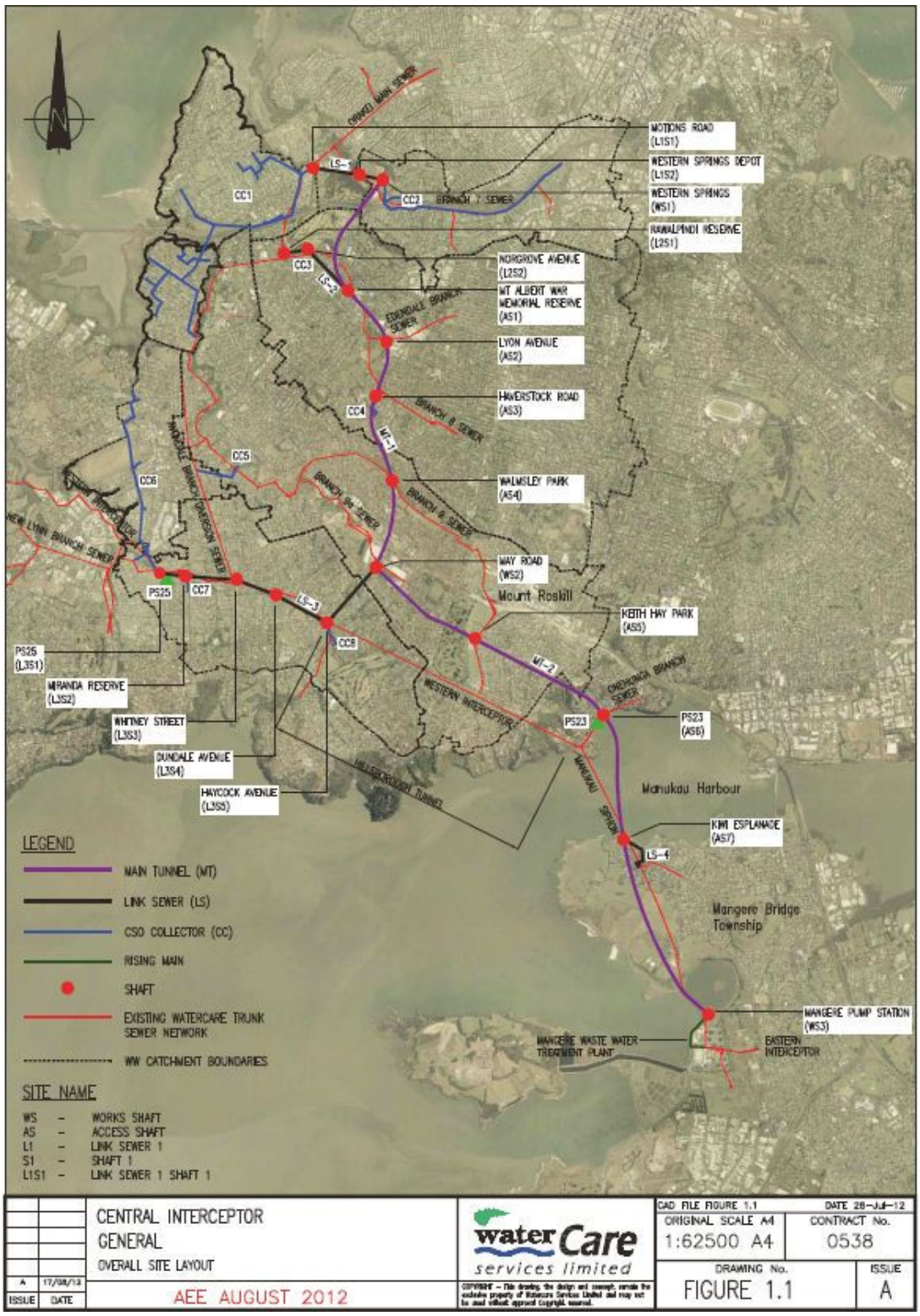
- Three primary construction sites which will serve as the main construction bases for the tunnelling activities. Earth (spoil) from the tunnelling work will be removed from these sites via the construction shaft, which will also provide access to the tunnel, will serve to launch the tunnel boring machine (TBM) and will provide access for the supply of construction materials and services. These construction sites could operate for around five to six years, depending on the construction methods employed, and are located at:
    - Western Springs (WS1)
    - May Road (WS2)
    - Mangere WWTP (WS3)
- Sixteen secondary construction sites to provide permanent connections to the main tunnel and to the link sewer tunnels. Seven of these sites are on the route of the main tunnel and are likely to involve active construction works for around 12 to 18 months each as the shaft is excavated and permanent works are constructed. These sites are:
    - Mount Albert War Memorial Reserve (AS1)
    - Lyon Avenue (AS2)
    - Haverstock Road (AS3)
    - Walmsley Park (AS4)
    - Keith Hay Park (AS5)
    - Pump Station 23 (Frederick Street) (AS6)
    - Kiwi Esplanade (AS7)

    The remaining nine of the 16 secondary construction sites provide connections to the link sewers. These sites would likely involve active construction works for around 6 to 18 months each (depending on the scale of works at the site) as the shaft is excavated and permanent works are constructed. However, the pipe installation method utilised to construct the link tunnels is likely to be microtunnelling due to the smaller pipe size required and these sites may also have a range of additional

construction activities to facilitate those works. These additional link sewer sites are located at:

- Motions Road (L1S1)
- Western Springs Depot (L1S2)
- Rawalpindi Reserve (L2S1)
- Norgrove Avenue (L2S2)
- Pump Station 25 (in Miranda Reserve) (L3S1)
- Miranda Reserve (L3S2)
- Whitney Street (L3S3)
- Dundale Avenue (L3S4)
- Haycock Avenue (L3S5)

Open trenching is likely to be used to construct shallow (less than about 4 m deep) connections between proposed structures and to connect to the existing wastewater network. However, the selection of either microtunnelling or trenching methods has not been finalised and will also be dependent on factors including ground conditions, surface obstructions and surface features.



2.2 Construction phases

Phased construction will take place along the alignment at different times, with sites being at different stages of construction and completion to service the overall project delivery programme. The construction phase commences when the Contractor takes possession of a site and starts site clearing and preparation for the works. The construction phase ends when all works at a particular site are completed and the site has been stabilised and reinstated to the agreed condition. Depending on the Contractor's programme and

methodology, individual sites may be occupied for periods varying from a few months to several years.

In broad terms, the construction activities at the main project works sites comprise the following activities:

1) **Site establishment**: Includes establishing areas of hardstanding, site access, wheel wash and the erosion and sediment control measures that are required to protect the environment generally and the stormwater network in particular.

2) **Shaft and tunnel excavation:**
   a) Shaft excavation: The excavation and "sinking" of shafts that facilitate the tunnelling works and for the construction of permanent structures. Associated activities include the excavation and removal of spoil, the installation of permanent or temporary shaft lining and the dewatering of any inflows into the excavation. Discharges may include concrete wash water and groundwater.
   b) Construction of temporary sheds over the tunnel access shafts (only applies to the primary construction sites at Western Springs and May Road): Note that clean roof rainwater runoff would be discharged to the clean water diversion channels that run around the outside of the site or directly to a stormwater manhole, if one is readily accessible.
   c) Tunnel excavation: The use of specialist equipment to excavate and line completed tunnels up to 5 m diameter. Only three sites along the main tunnel (Western Springs, May Road and Mangere Pump Station) are earmarked launch shafts for the TBM. Works at all other main tunnel sites will be limited to constructing the permanent access and drop structures. Construction activities at all link tunnel sites will either include works related to a launch or reception shaft. Discharges may include tunnel cuttings, concrete wash water, bentonite, foaming agents and ground water.
   d) Post tunnelling operations: On completion of tunnelling, removal of equipment and surplus tunnelling and lining materials from sites will occur.
   e) Construction of permanent access structures into the tunnels, including access and entry drop structures. Discharges from this work may include concrete wash water and pumped groundwater.

3) **Trenching:** The excavation of trenches and construction of wastewater pipework and manholes as required to connect to the existing wastewater network.

4) **Site disestablishment:** Final clean up of site and site remediation.

As parts of the scheme are completed, surplus equipment and supplies will be removed and sites disestablished and reinstated.

It is noted that the areas available for the construction sites vary significantly in terms of size and adjacent environments. Some are restricted in size and are set within urban residential areas. Other sites are in open areas of grass and remote from the public, where there is considerable space and good access during construction. Some sites are close to open watercourses and three sites are close to the coastal marine area (CMA). Different solutions will be required at different sites to provide the level of environmental management required under TP90.

2.3 Site Establishment

The initial phase of work at any site is the preparation of a suitable working area for sinking shafts and supporting tunnelling operations.

The site establishment activities at the primary and secondary sites will include a wide range of activities, including the removal of vegetation; minor earthworks; checking infrastructure service locations and relocating where necessary; and the establishment of a stabilised site access, construction yards and lay down areas. In addition, at the existing Watercare pump station (PS 23) on the edge of the Manukau Harbour at Hillsborough Bay, a temporary construction platform will be required in the CMA to facilitate the construction activities.

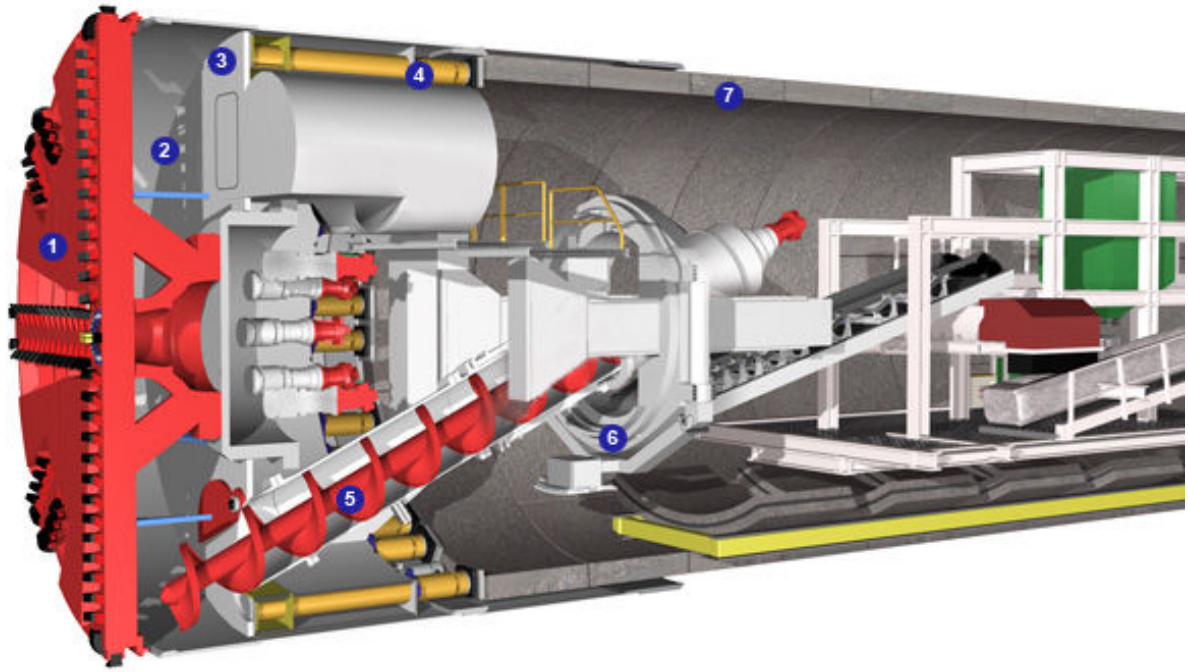
Generally, where there are wheel washes, Erosion and Sediment Control Ponds or Decanting Earth Ponds, these will remain in place at each site throughout the construction period, providing treatment facilities to intercept, clean and treat potential discharges prior to the discharge of any sediment that may be dropped or spilled onto the site during shaft sinking, tunnelling works and the construction of permanent underground drainage structures.

2.4 Main tunnel construction (primary construction sites)

2.4.1 General

The proposed main tunnel is a 3.5m to 5m diameter bore constructed using an Earth Pressure Balance capable tunnel boring machine (TBM), erecting a gasketed segmental lining. Intermediate shafts are constructed as required to provide link connections or access. Refer to Figure 2 for a schematic of an Earth Pressure Balancing TBM.

Figure 2: Schematic of Earth Pressure Balancing TBM (Source: Herrenknecht)



Each of the three primary construction sites may be used as TBM launch/retrieval sites for the main tunnel.

2.4.2 Construction sequence

A typical construction sequence is described below.

- Establishment and stabilisation of the work site.
- Launch shaft construction. Once the launch shaft is completed a temporary shed will be constructed over the launch shafts at Western Springs and May Road which will protect the work area and spoil stockpile from adverse weather (and also provide noise attenuation).
- Tunnel excavation and lining installation. During the tunnelling phase all surface works (handling of pipe segments, removing spoil, treatment of groundwater etc) are carried out at the primary construction sites.
- Prior to the completion of the tunnel drive the reception shaft is constructed (at Western Springs/May Road). This may also serve as a launch shaft for the next drive. Once the tunnel drive is completed, the tunnel boring machine is either redirected to carry out the next drive or lifted from the reception shaft and relocated to the next launch site.
- Once the tunnelling work at the primary construction sites is completed, the permanent structures (main tunnel shaft, wastewater network connections) are constructed. The launch shaft backfilled, the work site disestablished and the surface reinstated.

2.4.3 Use of cement, polymers and bentonite

TBM tunnelling frequently employs spoil conditioners usually in the form of foam, such as Meyco SLF20 which was used on the Rosedale project. Small quantities of the foam are injected at the tunnelling face to assist the cutting and handling of spoil through the machine. The foaming agent does not contain any hazardous substances which require labelling. The foam generally remains in the spoil which is disposed of at a designated fill site.

The use of this foaming product agent and the suitability of the spoil for disposal to land was investigated and approved by the former Auckland Regional Council for use in tunnelling works in 2008. This product has proven effective in similar ground conditions and is expected to be the contactor's first choice of spoil conditioner for this project.

Cement and cement / bentonite grouts will also be used in the shaft and tunnel excavation to fill rock discontinuities, to spray as shotcrete for primary support and to backfill around the tunnel segmental lining. Groundwater removed from the excavations is therefore likely to contain traces of cement and bentonite clay. Bentonite is a naturally occurring clay product.

Small quantities of cement are likely to be suspended or go into solution in water pumped from the shaft excavations, increasing the pH of the discharge water. This water could be discharged to sewer, or to the stormwater network, or to a watercourse. Chemical dosing to adjust the pH, along with sediment removal, may be required before the water is discharged to the stormwater network or a watercourse.

2.4.4 Spoil removal

Cuttings from the tunnel head are loaded into "muck wagons" and transported back through the completed section of tunnel to the launch shaft. There the "muck wagons" are lifted to the surface and emptied inside the temporary shed built over the tunnel shaft (at Western Springs and May Road). If required the stockpiled material will remain inside the temporary

shed for dewatering prior to being removed off site by conventional road truck or truck and trailer. Otherwise the removal of spoil will be carried out as required during approved working hours.

2.4.5 Dewatering

Shaft dewatering is usually managed by directing groundwater inflows to sumps from where it is pumped to settling tanks before discharge to the stormwater system. The amount and quality of water varies from site to site, and depends on the method of shaft construction and groundwater inflow along the tunnel.

The settling tanks are generally set up on a pallet or container base and may include several treatment stages. The first treatment stage may remove coarse solids, followed by a treatment stage that allows mixing of flocculants to remove fine solids, followed if required by a third stage to "polish" the water prior to discharge.

2.5 Pipe installation by Microtunnelling

2.5.1 General

Microtunnelling will generally be used for the installation of the link tunnels.

Common to all microtunnelling or pipe jacking is the concept of installing a pipe from a *launch shaft* to a *reception shaft*. A schematic of this concept is shown in Figure 3 below.

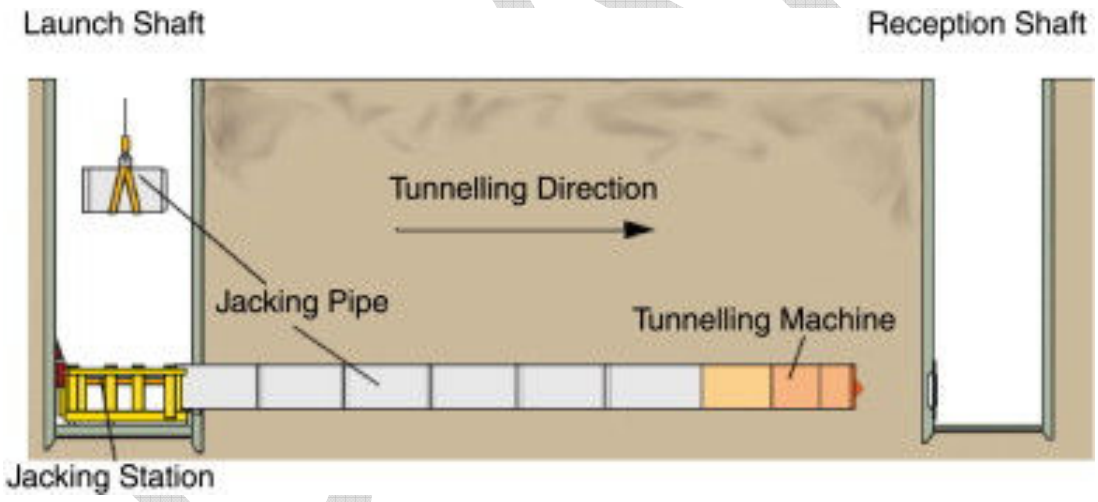


Figure 3 (Source: Science Direct)

Distances between the launch shaft and reception shaft can vary widely and are mainly dependent on pipe diameter, ground conditions and locating suitable locations for jacking or receiving shafts.

The bulk of the physical works are carried out at the launch shaft sites, which need to cater for site sheds, pipe stockpile areas, trucks, cranes, and any support equipment. Reception shaft sites only need to provide access for a crane and trucks to retrieve the tunnelling machine from the reception shaft. A single launch shaft may be used to drive pipes in several directions.

2.5.2 Construction sequence

The following outlines a typical microtunnelling construction sequence:

- Establishment and stabilisation of the work site.
- Construction of the launch shaft.
- The pipe installation commences towards the reception shaft once the launch shaft is completed and the microtunnelling machine or jacking shield installed.
- The construction of the reception shaft is likely to be timed so that its completion coincides with the arrival of the tunnelling machine or jacking shield. (Note: This could be months after the start of the pipe installation).
- During the pipe installation phase all work (installing pipes, removing spoil, etc) is carried out at the launch site.
- Prior to the completion of a tunnel drive the reception shaft is constructed. Once the tunnel drive is completed the tunnelling machine or jacking shield is lifted from the receiving shaft and set up for the next tunnel drive.

Once a shaft site is no longer required to install pipe or receive a micro tunnel machine/ jacking shield, the permanent access structure (manhole) is then constructed, the shaft backfilled, the work site disestablished and the surface area reinstated.

2.5.3 Use of polymers and bentonite

Polymers and bentonite are generally used to treat the material at the tunnel head, lubricate the pipe annulus to reduce jacking forces or to transport cuttings from the cutting head to the recycling plant.

Treatment of the material at the tunnel head may be required in reactive clays in order to prevent the cuttings from sticking to the tunnel machine head. In this case small quantities of polymers are used which stick to the cuttings and are removed off site with the spoil. As the polymers are removed with the cuttings off site no additional treatment is required on site.

Lubricating the pipe annulus applies to all shield microtunnelling techniques installing pipes greater than 900mm in diameter. An automatic lubrication system is used to pump polymer or bentonite into the annulus between the pipe and the tunnel to reduce friction. In this case it is likely that polymer or bentonite will mix with the water removed from the shaft and the water will require treatment prior to disposal.

Transporting cuttings from the cutting head to the recycling plant applies to slurry microtunnelling machines only. The method is regarded as a ‘closed loop’ system, with slurry pipes the sole means of spoil transport. In the separation plant solids are removed from the fluid and the “cleaned” slurry reused and pumped to the tunnel head.

2.5.4 Spoil removal

Open face microtunnelling machines or jacking shields
Cuttings from the tunnel head are loaded into “muck wagons” and transported back through the completed section of tunnel to the launch shaft. There the “muck wagons” are lifted to the surface. The excavated material may be loaded directly into a truck, or loaded into skips that are removed as required, or placed at a temporary stockpile area from which spoil is removed from the site at regular intervals.

Slurry microtunnelling machines
Cuttings from the tunnel head are mixed with water to form a slurry at the tunnel face and are then pumped to a separation plant. In the separation plant the fluid is removed and the

solids either placed into bins or stored in temporary bunded stockpile areas and removed from the site at regular intervals.

2.5.5 Dewatering

Shaft dewatering is usually managed by directing groundwater inflow to underground sumps from where it is pumped to settling tanks before discharge to the stormwater system. The amount and quality of water varies from site to site and depends on the method of shaft construction and groundwater inflow along the tunnel.

The settling tanks are generally set up on a pallet or container base and may include several treatment stages. The first treatment stage may remove coarse solids, followed by a second treatment stage that allows mixing of flocculant to remove fine solids, followed by a third stage if required to "polish" the water prior to discharge.

2.6 Trenching

Some connections to the existing network may be made using microtunnelling equipment, but most will be installed at shallow depth using open trenching. The construction duration for installation of each connection is generally only a few days, but may extend to weeks depending on the size of the connection, ground conditions and the presence of intervening services. Link Sewer 4 in Mangere Bridge will be trenched and may take around a month.

Excavated spoil may be removed directly from the site if the trench is to be hardfilled, or spoil may be retained for compaction over the pipe and ground reinstatement on completion. In general, trenches will be progressively backfilled as the pipe installation progresses and only short lengths of excavations are expected to be open at any given time.

2.7 Dis-establishment and site restoration

At the conclusion of construction works, all materials and equipment will be removed and sites will be reinstated.

3. DISCHARGE MANAGEMENT

Erosion and sediment control measures will be put in place during construction to minimise potential adverse effects. These will employ measures which meet industry best practice guidelines such as reflected by Auckland Council's Technical Publication Number 90 Erosion and Sediment Control Guidelines for Land Disturbing Activities (TP 90).

This draft CDMP outlines the general principles guiding the erosion and sediment control measures. Draft erosion and sediment control plans (ESCPs) and supporting text have been prepared and are contained in Appendix A of this document. These documents will be updated and the erosion and sediment control and stormwater management measures for each site will be confirmed prior to construction commencing.

Generally, erosion and sediment control measures will be undertaken and implemented with a hierarchy and priority order as follows:

1) Avoidance of adverse effects will be the first priority. Discharge locations will be carefully selected and stream works will only be undertaken where they are a necessary component of the project.

2) Erosion Control is the preferred option to control sediment discharge, and will utilise suitable approaches to prevent sediment generation through a range of structural and non-structural means.

3) Sediment Control measures will be adopted that are suitable for the particular site location and configuration and meet the requirements of TP90.

A number of construction sites are located in close proximity to watercourses and the coastal marine area. Where sediment control treatment devices discharge directly into a watercourse, suitable erosion protection measures will be installed in the watercourse to prevent localised stream bank/bed erosion.

Generic details of the treatment systems are set out below. All erosion and sediment controls are in accordance with the requirements of TP90. The proposed treatment train approach uses best practice options for specific construction activities as are currently in use around Auckland.

This draft CDMP provides the general principles and methodology for managing earthworks associated with the project construction. Site and activity specific erosion and sediment control plans will be prepared and submitted to Auckland Council for approval immediately prior to construction, however, draft plans are presented in Appendix A.

The proposed works will generally involve four main phases. Sections 3.1 to 3.4 below outline the general principles and standards to be applied during each of these phases:

1. Site establishment;
2. Shaft excavation and tunnelling;
3. Trenching.
4. Dis-establishment and site restoration

3.1 Site Establishment – Earthworks

Sites vary between 1,000 to 22,500 m^2 in area. A number of sites are located in reserves, with some sites in road reserve, residential land and industrial land. Site establishment work will principally involve site clearance, establishing formed and metalled access and the stabilisation of the working area. This phase of work is expected to take in the order of 2 to 3 weeks.

1. At the conclusion of the establishment works, the site, where applicable, will have:
   - Stabilised access from the public road to the work site;
   - A stabilised route and wheel wash within the work area or alternate site specific options such as to discharge spoil directly to skips or trucks and to maintain standby arrangements to rapidly mobilise road sweeping/cleaning equipment to respond to any spillages.
   - Clean stormwater diversion bunds in place as required to keep clean surface flows from entering the work areas; and
   - A sediment retention pond (SRP) or at smaller sites a decanting earth bund (DEB) or a tank system where needed, to retain any sediment that is deposited on the site by construction activities.
   - Where necessary, additional site specific features including filtersock dams around street cesspits and in channels, to prevent sediment discharge to the stormwater system.

2. Initially, the site will be protected with clean water diversion bunds or channels on the uphill side and a silt fence on the lower side. Dirty water runoff diversion channels will

be sized to cater for the 1% AEP rainfall event which will ensure that all storm events up to this design will be diverted to the control measures without overtopping. Where sufficient space is available the Contractor will install a wheel wash, with its own discharge tank and the associated treatment device will be constructed and commissioned, prior to stripping vegetation and topsoil from work areas in the site. In roadside verges, alternative methodologies may be adopted, as noted in Section 1 above. Once stripping is complete, the contractor will import and place aggregate to construct hardstanding areas and an access road to and within the site. If sufficient space is available, grassed areas may be retained as material laydown areas.

