Best Practicable Option Assessment

For

St Marys Bay and Masefield Beach

And

‘The Project’

Final

28 February 2018

EXECUTIVE SUMMARY

Auckland Council's Healthy Waters (Healthy Waters) is leading and delivering the "St Marys Bay and Masefield Beach Water Quality Improvement Project" (referred to in this document as 'The Project'). This is a water quality improvement project able to be delivered in the short to medium term to reduce direct discharges of wastewater-stormwater overflows from the combined sewer network to St Marys Bay and Masefield Beach by 2021.

The Project provides an opportunity to integrate a stormwater asset renewal project to replace a failed stormwater outfall at Masefield Beach with several water quality improvement initiatives. The Project achieves wider benefits for multiple Council organisations, stakeholders, and the local community.

Watercare Services Ltd (Watercare) as asset owner and operator of the combined sewer network and Consent Holder of Auckland's Comprehensive Wastewater Discharge Permit, or Network Discharge Consent (NDC) (referred in this document as the "NDC") is supporting Healthy Waters to achieve The Project's objective to improve water quality at St Marys Bay and Masefield Beach. Discharges related to The Project are from rainfall driven overflows from the combined sewer network which discharge via stormwater outfalls owned and operated by Healthy Waters. These discharges are currently authorised by Watercare's NDC and covered by the NDC Assessment of Environmental Effects for the Coxs Bay and Auckland Central Business District Catchments.

In particular, the existing Masefield Beach outfall currently discharges from the combined sewer network servicing an area of Herne Bay. There are two existing Engineered Overflow Points (EOPs) (EOP IDs 194 and 196) which discharge to Masefield Beach, Home Bay via the stormwater outfall which has failed. There are also three existing EOPs (EOP IDs 180, 172, and 1020) in the combined sewer network servicing St Marys Bay which discharge via two separate stormwater outfalls to St Marys Bay.

The Healthy Waters wish to replace the Masefield Beach outfall. Health Waters intent is to build a new outfall which allows discharges further offshore into the mid-stream of the Waitematā Harbour. The Project will also involve installing collector/linking pipes to the five EOPs, a 1 km storage tunnel and a pump station.

The Project will consolidate and reduce in volume, rainfall related wastewater-stormwater discharges from five existing EOPs within the combined sewer network. Storage will be provided in the new tunnel, and overflows that occur during light to moderate rain will be diverted via the new pump station to the combined sewer network for conveyance to Mangere Wastewater Treatment Plant (Mangere WWTP) for treatment.

The new tunnel has a storage volume of approximately 2,500 m^3 and is designed to contain a two month return period design storm. The new outfall structure will be created with a new discharge location further out into the mid-stream Waitematā Harbour. It will discharge heavily diluted overflows as a result of very heavy rain to this receiving environment which is higher energy and less sensitive than Masefield Beach.

The existing stormwater outfalls at St Marys Bay will remain operational following completion of The Project, and will continue to remain operational until the long term network solutions have been agreed and funded and the improvement projects are in place.

The Project will:

- **Reduce the frequency and volume of direct discharges to St Marys Bay.** During light to moderate rainfall overflows from EOPs 180,172, and 1020 will be captured, stored, and diverted via the new pump station to the combined sewer network. This means there will be a reduction in direct discharges from 99 to 2 times on average per year.

- **Remove direct discharges to Masefield Beach.** The Project involves the decommissioning and removal of the failed Masefield Beach outfall. Therefore there will be no discharges to Masefield Beach. A new outfall from the new pump station will be built which will be used to discharge heavily diluted wastewater-stormwater flows further out into the mid-stream Waitematā Harbour during very heavy rainfall conditions. Light to moderate rainfall related overflows which previously discharged to Masefield Beach from EOPs 194 and 196 will be captured, stored, and diverted via the new pump station to the combined sewer network for conveyance to Mangere WWTP.

- **Reduce the overall discharge frequency to the Waitematā Harbour.** The Project will be designed to reduce discharge frequencies from 206 to less than 22 times on average per year at the new discharge location. The Project is designed to capture smaller discharges with higher wastewater content and return them to the combined sewer network for conveyance to Mangere WWTP.

- **Reduce the average annual discharge volume to the Waitematā Harbour.** The Project will be designed to reduce total discharge volumes of stormwater-wastewater to the Waitematā Harbour from approximately 100,000 m^3 to 35,000 m^3 on average per year at the new discharge location.

The Project directly addresses an urgent need to improve water quality issues at St Marys Bay and reduces public health risks associated with recreational activities taking place in the bay and contact recreational activities at Masefield Beach.

The Project will be designed with a high degree of operational flexibility and will complement the combined sewer network strategy and future long term projects and associated improvement works. The Project will not replace or delay longer term projects addressing issues within the wider St Marys Bay Auckland CBD combined sewer network.

The supporting information provided in this Best Practicable Option Assessment (BPO) has been supplied by Healthy Waters and their specialist technical advisors for the purpose of Watercare obtaining Manger's Certification in accordance with condition 27, 28, and 29 of the Auckland-wide Wastewater Network Discharge Consent R/REG/2013/3743 (NDC).

The proposed new outfall structure falls within the Attachment 10 of the NDC definition of "New Engineered Overflow Point". It is "an addition to the Network after the Auckland Wastewater Network Comprehensive Discharge Permit commences", and the nature and scale of the works take the outfall structure outside the definition of "Replacement Engineered Overflow Point".

As part of The Project, Healthy Waters will be constructing a "New Engineered Overflow Point" (i.e. the new outfall). Manager's Certification is sought for Watercare's determination of the alternative discharge frequency (ADF) in accordance with condition 27a, and its determination of the location of the discharge from the new outfall in accordance with condition 27b, as envisaged in condition 29 of the NDC. Under condition 29 the Manager's role is to certify that the consent holder's determination of the ADF and location of the discharge from the New Engineered Overflow structure was undertaken in accordance with the BPO methodology set out in Chapters 3 and/or 4 of Attachment 3 to the NDC.

As anticipated by condition 29, Manager's Certification is being sought prior to construction of the New Engineered Overflow Point.

Existing Network

27. If a Replacement or New Engineered Overflow Point within the Existing Network does not comply with the requirements set out in conditions 24 or 26 respectively, or discharges to a SEA-M1 Area, the Consent Holder shall:

> *a. determine an alternative discharge frequency (ADF) for that Engineered Overflow Point using BPO methodology set out in **Chapter 3 of Attachment 3**; and or*
>
> *b. determine the location of that Engineered Overflow Point using the BPO methodology set out in **Chapter 4 of Attachment 3.***

The work required by the Consent Holder shall depend on whether a new location is proposed, and whether the Discharge Frequency Targets are met.

28. No discharge is allowed to a Tangata Whenua Management on whether a new location is proposed, and whether the Discharge Frequency Targets are met.

*29. Prior to construction of the Replacement or New Engineered Overflow Point, or concurrent with the lodgement of other necessary resource consent applications, the Consent Holder shall obtain Manger's Certification that the determination of the ADF in accordance with condition 27a and/or the determination of the location of the discharge from the Replacement or New Engineered Overflow Point in accordance with condition 27b was undertaken in accordance with the BPO methodology set out in **Chapters 3 and/or 4 of Attachment 3.***

The New Engineered Overflow Point (i.e. the new outfall) (in the mid-stream Waitematā Harbour) is assessed as having the same combined 'high' frequency and 'high' volume discharge as the existing Engineered Overflow Point at Masefield Beach. This is because the 'high' thresholds of more than 12 discharges on average per year of more than 10,000 m^3 are still exceeded, however they will be significantly reduced in comparison to the existing situation. The Project will direct flows to a preferential receiving environment and further improvements will continue to be implemented in the catchment and wider Auckland CBD combined sewer network over time.

The resource consents required to undertake the physical works and authorise the use/ occupation of the seabed for the new outfall, storage tunnel, pump station, and upstream connection works etc. (The Project) are being sought separately by Healthy Waters, as the asset owner.

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1 PROJECT INFORMATION

1.1 Name

This assessment relates to **St Marys Bay and Masefield Beach.**

The proposed project is the 'St Mary's Bay and Masefield Beach Water Quality Improvement Project' (The Project).

The Project is being led and delivered by Auckland Council's Healthy Waters (Healthy Waters) with support from Watercare Services Limited (Watercare) as asset owner and operator of the combined sewer network and Consent Holder of Auckland's Comprehensive Wastewater Network Discharge Permit, known as the Network Discharge Consent, or NDC.

1.2 Purpose

The Project will involve construction of new stormwater infrastructure which is required as part of Healthy Waters stormwater asset renewals programme and water quality improvement works.

The Project will:

- Consolidate rainfall related stormwater-wastewater overflows from five existing Engineered Overflow Points (EOP IDs 180, 172, 1020, 194, and 196) and reduce direct discharge frequency and volume to St Marys Bay, and completely eliminate discharges to Masefield Beach; and

- Relocate an existing stormwater outfall further offshore into the mid-stream Waitematā Harbour which will provide further water quality improvements to St Marys Bay and Masefield Beach.

1.3 Estimated Value

The estimated budget for The Project is $44 million. The Project is fully funded and is being sponsored and implemented by Healthy Waters.

1.4 Timeframe

Indicative construction start date is December 2018 and commissioning is scheduled for the end of 2020.

1.5 Description

The Project involves installing new stormwater infrastructure including connecting five EOPs within the combined sewer network which currently discharge to St Marys Bay and Masefield Beach, to a new storage tunnel, a pump station and new outfall structure.

The existing Masefield Beach outfall will be decommissioned and removed and replaced with a new outfall structure further offshore in the Waitematā mid-stream. Any rainfall related discharges will be to a higher energy and less sensitive receiving environment and will also be heavily diluted by very heavy rainfall.

The outfall structures at St Marys Bay will be retained with a reduced discharge frequency.

An overview plan of The Project is shown overleaf in **Figure 1.1** and The Project is described in more detail in **Appendix 1 – Project Outline.**

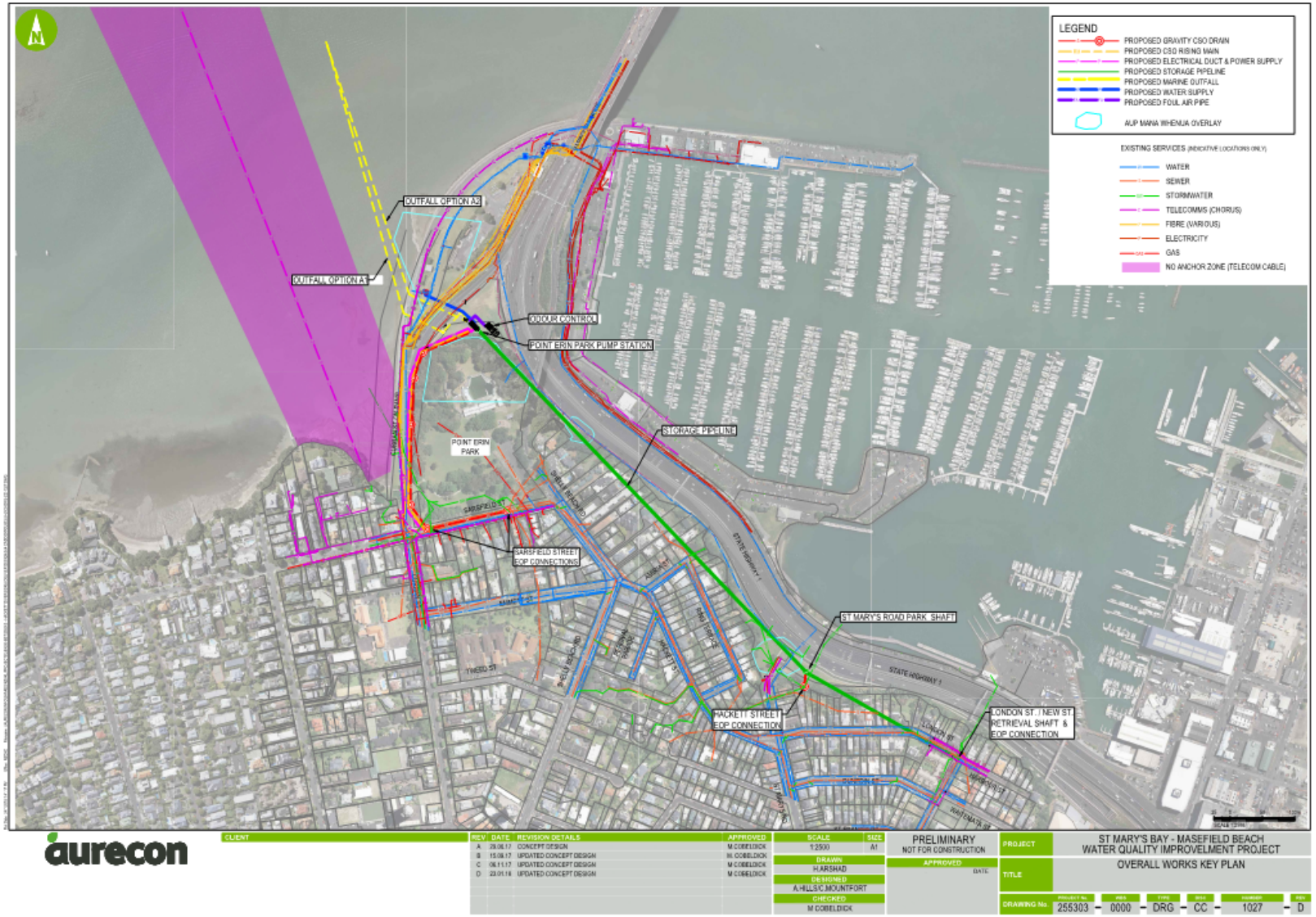

Figure 1.1 – Overview Plan of the St Marys Bay and Masefield Beach Water Quality Improvement Project

1.6 Background and Context

The Project provides an opportunity to integrate a stormwater asset renewals project and several water quality improvement projects.

1.6.1 Stormwater Asset Renewals Project

Healthy Waters has an existing failed stormwater outfall at Masefield Beach, Home Bay (See below photographs 1 and 2). The Masefield Beach outfall is currently used by Watercare for discharges from the combined sewer network servicing some of the Herne Bay area (EOP IDs 194 and 196).

Discharges from the existing stormwater outfall at Masefield Beach are currently authorised by Watercare's NDC and are part of the NDC Assessment of Environmental Effects (Volume 2.20) which relate to the Cox's Bay Catchment receiving environment.

Photographs 1 and 2: The existing Masefield Beach failed outfall

There is an urgent need to replace the Masefield Beach outfall to improve beach water quality.

1.6.2 Water Quality Improvement Initiatives

The water quality improvement initiatives come from the 'St Marys Bay Water Quality Improvement Programme' started in April 2016 (The Programme). The Programme is a joint initiative by a number of Auckland Council organisations including Healthy Waters, Panuku, Watercare, and Auckland Transport. Mana Whenua are also involved.

The Programme was developed in response to local community and marina owner concerns over poor water quality in St Marys Bay impacting on the increasing recreational use of the area. It also aligns with Auckland Council's plans to develop the area further as a public facility.

The Programme identified that a major source of pathogenic contamination at St Marys Bay was a result of rainfall related wastewater-stormwater overflows from the combined sewer network that serves St Marys Bay area (EOP IDs 180, 172, and 1020).

Discharges from the existing stormwater outfalls to St Marys Bay are authorised by Watercare's NDC and are part of the NDC Assessment of Environmental Effects which relate to the Auckland Central Business District Catchment receiving environment.

The Programme's aim is to resolve water quality issues at St Marys Bay and Masefield Beach, in order to facilitate public use of the space and improve Auckland's waterfront environment. Recognising the complexity and challenges of achieving the entire programme objectives, a number of agreed water quality improvement measures were developed and have been taken forward for implementation over the immediate term (within a year), the short to medium term (with 2 – 5 years), and the longer term (5 - 10 years).

Three immediate term projects have already been implemented with the objective to reduce the risk of visual pollution within the Bay and reduce and better manage the risk of human exposure to pathogens through contact recreation.

The objective of medium term projects is to provide public health protection benefit by significantly reducing the number of harmful pathogens entering St Marys Bay. The Project was among a number of potential short to medium term water quality improvement projects that were identified.

Longer term projects were also defined as having the objective of making significant improvements to water quality in the wider Waitematā Harbour by making improvements to the combined sewer network within St Marys Bay and the wider Auckland CBD area. It was recognised that the longer term projects would be costly as well as take longer to implement. The Project will not replace or delay longer term projects addressing issues within the wider St Marys Bay Auckland CBD combined sewer network.

1.6.3 Current System Performance

The combined sewer network conveys both wastewater and stormwater flows and when its capacity is exceeded due to rainfall, it is designed to overflow.

Watercare's hydraulic model for the existing development and wet weather scenarios shows that EOP IDs 196 and 180 are predicted to operate with a current overflow frequency of two times per week or greater, and EOP IDs 172, 1010, and 194 operate with a current overflow frequency of one per week or greater. The significant overflows are a result of capacity constraints in the trunk sewer and the volume of stormwater in the wastewater system.

1.7 Expected Outcome and Discharge Frequency

The expected results of The Project using outputs from Healthy Waters project related hydraulic model are presented below in Table 1.

Table 1 - Summary of Expected Results

Receiving Environment	Current System Performance			Post Improvement Project System Performance		
	Estimated Average Discharge Frequency (no. of Discharges per yr)	Estimated Average Annual Discharge Volume (m^3 per yr)	Estimated Average Volume of Domestic Wastewater (m^3 per yr)	Estimated Average Discharge Frequency (no. of Discharges per yr)	Estimated Average Annual Discharge Volume (m^3 per yr)	Estimated Average Volume of Domestic Wastewater (m^3 per yr)
Masefield Beach	107	38,400	6,900	-	-	-
St Marys Bay	99	63,400	11,400	2	<1000	20
Waitematā Harbour	-	-	-	20	34,000	680
Total	**206**	**101,800**	**18,300**	**22**	**35,000**	**700**

In summary, The Project is expected to:

- **Reduce the frequency and volume of direct discharges to St Marys Bay.** During light to moderate rainfall overflows from EOPs 180,172, and 1020 will be captured, stored, and diverted via the new pump station to the combined sewer network for conveyance to Mangere WWTP for treatment. This means there will be a reduction in direct discharges from 99 to 2 times on average per year.

- **Remove direct discharges to Masefield Beach.** The Project involves decommissioning and removal of the failed outfall at Masefield Beach. Therefore there will be no discharges to Masefield Beach from EOPs 194 and 196.

- **Reduce the overall discharge frequency to the Waitematā Harbour.** The Project will be designed to reduce discharge frequencies from 206 to 22 times on average per year at the new discharge location. The Project is designed to capture smaller, discharges with higher wastewater content and return them to the combined sewer network for conveyance to Mangere WWTP and treatment.

- **Reduce the average annual discharge volume to the Waitematā Harbour.** The Project will be designed to reduce total discharge volumes of wastewater-stormwater to the Waitematā Harbour from about 100,000 m3 per year to 35,000 m3 per year at the new discharge location.

The Project is designed to capture smaller, discharges with higher wastewater content and return them to the combined sewer network for conveyance to Mangere WWTP for treatment. Residual discharges to the environment at the new discharge location will be predominantly stormwater. The new tunnel has a storage capacity of 2,500 m^3 and is designed to contain a storm with a two month return period for the catchment.

2 CONSENT CONDITION COMPLIANCE

The proposed new outfall structure falls within the Attachment 10 of the NDC definition of "New Engineered Overflow Point". It is "an addition to the Network after the Auckland Wastewater Network Comprehensive Discharge Permit commences", and the nature and scale of the works take the outfall structure outside the definition of "Replacement Engineered Overflow Point".

As part of The Project, Healthy Waters will be constructing a "New Engineered Overflow Point" (i.e. the new outfall). Manager's Certification is sought for Watercare's determination of the alternative discharge frequency (ADF) in accordance with condition 27a, and its determination of the location of the discharge from the new outfall in accordance with condition 27b, as envisaged in condition 29 of the NDC. Under condition 29 the Manager's role is to certify that the consent holder's determination of the ADF and location of the discharge from the New Engineered Overflow structure was undertaken in accordance with the BPO methodology set out in Chapters 3 and/or 4 of Attachment 3 to the NDC. As anticipated by condition 29, Manager's Certification is being sought prior to construction of the New Engineered Overflow Point.

The proposed outfall will be approximately 1.4 m in diameter and extend approximately 430m into the Waitematā Harbour. The new outfall is not expected to achieve a discharge frequency of two wet weather overflow events per year, hence needing a Best Practicable Option (BPO) Assessment.

2.1 Compliance with Condition 27

27. If a Replacement or New Engineered Overflow Point within the Existing Network does not comply with the requirements set out in conditions 24 or 26 respectively, or discharges to a SEA-M1 Area, the Consent Holder shall:

a. *determine an alternative discharge frequency (ADF) for that Engineered Overflow Point using BPO methodology set out in **Chapter 3 of Attachment 3**; and or*

b. *determine the location of that Engineered Overflow Point using the BPO methodology set out in **Chapter 4 of Attachment 3.***

The work required by the Consent Holder shall depend on whether a new location is proposed, and whether the Discharge Frequency Targets are met.

This condition requires the consent holder to "*determine an alternative discharge frequency (ADF) for that Engineered Overflow Point using the BPO methodology set out in **Chapter 4 of Attachment 3***".

The summary assessment of The Project is provided next, and has been undertaken by Healthy Waters in accordance with Watercare's BPO methodology set out in Chapter 4 of Attachment 3 of the NDC, which is provided in full in **Appendix 2.**

2.2 Best Practicable Option Assessment

2.2.1 Risk (Loss of Service)

This assessment criterion is directly related to the total or partial risk of loss of service as a result of poor asset condition. It also considers deterioration of service, which occurs when the potential for overflow increases due to lack of capacity in the system, generally as a result of urban development.

The Project will address the current loss of service as a result of the failed stormwater outfall at Masefield Beach which is currently used by Watercare for discharges from the combined sewer network (EOP IDs 194 and 196).

The replacement provides much needed additional storage capacity in the form of a new storage tunnel which will significantly reduce direct discharges (frequency and volume) to St Marys Bay to two times per year on average. It will also totally eliminate direct discharges to Masefield Beach and reduce the total discharges to the Waitematā Harbour from 206 to 22 times per year on average as a result of overflows being diverted via the new pump station and returned to the combined sewer network.

The Project will also help mitigate existing capacity constraints in the trunk sewer. Loss of service or blockages associated with dry weather overflows will be fully contained.

2.2.2 Environmental Risk (Effects on the Environment)

The risk to the environment has been assessed and is discussed in more detail in Section 3 below. This assessment used an environmental risk profile and potential effects associated The Project and identified potential risks to public health, cultural values, and aesthetic values.

The NDC Methodology was not detailed enough to demonstrate the potential performance improvements which will be achieved as the NDC assessment process is based on ranges (low, medium, high) rather than numbers of overflows, and does not take into account that wastewater flows from the combined sewer system are diluted with stormwater. However, The Project provides the ability to capture, store, and divert overflows back to the combined sewer network via the new pump station. It is estimated that there will be a 95% reduction in wastewater loads being discharged to the environment as a result of this.

The new outfall and proposed discharge location is in the mid-stream Waitematā Harbour which is a higher energy, less sensitive receiving environment than the current outfall location and allows for better dispersion and dilution by the current. The new discharge location from the new outfall will be approximately 430 m away from the shoreline and the discharge will be heavily diluted by rainfall.

The Project significantly lowers public health and ecological risks at St Marys Bay (reduces discharges to two times per year on average) and Masefield Beach (discharges will be completely eliminated). The frequency of discharges to the Waitematā Harbour will be reduced from an average of 206 to less than 22 times per year. This is anticipated to be further reduced once a longer-term combined sewer network solution is implemented.

Given the reduction in wastewater loads being discharged to the environment, the dilution of the loads, and the more appropriate receiving environment, the environmental risk with The Project is considered to be significantly lower.

The Project will direct lower volume flows to a preferential receiving environment (Class 2 Recreational) and future network improvements will continue to be implemented and further reduce discharges over time.

Monitoring will be part of The Project to confirm the discharge frequency from the new outfall.

2.2.3 Cost Effectiveness, Short Term Need, and Effectiveness of Available Options

2.2.3.1 Cost effectiveness:

Watercare is required by legislation to minimise the costs of providing an effective service and maintaining the long-term integrity of its assets. As part of Auckland Council, Healthy Waters is required to provide its services in a way that is most cost effective for households and businesses (Local Government Act 1974, section 10).

As previously noted, there is an urgent need to replace the failed stormwater outfall to prevent the continued discharge directly onto Masefield Beach. The capital cost associated with the replacement of the Masefield Beach outfall will be partially funded through the Healthy Waters operational budget for stormwater asset renewals.

The cost of separation works for St Marys Bay area (excluding any local/trunk network upgrades or rehabilitation of existing pipes) was estimated to be around $26 million. In order to provide the same level of benefit as The Project, the areas of Herne Bay that drain to EOP IDs 194 and 196 would also need to be separated, and the Masefield Outfall would still need to be replaced. Separation and associated improvement projects to achieve the same level of benefit as The Project are unlikely to be less than $44 million.

The Project provides the best value option and better performance in the medium term with the potential to be an integral part of any long term solution, thus minimising any future costs and avoiding investment in assets without a long term useful lifespan.

2.2.3.2 Short-term need:

The Project is required to address a short term need to replace a failed stormwater outfall to prevent the continued discharge of rainfall related wastewater-stormwater overflows from the combined sewer network directly onto Masefield Beach.

The Project is also necessary to meet The Programme's short to medium term project objectives to provide public health protection benefit by significantly reducing the number of harmful pathogens entering St Marys Bay by 2020. It aligns with the objectives under the NDC (target of less than two spills per year) and SAFESWIM initiative.

2.2.3.3 Effectiveness of available options:

Other improvement options considered included:

- **Separation**: Separation of the combined system in the Herne Bay and St Marys Bay areas that drain to the five EOPs. There was a risk that this option could not provide the performance outcomes within the short to medium timeframe and not at a comparable cost with the additional associated works required. It would take much longer and be more disruptive to the local community as well as not being any cheaper. Separation however, is still a viable option for the longer-term and when done correctly achieves the same water quality.

- **Screening and disinfection of discharges at St Marys Bay**: Screening and disinfection facilities have significant space requirements that involve significant costs and consenting implications especially when constructed in heavily built-up urban areas. There was a risk that this option could not be achieved within the short to medium timeframe and at a comparable cost and certainty of outcome and it would not result in a reduction in discharges. The constructed asset base would not be useful in the long term.

In summary, The Project provides the greatest level of benefit, in terms of environmental and public health outcomes, cost, construction/programme risk, operational risk, and certainty of outcome for medium-term improvement projects. The project is the only available option that addresses multiple needs for multiple Council organisations and stakeholders within the specified timeframe.

A clear advantage of the Project is the ability to significantly reduce direct discharges to St Marys Bay (to two per year on average) in-line with the requirements of the NDC immediately. In addition, the construction of the storage tunnel and new outfall will completely eliminate direct discharges at Masefield Beach. Overall wastewater discharges will be reduced by approximately 95% and discharges will be to an environmentally preferable location.

2.2.4 Opportunity to Benefit from and/or Link with Projects Undertaken by Other Network Utility Operators

The Project is directly linked to the following projects:

- **St Marys Bay Water Quality Improvement Programme**: A joint initiative by a number of Council organisations including Healthy Waters, Panuku, Watercare and Auckland Transport. Mana Whenua have also been engaged with.

- **Healthy Waters Stormwater Asset Renewal Project**: There is a need to replace the failed Masefield Beach outfall and to remove very high discharges from the poorly flushed environment at St Marys Bay.

- **Panuku Developments (Westhaven Plan):** Continued use of these beaches and on-going development of the waterfront area, including St Marys Bay, as a high value public amenity and adjacent to Westhaven Marina requires an improvement of water quality. Until such time as water quality improves, planned initiatives for the bay development (such as Waka Ama and learn-to-sail) cannot be implemented due to the high public health and aesthetic risks. Capital projects to improve the bay for a variety of uses also rely on improved water quality.

- **Healthy Waters and Watercare's Western Isthmus Water Quality Improvement Programme:** Healthy Waters and Watercare are currently preparing the long term combined sewer network strategy which will outline the expected costs and timeframes for implementation and develop long term projects.

The Project also provides an effective intermediate step in that it can be integrated with other future Healthy Waters and Watercare improvement projects to further improve the performance of the combined sewer network.

2.2.5 Consequential Project/Planning Linkages

Short term measures have already been implemented to manage visible pollution at St Marys Bay and Masefield Beach including installation of 100 Tetra-traps within the road network in the adjacent residential area; further installation of traps are planned in the road network and marina area. Watercare has installed sensors in the wastewater network for real-time monitoring of overflows to enable early warning notification of potential dry weather overflow incidents and ensure a rapid and appropriate field response.

As discussed previously, The Project will be designed with a high degree of operational flexibility (future proofing) so that it can be integrated with other future Healthy Waters and Watercare improvement projects to further improve the performance of the combined sewer network and proposed development in the area by Panuku and Auckland Council to improve public facilities and amenity development

The detailed BPO Assessment by Healthy Waters is provided in **Appendix 3 – BPO (Alternatives) Assessment.**

2.3 Compliance with Condition 27b

The new outfall location further into the mid-stream Waitematā Harbour provides the most cost-effective option with better performance in the short term and the potential to be an integral part of any long term solution which will provide further water quality improvements. The Project will direct flows to the new outfall which will discharge to a preferential receiving environment.

Appendix 4 – Outfall Alternatives Assessment contains the assessment undertaken by Healthy Waters to confirm **t**he optimal location for the new outfall and discharge location.

2.4 Compliance with Condition 28

28. No discharge is allowed to a Tangata Whenua Management Area on whether a new location is proposed, and whether the Discharge Frequency Targets are met.

As part of The Project the new outfall does not discharge to a *Tangata Whenua Management Area* as identified in the *Regional Plan: Coastal*, or an equivalent area in the Unitary Plan where discharges are a Prohibited Activity.

3 ASSESSMENT OF EFFECTS ON THE ENVIRONMENT AND ASSOCIATED RISK

This assessment has been undertaken by Healthy Waters in accordance with the approach set out in Attachment 5 of the NDC. More details are included in **Appendix 5.**

3.1 Receiving Environments Characteristics

The Project relates specifically to EOP IDs 180, 172, 1020, 194, and 196 located within the combined sewer network which currently discharge via stormwater outfalls to St Marys Bay and Masefield Beach. The location of these overflow structures is shown in **Figures 3.1** and **3.2**. Related discharge locations are shown in **Figure 3.3**.

EOP IDs 180, 172, and 1020 are part of the NDC Auckland Central Business District (CBD) Geographic Catchment (**Figure 3.1**). They are existing EOPs identified in Schedule 1 of Attachment 2 of the NDC, and at the time of the NDC, they were described as directly discharging to the Waitematā Harbour. They discharge via two outfall locations as shown in **Figure 3.3**.

EOP IDs 194 and 196 are part of the NDC Coxs Bay Geographic Catchment (**Figure 3.2**). They are also identified as existing EOPs in Schedule 1 of Attachment 2 of the NDC, and are described as directly discharging into the Home Bay receiving environment (which includes Masefield Beach), and indirectly into the Waitematā Harbour. They discharge via the existing stormwater outfall at Masefield Beach as shown in **Figure 3.3**.

In summary, the existing direct receiving environments at St Marys Bay and Masefield Beach are classified as a Class 1 Recreational receiving environment and Class 3 Ecological receiving environment and have combined 'high' frequency and 'high' volume discharge, which results in very high risk profiles in relation to public health, aesthetics, and cultural effects, and 'moderate to very high' risk profiles for ecological effects.

Given the proposed changes to existing EOP discharge frequencies, the new outfall, and proposed new discharge location, the existing receiving environments have been reassessed to determine whether there is any change in the risk profile for the existing receiving environment as a result of the predicted discharges from The Project. Table 2 provides a summary of this assessment.

St Marys Bay's risk profile improves significantly as a result of The Project, given that potential discharges will be low frequency and, on an average annualised basis, low volume. As a consequence, this changes the risk profile to moderate for cultural, low for public health and aesthetics and very low for ecological. There will no longer be any discharges directly to Masefield Beach.

