

# Wainui Subdivision Wetland Assessment

# Hydric Soil & Hydrology Tool Assessments

Vineway Limited

WWLA1147

1 July 2025





# Hydric Soil & Hydrology Tool Assessments

Project no: WWLA1147

Revision: 2

Date: 1 July 2025
Client name: Vineway Limited
Project manager: Jon Williamson
Author(s): Mya Mobberley

File name: WWLA Report\_Wainui Subdivision\_Wetland Assessment\_v2.docx

Williamson Water & Land Advisory

P.O. Box 314 Kumeu New Zealand www.wwla.kiwi

## Document history and status

Rev	Date	Description	Ву	Review	Approved
1	30 June 2025	Hydric Soil & Hydrology Tool Assessments	Mya Mobberley	Jon Williamson	
2	1 July 2025	Hydric Soil & Hydrology Tool Assessments	Mya Mobberley	Jon Williamson	Jon Williamson

## Distribution of copies

Rev	Date issued	Issued to	Comments
1	30 June 2025	Client team for internal review	
2	1 July 2025	Client team for internal review	



# **Executive Summary**

Williamson Water & Land Advisory (WWLA) were commissioned by Vineway Limited in June 2025 to undertake Hydric Soil and Wetland Hydrology Tool Assessments at 16 proposed wetland offset sites as part of the proposed residential development 'Delmore' in Upper Orewa, Auckland ("the Site"). The proposed wetland sites are currently not considered wetland according to their vegetation assemblage, as defined by the project ecologists (Viridis Consultants Ltd). However, each of the proposed sites is adjacent and/or adjoining existing wetlands and will provide a contiguous wetland if the site characteristics are appropriate and if allowed to coalesce into a natural state.

## The following summarises the key findings:

	manaes the key infamigs.
Project Objectives	<ul> <li>The specific objective of the assessment was to:</li> <li>Confirm the soil characteristics with a key focus on soil drainage, and the presence or absence of hydric soil and hydrology indicators of natural inland wetlands; and</li> <li>Map areas where wetland transition would occur naturally without stock grazing, and/or develop interventions to create wetlands where the offset locations were considered suitable, based on the findings of the field assessment.</li> </ul>
Methods	All investigations were undertaken in accordance with the Landcare Research (2018) and MfE (2021) guidelines for hydric soil and hydrology assessment for natural inland wetlands. The key focus of this methodology is the presence of hydric soils within the top 300 mm of soil, and/or the presence of a distinct soil horizon showing saturation or severe drainage limitation within the top 400 mm of soil.  The work was undertaken during winter, following two days of dry weather. The ground conditions were drier than expected in two areas, with one area showing wetter ground conditions.  Across the 16 proposed wetland offset sites, a total of 22 test pits were hand dug to provide an appropriate data coverage that represented the proposed wetland areas based on plan identification by ecologists.  Test pits were dug to a depth of 400 mm and hand-augured further to 1,000 mm, with key lithological and morphological characteristics logged as the depth of investigation progressed. Each was measured, photographed and backfilled following investigation.
Summary of Results	<ul> <li>In summary, soils comprised:</li> <li>between 150-400 mm of mostly dryish topsoil, with some areas containing moist topsoil.</li> <li>Underlying the topsoil was predominantly a clayey silt or silty clay of the East Coast Bays Formation and the Hukerenui Mudstone.</li> <li>fill containing clayey SILT, with minor gravels was observed in one location (Site 13).</li> <li>poor permeability in general.</li> <li>The soils examined within the Site were mostly unsaturated, with wetter (moist) topsoil observed in the northwestern portion of the site.</li> <li>Soils had been previously disturbed in one location, as mentioned above with fill present deeper than 1.0 m.</li> <li>All other locations comprised of clayey subsoils underlying topsoil, with generally poor permeability. Out of the 22 sites investigated 20 presented with low chroma soils. Whilst it is important to note that soil colour in the North Auckland area is not the most reliable indicator of hydric soils because of the pale colour of the parent rock material, and also the soil leaching from native podocarp forests that prevailed in this area prior to human inhabitation, the same low chroma soil sites in this case also presented hydrology indicators of wetlands – either rhizospheres, geomorphic position or algal mats. Overall, this suggests that these 20 sites are hydric, and the remaining 2 are not hydric.</li> <li>Most sites displaying hydric soils and hydrology tool indicators were located at landscape features such as a depression in gently undulating areas within an overland flow path (OLFP). These landscape features prevent water from draining freely, which explains the presence of hydric soils and hydrology indicators of wetland.</li> </ul>
Key Conclusions	The assessment of potential wetland offset areas within the site using the hydric soil and hydrology delineation tools confirmed 20 sites (all sites except for site 6 and site 9) had both hydric soils and primary and/or secondary wetland hydrology tool indicators,  The geomorphic position of the sites are in lowish lying areas adjacent to surface water courses and adjoining existing wetlands, and all sites have relatively low permeability soils.



Some of the proposed wetland offset sites were identified as suitable for minor intervention to further impede drainage and provide high confidence that the sites would coalesce into wetland if allowed to return to a natural state. The long thin sites that are on the margin of existing wetlands or short sites between existing wetlands were considered not requiring any intervention other than cessation of stock or vehicle traffic.

In conclusion, provided the recommendations in this report are implemented, we consider that all proposed wetland offset areas will support wetland hydrology, facilitate the establishment of wetland vegetation, and promote the development of hydric soils.

# Vineway Limited Hydric Soil & Hydrology Tool Assessments



## Contents

1.	Introduction	1
2.	Field Investigation Methodology	3
2.1	Overview	3
2.2	Methodology	3
2.3	Overview of the Wetland Assessment Tools	4
3.	Environmental Setting	5
3.1	Topography and Drainage	5
3.2	Soils	5
3.3	Geology	5
3.4	Site Locations	5
4.	Hydric Soil Tool Assessment	9
4.1	Indicators	9
4.2	Results	11
4.2.1	Soils Description	11
4.2.2	Soil Infiltration Testing	17
5.	Hydrology Tool Assessment	19
5.1	Indicators	19
5.2	Results	21
6.	Drainage Intervention	22
7.	Conclusions	27
8.	References	28

# Appendices:

Appendix A – Hydric Soils and Hydrology Tool Test Sheets

Appendix B – Soil Logs and Photos



# 1. Introduction

Williamson Water & Land Advisory (WWLA) were commissioned by Vineway Ltd to undertake Hydric Soil and Wetland Hydrology Tool Assessments in accordance with the guidance in Landcare Research (2018) and MfE (2021) in January 2025 at 16 sites located at 53b, 55 Russell Road and 88, 130 and 132 Upper Orewa Road as part of the Delmore development ("the Site").

The work was required to investigate the 16 sites identified by the project ecologists (Viridis Consultants Ltd) as not currently wetland according to the lack of hydrophytic plant assemblages, and hence potentially suitable as wetland offset areas. Each of the proposed sites is adjacent and/or adjoining existing wetlands and will provide a contiguous wetland if allowed to coalesce into a natural state. Hence, this assessment was focused on understanding how close the soils are to wetland soils, and hence confirm whether the proposed wetland offset sites would likely coalesce to wetland if fenced from stock and allowed reach a natural state, or if some form of drainage intervention was implemented.

A previous assessment undertaken by Viridis Consultants Limited identified areas of existing wetlands based on possible hydrophytic vegetation, which are shown in **Figure 1** along with the proposed soil test locations.

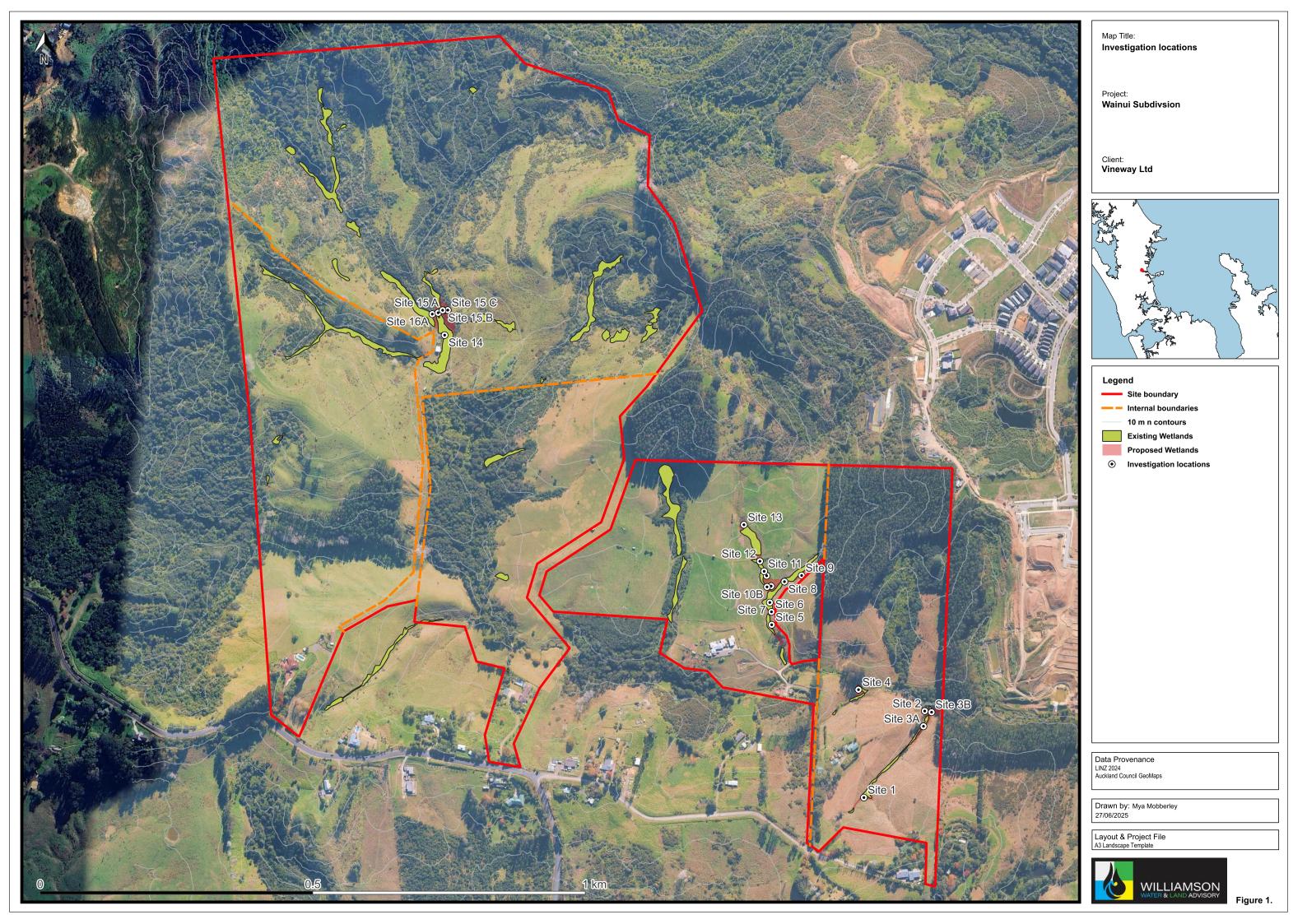
The report structure is as summarised in **Table 1**.

Table 1. Report structure.

Section	Heading	Description
1	Introduction	Project overview and background.
2	Field Investigation Methodology	Description of the field investigation site and procedures undertaken, as well as an overview of the wetland assessment tools.
3	Environmental Setting	Description of climate, topography and drainage, soils and geology, and previous Investigations.
4	Hydric Soil Tool Assessment	Tool methodology, site specific considerations implementation and results.
5	Hydrology Tool Assessment	Tool methodology, site specific considerations and implementation and results.
6	Drainage Intervention	Description of intervention requirements.
7	Conclusions	Results of study.

<sup>&</sup>lt;sup>1</sup> Landcare Research, 2018. Hydric soils – field identification guide. Consultancy report prepared for Tasman District Council under Envirolink Grant: C09X1702. June 2018.

MfE, 2021. Wetland delineation hydrology tool for Aotearoa New Zealand. Published in July 2021 by the Ministry for the Environment. ISBN: 978-1-99-003362-9. Publication number: ME 1575.





# 2. Field Investigation Methodology

## 2.1 Overview

The investigation was conducted on 17-18 June 2025 by four WWLA environmental scientists.

The weather conditions at the time of the survey were sunny and dry, with temperatures recorded of 15° and 16°C, respectively. Approximately 17.4 mm of rainfall had occurred 2 days prior on 15 June. The ground conditions were a mix of dry and some discrete areas of ponded water.

Ground cover typically consisted of a mixture of tall grasses, buttercup leaf, sporadic patches of reeds and gorse. Within the northwestern sites (No. 15A-15C and 16B), gorse was a predominant vegetation.

Soil investigation and hydrological inspection were undertaken at 22 assessment locations across 16 proposed wetland offset sites, as shown in **Figure 1** and summarised in **Table 9**. The hydric soil investigation plan was developed at scale of approximately 1:200 (one test per 200 m<sup>2</sup>).

Table 2. Schedule of investigation holes at each location.

ID	Area (m²)	No. Tests
1	268.45	1
2	138.91	1
3	497.15	2
4	133.83	1
5	225.49	1
6	42.48	1
7	36.01	1
8	23.58	1
9	138.47	1
10	619.49	3
11	26.5	1
12	213.27	1
13	135.43	1
14	65.26	1
15	936.2	3
16	363.29	2
TOTAL	3,864	22

## 2.2 Methodology

The field investigation methodology undertaken at each site involved:

- Hand excavation of a 400 x 400 mm hole to a depth of 400 mm, followed by hand auger of a 60 mm core to a depth of 1,000 mm;
- In 21 out of 22 locations water was poured into the test pits, with the depth of water measured immediately. The water was left to soak into the soils and was remeasured to identify the infiltration rate.



- Describing the soil in accordance with the NZ Geotechnical Society guidelines for soil and rock description, and the requirements for hydric soil identification provided in Section 5 of the Hydric Soils Identification Guide<sup>1</sup>, which included:
  - Munsell Soil Colour Book 2009;
  - New Zealand Hydric Soils Field Identification Guide Sheet; and
  - · copies of the wetland soil data form.
- Recording the hydrological indicators of the site.
- In 21 of the 22 test locations, 20 L of water was poured into the test pits, with the depth of water measured immediately. The water level recession within the pits was measured to provide an estimate of the soil infiltration rate.

#### 2.3 Overview of the Wetland Assessment Tools

The key objective of wetland hydric soil and hydrology tools is to aid in identifying and delineating wetlands<sup>3</sup>, and are two of the three component suite of tools for conducting this type of wetland assessment, including:

- 1) Hydrophytic vegetation;
- 2) Hydric soils; and
- 3) Hydrology.

It is re-iterated that the site had previously been confirmed by the project Ecologists from Viridis Consultants Ltd as not meeting the hydrophytic vegetation threshold classification as wetlands. Hence, this assessment was focused on understanding whether the soil characteristics resembled wetland soils and hence confirm whether the proposed wetland offset sites would likely coalesce to wetland if allowed.

These tools are based on the US Army Corps of Engineers Wetlands Delineation manual for the USA originally developed in 1987 and refined through the 1990's. Since 1991, this document has been a mandatory requirement for permitting activities that potentially impact on wetlands (amongst other things) under Section 404 of the USA Clean Water Act (CWA). The use of this document is a legislative requirement of the National Policy Statement for Freshwater Management 2022 update.

The wetland hydrology tool outlines assessment procedures for primary and secondary hydrology indicators. To confirm the presence of wetland hydrology, positive identification of the following are required:

- One primary indicator, or
- Two secondary indicators.

There is an overlap in the guidelines between the hydric soil and hydrology tools, hence the guideline suggests the hydrology tool should be concurrently with the hydric soils tool. For this reason, this assignment completes both tasks in both the wetland hydric soil and hydrology tools.



# 3. Environmental Setting

## 3.1 Topography and Drainage

Topography and drainage patterns, within the Site, interpolated from high-resolution local LiDAR are indicated in **Figure 2**. Multiple streams traverse the site, accompanied by various overland flow paths running through the site and through the existing and proposed wetland areas. The proposed wetland areas lie within depressions in the topography and are adjacent to existing wetlands.

### 3.2 Soils

The New Zealand Soil Classification (NZSC) system classifies the soils as Perch-Gley (UP) and Albic Ultic (UE). It should be noted that there was limited information available for these soil classifications due to lack of investigations within this area.

# 3.3 Geology

The QMap geology for the area is presented in **Figure 3**, indicating the site is primarily underlain by the East Coast Bays Formation Alternating sandstone/siltstone to the north, west and the east of the site, the Hukerenui Mudstone which is part of the Northland Allochthon coming up through the southern central portion of the site.

Table 3. Geologic descriptions.

Map Code	Identifier	Key Group	Rock Group	Age	Description
eMi.sst7	East Coast Bays		Alternating		Alternating sandstone and mudstone
eMi.sst10	Formation	Waitemata Group	sandstone/siltstone	Mwe	with variable volcanic content and interbedded volcaniclastic grits.
IKPa.mst2_all	Hukerenui Mudstone	Northland Allochthon	Mudstone	Kkh	Weakly indurated, commonly sheared red, brown, grey and green mudstone.

## 3.4 Site Locations

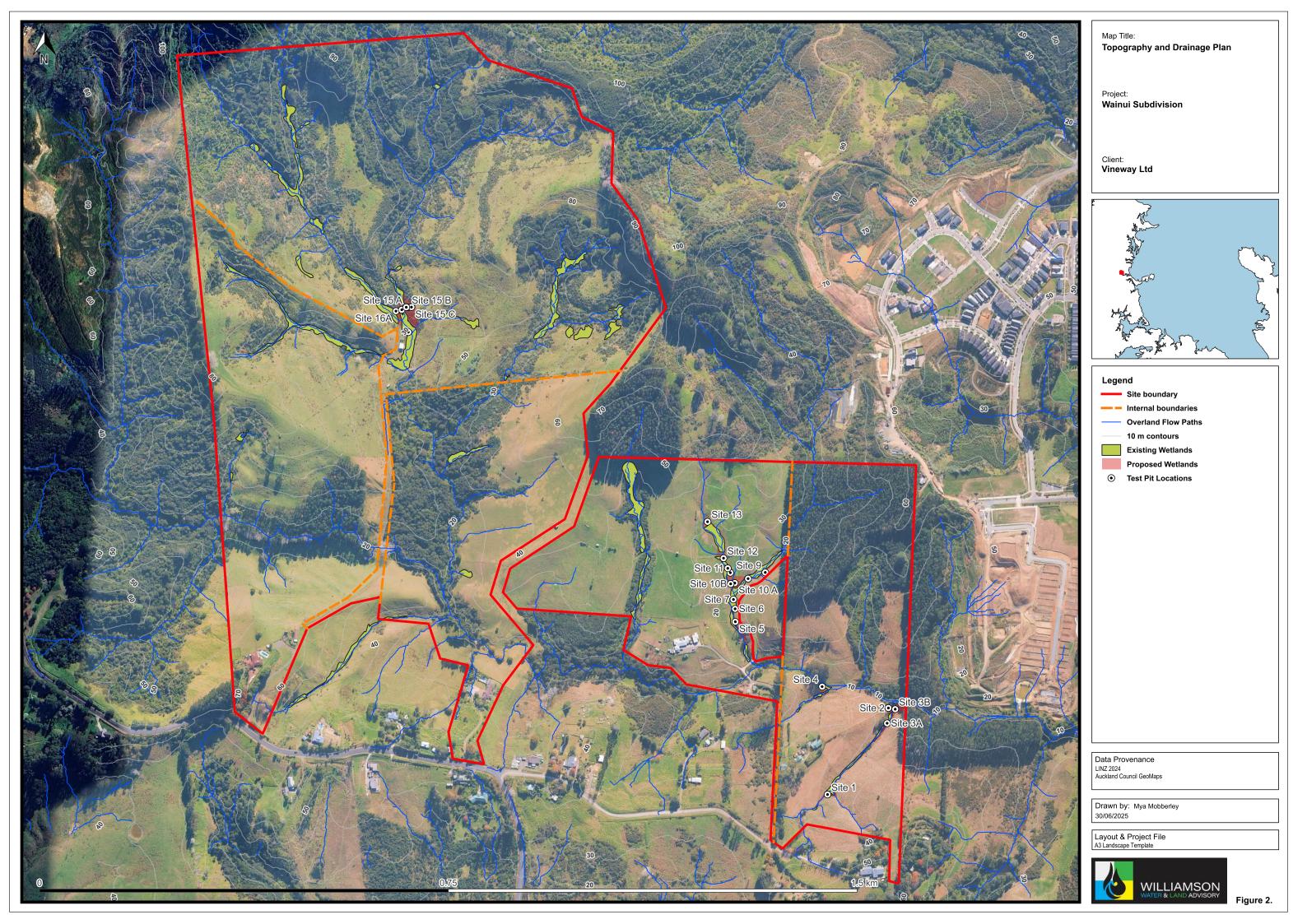
The geomorphic setting and important land characteristics to understand the hydrological processes operating at each proposed wetland offset site are summarised in **Table 9**.

