

Review of Environmental Factors

Refresh Vacluse Diamond Bay (June, 2020)

Sydney
WATER



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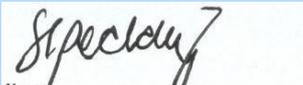


Determination

This Review of Environmental Factors (REF) assesses potential environmental impacts of the wastewater infrastructure at Vacluse and Diamond Bay and was prepared under Division 5.1 of the *Environmental Planning and Assessment Act 1979* (EP&A Act), with Sydney Water both the proponent and determining authority. The State Environmental Planning Policy (Infrastructure) 2007 allows the proposal to be carried out without development consent. The proposal has also been considered against the matters listed in clause 228 of the *Environmental Planning and Assessment Regulation 2000* (EP&A Regulation) (Appendix A).

During construction, the main potential environmental impacts of the proposal are typical construction impacts such as noise, visual, traffic and access and waste management. During operation, the main impacts are associated with visual amenity and potential odour. The assessment shows that if we adopt the measures identified in this REF, the proposal would not have a significant environmental impact. Accordingly, we do not require an Environmental Impact Statement (EIS). Once operational, the proposal will have positive impact on public health and the surrounding environment.

The Sydney Water Project Manager will make sure the proposal is carried out as described in this REF. If the scope of work or work methods described in this REF change significantly following determination, additional environmental impact assessment may be required.

Prepared by:	Reviewed by:	Endorsed by:
		
Dane Collins Environmental Scientist Integrated Systems Planning, Sydney Water Date: 1/6/2020	Sally Spedding Senior Environmental Scientist Integrated Systems Planning, Sydney Water Date: 1/6/2020	Murray Johnson Resource and Environment Manager Integrated Systems Planning, Sydney Water Date: 1/6/2020
Endorsed by:	Approved by:	



Bala Subramanian
Senior Project Manager
Delivery Management, Sydney
Water
Date: 1/6/2020



Paul Plowman
Liveable City Solutions General
Manager
Integrated Systems Planning,
Sydney Water
Date: 4/6/2020



1 Executive summary

Three ocean outfalls on the Vaucluse peninsula remain as the only outfalls on the NSW coast that continue to discharge untreated wastewater to the ocean. The ocean outfall at Vaucluse has been in operation since 1918, and the two outfalls at Diamond Bay have been in operation since the 1930s.

In 2016, the EPA issued a Pollution Reduction Program requiring Sydney Water to assess the level of risk to the environment and public health posed by these outfalls. In response to the findings of the pollution study, Sydney Water initiated the “Refresh Vaucluse Diamond Bay” proposal. In November 2018, the NSW Government announced its commitment to stop the continuous flow of untreated wastewater from the three ocean outfalls in Vaucluse and Diamond Bay.

The proposal involves transferring dry weather wastewater flows from the existing ocean outfalls to the Bondi Wastewater Treatment Plant. This would be achieved by constructing and operating two new wastewater pumping stations, new wastewater pipelines and ancillary infrastructure in the Vaucluse and Diamond Bay areas.

The principle objectives of the proposal are to protect public health and the environment. Once operational, the proposal would significantly reduce pollution to the environment by eliminating dry weather wastewater entering the environment from the three ocean outfalls. We anticipate a 93 percent reduction in the volume of untreated wastewater discharged to the ocean.

This Review of Environmental Factors assesses the potential impacts of the proposal on the surrounding environment. Our assessment concludes that the proposal is unlikely to have a significant adverse impact on the environment. On balance, the proposal will result in positive long-term improvements for the protection of public health and the environment. We now invite stakeholders and the community to comment on this assessment.



2 Introduction

2.1 Context

We provide water, wastewater, recycled water and some stormwater services to almost five million people. We operate under the Sydney Water Act 1994 and have three equal objectives to: protect public health, protect the environment and be a successful business.

We are a statutory State-owned corporation and are classified as a public authority, and a determining authority for the proposed work under Division 5.1 of the EP& A Act. This REF assesses the potential environmental impacts associated with the proposal, and identifies safeguards that avoid or minimise potential impacts.

Under the Protection of Environmental Operations (POEO) Act 1997, our wastewater systems are licenced by the EPA via an Environmental Protection Licence (EPL). The wastewater system in Vaucluse and Diamond Bay is licenced under the Bondi EPL 1688.

2.2 Proposal background

In November 2018, the NSW Government announced its commitment to address the flow of untreated wastewater from three ocean outfalls at Vaucluse and Diamond Bay. To address this issue, Sydney Water proposes to construct and operate wastewater infrastructure at Vaucluse and Diamond Bay (the proposal), which will redirect untreated wastewater through the wastewater network to the catchment of Bondi WWTP for treatment, mitigating the associated risks to water quality and public health. The location of the proposal and the existing outfalls is shown in Figure 1.

The proposal will include the construction and operation of the following key components:

- wastewater pumping station and storage at Parsley Bay, Vaucluse
- wastewater pumping station and storage at Eastern Avenue Reserve, Diamond Bay
- wastewater mains connecting the pumping stations to the existing outfalls and network.

The two wastewater pumping stations at Vaucluse and Diamond Bay would be constructed at or around existing ground level. The wastewater mains would be constructed underground by a mix of open trenching and trenchless methods.

The key components of the proposal and indicative construction footprint, including sections of wastewater mains that would be constructed by trenched or trenchless methods, are shown in Figures 1 to 5.



During normal operation, the proposal will redirect untreated wastewater through the wastewater network to the catchment of Bondi WWTP for treatment. During wet weather, when the catchment is at full capacity, wastewater may flow through the existing ocean outfalls.



Figure 1 – Proposal location



Legend

- Proposed underground wastewater pipeline (open trench construction)
- Proposed underground wastewater pipeline (trenchless construction)
- P Proposed pump station
- Existing outfall
- Waterway
- Roads



Map is indicative and not to scale – proposed locations are subject to change during the detailed design phase

DATA SOURCES:
NSW LPI DTDB/DCDC 2018
SIXMAPS 2020
SYDNEY WATER 2020

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2.2.1 Proposal need

The wastewater system on the South Head Peninsula is different from the rest of Sydney.

A legacy from Sydney's early network, wastewater from the peninsula is not treated. Instead, it flows directly into the ocean at three locations, called "ocean outfalls". These outfalls are located at Vaucluse and Diamond Bay.

There have been a number of previous investigations to address the ongoing discharge of untreated wastewater from the Vaucluse and Diamond Bay outfalls, including proposals to either treat locally or transfer the wastewater to the nearby wastewater treatment plant.

In 2016 the EPA issued a Pollution Reduction Program (PRP 305) to Sydney Water, which required Sydney Water to assess the level of risk to the environment and public health posed by the outfalls. The resulting pollution study (Sydney Water 2017) completed by Sydney Water found that the:

- extent of the visible plume is larger than previously understood
- number of people accessing the area for recreational purposes (spear fishing, swimming, rock fishing) each year is greater than had been estimated previously
- risk to public health was rated 'very high' for anyone accessing the area in the immediate vicinity of the outfalls for primary contact use
- risk to the aquatic ecosystems was rated as 'high' due to the outfalls operating continuously.

In response to the findings of the pollution study, we instigated the 'Refresh Vaucluse Diamond Bay' proposal to revisit, further plan and assess options to address the discharges from the three outfalls. On 7 March 2018, Sydney Water announced it was investigating options to deliver a permanent solution to re-direct untreated wastewater away from the ocean outfalls at Vaucluse and Diamond Bay in Sydney's east. Further to the announcement, Sydney Water commenced detailed planning work and stakeholder consultation. Options development and assessment has also been informed by input from the Community Reference Group that was formed by Sydney Water early in the process to ensure community values were included in the decision-making process.

2.2.2 Proposal objectives

The principle objectives of this proposal are to protect public health and the environment. In implementing these objectives, Sydney Water will achieve the following outcomes:

- reduce risks to human health
- enable environmental improvement by reducing discharge of untreated wastewater to the environment

- reduce plastic and other solid waste in our waterways.

2.2.3 Consideration of alternatives/options

A long-list of options was developed and grouped into four broad or 'similar' options as described below:

- Option 1 – Build a new wastewater treatment plant on the peninsula. Two sub-options were investigated. They differed according to the level of treatment (primary and secondary stage treatment plants) and how the treated wastewater was discharged (via a new deep-ocean outfall or via existing cliff-face ocean outfall).
- Option 2 – Transfer wastewater to Bondi WWTP via the existing wastewater network at Rose Bay and Dover Heights.
- Option 3 – Transfer wastewater to Bondi WWTP via a new direct route (building a new wastewater network). Four sub-options utilizing either larger (1200 mm or greater) or smaller pipes (300 mm) were investigated.
- Option 4 - Transfer wastewater to either Bondi WWTP or North Head WWTP via a sea route. Three sub-options were investigated, one to Bondi WWTP, one to North Head WWTP, and the third option was a cliff-face pipe to Bondi WWTP.

A culling process was developed which reduced the ten long list options to a short list of three options. The options culling process was contributed to by an internal Sydney Water stakeholder group as well as the CRG. These groups provided key inputs to assist the proposal team in options development, options culling, issue management and decision-making.

Assessment of the three short-listed options was undertaken. This assessment looked at constraints of each of the options in relation to constructability, geotechnical limitations of the area, environmental impacts, social/ community and financial impacts. A value management study workshop which included a Multi Criteria Analysis (MCA) was completed by Sydney Water's internal stakeholder group. The workshop identified the preferred option as well as proposal opportunities, improvements, risks and assumptions, all of which contributed to the proposal outcome. The three short listed options are detailed in Table 1 below.

Table 1 - Summary of shortlisted options

Shortlisted Option	Description
Option 2 (preferred option)	Transfer wastewater to Bondi WWTP by connecting to the existing wastewater system (Rose Bay submain)
Option 3A	Transfer wastewater to Bondi WWTP via a new wastewater system (direct land route)
Option 4A	Transfer wastewater to Bondi WWTP via a new wastewater system (sea route)

Options 3A and 4A were eliminated from further study on the basis of higher cost, higher risk and higher impact to local communities, when compared with Option 2. Furthermore, the discarded options had little to no added benefit in terms of reducing untreated wastewater discharges to the ocean.

Sydney Water also shared the shortlisted options with the CRG members at the 3rd meeting of the group to obtain their feedback. They also indicated their preference to move forward with Option 2 as the preferred option.

2.2.4 Preferred option

Option 2, which transfers wastewater to Bondi WWTP via the existing network at Rose Bay and Dover Heights, was adopted as the preferred option. The preferred option is shown in Figure 1-2 below and a detailed description is presented in Section 6.

For the selected option, a pumping station at Parsley Bay will transfer peak dry weather flow from the Vaucluse catchment to the west arm of the Rose Bay submain where it will flow to Bondi WWTP to be treated and discharged via the existing deep ocean outfall. This location was selected due to proximity to Vaucluse Ocean Outfall, as well as reduced overall environmental and community impacts compared to other options. Similarly, a pumping station at Eastern Reserve will transfer flow from the Diamond Bay catchments to the Bondi WWTP by connecting it to the eastern arm of the Rose Bay submain.

Under wet weather conditions, when the wastewater system reaches capacity, transfer of wastewater to the Rose Bay submain will cease and instead, will be directed to the existing ocean outfalls. Over a ten-year period, we estimate that there will be around 254 events of this nature. The selection of this pumping station site was substantially restricted by available land, as well as proximity to existing wastewater infrastructure, including the two ocean outfalls at Diamond Bay which needed to be intercepted.

The selected option will not result in any dry weather overflow, nor will it result in any wet weather performance deterioration in overflows to the harbour. It will however reduce the volume of untreated wastewater discharged to the ocean by 93 percent.

2.3 Consideration of Ecologically Sustainable Development

The proposal has been considered against the principles of ecologically sustainable development (ESD) (refer to Table 2 below).

Table 2 - Consideration of principles of ecologically sustainable development (ESD)

Principle	Consideration in proposal
<p>Precautionary principle - <i>if there are threats of serious or irreversible environmental damage, lack of scientific uncertainty should not be a reason for postponing measures to prevent environmental degradation. Public and private decisions should be guided by careful evaluation to avoid serious or irreversible damage to the environment where practicable, and an assessment of the risk-weighted consequences of various options.</i></p>	<p>The proposal will not result in serious or irreversible environmental damage and there is no scientific uncertainty relating to the proposal. The new wastewater infrastructure will provide environmental benefits to receiving waterways by reducing untreated wastewater currently being discharged by 93%.</p>
<p>Inter-generational equity - <i>the present generation should ensure that the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations.</i></p>	<p>The proposal will help to meet the needs of the present and future generations by providing an improved wastewater service that reduces risk to human health, prevents environmental degradation and results in cleaner waterways.</p>
<p>Conservation of biological diversity and ecological integrity - <i>conservation of the biological diversity and ecological integrity should be a fundamental consideration in environmental planning and decision-making processes.</i></p>	<p>The proposal will not significantly impact on biological diversity or impact ecological integrity. The proposal will occur in an urban environment and involve minor vegetation clearing of non-threatened plant or landscape species at Parsley Bay and Diamond Bay. Impacts and safeguards are discussed further in Section 6.2.2.</p>
<p>Improved valuation, pricing and incentive mechanisms - <i>environmental factors should be included in the valuation of assets and services, such as 'polluter pays', the users of goods and services should pay prices based on the full life cycle costs (including use of natural resources and ultimate disposal of waste) and environmental goals</i></p>	<p>The proposal will provide cost efficient use of resources and provide optimum outcomes for the community, environment and with respect to financial cost.</p>



3 Proposal Description

3.1 Proposal details

The proposal involves new wastewater infrastructure in the Vaucluse and Diamond Bay areas to re-divert untreated wastewater from the Vaucluse and Diamond Bay ocean outfalls to the Bondi WWTP for treatment. We aim to achieve this by constructing two new wastewater pumping stations, as well as wastewater pipelines and ancillary infrastructure. The proposal will ensure that Sydney Water satisfies regulatory requirements, and minimises community and environmental impacts.

In summary, the works will include:

- the transfer of dry weather wastewater flow from the Vaucluse and Diamond Bay Ocean Outfalls to Bondi WWTP
- the construction of two new wastewater pumping stations, one at Parsley Bay (SP1216) and one at Eastern Avenue Reserve (SP1217)
- the construction of a new 1.8 km wastewater pipeline from Parsley Bay to Carlisle St, at a depth of up to 60 m
- the construction of wastewater infrastructure, including reticulation pipelines, maintenance holes and ventilation points in Vaucluse and Diamond Bay.

The proposal will stop the continuous flow of untreated wastewater to the ocean and reduce the volume of untreated wastewater discharged to the ocean by 93 percent.

3.2 Proposed activities

3.2.1 Pre-construction work

Pre-construction activities include geotechnical and soil sampling surveys as well as locating existing underground services.

We will also:

- prepare management plans and procedures including a Construction Environmental Management Plan (CEMP), a Community and Stakeholder Engagement Plan (CSEP), site inductions and safety plans
- liaise with local authorities (Woollahra and Waverley Councils), as well as other external stakeholders, such as Ausgrid and Telstra, to obtain any necessary approvals, including prior notification, in accordance with Sydney Water's community relations protocols, of any works being undertaken on or adjacent to private property

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- establish and mark out the designated construction area, and areas for material, machinery and storage
 - set up traffic control at each work location
 - prepare the site including any vegetation removal
 - set up temporary construction compounds, including site sheds, amenities and associated infrastructure, such as connecting services (electricity, water and wastewater)
 - deliver and store materials and equipment.

3.2.2 Construction – wastewater pump stations at Parsley bay and Eastern Avenue Reserve

The main activities during construction include:

- the removal and replacement of structures, such as the amenities block at Parsley Bay
- civil and structure works such as excavating for the wet wells (approximately 5 m diameter and 7 m deep) and new localised wastewater reticulation pipelines into each pump station
- install new equipment associated with each pump station, such as pumps, valves, pipework, electrical kiosks and ventilation points (approximately 14 m high)
- install new buried and above ground services (electrical, communication)
- modify the operation of the existing wastewater network by diverting flow away from the existing ocean outfalls.