The direct receiving environment for the new outfall and proposed discharge, further out in the Waitematā Harbour maintains 'high' frequency and 'high' volume discharge as the frequency exceeds 12 discharges per year. However, the new receiving environment is less sensitive (harbour) than the existing sites (tidal beaches which have less dilution and dispersal.

The risk profiles for the existing situation receiving environment compared with the predicted discharges from The Project receiving environment are reduced, as there is a reduction in overall contamination from wastewater-stormwater. Dispersion modelling indicates that there is no significant impact on Harbour or near shore environments such as Masefield Beach or Home Bay from the new discharge. Ecological assessment indicates that there is no significant impact from the new outfall.

Figure 3.1 NDC Auckland CBD Catchment showing location of EOP IDs 172, 180 and 1020

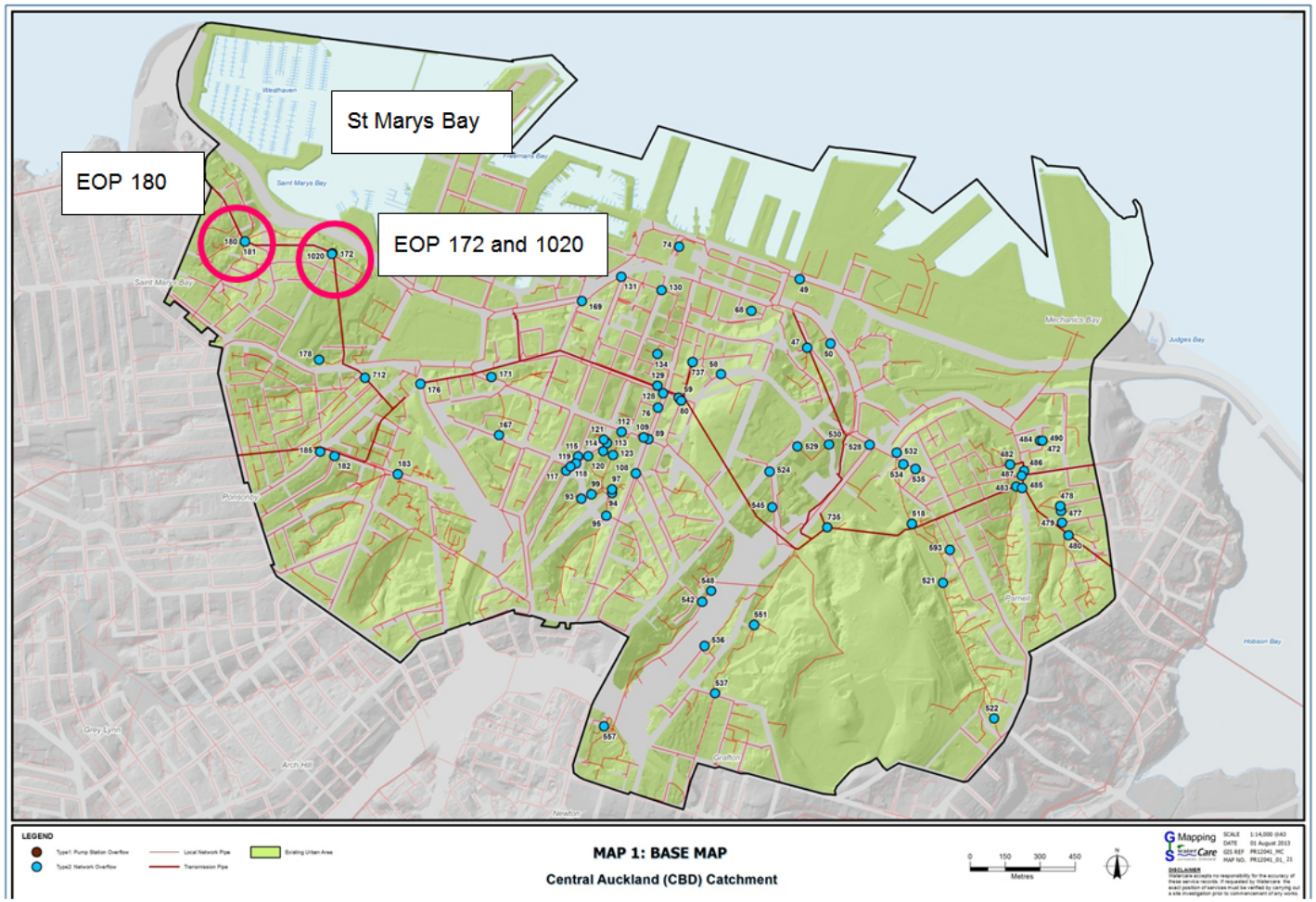

Figure 3.2 NDC Coxs Bay Catchment showing locations of EOP IDs 194 and 196

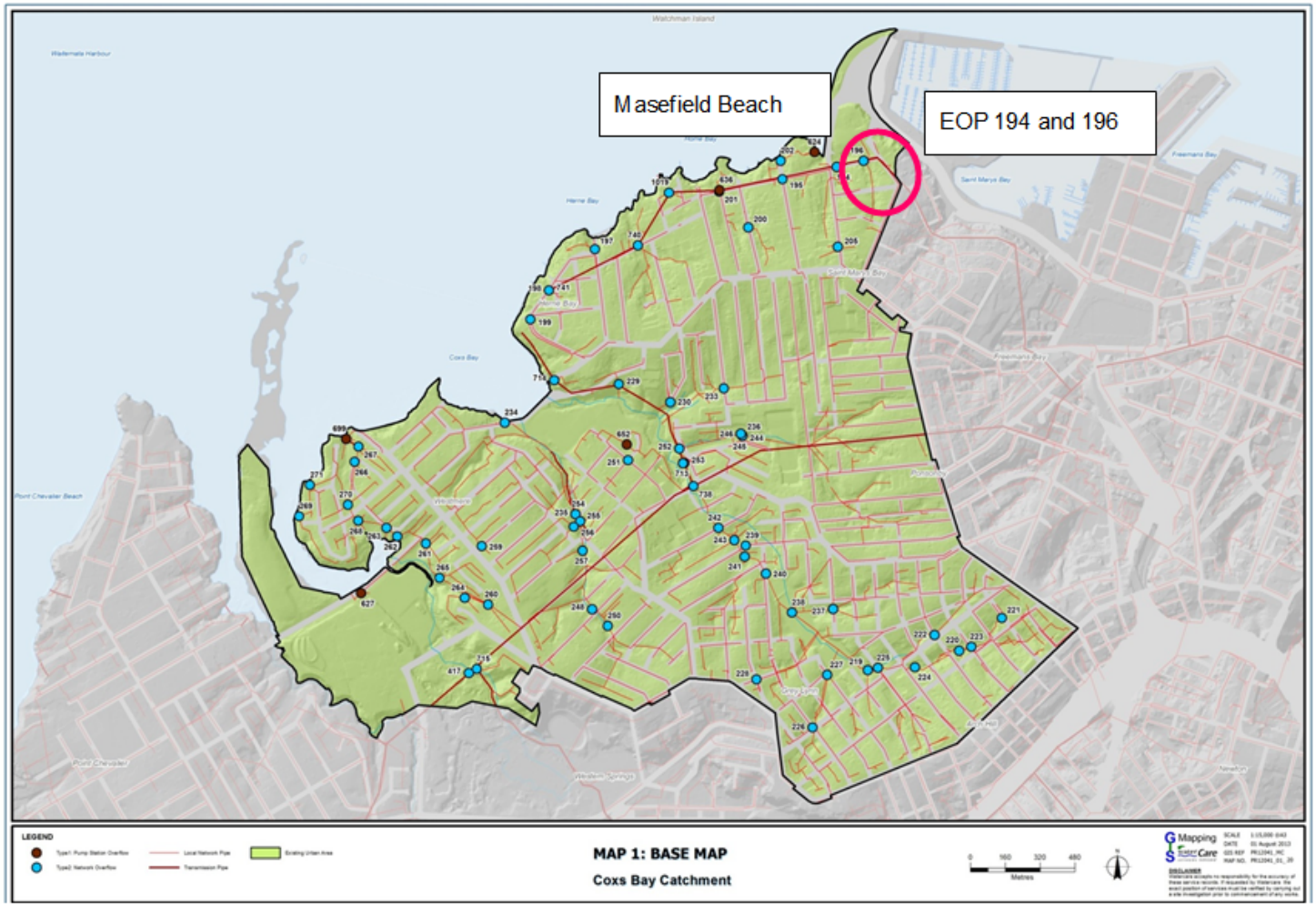

Figure 3.3 Location of the five existing EOPs and their associated discharge location via stormwater outfalls

Table 2 - Summary of Receiving Environments Categorisation – Existing Situation and after the Completion of The Project

		Existing Situation		Post Improvement Project		
Receiving Environment (RE) Name		St Marys Bay	Masefield Beach	Waitematā Harbour	St Marys Bay	Masefield Beach
Direct or Indirect RE		Direct	Direct	Direct	Direct	N/A
Type		Beach	Beach	Harbour	Beach	Beach
Class	Recreational	Class 1	Class 1	Class 2	Class 2	Class 1
	Ecological	Class 3	Class 3	Class 3	Class 3	Class 3
	Cultural	Very Important	Very Important	Very Important	Very Important	Very Important
	Aesthetic	High	High	High	High	High
EOP ID		172, 180, 1020	194, 196	172, 180, 1020, 194, 196	172, 180, 1020	None
Volume Range		High >10,000m^3 p.a.	High >10,000m^3 p.a.	High >10,000m^3 p.a.	Low <1,000 m^3 p.a.	N/A
Frequency Range		High (>12 p.a.)	High (>12 p.a.)	High (>12 p.a.)	Low (<12 p.a.)	N/A
Potential Effects	Public Health	High	High	High	Moderate	N/A
	Ecological	Low	Low	Low	Very Low	N/A
	Cultural	Very High	Very High	Very High	High	N/A
	Aesthetic	High	High	High	High	N/A
Potential Risk	Public Health	Very High	Very High	Very High	Low	N/A
	Ecological	Moderate	Very High	Moderate	Very Low	N/A
	Cultural	Very High	Very High	Very High	Moderate	N/A
	Aesthetic	High	High	High	Low	N/A

3.2 Conclusion

The NDC assessment methodology (as set out in Attachment 5 of the NDC) used for the effects and risk assessment does not indicate a substantial reduction in effects and risk, other than in the ecological effects and risk category. This is due to the way in which the methodology has grouped overflow frequencies (any frequency above 12 overflows per year is categorised as high) and the fact that it does not take into account the composition of the overflows in terms of stormwater and wastewater. Thus, even if the number of overflows is reduced from 206 to 22, this significant reduction is not 'captured' by the frequency range assigned.

It is therefore important to acknowledge that direct discharges to St Marys Bay will be reduced to less than 2 per year and completely eliminated at Masefield Beach. Consolidated overflows from the five existing EOPs will discharge less frequently with a lower volume than the existing situation, to a less sensitive receiving environment (Class 2 Recreational and Class 3 Ecological).

In addition, the NDC assessment methodology does not take into consideration the fact that rainfall related discharges from a combined sewer system are combined wastewater and stormwater flows; heavily diluted. Notwithstanding, there is wastewater in these discharges. With The Project in place and providing the ability to capture, store, and divert overflows back to the combined sewer network for conveyance to Mangere WWTP, it is estimated that there will be a 95% reduction in wastewater loads being discharged to the environment.

4 OTHER MATTERS

4.1 Consent Requirements

The resource consents required to undertake the physical works and authorise the use/ occupation of the seabed for the new outfall, storage tunnel, pump station, and upstream connection works etc. for The Project are being sought separately by Healthy Waters, as the asset owner.

4.2 Other Approvals

Healthy Waters to notify Watercare of the proposed works and other affected stakeholders including land owners, Iwi, and other utility providers impacted by the works as appropriate.

MANAGER'S CERTIFICATION

Condition 27 *27. If a Replacement or New Engineered Overflow Point within the Existing Network does not comply with the requirements set out in conditions 24 or 26 respectively, or discharges to a SEA-M1 Area, the Consent Holder shall:* *a. determine an alternative discharge frequency (ADF) for that Engineered Overflow Point using BPO methodology set out in **Chapter 3 of Attachment 3**; and or* *b. determine the location of that Engineered Overflow Point using the BPO methodology set out in **Chapter 4 of Attachment 3.*** *The work required by the Consent Holder shall depend on whether a new location is proposed, and whether the Discharge Frequency Targets are met.*	Compliant Compliant
Condition 28 No discharge is allowed to a *Tangata Whenua Management Area* as identified in the *Regional Plan: Coastal*, or an equivalent are in the Unitary Plan where discharges are a *Prohibited Activity*	Compliant
BPO Assessment 1. Risk 2. Environmental Risk (Effects on the Environment) 3. Cost Effectiveness 4. Short-Term Need 5. Effectiveness of Available Options 6. Opportunity to benefit from and/or link with projects undertaken by other network utility operators 7. Consequential project/planning linkages	Compliant Compliant Compliant Compliant Compliant Compliant Compliant

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APPENDIX 1: PROJECT OUTLINE

The Project involves the installation of a new storage tunnel that will collect and store combined rainfall related wastewater-stormwater overflows from five existing Engineered Overflow Points (EOPs) within the combined sewer network which currently discharge via stormwater outfalls to Masefield Beach and St Marys Bay (EOP IDs 172, 180, 1020, 194, 196) until there is capacity for them to be returned via the new pump station to the combined sewer network on Sarsfield Street, Herne Bay.

The new storage tunnel will extend from New Street/London Street through to the NZTA owned land north of Point Erin Park. It will be approximately 1 km long; will have an outer diameter of approximately 2.2 m, and an internal diameter of approximately 1.8 m. A new pump station will be constructed within NZTA land, and a new rising main pipeline will be installed along Curran Street and Sarsfield Street to connect the Branch 5 Herne Bay Sewer.

The Project will also replace the outfall at Masefield Beach. Watercare currently discharges via this stormwater outfall at Masefield Beach (EOP IDs 194 and 196). The Project will replace this outfall with one that extends further out into the Waitematā Harbour, into a less sensitive receiving environment with greater dilution and dispersion.

In summary the physical works will comprise of:

- Approximately 1 km long storage pipeline (2.2 m external diameter, 1.8 m internal diameter) extending from New Street to Point Erin Park.

- A new pump station at Point Erin Park. The new pump station will have a forced ventilation system and odour control.

- A 150 mm diameter rising main will connect the new pump station with Branch 5 Herne Bay sewer on Sarsfield Street. This will allow wastewater overflows to be pumped back to the combined sewer when there is capacity.

- Two additional shafts along the alignment, providing access for construction and then conversion to permanent manholes for on-going operation and maintenance of the storage pipeline. One shaft will be located within St Marys Road Park, and one on the corner of New Street and London Street. Odour control and vent stacks are included within these sites to assist with ventilation and odour control.

- Upstream connection works from the five EOPs to the new storage tunnel. A new 750 mm diameter gravity line will connect EOP IDs 194 and 196 to the new pump station. EOP IDs 172, 180, and 1020 will connect to a new pipeline within St Marys Road Park.

- A new marine outfall pipeline (1.2 m in diameter), approximately 430 m long with a diffuser, connecting from the pump station to the new discharge point in the Waitematā Harbour.

- The decommissioning and removal of the existing marine outfall pipeline at Masefield Beach.

The new tunnel has a storage volume of approximately 2,500 m^3, and is designed to contain a 2 month design storm. During more extreme rainfall some combined overflows will occur through the new outfall pipeline that extends further into the Waitematā Harbour. Overall, the scheme has been designed to reduce discharges from a total average per year of 206 (99 at St Marys Bay and 107 at Masefield Beach) to less than 20 times per year via the new outfall. There will no longer be any rainfall related overflows and direct discharges to Masefield

Beach, and any potential direct discharges to St Marys Bay will be less than 2 times per year.

In addition to reducing the frequency of discharges, The Project will also significantly reduce the volume of discharges from around 100,000 m^3 per year (total discharge into St Marys Bay and Masefield Beach), to an average of 35,000 m^3 per year to the new discharge location in the Waitematā Harbour. With The Project in place and providing the ability to store and divert overflows back to the combined sewer network, it is estimated that there will be a 95% reduction in wastewater loads being discharged to the environment.

APPENDIX 2: BEST PRACTICABLE OPTION (BPO) METHODOLOGY – ATTACHMENT 3 OF THE NDC

1 PURPOSE OF THE BPO

Section 2 of the RMA defines Best Practicable Option (BPO) in relation to a discharge of a contaminant or an emission of noise as "*the best method for preventing or minimising the adverse effects on the environment having regard, among other things, to—*

(a) the nature of the discharge or emission and the sensitivity of the receiving environment to adverse effects; and

(b) the financial implications, and the effects on the environment, of that option when compared with other options; and

(c) the current state of technical knowledge and the likelihood that the option can be successfully applied."

Watercare has developed a BPO methodology based on the principles identified above that is dedicated to managing the wastewater network, and is specifically used for the following:

(1) Prioritisation of expenditure for wastewater network improvements and high-level options to inform the six-yearly Wastewater Network Improvement Works Programme set out in the Wastewater Network Strategy (set out in Chapter 3).

(2) Determination of alternative discharge frequencies (ADF) for specific engineered overflow points (set out in Chapter 4), predominantly those that are located in the combined system or in parts of the wastewater network that behave like a combined system. This will usually be undertaken as part of developing the Wastewater Network Improvement Works Programme set out in the Wastewater Network Strategy, but may also become necessary on a once-off basis where specific works need to be undertaken that were not identified in the Wastewater Network Strategy.

(3) Determination of the most appropriate location of engineered overflow points where receiving environments are generally of high value (set out in Chapter 5). Again, this will normally be part of preparing the Wastewater Network Improvement Works Programme but may be necessary in isolated cases if a project was not included in the Wastewater Network Strategy.

The specific aspects of the BPO Methodology applying to each of these three uses are further described below.

In addition, the BPO approach is also used:

- at an organisational level for asset management planning to prioritise funding between water supply, water treatment, wastewater network and wastewater treatment expenditure.
- at the project level, determining the best technical solution from a range of available options.

Both of these additional uses are outside the scope of this consent and only referred to here for reasons of completion. However, the asset management planning process at the organisational level does generally determine the amount of funding available for the Wastewater Network Improvement Works Programme.

2 GENERAL APPLICATION OF THE BPO METHODOLOGY

The following sections set out the application of the BPO methodology relating to wastewater network improvement works, determining alternate discharge frequencies, and determining the location of the engineered overflow points.

In each case, the BPO methodology follows on from an analysis of alternatives where the available options for preventing or minimising adverse effects of wastewater overflows are compared in terms of their effects on the environment, their whole-of-life costs, and their technical feasibility.

This analysis and the criteria set out in the following relevant sections are the basis of the BPO process.

3 APPLICATION OF THE BPO METHODOLOGY TO THE WASTEWATER NETWORK IMPROVEMENT WORKS PROGRAMME

The primary objective of the BPO process is to prevent or minimise adverse effects resulting from wet weather wastewater overflows, and therefore achieve the best level of public health protection, environmental quality and cultural and community well-being for the Auckland Council area as a whole, with the funding that is available.

With respect to minimising wastewater overflows and the potentially adverse effects of such overflows, the principal application of the BPO methodology occurs at the strategic level, i.e. long-term wastewater network improvement planning. The key implementation tool for wastewater network planning is the Wastewater Network Strategy, which is revised at regular six yearly intervals. The first Wastewater Network Strategy is required in 2017. Subsequent revisions will be prepared in 2023, 2029, 2035, 2041 and 2047, in accordance with the conditions of the Comprehensive Wastewater Network Discharge Permit.

The Wastewater Network Strategy sets out Watercare's six year wastewater network works programme, as required by conditions 13 to 23 of the Comprehensive Wastewater Network Discharge Permit, providing - with respect to wastewater network matters - more detail and analysis than can be included in the Asset Management Plan (AMP).

As is the case with the AMP, the prioritisation of works in the Wastewater Network Strategy is based on consideration of **risk (loss of service)** and **environmental effects and risk**.

The assessment of risk considers the urgency with which the works should be undertaken, which is usually linked to asset conditions and/or network capacity. The latter in turn is directly related to urban growth, both through intensification and greenfield development. Risk is also determined by the frequency with which wastewater overflows occur – the more frequently discharges occur, the higher the risk that environmental effects may occur.

The assessment of effects considers the location of existing or new wastewater overflows as well as the volume of these overflows. Overflows to highly valued aquatic receiving environments are generally deemed to generate larger effects than those to environments that are of less importance.

Cost-effectiveness is also an important factor because Watercare must be able to demonstrate that it complies with legal requirements.

Other BPO criteria are normally taken into account following the broad prioritisation of works and determination of options based on risk.

The BPO criteria applicable to developing the wastewater network improvement programme for the Wastewater Network Strategy are set out below.

Criteria	(1) Risk (Loss of Service)
Explanation	Loss of service is primarily due to total or partial failure of the system as a result of poor asset condition. Deterioration of service occurs when the potential for overflows increases due to lack of capacity in the system, generally as a result of urban development.
Matters to be considered	(a) Options for operational procedures that may improve asset conditions and/or prolong asset life. (b) Asset condition and likely time remaining until asset replacement becomes necessary, after relevant operational procedures (for example, re-lining of pipes) have been undertaken. (c) Results of relevant investigations and/or wastewater network modelling. (d) Expected changes/increases in population density (urban development), as advised by Auckland Council. (e) Potential effects of increased urban development upstream of the overflow points/catchment.

Criteria	(2) Environmental Risk (Effects on the Environment)
Explanation	Wastewater overflows have the potential to adversely affect public health, the ecology of the aquatic receiving environment into which they discharge, the cultural values of these receiving environments and the aesthetic enjoyment people may derive from the landscape or amenity in the vicinity of an overflow location. The frequency of overflows is an important factor as this determines the likelihood with which an adverse effect may occur.
Matters to be considered	(a) The value and sensitivity of the receiving environment, as determined through Watercare's *Methodology for the Assessment of Effects of Wet Weather Wastewater Overflows*. (b) The volume of the overflow. (c) Frequency of wastewater overflows under current conditions and/or future frequencies expected as a result of increased urban development. (d) The potential for cumulative effects from wastewater overflows. (e) The characteristics of the discharge, i.e. whether the discharge originates in the combined system or the separated system.

Criteria	(3) Cost-effectiveness
Explanation	Watercare is required by legislation to minimise the costs of providing an effective service and maintaining the long-term integrity of its assets. It is therefore necessary to compare the cost-effectiveness of the improvement works being considered, both in terms of available options for specific projects and with respect to the relative effectiveness of different projects.
Matters to be considered	(a) Cost-effectiveness of specific works when compared to

	works of similar urgency. (b) Estimated costs of available options for specific works to determine the best-value option.
Criteria	**(4) Short-Term Need**
Explanation	This factor is usually taken into account where an overflow causes a significant and direct public health effect, for example by discharging onto private property or public land that is in frequent use. If the long-term solution (for example, network upgrades to accommodate additional flow) cannot be provided within a short time frame, or there is no feasible long-term solution, other methods to minimise the public health effect will need to be implemented.
Matters to be considered	(a) The extent of the public health effect, with particular consideration of overflow frequency. (b) Availability and timing of a long-term solution that would provide the required Network capacity to eliminate or reduce the discharge. (c) Range of available options.
Criteria	**(5) Effectiveness of Available Options**
Explanation	In most instances, there is more than one option for reducing wastewater overflows and their potential effects.
Matters to be considered	(a) The reduction in frequency and/or volume that may be achieved by a particular option. (b) The degree to which the option depends on the implementation of other works.
Criteria	**(6) Opportunity to benefit from and/or link with projects undertaken by other network utility operators**
Explanation	The performance of the wastewater network depends, to a large degree, on the availability of a functioning stormwater network. In areas where the system is still combined, or was combined and has been separated, or where stormwater is intended to be absorbed by soakage, the wastewater system generally performs less well than in separated areas with relatively recent infrastructure. Where it is possible to undertake work on both the stormwater system and the wastewater system at the same time, or where other major infrastructure providers also work in an area and disruption to the public can be minimised, projects may be elevated in priority.
Matters to be considered	(a) Options for joint projects with the Auckland Council Stormwater Unit, to achieve improved project outcome and/or cost savings. (b) Options for undertaking a Watercare project in conjunction with another network utility operator to minimise disruption to the public and/or save in construction costs.

Criteria	**(7) Consequential project/planning linkages**
Explanation	A specific project may, in itself, not achieve a significant reduction in overflows at a specific location, or present the best investment for the anticipated outcome. However, the project may be a key factor in minimising wastewater overflows within the catchment over time, in combination with other works.
Matters to be considered	(a) Sequencing of projects to optimise short-term benefits as well as overall outcomes.
Criteria	**(8) Step-change effect of options**
Explanation	The degree of change brought about by a particular option is an important consideration. For example, a single improvement project may result in an immediate significant reduction of overflows in a given location, or it may require a series of smaller projects within the general area to achieve the same improvement over a longer time period. Unless there are valid reasons for the more gradual improvements, projects that yield large step changes are generally preferred.
Matters to be considered	(a) The degree to which several linked and staged projects (as per Criterion 7) may achieve a better outcome in terms of reducing effects on the environment than one project focusing on a specific location.
Criteria	**(9) Ability to future-proof**
Explanation	Improvement projects that will allow for future-proofing of the network without significant additional cost (provided that population density is expected to increase in the area) are normally ranked above those that cannot achieve this additional benefit.
Matters to be considered	(a) The extent to which population density in the area serviced is expected to increase, and the time frame of this growth. (b) The cost of providing additional capacity now in comparison to undertaking the works at a later stage.
Criteria	**(10) Time-related funding limitations (related to size of project)**
Explanation	Some projects are so large that they require substantial expenditure and very long time frames for construction – works relating to the large interceptors are an example. The financial implications of funding such projects play a significant role in the prioritisation process.
Matters to be considered	(a) Options for financing the project.
Criteria	**(11) Quality of Existing Data**
Explanation	Because network investigations and network modelling are both lengthy and costly, existing information may be of limited accuracy and reliability. Where major expenditure is required

	for an improvement project, additional and up-to-date data may be required to ensure that the project is scoped correctly and will achieve the desired outcome.
Matters to be considered	(a) Quality and age of data needed to scope and define the works. (b) Cost and timeframes for obtaining additional information.
Criteria	**(12) Regulatory requirements**
Explanation	Depending on the nature of the improvement works, various resource consents may be required to be able to proceed.
Matters to be considered	(a) The nature of the works and what resource consents will be required, including the time frame for securing the necessary consents. (b) Consent compliance issues, i.e. whether consent is already in place that requires specific works within a defined timeframe.
Criteria	**(13) Odour and visual nuisance**
Explanation	A particular overflow location may have a recent and ongoing history of complaints about odour and/or visual effects due to the presence of gross floatable solids.
Matters to be considered	(a) The number of people affected and the frequency of overflows that generate the odour or visual effects. (b) Available options, if necessary, to reduce the extent of odour and visual effects.
Criteria	**(14) Historical community concerns**
Explanation	Circumstances may exist that may result in historical community concerns about a particular overflow location although neither the likelihood of discharges associated with it nor the potential effects are sufficient to prioritise the works.
Matters to be considered	(a) Known community concerns about a particular overflow location, and the reasons for this concern. (b) Options, if necessary, for reducing the adverse effects.

4 APPLICATION OF THE BPO METHODOLOGY TO DETERMINING ALTERNATIVE DISCHARGE FREQUENCIES

Condition 9 of the Comprehensive Wastewater Network Discharge Permit sets out the discharge frequencies to be achieved for the wastewater network, specifically an average of no more than two *Wet Weather Overflow Events* per *Engineered Overflow Point* per year. This discharge frequency generally applies to the separated wastewater network, particularly those parts of the network that have been designed to function as a separated network.

An alternative discharge frequency may be determined through the BPO methodology where this frequency cannot be achieved, generally because the network is old, was designed as a combined network and retains many of the features of a combined network, or is still combined.

This determination is generally made when the Wastewater Network Improvement Works Programme is developed, as part of the Wastewater Network Strategy. However, there may be occasions when *Engineered Overflow Points* need to be constructed that have not been identified as part of the Wastewater Network Improvement Works Programme. Such works are authorised through conditions 24 to 29 of the Comprehensive Wastewater Network Discharge Permit.

The BPO methodology applicable to the determination of alternative discharge frequencies for specific overflow points uses the same criteria considering risk and effects that are the basis of the Wastewater Network Improvement Works Programme BPO. However, as the decision-making process is limited to determining an acceptable overflow frequency for a specific overflow point, the level of detail required is less, and some criteria with a strategic focus are unnecessary.

The BPO criteria applicable to the determination of alternative discharge frequencies are set out below.

Criteria	**(1) Risk**
Explanation	Loss of service is primarily due to total or partial failure of the system as a result of poor asset condition. Deterioration of service occurs when the potential for overflows increases due to lack of capacity in the system, generally as a result of urban development. With respect to determining an acceptable discharge frequency for a single overflow point, the degree of risk (i.e. likelihood of asset failure) is important as this determines the urgency of the required works.
Matters to be considered	(a) Options for operational procedures that may improve asset conditions and/or prolong asset life. (b) Asset condition and likely time remaining until asset replacement becomes necessary, after relevant operational procedures (for example, re-lining of pipes) have been undertaken. (c) Results of relevant investigations and/or wastewater network modelling. (d) Expected changes/increases in population density (urban development), as advised by Auckland Council. (e) Frequency of wastewater overflows under current conditions and/or future frequencies expected as a result

	of increased urban development, or if asset failure occurs. (f) Potential effects of increased urban development upstream of the overflow points/catchment.
Criteria	**(2) Environmental Risk (Effects on the Environment)**
Explanation	Wastewater overflows have the potential to adversely affect public health, the ecology of the aquatic receiving environment into which they discharge, the cultural values of these receiving environments and the aesthetic enjoyment people may derive from the landscape or amenity in the vicinity of an overflow location. The frequency of overflows is an important factor as this determines the likelihood with which an adverse effect may occur. An assessment of effects in accordance with the *Methodology for the Assessment of Effects of Wet Weather Wastewater Overflows* is therefore an essential component of this BPO methodology.
Matters to be considered	(a) The value and sensitivity of the receiving environment, as determined through Watercare's *Methodology for the Assessment of Effects of Wet Weather Wastewater Overflows*. (b) The volume of the overflow. (c) The frequency of the wastewater overflow under current conditions and/or future frequencies expected as a result of increased urban development. (d) The potential for cumulative effects from wastewater overflows. (e) The characteristics of the discharge, i.e. whether the discharge originates in the combined system or the separated system.
Criteria	**(3) Cost-effectiveness**
Explanation	Watercare is required by legislation to minimise the costs of providing an effective service and maintaining the long-term integrity of its assets. It is therefore necessary to compare the cost-effectiveness of the available improvement options for the specific overflow location.
Matters to be considered	(a) Cost-effectiveness of available options.
Criteria	**(4) Short-Term Need**
Explanation	This factor is of particular importance in this context, as any available long-term solutions would have been considered in the Wastewater Network Strategy.
Matters to be considered	(a) The extent of the public health effect, with particular consideration of overflow frequency. (b) Availability and timing of a long-term solution that would provide the required Network capacity to eliminate or reduce the discharge. (c) Range of available options.

Criteria	**(5) Effectiveness of Available Options**
Explanation	In most instances, there is more than one option for reducing wastewater overflows and their potential effects.
Matters to be considered	(a) The reduction in frequency and/or volume that may be achieved by a particular option. (b) The degree to which the option depends on the implementation of other works.

Criteria	**(6) Opportunity to benefit from and/or link with projects undertaken by other network utility operators**
Explanation	Although it is likely that opportunities for joint projects would be identified at a more strategic level (i.e. the Wastewater Network Strategy) the potential for links to smaller scale projects exist.
Matters to be considered	(a) Options for joint projects with the Auckland Council Stormwater Unit, to achieve improved project outcome and/or cost savings. (b) Options for undertaking a Watercare project in conjunction with another network utility operator to minimise disruption to the public and/or save in construction costs.

