

Southern Link Inland Port

Groundwater Assessment

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Southern Link Property Limited

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Prepared by:
Stantec New Zealand

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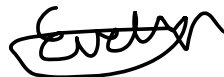
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Table of Contents

1	Introduction	1
1.1	Scope	1
1.2	Contract Details	1
1.3	Code of Conduct	1
1.4	Project Overview	1
2	Site Description	4
2.1	Regional Geology	4
2.2	Topography and Hydrology	6
3	Site Investigations	7
3.1	Stantec New Zealand	7
3.2	Previous Investigations	8
3.2.1	Wells Aotearoa New Zealand Database	8
3.2.2	North Taieri Closed Landfill Assessment	9
4	Hydrogeological Setting	11
4.1	Measured Groundwater Levels	12
4.2	Site Conceptual Model	14
4.3	Aquifer Parameters	15
4.4	Groundwater Quality	16
5	Groundwater Impacts Assessment	20
5.1	Groundwater Levels and Flow Patterns	20
5.2	Groundwater Quality	20
5.3	Stormwater Basin	20
5.4	Surface Water Depletion	21
5.5	Effects on Current and Future Groundwater Users	21
6	Recommendations	22
7	Conclusion	23
8	References	24

List of Tables

Table 4-1	Summary of groundwater quality results, as reported in the North Taieri closed landfill 2024 Annual Monitoring Report (Dunedin City Council, 2024)	18
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List of Figures

Figure 1-1	Site Overview
Figure 2-1	Site Location
Figure 2-2	Mapped regional geology (Geological and Nuclear Science, 2025)
Figure 2-3	Schematic block diagram of the Lower Taieri Plains regional geology (Irricon Consultants & ROYD Consulting, 1994)
Figure 3-1	Onsite boreholes with groundwater level monitoring loggers installed by Stantec
Figure 3-2	Nearby borehole records from Wells Aotearoa New Zealand database
Figure 4-1	Groundwater contours across the Lower Taieri Plains, sourced from (Otago Regional Council, 2010). Approximate site location outlined in red.
Figure 4-2	Onsite groundwater level monitoring data
Figure 4-3	Historical groundwater elevation data from onsite monitoring boreholes
Figure 4-4	Historic rainfall data and groundwater level data to demonstrate the groundwater response to rainfall
Figure 4-5	Site conceptual diagram



Southern Link Logistics Park

Figure 4-6 Location of groundwater quality monitoring sites, as per the North Taieri closed landfill Annual Monitoring Report (Dunedin City Council, 2024). The proposed site is circled in red, with the landfill site shown in blue.

List of Appendices

Appendix A Onsite Monitoring Boreholes

Appendix B Earthworks Diagrams

Appendix C Groundwater Seepage Calculations



Executive Summary

Stantec New Zealand (Stantec) has been engaged by Southern Link Property Limited (SLPL) to undertake a hydrogeological assessment to support the substantive application for the Southern Link Inland Port (SLIP, also referred to as the Site) under the Fast-track Approvals Act 2024. The purpose of this assessment is to characterise the existing groundwater environment at the proposed approximately 40-hectare Site on the Taieri Plains near Mosgiel and evaluate potential hydrogeological effects arising from construction and operation of the SLIP.

Hydrogeological Setting and Site Conditions

The Site is underlain by Pleistocene and Holocene river deposits comprising gravel, sand, silt, and clay. Groundwater on the Lower Taieri Plains flows westward, with the site located in a recharge zone where rainfall, foothill runoff, and Silver Stream contribute to groundwater recharge. Silver Stream, located along the southern site boundary, is a losing stream and hydraulically connected to the aquifer.

Onsite groundwater monitoring undertaken by Stantec indicates groundwater depths of approximately 7.5 - 9m below ground level, with a negative vertical hydraulic gradient confirmed through nested piezometers. These findings align with long-term regional monitoring records and show seasonal fluctuations of only 1 - 2 m. Groundwater levels are therefore well below the expected 3 m excavation depth required for bulk earthworks, and groundwater interception during construction is unlikely.

Groundwater quality information was reviewed with reference to long-term monitoring data from the nearby North Taieri closed landfill, located approximately 600 m north-east of the Site. Across more than 20 years of monitoring, most analytes have remained stable and within New Zealand Drinking Water Standards guideline values, with only isolated historical exceedances. Overall, current groundwater quality in the area is considered good, and no evidence suggests landfill-related impacts at the SLIP site.

Assessment of Potential Effects

The proposed Site is not expected to adversely affect groundwater levels, groundwater quality, or groundwater users. Key findings include:

- **Groundwater Levels:** Excavations are not expected to encounter groundwater, and no dewatering is anticipated. Site development (e.g., buildings, pavement) will reduce local recharge but only at a minor scale, with negligible effect on regional groundwater levels.
- **Groundwater Quality:** No contaminants will be discharged to groundwater as part of site construction or operation. Standard erosion and sediment controls will manage risks during earthworks. Minimal impacts on groundwater quality are expected.
- **Stormwater Basin:** The proposed unlined stormwater attenuation pond may allow limited seepage. Calculations indicate seepage volumes would be modest and groundwater levels are unlikely to reach the pond base except during extreme recharge events, in which case no adverse effect is expected due to the basin already containing water.
- **Surface Water Depletion:** As no groundwater abstraction is proposed, there is no risk of drawdown effects on Silver Stream or other surface water bodies.
- **Effects on Groundwater Users:** With no abstraction or expected impacts on groundwater quality, no effects on existing or future groundwater users are anticipated.



Recommendations

- Continue short-term groundwater level monitoring to strengthen the baseline dataset prior to and during construction.

Overall Conclusion

The hydrogeological assessment concludes that the proposed SLIP will have **negligible effects** on groundwater levels, groundwater flow patterns, groundwater quality, or groundwater users. No significant hydrogeological constraints are identified.



1 Introduction

1.1 Scope

This hydrogeological study and assessment has been undertaken to gather, collate, and assess existing knowledge of the expected hydrogeological conditions relevant to the proposed Southern Link Inland Port (SLIP) site located at 270 – 292 Dukes Road North, Mosgiel (the Site). The intent of this report is to document the desktop / field investigation findings and provide a preliminary assessment of potential groundwater impacts at the SLIP Site.

1.2 Contract Details

Stantec has been commissioned by Southern Link Property Limited (SLPL) to support a substantive application for the SLIP under the Fast-track Approvals Act 2024. The contract works have been undertaken to advance the design, construction and operation of the SLIP, with the intent to facilitate the granting of all necessary approvals.

1.3 Code of Conduct

The Independent Reviewer of this report is Vanessa Dally. Vanessa is a Senior Principal Hydrogeologist with 21 years' experience. Vanessa has undertaken numerous hydrogeological and water supply investigations in both Australia and New Zealand ranging from groundwater exploration within remote arid locations to dewatering investigations within low lying coastal areas under development. Vanessa also has experience in contaminated land, carrying out investigations of soil and groundwater, including site remediation, as well as other fields of environmental science and geology. Vanessa's experience includes water quality monitoring, groundwater contaminant transport modelling, contaminated groundwater remediation, pump and step test analysis, regional groundwater modelling, dewatering investigations, and supervision of drilling and groundwater bore installation. She is member of the New Zealand Hydrological Society and WasteMINZ.

Vanessa has read the Code of Conduct for expert witnesses contained in the Environment Court Practice Note 2023. This report has been prepared in compliance with that Code, as if it was expert evidence presented in proceedings before the Environment Court. Unless stated otherwise, this report is within Vanessa's area of expertise, and she have not omitted to consider material facts known to her that might alter or detract from the opinions expressed in this report.

1.4 Project Overview

SLPL seeks to establish an Inland Port / Logistics Hub on an approximately 40-hectare site on the Taieri Plains near Mosgiel to enable freight transfer between trains and trucks. The SLIP Site location is shown in outlined yellow, with ancillary activities for the project also to occur within the KiwiRail roading corridor marked blue in Figure 1-1. The ancillary activities within the KiwiRail corridor are not being applied for as part of this application, do not impact on the content of this report, and are therefore not discussed further. This SLIP will deliver significant infrastructure to support regional economic growth, improve freight logistics, and enhance resilience to environmental risks. The development will occur as described in the Project Description of SLPL's Substantive Fast-track Application which should be referred to for a complete description of the SLIP development. In summary, the SLIP will include:



Southern Link Logistics Park

1 Introduction

- A new rail siding off the Taieri Branch Line to enable loading, unloading and operation of a rail freight shuttle service to Port Chalmers and the wider rail network;
- Approximately 80,000 m² of high stud warehousing (chilled and ambient);
- Truck canopy and unloading areas; A 5 ha container depot facility enabling the inspection, cleaning, upgrading and repair of containers including for food grade repacking;
- Up to 5 ha of container terminal for storage of full containers including refrigerated containers;
- Break bulk storage facilities;
- Road widening;
- Ancillary activities to support the above including earthworks, construction of the rail siding, site access, internal roadways and vehicle parking, hardstand areas, landscaping, buildings for storage, administration and maintenance facilities, and associated infrastructure and works including measures necessary to manage stormwater and stabilise the site.

Construction of the SLIP is anticipated to be undertaken in three stages however the timing of the delivery of each stage, and discrete works within each stage, may change in response to demand for logistics capacity at the SLIP. Each stage of works will involve site clearance, earthworks, construction of buildings, hardstanding and access, installation of infrastructure, landscaping and works and management activities necessary to manage environmental effects during construction including erosion and sediment controls and construction management activities:

- Stage 1 is estimated to be completed 1 to 3 years following approval of the Project and will include clearance of the southern area of the site and construction of the 'Stage 1' container storage concrete pad, rail siding, container service area, warehouses, internal roading, parking and loading, road widening and construction of the new intersection on Dukes Road North, stormwater attenuation pond, Silver Stream stormwater outlets, servicing infrastructure, flood management measures, landscaping, acoustic barriers and eastern bund, and lighting.
- Stage 2 is estimated to be completed 3 to 5 years following approval of the Project and will include clearance of the northern area of the site and construction of the 'Stage 2' container storage concrete pad, warehouses, ancillary offices, internal roading, parking and loading, emergency egress onto Dukes Road North, expansion of the stormwater attenuation pond, landscaping, extension of the servicing infrastructure and lighting.
- Stage 3 is estimated to be completed 5 to 10 years following approval of the Project and will include clearance of the eastern area of the site, and construction of the 'Stage 3' warehouse and break bulk hardstand areas, internal roading, parking and loading, landscaping, extension of the servicing infrastructure and lighting.