3.2.3 Construction – wastewater pipelines

The Vacluse wastewater pipeline (approximately 1.8 km long) will be constructed by horizontal directional drilling (HDD) due to the depth of the pipeline (up to 60 m). The main activities are:

- establishing a launch pit within the car park at Parsley Bay and a receival pit on Carlisle Avenue (pits are about 5 m by 8 m and up to 6 m deep)
- set up of groundwater dewatering equipment (to be confirmed)
- installing a thrust block and drilling rig in the launch pit
- drilling of the underbore
- stringing out the pipe from the launch pit at Parsley Bay or at Carlisle Street (to be confirmed during detailed design)
- pulling the pipe through once the bore is complete.

The construction methodology for the HDD will be determined once the construction contractor has been selected. The pipe will either need to be strung out through the grassed reserve at Parsley Bay or from the Carlisle St end. The decision on pipe stringing or welding would be influenced by



community impacts and quality considerations. The option of pipe stringing into Parsley Bay has been discounted due to community and environmental impacts.

A section (approximately 240 m) of wastewater reticulation between Diamond Bay and Eastern Avenue Reserve will be constructed via microtunneling, which includes:

- dilapidation assessment for nearby properties and structures
- establishing a launch pit at Eastern Avenue Reserve and Ray Street and a receiveal pit at Diamond Bay near Isabel Street.

Wastewater reticulation is required along Oceanview Avenue, Carlisle Street, Dover Road, as well as near Kimberley Street and within Parsley Bay which will be constructed via open trenching. Some sections of wastewater reticulation within Parsley Bay bushland area may be constructed using trenchless methods to reduce environmental impacts. The main construction activities are:

- preparing the site
- occupancy of part Oceanview Avenue, Carlisle Street and Dover Road, in accordance with the approved Traffic Management Plan
- excavating trenches, including stockpiling spoil material beside trenches
- installing the pipelines
- backfilling the trench with compacted bedding material and excavated soil
- constructing maintenance holes and ventilation points (approximately three are required, one at each pump station and one at the western end of Oceanview Avenue).

Figure 2 – Scope of works, Parsley Bay



Legend

- Indicative construction footprint
- Parsley Bay proposed pump station indicative footprint
- Proposed underground wastewater pipeline (open trench construction)
- Proposed underground wastewater pipeline (trenchless construction)
- Cadastre



Map is indicative and not to scale – proposed locations are subject to change during the detailed design phase

DATA SOURCES:
NSW LPI DTDB/DCDC 2018
SIXMAPS 2020
SYDNEY WATER 2020

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Figure 3 – Scope of works Eastern Ave, Oceanview Ave and Diamond Bay

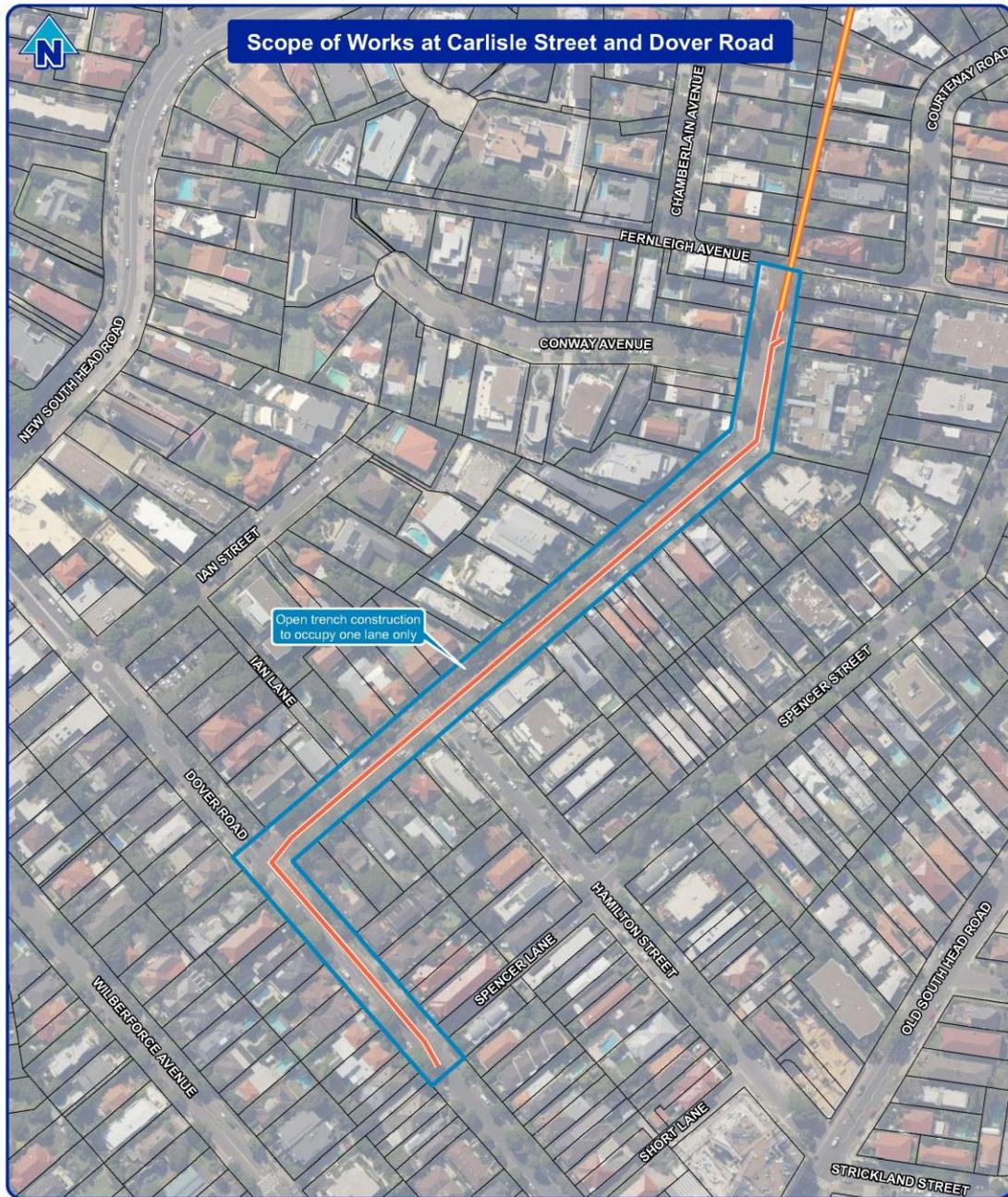


Legend

-  Indicative construction footprint
-  Diamond Bay proposed pump station indicative footprint
-  Proposed underground wastewater pipeline (open trench construction)
-  Proposed underground wastewater pipeline (trenchless construction)
-  Cadastre



Figure 4 – Scope of works, Carlisle St and Dover Rd



Legend

-  Indicative construction footprint
-  Proposed underground wastewater pipeline (open trench construction)
-  Proposed underground wastewater pipeline (trenchless construction)
-  Cadastre



Map is indicative and not to scale – proposed locations are subject to change during the detailed design phase

DATA SOURCES:
NSW LPI DTDB/DCDC 2018
SIXMAPS 2020
SYDNEY WATER 2020

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3.2.4 Commissioning

The main pre-commissioning and commissioning activities following the completion of construction include:

- provide all resources and undertake all activities to comply with the commissioning requirements of Sydney Water's Maintenance related clauses
- provide site labelling of pump station components
- prepare and test contingency plans for the pump station
- commission the pump station and associated assets.

3.2.5 Post construction works

Once construction and commissioning are complete, activities to complete the works include:

- dismantling the site, cleaning up and restoring areas
- reinstating impacted roadways and ground surfaces
- removing waste materials, machinery and excess materials
- replanting trees, and restoring grassed areas
- removing environmental controls, temporary fencing, site sheds, amenities and safety barriers
- fixing any defects during the liability period.

3.2.6 Operation

All new wastewater infrastructure will operate to meet EPL compliance and reduce community and environmental impacts. This is likely to involve access to the pumping stations by Sydney Water light vehicles 1-2 times per month. Access from time to time would also be required to the maintenance holes and ventilation points along the wastewater pipeline alignments.

3.3 Materials and equipment

The materials required to construct the proposal include:

- concrete and steel reinforcement, structural steel work, aluminium, stainless steel
- pipework, ductwork and vessels, made from stainless steel, fibreglass, PVC, Polyethylene, steel or concrete
- colourbond sheeting
- electrical cabling and conduits
- mechanical and electrical equipment
- roadbase and engineered backfill

- asphalt for sealing road surfaces
- fuel for equipment, machinery and vehicles
- painting and coating materials
- ancillary construction materials.

Equipment typically used during construction includes:

- backhoes, bobcats, excavators and drill rigs
- compactors, concrete vibrators and rollers
- tipper trucks
- concrete trucks and concrete pumping trucks
- mobile cranes
- compressors for pneumatic equipment
- generators and welding equipment.

3.4 Work sites, access and vehicle movements

Construction compounds may include sheds, stockpiles, parking and material storage. The indicative locations have been included in Figures 2 and 3 and will be confirmed during detailed construction planning with the contractor. The compounds and access points will be located on previously cleared and disturbed land away from any known environmental constraints to the greatest extent possible.

Approximately 30 light vehicle movements per day across the sites is estimated. Heavy vehicle traffic generation will fluctuate depending on the program of work. Most truck movements are expected at Parsley Bay and Eastern Avenue due to delivering construction material and equipment, as well as the removal of construction waste including spoil. It is expected that truck movements will peak at approximately 10 movements per day at each works location.

All sites will be accessed via existing public roads and access paths. The exception to this is Diamond Bay where a five metre wide access track will be required off Craig Avenue, as well as the bushland area of Parsley Bay to construct the wastewater reticulation pipelines.

Further details on traffic and access are provided in Section 6.1.9.

3.5 Workforce

The construction workforce is estimated to peak at around 40 people a day.

The construction workforce is likely to fluctuate each day, depending on the program of work, but would generally be around:

- 15 people at Parsley Bay
- 15 people at Eastern Avenue Reserve
- 10 people at Carlisle Street.

3.6 Working hours and proposal timeframe

Construction is expected to start in mid-2021 and finish in mid to late 2022. The following construction hours are proposed for this proposal:

- Monday to Friday – 7 am to 6 pm
- Saturday – 8 am to 1 pm
- Sunday and public holidays (no work).

The EPA's *Interim Construction Noise Guidelines* (ICNG) (DECC, 2009) acknowledges that the following activities have justification to be undertaken outside standard construction hours assuming all feasible and reasonable mitigation measures are implemented to minimise the impacts to the surrounding sensitive land uses:

- the delivery of oversized plant, equipment and materials that police or other authorities determine require special arrangements to transport along public roads
- emergency work to avoid the loss of life or damage to property, or to prevent environmental harm
- maintenance and repair of public infrastructure where disruption to essential services or considerations of worker safety do not allow work within standard hours
- public infrastructure works that shorten the length of the proposal and are supported by the affected community
- works where a proponent demonstrates and justifies a need to operate outside the recommended standard construction hours
- works which maintain noise levels below the noise management levels outside of the recommended standard construction hours.

We expect that most construction work will occur during standard daytime hours. However, should the need for any out of hours works be identified during detailed construction planning with the contractor, approval and further consultation will occur as per the process described in Section 6.1.8.

3.7 Changes to the scope of work

The proposal assessed in this REF includes construction, commissioning and operation activities as described above and is based on concept design prepared to date. Detailed design and construction may result in changes to these components.



If the scope of work or construction methods described in this document change significantly following the awarding of the contract and exhibition of the REF, supplementary environmental impact assessment must be prepared for the amended components. These proposal changes will be documented in a Decisions Report or REF addendum and displayed on Sydney Water's website.



4 Consultation

4.1 Community and stakeholder consultation

Our approach to community and stakeholder consultation is guided by the Policy and Guidelines for Community and Stakeholder Engagement (Sydney Water, 2019).

Stakeholder and community engagement is a planned process of initiating and maintaining relationships with external parties who have an interest in our activities. Community and stakeholder engagement:

- enables us to explain strategy, policy, proposals, projects or programs
- gives the community and stakeholders the opportunity to share their knowledge, issues and concerns
- enables us to understand community and stakeholder views in our decision-making processes alongside safety, environment, economic, technical and operational factors.

If our work will impact the community in some way, we will consult with affected groups through a variety of ways and through different stages of a proposal. This includes engaging the broader community and before making key decisions.

We will also provide local councils with reasonable notice when we would like to commence works, regardless of the need for development consent. Local council(s) will be consulted about: public safety issues, the placement of any temporary site sheds or laydown areas on council land, or full or partial road closures of council managed roadways.

A Community and Stakeholder Engagement Plan (CSEP) will be prepared for the proposal. The plan helps us provide the community and key stakeholders with clear, accurate and timely information.

Consultation with key stakeholders will continue throughout detailed design, construction and commissioning of the proposal. We will consult with community members where the proposal directly impacts them. During construction, the contractors responsible for delivering the proposal will do the consultation and, as representatives of Sydney Water, will adhere to our community relations' policies and procedures. We will continually monitor the contractor's performance during proposal delivery.

The CSEP will identify stakeholders with an interest in the proposal, and ensure they are informed during proposal delivery. The CSEP will also:

- identify the directly and indirectly affected landowners and other stakeholders, including government agencies and interest groups
- identify issues likely to be of high community / stakeholder concern and determine the level of risk to the proposal's development

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- identify ways to raise the level of community satisfaction and ensure that Sydney Water's reputation is protected and enhanced
 - incorporate stakeholder views into the proposal planning and delivery.

4.2 Community Reference Group

Following a public expression of interest process in May 2018, 12 residents from Dover Heights, Vaucluse, Rose Bay and North Bondi were selected to be part of a Community Reference Group (CRG) formed by Sydney Water to ensure it truly understands what's important to the community ahead of its decision on what the preferred solution would look like.

While the CRG and other external stakeholders were asked to express their views, Sydney Water indicated from the outset that the responsibility for the decision on the preferred option would lie with Sydney Water.

Alongside the CRG, Sydney Water also sought feedback from the wider community. Over 3000 individual users have visited the Refresh Vaucluse and Diamond Bay proposal page on Sydney Water's online engagement platform, Sydney Water Talk, and around 300 residents attended six pop up information sessions held in Rose Bay and Diamond Bay in November 2019.

A robust community and stakeholder engagement process is key to the success of this proposal and Sydney Water sought to achieve the following outcomes from its engagement activities during the detailed planning phase:

- that recreation groups and individuals understand the findings of the 2016 pollution study and carry out their activities well away from the three ocean outfalls and wastewater plumes
- that the community and key stakeholder organisations are informed and understand the existing environmental problem and proposal need
- that the community and other interested stakeholders know how they can provide feedback and acknowledge there will be 'negotiables and non-negotiables' in the planning process
- that a CRG is formed and provides meaningful feedback to ensure community values help shape technical solutions from which Sydney Water chooses a preferred option
- that community groups act as champions for a preferred scheme during subsequent environmental assessment, concept design and construction stages
- sufficient level of community and stakeholder engagement.

4.3 Consultation on this REF

We will invite the community and stakeholders to comment on this REF. We will provide information about the proposal, REF and invite comment through:

- a community newsletter

- Sydney Water's website (www.sydneywatertalk.com.au).

This REF will be available to download from sydneywatertalk.com.au from 9th June to 28th June 2020.

Submissions must be made in writing and received by 28th June 2020 by emailing vauclusediamondbay@sydneywater.com.au.

We will collect information in written representations to help us assess the proposal. The information may be disclosed to appropriate agencies such as the Environment Protection Authority (EPA) or the Department of Planning, Infrastructure and Environment (DPIE).

If the respondent indicates at the time of submission that the information should remain confidential, Sydney Water will attempt to ensure this, but there may be legislative or legal justification for its release, for example under the *Government Information (Public Access) Act 2009*. The supply of information is voluntary.

Each respondent can request to access the information they have supplied, but not information supplied by others. Respondents may correct or update information they have submitted if it is received by 28th June 2020.

At the end of the public display period we will consider all submissions, and if required we will prepare a Decisions Report.