3. Cleanwater diversion channels are to be designed to cater for the 1% AEP rainfall event and will be installed to divert all possible upslope cleanwater away from the earthworks areas. Where this cannot occur in practice, SRP volumes will be increased to allow for the cleanwater catchment area that cannot be diverted.

4. Where needed, all SRPs will be based on TP90 design with the 3% volume criterion applied in relationship to catchment size (i.e. $3m^3$ SRP volume per $100m^2$ of contributing catchment). Each SRP will include a spillway for the 1% AEP rain event, with the outlet weir channel designed to minimise scour.

5. On sites less than 3,000 m^2, a DEB or tank system may be used, designed to the 3% volume criterion if sufficient space is available, but to be no smaller than 2% of the contributing catchment. All spillways from the DEBs will be installed as per TP90 guidelines which ensure that they safely pass the 1% AEP rain event with the outlet designed to prevent scour at the design flow.

6. In general, chemical treatment will be applied by rainfall event activated dosing to the SRP or DEB. In the subsequent phases of construction, the SRP, DEB or tank will provide a secondary component of the treatment train on site and will only require dosing when there is a spill of soil.

7. All SRPs and DEBs will be fitted with floating decants and a mechanism to adjust the outflow level if required.

8. The wheel wash is likely to be in the form of a permeable grid suspended over a pit, with a high pressure water blaster unit to be used to clean trucks over the pit, minimising water usage. During the initial phase of work, the pit would be cleaned by sucker truck, with the ability to be pumped out for treatment in the next phases of construction. For construction sites within the road reserves, there is unlikely to be sufficient space to set up effective wheel wash facilities. Alternative site specific options may be established, such as to discharge spoil directly to skips or trucks to minimise handling and to maintain standby arrangements to rapidly mobilise road sweeping/cleaning equipment to respond to any spillages.

9. Once the area is stabilised, any sediment in the SRP, DEB or tanks will be removed. The silt fence will be removed and the area left stabilised and ready for the next phase of work.

3.2 Shaft Excavation and Tunnelling

1. Prior to the commencement of shaft excavation, a pumped dewatering treatment system will be installed based on automatic dosing with settlement tanks or bunded chambers to remove sediment from dewatering flows. In addition, the discharge from the wheel wash will also be pumped to the treatment system, which will be designed to treat simultaneous flows from both the wheel wash and dewatering pumps.

2. The wheel wash, if required, will continue to operate throughout this phase of work and all vehicles will be inspected and washed down, before leaving the site.

3. The wheel wash pit will be inspected daily and when a significant amount of solid material has accumulated, it will be removed either by sucker truck (wet material) or by excavator (dry material) and trucked from the site.

4. Excavated material removed from the shaft excavation will be placed either
   (a) In skips that are progressively removed by truck;
   (b) Directly into trucks; or
   (c) In a bunded temporary stockpile area on site and removed progressively by truck.

   If the material is wet or sloppy, all skips or trucks collecting the spoil will be lined to contain the water. Any dirty water discharged from the bunded area will be pumped and flocculant added before being treated in the treatment system (item 10 above).

5. The wheel wash will continue to operate throughout this phase of work and all vehicles will be inspected and washed down, before leaving the site.

6. In the event of a soil spill, the area will be cleaned up as soon as possible. If sediment is discharged to the site SRP or DEB, chemical dosing will be required to maximise settlement within the pond prior to discharge, until the site cleanup is completed.

7. Concrete truck, concrete pump and shute cleanout water will be discharged to a skip and allowed to settle. During high summer, the water is expected to evaporate, while at other times of the year, it may build up in the skip. The water may be discharged to the SRP, DEB or tank after it has been neutralised (pH range 5.5 – 7.5). When the skip is full of concrete, it will be removed and replaced by another.

8. Fuel and Oil: It is anticipated that fuel bowser trucks will be used to refuel plant and equipment. The refuelling will be undertaken within the site and a spill clean-up kit will be available at all times when refuelling is in progress. Where a permanent fuel tank is maintained on site, it will be contained within a bund and secured against unauthorised access. Fuelling and refuelling may only be carried out when the spill clean-up equipment is available at the re-fuelling site.

9. Storage of Fuel, Oil and Chemicals: These will be stored in secured containers.

10. Tunnelling – small amounts of polymers may be applied to the cutting head while excavating through certain types of soils. The polymers generally remain attached to the spoil which is removed from the tunnel and then trucked to a landfill. Refer comments in section 2.5.3. Any polymers mixing with groundwater will be pumped to a close by wastewater system or into a container and taken off site.

11. Bentonite may be used to lubricate the pipes during jacking and is often mixed with groundwater before it is pumped to the surface. The groundwater bentonite mix will be dosed with flocculant and sediment removed by settlement tank(s) prior to discharge from the site.

12. The use of chemical dosing is required to achieve a high standard of discharge quality that has minimal adverse effects on the environment. Chemical treatment is likely to use PAC for both flocculant and pH adjustment for concrete washings. A draft Chemical Treatment Management Plan (CTMP) is included as Appendix C to this document. The CTMP will be updated before works are undertaken to ensure that the site-specific issues such as soil type, suitability of proposed chemical compound and settlement tank

design are appropriate for the subject work area and activity. The criterion for quality of discharges from the project work sites is 100mm clarity prior to any discharge.

13. Note that clean roof rainwater runoff from buildings on site is to be discharged to the diversion channels that run around the outside of the site or directly to a stormwater manhole, if one is readily accessible.

3.3 Trench Excavation

Some trenching works will be undertaken to connect to the existing network, including for the construction of Link Sewer 4 in Mangere Bridge. These trenches will extend outside of the main construction areas.

Generally, trench excavation will commence at the shaft, which will be the lowest point along the alignment of the new connections. If dewatering is required, the outflow can be discharged via the progressively installed pipe to the treatment system that is already located on the worksite and any sediment removed prior to discharge.

The progress of trench excavation, pipe laying, backfilling and reinstatement is progressive and it will be rare to have more than 30 m of trench open at any time during construction. This limits the sediment generation potential of this phase of work.

The following principles and standards will be applied to trenching work:

1. When working through grassed or reserve areas, the excavated material will be placed in “windrows” along either side of the alignment, with topsoil and general material separated for reuse. As the pipes are laid and jointed in the trench, they will be progressively backfilled and the surface reinstated, with the surplus excavated materials removed.

2. Where such work is undertaken close to a watercourse or the coastal marine area a super silt fence will be erected and maintained between the work areas and the watercourse or coastal marine area to prevent sediment from unstabilised areas of work being discharged into those environments. Stabilisation options include progressive mulching and grassing once the surface is reinstated.

3. Where the trench excavation is undertaken under or adjacent to a road or pavement, the trench will generally be backfilled with hardfill. The excavated material will generally be removed from the site as it is excavated. Once backfilled with hardfill, the site will be stabilised.

3.4 Dis-establishment and Site Restoration

At the conclusion of construction works, all materials and plant will be removed and the site will be reinstated to the agreed condition. Once the remedial works are completed to the extent that the site is stabilised, the site erosion and sediment controls will be dis-established and any affected areas reinstated.

3.5 Temporary coastal work

At Pump Station 23, off Frederick Street, the work site extends below the level of high tide, out into the Manukau Harbour. A specific construction methodology will be required for works in the CMA in order to mitigate the potential adverse effects of releasing sediment into the harbour and this will be developed as part of the detailed design and confirmed by the contractor.

One option is to construct a granular bund in the harbour to form the outer perimeter of the work platform and create a robust barrier to the discharge of general fill sediment to the harbour. The work would be carried out around tidal and weather conditions.

A typical methodology which may be utilised is to lay the geotextile on the sea bed as the tide falls, with plenty of spare material on the seaward side. Granular material (clean GAP 40 or SAP 40 scoria) would be end tipped onto the geotextile and then moved in to place to form the bund wall using an excavator. The excavator would track roll the granular materials and progressively build up the outer bund. If the work is incomplete when the tide comes back in, the surplus geotextile is pulled up and over the completed section of bund and pinned in place. This process would be repeated over subsequent tidal cycles, until the bund wall is completed. During this work, as sections of the bund are completed, rock armour units are progressively placed on the face of the bund until the entire bund is protected.

Once the outer bund is completed, the seafloor would be covered with geotextile and bulk fill (which may also be granular) and compacted inside the bund to form the work platform. The platform would be completed with the surface graded from the seaward edge to the land, so that any contaminated runoff is directed to the sediment sump. If the platform settles due to compression of underlying silts and mud, then the internal fill would be topped up to maintain the required fall to the sump.

At the conclusion of the work, the fill will be removed and trucked from the site using sealed trucks to cart any saturated material. Once the general fill is removed, the rock armour units will be progressively removed and the original bund excavated. Finally, where possible, the geotextile is removed and the intertidal zone reinstated to its original condition.

Similarly, at the Mangere Pump Station site, works to construct the emergency pressure relief structure in the CMA would be undertaken around tidal and weather conditions.

4. OVERALL EROSION AND SEDIMENT CONTROL APPROACH

This section provides an outline of the erosion and sediment control measures to be implemented, consistent with the principles identified above. Further design and detail will be developed through refinement of the draft site specific erosion and sediment control plans in Appendix A (with supporting text in Appendix B). These will be subject to a Manager approval process prior to commencement of construction, in accordance with normal resource consent conditions.

The erosion and sediment control measures are designed to be in accordance with TP90 and to minimise soil erosion and sediment yield from the construction sites.

A number of sites are located in close proximity to watercourses. These sites are:

- Lyon Avenue (Meola Creek);
- Haverstock Road (Meola Creek, partly piped);
- Walmsley Park (Oakley Creek);
- May Road (connects to Oakley Creek);
- Keith Hay Park (Oakley Creek);
- Rawalpindi Reserve (Meola Creek);
- Norgrove Avenue (Meola Creek);
- PS 25 (Miranda Reserve) (Whau Creek); and
- Miranda Reserve (Whau Creek).

Three sites (PS 23 (Frederick Street), Kiwi Esplanade, and Mangere Pump Station) are near the coastal marine area (Manukau Harbour).

The typical control measures applicable to the project are:

- Clean water runoff diversion channels and bunds;
- Dirty water collection channels;
- Super silt fence;
- Rapid revegetation and stabilisation;
- Stabilised, durable construction access and egress;
- Wheel wash at the site exit;
- Use of Sediment Retention Ponds and Decanting Earth Bunds for sediment removal;
- The use of chemical flocculants to promote settlement of entrained sediment;
- Setting up purpose built treatment facilities with automatic flocculant dosing for treatment of pumped dewatering discharges and the wheel wash discharge.

The Contractor will be responsible for the management and maintenance of all erosion and sediment control measures for the duration of the period of construction at each site. If construction activities cease for a period at any site, the Contractor will (as a minimum), inspect and monitor site discharges and maintain the measures that are in place once a week and at any time there is a significant rainfall event. When construction activities resume, the Contractor will revert to the “active site” monitoring and inspection programme.

4.1.1 Dust control

This is not generally an issue in Auckland with the type of soils that are expected to be encountered and given that the work generally is taking place on stabilised sites.

Any potential dust effects will be managed to avoid the emission of dust beyond the boundaries of the sites. Methods for minimising and monitoring dust generated by

construction activities will be included in the Construction Management Plan(s). Dust suppression measures will be implemented in accordance with the "*Good Practice Guide for Assessing and Managing the Environmental Effects of Dust Emissions"* published by the Ministry for the Environment in 2001.

For example, the following additional measures may be appropriate to minimise potential dust nuisance:

- Areas of exposed earth stabilised as soon as possible;
- Stockpiles covered or dampened in dry windy conditions;
- Water carts used in dry windy conditions to dampen areas of exposed earth.

4.1.2 Wheel washes

Where practical and necessary sites will be provided with a wheel wash which will be maintained until work on that site is completed and the site reinstated. The wheel wash will comprise a heavy duty grid over a sealed sump and a means of washing down the truck body over the sump. There are various options including using a standard tap and hose, possibly including recycling of settled water from the sump; and of using high capacity water blasters, which are an efficient way to clean trucks with low water consumption.

When the wheel wash is first set up on site, it is proposed to be cleaned using sucker trucks until the dewatering treatment plant is operational. Once that is completed, water from the sump will automatically be dosed and pumped for treatment, prior to discharge.

4.1.3 Access roads

Where access roads are required, they will typically be formed and metalled, and standard road crossings constructed. Sealed access roads may be utilised at primary construction sites, or at other sites as determined by the contractor's methodology.

4.1.4 Monitoring and maintenance

The Contractor will be required to plan, undertake and record the outcomes of environmental monitoring and maintenance at each site. This is to ensure that the proposed erosion and sediment control measures have been installed correctly, and are functioning effectively throughout the duration of the works.

4.1.5 Groundwater

Groundwater may enter through the shaft lining or tunnel wall during construction and will accumulate at the tunnel head and/or the shaft. The amount of groundwater entering the underground work area will be site specific and is dependent on ground conditions and the shaft lining system selected.

Groundwater entering construction trenches is likely to be transferred to the downstream shaft site via the progressively installed pipe system. The amount of groundwater entering a trenched excavation is likely to be minimal.

All groundwater entering the underground work area will be pumped to the surface where it will be treated prior to discharge to a receiving environment. The treatment of the groundwater will be dependent on its quality and may include flocculation and a series of settling devices in order to achieve the required quality.

Any groundwater deemed unfit for discharge to surface water following treatment will either be disposed of directly to the wastewater system or transported off site for disposal. This could be triggered by concreting work within the tunnel if it raises the pH above 7.5. There

are options for lowering the pH which would also be considered in evaluating the appropriate wastewater or off-site disposal option.

5. STORMWATER MANAGEMENT

Stormwater runoff will generally be managed during construction with the use of TP 90 devices. At some of the larger sites where there will be temporary sheds over the shafts (Western Springs and May Road) additional rain detention tanks are also proposed to provide attenuation.

At the following sites it is proposed to discharge stormwater directly into streams:

- Lyon Avenue;
- Walmsley Park;
- May Road;
- Keith Hay Park;
- Motions Road;
- Western Springs Depot;
- Rawalpindi Reserve;
- Norgrove Avenue;
- PS 25 (Miranda Reserve);
- Miranda Reserve;
- Dundale Avenue; and
- Haycock Avenue.

The catchments of the streams adjacent to the construction sites are substantial in area and the increased discharge resulting from additional hardstanding on each site will not materially affect the flow in the stream. Where runoff is to be directed to a stream on any site, temporary scour protection (e.g. riprap on geotextile) will be constructed where necessary on the banks and bed of the stream to mitigate the risk of erosion at the point of discharge.

Where stormwater is discharged to the CMA (at PS 23 (Frederick Street) and potentially at Mangere Pump Station and Kiwi Esplanade) the stormwater volume will be minimal in the context of the receiving environment. Where necessary, temporary scour protection will be installed at the point of discharge to mitigate the risk of erosion.

Appendix A: Erosion and Sediment Control Drawings and Supporting Text

Appendix A was provided in December 2012 and has not been reproduced here

Appendix B – Draft Chemical Treatment Management Plan

Central Interceptor Main Project Works

Draft Chemical Treatment Management Plan

May 2013

CONTENTS

DOCUMENT HISTORY AND STATUS

Revision 01 s92 response	***Date***	***Name***	***Signature***	***Status***
Author	22/5/13	A Gough		
Reviewed by	22/5/13	Tom Halpin		
Approved by				

1. Environmental Quality Safety Manager

An individual shall be appointed (Environmental Quality Safety Manager or EQSM) to be responsible for the safe delivery, storage and use of the chemicals on the sites for the duration of the project.

2. Scope of this document

This document refers to the requirements for Erosion and Sediment Controls that manage the discharge of surface runoff from unstabilised construction sites. Generally, the management of groundwater discharges is undertaken using a proprietary multi-tank system, which also includes chemical dosing.

3. Use of chemicals for sediment removal

The Construction Discharge Management Plan sets out the requirements for erosion and sediment controls during the period of construction of stabilised sites that are subsequently used in the construction of the CSO Collector Sewers. Depending on available space it is proposed to establish DEBs or tanks at each of the construction sites and that the DEB or tank will be dosed with chemicals to optimise sediment removal prior to discharge. In addition, chemicals may be used to enhance sediment removal in treatment facilities for truck wash runoff or spoil heap runoff. Much of the following will be applicable to these facilities.

4. Chemical Trials

Take a bulk soil sample taken from the site and use bench testing on the soil to determine the optimal dose rates for PAC coagulation and settlement for the given soil characteristics.

Note that once results have been obtained over the range of soils that occur across the project, the optimal dosage levels for a site may be based on test data from other sites with similar soils types and conditions.

5. Dosing Methodology

Dosing the DEB or pond shall be carried out using an appropriate form of rain activated dosing device. For larger ponds, it is expected that dosing shall be provided using a displacement tank system, which is activated by a roof mounted catchment tray.

For smaller sites, alternative dosing devices may be used that are appropriate to the situation. This may include the use of a pre-fabricated concrete forebay unit with a restricted flow outlet and a ballcock valve activated PAC dosing system or the use of flocculant impregnated permeable bunds in the flow path upstream of the receiving DEB or pond.

Whichever dosing system is used, it shall be monitored carefully during the first few rainfall events to check that the system is effective and to ensure that overdosing is not occurring. If overdosing is suspected because the pond or DEB water is exceptionally clear, take samples to check pH and dissolved aluminium analysis. If overdosing occurs, take steps to reduce the size of the dose being added.

In any case, inspect and check the operation of the system no less than twice a week and after each rainfall event. Check all flocculant storage units have adequate PAC for the next

storm event and that all valves, pipe and other components are clean and there are no leaks in the system.

6. Spill Contingency Plan

To minimise the potential of a chemical spill the following measures will be taken:

- Limited volumes of chemicals will be stored on site.
- Chemicals will be stored in secure facilities.
- Chemicals will not be stored within 10m of a watercourse, or surface water drain.
- Wheelie bin spill kits will be located at or near the chemical storage area. These kits are designed to be mobile and in the event of a spill they will be moved to that area.

In the event of a spill to ground the following procedures will be followed:

- The source of the spill will be identified and further spillage prevented by stopping the source of the spill, i.e. ceasing chemical handling, plugging burst barrels, standing up overturned containers etc.
- Chemical storage areas will be drained towards the SRP or DEB to control the effects in the event of a spillage.
- Details of the spill and remedial actions will be recorded. The EQSM is to be notified immediately if the spill is in excess of 60 litres.

In the event of a spill to a watercourse the following procedures will be followed:

- The source of the spill will be identified and further spillage prevented, i.e. by ceasing chemical handling, standing up overturned containers etc.
- Details of the spill and remedial actions are to be recorded and the EQSM is to be notified immediately. The EQSM will then notify Watercare and Auckland Council.

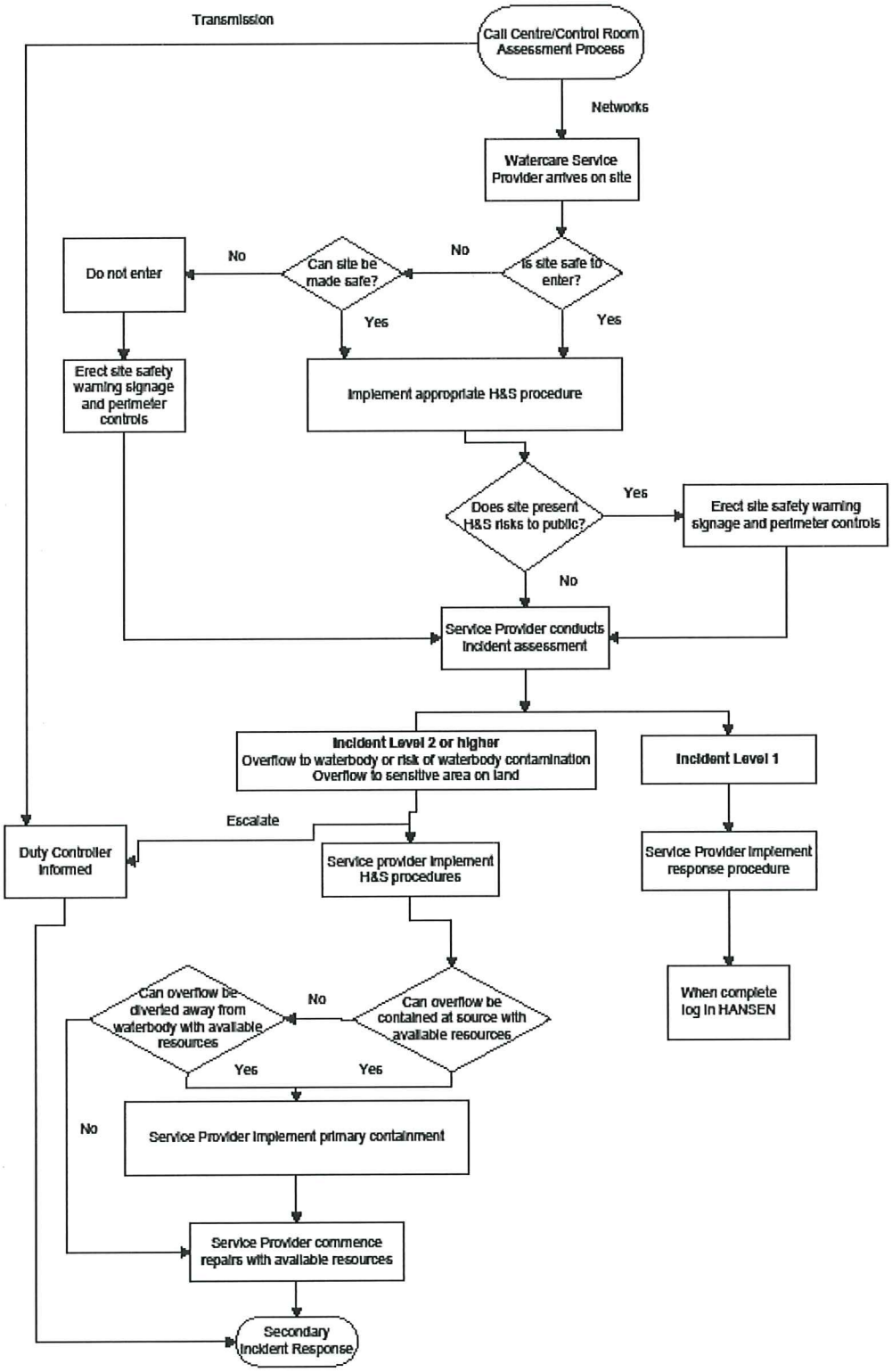
Attachment 3

Watercare Incident Response Procedures

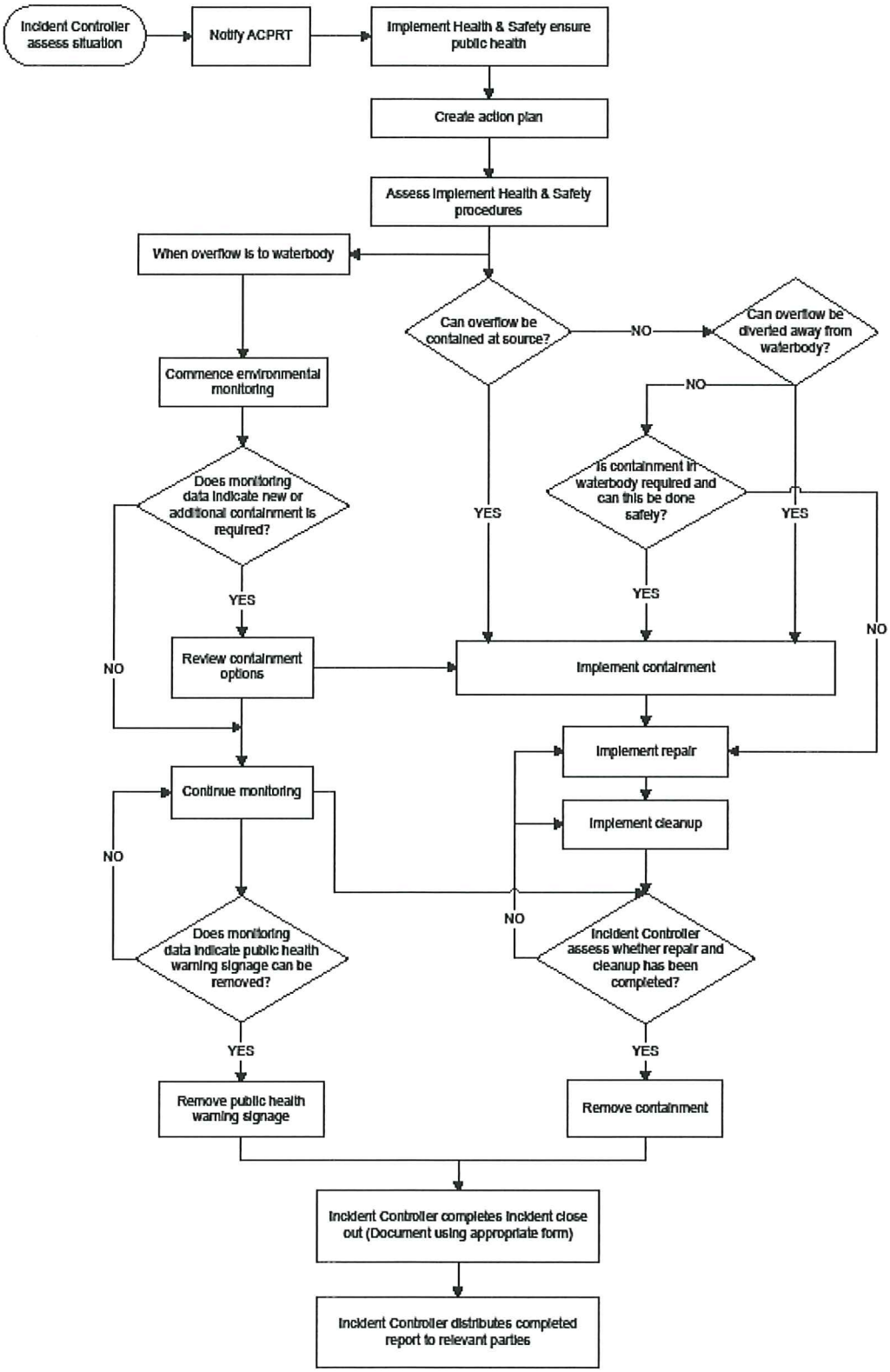
(source: Wastewater Overflow Regional Response Manual, Version 1.0, May 2013)

