# Ocean Beach Domain

## Desktop Hazards and Geotechnical Assessment

Prepared for:
Dunedin City Council

Date:
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Prepared by:
Stantec New Zealand

Project/File:
310206719

Stantec New Zealand

# Revision Schedule

| Revision No. | Date | Description | Prepared by | Quality Reviewer | Independent Reviewer | Project Manager Final Approval |
|---|---|---|---|---|---|---|
| 0 | 5 Feb 26 | Draft for review | L Paterson<br>H Sussex | | R Oakley | S Lilley |
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# Executive Summary

*To be completed with Final Report.*

# 1 Introduction

The Dunedin City Council has requested that Stantec undertake a desktop data gathering exercise to confirm potential issues associated with a change in use for the Ocean Beach Domain.

## 1.1 Site description

The site comprises two sections within the suburbs of St Kilda and Tainui in Dunedin. A golf course, lawn bowls and croquet club are located within the eastern section while Tahuna Park, Dunedin Holiday Park and Motel, a kindergarten, and Hancock Park are located within the western section. Refer to Figure 1-1 for the site layout.


*Figure 1-1: Site layout*

The properties associated within the boundaries are highlighted in the plan supplied by DCC – in Appendix A.

## 1.2 Ocean Beach Domain History

Reference the historical Ocean Beach Domain Board, established by an Act in 1892 to make sure that the coastal protection provided by the dune system was maintained and enhanced. This was an issue of real concern and we believe that in early years of Dunedin history there were some breaches (??).This led to things like the St Clair seawall and the dune protection work up to Lawyers Head.

There is a management plan that seems to be in existence, refer to DCC website:

https://www.dunedin.govt.nz/council/policies,-plans-and-strategies/plans/ocean-beach-reserve-management-plan

# 2 Contaminated Land

## 2.1 Environmental setting

The environmental setting of the site is as detailed in Table 2-1.

*Table 2-1 Environmental setting*

| Site | Details |
|---|---|
| Geology | The majority of the site is underlain by Holocene shoreline deposits which is characterised by loose well sorted sand deposited predominantly by marine and lesser aeolian processes, minor gravel and silt. The eastern section of the site is underlain by Dunedin Volcanic Group second main phase extrusives which is characterised by Extensive flows of trachybasalt, olivine dolerite, basalt, phonolite. |
| Hydrogeology | The site is located within the South Dunedin urban area which is low-lying and was progressively reclaimed from coastal dunes, marshes, and intertidal deposits following European settlement. The water table sits very near the ground surface—typically only 0.3 to 0.7 meters below ground level (m bgl)[1].<br>This shallow groundwater forms part of a coastal aquifer system made up largely of sands, estuarine muds, and alluvial gravels that infill the basin separating mainland Dunedin from the Otago Peninsula. The aquifer is influenced by the surrounding sea level at both the ocean and harbour basin.<br>Groundwater at the site would be anticipated to flow towards Ocean Beach. |
| Topography | The western section of the site is relatively flat. The eastern section is more undulating within the golf course, with the highest point situated within the golf course, at about 20 m RL. |
| Hydrology | There are no rivers or water bodies located within the site. The closest water body is Ocean Beach, located to the south. |

## 2.2 Historical aerials

Historical aerials for the site were reviewed to identify any land uses that indicate the presence of HAIL sites. This information is summarised in Table 2-2 and relevant aerials are provided in Appendix B.

*Table 2-2 Historical aerial review*

| Year | Eastern section | Western section |
|---|---|---|
| 1947-1952 | The eastern section of the site comprises undeveloped land with a golf course and bowling green present. A cemetery is noted directly adjacent to the east. | The western section of the site comprises Tahuna Park, the partially constructed holiday park, and an area of scattered dwellings with probable market garden use. |
| 1958 | No significant changes observed within the site. Development of the Tahuna WWTP evident to the west. | The holiday park is noted to have finished construction. The group of dwellings noted within the western section is evident to have a small area of horticultural land use. |
| 1967 | Additional structures noted within the bowling green complex. | Group of houses and gardens noted to have been removed and replaced with grassed field. |
| 1975 | No significant changes observed. | No significant changes observed. |

[1] The South Dunedin Coastal Aquifer & Effect of Sea Level Fluctuations. Prepared by Jens Rekker, Resource Science Unit, ORC. October 2012.

| Year | Eastern section | Western section |
|---|---|---|
| 1985 | No significant changes observed. | Removal of vegetation and expansion of holiday park noted. |
| 2000 | Construction of lawn bowls stadium noted. | No significant changes observed. |
| 2006-2007 | No significant changes noted. | No significant changes observed. |
| 2013 | No significant changes noted. | Minor earthworks/disturbances noted at the southern edge of Tahuna Park. |
| 2024 | Removal of bowling green lawn and associated buildings observed. | No significant changes observed. |

## 2.3 ORC HAIL enquiry

An Otago Regional Council (ORC) HAIL request was submitted for the site to identify any information held regarding potential soil contamination.

The ORC HAIL enquiry confirmed the following HAIL activities within and adjacent to the site as detailed in Table 2-3.