4.4 Consultation before and during construction

We will continue to inform the community and stakeholders about the proposal start date, about where we will be working and when, as well as what to expect during each stage of the proposal's progress.

During construction, we will ensure the construction contractor is mindful of the community, that they inform the community about any work that may impact nearby residents and businesses, and that they leave a positive legacy when their work is done.

Engaging with the community enables Sydney Water and its contractors to listen and understand the opinions of the community. Feedback will be used to improve our performance and all complaints during the construction of the proposal and following its commissioning will be managed according to Sydney Water's Customer Complaint Policy and Procedure.

4.5 Consultation during operation

Following the commissioning of the proposal, Sydney Water's standard policies and procedures for customer and community relations will apply.



4.6 ISEPP consultation

To meet *State Environmental Planning Policy (Infrastructure) 2007* (ISEPP) requirements, Sydney Water must consult with councils and other authorities for work in sensitive locations or for work which may impact upon council's infrastructure. A review of ISEPP consultation requirements is contained in Appendix B.

Due to potential traffic impacts from the proposed works, as well as modification to council owned land at Parsley Bay and Diamond Bay, consultation with council has already occurred during the option selection phase and will continue to occur as part of the REF consultation process.

5 Legislative requirements

The following environmental planning instruments (Table 3) and legislation (Table 4) are relevant to the proposal. Table 4 also documents any licences and permits, timing and responsibility for obtaining them.

Table 3 - Consideration of environmental planning instruments relevant to the proposal

Environmental Planning Instrument	Relevance to proposal
<i>Woollahra Local Environmental Plan 2014</i> (Woollahra LEP)	<p>The proposal is located on land zoned as:</p> <ul style="list-style-type: none"> - Low Density Residential (R2) - Public Recreation (RE1) <p>We do not require approval from Woollahra Council as the proposal is permissible without development consent under the ISEPP.</p>
<i>Waverley Local Environmental Plan 2012</i> (Waverley LEP)	<p>The proposal is located on land zoned as:</p> <ul style="list-style-type: none"> - Low Density Residential (R2) - Public Recreation (RE1) - Medium Density Residential (R3) - Mixed Use (B4) <p>We do not require approval from Waverley Council as the proposal is permissible without development consent under the ISEPP.</p>
<i>State Environmental Planning Policy (Infrastructure) 2007</i> (ISEPP)	<p>Clause 106 permits development by or on behalf of a public authority for sewerage without consent on any land in a prescribed zone.</p> <p>The proposal involves development of a wastewater system and is in land zoned Low Density Residential, Medium Density Residential, Public Recreation and Mixed Use. Sewerage reticulation systems can be carried out within these zones by a public authority.</p> <p>As Sydney Water is a public authority, the proposal is permissible without consent.</p>
<i>State Environmental Planning Policy (Vegetation in Non-Rural Areas) 2017</i>	<p>This SEPP applies as it is in an area listed in Clause 5.1a and/ or land within the zones listed in Clause 5.1b. However, section 6.1 states: ‘This Policy does not affect the provisions of any other SEPP....’ As the works are</p>

permissible under ISEPP a Council permit to clear vegetation under this SEPP is not required.

Water Sharing Plan for the Greater Metropolitan Region Groundwater Sources 2011

This plan protects the health and integrity of water dependant ecosystems in the Sydney Metropolitan Region. The proposal area falls within the Sydney Basin Central groundwater source. A Water Access Licence (WAL) may be required with an allocation of groundwater from this groundwater source.

Sydney Regional Environmental Plan (Sydney Harbour Catchment) 2005

The proposal is located within the area in which this planning instrument applies. However, no work will be undertaken within the marine area of Sydney Harbour. Consent is not required under this planning instrument.

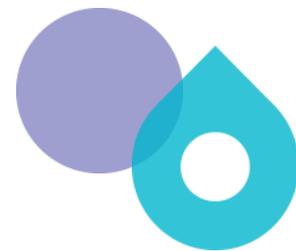
The proposal is consistent with the planning principles of the Foreshores and Waterways Area of the planning instrument in that it will 'protect, enhance and maintain' the environment of Sydney Harbour.

State Environmental Planning Policy (Coastal Management) 2018

The proposal is located within land zoned as 'Coastal Environment' and 'Coastal Use' under the planning instrument. The proposal will not impact upon the objectives of these zones.

Table 4 - Consideration of key environmental legislation

Legislation	Relevance to proposal	Permit or approval	Timing and responsibility
<i>Environmental Planning and Assessment (EP&A) Act 1979</i>	Sydney Water is the proponent and determining authority under this Act. The proposal does not require development consent, and is not classified as State Significant Infrastructure. We have assessed this proposal under Division 5.1 of the EP&A Act. This REF has concluded that the proposal is unlikely to have a significant impact on the environment. Appendix A includes our consideration of factors in clause 228 of the EP&A Regulation.	REF	Pre-construction, Sydney Water
<i>Protection of the Environment Operations Act 1997</i>	The Bondi Sewage Treatment System (STS) premises include Diamond Bay, Eastern Reserve and Vaucluse. The Bondi STS Environmental Protection Licence (EPL) No. 1688 states that the outfall at Diamond Bay	EPL variation (if required)	Prior to operation, Sydney Water



has a discharge limit of 30 ML/day, Eastern Reserve outfall has a discharge limit of 10 ML/day and Vaucluse outfall has a discharge limit of 30 ML/day.

The transfer of dry weather flow to Bondi WWTP will reduce the likelihood of exceeding the above licence limits in the EPL.

Biodiversity Conservation Act 2016 (BC Act)

Schedules 1 and 2 of the BC Act list terrestrial species, populations, and ecological communities threatened in NSW. We are required to assess impacts to listed items according to section 73 of the Act.

REF

An assessment has been completed which considered the impact of the proposal on threatened species, communities and their habitats, and is described in Section 6.1.3 of this REF. The assessment found that the proposal is unlikely to affect any threatened species. As such, we will not require a Species Impact Statement (SIS) and / or approvals under this Act.

National Parks and Wildlife Act 1974

The proposal will not directly or indirectly impact any known Aboriginal archaeological sites, Aboriginal objects or places. Also, all works will be in previously disturbed areas so the likelihood of disturbing previously unidentified Aboriginal sites is considered low. We discuss Aboriginal Heritage in Section 6.1.7 of this REF.

AHIP – not required N/A

Heritage Act 1977

The proposal will not directly or indirectly impact the heritage significance of any non-Aboriginal heritage listed items. We discuss non-Aboriginal Heritage in Section 6.1.6 of this REF.

exception, s60 approval – not required N/A

Fisheries Management Act 1994

Parsley Bay is mapped Key Fish Habitat. No work will be required within Parsley Bay marine area. See Section 6.1.3 of the REF for further details.

Permit – not required N/A

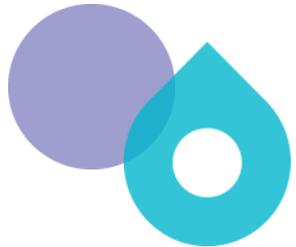




Water Act 1912/ Water Management Act 2000

It is likely that the works, particularly at Parsley Bay will require the management and disposal of groundwater. It is estimated that >3 ML of groundwater will be intercepted during construction. As such, a Water Access Licence (WAL) under the Act will be required.

WAL approval



Pre-construction, Sydney Water



6 Environmental assessment

The potential environmental aspects and impacts associated with construction and operation of the proposal are identified in Section 6.1 as well as safeguards to minimise these. These safeguards will be incorporated into contract documents and a Construction Environmental Management Plan (CEMP) to be developed by the contractor prior to commencement of work.

6.1 Environmental aspects, impacts and safeguards

6.1.1 Topography, geology and soils

Existing environment

Parsley Bay

Parsley Bay Reserve is a council managed reserve located in the suburb of Vaucluse. The topsoil shows evidence of past and recent disturbance, including cutting and filling for parkland development. The original soils around Parsley Bay would have been derived from soils of the Hawkesbury (ha) Soil Landscape Group. Soils of the Hawkesbury Group are derived from Hawkesbury Sandstone and consist of "...medium to coarse-grained quartz sandstone with minor shale and laminite lenses (GHD 2020). Geotechnical investigations identified shallow bedrock levels 0.15-1.70m below ground level (bgl) at the pumping station site.

There is no known salinity or recorded contaminated sites within one kilometre of the site. Parts of Parsley Bay are mapped as containing 'Disturbed Terrain' and may contain acid sulphate soils. No asbestos was identified in laboratory testing or visual field investigations. However, the potential for asbestos being present in the proposal area is still possible.

Eastern Avenue Reserve

Eastern Avenue Reserve is a council managed reserve located in the suburb of Diamond Bay. Soils along the cliff edge at Diamond Bay are derived from soils of the Lambert (la) Soil Landscape Group. Soils of the Lambert Group occur on "...undulating low hills on Hawkesbury Sandstone..." (GHD 2020). Geotechnical investigations identified shallow bedrock levels (1.00 m bgl) at the pumping station site.

There are no known salinity or acid sulphate soils within the site. There are also no known records of contaminated sites within one kilometre of the site. No asbestos was identified in laboratory testing or visual field investigations. However, the potential for asbestos being present in the proposal area is still possible.

Large caverns were identified during a drone survey of the cliff face at Eastern Avenue Reserve. These extend back towards Eastern Avenue Reserve. The location of the pump station, particularly the underground assets will be located away from the identified caverns.



Vaucluse Wastewater Pipeline

The 1.8km pipeline will predominately be located within high strength Hawkesbury Sandstone bedrock. A dyke was intercepted during the geotechnical field investigations, which consisted of weathered dolerite (very low strength), approximately 0.3 m thick.

Carlisle Street and Dover Road

Carlisle Street is predominately located within granular Aeolian soils. Sandstone bedrock is shallow in locations along the proposed alignment, with overlying sand/ fill. Polycyclic Aromatic Hydrocarbons (PAHs) were identified during field investigations, which indicates presence of past contamination.

There are no known salinity or acid sulphate soils within the site. There is one known recorded contaminated site within one kilometre. This is the Rose Bay Budget Service Station located at 638-646 New South Head Road, Rose Bay. No asbestos was identified in laboratory testing or visually field investigations. However, the potential for asbestos being present in the proposal area is still possible.

Diamond Bay

Soils along the cliff edge at Diamond Bay are derived from soils of the Lambert (Ia) Soil Landscape Group. Soils of the Lambert Group occur on "...undulating low hills on Hawkesbury Sandstone..." (GHD 2020).

There are no known salinity or acid sulphate soils within the site. There are also no known records of contaminated sites within one kilometre of the site

Oceanview Avenue

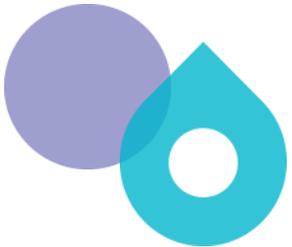
Soils along the cliff edge at Diamond Bay (including Oceanview Ave) are derived from soils of the Lambert (Ia) Soil Landscape Group. Soils of the Lambert Group occur on "...undulating low hills on Hawkesbury Sandstone..." (GHD 2020). Geotechnical field investigations identified Oceanview Avenue as predominately granular soils/ fill.

PAHs were identified during field investigations. There are no known salinity or acid sulphate soils within the site. There are also no known records of contaminated sites within one kilometre of the site.

Potential impacts

The proposal disturbance areas include areas that have been previously disturbed. Bedrock will be impacted at some locations, including Parsley Bay and Eastern Avenue Reserve, however, no significant impacts are expected. The worksites will be returned to their pre-construction conditions and no changes to local topography following construction are expected.

There may be some potential to encounter contaminated material, especially where the subsurface conditions are comprised of fill material, such as along Oceanview Ave and Carlisle Street. Acid sulphate soils may also be encountered at Parsley Bay, Carlisle Street and Dover Road. If these



potentially contaminated or acid sulphate soils are inappropriately managed, they can result in off-site impacts to nearby waterways or land.

Safeguards

We will implement the following safeguards during construction and operation to minimise any impacts to soils, topography and geology.

Prevent sediment moving offsite in accordance with Managing Urban Stormwater, Soils and Construction, Volume 1 and 2A (Landcom 2004 and DECC 2008), including:

- develop a Soil and Water Management Plan (SWMP) as part of the CEMP
- divert surface runoff away from disturbed soil and stockpiles
- install sediment and erosion controls before construction starts
- reuse topsoil where possible and stockpile separately
- inspect controls daily and immediately after rainfall
- rectify damaged controls immediately
- remove controls once surfaces have been stabilised, including removing trapped sediment in drainage lines.

Minimise ground disturbance and stabilise disturbed areas progressively.

Ensure any imported material is certified for intended use and is free from contamination including asbestos.

Stop work in the immediate vicinity of suspected contamination. Indicators of contamination include discoloured soil, anthropogenic fill material, asbestos, strong chemical or petrol odours and leachate. Contain disturbed material on an impermeable surface and cordon areas off. Notify the Sydney Water Project Manager and the Environmental Representative.

Sydney Water Project Manager will contact Property Environmental Services for advice regarding management options of any encountered contaminated material.

Prepare a Waste Management Plan as part of the CEMP to guide waste classification and management activities, in order to segregate waste of different classification, and identify opportunities to manage materials under the resource recovery frameworks. The plan would identify the type and location of known/potential contamination, management and disposal measures.

Stop work during heavy rainfall or in waterlogged conditions when there is a risk of sediment loss off site.



Ensure site access points are stabilised and measures installed to prevent off-site tracking of mud/ dirt onto public roads.

Sweep up any sediment/soil transferred off site at least daily, or before rainfall.

Eliminate ponding and erosion by restoring worksites to the pre-works condition.

6.1.2 Water and drainage

Existing environment

Parsley Bay

Parsley Creek flows down a gully from Hopetoun Road and through Parsley Bay Reserve before entering Parsley Bay. This creek flows within the construction boundary of the works but will not be impacted by the works. Parsley Bay is mapped as Key Fish Habitat (KFH) by the Department of Primary Industries.

A review of the *Woollahra Local Environmental Plan (2014)* (Woollahra LEP) indicates the site is not within any flood liable land.

Groundwater was encountered at approximately 1.5 m bgl during geotechnical field investigations undertaken in December 2019 (GHD, 2020). There is potential for the groundwater to contain elevated Copper and Zinc levels based on preliminary laboratory analysis.

Eastern Avenue Reserve

The Tasman Sea is located adjacent to the location of the Eastern Avenue Reserve wastewater pumping station. The Tasman Sea is mapped as KFH by the Department of Primary Industries.

A review of the *Waverley Local Environment Plan (2012)* (Waverley LEP) indicates the site is not within any flood liable land.

No groundwater was encountered during geotechnical field investigations undertaken in December 2019 (GHD, 2020a).

Vaucluse Wastewater Pipeline

The new wastewater pipeline is not located within close proximity to any waterways. A review of the Woollahra LEP indicates the site is not within any flood liable land.

Geotechnical field investigations indicate that the pipeline is located above the groundwater table, however, localised groundwater may still be encountered during construction.

Carlisle Street and Dover Road

Rose Bay is located approximately 400 m west of the works on Carlisle Street. Rose Bay is mapped as KFH by the Department of Primary Industries. A review of the Woollahra LEP indicates the site is not within any flood liable land.

Small amounts of groundwater were encountered during geotechnical field investigations undertaken in December 2019 (GHD, 2020a). There is potential for the groundwater to contain elevated Copper and Zinc levels based on preliminary laboratory analysis.

Diamond Bay



The Tasman Sea is located adjacent to the proposed works at Diamond Bay. The Tasman Sea is mapped as KFH by the Department of Primary Industries. A review of the Waverley LEP indicates the site is not within any flood liable land.

No groundwater was encountered during geotechnical field investigations undertaken in December 2019 (GHD, 2020a).

Oceanview Avenue

The Tasman Sea is located adjacent to the proposed works at Oceanview Avenue. The Tasman Sea is mapped as KFH by the Department of Primary Industries. A review of the Waverley LEP indicates the site is not within any flood liable land.

Small amounts of groundwater were encountered during geotechnical field investigations undertaken in December 2019 (GHD, 2020a). There is potential for the groundwater to contain elevated Copper and Zinc levels based on preliminary laboratory analysis.