9. Watercare Incident Response Flow Charts

9.1 Primary Response

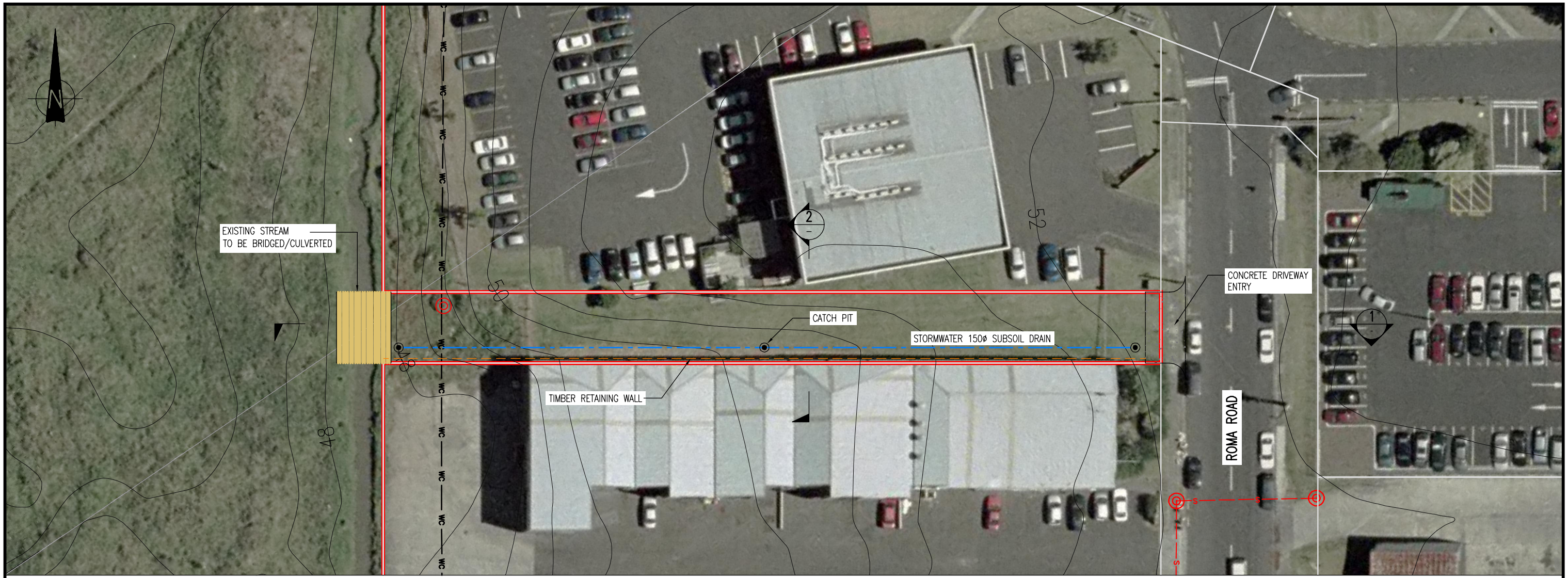


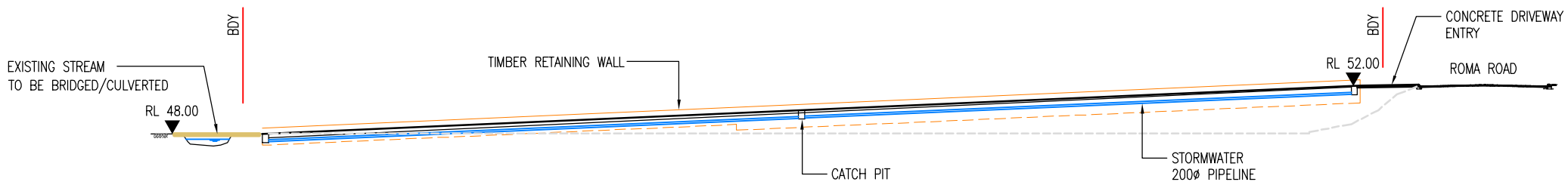
9.2 Secondary Response Watercare



Attachment 4

Roma Road Access Drawing





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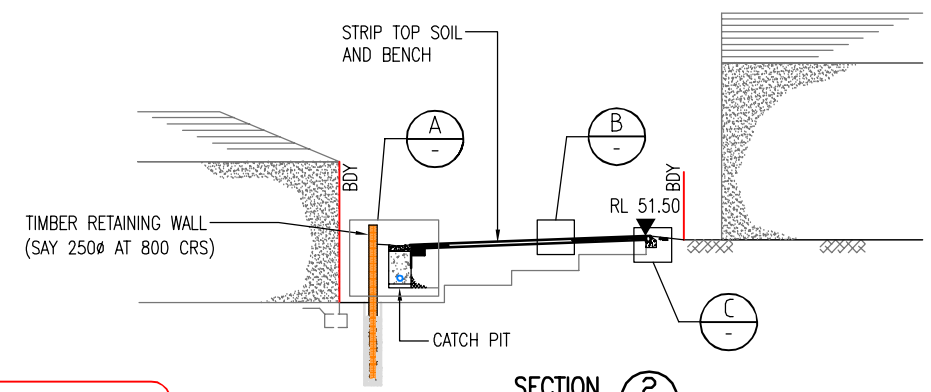

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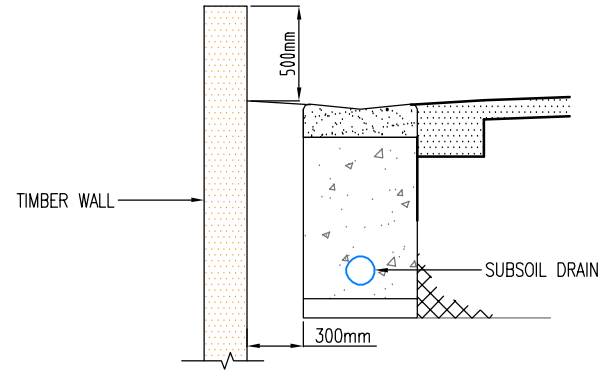
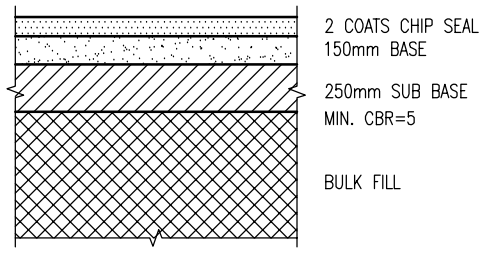
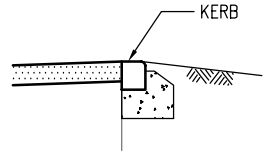


DETAIL A



DETAIL B



DETAIL C

NOTES:

1. ALL DIMENSIONS AND LEVELS TO BE CONFIRMED ON SITE.

FOR INFORMATION ONLY

Plot Date: 27-May-13 1:30 p.m.
File path: P:\0538 - Central Interceptor\11.0 Compiled Drawings\6_WS2_May Road\Alternatives-Options\Dwg

Project No.

ISSUE	DATE	AMENDMENT	BY	APPD.
1		FOR INFORMATION	AP	

DESIGNED	NL	
DES. CHECKED	JQC	–
DRAWN	AP	
DWG. CHECKED	NL	–
REV'D P.MGR	JQC	
APP'D P.DIR	CC	

OPERATIONS

ASSET MANAGER

SITE LAYOUT AND DESIGNS INDICATIVE ONLY AND SUBJECT TO CHANGE DURING DETAILED DESIGN DEVELOPMENT

MAY 2013

water Care services limited

CENTRAL INTERCEPTOR
GENERAL
MAY ROAD (WS2) – ACCESS FORMATION

DRAFT

CAD FILE SK_1300 — DATE 23-May-13

ORIGINAL SCALE A1 1:500 A3 — CONTRACT No. 0538

DRAWING No. SK_1300 — ISSUE 1

Attachment 5

Alternative Sites Comparisons

Lyon Ave Site (Proposed Location)

Land Owner:

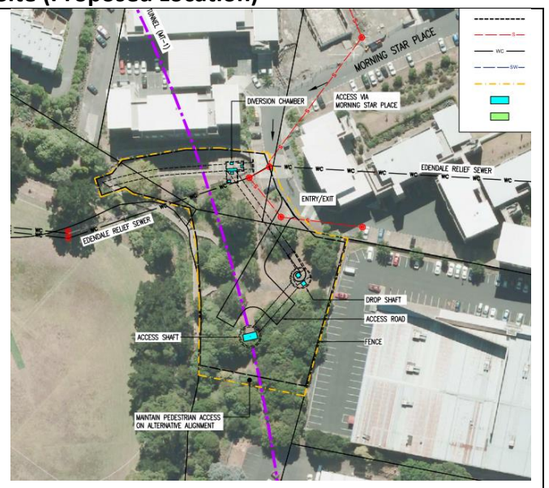
- Crown (Ministry of Education / MAGS)
- Multiple unit owners (St Lukes Garden Apartments (SLGA)), St Lukes Holdings Ltd

Construction site location

- Proposed shaft location in optimal location for connection to Edendale Branch Sewer
- Construction access via Morning Star Place

Maintenance & Operations

- Permanent structures finished generally at ground surface level
- Permanent access via Morning Star Place for occasional inspection and maintenance activities



Land use effects

- Landscape – Removal of mature vegetation, construction site screening and construction activities will have more than minor effects on visual amenity and landscape character of Roy Clements Treeway. Mitigation of effects on-site will be required through design and landscape plantings, but this will take time to achieve.
- Neighbours & amenity – Limited separation from residential neighbours (approx. 15m to closest). Temporary loss of amenity for users of Roy Clements Treeway and for SLGA residents due to construction activities.
- Recreation – Local effect on recreation values during construction due to need for diversions of the public walkway around the site to maintain access through Roy Clements Treeway.

Cultural heritage effects

- Cultural heritage - Site in modified area with no archaeological evidence.

Environmental effects

- Traffic – Morning Star Place represents good option for traffic and pedestrian safety during construction, and additional traffic well within capacity of Morning Star Place and St Lukes Road. The temporary loss of visitor parking during construction work at Morning Star Place is anticipated in existing resource consents for apartments. Access via Morning Star Place is provided for in an existing agreement with SLGA.
- Ecology – Wider Roy Clements Treeway area is identified as of ecological significance in draft Unitary Plan, and construction site is assessed as being of moderate ecological value by ecologist. Reduction in value associated with vegetation removal, but noting reinstatement landscaping and ecological mitigation plantings proposed to offset effect.
- Noise – Works will generally comply with construction noise standards at adjacent apartments, except for period during excavations through basalt and during shaft construction, and will require management measures.
- Vibration – Excavation in basalt, either by mechanical rockbreaker or blasting, will result in some short term disturbance at adjacent apartments
- Groundwater & settlement – Not expected to cause adverse effects on adjacent buildings or structures

MAGS Sports Fields Site

Land Owner:

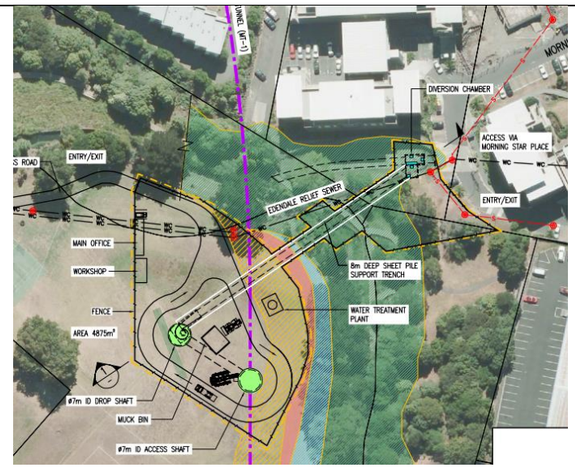
- Crown (Ministry of Education / MAGS)
- Multiple unit owners (SLGA), St Lukes Holdings Ltd

Cost comparison relative to Lyon Ave site

- Additional $400,000 (main tunnel 12 m shorter but additional cost for construction access, temporary stream diversions for connections and for reinstatement of playing fields to a raised ground level)

Construction site location

- Connection between Edendale Branch Sewer via diversion chamber and drop structure requires either trenching across Meola Creek via deep excavation (approx. 8 m deep) and associated temporary stream diversion; or dropshaft (approx. 8.5m in diameter) adjacent to diversion chamber and tunnelling across to access chamber in school playing field
- Construction access via new road across MAGS sports fields, either from Alberton Ave or from Fergusson Road and Fergusson Reserve (reserve land owned by Auckland Council), with access to works on right bank for connections either by bridging of Meola Creek and / or via Morning Star Place



Maintenance & Operations

- Permanent shaft structures partially above ground to avoid inundation in flood, or fill will be needed to raise ground level around lids to ensure fields remain usable.
- All weather trafficable access road required across MAGS playing fields for occasional inspection and maintenance activities

Land use effects

- Landscape – Works required for connection to Edendale Branch sewer and overflow (either trenching or drop shaft on right bank of stream) will require removal of mature vegetation. These works, along with construction site screening will have more than minor effects on existing visual amenity and landscape character. Mitigation of effects will be required through design and landscape plantings on both sides of Meola Creek, but this will take time to achieve. The overall area of vegetation affected is less than for the Lyon Ave site.
- Neighbours & amenity – Limited separation is available from residential neighbours (approx. 15m to closest) at the diversion chamber and for trenching or drop shaft options, but separation is increased for construction of the access shaft and drop shaft. There will be some loss of amenity for users of Roy Clements Treeway and SLGA residents as for the Lyon Ave site option. With construction activities in the MAGS grounds, these effects will also be extended to school users.
- Recreation - Local effect on recreation values during construction due to need for diversions of the public walkway around the site to maintain access through Roy Clements Treeway. Trenching works may require some temporary closures of the walkway if trenching across Meola Creek is required. Works will remove at least one playing field from service during construction, impacting on school users. Permanent works (lids and all weather access track) will also impact on use and value of playing field.

Cultural heritage effects

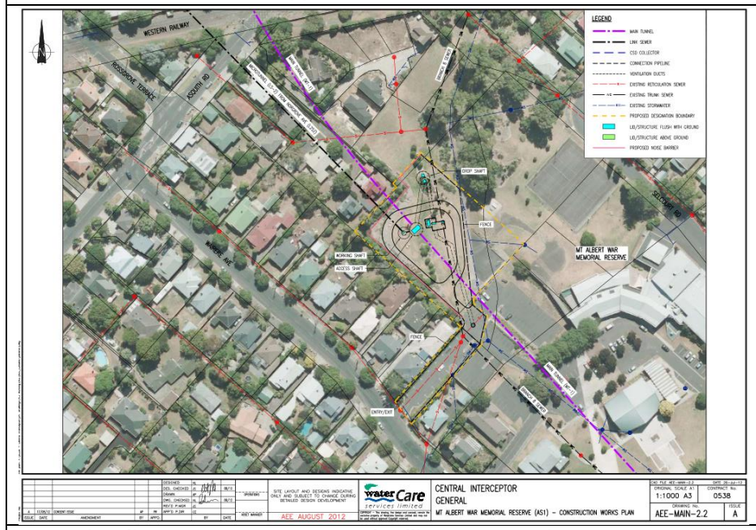
- Cultural heritage - Site in modified area with no archaeological evidence.

Environmental effects

- Traffic – Operating restrictions to avoid peak school hours and associated traffic management measures will be required to minimise adverse traffic and pedestrian safety effects of construction traffic on Alberton Ave or Fergusson Ave and MAGS fields. Additional construction traffic is well within capacity of local roads. Works will result in temporary loss of visitor parking at Morning Star Place, but this is anticipated in existing resource consents for apartments. Morning Star Place represents good option for traffic and pedestrian safety if this option is utilised for access during construction works on right bank. Access via Morning Star Place is provided for in an existing agreement with SLGA.
- Ecology – Wider Roy Clements Treeway area is identified as of ecological significance in draft Unitary Plan, and construction site is assessed as being of moderate ecological value by ecology specialist. Reduction in value associated with vegetation removal, but noting reinstatement landscaping and ecological mitigation plantings proposed to offset effect. Potential for effect on Meola Creek during trenching works with temporary stream diversion required, and associated risks with flood events.
- Noise – Works will generally comply with construction noise standards at adjacent apartments, except for period during excavations through basalt for trench or shaft construction. Will not be significantly different to effects of Lyon Ave option, due to works required to make connections. Access road from Alberton Ave would pass adjacent to MAGS boarding hostel.
- Vibration – Excavation in basalt, either by mechanical rockbreaker or blasting, will result in some short term disturbance at adjacent apartments. Will not be significantly different to effects of Lyon Ave option, due to works required to make connections.
- Groundwater & settlement – Not expected to cause adverse effects on adjacent buildings or structures.

Mt Albert War Memorial Reserve Alternative Sites

Option 1: NOR & Consent Application



Separation distance:	nearest dwelling	Recreation Centre
Access shaft:	15 m	70 m
Drop shaft:	20 m	80 m
Control chamber	25 m	60 m
Trenched pipeline	10 m	50 m

Depth of CI tunnel below ground approx. 40m

Noise:
The construction sound levels are predicted to comply with the Construction Noise Standard for Monday to Saturday day-time (0730 – 1800hrs) for all receivers with the exception of the first floor of receiver at 65B and 65C Asquith Ave. A non-compliance of 3 decibels is predicted for that site during rock breaking (longest duration will be during shaft sinking, with the rock breaking phase expected to take several weeks to complete). Designing a barrier to mitigate levels to comply with the limit of the Construction Noise Standard is not practicable for this receiver as it would need to be excessively high and alternative noise mitigation may be required. General day-to-day construction sound levels would be lower.

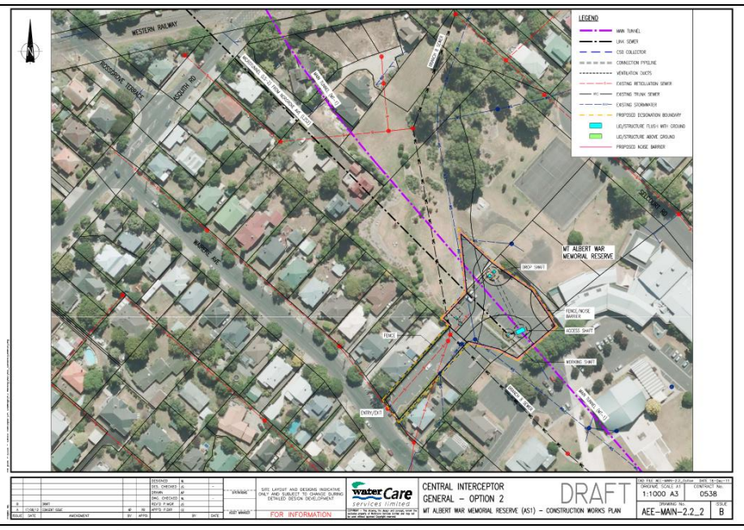
Vibration:
Minor disturbance effects possible during rock breaking and blasting (if required) for shafts and for trenching at sites at 65 B & C Asquith Ave and 9 – 17 Wairere Ave, with effects mitigated via Construction Vibration Management Plan. No damage to structures expected.

Settlement:
Houses on Wairere Ave (9, 11, 13, 15, 17) & Asquith Ave (65C & B) next to the shaft site are exposed to the highest potential settlement hazard, but damage is not expected due to settlement. Practical methodologies are available to construct the shafts at the locations as shown without resulting in settlement related damage.

Traffic:
Loss of some 23 parking spaces

Arboriculture:
Removal of native plantings on southern boundary of reserve and on rise near access shaft location

Option 2: Lower Carpark



Separation distance:	nearest dwelling	Recreation Centre
Access shaft:	40 m	15 m
Drop shaft:	35 m	35 m
Control chamber	10 m	50 m
Trenched pipeline	12 m	15 m

Depth of CI tunnel below ground approx. 40m

Noise:
The construction sound levels are predicted to comply with the Construction Noise Standard for Monday to Saturday day-time (0730 – 1800hrs) for all receivers with the exception of 11 Wairere Ave, 9 Wairere Ave and the AC Recreation Centre. A non-compliance of 4 to 11 decibels is predicted for these locations, mainly attributable to rock breaking (longest duration will be during shaft sinking, with the rock breaking phase expected to take several weeks to complete). Other activities such as bored piling would generally be compliant with the Construction Noise Standard, based on screening from the recommended acoustic barrier. General day-to-day construction sound levels would be lower.

Vibration:
Minor disturbance effects possible during rock breaking and blasting (if required) for shafts and for trenching at sites at 5 and 9 Wairere Ave, and at Recreation Centre, with effects mitigated via Construction Vibration Management Plan. No damage to structures expected.

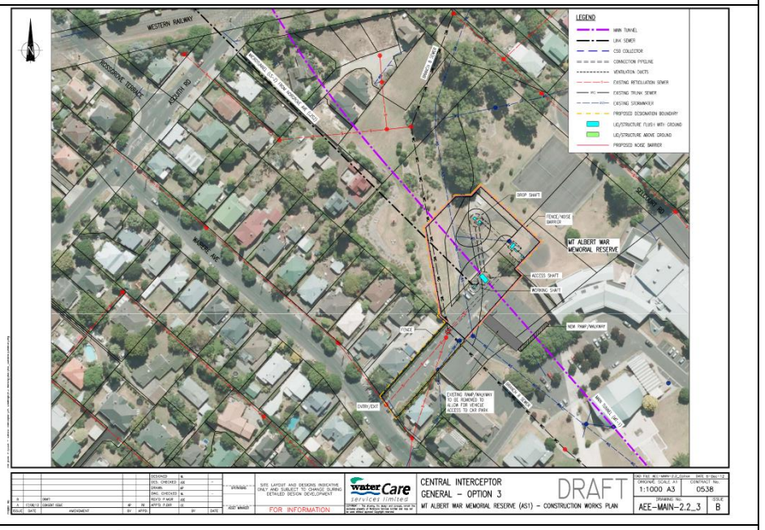
Settlement:
Settlement hazard is shifted away from residential structures to the AC Recreation Centre buildings adjacent to the western car park. Settlement is not expected to result in damage to the council buildings (but could affect kerb lines and asphalt surfaces of carpark). Practical methodologies are available to construct the shafts at the locations as shown without resulting in settlement related damage.

Traffic:
Loss of some 67 parking spaces (44 additional parking spaces compared to Option 1).

Arboriculture:
Removal of exotic tree on slope towards northern end of existing retaining wall

Cost differential (compared to Option 1):
Additional: ≈ $800K (additional length of Link Sewer ≈ 82m)

Option 3: Basketball Court



Separation distance:	nearest dwelling	Recreation Centre
Access shaft:	25 m	30 m
Drop shaft:	50 m	50 m
Control chamber	60 m	20 m
Trenched pipeline	30 m	30 m

Depth of CI tunnel below ground approx. 40m

Noise:
The construction sound levels are predicted to comply with the Construction Noise Standard for Monday to Saturday day-time (0730 – 1800hrs) for all receivers with the exception of the first floor of receiver at 65B and 65C Asquith Ave. A non-compliance of 3 decibels is predicted for that site during rock breaking (longest duration will be during shaft sinking, with the rock breaking phase expected to take several weeks to complete). Designing a barrier to mitigate levels to comply with the limit of the Construction Noise Standard is not practicable for this receiver as it would need to be excessively high and alternative noise mitigation may be required.

Vibration:
Minor disturbance effects possible during rock breaking and blasting (if required) for shafts and for trenching at sites at 65 B & C Asquith Ave and 9 – 17 Wairere Ave, with effects mitigated via the Construction Vibration Management Plan. No damage to structures expected.

Settlement:
Greater separation distance from residential structures and council buildings results in lowest shaft settlement hazard (but could affect kerb lines and asphalt surfaces of carpark). Practical methodologies are available to construct the shafts at the locations as shown without resulting in settlement related damage.