*Table 2-3 Summary of the HAIL information provided from ORC*

| Address | HAIL code | Details | Associated reports |
|---|---|---|---|
| Chrisholm Park Landfill | G3: Landfill sites | The Chrisholm Park Landfill is understood to have been utilised for the disposal of domestic waste more than 50 years ago. The site has likely been capped with soil and is currently used as a golf course. The exact extent of the landfill is not well defined, and it is listed as a low priority landfill on the Environmental Sensitivity Ranking of High Priority Landfill Sites in the Otago Region (SEM New Zealand Limited, 2000). The site contamination status is not investigated. | None provided. |
| Chrisholm Park Landfill | G3: Landfill sites<br>A10: Persistent pesticide use | A portion of the wider Chrisholm Park Landfill is also listed as a separate (contained) site on the HAIL register, associated with a bowling green. Soil sampling and analysis was completed for heavy metals and OCPs in shallow soils across the site. Exceedances above the recreational soil contaminant standards were reported at six locations for arsenic. Remediation of the site has been completed, however ORC has yet to review the SVR. | Detailed Site Investigation - 38 Tahuna Road, EC Otago, August 2024. |
| Tahuna Wastewater Treatment Plant | G6: Wastewater treatment | The wastewater treatment plant is listed on the HAIL register with a contamination status of not investigated. | None provided. |
| Tahuna Wastewater Treatment Plant – lime dosing plant | G6: Wastewater treatment | A portion of the wider treatment plant is listed as a subsite with a contamination status of partially investigated for unpaved commercial land use. Sampling was completed at three locations with results showing concentrations at or below the predicted background levels. | Contamination Summary Report – Tahuna Wastewater Treatment Plant, EC Otago, May 2022. |
| Pirates Rugby Football Club - 6 John Wilson Ocean Drive | A17: Storage tanks or drums | ORC records indicate that one underground storage tank was removed from the site in November 2004. The contamination status is listed as acceptable for unpaved commercial land use. | UPSS Decommissioning at BP Pirates Football Club, St Kilda letter from |

| Address | HAIL code | Details | Associated reports |
|---|---|---|---|
| | | | ORC to DCC, December 2004. |
| Victoria Road Motors - 80 Ascot Street | A17: Storage tanks or drum | ORC records indicate that based on a DCC HAIL assessment that the site was established in 1967 by Victoria Road Motors, with St Kilda Borough using the site for vehicle repairs since 1983. The site contamination status is not investigated. | DCC HAIL assessment – 80 Ascot Street, August 2013. |
| 17 Culling Street | F4: Motor vehicle workshops<br>G4: Scrap yards | ORC records indicate that this site is considered to be appropriately managed and as such is unlikely to pose a risk to human health. The site contamination status is managed for high density residential land use with a mitigation status of completed with partial remediation and site management. | Detailed Site Investigation – 17 Culling Street, EC Otago, July 2020.<br>Site Validation Report – 17 Culling Street, EC Otago, January 2021. |
| 134 Prince Albert Rd | A17: Storage tanks or drums for fuel | ORC records indicate this this site has housed a 4,546 L underground and 2,000 L aboveground fuel tank for Class 3C Fuel Oil. The exact location of these tanks is unknown with duration understood to have occurred from before 1995, to past 2003. The site contamination status is not investigated. | DCC HAIL notification - 134 Prince Albert Rd, February 2024. |

The reports received from ORC in association with their HAIL report were reviewed and are summarised as presented in Table 2-4.

*Table 2-4 Summary of provided reports from ORC*

| Report | Summary of findings |
|---|---|
| Detailed Site Investigation - 38 Tahuna Road, EC Otago, August 2024. | A DSI was completed for part of the property at 38 Tahuna Road. A review of the site history identified that the site had been subject to HAIL A10 due to its use as a bowling green since the early 1930s and HAIL G3 in association with the Chisholm Park Landfill. Newspaper articles were reviewed which discussed the Chrisholm Park Landfill which noted that it was considered in 1920 as a possible landfill site, with proposals to transport household refuse there by tram or motor vehicle. It is uncertain whether this plan proceeded. By 1922, the park was instead being described as containing a playground for Andersons Bay School, although “nightsoil” had previously been dumped in the area and was noted as fertilising local vegetation. Through the early 1920s, the park was used for various waste-disposal purposes, including the burial of dead horses and the dumping of fish offal within a fenced-off area. At the same time, Chisholm Park became a venue for League Football, and by 1928 permission had been granted for a dressing shed at the league field. In 1930, plans were developed for a bowling green, two croquet lawns, three tennis courts, and a pavilion at Chisholm Park. By 1938, the surrounding area had been transformed into a municipal golf course, extending across Chisholm Park and Ocean Beach from St Kilda to Lawyer’s Head.<br>Samples were collected at 18 locations up to a depth of 0.5 m bgl. Sampling results indicated that widespread heavy metal (primarily arsenic and lead, with localised cadmium, copper, and zinc) and OCP contamination is present in shallow soils across the site. Concentrations of arsenic were found to exceed the Recreational SCS at six locations, presenting a risk to human health under the current recreational land use. As such, remediation or management of the site is required. |
| Contamination Summary Report – Tahuna | Soil sampling was undertaken to enable the construction of a lime dosing plant within the Tahuna Wastewater Treatment Plant. Samples were collected at three |

| Report | Summary of findings |
|---|---|
| Wastewater Treatment Plant, EC Otago, May 2022. | locations up to a depth of 2.5 m bgl. Sampling results showed that in general heavy metal results were at or below the predicted background levels. Asbestos was not detected and SVOCs were below the levels of detection. As such, earthworks were concluded to not pose a risk to human health.<br>Groundwater results reported heavy metals exceedances above the freshwater and marine species ANZECC trigger values (80%). |
| UPSS Decommissioning at BP Pirates Football Club, St Kilda letter from ORC to DCC, December 2004. | ORC received a report from URS detailing the removal of 1 underground storage tank at the Pirates Football Club property. Sampling results of soils remaining on site after the tank removal complied with the relevant MfE Tier 1 Soil Acceptance Criteria for commercial/industrial land use. |
| DCC HAIL assessment – 80 Ascot Street, August 2013. | The DCC HAIL assessment notes that the site has been subject to the following HAIL tags – F4, A13, and F7. The site has been in operation since 1967, and it is assumed that the historical use extended over the entire site. |
| Detailed Site Investigation – 17 Culling Street, EC Otago, July 2020. | A DSI was completed for the property in order to enable residential development. A review of the site history identified that the site had been subject to HAIL F4 and G4 due to historical car storage. Samples were collected at six locations up to a depth of 0.3 m bgl. Sampling results showed low level PAH contamination however reported concentrations were below the adopted human health criteria. Lead was reported to exceed the human health criteria within three samples, with all other heavy metals concentration recorded below the human health guideline values. As such, remediation of the site was required to enable future residential land use. |
| Site Validation Report – 17 Culling Street, EC Otago, January 2021. | A SVR was completed to verify that the site was suitable for future residential land use. Remediation was considered complete through the removal of contaminated soils to landfill and capping the site with hard surfaces. As such, the site was considered to be suitably managed and highly unlikely to present a risk to human health. |
| DCC HAIL notification - 134 Prince Albert Rd, February 2024. | The HAIL notification records that the site had been subject to HAIL A17 due to the storage of one underground and one aboveground tank. The exact locations of the tanks are unknown with an unknown time frame of duration. |

## 2.4 DCC HAIL request

A HAIL request was also submitted to Dunedin City Council (DCC) to identify any additional site history. Two additional relevant reports were reviewed as detailed in Table 2-5.