Potential impacts – construction

We don't expect construction activities to significantly impact the water quality of nearby waterways. Potential impacts to water quality may occur from:

- increased erosion and sedimentation from excavation, temporary stockpiling of soil and unsealed access roads
- runoff of contaminated or dirty water from the construction sites impacting a local waterway (eg. Parsley Creek)
- contamination of ground and / or surface water, due to spillage or inappropriate storage of chemicals required for construction
- inappropriate management of drilling fluids
- dewatering of excavation / trenches
- inappropriate management of groundwater.

A groundwater inflow assessment completed by GHD during concept design has identified the following groundwater impacts for the proposed works:

- dewatering of the Carlisle Street wastewater pipeline will require discharge of up to 38.8 m³/ day of groundwater per 10 m length of pipeline. Over the expected construction period of two weeks this would result in total dewatering volumes of between 33 m³ (0.03 megalitres - ML) and 602 m³ (0.6 ML)
- dewatering of Parsley Bay pumping station will require discharge of up to 57 m³/day of groundwater with a radius of influence of up to 178 m. Dewatering has been estimated at 90 days for construction of the pumping station and as such, the total discharge volume could range from 456 m³ (0.456 ML) to 4563 m³ (4.56 ML). Draw down is not expected to have an adverse impact on the surrounding water table

- small or incremental amounts of groundwater are expected to be intersected during construction at Oceanview Avenue near the cliff edge.

Groundwater and the contractor's drilling fluid will be recirculated on site during drilling operations. The destination of disposal will be determined based on the quality of the water. Options for disposal include the environment (subject to meeting water quality criteria), existing wastewater system or disposal at a suitable waste disposal facility.

A Water Supply Approval (WSA) will be required for the works from the Natural Resource Access Regulator (NRAR). A Water Access Licence (WAL) from NRAR will only be required under the *Water Management Act* if >3 ML/year of groundwater will be intercepted. If required, this licence will be obtained prior to the need to intercept groundwater.

The groundwater source is the Sydney Basin Central in the 'Water Sharing Plan for the Greater Metropolitan Region Groundwater Sources 2011'.

Potential impacts – operation

We do not expect any operational impacts to water quality. The proposal will remove 93% of the current untreated wastewater from the ocean outfalls, resulting in an improvement to the surrounding water quality. All pipelines will be pressure tested during commissioning and upon completion, the water will be disposed of in accordance with Sydney Water's Discharge Protocol.

Safeguards

We will implement the following safeguards during construction and operation to minimise any impacts to water and drainage.

Bund open maintenance holes if risk of wastewater spills.

Bund potential contaminants and store on robust waterproof membrane, away from drainage lines.

Keep functioning spill kit on site for clean-up of accidental chemical/fuel spills. Keep the spill kits stocked and located for easy access.

If discharge of groundwater to the environment is not possible, seek approval and discharge criteria from the relevant Sydney Water Network Area Manager prior to discharge to the wastewater system. Otherwise tanker by a licensed waste contractor and dispose off-site to an appropriately licensed facility.

Locate portable site amenities away from watercourses or drainage lines.

A Water Supply Approval will be obtained from NRAR prior to the works commencing.

If required, Sydney Water will obtain a groundwater Water Access Licence from NRAR prior to intercepting groundwater. The construction contractor is responsible for:

- preparing a Dewatering Management Plan
- complying with the approval conditions (such as protecting water quality; minimising aquifer extraction volumes, monitoring extraction with flow meters and recording volumes).

Store all chemicals and fuels in accordance with relevant Australian Standards and Safety Data Sheets. Record stored chemicals on site register. Bunded areas to have 110% capacity of stored liquid volume. Chemicals and fuels in vehicles must be tightly secured. All chemicals to be clearly labelled.

Conduct refuelling, fuel decanting and vehicle maintenance in a designated area away from waterways and drainage lines with functioning spill kits close by.

Ensure equipment is leak free. Repair oil/fuel leaks immediately or remove from site and replace with a leak-free item.

Outline measures as part of the CEMP to avoid impacts from drilling fluids, including:

- contain and monitor drilling fluids at entry/exit points
- identify and manage frac-outs
- re-use and/or disposal of drilling fluids (checking waste classification).
- suitable use of biodegradable drilling fluids.

6.1.3 Flora and fauna

Existing environment

Terrestrial flora and fauna

A Biodiversity Assessment Report was prepared by GHD in December 2019 to assess the ecological values of the proposal area, and assess the potential impacts from the works (GHD, 2020b). The report identified the following ecological features at each of the proposal sites:

Parsley Bay

- vegetation mapped as Sydney Foreshore Shale Forest on the level areas, and Coastal Sandstone Foreshore Forest on the slopes and sandstone terraces
- no Threatened Ecological Communities (TECs) were identified during desktop and field assessments
- disturbed vegetation along urban edges including planting of exotic ornamental trees and self-recruited exotic species
- planted specimens of threatened flora species Magenta Lilly Pilly (*Syzygium paniculatum*) were identified at three locations at Parsley Bay, including the end of Horler Avenue, behind the existing toilet block and near the trenchless alignment of wastewater infrastructure within the bushland area

- no threatened fauna species were identified during field surveys. However, threatened fauna species with potential to be present include, the Grey-headed Flying-fox, Powerful Owl and a number of microbat species
- two large Small-Leaved Figs at the entrance to the carpark.

Diamond Bay

- vegetation mapped as Coastal Headland Banksia Heath, Coastal Clifftop Marsh and Urban – native/ exotic
- no TECs or threatened flora species were identified during desktop and field assessments
- several Priority Weed species were identified, including patches of Bitou Bush close to the cliff edge.

Eastern Avenue Reserve and Oceanview Avenue

- vegetation within these proposal areas is limited to the presence of small street trees
- street trees close to the cliff line indicate stress factors from wind-shear, necrotic leaf margins and stunted growth.

Carlisle Street

- Carlisle Street is a broad street with wide nature strips and large mature trees growing on both sides.
- threatened Magenta Lilly Pilly is present as a street tree.

Marine flora and fauna

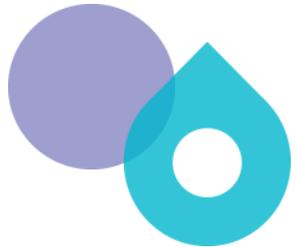
A Marine Impact Assessment was prepared by GHD in February 2020 to assess the ecological values of Parsley Bay marine environment, and assess the potential impacts on the marine ecosystem (GHD, 2020c). The report identified the following ecological features of Parsley Bay:

- mapped as Key Fish Habitat under the FM Act
- expanses of coarse grained sandy sediments, with rocky reef and macroalgae beds bordering the sandstone cliffs that line the Bay on the eastern and western boundaries
- seagrass meadows, *Halophila ovalis*, *Zostera capricorni* and *Posidonia australis*, located on the eastern and western boundaries and in the centre of the bay. *Posidonia australis* is listed as a TEC under the BC Act and is an endangered species under the EPBC Act
- a swimmer protection shark net that provides ideal habitat for syngnathids (seahorses and pipefish).

Potential impacts

Terrestrial flora and fauna

Vegetation removal is required at Parsley Bay and Diamond Bay. This is mainly to facilitate access as well as to construct new wastewater infrastructure. The design will avoid clearing large mature



trees, and will not impact any threatened ecological communities. Where possible, all impacted vegetation will be reinstated at the completion of the proposal.

Parsley Bay

Potential impacts during construction would include:

- clearing of up to 0.36 hectares (ha) of vegetation. This includes 0.26 ha Coastal Sandstone Foreshores Forest and 0.10 ha Urban – exotic/ native communities. Vegetation removal is required to provide access into the vegetated areas of Parsley Bay to construct the wastewater reticulation pipelines
- trimming of the canopy of the Small Leaved Figs at the end of Horler Avenue to enable access for construction plant and equipment
- potential spread of weeds into adjacent bushland areas from construction vehicles, plant and equipment
- potential removal of planted juvenile Magenta Lilly Pilly (*Syzygium paniculatum*). Although a threatened species, these planted specimens do not contribute to the conservation of the species (GHD, 2020b)
- an Aboricultural Impact Assessment (GHD 2019) identified two Small-leaved Figs and one Plum Pine located at the entrance to Parsley Bay carpark at the end of Horler Avenue. Canopy trimming (approximately 5% of total canopy to be removed) will be required to allow safe access of machinery and construction of the pumping station. The fig tree adjacent to the toilet block will require removal of approximately 2% of its root system. It is unlikely that these trees will require removal. Appendix C provides more information on potential impacts to these trees.

The works at Parsley Bay are expected to have a negligible impact on potential habitat of threatened fauna species, including the Grey-headed Flying-fox or Powerful Owl. There is a slight potential for cave-dwelling microbats to inhabit the toilet block. This will be inspected prior to removal.

Figure 6 outlines the construction footprint of the works at Parsley Bay, including areas of vegetation removal.

Diamond Bay

Potential impacts during construction would include:

- clearing of up to 0.13 ha of native vegetation. This includes 0.08 ha Coastal Headland Banksia Heath, 0.01 ha of Coastal Cliff-top Marsh, 0.04 ha of Weed – exotic and 0.01 ha Urban – exotic/ native communities. Vegetation removal is required at Diamond Bay to provide construction access to the site for machinery
- potential impacts to habitat of small, common, less mobile ground-dwelling fauna such as lizards and frogs.

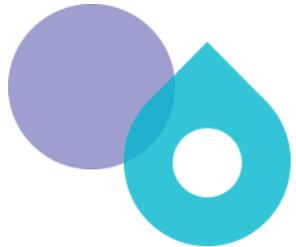


Figure 7 outlines the construction footprint of the works at Diamond Bay, including areas of vegetation removal.

Eastern Avenue Reserve and Oceanview Avenue

Potential impacts during construction would include:

- clearing of up to 0.23 ha of vegetation. This includes 0.02 ha of Coastal Headland Banksia Heath and 0.21 ha Urban – exotic/ native communities.
- potential impacts to habitat of small, common, less mobile ground-dwelling fauna such as lizards and frogs.

Figure 7 outlines the construction footprint of the works at Eastern Avenue Reserve and Oceanview Avenue, including areas of vegetation removal.

Carlisle Street and Dover Road

Potential impacts during construction would include:

- minor trimming of overhanging street trees to accommodate machinery access
- minor trimming of roots of mature street trees if they extend into the proposed work area in the roadway.

Large canopy trees will be retained at all work sites where possible. Where vegetation clearing is required, it will be restricted to groundcover and mid-story species.

Appendix C contains the Biodiversity Assessment, Arboricultural Impact Assessment and the Marine Environment Assessment.

Figure 5 – Flora and fauna at Parsley Bay



Legend

- Indicative construction footprint
- Vegetation (GHD 2019)**
 - Coastal Sandstone Foreshores Forest
 - Urban - native/exotic
 - Weed - exotic
 - Magenta Lilly Pilly planted specimens and seedlings



Sydney
WATER

Map is indicative and not to scale – proposed locations are subject to change during the detailed design phase

DATA SOURCES:
NSW LPI DTDB/DCDC 2018
SIXMAPS 2020
SYDNEY WATER 2020
GHD 2019

A4
1:1,800

Figure 6 – Flora and fauna at Diamond Bay



Legend

- Indicative construction footprint
- Diamond Bay proposed pump station indicative footprint
- Proposed underground wastewater pipeline (open trench construction)
- Proposed underground wastewater pipeline (trenchless construction)

Vegetation (GHD 2019)

- Coastal Clifftop Marsh
- Coastal Headland Banksia Heath
- Urban - native/exotic
- Weed - exotic



Map is indicative and not to scale – proposed locations are subject to change during the detailed design phase

DATA SOURCES:
NSW LPI DTDB/DCDC 2018
SIXMAPS 2020
SYDNEY WATER 2020
GHD 2019

A4
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Safeguards

We will implement the following safeguards during construction and commissioning to minimise any impacts to terrestrial flora and fauna.

Vegetation removal will be restricted to what has been assessed in this REF. This vegetation will be clearly delineated in the CEMP and on site prior to construction.

Provided it is essential for delivering the proposal, Sydney Water's Project Manager can approve the following vegetation removal and tree trimming, without additional environmental assessment (but only after consultation with Sydney Water's Environmental and Community Representatives and affected landowners). Sydney Water considers vegetation removal in these circumstances has minimal environmental impact.

- Any minor:
 - vegetation trimming or
 - removal of exotic vegetation or
 - removal of planted native vegetation
- where the vegetation is not a threatened species (including a characteristic species of a threatened community or population), heritage listed, in declared critical habitat or in a declared area of outstanding biodiversity value.
- Any removal of remnant vegetation where there is no net change to environmental impact (eg a different area of vegetation is removed but the total area is the same or less than assessed in the REF).

Written explanation of the application of this clause (including justification of the need for trimming or removal and any proposed revegetation) should be provided when seeking Project Manager approval.

Detailed design and construction planning will reduce impacts to native vegetation communities, e.g. opportunities to realign access paths or temporary bridging over vegetation.

Minimise impacts to hollow bearing trees along the pathway and creek line at Parsley Bay reserve.

The temporary storage area for pipe lengths at Parsley Bay should be located in areas of grassland and not beneath tree canopies to avoid impacts on tree protection zones (TPZ)s.

Measures to minimise the extent of vegetation disturbance/clearing required to avoid the removal of Magenta Lilly Pilly specimens, where possible, at Parsley Bay Reserve.

An Arborist will be on site to guide any required tree removal and trimming.

Root zones located within or adjacent to works area or vehicular access should be protected by the application of either organic mulch, coarse gravel or geocells in consultation with an Arborist.



The root protection should be installed prior to commencement of works and should not be removed until completion of all works.

Protective fencing should comply with Australian Standards 2009 where possible. An example of appropriate fencing is provided in the Aboricultural Impact Assessment in Appendix C. The fencing should be installed prior to commencement of clearing and should be retained in place until the completion of construction.

The following actions should not be permitted, where feasible, within the Tree Protection Zones (TPZs):

- storage of materials, plants or equipment
- installation of site sheds or portable toilets
- excavations, trenching, ripping or cultivation of soils
- modification of existing soil level or addition of fill materials
- disposal of waste materials and chemicals (both solid or liquid)
- mechanical removal of vegetation.

Once the construction works are completed, retained trees should be re-inspected by an Arborist who should carry out a more in-depth assessment that would prescribe remedial work where necessary to reduce the risk of dropped tree limbs or falling trees on pedestrians or parked vehicles.

Residual impacts to native vegetation and trees will be offset in accordance with the Sydney Water Biodiversity Offset Guideline (SWEMS0019.13). All restoration and offsets will be identified and implemented in consultation with council requirements, or other landowner. Based on the proposed vegetation impacts in the GHD Biodiversity Assessment report (GHD, 2020b), the following re-planting is likely to be required following construction:

- 0.02 ha of Coastal Clifftop Marsh
- 0.2 ha of Coastal Headland Banksia Heath
- 0.48 ha of Coastal Sandstone Foreshores Forest.

Actual vegetation impacts would be quantified prior to clearing and required offsets provided for verified impacts. The location of offsets/ replanting would be determined in consultation with council.



6.1.4 Air and energy

Existing environment

Air quality is usually considered in terms of odour and dust. There is potential odour generated by the existing wastewater network systems, which can cause nuisance to surrounding receivers. Potential odour generation from wastewater networks usually occurs during the hottest periods of the year (eg. summer).

Potential impacts – Construction

Construction work can generate dust and vehicle exhaust emissions. Dust could result from site excavations, materials delivery, spoil stockpiles and vehicle movements particularly during dry and windy conditions. Poorly maintained construction machinery could also result in air quality impacts. We will minimise the potential impacts of dust and vehicle emissions during construction work by implementing mitigation measures listed below.

During construction and commissioning, some activities could cause isolated increases in odour, due to such things as access hatches being open, however, these will be minimised to the greatest extent possible.