Criteria	**(7) Consequential project/planning linkages**
Explanation	A specific project may, in itself, not achieve a significant reduction in overflows at a specific location, or present the best investment for the anticipated outcome. However, the project may be a key factor in minimising wastewater overflows within the catchment over time, in combination with other works. The need for an alternative discharge frequency may therefore exist only for a limited time, until associated projects can be implemented.
Matters to be considered	(a) Relationship of improvement works at the specific overflow location with other projects.

5 APPLICATION OF THE BPO METHODOLOGY TO DETERMINING THE LOCATION OF ENGINEERED OVERFLOW POINTS

In most cases, the location of Replacement or New Engineered Overflow Points will be determined when the Wastewater Network Improvement Works Programme is developed, as part of the Wastewater Network Strategy. However, there may be occasions when *Engineered Overflow Points* need to be constructed that have not been identified as part of the Wastewater Network Improvement Works Programme. Such works are authorised through conditions 24 to 29 of the Comprehensive Wastewater Network Discharge Permit.

Watercare is committed to ensuring that wastewater overflows from Engineered Overflow Points do not discharge directly to Class 1 (high value) recreational, ecological or cultural aquatic receiving environments. However, in some cases topographical or other constraints may severely limit the available options for determining the location of a potential wastewater overflow discharge.

The BPO methodology applicable to the determination of acceptable locations for specific overflow points uses the same criteria considering risk and effects that are the basis of the Wastewater Network Improvement Works Programme BPO. However, as the decision-making process is limited to matters of location, the level of detail required is less, and some criteria with a strategic focus are unnecessary.

The BPO criteria applicable to the determination of the location of engineered overflow points are set out below.

Criteria	**(1) Risk**
Explanation	Loss of service is primarily due to total or partial failure of the system as a result of poor asset condition. Deterioration of service occurs when the potential for overflows increases due to lack of capacity in the system, generally as a result of urban development. Where an existing asset is at risk, locational options are likely to be limited.
Matters to be considered	(a) Options for operational procedures that may improve asset conditions and/or prolong asset life. (b) Asset condition and likely time remaining until asset replacement becomes necessary, after relevant operational procedures (for example, re-lining of pipes) have been undertaken. (c) Results of relevant investigations and/or wastewater network modelling. (d) Expected changes/increases in population density (urban development), as advised by Auckland Council. (e) Potential effects of increased urban development upstream of the overflow points/catchment.

Criteria	**(2) Environmental Risk (Effects on the Environment)**
Explanation	Wastewater overflows have the potential to adversely affect public health, the ecology of the aquatic receiving environment into which they discharge, the cultural values of these receiving environments and the aesthetic enjoyment

	people may derive from the landscape or amenity in the vicinity of an overflow location. The frequency of overflows is an important factor as this determines the likelihood with which an adverse effect may occur. An assessment of effects in accordance with the *Methodology for the Assessment of Effects of Wet Weather Wastewater Overflows* is therefore an essential component of this BPO methodology, where these have not previously been undertaken.
Matters to be considered	(a) The value and sensitivity of the receiving environment, as determined through Watercare's *Methodology for the Assessment of Effects of Wet Weather Wastewater Overflows*. (b) The volume of the overflow. (c) The frequency of the wastewater overflow under current conditions and/or future frequencies expected as a result of increased urban development. (d) The potential for cumulative effects from wastewater overflows. (e) The characteristics of the discharge, i.e. whether the discharge originates in the combined system or the separated system.
Criteria	**(3) Cost-effectiveness**
Explanation	Watercare is required by legislation to minimise the costs of providing an effective service and maintaining the long-term integrity of its assets. It is therefore necessary to compare the cost-effectiveness of the improvement works being considered, both in terms of available options for specific projects and with respect to the relative effectiveness of different projects.
Matters to be considered	(a) Cost-effectiveness of available options/locations.
Criteria	**(4) Short-Term Need**
Explanation	This factor is of particular importance in this context, as any available long-term solutions would have been considered in the Wastewater Network Strategy.
Matters to be considered	(a) The extent of the public health effect, with particular consideration of overflow frequency. (b) Availability and timing of a long-term solution that would provide the required Network capacity to eliminate or reduce the discharge. (c) Range of available options.
Criteria	**(5) Effectiveness of Available Options**
Explanation	In most instances, there is more than one option for reducing wastewater overflows and their potential effects.
Matters to be considered	(a) The reduction in frequency and/or volume that may be

	achieved by a particular option. (b) The degree to which the option depends on the implementation of other works.
Criteria	**(6) Opportunity to benefit from and/or link with projects undertaken by other network utility operators**
Explanation	Although it is likely that opportunities for joint projects would be identified at a more strategic level (i.e. the Wastewater Network Strategy) the potential for links to smaller scale projects exist.
Matters to be considered	(a) Options for joint projects with the Auckland Council Stormwater Unit, to achieve improved project outcome and/or cost savings. (b) Options for undertaking a Watercare project in conjunction with another network utility operator to minimise disruption to the public and/or save in construction costs.
Criteria	**(7) Consequential project/planning linkages**
Explanation	A specific project may, in itself, not achieve a significant reduction in overflows at a specific location, or present the best investment for the anticipated outcome. However, the project may be a key factor in minimising wastewater overflows within the catchment over time, in combination with other works. The need for an overflow point in the location being considered may not be permanent as other improvement works may allow for relocation at a later stage.
Matters to be considered	(a) Relationship of improvement works with other related works.

APPENDIX 3: HEALTHY WATERS BPO (ALTERNATIVES) ASSESSMENT

ST MARY'S BAY WATER QUALITY IMPROVEMENT PROGRAMME:

Medium-term Option 'BPO' (Alternatives) Assessment

Additional information requested by Auckland Council compliance to support consenting of the programme team preferred medium-term option:

The St Marys Bay and Masefield Beach Improvement Project

November 2017

Auckland Council
Te Kaunihera o Tāmaki Makaurau

1. Introduction

Auckland Council Healthy Waters (HW) proposes to undertake a project to reconfigure and renew its existing outfall assets that discharge overflows from Watercare's combined sewer network directly onto St Marys Bay and Masefield Beach. The project is known as 'The St Marys Bay and Masefield Beach Improvement Project' (the Project). The Project was selected as a preferred medium-term option for improving water quality during the Phase 1 of the St Marys Bay Water Quality Improvement Programme in 2016.

The purpose of this document is to provide additional information on the selection of the Project as the preferred medium-term option. Compliance with the requirements of the Resource Management Act is therefore demonstrated in terms of meeting the requirements of the 'Best Practicable Option' assessment, this is required by the process specified in Watercare's Network Discharge Consent (NDC).

This document supports the application from Auckland Council Healthy Waters and Watercare Services Limited for Managers Approval under the NDC to relocate the discharge points for the 5 existing EOPs and consolidate these at a single Harbour location further offshore.

2. Background

All discharges from the combined sewer network are authorised by Watercare's Network Discharge Consent (NDC). The current discharges on to St Marys Bay and Masefield Beach, comprise overflows from 5 Type 2 Engineered Overflow Points (EOPs) discharging through 3 Healthy Waters outfalls.

The current function of the existing HW outfalls is to safely convey and discharge overflows from the Watercare combined sewer network into the receiving environments that they are currently authorised to discharge to. In a Regulatory sense, Healthy Waters is not responsible for these managing discharges from its outfalls, however as the asset owner it is responsible for the outfall maintenance and operation. This is the reason that Healthy Waters is leading and delivering this project and Watercare is supporting with respect to discharges. The arrangement of asset ownership and operation is a legacy from the formation of Auckland Council. This type of joint planning for the combined sewer areas of Auckland was mandated at the time of Auckland Council formation and formalised through the 2010 Detailed Partnership Schedule, in recognition of the fact that stormwater and wastewater would be administered by 2 separate organisations.

3. Summary of Objectives

3.1. Phase 1 Programme

The St Mary's Bay water quality improvement programme was initiated in April 2016 in response to continuing community and Westhaven Marina complaints to Auckland Council network operators about the frequency of combined sewer overflows to the Bay, with accompanying public health and aesthetic risks. The objective of Phase 1 of the programme (April through December 2016) was to set objectives for the programme and then identify, assess and determine preferred improvement measures to meet these objectives, reporting on this to Council executives before the end of the year.

3.2. Overarching Programme Objectives

The primary objective of all projects assessed as part of the St Marys Bay Water Quality Improvement Programme is to meet the programme specific objectives developed by the Programme Team, namely:

1. *To enable contact recreation to occur safely in St Mary's Bay*
2. *To reduce and remove contaminant loads to the Bay as far as is practicable*
3. *To develop a programme of work that will progressively achieve this as quickly as practicable*
4. *To invest in projects to progressively achieve this; aligning these projects with long-term plans as far as is practicable*

In August 2016 the programme team identified a suite of potential improvement projects for the Bay, and recognised that these would have very different levels of complexity, engineering design, operational implications, construction risk, community involvement and innovation potential. Consequently, the group identified three project subsets based on the timeframe in which meaningful progress/implementation could be made for the various projects.

- Short term (1 – 2 years)
- Medium term (3 – 5)
- Long term (5 – 10 years+)

3.3. Specific Objectives for Medium term projects

In terms of meeting overarching programme objectives, the objectives of a medium-term project were further specified as follows:

"The objective of short to mid-term projects is to provide public health protection benefit by significantly reducing the number of harmful pathogens entering the water (at St Marys Bay). These projects cannot be implemented immediately because of the funding, planning and construction timeframes associated with them".

" The projects are able to be implemented and achieve specified benefits within a 2 -5 year timeframe".

In order to meet Council family asset and business objectives and to improve alignment between proposed projects the following criteria were also assessed for medium term projects:

i. Acknowledge that a long-term plan needs to be implemented for the wider combined sewer network. This plan will be complex and require significant funding. As far as practicable short and medium term improvement projects should be a logical "first step" towards achieving a long-term strategy and not preclude its effective implementation
ii. Projects should minimise 'wasted' cost by not building or minimising the building of assets that will not be functional in the long term
iii. Projects should maximise overall benefits to the community by catering for areas other than St Mary's Bay as far as practicable.

iv. Where possible, projects should take advantage of current or near-future requirements for asset renewal and upgrades, minimising additional cost to that already programmed by Council and CCOs.

Projects should aim to provide the maximum "Whole of Community Value" for "Minimum Total Community Cost" (i.e. minimum cost irrespective of owning utility – remembering all are benefitting and billing the same ratepayers).

4. Medium-Term Options

4.1. Note on the Do-Nothing/ Status-Quo Option

A do-nothing approach was rejected by programme participants on the grounds that it fails to meet programme objectives. The 'do-nothing' approach was not assessed as a viable medium-term option. Continued discharge in the medium to long term of overflows at a frequency of over 100 per annum to St Marys Bay is not acceptable.

4.2. Assessed Options

The following options were assessed:

	Medium Term (2 – 5years to benefit)	Description /Objective
SM1	Combined Sewer Overflow Storage facilities prior to discharge	To investigate whether full /partial storage of CSO volumes, with pump back to the combined network is technically feasible and what it would cost
SM2	Stormwater storage facilities in catchment	To investigate whether stormwater only storage could be installed in the catchment and released slowly once rainfall and flows subside, whether this is technically feasible and what it would cost
SM3	Screening and Disinfection of CSOs	To investigate whether full /partial disinfection of the overflow is beneficial (in context of total contamination load) and technically feasible and what it would cost
SM4	Piped Diversion/s of CSOs to other locations	To investigate whether diversion is technically feasible and what it would cost
SM5	Bioremediation /Bioengineering	To investigate options for bioremediation and present on what these could be, technical feasibility, benefits, risks and whether this could be a viable means of improving water quality
SM6	Living Machines to treat discharges	To investigate whether installation of a "Living Machine" could be a viable means of providing water treatment for full/partial flow, useful as part of an educational or innovation initiative and whether it is technically feasible and what it would cost
SM7	Network Separation	To investigate whether networks separation is feasible in the medium-term and what it would cost
SM8	Outfall reconfiguration (also incorporating elements of storage and diversion)	To investigate whether improvements to St Marys Bay could be aligned with the urgent need to renew the failed Masefield Beach outfall (adjacent Bay)

5. Assessment Summary

5.1. Initial Assessment of Options

	Medium Term (2 – 5 years to benefit)	Assessment Summary
SM1 /SM2	Combined Sewer Overflow Storage facilities prior to discharge/Stormwater storage facilities	• These options are constrained by the same technical factors - there are very few spaces around St Marys Bay available to construct storage tanks, the ground conditions in these spaces are not good for construction of such facilities and the volumes required to reduce overflows are large (4000 – 6000 m3). Without diversion to another area, it is unlikely that storage of this size can even be constructed just for St Marys Bay and the cost of the construction for St Marys Bay alone is unlikely to be justifiable for either Healthy Waters or Watercare. • Highly likely that some form of outfall will need to be constructed or retained (into St Marys Bay) as the existing network sewers will not have capacity to receive the full stored volumes • Could result in stranded asset depending on long-term network solution • Not preferred
SM3	Screening and Disinfection of CSOs	• The capital cost is in the order of 15M and operating cost is very high (over $200k per annum) • It reduces the frequency of untreated overflows from twice a week to twice a month – further reduction is not possible as construction areas are highly space constrained in terms of space for the treatment plant - higher capacity becomes very technically difficult and expensive. • From a technical perspective, disinfection process feasibility cannot be guaranteed on highly variable CSO flows to meet recreational swimming standards – therefore uncertain that this approach can meet overarching programme objectives (although it would represent some progressive improvement in the medium term) • Does not benefit areas other than St Marys Bay • Installation of significant infrastructure (including screenings plant and collection) in St Marys Road park (most feasible hydraulic option to intercept Hackett St) will impact adversely on use of this space as Park land • Sunk investment – once long-term network strategy has been decided on – the disinfection plant will be stranded assets as installing similar sorts of infrastructure at all other overflow points in the combined network is not preferred by Healthy Waters or Watercare (for reasons of cost, impacts on the public and technical feasibility as above). • Not preferred

SM4	Piped Diversion/s of CSOs to other locations	• This option is considered technically feasible. • Diversion out of St Marys Bay was considered very desirable and could be joined up with need to replace Masefield Beach outfall, however the programme team would strongly prefer to see some reduction in wastewater contamination level, rather than simply 'shifting the problem around', even as an interim step towards the long term. This option would need augmentation in order to be acceptable to the programme team.
SM5	Bioremediation /Bioengineering	Can not be constructed at a scale that can meet medium-term water quality objectives
SM6	Living Machines to treat discharges	Can not be constructed at a scale that can meet medium-term water quality objectives

5.2. Further Development and Assessment of Options

Following on from the initial assessments, the technical team was challenged to consider and develop further options that better met programme and business objectives. The following additional options were developed and taken through a feasibility assessment. Both were found to be technically feasible. They were then compared to determine a preferred option.

	Medium Term (2 – 5 years to benefit)	Update
SM7	Network Separation (separate the stormwater and wastewater networks)	This option involves complete separation of the combined network into separate stormwater and wastewater networks. The existing combined network would be retained for service so only one additional network would need to be constructed. Networks separation is a potential long-term option and the team considered whether significant improvement could be made in the medium-term using this approach. The following sub-options were considered: • Full separation by constructing new WW network (capital cost 22M for St Marys catchment alone) • Full separation by constructing new SW network (capital cost 26M + pipe rehabilitation costs of existing network for St Marys catchment alone) ○ At the time it was noted that the cost did not include any significant upgrades required for the existing combined network, irrespective of whether it would be retained for wastewater or stormwater purposes • Partial separation (i.e. only installing the new public drains and then either forcing or waiting for the individual householders to connect, making them pay for the connection). This option is not preferred as could be highly contentious, unsupported by the community and there is a very high risk full water quality benefits could never be

		achieved if individual households did not consent /wish to pay for this Issues with network separation as a medium- term solution are: • Experience in NZ and elsewhere indicates that water quality improvements are often not achieved (including conclusion of Watercare's recent international review panel) – i.e. often you don't get all the wastewater out of the stormwater and vice versa) and that planned costs blow out. • Significantly more disruptive to the community than retaining and utilising the existing network • Significantly more programme risk through consent process due to the need to obtain approval from every landowner and dig up every street • Significantly more disruption to other utility providers (Auckland Transport, gas, electricity and communications providers) • In order to achieve water quality benefits all households must be separated and all necessary local and trunk network remediation and upgrades must be completed • In order to achieve the same benefits as SM8, the full cost of separation of the Sarsfield drainage sub-catchment would need to be added as well as the renewal cost for the Masefield Beach outfall, this will double the cost as a minimum • The networks in these catchments are extremely old and complicated. There is a risk that separation may not be technically feasible or found to be uneconomic this can only be determined after considerably more detailed analysis • The full cost is very hard to estimate due to the above and also the need to consider the remedial and capacity upgrades required to local and trunk sewers • Implementing separation precludes a potential long-term network strategy of retaining and augmenting the combined sewer network in the longer-term o It was noted that separation should not be discounted as a longer-term option
SM8	Outfall reconfiguration (St Marys Bay and Masefield Beach Improvement Project)	This option was developed as a combination of storage and diversion and adds a contamination reduction component in the form of a new pump station that will return flows to the existing branch sewers when capacity is available. This project is fully described in the Managers Approval application document. The full outturn cost of the project was estimated at 44M. This is a conservative estimate and includes the cost of renewal of the Masefield Beach outfall. This makes it comparable in cost to full wastewater separation (which was not preferred by Watercare) and less expensive than stormwater separation (preferred by Watercare) even if the costs of additional

		remediation and network capacity upgrades are not factored in.
		
		SM8 is preferred as a medium-term project because:
		
		• The option is considered to have a significantly lower **cost risk** (the full scope of work to deliver the project can be well defined), **benefit risk** (achieving the water quality benefits does not rely on a complex series of upgrades that may or may not be able to be realised within 5 years) and **programme risk** (significantly less consenting and approvals risk)
		• A long-term network strategy for the northern combined catchments is being developed by Healthy Waters and Watercare. This will either comprise extensive network separation or purposeful retention and augmentation of the combined network.
		• SM8 was developed so that a functional asset base can be retained irrespective of which strategy is selected.
		  ○ If the long-term network management strategy is retention of the combined network, the new pipeline from Hackett to Sarsfield can be replumbed into a new combined sewer interceptor or pump station.
		  ○ If the long-term strategy is separation, the existing combined network pipes and new diversion pipe and outfall will be retained to convey stormwater only. If separation takes some time to successfully implement, the new outfall system will safely convey contaminated stormwater away from the beaches out to a more dispersive receiving environment

APPENDIX 4: HEALTHY WATERS OUTFALL ALTERNATIVES ASSESSMENT

Appendix 4

ST MARYS BAY WATER QUALITY IMPROVEMENT PROGRAMME:

Medium-term Option – Preferred Outfall Location

Additional information requested by Auckland Council compliance to support Managers Approval of the programme team preferred medium-term option:

The St Marys Bay and Masefield Beach Improvement Project

December 2017

1. Introduction

Auckland Council Healthy Waters (HW) proposes to undertake a project to reconfigure and renew its existing outfall assets that discharge overflows from Watercare's combined sewer network directly onto St Marys Bay and Masefield Beach. The project is known as 'The St Marys Bay and Masefield Beach Improvement Project' (the Project). The Project was selected as a preferred medium-term option for improving water quality during the Phase 1 of the St Marys Bay Water Quality Improvement Programme in 2016.

This document supports the application from Auckland Council Healthy Waters and Watercare Services Limited for Managers Approval under Watercare's NDC to relocate the discharge points for the 5 existing EOPs and consolidate these at a single Harbour location further offshore, via a new marine outfall that replaces the existing failed marine outfall at Masefield Beach.

The purpose of this document is to provide additional summary information on the selection of replacement marine outfall location. A full description of the project and background is provided in other application documents

2. Background

The Project proposes to divert overflows from 5 existing EOPs away from existing onshore discharge locations at St Marys bay (via two existing outfalls) and Masefield beach (via one existing outfall) further out into the Waitemata Harbour. This will provide a discharge location with significantly improved dilution and dispersion than that achieved in the nearshore environment. This represents a diversion of the combined sewer overflows to an improved location (as defined under the Network Discharge Consent).

In addition, the project will also reduce the total amount of wastewater contamination of the Waitemata Harbour as the diversion pipeline also acts as an in-line storage tank. This means that many of the overflows that are currently discharged to the beaches can be captured, for later return to the trunk sewer via a new pump station. In large rainfall events when there is no capacity in the trunk sewer, the new marine outfall will be used to discharge overflows to the Harbour channel. These overflows will be dilute and contain less wastewater than many of the current small overflows.

The Harbour channel is a preferable receiving environment (due to much lower overall public exposure risk, and as it will allow better dilution and dispersion) and overall there will be much less wastewater discharged into the Waitemata. However, construction and operation of significant infrastructure in the Coastal Marine Area requires examination of available alternatives so that impacts from both construction and operation can be minimised.

In order to examine potential locations for the outfall and the differences between them in terms of construction and operation, the project team carried out an options study looking at:

1. Potential Outfall locations
2. Hydrodynamic impacts at each site (dispersion modelling)
3. Constructability
4. Cost
5. Impacts on ecology and coastal processes
6. Impacts on the public, Mana Whenua, NZTA and other stakeholders
7. Overall risk

3. Outfall Options Assessment

3.1. Preamble

There are limited options available for construction of the replacement as the terminal shaft for the project needed to be at the Masefield Beach end of the pipeline for hydraulic reasons. Once the terminal shaft location had been determined (north of Pt Erin park), several options for the replacement outfall alignment were identified.

3.2. Potential Outfall locations

The outfall alignments in the context of the overall project alignments are shown in Figure 1 . The outfall options and their surrounds are shown in Figure 2 overleaf.

Figure 1 Outfall alignments in the overall project context

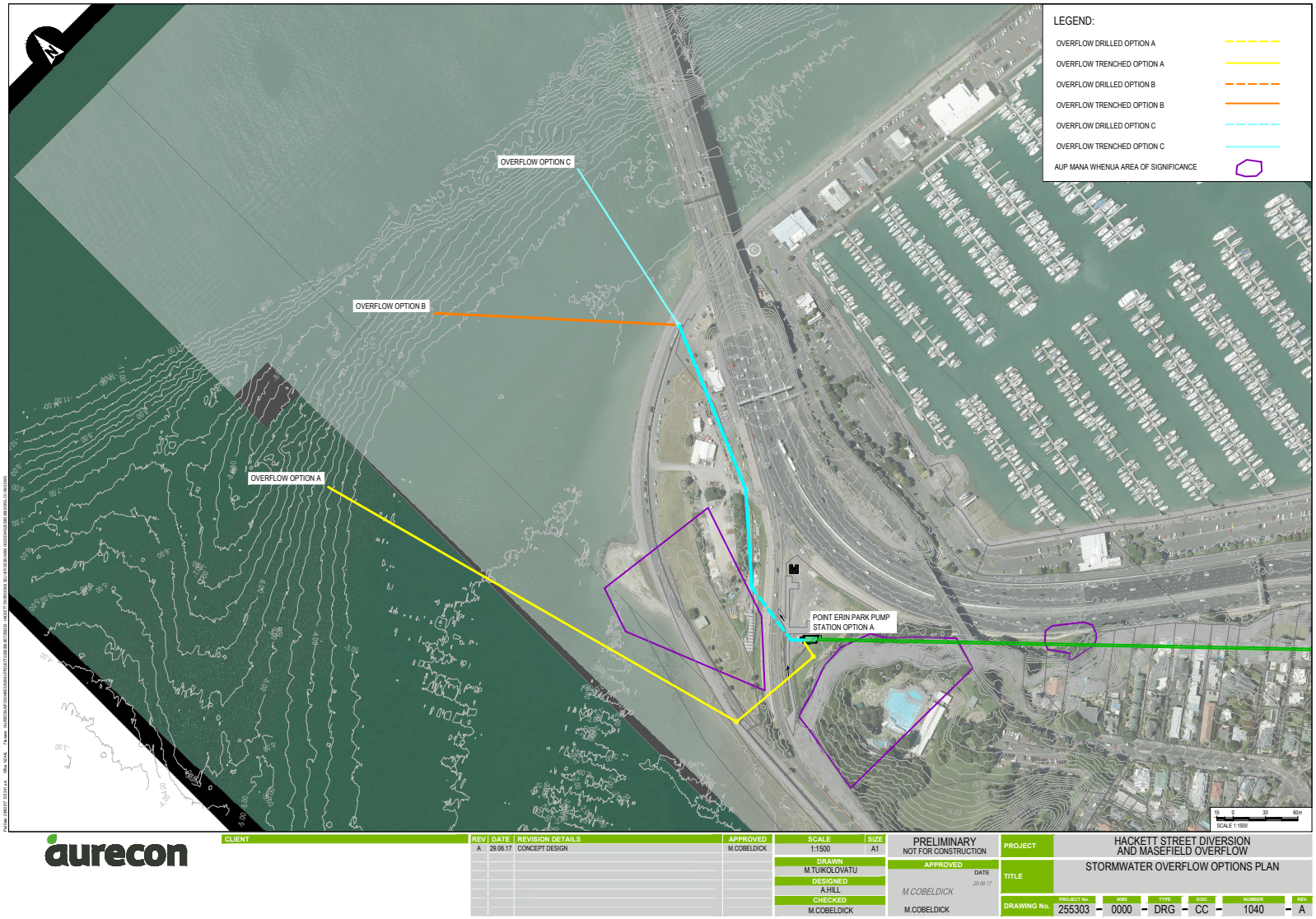


Figure 2 Outfall Alignment Options

3.3. Comparison of Outfall options

Table 1 Summary of Options Assessment

	Option A (Easternmost)	Option B (Central)	Option C Westernmost)
Hydrodynamic Performance There is no significant difference between the options from a dispersion perspective, as the performance of all options would result in discharges from the outfall resulting in E Coli concentrations less than Safeswim amber alert levels (i.e. be considered low risk for public exposure). However, the modelling shows that option A does give a marginally better dispersion relative to options B and C..	Best relative dispersion	Moderate relative dispersion	Worst relative dispersion \
Impacts on marine environment (ecology and coastal processes) Specialists have been engaged to examine the impacts from construction and ongoing operation of the outfall. The full reports will form part of the consent application. The reports conclude that none of the options have significant lasting impacts on the marine environment from construction or operation, from either an ecological or coastal processes perspective. From an ecological perspective there are minor temporary impacts during construction from Option A which potentially could disrupt an existing horse mussel bed, however the mussels are considered to have low ecological value and it is considered that they will recover as the disturbance is not large and only temporary.	Moderate impact during construction – longest outfall length	Lower impact- shortr	Lower impact
Impacts on Mana Whenua There are several areas of interest to Mana Whenua as identified in the Unitary Plan. In addition, ongoing consultation with Mana Whenua has stressed the historical importance of this area. Although consultation to date indicates that the project can be supported by Mana Whenua in general, no outfall alignment is 'preferred' by Mana Whenua – rather all alignments must seek to avoid or minimise impacts to the marine area.	No difference– all alignments to avoid to the extent practicable the marine area of interest (Te Routu o Ureia).		

Impacts on the Public	Least impact on public during construction When constructed (during operations), furthest from public activities		Closest to public activities such as AJ Hackett bungee jumping and local recreational fishing
Constructability (technical assessment) Construction of the marine outfall is not considered overly problematic or risky. Ground investigations confirm this. All options will need to cross two road sections and the sea wall. This is not a differentiating factor. All options will need to take account of services that cross this area, including a significant water main. The land-based section of the marine outfall will need to be constructed across old reclaimed fill. There is considerable risk with this construction in terms of contamination and ground conditions.	Shortest land based construction – least amount of services to disrupt – lowest construction programme risk	Longest land – based construction, highest risk, may clash with Skypath and Panuku development of harbour bridge Park.	Longest land – based construction, highest risk, may clash with Skypath and Panuku development of harbour bridge Park
Cost Risk Capital cost was not considered to be a differentiating factor all estimates are within the order of accuracy for estimates at this stage of the project. The relative cost risk for options was considered.	Shortest land-based construction – lowest cost risk.	Highest cost risk due to unknown conditions across longest land based construction	Highest cost risk due to unknown conditions across longest land based construction
NZTA Input NZTA own the land and are the Requiring Authority for the project site (it is designated Strategic highway Corridor). Therefore NZTA are a key stakeholder. NZTA prefer Option A as it has the lowest impact on their operations, both during construction and operation.	Lowest impact on operations during construction	Moderate/ high impact on operations during construction	Moderate/ high impact on operations during construction
Overall Impacts and Risk	Preferred	Least Preferred	Least Preferred

Option A is preferred as it

- Provides the best dispersion of flow
- Has the least impact on stakeholders
- Is preferred by NZTA
- Has the lowest constructability, programme and cost risk

Further assessment has been carried out on Option A.

4. Preferred Outfall Location

The preferred location is shown below. More detailed assessment of this location has been undertaken, including detailed dispersion modelling over a full time series to determine operational impacts. As shown in Figure 3, it is likely that an envelope will be applied for during consent for the outfall and final alignment will be decided on in conjunction with Man Whenua and other stakeholders.

Figure 3 Engineering Outline Plan showing Outfall Option A

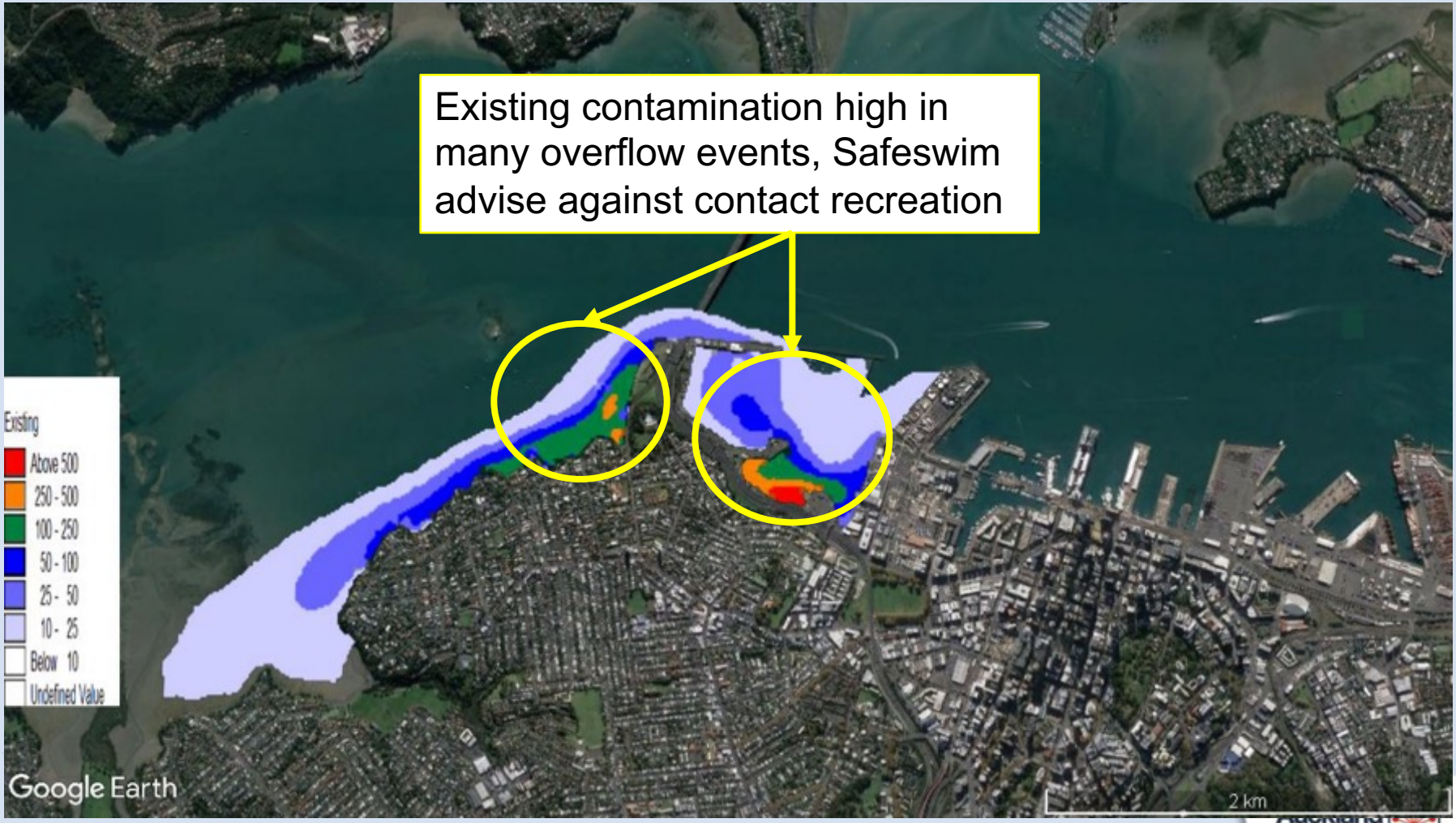
More detailed hydrodynamic modelling of this outfall location was undertaken. The model shows that the discharges from this outfall are rapidly diluted to very low levels (below Safeswim 'green' levels). An analysis of shoreline points was undertaken and shows that there is some contamination from the existing overflows for a reasonable extent of shoreline. Once the project has been commissioned, contamination from these 5 overflows is negligible.