Traffic:
Loss of some 39 parking spaces (16 additional parking spaces compared to Option 1).

Arboriculture:
Removal of exotic tree on slope towards northern end of existing retaining wall; possibility of avoiding trees in western part of reserve

Cost differential (compared to Option 1):
Additional: ≈ $507K (additional length of Link Sewer ≈ 52m)

Note; Comparative alternatives assessment table as provided to Albert-Eden Local Board and AC Parks on 8 February 2013

Keith Hay Park Site (proposed location)

Land Owner:

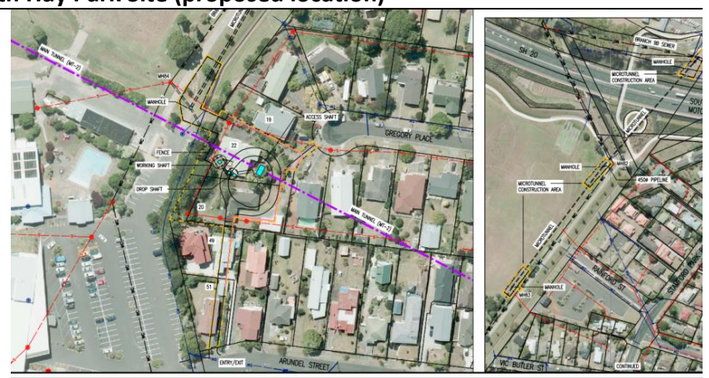
- Auckland Council, 1 private residential property

Construction site location

- Connection to Branch 9B Sewer
- Construction access via Arundel Street across 49 and 51 Arundel Street and Rainford Street (for micro-tunnelling works)

Maintenance & Operations

- Permanent structures finished generally at ground surface level
- Permanent access via Gregory Place



Land use effects

- Landscape – Low level adverse effects on open space and landscape character for passersby and residents at the northern end of Keith Hay Park. More than minor adverse effects on visual amenity for closest neighbours on Arundel Street and Gregory Place.
- Neighbours & amenity – Limited separation from residential neighbours (approx. 15 m between 19 Gregory Place and closest shaft location shown on drawing). Loss of amenity due to construction traffic and noise.
- Recreation - Limited effect on recreation values as only microtunnel connection sites on part of reserve currently used for recreation. Design minimises conflict with Keith Hay Park Concept Plan.

Cultural heritage effects

- Cultural heritage - Site in modified area with no archaeological evidence.

Environmental effects

- Traffic – Additional traffic within the capacity of surrounding roads. Access to works site and to micro-tunnelling sites will require traffic management. Alternative pedestrian/cycle facilities to be provided.
- Trees – Limited vegetation removal. Some vegetation removal being undertaken by Auckland Council as part of their park development works. Recently planted buffer along eastern boundary to be retained.
- Ecology – Low overall ecological value and effects less than minor.
- Noise – Noise levels are expected to exceed Construction Noise Standard at 18 and 19 Gregory Place and 47 Arundel Street at times.
- Vibration – Given the ground conditions, vibration levels are not expected to cause damage or disturbance.
- Groundwater & settlement – Not expected to cause adverse effects on adjacent buildings or structures.

Keith Hay Park Sports Fields Site

Land Owner:

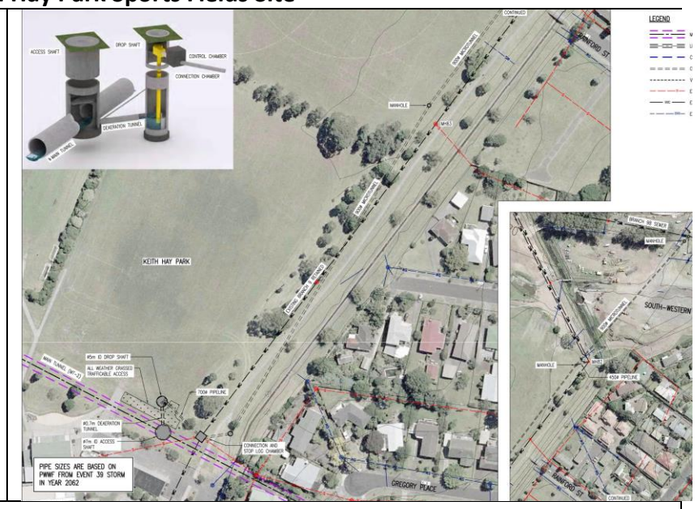
- Auckland Council

Construction site location

- Connection to Branch 9B Sewer
- Construction access via Rainford Street

Maintenance & Operations

- Permanent structures finished generally at ground surface level
- Permanent access via Arundel Street



Land use effects

- Landscape – Temporary effects on reserve due to construction traffic and noise within the reserve and removal of some trees and shrubs.
- Neighbours & amenity – Greater separation from residential neighbours (approx. 50 m between house at 19 Gregory Place and the shaft as shown on drawing).
- Recreation – Located away from main sports fields, but Auckland Council Parks and Puketepapa Local Board opposed to site due to impact on recreation in this well used reserve and conflict with Keith Hay Park Concept Plan. Site access via Rainford Street impacts on park users and alternative pedestrian pathway would need to be provided.

Cultural heritage effects

- Cultural heritage - Site in modified area with no archaeological evidence.

Environmental effects

- Traffic – Additional traffic within the capacity of surrounding roads. Access to works site and to micro-tunnelling sites will require traffic management. Alternative pedestrian/cycle facilities to be provided.
- Trees – Some limited vegetation removal required in the vicinity of the construction area.
- Ecology – Low overall ecological value and effects less than minor.
- Noise – Noise levels at nearest residential receivers expected to meet Construction Noise Standard. Potential exceedence at recreational complex within the Park.
- Vibration – Given the ground conditions, vibration levels are not expected to cause damage or disturbance.
- Groundwater & settlement – not expected to cause adverse effects on adjacent buildings or structures.

Keith Hay Park Site (49 and 51 Arundel Street)

Land Owner:

- Auckland Council

Construction site location

- Connection to Branch 9B Sewer
- Construction access via Arundel Street and Rainford Street (for micro-tunnelling works)
- Site area and internal circulation constrained

Maintenance & Operations

- Permanent structures finished generally at ground surface level
- Permanent access via Arundel Street

Land use effects

- Landscape – Low level adverse effects on open space and landscape character for passersby and residents at the northern end of Keith Hay Park. More than minor adverse effects on visual amenity for closest neighbours on Arundel Street and Gregory Place.
- Neighbours & amenity – Limited separation from residential neighbours (approx. 10 m between 47A Arundel Street and shaft location shown on drawing). Loss of amenity due to construction traffic and noise.
- Recreation - Limited effect on recreation values as only microtunnel connection sites on part of reserve used for recreation. Design minimises conflict with Keith Hay Park Concept Plan.

Cultural heritage effects

- Cultural heritage - Site in modified area with no archaeological evidence.

Environmental effects

- Traffic – Additional traffic within the capacity of surrounding roads. Access to works site and to micro-tunnelling sites will require traffic management. Alternative pedestrian/cycle facilities to be provided.
- Trees – Vegetation removal undertaken by Auckland Council. Not possible to retain recently planted buffer along eastern boundary due to space constraints.
- Ecology – Low overall ecological value and effects less than minor.
- Noise – Noise levels would likely exceed Construction Noise Standard at times at the closest residential properties.
- Vibration – Vibration levels not expected to cause damage to structures but could disturb residents.
- Groundwater & settlement – Not expected to cause adverse effects on adjacent buildings or structures.

Keith Hay Park (20 and 22 Gregory Place)

Land Owner:

- Auckland Council, 1 private residential property

Construction site location

- Connection to Branch 9B Sewer
- Construction access via Gregory Place and Rainford Street (for micro-tunnelling works)

Maintenance & Operations

- Permanent structures finished generally at ground surface level
- Permanent access via Gregory Place

Land use effects

- Landscape – Low level adverse effects on open space and landscape character for passersby and residents at the northern end of Keith Hay Park. More than minor adverse effects on visual amenity for closest neighbours on Arundel Street and Gregory Place.
- Neighbours & amenity – Limited separation from residential neighbours (approx. 6 m between 19 Gregory Place and closest shaft location shown on drawing). Loss of amenity due to construction traffic and noise.
- Recreation - Limited effect on recreation values as only microtunnel connection sites on part of reserve used for recreation. Design minimises conflict with Keith Hay Park Concept Plan.

Cultural heritage effects

- Cultural heritage - Site in modified area with no archaeological evidence.

Environmental effects

- Traffic – Site access limited and requires construction access down narrow residential cul-de-sac (Gregory Place).
- Trees – Limited vegetation removal. Some vegetation removal being undertaken by Auckland Council. Recently planted buffer along eastern boundary to be retained.
- Ecology – Low overall ecological value and effects less than minor.
- Noise – Noise levels are expected to exceed Construction Noise Standard at 18 and 19 Gregory Place and 47 Arundel Street at times.
- Vibration – Vibration levels not expected to cause damage to structures but could disturb residents.
- Groundwater & settlement – Not expected to cause adverse effects on adjacent buildings or structures.

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Memorandum

To	Belinda Petersen	Page	1
CC			
Subject	Southern Mangere Inlet Options		
From	Central Interceptor Project Team		
File/Ref No.	DRAFT (Update of memo dated 23 April 2013)	Date	1 May 2013

1.1 Background

As requested, we set out as follows a summary of the assessments completed prior to lodgement of the NoR of the various site options considered on the southern side of the Manukau Harbour.

As you are aware, associated with the construction of the proposed Central Interceptor, works are required on the southern side of the Manukau Harbour to provide for:

- A tunnel access shaft to provide access to the tunnel and Tunnel Boring Machine during construction, and to provide access for inspection and maintenance once the tunnel is in use;
- A connection point to divert wastewater from the existing Mangere Bridge Branch sewer to the new Central Interceptor; and
- A pressure relief air vent to safely release air flows during tunnel filling in very large storm events.

1.2 Site options assessment process

In terms of evaluating site options a number of factors have been considered, including:

- *TBM and tunnel access* - a key consideration has been the need during construction to check the TBM and tunnel alignment before the harbour crossing. Once under the harbour, any mechanical problems with the TBM would be extremely difficult to remedy. This risk is reduced by locating the construction site as close as possible to the coastline to enable access to the TBM. Future maintenance access is also required once the tunnel is operational, and minimising the distance for access under this harbour section is also desirable.
- *Managing tunnel pressurisation during filling* - Hydraulic modelling has shown that during tunnel filling in a large storm an air pocket may be created between May Road and the Mangere Pump Station at the Wastewater Treatment Plant (WWTP). This event is expected to occur around twice in five years. This air pocket must be safely vented before tunnel pressurisation and damage occurs and modelling has shown that a shaft is needed between the WWTP and PS23 to provide for pressure relief venting. The analysis shows that the favourable location for this shaft and air vent is in the vicinity of Kiwi Esplanade. The risk of inadequate pressure relief and subsequent damage to the tunnel and associated structures increases as the venting location is shifted closer to the WWTP, ultimately becoming unacceptably high.
- *Length of the tunnel alignment* – as site locations move towards the west tunnel length increases, adding to the construction cost of the project.
- *Construction and operational effects* – considerations have focused on the potential effects of construction on the cultural and geological heritage values of the Ambury Farm Park area, and the local effects on residential neighbours.

1.3 Site locations considered

The site locations considered for the construction site on the southern side of the Manukau harbour are shown on the attached A3 drawing. The site locations considered were:

- Kiwi Esplanade:
  - Proposed location (at existing toilet block near Manukau Yacht and Motor Boat Club); and
  - Kiwi Esplanade West.

- Ambury Park:
    - Ambury Park North;
    - Northern Edge Ambury; and
    - East Ambury.
- Bull Paddock (at western end of Ambury Road);
- Muir Avenue Park;
- Watercare land.

1.4 Summary assessment sheets

A broad summary of this analysis is presented in the August 2012 AEE (Part B Section 9A), and we expand on that work in the summary assessment sheets attached, including site options not specifically identified in the AEE. The summary assessment considers site options generally in relation to the factors described above.

Yours sincerely

Attachments:

A3 drawing of site options and tunnel alignments
Summary sheets for:

Kiwi Esplanade Site
Kiwi Esplanade West Site
Ambury Park North Site
Northern Edge Ambury Site
East Ambury Site
Bull Paddock Site
Muir Ave Park Site
Watercare Land Site

MANGERE BRIDGE – OPTIONS

MAIN TUNNEL

PS23
(AS6)

Manukau Harbour

LENGTH BETWEEN PS23 AND WS3

- 4153m
- 4166m
- 4173m
- 4255m
- 4313m

LEGEND

- NZRC OIL PIPE

KIWI ESPLANADE
PROPOSED LOCATION

KIWI ESPLANADE
WEST

AMBURY PARK
NORTHERN EDGE

AMBURY PARK
NORTH

EAST AMBURY

BULL PADDOCK

WATERCARE LAND

LS-4

MUIR AVE PARK

Mangere Bridge
Township

MANGERE PUMP STATION
(WS3)

MANGERE WASTE WATER
TREATMENT PLANT

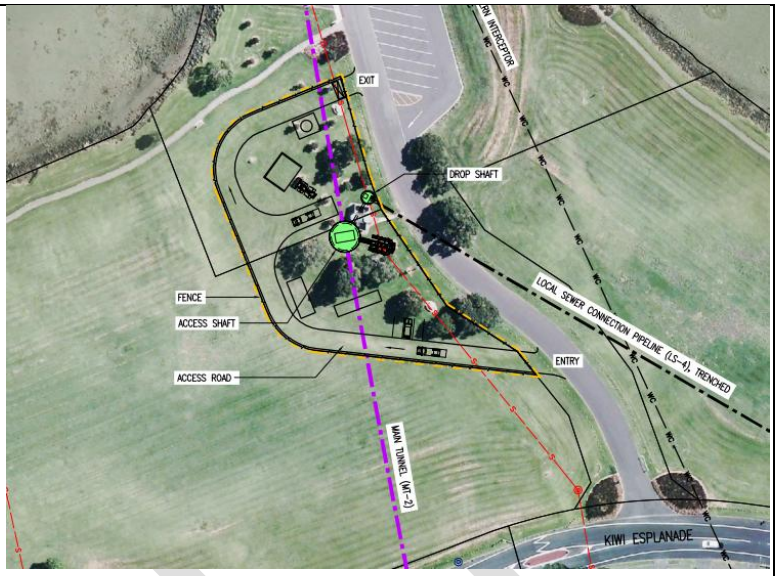
Kiwi Esplanade Site (proposed location)

Tunnel alignment and connections

- Main tunnel length PS 23 – WWTP: 4,153 m;
- Link Sewer 4 connection to Witla Court: 534m

Construction site location

- Proposed shaft location:
  - minimises distance between tunnel access shafts on either side of the Manukau Harbour
  - allows inspection of TBM before crossing the harbour to ensure it is in good working order
- Construction access via an existing formed road.



Operation and safety

- Pressure relief air vent optimally located to avoid tunnel pressurisation and damage during tunnel filling.
- Access shaft location minimises distances for maintenance workers in section under harbour.

Land use effects

- Landscape - Open space setting on coastal edge, existing trees provide some screening of permanent works, but construction site fencing and works will be visible to houses on western end of Kiwi Esplanade Reserve
- Neighbours - Reasonable separation from residential neighbours (approx. 100m)
- Recreation - Limited effect on recreation values. Adjacent public walkway. Temporary closure of toilet block.

Cultural & heritage effects

- Cultural heritage - Site in modified area with no archaeological evidence. Site supported by AC Parks
- Geological heritage - No geological heritage sites

Environmental effects

- Air discharge - Reasonable separation from residential neighbours (approx. 100 m). Air treatment for discharge which may occur during tunnel filling in normal wet weather events.
- Replacement of existing toilet / changing building provides opportunity to incorporate pressure relief air vent
- Traffic - Low level of traffic generation during construction will be well within capacity of local roads
- Trees - Loss of some existing trees, but will be retained where possible. Replanting & landscaping proposed
- Ecology - Site in proximity to high tide roost used by wading birds. Potential for some limited disturbance during construction. Trenching for Link 4 connection timed to avoid high wader numbers.

Kiwi Esplanade West Site

Tunnel alignment and connections

- Main tunnel length PS 23 – WWTP: 4,255 m;
- Link Sewer 4 connection to Witla Court: 670 m

Construction site location

- Proposed shaft location:
  - minimises distance between tunnel access shafts on either side of the Manukau Harbour
  - allows inspection of TBM before crossing the harbour to ensure it is in good working order
- Construction access off Kiwi Esplanade.

Operation and safety

- Pressure relief air vent optimally located to avoid tunnel pressurisation and damage during tunnel filling.
- Access shaft location minimises distances for maintenance workers in section under harbour.

Land use effects

- Landscape - Open space setting on coastal edge, construction site fencing and works will be highly visible to houses on western end of Kiwi Esplanade Reserve. Permanent works landscaped but remaining in residential views
- Neighbours - Reasonable separation from residential neighbours (approx. 100m)
- Recreation - Limited effect on recreation values. Construction works will conflict with use of adjacent public walkway and require local diversions.

Cultural & heritage effects

- Cultural heritage - Site in modified area with no archaeological evidence. Site supported by AC Parks
- Geological heritage - No geological heritage sites

Environmental effects

- Air discharge - Reasonable separation from residential neighbours (approx. 100 m). Air treatment for discharge which may occur during tunnel filling in normal wet weather events.
- Traffic - Low level of traffic generation during construction will be well within capacity of local roads
- Trees – Limited effect. Replanting & landscaping proposed
- Ecology - Site in proximity to high tide roost used by wading birds. Potential for some limited disturbance during construction. Trenching for Link 4 connection timed to avoid high wader numbers.

Ambury Park North Site

Tunnel alignment and connections

- Main tunnel length PS 23 – WWTP: 4,313 m;
- Link Sewer 4 connection to Witla Court: 790m

Construction site location

- Proposed shaft location:
  - minimises distance between tunnel access shafts on either side of the Manukau Harbour
  - allows inspection of TBM before crossing the harbour to ensure it is in good working order
- Construction access off end of Kiwi Esplanade into Ambury Farm Park.

Operation and safety

- Pressure relief air vent optimally located to avoid tunnel pressurisation and damage during tunnel filling.
- Access shaft location minimises distances for maintenance workers in section under harbour.

Land use effects

- Landscape - Greenfields, rural setting on edge of Ambury Farm Park, but largely screened from residential views.
- Neighbours - Reasonable separation from residential neighbours (approx. 100m)
- Recreation - Adjacent public walkway and some potential conflict with public access during construction requiring local diversions and safety management. AC Parks not in favour of sites in Ambury Park.

Cultural & heritage effects

- Cultural heritage - Site identified in Manukau District Plan as Archaeological site & waahi tapu. Site work, including trenching for Link Sewer 4 connection likely to encounter archaeological sites. Iwi in opposition to construction works in Ambury Park. AC Parks identified potential impact on cultural values.
- Geological heritage - Site in part of Ambury lava flow, with several lava caves / tubes identified in the vicinity. Cave not evident at construction site but possible that excavations could encounter one.

Environmental effects

- Air discharge - Reasonable separation from residential neighbours (approx. 100 m). Air treatment for discharge which may occur during tunnel filling in normal wet weather events
- Traffic - Low level of traffic generation during construction will be well within capacity of local roads, but with access off end of Kiwi Esplanade into Ambury Farm Park
- Trees – No effects
- Ecology – Site used as occasional high tide roost by wading birds – potential for some limited disturbance during construction

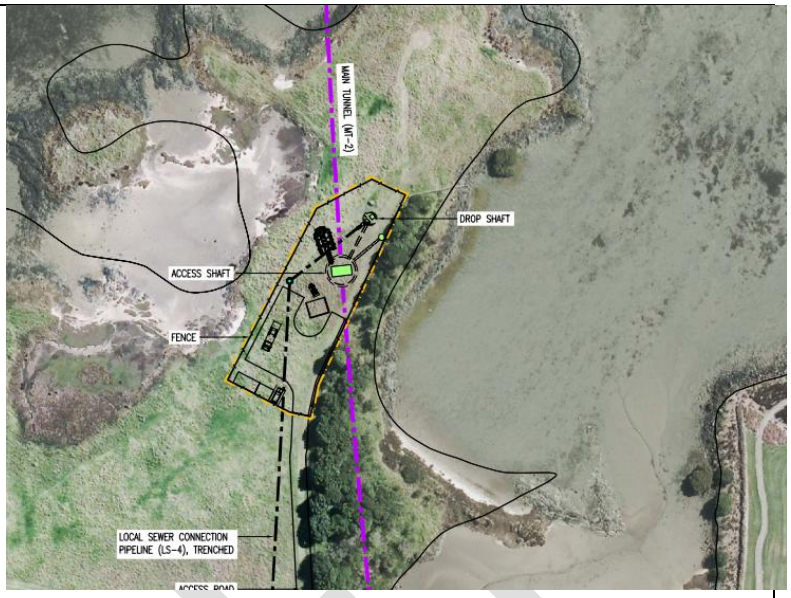
Northern Edge Ambury Site

Tunnel alignment and connections

- Main tunnel length PS 23 – WWTP: 4,313 m;
- Link Sewer 4 connection to Witla Court: 890m

Construction site location

- Proposed shaft location:
  - minimises distance between tunnel access shafts on either side of the Manukau Harbour
  - allows inspection of TBM before crossing the harbour to ensure it is in good working order
- Construction access off end of Kiwi Esplanade via new access road through Ambury Farm Park to site.



Operation and safety

- Pressure relief air vent optimally located to avoid tunnel pressurisation and damage during tunnel filling.
- Access shaft location minimises distances for maintenance workers in section under harbour.

Land use effects

- Landscape - Greenfields, rural setting on edge of Ambury Farm Park, but well screened from residential views. Relatively unmodified part of Ambury Farm Park.
- Neighbours - well separated from residential neighbours (approx. 200m)
- Recreation - Adjacent public walkway and some potential conflict with public access during construction requiring local diversions and safety management. AC Parks not in favour of sites in Ambury Park

Cultural & heritage effects

- Cultural heritage - Site identified in Manukau District Plan as Archaeological site & waahi tapu. Site work, including trenching for Link Sewer 4 connection, likely to encounter archaeological sites. Iwi in opposition to construction works in Ambury Park. AC Parks identified potential impact on cultural values.
- Geological heritage - Site in part of Ambury lava flow, with several lava caves / tubes identified in the vicinity. Cave not evident at construction site but possible that excavations could encounter one.

Environmental effects

- Air discharge - Reasonable separation from residential neighbours (approx. 200 m). Air treatment for discharge which may occur during tunnel filling in normal wet weather events
- Traffic - Low level of traffic generation during construction will be well within capacity of local roads, but with access off end of Kiwi Esplanade into Ambury Farm Park
- Trees – No effects
- Ecology – Site used as occasional high tide roost by wading birds – potential for some limited disturbance during construction

East Ambury Site

Tunnel alignment and connections

- Main tunnel length PS 23 – WWTP: 4,313 m
- Link Sewer 4 connection to Witla Court: 715 m

Construction site location

- Proposed shaft location:
  - approx. 200 m from coast making less suitable location for checking TBM before harbour crossing
  - increased distance between shafts on either side of Manukau Harbour
- Construction access required through part of Ambury Farm Park.

Operation and safety

- Site closer to WWTP so less suitable location for air venting to avoid tunnel pressurisation and damage during tunnel filling.
- Access shaft location increases distances for maintenance workers in section under harbour.

Land use effects

- Landscape - Greenfields, rural setting on edge of Ambury Farm Park, but largely screened from residential views.
- Neighbours - Reasonable separation from residential neighbours (approx. 150m)
- Recreation - Area used for overnight campervan parking. Conflicts with adjacent public walkway and local diversion required during construction. AC Parks not in favour of this site.

Cultural & heritage effects

- Cultural heritage - Site identified in Manukau District Plan as Archaeological site & waahi tapu. Iwi in opposition to sites in Ambury Park. AC Parks identified potential impact on cultural values.
- Geological heritage - Site in part of Ambury lava flow, with several lava caves / tubes identified in the vicinity. Cave not evident at construction site but possible that excavations could encounter one.

Environmental effects

- Air discharge - Reasonable separation from residential neighbours (approx. 150 m). Air treatment for discharge which may occur during tunnel filling in normal wet weather events
- Traffic - Low level of traffic generation during construction will be well within capacity of local roads, but with access through part of Ambury Farm Park
- Trees – No effects
- Ecology – No ecological values of note

Bull Paddock Site

Tunnel alignment and connections

- Main tunnel length PS 23 – WWTP: 4,255 m;
- Link Sewer 4 connection to Witla Court: 460m

Construction site location

- Proposed shaft location:
  - approx. 350 m from coast making less suitable location for checking TBM before harbour crossing
  - increased distance between shafts on either side of Manukau Harbour
- Construction access off end of Ambury Rd.

Operation and safety

- Site closer to WWTP so less suitable location for air venting to avoid tunnel pressurisation and damage during tunnel filling.
- Access shaft location increases distances for maintenance workers in section under harbour.