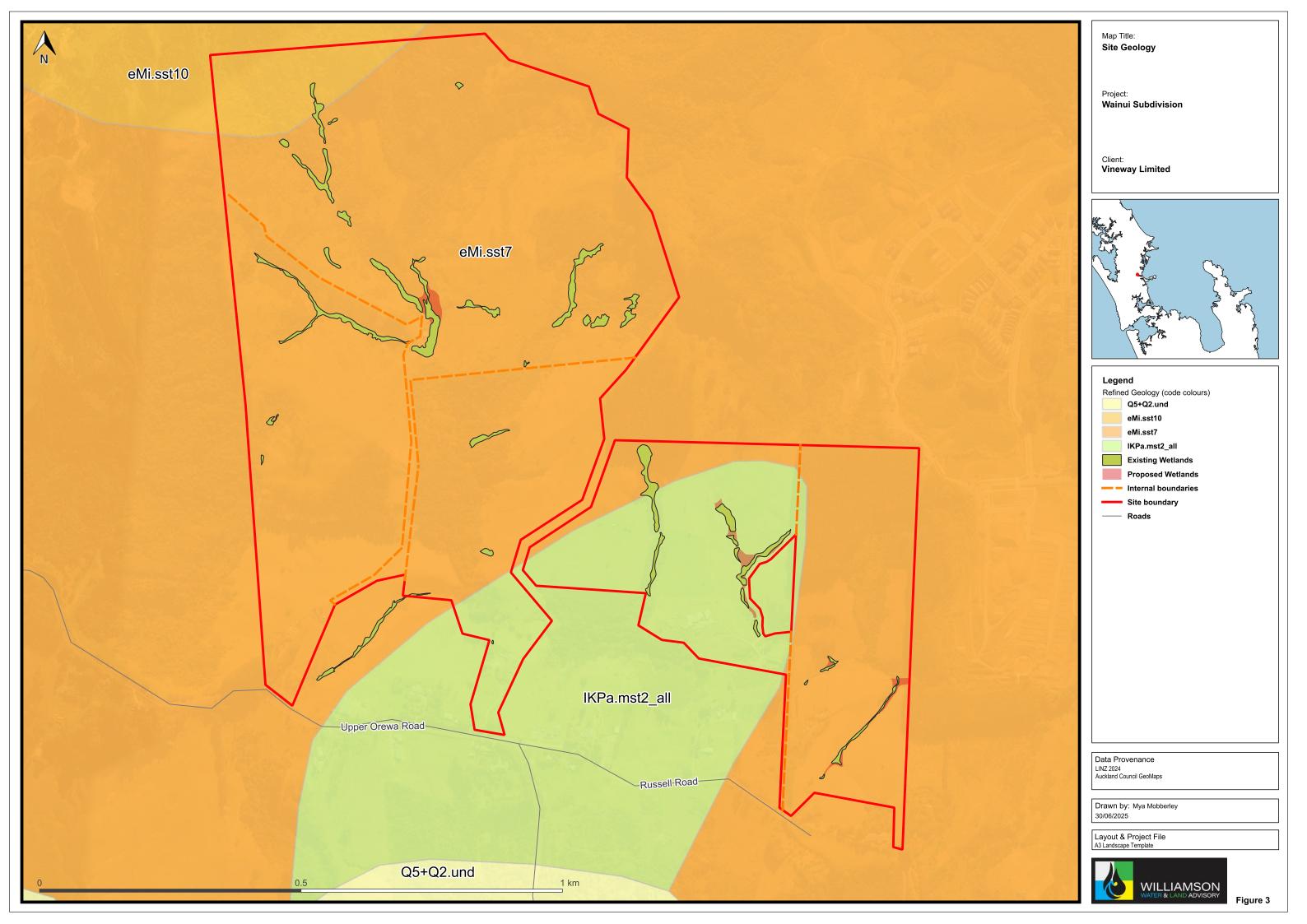
Table 4. Summary of geomorphic position.

Site	Ground Elevation	Distance from Stream or OLFP	Average Hydrological Slope	Summary of Ground Conditions (incl. Vegetation Cover)
	(mAMSL)	(m)	(%)	
1	22 to 24	3.5	25	The ground conditions were dry with areas of dry long grass.
2	15 to 12	11	38	The ground conditions were dry, with long grass and gorse to the right of the site location.
3	12 to 15	2	38	The ground conditions were dry and had areas of long grass.
4	11 to 14	0 to 13	12.6	The ground conditions were dry, the test pit location had long grass however within the general site four area the grass would not be considered long. The test pit location was uphill from a culvert.
5	13 to 14	0 to 4	28	The ground conditions were dry and typically covered in shorter grass and sporadic reeds. The test pit location was adjacent to the watercourse.
6	15	1 to 4	7	The ground conditions were dry and typically covered in shorter grasses with sporadic reeds. The test pit location was adjacent to the water course.



Site	Ground Elevation	Distance from Stream or OLFP	Average Hydrological Slope	Summary of Ground Conditions (incl. Vegetation Cover)
	(mAMSL)	(m)	(%)	
7	17.5	1 to 4	16	The ground conditions were dry and typically covered in longer grass and sporadic reeds. The test pit location was on a farm crossing with the watercourse adjacent.
8	18	1 to 2	25	The ground conditions were dry and on a slope. The vegetation within this area typically comprised of longer grass and sporadic reeds.
9	17 to 20	2 to 4	22	As for site 8.
10	17 to 20	0 to 8	11.4	The ground conditions were within an area of shorter grass. There were no other evident areas of vegetation.
11	21	0 to 4	7	The ground conditions were within an area of shorter grass, with no other types of vegetation. The test pit location was undertaken on a farm crossing.
12	23 to 24	0 to 8	7	The ground conditions were moist, and pugging was evident. Vegetation present within this area included shorter grass and sporadic reeds.
13	30 to 31	1 to 14	<5	The ground conditions were within an area of shorter grass, with no other types of vegetation. The test pit location was undertaken on a farm crossing.
14	30	1 to 10	<5	The ground conditions were dry with long grasses and sporadic reeds. The site location was adjacent to a large, ponded area within the existing wetland.
15	30 to 36	2 to 20	22.8	The ground conditions were moist with long grasses, surrounded by dense gorse. However, the test pit location was not covered in gorse.
16	30	2 to 20	<5	The ground conditions were moist and surrounded by sporadic reeds and long grasses. The test pit location was slightly elevated from the ponded areas.







# 4. Hydric Soil Tool Assessment

As discussed in **Section 1**, the hydric soil assessment undertaken in this report was undertaken using the Landcare Research (2018) field guide.

'Hydric soils' is a general term for soils that are poorly or very poorly drained and have a water table above, at, or near the surface long enough during the growing season to develop anaerobic conditions in the upper layers. Gley and Organic soils are the two main orders of hydric soils.

- Gley soils have pale subsoils often with reddish mottles. These colours are indicators of saturated low oxygen conditions.
- Organic soils are also formed in saturated conditions and have at least 300 mm of peaty material.

Generally hydric soils are peaty or humic or have pale light grey subsoil colours caused by saturation and a lack of oxygen. Blotches (mottles) of redder colour can occur in the topsoil or subsoil where air can get into the soil and oxidises iron minerals to form redder colours.

## 4.1 Indicators

The procedure for hydric soil testing involved examining various soil characteristics indicative of hydric soils including the following:

- *Field observations and soil colour*. This provided valuable information about soil characteristics that can indicate wetland conditions, including the presence of gleyed colours (grey or bluish-grey), and presence of mottling (speckled, low chroma colours).
- **Soil morphology**: Morphological features seen in the soil profile can provide details about potentially hydric conditions such as mottling, oxidised root channels, accumulation of organic matter, and presence of iron or manganese concretions can indicate perennial or prolonged wet conditions in the growing season.
- Soil structure and texture: Proportions of sand, silt, and clay influence water-holding capacity, drainage, and aeration potential. Hydric soils are often characterised by finer textures such as silty or clayey soils with poor drainage.
- **Soil moisture**: Hydric soils typically exhibit saturated or ponded conditions for a significant portion of the year, resulting in anaerobic conditions that do not require oxygen for growth.
- **Soil chemistry**: Chemical indicators such as iron and manganese reduction, accumulation of organic matter, and low redox potential, can suggest hydric soil conditions.

Soil colour<sup>4</sup> is one of the key defining feature for identification of hydric soils because the presence of water within the soil profile will affect the colour of soils, depending on the duration of anaerobic conditions. Soils that are subject to prolonged anaerobic conditions with the matrix iron reduced tend to have matrix with low chroma colours. The low chroma colour are typical of hydric soils, as shown in **Figure 4**. Note that dark topsoil colour values of 3 or less are not good indicators of hydric soils as many topsoils have colours in this range.

Describing a colour requires three components: hue, value, and chroma. Hue refers to the colour (e.g. red, orange, yellow), value describes how light or dark the colour is, and chroma rates how bright or vibrant the colour is.



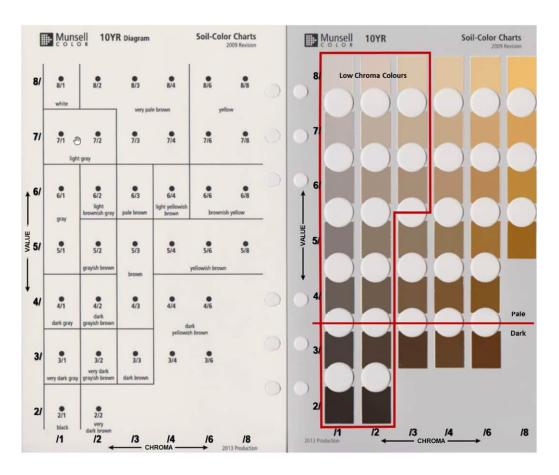


Figure 4. 10YR hue page from a soil colour chart.

A simple indicator for hydric soils is provided in Landcare Research (2018), which is reproduced in Figure 5.

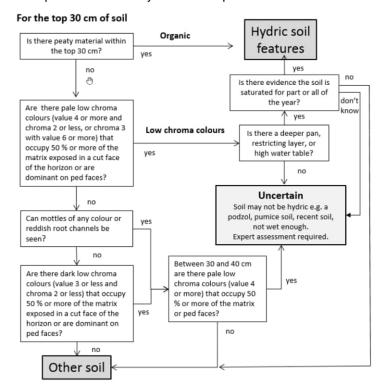


Figure 5. Simple key to identifying hydric soils.



# 4.2 Results

## 4.2.1 Soils Description

Details of the observations made at each site are summarised in **Table 5** and full descriptions along with photos are provided in full in **Appendix A**.

Table 5. Summary of hydric soil tests.

	Soil Description Summary	Soil	Hydric Soil?		
Site #	Lithology	Hydric Soil Indicators	permeability (slow/moderate/ high)	(Yes/No/ Uncertain)	
	0 - 300 mm. TOPSOIL, silt. Very dark grey. Dry and friable. Rootlets present (Topsoil)	Matrix Colour (7.5YR - Value/Chroma):  • Topsoil - 3/1  Mottle Colour  • Mottles - 5/6 (1%)		Y (Marginally hydric based on colour and	
	300 - 750 mm. Clayey SILT. Grey with brownish yellow mottles. Dry, moderate plasticity.	Matrix Colour (7.5YR - Value/Chroma):  Silt - 5/1  Mottle Colour (7.5YR - Value/Chroma):  Mottles - 6/8 (5%)			
1	750 - 950 mm. Silty CLAY. Grey, with brownish yellow mottles. Dry and highly plastic.	Matrix Colour (7/5YR - Value/Chroma):  Clay - 6/1  Mottle Colour (7.5YR - Value/Chroma):  Mottles - 6/8 (5%)	Moderate	minor rhizospheres, noting parent geology is light in colour.)	
	950 – 1000 mm. Clayey SILT. Grey with brownish yellow mottles. Dry and moderately plastic.	Matrix Colour (7.5YR - Value/Chroma):  Clay - 6/1  Mottle Colour (7.5YR - Value/Chroma):  Mottles - 6/8 (50%)			
	0 - 200 mm. TOPSOIL, silt. Dark grey, with some rootlets present. Dry and friable.	Matrix Colour (10YR - Value/Chroma):  • Topsoil - 4/1			
	200 - 400 mm. SILT. Yellowish brown, dry and low plasticity.	Matrix Colour (10YR - Value/Chroma):  • Silt - 5/4		Y	
2	400 - 700 mm. Clayey SILT. Brownish yellow, with yellowish brown mottles with light grey inclusions. Dry, moderate plasticity.	Matrix Colour (10YR - Value/Chroma):  • Clay - 6/6 with 6/1 inclusions  Mottle Colour (10YR - Value/Chroma):  • Mottles - 5/8 (5%)	High	(Marginally hydric based on colour, noting parent geology is light in colour.)	
	700 – 1000 mm Clayey SILT, very pale greyish brown, with brownish yellow mottles. Dry, moderate plasticity.	Matrix Colour (10YR - Value/Chroma):  Clay - 7/4  Mottle Colour (10YR - Value/Chroma):  Mottles - 6/8 (5%)			
	0 - 300 mm. TOPSOIL, silt. Dark grey. Dry and friable.	Matrix Colour (10YR - Value/Chroma):  Topsoil - 4/1		Y (Marginally	
3a	300 - 700 mm. Silty CLAY. Brownish yellow, dry and highly plastic.	Matrix Colour (10YR - Value/Chroma):  • Clay – 6/6	Moderate	hydric based on colour, plasticity and minor	
	700 - 1000 mm. Silty CLAY. Light yellowish brown, with light	Matrix Colour (10YR - Value/Chroma):  • Clay – 6/4 with 7/1 inclusions		rhizospheres, noting parent	



	Soil Description Summary	Soil	Hydric Soil?		
Site #	Lithology	Hydric Soil Indicators	permeability (slow/moderate/ high)	(Yes/No/ Uncertain)	
	grey inclusions and brownish yellow mottles. Dry and highly plastic.	Mottle Colour (10YR – Value/Chroma):  • Mottles – 6/8 (5%)		geology is light in colour.)	
	0 - 300 mm. TOPSOIL, silt. Dark grey. Dry and friable.	Matrix Colour (10YR - Value/Chroma): Topsoil - 4/1		Y (Marginally hydric based on colour and minor rhizospheres, noting parent geology is light in colour.)	
3b	300 - 700 mm. Silty CLAY. Brownish yellow, dry and highly plastic.	Matrix Colour (10YR - Value/Chroma): Clay – 6/6	Moderate		
	700 - 1000 mm. Silty CLAY. Light yellowish brown, with light grey inclusions and brownish yellow mottles. Dry and highly plastic.	Matrix Colour (10YR - Value/Chroma):  • Clay – 6/4 with 7/1 inclusions  Mottle Colour (10YR – Value/Chroma):  Mottles – 6/8 (5%)			
	0 - 300 mm. Topsoil, Clayey SILT. Very dark greyish brown. Some moisture and low plasticity.	Matrix Colour (10YR - Value/Chroma):  • Topsoil - 3/2		Y (Marginally hydric based or colour, noting parent geology is light in colour.)	
4	300 - 600 mm. Clayey SILT. Brownish yellow. Some moisture, low to medium plasticity.	Matrix Colour (10YR - Value/Chroma):  • Silt – 6/8	High		
	600 – 1000 mm. Silty CLAY, light grey, with light yellowish-brown streaks. Moderately moist, moderate to high plasticity.	Matrix Colour (10YR - Value/Chroma):  • Clay - 7/1			
	0 - 400 mm. TOPSOIL, silt. Very dark grey with clay inclusions, yellowish brown mottling within the clay. Rootlets are present.	Matrix Colour (10YR - Value/Chroma):  Topsoil - 3/1 (5%)  Mottle Colour (10YR - Value/Chroma):  Clay - 5/8		Y (Marginally hydric based or colour, noting parent geology is light in colour.)	
5	400 - 700 mm. Clayey SILT. Yellowish brown with dark grey mottles. Dry, moderately plastic.	Matrix Colour (10YR - Value/Chroma):  Silt - 5/8  Mottle Colour (10YR – Value/Chroma):  Silt - 4/1	Moderate		
	700 - 1000 mm. Silty CLAY. Very pale brown with light grey inclusions and brownish yellow mottles. Dry and highly plastic.	Matrix Colour (10YR - Value/Chroma):  Clay – 7/4  Mottle Colour (10YR - Value/Chroma):  Mottles - 6/8 (1-5%)			
6	0 – 250 mm TOPSOIL, silt with minor clay. Yellowish brown with dark reddish orange mottles. Rootlets were present, dry.	Matrix Colour (10YR - Value/Chroma):  Topsoil - 5/4  Mottle Colour (10YR - Value/Chroma):  Mottles - 7/8 (1-5%)	Moderate	N	
	250 - 350 mm. Silty CLAY. Brownish yellow, moist and highly plastic.	Matrix Colour (10YR - Value/Chroma):  • Clay – 6/6			



	Soil Description Summary	Soil	Hydric Soil?	
Site #	Lithology	Hydric Soil Indicators	permeability (slow/moderate/ high)	(Yes/No/ Uncertain)
	350 - 1,000 mm. Clayey SILT. Dark greyish brown, with dark brown mottles. Moist, and moderately plastic.	Matrix Colour (10YR - Value/Chroma):  • Silt - 4/2  Mottle Colour (10YR - Value/Chroma):  • Mottles - 3/3 (5%)		
	0 - 100 mm. TOPSOIL, silt Dark greyish brown, with yellowish brown mottles. Rootlets present, slightly damp.	Matrix Colour (10YR - Value/Chroma)  Topsoil - 4/2  Mottle Colour (10YR - Value/Chroma):  Topsoil - 5/8 (10%)		
	100 – 200 mm. Peat. Black, slightly damp and contains some charcoal pieces.	Matrix Colour (10YR - Value/Chroma)  • Peat – 2/1		
7	200 – 500 mm. Clayey SILT. Yellowish brown, with yellowish brown mottles. Dry, low plastic.	Matrix Colour (10YR - Value/Chroma)  Silt - 5/6  Mottle Colour (10YR - Value/Chroma):  Silt - 5/8 (10%)	Moderate	Y
	500 – 1000 mm. Clayey SILT, light grey with yellowish brown streaks and mottles. Dry, moderate plasticity.	Matrix Colour (10YR - Value/Chroma)  Silt - 7/2  Mottle Colour (10YR - Value/Chroma):  Silt - 5/8 (10%)		
	0 - 100 mm. TOPSOIL, silt with minor clay, very dark brown.  Moderate moisture and low plasticity.	Matrix Colour (10YR - Value/Chroma):  Topsoil – 2/2		Y (Marginally
8	100 - 600 mm. Silty CLAY. Light brown, some moisture and moderately plastic.	Matrix Colour (10YR - Value/Chroma):  • Clay – 5/8	Moderate	hydric based colour, notin parent geolog
	600 - 1000 mm. Silty CLAY, yellow with light grey streaks. Some moisture, moderate to high plasticity.	Matrix Colour (10YR - Value/Chroma):  • Clay – 7/6		is light in colour.)
	0 - 300 mm. TOPSOIL, Clayey SILT. Yellowish brown, some moisture and some plasticity.	Matrix Colour (10YR - Value/Chroma):  • Topsoil – 5/8		
9	300 - 600 mm. Silty CLAY. Yellow, with light grey streaks. Some moisture and moderate to high plasticity.	Matrix Colour (10YR - Value/Chroma):  • Silt – 7/6	Moderate	N
	600 - 1000 mm. Silty CLAY. Brownish yellow, dark orange inclusions. Moderately moist, low plasticity.	Matrix Colour (10YR - Value/Chroma):  Clay - 6/6		
10A	0 - 300 mm. TOPSOIL, Clayey silt. Dark brown. Some moisture, low plasticity.	Matrix Colour (10YR - Value/Chroma):  Topsoil - 3/2	Moderate	Y (Marginally hydric based