Attachment 1 summarises this – from a presentation given to the Local Community. Although this dispersion modelling is not strictly needed for the purposes of Managers Approval, the project team recognised the need for some technical assessment to provide assurance to the community that adequate dispersion can be achieved and that areas such as Herne Bay and Home Bay will not suffer additional contamination from this project. The analysis explicitly only focuses on discharges from the 5 EOPs that are impacted by the project.

It needs to be stressed that the St Marys Bay /Masefield Beach Improvement project is a local, medium-term improvement project for the 5 EOPs that currently impact on St Marys Bay and Masefield Beach and that further initiatives will be required to reduce contamination from other overflows. This longer term improvement is the focus of the Western Isthmus Water Quality Improvement Programme (WIWQIP) being jointly undertaken by Watercare and Healthy Waters.

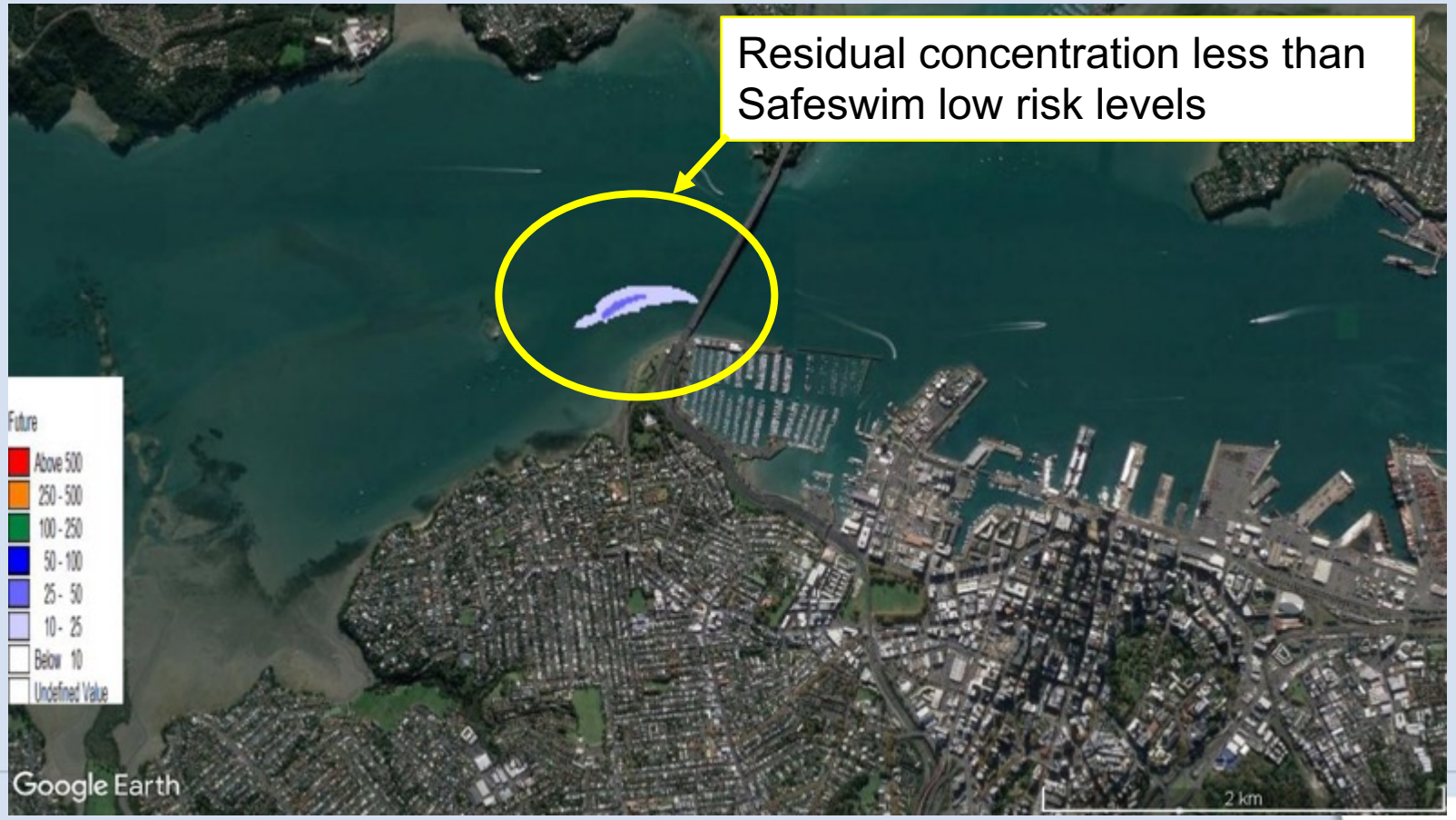
Extent of contamination – existing situation

(from the 5 project EOPs)



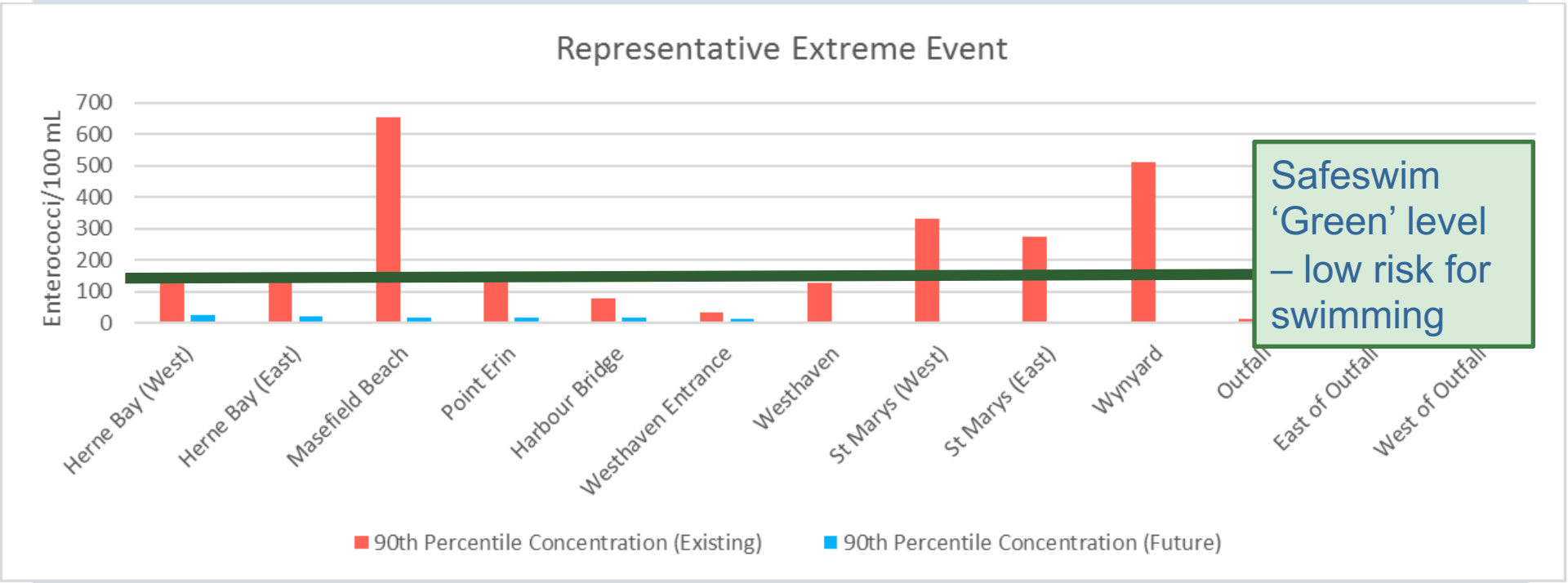
Extent of contamination – after commissioning

(from 5 project EOPS)



Impacts on local sites

Impacts on local sites from these EOPs in adverse conditions and very high rainfall – before and after commissioning



Safeswim 'Green' level – low risk for swimming

90% of the time, concentrations are lower than this

Auckland Council

APPENDIX 5: HEALTHY WATERS DETAILED RECEIVING ENVIRONMENT ASSESSMENT

The following assessment of environmental effects and risk has been undertaken by Healthy Waters for the existing situation in accordance with the approach set out in Attachment 5 of the NDC.

St Marys Bay – Existing Situation

Step 1 – Receiving Environment Classification

The direct receiving environment for discharges associated with rainfall related overflows from the combined sewer network from EOPs 172, 180, and 1020 is St Marys Bay (Bay), an embayment west of the Ports of Auckland. The EOPs discharge via two separate stormwater outfalls which are located within the sea wall formed at the edge of the reclamation for Westhaven Drive.

Contact recreation within St Marys Bay is frequent, with hundreds of boats berthed at Westhaven Marina and numerous clubs operating within the Bay, including the Auckland Dragon Boating Association and the Auckland Waka Ama Association. Recreational activities also take place along the coastline of the Bay, including a board walk that runs parallel to Westhaven Drive. St Marys Bay is also part of the Auckland Council's Safe Swim monitoring programme. Based on this information, the Bay has been given a Recreation value of Class 1.

Previous ecological studies undertaken along the harbour edge, including at Westhaven Marina, have identified moderate to low benthic species diversity, low abundance, and a dominance of polychaete worms and juvenile crabs. Several small molluscs (*Theora lubrica* and *Philine auriformis)* have been recorded in low numbers. Overall, the biological communities in the RE are dominated by relatively common and opportunistic species. The Ports of Auckland area and Westhaven Marina are subject to regular maintenance dredging and there are significant stormwater discharges and associated contamination within the immediate receiving environment. There are no specific ecological values identified in the Coastal Plan or the Auckland Unitary Plan. On this basis, a Class 3 Ecological value has been assigned for the purpose of this assessment.

The Bay is part of the Auckland Waterfront, and has been subject to significant alteration since the mid-1880s, with multiple reclamations and coastal developments. As a result of these reclamations, multiple cultural heritage sites have been lost or significantly modified. Point Erin is a known pā that provided a fishing base, with adjacent beaches within the Bay favourable for hauling out and storing waka. Ko Takerehaea (CHI 12769 and SSMW 62) is located inland of the motorway near the original coastline, and immediately upstream of the EOP discharge locations into St Marys Bay. Whilst the EOPs are greater than 50 m from any identified cultural site, given the importance of the Waitematā as a whole, a Cultural Value of 'very important' for the purposes of this assessment has been adopted.

The Bay is heavily utilised by recreational boaters with berths at Westhaven Marina and by the boat building and maintenance industry located on the eastern shores of the Bay. Amenity values on the coastline therefore reflect these water uses and vary from Silo Park to Westhaven Marina. Despite these variations, on-going efforts by Panuku are aiming to improve the amenity of the area over time. The Westhaven Plan has identified the following objectives:

- A smart working waterfront – supporting the growth of marine industries;
- Blue-green waterfront – development aligned with national and international best environmental practices;

- A connected waterfront – providing high quality pedestrian, cycle, boat, and vehicle access to all users;

- A public waterfront – to create Westhaven as a premier park with acknowledgement of Maori and maritime culture and heritage; and
- Liveable waterfront – to integrate with the CBD waterfront.

Due to the easy public access available to nearby residents and recreational boaties, the aesthetic values have been assigned a 'high' value.

Figure A5.1: Direct Receiving Environment for St Marys Bay from EOP IDs 172, 180, and 1020

The Bay's direct receiving environment has been classified as follows:

RE Name	Type	Recreation	Ecology	Cultural	Aesthetic
St Marys Bay	Beach	Class 1	Class 3	Very Important	High

Step 2 – Discharge Characteristics

The two discharge locations via stormwater outfalls into St Marys Bay are in close proximity to each other. Given the characteristics of the Bay, they have been combined for assessment, with a total discharge frequency per year of 99 and a total expected average volume of discharges being 63,400 m^3 per year. Therefore, expected discharges are characterised as High Frequency (>12 discharges per year) and expected volumes are in the High range (>10,000 m^3 per year).

Predicted discharges are estimated to be on average approximately 11,400 m^3 per year.

Step 3 – Public Health Effects

High volume discharges to beaches with Class 1 Recreational values are assessed as having a **high effect** on all recreational activities.

Step 4 –Ecological Effects

High volume discharges to beaches with Class 3 Ecological values are assessed as having **predominantly low effects** on ecological values.

Step 5 – Assessment of Cumulative Effects

The discharges via the stormwater outfalls are within a 250 m stretch of coastline. The EOPs are predicted to discharge at a frequency of 1 – 2 times per week or greater.

The assessment of public health and ecological effects on the Bay has already been undertaken on the basis of combining the volume and frequency of these predicted discharges, and has resulted in the highest effects category possible. A further cumulative effects assessment is not necessary and would not change the outcome of the assessment.

Step 6 – Assessment of the Risk of Public Health and Ecological Effects

Risk is conventionally defined as the combination of the likelihood of an event (with respect to wastewater overflows, this is expressed as frequency) and the consequences of an event (with respect to wastewater overflows, the effects as assessed in Steps 3 and 4 above).

The "risk profile" for public health and ecological effects is generated by combining the effects with the overflow frequency range, as shown below.

Risk Profile for Public Health and Ecological Effects

Discharge Frequency Range	Effects Score				
	5 Very High	4 High	3 Moderate	2 Low	1 Very Low
High	Very high	Very high	High	Moderate	Low
Medium	Very high	High	Moderate	Low	Very low
Low	High	Moderate	Low	Very low	Very low

Colour key:

Colour	Assigned level of risk
	Very high - high
	Moderate
	Low – very low

EOP IDs 172, 180, and 1020 have been assessed together, and their combined discharge frequency range is 'high' as shown in the above table as red. It is important to note that the overflow volume range is used for determining effects, and therefore does not influence the risk rating.

To summarise Steps 3 and 4 above, the 3 EOPs have a 'high' effect on recreational values (shown in the above table in orange), and a predominantly 'low' effect on ecological values (shown in the above table in green (based on the high recreational by low ecological classification of the receiving environment.

The public health and ecological risk profiles are therefore as follows:

EOP	Public Health Effect	Ecological Effect	Overflow Frequency Range	Public Health Risk	Ecological Risk
172, 180, and 1020	**High**	**Low**	**High**	**Very High**	**Moderate**

Step 7 – Assessment of the Risk of Cumulative Effects

This assessment has already been undertaken on a combined basis therefore an additional assessment of the risk of cumulative effects is not necessary.

Steps 8 and 9 – Assessment of Cultural Effects and the Risk of Cultural Effects

For the purpose of this assessment, the direct receiving environment for discharges from EOP IDs 172, 180, and 1020 have been assigned a very important cultural value.

High volume discharges from overflows to culturally very important receiving environments are considered to have 'very high' effects. High frequency discharges have a very high risk of cultural effects as set out in the table below.

Risk Profile for Cultural Effects

Discharge Frequency Range	Effects Score			
	Very High	**High**	**Moderate**	**Low**
High	Very high	Very high	High	Moderate
Medium	Very high	High	Moderate	Low
Low	High	Moderate	Low	Very low

Step 10 and 11 – Assessment of Aesthetic Effects and the Risk of Aesthetic Effects

The Bay's receiving environment was identified as having High aesthetic values. High volume discharges to such an environment have a High effect on these values.

Aesthetic Effects Scale

Discharge Volume Range	Effects Score	
	High Value	**Low Value**
High	High	Low
Medium	High	Low
Low	High	Low

Because the overflows occur with a High frequency, the risk is assessed as being High, using the risk profile below.

Risk Profile for Aesthetic Effects

Discharge Frequency Range	Effects Score	
	High Value	Low Value
High	High	Low
Medium	Moderate	Low
Low	Low	Low

Summary

A combined assessment of effects was undertaken of discharges to the Bay due to their close proximity of the stormwater outfalls to each other. This represents the worst case scenario should discharges occur at the same time.

The combined effects from discharges to the Bay receiving environment in the existing situation is considered to be very high for cultural values, high for public health and aesthetic values, and low for ecological values.

The overall risk of effects is assessed as 'moderate' for ecological values, 'high' for aesthetic values and 'very high' for cultural and public health values.

As the discharge is from a combined sewer network, the wastewater loads of the discharge are diluted with stormwater. Notwithstanding this, modelling undertaken indicates that the volume of wastewater loads in the existing discharge is still high.

St Marys Bay – with Completion of The Project

Step 1 – Receiving Environment Classification

The St Marys Bay direct receiving environment has been classified as follows:

RE Name	Type	Recreation	Ecology	Cultural	Aesthetic
St Marys Bay	Beach	Class 1	Class 3	Very Important	High

Step 2 – Discharge Characteristics

Discharges from the existing three EOP IDs 172, 180, and 1020 will be captured, stored and diverted via the new pump station and during extreme rainfall discharges are expected to occur through the new outfall at the new discharge location. It is estimated that discharges directly to St Marys Bay will be an average of two times per year in high rainfall events. Therefore, expected discharges with The Project are characterised as low frequency (<2 overflows per year) and are anticipated to be low volumes on an annualised average basis. but may occasionally be high volume in very heavy rainfall events.

Predicted wastewater loads in the discharges to St Marys Bay with the Project, given the dilution with stormwater within the combined system, are estimated to be on average approximately 20 m^3 per year, with the remainder of flow uncontaminated stormwater.

Step 3 – Public Health Effects

Low frequency, high volume and very dilute (minimal wastewater) discharges to beaches with Class 1 Recreational values are assessed as having a **moderate** effect on all recreational activities. The discharges to St Marys Bay will only occur on average two times per year in heavy rainfall – further reducing the public exposure risk as conditions are unlikely to be favourable to use of the bay at the time these sorts of rainfall events are occurring.

Step 4 – Ecological Effects

Low volume discharges to beaches with Class 3 Ecological values are assessed as having **very low effects** on ecological values.

Step 5 – Assessment of Cumulative Effects

The discharge locations for overflows from EOP IDs 172, 180, and 1020 are within a 250 m stretch of coastline. With the Project in place, any discharges to St Marys Bay would have a low frequency discharge. The assessment of public health and ecological effects on St Marys Bay has already been undertaken on the basis of combining the volume and frequency of these discharges. A further cumulative effects assessment is not necessary and would not change the outcome of the assessment.

Step 6 – Assessment of the Risk of Public Health and Ecological Effects

With the Project in place, the public health and ecological risk profiles for St Marys Bay have been assessed, as:

EOP	Public Health Effect	Ecological Effect	Overflow Frequency Range	Public Health Risk	Ecological Risk
172, 180, and 1020	**Moderate**	**Very Low**	**Low**	**Low**	**Very Low**

Step 7 – Assessment of the Risk of Cumulative Effects

Because this assessment has already been undertaken on a combined basis, an additional assessment of the risk of cumulative effects is not necessary.

Steps 8 and 9 – Assessment of Cultural Effects and the Risk of Cultural Effects

As previously, the direct receiving environments of EOP IDs 172, 180, and 1020 within St Marys Bay have been assigned a 'very important cultural value. Any discharge of contaminated water is considered highly undesirable by Mana Whenua and any residual discharges will result in cultural effects. However, as compared to the existing situation, the effects at Masefield Beach will be removed and those at St Marys Bay and for the wider Waitemata will be reduced (due to the capture and return to sewer of wastewater, reducing overall wastewater discharged). The risk of cultural impacts on St Marys Bay is reduced, while that of the specific outfall location is increased.

Healthy Waters has been working with Mana Whenua through Panuku forums and with a formal Project Working Group. It must be acknowledged that Mana Whenua has a strong preference that no wastewater be discharged to any water receiving environment. However, Mana Whenua understand that the path towards improvement must be taken in steps and in good faith are largely supportive of The Project as an achievable medium-term improvement and the first step towards wider network improvements and further reduction in overflows.

Step 10 and 11 – Assessment of Aesthetic Effects and the Risk of Aesthetic Effects

The St Marys Bay receiving environment was identified as having high aesthetic values. Low volume discharges to such an environment have a high effect on these values. The discharges with the Project will occur with a Low frequency therefore the risk is assessed as being low.

Summary

With the Project in place, the change to any discharges means there is a significant change to the effects and risk profile at St Marys Bay. Any effects to public health have been reduced to moderate, with a low risk profile. Ecological effects are considered to be very low, with a very low risk profile. As cultural and aesthetic values are high and the risk profile reduces from moderate to a low risk profile.

Masefield Beach – Existing Situation

Step 1 – Receiving Environment Classification

The direct receiving environment for discharges from EOPs 194 and 196 is via an outfall directly onto Masefield Beach, an embayment west of Point Erin. The coastline of the bay is largely unmodified along its western shore, but has been significantly modified on its eastern shore due to reclamations associated with the construction of the Auckland Harbour Bridge and the Curran Street on-ramp. Overflows from 194 and 196 are discharged via the same 70 m long partially submerged stormwater outfall located at Masefield Beach.

Contact recreation occurs within Masefield Beach. The local beach is a known swimming place for some locals and dogs, and the beach is also utilised in organised swim events. Fishing occurs to the north of the beach along the Curran Street seawall adjacent to the Auckland Harbour Bridge, and a shared path runs along this seawall catering for runners and cyclists. Given the use of the beach for contact recreation, a Class 1 Recreational Value has been assigned.

No specific ecological values have been attributed to Masefield Beach in either the Auckland Coastal Plan or the Auckland Unitary Plan. An ecological assessment undertaken for the Project characterised the intertidal area as comprising a mix of exposed sandstone reef and boulders, with communities typical of those found in the broader area. The existing intertidal habitats were found to be highly modified with degraded ecological values. The sub tidal area contains habitats that are likely to be locally significant, particularly the horse mussel and sponge beds. The ecological assessment noted that Masefield Beach and the surrounding area are intensively fished by recreational fishers. Pohutakawa-lined sandstone cliffs edge the western side of Masefield Beach. Whilst the existing environment is degraded, given the outcome of the ecological assessment the Beach has been given a Class 2 ecological value.

Masefield Beach is located to the west of the culturally significant Point Erin pā, and includes Te Routu o Ureia (Taniwha's Comb), a formation of partially submerged coastal reef formation where the coastal taniwha (Ureia) would 'rub his body'. The formation has been partially covered with the Curran Street reclamation, but is still visible during low tide within the embayment. Freshwater streams once flowed down to this beach, and it was a significant fishing and harvesting spot. This area is scheduled as Wahi Tapu under the Historical Places Act 1993. Given this, the beach has been given a Very Important cultural rating.

Amenity values within the beach include value provided by the mature pohutukawa and other native cliff line vegetation running along the residential western coastline, and the current and planned amenities within Point Erin Park and Auckland Harbour Bridge Park along Curran Street. Views across the beach extend out to Watchman's Island and the Chelsea Sugar Factory across the Harbour. Given the public access provided along Curran Street and existing amenity, the beach has been given a high Value aesthetic value.

Figure A5.2: Direct receiving environment for Masefield Beach

The Masefield Beach direct receiving environment has been classified as follows:

RE Name	Type	Recreation	Ecology	Cultural	Aesthetic
Masefield Beach	Beach	Class 1	Class 2	Very Important	High Value

Step 2 – Discharge Characteristics - Existing

The discharges from the two EOPs have an estimated frequency of on average 107 per year, with an estimated average annual volume of 38,400 m^3 per year. This is considered to be a high frequency (> 12 overflows per year) and within the high volume range (> 10,000 m^3 per year).

The predicted wastewater loads within the discharge, taking into account dilution with stormwater in the combined system, has been estimated to be on average approximately 6,900 m^3 per year to Masefield Beach.

Step 3 – Public Health Effects

High volume discharges to beaches with Class 1 recreational values are assessed as having a **high effect** on all recreational activities.

Step 4 – Ecological Effects

High volume discharges to beaches with Class 2 ecological values are assessed as having **predominantly high effects** on ecological values.

Step 5 – Cumulative Effects

The assessment of Masefield Beach has been undertaken on a combined basis as overflows from the two EOPs discharge through the same stormwater outfall. Another stormwater outfall is located on Masefield Beach which also discharges directly onto the beach. It is understood that this outfall discharges stormwater only.

Step 6 – Assessment of the Risk of Public Health and Ecological Effects

The public health and ecological risk profile for EOPs 194 and 196 are shown below.

EOP	Public Health Effect	Ecological Effect	Overflow Frequency Range	Public Health Risk	Ecological Risk
194 and 196	High	High	High	**Very High**	**Very High**

Step 7 – Assessment of the Risk of Cumulative Effects

This assessment has been undertaken on a combined basis, and an additional assessment of the risk of cumulative effects is not necessary.

Steps 8 and 9 – Cultural Effects and Associated Risk

As noted previously, Masefield Beach has been assessed as having Very Important cultural values. The combined discharges have high volume therefore cultural effects are assessed as Very High. The overall risk profile for potential cultural effects is high.

Step 10 and 11 – Assessment of Aesthetic Effects and the Risk of Aesthetic Effects

Masefield Beach has been identified as having High aesthetic value. High volume discharges to such an environment have a High potential effect on these values and therefore the risk profile for aesthetic effects is also high.

Summary

A combined assessment of effects was undertaken at the combined discharge point at Masefield Beach. The effects of wastewater overflows to this receiving environment under the existing situation range from High (public health, ecological and aesthetic effects) to Very High (cultural effects). The risk to public health and ecological values is very high and the risk to cultural and aesthetic values is high. It is noted that even if just the wastewater loads were used, rather than the combined stormwater and wastewater discharge volume, this would not significantly change the conclusions, as the proportion of wastewater is currently high.

Current Situation - Summary of Receiving Environments, Effects, and Risks to Receiving Environments

A re-classification of the receiving environment for EOP IDs 172, 180, 1020, 194, and 196 has been undertaken in accordance with Attachment 5 of the NDC, and using the additional information that has been collated as part of The Project. A summary of the assessment is provided in the following table (A5.1).

Overall the risk profile for the existing situation has not changed for discharges to St Marys Bay and Masefield Beach from what was previously submitted for the NDC. Whilst the NDC does not recognise the dilution that is provided by stormwater in the discharge from the combined sewer network, the wastewater loads in the discharge are relatively high.

Table A5.1: Current Situation - Summary of Receiving Environments, Potential Effects, and Risks to Receiving Environments

Receiving Environment Name			**St Marys Bay**	**Masefield Beach**
Type			Beach	Beach
Class	Recreational		Class 1	Class 1
	Ecological		Class 3	Class 2
	Cultural		Very Important	Very Important
	Aesthetic		High	High
EOP ID			172, 180, 1020	194, 196
Volume Range (combined stormwater and wastewater)			High >10,000 m^3 p.a.	High >10,000 m^3 p.a.
Frequency Range			High (>12 p.a.)	High (>12 p.a.)
Potential Effects	Public Health	Combined Volume	High	High
	Ecological	Combined Volume	Low	High
	Cultural	Combined Volume	Very High	Very High
	Aesthetic	Combined Volume	High	High
Potential Risk	Public Health	Combined Volume	Very High	Very High
	Ecological	Combined Volume	Moderate	Very High
	Cultural	Combined Volume	Very High	Very High
	Aesthetic	Combined Volume	High	High

Masefield Beach – with Completion of The Project

There will no longer be any direct discharges to Masefield Beach following completion of the Project.

Summary of Receiving Environments, Potential Effects and Risks to Receiving Environments with the Completion of The Project

A summary of the assessment is provided in Table A5.2, following implementation of the Project and the changes to the receiving environment.

There are significant benefits to St Marys Bay and Masefield Beach following implementation of the Project. The risk profile to St Marys Bay is significantly reduced across all of the criteria, with public health and aesthetic now low, ecology very low and cultural risk moderate. There is no longer any direct discharge to Masefield Beach.

The new main discharge point into the Waitematā Harbour is considered a better receiving environment, as a harbour provides better dilution and dispersion, this coupled with the reduced wastewater loads in the discharges means that overall there is anticipated to be a significant improvement over the existing situation. However, due to the way the NDC categorises discharges, the discharge is still a 'high volume" and high frequency' discharge, and therefore overall the risk rating associated with the discharge ranges from moderate to very high. Importantly, however, the total number of discharges to the Waitematā Harbour is reduced from a combined total of 206 (to St Marys Bay and Masefield Beach) to approximately 22 times per year, which is a significant improvement.

Categorisation of the Receiving Environment with the Project - Effects Assessment and Risk Assessment

The 'new' single direct receiving environment for all five EOPs will be the mid-stream Waitematā Harbour. An assessment of the changes with the Project to St Marys Bay and Masefield Beach has been provided below.

Waitematā Harbour – with the Completion of the Project

Step 1 – Receiving environment classification

The new direct RE for discharges from EOP IDs 172, 180, 1020, 194, and 196 will be the mid-stream Waitematā Harbour, following the completion of the Project.

Contact recreation in and around the mid-stream Waitematā Harbour is infrequent, although as discussed above there are some across harbour swim events that start from Masefield Beach. Fishing occurs along the Curran Street seawall adjacent to the Auckland Harbour Bridge, and a shared path runs along this seawall catering for runners and cyclists. Fishing also occurs further out in the main channel. As contact recreation (swimming event) is substantially less than in other more popular areas, the Waitematā Harbour in this location has been given a Class 2 Recreational value.

No specific ecological values have been attributed to the Waitematā Harbour in this vicinity in either the Auckland Coastal Plan or the Auckland Unitary Plan. An ecological study undertaken as part of this project has indicated that ecological values are low due to the degraded environment near the proposed position of the outfall. It is noted that the proposed outfall specifically avoids the sub tidal area known to contain habitats that are likely to be locally significant (particularly the horse mussel and sponge beds). Therefore, the Waitematā Harbour in this vicinity has been attributed a Class 3 Ecological value.

The site of the proposed discharge is located to the west of Te Routu o Ureia (Taniwha's Comb), a formation of partially submerged coastal reef formation where the coastal taniwha (Ureia) would 'rub his body'. The formation has been partially covered with the Curran Street reclamation, but is still visible during low tide within the embayment. This area is scheduled as Wahi Tapu under the Historical Places Act 1993. Given this, the Waitematā Harbour in this vicinity has been given a Very Important cultural rating.

The Waitematā Harbour in this vicinity has a moderate level of public accessibility, however there are plans to improve and increase public accessibility by Auckland Council. There are plans to construct 'Skypath' within the next few years, which would enhance the aesthetic value. For the purpose of this assessment, a High aesthetic value has therefore been assigned to the Waitematā Harbour (CBD Edge).

Based on the available information, the Waitematā Harbour in this vicinity as the direct RE has been classified as follows:

Receiving Environment Name	Type	Recreation	Ecology	Cultural	Aesthetic
Waitematā Harbour	Harbour	Class 2	Class 3	Very Important	High

Step 2 – Discharge Characteristics

The combined frequency of discharges from the proposed outfall is expected on average to be up to 22 times per year. This is characterised as high frequency range (> 12 overflows per year) range.

On average, the combined volume of discharges is expected to be approximately 34,000 m^3 per year. This is characterised as high volume range (>10,000 m^3 per year).

Step 3 – Public Health Effects

High volume discharges to harbours with Class 2 Recreational values are assessed as having a **moderate to high effect** on all recreational activities.

Step 4 – Ecological Effects

High volume discharges to harbours with Class 3 Ecological values are assessed as having a **predominantly low effect** on ecological values, as Harbours provide some dilution and/or flushing.

