

## APPENDIX 2: Groundwater Management Regions

**Table 1. Groundwater management regions of the Study Islands**

Study Island	Groundwater Region Name	Groundwater Region ID	Groundwater Region Area (km <sup>2</sup> )	Total Area (km <sup>2</sup> )	GW Region Count
Denman Island	BOYLE	BL	2.38	51.58	11
	HENRY	HY	3.84		
	HORNBY_1	H1	1.12		
	HORNBY_2	H2	3.60		
	KOMAS	KS	8.32		
	CENTRAL	CL	11.14		
	SOUTH	SU	1.33		
	DENMAN_1	D1	5.43		
	DENMAN_2	D2_2	5.64		
	GRAHAM LAKE	GL	5.63		
	The MADDIGAN	MN	3.15		
Hornby Island	Dunloo Point	DP	6.97	29.92	7
	Spray Point	SY	6.10		
	Shields Point	SL	4.50		
	Whaling Station Bay	WS	4.09		
	Maning Point	MP	2.90		
	Shingle Spit	SS	2.90		
	Norman Point	NP	2.50		
Gabriola Island	North Degnen Bay Region	ND	2.22	52.65	11
	West Degnen Bay	WD	2.77		
	Gabriola Region	GR	12.30		
	False Narrow Region	FN	6.18		

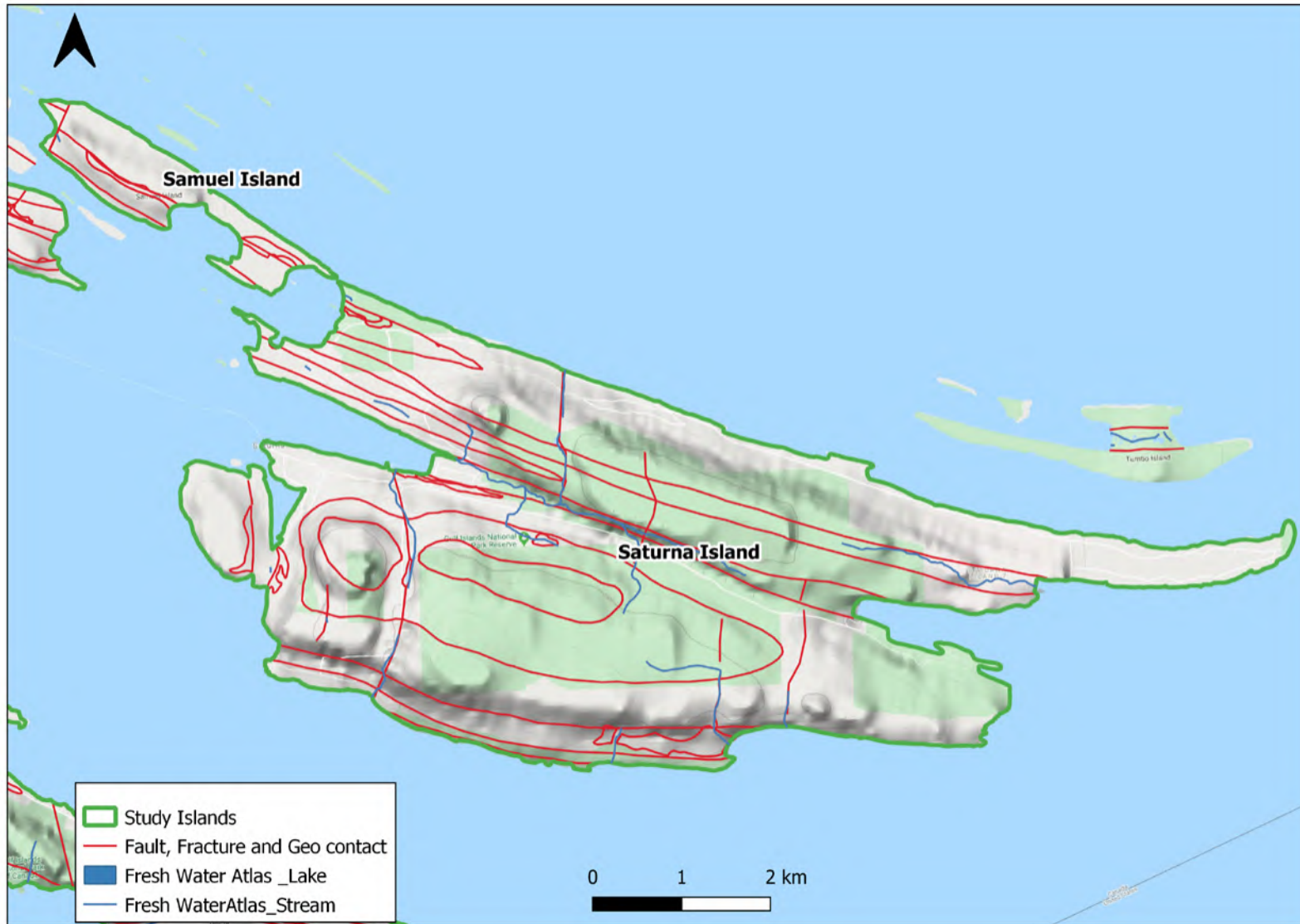
Study Island	Groundwater Region Name	Groundwater Region ID	Groundwater Region Area (km <sup>2</sup> )	Total Area (km <sup>2</sup> )	GW Region Count