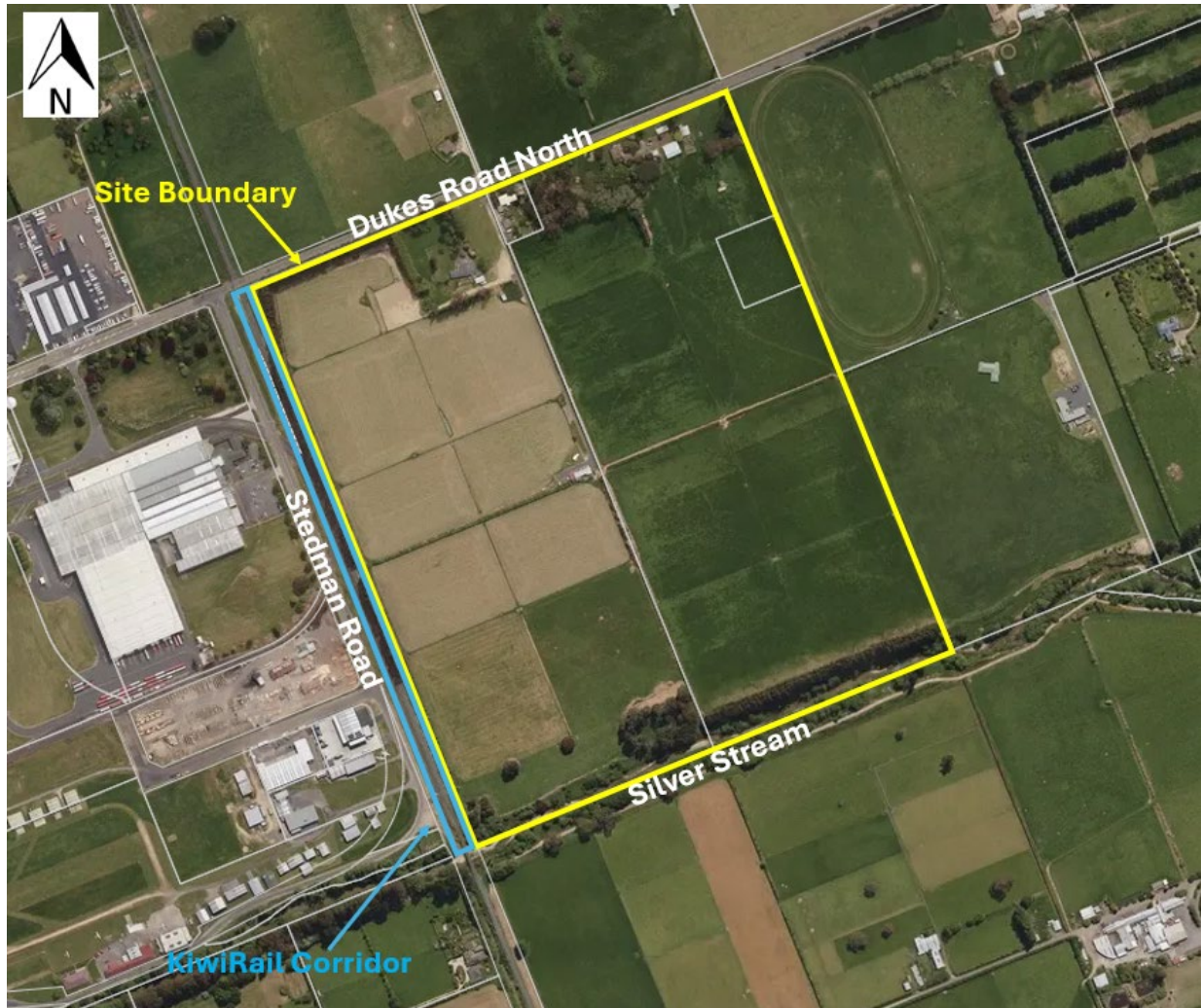


Figure 1-1 Site Overview

2 Site Description

The Site is located on the Taieri Plains near Mosgiel, Dunedin. Figure 2-1 shows the proposed Site boundaries and the location of Silver Stream, a prominent surface water body located to the southeast of the Site.



Figure 2-1 Site Location

2.1 Regional Geology

The regional geology of the area is described in the Institute of Geological and Nuclear Science (GNS) 1:250,000 scale geological map (Geological and Nuclear Science, 2025). The majority of the Site is underlain by Late Pleistocene River Deposits (OIS2). These are described as “poorly consolidated, slightly weathered sandy quartz, schist, or volcanoclastic-derived gravel and sand”. The south-eastern corner of the Site is underlain by Holocene River Deposits (OIS1), described as “poorly consolidated often poorly sorted fine to bouldery gravel with sand and mud”. The regional geology, as mapped by GNS, is shown in Figure 2-2.

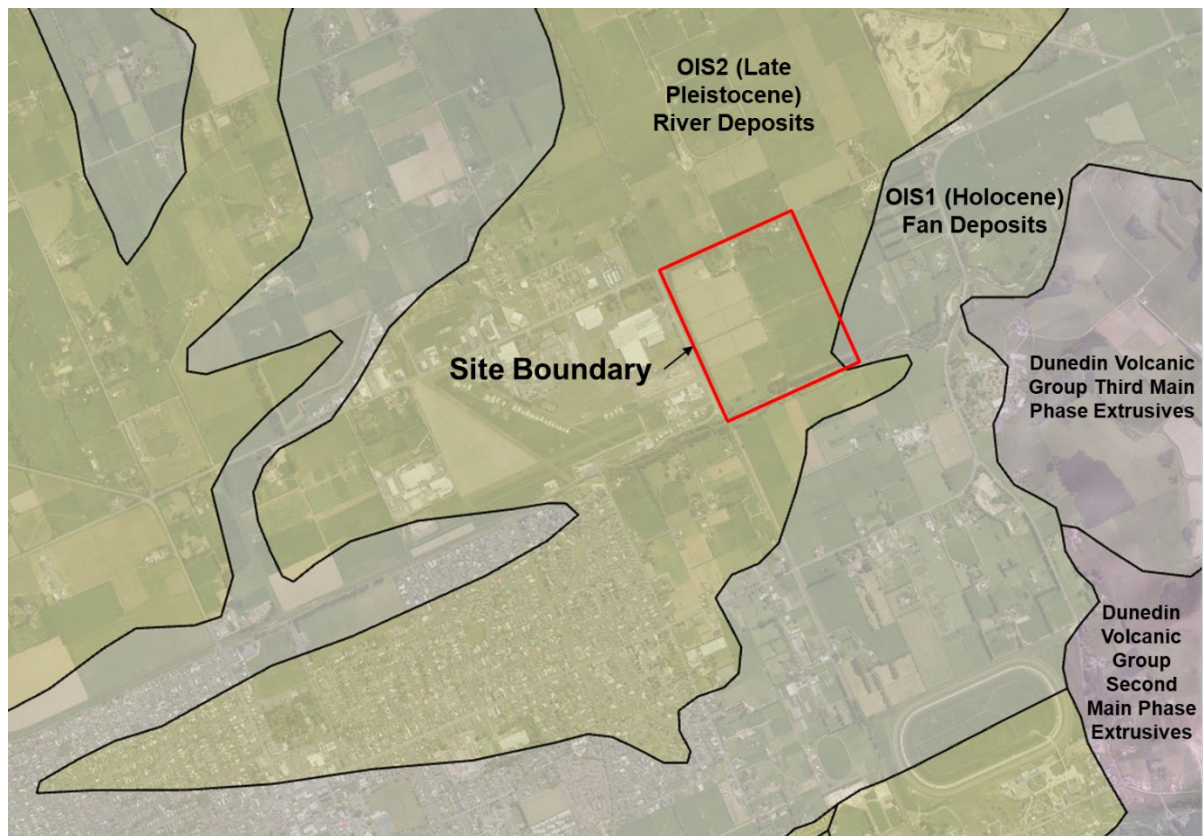


Figure 2-2 Mapped regional geology (Geological and Nuclear Science, 2025)

A groundwater study of the Lower Taieri Plains describes the underlying site geology as the “Dukes Formation” overlain by the “Wingatui Formation” (Irricon Consultants & ROYD Consulting, 1994). Whilst these naming conventions are no longer used, they describe the same river deposits mapped by GNS. A schematic block diagram of the regional geology underlying the site, as also provided in the 1994 groundwater study (Irricon Consultants & ROYD Consulting, 1994) is shown below in Figure 2-3.

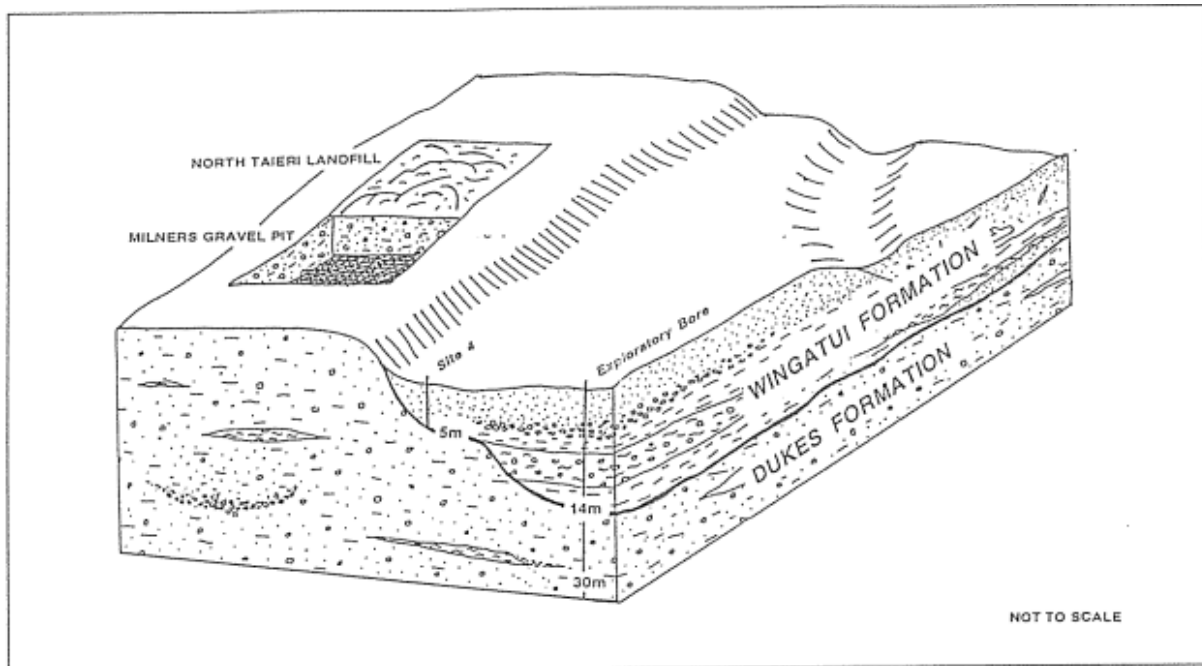


Figure 2-3 Schematic block diagram of the Lower Taieri Plains regional geology (Irricon Consultants & ROYD Consulting, 1994)

2.2 Topography and Hydrology

Based on the New Zealand LiDAR 1 m DEM (Land Information New Zealand , 2025), the site topography is generally flat, with an elevation of between approximately 29 – 25 m amsl. There is a gradual slope (3 – 5 m fall) to the south and west across the site.

Silver Stream runs along the southeastern site boundary (as shown in Figure 2-1), with its flow direction towards the southwest. The bed of Silver Stream is a low point along the Site, at approximately 20 m amsl, based on the LiDAR 1 m DEM. Silver Stream is one of the main rivers on the Taieri Plains. Based on the available data and a review of the literature, Silver Stream is hydraulically connected to the local groundwater system (Dunedin City Council, 2008; Irricon Consultants & ROYD Consulting, 1994; Irricon Consulting, 2005; Otago Regional Council, 2010). At and near the Site, Silver Stream acts as a recharge feature to the groundwater system and therefore is classified as a losing stream. This is discussed in further detail in Section 4.