Land use effects

- Landscape - Greenfields, rural setting on edge of Ambury Farm Park, with some screening from residential views.
- Neighbours – close proximity to residential neighbours (approx. 20m)
- Recreation – Limited effect

Cultural & heritage effects

- Cultural heritage - Three recorded archaeological sites located in vicinity of site. These are identified as R11/1423 (stone heaps), R11/742 (cave and midden in a lava tunnel) and R11/1424 (depression and stone heaps). Iwi in opposition to construction works in Ambury Park. AC Parks identified potential impact on cultural values.
- Geological heritage - Site in part of Ambury lava flow, with several lava caves / tubes identified in the vicinity. Cave not evident at construction site but possible that excavations could encounter one.

Environmental effects

- Air discharge - Limited separation from residential neighbours (approx. 20 m). Air treatment for discharge which may occur during tunnel filling in normal wet weather events
- Traffic - Low level of traffic generation during construction will be well within capacity of local roads
- Trees – No effects
- Ecology – No ecological values of note

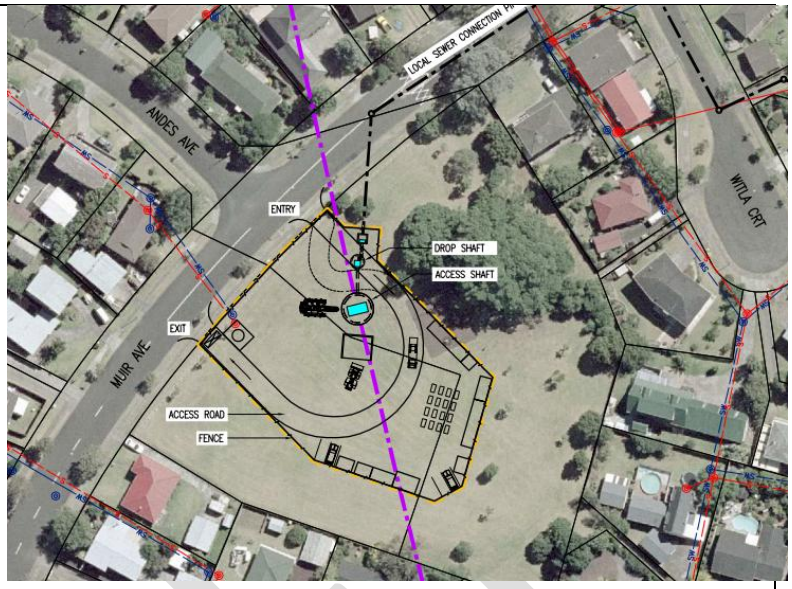
Muir Ave Park Site

Tunnel alignment and connections

- Main tunnel length PS 23 – WWTP: 4,166 m;
- Link Sewer 4 connection to Witla Court: 177 m

Construction site location

- Proposed shaft location:
  - approx. 450 m from coast making less suitable location for checking TBM before harbour crossing
  - increased distance between shafts on either side of Manukau Harbour
- Construction access off Muir Ave direct into park.



Operation and safety

- Site closer to WWTP so less suitable location for air venting to avoid tunnel pressurisation and damage during tunnel filling.
- Access shaft location increases distances for maintenance workers in section under harbour.

Land use effects

- Landscape - Open space setting in local neighbourhood park, difficult to screen from residential views.
- Neighbours – residential areas in close proximity on all sides (approx. 20m)
- Recreation – Significant impact on local use of park during construction

Cultural & heritage effects

- Cultural heritage - Site in modified area with no known archaeological evidence
- Geological heritage – no known sites of interest.

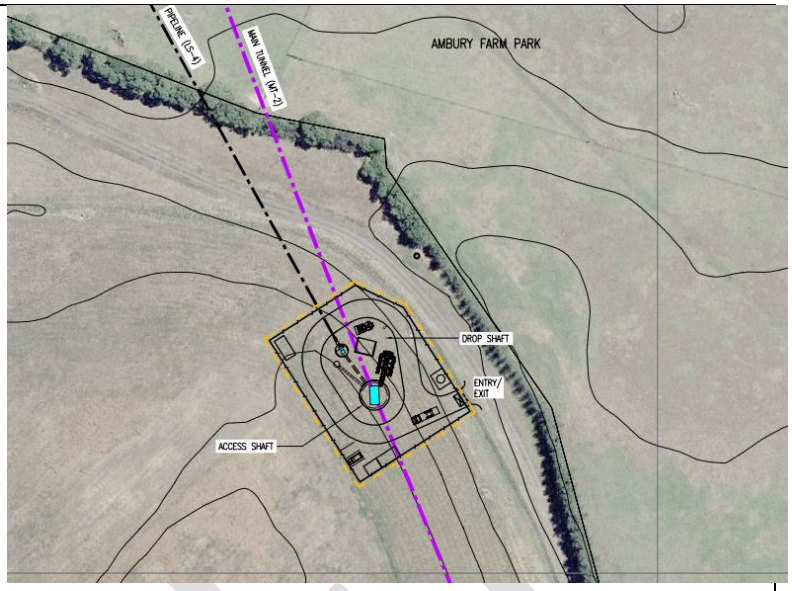
Environmental effects

- Air discharge - Limited separation from residential neighbours (approx. 20 m). Air treatment for discharge which may occur during tunnel filling in normal wet weather events
- Traffic - Low level of traffic generation during construction will be well within capacity of local roads
- Trees – No effects
- Ecology – No ecological values of note

Watercare Land Site

Tunnel alignment and connections

- Main tunnel length PS 23 – WWTP: 4,173 m;
- Link Sewer 4 connection to Witla Court: 830 m



Construction site location

- Proposed shaft location:
  - o approx. 1 km from coast making unsuitable location for checking TBM before harbour crossing
  - o increased risk profile
  - o increased distance between shafts on either side of Manukau Harbour
- Link sewer 4 would cross Refinery pipeline
- Construction access utilising Watercare access roads from WWTP.

Operation and safety

- Site closer to WWTP so less suitable location for air venting to avoid tunnel pressurisation and damage during tunnel filling. Further hydraulic modelling is needed to confirm whether an additional vent shaft is required.
- Access shaft location increases distances for maintenance workers in section under harbour.

Land use effects

- Landscape - Rural setting on land to west of Ambury Farm Park, well screened from residential views, with existing restoration plantings.
- Neighbours - Well separated from residential neighbours (approx. 300m)
- Recreation – limited effect

Cultural & heritage effects

- Cultural heritage – Land adjacent Ambury Park but has been subject to previous modification and unlikely to have cultural sites remaining. Trenching through Ambury Farm Park for Link Sewer 4 connection likely to encounter archaeological sites. Iwi in opposition to construction works in Ambury Park.
- Geological heritage - Site adjacent to / in filled explosion crater.

Environmental effects

- Air discharge - Well separated from residential neighbours (approx.300 m). Air treatment for discharge which may occur during tunnel filling in normal wet weather events
- Traffic - Low level of traffic generation during construction will be well within capacity of local roads, but with access through Ambury Farm Park which will require traffic controls to manage public safety
- Trees – possible removal of restoration plantings
- Ecology – Recent restoration plantings and some high tide roost by wading birds – potential for some limited disturbance during construction

Attachment 6

Consultation Update

Central Interceptor Main Project Works
Update on Consultation Activities Since Lodgement in August 2012

Consultation undertaken as part of the Central Interceptor project to the end of June 2012 is summarised in Section 8 of Part A of the Central Interceptor Main Project Works AEE (August 2012). Further consultation that has taken place between 1 July 2012 and 24 May 2013 is summarised in the table below, using the same headings and order as set out in the AEE report.

Name	Date	Activity summary (July 2012 – May 2013)	Outcome
AUCKLAND COUNCIL			
Local boards			
All	27 Aug 2012	Written responses received from Local Boards and Auckland Council Parks in relation to all sites within parks	Identification of general principles and key points for consideration in further design development.
	2012 – 2013	Central Interceptor project progress updates as part of regular major project briefings to all Local Boards	Updates provided.
Albert-Eden Local Board	4 July 2012	Attendance at Albert-Eden Local Board meeting	Local Board identification of general principles and key points for consideration in further design development.
	17 July 2013	Site visit at Mount Albert War Memorial Reserve (MAWMR) with Albert-Eden Local Board members, Auckland Council parks staff, and residents	Discussion on site options at MAWMR. Support for proposed site with extended designation to provide flexibility for design to reduce potential effects on residents. (Outcome advised to Watercare following Albert-Eden Local Board meeting with Auckland Council parks staff on 18 July.)
	Sept 2012 – Feb 2013	Telephone and e-mail communications with Albert-Eden Local Board members regarding site in MAWMR	Further information provided; additional parking surveys undertaken; further review of options.
	28 Nov 2012 and 5 Feb 2013	Meetings with Albert-Eden Local Board members to discuss site options at MAWMR	Further development and review of options, including 'hybrid' option part way between proposed Watercare site and alternative car park site. Local Board confirmation of support for alternative site in lower car park.
	22 May 2013	Meeting with Albert-Eden Local Board members	Update to Local Board on statutory process; discussion on parking options at MAWMR site; extent of works and reinstatement at Lyon Ave site.
Puketapapa Local Board	26 July 2012	Attendance at Puketapapa Local Board meeting	Local Board identification of general principles and key points for consideration in further design development.

Name	Date	Activity summary (July 2012 – May 2013)	Outcome
	Aug 2012	E-mail correspondence regarding extent of works at Keith Hay Park site	Information provided.
	13 Feb 2013	Presentation to Puketapapa Local Board Workshop on Manukau Harbour and Central Interceptor	Information provided, proposed works discussed.
Mangere-Otahuhu Local Board	8 Aug 2012	Presentation to Mangere-Otahuhu Local Board on proposed Central Interceptor project and works at Kiwi Esplanade	Discussion on proposed works; concerns raised about vent location at Kiwi Esplanade.
	27 March 2013	Presentation to Mangere-Otahuhu Local Board on Manukau Harbour and Central Interceptor	Information provided.
Papakura and Manurewa Local Boards	7 Feb 2013	Presentation to joint Local Boards workshop on Manukau Harbour and Central Interceptor	Information provided, general support for Watercare activities.
Auckland Council staff			
Auckland Council Parks, Sports and Recreation	Aug 2012	Written responses received from Local Boards and Auckland Council Parks in relation to all sites within parks	Identification of general principles and key points for consideration in further design development.
	Various dates	Various meetings held to discuss proposed Central Interceptor works in parks.	Confirmation of proposed site at Kiwi Esplanade (August 2012); new site proposed in MAWMR (March 2013); review of alternative parking options in MAWMR (April, May 2013); discussion on mitigation options at Lyon Ave site (May 2013).
Auckland Council Stormwater Unit	Various dates	Meetings held to discuss proposed Central Interceptor works and interface with Auckland Council stormwater projects	Information sharing to inform development of Watercare and Auckland Council Stormwater Unit projects.
Auckland Council Regulatory Team	Various dates	Regular meetings to discuss Central Interceptor project NoRs and consent applications, statutory process, requests for further information and conditions	Continuation of the statutory process; further information provided on various aspects of the proposed works.
TANGATA WHENUA			

Name	Date	Activity summary (July 2012 – May 2013)	Outcome
Tainui	13 July 2012	Meeting to discuss Central Interceptor project	Information provided; key areas of discussion – long term future of Mangere WWTP and discharges; potential for reuse of treated wastewater; effects on Manukau Harbour before and after Mangere WWTP improvement works; physical effects of Central Interceptor construction.
Te Kawerau a Maki, Te Ahiwaru (Makaurau Marae)	20 July 2012	Meeting to discuss Central Interceptor project	Information provided; key areas of discussion – sizing of interceptor to provide for growth, flows to and planned improvements at Mangere WWTP, effects of growth on land and water resources.
Ngati Whatua o Orakei	31 July 2012	Meeting to discuss Central Interceptor project	Information provided; key areas of discussion – effects on watercourses, opportunities for enhancement, overflows at Onehunga.
Ngai Tai ki Tamaki, Ngati Tamaoho	27 July 2012	Meeting to discuss Central Interceptor project; site visit to Kiwi Esplanade, Lyon Ave, Haverstock Road	Information provided; key areas of discussion – proposed works at Mangere WWTP, potential beneficial use of treated wastewater, flows to Mangere WWTP, extent of works at sites visited.
	25 March 2013	Meeting to discuss Central Interceptor project	Information provided; key areas of discussion – quality of Manukau Harbour, long term future of Mangere WWTP and treated wastewater discharge, effects on streams in Auckland isthmus, proposed mitigation. Proposed designation and draft consent conditions provided by Watercare for comment.
Ngai Tai ki Tamaki, Ngati Tamaoho, Ngati Paoa and Ngati te Ata	21 Nov 2012	Meeting to discuss Central Interceptor project	Information provided; key areas of discussion – flows to Mangere WWTP, stormwater management, potential beneficial use of treated wastewater.
Te Akitai	30 July 2012	Meeting to discuss Central Interceptor project; site visit to Mangere WWTP, Kiwi Esplanade and Lyon Ave sites	Information provided; key areas of discussion – effects on streams; flows to Mangere WWTP; extent of works at sites visited.
	23 & 29 Nov 2012 19 March 2013	Meetings to discuss Central Interceptor project (Meetings with Te Akitai consultants)	Information provided; key areas of discussion – project drivers, extent of works, planned works at Mangere WWTP (23 Nov 2012) Information provided; key areas of discussion – performance of Mangere WWTP, planned works at Mangere WWTP, tunnel operation, implications of proposed Northern Interceptor (29 Nov 2012) Information provided; key areas of discussion – EPR structure at proposed Mangere pump station, network discharges, flows to Mangere WWTP, planned works at Mangere WWTP, Manukau Siphon (19 March 2013)

Name	Date	Activity summary (July 2012 – May 2013)	Outcome
	3 May 2013	Meeting to discuss Central Interceptor project	Information provided; key areas of discussion – Manukau Siphon condition and future use, design of EPR structure at proposed Mangere pump station, consenting strategy.
	15 May 2013	Written response provided to technical matters raised in submission	Information provided.
All iwi	Sept 2012	Central Interceptor lodgement documents (AEE) provided to all iwi	Information provided.
TRANSPORT AUTHORITIES			
Auckland Transport	2 April 2013	Meeting to discuss Auckland Transport submission	Discussion on process for works within road reserve and amendments to designation conditions.
	6 May 2013	Meeting to discuss Watercare and Auckland Transport submissions on various projects, including Central Interceptor	Discussion on process for works within road reserve and amendments to designation conditions.
	20 May 2013	Written response to submission	Information provided, including suggested amendments to proposed designation conditions 2 and 21.
New Zealand Transport Agency (NZTA)	Various	E-mail communications regarding NZTA works at St Lukes overbridge and Western Springs interchange	Information sharing to inform design of NZTA and Watercare projects.
KiwiRail	Various	E-mail correspondence regarding future works within rail corridor and Central Interceptor statutory process	Information sharing in relation to future KiwiRail and Watercare projects.
	7 Dec 2012	Meeting to discuss proposed works	Discussed potential conflict between Watercare collector sewer and future rail corridor. Discussed need for requiring authority approvals and deed of grant process. Further investigation into the potential conflict, identification of possible solutions.
	26 April 2013	Memo forwarded to KiwiRail on options to address potential conflict between Watercare collector sewer and future rail corridor	Further meeting requested to discuss possible design solutions. Outcome of that meeting will inform detailed design process.
NETWORK UTILITIES			
Transpower	29 March 2013	Letter to Transpower	Written response to submission provided, including technical assessment of potential groundwater and surface settlement effects at Transpower assets.

Name	Date	Activity summary (July 2012 – May 2013)	Outcome
	21 May 2013	Meeting to discuss submission	Further information provided; key areas of discussion – matters for consideration in detailed design; monitoring and risk management.
DIRECTLY AFFECTED LANDOWNERS (Surface construction sites)			
Tawa Farms Limited (TFL)	Aug – Nov 2012	Written and telephone contact with TFL	Information provided.
	13 March 2013	Meeting to discuss TFL submission and potential effects of Central Interceptor works	Information provided; key areas of discussion – vibration, traffic, implications on future development.
	30 April 2013	Letter to TFL	Information provided in response to submission and meeting on 13 March.
Ministry of Education (MoE) and Mount Albert Grammar School (MAGS)	July – Aug 2013	E-mail correspondence to Ministry of Education and Mount Albert Grammar School regarding proposed works	Information provided.
	April 2013	E-mail correspondence to MoE and MAGS regarding proposed works and submissions received.	Information provided including copies of submissions received.
	16 April 2013	Site visit to MAGS	Site visit to inform review of alternative construction access options and site location.
	8 May 2013	Meeting with MoE and MAGS regarding proposed works and alternative construction access options and site location	Discussion on construction access and alternative site locations; MoE and MAGS confirmed support for proposed site location on Crown land at Lyon Ave and opposition to an alternative option within the school fields.
Housing New Zealand Corporation (HNZC)	Aug, Oct 2012	E-mail correspondence regarding proposed works	Information provided.
	29 Jan 2013	Meeting with HNZC	Information provided; key discussion point – impact of proposed site access on HNZ future land divestment proposals.
	Jan – April 2013	E-mail and written correspondence regarding proposed access and easement agreement	Information provided; designation amended at 96 & 98 Haverstock Road; draft agreement documents prepared.
Plant & Food Research (PFR)	Aug, Sept 2012	E-mail correspondence regarding proposed works	Information provided on aspects of proposed works.

Name	Date	Activity summary (July 2012 – May 2013)	Outcome
	16 Oct 2012	Meeting to discuss proposed works and PFR submission	Discussion regarding proposed works, impacts on PFR activities, access agreements, landowner approval processes, site reinstatement.
	Nov 2012	E-mail correspondence; site visit by Watercare landscape architect	Consideration of options for site reinstatement.
	6 March 2013	Meeting with PFR to discuss proposed works	Discussion on PFR submission, effects of proposed works, agreement and approval processes.
	1 May 2013	Letter to PFR	Draft documentation for access and works agreement.
St Lukes Garden Apartments (SLGA)	Aug 2012	E-mail correspondence confirming lodgement of NoR	Information provided.
	Feb – March 2013	E-mail correspondence regarding submissions received and request for meeting	Information provided.
	10 April 2013	Meeting with SLGA to discuss submissions lodged	Meeting to discuss the SLGA submission; key areas of discussion – alternatives to project; alternative site locations; scale and duration of works, potential traffic and other construction effects on residents; scope of previous agreements between Watercare and SLGA.
	April – May 2013	E-mail correspondence regarding information to be provided by Watercare	Watercare review of matters raised in submission. Designation boundary amended to exclude area of private car parks. Further meeting arranged for early June.
Owner, 105 May Road, Mount Roskill	Various	Meetings, e-mail and written correspondence (May Road site)	Information provided; property negotiations ongoing.
Owner, 22 Gregory Place, Hillsborough	Various	Meetings, e-mail and written correspondence (Keith Hay Park site)	Information provided; property negotiations concluded.
Owner, 4 Haycock Avenue, Mt Roskill	Various	Meetings, e-mail and written correspondence (Haycock Avenue site)	Information provided; property negotiations concluded.
ADJACENT LANDOWNERS			
Foodstuffs, Roma Road, Mount Roskill	23 Oct 2012 and 21 Nov 2012	Meetings to discuss proposed works and Foodstuffs submission	Discussion on potential effects of works on Foodstuffs property; key concerns relating to traffic effects on Roma Road and surrounding roading network. Further assessment of physical works required to establish Roma Road access.
	Oct 2012 – April 2013	E-mail correspondence regarding traffic effects.	Further information provided on traffic effects and traffic management measures.

Name	Date	Activity summary (July 2012 – May 2013)	Outcome
Neighbours, Mount Albert War Memorial Reserve	17 July 2013	Site visit at MAWMR with Albert-Eden Local Board members, Auckland Council parks staff, and residents	Discussion on site options at MAWMR.
	July 2012 – March 2013	E-mail correspondence to and from residents regarding site in MAWMR	Further information provided on site options, potential effects, statutory process.
	11 Feb 2013	Meeting with MAWMR submitters to discuss site options for the MAWMR site	Information provided on site options and effects. Feedback from meeting considered in options review process and subsequent submission of NoR3 for MAWMR car park site.
Community of Refuge Trust (CORT), 9 Wairere Ave, Mount Albert	24 Jan 2013	Meeting to discuss proposed works at MAWMR	Discussed potential effects of proposed works; mitigation during construction; effects of original site and effects of proposed alternative site in MAWMR car park.
	11 April 2013	Letter to CORT regarding proposed works and mitigation of construction effects at MAWMR	Information provided on proposed measures to mitigate effects during construction.
	2 May 2013	Meeting to discuss proposed works at MAWMR	Discussed potential effects of proposed works; options to address specific requirements of CORT tenants; situations in which temporary relocation of residents may be considered. Location of proposed control chamber amended to increase distance from CORT property. Further information to be provided to CORT by end May 2013.
Mr & Mrs Whitehead, 18 Gregory Place, Mount Roskill	Sept – Oct 2013	Letters to and from Mr & Mrs Whitehead; e-mail correspondence	Further information provided on scope of works, excavation volumes and potential mitigation options to be considered during detailed design.
	6 Nov 2012	Meeting to discuss proposed works at Keith Hay Park site	Discussed proposed works, potential effects and mitigation options. Further meeting arranged for late May.
INTEREST GROUPS AND ORGANISATIONS			
STEPS	4 April 2013	Meeting to discuss Central Interceptor project	Information provided in response to submission; key areas of discussion – statutory process, Watercare's regional strategy and how Central Interceptor fits within that; stream management, roles and responsibilities; restoration opportunities along Meola Creek.
Mangere Bridge Residents and Ratepayers Association (MBRRA)	19 July 2012	Meeting to discuss Central Interceptor project, particularly site options in Mangere Bridge	Options discussed; including scope of works, site locations and layout, potential effects at each site, matters to consider in site decision making process.
	July 2012	E-mail correspondence relating to site options in Mangere Bridge	Information considered by Watercare in site decision making process.

Name	Date	Activity summary (July 2012 – May 2013)	Outcome
	Nov – Dec 2012	E-mail correspondence relating to proposed wet weather treatment facility at Mangere WWTP	Further information provided.
	27 Feb 2013 13 and 27 March 2013 17 and 24 April 2013	Meetings to discuss Central Interceptor project	Information provided at and following meetings; key areas of discussion – Manukau Harbour quality; compliance with existing Mangere WWTP consents; alternative site options; construction methods, tunnelling and safety; construction effects; operation of tunnel and pump station; location and operation of air vent at Kiwi Esplanade.
	12 March 2013	Letter to MBRRA	Further information provided on site options at Mangere Bridge; Manukau Harbour existing condition and effects of ongoing discharges; further report provided at meeting on 27 March regarding condition of Manukau Harbour.
	15 May 2013	Letter to MBRRA	Further information provided on site options at Mangere Bridge; operation of Central Interceptor; existing and future facilities at Mangere WWTP; key hydraulic factors in site location.
Forest and Bird (F&B)	9 April 2013	Meeting to discuss Central Interceptor project	Further information provided; key areas of discussion – key drivers and environmental benefits arising from Central Interceptor main works and collector sewers; timing of works; existing contamination levels in Oakley Creek; proposed F&B works around Motu Manawa Pollen Island Marine Reserve, reinstatement and amenity improvements.
Friends of Oakley Creek	11 April 2013	Meeting to discuss Central Interceptor project	Further information provided; key areas of discussion – proposed works and reinstatement opportunities at Walmsley Road, May Road and Keith Hay Park.
Manukau Harbour Restoration Society (MHRS)	28 Feb 2013 and 16 April 2013	Meetings to discuss Central Interceptor project	Further information provided; key areas of discussion – overflows in Onehunga, Watercare corporate responsibilities, regional wastewater strategy, Central Interceptor key drivers, suspended solids in treated wastewater discharge from Mangere WWTP, land use planning process, Unitary Plan.
	April – May 2013	E-mail correspondence	Information provided and further questions received from MHRS.
	15 May 2013	Letter to MHRS	Further information provided in response to questions from MHRS directly related to Central Interceptor project. Further response to be provided by Watercare at a later date on the wider Manukau Harbour issues.

Name	Date	Activity summary (July 2012 – May 2013)	Outcome
Mount Albert Residents Association	19 April 2013	Meeting to discuss submission	Provided further information on proposed works at Haverstock Rd and Lyon Ave sites; discussed alternative sites considered, implications of an alternative site in MAGS, possible mitigation of proposed works at Lyon Ave.
Roskill Puketapapa Residents Association	16 May 2013	Meeting with Hillsborough residents to provide information on Central Interceptor project and works at PS23, Frederick Street	Discussion about the extent of proposed works at PS23, traffic effects, construction effects and duration and extent of works on the temporary construction platform. Discussed form of permanent works and seawall, potential odour effects and opportunities to provide for pedestrian access to the coast. Also discussed the Keith Hay Park site and potential effects at that location.
WATERCARE ADVISORY GROUPS			
Environmental Advisory Group	3 Aug 2012 7 Dec 2012	Update to Environmental Advisory Group on Central Interceptor project and statutory process	Further information provided following the December meeting on Central Interceptor and implications for the Mangere WWTP.
Mangere Community Liaison Group	13 Sept 2013	Update on Central Interceptor statutory process	Information provided.
	24 Jan 2013	Presentation on Central Interceptor project and Manukau Harbour	Information provided.
Mana Whenua Kaitiaki Forum	2 May 2013	Presentation on Central Interceptor project and Manukau Harbour	Information provided.