	Soil Description Summary	Soil	Hydric Soil?		
Site #	Lithology	Hydric Soil Indicators	permeability (slow/moderate/ high)	(Yes/No/ Uncertain)	
	300 - 600 mm. Clayey SILT. Brownish yellow, some moisture, low to moderate plasticity.	Matrix Colour (10YR - Value/Chroma):  • Silt – 6/8		colour, noting parent geology is light in	
	600 – 1000 mm. Silty CLAY, light grey with light orange, brown streaks. Moderately moist, moderate to highly plastic.	Matrix Colour (10YR - Value/Chroma):  • Silt – 7/1		colour.)	
	0 - 300 mm. TOPSOIL, silt, very dark grey, with dark yellowish-brown mottles. Rootlets present.	Matrix Colour (10YR - Value/Chroma):  • Topsoil - 3/1  Mottle Colour (10YR - Value/Chroma):  • Topsoil - 3/6 (2%)		Y	
10B	300 - 500 mm. Clayey SILT. Yellowish brown, with brownish yellow mottles and grey inclusions. Dry, with low plasticity.	Matrix Colour (10YR - Value/Chroma):  • Silt – 5/4  Mottle Colour (10YR – Value/Chroma):  • Silt – 6/8 (2%)	Moderate	(Marginally hydric based o colour, noting parent geolog is light in	
	500 - 1000 mm Clayey SILT. Very pale brown, with yellowish brown mottles and streaks, dry and moderately plastic.	Matrix Colour (10YR - Value/Chroma):  • Silt - 7/3  Mottle Colour (10YR - Value/Chroma):  • Silt - 5/8 (2%)		colour.)	
400	0 - 200 mm. TOPSOIL, silt. Very dark greyish brown, with brownish yellow mottles. Dry.	Matrix Colour (10YR - Value/Chroma):  • Topsoil - 3/2  Mottle Colour (10YR - Value/Chroma):  • Topsoil - 6/6 (5%)	Madaga	Y (Marginally hydric based or colour and rhizospheres, noting parent geology is light in colour.)	
10C	200 – 1000 mm. Clayey SILT. Yellow with light grey streaks and yellow mottles. Dry, moderately plastic.	Matrix Colour (10YR - Value/Chroma):  • Silt - 7/8  Mottle Colour (10YR - Value/Chroma):  • Silt - 7/8 (10%)	Moderate		
	0 - 200 mm. TOPSOIL, Silt with minor clay. Dark greyish brown with dark yellowish-brown mottles. Moist, some plasticity.	Matrix Colour (10YR - Value/Chroma):  • Topsoil - 4/2  Mottle Colour (10YR - Value/Chroma):  • Mottles - 3/6 (10%)		Y	
11	200 - 300 mm. Clayey SILT. Greyish brown with yellow mottles. Dry with moderate plasticity.	Matrix Colour (10YR - Value/Chroma):  • Silt - 5/2  Mottle Colour (10YR - Value/Chroma):  • Mottles - 7/8 (5%)	Moderate	(Marginally hydric based o colour and rhizospheres, noting parent	
	300 - 1,000 mm. Clayey SILT. Light grey with yellow streaks and mottles. Dry, moderate plasticity.	Matrix Colour (10YR - Value/Chroma):  • Silt – 7/1  Mottle Colour (10YR – Value/Chroma):  • Mottles – 7/8 (5%)		geology is ligh	
12	0 - 200 mm. TOPSOIL, Silt.  Dark grey with dark yellowish- brown mottles. Dry and friable.	Matrix Colour (10YR - Value/Chroma):  Topsoil - 4/1  Mottle Colour (10YR - Value/Chroma):  Mottles - 3/6 (5%)	Moderate	Y (Marginally hydric based c	



	Soil Description Summary	Soil	Hydric Soil?		
Site #	Lithology	Hydric Soil Indicators	permeability (slow/moderate/ high)	(Yes/No/ Uncertain)	
	200 - 400 mm. Clayey SILT, with peat. Black with dark yellowish-brown mottles. Dry and moderately plastic.	Matrix Colour (10YR - Value/Chroma):  Silt – 2/1  Mottle Colour (10YR – Value/Chroma):  Mottles – 3/6 (5%)		rhizospheres, noting parent geology is light in colour.)	
	400 – 1000 mm Silty CLAY, black. Moist and highly plastic.	Matrix Colour (10YR - Value/Chroma):  Clay – 2/1			
13	0 - 200 mm. TOPSOIL, silt. Dark grey with dark yellowish-brown mottles. Dry, rootlets present.	Matrix Colour (10YR - Value/Chroma):  Topsoil - 4/1  Mottle Colour (10YR - Value/Chroma):  Topsoil - 3/4 (10%)	Slow	Y (Marginally hydric based or colour and	
	200 - 1000 mm. Clayey SILT (Fill). Dark yellowish brown. Gravels were observed at 0.7 m.	Matrix Colour (10YR - Value/Chroma):  • Silt – 4/6		rhizospheres, noting parent geology is light in colour.)	
14	0 - 300 mm. TOPSOIL, silt. Dark greyish brown with dark yellowish-brown mottles. Dry and moderate plasticity.	Matrix Colour (7.5YR - Value/Chroma):  Topsoil - 4/2  Mottle Colour (7.5YR – Value/Chroma):  Mottles – 4/6 (10%)		Y (Marginally hydric based on colour and rhizospheres, noting parent geology is light in colour.)	
	300 - 1000 mm. Clayey SILT. Brownish yellow with light grey streaks, dry, moderate plasticity when moistened.	Matrix Colour (10YR - Value/Chroma):  • Silt – 6/6 Streak Colour (10YR - Value/Chroma):  • Streaks - 7/1	Moderate		
	0 - 150 mm. TOPSOIL, Silt. Very dark greyish brown. Dry, friable.	Matrix Colour (10YR - Value/Chroma):  • Topsoil - 3/2			
	150 - 400 mm. SILT with minor clay. Dark greyish brown. No mottles but rhizospheres were present. Dry and friable.	Matrix Colour (10YR - Value/Chroma):  • Silt - 4/2		Y (Marginally	
15A	400 - 500 mm. Clayey SILT. Yellowish brown with some mottles yellowish brown. Dry.	Matrix Colour (10YR - Value/Chroma):  • Silt – 5/4  Mottle Colour (10YR – Value/Chroma):  • Mottles – 5/8 (5%)	Moderate	hydric based or colour and rhizospheres, noting parent geology is light	
	500 – 800 mm. Clayey SILT, minor sand. Yellowish brown. Dry, moderately plastic.	Matrix Colour (10YR - Value/Chroma):  • Silt – 5/4		in colour.)	
	800 – 1000 mm. Silty CLAY, minor sand. Yellowish brown. Dry, highly plastic.	Matrix Colour (10YR - Value/Chroma):  • Silt – 5/6			
	0 - 150 mm. TOPSOIL, Silt. Grey. Saturated. Slight sulfuric smell.	Matrix Colour (10YR - Value/Chroma): Topsoil - 5/1	Water table at surface, infiltration test	Y	
15B	150 - 600 mm. Silty CLAY. Light grey with brownish yellow mottles. Saturated and highly	Matrix Colour (10YR - Value/Chroma):  • Silt - 7/1  Mottles Colour (7.5YR – Value/Chroma):	- 7/1		



	Soil Description Summary	Soil	Hydric Soil?	
Site #	Lithology	Hydric Soil Indicators	permeability (slow/moderate/ high)	(Yes/No/ Uncertain)
	plastic. EOH as everything was saturated and material was consistent.	Mottles – 6/8 (20%)		
	0 - 150 mm. TOPSOIL, Silt. Dark grey. Moist.	Matrix Colour (10YR - Value/Chroma):  Topsoil - 4/1		Y
15C	150 - 450 mm. Clayey SILT, grey with brownish yellow clay inclusions. Moist and sticky with moderate plasticity.	Matrix Colour (10YR - Value/Chroma):  • Clay - 5/1	Moderate	(Marginally hydric based on colour and rhizospheres, noting parent geology is light in colour.)
	450 - 1000 mm. Clayey SILT, light yellowish brown with yellow mottles and rhizospheres. Moist and moderately plastic.	Matrix Colour (10YR - Value/Chroma):  Clay - 6/4  Mottles Colour (10YR - Value/Chroma):  Mottles - 7/6 (10%)  Matrix Colour (10YR - Value/Chroma):  Topsoil - 5/2  Mottles Colour (7.5YR - Value/Chroma):  Mottles - 5/8 (15-20%)  Matrix Colour (10YR - Value/Chroma):  Silt - 5/2  Mottles Colour (7.5YR - Value/Chroma):  Mottles - 6/4 (2%)  Matrix Colour (10YR - Value/Chroma):  Clay - 3/3		
	0 - 300 mm. TOPSOIL, Silt, greyish brown with yellowish brown mottles. Moist.	<ul> <li>Topsoil - 5/2</li> <li>Mottles Colour (7.5YR – Value/Chroma):</li> </ul>		
16A	300 - 900 mm. Clayey SILT. Light yellowish brown. Relatively dry and moderately plastic.	Silt – 5/2  Mottles Colour (7.5YR – Value/Chroma):	Moderate	Y
	900 – 1000 mm. Silty CLAY.  Dark brown. Moist and highly plastic.			
	0 - 200 mm. TOPSOIL, silt. Dark greyish brown with yellowish brown mottles. Moist.	Matrix Colour (10YR - Value/Chroma):  • Topsoil - 4/2  Mottle Colour (10YR – Value/Chroma):  • Mottles – 5/6 (5%)		
16B	200 - 400 mm. Clayey SILT. Grey, with dark yellowish-brown mottles. Moist and moderately plastic. GW encountered at 350 mm. GW soil seepage at 270 mm.	Matrix Colour (10YR - Value/Chroma):  Silt – 5/1  Mottle Colour (10YR – Value/Chroma):  Mottle – 3/4 (40%)	Moderate	Y
100	400 - 800 mm. Clayey SILT. Yellowish brown with dark yellowish-brown mottles. Moist with moderate plasticity.	Matrix Colour (10YR - Value/Chroma):  Silt – 5/4  Mottle Colour (10YR – Value/Chroma):  Mottle – 4/6 (10%)		
	800 - 1000 mm. Silty CLAY, light yellowish brown with light grey streaks and brownish yellow mottles. Moist and highly plastic.	Matrix Colour (10YR - Value/Chroma):  Clay – 6/4  Mottle Colour (10YR - Value/Chroma):  Mottles - 6/6 (5%)		

Of the 22 total tests pits, the hydric soil tool assessment found 20 pits that displayed hydric soil conditions within the top 400 mm.



One of the test pits (Site 13) contained fill material extending deeper than 1.0 m. As noted in **Table 5** there are 15 location which have been classified as marginal hydric soils due to soil colour, with 10 of those locations also containing oxidised rhizospheres on the roots.

## 4.2.2 Soil Infiltration Testing

Soil permeability reflects the rate at which surface water drains through the soil. It is influenced by factors such as potential rooting depth, the depth to any slowly permeable horizons, and internal soil drainage, which in turn depend on soil texture, structure, and density.

The permeability classes and their equivalent flow rates (mm/hr) from Clayden and Webb (1994) are as shown in **Table 6**, while **Table 9** shows the infiltration rates at each site.

Table 6. Soil permeability classes.

Class	Rate (mm/hr)
Slow	< 4
Moderate	4-72
High	>72

Table 7. Summary of soil infiltration test results.

Site ID	Test Duration	Water Level Change	Water Drainage	Soil Permeability Class	Observations
	(hr)	(m)	(mm/hr)		
1	7	0.1	14	Moderate	
2	0.25	0.07	280	High	
ЗА	6	0.21	35	Moderate	
3B	6	0.21	35	Moderate	
4	0.25	0.03	120	High	Seepage at bottom of the hill.
5	4	0.17	43	Moderate	
6	4	0.20	50	Moderate	On soil bridge that has likely been built up. Thus, likely unnatural profile
7	4	0.20	50	Moderate	
8	3.75	0.233	62	Moderate	
9	3.75	0.05	13	Moderate	
10A	5	0.06	12	Moderate	
10B	5	0.06	12	Moderate	
10C	2.25	0.09	40	Moderate	
11	2	0.01	5	Moderate	
12	0.75	0.05	67	Moderate	
13	0.17	0	0	Low	
14	4	0.12	30	Moderate	
15A	0.25	0.04	160	Moderate	
15B	N/A	N/A	N/A	N/A	Water table at surface. No infiltration test possible.



Site ID	Test Duration	Water Level Change	Water Drainage	Soil Permeability Class	Observations
	(hr)	(m)	(mm/hr)		
15C	0.5	0.04	80	Moderate	
16A	5.5	0	0	Moderate	Substantial core loss on auger. Seepage into dug hole.
16B	1.5	0.01	7	Moderate	



# 5. Hydrology Tool Assessment

Wetland hydrology can be defined as encompassing all hydrological characteristics of areas that are periodically inundated or have soils saturated to, or near, the surface during a portion of the growing season (based on US Army Corp of Engineers - Environmental Laboratory, 1987). To meet the standard for wetland hydrology, an area must be:

- Inundated for at least seven consecutive days during the growing season in most years (50 per cent probability of recurrence); or
- Saturated at or near the surface for at least 14 consecutive days during the growing season in most years (50 per cent probability of recurrence, for example, 5 years in 10).

Soils may be considered saturated if the water table is within:

- 150 mm of the surface for sands; and
- 300 mm of the surface for all other soils.

#### 5.1 Indicators

Hydrology indicators are one-off observations that identify the presence or absence of a wetland in areas where hydrophytic vegetation and hydric soils are present or uncertain. Wetland delineation using the hydrology tool should be undertaken during periods of 'normal rainfall'. Because hydrology indicators can be highly transient, a follow-up visit may be required during normal and wetter periods of the growing season.

There are four indicator groups identified in the guidelines:

- · Observation of flooding or groundwater;
- · Evidence of flooding or ponding;
- · Soil saturation; and
- Landscape, vegetation and soil observations (which may overlap with the vegetation and hydric soil tools).

Group 1 are primary indicators and Groups 2 to 4 have a mix of primary and secondary indicators. The presence of one primary indicator, or two secondary indicators, confirms the presence of a wetland. The full suite of 26 hydrology indicators are summarised in **Table 8**.

Table 8. Summary of wetlands hydrology indicators.

Indicator	Primary	2ndary	Observation Description ("observed in the area of interest during the growing season")			
Group 1: Observation of	Group 1: Observation of flooding or groundwater					
1A: Surface water	✓		Surface water can be observed in the form of either flooding or ponding.			
1B: Groundwater	<b>✓</b>		A high water table is observed within 30 centimeters of the soil surface as determined by soil pit, auger hole or shallow monitoring well.			
1C: Soil saturation	<b>✓</b>		Soil saturation is observed in the top 30 centimeters of the soil profile. Indicated by 'water glistening on the surfaces and broken interior faces of the soil samples removed from a pit or auger hole'. Pg 19.			
Group 2: Evidence of floor	ding or pond	ing				
2A: Water marks	✓		Water marks (discoloration or staining) are seen on trees, rocks, fences or other fixed objects. Lichen may also be absent below the flooding level.			
2B: Sediment deposits	✓		Thin layers or coatings of fine mineral material (e.g., silt or clay) or organic matter (e.g., pollen) are seen on trees, rocks or other fixed objects.			
2C: Drift deposits	✓		Debris (e.g., branches, leaves, plastic fragments) are seen deposited on the ground surface or entangled in vegetation or other fixed objects.			



Indicator	Primary	2ndary	Observation Description ("observed in the area of interest during the growing season")
2D: Agal mat or crust	✓		An algal mat or crust is seen on or near the soil surface after the water has drained away.
2E: Iron deposits	<b>✓</b>		A thin orange or yellow crust or gel or oxidised iron is seen on or near the soil surface or as a sheen on standing water.
2F: Surface soil cracks	<b>✓</b>		Surface soil cracks are seen where mineral or organic sediment dry and shrink to form a network of cracks or polygons.
2G: Inundation visible on aerial imagery	<b>✓</b>		Inundation is seen on one or more recent aerial or satellite images.
2H: Sparsely vegetated concave surface	<b>✓</b>		A lack of vegetation (less than 5 per cent coverage) is seen on concave land surfaces resulting from prolonged ponding.
2I: Salt crust	<b>√</b>		Hard or brittle deposits of salts are seen on the ground surface, usually in depressions, seeps or lake fringes, after evaporation of saline surface water.
2J: Aquatic invertebrates	~		Numerous live or dead aquatic invertebrates, including diapausing eggs, remains of aquatic invertebrates, such as aquatic snails or crustaceans, are seen on the soil surface or plants or other emergent objects.
2K: Water-stained leaves	<b>✓</b>	✓	Water-stained grey or black leaves are visible due to long periods of saturation during the growing season
2L: Drainage patterns		<b>✓</b>	Areas that have recently experienced overland water flow may show soil erosion, low vegetation bent in the direction of water flow, or absence of leaf litter or small woody debris.
Group 3: Evidence of curre	ent or recent	t soil satura	ation
3A: Hydrogen sulphide odour	<b>✓</b>		Hydrogen sulphide odour, similar to rotten eggs, is detected from the top 30 centimeters of the soil profile. Hydrogen sulphide is produced in soils only when saturation has been prolonged.
3B: Oxidised rhizospheres along living roots	<b>✓</b>		A soil horizon with greater than or equal to 2 per cent iron-oxide (orange coating) can be seen on the surfaces of living roots or soil pores immediately surrounding the roots within the top 30 centimeters of the soil profile.
3C: Reduced iron	<b>✓</b>		A soil layer containing reduced iron in the top 30 centimeters of the soil profile can be seen where the soil changes colour upon air exposure.
3D: Recent iron reduction in tilled soils	<b>✓</b>		A soil layer containing greater than or equal to 2 per cent redox concentrations (mottles) is visible in pore linings of masses in a soil that has been tilled less than two years ago within the tillage zone or the top 30 centimeters of the soil profile, whichever one is shallower.
3E: Dry-season water table		✓	A water-table depth between 30 centimeters and 60 centimeters of the soil profile can be seen during the normal dry season or a drier-than-normal period of the year.
3F: Saturation visible on aerial imagery		<b>✓</b>	Visual assessment of one or more aerial or satellite images can identify sites where soil saturation corresponds to depressions, drainage patterns, crop management, field verified hydric soils or other evidence of a seasonally high-water table during the growing season
Group 4: Evidence from ot	her site con	ditions or c	lata
4A: Stunted or stressed plants	<b>✓</b>		It can be seen that most plants in cultivated or planted wetland areas are smaller, less vigorous or appear more stressed compared with neighbouring non-wetland areas
4B: Geomorphic position		<b>✓</b>	The possible wetland may be seen in a localised depression, swale, drainage system, concave position in a floodplain, at the toe of a slope, on extensive flatland, the low-elevation fringe of a pond or waterbody, or groundwater discharge zone.
4C: Shallow aquitard		~	A semi-permeable–impermeable layer is confirmed within 60 centimeters of the soil surface, which decreases movement of groundwater and causes a perched water table within 30 centimeters of the soil surface. This semi-permeable–impermeable layer can be composed of clay or non-porous rock.
4D: Facultative-neutral test		✓	Plant test – normally done by ecologists.



Indicator	Primary	2ndary	Observation Description ("observed in the area of interest during the growing season")
4E: Frost-heave hummocks		✓	Frost-heave hummocks are produced as water-logged soils undergo freeze—thaw processes. Exclude livestock pugging hummocks.

### 5.2 Results

Full test data sheets and a table summarising the findings are provided in **Appendix B**.

With respect to the aforementioned assessment parameters, the presence of one primary indicator, or two secondary indicators confirms the presence of a wetland.

In summary, the key findings are as follows:

- Primary Indicators 15 sites displayed primary indicators
- **Secondary Indicators** 12 sites displayed one secondary indicator, but each of these site also displayed a primary indicator or hydric soil colour.

Of the total 22 test sites, 20 confirmed hydric soils, and 15 confirmed hydrology indicators of wetlands. Of these, sites (1, 3A-3B, 7, 8, 10C, 11-14, 15A-15C, 16A-16B) had both hydric soils and hydrology indicators of wetlands.



# 6. Drainage Intervention

To provide a high degree of confidence the sites will coalesce to wetlands if given a chance, minor surface water drainage intervention is recommended in the form of a series of shallow bunds to be constructed. These bunds will retain stormwater and sub-soil interflow from upslope, allowing the environment to retain moisture, in much the same manner as the adjacent natural wetlands.

To construct the bunds, it is recommended that a small swale following the natural contour of the slope will be excavated, with a maximum depth of approximately 0.3 m and swale width of up to 2 m. The material removed to create the swale would then be used to raise the ground level for the bund, minimising work involved. **Figure 6** shows a conceptual schematic of each bund, with pooled water during or after a storm.

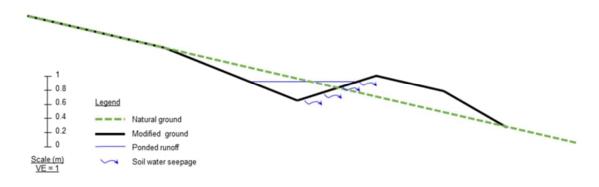


Figure 6. Cross section showing conceptual contour bund design.

A total of 14 bunds have been recommended within the non-hydric soil areas, at roughly 2 m change in elevation intervals. Each bund follows the natural contour of the slope with each end turned uphill to prevent water from flowing out of the bund – i.e. the only way runoff can migrate downslope is via sub-soil seepage or overtopping of the bunds during large storm events (refer to **Figure 7** to **Figure 9**). **Table 9** summarises the sites requiring drainage intervention.