Potential impacts – Operation

Parsley Bay and Eastern Avenue Reserve wastewater pumping stations

The proposal involves the construction of two new wastewater pumping stations. An odour assessment for the new wastewater infrastructure was completed during concept design (GHD, 2020d). Both the Vacluse and Diamond Bay catchments have been assessed as having a low odour nuisance from the new proposed wastewater infrastructure. This is due to the nature of wastewater in the catchments having low Biological Oxygen Demand (BOD) and hydrogen sulfides, both of which can often produce odour. We consider the risk of odour generation during operation of the proposed wastewater infrastructure to be low.

The proposal will require the construction of three ventilation points which function to disperse any odour produced in the wastewater system. These will be located at each of the pumping stations, as well as along Oceanview Avenue. The new wastewater infrastructure has been designed to minimise the generation of odour.

Safeguards

We will implement the following safeguards during construction and operation to minimise air quality and energy impacts.

- Use alternatives to fossil fuels where practical and cost-effective.

- Use of odour neutralising agents during construction and commissioning of the pumping stations.



Track energy use as per Sydney Water's National Greenhouse and Energy Report SWEMS0015.28.

Maintain equipment in good working order, comply with the clean air regulations of the Protection of the Environment Operations Act 1997, have appropriate exhaust pollution controls, and meet Australian Standards for exhaust emissions.

Switch off vehicles/machinery when not in use.

Implement measures to prevent offsite dust impacts, for example:

- water exposed areas (using non-potable water source where possible such as groundwater from excavation pits)
- cover exposed areas with tarpaulins or geotextile fabric
- modify or cease work in windy conditions
- modify site layout (place stockpiles away from sensitive receivers)
- vegetate exposed areas using appropriate seeding.

Odour levels will be monitored in the new wastewater infrastructure during commissioning and operation to assess if further odour mitigation measures are required.

Cover all transported waste.

6.1.5 Waste and hazardous materials

Potential impacts – construction

During concept design of the proposal a geotechnical and contamination assessment was completed for the proposed works to guide design and construction (GHD, 2020a). The following potential types and areas of contamination were identified from this assessment:

- acid Sulphate Soil (ASS) above the Action Criteria at Bore Hole (BH) 1 along Dover Road
- Polycyclic Aromatic Hydrocarbons (PAHs) at BH03 (Carlisle St) and BH15 (Oceanview Ave)
- copper, nickel and zinc concentrations in groundwater at BH01 (Dover Rd), BH11 (Parsley Bay) and BH17 (Oceanview Ave) above the *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZG, 2018).

Soil sample analysis completed identified the following waste classifications for the proposal in accordance with the NSW EPA Waste Classification Guidelines (EPA, 2019):

- Hazardous Waste along Carlisle Street and Oceanview Avenue
- Restricted Solid Waste along Dover Road

- General Solid Waste at all other locations.

Typical sources of waste that will be generated by the proposed works include:

- excavated rock and spoil from construction of the pumping stations at Parsley Bay and Eastern Reserve
- excavated materials from installation of new pipelines
- drilling fluid from HDD of Vaucluse Wastewater Pipeline
- groundwater from Parsley Bay, which has the potential to be contaminated
- vegetation waste from clearing at Parsley Bay and Diamond Bay
- demolition waste from existing buildings and hardstand areas
- potential contaminated material, including asbestos, in disturbed areas along Carlisle Street and Oceanview Avenue
- small volumes of general construction waste.

There will be a need to stockpile material excavated from construction of the pumping stations and wastewater pipelines, whilst it is further analyzed for suitability for reuse as backfill on site or disposed of offsite at EPA licenced waste facility. The quantities of this material have been estimated at 14,000 m³. The location of this stockpiling will be determined during detailed design and after award of the contract. Further environmental assessment will be undertaken at that time if the stockpiles are located outside the proposal area shown in this REF.

Potential impacts – operation

We do not expect the generation of additional waste from operation of the new wastewater infrastructure. The proposal will result in the transfer for dry weather wastewater flows from the Vaucluse and Diamond Bay catchments to Bondi WTP. This will significantly reduce the amount of untreated wastewater from entering the environment.

Safeguards

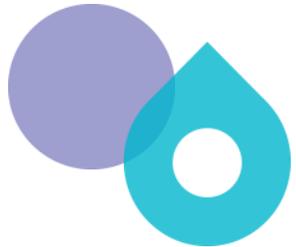
We will implement the following safeguards during construction and operation to minimise waste and contamination.

Prepare a Waste Management Plan (SWEMS0025.09) as part of the CEMP.

Identify spoil storage and disposal options during detail design and construction planning.

Manage waste in accordance with relevant legislation and maintain records to show compliance eg waste register, transport and disposal records.

Provide adequate bins for general waste, hazardous waste and recyclable materials. Remove bins when 80% full.



Minimise the generation of waste, sort waste streams to maximise reuse/recycling in accordance with the *Waste Avoidance and Resource Recovery Act 2001*.

Manage waste and excess spoil in accordance with the NSW EPA Waste Classification Guidelines 2019.

Dispose wastes at an appropriately licenced facility.

Securely store all wastes to prevent pollutants from escaping.

Dispose excess vegetation (non-weed) that cannot be used for site stabilisation at an appropriate green waste disposal facility.

If fibro or other asbestos containing material is identified, restrict access and follow Sydney Water's Asbestos Management procedure, WHSMS0064. Contact Property Environmental Services for advice.

Prepare an Acid Sulphate Soils Management Plan if required to detail the monitoring and characterisation works to be undertaken during the proposal for shallow soils around BH01 (Dover Road), and possible ASS present outside the proposal area in the vicinity of Carlisle Street and Parsley Bay Reserve.

Track waste as required using EPA's WasteLocate online tracking system.

Undertake further sampling near BH03 and BH15 prior to construction to further understand the extent and nature of the PAH contamination and establish mitigation measures for inclusion in the CEMP.

Should design details change (e.g. change of construction methodology, alignment, infrastructure layout), a review of the available investigation results should be undertaken by a qualified contaminated land specialist to evaluate the need for undertaking further investigation.

6.1.6 Non-Aboriginal Heritage

Existing environment and potential impacts

A Statement of Heritage Impact (SoHI) was completed by Artefact Heritage for the proposed works (Artefact, 2020). Overall, it was identified that the proposed works would have a negligible to minor impact on non-Aboriginal heritage items. No approval under the *Heritage Act 1977* is required for the proposed works.

Parsley Bay

The proposal is located within the curtilage of the following heritage items at Parsley Bay which are shown on Figure 8:

- Parsley Bay Swimming Enclosure (Register of the National Estate or RNE Item no. 103518)

- Suspension Footbridge (Woollahra LEP 2014 I386) – local heritage
- Vacluse Outfall (Sydney Water Section 170 State Heritage Item (SHI) 4574203)).
- 3 Forest Red Gums, Sydney Pink Gum (Woollahra LEP 2012 I388) – local heritage.

The visual impact during construction would have a moderate (temporary) indirect impact on these heritage items. However, these impacts would be restricted to the construction phase of the proposal. Excavation is required near the Vacluse Outfall, including a temporary diversion, and removal of approximately 20 m of the pipeline in the location of the Parsley Bay pumping station. This amounts to a small section of the entire heritage listed pipeline.

There were also unlisted heritage items in the area identified during the site visit. This includes a surveyors mark on a sandstone boulder to the east of the Parsley Bay pumping station location and south of the proposed wastewater reticulation in the bushland area, as well as landscape modifications (chiseled steps) on the northern side of the reserve in the bushland area. Both items will not be impacted by the works.

Diamond Bay, Oceanview Avenue Eastern Avenue Reserve

The proposal is located within the curtilage of the following heritage items at Diamond Bay, Oceanview Avenue and Eastern Avenue Reserve:

- Oceanview Avenue Conservation Area (Waverley LEP 2012 C54) – local heritage
- Sandstone Escarpment Conservation Area (Waverley LEP 2012 C37) – local heritage
- Diamond Bay Outfall (No. 1 & No. 2) (Sydney Water Section 170 SHI 4574204).

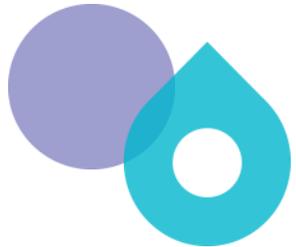
The proposed works would involve open trenching within the above two heritage items, including the construction of a wastewater pumping station within the curtilage of the ‘Sandstone Escarpment Conservation Area’ heritage item. This would include new above ground infrastructure, such as an electrical kiosk, as well as the temporary removal of the existing white picket fence at the end of Eastern Avenue during construction which will then be reinstated at the completion of works. The proposed works would have a minor – moderate impact on the heritage significance of the conservation Sandstone Escarpment Conservation Area.

The proposal is located within or nearby to four heritage items which are shown in Figure 9:

- 1950s House (Waverley LEP 2012 I438) – local heritage
- 1930s style bungalow (Waverley LEP 2012 I441) – local heritage
- Oceanview Avenue Conservation Area (Waverley LEP 2012 C54) – local heritage
- Diamond Bay Outfalls No. 1 & 2 (Sydney Water s170 SHI 4574204).

There were also unlisted heritage items in the area identified during the site visit. This include the chiseled steps and doorway within the Coastal Sandstone Escarpment at Dover Heights. It is not anticipated that the works will impact upon this landscape feature.

Carlisle Street and Dover Road



No non-Aboriginal heritage items were located within the proposal footprint at Carlisle Street and Dover Road. The proposal is located within or nearby to the following heritage items which are shown in Figure 10, however, no impacts to these items are anticipated:

- Fernleigh Castle – main building and interiors (Woollahra LEP 2014 I309)
- House and interiors (Woollahra LEP 2014 I311) – local heritage
- House, interiors and grounds (Woollahra LEP 2014 I336) – local heritage
- Electricity Substation No. 94 (Ausgrid s170 SHI 3430453)
- Mary Magdalene Catholic Church – church and interiors (Woollahra LEP 2014 I327) – local heritage
- *Fisucs superba, var. henneana* (cedar fig) (Woollhara LEP) – local and state heritage.

There were also unlisted heritage items in the area identified during the site visit. These included the sandstone kerbs along Carlisle Street. The wastewater pipeline along Carlisle Street should not impact the sandstone curb.

More information on impacts of the proposed works to non-Aboriginal heritage items is provided in Appendix D.

Safeguards

We will implement the following safeguards during construction and operation to minimise impacts to non-Aboriginal heritage.

During ground disturbing works, an unexpected finds procedure would be followed. This procedure would consist of the following controls should unexpected archaeological finds be identified during works:

- all work must immediately cease in the area of, and around, the location of the unexpected find
- the contractor supervisor must notify the environmental manager, and a qualified archaeologist will be consulted for further advice
- should the unexpected find constitute a significant archaeological 'relic', work cannot continue in the area of location of the find until a S.146 Notification of the Discovery of a 'Relic' has been submitted to the NSW Heritage Division. Further approvals from the NSW Heritage Division may be required before works in this area can proceed.

All impacted areas should be reinstated as near as possible to their original appearance following the completion of works.

In order to reduce impacts to the heritage significance of the Sandstone Escarpment Conservation Area (Waverley LEP 2012 C37), it is recommended that:

- 
- 
- an existing picket fence at Eastern Avenue would be retained or reinstated following construction
 - sandstone outcrops be protected and avoided where feasible
 - evidence of landscape modification near 33 Kimberley Street and nearby properties along the sandstone escarpment coastal walk be protected and avoided where feasible.

If impacts to unlisted sandstone kerbs along Carlisle Street are required for the proposal, they would be carefully removed, stored in a secure location and reinstated following the completion of works.

The design of proposed pumping stations would aim to be sympathetic to Parsley Bay Reserve and the Coastal Sandstone Escarpment Conservation Area's existing nature and designed to minimise physical and visual impacts towards these areas.

Direct impacts to an unlisted Surveyor's Mark identified within Parsley Bay Reserve during the site inspection for the proposal would be avoided during proposed works. The item would be protected as per mitigation measures for listed and unlisted heritage items provided

Direct impacts to unlisted landscape modifications (chiselled steps and doorway) within the Coastal Sandstone Escarpment Conservation Area would be avoided during proposed works for the proposal where feasible. All landscape features would be protected as per mitigation measures for listed and unlisted heritage items provided.

Prior to the commencement of works a heritage induction would be prepared for all contractors to complete. The induction would address significant fabric and heritage items in the proximity of works. The induction would also stress that in the event significant fabric is impacted or archaeological remains are encountered, works must cease immediately and the advice of an archaeologist and/or heritage consultant must be sought.

Areas of listed and unlisted significant fabric would be identified to all site workers, and physically marked out with temporary hi-visibility markers if required. This includes unlisted heritage items identified in this REF (for example, the Surveyor's Mark and landscape features at Parsley Bay). These areas would be delineated with hi-visibility flagging and bollards where suitable, and any ground-breaking work activity, storage of equipment, or vehicle parking would not occur within these zones.

Figure 7 – Non-Aboriginal heritage items at Parsley Bay



- Legend**
- Indicative construction footprint
 - Cadastre
 - Sydney Water heritage
 - Local heritage**
 - Item - General



DATA SOURCES:
 NSW LPI DTDB/DCDC 2018
 SIXMAPS 2020
 SYDNEY WATER 2020 & 2015
 NSW DPE 2018
 OEH

A4
 1:1,800



Map is indicative and not to scale – proposed locations are subject to change during the detailed design phase

Figure 8 – Non-Aboriginal heritage items at Eastern Avenue, Oceanview Avenue and Diamond Bay



- Legend**
- Indicative construction footprint
 - Diamond Bay proposed pump station indicative footprint
 - Proposed underground wastewater pipeline (open trench construction)
 - Proposed underground wastewater pipeline (trenchless construction)
 - Cadastre
 - +++ Sydney Water heritage
 - Local heritage**
 - ++ Aboriginal Object
 - +++ Conservation Area - Landscape
 - ++ Item - General



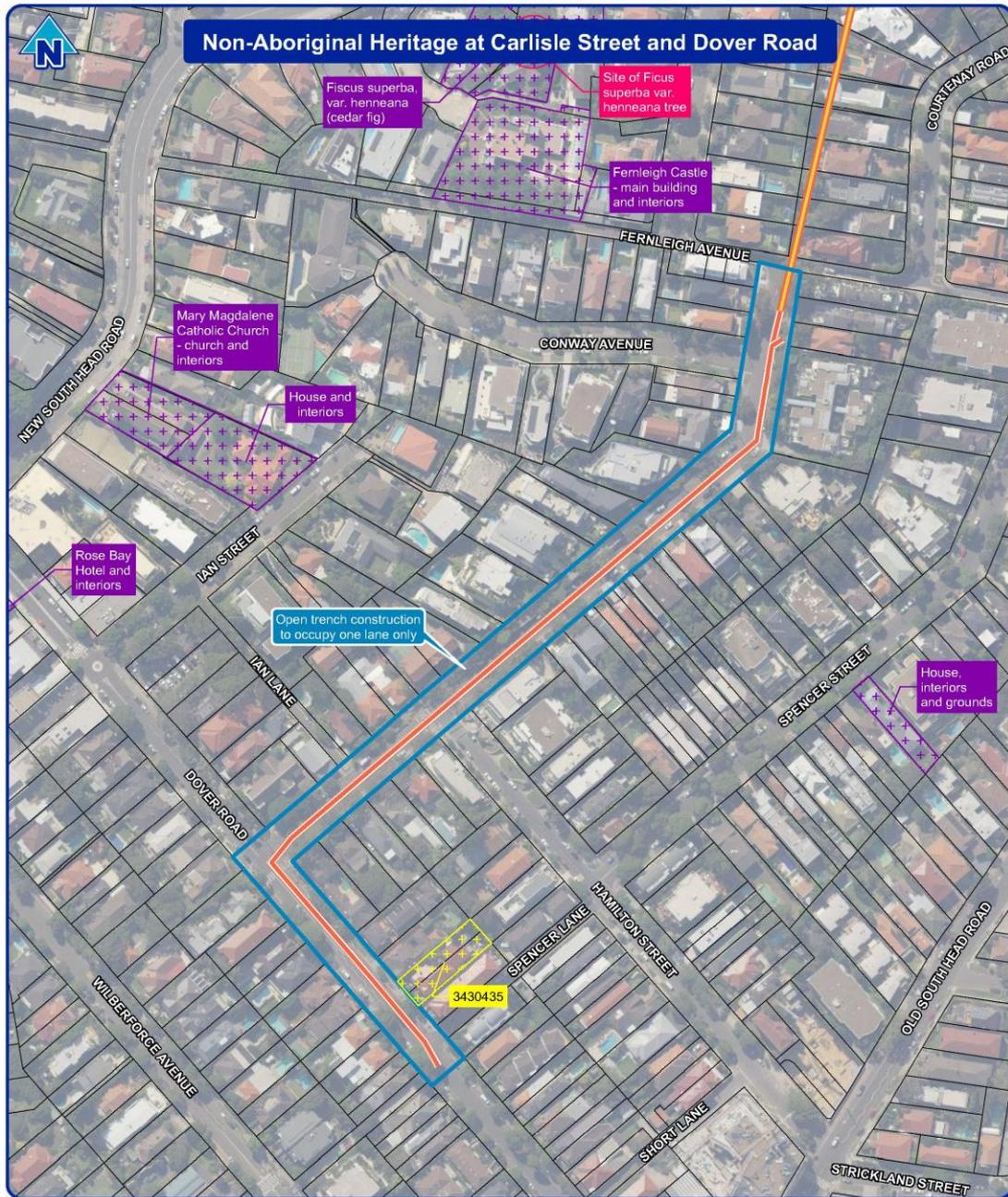
DATA SOURCES:
 NSW LPI DTDB/DCDC 2018
 SIXMAPS 2020
 SYDNEY WATER 2020 & 2015
 NSW DPE 2018
 OEH