Step 5 – Cumulative Effects

The assessment of cumulative effects is, not necessary as the five EOPs will discharge to the same location via one outfall.

Step 6 – Assessment of the Risk of Public Health and Ecological Effects

For ease of reading, the guidance table for public health and ecological risk from the NDC is repeated below.

The discharge has a high frequency range and is a high volume discharge. This results in a public health effect conservatively categorised as High, and a Low ecological effect. The corresponding public health risk is very high, and the risk of ecological effects is moderate.

Risk Profile for Public Health and Ecological Effects

Discharge Frequency Range	Effects Score				
	5 Very High	4 High	3 Moderate	2 Low	1 Very Low
High	Very high	Very high	High	Moderate	Low
Medium	Very high	High	Moderate	Low	Very low
Low	High	Moderate	Low	Very low	Very low

Step 7 – Assessment of the Risk of Cumulative Effects

This assessment has been undertaken on a combined basis, and an additional assessment of the risk of cumulative effects from a single outfall combining the existing EPOs is not necessary.

Steps 8 and 9 – Cultural Effects and Associated Risk

The Waitematā Harbour in this vicinity has been assessed as having Very Important cultural values. Together, the discharge with high frequency and cultural risks are assessed as Very High.

Step 10 and 11 – Assessment of Aesthetic Effects and the Risk of Aesthetic Effects

The Waitematā Harbour has been identified as having a high aesthetic value. High volume discharges to such an environment have a high effect. As the discharges are expected to occur in the high frequency range, the risk is also high.

Summary

Overall the effects and risk profile associated with the new outfall and the proposed new discharge location for the existing EOPs has improved slightly as the new receiving environment is mid-stream in a harbour, with the ability to provide better dispersion and dilution. In particular, the ecological risk profile has changed from high risk to moderate risk. All other risk ratings remain the same due to the “high” frequency and “high” volume range attributed to the discharge; however, because the discharge location is moved further away from the shore, and given the significant reduction in wastewater loads in the proposed discharge, it is expected that the impact on contact recreation will be less.

Table A5.2: Summary of receiving environment Assessment with Completion of The Project

Receiving Environment Name		Waitematā Harbour	St Marys Bay	Masefield Beach
Direct / Indirect Receiving Environment		Direct	Direct	N/A
Type		Harbour	Beach	Harbour
Class	Recreational	Class 2	Class 1	Class 1
	Ecological	Class 3	Class 3	Class 3
	Cultural	Very Important	Very Important	Very important
	Aesthetic	High Value	High Value	High Value
EOP ID		194, 196, 172, 180, 1020	172, 180, 1020	None
Volume Range		High	Low	None
Frequency Range		High	Low	None
Potential Effects	Public Health	High	Moderate	N/A
	Ecological	Low	Very Low	N/A
	Cultural	Very High	High	N/A
	Aesthetic	High	High	N/A
Potential Risk	Public Health	Very High	Low	N/A
	Ecological	Moderate	Very Low	N/A
	Cultural	Very High	Moderate	N/A
	Aesthetic	High	Low	N/A

As anticipated by condition 29, Manager's Certification is being sought prior to construction of the New Engineered Overflow Point.

Existing Network

27. If a Replacement or New Engineered Overflow Point within the Existing Network does not comply with the requirements set out in conditions 24 or 26 respectively, or discharges to a SEA-M1 Area, the Consent Holder shall:

> *a. determine an alternative discharge frequency (ADF) for that Engineered Overflow Point using BPO methodology set out in **Chapter 3 of Attachment 3**; and or*
>
> *b. determine the location of that Engineered Overflow Point using the BPO methodology set out in **Chapter 4 of Attachment 3.***

The work required by the Consent Holder shall depend on whether a new location is proposed, and whether the Discharge Frequency Targets are met.

28. No discharge is allowed to a Tangata Whenua Management on whether a new location is proposed, and whether the Discharge Frequency Targets are met.

*29. Prior to construction of the Replacement or New Engineered Overflow Point, or concurrent with the lodgement of other necessary resource consent applications, the Consent Holder shall obtain Manger's Certification that the determination of the ADF in accordance with condition 27a and/or the determination of the location of the discharge from the Replacement or New Engineered Overflow Point in accordance with condition 27b was undertaken in accordance with the BPO methodology set out in **Chapters 3 and/or 4 of Attachment 3.***

The New Engineered Overflow Point (i.e. the new outfall) (in the mid-stream Waitematā Harbour) is assessed as having the same combined 'high' frequency and 'high' volume discharge as the existing Engineered Overflow Point at Masefield Beach. This is because the 'high' thresholds of more than 12 discharges on average per year of more than 10,000 m^3 are still exceeded, however they will be significantly reduced in comparison to the existing situation. The Project will direct flows to a preferential receiving environment and further improvements will continue to be implemented in the catchment and wider Auckland CBD combined sewer network over time.

The resource consents required to undertake the physical works and authorise the use/ occupation of the seabed for the new outfall, storage tunnel, pump station, and upstream connection works etc. (The Project) are being sought separately by Healthy Waters, as the asset owner.

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1 PROJECT INFORMATION

1.1 Name

This assessment relates to **St Marys Bay and Masefield Beach.**

The proposed project is the 'St Mary's Bay and Masefield Beach Water Quality Improvement Project' (The Project).

The Project is being led and delivered by Auckland Council's Healthy Waters (Healthy Waters) with support from Watercare Services Limited (Watercare) as asset owner and operator of the combined sewer network and Consent Holder of Auckland's Comprehensive Wastewater Network Discharge Permit, known as the Network Discharge Consent, or NDC.

1.2 Purpose

The Project will involve construction of new stormwater infrastructure which is required as part of Healthy Waters stormwater asset renewals programme and water quality improvement works.

The Project will:

- Consolidate rainfall related stormwater-wastewater overflows from five existing Engineered Overflow Points (EOP IDs 180, 172, 1020, 194, and 196) and reduce direct discharge frequency and volume to St Marys Bay, and completely eliminate discharges to Masefield Beach; and

- Relocate an existing stormwater outfall further offshore into the mid-stream Waitematā Harbour which will provide further water quality improvements to St Marys Bay and Masefield Beach.

1.3 Estimated Value

The estimated budget for The Project is $44 million. The Project is fully funded and is being sponsored and implemented by Healthy Waters.

1.4 Timeframe

Indicative construction start date is December 2018 and commissioning is scheduled for the end of 2020.

1.5 Description

The Project involves installing new stormwater infrastructure including connecting five EOPs within the combined sewer network which currently discharge to St Marys Bay and Masefield Beach, to a new storage tunnel, a pump station and new outfall structure.

The existing Masefield Beach outfall will be decommissioned and removed and replaced with a new outfall structure further offshore in the Waitematā mid-stream. Any rainfall related discharges will be to a higher energy and less sensitive receiving environment and will also be heavily diluted by very heavy rainfall.

The outfall structures at St Marys Bay will be retained with a reduced discharge frequency.

An overview plan of The Project is shown overleaf in **Figure 1.1** and The Project is described in more detail in **Appendix 1 – Project Outline.**

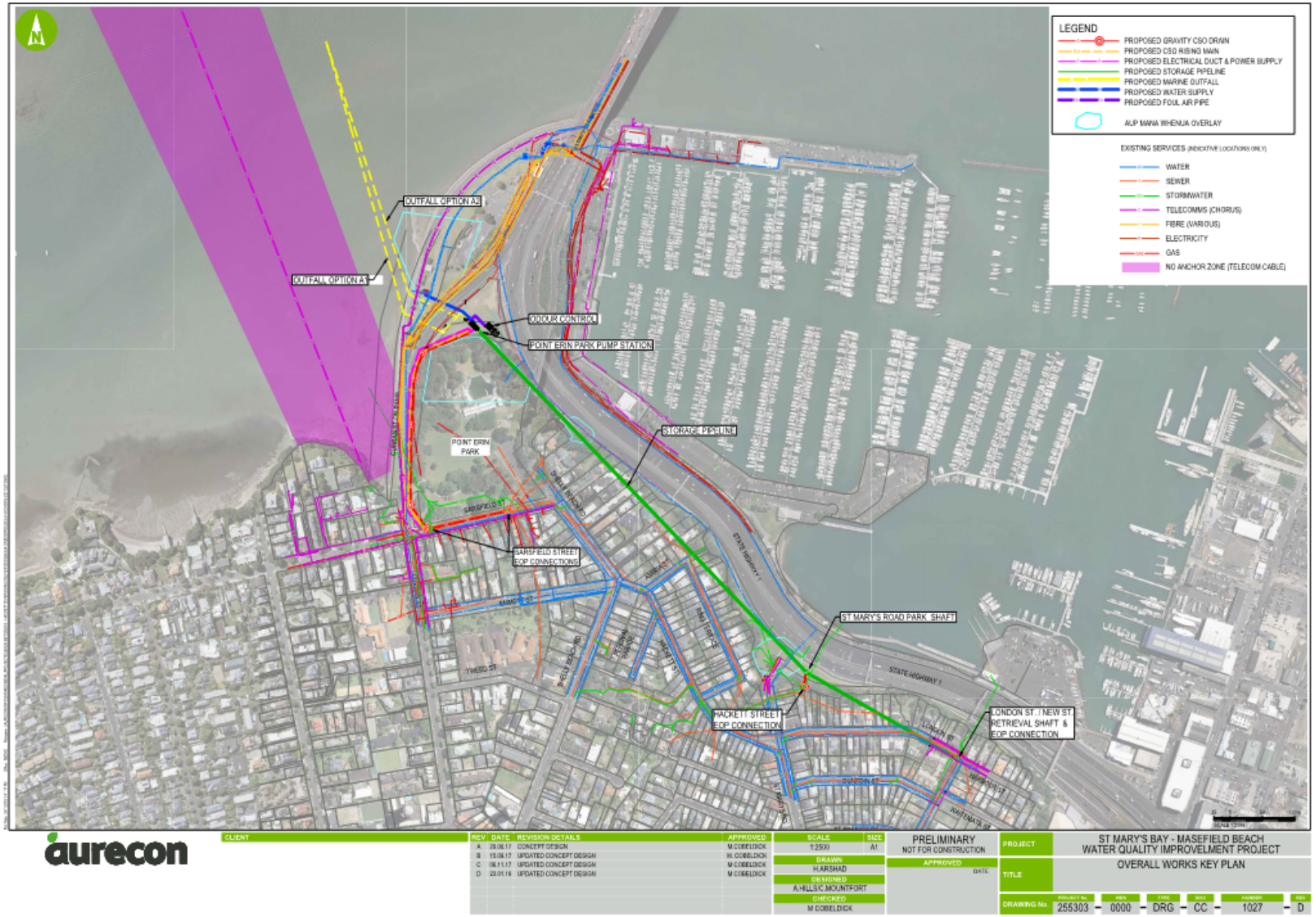

Figure 1.1 – Overview Plan of the St Marys Bay and Masefield Beach Water Quality Improvement Project

1.6 Background and Context

The Project provides an opportunity to integrate a stormwater asset renewals project and several water quality improvement projects.

1.6.1 Stormwater Asset Renewals Project

Healthy Waters has an existing failed stormwater outfall at Masefield Beach, Home Bay (See below photographs 1 and 2). The Masefield Beach outfall is currently used by Watercare for discharges from the combined sewer network servicing some of the Herne Bay area (EOP IDs 194 and 196).

Discharges from the existing stormwater outfall at Masefield Beach are currently authorised by Watercare's NDC and are part of the NDC Assessment of Environmental Effects (Volume 2.20) which relate to the Cox's Bay Catchment receiving environment.

Photographs 1 and 2: The existing Masefield Beach failed outfall

There is an urgent need to replace the Masefield Beach outfall to improve beach water quality.

1.6.2 Water Quality Improvement Initiatives

The water quality improvement initiatives come from the 'St Marys Bay Water Quality Improvement Programme' started in April 2016 (The Programme). The Programme is a joint initiative by a number of Auckland Council organisations including Healthy Waters, Panuku, Watercare, and Auckland Transport. Mana Whenua are also involved.

The Programme was developed in response to local community and marina owner concerns over poor water quality in St Marys Bay impacting on the increasing recreational use of the area. It also aligns with Auckland Council's plans to develop the area further as a public facility.

The Programme identified that a major source of pathogenic contamination at St Marys Bay was a result of rainfall related wastewater-stormwater overflows from the combined sewer network that serves St Marys Bay area (EOP IDs 180, 172, and 1020).

Discharges from the existing stormwater outfalls to St Marys Bay are authorised by Watercare's NDC and are part of the NDC Assessment of Environmental Effects which relate to the Auckland Central Business District Catchment receiving environment.

The Programme's aim is to resolve water quality issues at St Marys Bay and Masefield Beach, in order to facilitate public use of the space and improve Auckland's waterfront environment. Recognising the complexity and challenges of achieving the entire programme objectives, a number of agreed water quality improvement measures were developed and have been taken forward for implementation over the immediate term (within a year), the short to medium term (with 2 – 5 years), and the longer term (5 - 10 years).

Three immediate term projects have already been implemented with the objective to reduce the risk of visual pollution within the Bay and reduce and better manage the risk of human exposure to pathogens through contact recreation.

The objective of medium term projects is to provide public health protection benefit by significantly reducing the number of harmful pathogens entering St Marys Bay. The Project was among a number of potential short to medium term water quality improvement projects that were identified.

Longer term projects were also defined as having the objective of making significant improvements to water quality in the wider Waitematā Harbour by making improvements to the combined sewer network within St Marys Bay and the wider Auckland CBD area. It was recognised that the longer term projects would be costly as well as take longer to implement. The Project will not replace or delay longer term projects addressing issues within the wider St Marys Bay Auckland CBD combined sewer network.

1.6.3 Current System Performance

The combined sewer network conveys both wastewater and stormwater flows and when its capacity is exceeded due to rainfall, it is designed to overflow.

Watercare's hydraulic model for the existing development and wet weather scenarios shows that EOP IDs 196 and 180 are predicted to operate with a current overflow frequency of two times per week or greater, and EOP IDs 172, 1010, and 194 operate with a current overflow frequency of one per week or greater. The significant overflows are a result of capacity constraints in the trunk sewer and the volume of stormwater in the wastewater system.

1.7 Expected Outcome and Discharge Frequency

The expected results of The Project using outputs from Healthy Waters project related hydraulic model are presented below in Table 1.

Table 1 - Summary of Expected Results

Receiving Environment	Current System Performance			Post Improvement Project System Performance		
	Estimated Average Discharge Frequency (no. of Discharges per yr)	Estimated Average Annual Discharge Volume (m^3 per yr)	Estimated Average Volume of Domestic Wastewater (m^3 per yr)	Estimated Average Discharge Frequency (no. of Discharges per yr)	Estimated Average Annual Discharge Volume (m^3 per yr)	Estimated Average Volume of Domestic Wastewater (m^3 per yr)
Masefield Beach	107	38,400	6,900	-	-	-
St Marys Bay	99	63,400	11,400	2	<1000	20
Waitematā Harbour	-	-	-	20	34,000	680
Total	**206**	**101,800**	**18,300**	**22**	**35,000**	**700**

In summary, The Project is expected to:

- **Reduce the frequency and volume of direct discharges to St Marys Bay.** During light to moderate rainfall overflows from EOPs 180,172, and 1020 will be captured, stored, and diverted via the new pump station to the combined sewer network for conveyance to Mangere WWTP for treatment. This means there will be a reduction in direct discharges from 99 to 2 times on average per year.

- **Remove direct discharges to Masefield Beach.** The Project involves decommissioning and removal of the failed outfall at Masefield Beach. Therefore there will be no discharges to Masefield Beach from EOPs 194 and 196.

- **Reduce the overall discharge frequency to the Waitematā Harbour.** The Project will be designed to reduce discharge frequencies from 206 to 22 times on average per year at the new discharge location. The Project is designed to capture smaller, discharges with higher wastewater content and return them to the combined sewer network for conveyance to Mangere WWTP and treatment.

- **Reduce the average annual discharge volume to the Waitematā Harbour.** The Project will be designed to reduce total discharge volumes of wastewater-stormwater to the Waitematā Harbour from about 100,000 m3 per year to 35,000 m3 per year at the new discharge location.

The Project is designed to capture smaller, discharges with higher wastewater content and return them to the combined sewer network for conveyance to Mangere WWTP for treatment. Residual discharges to the environment at the new discharge location will be predominantly stormwater. The new tunnel has a storage capacity of 2,500 m^3 and is designed to contain a storm with a two month return period for the catchment.

2 CONSENT CONDITION COMPLIANCE

The proposed new outfall structure falls within the Attachment 10 of the NDC definition of "New Engineered Overflow Point". It is "an addition to the Network after the Auckland Wastewater Network Comprehensive Discharge Permit commences", and the nature and scale of the works take the outfall structure outside the definition of "Replacement Engineered Overflow Point".

As part of The Project, Healthy Waters will be constructing a "New Engineered Overflow Point" (i.e. the new outfall). Manager's Certification is sought for Watercare's determination of the alternative discharge frequency (ADF) in accordance with condition 27a, and its determination of the location of the discharge from the new outfall in accordance with condition 27b, as envisaged in condition 29 of the NDC. Under condition 29 the Manager's role is to certify that the consent holder's determination of the ADF and location of the discharge from the New Engineered Overflow structure was undertaken in accordance with the BPO methodology set out in Chapters 3 and/or 4 of Attachment 3 to the NDC. As anticipated by condition 29, Manager's Certification is being sought prior to construction of the New Engineered Overflow Point.

The proposed outfall will be approximately 1.4 m in diameter and extend approximately 430m into the Waitematā Harbour. The new outfall is not expected to achieve a discharge frequency of two wet weather overflow events per year, hence needing a Best Practicable Option (BPO) Assessment.

2.1 Compliance with Condition 27

27. If a Replacement or New Engineered Overflow Point within the Existing Network does not comply with the requirements set out in conditions 24 or 26 respectively, or discharges to a SEA-M1 Area, the Consent Holder shall:

a. *determine an alternative discharge frequency (ADF) for that Engineered Overflow Point using BPO methodology set out in **Chapter 3 of Attachment 3**; and or*

b. *determine the location of that Engineered Overflow Point using the BPO methodology set out in **Chapter 4 of Attachment 3.***

The work required by the Consent Holder shall depend on whether a new location is proposed, and whether the Discharge Frequency Targets are met.

This condition requires the consent holder to "*determine an alternative discharge frequency (ADF) for that Engineered Overflow Point using the BPO methodology set out in **Chapter 4 of Attachment 3***".

The summary assessment of The Project is provided next, and has been undertaken by Healthy Waters in accordance with Watercare's BPO methodology set out in Chapter 4 of Attachment 3 of the NDC, which is provided in full in **Appendix 2.**

2.2 Best Practicable Option Assessment

2.2.1 Risk (Loss of Service)

This assessment criterion is directly related to the total or partial risk of loss of service as a result of poor asset condition. It also considers deterioration of service, which occurs when the potential for overflow increases due to lack of capacity in the system, generally as a result of urban development.

The Project will address the current loss of service as a result of the failed stormwater outfall at Masefield Beach which is currently used by Watercare for discharges from the combined sewer network (EOP IDs 194 and 196).

The replacement provides much needed additional storage capacity in the form of a new storage tunnel which will significantly reduce direct discharges (frequency and volume) to St Marys Bay to two times per year on average. It will also totally eliminate direct discharges to Masefield Beach and reduce the total discharges to the Waitematā Harbour from 206 to 22 times per year on average as a result of overflows being diverted via the new pump station and returned to the combined sewer network.

The Project will also help mitigate existing capacity constraints in the trunk sewer. Loss of service or blockages associated with dry weather overflows will be fully contained.

2.2.2 Environmental Risk (Effects on the Environment)

The risk to the environment has been assessed and is discussed in more detail in Section 3 below. This assessment used an environmental risk profile and potential effects associated The Project and identified potential risks to public health, cultural values, and aesthetic values.

The NDC Methodology was not detailed enough to demonstrate the potential performance improvements which will be achieved as the NDC assessment process is based on ranges (low, medium, high) rather than numbers of overflows, and does not take into account that wastewater flows from the combined sewer system are diluted with stormwater. However, The Project provides the ability to capture, store, and divert overflows back to the combined sewer network via the new pump station. It is estimated that there will be a 95% reduction in wastewater loads being discharged to the environment as a result of this.

The new outfall and proposed discharge location is in the mid-stream Waitematā Harbour which is a higher energy, less sensitive receiving environment than the current outfall location and allows for better dispersion and dilution by the current. The new discharge location from the new outfall will be approximately 430 m away from the shoreline and the discharge will be heavily diluted by rainfall.

The Project significantly lowers public health and ecological risks at St Marys Bay (reduces discharges to two times per year on average) and Masefield Beach (discharges will be completely eliminated). The frequency of discharges to the Waitematā Harbour will be reduced from an average of 206 to less than 22 times per year. This is anticipated to be further reduced once a longer-term combined sewer network solution is implemented.

Given the reduction in wastewater loads being discharged to the environment, the dilution of the loads, and the more appropriate receiving environment, the environmental risk with The Project is considered to be significantly lower.

The Project will direct lower volume flows to a preferential receiving environment (Class 2 Recreational) and future network improvements will continue to be implemented and further reduce discharges over time.

Monitoring will be part of The Project to confirm the discharge frequency from the new outfall.

2.2.3 Cost Effectiveness, Short Term Need, and Effectiveness of Available Options

2.2.3.1 Cost effectiveness:

Watercare is required by legislation to minimise the costs of providing an effective service and maintaining the long-term integrity of its assets. As part of Auckland Council, Healthy Waters is required to provide its services in a way that is most cost effective for households and businesses (Local Government Act 1974, section 10).

As previously noted, there is an urgent need to replace the failed stormwater outfall to prevent the continued discharge directly onto Masefield Beach. The capital cost associated with the replacement of the Masefield Beach outfall will be partially funded through the Healthy Waters operational budget for stormwater asset renewals.

The cost of separation works for St Marys Bay area (excluding any local/trunk network upgrades or rehabilitation of existing pipes) was estimated to be around $26 million. In order to provide the same level of benefit as The Project, the areas of Herne Bay that drain to EOP IDs 194 and 196 would also need to be separated, and the Masefield Outfall would still need to be replaced. Separation and associated improvement projects to achieve the same level of benefit as The Project are unlikely to be less than $44 million.

The Project provides the best value option and better performance in the medium term with the potential to be an integral part of any long term solution, thus minimising any future costs and avoiding investment in assets without a long term useful lifespan.

2.2.3.2 Short-term need:

The Project is required to address a short term need to replace a failed stormwater outfall to prevent the continued discharge of rainfall related wastewater-stormwater overflows from the combined sewer network directly onto Masefield Beach.

The Project is also necessary to meet The Programme's short to medium term project objectives to provide public health protection benefit by significantly reducing the number of harmful pathogens entering St Marys Bay by 2020. It aligns with the objectives under the NDC (target of less than two spills per year) and SAFESWIM initiative.

2.2.3.3 Effectiveness of available options:

Other improvement options considered included:

- **Separation**: Separation of the combined system in the Herne Bay and St Marys Bay areas that drain to the five EOPs. There was a risk that this option could not provide the performance outcomes within the short to medium timeframe and not at a comparable cost with the additional associated works required. It would take much longer and be more disruptive to the local community as well as not being any cheaper. Separation however, is still a viable option for the longer-term and when done correctly achieves the same water quality.

- **Screening and disinfection of discharges at St Marys Bay**: Screening and disinfection facilities have significant space requirements that involve significant costs and consenting implications especially when constructed in heavily built-up urban areas. There was a risk that this option could not be achieved within the short to medium timeframe and at a comparable cost and certainty of outcome and it would not result in a reduction in discharges. The constructed asset base would not be useful in the long term.

In summary, The Project provides the greatest level of benefit, in terms of environmental and public health outcomes, cost, construction/programme risk, operational risk, and certainty of outcome for medium-term improvement projects. The project is the only available option that addresses multiple needs for multiple Council organisations and stakeholders within the specified timeframe.

A clear advantage of the Project is the ability to significantly reduce direct discharges to St Marys Bay (to two per year on average) in-line with the requirements of the NDC immediately. In addition, the construction of the storage tunnel and new outfall will completely eliminate direct discharges at Masefield Beach. Overall wastewater discharges will be reduced by approximately 95% and discharges will be to an environmentally preferable location.

2.2.4 Opportunity to Benefit from and/or Link with Projects Undertaken by Other Network Utility Operators

The Project is directly linked to the following projects:

- **St Marys Bay Water Quality Improvement Programme**: A joint initiative by a number of Council organisations including Healthy Waters, Panuku, Watercare and Auckland Transport. Mana Whenua have also been engaged with.

- **Healthy Waters Stormwater Asset Renewal Project**: There is a need to replace the failed Masefield Beach outfall and to remove very high discharges from the poorly flushed environment at St Marys Bay.

- **Panuku Developments (Westhaven Plan):** Continued use of these beaches and on-going development of the waterfront area, including St Marys Bay, as a high value public amenity and adjacent to Westhaven Marina requires an improvement of water quality. Until such time as water quality improves, planned initiatives for the bay development (such as Waka Ama and learn-to-sail) cannot be implemented due to the high public health and aesthetic risks. Capital projects to improve the bay for a variety of uses also rely on improved water quality.

- **Healthy Waters and Watercare's Western Isthmus Water Quality Improvement Programme:** Healthy Waters and Watercare are currently preparing the long term combined sewer network strategy which will outline the expected costs and timeframes for implementation and develop long term projects.

The Project also provides an effective intermediate step in that it can be integrated with other future Healthy Waters and Watercare improvement projects to further improve the performance of the combined sewer network.

2.2.5 Consequential Project/Planning Linkages

Short term measures have already been implemented to manage visible pollution at St Marys Bay and Masefield Beach including installation of 100 Tetra-traps within the road network in the adjacent residential area; further installation of traps are planned in the road network and marina area. Watercare has installed sensors in the wastewater network for real-time monitoring of overflows to enable early warning notification of potential dry weather overflow incidents and ensure a rapid and appropriate field response.

As discussed previously, The Project will be designed with a high degree of operational flexibility (future proofing) so that it can be integrated with other future Healthy Waters and Watercare improvement projects to further improve the performance of the combined sewer network and proposed development in the area by Panuku and Auckland Council to improve public facilities and amenity development

The detailed BPO Assessment by Healthy Waters is provided in **Appendix 3 – BPO (Alternatives) Assessment.**

2.3 Compliance with Condition 27b

The new outfall location further into the mid-stream Waitematā Harbour provides the most cost-effective option with better performance in the short term and the potential to be an integral part of any long term solution which will provide further water quality improvements. The Project will direct flows to the new outfall which will discharge to a preferential receiving environment.

Appendix 4 – Outfall Alternatives Assessment contains the assessment undertaken by Healthy Waters to confirm **t**he optimal location for the new outfall and discharge location.

2.4 Compliance with Condition 28

28. No discharge is allowed to a Tangata Whenua Management Area on whether a new location is proposed, and whether the Discharge Frequency Targets are met.

As part of The Project the new outfall does not discharge to a *Tangata Whenua Management Area* as identified in the *Regional Plan: Coastal*, or an equivalent area in the Unitary Plan where discharges are a Prohibited Activity.

3 ASSESSMENT OF EFFECTS ON THE ENVIRONMENT AND ASSOCIATED RISK

This assessment has been undertaken by Healthy Waters in accordance with the approach set out in Attachment 5 of the NDC. More details are included in **Appendix 5.**

3.1 Receiving Environments Characteristics

The Project relates specifically to EOP IDs 180, 172, 1020, 194, and 196 located within the combined sewer network which currently discharge via stormwater outfalls to St Marys Bay and Masefield Beach. The location of these overflow structures is shown in **Figures 3.1** and **3.2**. Related discharge locations are shown in **Figure 3.3**.

EOP IDs 180, 172, and 1020 are part of the NDC Auckland Central Business District (CBD) Geographic Catchment (**Figure 3.1**). They are existing EOPs identified in Schedule 1 of Attachment 2 of the NDC, and at the time of the NDC, they were described as directly discharging to the Waitematā Harbour. They discharge via two outfall locations as shown in **Figure 3.3**.

EOP IDs 194 and 196 are part of the NDC Coxs Bay Geographic Catchment (**Figure 3.2**). They are also identified as existing EOPs in Schedule 1 of Attachment 2 of the NDC, and are described as directly discharging into the Home Bay receiving environment (which includes Masefield Beach), and indirectly into the Waitematā Harbour. They discharge via the existing stormwater outfall at Masefield Beach as shown in **Figure 3.3**.

In summary, the existing direct receiving environments at St Marys Bay and Masefield Beach are classified as a Class 1 Recreational receiving environment and Class 3 Ecological receiving environment and have combined 'high' frequency and 'high' volume discharge, which results in very high risk profiles in relation to public health, aesthetics, and cultural effects, and 'moderate to very high' risk profiles for ecological effects.

Given the proposed changes to existing EOP discharge frequencies, the new outfall, and proposed new discharge location, the existing receiving environments have been reassessed to determine whether there is any change in the risk profile for the existing receiving environment as a result of the predicted discharges from The Project. Table 2 provides a summary of this assessment.

St Marys Bay's risk profile improves significantly as a result of The Project, given that potential discharges will be low frequency and, on an average annualised basis, low volume. As a consequence, this changes the risk profile to moderate for cultural, low for public health and aesthetics and very low for ecological. There will no longer be any discharges directly to Masefield Beach.

The direct receiving environment for the new outfall and proposed discharge, further out in the Waitematā Harbour maintains 'high' frequency and 'high' volume discharge as the frequency exceeds 12 discharges per year. However, the new receiving environment is less sensitive (harbour) than the existing sites (tidal beaches which have less dilution and dispersal.

The risk profiles for the existing situation receiving environment compared with the predicted discharges from The Project receiving environment are reduced, as there is a reduction in overall contamination from wastewater-stormwater. Dispersion modelling indicates that there is no significant impact on Harbour or near shore environments such as Masefield Beach or Home Bay from the new discharge. Ecological assessment indicates that there is no significant impact from the new outfall.