3 Site Investigations

3.1 Stantec New Zealand

Stantec New Zealand (Stantec) completed a desktop investigation to identify existing onsite bores that were suitable for groundwater level monitoring at the Site (and wider local area including the Closed Taieri Landfill). The desktop review was followed by a site walkover to locate the various onsite bores identified. The objective of the groundwater monitoring was to:

- Characterise groundwater levels below the Site including likely groundwater fluctuations
- Estimate groundwater flow directions
- Understand the interaction between Silver Stream and the groundwater system
- Determine if there is a negative or positive vertical hydraulic gradient.

To achieve the monitoring objectives groundwater level loggers were installed in three pre-existing boreholes across the site. The locations of these are provided in Figure 3-1, and the installation drawings are provided in Appendix A. Loggers were installed in the well labelled “Not Specified” (referred to as IP-S2 in the drawings), I44/035 shallow well (IP-P5b) and I44/035 deep well (IP-P5).

The two bores closest to the Silver Stream are screened at various depths. The difference in water levels indicated by each bore provided information on the vertical gradient and the groundwater interaction with the Silver Stream. All three bores provided data to understand depth to groundwater, groundwater flow directions, and groundwater level fluctuations. The groundwater monitoring data is discussed in Section 4.1.

SLPL provided Stantec with information from a test pit (TP) investigation program that was undertaken at the Site in August 2024. This is described in detail in the Geotechnical Desktop Study (Stantec New Zealand, 2025).



Figure 3-1 Onsite boreholes with groundwater level monitoring loggers installed by Stantec

3.2 Previous Investigations

3.2.1 Wells Aotearoa New Zealand Database

Borehole logs and recorded groundwater levels from nearby boreholes documented on the Wells Aotearoa New Zealand database were also analysed. The location of these is shown colour coded blue and red on Figure 3-2. These records were used to provide an understanding of the recorded lithology and groundwater levels across the wider local area. The wells within the immediate local context (colour coded in blue on Figure 3-2) were preferentially used to develop the Site conceptual model.

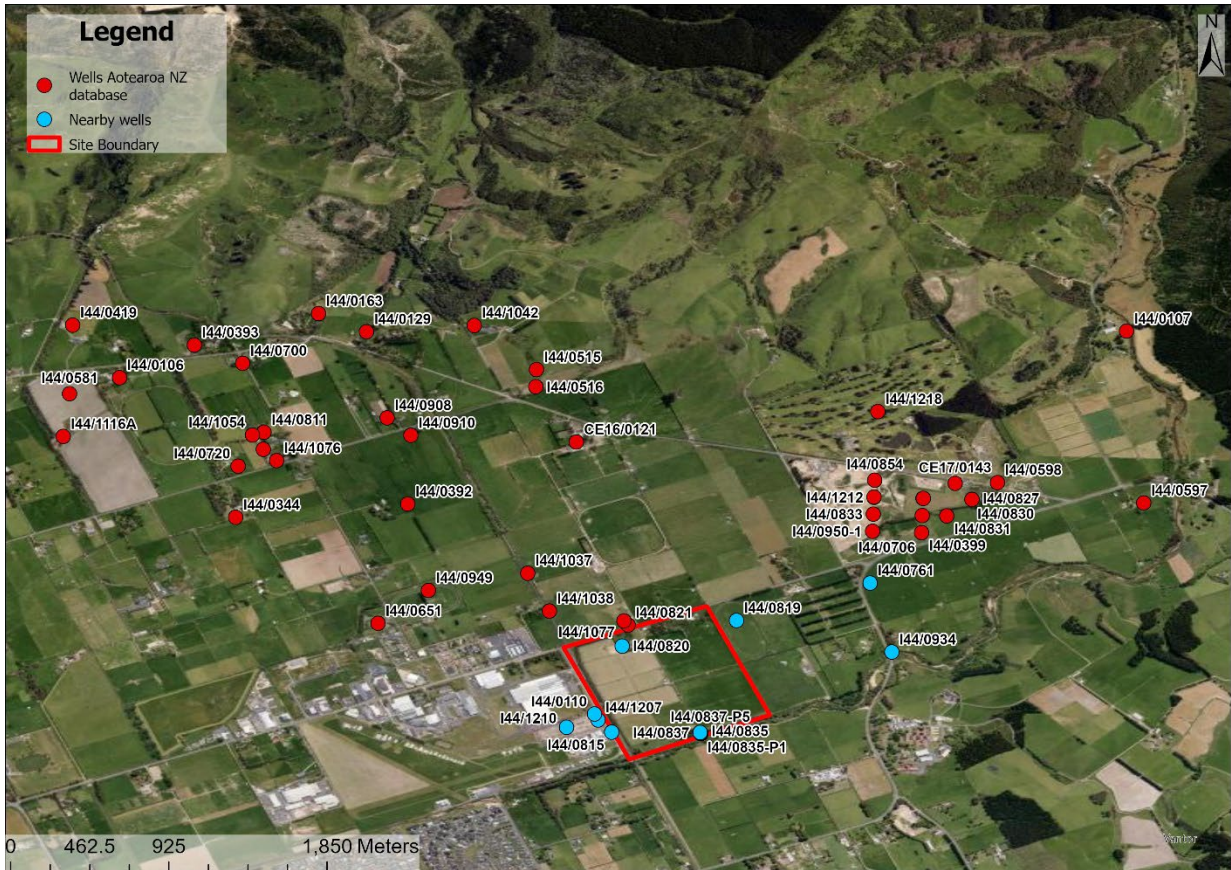


Figure 3-2 Nearby borehole records from Wells Aotearoa New Zealand database

3.2.2 North Taieri Closed Landfill Assessment

The North Taieri closed landfill is located approximately 600 m northeast of the proposed site (at its closest point). The former landfill is located between a working quarry to the west and a private closed landfill to the east. The North Taieri closed landfill ceased operations in 1992 due to concerns that the landfill leachate may be contaminating groundwater. Annual environmental monitoring and reporting is required to fulfil the consent conditions of the landfill (Dunedin City Council, 2024). The 2024 annual monitoring report (full reference below) was reviewed, and relevant data was analysed.

Along with the annual monitoring report, a range of historical environmental assessments have been submitted as part of the original Assessment of Environmental Effects (AEE) for the closure of the landfill. These reports have been reviewed as part of this hydrogeological assessment, given the proximity of the proposed site to the North Taieri closed landfill (location of which is shown in Figure 4-6). These are provided below.

- Annual Monitoring Report 2024: Community and Closed Landfills, Dunedin City Council, September 2024.
 - Summarises the wider site setting and provides a groundwater quality assessment of the groundwater quality monitoring record.
- Lower Taieri Groundwater Preliminary Study, Irricon Consultants & ROYD Consulting, July 1994.
 - Groundwater study of the wider Lower Taieri Plains, investigating the hydrogeological system, aquifer yields, groundwater quality, and usage of the aquifer.
- Lower Taieri Groundwater Allocation Study, Otago Regional Council, August 2010.

Southern Link Logistics Park

3 Site Investigations

- Characterises the hydrogeological setting of the Lower Taieri Plains and management of the groundwater system. Includes numerical modelling of the groundwater system for groundwater allocation and resource allocation recommendations.
- North Taieri Closed Landfill: Aquifer Contamination Risk Assessment, Irricon Consulting, June 2005.
 - Assesses the risk of the closed landfill to the East Taieri aquifer system through groundwater modelling and leachate / discharge monitoring.
- North Taieri Closed Landfill – DCC Response to Section 92 Request, Dunedin City Council, May 2008.
 - Response to further information request regarding the landfill closure, including monitoring results and groundwater leachate modelling.



4 Hydrogeological Setting

The groundwater flow direction across the Taieri Plains is westward, based on groundwater contours diagrams and groundwater level measurements (Irricon Consultants & ROYD Consulting, 1994; Irricon Consulting, 2005; Otago Regional Council, 2010). Groundwater contours provided in the Lower Taieri Groundwater Allocation Study (Otago Regional Council, 2010) are shown in Figure 4-1, with the site location identified.

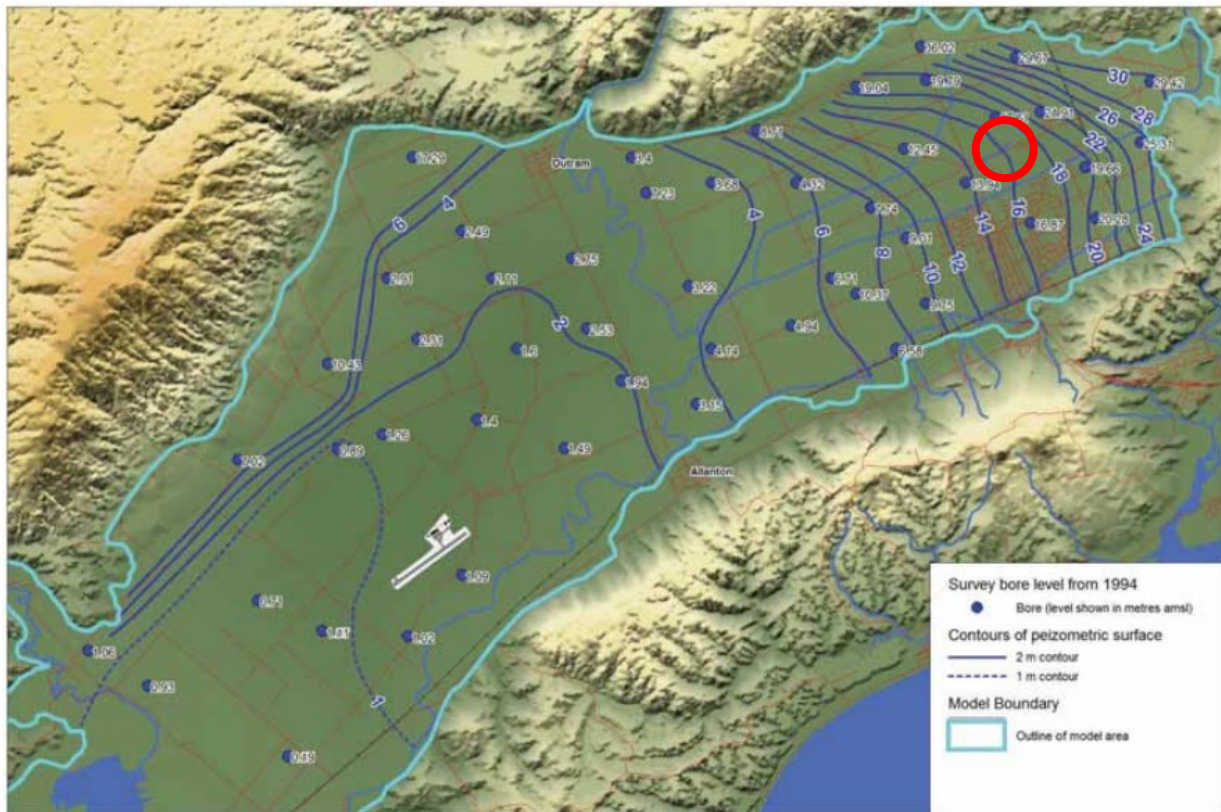


Figure 4-1 Groundwater contours across the Lower Taieri Plains, sourced from (Otago Regional Council, 2010). Approximate site location outlined in red.

The East Taieri aquifer is semi-confined, containing areas of water-bearing units intersected by aquitards. Within the vicinity of the proposed Site, the aquifer is considered unconfined (Dunedin City Council, 2008). As discussed in Section 2.1, it is comprised of river deposits, including gravels, sands, silts and clays.