A4
 1:2,800

Map is indicative and not to scale – proposed locations are subject to change during the detailed design phase



Figure 9 – Non-Aboriginal heritage items at Carlisle Street and Dover Road



Legend

- Indicative construction footprint
- Proposed underground wastewater pipeline (open trench construction)
- Proposed underground wastewater pipeline (trenchless construction)
- Cadastre
- State heritage
- Ausgrid s170 heritage item
- Local heritage**
- Item - General



Map is indicative and not to scale – proposed locations are subject to change during the detailed design phase

DATA SOURCES:
 NSW LPI DTDB/DCDC 2018
 SIXMAPS 2020
 SYDNEY WATER 2020 & 2015
 NSW DPE 2018 / OEI / artefact 2020

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6.1.7 Aboriginal heritage

Existing environment

Landforms with the study area vary across the Vaucluse, Rose Bay and Dover Heights suburbs. Landforms are characterised by moderate to steep gully slopes, flats and a modified drainage depression at Parsley Bay, undulating rocky and grassed clifftops at Diamond Bay and gentle to moderate slope and flat landforms within the remainder of the study area in Dover Heights and Rose Bay.

The remainder of the study area consists of road, utilities and water-related infrastructure corridors built to accommodate low to medium density residential development in the local area. The study area has been largely cleared of original vegetation in built areas, with short maintained grasses and isolated trees present within road verges. Parsley Bay Reserve and Diamond Bay consist of a mix of regrowth and remnant vegetation, maintained grasses and introduced weed species.

Potential impacts

An Aboriginal Heritage Due Diligence (AHDD) assessment has been completed for the works by Kelleher Nightingale Consulting in March 2020 (KNC, 2020). The impact assessment included a desktop assessment to identify any known sites already in the area, as well as a visual inspection of all works areas. Visual inspection aimed to identify Aboriginal objects, sites and areas of potential and to confirm the location of the previously recorded sites within close proximity to the study area.

The *Due Diligence Code of Practice for the Protection of Aboriginal Objects in NSW* (OEH, 2010) defines that previously undisturbed areas within 200 m of waterways have high potential for discovery of Aboriginal objects. Diamond Bay, Oceanview Avenue and Eastern Avenue Reserve are located within 200 m of the Tasman Sea. However, the AHDD did not identify any new registered AHIMS sites, and concluded that the work sites have low archaeological potential due to unfavourable topography, erosion and disturbance from land use practices.

Parsley Bay

Two previously registered Aboriginal Heritage Information Management System (AHIMS) sites, were located adjacent to the works area as part of the field investigations. These AHIMS sites won't be impacted by construction as the worksites will be physically delineated with site fencing. Furthermore, due to the distance, impacts from vibration on these AHIMS sites is not expected.

The surveyed area displays low archaeological potential due to combinations of archaeologically unfavourable topography, erosion and disturbance from land use practices. Most of the study area was found to have been disturbed by construction of the carpark, Horler Avenue and the toilet block.

There are also a number of previously registered AHIMS sites located over 100 m further north/north west of the works area, however, no impact to these sites is expected.

Diamond Bay



The location of the proposed works area at Diamond Bay has been subject to disturbance related to construction and use of the boardwalk and clifftop area. Remnant retaining walls and mechanical cuts in the rock outcrops also suggest that land had previously been modified and disturbed (likely related to residential development of the area) prior to regeneration efforts along the coastline. No Aboriginal objects or areas of archaeological sensitivity were identified in the study area located at Diamond Bay.

Oceanview Avenue and Eastern Avenue Reserve

Oceanview Avenue and Eastern Avenue have been significantly disturbed from road construction and services installation. Eastern Avenue Reserve is primarily used for public recreation and has undergone landscaping work. Services have also been installed within Eastern Avenue Reserve, including Diamond Bay Ocean Outfall No. 2. No Aboriginal archaeological sites were identified within this study area.

Carlisle Street and Dover Road

The proposed works area along Carlisle Street and Dover Road includes the road corridor and road verges across flat and slope landforms. The study area had been significantly disturbed by road construction, general residential development and associated utilities and drainage. No Aboriginal archaeological sites were identified within this study area.

Safeguards

We will implement the following safeguards during construction and operation to minimise impacts to Aboriginal heritage.

Repeat the basic AHIMS search if it is older than 12 months. Conduct additional assessment if new sites are registered and could be impacted by the works.

If any Aboriginal object or non-Aboriginal relic is found, cease all excavation or disturbance in the area and notify SW Project Manager in accordance with SWEMS0009.

All workers will be inducted into the Aboriginal heritage sensitivities of the proposal, particularly those at Parsley Bay.

No work is permitted within the curtilage of any AHIMS sites.

6.1.8 Noise and vibration

Existing environment

A construction noise and vibration assessment was prepared for the proposal (GHD, 2020e). This involved the placement of four sound level meters at different locations for a period of 15 days in December 2019. The collected data assisted in identifying the existing background noise levels to determine the impact of the proposed works and identify sensitive receivers.

Parsley Bay

The proposed wastewater pumping station is located within the carpark area of Parsley Bay. It is surrounded by bushland with residential properties within 100 m along Parsley Road, Horler Avenue and Hopetoun Avenue. Parsley Bay is also a popular recreational area with a swimming enclosure, children's playground, café and open grassed area. Background noise is typical of a low density residential area, dominated by local traffic, wind and occasional construction noise.

For the works at Parsley Bay a monitor was placed at 20 Parsley Road to record existing background noise levels. Average rating background noise levels at Parsley Bay were:

- 39 dB(A) - daytime (7 am to 6 pm)
- 31 dB(A) - evening (6 pm to 10 pm)
- 24 dB(A) - night-time (10 pm to 7 am)

Eastern Avenue Reserve and Oceanview Avenue

The proposed work at Eastern Avenue Reserve is located within a public open space area, surrounded by residential properties and the Tasman Sea. The proposed works at Oceanview Avenue are located along a residential road with properties on either side. Background noise is typical of a low density residential area, dominated by local traffic, wind and occasional construction noise.

For the works at Eastern Avenue Reserve and Oceanview Avenue a monitor was placed at 56 Oceanview Avenue to record existing background noise levels. Average rating background noise levels were:

- 37 dB(A) - daytime (7 am to 6 pm)
- 35 dB(A) - evening (6 pm to 10 pm)
- 32 dB(A) - night-time (10 pm to 7 am)

Diamond Bay

The proposed work at Diamond Bay is located within a public open space area, surrounded by residential properties and the Tasman Sea. Background noise is typical of a low density residential area, dominated by local traffic, wind and occasional construction noise.

For the works at Diamond Bay a monitor was placed at 23 Kimberley Street to record existing background noise levels. Average rating background noise levels were:

- 39 dB(A) - daytime (7 am to 6 pm)
- 37 dB(A) - evening (6 pm to 10 pm)
- 34 dB(A) - night-time (10 pm to 7 am)

Carlisle Street



The proposed work at Carlisle Street and Dover Road is located within the roadway of a residential road, surrounded by residential properties. Background noise is typical of a low density residential area, dominated by local traffic, wind and occasional construction noise.

For the works at Carlisle Street a monitor was placed at 1A Conway Avenue to record existing background noise levels. Average rating background noise levels were:

- 39 dB(A) - daytime (7 am to 6 pm)
- 35 dB(A) - evening (6 pm to 10 pm)
- 26 dB(A) - night-time (10 pm to 7 am)

Potential impacts – construction

Noise

Noise generating activities from the construction of the wastewater pumping stations at Parsley Bay and Eastern Avenue Reserve include:

- earthworks
- rock breaking
- demolition of existing toilet block
- truck movements.

In addition, noise impacts are expected from construction of the wastewater pipelines, in particular:

- excavation along Oceanview Avenue, Carlisle Street and Dover Road
- horizontal Directional Drilling (HDD) at Carlisle Street and Parsley Bay
- truck movements.

At all work locations, construction is proposed to take place during standard hours specified in the EPA's *Interim Construction Noise Guidelines (ICNG)* (DECC, 2009). These include:

- 7 am to 6 pm (Monday to Friday)
- 8 am to 1 pm (Saturday)
- No work on Sundays or Public Holidays.

The construction noise assessment was undertaken in accordance with the ICNG. According to the ICNG, construction noise is considered to impact a receiver if the predicted noise level exceeds the Noise Management Level (NML) for that area. The NML is defined as follows:

- Recommended Background Level (RBL) + 10 dB(A) – for works within standard construction hours
- RBL + 5 dB(A) – for works outside standard construction hours
- 75 dB(A) – considered to represent 'highly noise affected' receivers

- commercial receivers – 70 dB(A)
- classrooms / child care centres – 55 dB(A).

The construction noise impact assessment was undertaken for ‘worst case’ construction scenarios and results are described below.

Wastewater pumping station construction

- Highly noise affected level of 75 dBA is predicted at up to 99 residential receivers, generally within 50 m of construction activities associated with both the wastewater pumping stations sites and Vacluse wastewater pipeline. This would generally be during rock-breaking activities which would generally only occur during the initial period of 2-3 months of the proposal.
- One exceedance of up to 5 dBA at the place of worship (Wentworth Memorial Church) located at 32 Fitzwilliam Road, Vacluse.

Open trenching pipeline construction

- Highly noise affected level of 75 dBA is predicted to be exceeded at up to 229 residential receivers, generally within 50 m of construction activities associated with open trenching for pipelines. Pipeline trenching will occur in a progressive manner, with approximately 10 m constructed per day. As such, noise generating activities may only persist along these alignments for each receiver for 1-2 weeks.
- The following impacts on non-residential receivers:
 - an exceedance of up to 2 dBA at one commercial receiver located at 21 Dover Road, Rose Bay
 - an exceedance of up to 40 dBA at two educational institutes located at 12 Carlisle Street, Rose Bay (McAuley Catholic Primary School) and 21 Wilberforce Avenue, Rose Bay (Rose Bay Public School)
 - an exceedance of up to 38 dBA at the places of worship at 2 Carlisle Street, Rose Bay (St. Andrew’s Scots Presbyterian Church), 835 New South Head Road, Rose Bay (St. Mary Magdalene’s Catholic Church) and 32 Fitzwilliam Road, Vacluse (Wentworth Memorial Church)
 - no predicted exceedances at the identified industrial and passive recreation receivers.

Trenchless pipeline construction

- Highly noise affected level of 75 dBA is predicted to be exceeded at up to 17 residential receivers, generally within 30 m of construction activities associated with entry and exit HDD sites located at Parsley Bay and Carlisle Street.
- Ground-borne noise and vibration at surface level is unlikely to be generated from trenchless pipe installation of pipe sizes ranging from 22.5 cm to 35.5 cm at 8-70m depth in



sandstone rock formation. However noise will be generated at pit sites at Eastern Reserve, Carlisle Street and Parsley Bay due to rock excavation and operating the equipment used in trenchless pipe installation.

The most effective measure for minimising ground-borne noise impacts is scheduling activities during less sensitive time periods, installing noise barriers and providing residences with notification of the potential for impacts and responding to complaints. The trenchless pipe installation for this project would be undertaken during standard construction hours which minimises any potential sleep impacts. The EPA's Interim Construction Noise Guideline (DECC, 2007) ground-borne noise criteria are to, '*protect the amenity and sleep of residences*' and do not apply to daytime periods. There are no ground-borne noise objectives for construction works during the day as higher ambient noise levels typically mask the audibility of ground-borne noise emissions.

The trenchless pipe installation of gravity main of 22.5 cm at Parsley Bay will have an indicative drilling rate of 20 m/ day and take approximately five days. No receivers have been identified within the screening distances for human comfort. Therefore ground-borne vibration impacts are considered unlikely as the trenchless gravity main installation at Parsley Bay does not pass under any residential areas.

The trenchless pipe installation of 35.5 cm pressure main Parsley Bay to Carlisle Street will have an indicative drilling rate of 30 m/ day and take approximately 60 days to complete. Although this pipeline is mostly at a depth of up to 8-70 m in sandstone, there will unlikely be ground-borne noise and vibration at the surface level.

Potential ground-borne noise and vibration impacts at surface level are unlikely at Eastern Reserve as the trenchless installation of 30 cm gravity main passes in sandstone at above 8 m depth under residential areas. The drill rate would be approximately 15 m per day as such, any potential impacts would be present for a very short period of time (less than a few days) as the pipe progresses. In addition, it is anticipated that the trenchless pipe installation would only occur during daytime hours which would limit potential impacts to receivers.

Ground-borne vibration from trenchless pipe installation would be short term as drilling would progress along the alignment and impact receivers for no more than 2 to 3 days. Impacts are considered unlikely as the trenchless pipe installations are located at a depth of 8 m or more below the surface level from any residential structure. The recommend approach for managing impacts is through notification, compliance monitoring to confirm predictions and consultation with residences.

Vibration

The vibration impact assessment has identified potential impacts to standard structures (i.e. non-heritage structures) within 22 m from rock breaking activities. Impacts would be minimal, if at all, and would only be present during rock breaking activities associated with pumping station construction and trenchless pipeline pits. Mitigation measures would be implemented to minimise any potential impacts. The following areas are located within 22 m of the construction activities:

- Rose Bay: Cecil Road, Chamberlain Avenue, Dudley Road, Carlisle Street, Fernleigh Avenue, Conway Avenue, Hamilton Street, Dover Road, Courtenay Road, Old South Head Road
- Dover Heights: Oceanview Avenue, Eastern Avenue, Military Road
- Vaucluse: Black Street, Fitzwilliam Road, Girilang Avenue, Hay Street, Hopetoun Avenue, Petrarch Avenue, Oceanview Avenue, Ray Street, Ethel Street, Kimberley Street, Serpentine Parade, Clairvaux Road, Parsley Road, New South Head Road, Village Lower Road, Captain Pipers Road, Military Road, Towns Road, Old South Head Road.

In addition to the areas above, the following roads have been identified within 73 m of the construction activities and receivers on these roads could potentially experience human comfort impacts during construction. Impacts for these locations would not be present throughout the entire duration of the proposal, only during high noise generating activities such as rock breaking. These activities will persist for a short period of the total proposal duration as works progress and mitigation measures would be implemented to reduce potential impacts:

- Rose Bay: Churchhill Road, Fernleigh Gardens, Ian Street, Norton Avenue, Spencer Street, Towns Road, Wilberforce Avenue
- Dover Heights: Bulga Road, Elvina Street, Norton Avenue
- Vaucluse: Billong Avenue, Burrabirra Avenue, Clarendon Street, Craig Avenue, Dalley Avenue, Olola Avenue, Ray Avenue, The Crescent, Wilfield Avenue.