*Table 2-5 Summary of provided reports from DCC*

| Report | Summary of findings |
|---|---|
| DCC HAIL property search - 7 John Wilson, June 2021. | The DCC HAIL property search was completed for a proposed softball pitch located within Hancock Park. It noted that the area had previously been used as a sports field with a possible HAIL A10 tag. The search also referred to Ocean Beach Landfill which is noted to have originally been used for night soil deposits, then from 1921 to 1922 it was opened for offensive trade waste and Caversham rubbish, and then OBDB took over the running of the tip from 1924-25 where the tip accepted household and trade refuse. |
| Report on Environmental Sensitivity Ranking on Landfills in the Otago Region, SEM, March 2000. | SEM was commissioned to assess historical landfills in the Otago region. Chisholm Park Landfill was assessed (although misspelled) and classified as low priority. No further information about the nature or extent of the landfill is mentioned in the report. |

## 2.5 Risk assessment

Based on the historical aerials, the ORC HAIL register, and the site history reviewed, the HAIL activities identified can be summarised and categorised into three broad risk categories – low, medium and high as detailed in Table 2-6 and displayed in Figure 2-1.

*Table 2-6 Risk assessment*

| Identifier and HAIL tag | Map ID | Risk assessment |
|---|---|---|
| Andersons Bay Cemetery (HAIL G1) | 1 | **Low risk**<br>Given that the cemetery is located adjacent to the site and down-across hydraulic gradient, this is considered to pose a low risk to the site. |
| Chisholm Park Landfill (including the former bowling green area) (HAIL G3) | 2 | **High risk**<br>Given that the extent and contents of the landfill are unknown and the limited testing carried out, this poses a high risk to the site. |
| Tahuna Wastewater Treatment Plant (HAIL G6) | 3 | **Low risk**<br>Given that this HAIL activity is not located within the site, is across hydraulic gradient, and the soil concentrations reported from the previous investigation, this is considered to pose a low risk to the site. |
| Victoria Road Motors - 80 Ascot Street (HAIL tags – F4, A13, and F7) | 4 | **Medium risk**<br>It is considered unlikely that contamination, if any, in soils to pose a risk to the site given the distance (approximately 35m to the north of the south). However, there is potential for groundwater, if impacted, to flow towards the site. As such, this is considered to pose a medium risk to the site. |
| 17 Culling Street (HAIL tags F4, G4) | 5 | **Low risk**<br>Given that this HAIL activity is not located within the site and that the site has undergone remediation, this is considered to pose a low risk to the site. |
| 134 Prince Albert Rd (HAIL tags A17) | 6 | **Low risk**<br>Given that this HAIL activity is located at a distance from the site and is across hydraulic gradient, this is considered to pose a low risk to the site. |
| Area of former houses within Hancock Park (HAIL I) | 7 | **Medium risk**<br>Given the age of these houses (pre 1980s), there is the potential for asbestos containing materials (ACM) to have been used in their construction. As such, there is a risk that during demolition and removal of these buildings for ACM material to have impacted soils. As such, this is considered to pose a medium risk to the site. |
| Pirates Rugby Football Club - 6 John Wilson Ocean Drive (HAIL A17) | 8 | **Low risk**<br>Given that the club is located adjacent to the site and down hydraulic gradient, this is considered to pose a low risk to the site. |
| Ocean Beach Railway (HAIL F6) | 9 | **Low risk**<br>Given that the railyard is located down-across gradient and that contamination is not considered likely to migrate, this is considered to pose a low risk to the site. |


*Figure 2-1 Identified HAIL*

# 3 Planning Maps

Stantec has undertaken a search of publicly available data on zoning and hazards for this region.

This data has been sourced from the DCC Planning Map (Appeals Version)
https://www.arcgis.com/apps/webappviewer/index.html?id=f7fc69e07dba4db589ffe2ddcac4acc7

The Otago Regional Natural Hazards Database Portal was also reviewed for relevant zones.
https://experience.arcgis.com/experience/30bb9b65ada445b5af4ab4a0bc2d6d93

## 3.1 DCC District Plan

### 3.1.1 Present Zoning/Use

Most of the site is zoned as Recreation, apart from the portions occupied by the Holiday Park, and kindergarten for the NZ Gazette.