	Lock Bay Region	LB	8.30		
	Hoggan Lake Region	HL	9.02		
	Sand Region	SR	3.65		
	Descanso Bay Region	DB	3.03		
	Northumberland Channel Region	NC	1.22		
	South Descanso Bay Region	SD	1.74		
	Silva Bay Region	SB	2.22		
Galiano Island	North Galiano Spanish Hills	GAL01	2.29	58.15	21
	Dionisio Point	GAL02	1.73		
	North Georgia Strait	GAL03	1.46		
	North Trincomali Channel	GAL04	4.66		
	West Galiano	GAL05	1.92		
	East Galiano	GAL06	3.63		
	Greig Creek	GAL07	2.38		
	Central Georgia Strait	GAL08	3.36		
	Quadra Hill East	GAL09	3.15		
	Quadra Hill West	GAL10	5.04		
	South Trincomali Channel	GAL11	1.07		
	Cook Cove	GAL12	3.23		
	Finlay Lake	GAL13	3.32		
	Montague Harbour	GAL14	3.17		
	Winstanley Point	GAL15	0.62		
	Sutil Mountain	GAL16	2.11		
	Georgeson Bay	GAL17	1.90		
	Matthews Point	GAL18	0.53		
	South Galiano	GAL19	3.75		
	Cain Peninsula	GAL20	0.54		
	Murchison- Whaler Bay	GAL21	8.29		