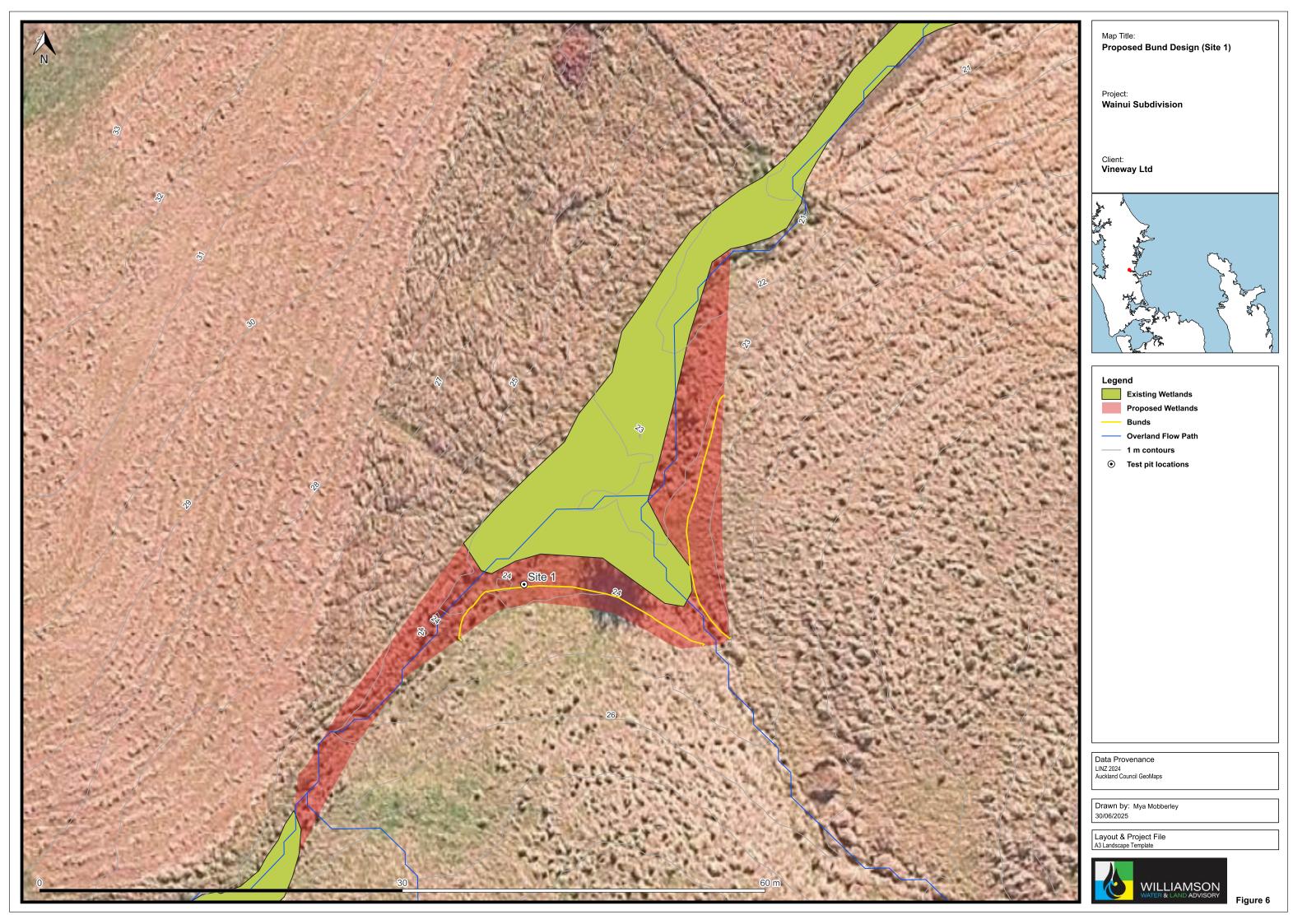
Table 9. Summary of site requiring drainage intervention.

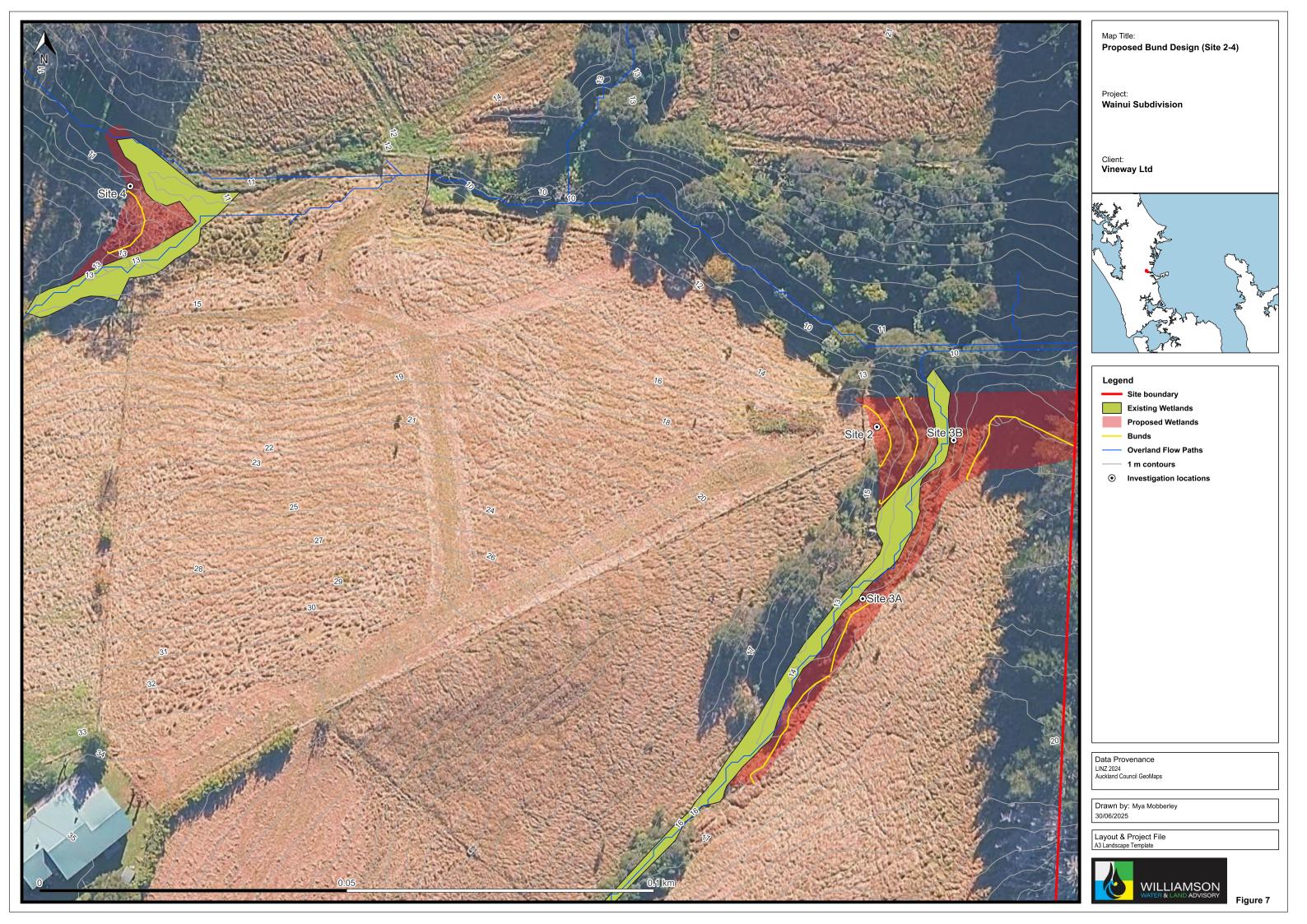
Sites	Required (Y/N)
1	Y
2	Y
3	Y
4	Y
5	N
6	N
7	N
8	N
9	Y
10	Y
11	N
12	N
13	Υ
14	N
15	N

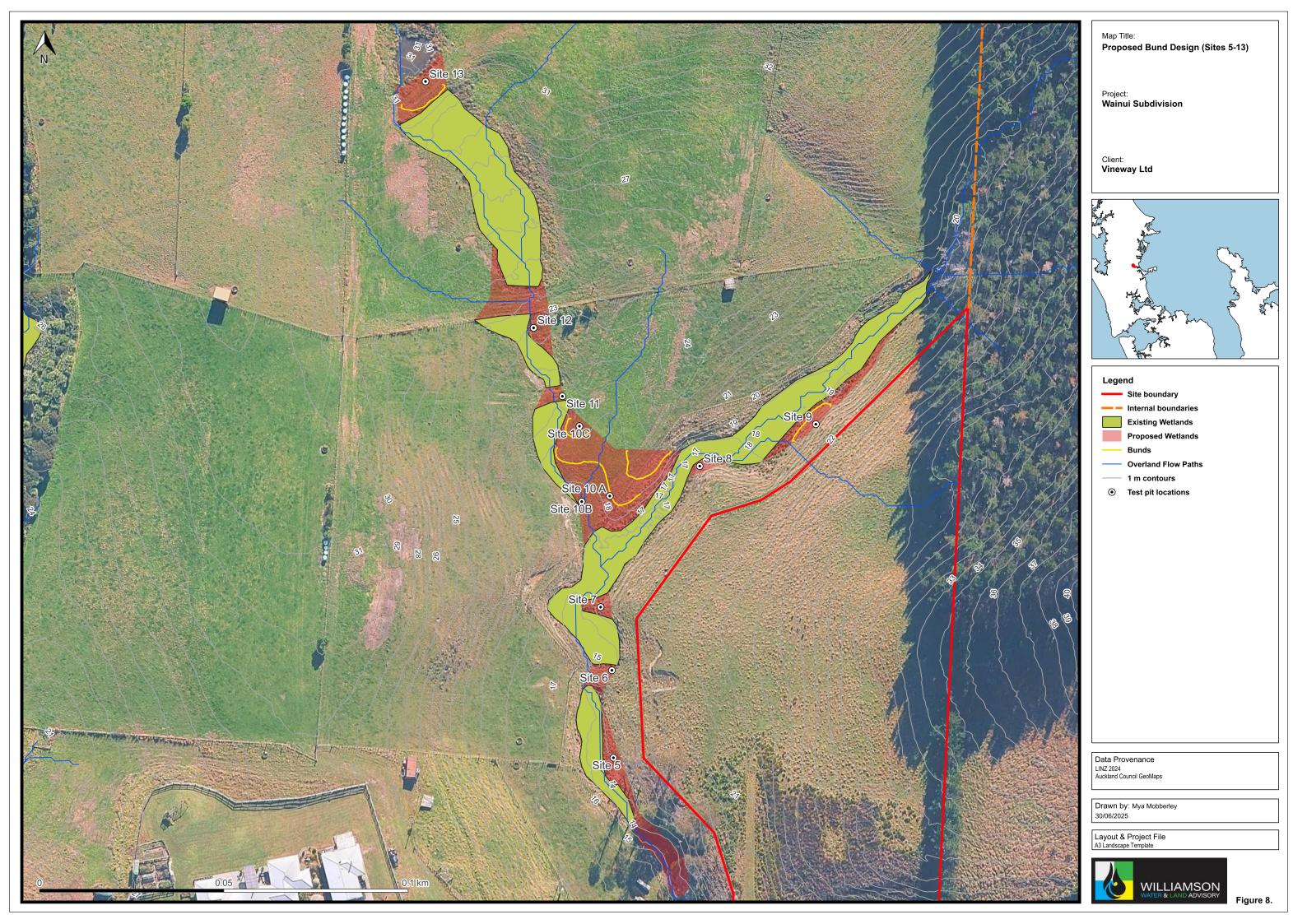
Vineway Limited Hydric Soil & Hydrology Tool Assessments



16	N
----	---









## 7. Conclusions

Out of the 22 sites investigated, 20 presented with low chroma soils. Whilst it is important to note that soil colour in the North Auckland area is not the most reliable indicator of hydric soils because of the pale colour of the parent rock material, and also the soil leaching from native podocarp forests that prevailed in this area prior to human inhabitation, the same sites also presented hydrology indicators of wetlands – either rhizospheres, geomorphic position or algal mats. Overall, this suggests that these 20 sites are strongly hydric, and the remaining 2 are not hydric.

Most sites displaying hydric soils and hydrology tool indicators were located at landscape features such as the depression/valley in gently undulating areas within the OLFP. These landscape features prevent water from draining freely, which explains the presence of hydric soils/hydrology indicators.

The assessment of potential wetland offset areas within the site using the hydric soil and hydrology delineation tools confirmed 20 sites (all sites except for site 6 and site 9) had both hydric soils and primary and/or secondary wetland hydrology tool indicators.

The geomorphic position of the sites are in lowish lying areas adjacent to surface water courses and adjoining existing wetlands, and all sites have relatively slow to moderate permeability soils.

Some of the proposed wetland offset sites were identified as suitable for minor intervention to further impede drainage and provide high confidence that the sites would coalesce into wetland if allowed to return to a natural state. The long thin sites that are on the margin of existing wetlands or short sites between existing wetlands were considered not requiring any intervention other than cessation of stock or vehicle traffic.

In conclusion, provided the recommendations in this report are implemented, we consider that all proposed wetland offset areas will support wetland hydrology, facilitate the establishment of wetland vegetation, and promote the development of hydric soils.

The physical works recommended will be occurring within 10 m of natural inland wetland, but in our view the works are a permitted activity as they will protect and enhance the adjacent natural inland wetlands.



# 8. References

Landcare Research, 2018. Hydric soils – field identification guide. Consultancy report prepared for Tasman District Council under Envirolink Grant: C09X1702. June 2018.

MfE, 2021. Wetland delineation hydrology tool for Aotearoa New Zealand. Published in July 2021 by the Ministry for the Environment. ISBN: 978-1-99-003362-9. Publication number: ME 1575.

Edbrooke, S. W. (compiler), 2011. Geology of the Auckland area. Institute of Geological and Nuclear Sciences 1:250,000, geological map 3.



# **Appendix A. Detailed Soil Logs**

### Site # and Soil Description

1

### 0 - 300 mm.

TOPSOIL, silt. Very dark grey. Dry and friable. Rootlets present.

Matrix colour - (7.5YR - Value/Chroma) - 3/1 Mottle Colour - Mottles - 5/6 (1%)

Oxidised rhizospheres on roots

#### 300 - 750 mm.

Clayey SILT. Grey with brownish yellow mottles. Dry, moderate plasticity.

Matrix Colour (7.5YR - Value/Chroma) - 5/1 Mottle Colour (10YR - Value/Chroma) - 6/8 (5%)

#### 750 - 950 mm.

Silty CLAY. Grey, with brownish yellow mottles. Dry and highly plastic.

Matrix Colour (10YR - Value/Chroma) - 6/1 Mottle Colour (10YR -Value/Chroma) - 6/8 (5%)

#### 950 - 1000 mm.

Clayey SILT. Grey with brownish yellow mottles. Dry and moderately plastic.

Matrix Colour (10YR - Value/Chroma) - 6/1

Mottle Colour (10YR - Value/Chroma) - 6/8 (50%)



Photograph 1: Site 1 test pit.



Photograph 2: Site 1 core.

Soil Photo

## 2

## 0 - 200 mm.

TOPSOIL, silt. Dark grey, with some rootlets present. Dry and friable.

Matrix Colour (10YR - Value/Chroma):

Topsoil - 4/1

#### 200 - 400 mm.

SILT. Yellowish brown, dry and low plasticity.

Matrix Colour (10YR - Value/Chroma) - 5/4

### 400 - 700 mm.

Clayey SILT. Brownish yellow, with yellowish brown mottles with light grey inclusions. Dry, moderate plasticity.

Matrix Colour (10YR - Value/Chroma) - 6/6 with 6/1 inclusions

Mottle Colour (10YR - Value/Chroma) - 5/8 (5%)

#### 700 - 1000 mm

Clayey SILT, very pale greyish brown, with brownish yellow mottles. Dry, moderate plasticity.

Matrix Colour (10YR - Value/Chroma) - 7/4



Photograph 3: Site 2 test pit.



Photograph 4: Site 2 core.

### Site # and Soil Description

Mottle Colour (10YR - Value/Chroma) - 6/8 (5%)

#### **3A**

#### 0 - 300 mm.

TOPSOIL, silt. Dark grey. Dry and friable. Matrix Colour (10YR - Value/Chroma) – 4/1

Oxidised rhizospheres on roots

#### 300 - 700 mm.

Silty CLAY. Brownish yellow, dry and highly plastic.

Matrix Colour (10YR - Value/Chroma) - 6/6

#### 700 - 1000 mm.

Silty CLAY. Light yellowish brown, with light grey inclusions and brownish yellow mottles. Dry and highly plastic.

Matrix Colour (10YR - Value/Chroma) – 6/4 with 7/1 inclusions

Mottle Colour (10YR – Value/Chroma): Mottles – 6/8

#### 3B

### **0 - 300** mm.

TOPSOIL, silt. Dark grey. Dry and friable. Matrix Colour (10YR - Value/Chroma) - 4/1 **300 - 700 mm.** 

Silty CLAY. Brownish yellow, dry and highly plastic.

Matrix Colour (10YR - Value/Chroma) – 6/6 **700 - 1000 mm.** 

Silty CLAY. Light yellowish brown, with light grey inclusions and brownish yellow mottles. Dry and highly plastic.

Matrix Colour (10YR - Value/Chroma):- 6/4 with 7/1 inclusions

Mottle Colour (10YR – Value/Chroma): Mottles – 6/8 (5%)

Oxidised rhizospheres on roots



Photograph 5: Site 3A test pit.



Photograph 7: Site 3B test pit.



Photograph 6: Site 3A core.

Soil Photo



Photograph 8: Site 3B core.

#### 4

#### 0 - 300 mm.

Topsoil, Clayey SILT. Very dark greyish brown. Some moisture and low plasticity.

Matrix Colour (10YR - Value/Chroma):- 3/2

300 - 600 mm.

Clayey SILT. Brownish yellow. Some moisture, low to medium plasticity.

Matrix Colour (10YR - Value/Chroma) - 6/8 **600 - 1000 mm**.

Silty CLAY, light grey, with light yellowishbrown streaks. Moderately moist, moderate to high plasticity.

Matrix Colour (10YR - Value/Chroma) - 7/1

### Soil Photo



Photograph 9: Site 4 (looking towards culvert from test pit).

#### 5

#### 0 - 400 mm.

TOPSOIL, silt. Very dark grey with clay inclusions, yellowish brown mottling within the clay. Rootlets are present.

Matrix Colour (10YR - Value/Chroma) - 3/1 (5%)

Mottle Colour (10YR – Value/Chroma) – 5/8 **400 - 700 mm.** 

Clayey SILT. Yellowish brown with dark grey mottles. Dry, moderately plastic.

Matrix Colour (10YR - Value/Chroma) - 5/8

Mottle Colour (10YR - Value/Chroma) - 4/1

#### 700 - 1000 mm.

Silty CLAY. Very pale brown with light grey inclusions and brownish yellow mottles. Dry and highly plastic.

Matrix Colour (10YR - Value/Chroma) - 7/4 Mottle Colour (10YR - Value/Chroma) - 6/8 (1-5%)



Photograph 10: Site 5 testpit.



Photograph 11: Site 5 core.

#### 6

#### 0 -250 mm

Silty TOPSOIL with minor clay, yellowish brown, with rootlets, dry. Dark reddish yellow mottles

Matrix Colour (10YR - Value/Chroma) - 5/4 Mottle Colour (10YR - Value/Chroma) - 7/8 (1-5%)

#### 250 - 350 mm

Silty clay, brownish yellow, moist. High plasticity.

Matrix Colour (10YR - Value/Chroma) - 6/6

#### 350 mm - 1 m

Clayey SILT. dark greyish brown, with dark brown mottles, moist, moderate plasticity.

Matrix Colour (10YR - Value/Chroma) - 4/2

Mottle Colour (10YR - Value/Chroma) - 3/3

(5%)



Photograph 12: Site 6 test pit.



Photograph 13: Site 6 topsoil.

**Soil Photo** 

#### 7

#### 0 - 100 mm

TOPSOIL, SILT, dark greyish brown, slightly damp, yellowish-brown mottles, rootlets.

Matrix Colour (10YR - Value/Chroma) - 4/2 Mottle Colour (10YR - Value/Chroma) - 5/8 (10%)

#### 100 - 200 mm

PEAT layer, some charcoal, black slightly damp.

Matrix Colour (10YR - Value/Chroma) - 2/1

#### 200 - 500 mm

Clayey SILT, 5/6 yellowish brown. 5/8 yellowish brown mottles. 10% dry with low plasticity.