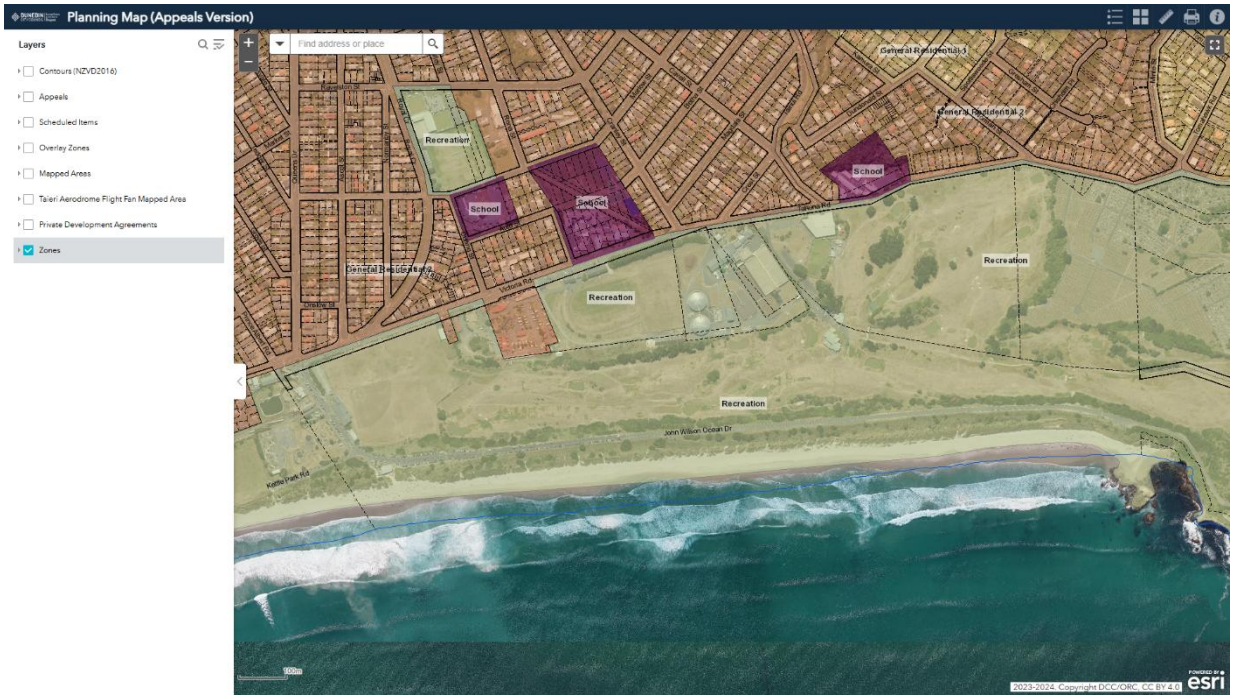


*Figure 3-1 District Plan Zoning*

Although not zoned on the district plan, the 2 areas of interest are bisected by the Tahuna Wate Water Treatment Plant.

The recreational area surrounds the site is actively used as a golf course.

No planning assessment has been undertaken as yet, but it is clear that any changes of use to the proposed areas would have a risk of reverse sensitivity to the existing land use surrounding the sites.