Potential impacts – operation

The following infrastructure will be installed which has the potential for operational noise impacts:

- 2 submersible Xylem NP 3315 HT pumps operating at 105 kW within a wet well (interim) – Parsley Bay
- 2 submersible Xylem NP 3202 HT pumps operating at 47 kW within a wet wall (interim) – Eastern Avenue Reserve.

The following operational noise levels shown in Table 5 at the nearest sensitive receivers to each wastewater pumping station have been calculated. This indicates that operational noise from the new wastewater pumping stations at Parsley Bay and Eastern Avenue Reserve is expected to comply with noise criteria for surrounding residents. These noise levels will be verified during commissioning of the pumping stations to ensure compliance. It is not expected that operational noise levels will exceed existing background noise levels.

The wastewater pumping stations will operate periodically and are unlikely to generate excessive noise and vibration. The pumps will be located below ground which will also reduce the amount of noise generated at the ground surface. Appendix E has a copy of the Noise and Vibration Impact Assessment.

Table 5 - Compliance of predicted operational noise levels at adjacent residential properties.

Receiver address	Receiver type	Proposal Noise Trigger Level	Predicted noise level dB(A)	Compliance
24 Parsley Rd	Residential	35 ¹	27	Yes
26 Parsley Rd	Residential	35 ¹	24	Yes
52 Eastern Rd	Residential	37 ¹	34	Yes

1. These noise trigger levels have been adopted from EPA's *Noise Policy for Industry (EPA, 2017)*

Safeguards

We will implement the following safeguards during construction and commissioning to minimise noise and vibration impacts.

Schedule work and deliveries during standard daytime working hours of 7am to 6pm Monday to Friday and 8am to 1pm Saturday. No work to be scheduled on Sundays or public holidays (DECC Interim Construction Noise Guideline, 2009).

Works will be carried out in accordance with:

- Sydney Water's Noise Management Procedure SWEMS0056
- Noise Policy for Industry (EPA, 2017).

Incorporate standard daytime hours noise management safeguards into the CEMP:

- identify and consult with potentially affected residents prior to the commencement of work:
 - describe the nature of works; the expected noise impacts; approved hours of work; duration, complaints handling and contact details
 - determine need for, and appropriate timing of respite periods (eg times identified by the community that are less sensitive to noise such as mid-morning or mid-afternoon for works near residences)
 - acceptance by the community of longer construction periods in exchange for restriction to construction times.
- implement a complaint handling procedure for dealing with noise complaints

- 
- 
- plant or machinery will not be permitted to warm-up near residential dwellings before the nominated working hours
 - appropriate plant will be selected for each task, to minimise the noise impact (eg all stationary and mobile plant will be fitted with residential type silencers)
 - engine brakes will not be used when entering or leaving the work site(s) or within work areas
 - regularly inspect and maintain equipment in good working order
 - arrange work sites where possible to minimise noise (eg generators away from sensitive receivers, minimise use of vehicle reversing alarms)
 - schedule noisy activities around times of surrounding high background noise (local road traffic or when other noise sources are active).

If works beyond standard daytime hours are needed, the contractor's environmental representative would:

- justify the need for out of standard daytime work
- consider potential noise impacts and: implement the relevant standard daytime hours safeguards; Sydney Water's Noise Management Code of Behaviour (SWEMS0056.01) and other reasonable and feasible management measures
- identify community notification requirements
- seek approval from the Sydney Water Project Manager.

If night works are needed, the contractor's environmental representative would:

- justify the need for night works
- consider potential noise impacts and implement the relevant standard daytime and out of hours safeguards and other reasonable and feasible management measures
- identify community notification requirements (ie for scheduled night work (not emergency works))
- notify all potentially impacted residents and sensitive noise receivers not less than one week prior to commencing night work
- seek approval from the Sydney Water Project Manager.

If works on Sundays or public holidays are required, the contractor's environmental representative would:

- justify why all other times are not feasible

- consider potential noise impacts and, implement relevant standard daytime, out of hours and night-time safeguards and other reasonable and feasible management measures
- identify community notification requirements
- seek approval from the Sydney Water Project Manager.

Conduct a dilapidation survey / asset condition assessment prior to works which have potential to damage existing structures. Dilapidation surveys would be undertaken at structures located within 22 m of any area requiring operation of a rock breaker and at the heritage structure located at 30 Dover Road, Rose Bay.

Monitor compliance with the recommended vibration levels in DIN 4150-3 1999: Structural Vibration – Part 3; Effects of vibration on structures.

The pumping stations must be designed to meet the requirements of the Noise Policy for Industry (EPA, 2017) and this must be verified on commissioning.

Monitoring would be undertaken prior to operation of the rock breaker and HDD rig to confirm site specific conditions and equipment vibration source levels.

Alternative equipment shall be investigated if operation of the vibration intensive equipment results in vibration above the recommended vibration levels. This may include the use of a jack hammer or smaller rock breaker.

Operation of the HDD and micro-tunnelling equipment should be undertaken during standard construction hours where feasible and reasonable.

A minimum of 2 m high temporary noise barriers should be constructed around the all compound sites including the HDD compound and micro-tunnelling sites.

Vibration monitoring to occur at the commencement of micro-tunneling to refine the ground-borne noise and vibration contours.

6.1.9 Traffic and access

Existing environment

All construction locations are located in public areas, along or adjacent to public roads. Access to each site is via the existing public road network. A Traffic Impact Assessment has been completed for the proposed works (GHD, 2020f) and is included in Appendix F.

As part of this assessment a seven-day automatic tube traffic count was undertaken in December 2019 to assess the current traffic volumes. The results of which are shown in Table 6 below.

Table 6 – Existing background vehicle movements at each works location

Traffic count site	7-day average volume (two-way)	Maximum Weekday AM Peak Hour (two-way)	Maximum Weekday PM Peak Hour (two-way)	Maximum Weekend Peak Hour (two-way)	Existing vehicle use classification
Oceanview Ave	836	75	87	85	98% Light 2% Medium
Eastern Ave	938	73	93	82	89% Light 11% Medium
Kimberley St	948	80	94	88	90% Light 10% Medium
Chamberlain Ave	792	84	74	66	97% Light 3% Medium
Carlisle St	1,364	147	139	125	96% Light 4% Medium
Dover Rd	6,766	550	540	516	95% Light 5% Medium
Horler Ave	378	62	42	116	80% Light 19% Medium 1% Unclassifiable



Potential impacts

During construction, the proposal will generate traffic from the following key work activities:

- construction of wastewater pumping stations at Parsley Bay and Eastern Avenue Reserve – mainly the transportation of materials and equipment, as well as the disposal of spoil from excavation activities
- pipeline construction by a mix of open trenching and trenchless methods, such as HDD and microtunneling – mainly the removal and disposal of spoil from drilling operations, and the delivery of pipe segments.

The construction traffic movements are expected to occur with works associated at:

- Parsley Bay: New South Head Road, Vaucluse Road, Parsley Road, Horler Avenue
- Eastern Avenue Reserve: New South Head Road, Dover Road, Old South Head Road, Oceanview Avenue, Military Road, Eastern Avenue
- Carlisle Street: New South Head Road, Dover Road, Carlisle Street.

Expected construction traffic volumes for the proposal would be:

- 30 daily light vehicle movements
- 5 - 10 daily heavy vehicle movements per construction site.

The works at Parsley Bay will likely require restricted access and use of the carpark for a period of 12 months. During this time Horler Avenue will also have restricted vehicular access and will be managed via traffic control. Minor widening at tight restricted points along Horler Avenue will be required to allow safe entry and exit of heavy vehicles. No alternative parking will be provided for the closure of the car park. However, attempts will be made to time the most disruptive works to traffic and access during cooler months when the use of Parsley Bay is reduced.

For all work sites, it is anticipated that work vehicles will utilize available street parking. The exception to this is Parsley Bay and Eastern Avenue Reserve where construction compounds may be able to house work vehicles. Impacts on street parking is expected to be minimal due to the limited number of light work vehicles required, as well as the availability of street parking in surrounding streets to the work sites.

Street parking would be impacted along Carlisle Street, Dover Road, Oceanview Road and Eastern Avenue due to trenching for wastewater pipelines and site access. All impacts would be temporary and short term as the works progress along each street.

The traffic volumes will vary across the work sites as well as at different stages of the proposal. The largest impacts are expected at Parsley Bay during HDD operations during the construction of the Vaucluse wastewater pipeline.

All sites will be accessed via existing public roads and access paths. The exception to this is Diamond Bay where a maximum five metre wide access track through bushland off Craig Avenue



will be required, as well as a maximum five metre access track through the bushland area of Parsley Bay. Access tracks at these locations are shown in Figures 6 and 7.

The public toilet block at Parsley Bay will be removed and a new amenities block will be built at a new location in consultation with council. The details of this are yet to be determined. The new amenities block is planned to be built and will be functional before the existing toilet block is demolished. However, if areas of Parsley Bay remain accessible to the public during construction, temporary toilet facilities will be provided.

The public boardwalk at Diamond Bay from Craig Avenue to Kimberley Street will be closed for the duration of the works in this area. A safe alternative access path following the road network will be provided. As part of the proposal, Sydney Water will work with council to upgrade the existing boardwalk at the same time in which these works are being undertaken. The details of the improved boardwalk are yet to be determined.

Safeguards

We will implement the following safeguards during construction and operation to minimise traffic and access impacts.

- Prepare a Traffic Management Plan (TMP) in consultation with the relevant traffic authority.

- Comply with NSW Roads and Maritime Service's Traffic Control at Worksites Manual v5 requirements for Transport for NSW (TfNSW) roads. The contractor will obtain a Road Occupancy Licence (ROL) from TfNSW, including if works are within 100m of traffic signals when construction commences.

- Minimise traffic impacts near residential properties, schools and businesses (eg no major materials deliveries at school drop off or pick up times etc).

- Manage sites to allow people to move safely past the works, including alternative pedestrian, bicycles, pram and wheelchair access.

- Consult with the relevant traffic authority about managing impacts to pedestrian traffic, signposting, meters, parking, line-marking or if traffic control or pavement restoration is required.

- Erect signs to inform road users of the proposed works and any temporary road closures.

- Ensure work vehicles do not obstruct vehicular or pedestrian traffic, or private driveway, public facility or business access unless necessary and only if appropriate notification has been provided.

- Any temporary access tracks will be restored to pre-existing conditions or better at the completion of works.



Any required temporary closure of public facilities, i.e. public toilets at Parsley Bay and boardwalk at Diamond Bay, will be adequately communicated to the public prior to the commencement of works.

6.1.10 Social and visual

Existing environment

The works areas are located in a highly visible urban environment. All sites are directly accessible by the public and are surrounded by residential properties, as well as public open space. Although the pumping stations at Parsley Bay and Eastern Avenue Reserve will be located below or at ground level, some permanent above ground assets will be required.

Parsley Bay is a small inlet on Sydney Harbour surrounded by native bushland and residential properties. There is a swimming enclosure, children's playground, amenities, car park and a large open grassed area for public recreation.

Eastern Avenue Reserve is a grassed reserve on the cliff face looking over the Tasman Sea. There is a popular public walking track that traverses this area and is surrounded by residential properties along Eastern Avenue and Oceanview Avenue.

Potential impacts

Visual impacts consist of impacts during both construction and operation. Construction visual impacts are temporary, and will include the movement of vehicles and machinery, installation of equipment, earth moving and changed traffic conditions. Construction impacts are common across all work sites. Operational visual impacts are permanent and include installation of new above ground equipment, as well as vegetation trimming and removal. Operational visual impacts are predominately restricted to Parsley Bay and Eastern Avenue Reserve where two pumping stations will be constructed, as well as a ventilation point along Oceanview Avenue.

A Visual Impact Assessment has been completed for the proposed works (RPS, 2020). This report has primarily focused on the visual impact of the pumping stations at Parsley Bay and Eastern Avenue Reserve. The report was developed during concept design of the proposal and suggests mitigation measures to be implemented to minimise impacts. Any residual visual impacts to surrounding sensitive receivers will be further minimised as far as practicable during detailed design and in consultation with directly affected property owners.

Parsley Bay

The pumping station will be located in the existing location of the toilet block on the southern side of the car park. The Visual Impact Assessment concluded that the overall visual impact of the pumping station will be low. This is primarily due to the majority of the permanent infrastructure will be located below ground and will not be visible. Furthermore, the location of the pumping station is surrounded by dense vegetation which minimizes the visual impact on surrounding residential properties. Above ground structures will include an electrical kiosk, ventilation point (approximately 14m high), safety bollards / railing and metal access covers.



The visual impact assessment has concluded that the main impacted viewpoint will be from the Parsley Bar carpark looking south towards the pumping station. Due to the surrounding vegetation and steep terrain, the pumping station will not be visible to surrounding residents. Figure 11 shows a viewpoint analysis of the pumping station at Parsley Bay.

There are number of measures planned to blend the above ground structures with the environment:

- removal of the existing toilet block and associated structures and replacement with a underground pumping station
- utilisation of existing ventilation point and relocation to an alternate position in the same area for the new pumping station
- planting of additional mature shrubs/trees to improve visual amenity.

Social impacts associated with the potential closure/ restricted access to Parsley Bay during construction has yet to be determined. It is likely that the car park will be closed during construction, however, the park and bay areas will remain open. We will consult with local residents and council on how these impacts will be mitigated. It is our intention to have as minimal impact on the community as reasonable practicable.

Eastern Avenue Reserve

The pumping station at Eastern Avenue Reserve will be located in an open cleared grassy reserve at the eastern end of Eastern Avenue. The Visual Impact Assessment concluded that the overall visual impact of the pumping station will be moderate. This is due to the proximity of residential properties, lack of existing visual screening and high pedestrian use of the reserve. However, as with Parsley Bay, the majority of equipment will be located below ground. Above ground structures will include an electrical kiosk, co-location of a ventilation point with existing light pole and safety bollards. The works will also remove the overhead power line that provides power to the light pole and the new light will be solar powered. There will also be some new hardstand/ short driveway for a Sydney Water maintenance trucks to access the site.

The white picket fence at the eastern end of Eastern Avenue will be temporarily removed during construction, however, it will be reinstated at the completion of the works.

The visual assessment has concluded that the main impacted view will be from the residential properties at the end of Eastern Reserve looking east, as well as for members of the public in Eastern Reserve. Figure 12 shows a viewpoint analysis of the pump station at Eastern Avenue Reserve.

A ventilation point will also be required at the western end of Oceanview Avenue near Old South Head Road. The visual impact will minimised as far as practicable through consultation with surrounding residents.

There will likely be social impacts associated with restricted access to the boardwalk between Craig Avenue and Kimberley Street. We are working closely with council to assess the level of



impact. We will also work closely with council to replace the boardwalk with an improved boardwalk during the proposal.

Safeguards

We will implement the following safeguards during construction and operation to minimise social and visual impacts.

Undertake works in accordance with Sydney Water Communications policies and requirements including appropriate consultation with surrounding community so that all reasonable and feasible mitigation measures such as visual and design features are considered and costed into the proposal.

Work sites will be restored to pre-existing condition or better.

Minimise visual impacts (eg retain existing vegetation where possible).

Maintain work areas in a clean and tidy condition.

The built form of the proposed infrastructure should be of a similar scale to the surrounding landscape character.

Materials selected are to reduce colour contrast and blend any new and existing structures, as far as possible, into the surrounding landscape.

The following mitigation measures will be implemented during construction:

- installation of screen hoarding and/or shade cloth screens
- retention and protection of existing tree planting as practicable
- avoidance of temporary light spill beyond the construction site where temporary lighting is required
- rehabilitation of disturbed areas
- removal of graffiti in accordance with Sydney Water standard procedures.

New structures should be painted with a non-reflective colour which complements the existing colours of the surrounding sites.