Matrix Colour (10YR - Value/Chroma) - 5/6 Mottle Colour (10YR - Value/Chroma) - 5/8 (10%)

#### 500 mm – 1 m

Clayey SILT, 7/2 light grey with 5/8 yellowish brown streaks and mottles. Dry with moderate plasticity.

Matrix Colour (10YR - Value/Chroma) - 7/2 Mottle Colour (10YR - Value/Chroma) - 5/8 (10%)



Photograph 14: Site 7 test pit.



Photograph 15: Site 7 core.

8

#### 0 - 100 mm.

TOPSOIL, silt with minor clay, very dark brown. Moderate moisture and low plasticity. Matrix Colour (10YR - Value/Chroma):– 2/2 100 - 600 mm.

Silty CLAY. Yellowish brown, some moisture and moderately plastic.

Matrix Colour (10YR - Value/Chroma):— 5/8 **600 - 1000 mm.** 

Silty CLAY, yellow with light grey streaks. Some moisture, moderate to high plasticity. Matrix Colour (10YR - Value/Chroma): - 7/6



Photograph 16:Site 8 test pit.



Photograph 17: Site 8 core.

Soil Photo

9

#### 0 - 300 mm.

TOPSOIL, Clayey SILT. Yellowish brown, some moisture and some plasticity.

Matrix Colour (10YR - Value/Chroma):- 5/8 **300 - 600 mm.** 

Silty CLAY. Yellow with light grey streaks. Some moisture and moderate to high plasticity.

Matrix Colour (10YR - Value/Chroma) – 7/6 **600 - 1000 mm.** 

Silty CLAY. Brownish yellow, dark orange inclusions. Moderately moist, low plasticity.

Matrix Colour (10YR - Value/Chroma) - 6/6



Photograph 18: Site 9 test pit.



Photograph 19: Site 9 core.

#### 10A

#### 0 - 300 mm.

TOPSOIL, Clayey SILT. Dark brown. Some moisture, low plasticity.

Matrix Colour (10YR - Value/Chroma):- 3/2 **300 - 600 mm.** 

Clayey SILT. Brownish yellow, some moisture, low to moderate plasticity.

Matrix Colour (10YR - Value/Chroma) – 6/8 **600 – 1000 mm**.

Silty CLAY, light grey with light orange, brown streaks. Moderately moist, moderate to highly plastic.

Matrix Colour (10YR - Value/Chroma) - 7/1



Photograph 20: Ssite 10A Test pit.



Photograph 21: Site 10A core.

Soil Photo

#### 10B

#### 0 - 300 mm.

TOPSOIL, silt, very dark grey, rootless, some dark yellowish-brown mottles.

Matrix Colour (10YR - Value/Chroma) - 3/1 Mottle Colour (10YR - Value/Chroma) - 3/6 (2%)

#### 300 - 500 mm.

Clayey SILT, yellowish brown with brownish yellow mottles and grey inclusions. Dry with low plasticity.

Matrix Colour (10YR - Value/Chroma) - 5/4 Mottle Colour (10YR - Value/Chroma) - 6/8 (2%)

#### 500 - 1000 mm.

Clayey SILT. 7/3 very pale brown and dry with yellowish brown mottles 5/8 and streaks, dry with moderate plasticity.

Matrix Colour (10YR - Value/Chroma) - 7/3

Mottle Colour (10YR - Value/Chroma) - 5/8 (2%)



Photograph 22: Site 10B Test pit.



Photograph 23: Site 10B core.

#### 10C

#### 0 - 200 mm

TOPSOIL silt, very dark greyish brown, dry, brownish yellow mottles.

Matrix Colour (10YR - Value/Chroma) - 3/2 Mottle Colour (10YR - Value/Chroma) - 6/6 (5%)

#### 200 - 1000 mm.

Clayey SILT. Yellow with light grey streaks and yellow mottles. Dry, moderately plastic.

Matrix Colour (10YR - Value/Chroma) - 7/8

Mottle Colour (10YR - Value/Chroma) - 7/8

(10%)

Oxidised rhizospheres on roots



Photograph 24: Site 10C test pit.



Photograph 25: Site 10C core.

Soil Photo

#### 11

#### 0 - 200 mm.

TOPSOIL, Silt with minor clay. Dark greyish brown with dark yellowish-brown mottles. Moist, some plasticity.

Matrix Colour (10YR - Value/Chroma) - 4/2 Mottle Colour (10YR - Value/Chroma) - 3/6 (10%)

#### 200 - 300 mm.

Clayey SILT. Greyish brown. Dry with moderate plasticity.

Matrix Colour (10YR - Value/Chroma) - 5/2 Mottle Colour (10YR - Value/Chroma) - 7/8 (5%)

#### 300 - 1,000 mm.

Clayey SILT. Light grey with yellow streaks and mottles. Dry, moderate plasticity.

Matrix Colour (10YR - Value/Chroma) - 7/1

Mottle Colour (10YR - Value/Chroma) - 7/8

(5%)



Photograph 26: Site 11 test pit.



Photograph 27: Site 11 core.

#### 12

#### 0 - 200 mm.

TOPSOIL, Silt. Dark grey with dark yellowish-brown mottles. Dry and friable.

Matrix Colour (10YR - Value/Chroma) - 4/1

Mottle Colour (10YR - Value/Chroma) - 3/6
(5%)

#### 200 - 400 mm.

Clayey SILT, with peat. Dark grey. Dry and moderately plastic.

Matrix Colour (10YR - Value/Chroma) -2/1Mottle Colour (10YR - Value/Chroma) -3/6 (5%)

#### 400 - 1000 mm

Silty CLAY, black with dark yellowish-brown. Moist and highly plastic.

Matrix Colour (10YR - Value/Chroma) - 2/1

Oxidised rhizospheres observed on roots. Groundwater encountered at 900 mm

Photograph 28: Site 12 test pit.



Photograph 29: Site 12 peat

Soil Photo

#### 13

#### 0 - 200 mm.

TOPSOIL, silt. Dark grey with dark yellowish-brown mottles. Dry, rootlets present.

Matrix Colour (10YR - Value/Chroma) - 4/1 Mottle Colour (10YR - Value/Chroma) - 3/4 (10%)

#### 200 - 1000 mm.

Clayey SILT (Fill). Dark yellowish-brown. Gravels were observed at 0.7 m.

Matrix Colour (10YR - Value/Chroma) - 4/6



Photograph 30: Site 13 test pit



Photograph 31: Site 13 topsoil

#### 14

#### 0 - 300 mm.

TOPSOIL, silt. Dark greyish brown with dark yellowish-brown mottles. Dry and moderate plasticity.

Matrix Colour (7.5YR - Value/Chroma) - 4/2 Mottle Colour (7.5YR - Value/Chroma) - 4/6 (10%)

#### 300 - 1000 mm.

Clayey SILT. Brownish yellow with light grey streaks, dry, moderate plasticity when moistened.

Matrix Colour (10YR - Value/Chroma) - 6/6 Streak Colour (10YR - Value/Chroma) - 7/1

Oxidised rhizospheres on roots



Photograph 32: Site 14 test pit



Photograph 33: Site 14 core

**Soil Photo** 

#### 15A

#### 0 - 150 mm.

TOPSOIL, Silt. Very dark greyish brown. Dry, friable.

Matrix Colour (10YR - Value/Chroma) - 3/2 **150 - 400 mm.** 

SILT with minor clay. Dark greyish brown. No mottles but rhizospheres were present. Dry and friable.

Matrix Colour (10YR - Value/Chroma) - 4/2

#### 400 - 500 mm.

Clayey SILT. Yellowish brown with some mottles yellowish brown. Dry.

Matrix Colour (10YR - Value/Chroma) - 5/4 Mottle Colour (10YR - Value/Chroma) - 5/8 (5%)

#### 500 – 800 mm.

Clayey SILT, minor sand. Yellowish brown. Dry, moderately plastic.

 $Matrix\ Colour\ (10YR\ -\ Value/Chroma) - 5/4$ 

#### 800 - 1000 mm.

Silty CLAY, minor sand. Yellowish brown. Dry, highly plastic.

Matrix Colour (10YR - Value/Chroma) - 5/6



Photograph 34: Site 14 test pit



Photograph 35: Site 14 core

#### 15B

#### 0 - 150 mm.

TOPSOIL, Silt. Grey.

Matrix Colour (10YR - Value/Chroma) - 5/1 **150 - 600 mm.** 

Silty CLAY. Light grey with brownish yellow mottles. Saturated and highly plastic. EOH as everything was saturated and material was consistent.

Matrix Colour (10YR - Value/Chroma) - 7/1 Mottles Colour (7.5YR - Value/Chroma) - 6/8 (20%)

Oxidised rhizospheres observed on roots, in addition to a hydrogen sulphide odour



Photograph 36: 15B - surface water filled the pit immediately.

#### Soil Photo



Photograph 37: 15B core

#### 15C

#### 0 - 150 mm.

TOPSOIL, Silt. Dark grey. Moist.

Matrix Colour (10YR - Value/Chroma) - 4/1 **150 - 450 mm.** 

Clayey SILT, grey with brownish yellow clay inclusions. Moist and sticky with moderate plasticity.

#### 450 - 1000 mm.

Clayey SILT, light yellowish brown with yellow mottles and rhizospheres. Moist and moderately plastic.

Matrix Colour (10YR - Value/Chroma) - 6/4 Mottles Colour (10YR - Value/Chroma) - 7/6 (10%)

Oxidised rhizospheres observed on the roots.



Photograph 38: Site 15C core



Photograph 39: Site 15C test pit

#### 16A

#### 0 - 300 mm.

TOPSOIL, Silt, greyish brown with yellowish brown mottles. Moist.

Matrix Colour (10YR - Value/Chroma) - 5/2 Mottles Colour (7.5YR - Value/Chroma) - 5/8 (15-20%)

#### 300 - 900 mm.

Clayey SILT. Light yellowish brown with light brown mottles. Relatively dry and moderately plastic.

Matrix Colour (10YR - Value/Chroma) - 5/2 Mottles Colour (7.5YR - Value/Chroma) - 6/4 (2%)

#### 900 - 1000 mm.

Silty CLAY. Dark brown. Moist and highly plastic.

Matrix Colour (10YR - Value/Chroma) - 3/3

Oxidised rhizospheres observed on the roots.

Groundwater was encountered at 300 mm bgl.



Photograph 40: 16A test pit.

#### **Soil Photo**



Photograph 41: 16A core.

#### 16B

#### 0 - 200 mm.

TOPSOIL, silt. Dark greyish brown with yellowish brown mottles. Moist.

Matrix Colour (10YR - Value/Chroma) - 4/2 Mottle Colour (10YR - Value/Chroma) - 5/6 (5%)

#### 200 - 400 mm.

Clayey SILT. Grey, with dark yellowishbrown mottles. Moist and moderately plastic. Matrix Colour (10YR - Value/Chroma) – 5/1 Mottle Colour (10YR - Value/Chroma) – 3/4 (40%)

#### 400 - 800 mm.

Clayey SILT. Yellowish brown with dark yellowish-brown mottles. Moist with moderate plasticity.

Matrix Colour (10YR - Value/Chroma) - 5/4 Mottle Colour (10YR - Value/Chroma) - 4/6 (10%)

#### 800 - 1000 mm.

Silty CLAY, light yellowish brown with light grey streaks and brownish yellow mottles. Moist and highly plastic

Matrix Colour (10YR - Value/Chroma) - 6/4



Photograph 42: Site 16B test pit



Photograph 43: Site 16B core

Site # and Soil Description	Soil F	Photo
Mottle Colour (10YR - Value/Chroma) - 6/6 (5%)		
Oxidised rhizospheres on roots.  GW encountered at 350 mm bgl.  GW soil seepage at 270 mm bgl.		



### **Appendix B. Hydric Soil and Hydrology Tool Test Sheets**

Profile description. (Describe to the depth needed to confirm indicator presence/absence, 30 cm default)

Depth (pnm	Matrix colour (moist)	Mottles colour (moist)	Mottles	Mottles Size	Mottle location	Material <sup>4</sup>	Remarks
0300	3/1 7.5yr	5/67.5yr	1	-	-	Topsoil SILT	Dry and friable
300-750	5/17.5yr	6/8 7.5yr	5	-	-	Clayey	Dry, mod plastic
750-950	-	6/8 logr	5		_	Silty	Dry, highly plasti
950-1000	6/11098	6/8 logr	50	_	-	Clayey	Dry & modtic

*Use% area charts, *Use size cl	asses, <sup>1</sup> Ped face, pore, within	ped along roots, within mat			
Hydric soil indicators:	Soil drainage (circle) W	MW I P VP		use of wetness (circle	
Organic layers:	Concretions:	Colours: profile for	m either:	cation Depression Fla	
Organic soil material	Iron concretions	Gley OR		ater table Depth (cm)	The state of the s
Litter	Manganese concretion	Mottled		gh GW Perched See	
Fibric	Nodular	Horizon:		ns Depth(an)	
Mesic	Consistence:	Reductimorphi	C		nsi- Duri- Fragi Ortstein
Humic	Plastic	Redox mottled		yers Depth (am)	
Peaty topsoil	Sticky	Redox segrega	tions SI	ow perm argillic	
Peaty subsoil	Fluid	Perch-gleyfeat	tures [	Pugged	
Hydric soils present?	YES NO	UNCERT	AIN	NZSC subgroup	provinces and the second secon
Primary hydrology ind	icators: minimum of 1 r	equired; check all bo	xes that apph		
Surface water (1A)	Algal mat/cri	st (2D)	Aquatic	invertebrates (2J)	
Groundwater < 30 cm (18	PRINCES.			en sulphide odour (3A)	
Soil saturation < 30 cm (1				rhizosphere on roots	
Water marks (2A)	and the same of th	naerial imagery (2G)	-	diron (3C)	(100)
Sediment deposits (2B)		etated concave surface (2H	THE REAL PROPERTY.	diron in tilled soil (3D)	
Drift deposits (2C)	Salt crust (21			ter table stunted/stre	
		And other transfer of the state			and the same of th
Secondary hydrology inc	acators. minimum of 2	equired; check an bo			
Water-stained leaves (2K	√ Geome	orphic position (48)		t (4D), refer to Section	
Drainage patterns (2L)	Shallo	w aquitard (4C)	20 20 20 20 20 20 20 20 20 20 20 20 20 2	ACW dominant species	
Dry-season water table (	3E) FAC-ne	eutral test (4D)	2. No FACU &	JPL dominant species	
Saturation in aerial image	ery (3F) Frost-h	neave hummocks (4E)	3 Total		(A+B)
	/		4. FAC-neutral	>50%)	(A/A+B)*100
Wetland hydrology prese	ent? YES V	NO [	)		
Sketch of site/soil	site			1-44-man-241-man-141-man-141-man-141-man-141-man-141-man-141-man-141-man-141-man-141-man-141-man-141-man-141-m	
			tt-		
	Mice	11100	Wills		
		Water	With		
		1			
		V 1011/1			
Remarks 9-17	ANI - Fill	A 1	101	- 200	L from groun
1.12	THE FILLS	u with a		200 m	L Trom grade
4:15	PM - 200	m1 0.	Company of the	4	(6)
	PM - 300	Wr trow	diadis	19 Water	(a) top of
			tevel	quaer	l_ i -

Profile description. (Describe to the depth needed to confirm indicator presence/absence, 30 cm default)

Depth (pnn	Matrix colour (moist)	Mottles colour (maist)	Mottles %1	Mottles Size	Mottle location'	. Material*	Remarks
0-200	4/1 logr	_	-	_	_	Topsoil	Dry & friable some rootlets
200-400	5/4 logr	_	-	_	_	Silt	dry & low plasticity
400-700	6/6 with 109	5/8 10gr	51	-	-	clayey	Dry, mod plastic
700-1000	- Anna Carlotte Commission of the Commission of	6/8 logr	51-	-	-	Clayey	Dry, mod plastic
						<u></u>	

<sup>1</sup> Use% area charts; <sup>2</sup> Use size cla	ses; <sup>1</sup> Ped face, pore, within ped along roots, within matrix; <sup>5</sup> Organic (peaty), humic, mineral soil
Hydric soil indicators:	Soil drainage (circle) W MW   P VP Cause of wetness (circle appropriate):
Organic layers:	Concretions: Colours: profile form either:
Organic soil material	Water table Depth (cm)
Litter	Iron concretions   Gley OR   High GW   Perched   Seepage   Tidal   Uthic
Fibric	Nodular Horizon: Pans Depth (cm )
Mesic	Consistence: Pan Humus Fe-pan Densi- Duri- Fragi Ortstein
Humic	Plastic Redox mottled Layers Depth (cm)
Peaty topsoil	Sticky Redox segregations Slow perm argillic
Peaty subsoil	Fluid Perch-gleyfeatures Pugged
Land	Letting Cyteston C
Hydric soils present?	YES NO UNCERTAIN NZSC subgroup
Primary hydrology indi	eators: minimum of <u>1</u> required; check all boxes that apply
Surface water (1A)	Algal mat/crust (2D) Aquatic invertebrates (2J)
Groundwater < 30 cm (1B)	Iron deposits (2E) Hydrogen sulphide odour (3A)
Soil saturation < 30 cm (10	Surface soil cracks (2F) Oxidised rhizosphere on roots (38)
Water marks (2A)	Inundation on aerial imagery (2G) Reduced iron (3C)
Sediment deposits (2B)	Sparsely vegetated concave surface (2H) Reduced iron in tilled soil (3D)
Drift deposits (2C)	Salt crust (21) High water table stunted/stressed plants (4A)
Secondary hydrology ind	cators: minimum of 2 required; check all boxes that apply
	FAC-neutral test (4D), refer to Section B Vegetation
Water-stained leaves (2K)	A No. COLO FACOL AND
Drainage patterns (2L)	Sharov aguitato (40)
Dry-season water table (3	1.00
Saturation in aerial image	y (3F) Frost-heave hummocks (4E) 3. Total
	4. TACTICUITI (250/6)
Wetland hydrology prese	
Sketch of site/soil:	2 4
	83
	g es
	Water &
	Water 9
Remarks 2.2	
10L 22	mm from ground @ 10:12 AM
added 40	mm forms are and a
	omm from ground @ 10:12 AM  omm from ground @ 10:19 AM > Down to top
	dditional oranger

Added additional IOL @ 3:57pm 180mm Top of grass 250 mm Top of grass

Profile description. (Describe to the depth needed to confirm indicator presence/absence, 30 cm default)

Depth (pn/n	Matrix colour (moist)	Mottles colour (moist)	Mottles %1	Mottles Size	Mottle location	. Material*	Remarks
0-300	4/1 logr	-	-	_	_	Topsoil silt	ory and friable
300-700	6/6 logr	-	-	_	-	Silty	Dry and highly
							,

							-
¹Use% area charts; ²Use size cla	isses, <sup>1</sup> Ped face, pore, wit	hin ped along roots	, within matrix.	*Organic (peat	y), humic, minera	l soil	
Hydric soil indicators:	Soil drainage (circle)				se of wetness (ci		*
Organic layers:	Concretions:		profile form ei	ther:	ation Depression	Flat Valley Gull	y Slope
Organic soil material	Iron concretions		y OR	Wa	ter table Depth (		
Litter	Manganese concre	Annual and a second	ttled		h GW Perched S		uthic
Fibric	Nodular	Horizon			s Depth (cm) Humus Fe-pan		pi Ortotain
Mesic	Consistence:	and the same of	ductimorphic		ers Depth (cm)		P. OLOTGIU
Humic Peaty topsail	Plastic	discount of the last of the la	dox mottled		ers Depth (cm) w perm argillic		
Peaty topsoil Peaty subsoil	Sticky	and the same of	dox segregations ch-gley features	·	Pugged		
L.,, 100011		L J Per	crigicy reatures	, L	J		
Hydric soils present?	YES N	0	UNCERTAIN		NZSC subgro	up	
Primary hydrology ind	icators: minimum of	1 required; che	eck all boxes	that apply			
Surface water (1A)	SAMPLE SA	c/crust (2D)	1	Aquatic in	overtebrates (2J)		
Groundwater < 30 cm (1B					sulphide odour (		
Soil saturation <30 cm (10	- Comment	oll cracks (2F)			rhizosphere on ro	ots (38)	
Water marks (2A)		on on aerial imagery		Reduced		201	
Sediment deposits (2B) Drift deposits (2C)	Sparsely Salt crust	vegetated concave	surrace (271)		iron in tilled soil (		Δ
					er table stunted/s	Gesseu plants (4	
Secondary hydrology ind	licators: min imu m o	f 2 required; che	eck all boxes	that apply	to the second se		
Water-stained leaves (2K)	Ge	omorphic position	(40)		(4D), refer to Sed		
Drainage patterns (2L)		allow aquitard (4C)	1		CW dominant spe		
Dry-season water table (3	processor.	C-neutral test (4D)			PL dominant spec		
Saturation in aerial image	ry (3F)	ost-heave hummock	(3 ( 142 )	Total EAC-pautcal (2	5.09/4		(A+8) (A/A+8)*100
			[4.	FAC-neutral (>	JU76)		(A/A+B)*100
Wetland hydrology prese	nt? YES 🗸		NO 🗌				
Sketch of site/soil:	To any advices property						
			12.3	10			
			Si	ite	- Characterist		
	18		1				
	\Pc	3	. 4				
	\ \ \ \	8 Water					
	$\bigvee$	NE I	×/				
	Y	T V	30				
Remarks 0				10 = 1	201 -4	ded	<del>-</del>
9:48	3 AM 200n	um tros	n gro	and le	ver ad	MEU	
10:0	2 AM 25	omm f	roma	roun	id leve	1	
10:0	2 AM 25 5 AM 300	mm .	from	groun	nd lev	19	
2:5	6 PM (LI	000	£mm	3	ad las	10	