In the vicinity of the Site the aquifer system is in a recharge zone. This means that the aquifer is being recharged through rainfall, foothill runoff, and through surface water features (i.e., the Silver Stream), resulting in a negative vertical hydraulic gradient, which is demonstrated by lower groundwater levels with depth (see Figure 4-2). This has been observed in the nested piezometers set up on site (IP-P5 and IP-P5b) and has been acknowledged throughout the various hydrogeological assessments carried out within the area (Irricon Consulting, 2005; Irricon Consultants & ROYD Consulting, 1994; Dunedin City Council, 2008). This is discussed in more detail in Section 4.2, alongside the site conceptual model.

The groundwater table within the Site ranges from 6 – 9 m bgl, with seasonal fluctuations of 1 – 2 m - i.e. the groundwater level is typically deeper in summer and shallower in winter (Dunedin City Council,

2008). Groundwater level monitoring data from the onsite loggers is provided and discussed in Section 4.1.

4.1 Measured Groundwater Levels

Three groundwater level loggers have been installed on the Site. Two and a half months of groundwater level data (mid-November to end of January) has been collected, downloaded, and processed at the time of writing (Figure 4-2).

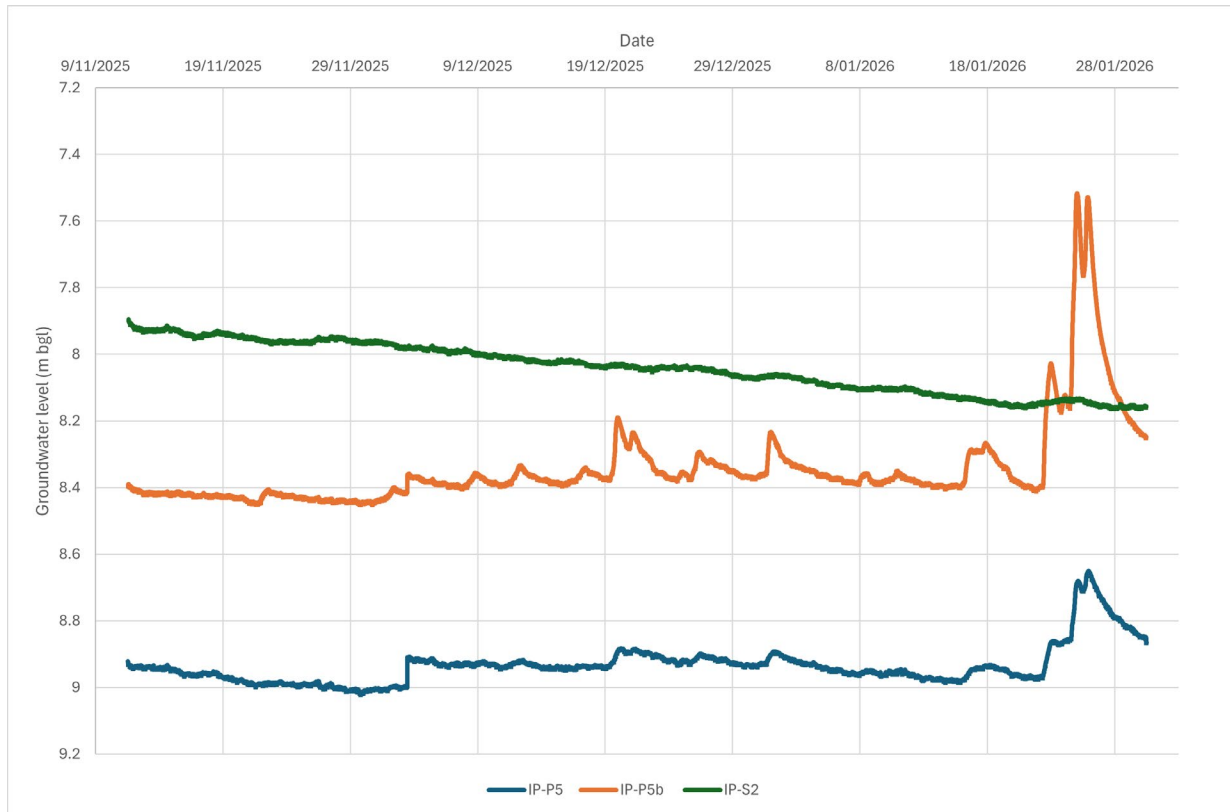


Figure 4-2 Onsite groundwater level monitoring data

The monitoring data shows that groundwater levels are between approximately 7.5 – 9 m bgl across the site. IP-P5 and IP-P5b are nested piezometers, installed in the same location but at different depths. IP-P5 is 16 m deep and IP-P5b is 9 m deep. The groundwater level data for these nested piezometers demonstrates the negative vertical hydraulic gradient discussed in Section 4, with the deeper well (IP-P5) showing a deeper average groundwater level of ~9 m bgl compared to the shallower well (IP-P5b) which shows a shallower average groundwater level of 8.3 m bgl. Monitoring of the groundwater levels should continue to better understand the seasonal variation of the groundwater table. However, data shows that the groundwater levels across the Site are relatively deep (i.e. not within 2 m of the surface, and likely at least 5 m below site) and therefore are not expected to be encountered during the proposed excavation works, unless the detailed design process determines deep excavations are required.

Historical monitoring data from borehole I44/0835, I44/0836 and I44/0837 (locations shown in Figure 3-1) was provided by Otago Regional Council. This is shown below in Figure 4-3. This data also displays the negative vertical hydraulic gradient, as I44/0838 is the deepest well and shows the deepest water level.

Southern Link Logistics Park

4 Hydrogeological Setting

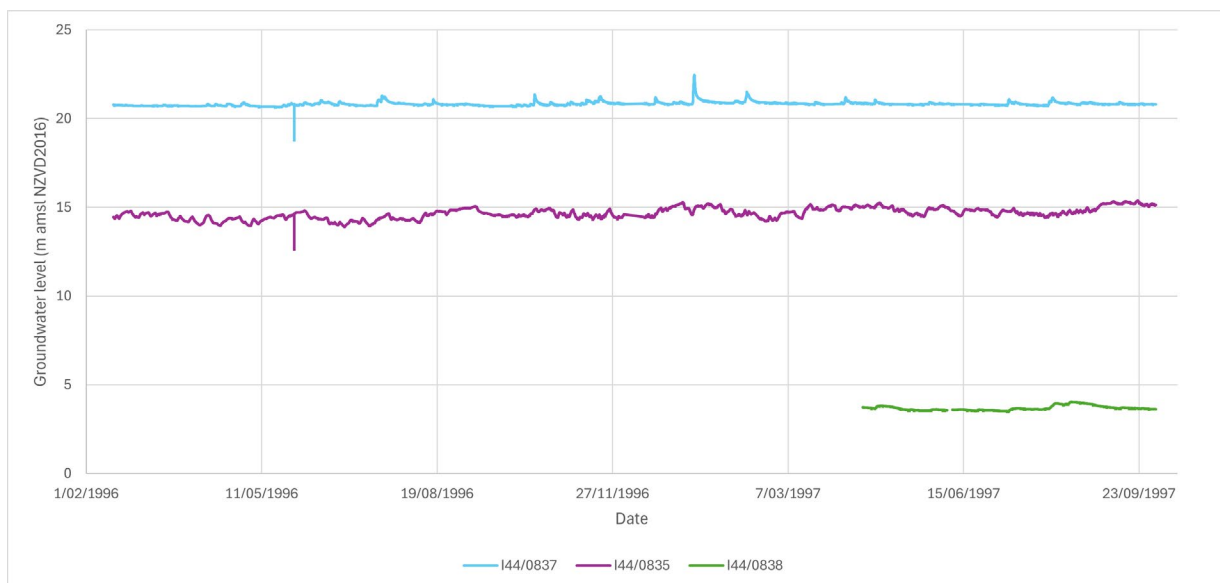


Figure 4-3 Historical groundwater elevation data from onsite monitoring boreholes

The groundwater level data was plotted against rainfall data from the Dunedin International Airport (located approximately 15 km away from the site) to better understand the recharge response to rainfall (Figure 4-4). Rainfall data from the Dunedin International Airport will likely be representative of the rainfall at the Site. Based on the data, groundwater level response to rainfall is relatively muted; the rainfall data from 1997 shows that 36 mm of rain caused a 1.5 m rise in groundwater levels in I44/0837. This would suggest that annual high recharge events are unlikely to bring groundwater levels to within 5 m of the ground surface. Furthermore, even if decadal recharge events do increase groundwater levels to above 5 m bgl, groundwater levels are unlikely to remain there for long periods, reducing to greater depths within hours or days of the event culminating.

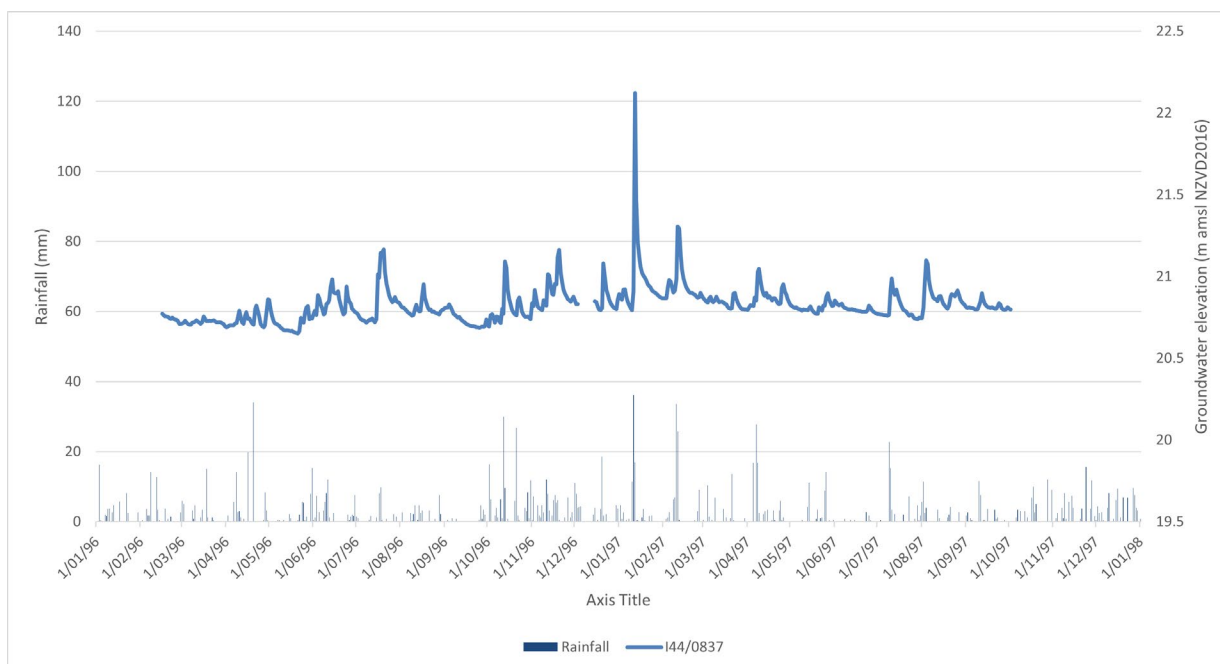


Figure 4-4 Historic rainfall data and groundwater level data to demonstrate the groundwater response to rainfall



4.2 Site Conceptual Model

A conceptual model of the site and the underlying groundwater system is shown in Figure 4-5. This presents a best guess estimate of the geological sequence under the proposed Site and the likely water table based on the borehole logs analysed and the onsite groundwater level monitoring data.