Figure 10 – Existing and proposed viewpoint analysis at Parsley Bay

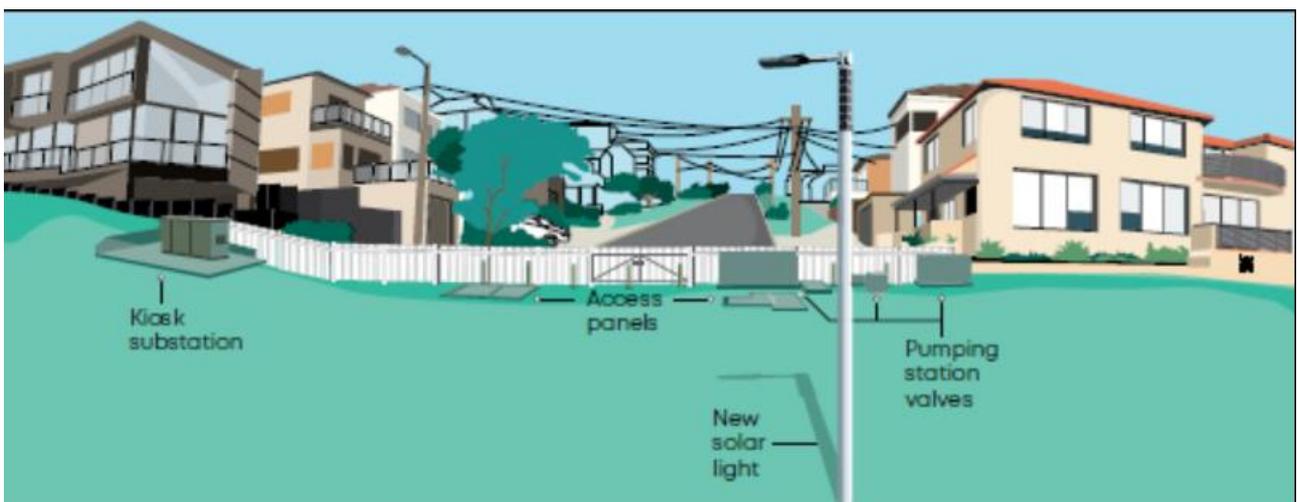
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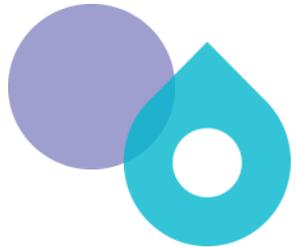


PROPOSED



Figure 11 – Proposed viewpoint analysis at Eastern Avenue Reserve





6.1.11 Cumulative

We do not expect any significant adverse cumulative impacts to occur during the proposal. During construction, there may be other minor works in surrounding residential properties or roadways.

We will continue to maintain contact with Waverley Council and Woollahra Council to ensure any cumulative impacts are minimised.

6.2 General Environmental Management

The following general environmental management safeguards will be implemented.

Prepare a Construction Environmental Management Plan (CEMP) addressing the requirements of this environmental assessment. The CEMP should specify license, approval and notification requirements. Prior to the start of work, all proposal staff and contractors will be inducted in the CEMP.

The CEMP should be readily available on site and include a site plan which shows:

- no go areas and boundaries of the work area
- location of environmental controls (such as erosion and sediment controls, fences or other measures to protect vegetation or fauna, spill kits)
- location and full extent of any vegetation disturbance.

As part of the CEMP, the following Management Plans would be prepared:

- Soil and Water Management Plan
- Groundwater/ Dewatering Management Plan
- Acid Sulphate Management Plan (if required)
- Waste Management Plan
- Incident Management Plan.

The alignments shown in the REF are indicative and based on latest concept design at the time of REF preparation. The final alignment may change based on activities such as detailed design and construction planning. No further environmental assessment is required provided the changed alignment:

- remains within the field assessment area for the REF and has no net additional environmental impact, or
- is outside the field assessment area for the REF but reduces the overall environmental impact of the proposal.

Changes to the Proposal outside the field assessment area will only occur:

- to reduce impacts to biodiversity, heritage or human amenity, or
- to avoid engineering (for example, geological, topographical) constraints; and
- after consultation with any potentially affected landowners and relevant agencies.



The contractor must demonstrate in writing how the changes meet these requirements, for approval by Sydney Water's Project Manager in consultation with the environmental and communication representatives.

Sydney Water's Project Manager (after consultation with Sydney Water's environment and community representatives and affected landowners) can approve temporary ancillary construction facilities (such as compounds and access tracks), without additional environmental assessment or approval if the facilities meet the following principles:

- limit proximity to sensitive receivers
- no disruption to property access
- no impact to known items of non-Aboriginal and Aboriginal heritage
- outside high-risk areas for Aboriginal heritage
- use existing cleared areas and existing access tracks
- no impacts to remnant native vegetation or key habitat features
- no disturbance to waterways
- potential environmental impacts can be managed using the safeguards in this REF
- no disturbance of contaminated land or acid sulphate soils
- will be rehabilitated at the end of construction.

The contractor must demonstrate in writing how the proposed ancillary facilities meet these principles. Any facilities that do not meet these principles will require additional environmental impact assessment.

The agreed location of these facilities must be shown on the CEMP site plan and appropriate environmental controls installed.

Prepare an Incident Management Plan (IMP) outlining actions and responsibilities during:

- onset of heavy rain during works
- spills
- unexpected heritage finds
- other potential incidents relevant to the scope of works.

All site personnel should be inducted into the IMP.

Immediately notify the Sydney Water Project Manager and Community Relations Representative of any complaints.

To ensure compliance with legislative requirements for incident notification (eg. Protection of the Environment Operations Act 1997), Sydney Water's employees and contractors will follow SWEMS0009.



7 Conclusion

The Refresh Vacluse and Diamond Bay proposal will result in cleaner waterways, reduce risks to human health, reduce degradation to the environment and reduce waste entering the environment via the three ocean outfalls at Vacluse and Diamond Bay.

It will improve the wastewater network performance in Vacluse and Diamond Bay by transferring dry weather flows from the existing ocean outfalls to the Bondi WWTP. This will be achieved by constructing two new wastewater pumping stations, new wastewater pipelines and ancillary infrastructure in the Vacluse and Diamond Bay areas.

The REF has identified where the proposal could impact the surrounding environment during construction and operation. The main construction environmental impacts relate to potential noise, visual, traffic and access, and waste management. These impacts should not be significant, and we can manage them using the identified environmental safeguards.

Once operational, we do not expect the proposal to cause any significant environmental or community impacts and the new above ground structures are expected to have low to moderate visual impact from surrounding viewpoints. The proposal will reduce the amount of untreated wastewater discharged via the three ocean outfalls at Vacluse and Diamond Bay by 93%.

We believe, given the nature, scale and extent of impacts and implementation of the safeguards outlined in this REF, the proposed work is unlikely to have a significant impact on the environment and an environmental impact statement is not required under Division 5.1 of the EP&A Act.

The proposal will result in positive long-term environmental improvements, aligned with the principles of ecologically sustainable development. The proposal will not result in the degradation of the quality of the environment, and will not pose a risk to the safety of the environment.

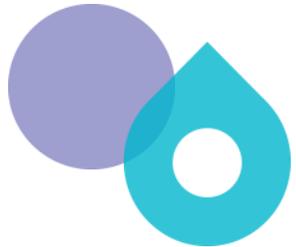
8 Glossary and References

8.1 Glossary and abbreviations

Ambient noise	background noise or the total noise in each area
dB	decibels, the measurement of sound or noise
LGA	local government area
Receiver	the noise-sensitive landuse at which noise from a development can be heard

8.2 Reference list

- Artefact (2020), *Vaucluse Diamond Bay Ocean Outfalls Project – Statement of Heritage Impact*, March 2020
- ANZG (2018) *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*
- EPA (2017), *Noise Policy for Industry*, NSW EPA, October 2017
- EPA (2019), *Waste Classification Guidelines*, NSW EPA, November 2014
- DECC (2009), *Interim Construction Noise Guidelines*, Department of Environment and Climate Change
- GHD (2019), *Vaucluse Diamond Bay – Arboricultural Impact Assessment relating to the Vaucluse Diamond Bay Wastewater Improvements Project*, November 2019
- GHD (2020), *Vaucluse Diamond Bay – Geotechnical Investigation Report*, April 2020
- GHD (2020a), *Vaucluse Diamond Bay – Contamination Assessment and Groundwater Inflow Assessment*, April 2020
- GHD (2020b), *Vaucluse Diamond Bay – Biodiversity Assessment*, January 2020
- GHD (2020c), *Vaucluse Diamond Bay – Marine Environment Assessment*, March 2020
- GHD (2020d), *Vaucluse Diamond Bay – Concept Design Report*, February 2020
- GHD (2020e), *Vaucluse Diamond Bay – Noise and Vibration Impact Assessment*, April 2020
- GHD (2020f), *Vaucluse Diamond Bay – Concept Design Construction Traffic Impact Assessment*, April 2020
- KNC (2020), *Refresh Vaucluse Diamond Bay Project – Aboriginal Heritage Due Diligence Assessment*, April 2020

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- OEH (2010), *Due Diligence Code of Practice for the Protection of Aboriginal Objects in NSW*
 - RPS (2020), *Visual Impact Assessment of Vaocluse Diamond Bay Concept Design*, April 2020
 - Sydney Water (2018), *Refresh Vaocluse Diamond Bay – Detailed Planning*, October 2018



9 Appendices

Appendix A – Clause 228 checklist



Clause 228 checklist	REF finding
Any environmental impact on a community	There may be short-term impacts on the community from traffic, dust and noise. There will be environmental improvements by eliminating the continuous flow of untreated wastewater into the surrounding environment.
A transformation of a locality	The proposed work will result in the construction of two new wastewater pumping stations. This will result in minor to moderate visual changes to these locations. The majority of structures will be located below ground which will minimise the visual impact during operation.
Any environmental impact on the ecosystem of the locality	The proposed work will reduce environmental impacts to ecosystems of the locality. No threatened flora or fauna or ecological communities will be impacted. The receiving environment around the ocean outfalls at Vacluse and Diamond Bay will be improved with a 93 percent reduction in untreated wastewater discharge.
Any reduction of the aesthetic, recreational, scientific or other environmental quality or value of the locality	The proposed work will not result in a reduction of the aesthetic, recreational, scientific or other environmental quality or value of the locality. The proposal will reduce the environmental impact associated with discharge of untreated wastewater at the three ocean outfalls at Vacluse and Diamond Bay. There will be a short-term reduction in the recreational value and use of Parsley Bay and Eastern Avenue reserves during construction.
Any effect upon a locality, place or building having aesthetic, anthropological, archaeological, architectural, cultural, historical, scientific or social significance or any other special value for present or future generations	The proposed work will have a minor – moderate impact on the heritage significance of the conservation Sandstone Escarpment Conservation Area at Eastern Reserve. There will also be a minor-moderate visual impact at Parsley Bay and Eastern Reserve at the pump station locations.
Any impact on the habitat of any protected animals (within the meaning of the Biodiversity Conservation Act 2016)	The proposed work will not impact upon the habitat of protected species. The proposal will minimize vegetation clearance as far as practicable and will not clear any threatened ecological communities.
Any endangering of any species of animal or plant or other form of life, whether living on land, in water or in the air	The proposed work will not result in endangering any species of animal, plant or other form of life, whether living on land, in water or in the air. No threatened flora or fauna will be impacted, and no threatened ecological communities will be cleared.
Any long-term effects on the environment	The proposed work will not have any long-term impacts on the environment but will have a long-term benefit by providing a reliable and modern wastewater service for the area. The reduction of untreated wastewater discharge to the environment at the three ocean outfalls will result in long-term positive impacts on the receiving environment.



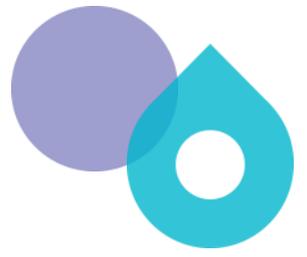
Clause 228 checklist	REF finding
Any degradation of the quality of the environment	The proposed work will not cause the degradation of the quality of the environment. The works will increase the quality of the environment by reducing the amount of untreated wastewater entering the environment.
Any risk to the safety of the environment	The proposed work will not increase risk to the safety of the environment. The proposal will reduce the risk to human health near the three ocean outfalls.
Any reduction in the range of beneficial uses of the environment	The proposed work will not have any reduction in the range of beneficial uses of the environment.
Any pollution of the environment	Environmental safeguards will mitigate the potential for the proposed work to pollute the environment. No pollution of the environment is expected. The proposal will significantly reduce pollution to the environment by eliminating dry weather wastewater entering the environment from the existing ocean outfalls.
Any environmental problems associated with the disposal of waste	The disposal of wastes will be conducted in accordance with the environmental safeguards, and no environmental problems associated with the disposal of waste are expected. There will be a significant reduction in the amount of wastewater entering the environment via the three ocean outfalls.
Any increased demands on resources (natural or otherwise) that are, or are likely to become, in short supply	The proposed work will not increase demand on resources, that are, or are likely to become, in short supply.
Any cumulative environmental effect with other existing or likely future activities	There is unlikely to be any cumulative environmental effects with other existing or likely future activities.
Any impact on coastal processes and coastal hazards, including those under project climate change conditions	The proposed work will not have any impact on coastal processes or hazards.

Appendix B – Consideration of ISEPP consultation

ISEPP clause	Yes	No
Clause 13, council related infrastructure or services – consultation with council		



Will the work:		
Potentially have a substantial impact on stormwater management services provided by council?		N
Be likely to generate traffic that will strain the capacity of the road system in the LGA?		N
Involve connection to, and have a substantial impact on, the capacity of a council owned sewerage system?		N
Involve connection to, and use of a substantial volume of water from a council owned water supply system?		N
Involve installation of a temporary structure on, or enclosing, a public space under council's control that will cause a disruption to pedestrian or vehicular traffic that is not minor?	Y	
Involve excavation of the surface of, or a footpath adjacent to, a road for which the council is the roads authority that is not minor or inconsequential?	Y	
Clause 14, local heritage – consultation with council		
Is the work likely to affect the heritage significance of a local heritage item, or of a heritage conservation area (not also a State heritage item) more than a minor or inconsequential amount?	Y	
Clause 15, flood liable land – consultation with council		
Will the work be located on flood liable land (that is land that is susceptible to flooding by the probable maximum flood event) and will they alter flood patterns other than to a minor extent?		N
Clause 15AA, flood liable land – consultation with State Emergency Services		
Will the work be located on flood liable land (ie. land that is susceptible to flooding by the probable maximum flood event) and undertaken under a relevant provision*, but not the carrying out of minor alterations or additions to, or the demolition of, a building, emergency works or routine maintenance? * (e) Div.14 (Public admin buildings), (g) Div. 16 (Research/ monitoring stations), (i) Div. 20 (Stormwater systems)?		N
Clause 15A, development with impacts on certain land within the coastal zone– council consultation		
Is the work on land mapped as coastal vulnerability area and inconsistent with a certified coastal management program?		N
Clause 16 – consultation with public authorities other than councils		
Will the proposal be located on land adjacent to land reserved under the <i>National Parks and Wildlife Act 1974</i> or to land acquired under Part 11 of that Act? <i>If so, consult with DPIE.</i>		N
Will the proposal be located on land in Zone E1 Nationals Parks and Nature Reserves or in a land use zone that is equivalent to that zone? <i>If so, consult with DPIE</i>		N
Will the proposal be adjacent to an aquatic reserve or a marine park declared under <i>Marine Estate Management Act 2014</i> ? <i>If so, consult with the Department of Industry.</i>		N
Will the proposal be in the foreshore area within the meaning of the <i>Sydney Harbour Foreshore Authority Act 1998</i> ? <i>If so, consult with Sydney Harbour Foreshore Authority</i>		N
Will the proposal comprise a fixed or floating structure in or over navigable waters? <i>consult RMS</i>		N
Will the proposal be located on land in a mine subsidence district within the meaning of the <i>Coal Mine Subsidence Compensation Act 2017</i> ? <i>If so, consult with Subsidence Advisory NSW.</i>		N
Will the proposal involve clearing of native vegetation on land that is not subject land (ie non-certified land)? <i>If so, notify DP&E at least 21 days prior to work commencing.</i>		N



Appendix C – Flora and Fauna assessments





Appendix D – Statement of Heritage Impact





Appendix E – Noise and Vibration Assessment





Appendix F – Traffic Impact Assessment