### 3.1.2 Zoning - Urban Biodiversity

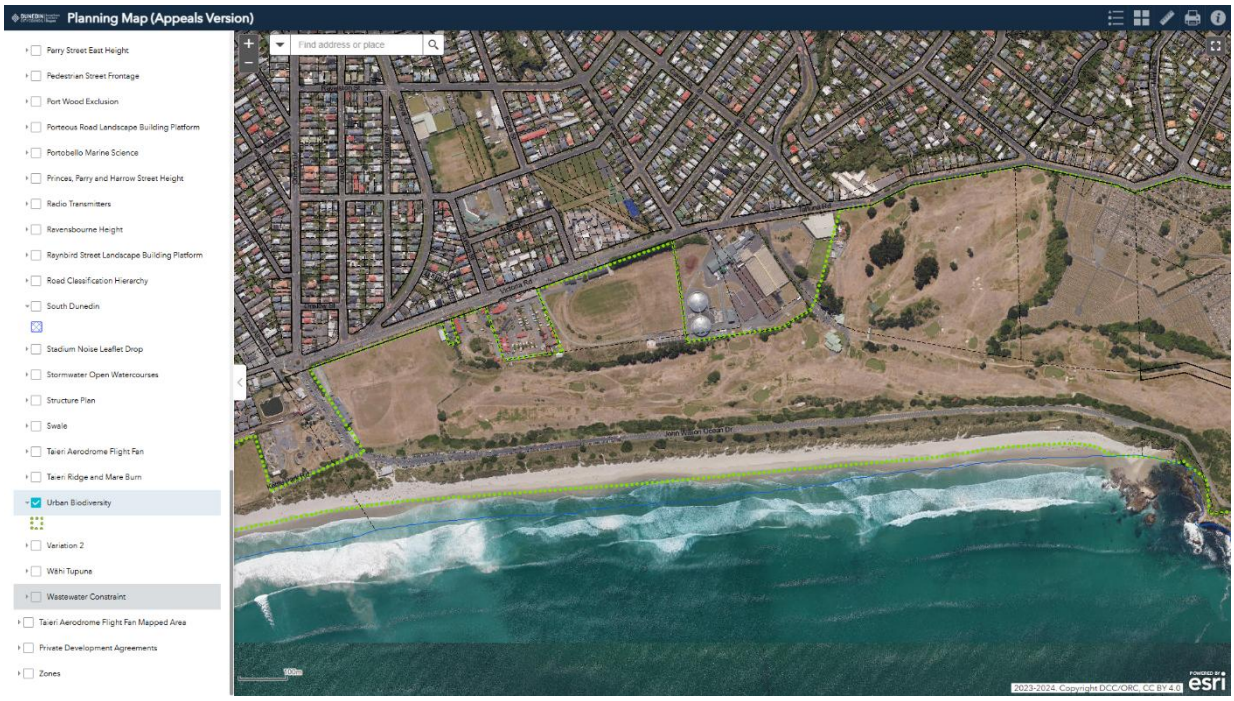


*Figure 3-2: District Plan Urban Biodiversity Zone*

### 3.1.3 Zoning - Dune

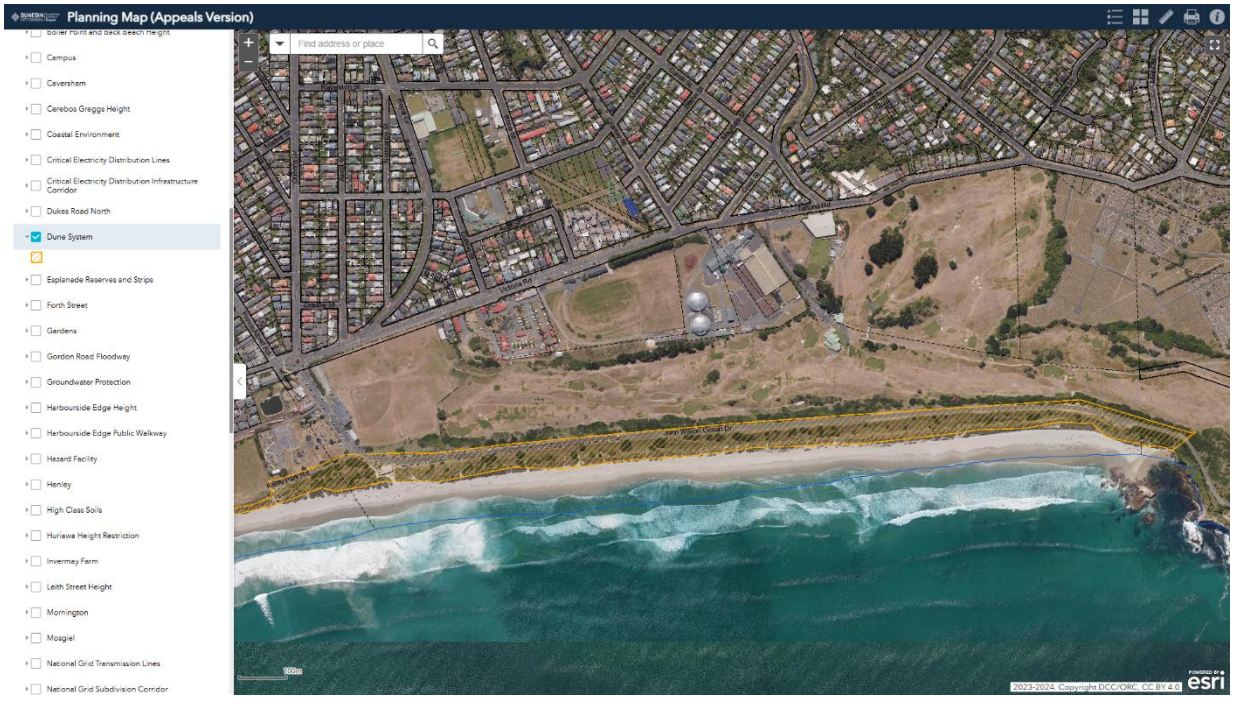


*Figure 3-3 District Plan Dune System Zoning*

### 3.1.4 Archaeology

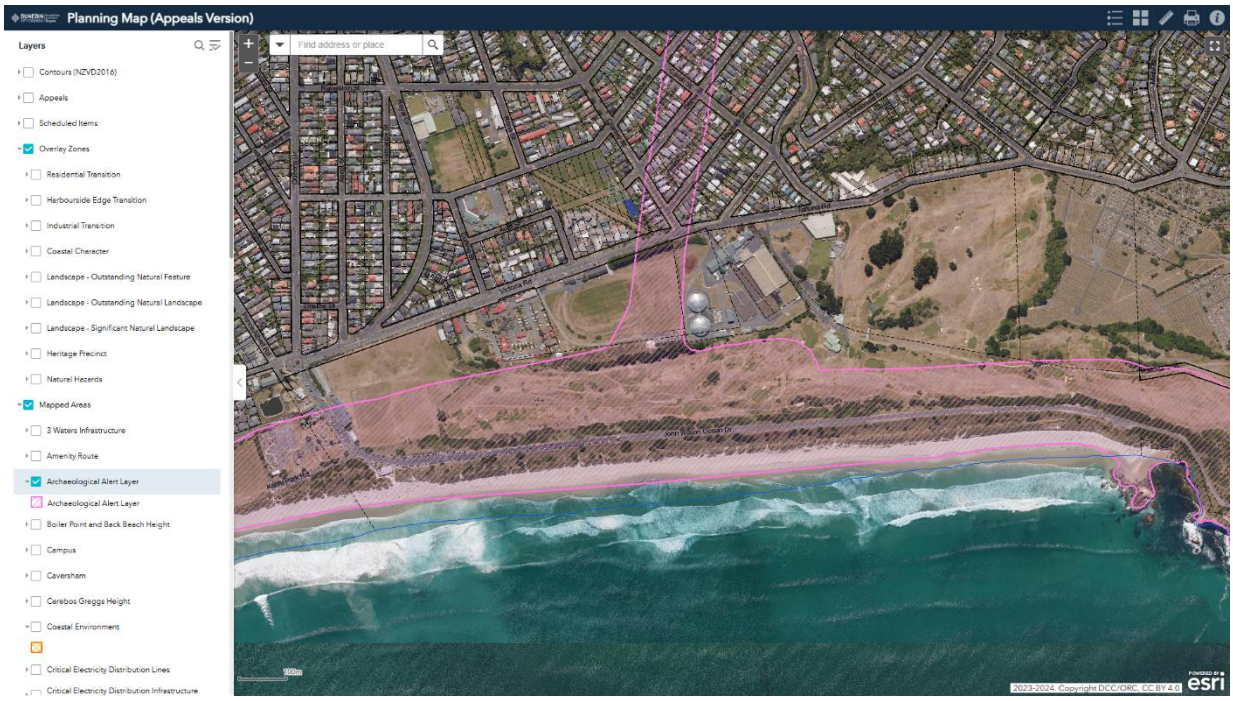


*Figure 3-4 District Plan Archaeological Alert Layer*

We have not undertaken a specific Historic places search, but future development work should include a cultural impact assessment informed through local Iwi.