As shown below and discussed previously, the groundwater system displays a negative vertical hydraulic gradient. This means that the groundwater is flowing downwards, and the groundwater level / pressure at depth is lower than the level / pressure nearer the surface. Groundwater will move downwards through the aquifer. As a result, the groundwater system is recharged through surface water; at the Site, this means Silver Stream recharges the groundwater system and is a losing stream (i.e. loses water to the groundwater system and therefore recharges the groundwater system). This regime is observed within the groundwater levels in the nested piezometers installed onsite as well as described within previous reporting and assessments. For example, it was noted by Irricon Consultants & ROYD Consulting (1994) that three nested monitoring piezometers installed in the Lower Taieri Plains showed a drop in groundwater level with increasing depth, showing flow down the profile.

A downwards hydraulic gradient is a sign of hydraulic recharge as opposed to hydraulic discharge. This means it is less likely for artesian (or spring) conditions to occur onsite, reducing the risk of groundwater levels being close to the surface or upwelling during construction / operation.

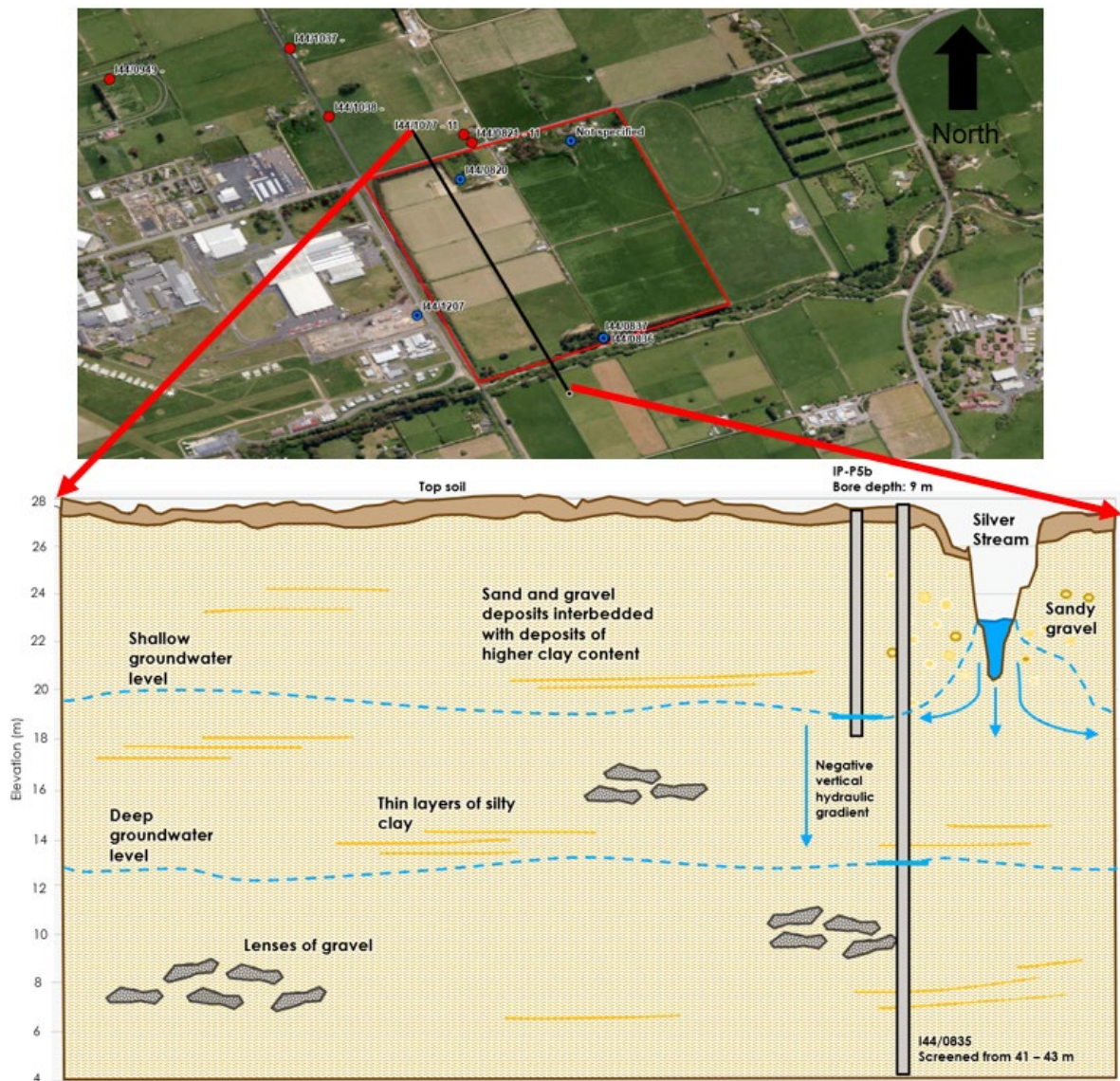


Figure 4-5 Site conceptual diagram

4.3 Aquifer Parameters

Hydraulic conductivity is a parameter of porous materials which measures the ease with which water can move through the pore spaces or fractures within the material. The horizontal hydraulic conductivity refers to the ability of water to move horizontally through a porous material, whereas the vertical hydraulic conductivity refers to the ability of water to move vertically through a porous material. Hydraulic conductivity varies with direction depending on the way the material has been formed or deposited (Woessner & Poeter, 2020).

Groundwater modelling for the Lower Taieri Plains has been carried out to understand the potential impact of leachate from the North Taieri closed landfill on the aquifer (see Section 3.2.2 for further detail). This requires estimates of aquifer parameters for the Lower Taieri Plains. Pumping tests undertaken in East Taieri estimate the hydraulic conductivity to be between 18 – 22 m/day (Irricon Consulting, 2005). These hydraulic conductivity values indicate that the aquifer system is mainly comprised of sandy gravel, with thinner layers of silt / clay. It is also worth noting that pumping tests

often target the potential water-bearing units of an aquifer, and as a result tend to be biased towards the higher yielding units with higher hydraulic conductivities.

It was also noted that the responses during testing completed by others indicated that the vertical hydraulic conductivity of the system is lower than the horizontal hydraulic conductivity. The vertical hydraulic conductivity determined by others was assumed to be 0.25 of the horizontal hydraulic conductivity, for modelling purposes (Irricon Consulting, 2005). Vertical hydraulic conductivity is typically much less than horizontal hydraulic conductivity, and ratios of 0.10 – 0.50 are typically chosen for groundwater modelling. Therefore, we agree with assuming the vertical hydraulic conductivity is 0.25 of the horizontal hydraulic conductivity for groundwater modelling.

4.4 Groundwater Quality

As previously mentioned, the North Taieri closed landfill is approximately 600 m northeast of the site, as indicated on Figure 4-6. The landfill site is upgradient of the site, assuming a westward groundwater flow (as shown in Figure 4-1)

Groundwater quality monitoring is required as part of the consent conditions for the North Taieri closed landfill. 30 sampling points are monitored on a six-monthly basis in October and April each year; this includes two surface water sampling locations and nested piezometers. The sampling locations are provided in Figure 4-6, as per the 2024 Annual Monitoring Report for the North Taieri closed landfill (Dunedin City Council, 2024).

The sampling locations include 6 wells either within the site boundary or directly adjacent. These wells are Donnelly p1, Donnelly p3, Donnelly p4, Donnelly p5, Morris and Anderton Dukes Road (which is immediately opposite the site boundary) as shown on Figure 4-6. Only the results for Donnelly p1 and Morris were presented in the 2024 annual monitoring report (Dunedin City Council, 2024). The depth of the Morris well is approximately 10 m. The depth of the Donnelly P1 well is unknown, but on the Wells Aotearoa New Zealand Database it is indicated as being shallow.

Southern Link Logistics Park 4 Hydrogeological Setting

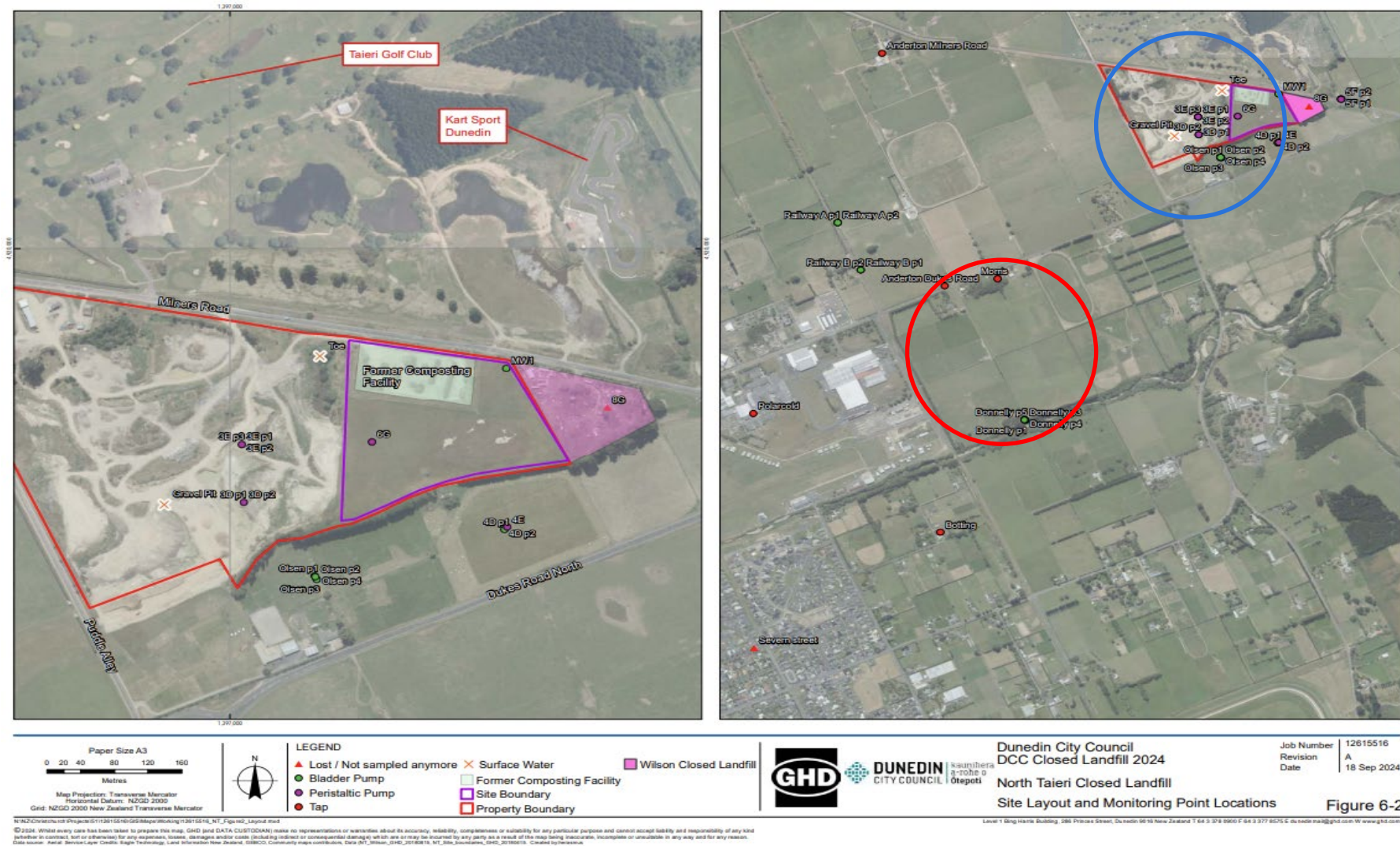


Figure 4-6 Location of groundwater quality monitoring sites, as per the North Taieri closed landfill Annual Monitoring Report (Dunedin City Council, 2024). The proposed site is circled in red, with the landfill site shown in blue.