	South Pender I	SP01	2.69	9.12	4

Study Island	Groundwater Region Name	Groundwater Region ID	Groundwater Region Area (km <sup>2</sup> )	Total Area (km <sup>2</sup> )	GW Region Count
South Pender Island	South Pender II	SP02	3.80		
	South Pender III	SP03	0.48		
	South Pender IV	SP04	2.15		
North Pender Island	North Pender I	NP01	2.65	27.09	8
	North Pender II	NP02	7.95		
	North Pender III	NP03	2.34		
	North Pender IV	NP04	6.15		
	North Pender V	NP05	0.23		
	North Pender VI	NP06	2.00		
	North Pender VII	NP07	4.33		
	North Pender VIII	NP08	1.44		
Saturna Island	Boot Cove	SAT01	2.66	34.25	5
	Brown Ridge	SAT02	6.70		
	Lyall Harbour	SAT03	10.39		
	Narvaez Bay	SAT04	5.94		
	Tumbo Channel	SAT05	6.56		
Mayne Island	Navy Channel Westside	MAY06	3.00	23.36	7
	Navy Channel_Eastside	MAY07	0.86		
	Center1_East	MAY02	4.28		
	Center1_West	MAY03	3.91		
	Center2_East	MAY04	5.45		
	Center2_West	MAY05	2.04		
	Georgina Pt_Hall Hill North	MAY01	3.82		