Figure 3.1 NDC Auckland CBD Catchment showing location of EOP IDs 172, 180 and 1020

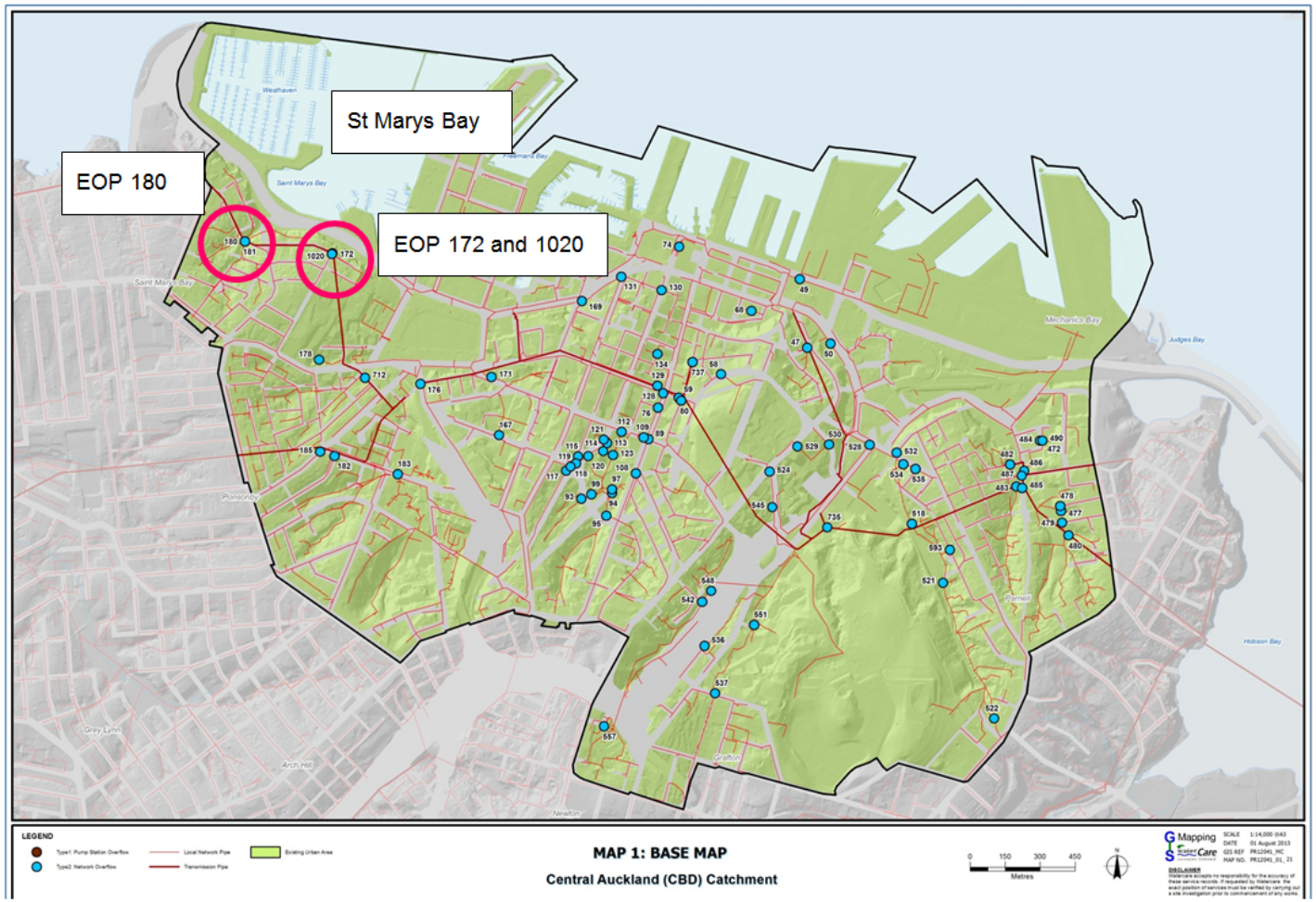

Figure 3.2 NDC Coxs Bay Catchment showing locations of EOP IDs 194 and 196

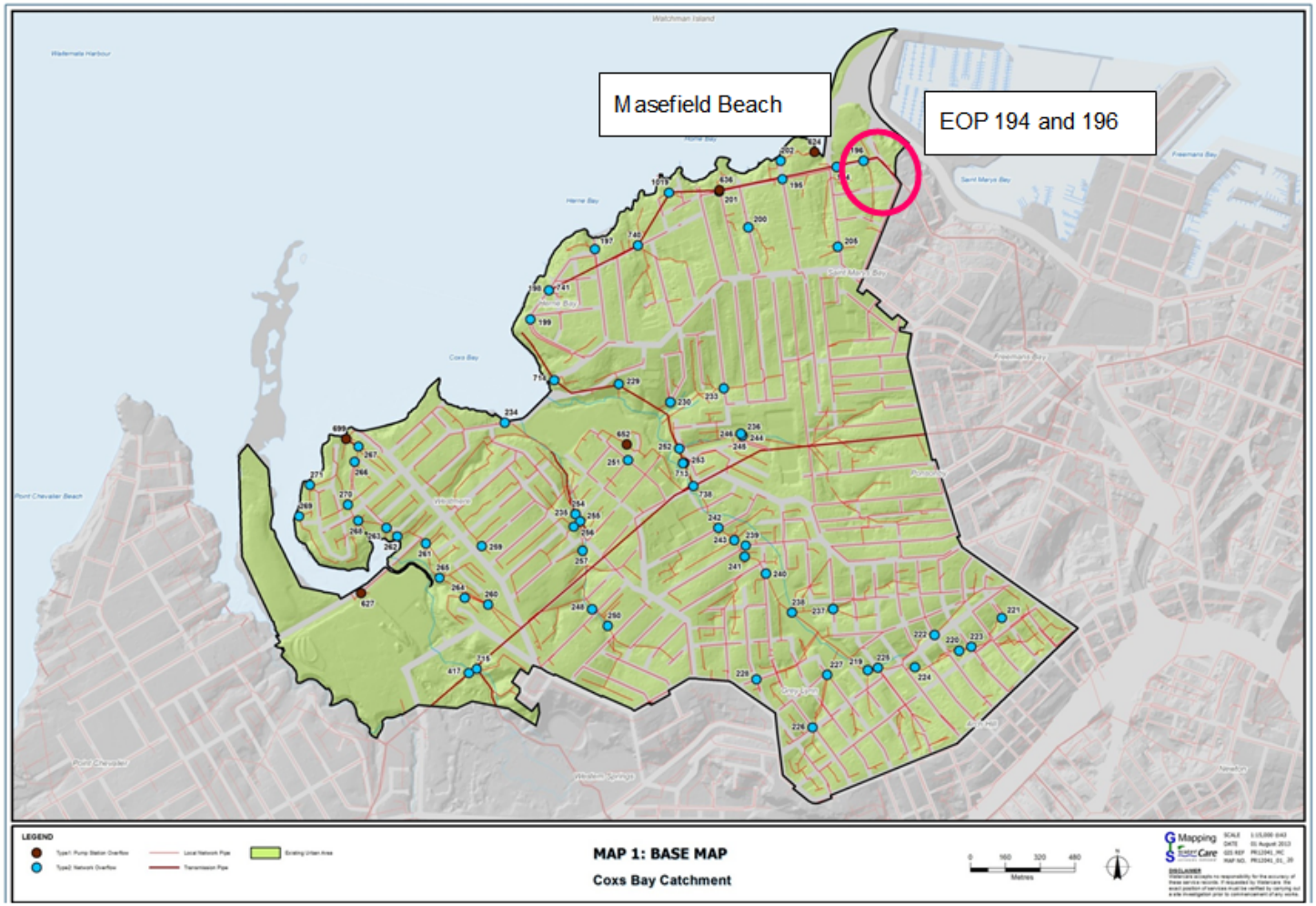

Figure 3.3 Location of the five existing EOPs and their associated discharge location via stormwater outfalls

Table 2 - Summary of Receiving Environments Categorisation – Existing Situation and after the Completion of The Project

		Existing Situation		Post Improvement Project		
Receiving Environment (RE) Name		St Marys Bay	Masefield Beach	Waitematā Harbour	St Marys Bay	Masefield Beach
Direct or Indirect RE		Direct	Direct	Direct	Direct	N/A
Type		Beach	Beach	Harbour	Beach	Beach
Class	Recreational	Class 1	Class 1	Class 2	Class 2	Class 1
	Ecological	Class 3	Class 3	Class 3	Class 3	Class 3
	Cultural	Very Important	Very Important	Very Important	Very Important	Very Important
	Aesthetic	High	High	High	High	High
EOP ID		172, 180, 1020	194, 196	172, 180, 1020, 194, 196	172, 180, 1020	None
Volume Range		High >10,000m^3 p.a.	High >10,000m^3 p.a.	High >10,000m^3 p.a.	Low <1,000 m^3 p.a.	N/A
Frequency Range		High (>12 p.a.)	High (>12 p.a.)	High (>12 p.a.)	Low (<12 p.a.)	N/A
Potential Effects	Public Health	High	High	High	Moderate	N/A
	Ecological	Low	Low	Low	Very Low	N/A
	Cultural	Very High	Very High	Very High	High	N/A
	Aesthetic	High	High	High	High	N/A
Potential Risk	Public Health	Very High	Very High	Very High	Low	N/A
	Ecological	Moderate	Very High	Moderate	Very Low	N/A
	Cultural	Very High	Very High	Very High	Moderate	N/A
	Aesthetic	High	High	High	Low	N/A

3.2 Conclusion

The NDC assessment methodology (as set out in Attachment 5 of the NDC) used for the effects and risk assessment does not indicate a substantial reduction in effects and risk, other than in the ecological effects and risk category. This is due to the way in which the methodology has grouped overflow frequencies (any frequency above 12 overflows per year is categorised as high) and the fact that it does not take into account the composition of the overflows in terms of stormwater and wastewater. Thus, even if the number of overflows is reduced from 206 to 22, this significant reduction is not 'captured' by the frequency range assigned.

It is therefore important to acknowledge that direct discharges to St Marys Bay will be reduced to less than 2 per year and completely eliminated at Masefield Beach. Consolidated overflows from the five existing EOPs will discharge less frequently with a lower volume than the existing situation, to a less sensitive receiving environment (Class 2 Recreational and Class 3 Ecological).

In addition, the NDC assessment methodology does not take into consideration the fact that rainfall related discharges from a combined sewer system are combined wastewater and stormwater flows; heavily diluted. Notwithstanding, there is wastewater in these discharges. With The Project in place and providing the ability to capture, store, and divert overflows back to the combined sewer network for conveyance to Mangere WWTP, it is estimated that there will be a 95% reduction in wastewater loads being discharged to the environment.

4 OTHER MATTERS

4.1 Consent Requirements

The resource consents required to undertake the physical works and authorise the use/ occupation of the seabed for the new outfall, storage tunnel, pump station, and upstream connection works etc. for The Project are being sought separately by Healthy Waters, as the asset owner.

4.2 Other Approvals

Healthy Waters to notify Watercare of the proposed works and other affected stakeholders including land owners, Iwi, and other utility providers impacted by the works as appropriate.

MANAGER'S CERTIFICATION

Condition 27 *27. If a Replacement or New Engineered Overflow Point within the Existing Network does not comply with the requirements set out in conditions 24 or 26 respectively, or discharges to a SEA-M1 Area, the Consent Holder shall:* *a. determine an alternative discharge frequency (ADF) for that Engineered Overflow Point using BPO methodology set out in **Chapter 3 of Attachment 3**; and or* *b. determine the location of that Engineered Overflow Point using the BPO methodology set out in **Chapter 4 of Attachment 3.*** *The work required by the Consent Holder shall depend on whether a new location is proposed, and whether the Discharge Frequency Targets are met.*	Compliant Compliant
Condition 28 No discharge is allowed to a *Tangata Whenua Management Area* as identified in the *Regional Plan: Coastal*, or an equivalent are in the Unitary Plan where discharges are a *Prohibited Activity*	Compliant
BPO Assessment 1. Risk 2. Environmental Risk (Effects on the Environment) 3. Cost Effectiveness 4. Short-Term Need 5. Effectiveness of Available Options 6. Opportunity to benefit from and/or link with projects undertaken by other network utility operators 7. Consequential project/planning linkages	Compliant Compliant Compliant Compliant Compliant Compliant Compliant

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Compliance Unit - Resource Consents Department
Auckland Council

APPENDIX 1: PROJECT OUTLINE

The Project involves the installation of a new storage tunnel that will collect and store combined rainfall related wastewater-stormwater overflows from five existing Engineered Overflow Points (EOPs) within the combined sewer network which currently discharge via stormwater outfalls to Masefield Beach and St Marys Bay (EOP IDs 172, 180, 1020, 194, 196) until there is capacity for them to be returned via the new pump station to the combined sewer network on Sarsfield Street, Herne Bay.

The new storage tunnel will extend from New Street/London Street through to the NZTA owned land north of Point Erin Park. It will be approximately 1 km long; will have an outer diameter of approximately 2.2 m, and an internal diameter of approximately 1.8 m. A new pump station will be constructed within NZTA land, and a new rising main pipeline will be installed along Curran Street and Sarsfield Street to connect the Branch 5 Herne Bay Sewer.

The Project will also replace the outfall at Masefield Beach. Watercare currently discharges via this stormwater outfall at Masefield Beach (EOP IDs 194 and 196). The Project will replace this outfall with one that extends further out into the Waitematā Harbour, into a less sensitive receiving environment with greater dilution and dispersion.

In summary the physical works will comprise of:

- Approximately 1 km long storage pipeline (2.2 m external diameter, 1.8 m internal diameter) extending from New Street to Point Erin Park.

- A new pump station at Point Erin Park. The new pump station will have a forced ventilation system and odour control.

- A 150 mm diameter rising main will connect the new pump station with Branch 5 Herne Bay sewer on Sarsfield Street. This will allow wastewater overflows to be pumped back to the combined sewer when there is capacity.

- Two additional shafts along the alignment, providing access for construction and then conversion to permanent manholes for on-going operation and maintenance of the storage pipeline. One shaft will be located within St Marys Road Park, and one on the corner of New Street and London Street. Odour control and vent stacks are included within these sites to assist with ventilation and odour control.

- Upstream connection works from the five EOPs to the new storage tunnel. A new 750 mm diameter gravity line will connect EOP IDs 194 and 196 to the new pump station. EOP IDs 172, 180, and 1020 will connect to a new pipeline within St Marys Road Park.

- A new marine outfall pipeline (1.2 m in diameter), approximately 430 m long with a diffuser, connecting from the pump station to the new discharge point in the Waitematā Harbour.

- The decommissioning and removal of the existing marine outfall pipeline at Masefield Beach.

The new tunnel has a storage volume of approximately 2,500 m^3, and is designed to contain a 2 month design storm. During more extreme rainfall some combined overflows will occur through the new outfall pipeline that extends further into the Waitematā Harbour. Overall, the scheme has been designed to reduce discharges from a total average per year of 206 (99 at St Marys Bay and 107 at Masefield Beach) to less than 20 times per year via the new outfall. There will no longer be any rainfall related overflows and direct discharges to Masefield

Beach, and any potential direct discharges to St Marys Bay will be less than 2 times per year.

In addition to reducing the frequency of discharges, The Project will also significantly reduce the volume of discharges from around 100,000 m^3 per year (total discharge into St Marys Bay and Masefield Beach), to an average of 35,000 m^3 per year to the new discharge location in the Waitematā Harbour. With The Project in place and providing the ability to store and divert overflows back to the combined sewer network, it is estimated that there will be a 95% reduction in wastewater loads being discharged to the environment.

APPENDIX 2: BEST PRACTICABLE OPTION (BPO) METHODOLOGY – ATTACHMENT 3 OF THE NDC

1 PURPOSE OF THE BPO

Section 2 of the RMA defines Best Practicable Option (BPO) in relation to a discharge of a contaminant or an emission of noise as "*the best method for preventing or minimising the adverse effects on the environment having regard, among other things, to—*

(a) the nature of the discharge or emission and the sensitivity of the receiving environment to adverse effects; and

(b) the financial implications, and the effects on the environment, of that option when compared with other options; and

(c) the current state of technical knowledge and the likelihood that the option can be successfully applied."

Watercare has developed a BPO methodology based on the principles identified above that is dedicated to managing the wastewater network, and is specifically used for the following:

(1) Prioritisation of expenditure for wastewater network improvements and high-level options to inform the six-yearly Wastewater Network Improvement Works Programme set out in the Wastewater Network Strategy (set out in Chapter 3).

(2) Determination of alternative discharge frequencies (ADF) for specific engineered overflow points (set out in Chapter 4), predominantly those that are located in the combined system or in parts of the wastewater network that behave like a combined system. This will usually be undertaken as part of developing the Wastewater Network Improvement Works Programme set out in the Wastewater Network Strategy, but may also become necessary on a once-off basis where specific works need to be undertaken that were not identified in the Wastewater Network Strategy.

(3) Determination of the most appropriate location of engineered overflow points where receiving environments are generally of high value (set out in Chapter 5). Again, this will normally be part of preparing the Wastewater Network Improvement Works Programme but may be necessary in isolated cases if a project was not included in the Wastewater Network Strategy.

The specific aspects of the BPO Methodology applying to each of these three uses are further described below.

In addition, the BPO approach is also used:

- at an organisational level for asset management planning to prioritise funding between water supply, water treatment, wastewater network and wastewater treatment expenditure.
- at the project level, determining the best technical solution from a range of available options.

Both of these additional uses are outside the scope of this consent and only referred to here for reasons of completion. However, the asset management planning process at the organisational level does generally determine the amount of funding available for the Wastewater Network Improvement Works Programme.

2 GENERAL APPLICATION OF THE BPO METHODOLOGY

The following sections set out the application of the BPO methodology relating to wastewater network improvement works, determining alternate discharge frequencies, and determining the location of the engineered overflow points.

In each case, the BPO methodology follows on from an analysis of alternatives where the available options for preventing or minimising adverse effects of wastewater overflows are compared in terms of their effects on the environment, their whole-of-life costs, and their technical feasibility.

This analysis and the criteria set out in the following relevant sections are the basis of the BPO process.

3 APPLICATION OF THE BPO METHODOLOGY TO THE WASTEWATER NETWORK IMPROVEMENT WORKS PROGRAMME

The primary objective of the BPO process is to prevent or minimise adverse effects resulting from wet weather wastewater overflows, and therefore achieve the best level of public health protection, environmental quality and cultural and community well-being for the Auckland Council area as a whole, with the funding that is available.

With respect to minimising wastewater overflows and the potentially adverse effects of such overflows, the principal application of the BPO methodology occurs at the strategic level, i.e. long-term wastewater network improvement planning. The key implementation tool for wastewater network planning is the Wastewater Network Strategy, which is revised at regular six yearly intervals. The first Wastewater Network Strategy is required in 2017. Subsequent revisions will be prepared in 2023, 2029, 2035, 2041 and 2047, in accordance with the conditions of the Comprehensive Wastewater Network Discharge Permit.

The Wastewater Network Strategy sets out Watercare's six year wastewater network works programme, as required by conditions 13 to 23 of the Comprehensive Wastewater Network Discharge Permit, providing - with respect to wastewater network matters - more detail and analysis than can be included in the Asset Management Plan (AMP).

As is the case with the AMP, the prioritisation of works in the Wastewater Network Strategy is based on consideration of **risk (loss of service)** and **environmental effects and risk**.

The assessment of risk considers the urgency with which the works should be undertaken, which is usually linked to asset conditions and/or network capacity. The latter in turn is directly related to urban growth, both through intensification and greenfield development. Risk is also determined by the frequency with which wastewater overflows occur – the more frequently discharges occur, the higher the risk that environmental effects may occur.

The assessment of effects considers the location of existing or new wastewater overflows as well as the volume of these overflows. Overflows to highly valued aquatic receiving environments are generally deemed to generate larger effects than those to environments that are of less importance.

Cost-effectiveness is also an important factor because Watercare must be able to demonstrate that it complies with legal requirements.

Other BPO criteria are normally taken into account following the broad prioritisation of works and determination of options based on risk.

The BPO criteria applicable to developing the wastewater network improvement programme for the Wastewater Network Strategy are set out below.

Criteria	(1) Risk (Loss of Service)
Explanation	Loss of service is primarily due to total or partial failure of the system as a result of poor asset condition. Deterioration of service occurs when the potential for overflows increases due to lack of capacity in the system, generally as a result of urban development.
Matters to be considered	(a) Options for operational procedures that may improve asset conditions and/or prolong asset life. (b) Asset condition and likely time remaining until asset replacement becomes necessary, after relevant operational procedures (for example, re-lining of pipes) have been undertaken. (c) Results of relevant investigations and/or wastewater network modelling. (d) Expected changes/increases in population density (urban development), as advised by Auckland Council. (e) Potential effects of increased urban development upstream of the overflow points/catchment.

Criteria	(2) Environmental Risk (Effects on the Environment)
Explanation	Wastewater overflows have the potential to adversely affect public health, the ecology of the aquatic receiving environment into which they discharge, the cultural values of these receiving environments and the aesthetic enjoyment people may derive from the landscape or amenity in the vicinity of an overflow location. The frequency of overflows is an important factor as this determines the likelihood with which an adverse effect may occur.
Matters to be considered	(a) The value and sensitivity of the receiving environment, as determined through Watercare's *Methodology for the Assessment of Effects of Wet Weather Wastewater Overflows*. (b) The volume of the overflow. (c) Frequency of wastewater overflows under current conditions and/or future frequencies expected as a result of increased urban development. (d) The potential for cumulative effects from wastewater overflows. (e) The characteristics of the discharge, i.e. whether the discharge originates in the combined system or the separated system.

Criteria	(3) Cost-effectiveness
Explanation	Watercare is required by legislation to minimise the costs of providing an effective service and maintaining the long-term integrity of its assets. It is therefore necessary to compare the cost-effectiveness of the improvement works being considered, both in terms of available options for specific projects and with respect to the relative effectiveness of different projects.
Matters to be considered	(a) Cost-effectiveness of specific works when compared to

	works of similar urgency. (b) Estimated costs of available options for specific works to determine the best-value option.
Criteria	**(4) Short-Term Need**
Explanation	This factor is usually taken into account where an overflow causes a significant and direct public health effect, for example by discharging onto private property or public land that is in frequent use. If the long-term solution (for example, network upgrades to accommodate additional flow) cannot be provided within a short time frame, or there is no feasible long-term solution, other methods to minimise the public health effect will need to be implemented.
Matters to be considered	(a) The extent of the public health effect, with particular consideration of overflow frequency. (b) Availability and timing of a long-term solution that would provide the required Network capacity to eliminate or reduce the discharge. (c) Range of available options.
Criteria	**(5) Effectiveness of Available Options**
Explanation	In most instances, there is more than one option for reducing wastewater overflows and their potential effects.
Matters to be considered	(a) The reduction in frequency and/or volume that may be achieved by a particular option. (b) The degree to which the option depends on the implementation of other works.
Criteria	**(6) Opportunity to benefit from and/or link with projects undertaken by other network utility operators**
Explanation	The performance of the wastewater network depends, to a large degree, on the availability of a functioning stormwater network. In areas where the system is still combined, or was combined and has been separated, or where stormwater is intended to be absorbed by soakage, the wastewater system generally performs less well than in separated areas with relatively recent infrastructure. Where it is possible to undertake work on both the stormwater system and the wastewater system at the same time, or where other major infrastructure providers also work in an area and disruption to the public can be minimised, projects may be elevated in priority.
Matters to be considered	(a) Options for joint projects with the Auckland Council Stormwater Unit, to achieve improved project outcome and/or cost savings. (b) Options for undertaking a Watercare project in conjunction with another network utility operator to minimise disruption to the public and/or save in construction costs.

Criteria	**(7) Consequential project/planning linkages**
Explanation	A specific project may, in itself, not achieve a significant reduction in overflows at a specific location, or present the best investment for the anticipated outcome. However, the project may be a key factor in minimising wastewater overflows within the catchment over time, in combination with other works.
Matters to be considered	(a) Sequencing of projects to optimise short-term benefits as well as overall outcomes.
Criteria	**(8) Step-change effect of options**
Explanation	The degree of change brought about by a particular option is an important consideration. For example, a single improvement project may result in an immediate significant reduction of overflows in a given location, or it may require a series of smaller projects within the general area to achieve the same improvement over a longer time period. Unless there are valid reasons for the more gradual improvements, projects that yield large step changes are generally preferred.
Matters to be considered	(a) The degree to which several linked and staged projects (as per Criterion 7) may achieve a better outcome in terms of reducing effects on the environment than one project focusing on a specific location.
Criteria	**(9) Ability to future-proof**
Explanation	Improvement projects that will allow for future-proofing of the network without significant additional cost (provided that population density is expected to increase in the area) are normally ranked above those that cannot achieve this additional benefit.
Matters to be considered	(a) The extent to which population density in the area serviced is expected to increase, and the time frame of this growth. (b) The cost of providing additional capacity now in comparison to undertaking the works at a later stage.
Criteria	**(10) Time-related funding limitations (related to size of project)**
Explanation	Some projects are so large that they require substantial expenditure and very long time frames for construction – works relating to the large interceptors are an example. The financial implications of funding such projects play a significant role in the prioritisation process.
Matters to be considered	(a) Options for financing the project.
Criteria	**(11) Quality of Existing Data**
Explanation	Because network investigations and network modelling are both lengthy and costly, existing information may be of limited accuracy and reliability. Where major expenditure is required

	for an improvement project, additional and up-to-date data may be required to ensure that the project is scoped correctly and will achieve the desired outcome.
Matters to be considered	(a) Quality and age of data needed to scope and define the works. (b) Cost and timeframes for obtaining additional information.
Criteria	**(12) Regulatory requirements**
Explanation	Depending on the nature of the improvement works, various resource consents may be required to be able to proceed.
Matters to be considered	(a) The nature of the works and what resource consents will be required, including the time frame for securing the necessary consents. (b) Consent compliance issues, i.e. whether consent is already in place that requires specific works within a defined timeframe.
Criteria	**(13) Odour and visual nuisance**
Explanation	A particular overflow location may have a recent and ongoing history of complaints about odour and/or visual effects due to the presence of gross floatable solids.
Matters to be considered	(a) The number of people affected and the frequency of overflows that generate the odour or visual effects. (b) Available options, if necessary, to reduce the extent of odour and visual effects.
Criteria	**(14) Historical community concerns**
Explanation	Circumstances may exist that may result in historical community concerns about a particular overflow location although neither the likelihood of discharges associated with it nor the potential effects are sufficient to prioritise the works.
Matters to be considered	(a) Known community concerns about a particular overflow location, and the reasons for this concern. (b) Options, if necessary, for reducing the adverse effects.

4 APPLICATION OF THE BPO METHODOLOGY TO DETERMINING ALTERNATIVE DISCHARGE FREQUENCIES

Condition 9 of the Comprehensive Wastewater Network Discharge Permit sets out the discharge frequencies to be achieved for the wastewater network, specifically an average of no more than two *Wet Weather Overflow Events* per *Engineered Overflow Point* per year. This discharge frequency generally applies to the separated wastewater network, particularly those parts of the network that have been designed to function as a separated network.

An alternative discharge frequency may be determined through the BPO methodology where this frequency cannot be achieved, generally because the network is old, was designed as a combined network and retains many of the features of a combined network, or is still combined.

This determination is generally made when the Wastewater Network Improvement Works Programme is developed, as part of the Wastewater Network Strategy. However, there may be occasions when *Engineered Overflow Points* need to be constructed that have not been identified as part of the Wastewater Network Improvement Works Programme. Such works are authorised through conditions 24 to 29 of the Comprehensive Wastewater Network Discharge Permit.

The BPO methodology applicable to the determination of alternative discharge frequencies for specific overflow points uses the same criteria considering risk and effects that are the basis of the Wastewater Network Improvement Works Programme BPO. However, as the decision-making process is limited to determining an acceptable overflow frequency for a specific overflow point, the level of detail required is less, and some criteria with a strategic focus are unnecessary.

The BPO criteria applicable to the determination of alternative discharge frequencies are set out below.

Criteria	**(1) Risk**
Explanation	Loss of service is primarily due to total or partial failure of the system as a result of poor asset condition. Deterioration of service occurs when the potential for overflows increases due to lack of capacity in the system, generally as a result of urban development. With respect to determining an acceptable discharge frequency for a single overflow point, the degree of risk (i.e. likelihood of asset failure) is important as this determines the urgency of the required works.
Matters to be considered	(a) Options for operational procedures that may improve asset conditions and/or prolong asset life. (b) Asset condition and likely time remaining until asset replacement becomes necessary, after relevant operational procedures (for example, re-lining of pipes) have been undertaken. (c) Results of relevant investigations and/or wastewater network modelling. (d) Expected changes/increases in population density (urban development), as advised by Auckland Council. (e) Frequency of wastewater overflows under current conditions and/or future frequencies expected as a result

	of increased urban development, or if asset failure occurs. (f) Potential effects of increased urban development upstream of the overflow points/catchment.
Criteria	**(2) Environmental Risk (Effects on the Environment)**
Explanation	Wastewater overflows have the potential to adversely affect public health, the ecology of the aquatic receiving environment into which they discharge, the cultural values of these receiving environments and the aesthetic enjoyment people may derive from the landscape or amenity in the vicinity of an overflow location. The frequency of overflows is an important factor as this determines the likelihood with which an adverse effect may occur. An assessment of effects in accordance with the *Methodology for the Assessment of Effects of Wet Weather Wastewater Overflows* is therefore an essential component of this BPO methodology.
Matters to be considered	(a) The value and sensitivity of the receiving environment, as determined through Watercare's *Methodology for the Assessment of Effects of Wet Weather Wastewater Overflows*. (b) The volume of the overflow. (c) The frequency of the wastewater overflow under current conditions and/or future frequencies expected as a result of increased urban development. (d) The potential for cumulative effects from wastewater overflows. (e) The characteristics of the discharge, i.e. whether the discharge originates in the combined system or the separated system.
Criteria	**(3) Cost-effectiveness**
Explanation	Watercare is required by legislation to minimise the costs of providing an effective service and maintaining the long-term integrity of its assets. It is therefore necessary to compare the cost-effectiveness of the available improvement options for the specific overflow location.
Matters to be considered	(a) Cost-effectiveness of available options.
Criteria	**(4) Short-Term Need**
Explanation	This factor is of particular importance in this context, as any available long-term solutions would have been considered in the Wastewater Network Strategy.
Matters to be considered	(a) The extent of the public health effect, with particular consideration of overflow frequency. (b) Availability and timing of a long-term solution that would provide the required Network capacity to eliminate or reduce the discharge. (c) Range of available options.

Criteria	**(5) Effectiveness of Available Options**
Explanation	In most instances, there is more than one option for reducing wastewater overflows and their potential effects.
Matters to be considered	(a) The reduction in frequency and/or volume that may be achieved by a particular option. (b) The degree to which the option depends on the implementation of other works.

Criteria	**(6) Opportunity to benefit from and/or link with projects undertaken by other network utility operators**
Explanation	Although it is likely that opportunities for joint projects would be identified at a more strategic level (i.e. the Wastewater Network Strategy) the potential for links to smaller scale projects exist.
Matters to be considered	(a) Options for joint projects with the Auckland Council Stormwater Unit, to achieve improved project outcome and/or cost savings. (b) Options for undertaking a Watercare project in conjunction with another network utility operator to minimise disruption to the public and/or save in construction costs.

Criteria	**(7) Consequential project/planning linkages**
Explanation	A specific project may, in itself, not achieve a significant reduction in overflows at a specific location, or present the best investment for the anticipated outcome. However, the project may be a key factor in minimising wastewater overflows within the catchment over time, in combination with other works. The need for an alternative discharge frequency may therefore exist only for a limited time, until associated projects can be implemented.
Matters to be considered	(a) Relationship of improvement works at the specific overflow location with other projects.

5 APPLICATION OF THE BPO METHODOLOGY TO DETERMINING THE LOCATION OF ENGINEERED OVERFLOW POINTS

In most cases, the location of Replacement or New Engineered Overflow Points will be determined when the Wastewater Network Improvement Works Programme is developed, as part of the Wastewater Network Strategy. However, there may be occasions when *Engineered Overflow Points* need to be constructed that have not been identified as part of the Wastewater Network Improvement Works Programme. Such works are authorised through conditions 24 to 29 of the Comprehensive Wastewater Network Discharge Permit.

Watercare is committed to ensuring that wastewater overflows from Engineered Overflow Points do not discharge directly to Class 1 (high value) recreational, ecological or cultural aquatic receiving environments. However, in some cases topographical or other constraints may severely limit the available options for determining the location of a potential wastewater overflow discharge.

The BPO methodology applicable to the determination of acceptable locations for specific overflow points uses the same criteria considering risk and effects that are the basis of the Wastewater Network Improvement Works Programme BPO. However, as the decision-making process is limited to matters of location, the level of detail required is less, and some criteria with a strategic focus are unnecessary.

The BPO criteria applicable to the determination of the location of engineered overflow points are set out below.

Criteria	**(1) Risk**
Explanation	Loss of service is primarily due to total or partial failure of the system as a result of poor asset condition. Deterioration of service occurs when the potential for overflows increases due to lack of capacity in the system, generally as a result of urban development. Where an existing asset is at risk, locational options are likely to be limited.
Matters to be considered	(a) Options for operational procedures that may improve asset conditions and/or prolong asset life. (b) Asset condition and likely time remaining until asset replacement becomes necessary, after relevant operational procedures (for example, re-lining of pipes) have been undertaken. (c) Results of relevant investigations and/or wastewater network modelling. (d) Expected changes/increases in population density (urban development), as advised by Auckland Council. (e) Potential effects of increased urban development upstream of the overflow points/catchment.