The monitoring results have been compared by others to the New Zealand Drinking Water Standards (DWSNZ) 2005 Guideline Values (GV) or Maximum Acceptable Value (MAV), this comparison has been reproduced here. The DWSNZ were updated in 2022, however it is assumed that the 2005 guidelines values were used to ensure consistent comparison values were used throughout the monitoring period. The groundwater monitoring results for groundwater bores Donnelly p1 and Morris is summarised below in Table 4-1.

Table 4-1 Summary of groundwater quality results, as reported in the North Taieri closed landfill 2024 Annual Monitoring Report (Dunedin City Council, 2024)

Contaminants Monitored	Monitoring period	Comparison to DWSNZ and trend
Zinc	2001 – 2024	All sampled values are below the DWSNZ GV. There has been a decreasing trend in the Donnelly p1 well since 2013. There has been a slight increasing trend in the Morris well since 2016.
Lead	2004 – 2024	Samples from Donnelly p1 were above DWSNZ MAV from 2012 – 2016, and in 2023. There is no clear trend in the data. One sample from Morris in 2006 was above the DWSNZ MAV, but since then all samples have remained below the MAV. There is no clear trend.
Sodium	2001 – 2024	All sampled values are below the DWSNZ GV. The sampled values have remained consistent and stable across the entire monitoring period.
Boron	2001 – 2024	All sampled values are below the DWSNZ MAV. The sampled values have remained mostly stable across the entire monitoring period.
Nickel	2009 – 2024	All sampled values are below the DWSNZ MAV. The sampled values have remained mostly stable across the entire monitoring period.
Copper	2009 – 2024	All sampled values are below the DWSNZ MAV. The sampled values have remained mostly stable across the entire monitoring period, although the 2015 sampled value for the Donnelly p1 well was at the GV.
Nitrate (as NO ₃ -N)	2001 – 2024	One sampled value for Morris in 2006 was above the DWSNZ MAV. All other values have been below the DWSNZ MAV and have remained fairly consistent throughout the monitoring period.
COD	2001 – 2024	There is no comparable standard value for COD. The values have remained fairly consistent across the monitoring period, around 40 mg/L.
Chloride	1996 – 2024 (Morris) 2001 – 2024 (Donnelly p1)	All sampled values are below the DWSNZ GV. The sampled values have remained consistent and stable across the entire monitoring period.
Ammoniacal Nitrogen	1996 – 2024 (Morris) 2001 – 2024 (Donnelly p1)	One sampled value for Morris in 2017 was above the DWSNZ GV. All other values are below the DWSNZ GV and have remained fairly consistent throughout the monitoring period.
Cadmium	2009 – 2024	One sampled value for Morris in 2011 was above the DWSNZ MAV. All other values are below the DWSNZ GV and have remained fairly consistent throughout the monitoring period.

Southern Link Logistics Park
4 Hydrogeological Setting

Contaminants Monitored	Monitoring period	Comparison to DWSNZ and trend
Chromium (III + VI)	2007 – 2024 (Morris) 2009 – 2024 (Donnelly p1)	All values are below the DWSNZ MAV. There is no discernible trend within the data.
EC	1996 – 2024 (Morris) 2000 – 2024 (Donnelly p1)	There is no comparable standard value for EC. All value range between 100 – 400 µS/cm.
pH	1996 – 2024 (Morris) 2008 – 2024 (Donnelly p1)	The pH guideline range is 7.0 – 8.5. Most of the values sit just below this range, at around 6.5 – 7.0. Monitoring in 2010 showed results with a pH of 9.5 – 10 in both wells, but this result has not been observed since.

Overall, the groundwater sampling shows that the sampled parameters are within the comparable guideline values, with many of the parameters remaining consistent and stable over the monitored time period. This data provides a useful set of baseline groundwater quality data, which can be used to compare with groundwater quality during and after construction to determine any changes. This also suggests that any groundwater quality impacts from the nearby landfill site are not likely to be an issue at the Site.



5 Groundwater Impacts Assessment

5.1 Groundwater Levels and Flow Patterns

The proposed excavation depth for the construction of the hard stand areas is approximately 3 m. The earthworks diagrams are provided in Appendix B. The onsite groundwater level monitoring data shows that groundwater levels are 7.5 – 9 m bgl. Whilst seasonal variation of 1 – 2 m has been reported (Dunedin City Council, 2008), it is not expected that the proposed excavation will intersect groundwater levels. As a result, it is not expected that dewatering during construction will be required.

Groundwater flow has been identified as westward across the site (Figure 4-1). A negative vertical hydraulic gradient has been assumed at the site, based on onsite groundwater level monitoring data and previous investigations. This means that the groundwater system is recharged by the Silver Stream, as well as rainfall, and that the downwards movement of groundwater persists. The installation of building foundations, roading and hardstand areas will reduce the recharge to the aquifer via rainfall due to the impervious nature of these surfaces. However, it is not expected that the proposed Inland Port will impact the groundwater flow patterns significantly.

Annual average rainfall was calculated using a 30-year rainfall monitoring dataset from the Dunedin International Airport monitoring site. A high-level estimate of annual recharge to the site was done using the Rushton recharge model. This soil moisture model incorporates rainfall, evapotranspiration, soil characteristics and runoff to determine recharge to groundwater. Soil characteristics for the site were based on the soil mapping provided by S-Map (Manaaki Whenua - Landcare Research, 2026). It is estimated that approximately 13.5% of average rainfall ends up as average annual recharge to the site. Based on the average annual recharge to the site and the site area, the development will divert approximately 38,000 m³/year of groundwater recharge. Most of the diverted recharge will end up in surface water features via runoff (i.e. Silver Stream) or migrate to the groundwater system at other locations. The reduced recharge below the hardstand areas will result in a minor, localised reduction in groundwater levels.

The deeper groundwater levels observed on site mean that the excavation and site development should not interfere with or intersect the groundwater table, and therefore the impact of the proposed development on the groundwater levels and flow patterns is expected to be negligible.

5.2 Groundwater Quality

Groundwater quality data from onsite, as part of the North Taieri closed landfill monitoring requirements, has been analysed (Section 4.4). The groundwater quality across the site is good, with very few exceedances of the DWSNZ guideline values over the 20-year monitoring period (Section 4.4). The proposed site development is not expected to impact the groundwater quality across the site, as no discharge is occurring. During the development of the site and earthworks, an Earthworks Management Plan is required to outline how soil and earth materials will be managed onsite.

The impact of the proposed development on the groundwater quality at the site is expected to be negligible.

5.3 Stormwater Basin

Stormwater is expected to be managed through a network of drainage infrastructure installed on the proposed site, including a stormwater attenuation pond (Stantec New Zealand, 2025). The depth of the



stormwater attenuation pond is 4.4 m bgl at its deepest point. The current phase of design suggests that the stormwater attenuation pond will not be lined. However, this will be assessed and confirmed during the detail design phase of the project. If the stormwater basin is not lined, some seepage will occur.

An estimate of seepage from an unlined stormwater attenuation pond has been calculated using the Massmann equation (Massmann, 2003). The following assumptions were made:

- The area of the stormwater attenuation pond is 115 m x 115 m, as per the current earthwork's drawings.
- The groundwater level is modelled to be at the base of the stormwater attenuation pond.
- The depth of the stormwater in the attenuation pond is assumed to be 4 m.
- A hydraulic conductivity of 20 m/d has been assumed (Section 4.3).
- A clogging factor of 0.5.

An estimate of seepage during a full discharge event has been calculated as 2000 m³/day. See Appendix C for the full calculation including inputs.

It is not expected that the groundwater levels will intercept the base of the stormwater attenuation pond. The data from the current groundwater level loggers installed on site show groundwater levels being at least 2 m from the base of the proposed stormwater attenuation pond (Figure 4-2). The elevation of the base of the stormwater attenuation pond is expected to be 22.5 m amsl. One historical reading shows the groundwater level as reaching 22 m amsl (Well I44/0837 in Figure 4-3), however this was approximately 30 years ago. Therefore, it is not expected that the groundwater levels will reach the base of the stormwater attenuation pond. It is possible that if an extreme (i.e. decadal) recharge event occurred, groundwater levels would intercept the base of the stormwater attenuation pond. However, in this scenario the stormwater attenuation pond would already contain water, and therefore there would be no increased impact of seepage into the groundwater system due to higher groundwater levels.

Given the depth of the groundwater levels and the depth of the stormwater attenuation pond, it is not expected that groundwater will contribute to the flooding risk.

5.4 Surface Water Depletion

Surface water depletion occurs when groundwater abstraction causes drawdown within a surface water body due to the surface-groundwater connectivity. As previously discussed, Silver Stream (the nearest surface water body) is a losing stream, where it recharges the groundwater system. This is opposed to a gaining stream, which is fed by groundwater and therefore at a greater risk to surface water depletion. No groundwater abstraction is proposed to occur on the Site and dewatering will not be required. Therefore, there is no expected surface water depletion due to the proposed SLIP.

5.5 Effects on Current and Future Groundwater Users

There will be no drawdown impacts on nearby groundwater users from groundwater abstraction/dewatering. If the stormwater pond is unlined, there are anticipated discharges from the stormwater retention basin, although the seepage volumes are expected to be similar to stormwater infiltration currently occurring on site. Change of land use may result in slightly elevated heavy metals and petroleum hydrocarbon concentrations within stormwater runoff. However, impacts to groundwater users is not expected given depth to groundwater and natural attenuation process.

Therefore, impacts on down-gradient users are not expected.



6 Recommendations

The recommendations are as follows:

- **Groundwater levels**
 - Groundwater levels onsite should continue to be monitored with the installed level loggers to establish a baseline set of groundwater level data prior to and during construction.



7 Conclusion

This hydrogeological study has collated and assessed existing knowledge on the expected hydrogeological conditions at the SLIP site. The outcome of the desktop review and field investigation findings shows that the expected impacts on the hydrogeological system as a result of the SLIP are negligible.