## All depths are in imm

### SECTION C - SOIL AND HYDROLOGY

Profile description: (Describe to the depth needed to confirm indicator presence/absence, 30 cm default)

Depth (pn/)	, , , , , ,	rix colour noist)	Mottles colour (maist)	Mottles %1	Mottles Size <sup>2</sup>	Mottle lo	cation'	Material*	Remarks
0-300	4/1	logr	_	_	_	_		Topsoil silt	Dry and friable
300-700			_	_	_	_		Siltu	Dry and highly
	0/6							clay	DIGSEIL.
				<del>                                     </del>					
				-					
					-				
			L		<u> </u>	<u></u>			
The second second second	The same of the sa		es, <sup>1</sup> Ped face, pore, wit			matrix; Org			
Hydric soi			Soil drainage (circle)				Loc		rcle appropriate):  a Flat Valley Gully Slope
Organic laye			oncretions:	(	Colours: profile	form either		ter table Depth (	
Litter	soil mate	eriai	Iron concretions  Manganese concre	etions [	Gley OR Mottled		Hig	h GW Perched	Seepage Tidal Lithic
Fibric			Nodular	L	torizon:			ns Depth(on)	
Mesic		C	onsistence:	[	Reductimo	rphic			Densi- Duri- Fragi Ortstein
Humic		L	Plastic	Ĺ	Redox mot			ers Depth (cm) _ w perm argillic	Auto-Graff Control
Peaty to		}	Sticky	}	Redox segr	-		Pugged	
Hydric soil		nt?		ю П		RTAIN	7	NZSC subero	pup
						L	t annly	71200 3008.0	
Primary hydrology indicators: minimum of 1 required; check all boxes that apply									
Surface water (1A)  Algal mat/crust (2D)  Aquatic invertebrates (2J)  Groundwater <30 cm (1B)  Iron deposits (2E)  Hydrogen sulphide odour (3A)									
manusco.		(30 an (10)	(	soil cracks (2	F)		/	rhizosphere on ro	
Water	marks (2	A)	Inundati	on on aerial	imagery (2G)		Reduced	iron (3C)	
1	ent depo		Common of the co		oncave surface	(2H)	Reduced	iron in tilled soil i	(3D)
Drift d	eposits (2	(C)	Salt crus	t (2I)			High wat	er table stunted/	stressed plants (4A)
Secondary	y hydro	logy indica	ators: min imu m o	f <u>2</u> require	ed; check all	boxes the	at apply		
Water	stained l	eaves (2K)	G	eomorphic p	osition (48)	FAC-ne	utral test	(4D), refer to Sec	tionB Vegetation
Draina	ge patter	ns (2L)	St	nallow aquita	ard (4C)			CW dominant spe	100000000000000000000000000000000000000
discount of the same of the sa		er table (3E)	L	AC-neutral te		1		PL dominant spec	des(B) (A+B)
Satura	tioninae	rial imagery (	(3F) Fr	ost-heave hi	ummocks (4E)	3. Tota	neutral (	>50%	(A/A+B)*100
			/	Harptonia (Augusta (					
Wetland h		gy present	? YES V		NO		***************************************		
Sketch of sit	e/soil:						5	ite	
			m						
		_	<u> </u>	B			V		
			75	5		. (1)	1		
				100		Mar			
				1	Jater				
	_								
Remarks	9:	48 A	MYDO		~			1	
	3:	50 P	m 7500	mm	+10	om 6	grou	ina 16	200
			m \$200	Omm	- tro	p ma	rour	nd le	vel added
						9			

### All depths are in mim

#### SECTION C - SOIL AND HYDROLOGY

Depth ( <b>pnn</b>	Matrix colour (moist)	Mottles colour (maist)	Mottles %1	Mottles Size	Mottle location <sup>3</sup>	Material*	Remarks
3-300	3/2 royr	_	_	-	_	Clayey	moisture and low p
300 <i>-6a</i> 0	6/8 10gr	_	_	_	_	clayey Silt	some moisture low to med plasticit
	harts; <sup>2</sup> Use size classe indicators:	s; Ped face, pore, wit		1		NAME OF TAXABLE PARTY.	ol soil rcle appropriate):
ganic laye Organic Litter Fibric Mesic Humic Peaty to Peaty su	soil material Composition Comp	Soil drainage (circle) oncretions:  Iron concretions Manganese concre Nodular onsistence: Plastic Sticky Fluid  YES Notes: Minimum of	tions [	Gley OR Mottled Horizon: Reductimo Redox mott Redox segr Perch-gley	form either:  Wa Hig Par rphic Par tled Lay regations Slo features	ation Depression ter table Depth( hGW Perched in Depth(on) h Humus Fe-pan ers Depth (om) w perm argillic Pugged	r Flat Valley Gully Slope  cm) Seepage Tidal Lithic  Densi- Duri- Fragi Ortstein
Surface Ground Soil sat Water of Sedime	water (1A) iwater <30 cm (1B) uration <30 cm (1C) marks (2A) ent deposits (2B) eposits (2C)	Algal ma Iron depi Surface s Inundati Sparsely Salt crust	t/crust (2D) posits (2E) poil cracks (2 pon on aerial vegetated c	F) imagery (2G) oncave surface	Aquatic i Hydrogei Oxidised Reduced (2H) Reduced High wat	iron in tilled soil ( er table stunted/	oots (38)
Water-s Drainag Dry-sea	stained leaves (2K) ge patterns (2L) ison water table (3E) ion in aerial imagery (	Sh	omorphic p allow aquita C-neutral te	osition (48) ard (4C)	FAC-neutral test	(4D); refer to Sec CW dominant spec PL dominant spec	tionB Vegetation edes(A) ties(B)(A+B)(A/A+B)*100
Vetland h	ydrology present?	YES [		NO	Ø		American plane where the process of the control of the second of the sec
ketch of site	t/soil:	Vsite		stream	/		
		*	_	1			

Remarks

aw seepage @ B\* at bottom of hill

by orange biofilm present.

Drainage - 20 mins -> 30mm below ground

16:03 -> 150mm from ground level.

Site 5

### SECTION C - SOIL AND HYDROLOGY

Profile description: (Describe to the depth needed to confirm indicator presence/absence, 30 cm default)

Depth (DA)		x colour oist)	0.000	les colour noist)	Mottles %1	Mottles Size <sup>1</sup>	Mottle location?	Material <sup>4</sup>	Remarks
0-400	3/1	IOYR	5/8	1045	5			Topsoil, silt	Clay inclusions,
				***************************************					

	sses; <sup>3</sup> Ped face, pore, within ped along roots, w	ithin matrix; *Organic (	
Hydric soil indicators:	Soil drainage (circle) W MW I P VP		Cause of wetness (circle appropriate):
Organic layers:	Concretions: Colours: pr	ofile form either:	Location Depression Flat Valley Gully Slope
Organic soil material	Iron concretions Gley (		Water table Depth (cm)
Litter	Manganese concretions Mottl		High GW Perched Seepage Tidal Lithic
Fibric	Nodular Horizon:		Pans Depth(cm)
Mesic	Consistence: Reduc	ctimorphic	Pan Humus Fe-pan Densi- Duri- Fragi Ortstein
Humic	Plastic Redox	emottled	Layers Depth (cm)
Peaty topsoil	Sticky	csegregations	Slow perm. argillic
Peaty subsoil	Fluid Perch	gleyfeatures	Pugged
Hydric soils present?	YES NO	INCERTAIN	NZSC subgroup
Primary hydrology indi	cators: minimum of 1 required; check	all hoxes that an	nlv
		t diroones that ap	P-1
Surface water (1A)	Algal mat/crust (2D)	Aqua	tic invertebrates (2J)
Groundwater < 30 cm (1B)		and the same of th	ogen sulphide odour (3A)
Soil saturation <30 cm (10	annound .		ised rhizosphere on roots (38)
Water marks (2A)	Inundation on aerial imagery (	and the same of th	ucediron (3C)
Sediment deposits (2B)	Sparsely vegetated concave su	-	uced iron in tilled soil (3D)
Drift deposits (2C)	Salt crust (2I)	High	water table stunted/stressed plants (4A)
Secondary hydrology ind	icators: minimum of 2 required; chec	k all boxes that ap	ply
	/	[5.4.5	test (4D), refer to Section B Vegetation
Water-stained leaves (2K)	de la constante de la constant	27	& FACW dominant species(A)
Drainage patterns (2L)	Shallow aguitard (4C)		& UPL dominant species(B)
Dry-season water table (3)	The same of the sa		(A+B)
Saturation in aerial image	rost-neave nummocks	4/FAC-neutr	
		Z TACTICUM	51(750%)
Wetland hydrology preser	nt? YES 🗌	NO 🗸	2
Sketch of site/soil:			
HHE			Fonce
fence	0.1		4
Carro	Site		
lence	1 Was	ter	
	A Mr.		
	Www.	W. W. W.	W.
	<b>*</b>	W V	
Remarks 0 0 1	. ( )):0: 2 ==	1 1	f
Remarks 20 L	at 11:21, 200 mm	bal	(Mottling is within) clayer inclusions
	11:34, 250mm	bgl	clayer inclusions
	15:15, 370mm	bal	,

Profile description. (Describe to the depth needed to confirm indicator presence/absence, 30 cm default)

Depth (pnix		Mottles colour (moist)	Mottles %1	Mottles Size <sup>2</sup>	Mottle location	Material*	Remarks
0-250	(moist) 5/4 NELLOWS BROWN 6/6 10 YR	(maist) U DARKYElla REDDISH OCHUR	υ -			MINOR CLAY	
350	BROWLISH MELLON					SILTY CLAY	MOIST, HIGH PLASTICITY
250 -	A/2 10 MR DARK GREYISH BROW	63/3 107R	5			SILT	MOIST, MODERATE PLACTICITY.
						<u> </u>	

<del></del>							- Marini - All Control - C	
		<u> </u>						
	the state of the s	es; <sup>1</sup> Ped face, pore	, within ped alor	ng roots, within	matrix, *Organi	c (peaty), humic, minera		
Hydric soil	indicators:	Soil drainage (ci	rcle) W MW I	P VP		Cause of wetness (ci		
Organic layers	s: C	oncretions:	(	Colours: profile	form either:		Flat Valley Gully Slo	pe
Organic s	oil material	Iron concretio	ns	Gley OR		Water table Depth (		
Litter		Manganese co	ncretions	Mottled			Seepage Tidal Lithic	
Fibric		Nodular	Ī	Horizon:		Pans Depth(an)		
Mesic	C	onsistence:	[	Reductimo	rphic		Densi- Duri- Fragi Or	tstein
Humic	Ļ	Plastic	[	Redox mot	led	Layers Depth (cm) _	and the second space	
Peaty top	-	Sticky	ļ	Redox segr	egations	Slow perm argillic		
Peaty sul	bsoil	Fluid	Į	Perch-gley	features	Pugged		
Hydric soils	present?	YES	NO V	UNCE	RTAIN	NZSC subgro	up	
Primary h	hydrology indica	tors: minimur	n of <u>1</u> require	d; check all	boxes that a	pply		
Surface	water (1A)	Alga	mat/crust (2D)		Aq	uatic invertebrates (2J)		
posesso.	water <30 cm (1B)	-	deposits (2E)		Ну	drogen sulphide odour (	3A)	
Soil satu	uration <30 cm (1C)		ace soil cracks (2	F)	Ox	idised rhizosphere on ro	oots (38)	
Waterm	narks (2A)	Inun	dation on aerial	imagery (2G)	Re	duced iron (3C)		
Sedimen	nt deposits (2B)	Spar	sely vegetated o	oncave surface	(2H) Re	duced iron in tilled soil (	3D)	
Drift de	posits (2C)	Salt	crust (2I)		Hig	gh water table stunted/s	tressed plants (4A)	
Secondary	hydrology indica	ators: min imu i	n of <u>2</u> require	ed; check all	boxes that a	apply		4 (1) (1) (1) (1) (1) (1) (1) (1) (1) (1)
[]Water c	tained leaves (2K)	[3	Geomorphic p	ocition (48)	FAC-neutr	al test (4D), refer to Sec	tionB Vegetation	
	e patterns (2L)		Shallow aguita			L & FACW dominant spe		
	son water table (3E)	-	FAC-neutral te		2. No. FAC	U & UPL dominant spec	ies(B)	
	on in aerial imagery i	(3E)	Frost-heave h		3 Total		(A+B)	
			J	entille (see)	4. FAC-neu	utral (>50%)	(A/A+	-B) *100
		-	1					
	drology present	? YES L		NO	M			
Sketch of site/	/50II:					HIGH	TE THE	H.
		51	TE		1			
							WL	VERI
			,				11.	
					1	4	// 1	1
					a)	" 4/	1614	H
					=		0===	
				11/		V	X II	6- 1
				The same of the sa		1	TE W	Ve V
						SV VI	V/X	1st
Remarks 20	L 11:27A	m 15cm	from .	CO C	CONDON	wer/		
	11: 46A	m 18cm	Feen	100 act	CREGAD	LEVEL		
SITE	15:27	Pm 35 cm	n, econ	100 OC	CROWS	HAS LIKEL	. 0.7 - 0	M
DP . T	nus in	UK H H	D PE A	T BRIDE	DE TVAT	PROFILE.	1 ROOM B	JUILT
	- 010							

Profile description. (Describe to the depth needed to confirm indicator presence/absence, 30 cm default)

Depth (pn)	Matrix colour (moist)	Mottles colour (maist)	Mottles %1	Mottles Size	Mottle location	Material*	Remarks
0-100	4/2 IBMR DARK GRANISH BRO	5/8 104R 4610 N BROWN	ush 10			SILT	DAMP, ROOTLERS
100-	2/1 10 MR RUACK					PEAT	DRY/SLIGHTLY DYMP.
300-	5/6 107R	5/8 IOMR Hellowsh Rocks	10			CLAURY	DRY, LOW FLASTICITY

*Use% area charts: *Use size classes. *Ped fa	ace, pore, within ped along roots, within matrix; 'O	rganic (peaty), humic, mineral soil
Thudele sell indicators:	inage (circle) W MW I P VP	Cause of wetness (circle appropriate):
Organic layers: Concretion		Location Depression Flat Valley Gully Slope
	concretions Gley OR	Water table Depth (cm)
prostor mounts	ganese concretions Mottled	High GW Perched Seepage Tidal Lithic
Fibric Nodu	lar Horizon:	Pans Depth(cm)
Mesic Consistence	ce: Reductimorphic	Pan Humus Fe-pan Densi- Duri- Fragi Ortstein
Humic Plasti	c Redox mottled	Layers Depth (cm)
Peaty topsoil Sticky	ACCOUNT.	Slow perm argillic
Featy subsoil Fluid	Perch-gley features	Pugged
Hydric soils present? YES V	NO UNCERTAIN	NZSC subgroup
Primary hydrology indicators: m	inimum of <u>1</u> required; check all boxes th	at apply
Surface water (1A)	Algal mat/crust (2D)	Aquatic invertebrates (2J)
Groundwater < 30 cm (1B)	Iron deposits (2E)	Hydrogen sulphide odour (3A)
Soil saturation <30 cm (1C)	Surface soil cracks (2F)	Oxidised rhizosphere on roots (38)
Water marks (2A)	Inundation on aerial imagery (2G)	Reduced iron (3C)
Sediment deposits (2B)	Sparsely vegetated concave surface (2H)	Reduced iron in tilled soil (3D)
Drift deposits (2C)	Salt crust (21)	High water table stunted/stressed plants (4A)
Secondary hydrology indicators: m	nin imum of 2 required; check all boxes the	hat apply
Water-stained leaves (2K)	Geomorphic position (48) FAC-	neutral test (4D); refer to Section B Vegetation
Drainage patterns (2L)		o. OBL & FACW dominant species(A)
Dry-season water table (3E)		FACU & UPL dominant species(B)
Saturation in aerial imagery (3F)	Frost-heave hummocks (4E) 3. To	tal(A+B)
	4. FA	C-neutral (>50%)(A/A+B)*100
Wetland hydrology present?	YES V NO	
Sketch of site/soil	Processor and a figure control of the control of th	WATER WE
M		WHICH IN WHICH WE
Sirk Sirk		WET A
1 Apres 2 100		will.
		W. W.
	WATE	W NEW OOK
W.		W SITE YO
· ·	\$11	1" 1
The state of the s	V 311	
	$\smile$	
Remarks 20L 11:49Am 18	som from top of around	DIACL
12:03PM	22cm from accumb	LEVEL 2 DOWN - BATTOM -
15:28pm	38cm FROM GROUND 1	EVEL.
	The second secon	AUGGE HOLE

Site 8

### SECTION C - SOIL AND HYDROLOGY

Profile description: (Describe to the depth needed to confirm indicator presence/absence, 30 cm default)

Depth (anim	Matrix colour (moist)	Mottles colour	Mottles	Mottles Size	Mottle location	Material *	Remarks
	29/2 104R	(11.03.9				SILT WHU	TOPSOIL, MODERATE MOIS
	VERY DARK RECOUNTS /5 10 YR HAMBIT RECOUNTS H					SILTY CLAY	MOIST, MODERATEMY PLASTIC
Organic laye Organic laye Organic laye Citter Fibric Mesic Humic Peaty to Peaty st  Fydric soils  Primary Surface	harts; *Use size classe indicators: rs: Co soil material  co spsoil absoil	Soil drainage (circle) oncretions: Iron concretions Manganese concre Nodular onsistence: Plastic Sticky Fluid YES Algal ma	w MW I	P VP  colours: profile     Gley OR     Mottled  dorizon:     Reductimo     Redox mot     Redox segi     Perch-gley  UNCE	form either:  Wa Hig Par  Irphic Lay regations Features  ERTAIN  Aquatic in	ise of wetness (ci ation. Depression ter table. Depth ( h.G.W. Perched. is. Depth (cm.) h. Humus. Fe-pan ers. Depth (cm.) _ w. perm. argillic. ] Pugged.	rcle appropriate):  n Flat Valley Gully Slope  (cm)  Seepage Tidal Lithic  Densi- Duri- Fragi Ortstein
Soil sat Water Sedime Drift de	ruration <30 cm (1C) marks (2A) ent deposits (2B) eposits (2C)	Surface Inundati Sparsely Salt crus	soil cracks (2) on on aerial i vegetated co t (21)	magery (2G) oncave surface	(2H) Reduced Reduced High wat		
Water-	r hydrology indica stained leaves (2K) ge patterns (2L) sson water table (3E) don in aerial imagery (	G SI F	eomorphic po nallow aquita AC-neutral te	osition (48) rd (4C)	1 No OBL&FA	(4D); refer to Sec CW dominant spec PL dominant spec	
Wetland h	ydrology present	YES V	- The state of the	NO	(many)		
Sketch of site	e/soil:	SITE			→ E		
Remarks	1 L 1:47	100			lound lever		