Attachment 7

Lyon Avenue Updated Drawings

NOTES:

1. DESIGNATION AREA TO BE REDUCED UPON COMPLETION OF WORKS.

LEGEND

- MAIN TUNNEL
- LINK SEWER
- CSO COLLECTOR
- CONNECTION PIPELINE
- VENTILATION DUCTS
- EXISTING RETICULATION SEWER
- EXISTING TRUNK SEWER
- EXISTING STORMWATER
- PROPOSED DESIGNATION BOUNDARY
- LID/STRUCTURE FLUSH WITH GROUND
- LID/STRUCTURE ABOVE GROUND

Plot Date: 28-May-13 12:16 p.m.
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Project No.

ISSUE	DATE	AMENDMENT	BY	APPD.
B	28/05/13	CONSENT ISSUE - DESIGNATION BOUNDARY/ACCESS REVISED	AP	PR
A	17/08/12	CONSENT ISSUE	AP	PR

		BY	DATE
DESIGNED	NL		
DES. CHECKED	JS	-	
DRAWN	AP		
DWG. CHECKED	NL	-	
REV'D P.MGR	JS		
APP'D P.DIR	CC		

OPERATIONS

ASSET MANAGER

SITE LAYOUT AND DESIGNS INDICATIVE ONLY AND SUBJECT TO CHANGE DURING DETAILED DESIGN DEVELOPMENT

AEE MAY 2013

water Care services limited

CENTRAL INTERCEPTOR
GENERAL
LYON AVENUE (AS2) - PERMANENT WORKS PLAN

CAD FILE AEE-MAIN-3.1_B | DATE 28-May-13

ORIGINAL SCALE A1 1:1000 A3 | CONTRACT No. 0538

DRAWING No. AEE-MAIN-3.1 | ISSUE B

Plot Date: 28-May-13 12:17 p.m.
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Project No.

ISSUE	DATE	AMENDMENT	BY	APPD.
B	28/05/13	CONSENT ISSUE - DESIGNATION BOUNDARY REVISED	AP	PR
A	17/08/12	CONSENT ISSUE	AP	PR

		DATE
DESIGNED	NL	
DES. CHECKED	JS	-
DRAWN	AP	
DWG. CHECKED	NL	-
REV'D P.MGR	JS	
APP'D P.DIR	CC	

OPERATIONS

ASSET MANAGER

SITE LAYOUT AND DESIGNS INDICATIVE ONLY AND SUBJECT TO CHANGE DURING DETAILED DESIGN DEVELOPMENT

AEE MAY 2013

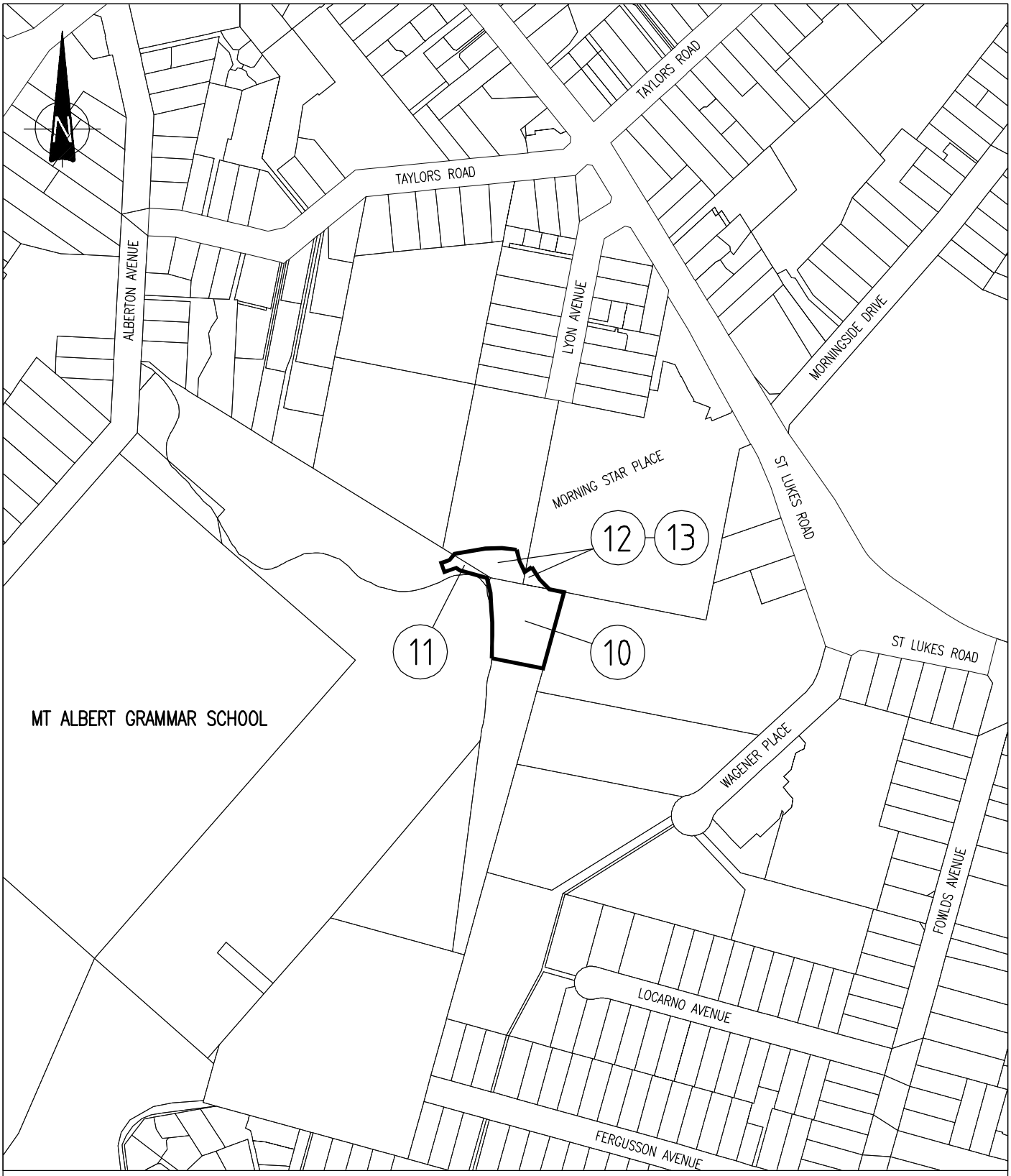
water Care services limited

CENTRAL INTERCEPTOR
GENERAL
LYON AVENUE (AS2) - CONSTRUCTION WORKS PLAN

CAD FILE AEE-MAIN-3.2_B | DATE 28-May-13

ORIGINAL SCALE A1 1:1000 A3 | CONTRACT No. 0538

DRAWING No. AEE-MAIN-3.2 | ISSUE B



LEGEND

PROPOSED DESIGNATION BOUNDARY

ISSUE	DATE
B	27/05/13
A	17/08/12

CENTRAL INTERCEPTOR
PROPOSED DESIGNATION OF LAND
LYON AVENUE

NOR MAY 2013

waterCare services limited

CAD FILE MAIN–NOR1–3 DATE 26–Jul–12

ORIGINAL SCALE A4 1:2500 A4

CONTRACT No. 0538

DRAWING No. MAIN–NOR1–3

ISSUE B

Attachment 8

Mt Albert War Memorial Reserve Updated Drawing

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Project No.

ISSUE	DATE	AMENDMENT	BY	APPD.			DATE
B	28/05/13	CONSENT ISSUE – NOISE BARRIER EXTENDED	AP	PR	REV'D P.MGR	JS	
A	17/08/12	CONSENT ISSUE	AP	PR	APP'D P.DIR	CC	
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					DRAWN	AP	
					DES. CHECKED	JS	
					DESIGNED	NL	

OPERATIONS

ASSET MANAGER

SITE LAYOUT AND DESIGNS INDICATIVE ONLY AND SUBJECT TO CHANGE DURING DETAILED DESIGN DEVELOPMENT

AEE MAY 2013

water Care services limited

CENTRAL INTERCEPTOR
GENERAL
MT ALBERT WAR MEMORIAL RESERVE (AS1) – CONSTRUCTION WORKS PLAN

CAD FILE AEE-MAIN-2.2_B | DATE 28-May-13

ORIGINAL SCALE A1 1:1000 A3 | CONTRACT No. 0538

DRAWING No. AEE-MAIN-2.2 | ISSUE B

Attachment 9

Haverstock Road Updated Drawings

NOTES:

1. DESIGNATION AREA TO BE REDUCED UPON COMPLETION OF WORKS.

LEGEND

- MAIN TUNNEL
- LINK SEWER
- CSO COLLECTOR
- CONNECTION PIPELINE
- VENTILATION DUCTS
- EXISTING RETICULATION SEWER
- EXISTING TRUNK SEWER
- EXISTING STORMWATER
- PROPOSED DESIGNATION BOUNDARY (FEB 2013)
- LID/STRUCTURE FLUSH WITH GROUND
- LID/STRUCTURE ABOVE GROUND

Plot Date: 28-May-13 2:35 p.m.
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Project No.

ISSUE	DATE	AMENDMENT	BY	APPD.			
C	28/05/13	CONSENT ISSUE – CONTROL CHAMBER ABOVE GROUND	AP	JQC	DWG. CHECKED	NL	–
B	20/02/13	CONSENT ISSUE – REVISED	AP	PR	REV'D P.MGR	JS	
A	17/08/12	CONSENT ISSUE	AP	PR	APP'D P.DIR	CC	
					DRAWN	AP	
					DES. CHECKED	JS	–
					DESIGNED	NL	

OPERATIONS

ASSET MANAGER

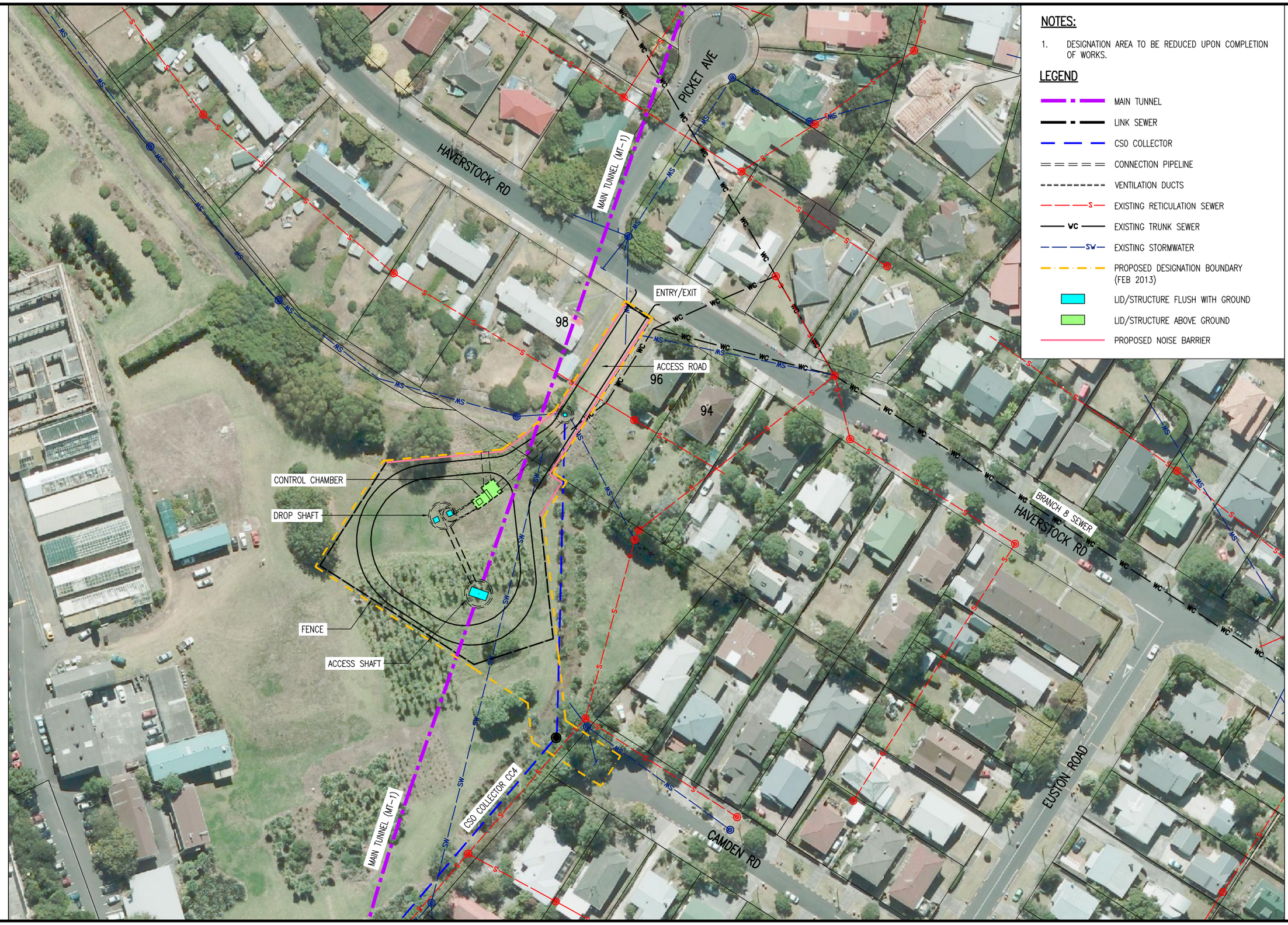
SITE LAYOUT AND DESIGNS INDICATIVE ONLY AND SUBJECT TO CHANGE DURING DETAILED DESIGN DEVELOPMENT

AEE MAY 2013

water Care services limited

CENTRAL INTERCEPTOR
GENERAL
HAVERSTOCK ROAD (AS3) – PERMANENT WORKS PLAN

CAD FILE AEE-MAIN-4.1_C	DATE 16-May-13
ORIGINAL SCALE A1 1:1000 A3	CONTRACT No. 0538
DRAWING No. AEE-MAIN-4.1	ISSUE C



NOTES:

1. DESIGNATION AREA TO BE REDUCED UPON COMPLETION OF WORKS.

LEGEND

- MAIN TUNNEL
- LINK SEWER
- CSO COLLECTOR
- CONNECTION PIPELINE
- VENTILATION DUCTS
- EXISTING RETICULATION SEWER
- EXISTING TRUNK SEWER
- EXISTING STORMWATER
- PROPOSED DESIGNATION BOUNDARY (FEB 2013)
- LID/STRUCTURE FLUSH WITH GROUND
- LID/STRUCTURE ABOVE GROUND
- PROPOSED NOISE BARRIER

Plot Date: 28-May-13 4:07 p.m.
File path: P:\0538 - Central Interceptor\04. Drawings\4.3 Working\AEE\AEE_Consent\General\Dwg

Project No.

ISSUE	DATE	AMENDMENT	BY	APPD.
C	28/05/13	CONSENT ISSUE – CONTROL CHAMBER ABOVE GROUND	AP	JQC
B	20/02/13	CONSENT ISSUE – REVISED	AP	PR
A	17/08/12	CONSENT ISSUE	AP	PR

DESIGNED	NL	
DES. CHECKED	JS	–
DRAWN	AP	
DWG. CHECKED	NL	–
REV'D P.MGR	JS	
APP'D P.DIR	CC	
	BY	DATE

OPERATIONS

ASSET MANAGER

SITE LAYOUT AND DESIGNS INDICATIVE ONLY AND SUBJECT TO CHANGE DURING DETAILED DESIGN DEVELOPMENT

AEE MAY 2013

water Care services limited

CENTRAL INTERCEPTOR
GENERAL
HAVERSTOCK ROAD (AS3) – CONSTRUCTION WORKS PLAN

CAD FILE AEE-MAIN-4.2_C — DATE 28-May-13

ORIGINAL SCALE A1 1:1000 A3 — CONTRACT No. 0538

DRAWING No. AEE-MAIN-4.2 — ISSUE C

Boffa Miskell

NOTES

AECOM BASE ENGINEERING FILE 27.12.13 - PFR-MAIN-4.2.dwg

REV	DATE	DESCRIPTION
A	30.11.12	Draft concept plan - exisiting designation
B	21.02.13	Draft concept plan - updated designation
C	02.04.13	Draft concept plan - updated engineers plans

CLIENT

WATERCARE

CONSULTANTS

DRAFT

A08301A Central Interceptor
Proposed Haverstock Rd Design
Draft Concept Plan

PROPOSED CONSTRUCTION WORKS - LANDSCAPE PLAN

Design	HDO	Scale	Date
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Check	JGO	1:500@A1	
App'd			

DRAWING NO. A08301A_001

REVISION C

A08301A_Haverstock_Rd_001.dgn

Boffa Miskell

NOTES

AECOM BASE ENGINEERING FILE 11.04.13 - PFR-MAIN-4.2.dwg

REV	DATE	DESCRIPTION
_	30.11.12	Draft concept plan - exisiting designation
A	21.02.13	Draft concept plan - updated designation
B	02.04.13	Draft concept plan - updated engineers plans

CLIENT

WATERCARE

CONSULTANTS

DRAFT

A08301A Central Interceptor
Proposed Haverstock Rd Design
Draft Concept Plan

PROPOSED PERMANENT WORKS - LANDSCAPE PLAN

Design	HDO	Scale	Date
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Check	JGO	1:500@A1	
Appv'd			

DRAWING NO. A08301A_002

REVISION (D)

A08301A_Haverstock_Rd_002.dgn

Attachment 10

Updated Drawing Index

Central Interceptor AEE Drawing Index – May 2013

Western Springs (WS1) - Permanent Works Plan Sheet 1	AEE-MAIN-1.1	A
Western Springs Interchange (WS1) - Permanent Works Plan Sheet 2	AEE-MAIN-1.2	A
Western Springs (WS1) - Construction Works Plan Sheet 1	AEE-MAIN-1.3	A
Western Springs Interchange (WS1) - Construction Works Plan Sheet 2	AEE-MAIN-1.4	A
Mt Albert War Memorial Reserve (AS1) - Permanent Works Plan	AEE-MAIN-2.1	A
Mt Albert War Memorial Reserve (AS1) - Construction Works Plan	AEE-MAIN-2.2	B
Mt Albert War Memorial Reserve Car Park (AS1) - Permanent Works Plan	AEE-MAIN-2.1A	C
Mt Albert War Memorial Reserve Car Park (AS1) - Construction Works Plan	AEE-MAIN-2.2A	D
Lyon Avenue (AS2) - Permanent Works Plan	AEE-MAIN-3.1	B
Lyon Avenue (AS2) - Construction Works Plan	AEE-MAIN-3.2	B
Haverstock Road (AS3) - Permanent Works Plan	AEE-MAIN-4.1	C
Haverstock Road (AS3) - Construction Works Plan	AEE-MAIN-4.2	C
Walmsley Park (AS4) - Permanent Works Plan	AEE-MAIN-5.1	A
Walmsley Park (AS4) - Construction Works Plan	AEE-MAIN-5.2	A
May Road (WS2) - Permanent Works Plan	AEE-MAIN-6.1	A
May Road (WS2) - Construction Works Plan	AEE-MAIN-6.2	A
Keith Hay Park (AS5) - Permanent Works Plan	AEE-MAIN-7.1	A
Keith Hay Park (AS5) - Construction Works Plan	AEE-MAIN-7.2	A
PS23 (AS6) - Permanent Works Plan	AEE-MAIN-8.1	A
PS23 (AS6) - Construction Works Plan	AEE-MAIN-8.2	A
Sea Wall Detail	AEE-MAIN-8.4	A
Extent of Temporary Works Platform	AEE-MAIN-8.5	A
Kiwi Esplanade Utilities (AS7) - Permanent Works Plan	AEE-MAIN-9.1	A
Kiwi Esplanade Utilities (AS7) - Construction Works Plan	AEE-MAIN-9.2	A
Mangere Pump Station (WS3) - Permanent Works Plan	AEE-MAIN-10.1	A
Mangere Pump Station (WS3) - Construction Works Plan	AEE-MAIN-10.2	A
Emergency Pressure Relief	AEE-MAIN-10.3	A
Motions Road (L1S1) - Permanent Works Plan	AEE-MAIN-11.1	A
Motions Road (L1S1) - Construction Works Plan	AEE-MAIN-11.2	A
Western Springs Depot (L1S2) - Permanent Works Plan	AEE-MAIN-12.1	A
Western Springs Depot (L1S2) - Construction Works Plan	AEE-MAIN-12.2	A
Rawalpindi Reserve (L2S1) - Permanent Works Plan	AEE-MAIN-13.1	A
Rawalpindi Reserve (L2S1) - Construction Works Plan	AEE-MAIN-13.2	A
Norgrove Avenue (L2S2) - Permanent Works Plan	AEE-MAIN-14.1	A
Norgrove Avenue (L2S2) - Construction Works Plan	AEE-MAIN-14.2	A
PS25 (L3S1) - Permanent Works Plan	AEE-MAIN-15.1	A
PS25 (L3S1) - Construction Works Plan	AEE-MAIN-15.2	A
Miranda Reserve (L3S2) - Permanent Works Plan	AEE-MAIN-16.1	A
Miranda Reserve (L3S2) - Construction Works Plan	AEE-MAIN-16.2	A
Whitney Street (L3S3) - Permanent Works Plan	AEE-MAIN-17.1	A
Whitney Street (L3S3) - Construction Works Plan	AEE-MAIN-17.2	A
Dundale Avenue (L3S4) - Permanent Works Plan	AEE-MAIN-18.1	A
Dundale Avenue (L3S4) - Construction Works Plan	AEE-MAIN-18.2	A
Haycock Avenue (L3S5) - Permanent Works Plan	AEE-MAIN-19.1	A
Haycock Avenue (L3S5) - Construction Works Plan	AEE-MAIN-19.2	A
Geological Section, Main Tunnel	AEE-MAIN-20	A
Geological Sections, Link Sewers LS1, LS2	AEE-MAIN-21	A
Geological Section, Link Sewer LS3	AEE-MAIN-22	A
Typical Detail- Overflows	AEE-MAIN-23	A
Construction Site Works Plan - Typical Site Works	AEE-MAIN-24	A
Corridor For Main Tunnel and Link Sewers - Sheet Location Plan	AEE-MAIN-25	A
Corridor For Main Tunnel and Link Sewers - Layout Plan- Sheet 1	AEE-MAIN-26	A
Corridor For Main Tunnel and Link Sewers - Layout Plan- Sheet 2	AEE-MAIN-27	A
Corridor For Main Tunnel and Link Sewers - Layout Plan - Sheet 3	AEE-MAIN-28	A
Corridor For Main Tunnel and Link Sewers - Layout Plan- Sheet 4	AEE-MAIN-29	A
Corridor For Main Tunnel and Link Sewers - Layout Plan- Sheet 5	AEE-MAIN-30	A
Corridor For Main Tunnel and Link Sewers - Layout Plan- Sheet 6	AEE-MAIN-31	A
Corridor For Main Tunnel and Link Sewers - Layout Plan- Sheet 7	AEE-MAIN-32	A
Corridor For Main Tunnel and Link Sewers - Layout Plan- Sheet 8	AEE-MAIN-33	A
Western Springs (WS1) – Stormwater Works Plan	SW-MAIN-1	A
Haverstock Road (AS3) – Stormwater Works Plan	SW-MAIN-2	A
May Road (WS2) – Stormwater Works Plan	SW-MAIN-3	A
Mangere Pump Station (WS3) – Stormwater Works Plan	SW-MAIN-4	A
PS25 (L3S1) – Stormwater Works Plan	SW-MAIN-5	A

Attachment 11

Information on Mangere WWTP and the Manukau Harbour

ATTACHMENT 2
Preliminary Response to Mangere Bridge Residents and Ratepayers Association Submissions on Central Interceptor – Existing Resource Consent Conditions

Introduction

Watercare and the Mangere Bridge Residents and Ratepayers Association (MBRRA) are meeting to discuss matters raised in the MBRRA submission on the Central Interceptor (CI) Scheme. The purpose of this preliminary information is to provide a starting point for discussion on the concerns raised. The information is provided for each concern raised by MBRRA. A separate summary report on the condition of the Manukau Harbour will be provided for discussion at a subsequent meeting.

Concerns About Meeting the Intent, Spirit and Letter of the Existing Resource Consents

Watercare remains committed to the underlying intent of the existing consents and at the same time to meeting its wider overall obligations to provide safe wastewater services to the people of Auckland. Watercare and some of the previous councils have undertaken extensive investigations of alternatives and their effects as part of the Three Waters Strategic Planning Programme completed in 2008 and in other programmes.