Prevost Island	Prevost Island	PRE01	6.72	6.72	1



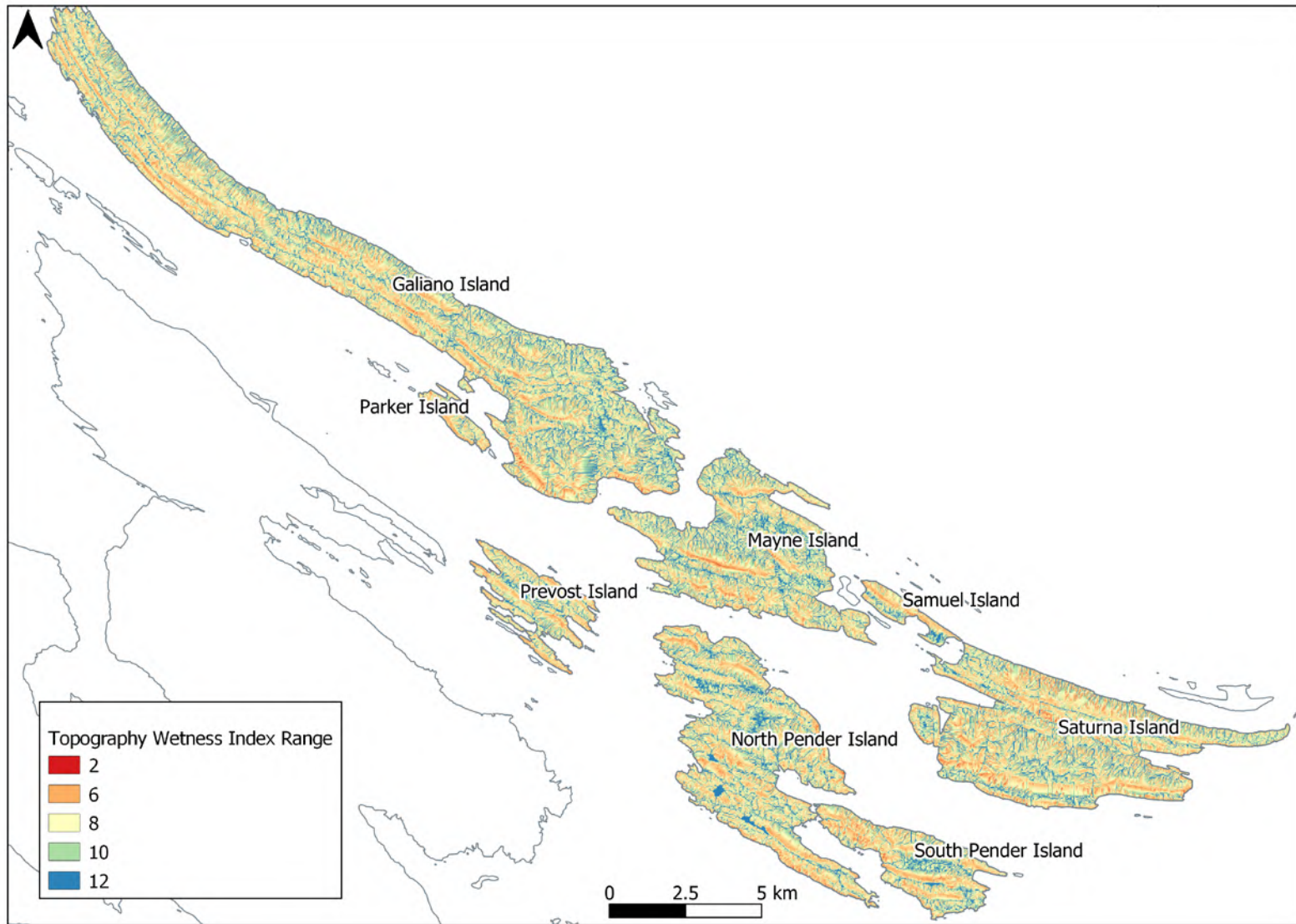
Saturna Island

## **APPENDIX 3: The Map of Delineated Lineaments for the Study Islands**



**Saturna Island Lineaments (faults, fractures and geological contacts)**

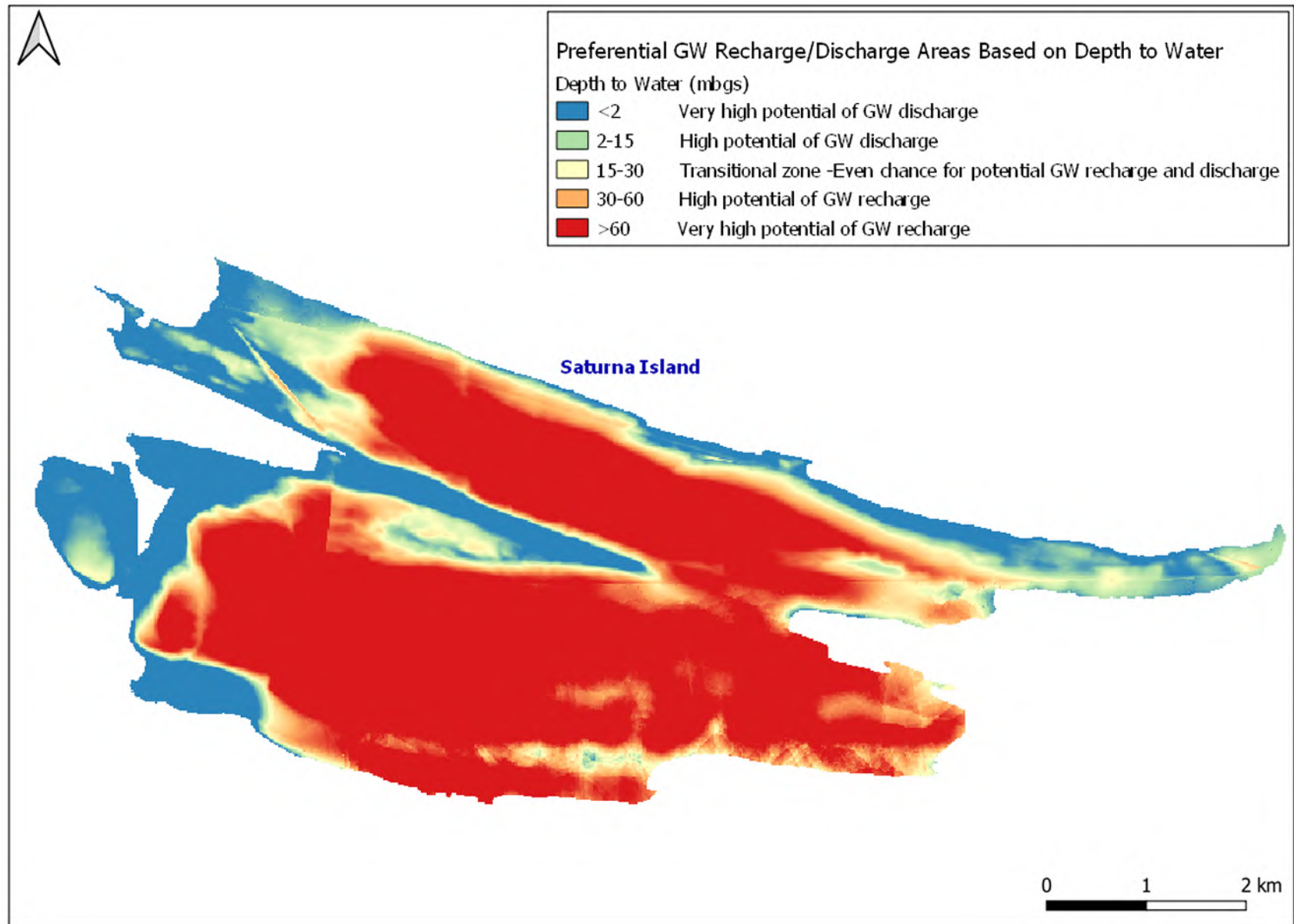
## **APPENDIX 4: Topography Wetness Index (TWI) across the Study Islands**



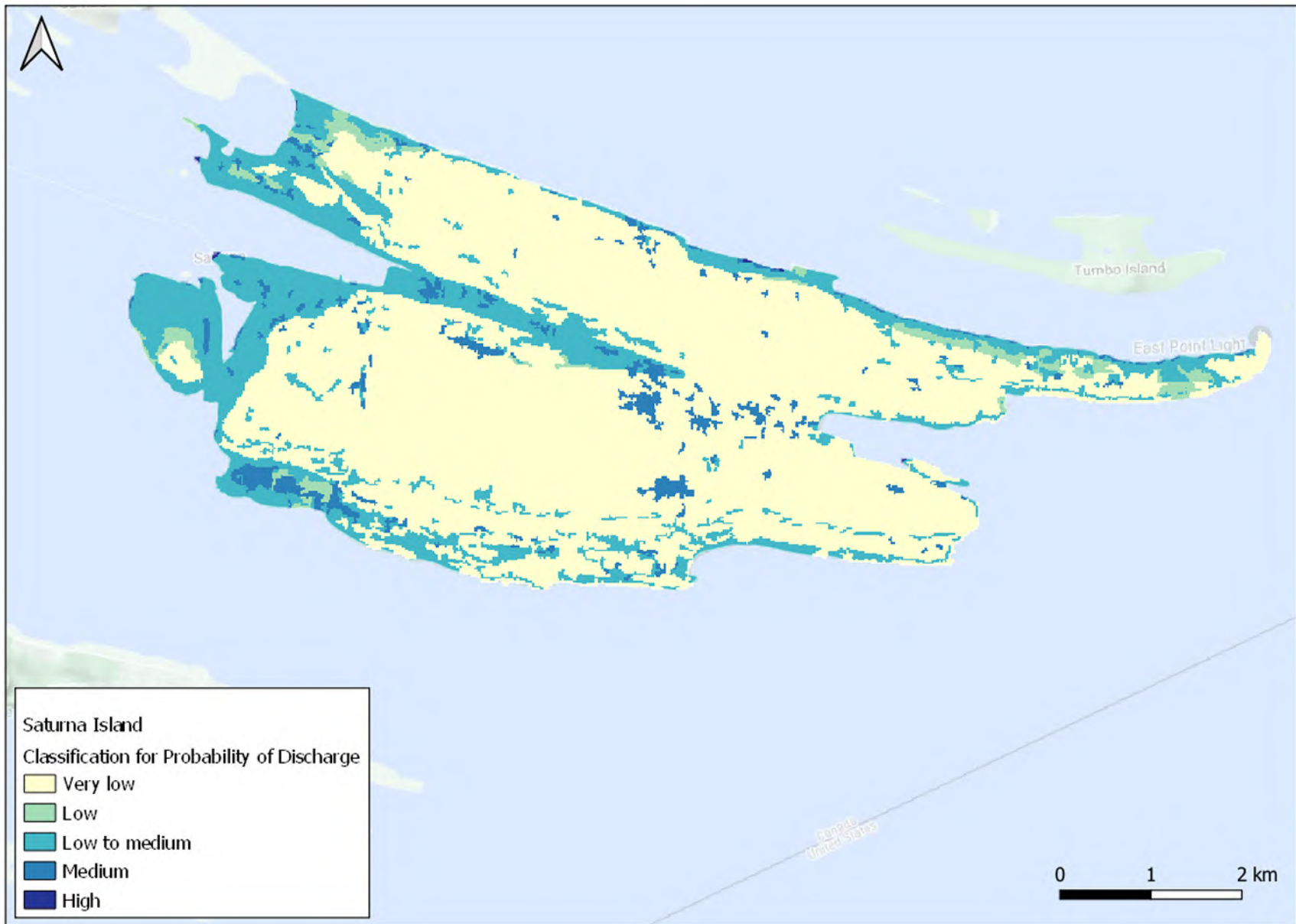
Generated Topography Wetness Index across Galiano, North Pender, South Pender, Mayne, Saturna, and Prevost Islands