# Site 9 All depths in mm

		SECTIO	N C -	SOIL AN	ND HYD	ROL	OGY	,
rofile descri	ption: (Describe to the	depth needed to conf	firm indicato	or presence/ab	sence, 30 cm d	efault)		
epth (mm)	Matrix colour (moist)	Mottles colour (moist)	Mottles %1	Mottles Size <sup>2</sup>	Mottle loca	tion <sup>3</sup>	Material <sup>4</sup>	Remarks
-300	5/8 loyr	-	-	_	_		Topsoil	it low plasticity
300-40	7/6 logr	-	_	_	_		silty	moist, modicity
		s; <sup>3</sup> Ped face, pore, wit	hin ped alon	ng roots, within	matrix; <sup>4</sup> Organ	ic (peat	y), humic, minera	al soil
ydric soi	l indicators:	Soil drainage (circle)	w Mw I	P VP		Cau	se of wetness (ci	rcle appropriate):
rganic laye	ers: C	oncretions:	(	Colours: profile	form either:			Flat Valley Gully Slope
Organic	soil material	Iron concretions		Gley OR			ter table: Depth (	
Litter		Manganese concre	tions	Mottled		-		Seepage Tidal Lithic
Fibric		Nodular	F	torizon:			s: Depth (cm )	Densi- Duri- Fragi Ortstein
Mesic		onsistence:	}	Reductimo			ers: Depth (cm) _	_
Peaty to	opsoil	Sticky	}	Redox mot			v perm argillic	
Peaty s	_	Fluid	Ì	Perch-gley			Pugged	
ydric soil	s present?	YES N	0 7	UNCE	RTAIN		NZSC subgro	up
Primary	hydrology indica	tors: minimum of	1 require	d; check all	boxes that	apply		
Surface	e water (1A)	Algal mat	/crust (2D)		ПА	quatic ir	vertebrates (2J)	
	dwater <30 cm (1B)	Iron depo					sulphide odour (	(3A)
Soil sat	turation <30 cm (1C)	Surfaces	oil cracks (2)	F)		xidised i	rhizosphere on ro	oots (38)
Water	marks (2A)	Inundatio	on on aerial i	imagery (2G)	R	educedi	ron (3C)	
-	ent deposits (2B)			oncave surface	(2H) R	educed	iron in tilled soil (	3D)
Drift de	eposits (2C)	Salt crust	(21)		Шн	igh wate	er table stunted/s	stressed plants (4A)
econdary	y hydrology indica	tors: min imu m o	2 require	ed; check all	boxes that	apply		
Water-	stained leaves (2K)	VGe	omorphic p	osition (4B)				tion B: Vegetation
Draina	ge patterns (2L)	Sh	allow aquita	rd (4C)			CW dominant spe	
-	ason water table (3E)		C-neutral te		4 1111000114	CU & UI	PL dominant spec	
Saturat	tion in a erial imagery (	3F) Fro	st-heave hu	ummocks (4E)	3. Total		P. O. C.	(A+B)
					4. FAC-ne	utrai (>	50%)	(A/A+B)*100
etland h	ydrology present?	YES		NO				
etch of site	e/soil:							
				5	stream	7	Site	
					i		1	
					$\checkmark$	24	100	
			M	112			All Venner	FE - 5-6
emarks:	t = 1							1
	101	1:530		100 r		13	elow	ground lever ground lever
		2:12 p		(10 m		Be	low.	ground levi
		3:33	pm		mm	R	PLAN	Jamund 18

#### SECTION C - SOIL AND HYDROLOGY Profile description: (Describe to the depth needed to confirm indicator presence/absence, 30 cm default) Remarks Mottles Mottle location Material\* Matrix colour Mottles colour Mottles Depth (m) Size (moist) (maist) some moisture, CLAMEY TOPSOIL SOME ME 1048 L BROUN 0-300 SILT some moisture; ow-moregate flasticity 6/8 104R CLANEY SILT EGUNNISH MELLA Use% area charts; "Use size classes; "Ped face, pore, within ped along roots, within matrix, "Organic (peaty), humic, mineral soil Hydric soil indicators: Cause of wetness (circle appropriate): Soil drainage (circle) W MW | P VP Location Depression Flat Valley Gully Slope Concretions: Organic layers: Colours: profile form either: Water table Depth (cm) \_\_\_\_ Organic soil material Iron concretions Gley OR High GW Perched Seepage Tidal Lithic Litter Manganese concretions Mottled Pans Depth(cm)\_\_\_ Nodular Fibric Horizon: Pan Humus Fe-pan Densi- Duri- Fragi Ortstein Mesic Consistence: Reductimorphic Lavers Depth (cm) Humic Plastic Redox mottled Slow perm argillic Sticky Peaty topsoil Redox segregations Pugged Peaty subsoil Fluid Perchigley features UNCERTAIN NZSC subgroup YES NO Hydric soils present? Primary hydrology indicators: minimum of 1 required; check all boxes that apply Aquatic invertebrates (2J) Algal mat/crust (2D) Surface water (1A) Groundwater < 30 cm (1B) Iron deposits (2E) Hydrogen sulphide odour (3A) Soil saturation <30 cm (10) Oxidised rhizosphere on roots (38) Surface soil cracks (2F) inundation on aerial imagery (2G) Reduced iron (3C) Water marks (2A) Sparsely vegetated concave surface (2H) Sediment deposits (2B) Reduced iron in tilled soil (3D) Drift deposits (2C) Salt crust (21) High water table stunted/stressed plants (4A) Secondary hydrology indicators: minimum of 2 required; check all boxes that apply FAC-neutral test (4D), refer to Section B Vegetation Geomorphic position (48) Water-stained leaves (2K) 1. No. OBL & FACW dominant species \_\_\_(A) Drainage patterns (2L) Shallow aquitard (4C) 2. No. FACU & UPL dominant spedies (B) Dry-season water table (3E) FAC-neutral test (4D) (A+B) 3 Total Saturation in aerial imagery (3F) Frost-heave hummocks (4E) 4. FAC-neutral (>50%) (A/A+B)\*100 NO V Wetland hydrology present? YES Sketch of site/soil: SITE REMARKS (IN SEEPAGE NEAR STREAM + BIOFILM GRANGET STREAM 12:10pm 18cm Belobbe GROUND LEVEL 81 24cm BELOW GROUND LOKE

15:20 pm

Site 10B

### SECTION C - SOIL AND HYDROLOGY

Profile description: (Describe to the depth needed to confirm indicator presence/absence, 30 cm default)

Depth (pn)	↑ Matrix colour (moist)	Mottles colour (maist)	Mottles %1	Mottles Size <sup>1</sup>	Mottle location <sup>3</sup>	Material *	Remarks
0-300	3/1 104R	3/6 104R	2			SILT	TOPSOIL, ROSTLETSA
300-500	5/4 104R	6/8 10MB # 10MB	ζ2			CHAMEN	DRY, LOW PLASTICITY
	charts; <sup>2</sup> Use size class: Lindicators:	es, <sup>3</sup> Ped face, pore, wit				The state of the s	ral soil circle appropriate):

-					
<sup>1</sup> Use% area charts; <sup>2</sup> Use size classes <b>Hydric soil indicators:</b>	; <sup>3</sup> Ped face, pore, within ped al	long roots, within matr			l soil rcle appropriate):
Organic layers: Co Organic soil material Litter Fibric Mesic Co Humic Peaty topsoil Peaty subsoil  Hydric soils present?  Primary hydrology indicat Surface water (1A) Groundwater <30 cm (1B) Soil saturation <30 cm (1C) Water marks (2A)	Algal mat/crust (2l Iron deposits (2E) Surface soil cracks Inundation on aeri	Colours: profile form Crey OR Mottled Horizon: Reductimorphic Redox mottled Redox segregati Perch-gley featu UNCERTA ired; check all box (2F) (2F)	wa either:  Wa Hig Par Lay lors Sloures  Es that apply  Aquatic i Hydrogei Oxidised Reduced	ation. Depression ter table. Depth(in) h.G.W. Perched. Sins. Depth (cm.) h. Humus Fe-pan ers: Depth (cm.) w. perm. argillic. Pugged  NZSC subgro  nvertebrates (2J) in sulphide odour (inhizosphere on roliron (3C)	Flat Valley Gully Slope  cm)  Seepage Tidal Lithic  Densi- Duri- Fragi Ortstein  up  3A)  bots (38)
Sediment deposits (2B) Drift deposits (2C)	Sparsely vegetated Salt crust (21)	d concave surface (2H)	The transfer	iron in tilled soil ( er table stunted/s	3D) tressed plants (4A)
Secondary hydrology indica  Water-stained leaves (2K)  Drainage patterns (2L)  Dry-season water table (3E)  Saturation in aerial imagery (3	Geomorphic Shallow aqu	c position (48) litard (4C) test (4D) hummocks (4E)	FAC-neutral test 1. No. OBL & FA 2. No. FACU & U 3. Total	(4D), refer to Sed CW dominant spec PL dominant spec	(B) (A+B)
Wetland hydrology present?	YES 🗍	NO 🗸	4. FAC-neutral (	>50%)	(A/A+B)*100
Sketch of site/soil:	The state of the s	STREAM	M M		
Remarks (6.5L 12	:09pm 20cm				

Profile description. (Describe to the depth needed to confirm indicator presence/absence, 30 cm default)

Depth (phn)(1	↑ Matrix colour (moist)	Mottles colour (maist)	Mottles %	Mottles Size <sup>2</sup>	Mottle location <sup>3</sup>	Material*	Remarks
0-200	3/2 104R	6/6 104R	15		BOHOM OF TOPSOIL	SILT	TOPSOIL, DRY
200-400	7/8 1048	7/8 104R	10		LAYER	CLAMEM	DRY MODERATE PLASTICITY
				***************************************			

<sup>1</sup> Use% area charts; <sup>2</sup> Use size classes; <sup>1</sup> Ped face, pore, within ped along roots, within matrix, <sup>4</sup> Organic (peaty), humic, mineral soil
Hydric soil indicators: Soil drainage (circle) W MW   P VP Cause of wetness (circle appropriate):
Location Depression Flat Valley Gully Slope
Organic layers: Concretions: Colours: profile form either: Water table Depth (cm)
Litter Manganese concretions Mottled High GW Perched Seepage Tidal Lithic
Fibric Nodular Horizon: Pans Depth(cm)
Mesic Consistence: Reductimorphic Pan Humus Fe-pan Densi- Duri- Fragi Ortstein
Humic Plastic Redox mottled Layers Depth (cm)
Peaty topsoil Sticky Redox segregations Slow-perm argillic
Peaty subsoil   Fluid   Perch-gley features   V Pugged
Hydric soils present? YES NO UNCERTAIN NZSC subgroup
Primary hydrology indicators: minimum of 1 required; check all boxes that apply
Surface water (1A) Algal mat/crust (2D) Aquatic invertebrates (2J)
Groundwater < 30 cm (1B) Iron deposits (2E) Hydrogen sulphide odour (3A)
Soil saturation <30 cm (1C) Surface soil cracks (2F) Oxidised rhizosphere on roots (38)
Water marks (2A) Inundation on aerial imagery (2G) Reduced iron (3C)
Sediment deposits (2B)  Sparsely vegetated concave surface (2H)  Reduced iron in tilled soil (3D)
Drift deposits (2C) Salt crust (2I) High water table stunted/stressed plants (4A)
Secondary hydrology indicators: minimum of $\underline{2}$ required; check all boxes that apply
Water-stained leaves (2K) Geomorphic position (4B) FAC-neutral test (4D); refer to Section B. Vegetation
Drainage patterns (2L) Shallow aguitard (4C) 1. No. OBL & FACW dominant spedes (A)
Dry-season water table (3E) FAC-neutral test (4D) 2. No. FACU & UPL dominant species (B)
Saturation in aerial imagery (3F) Frost-heave hummocks (4E) 3 Total (A+B)
4. FAC-neutral (>50%)(A/A+B)*100
Wetland hydrology present? YES V NO
Sketch of site/soil:
COLVO
WATER WATER
+ W W
I-12
The state of the s
SITE
311%
Remarks 17L 13:03pm 15cm BELOW GROUND LEVEL SMALL AREA OF
Moss or
13:38pm 20cm BELOW GROWD LEVEL TOPSOIL.
15:17pm 24cm BELOW GROUND LEVEL

Profile description: (Describe to the depth needed to confirm indicator presence/absence, 30 cm default)

Depth (DM)	Matrix colour (moist)		Mottles colour (moist)		Mottles %1	Mottles Size <sup>1</sup>	Mottle location	Material*	Remarks
0-200	412	loye	36	IOYR	10			Topsoil, Silt on-clay	Moist, some-plastic
200-300	5/2	1045	7/8	1045	5			ClayeySilt	Dry mod-Dlastic
300-1000	7/1	loyp	718	1018	5			ClayeySilt	Dry, mod-plastic