8 References

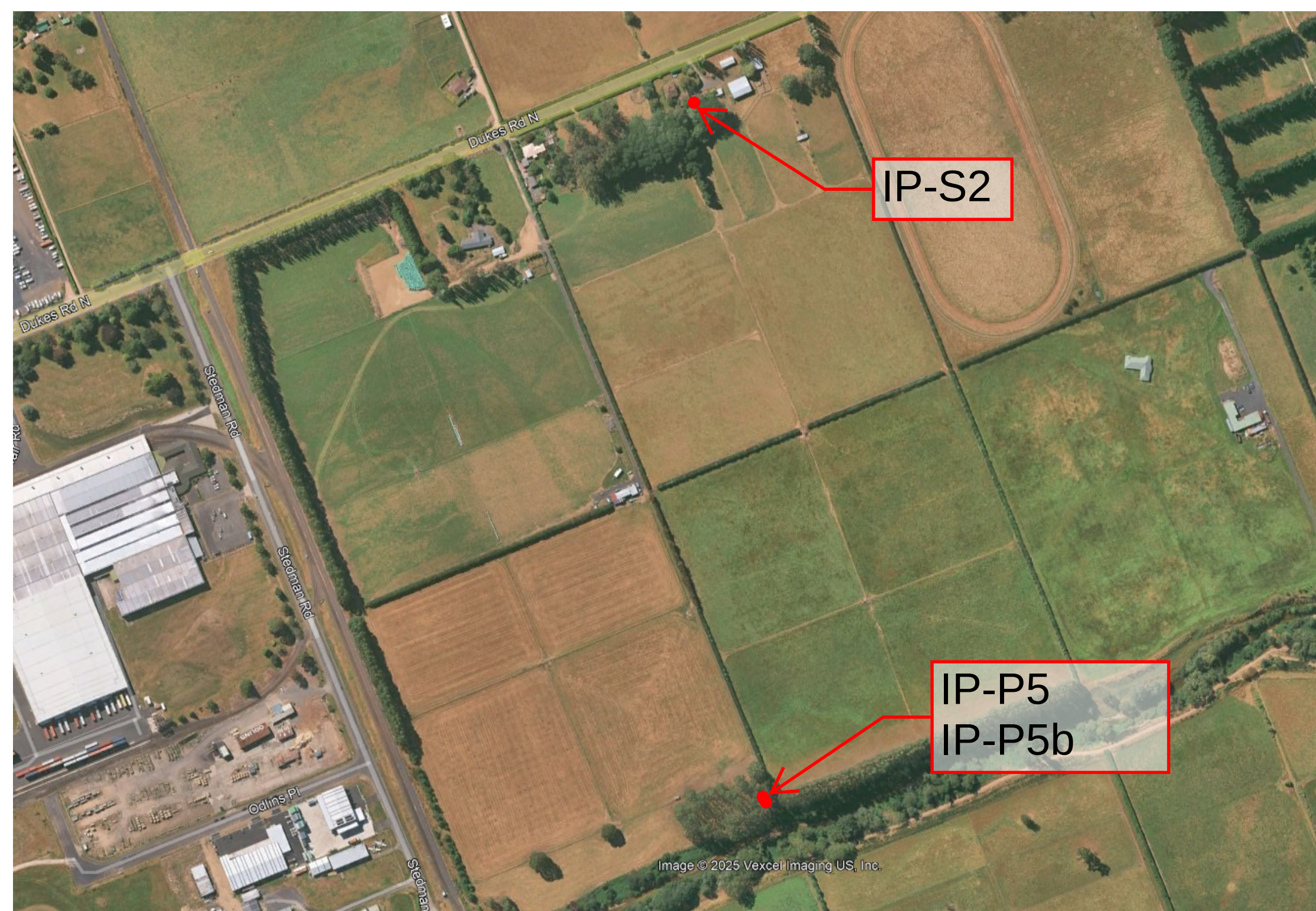
- Dunedin City Council. (2008). *Dunedin City Council, North Taieri Closed Landfill - DCC response to Section 92 Request*.
- Dunedin City Council. (2024). *Annual Monitoring Report 2024*. Dunedin: Dunedin City Council.
- Geological and Nuclear Science. (2025, December). *Geoscience webmap*. Retrieved from GNS Science Te Pu Ao: <https://www.gns.cri.nz/data-and-resources/geoscience-webmap/>
- Irricon Consultants & ROYD Consulting. (1994). *Lower Taieri Groundwater Preliminary Study*.
- Irricon Consulting. (2005). *North Taieri Closed Landfill: Aquifer Contamination Risk Assessment*.
- Land Information New Zealand . (2025, December). *New Zealand LiDAR 1 m DEM*. Retrieved from <https://data.linz.govt.nz/layer/121859-new-zealand-lidar-1m-dem/>
- Manaaki Whenua - Landcare Research. (2026, January 23). *S-Map Online*. Retrieved from Manaaki Whenua Landcare Research: <https://smap.landcareresearch.co.nz/maps-and-tools/app>
- Massmann, J. (2003, October). A design manual for sizing infiltration ponds. Prepared for Washington State Transport Commission.
- Mitchell Daysh. (2025). *Southern Link Property Limited Southern Link Inland Port Project Description*.
- Otago Regional Council. (2010). *Lower Taieri Groundwater Allocation Study* .
- Stantec New Zealand. (2025). *Geotechnical Desktop Study and Appraisal: Southern Logistics Park*.
- Stantec New Zealand. (2025). *Southern Link Inland Port Stormwater Assessment*. Stantec New Zealand.
- Woessner, W. W., & Poeter, E. P. (2020). *Hydrogeologic Properties of Earth Materials and Principles of Groundwater Flow*. Ontario, Canada: The Groundwater Project.

Appendices



Appendix A Onsite Monitoring Boreholes

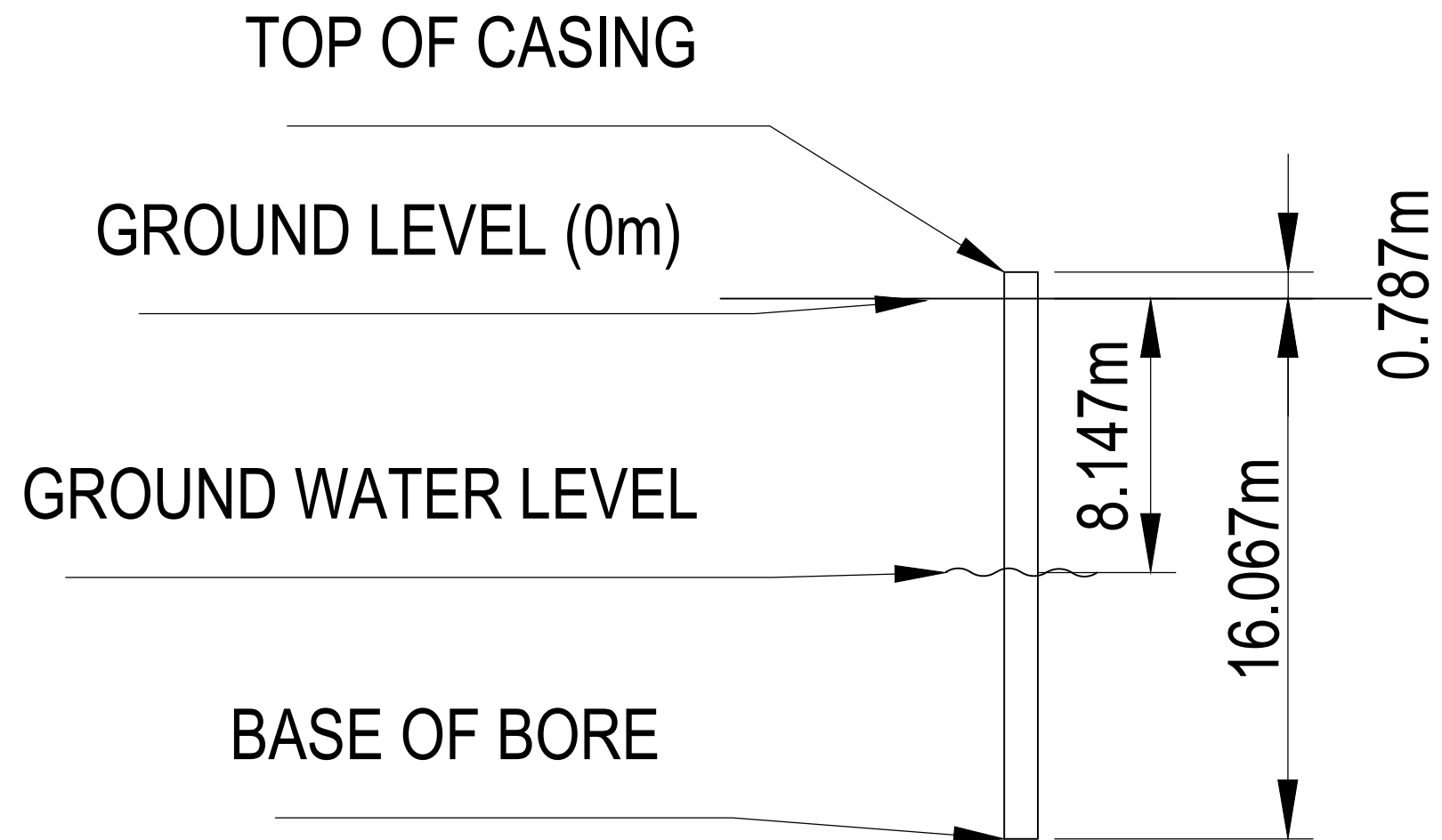




IP-S2

IP-P5
IP-P5b

IP-P5



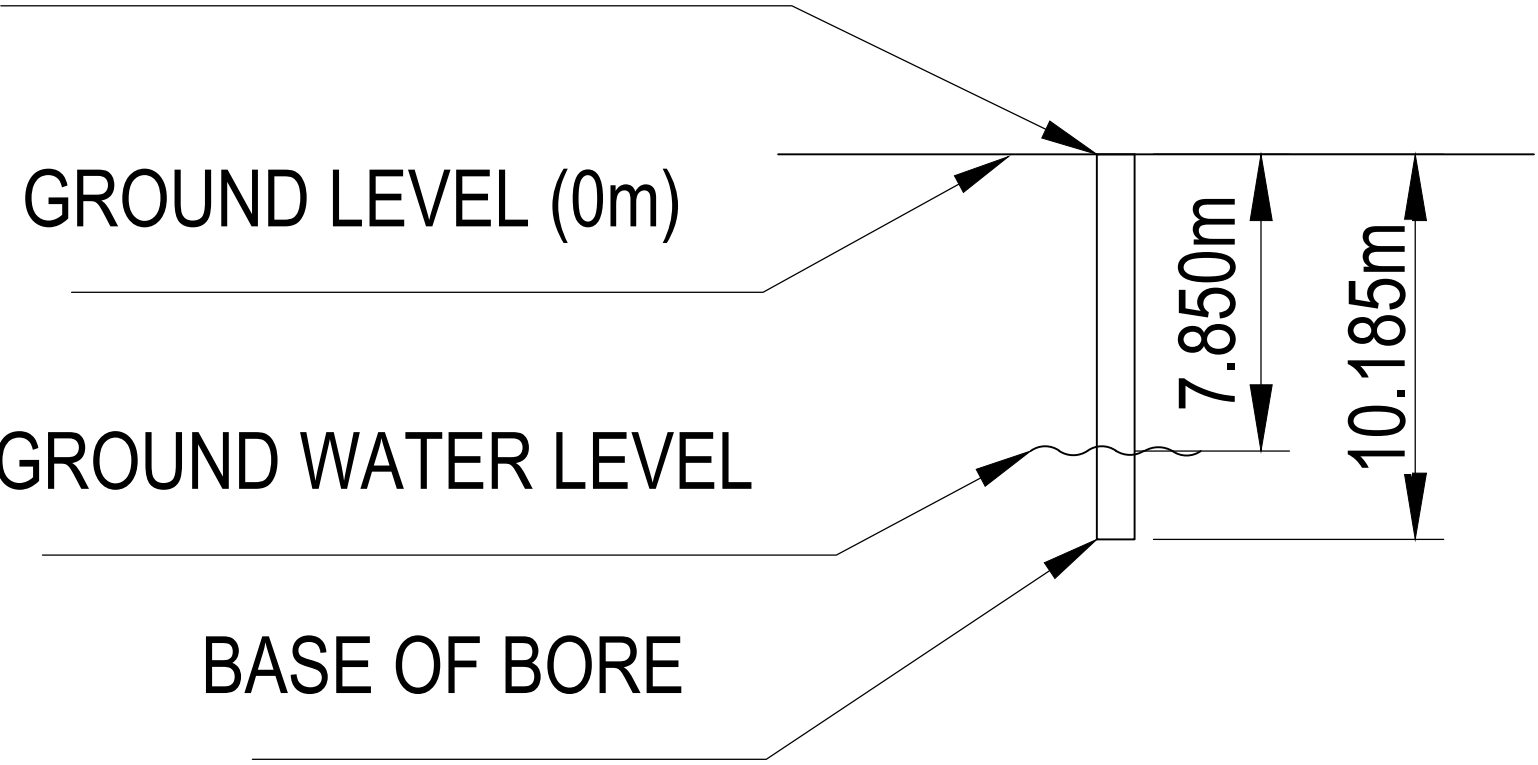
IP-S2

TOP OF CASING (AT GL)