The following proposals arising from the Three Waters investigations are directly relevant to the concerns raised by the MBRRA:

i) It is proposed to divert flows from areas of West Auckland currently served by the Mangere Wastewater Treatment Plant (WWTP) for treatment at Auckland's other major wastewater treatment plant at Rosedale. This is consistent with previous commitments to divert flows away from Mangere WWTP, and it is currently anticipated that flows from 230,000 people will be progressively redirected from around 2020 to 2062.

ii) It was always the intention to upgrade the Mangere WWTP in stages and the current designations include land for future extensions. Watercare does not anticipate the size of the plant will require any additional land for construction outside the current designated area within the current planning period to 2062.

iii) No extension of the odour buffer zone is expected to be required or is planned within the current planning period to 2062.

iv) Watercare has had strong regard to the Wastewater 2000 outcomes from the early stages of its planning of the last plant upgrade and continues to do so. Working through the goals shows that a high level of success in meeting them has already been achieved. Future upgrading works proposed by Watercare will contribute even further to the achievement of the goals. The results of an analysis of performance in relation to each goal are included at the end of this document.

v) The discharge permit defines limits that Watercare must meet in terms of satisfying its obligations under the Resource Management Act 1991 (RMA) and the overall level of compliance has been extremely high. On the small number of occasions when full

compliance was not achieved, any effects on the environment were no more than minor. An important reason for undertaking the proposed additional works is to provide additional capacity and processes to ensure on-going compliance in the future.

vi) Flow is only one factor to be considered when managing the effects of an activity on the environment and can be varied without resulting in any increase in effects, provided other parameters change to compensate. The scientific advice Watercare has received is that managing load is a particularly important requirement to ensure protection of the Manukau Harbour and that can be done independent of flow at the discharge volumes likely to be required.

vii) Watercare has sought advice on allowable limits for freshwater discharges to the Manukau Harbour. This indicated that with a tidally staged discharge of 25 m^3/s (the current discharge permit flow limit) the maximum acceptable long-term average discharge at the existing discharge location would be between 600,000 and 900,000 m^3/d.

viii) The above advice indicates that discharge volume per se, at least up to 600,000 m^3/d, does not require the discharge volume from the Mangere WWTP to be limited to 390,000 m^3/d in perpetuity.

ix) Watercare does not anticipate a need to apply for any future increases in contaminant loads above those authorised by the existing discharge permit, based on projected population growth through to 2062. Future upgrading of the plant will be designed to ensure that no such increases in load occur and that the same level of public health protection will be maintained in the future as required by the existing discharge permit.

x) Watercare's current wastewater flow projections indicate that, mainly as a result of population growth, the mean annual daily flow of 390,000 m^3 authorised by the existing discharge permit will be reached in about 2032, the latest year in which a new consent application will need to be lodged. Thus, based on currently available information, Watercare expects to continue to meet requirements of the existing permit until its expiry date in 2032.

xi) When applying for a new discharge permit, Watercare will need to take into account future population growth through to 2062. It is currently anticipated this will increase the mean daily flow from 390,000 m^3/d to 450,000 m^3/d by 2062.

xii) It is noted for information that Watercare may alter the existing designation to enable relocation of Island Road to avoid it passing through the middle of the upgraded treatment plant in the future.

By way of a summary, Watercare has taken all practicable steps to achieve the Wastewater 2000 goals, manage the treatment plant to protect the Manukau Harbour and plan future upgrades to ensure that will continue to be the case in the future.

Future Wastewater Flows and Interceptor Capacity

The MBRRA has indicated it considers the capacity of the Mangere WWTP is capped at 390,000 m^3/d and that no increase in the capacity of interceptor sewers discharging at Mangere WWTP can occur.

The flow limit of 390,000 m^3/d in the existing discharge permit was appropriate for a consent granted in 1997 with an expiry date of 2032, as this reflected the anticipated annual mean flow that would be delivered to the treatment plant at the end of the consent period in 2032. An associated condition 11 (2) required "That the Consent Holder shall not increase the existing hydraulic capacity of the incoming interceptor system to the plant."

Condition 11 (2) also specifically provides that nothing in the condition prevented the Consent Holder from carrying out works which improve the efficiency or operability of the existing networks. The CI is required first of all as a long-term replacement for an existing section of the Western Interceptor which is reaching the end of its useful life. Failure to undertake this work would at some stage result in untreated wastewater being discharged direct to the Manukau Harbour and/or other natural water for long periods, with potentially major adverse effects. If the sections of the Western Interceptor being replaced can continue to be used safely for some time after the CI becomes operational, they may be retained for use when maintenance of the CI is required and possibly also to provide operational flexibility in the network. That is, the future use of the existing Western Interceptor (if its condition allows) would be based on operational efficiency, rather than any proposal to increase flows to Mangere WWTP.

The provision of storage in the CI will also provide substantially improved efficiency and operability. This will have no different effects on the Mangere WWTP as if the same volume of storage was provided in a series of tanks distributed around the network, which has been promoted by some as an alternative to the CI.

Flows delivered to Mangere WWTP from the CI will be controlled via the proposed new pumping station so that they do not exceed the limits set in the existing discharge permit for an annual mean flow of 390,000 m^3/d and a peak flow of 1,209,600 m^3/d for the term of the existing permit. As a consequence, there will be no contravention of the existing permit.

A new consent will need to be applied for before the existing discharge permit expires in 2032. At that time the flow will need to reflect the projected maximum flow at the end of a new 35-year consent period. Growth projections included in the recently published Auckland Plan indicate the region's population could increase by more than one million people over the next 30 years. Watercare must provide wastewater collection, treatment and disposal services for these people.

A major investigation of alternatives was completed as part of a programme to develop the Three Waters Strategic Plan. This confirmed the two existing large treatment plants at Mangere and Rosedale formed part of a best practicable option approach to meet the future wastewater needs of the main urban area of Auckland through to 2062. Based on subsequent more detailed planning since the Three Waters Strategic Plan was completed, the projected annual mean flow to be treated at Mangere WWTP in the design period is

approximately 450,000 m^3/d by 2062, or around a 15% increase above the limit in the existing permit. As noted above this is not expected to result in any increases to the contaminant loads discharged to the Manukau Harbour, or associated effects on the Harbour, as additional treatment capacity will be provided as required.

Thus, the CI will provide major environmental improvements for the region as a whole, without resulting in any increase in effects on the Manukau Harbour. In practice, with the improved treatment as planned, there will also be a positive benefit for the Manukau Harbour. This is discussed further below.

One method used to control flows to Mangere WWTP in the future will be to divert some flows to Rosedale WWTP. It is currently anticipated that flows from up to up to 230,000 people will be transferred by 2062, with flows diverted progressively from around 2020. Following the Three Waters Strategic Planning Programme, it was concluded that diversion of flows to Rosedale WWTP would replace the original intention to construct a new western plant. The reasons for this were as follows:

i) "Project West" proposed a new staged treatment plant for 180,000 people in West Auckland;

ii) The new Rosedale WWTP outfall is now operational and provides a viable alternative to a western plant, which was not available at the time of the Project West proposal;

iii) Rosedale WWTP has sufficient land and discharge capacity to cater for North Shore and West Auckland to 2062 with no more than minor effects on the environment;

iv) Use of Rosedale WWTP allows diversion of flows from Mangere WWTP with cost and environmental benefits compared to a western plant; and

v) Rosedale WWTP exists and is available, whereas availability of a western plant is uncertain and could be delayed 10 years or longer, or not approved.

In the event that the annual average flow of 390,000 m^3/d at Mangere WWTP looks as though it might be exceeded before the end of the current consent period, options may be to divert more flows to Rosedale WWTP or to apply for a new consent earlier.

Watercare will not be able to increase the flow above 390,000 m^3/d unless a new discharge permit is granted to authorise it.

Improvements in Treatment Plant Performance Since the Last Upgrade

The quality of treated wastewater has improved substantially for almost all parameters since the upgrade of the Mangere WWTP completed in 2003. More specifically:

i) Mean biochemical oxygen demand (BOD) has reduced by more than 90%.

ii) Mean suspended solids have reduced by more than 80%.

iii) Total nitrogen has reduced by more than 75%.

iv) Ammonia nitrogen has reduced by more than 95%.

v) The Mangere WWTP is achieving substantial reductions in pathogens, with concentrations in the untreated wastewater typically being reduced by more than 100,000 times under most flow conditions.

vi) Total copper and total zinc concentrations are reduced in the treatment process by 95% and 80% respectively.

An independent expert Microbiological Review Group (MRG) reports directly to the Auckland Council and Watercare on the performance of the Mangere WWTP in terms of the protection of public health and the effectiveness of the Mangere WWTP disinfection system. The MRG has advised it considers the upgrades to the Mangere WWTP are an outstanding success story in relation to protection of public health and the environment. Following a meeting in May 2012 the MRG confirmed, "*Data demonstrate a high level of disinfection is provided by the plant (4+ log reduction of viruses)*." It is noted that this is better than the minimum 4 log reduction which was the basis of the discharge permit.

Further Improvements Anticipated in Treatment Plant Performance

Three major ugrading programmes are planned as follows:

i) Construction of an extra 4 m^3/s of biological nutrient removal (BNR) capacity in two stages. Once complete this will provide 13 secondary treatment trains instead of the current nine. Eleven of the 13 will normally operate, leaving two spare to allow for maintenance without affecting treatment plant performance. Each train will be required to achieve less load removal per train than at present, providing an overall greater factor of safety and significantly less likelihood of consent non-compliance. The new BNR plant will be more efficient at removing nitrogen than the existing reactor clarifiers, which is an important consideration in terms of protecting the harbour.

ii) Progressive upgrading of the existing reactor clarifiers to improve their nitrogen removal efficiency as required to ensure continued compliance with discharge permit limits.

iii) Construction of a new wet weather treatment plant in stages to ensure that under all normal operating conditions, all flows arriving at Mangere WWTP will receive treatment to remove suspended solids in particular prior to disinfection. The benefis of the new wet weather treatment plant will include:

- The provision of treatment for the 2 to 4% of flows that currently do not receive secondary treatment under storm conditions (flows greater than 9 m^3/s).
- The provision of additional UV disinfection equipment as part of the wet weather treatment plant, which will ensure improved solids removal and more effective disnfection under storm conditions using dedicated equipment optimised to wet weather flow conditions.
- Allowing the existing UV plant to be optimised for non-wet weather conditions, with reduced potential for reduced efficiency due to the variability of UV transmissivity under storm flow conditions.

- Increased overall treatment options, capacity and flexibility to ensure the best practicable treatment is achieved.
- Improved overall solids, BOD metals and pathogen removal.

In combination with the existing plant, the above upgrading works will ensure a robust treatment system that will continue to protect the Manukau Harbour and meet the future needs of the people of Auckland, with the flexibility to respond to changing circumstances, should they arise. The upgraded plant will represent the Best Practicable Option as required under the relevant Auckland Council plans and, as a minimum, will ensure the conditions of the existing discharge permit will continue to be met and there will be no requirement to increase discharge loads above those currently authorised.

Ref[1]	Wastewater 2000 Outcome	Actions Taken by Watercare to Date	Results Achieved to Date	Further Measures Proposed	Implications for Compliance with Existing Designation and Discharge Permit Conditions	Implications for any New Discharge Permit on Expiry of Existing Permit
(a)	To support the progressive improvement and restoration of the Manukau Harbour towards a healthy natural state.	Major upgrading of Mangere WWTP and decommissioning and removal of oxidation ponds	Improvements in all key aspects monitored, as outlined elsewhere in this table and in Note 3 below	Additional biological treatment capacity to supplement existing and provide higher quality effluent. Wet weather treatment plant for flows in excess of biological treatment plant capacity to avoid need to bypass direct to UV plant, and separate additional UV treatment. Reduction of hydraulic load on existing clarifiers, with improved solids removal and overall disinfection efficiency.	Consistent with intent of the consents, designations and Wastewater 2000 outcomes	Any new consent application will be based on continuing to support the outcome
(b)	To seek to ensure that effluent (after initial mixing) will not prevent any part of the harbour from meeting recognised standards for: (i) swimming and surface recreation; and (ii) the free breeding and safe human consumption of fin-fish and shellfish.	Major upgrading of Mangere WWTP, including comprehensive UV disinfection, and extensive monitoring of system performance and effects on the Manukau Harbour.	The MRG (See Note 2 below) has advised "The upgrade to the Mangere Wastewater Treatment Plant is an outstanding success story in relation to protection of public health and the environment." The Group recently recommended that a recreational exclusion zone was no longer required in the harbour as a result of the treated wastewater discharge because of the level of treatment provided.	See (a) above	Will ensure more effective disinfection during peak wet weather conditions, will reduce the potential for reduced disinfection performance due to solids carry-over and reduce the risk of future non-compliance	Any new consent application will likely be based on achieving the same 4-log reduction in viruses as required by the existing consent, so no reduction in the existing level of protection of public health will occur
(c)	To treat effluent to the best practicable standards, recognising that it may not be possible to avoid having an adversely impacted area in the vicinity of a shoreline discharge.	Conditions set through the resource consent process would have ensured the standards represented the best practicable treatment option	The standards adopted have ensured that major improvements have occurred in the quality of the north-east Manukau Harbour since the WWTP was upgraded, as described in Note 3 below. Based on the improvements observed, it appears that the existing standards are ensuring the required results are being achieved	The WWTP was intended to be upgraded in stages, with only the first stage completed to date. Watercare proposes to construct the remaining works necessary to treat the average daily flow of 390,000 m^3/d authorised under the existing discharge permit. In addition, it is now possible at reasonable cost to incorporate more robust biological treatment, which will provided greater security of performance in the future. It is also now possible at reasonable cost to incorporate wet weather treatment, which will contribute further to ensuring the best practicable standards are achieved.	The new works are expected to be completed in accordance with the scope and conditions of the existing designations and to ensure compliance with the existing discharge permit. If it is found that some minor variations are required to facilitate a better overall outcome, Watercare will be required to apply for appropriate changes or variations.	Based on an extensive investigation of alternatives, the best practicable option for meeting Auckland's future wastewater treatment needs will be to treat up to 450,000 m^3/d at Mangere WWTP by 2062. As a minimum, the best practicable standards of treatment used at present will continue to be used or enhanced in the future and no reduction in the level of protection of public health and the environment provided by the existing discharge permit are anticipated at the current time.
(d)	To ensure the Manukau Harbour is not used for the treatment of effluent.	The WWTP is operated to achieve the maximum practicable level of treatment to ensure that to the greatest extent practicable, the Manukau Harbour is not used for the treatment of effluent.	The WWTP has a high level of compliance with the conditions of its discharge permit. The improvements that have occurred in harbour water quality indicate the harbour is not being used for the treatment of effluent.	The additional treatment listed under (a) will further reduce the potential for the harbour to be used for the treatment of effluent.	The intent of the discharge permit is being met in terms of ensuring the Manukau Harbour is not used for the treatment of effluent.	The intent of the existing consent will continue to be met in any future consent in terms of ensuring the Manukau Harbour is not used for the treatment of effluent.

Ref[1]	Wastewater 2000 Outcome	Actions Taken by Watercare to Date	Results Achieved to Date	Further Measures Proposed	Implications for Compliance with Existing Designation and Discharge Permit Conditions	Implications for any New Discharge Permit on Expiry of Existing Permit
(e)	To ensure the proliferation of undesirable biological growth as result of discharge of nitrogen is avoided.	Biological treatment to remove nitrogen was included in the WWTP upgrade and extensive monitoring of the Harbour has been undertaken pre and post upgrade.	A high level of compliance with the discharge permit limit for nitrogen is achieved. Nitrogen discharge loads and concentrations in the harbour have reduced by approximately 75% since the upgrade. Chlorophyll *a* concentrations are typically half the target set by scientific advisors prior to consent conditions being set and mean dissolved oxygen saturation in summer is around 80%, which is the Regional Plan minimum target. There is no record of any nuisance or toxic algae growth since the upgrade There is no known evidence of the proliferation of undesirable biological growth as result of discharge of nitrogen since the upgrade	Additional biological nitrogen removal capacity is proposed as part of the next stage of the upgrade and provision will be made to add carbon to further reduce nitrogen discharge loads if required. Watercare is also investigating natural processes in the treated wastewater discharge channel and tidal storage basin to provide additional nitrogen removal capacity. It is anticipated that these measures will be more than adequate to limit nitrogen discharge load to that authorised by the existing discharge permit. If future harbour monitoring shows some reduction in load is required, options exist to reduce the load by approximately 25%. However, because of the very high cost, this would only be considered if there is a demonstrated need.	Proposed works will ensure compliance with the existing discharge permit limit.	Any new consent application is expected to be based on achieving the same maximum nitrogen discharge load as authorised by the existing discharge permit. The sustainable load will be reviewed to take into account harbour monitoring over the next 20 years before any new consent application is made. There is no evidence to suggest that the current authorised load is not appropriate, but if future monitoring indicates otherwise, the allowable future nitrogen discharge load can be adjusted as appropriate.
(f)	To upgrade and operate the MWTP so as to avoid: (i) offensive odours; (ii) air emissions that are injurious to health or property; and (iii) insect nuisances.	Odour control measures were incorporated in the upgraded plant. Chemical dosing of the treated wastewater discharge channel and tidal storage basin is used to control insect nuisance	The following numbers of complaints have been verified at the plant over a five year period to June 2012: Odour - an average of one confirmed complaint every three months from Mangere WWTP and a similar number from the Pond 2 Landfill; Insect nuisance – six complaints over the full period.	Odour control measures will be incorporated as part of all future upgrades as appropriate.	All future works will be designed to meet condition 15 of Permit 9610850 that there shall be no odour which is noxious, offensive, or objectionable beyond the area designated as the “Odour Boundary”, caused by discharges from activities undertaken on the site.	Any new consent application will be based on meeting the same consent requirement as the existing.
(g)	To develop protocols to ensure that the on-site handling and use of sludge and sludge-derived product, for landforming and landscaping does not produce odour effects or health hazards.	Protocols were developed and procedures monitored to minimise the effects of odours to the greatest extent possible. The Pond 2 Landfill was capped and landscaped to enable safe public access	As inferred above, there have been one verified odour complaints every three months relating to the biosolids placement activity over the five year period to June 2012.	The new Puketutu biosolids rehabilitation project is required to comply with a new set of conditions as set out in the resource consents for the project	The current activity will cease in or before 2014.	New conditions are already in place for a 35 year period with biosolids placement starting in or before 2014.
(h)	To preserve future options to maximise economically sustainable and alternative disposal options and beneficial	No future options have been excluded. The decision to adopt a shoreline discharge as opposed to a discharge to the Tasman Sea or	A major review of alternatives was undertaken as part of the Three Waters Strategic Planning Programme completed in December 2008. This identified no economically sustainable	Watercare will continue to investigate as opportunities arise: • Opportunities for beneficial use in industry, even though extensive enquiries in relation to both Mangere and Rosedale WWTPs have	The proposed approach is consistent with the intent of the discharge permit but recognises that for a region the size of Auckland, practicable alternatives are not readily	Alternatives will continue to be reviewed, with a greater likelihood that treatment to potable standards will become a technically feasible and affordable solution within

Ref[1]	Wastewater 2000 Outcome	Actions Taken by Watercare to Date	Results Achieved to Date	Further Measures Proposed	Implications for Compliance with Existing Designation and Discharge Permit Conditions	Implications for any New Discharge Permit on Expiry of Existing Permit
	reuse of treated effluent.	elsewhere in the Manukau Harbour ensured the greatest opportunity to use economically viable alternatives in the future	alternatives at that time, but recognised that future treatment to potable standards was already technically feasible. Subject to community acceptance and improved affordability, this could significantly reduce future discharges to the Manukau Harbour	shown this is not viable to date. • The use of local beneficial reuse and the use of satellite plants where this is economically viable and sustainable. • Treatment to potable standards for general community use.	available, particularly taking into account the lack of sufficient suitable land for land disposal.	perhaps 20 to 30 years.
(i)	To restore as much as possible of the former harbour bed to its natural marine estuary condition.	As large an area as possible of the old oxidation ponds has been removed	Approximately 500 hectares of the harbour bed has been restored as closely as possible to its natural marine estuary condition	The option of a continuous discharge of treated wastewater has been identified as a possible alternative to the current tidal discharge. If this is found to be ecologically sustainable in the future, and cost effective, the opportunity will exist to restore a further area of harbour bed to its natural state through the removal of the tidal storage basin. It has not been possible to date to confirm that this would be ecologically sustainable.	All practicable steps have been taken to meet the intent of the desired Wastewater 2000 outcome.	The option of a continuous discharge and the potential to restore the area of the harbour on which the tidal storage basin is located will be reviewed at or before the time any future consent application is sought.
(j)	To recognise the Tangata Whenua customary and traditional relationships with the Manukau Harbour.	Watercare recognises that Waikato-Tainui do not support, endorse or condone the discharge of effluent, treated or untreated into the Manukau Harbour. Watercare has acted to mitigate the effects of the discharge and has continued to review alternatives to the discharge	Watercare has put in place significant mitigation measures, as outlined elsewhere in this table. Watercare has also continued to investigate alternatives to continued discharge, as outlined in (h). Watercare has sought to consult with Tangata Whenua in good faith. The ownership of Puketutu Island will be transferred to a Maori Trust.	As part of a continuing process of evolution of its relationships with Tangata Whenua throughout the Auckland region, Watercare has established a Mana Whenua Kaitiaki Forum with a view to ensuring continuing effective communication and consultation. Watercare will continue to upgrade the treatment plant to meet consent conditions relating to the discharge. Watercare will continue to investigate alternatives to continued discharge as they arise, as outlined in (h)	Watercare has recognised the outcomes sought by Waikato-Tainui, as recorded in an advice note attached to the discharge permit and has taken active steps to help achieve those outcomes, where practicable.	Any new consent application will be based on continued recognition of the Tangata Whenua customary and traditional relationships with the Manukau Harbour. It is believed that treatment of the discharge to potable standards will offer the best opportunity to avoid or further mitigate the effects of the discharge on the harbour, but will depend on affordability and acceptance by the community and the relevant authorities.

Notes:

1 Reference letter included in Advice Note

2 The MRG is the Microbiological Review Group reporting independently to the Auckland Council on the performance of the Mangere disinfection system and the level of protection of public health provided by the Mangere WWTP.

3 There have been major reductions in treated wastewater concentrations since the upgrade, including:

- Biochemical oxygen demand 90%
- Suspended solids 80%
- Total nitrogen 75%
- Ammonia 95%

A more than 10,000 times reduction of enteric human virus numbers occur under most conditions, with a mean reduction of more than 100,000 times

The largely inert solids in the treated wastewater have been reduced to levels that are now typically less than 30% of those occurring naturally in the north-east harbour

Watercare Services Limited
The Mangere Wastewater Treatment Plant and the North East Manukau Harbour
Status Report - March 2013

1 Key Findings

i) There has been a substantial improvement in the condition of the north-east Manukau Harbour since the last upgrade of the Mangere Wastewater Treatment Plant (WWTP) in 2003.
ii) The overall condition of the Manukau Harbour is now generally similar to or better than that of other harbour and estuarine waters within Auckland's Metropolitan Urban Limits (MUL).
iii) A review of compliance with the conditions of its discharge permit for the last three years shows the Mangere WWTP has achieved a very high level of compliance.
iv) In addition, the Mangere WWTP is being managed to ensure appropriate environmental guideline values and targets are not compromised as a result of the on-going discharge of treated wastewater.
v) Committed upgrading of the Mangere WWTP will further enhance the quality of treated wastewater and contribute to on-going restoration of the north-east Manukau Harbour in accordance with the Wastewater 2000 outcomes agreed with the community.
vi) There will be no adverse effects on the performance of the Mangere WWTP or the condition of the Manukau Harbour as a result of the Central Interceptor (CI) Project. To the contrary, the flow balancing capacity of the CI will benefit treatment plant performance and there will be environmental and public health benefits over much wider areas due to substantially reduced overflows of untreated wastewater from wastewater networks.

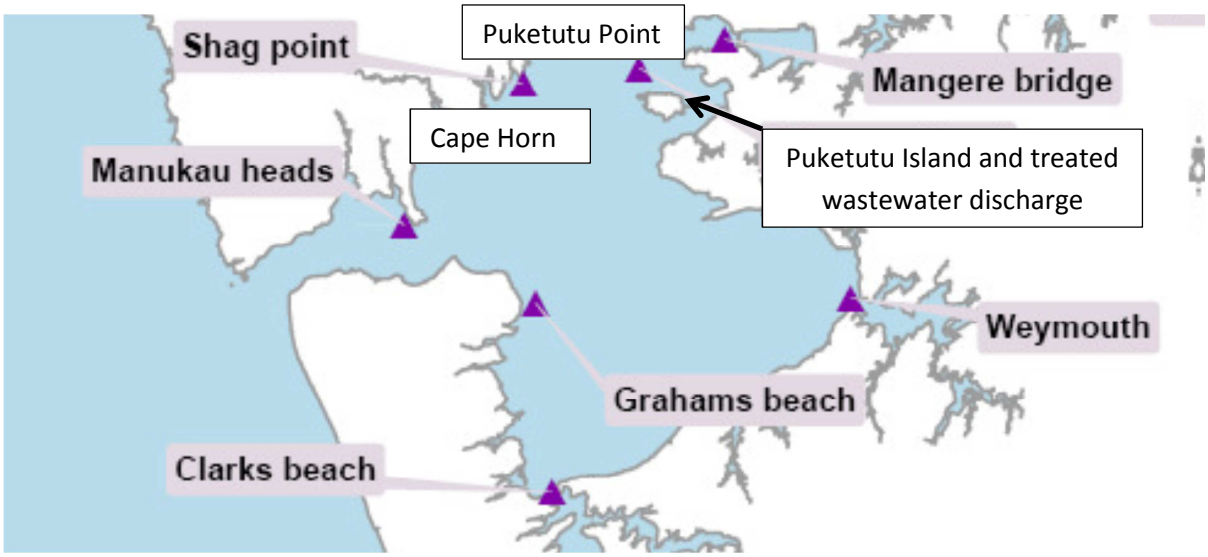
2 Introduction

The Manukau Harbour is an important natural asset. A map of the harbour is shown in Figure 1. Watercare has made and continues to make a strong commitment to the protection of the Harbour. In addition, there is understandable interest in ensuring continuing protection of the Harbour by a range of stakeholders including iwi, members of the local community, local board members, environmental groups and the Auckland Council.