### 3.1.5 Hazards - South Dunedin Flooding

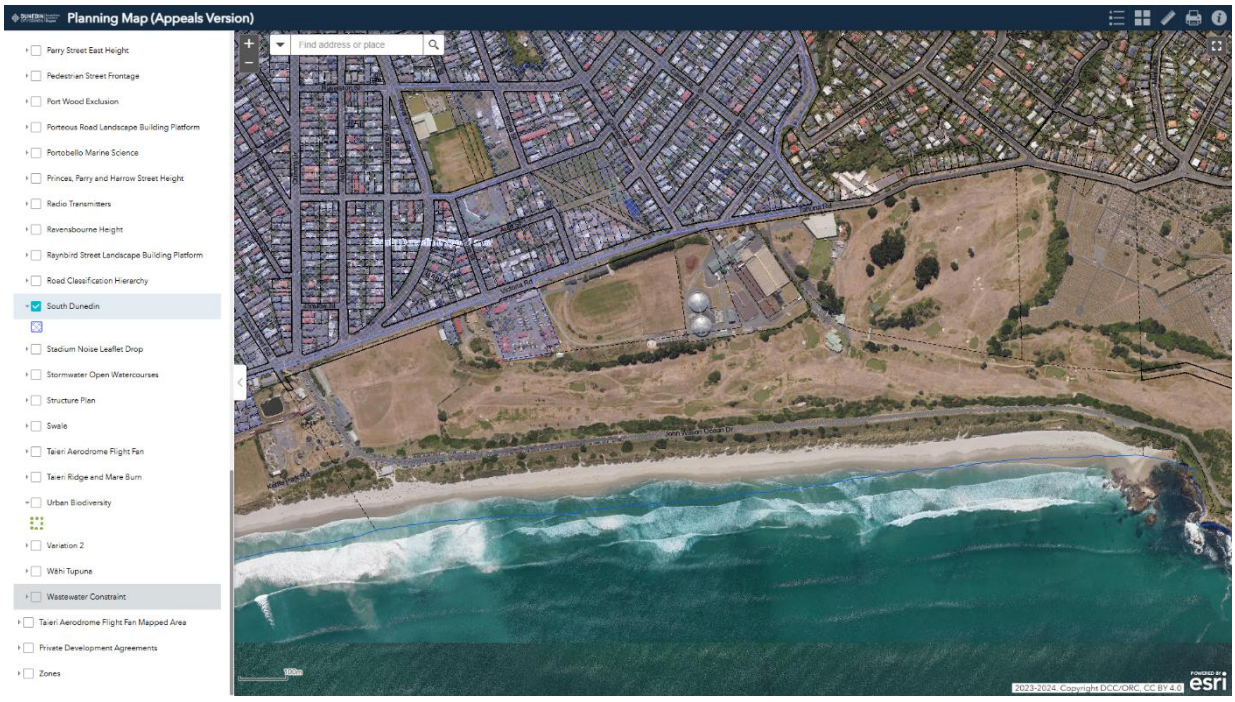


*Figure 3-5 District Plan South Dunedin Flood Hazard Zoning*

### 3.1.6 Hazards - Coastal

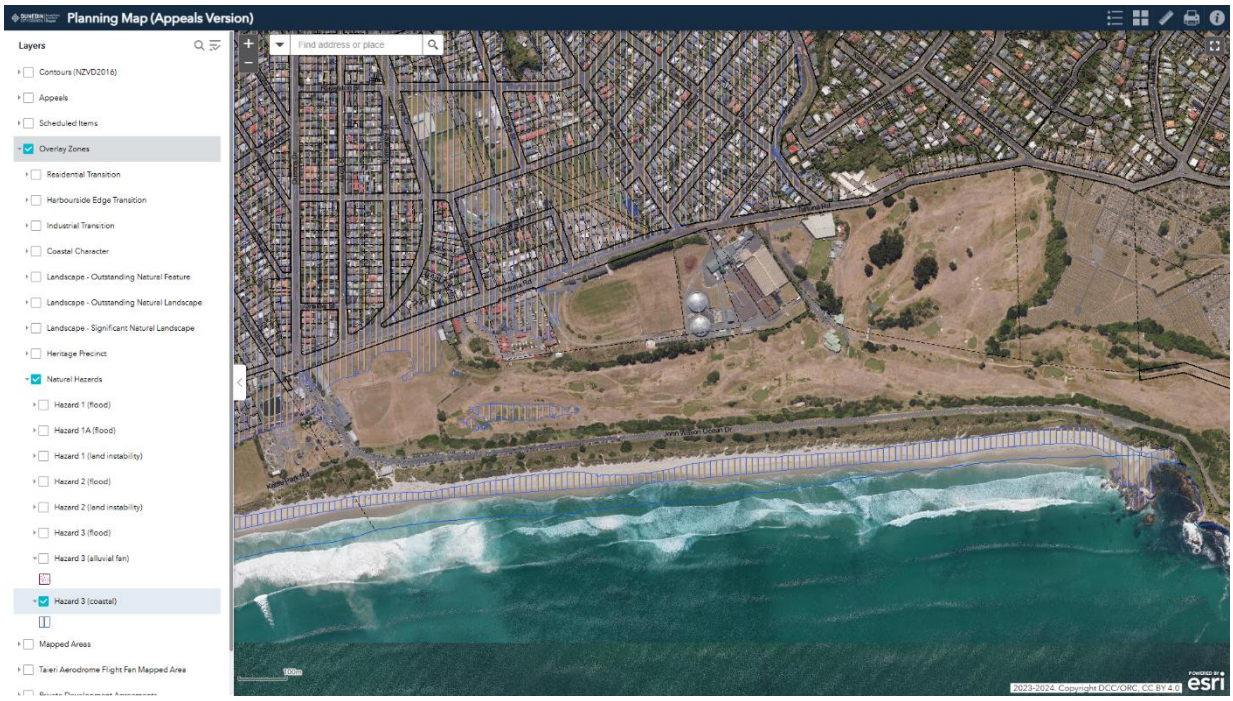


*Figure 3-6: District Plan South Dunedin Coastal Hazard Zoning*

## 3.2 Otago Regional Council; Hazards Portal

### 3.2.1 Liquefaction Hazard Awareness

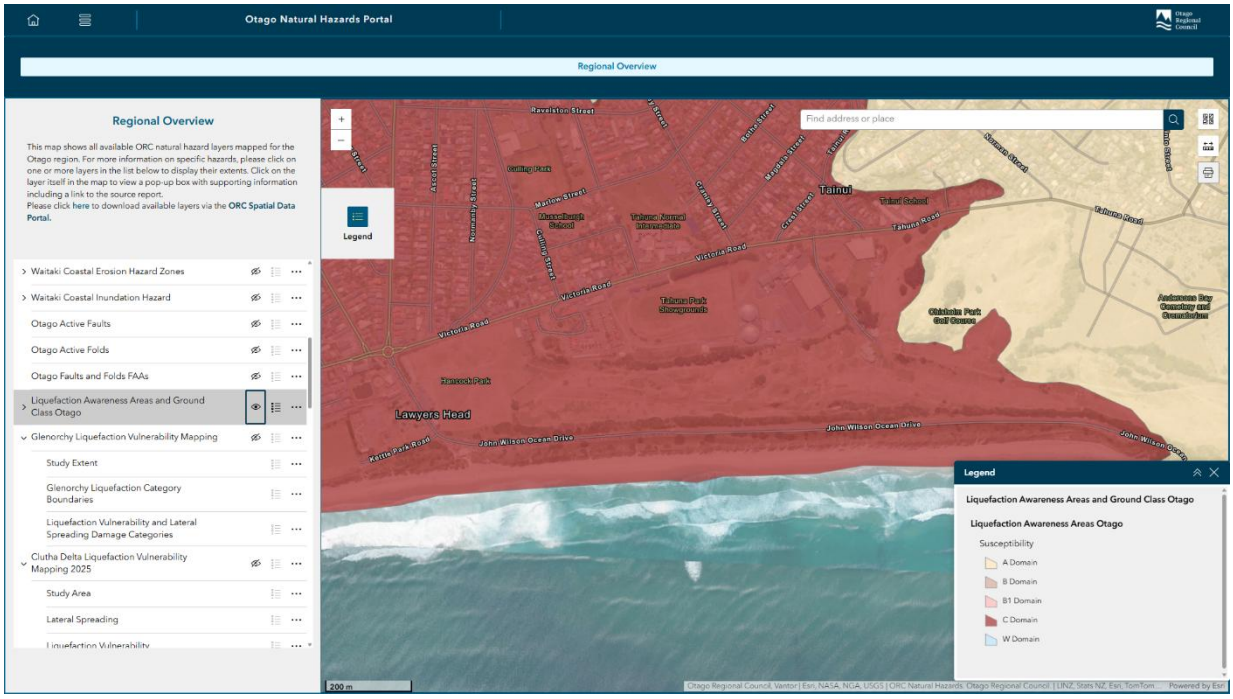


*Figure 3-7 ORC Natural Hazards Portal – Liquefaction Awareness Domain C – high likelihood (red)*

#### 3.2.1.1 Liquefaction Prone Land – Building Code

Since November 29, 2021, the New Zealand Building Code (specifically B1/AS1) requires that all new building consent applications for sites prone to liquefaction in Dunedin include specifically designed foundations. These changes, resulting from the Canterbury earthquake inquiries, ensure that new buildings are strong enough to withstand liquefaction, which causes loss of soil strength.

DCC have a specific policy on this at: https://www.dunedin.govt.nz/services/building-services/planning-your-project/liquefaction-prone-land