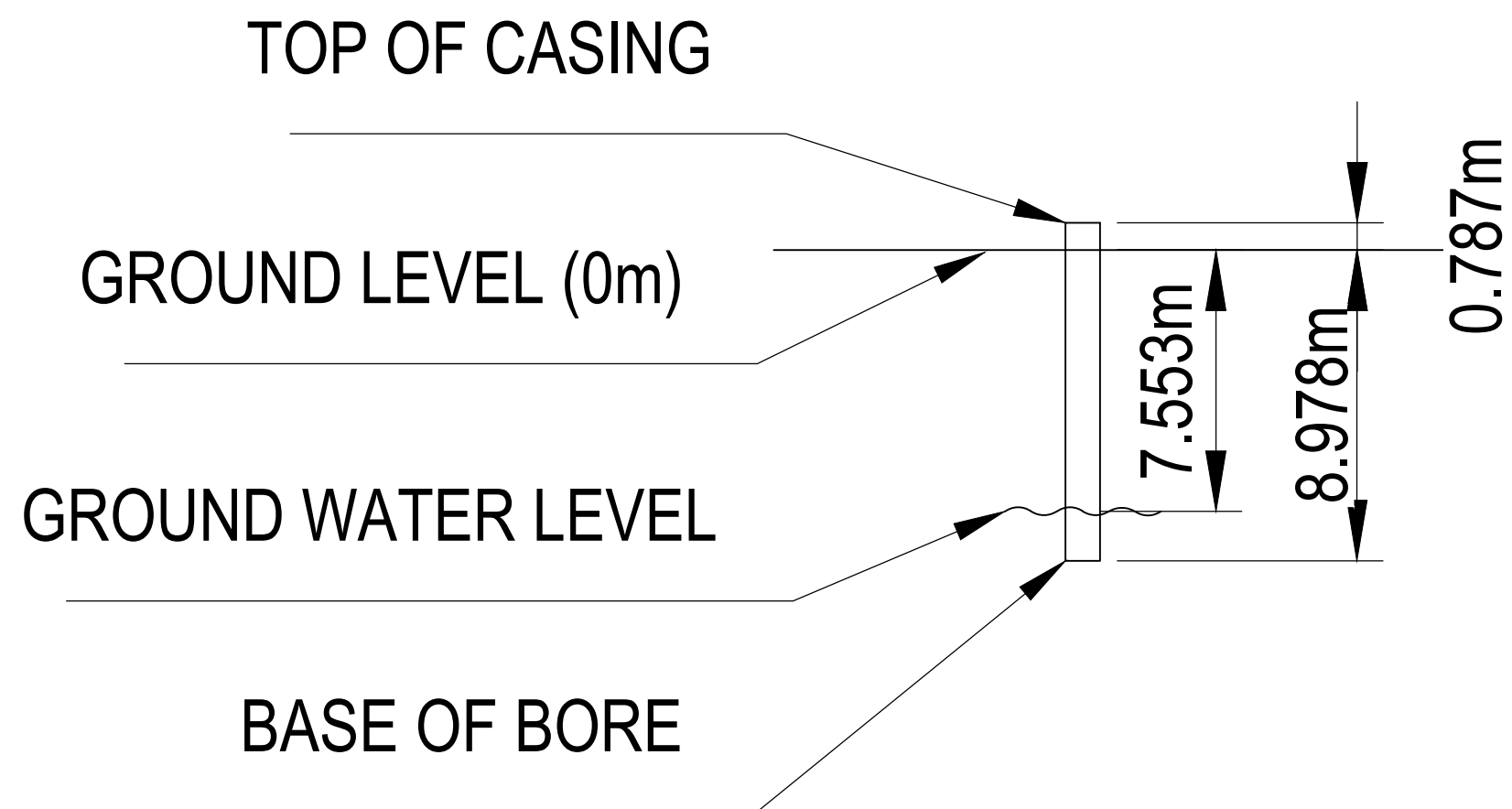
GROUND LEVEL (0m)

GROUND WATER LEVEL

BASE OF BORE

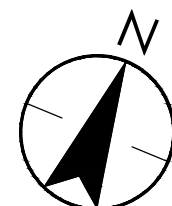


IP-P5b



Appendix B Earthworks Diagrams





DUKES ROAD NORTH

STEDMAN ROAD

STAGE 2

STAGE 2

STAGE 1
TEMPORARY
STOCKPILE AREA

STAGE 3

STAGE 1
TEMPORARY
BUND AREA

SILVER STREAM

LEGEND

 EXISTING GROUND CONTOURS
 SHOWN INTERVAL 2.5m X 0.5m
 FINISHED GROUND CONTOURS
 SHOWN INTERVAL 2.5m X 0.5m
 STAGING BOUNDARY
 SITE BOUNDARY

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C	ISSUED FOR CONSENT	BG	SL	26.02.20
B	ISSUED FOR CONCEPT DESIGN	BG	SL	26.02.05
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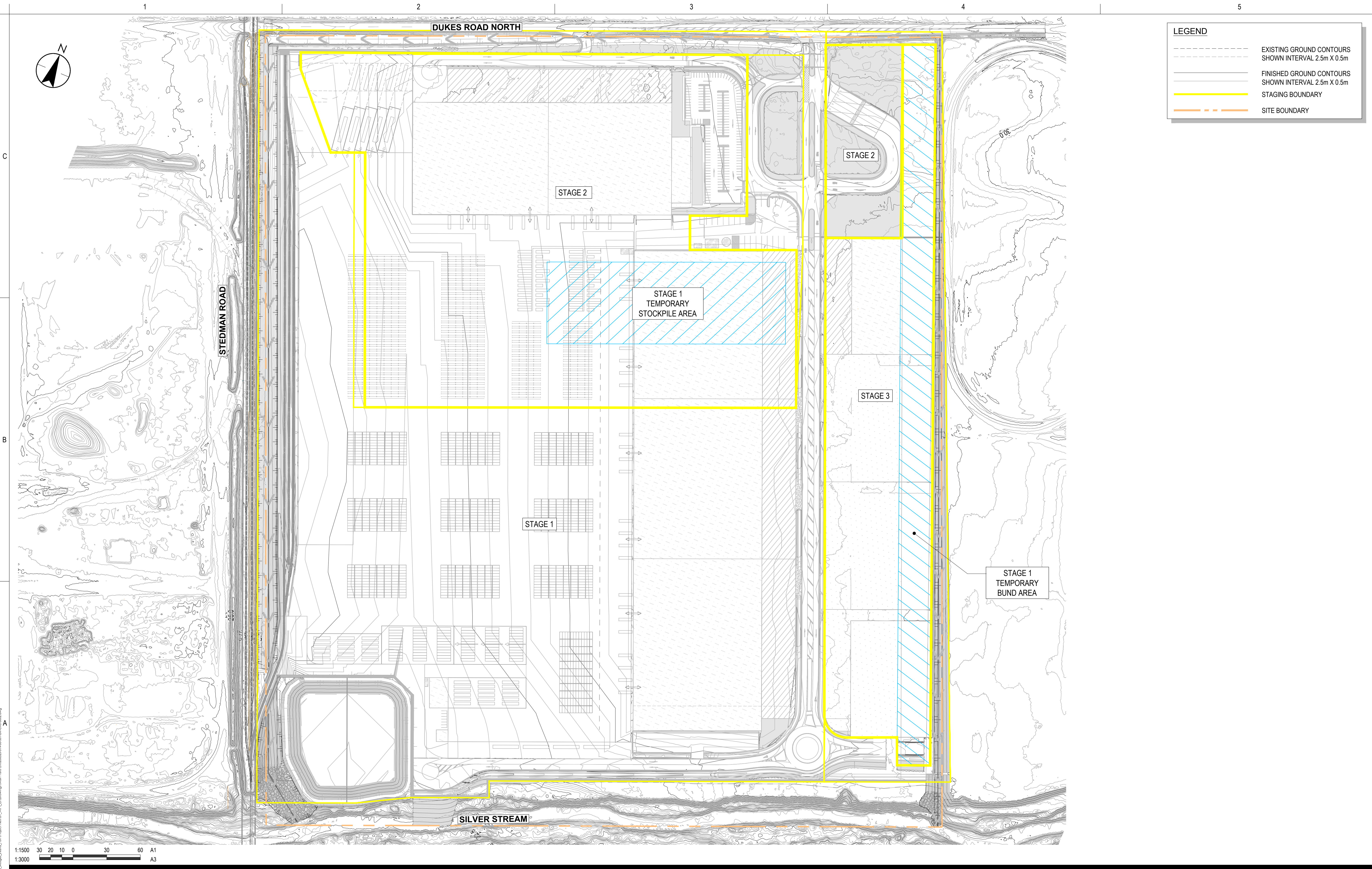
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CUT/FILL REPORT - EARTHWORKS STAGE 1				
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1. DEPTHS ARE SHOWN FROM EXISTING STRIPPED SURFACE TO SUBGRADE SURFACE. (SURFACE STRIP DEPTH 300mm)



310206525-STN-00-501-DR-CI-090301



CUT/FILL DEPTHS TABLE				
NUMBER	COLOUR	MINIMUM DEPTH	MAXIMUM DEPTH	RANGE VOLUME
1	■	-2.50	-2.00	62
2	■	-2.00	-1.50	1661
3	■	-1.50	-1.00	6006
4	■	-1.00	-0.50	7624
5	■	-0.50	0.00	16461
6	■	0.00	0.50	20754
7	■	0.50	1.00	5375
8	■	1.00	1.50	583

CUT/FILL REPORT - EARTHWORKS STAGE 2				
AREA (m ²)	CUT (m ³)	TOPSOIL STRIP (m ³)	FILL (m ³)	NET (m ³)
128,300	31,900	32,000 <CUT>	26,800	37,100 <CUT>

NOTE

1. DEPTHS ARE SHOWN FROM EXISTING STRIPPED SURFACE TO SUBGRADE SURFACE. (SURFACE STRIP DEPTH 300mm).

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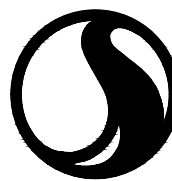
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