Criteria	**(2) Environmental Risk (Effects on the Environment)**
Explanation	Wastewater overflows have the potential to adversely affect public health, the ecology of the aquatic receiving environment into which they discharge, the cultural values of these receiving environments and the aesthetic enjoyment

	people may derive from the landscape or amenity in the vicinity of an overflow location. The frequency of overflows is an important factor as this determines the likelihood with which an adverse effect may occur. An assessment of effects in accordance with the *Methodology for the Assessment of Effects of Wet Weather Wastewater Overflows* is therefore an essential component of this BPO methodology, where these have not previously been undertaken.
Matters to be considered	(a) The value and sensitivity of the receiving environment, as determined through Watercare's *Methodology for the Assessment of Effects of Wet Weather Wastewater Overflows*. (b) The volume of the overflow. (c) The frequency of the wastewater overflow under current conditions and/or future frequencies expected as a result of increased urban development. (d) The potential for cumulative effects from wastewater overflows. (e) The characteristics of the discharge, i.e. whether the discharge originates in the combined system or the separated system.
Criteria	**(3) Cost-effectiveness**
Explanation	Watercare is required by legislation to minimise the costs of providing an effective service and maintaining the long-term integrity of its assets. It is therefore necessary to compare the cost-effectiveness of the improvement works being considered, both in terms of available options for specific projects and with respect to the relative effectiveness of different projects.
Matters to be considered	(a) Cost-effectiveness of available options/locations.
Criteria	**(4) Short-Term Need**
Explanation	This factor is of particular importance in this context, as any available long-term solutions would have been considered in the Wastewater Network Strategy.
Matters to be considered	(a) The extent of the public health effect, with particular consideration of overflow frequency. (b) Availability and timing of a long-term solution that would provide the required Network capacity to eliminate or reduce the discharge. (c) Range of available options.
Criteria	**(5) Effectiveness of Available Options**
Explanation	In most instances, there is more than one option for reducing wastewater overflows and their potential effects.
Matters to be considered	(a) The reduction in frequency and/or volume that may be

	achieved by a particular option. (b) The degree to which the option depends on the implementation of other works.
Criteria	**(6) Opportunity to benefit from and/or link with projects undertaken by other network utility operators**
Explanation	Although it is likely that opportunities for joint projects would be identified at a more strategic level (i.e. the Wastewater Network Strategy) the potential for links to smaller scale projects exist.
Matters to be considered	(a) Options for joint projects with the Auckland Council Stormwater Unit, to achieve improved project outcome and/or cost savings. (b) Options for undertaking a Watercare project in conjunction with another network utility operator to minimise disruption to the public and/or save in construction costs.
Criteria	**(7) Consequential project/planning linkages**
Explanation	A specific project may, in itself, not achieve a significant reduction in overflows at a specific location, or present the best investment for the anticipated outcome. However, the project may be a key factor in minimising wastewater overflows within the catchment over time, in combination with other works. The need for an overflow point in the location being considered may not be permanent as other improvement works may allow for relocation at a later stage.
Matters to be considered	(a) Relationship of improvement works with other related works.

APPENDIX 3: HEALTHY WATERS BPO (ALTERNATIVES) ASSESSMENT

ST MARY'S BAY WATER QUALITY IMPROVEMENT PROGRAMME:

Medium-term Option 'BPO' (Alternatives) Assessment

Additional information requested by Auckland Council compliance to support consenting of the programme team preferred medium-term option:

The St Marys Bay and Masefield Beach Improvement Project

November 2017

Auckland Council
Te Kaunihera o Tāmaki Makaurau

1. Introduction

Auckland Council Healthy Waters (HW) proposes to undertake a project to reconfigure and renew its existing outfall assets that discharge overflows from Watercare's combined sewer network directly onto St Marys Bay and Masefield Beach. The project is known as 'The St Marys Bay and Masefield Beach Improvement Project' (the Project). The Project was selected as a preferred medium-term option for improving water quality during the Phase 1 of the St Marys Bay Water Quality Improvement Programme in 2016.

The purpose of this document is to provide additional information on the selection of the Project as the preferred medium-term option. Compliance with the requirements of the Resource Management Act is therefore demonstrated in terms of meeting the requirements of the 'Best Practicable Option' assessment, this is required by the process specified in Watercare's Network Discharge Consent (NDC).

This document supports the application from Auckland Council Healthy Waters and Watercare Services Limited for Managers Approval under the NDC to relocate the discharge points for the 5 existing EOPs and consolidate these at a single Harbour location further offshore.

2. Background

All discharges from the combined sewer network are authorised by Watercare's Network Discharge Consent (NDC). The current discharges on to St Marys Bay and Masefield Beach, comprise overflows from 5 Type 2 Engineered Overflow Points (EOPs) discharging through 3 Healthy Waters outfalls.

The current function of the existing HW outfalls is to safely convey and discharge overflows from the Watercare combined sewer network into the receiving environments that they are currently authorised to discharge to. In a Regulatory sense, Healthy Waters is not responsible for these managing discharges from its outfalls, however as the asset owner it is responsible for the outfall maintenance and operation. This is the reason that Healthy Waters is leading and delivering this project and Watercare is supporting with respect to discharges. The arrangement of asset ownership and operation is a legacy from the formation of Auckland Council. This type of joint planning for the combined sewer areas of Auckland was mandated at the time of Auckland Council formation and formalised through the 2010 Detailed Partnership Schedule, in recognition of the fact that stormwater and wastewater would be administered by 2 separate organisations.

3. Summary of Objectives

3.1. Phase 1 Programme

The St Mary's Bay water quality improvement programme was initiated in April 2016 in response to continuing community and Westhaven Marina complaints to Auckland Council network operators about the frequency of combined sewer overflows to the Bay, with accompanying public health and aesthetic risks. The objective of Phase 1 of the programme (April through December 2016) was to set objectives for the programme and then identify, assess and determine preferred improvement measures to meet these objectives, reporting on this to Council executives before the end of the year.

3.2. Overarching Programme Objectives

The primary objective of all projects assessed as part of the St Marys Bay Water Quality Improvement Programme is to meet the programme specific objectives developed by the Programme Team, namely:

1. *To enable contact recreation to occur safely in St Mary's Bay*
2. *To reduce and remove contaminant loads to the Bay as far as is practicable*
3. *To develop a programme of work that will progressively achieve this as quickly as practicable*
4. *To invest in projects to progressively achieve this; aligning these projects with long-term plans as far as is practicable*

In August 2016 the programme team identified a suite of potential improvement projects for the Bay, and recognised that these would have very different levels of complexity, engineering design, operational implications, construction risk, community involvement and innovation potential. Consequently, the group identified three project subsets based on the timeframe in which meaningful progress/implementation could be made for the various projects.

- Short term (1 – 2 years)
- Medium term (3 – 5)
- Long term (5 – 10 years+)

3.3. Specific Objectives for Medium term projects

In terms of meeting overarching programme objectives, the objectives of a medium-term project were further specified as follows:

"The objective of short to mid-term projects is to provide public health protection benefit by significantly reducing the number of harmful pathogens entering the water (at St Marys Bay). These projects cannot be implemented immediately because of the funding, planning and construction timeframes associated with them".

" The projects are able to be implemented and achieve specified benefits within a 2 -5 year timeframe".

In order to meet Council family asset and business objectives and to improve alignment between proposed projects the following criteria were also assessed for medium term projects:

i. Acknowledge that a long-term plan needs to be implemented for the wider combined sewer network. This plan will be complex and require significant funding. As far as practicable short and medium term improvement projects should be a logical "first step" towards achieving a long-term strategy and not preclude its effective implementation
ii. Projects should minimise 'wasted' cost by not building or minimising the building of assets that will not be functional in the long term
iii. Projects should maximise overall benefits to the community by catering for areas other than St Mary's Bay as far as practicable.

iv. Where possible, projects should take advantage of current or near-future requirements for asset renewal and upgrades, minimising additional cost to that already programmed by Council and CCOs.

Projects should aim to provide the maximum "Whole of Community Value" for "Minimum Total Community Cost" (i.e. minimum cost irrespective of owning utility – remembering all are benefitting and billing the same ratepayers).

4. Medium-Term Options

4.1. Note on the Do-Nothing/ Status-Quo Option

A do-nothing approach was rejected by programme participants on the grounds that it fails to meet programme objectives. The 'do-nothing' approach was not assessed as a viable medium-term option. Continued discharge in the medium to long term of overflows at a frequency of over 100 per annum to St Marys Bay is not acceptable.

4.2. Assessed Options

The following options were assessed:

	Medium Term (2 – 5years to benefit)	Description /Objective
SM1	Combined Sewer Overflow Storage facilities prior to discharge	To investigate whether full /partial storage of CSO volumes, with pump back to the combined network is technically feasible and what it would cost
SM2	Stormwater storage facilities in catchment	To investigate whether stormwater only storage could be installed in the catchment and released slowly once rainfall and flows subside, whether this is technically feasible and what it would cost
SM3	Screening and Disinfection of CSOs	To investigate whether full /partial disinfection of the overflow is beneficial (in context of total contamination load) and technically feasible and what it would cost
SM4	Piped Diversion/s of CSOs to other locations	To investigate whether diversion is technically feasible and what it would cost
SM5	Bioremediation /Bioengineering	To investigate options for bioremediation and present on what these could be, technical feasibility, benefits, risks and whether this could be a viable means of improving water quality
SM6	Living Machines to treat discharges	To investigate whether installation of a "Living Machine" could be a viable means of providing water treatment for full/partial flow, useful as part of an educational or innovation initiative and whether it is technically feasible and what it would cost
SM7	Network Separation	To investigate whether networks separation is feasible in the medium-term and what it would cost
SM8	Outfall reconfiguration (also incorporating elements of storage and diversion)	To investigate whether improvements to St Marys Bay could be aligned with the urgent need to renew the failed Masefield Beach outfall (adjacent Bay)

5. Assessment Summary

5.1. Initial Assessment of Options

	Medium Term (2 – 5 years to benefit)	Assessment Summary
SM1 /SM2	Combined Sewer Overflow Storage facilities prior to discharge/Stormwater storage facilities	• These options are constrained by the same technical factors - there are very few spaces around St Marys Bay available to construct storage tanks, the ground conditions in these spaces are not good for construction of such facilities and the volumes required to reduce overflows are large (4000 – 6000 m3). Without diversion to another area, it is unlikely that storage of this size can even be constructed just for St Marys Bay and the cost of the construction for St Marys Bay alone is unlikely to be justifiable for either Healthy Waters or Watercare. • Highly likely that some form of outfall will need to be constructed or retained (into St Marys Bay) as the existing network sewers will not have capacity to receive the full stored volumes • Could result in stranded asset depending on long-term network solution • Not preferred
SM3	Screening and Disinfection of CSOs	• The capital cost is in the order of 15M and operating cost is very high (over $200k per annum) • It reduces the frequency of untreated overflows from twice a week to twice a month – further reduction is not possible as construction areas are highly space constrained in terms of space for the treatment plant - higher capacity becomes very technically difficult and expensive. • From a technical perspective, disinfection process feasibility cannot be guaranteed on highly variable CSO flows to meet recreational swimming standards – therefore uncertain that this approach can meet overarching programme objectives (although it would represent some progressive improvement in the medium term) • Does not benefit areas other than St Marys Bay • Installation of significant infrastructure (including screenings plant and collection) in St Marys Road park (most feasible hydraulic option to intercept Hackett St) will impact adversely on use of this space as Park land • Sunk investment – once long-term network strategy has been decided on – the disinfection plant will be stranded assets as installing similar sorts of infrastructure at all other overflow points in the combined network is not preferred by Healthy Waters or Watercare (for reasons of cost, impacts on the public and technical feasibility as above). • Not preferred

SM4	Piped Diversion/s of CSOs to other locations	• This option is considered technically feasible. • Diversion out of St Marys Bay was considered very desirable and could be joined up with need to replace Masefield Beach outfall, however the programme team would strongly prefer to see some reduction in wastewater contamination level, rather than simply 'shifting the problem around', even as an interim step towards the long term. This option would need augmentation in order to be acceptable to the programme team.
SM5	Bioremediation /Bioengineering	Can not be constructed at a scale that can meet medium-term water quality objectives
SM6	Living Machines to treat discharges	Can not be constructed at a scale that can meet medium-term water quality objectives

5.2. Further Development and Assessment of Options

Following on from the initial assessments, the technical team was challenged to consider and develop further options that better met programme and business objectives. The following additional options were developed and taken through a feasibility assessment. Both were found to be technically feasible. They were then compared to determine a preferred option.

	Medium Term (2 – 5 years to benefit)	Update
SM7	Network Separation (separate the stormwater and wastewater networks)	This option involves complete separation of the combined network into separate stormwater and wastewater networks. The existing combined network would be retained for service so only one additional network would need to be constructed. Networks separation is a potential long-term option and the team considered whether significant improvement could be made in the medium-term using this approach. The following sub-options were considered: • Full separation by constructing new WW network (capital cost 22M for St Marys catchment alone) • Full separation by constructing new SW network (capital cost 26M + pipe rehabilitation costs of existing network for St Marys catchment alone) ○ At the time it was noted that the cost did not include any significant upgrades required for the existing combined network, irrespective of whether it would be retained for wastewater or stormwater purposes • Partial separation (i.e. only installing the new public drains and then either forcing or waiting for the individual householders to connect, making them pay for the connection). This option is not preferred as could be highly contentious, unsupported by the community and there is a very high risk full water quality benefits could never be

		achieved if individual households did not consent /wish to pay for this Issues with network separation as a medium- term solution are: • Experience in NZ and elsewhere indicates that water quality improvements are often not achieved (including conclusion of Watercare's recent international review panel) – i.e. often you don't get all the wastewater out of the stormwater and vice versa) and that planned costs blow out. • Significantly more disruptive to the community than retaining and utilising the existing network • Significantly more programme risk through consent process due to the need to obtain approval from every landowner and dig up every street • Significantly more disruption to other utility providers (Auckland Transport, gas, electricity and communications providers) • In order to achieve water quality benefits all households must be separated and all necessary local and trunk network remediation and upgrades must be completed • In order to achieve the same benefits as SM8, the full cost of separation of the Sarsfield drainage sub-catchment would need to be added as well as the renewal cost for the Masefield Beach outfall, this will double the cost as a minimum • The networks in these catchments are extremely old and complicated. There is a risk that separation may not be technically feasible or found to be uneconomic this can only be determined after considerably more detailed analysis • The full cost is very hard to estimate due to the above and also the need to consider the remedial and capacity upgrades required to local and trunk sewers • Implementing separation precludes a potential long-term network strategy of retaining and augmenting the combined sewer network in the longer-term o It was noted that separation should not be discounted as a longer-term option
SM8	Outfall reconfiguration (St Marys Bay and Masefield Beach Improvement Project)	This option was developed as a combination of storage and diversion and adds a contamination reduction component in the form of a new pump station that will return flows to the existing branch sewers when capacity is available. This project is fully described in the Managers Approval application document. The full outturn cost of the project was estimated at 44M. This is a conservative estimate and includes the cost of renewal of the Masefield Beach outfall. This makes it comparable in cost to full wastewater separation (which was not preferred by Watercare) and less expensive than stormwater separation (preferred by Watercare) even if the costs of additional

		remediation and network capacity upgrades are not factored in.
		
		SM8 is preferred as a medium-term project because:
		
		• The option is considered to have a significantly lower **cost risk** (the full scope of work to deliver the project can be well defined), **benefit risk** (achieving the water quality benefits does not rely on a complex series of upgrades that may or may not be able to be realised within 5 years) and **programme risk** (significantly less consenting and approvals risk)
		• A long-term network strategy for the northern combined catchments is being developed by Healthy Waters and Watercare. This will either comprise extensive network separation or purposeful retention and augmentation of the combined network.
		• SM8 was developed so that a functional asset base can be retained irrespective of which strategy is selected.
		  ○ If the long-term network management strategy is retention of the combined network, the new pipeline from Hackett to Sarsfield can be replumbed into a new combined sewer interceptor or pump station.
		  ○ If the long-term strategy is separation, the existing combined network pipes and new diversion pipe and outfall will be retained to convey stormwater only. If separation takes some time to successfully implement, the new outfall system will safely convey contaminated stormwater away from the beaches out to a more dispersive receiving environment

APPENDIX 4: HEALTHY WATERS OUTFALL ALTERNATIVES ASSESSMENT

Appendix 4

ST MARYS BAY WATER QUALITY IMPROVEMENT PROGRAMME:

Medium-term Option – Preferred Outfall Location

Additional information requested by Auckland Council compliance to support Managers Approval of the programme team preferred medium-term option:

The St Marys Bay and Masefield Beach Improvement Project

December 2017

1. Introduction

Auckland Council Healthy Waters (HW) proposes to undertake a project to reconfigure and renew its existing outfall assets that discharge overflows from Watercare's combined sewer network directly onto St Marys Bay and Masefield Beach. The project is known as 'The St Marys Bay and Masefield Beach Improvement Project' (the Project). The Project was selected as a preferred medium-term option for improving water quality during the Phase 1 of the St Marys Bay Water Quality Improvement Programme in 2016.

This document supports the application from Auckland Council Healthy Waters and Watercare Services Limited for Managers Approval under Watercare's NDC to relocate the discharge points for the 5 existing EOPs and consolidate these at a single Harbour location further offshore, via a new marine outfall that replaces the existing failed marine outfall at Masefield Beach.

The purpose of this document is to provide additional summary information on the selection of replacement marine outfall location. A full description of the project and background is provided in other application documents

2. Background

The Project proposes to divert overflows from 5 existing EOPs away from existing onshore discharge locations at St Marys bay (via two existing outfalls) and Masefield beach (via one existing outfall) further out into the Waitemata Harbour. This will provide a discharge location with significantly improved dilution and dispersion than that achieved in the nearshore environment. This represents a diversion of the combined sewer overflows to an improved location (as defined under the Network Discharge Consent).

In addition, the project will also reduce the total amount of wastewater contamination of the Waitemata Harbour as the diversion pipeline also acts as an in-line storage tank. This means that many of the overflows that are currently discharged to the beaches can be captured, for later return to the trunk sewer via a new pump station. In large rainfall events when there is no capacity in the trunk sewer, the new marine outfall will be used to discharge overflows to the Harbour channel. These overflows will be dilute and contain less wastewater than many of the current small overflows.

The Harbour channel is a preferable receiving environment (due to much lower overall public exposure risk, and as it will allow better dilution and dispersion) and overall there will be much less wastewater discharged into the Waitemata. However, construction and operation of significant infrastructure in the Coastal Marine Area requires examination of available alternatives so that impacts from both construction and operation can be minimised.

In order to examine potential locations for the outfall and the differences between them in terms of construction and operation, the project team carried out an options study looking at:

1. Potential Outfall locations
2. Hydrodynamic impacts at each site (dispersion modelling)
3. Constructability
4. Cost
5. Impacts on ecology and coastal processes
6. Impacts on the public, Mana Whenua, NZTA and other stakeholders
7. Overall risk

3. Outfall Options Assessment

3.1. Preamble

There are limited options available for construction of the replacement as the terminal shaft for the project needed to be at the Masefield Beach end of the pipeline for hydraulic reasons. Once the terminal shaft location had been determined (north of Pt Erin park), several options for the replacement outfall alignment were identified.

3.2. Potential Outfall locations

The outfall alignments in the context of the overall project alignments are shown in Figure 1 . The outfall options and their surrounds are shown in Figure 2 overleaf.

Figure 1 Outfall alignments in the overall project context

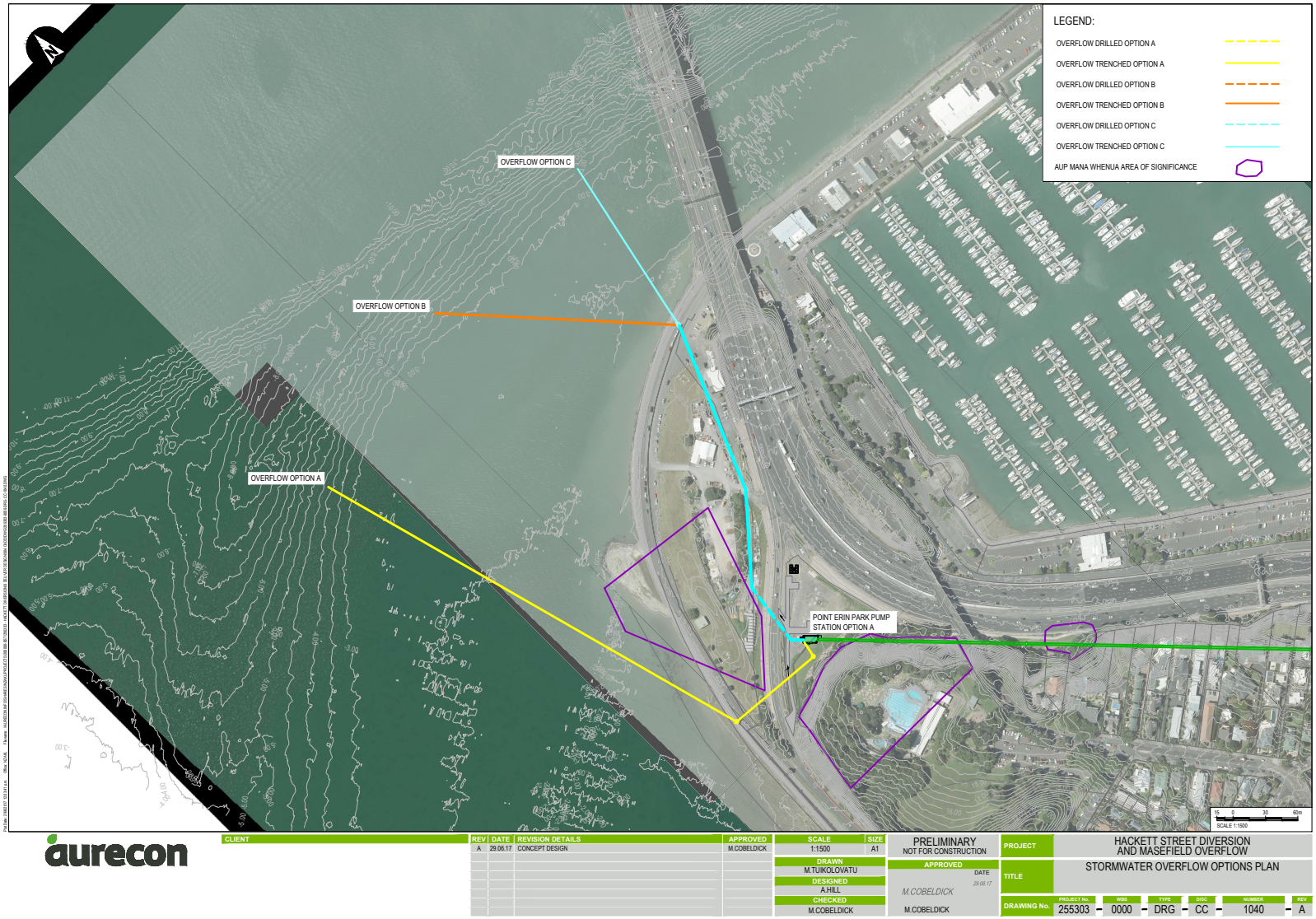


Figure 2 Outfall Alignment Options

3.3. Comparison of Outfall options

Table 1 Summary of Options Assessment

	Option A (Easternmost)	Option B (Central)	Option C Westernmost)
Hydrodynamic Performance There is no significant difference between the options from a dispersion perspective, as the performance of all options would result in discharges from the outfall resulting in E Coli concentrations less than Safeswim amber alert levels (i.e. be considered low risk for public exposure). However, the modelling shows that option A does give a marginally better dispersion relative to options B and C..	Best relative dispersion	Moderate relative dispersion	Worst relative dispersion \
Impacts on marine environment (ecology and coastal processes) Specialists have been engaged to examine the impacts from construction and ongoing operation of the outfall. The full reports will form part of the consent application. The reports conclude that none of the options have significant lasting impacts on the marine environment from construction or operation, from either an ecological or coastal processes perspective. From an ecological perspective there are minor temporary impacts during construction from Option A which potentially could disrupt an existing horse mussel bed, however the mussels are considered to have low ecological value and it is considered that they will recover as the disturbance is not large and only temporary.	Moderate impact during construction – longest outfall length	Lower impact- shortr	Lower impact
Impacts on Mana Whenua There are several areas of interest to Mana Whenua as identified in the Unitary Plan. In addition, ongoing consultation with Mana Whenua has stressed the historical importance of this area. Although consultation to date indicates that the project can be supported by Mana Whenua in general, no outfall alignment is 'preferred' by Mana Whenua – rather all alignments must seek to avoid or minimise impacts to the marine area.	No difference– all alignments to avoid to the extent practicable the marine area of interest (Te Routu o Ureia).		

Impacts on the Public	Least impact on public during construction When constructed (during operations), furthest from public activities		Closest to public activities such as AJ Hackett bungee jumping and local recreational fishing
Constructability (technical assessment) Construction of the marine outfall is not considered overly problematic or risky. Ground investigations confirm this. All options will need to cross two road sections and the sea wall. This is not a differentiating factor. All options will need to take account of services that cross this area, including a significant water main. The land-based section of the marine outfall will need to be constructed across old reclaimed fill. There is considerable risk with this construction in terms of contamination and ground conditions.	Shortest land based construction – least amount of services to disrupt – lowest construction programme risk	Longest land – based construction, highest risk, may clash with Skypath and Panuku development of harbour bridge Park.	Longest land – based construction, highest risk, may clash with Skypath and Panuku development of harbour bridge Park
Cost Risk Capital cost was not considered to be a differentiating factor all estimates are within the order of accuracy for estimates at this stage of the project. The relative cost risk for options was considered.	Shortest land-based construction – lowest cost risk.	Highest cost risk due to unknown conditions across longest land based construction	Highest cost risk due to unknown conditions across longest land based construction
NZTA Input NZTA own the land and are the Requiring Authority for the project site (it is designated Strategic highway Corridor). Therefore NZTA are a key stakeholder. NZTA prefer Option A as it has the lowest impact on their operations, both during construction and operation.	Lowest impact on operations during construction	Moderate/ high impact on operations during construction	Moderate/ high impact on operations during construction
Overall Impacts and Risk	Preferred	Least Preferred	Least Preferred

Option A is preferred as it

- Provides the best dispersion of flow
- Has the least impact on stakeholders
- Is preferred by NZTA
- Has the lowest constructability, programme and cost risk

Further assessment has been carried out on Option A.

4. Preferred Outfall Location

The preferred location is shown below. More detailed assessment of this location has been undertaken, including detailed dispersion modelling over a full time series to determine operational impacts. As shown in Figure 3, it is likely that an envelope will be applied for during consent for the outfall and final alignment will be decided on in conjunction with Man Whenua and other stakeholders.

Figure 3 Engineering Outline Plan showing Outfall Option A

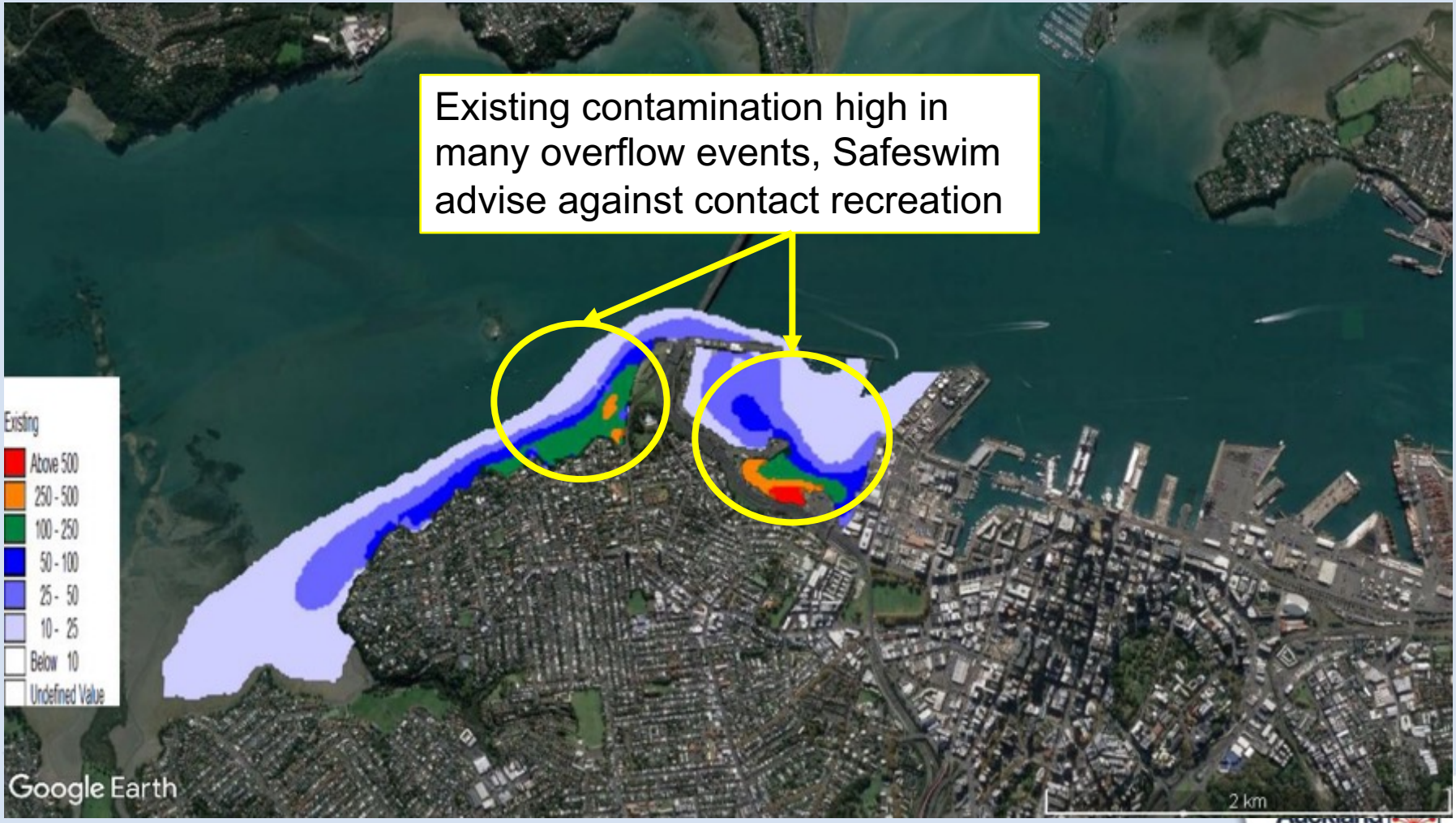
More detailed hydrodynamic modelling of this outfall location was undertaken. The model shows that the discharges from this outfall are rapidly diluted to very low levels (below Safeswim 'green' levels). An analysis of shoreline points was undertaken and shows that there is some contamination from the existing overflows for a reasonable extent of shoreline. Once the project has been commissioned, contamination from these 5 overflows is negligible.

Attachment 1 summarises this – from a presentation given to the Local Community. Although this dispersion modelling is not strictly needed for the purposes of Managers Approval, the project team recognised the need for some technical assessment to provide assurance to the community that adequate dispersion can be achieved and that areas such as Herne Bay and Home Bay will not suffer additional contamination from this project. The analysis explicitly only focuses on discharges from the 5 EOPs that are impacted by the project.

It needs to be stressed that the St Marys Bay /Masefield Beach Improvement project is a local, medium-term improvement project for the 5 EOPs that currently impact on St Marys Bay and Masefield Beach and that further initiatives will be required to reduce contamination from other overflows. This longer term improvement is the focus of the Western Isthmus Water Quality Improvement Programme (WIWQIP) being jointly undertaken by Watercare and Healthy Waters.