Construction of new residential dwellings will need specifically designed foundations for buildings on ground identified as liquefaction-prone ground. Current 'deemed to comply' acceptable solutions, such as NZS3604 for foundations, are unlikely to be able to be used".

The above policy references the following May 2014 GNS report:

https://www.orc.govt.nz/media/1983/technical-item-2-gns-science_cr_2014-068_dunedin-district-liquefaction.pdf

### 3.2.2 Dunedin Coastal Hazard

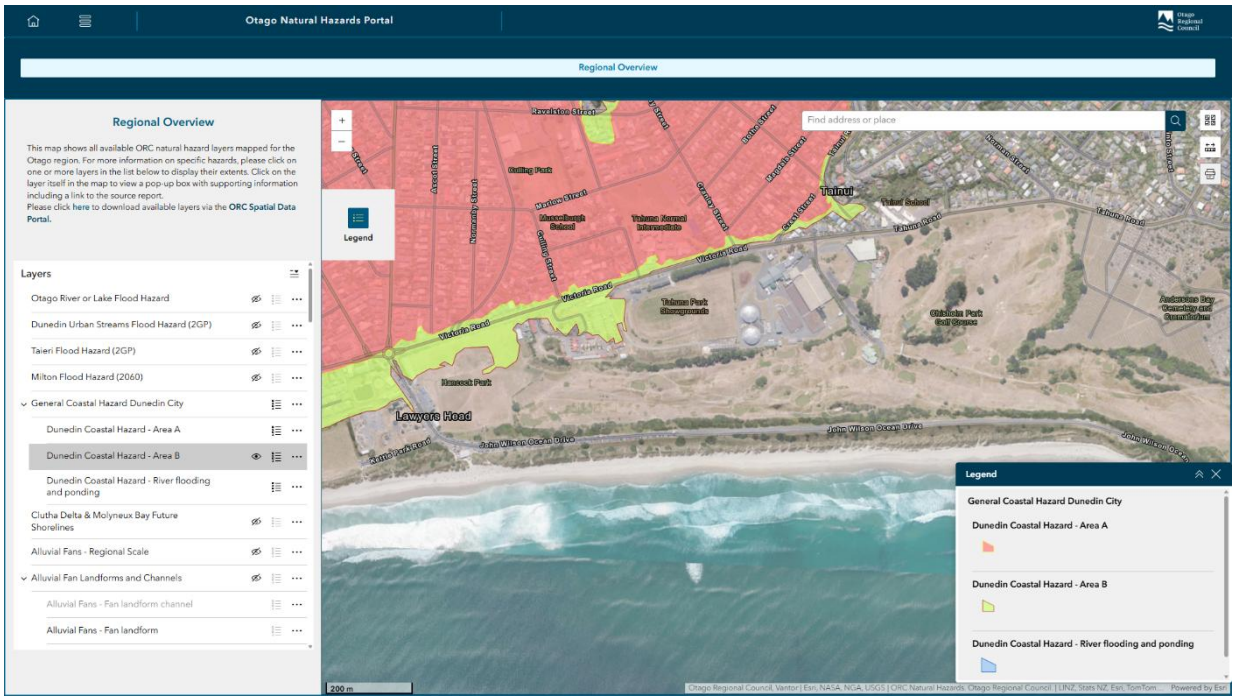


*Figure 3-8 ORC Natural Hazards Portal – Dunedin Coastal Hazard – Area B (lime green)*

### 3.2.3 Minimum floor

The 2021 Update to Methodology for Determining Minimum Floor Levels – was provided by Stantec in April 2022. https://www.dunedin.govt.nz/__data/assets/pdf_file/0017/1124126/2021-update-to-methodology-for-determining-minimum-floor-levels.pdf

This document concluded that *the resulting minimum acceptable floor level for a building with a life less than or equal to 2080 is 3.13m NZVD:2016*.