300-1000	7/1	loyp	718	LOYE	5					ClayeySilt	Dadio	nod-plastic
										9	0	
						↓						
			L							L	L	
			s, 'Ped face,	pore, with	in ped alor	ng roots, v	vithin m	natrix, "Org		y), humic, minera		
Hydric soil	indica	tors:	Soil drainag	ge (circle)	N MN I	P VP				se of wetness (ci		
Organic laye	rs:	Co	oncretions:			Colours: p	rofile fo	orm either	:	ation Depression		Gully Stope
Organic	soil mat	erial [	] iron cond	retions	[	Gley	OR			ter table Depth (		an areas
Litter			Mangane	se concret	ions [	Mott	led			h GW Perched		ai Uthic
Fibric			Nodular			Horizon:				s Depth(an)		
Mesic		C	onsistence:		[	Redu	ctim or p	phic		Humus Fe-pan		Fragi Ortstein
Humic		L	Plastic		[	Redo	x mottle	ed		ers Depth (am) _	-	
Peaty to	psoil		Sticky		[	Redo	xsegre	gations	Slo	w perm argillic		
Peaty s	ubsoil	L	Fluid		[	Perch	-gleyfe	atures		Pugged		
11			VEC (				INICER	TAIN [		N7CC cubara		
Hydric soil	s prese	ntr	YES 🗸	N			UNCER	CIAIN		NZSC subgro		
Primary	hydro	logy indica	tors: mini	mum of	1 require	ed; chec	k all b	oxes tha	t apply			
		* 41		011	(			_	LAmintie	nuarrahratar (21)		
NUMBERS.	e water (		-		/crust (2D)			usemana		nvertebrates (2J) is sulphide odour	(34)	
TOTAL PROPERTY.		30 cm (1B)		Iron depo		(E)		-	/	rhizosphere on ro		
CONCESSION		<30 cm (1C)			oil cracks (2 n on aerial		261	~	Reduced		10(3 (30)	
more man	marks (2 ent depo				regetated o			H-1		iron (SC) iron in tilled soil i	30/	
page 1	eposits (			Salt crust		OTTOM VE SE	nace (x					r. (46)
Drift o	eposis (	20)		Jak trust	(21)		UMBOO NAMED OF THE OWNER, OR OTHER DESIGNATION OF THE OWNER, OWNE		High Wat	er table stunted/	stressed plan	(2 (dec)
Secondary	hydro	ology indica	itors: min	imu m o f	2 requir	ed; ched	k all b	oxes th	at apply			
[]Water	ctained i	leaves (2K)		The	omorphic p	ocition (A	R.	FAC-ne	eutral test	(4D), refer to Sec	tionB Veget	ation
annual .	ge patter			a becomes a	flow aquit		0)			CW dominant spe		(A)
processor .		ter table (3E)		The same of the sa	G-neutral te			2. No.	FACU & U	PL dominant spec	ies	(B)
Constant of the last of the la		erial imagery (	3E)	The same of the sa	st-heave h		(AF)	3 Tota	el			(A+B)
Jacola	Libitiitae	. Har Hilagely (	517		Strice of	GITHITOCHS	(-16)	4 FAC	-neutral (>	50%		(A/A+B)*100
**************************************	water the same of		· · · · · · · · · · · · · · · · · · ·	_/	in the same of the							
Wetland h	ydrolo	gy present?	? YES	s 🔽			NO (					
Sketch of site	e/soil		( )	H-CONTROL CONTROL CONT	#1000.600 000.000 000.0000	T.			***************************************			
JACTON SIL	C) 2011.	C	ulvert	1								
				)		1						
			A.	W/		Var V	U					
		1.0	V	4		W						
		`	~~	0_			~	•				
			~~~	~~		~	<i>/</i> ~					
			W	W/:	Site	W	W					
			W	. /	1	1						
			4.			1	W					
						1						
Remarks	161	01	17.1	^	200	۸۸۸-	h. 1			The second second		
	15 L	. at					bol					
			13.4	0,	200	WW	bgl					
			15:	16	210	MM	bal					
L					***************************************		U					

#### SECTION C - SOIL AND HYDROLOGY Profile description. (Describe to the depth needed to confirm indicator presence/absence, 30 cm default) Remarks Mottles Mottle location Material " Matrix colour Mottles colour Depth Mottles (maist) (IOYR) Size (mm) (maist) 34 5 1 3/6 0-200 Topsoil 5 Dry, Mod-plastic 200-400 2/1 Moist, high-Plastic 400-1000 Use% area charts, 'Use size classes, 'Ped face, pore, within ped along roots, within matrix, 'Organic (peaty), humic, mineral soil Hydric soil indicators: Cause of wetness (circle appropriate): Soil drainage (circle) W MW I P VP Location Depression Flat Valley Gully Slope Organic layers: Concretions: Colours: profile form either: Water table Depth (cm) \_\_\_\_ Organic soil material iron concretions Gley OR High GW Perched Seepage Tidal Lithic Litter Manganese concretions ✓ Mottled Pans Depth (cm)\_\_\_ Fibric Nodular Horizon: Pan Humus Fe-pan Densi- Duri- Fragi Ortstein Mesic Consistence: Reductimorphic Layers Depth (cm) Plastic Humic Redox mottled Slow perm argillic Peaty topsoil Sticky Redox segregations Pugged Peaty subsoil Fluid Perch-gleyfeatures Hydric soils present? YES NO UNCERTAIN NZSC subgroup Primary hydrology indicators: minimum of 1 required; check all boxes that apply Surface water (1A) Algal mat/crust (2D) Aquatic invertebrates (2J) Hydrogen sulphide odour (3A) Groundwater < 30 cm (1B) Iron deposits (2E) Oxidised rhizosphere on roots (38) Soil saturation < 30 cm (10) Surface soil cracks (2F) Water marks (2A) Inundation on aerial imagery (2G) Reduced iron (3C) Sparsely vegetated concave surface (2H) Sediment deposits (2B) Reduced iron in tilled soil (3D) Drift deposits (2C) Salt crust (21) High water table stunted/stressed plants (4A) Secondary hydrology indicators: minimum of 2 required; check all boxes that apply FAC-neutral test (4D), refer to Section B. Vegetation Water-stained leaves (2K) Geomorphic position (4B) 1 No OBL& FACW dominant species (A) Drainage patterns (2U) Shallow aguitard (4C) 2. No FACU & UPL dominant spedies \_\_\_\_(B) Dry-season water table (3E) FAC-neutral test (4D) 3 Total (A+B) Saturation in aerial imagery (3F) Frost-heave hummocks (4E) (A/A+B)\*100 4. FAC-neutral (>50%) YES V NO Wetland hydrology present? Sketch of site/soil Jesse Ve Me Remarks GW at 0.9 mbgl 15L at 14:35, 200mm from ground level

Profile descrip	otion. (Describe to the	e depth needed to con	firm indicate	or presence/ab	sence, 30 cm default)	,	
Depth (mm)	Matrix colour (moist) <b>(lo/g)</b>	Mottles colour (maist)	Mottles %1	Mottles Size <sup>1</sup>	Mottle location <sup>3</sup>	Material*	Remarks
1-0-200	4/1	3/4	10			Topsoil,	Dry rootlets
00-1000	416	-	-			Clayeysilt (Fill)	Gravels at 0.7, der
	The same of the sa	es; <sup>3</sup> Ped face, pore, wi	thin ped alon	g roots, within	matrix, 'Organic (pea		
tydric soil	indicators:	Soil drainage (circle)	W MW I	P VP			rcle appropriate):
Organic laye	rs: C	oncretions:	(	olours: profile	form either:		Flat Valley Gully Slope
Organic	soil material	Iron concretions		Gley OR		ater table Depth (	om) Seepage Tidal Lithic
Litter	Ĺ	Manganese concr	etions [	✓ Mottled			
Fibric	L	Nodular	+	torizon:		ns Depth(an)	Densi- Duri- Fragi Ortstein
Mesic	C	onsistence:	Ĺ	Reductimo	orphic		
Humic	Ļ.	Plastic	-	Redox mat	area e	yers Depth (am) _	**************************************
Peaty to	-	Sticky	}	Redox seg Perchigley	regotions	w perm argillic Pugged	
			10 П		ERTAIN		oup
		L					
Primary	hydrology indica	tors: minimum o	f <u>1</u> require	d; check all	boxes that apply		
Surface	e water (1A)	Algal ma	t/crust (2D)		Aquatic	nvertebrates (2J)	
Ground	dwater < 30 cm (1B)	SATISFACE CO.	osits (2E)		Hydroge	n sulphide odour	(3A)
Soil sat	turation <30 cm (1C)	Account of	soil cracks (2	F)	Oxidised	rhizosphere on ro	oots (38)
Water	marks (2A)	Toronto and a second		imagery (2G)	Reduced	liron (3C)	
manage and	ent deposits (2B)			oncave surface	(2H) Reduced	liron in tilled soil (	(3D)
angenting.	eposits (2C)	Salt crus	-				stressed plants (4A)
econdary	hydrology indica	ators: min imu m o	f 2 require	ed; check al	l boxes that apply	1	
	stained leaves (2K)		eomorphic p		£		tionB Vegetation
annunture.		ļ			The same and the s		edes(A)
processes.	ge patterns (2L) ason water table (3E)	Samuel Control of the	nallow aquita AC-neutral te		1	IPL dominant spec	1
	, ,	PHASE PARTY NAME OF THE PARTY			3 Total		(A+B)
Saturat	don in aerial imagery i	(3F)	ost-heave nu	ımmocks (4E)	4. FAC-neutral (	V60961	(A/A+B)*100
		/		and the second second	4. FACTIEUTIAI (	/ 30/6/	[77 7.0]
Vetland h	ydrology present	? YES ✓		NO			
Sketch of site	e/soil: Small of	lam/		Pond.	Site.		
	K	1		1	1		
		1	1	~	~ · ·		
	Sit	0					
1	~~						
- 1	~   \	Stope					
(	~ / V	1					WXV
,		1				*	WALLEY W W
							TV W
Remarks							
							· ·

(mm)		ix colour naist)		es colour noist)	Mottles %1	Mottles Size <sup>1</sup>	Mottle locatio		Remarks
-300	4/2	7.5 m	4/6	7.5 YR				Topsoil,	Dry, mod - plastic
00-1000	616	IOYR	7/1	LOYR					Dry, mod-plastic
		***************************************	1						
100% 2024	harte. 31	sa ciza classo	ac Dedfa	ce pore wit	hin ned alor	a roots within	matrix Organic	(peaty), humic, mine	ral soil
lydric soil	and the same of the same of the same of		F	nage (circle)	Partie months		indina, organic	The state of the s	circle appropriate):
) Organic laye	rs:	C	oncretion			Colours: profile	form either:	Location Depression	n Flat Valley Gully Slope
	soil mate			oncretions	Ì	Gley OR	TOTAL CREATE	Water table Depth	(am)
Litter		Ī	Manga	anese concre	tions	Mottled			Seepage Tidal Lithic
Fibric		[	Nodul	ar	1	dorizon:		Pans Depth(cm)_	
Mesic		C	onsistenc	e:	(	Reductimo	orphic		Densi- Duri- Fragi Ortstein
Humic		Ļ	Plastic		[	Redox mot		Layers Depth (cm)	
Peaty to		}	Sticky		ļ	Redox seg		Slow perm argillic	
Peaty st	absoil	L	Fluid		l	Perch-gley	features	Pugged	
ydric soils	s preser	it?	YES V	N	o 🗌	UNC	ERTAIN	NZSC subgr	oup
Primary	hydrok	ogy indica	tors: mi	nimum of	1 require	d; check all	boxes that ap	ply	
			Г	***************************************					
manus (	e water (1		ļ.,	AND DESCRIPTION OF THE PERSON	/crust (2D)			atic invertebrates (2) rogen sulphide odour	
money		30 cm (1B) 30 cm (1C)	Ļ	Iron depo	oil cracks (2	E1	mount	ised rhizosphere on	
annessed.	marks (24		-	and the same of th		imagery (2G)	***************************************	uced frazosphere on	0003 (30)
MONTH OF THE PARTY	ent depos		F	and the same of th		oncave surface	mount	uced from in tilled soil	(3D)
and the same of	eposits (2			Salt crust				water table stunted	
			ators: m	in imu m o	2 require	ed: check al	boxes that a		
			a(0)3. III	/				test (4D), refer to Se	ction B Vegetation
Demons	stained le					osition (48)		& FACW dominants	
		15 (2L)		and the same of th	allow aquita			& UPL dominant spe	
		r table (3E)	/ DE \	-	C-neutral te	ummocks (4E)	3 Total	U 012 001111-0111 1p.	(A+B)
Saturat	.ioninaei	rial imagery	(50)		ist-neave n	ammocks (4c)	4. FAC-neut	rat (>50%)	(A/A+B)*100
Name and Address of the Owner, where					*				
Wetland h	ydrolog	y present	? /	res 🗸		NO		13.00	
ketch of site	e/soil:					*X		THE	
				site		A		Ŷ	
				1		Gorse		Gate	
V	vater			4		010176	-	- Wille	
	A		,	WW					
Colonia Colonia	~~	~	AM	WWW Y					

rofile descri	ption. (De	scribe to the	depth needed	to confirm indicate	or presence/ab	sence, 30 cm default)		
Depth (De)	Matri	ix colour	Mottles co	our Mottles	Mottles	Mottle location	Material*	Remarks
(mm)	(m	noist)	(maist)	96 3	Size			
-150	3/2	ioye	-	-			Topsoil,	Dry, Friable
50-400	14/2	IOYR	_	_			Silt	Dry Frake
20.400	-112	101/2					Minor clay	J. Triance
Jse% area o	harts: 'Us	se size classe	s; <sup>1</sup> Ped face, po	ore, within ped alor	ng roots, within	matrix, *Organic (pea	ty), humic, miner	alsoil
tydric soi	and the second second	and the latest section of the latest section in the latest section		(circle) W MW I	AND DESCRIPTION OF THE PERSON		the state of the s	ircle appropriate):
Organic laye	erc ·	C	oncretions:		Colours: profile	form either:	ation Depression	n Flat Valley Gully Slope
	soil mate	r	Iron concre	-	Glev OR	Wa	ter table Depth I	(cm)
Litter	301111010	ene	THE STATE OF THE S	concretions [	Mottled	Hig	h GW Perched	Seepage Tidal Lithic
Fibric			Nodular	L	Horizon:	Par	ns Depth(cm)_	
Mesic		Co	onsistence:	ľ	Reductimo	orphic Par	Humus Fe-pan	Densi- Duri- Fragi Ortstein
Humic			Plastic	ř	Redox mot		ers Depth (cm)	Name (SA) (SA) (SA)
Peaty to	opsail	F	Sticky	ŀ	Redox seg		w perm argillic	
Peatys			Fluid /		Perch-gley		Pugged	
ydric soil	s preser	nt?	YES 🗸	NO	UNC	ERTAIN	NZSC subgro	oup
Primary	hydrok	ogy indicat	ors: minim	ım of <u>1</u> require	d; check all	boxes that apply		
		4)				C Amustici	overtebrater (31)	
COMPANY.	e water (1		Transport .	gal mat/crust (2D)			nvertebrates (2J) n sulphide odour	
DESCRIPTION OF THE PERSON OF T		0 cm (1B)		on deposits (2E)	r.	THE PARTY OF THE P		
DECEMBER 1		30 cm (1C)	Comments of the Comments of th	irface soil cracks (2		and a second	rhizosphere on re	0015 (00)
DESCRIPTION	marks (2A			undation on aerial		monan	iron (3C)	
STATE OF THE PARTY	ent depos		amount .	arsely vegetated c	oncave surface		iron in tilled soil	
Drift d	eposits (2)	C)	S;	elt crust (2I)		High wat	er table stunted/	stressed plants (4A)
econdary	hydrol	logy indica	tors: min im	um of <u>2</u> require	ed; check all	boxes that apply		
Water-	stained le	aves (2K)		✓ Geomorphic p	osition (4B)	FAC-neutral test	(4D), refer to Sec	ctionB Vegetation
Draina	ge pattern	is (2L)		Shallow aguita		1. No. OBL& FA	CW dominant sp	edes(A)
Control of the Contro		r table (3E)		FAC-neutral te		2. No. FACU & U	PL dominant spe	des(B)
Saturat	doninaer	ial imagery (	3F)	Frost-heave hi	ummocks (4E)	3 Total		(A+8)
				/		4. FAC-neutral (	50%)	(A/A+B)*100
vetland h	ydrolog	y present?	YES	1	NO			
ketch of site	e/soil:	Carlos.	6 6				CONTRACTOR OF THE CONTRACTOR O	
	-	THE STATE OF	a- Gorse	,				
		The same						
		A	Site					
		\	\ / .					
			MANE	1.31	afer			
			13/2	000	rece			
			A	. 4				
			Gorse	Why you	W-W			
			20176					
lemarks _	71	at	13:00	300 mm	bal			
1.2	- 1	, 1	3:10,	400 mm	bgl			
4	V)	a. de	1 1 2	200	1 4			

Profile description (Describe to the depth needed to confirm indicator presence/absence, 30 cm default) Remarks Mottle location Material\* Matrix colour Mottles Mottles Depth (pn) Mottles colour Size: (maist) (maist) Saturated His, liozgoT 0-150 LOYR 7.5 YR 150-600 618 20 1042

Saturated, high plastic Use% area charts, 'Use size classes, 'Ped face, pore, within ped along roots, within matrix, 'Organic (peaty), humic, mineral soil Hydric soil indicators: Cause of wetness (circle appropriate): Soil drainage (circle) W MW I P VP Location Depression Flat Valley Gully Slope Colours: profile form either: Organic layers: Concretions: Water table Depth (cm) \_ Organic soil material iron concretions Gley OR High GW Perched Seepage Tical Lithic Manganese concretions Litter Mottled Pans Depthion I\_\_\_\_ Fibric Nodular Pan Humus Fe-pan Densi Duri- Fragi Ortstein Consistence: Mesic Reductimorphic Layers Depth (cm) Plastic Humic Redox mottled Slow perm argillic Stricky Peaty topsoil Redox segregations Pugged Peaty subsoli Fluid Perchigley features UNCERTAIN NZSC subgroup Hydric soils present? YES NO Primary hydrology indicators: minimum of 1 required; check all boxes that apply Aguatic invertebrates (2J) Algal mat/crust (2D) Youndwater < 30 cm (1B) Hydrogen sulphide odour (3A) Iron deposits (2E) Oxidised rhizosphere on roots (38) Soil saturation < 30 cm (1C) Surface soil cracks (2F) Reduced iron (3C) Water marks (2A) inundation on a erial imagery (2G) Sediment deposits (2B) Sparsely vegetated concave surface (2H) Reduced iron in tilled soil (3D) Drift deposits (2C) Salt crust (21) High water table stunted/stressed plants (4A) Secondary hydrology indicators: minimum of 2 required; check all boxes that apply FAC-neutral test (4D), refer to Section B. Vegetation Water-stained leaves (2K) Geomorphic position (48) 1 No OBL & FACW dominant species Drainage patterns (2L) Shallow aguitard (40) (B) 2 No FACU & UPL dominant species Dry-season water table (3E) PAC-neutral test (4D) 3 Total (A+6) Saturation in aerial imagery (3F) Frost-heave hummocks (4E) (A/A+B)\*100 4 FAC-neutral (>50%) NO Wetland hydrology present? YES V Sketch of site/soil Remarks Water table at surface. Infiltration test not possible.

#### SECTION C - SOIL AND HYDROLOGY Profile description. (Describe to the depth needed to confirm indicator presence/absence, 30 cm default) Remarks Depth (50) Mottle location Material\* Matrix colour Mottles colour Mottles Mottles (mm) (maist) Size (maist) Forsoit, Sill (liozgo] 0-150 4/1 LOYR Moist rootlets 150-450 5/1 IOYR Use% area charts; 'Use size classes, 'Ped face, pore, within ped along roots, within matrix, 'Organic (peaty), humic, mineral soil Hydric soil indicators: Cause of wetness (circle appropriate): Soil drainage (circle) W MW I P VP Location Depression Flat Valley Gully Slope Concretions: Organic layers: Colours: profile form either: Water table Depth (cm) \_\_\_ Organic soil material iron concretions Gley OR High GW Perched Seepage Tidal Lithic Litter Manganese concretions Mottled Pans Depth (cm )\_\_\_\_\_ Fibric Nodular Horizon: Pan Humus Fe-pan Densi- Duri- Fragi Ortstein Mesic Consistence: Reductimorphic Layers Depth (cm) Humic Plastic Redox mottled Slow perm argillic Peaty topsoil Sticky Redox segregations Pugged Peaty subsoil Fluid Perchigley features Hydric soils present? NO UNCERTAIN NZSC subgroup Primary hydrology indicators: minimum of 1 required; check all boxes that apply Surface water (1A) Algal mat/crust (2D) Aquatic invertebrates (2J) Groundwater < 30 cm (1B) Iron deposits (2E) Hydrogen sulphide odour (3A) Soil saturation <30 cm (1C) Surface soil cracks (2F) Oxidised rhizosphere on roots (38) Water marks (2A) Reduced iron (3C) Inundation on aerial imagery (2G) Sediment deposits (2B) Sparsely vegetated concave surface (2H) Reduced iron in tilled soil (3D) Drift deposits (2C) Salt crust (2I) High water table stunted/stressed plants (4A) Secondary hydrology indicators: minimum of 2 required; check all boxes that apply FAC-neutral test (4D), refer to Section B Vegetation Water-stained leaves (2K) Geomorphic position (4B) 1 No OBL & FACW dominant species Drainage patterns (2L) Shallow aguitard (4C) 2. No FACU & UPL dominant species (B) Dry-season water table (3E) FAC-neutral test (4D) 3 Total (A+8) Saturation in aerial imagery (3F) Frost-heave hummocks (4E) (A/A+B)\*100 4. FAC-neutral (>50%) Wetland hydrology present? YES V NO Sketch of site/soil at 15:25, 50mm bgl 15:37, 70mm bgl 15:51, 90mm bgl Remarks

#### SECTION C - SOIL AND HYDROLOGY Profile description. (Describe to the depth needed to confirm indicator presence/absence, 30 cm default) Mottle location' Material\* Remarks Mottles colour Mottles Mottles Matrix colour Depth (pm) Size (maist) (maist) 15-20 Topsoil, silt 7.542 0-300 LOYR 2 300-900 5/2 104R 614 7.5 YR Use% area charts; <sup>2</sup>Use size classes; <sup>1</sup>Ped face, pore, within ped along roots, within matrix, <sup>4</sup>Organic (peaty), humic, mineral soil Hydric soil indicators: Cause of wetness (circle appropriate): Soil drainage (circle) W MW I P VP Location Depression Flat Valley Gully Slope Concretions: Organic layers: Colours: profile form either: Water table Depth (cm) Organic soil material Iron concretions Glev OR High GW Perched Seepage Tidal Lithic Manganese concretions Mottled Litter Pans Depth (om )\_\_\_ Fibric Nodular Pan Humus Fe-pan Densi- Duri- Fragi Ortstein Consistence: Mesic Reductimorphic Layers Depth (cm) Plastic Humic Redox mottled Slow perm argillic Sticky Peaty topsoil Redox segregations Pugged Peaty subsoil Fluid Perch-gley features NZSC subgroup UNCERTAIN Hydric soils present? YES NO Primary hydrology indicators: minimum of 1 required; check all boxes that apply Aquatic invertebrates (2J) Syrface water (1A) Algal mat/crust (2D) Groundwater < 30 cm (1B) Iron deposits (2E) Hydrogen sulphide odour (3A) Oxidised rhizosphere on roots (38) Soil saturation <30 cm (10) Surface soil cracks (2F) Reduced iron (3C) Water marks (2A) inundation on aerial imagery (2G) Sediment deposits (2B) Sparsely vegetated concave surface (2H) Reduced iron in tilled soil (3D) Drift deposits (2C) Salt crust (21) High water table stunted/stressed plants (4A) Secondary hydrology indicators: minimum of 2 required; check all boxes that apply FAC-neutral test (4D), refer to Section B Vegetation Water-stained leaves (2K) Geomorphic position (48) \_\_\_(A) 1. No. OBL & FACW dominant species Drainage patterns (2L) Shallow aguitard (4C) 2. No. FACU & UPL dominant species (B) FAC-neutral test (4D) Dry-season water table (3E) 3 Total \_\_(A+B) Saturation in aerial imagery (3F) Frost-heave hummocks (4E) (A/A+B)\*100 4. FAC-neutral (>50%) YES V NO Wetland hydrology present? Sketch of site/soil Site W M W W W X Worter Remarks Substantial core loss on anger 18 L at 10:50, 150 nm bgl (1:19, 150 nm bgl 16:15, 150 nm bgl. Seepage into hole, see photos.

		SECTIO	ON C -	SOIL AN	ND HYDROL	OGY					
Profile descri	ption: (Describe to the	e depth needed to cor	nfirm indicate	or presence/ab	sence, 30 cm default)						
Depth (pn)	Matrix colour (moist)	Mottles colour (moist)	Mottles %1	Mottles Size <sup>2</sup>	Mottle location <sup>3</sup>	Material <sup>4</sup>	Remarks				
0-200	4/2 10 YR	5/6 104R	5			Topsoil, Silt	Moist, Sticky				
200-400	5/1 1042	3/4 LOYR	40								
<u></u>		<u> </u>									
Hydric soi	I indicators:	Soil drainage (circle	W MW I	P VP							
	_		(		form either:						
	soil material		etions [								
-	}		L								
Mesic	C		ŗ		rphic Par	Humus Fe-pan	Densi- Duri- Fragi Ortstein				
Humic		Plastic	ì			ers: Depth (cm) _					
Humic											
Peaty s	ubsoil	Fluid	(	Perch-gley	features	Pugged					
Hydric soil	s present?	YES 🔽 I	NO	UNC	RTAIN	NZSC subgro	oup				
Primary	hydrology indica	tors: minimum o	f <u>1</u> require	d; check all	boxes that apply						
Groun Soil sa	dwater <30 cm (1B) turation <30 cm (1C)	Iron dep	osits (2E) soil cracks (2		Hydroge Oxidised	n sulphide odour ( rhizosphere on ro	7 (7)				
							30)				
			77	2710012 2011012							
Secondary	hydrology indica	ators: min imu m o	f 2 require	ed; check all	boxes that apply						
Water-	stained leaves (2K)	NG	eomorphic p	osition (48)	FAC-neutral test	(4D); refer to Sec	tion B: Vegetation				
					1. No. OBL & FA	CW dominant spe	edes(A)				
Dry-sea	Soil drainage (circle) W MW   P VP   Cause of wetness (circle appropriate):										
Satura	tion in a erial imagery (	(3F) F	ost-heave hu	ummocks (4E)							
(maid)  (maid)											
Wetland h	ydrology present	? YES ✓		NO			100 A 1				
Sketch of site	e/soil:	Site	W		Fo	nce	Site Waste				
Remarks:	GW at 3	50 nm, S	eepage	at 2	town after	r 5 mins					
1	3L at	12:03.20	DOMM	bal							
'		12:34,20	Onn	bal							
L		12.77.71	Dana	bal							



## **Appendix C. Hydrology Tool Indicator Table**

Indicator	Group 1:															m other site conditions or data										
	1A: Surface water	1B: Ground- water	1C: Soil saturation	2A: Water marks	2B: Sediment deposits	2C: Drift deposits	2D: Agal mat or crust	2E: Iron deposits	2F: Surface soil cracks	2G: Inundation visible on aerial imagery	2H: Sparsely vegetated concave surface	2I: Salt crust	2J: Aquatic invert- ebrates	2K: Water- stained leaves	2L: Drainage patterns	3A: Hydrogen sulphide odour	3B: Oxidised rhizo-spheres along living roots	3C: Red- uced iron	3D: Recent iron reduction in tilled soils	3E: Dry-season water table	3F: Saturation visible on aerial imagery	4A: Stunted or stressed plants	4B: Geo-morphic position	4C: Shallow aquitard	4D: Facul- tative- neutral test	4E: Frost- heave humm-ocks
Prir	n. ✓	✓	✓	<b>✓</b>	✓	<b>✓</b>	<b>✓</b>	✓	<b>✓</b>	✓	✓	✓	<b>√</b>	<b>✓</b>		✓	✓	<b>✓</b>	<b>✓</b>			✓				
Site Sec	i.													<b>✓</b>	<b>✓</b>					✓	<b>✓</b>		✓	✓	✓	<b>√</b>
1	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	✓	×	×	×	×	×	✓	×	×	×
2	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	✓	×	×	×
3A	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	✓	×	×	×	×	×	✓	×	×	×
3B	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	<b>√</b>	×	×	×	×	×	×	×	×	×
4	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	✓	×	×	×
5	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	<b>√</b>	×	×	×
6	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	✓	×	×	×
7	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	<b>√</b>	×	×	×	×	×	✓	×	×	×
8	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	<b>√</b>	×	×	×	×	×	×	×	×	×
9	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	✓	×	×	×
10A	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×
10B	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×
10C	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	✓	×	×	×	×	×	×	×	×	×
11	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	✓	×	×	×	×	×	✓	×	×	×
12	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	✓	×	×	×	×	×	×	×	×	×
13	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	✓	×	×	×	×	×	×	×	×	×
14	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	✓	×	×	×	×	×	✓	×	×	×
15A	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	<b>√</b>	×	×	×	×	×	✓	×	×	×
15B	✓	<b>√</b>	✓	×	×	×	×	×	×	×	×	×	×	×	×	×	×	<b>✓</b>	×	×	×	×	×	×	×	×
15C	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	<b>√</b>	×	×	×	×	×	✓	×	×	×
16A	×	<b>√</b>	×	×	×	×	×	×	×	×	×	×	×	×	×	×	<b>√</b>	×	×	×	×	×	×	×	×	×
16B	×	×	✓	×	×	×	×	×	×	×	×	×	×	×	×	×	✓	✓	×	×	×	×	✓	×	×	×