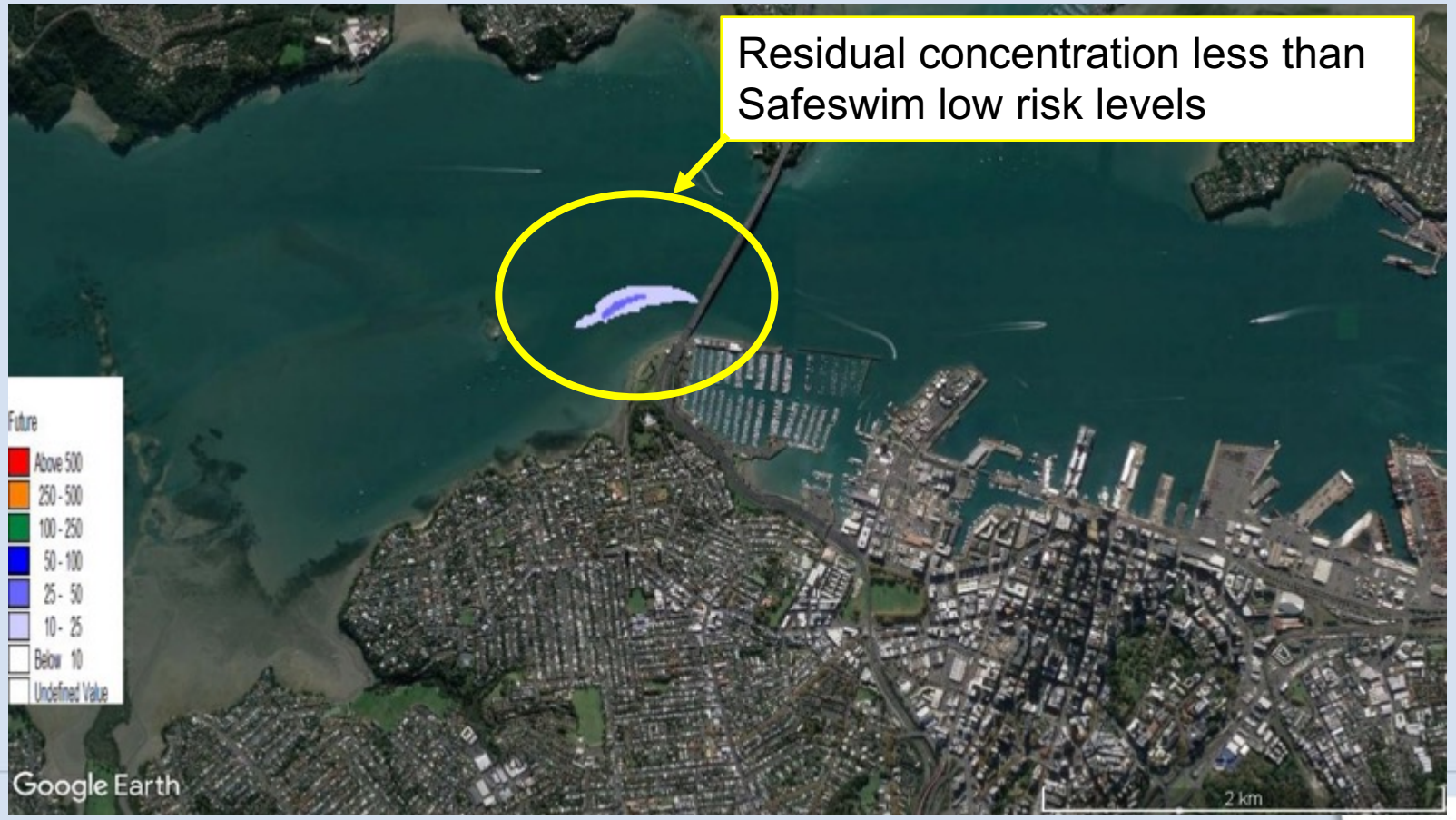
Extent of contamination – existing situation

(from the 5 project EOPs)



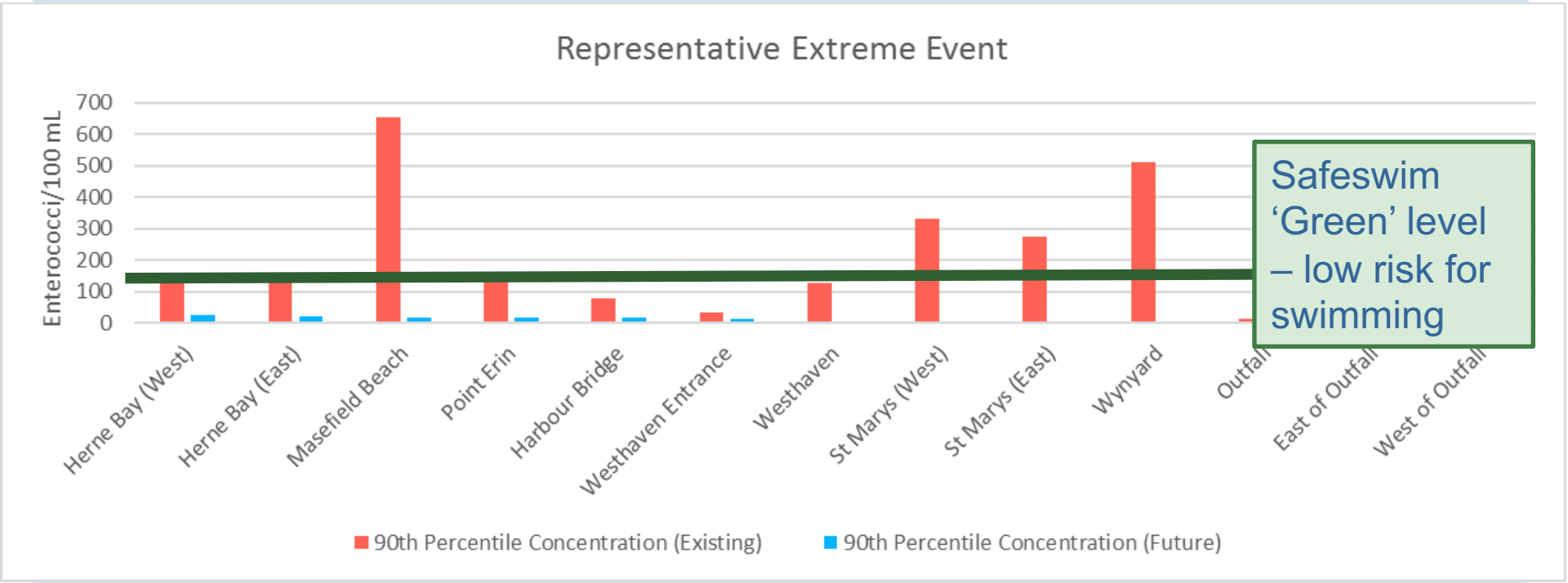
Extent of contamination – after commissioning

(from 5 project EOPS)



Impacts on local sites

Impacts on local sites from these EOPs in adverse conditions and very high rainfall – before and after commissioning



Safeswim 'Green' level – low risk for swimming

90% of the time, concentrations are lower than this

Auckland Council

APPENDIX 5: HEALTHY WATERS DETAILED RECEIVING ENVIRONMENT ASSESSMENT

The following assessment of environmental effects and risk has been undertaken by Healthy Waters for the existing situation in accordance with the approach set out in Attachment 5 of the NDC.

St Marys Bay – Existing Situation

Step 1 – Receiving Environment Classification

The direct receiving environment for discharges associated with rainfall related overflows from the combined sewer network from EOPs 172, 180, and 1020 is St Marys Bay (Bay), an embayment west of the Ports of Auckland. The EOPs discharge via two separate stormwater outfalls which are located within the sea wall formed at the edge of the reclamation for Westhaven Drive.

Contact recreation within St Marys Bay is frequent, with hundreds of boats berthed at Westhaven Marina and numerous clubs operating within the Bay, including the Auckland Dragon Boating Association and the Auckland Waka Ama Association. Recreational activities also take place along the coastline of the Bay, including a board walk that runs parallel to Westhaven Drive. St Marys Bay is also part of the Auckland Council's Safe Swim monitoring programme. Based on this information, the Bay has been given a Recreation value of Class 1.

Previous ecological studies undertaken along the harbour edge, including at Westhaven Marina, have identified moderate to low benthic species diversity, low abundance, and a dominance of polychaete worms and juvenile crabs. Several small molluscs (*Theora lubrica* and *Philine auriformis)* have been recorded in low numbers. Overall, the biological communities in the RE are dominated by relatively common and opportunistic species. The Ports of Auckland area and Westhaven Marina are subject to regular maintenance dredging and there are significant stormwater discharges and associated contamination within the immediate receiving environment. There are no specific ecological values identified in the Coastal Plan or the Auckland Unitary Plan. On this basis, a Class 3 Ecological value has been assigned for the purpose of this assessment.

The Bay is part of the Auckland Waterfront, and has been subject to significant alteration since the mid-1880s, with multiple reclamations and coastal developments. As a result of these reclamations, multiple cultural heritage sites have been lost or significantly modified. Point Erin is a known pā that provided a fishing base, with adjacent beaches within the Bay favourable for hauling out and storing waka. Ko Takerehaea (CHI 12769 and SSMW 62) is located inland of the motorway near the original coastline, and immediately upstream of the EOP discharge locations into St Marys Bay. Whilst the EOPs are greater than 50 m from any identified cultural site, given the importance of the Waitematā as a whole, a Cultural Value of 'very important' for the purposes of this assessment has been adopted.

The Bay is heavily utilised by recreational boaters with berths at Westhaven Marina and by the boat building and maintenance industry located on the eastern shores of the Bay. Amenity values on the coastline therefore reflect these water uses and vary from Silo Park to Westhaven Marina. Despite these variations, on-going efforts by Panuku are aiming to improve the amenity of the area over time. The Westhaven Plan has identified the following objectives:

- A smart working waterfront – supporting the growth of marine industries;
- Blue-green waterfront – development aligned with national and international best environmental practices;

- A connected waterfront – providing high quality pedestrian, cycle, boat, and vehicle access to all users;

- A public waterfront – to create Westhaven as a premier park with acknowledgement of Maori and maritime culture and heritage; and
- Liveable waterfront – to integrate with the CBD waterfront.

Due to the easy public access available to nearby residents and recreational boaties, the aesthetic values have been assigned a 'high' value.

Figure A5.1: Direct Receiving Environment for St Marys Bay from EOP IDs 172, 180, and 1020

The Bay's direct receiving environment has been classified as follows:

RE Name	Type	Recreation	Ecology	Cultural	Aesthetic
St Marys Bay	Beach	Class 1	Class 3	Very Important	High

Step 2 – Discharge Characteristics

The two discharge locations via stormwater outfalls into St Marys Bay are in close proximity to each other. Given the characteristics of the Bay, they have been combined for assessment, with a total discharge frequency per year of 99 and a total expected average volume of discharges being 63,400 m^3 per year. Therefore, expected discharges are characterised as High Frequency (>12 discharges per year) and expected volumes are in the High range (>10,000 m^3 per year).

Predicted discharges are estimated to be on average approximately 11,400 m^3 per year.

Step 3 – Public Health Effects

High volume discharges to beaches with Class 1 Recreational values are assessed as having a **high effect** on all recreational activities.

Step 4 –Ecological Effects

High volume discharges to beaches with Class 3 Ecological values are assessed as having **predominantly low effects** on ecological values.

Step 5 – Assessment of Cumulative Effects

The discharges via the stormwater outfalls are within a 250 m stretch of coastline. The EOPs are predicted to discharge at a frequency of 1 – 2 times per week or greater.

The assessment of public health and ecological effects on the Bay has already been undertaken on the basis of combining the volume and frequency of these predicted discharges, and has resulted in the highest effects category possible. A further cumulative effects assessment is not necessary and would not change the outcome of the assessment.

Step 6 – Assessment of the Risk of Public Health and Ecological Effects

Risk is conventionally defined as the combination of the likelihood of an event (with respect to wastewater overflows, this is expressed as frequency) and the consequences of an event (with respect to wastewater overflows, the effects as assessed in Steps 3 and 4 above).

The "risk profile" for public health and ecological effects is generated by combining the effects with the overflow frequency range, as shown below.

Risk Profile for Public Health and Ecological Effects

Discharge Frequency Range	Effects Score				
	5 Very High	4 High	3 Moderate	2 Low	1 Very Low
High	Very high	Very high	High	Moderate	Low
Medium	Very high	High	Moderate	Low	Very low
Low	High	Moderate	Low	Very low	Very low

Colour key:

Colour	Assigned level of risk
	Very high - high
	Moderate
	Low – very low

EOP IDs 172, 180, and 1020 have been assessed together, and their combined discharge frequency range is 'high' as shown in the above table as red. It is important to note that the overflow volume range is used for determining effects, and therefore does not influence the risk rating.

To summarise Steps 3 and 4 above, the 3 EOPs have a 'high' effect on recreational values (shown in the above table in orange), and a predominantly 'low' effect on ecological values (shown in the above table in green (based on the high recreational by low ecological classification of the receiving environment.

The public health and ecological risk profiles are therefore as follows:

EOP	Public Health Effect	Ecological Effect	Overflow Frequency Range	Public Health Risk	Ecological Risk
172, 180, and 1020	**High**	**Low**	**High**	**Very High**	**Moderate**

Step 7 – Assessment of the Risk of Cumulative Effects

This assessment has already been undertaken on a combined basis therefore an additional assessment of the risk of cumulative effects is not necessary.

Steps 8 and 9 – Assessment of Cultural Effects and the Risk of Cultural Effects

For the purpose of this assessment, the direct receiving environment for discharges from EOP IDs 172, 180, and 1020 have been assigned a very important cultural value.

High volume discharges from overflows to culturally very important receiving environments are considered to have 'very high' effects. High frequency discharges have a very high risk of cultural effects as set out in the table below.

Risk Profile for Cultural Effects

Discharge Frequency Range	Effects Score			
	Very High	**High**	**Moderate**	**Low**
High	Very high	Very high	High	Moderate
Medium	Very high	High	Moderate	Low
Low	High	Moderate	Low	Very low

Step 10 and 11 – Assessment of Aesthetic Effects and the Risk of Aesthetic Effects

The Bay's receiving environment was identified as having High aesthetic values. High volume discharges to such an environment have a High effect on these values.

Aesthetic Effects Scale

Discharge Volume Range	Effects Score	
	High Value	**Low Value**
High	High	Low
Medium	High	Low
Low	High	Low

Because the overflows occur with a High frequency, the risk is assessed as being High, using the risk profile below.

Risk Profile for Aesthetic Effects

Discharge Frequency Range	Effects Score	
	High Value	Low Value
High	High	Low
Medium	Moderate	Low
Low	Low	Low

Summary

A combined assessment of effects was undertaken of discharges to the Bay due to their close proximity of the stormwater outfalls to each other. This represents the worst case scenario should discharges occur at the same time.

The combined effects from discharges to the Bay receiving environment in the existing situation is considered to be very high for cultural values, high for public health and aesthetic values, and low for ecological values.

The overall risk of effects is assessed as 'moderate' for ecological values, 'high' for aesthetic values and 'very high' for cultural and public health values.

As the discharge is from a combined sewer network, the wastewater loads of the discharge are diluted with stormwater. Notwithstanding this, modelling undertaken indicates that the volume of wastewater loads in the existing discharge is still high.

St Marys Bay – with Completion of The Project

Step 1 – Receiving Environment Classification

The St Marys Bay direct receiving environment has been classified as follows:

RE Name	Type	Recreation	Ecology	Cultural	Aesthetic
St Marys Bay	Beach	Class 1	Class 3	Very Important	High

Step 2 – Discharge Characteristics

Discharges from the existing three EOP IDs 172, 180, and 1020 will be captured, stored and diverted via the new pump station and during extreme rainfall discharges are expected to occur through the new outfall at the new discharge location. It is estimated that discharges directly to St Marys Bay will be an average of two times per year in high rainfall events. Therefore, expected discharges with The Project are characterised as low frequency (<2 overflows per year) and are anticipated to be low volumes on an annualised average basis. but may occasionally be high volume in very heavy rainfall events.

Predicted wastewater loads in the discharges to St Marys Bay with the Project, given the dilution with stormwater within the combined system, are estimated to be on average approximately 20 m^3 per year, with the remainder of flow uncontaminated stormwater.

Step 3 – Public Health Effects

Low frequency, high volume and very dilute (minimal wastewater) discharges to beaches with Class 1 Recreational values are assessed as having a **moderate** effect on all recreational activities. The discharges to St Marys Bay will only occur on average two times per year in heavy rainfall – further reducing the public exposure risk as conditions are unlikely to be favourable to use of the bay at the time these sorts of rainfall events are occurring.

Step 4 – Ecological Effects

Low volume discharges to beaches with Class 3 Ecological values are assessed as having **very low effects** on ecological values.

Step 5 – Assessment of Cumulative Effects

The discharge locations for overflows from EOP IDs 172, 180, and 1020 are within a 250 m stretch of coastline. With the Project in place, any discharges to St Marys Bay would have a low frequency discharge. The assessment of public health and ecological effects on St Marys Bay has already been undertaken on the basis of combining the volume and frequency of these discharges. A further cumulative effects assessment is not necessary and would not change the outcome of the assessment.

Step 6 – Assessment of the Risk of Public Health and Ecological Effects

With the Project in place, the public health and ecological risk profiles for St Marys Bay have been assessed, as:

EOP	Public Health Effect	Ecological Effect	Overflow Frequency Range	Public Health Risk	Ecological Risk
172, 180, and 1020	**Moderate**	**Very Low**	**Low**	**Low**	**Very Low**

Step 7 – Assessment of the Risk of Cumulative Effects

Because this assessment has already been undertaken on a combined basis, an additional assessment of the risk of cumulative effects is not necessary.

Steps 8 and 9 – Assessment of Cultural Effects and the Risk of Cultural Effects

As previously, the direct receiving environments of EOP IDs 172, 180, and 1020 within St Marys Bay have been assigned a 'very important cultural value. Any discharge of contaminated water is considered highly undesirable by Mana Whenua and any residual discharges will result in cultural effects. However, as compared to the existing situation, the effects at Masefield Beach will be removed and those at St Marys Bay and for the wider Waitemata will be reduced (due to the capture and return to sewer of wastewater, reducing overall wastewater discharged). The risk of cultural impacts on St Marys Bay is reduced, while that of the specific outfall location is increased.

Healthy Waters has been working with Mana Whenua through Panuku forums and with a formal Project Working Group. It must be acknowledged that Mana Whenua has a strong preference that no wastewater be discharged to any water receiving environment. However, Mana Whenua understand that the path towards improvement must be taken in steps and in good faith are largely supportive of The Project as an achievable medium-term improvement and the first step towards wider network improvements and further reduction in overflows.

Step 10 and 11 – Assessment of Aesthetic Effects and the Risk of Aesthetic Effects

The St Marys Bay receiving environment was identified as having high aesthetic values. Low volume discharges to such an environment have a high effect on these values. The discharges with the Project will occur with a Low frequency therefore the risk is assessed as being low.

Summary

With the Project in place, the change to any discharges means there is a significant change to the effects and risk profile at St Marys Bay. Any effects to public health have been reduced to moderate, with a low risk profile. Ecological effects are considered to be very low, with a very low risk profile. As cultural and aesthetic values are high and the risk profile reduces from moderate to a low risk profile.

Masefield Beach – Existing Situation

Step 1 – Receiving Environment Classification

The direct receiving environment for discharges from EOPs 194 and 196 is via an outfall directly onto Masefield Beach, an embayment west of Point Erin. The coastline of the bay is largely unmodified along its western shore, but has been significantly modified on its eastern shore due to reclamations associated with the construction of the Auckland Harbour Bridge and the Curran Street on-ramp. Overflows from 194 and 196 are discharged via the same 70 m long partially submerged stormwater outfall located at Masefield Beach.

Contact recreation occurs within Masefield Beach. The local beach is a known swimming place for some locals and dogs, and the beach is also utilised in organised swim events. Fishing occurs to the north of the beach along the Curran Street seawall adjacent to the Auckland Harbour Bridge, and a shared path runs along this seawall catering for runners and cyclists. Given the use of the beach for contact recreation, a Class 1 Recreational Value has been assigned.

No specific ecological values have been attributed to Masefield Beach in either the Auckland Coastal Plan or the Auckland Unitary Plan. An ecological assessment undertaken for the Project characterised the intertidal area as comprising a mix of exposed sandstone reef and boulders, with communities typical of those found in the broader area. The existing intertidal habitats were found to be highly modified with degraded ecological values. The sub tidal area contains habitats that are likely to be locally significant, particularly the horse mussel and sponge beds. The ecological assessment noted that Masefield Beach and the surrounding area are intensively fished by recreational fishers. Pohutakawa-lined sandstone cliffs edge the western side of Masefield Beach. Whilst the existing environment is degraded, given the outcome of the ecological assessment the Beach has been given a Class 2 ecological value.

Masefield Beach is located to the west of the culturally significant Point Erin pā, and includes Te Routu o Ureia (Taniwha's Comb), a formation of partially submerged coastal reef formation where the coastal taniwha (Ureia) would 'rub his body'. The formation has been partially covered with the Curran Street reclamation, but is still visible during low tide within the embayment. Freshwater streams once flowed down to this beach, and it was a significant fishing and harvesting spot. This area is scheduled as Wahi Tapu under the Historical Places Act 1993. Given this, the beach has been given a Very Important cultural rating.

Amenity values within the beach include value provided by the mature pohutukawa and other native cliff line vegetation running along the residential western coastline, and the current and planned amenities within Point Erin Park and Auckland Harbour Bridge Park along Curran Street. Views across the beach extend out to Watchman's Island and the Chelsea Sugar Factory across the Harbour. Given the public access provided along Curran Street and existing amenity, the beach has been given a high Value aesthetic value.

Figure A5.2: Direct receiving environment for Masefield Beach

The Masefield Beach direct receiving environment has been classified as follows:

RE Name	Type	Recreation	Ecology	Cultural	Aesthetic
Masefield Beach	Beach	Class 1	Class 2	Very Important	High Value

Step 2 – Discharge Characteristics - Existing

The discharges from the two EOPs have an estimated frequency of on average 107 per year, with an estimated average annual volume of 38,400 m^3 per year. This is considered to be a high frequency (> 12 overflows per year) and within the high volume range (> 10,000 m^3 per year).

The predicted wastewater loads within the discharge, taking into account dilution with stormwater in the combined system, has been estimated to be on average approximately 6,900 m^3 per year to Masefield Beach.

Step 3 – Public Health Effects

High volume discharges to beaches with Class 1 recreational values are assessed as having a **high effect** on all recreational activities.

Step 4 – Ecological Effects

High volume discharges to beaches with Class 2 ecological values are assessed as having **predominantly high effects** on ecological values.

Step 5 – Cumulative Effects

The assessment of Masefield Beach has been undertaken on a combined basis as overflows from the two EOPs discharge through the same stormwater outfall. Another stormwater outfall is located on Masefield Beach which also discharges directly onto the beach. It is understood that this outfall discharges stormwater only.

Step 6 – Assessment of the Risk of Public Health and Ecological Effects

The public health and ecological risk profile for EOPs 194 and 196 are shown below.

EOP	Public Health Effect	Ecological Effect	Overflow Frequency Range	Public Health Risk	Ecological Risk
194 and 196	High	High	High	**Very High**	**Very High**

Step 7 – Assessment of the Risk of Cumulative Effects

This assessment has been undertaken on a combined basis, and an additional assessment of the risk of cumulative effects is not necessary.

Steps 8 and 9 – Cultural Effects and Associated Risk

As noted previously, Masefield Beach has been assessed as having Very Important cultural values. The combined discharges have high volume therefore cultural effects are assessed as Very High. The overall risk profile for potential cultural effects is high.

Step 10 and 11 – Assessment of Aesthetic Effects and the Risk of Aesthetic Effects

Masefield Beach has been identified as having High aesthetic value. High volume discharges to such an environment have a High potential effect on these values and therefore the risk profile for aesthetic effects is also high.

Summary

A combined assessment of effects was undertaken at the combined discharge point at Masefield Beach. The effects of wastewater overflows to this receiving environment under the existing situation range from High (public health, ecological and aesthetic effects) to Very High (cultural effects). The risk to public health and ecological values is very high and the risk to cultural and aesthetic values is high. It is noted that even if just the wastewater loads were used, rather than the combined stormwater and wastewater discharge volume, this would not significantly change the conclusions, as the proportion of wastewater is currently high.

Current Situation - Summary of Receiving Environments, Effects, and Risks to Receiving Environments

A re-classification of the receiving environment for EOP IDs 172, 180, 1020, 194, and 196 has been undertaken in accordance with Attachment 5 of the NDC, and using the additional information that has been collated as part of The Project. A summary of the assessment is provided in the following table (A5.1).

Overall the risk profile for the existing situation has not changed for discharges to St Marys Bay and Masefield Beach from what was previously submitted for the NDC. Whilst the NDC does not recognise the dilution that is provided by stormwater in the discharge from the combined sewer network, the wastewater loads in the discharge are relatively high.

Table A5.1: Current Situation - Summary of Receiving Environments, Potential Effects, and Risks to Receiving Environments

Receiving Environment Name			**St Marys Bay**	**Masefield Beach**
Type			Beach	Beach
Class	Recreational		Class 1	Class 1
	Ecological		Class 3	Class 2
	Cultural		Very Important	Very Important
	Aesthetic		High	High
EOP ID			172, 180, 1020	194, 196
Volume Range (combined stormwater and wastewater)			High >10,000 m^3 p.a.	High >10,000 m^3 p.a.
Frequency Range			High (>12 p.a.)	High (>12 p.a.)
Potential Effects	Public Health	Combined Volume	High	High
	Ecological	Combined Volume	Low	High
	Cultural	Combined Volume	Very High	Very High
	Aesthetic	Combined Volume	High	High
Potential Risk	Public Health	Combined Volume	Very High	Very High
	Ecological	Combined Volume	Moderate	Very High
	Cultural	Combined Volume	Very High	Very High
	Aesthetic	Combined Volume	High	High

Masefield Beach – with Completion of The Project

There will no longer be any direct discharges to Masefield Beach following completion of the Project.

Summary of Receiving Environments, Potential Effects and Risks to Receiving Environments with the Completion of The Project

A summary of the assessment is provided in Table A5.2, following implementation of the Project and the changes to the receiving environment.

There are significant benefits to St Marys Bay and Masefield Beach following implementation of the Project. The risk profile to St Marys Bay is significantly reduced across all of the criteria, with public health and aesthetic now low, ecology very low and cultural risk moderate. There is no longer any direct discharge to Masefield Beach.

The new main discharge point into the Waitematā Harbour is considered a better receiving environment, as a harbour provides better dilution and dispersion, this coupled with the reduced wastewater loads in the discharges means that overall there is anticipated to be a significant improvement over the existing situation. However, due to the way the NDC categorises discharges, the discharge is still a 'high volume" and high frequency' discharge, and therefore overall the risk rating associated with the discharge ranges from moderate to very high. Importantly, however, the total number of discharges to the Waitematā Harbour is reduced from a combined total of 206 (to St Marys Bay and Masefield Beach) to approximately 22 times per year, which is a significant improvement.

Categorisation of the Receiving Environment with the Project - Effects Assessment and Risk Assessment

The 'new' single direct receiving environment for all five EOPs will be the mid-stream Waitematā Harbour. An assessment of the changes with the Project to St Marys Bay and Masefield Beach has been provided below.

Waitematā Harbour – with the Completion of the Project

Step 1 – Receiving environment classification

The new direct RE for discharges from EOP IDs 172, 180, 1020, 194, and 196 will be the mid-stream Waitematā Harbour, following the completion of the Project.

Contact recreation in and around the mid-stream Waitematā Harbour is infrequent, although as discussed above there are some across harbour swim events that start from Masefield Beach. Fishing occurs along the Curran Street seawall adjacent to the Auckland Harbour Bridge, and a shared path runs along this seawall catering for runners and cyclists. Fishing also occurs further out in the main channel. As contact recreation (swimming event) is substantially less than in other more popular areas, the Waitematā Harbour in this location has been given a Class 2 Recreational value.

No specific ecological values have been attributed to the Waitematā Harbour in this vicinity in either the Auckland Coastal Plan or the Auckland Unitary Plan. An ecological study undertaken as part of this project has indicated that ecological values are low due to the degraded environment near the proposed position of the outfall. It is noted that the proposed outfall specifically avoids the sub tidal area known to contain habitats that are likely to be locally significant (particularly the horse mussel and sponge beds). Therefore, the Waitematā Harbour in this vicinity has been attributed a Class 3 Ecological value.

The site of the proposed discharge is located to the west of Te Routu o Ureia (Taniwha's Comb), a formation of partially submerged coastal reef formation where the coastal taniwha (Ureia) would 'rub his body'. The formation has been partially covered with the Curran Street reclamation, but is still visible during low tide within the embayment. This area is scheduled as Wahi Tapu under the Historical Places Act 1993. Given this, the Waitematā Harbour in this vicinity has been given a Very Important cultural rating.

The Waitematā Harbour in this vicinity has a moderate level of public accessibility, however there are plans to improve and increase public accessibility by Auckland Council. There are plans to construct 'Skypath' within the next few years, which would enhance the aesthetic value. For the purpose of this assessment, a High aesthetic value has therefore been assigned to the Waitematā Harbour (CBD Edge).

Based on the available information, the Waitematā Harbour in this vicinity as the direct RE has been classified as follows:

Receiving Environment Name	Type	Recreation	Ecology	Cultural	Aesthetic
Waitematā Harbour	Harbour	Class 2	Class 3	Very Important	High

Step 2 – Discharge Characteristics

The combined frequency of discharges from the proposed outfall is expected on average to be up to 22 times per year. This is characterised as high frequency range (> 12 overflows per year) range.

On average, the combined volume of discharges is expected to be approximately 34,000 m^3 per year. This is characterised as high volume range (>10,000 m^3 per year).

Step 3 – Public Health Effects

High volume discharges to harbours with Class 2 Recreational values are assessed as having a **moderate to high effect** on all recreational activities.

Step 4 – Ecological Effects

High volume discharges to harbours with Class 3 Ecological values are assessed as having a **predominantly low effect** on ecological values, as Harbours provide some dilution and/or flushing.

Step 5 – Cumulative Effects

The assessment of cumulative effects is, not necessary as the five EOPs will discharge to the same location via one outfall.

Step 6 – Assessment of the Risk of Public Health and Ecological Effects

For ease of reading, the guidance table for public health and ecological risk from the NDC is repeated below.

The discharge has a high frequency range and is a high volume discharge. This results in a public health effect conservatively categorised as High, and a Low ecological effect. The corresponding public health risk is very high, and the risk of ecological effects is moderate.

Risk Profile for Public Health and Ecological Effects

Discharge Frequency Range	Effects Score				
	5 Very High	4 High	3 Moderate	2 Low	1 Very Low
High	Very high	Very high	High	Moderate	Low
Medium	Very high	High	Moderate	Low	Very low
Low	High	Moderate	Low	Very low	Very low

Step 7 – Assessment of the Risk of Cumulative Effects

This assessment has been undertaken on a combined basis, and an additional assessment of the risk of cumulative effects from a single outfall combining the existing EPOs is not necessary.

Steps 8 and 9 – Cultural Effects and Associated Risk

The Waitematā Harbour in this vicinity has been assessed as having Very Important cultural values. Together, the discharge with high frequency and cultural risks are assessed as Very High.

Step 10 and 11 – Assessment of Aesthetic Effects and the Risk of Aesthetic Effects

The Waitematā Harbour has been identified as having a high aesthetic value. High volume discharges to such an environment have a high effect. As the discharges are expected to occur in the high frequency range, the risk is also high.

Summary

Overall the effects and risk profile associated with the new outfall and the proposed new discharge location for the existing EOPs has improved slightly as the new receiving environment is mid-stream in a harbour, with the ability to provide better dispersion and dilution. In particular, the ecological risk profile has changed from high risk to moderate risk. All other risk ratings remain the same due to the “high” frequency and “high” volume range attributed to the discharge; however, because the discharge location is moved further away from the shore, and given the significant reduction in wastewater loads in the proposed discharge, it is expected that the impact on contact recreation will be less.

Table A5.2: Summary of receiving environment Assessment with Completion of The Project

Receiving Environment Name		Waitematā Harbour	St Marys Bay	Masefield Beach
Direct / Indirect Receiving Environment		Direct	Direct	N/A
Type		Harbour	Beach	Harbour
Class	Recreational	Class 2	Class 1	Class 1
	Ecological	Class 3	Class 3	Class 3
	Cultural	Very Important	Very Important	Very important
	Aesthetic	High Value	High Value	High Value
EOP ID		194, 196, 172, 180, 1020	172, 180, 1020	None
Volume Range		High	Low	None
Frequency Range		High	Low	None
Potential Effects	Public Health	High	Moderate	N/A
	Ecological	Low	Very Low	N/A
	Cultural	Very High	High	N/A
	Aesthetic	High	High	N/A
Potential Risk	Public Health	Very High	Low	N/A
	Ecological	Moderate	Very Low	N/A
	Cultural	Very High	Moderate	N/A
	Aesthetic	High	Low	N/A