This report provides the following:

i) A summary of historical circumstances and improvements in harbour condition since the last Mangere WWTP upgrade;
ii) A summary of treatment plant performance in terms of meeting the conditions of its discharge permit;
iii) A comparison with relevant environmental guideline values and the condition of other similar receiving environments in Auckland; and
iv) A summary of committed upgrading works to ensure the Mangere WWTP continues to be effectively managed to contribute to the on-going restoration of the Manukau Harbour in the future.

Figure 1
Map of the Manukau Harbour



3 The Mangere Wastewater Treatment Plant and its Effects on the Manukau Harbour Prior to Watercare's Involvement in 1992

Watercare was formed and took over ownership of and responsibility for managing the Mangere WWTP from the Auckland Regional Council in 1992. At that time, the WWTP comprised primary and secondary land-based treatment and approximately 500 hectares of oxidation ponds constructed in the Harbour itself, as shown on Figure 2.

Water quality in the north-east Manukau Harbour, into which treated wastewater was discharged and resulted in greatest adverse effects, was seriously degraded, particularly in terms of organic materials, nitrogen concentrations, oxygen depletion, total suspended solids discharges and microbiological contaminants presenting significant risks to public health and the environment. Significant odour and midge issues were occurring at times.

Figure 2
The Mangere WWTP and Oxidation Ponds at the Time Watercare Took Over Ownership and Management Responsibility

4 Progress Achieved in Improving Treatment Plant Performance 1993 to 2003

Wide-ranging investigations showed there were no practicable alternatives to continued discharge of treated wastewater from the Mangere WWTP to the Manukau Harbour for the foreseeable future, and that remains the case today. Taking that into account, Watercare and the local community, iwi and other interested and affected parties worked closely together from 1993 onwards to agree a programme to upgrade the WWTP to support the progressive improvement and restoration of the Manukau Harbour to a healthy natural state. A comprehensive community workshop programme over a period of approximately three years, known as Wastewater 2000, resulted in the agreement between Watercare and workshop participants of a set of goals or outcomes that were included as an advice note in the discharge permit granted to allow continued discharge from the WWTP. The purpose of the consent is stated in the advice note as being to achieve or promote the Wastewater 2000 outcomes.

As part of the workshop process , a Harbour Water Quality Task Force (HWQTF) was established, comprising four nationally recognised and highly qualified and experienced scientists. To guide planning for future treatment plant upgrading, the HWQTF defined appropriate standards that should apply in the north-east Harbour and in the treated wastewater discharge for all important water quality constituents. These were taken into account by the regulator when setting conditions in the discharge permit. The conditions are legally binding on Watercare and provide the primary yardstick against which the plant's environmental performance must be judged.

A major upgrading of the WWTP was completed following the Wastewater 2000 consultation process and commissioned in 2003, as shown in Figure 3, at a total cost of approximately $500 million. The upgrade included the decommissioning of the oxidation ponds and the construction of a new shoreline discharge structure for treated wastewater. This was included as a result of the workshop process to ensure a high quality discharge, to encourage future beneficial use and to avoid the discharge becoming “out of sight, out of mind.”

Figure 3
The Mangere WWTP Now

The upgraded plant comprises primary, secondary and tertiary treatment stages with UV disinfection, which resulted in substantially improved WWTP perfomance, including a:

i) 90% improvement in the removal of biochemical oxygen demand (BOD);
ii) 80% improvement in the removal of suspended solids (SS);
iii) 95% improvement in the removal of ammonia nitrogen;
iv) 75% improvement in the removal of total nitrogen;

Figure 4 shows the quality of the treated wastewater on 21 March 2013.

Figure 4
Treated Wastewater March 2013

5 Treatment Plant Performance in Terms of Compliance with Discharge Permit Conditions

In the last three years full compliance has been achieved in terms of pH, SS, BOD and dissolved reactive phosphorus. The requirement to achieve a minimum DO saturation of 80% was met at all times except over three two week periods, when the mean monthly rolling average values reduced to 76, 77 and 79%. The 80% requirement is likely to have been met in all cases within the non-compliance zone boundary, an area specifically provided to allow consent compliance to be achieved.

The mean monthly total nitrogen concentration limit of 9.5 g/m^3 in summer was exceeded on five occasions, including during a period of toxicity of the digestors in 2012. They occurred at times of lower flow, which means the associated load was reduced and no significant effects on the environment were observed or were were likely to have occurred. Six exceedances of the maximum summer ammonia nitorgen limit occurred over a five year period, with all but nine other values 3 g/m^3 or less, the allowable mean value. Both total and ammoniac nitrogen limits are likely to have been met at the boundary of the non-compliance zone in most if not all cases.

Overall, the Mangere WWTP has achieved a very high level of compliance with the conditions of its discharge permit. On the very small number of occasions when full compliance was not achieved, the extent, duration and effects of non-compliance were minor.

6 Improvements in the Condition of the North-East Manukau Harbour Since the Upgrade (2003 to 2013)

6.1 General Overview

The most obvious improvement in the overall condition of the norh-east Manukau Harbour is the removal of the oxidation ponds, as shown in Figure 5.

Figure 5
The Harbour South of Puketutu Island with the Oxidation Ponds Removed

A 2008 Auckland Council report[1] observed, "*there is a clear picture of improvements in wastewater treatment at Mangere, which can be linked to water quality patterns*". and that "*Water quality in Manukau Harbour has shown dramatic improvements since decommissioning of the Mangere Oxidation Ponds completed in 2002".*

The Microbiological Review Group (MRG) described in Section 6.2 reported *"the upgrades to the Mangere Wastewater Treatment Plant are an outstanding success story in relation to protection of public health and the environment."*

6.2 Protection of Public Health

Desired Wastewater 2000 Outcome: *To seek to ensure that effluent (after initial mixing) will not prevent any part of the harbour for meeting recognised standards for:*

(i) Swimming and surface recreation; and

(ii) The free breeding and safe human consumption of fin fish and shellfish.

A specialist MRG comprising local and international experts has independently advised the Auckland Council and Watercare on public health issues associated with the treated wastewater discharge since before the ugrade. As a result of MRG recommendations, the largest ultra vilolet (UV) disnfection system in the world at the time was installed at Mangere as part of the last upgrade, as shown in Figure 6.

Figure 6
The Mangere WWTP UV Disinfection System

Following a review of WWTP performance in May 2012, the MRG confirmed that the plant exceeds the virus reduction requirements of the discharge permit and advised in relation to the treated wastewater discharge that:

i) "MRG recommends that contact and other recreational uses (including fishing) in the area are appropriate when considering public health risk.

ii) "With regard to shellfish gathering, it is unlikely that the plant discharge presents a measurable health risk.

iii) "However, the impact of diffuse and other point sources has not been assessed; therefore, the MRG cannot definitively recommend shellfish gathering in the area at this time."

This indicates that the treatment plant is providing a high level of protection of the north-east Manukau Harbour in terms of protecting public health and that the desired Wastewater 2000 outcome is being achieved. Protection of public health will continue to be one of two priority management objectives for the WWTP (the other being nitrogen management). As part on its on-going commitment to support the progressive improvement and restoration of the Manukau Harbour to a healthy natural state, Watercare will further improve UV disinfection peformance in the next upgrade programme to be completed within the 2013 to 2023 period.

6.3 Effects of Nutrients

Desired Wastewater 2000 Outcome: "*To ensure that the proliferation of undesirable algal growth as a result of discharge of nitrogen is avoided*."

The over-riding requirement is the prevention of planktonic algal blooms by limiting nutrient discharges. The effective control of nitrogen is the key nutrient management requirement in the Manukau Harbour. Mean nitrogen concentrations in the north-east Harbour have reduced substantially since the upgrade and are now less than the target concentrations recommended by the HWQTF. While phosphorus concentrations are high, they are not resulting in any increased algal biomass because the waters are significantly nitrogen limited. NIWA advised in June 2012 "*we see no case for phosphorus removal from the wastewater."*

The presence of algal biomass is generally measured in terms of Chlorophyll *a*. Where Chlorophyll *a* in marine waters is within the range 5 to 20 mg/m^3, generic international guidelines classify the waters as having moderate quality. For the north-east Manukau Harbour, the HWQTF recommended a maximun Chlorophyll *a* concentration of 30 mg/m^3 to provide an acceptable level of risk, taking into account the local conditions that exist (including low natural water clarity and high numbers of organisms that graze on algae).

Monitoring of the north-east Manukau Harbour indicates that maximum Chlorophyll *a* concentrations in the three years to June 2011 were almost always less than 15 mg/m^3 and generally less than 10 mg/m^3. There have been no recorded incidences of nuisance or toxic algal blooms arising from nitrogen concentrations in the Manukau Harbour since the last upgrade of the Mangere WWTP.

This indicates that the treatment plant is providing an appropriate level of protection of the north-east Manukau Harbour in terms of managing nitrogen and that the desired Wastewater 2000 outcome is being achieved. Control of nitrogen and the management of risks asociated with algal blooms will be the second priority management objective for the WWTP. Watercare will add substantial additional nitrogen removal capacity in the next upgrade programme to be completed by 2017. It will subsequently modify the existing treatment units to further improve their nitrogen removal performance in the period 2024 to 2030.

6.4 Oxygen Concentrations in Harbour Waters

Dissolved oxygen (DO) is important to ensure aquatic life is not distressed because of low DO levels. Auckland Council ERC Green guideline values for DO saturation (the “all clear level from an environmental effects perspective) are the range 80 to 110%.

DO concentrations in the north-east Manukau Harbour were poor prior to 2003 but have improved substantially since the upgrade. For all years prior to the upgrade, mean annual DO saturation (DOS) was below the desired minimum of 80%, 65 % of all individual samples had a DOS of less than 80% and the minimum DOS each year averaged less than 45%. Since the upgrade, mean annual DOS has increased to be above the desired minimum of 80% in all years, the number of individual samples with a DOS of less than 80% reduced by more than half to 26% and the minimum DOS each year increased to an average of around 55%.

Mean DOS in the north-east Manukau Harbour is typically middle of the Auckland Council’s ERC Green range and generally similar to or higher than most sites compared from the Council’s regional monitoring programme. Minimum DOS exceeded the ERC Green value of 80%, whereas a number of sites did not. Maximum DOS was generally higher than other sites, but generally within the ERC Green range. This represents a positive situation and a significant improvement as a result of the upgrade.

6.5 Effects of Suspended Solids

Naturally occurring SS concentrations in the north-east Manukau Harbour are high due to the re-suspension of solids from the seabed. This would be the case with or without the treated wastewater discharge from the Mangere WWTP.

Suspended solids in discharges generally need to be managed to avoid unacceptable effects on water clarity and the accumulation of solids around discharge locations as a result of settlement. The Mangere WWTP discharge permit SS limit is less than the natural SS concentration of the waters into which the treated wastewater discharges, which is significantly less than the SS concentration in waters further to the north east on the Harbour. The discharge permit SS limit is 5 g/m^3 less than the level at which scientific advisors considered adverse effects on water clarity could occur and the level necessary to reduce the potential for solids deposition and accumulation to occur around the shoreline discharge location.

Actual discharges have consistently met all SS discharge permit requirements in the last three years and longer, with a mean value over the period of less than half the limit allowed in the permit. Mean SS concentrations in the treated wastewater are generally similar to those occurring naturally in monitored open east coast beaches at Browns Bay and Orewa, which have good water quality, and are typically 50 to 70% less than those occurring naturally in the north-east Manukau Harbour.

6.6 General Water Quality

A broad, very general comparison of water quality in the north-east Manukau Harbour with that in other other receiving environments in Auckland indicates:

i) pH is normal for highly saline waters and is generally similar to that at all other sites monitored in the Auckland Council regional water quality programme.
ii) Salinity is similar to that at Weymouth in the southern harbour and is broadly in the middle of the range measured in Auckland saline receiving environments generally.
iii) Mean turbidity, due to the naturally high SS and other conditions in the Harbour, is higher (i.e. worse) than at most sites except Shelley Beach in the Kaipara Harbour.
iv) Mean nutrient concentrations in the north-east Manukau Harbour are significantly higher (i.e. worse) than at other sites monitored, particularly at Puketutu Point, which is located directly in the path of the treated wastewater discharge and where the samples are likely to contain relatively high concentrations of treated wastewater; and
v) Mean and maximum chlorophyll *a* concentrations are elevated (i.e. worse) compared to some sites but similar to those at some other sites such as Shelley Beach. This confirms the on-going importance of continuing to effectively manage nitrogen discharges.

In its Auckland-wide water quality monitoring reports, the Auckland Council uses an aggregated ranking system taking into account suspended solids (SS), nitrogen, phosphorus and faecal coliforms. Based on this system, Council reports rank sites in the north-east Manukau Harbour as continuing to have poor water quality, ranking poorest of all sites monitored. Considerable caution needs to be used when referring to this ranking system as a basis for assessing the effects of the treated wastewater discharge from the Mangere WWTP. The situation in the north-east Manukau Harbour with regard to each of the four parameters included in the ranking system is as follows:

i) The high SS that contribute to the poor ranking are naturally occurring and do not occur as a result of the treated wastewater discharge. To the contrary, the SS concentration in the treated wastewater is generally equivalent to or better than the SS in almost all higher graded receiving environments in the programme.
ii) Faecal coliforms are used as an indicator of the possible presence of wastewater, with an associated risk to public health. Faecal coliforms are unsuitable for use as an indicator of public health risks from the Mangere WWTP discharge, based on extensive research and advice from the MRG, so reliance on this as an indicator of poor water quality in the north-east Manukau compared to other receiving environments is not appropriate. The WWTP provides a very high level of protection of public health, as discussed in Section 6.2.
iii) The high phosphorus concentrations occur mainly as a result of the treated wastewater discharge. In the particular circumstances that exist in the north-east Manukau Harbour they present no additional risk of unacceptable biological growth occurring in the harbour, as it is significantly nitrogen limited, as noted in Section 6.3.
iv) The high nitrogen concentrations also occur mainly as a result of the treated wastewater discharge, but are being managed to control biological growth by meeting appropriate Chlorophyll *a* guideline values in the harbour, also as discussed in Section 6.3.

Overall, this ranking system cannot be used as a basis for assessing the effects of the treated wastewater discharge from the Mangere WWTP as:

- Results relating to the first of the parameters have nothing to do with the discharge;
- The second is invalid as a basis for comparing the public health effects of the discharge;
- The third is not a driver of adverse effects in the local circumstances; and
- The fourth is being managed to achieve the required Wastewater 2000 outcome.

6.7 Harbour Ecology

The Auckland Council's 2012 report[2] on Manukau Harbour ecology notes:

"*The most significant changes observed over the whole monitored period occurred at Cape Horn (CH) between 2000 and 2005 as a result of a strong El Niño Southern Oscillation (ENSO) and the decommissioning of the Mangere waste water treatment ponds in May 2001. Little change has occurred since 2005 and a new stable community appears to have evolved.*

"During the last two years, there has been no evidence to suggest there have been detrimental effects on communities at sites in the main body of Manukau Harbour.

"Overall, there is no evidence of detrimental effects on ecosystem health … within the extensive intertidal flats that make up the main body of the Manukau Harbour."

Watercare's Harbour Environment Monitoring Programme showed there has been a 50 to 100% increase in the number of species and the total number of animals at sites outside the old oxidation pond area following the plant upgrade. There has also been a small increase in diversity. Similar improvements to those in areas outside the old pond areas were observed in areas within the old pond area south of Puketutu Island. There has been an overall improvement in benthic biota since the upgrade.

6.8 Sediment Quality

83% of the 18 Manukau Harbour sediment quality sites monitored by the Auckland Council are in the ERC "Green" or environmental all clear range.[3] That is a substantially higher percentage than in the central and upper Waitemata Harbour, Tamaki estuary and East Coast Bays.

Immediately following decommissioning of the ponds, marine sediment quality within the old pond areas was adversely affected by wastewater contaminants that had settled out over the 40 or so years the ponds operated. Sediment quality in the area now meets ERC Green limits for metals and persistent organic compounds in all but a few localised areas. In these areas DDT remains above the Auckland Council guideline value, but concentrations have reduced substantially in the last 10 years and are now relatively close to guideline value. As DDT has not been produced or sold in New Zealand for more than 20 years, this is an historical artefact, and not as a result of recent discharges. Copper remains marginally

above ERC Green guideline values in the same general locations, but is expected to reduce to below guideline values within a relatively short time frame.

6.9 Shellfish Quality

As noted in Section 6.2, the MRG advised that with regard to shellfish gathering, it is unlikely that the plant discharge presents a measurable health risk. Within the areas previously covered by the oxidation ponds, some shellfish contain DDT and copper above guideline values particularly in the localities where sediment guideline values are exceeded. Concentrations of cadmium, mercury, lead and zinc were consistently below guideline values in Watercare's pond recovery monitoring programme.

Elevated copper and zinc in shellfish can occur in parts of the wider harbour, with stormwater likely to be a contributing factor. Sites more remote from the discharge location met the copper guideline values less frequently than at some closer ones.

6.10 Effects of Freshwater Discharges

The Manukau Harbour has a surface area of around 350 square kilometres, a tidal range of 2 to 3.3 metres at Onehunga and a tidal prism on mean spring tide of around 900 million m^3. The average wastewater discharge per tidal cycle in 2062 will be less than 250,000 m^3, or less than 0.03% of the volume flushed out of the harbour. In the wider harbour context, the volume of freshwater resulting from the treated wastewater discharge is minor.

The HWQTF advised "*The projected effluent flows are small in comparison with tidal volumes and it is considered that there is no need to limit the daily flow or instantaneous discharge rates for any of the discharge options*." and "*The presence of the freshwater and reduced salinity fields in the vicinity of the shoreline discharge area would not have any significant adverse effects on harbour aquatic life such as fish or plankton*." Scientific advice obtained as part of the Three Waters Strategic Planning Programme investigations indicated average daily fresh water inflows of between 600,000 and 900,000 m^3/d could be discharged without exceeding the assimilative capacity of the Manukau Harbour.

Mean salinity in the north-east Manukau Harbour generally is higher than that at Weymouth in the southern Manukau Harbour and Shelley Beach in the Kaipara Harbour and mid-range for other receiving environments in Auckland, other than open coastal waters. Overall, salinity is broadly similar to most other harbour and estuarine receiving environments in Auckland and current and projected freshwater discharges are well within the assimilative capacity of the north-east Manukau Harbour, based on scientific advice.

6.11 Possible Future Effects of Discharges from the Proposed Emergency Pressure Relief Structure on the Manukau Harbour

The new Mangere Pump Station to be constructed as part of the Central Interceptor project will incorporate an Emergency Pressure Relief (EPR) Structure. The EPR is required so that under emergency situations, pressure can be safely released from the tunnel without causing damage to the pump station or tunnel structures or causing uncontrolled overflows from shafts along the tunnel alignment.

The proposed emergency pressure relief structure is not expected to operate more often than once in every 50 years. It is an essential risk mitigation measure needed to protect the Central Interceptor in the event of an unusual and infrequent combination of circumstances involving extensive and prolonged rainfall, prolonged power failure and the unavailability of standby equipment. If this were to occur, Auckland as a whole would be expected to be affected by similar circumstances and widespread effects would be expected, regardless of whether or not the pressure relief structure operated.

If a discharge were to occur, it would contain reduced concentrations of contaminants due to the high volumes of wet weather flow stored in the tunnel. Any such discharge would be unlikely to result in any significant increased effects due to nutrients. The effect on solids and dissolved oxygen concentrations in the harbour would be minor and unlikely to be noticeable after one or two tidal cycles. As a precautionary approach, it is expected that the Department of Health would issue an advisory not to swim or take shellfish, which is the approach they have consistently recommended for areas within the MUL following heavy rain, based on possible stormwater effects alone.

7 Comparison of the Condition of the Manukau Harbour with That of Other Harbour and Estuarine Environments in Auckland

7.1 Comparisons Based on the General State of the Environments

The Auckland Council environmental report card for the Manukau Harbour gives it an overall grade of “C”, which is the same grade given to the Central Waitemata Harbour, better than the “D” grade given to the Upper Waitemata Harbour and Tamaki Estuary and not as good as the “B” grade given to the Kaipara Harbour. The condition of the Kaipara Harbour would be expected to be better than that of the others, as it is largely unaffected by urban development, which has been a major influencing factor on the condition of the other listed receiving environments.

7.2 Sediment Quality

Reference 3 notes that “*The concentrations of metals and PAH are generally low in most areas of the Manukau Harbour*” and that *“Highest contaminant concentrations are generally found in the muddy upper reaches of estuaries receiving runoff from the older, intensively urbanised and/or industrialised catchments, particularly in the Tamaki Estuary and Central Waitemata Harbour.*

7.3 Effects of Untreated Wastewater Overflows from Wastewater Networks

Frequency of occurrence is an important indicator of the potential effects of wastewater overflows on the environment. The Proposed Auckland Council Regional Plan: Coastal provides for locations where overflows from wastewater networks occur on no more than an average of two occasions a year to be controlled activities under the Resource Management Act 1991 (RMA). Based on modelling data collected from a range of sources for Watercare’s Auckland-wide network consent project, there could be approximately 200 locations where the target is not met in the region as a whole, of which around 3% are in locations draining to the Manukau Harbour. However, Watercare’s overflow records do not show any locations

where overflows occur significantly more frequently than twice a year, which suggests the modelling could be over-estimating the number of overflows, at least within the Manukau Harbour catchments. At the one location where the target was marginally exceeded, a large number of the overflows occurred in 2011, which was avery wet year. Overflow frequency will continue to be monitored and if found necessary, mitigation measuees will be put in place.

Overall, the adverse effects on the Manukau Harbour from untreated wastewater overflows from wastewater networks are substantially less than those in some parts of Auckland, particularly parts of central Auckland, where more than 70 network locations are projected to overflow more than twice a year and some more than 100 times a year.

7.4 Recreational Beach Water Quality

Based on a 2010 Watercare report[4], recreational beach water quality guidelines are exceeded on between 20% and more than 40% of monitoring occasions at Weymouth, French Bay, Green Bay, Wood Bay and Titirangi. These sites are all remote from the Mangere WWTP discharge location and the excedances are likely to result from local influences such as stormwater and septic tanks, not the treatment plant. Exceedances are significantly lower at beaches in most other parts of Auckland.

8 Summary of Committed Future Upgrading Works

The two main wastewater treatment requirements for the protection and enhancement of the condition of the Manukau Harbour are protection of public health and the effective management of nitrogen discharges. Watercare has developed a Mangere WWTP Master Plan to guide future development of the WWTP and this identified a number of key upgrading requirements. These are listed below, together with their estimated costs in dollars at the time of construction, including inflation and interest, and the programmes for completion. These programmes are included in Watercare's asset management and funding plans, which have been approved by the Watercare Board and Auckland Council and provide certainty of commitment to the works proceeding. Tenders have been invited for the appointment of a Principal Enginering Advisor to design and supervise construction of the biological nitrogen removal (BNR) plant. Tenders for the appointment of a Principal Engineering Advisor to design the wet weather treatment plant will be called in time to ensure the plant is fully operational before the Central Interceptor is commissioned.

i) New BNR plant to increase nitrogen removal capacity by 2 m^3/s or approximately 25%, operational by 2017 at an estimated cost of approximately $140 million.
ii) New wet weather treatment and UV disinfection plant to increase wet weather treatment capacity by 6 m^3/s, operational by 2022 at an estimated cost of approximately $75 million.
iii) Modifications of the existing secondary treatment plant to increase the efficiency of nitrogen removal over the approximate period 2024 to 2030 at an estimated cost of approximately $35 million.
iv) Second new BNR plant to increase nitrogen removal capacity by a further 2 m^3/s, operational by around 2033 at an estimated cost of approximately $250 million.

In addition to the Mangere WWTP upgrading works, Watercare has committed to construct a new northern interceptor sewer to divert flows from approximately 230,000 people in west Auckland from Mangere to Rosedale by 2062, but progressively from 2020. The work will be undertaken in a minimum of two stages at a total estimated cost of approximately $300 million. Stage one is expected to be operational by 2022. Tenders for the appointment of consultants to design and supervise construction of the works are expected to be called in May 2013.

These works are all in addition to the CI project, which will not have any effect on the existing discharge permit for the Mangere WWTP but which will provide overall benefits for treatment by storing and balancing peak flows.

References

1 "Saline Water Quality State and Trends in the Auckland Region", Auckland Council Report TR 2008/005

2 "Manukau Harbour Ecological Monitoring Programme: Report on data collected up until February 2011", Auckland Council Technical Report: 2012/004

3 "Marine sediment contaminants: Status and trends assessment 1998-2010, November 2012, Technical Report TR2012/041"

4 "Overview of Recreational Water Quality in Auckland" Watercare Services Limited, June 2010