The DCC has ratified this position with a 3.13m minimum floor level, according to long-term sea-level rise/flood risks. Ground at or below 3.13m NZVD is show on the following plan, using topographical LiDAR surface levels from 2021 aerially captured data.

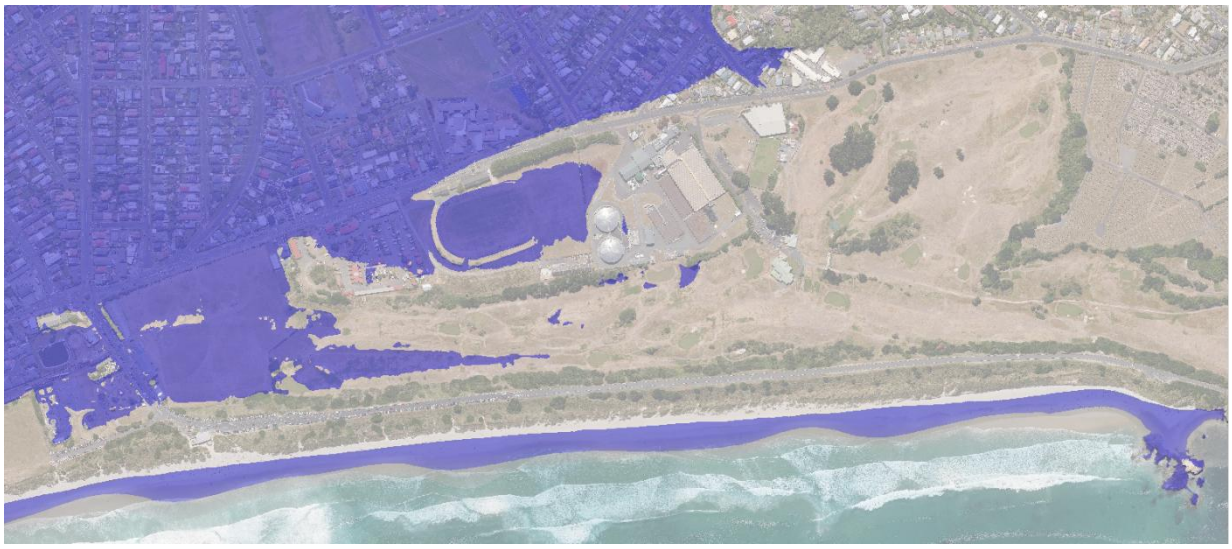

*Figure 3-9 Minimum floor level recommendations - Level of 3.13m NZVD2016 in blue.*

## 3.3 DCC Property Searches through Pataka

The Dunedin City Council holds a property files records system, known as Pataka.

Information garnered through Pataka raised a broad history of coastal erosion with Ocean Beach Domain interventions and stabilisation of John Wlson Memorial Drive.

Other information was associated with railways west of the John Wilson Ocean Drive / Victoria Road roundabout.

No correspondence was relevant to the area under assessment within this report. Given that there is a 150m buffer between John Wilson Ocean Drive and the assessment area, we have not paraphrased this information.

## 3.4 Specific Geotechnical Investigations

Geotechnical investigations have been undertaken at some relevant locations such as Tahuna Waste Water Treatment facility by Beca in about 2010. GNS may also have more comprehensive records of investigation data. Although this information is not provided within this assessment, we can confirm geotechnical information associated with the Tahuna WWTP site confirm generally anticipated weak / soft soils conditions with shallow ground water.

## 3.5 Natural Hazards Risk assessment summary

The site can be broken up into a limited number of zones affected progressively by hazards

The western site has potential flooding associated with sea level rise, requiring minimum floor level requirements (western zone is up to 0.75m below the recommended level of 3.05m MSL NZVD2016)

The potential for liquefaction is a design requirement potentially affecting ground up to 10m above MSL NZVD2016, resulting in the eastern zone being split into two areas, above and below this level.

The entire eastern site is also significantly affected by unconfirmed extents and depths of uncontrolled / un-engineered undifferentiated landfill. Foundation construction on this material would likely be subject to a Section 72 / 73 of the Building Act, as even piled foundations through such material may encounter obstructions within the fill or suffer significant drawdown loading on piles penetrating this material.


*Figure 3-10 Zoning for generalisation of risk.*

# Appendices

# Appendix A Property Plan provided by DCC


2023-2024. Copyright DCC/ORC, CC BY 4.0

# Appendix B Historical aerials


Legend
The site
1947-1952
N
0 120 240 480 Meters
Copyright DCC/LINZ, CC BY 4.0 NZ


Legend
The site
1958
N
0 120 240 480 Meters


Legend
The site
1967
N
0 120 240 480 Meters
Esri, Vantor, Earthstar Geographics, and the GIS User Community


Legend
The site
1975
N
0 120 240 480 Meters


Legend
1985
The site
N
0 120 240 480 Meters


Legend
The site
2000
N
0 120 240 480 Meters


Legend
The site
2006-2007
N
0 120 240 480 Meters
Aerial Photography 2006/07, Copyright NZAM


Legend
The site
2013
N
0 120 240 480 Meters
Aerial photography DCC, Jan/Feb 2013, CC BY 3.0 NZ


Legend
The site
2024
N
0 120 240 480 Meters
2023-2024. Copyright DCC/ORC, CC BY 4.0

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