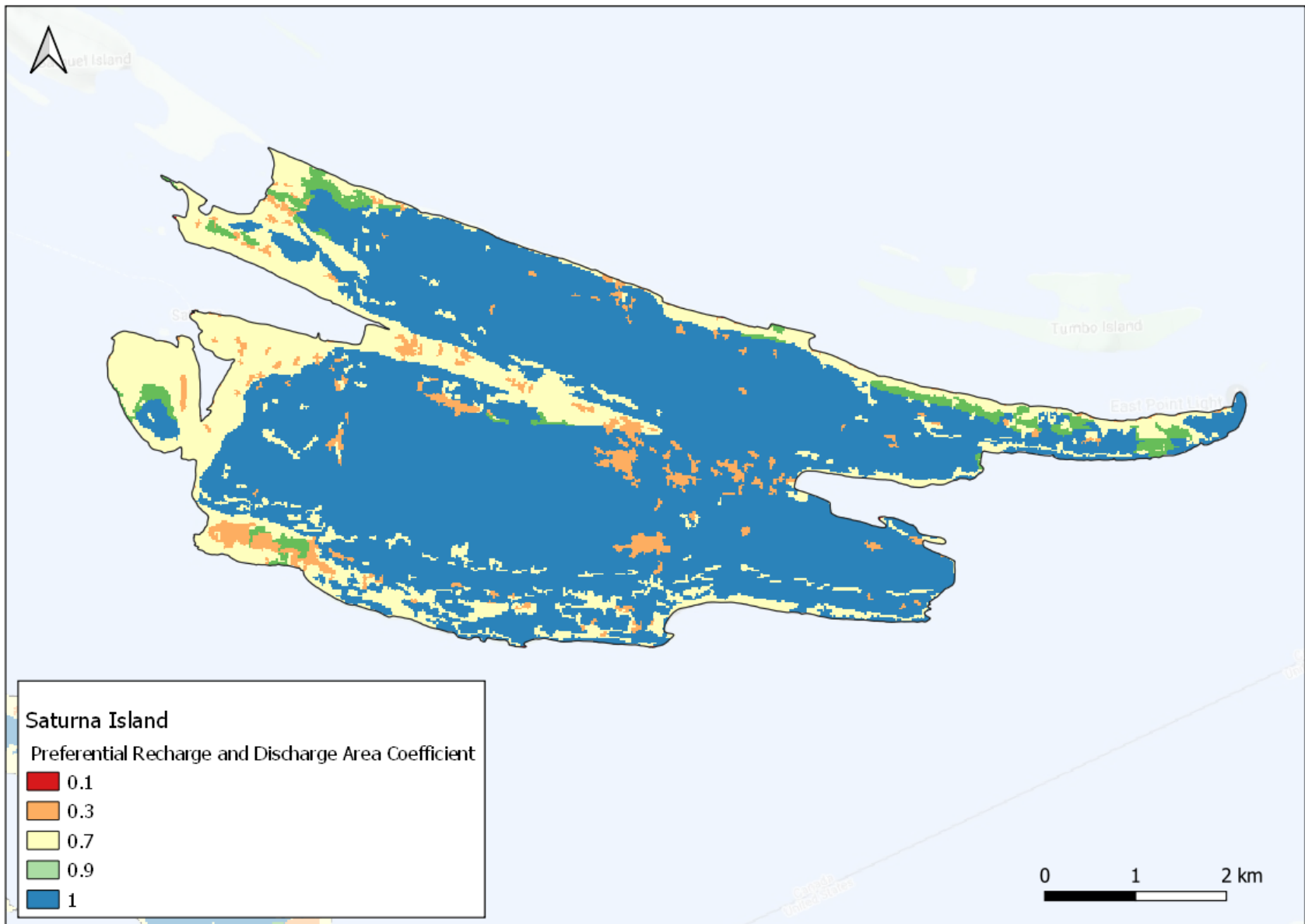
## **APPENDIX 5: Potential Zones for Groundwater Recharge and Discharge based on Depth to Water**

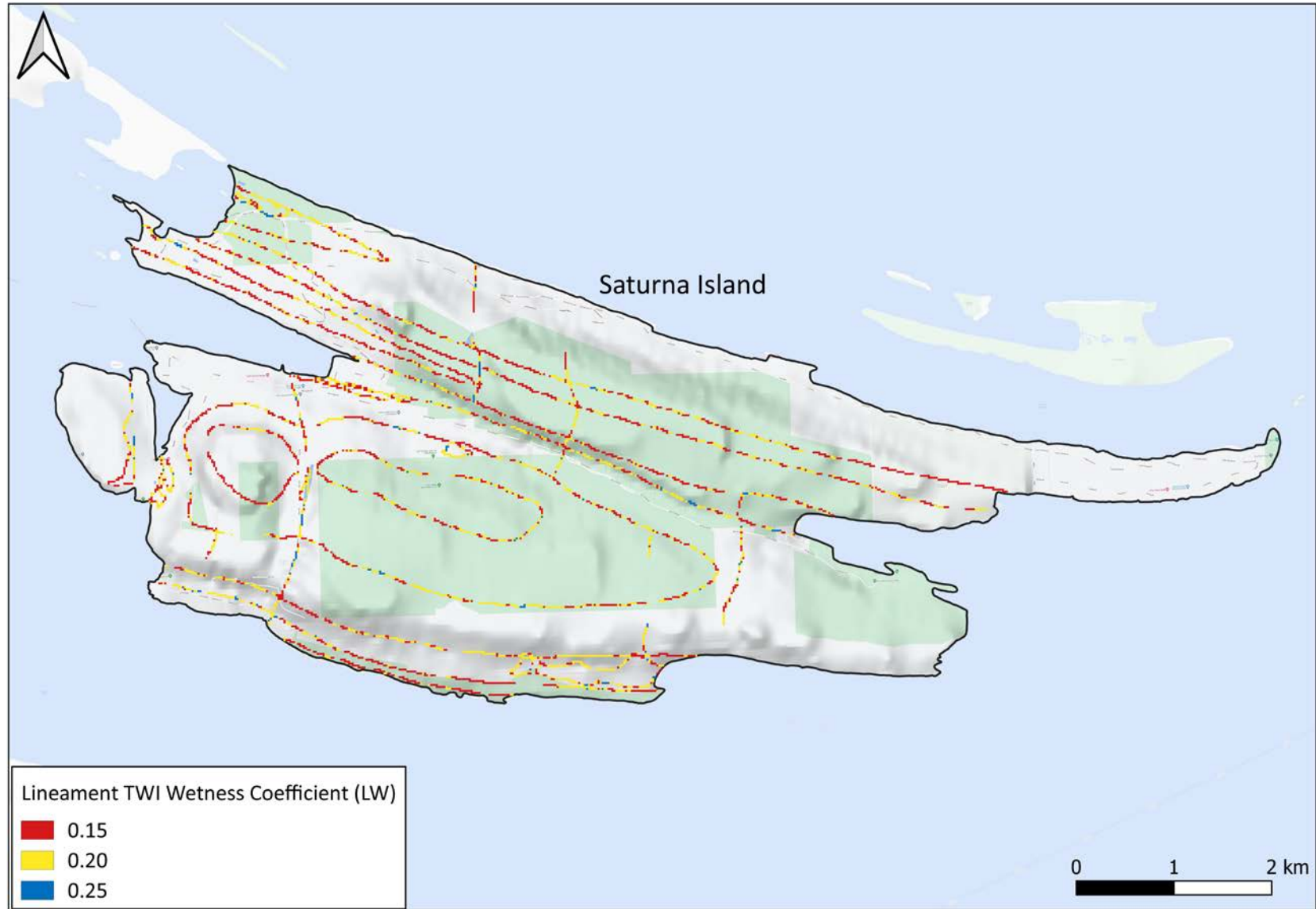


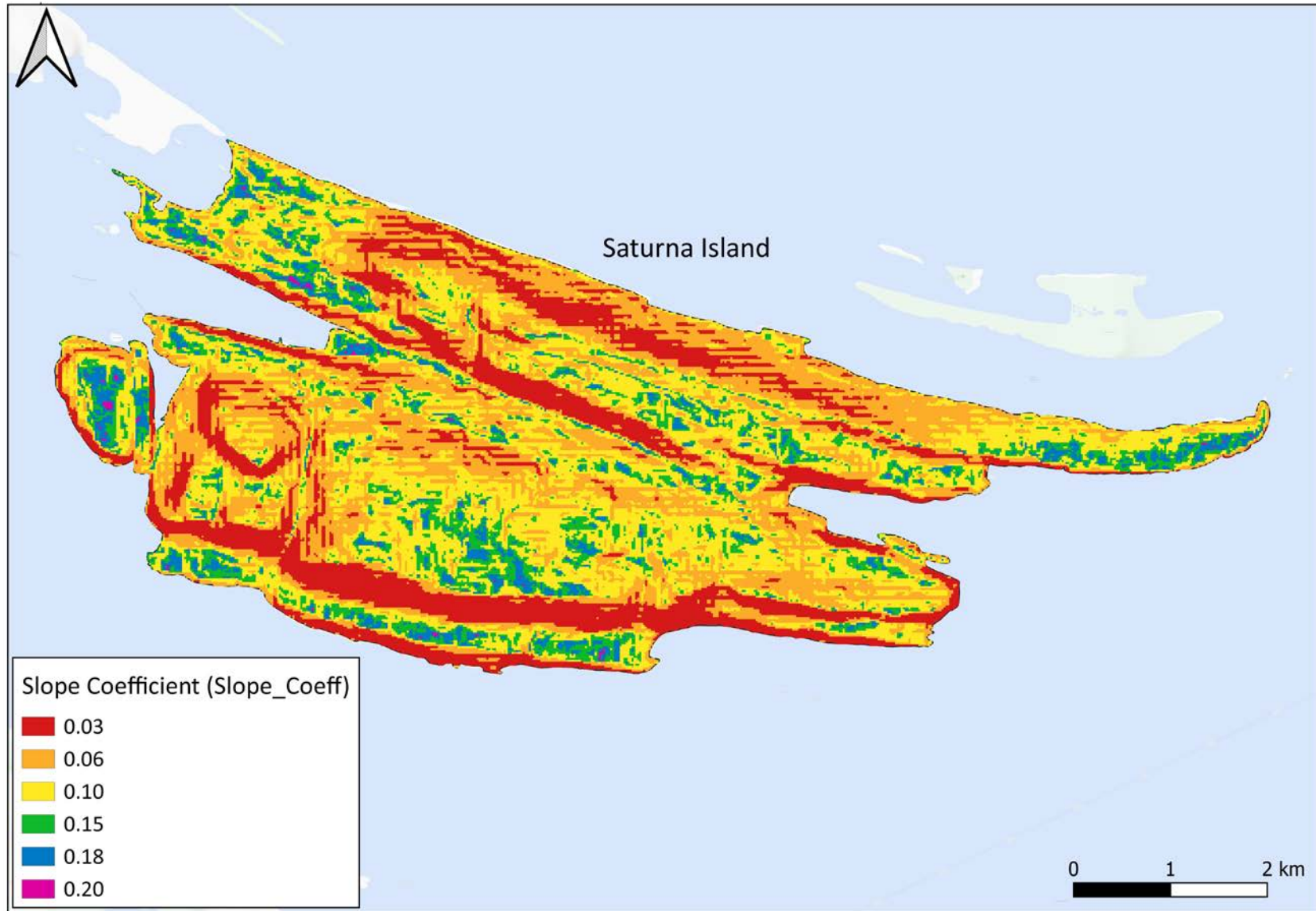
## **APPENDIX 7: Groundwater Discharge Probability Maps Based on NDVI and NDMI**



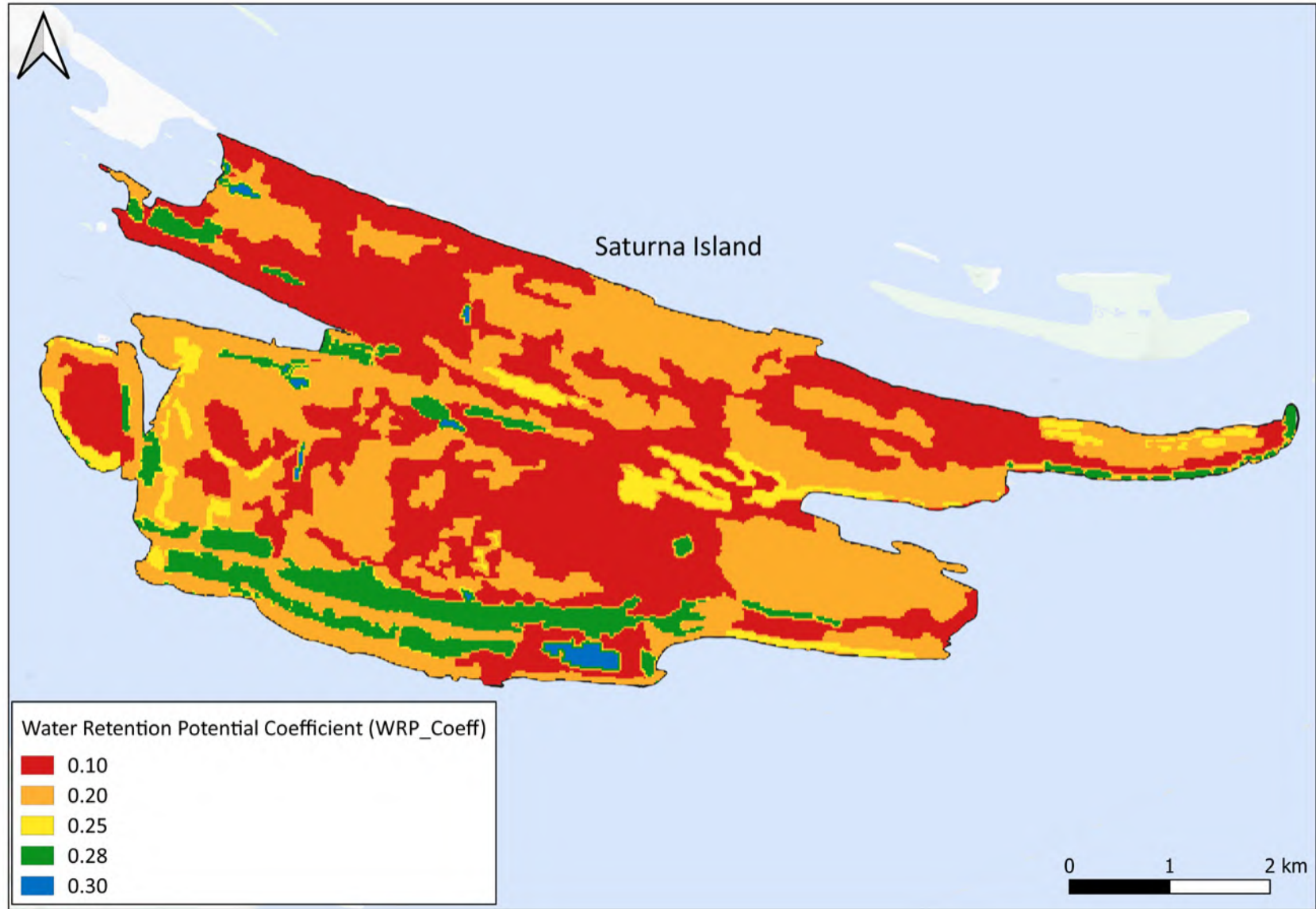
## **APPENDIX 8: Maps of recharge factors/coefficients across the Study Islands**

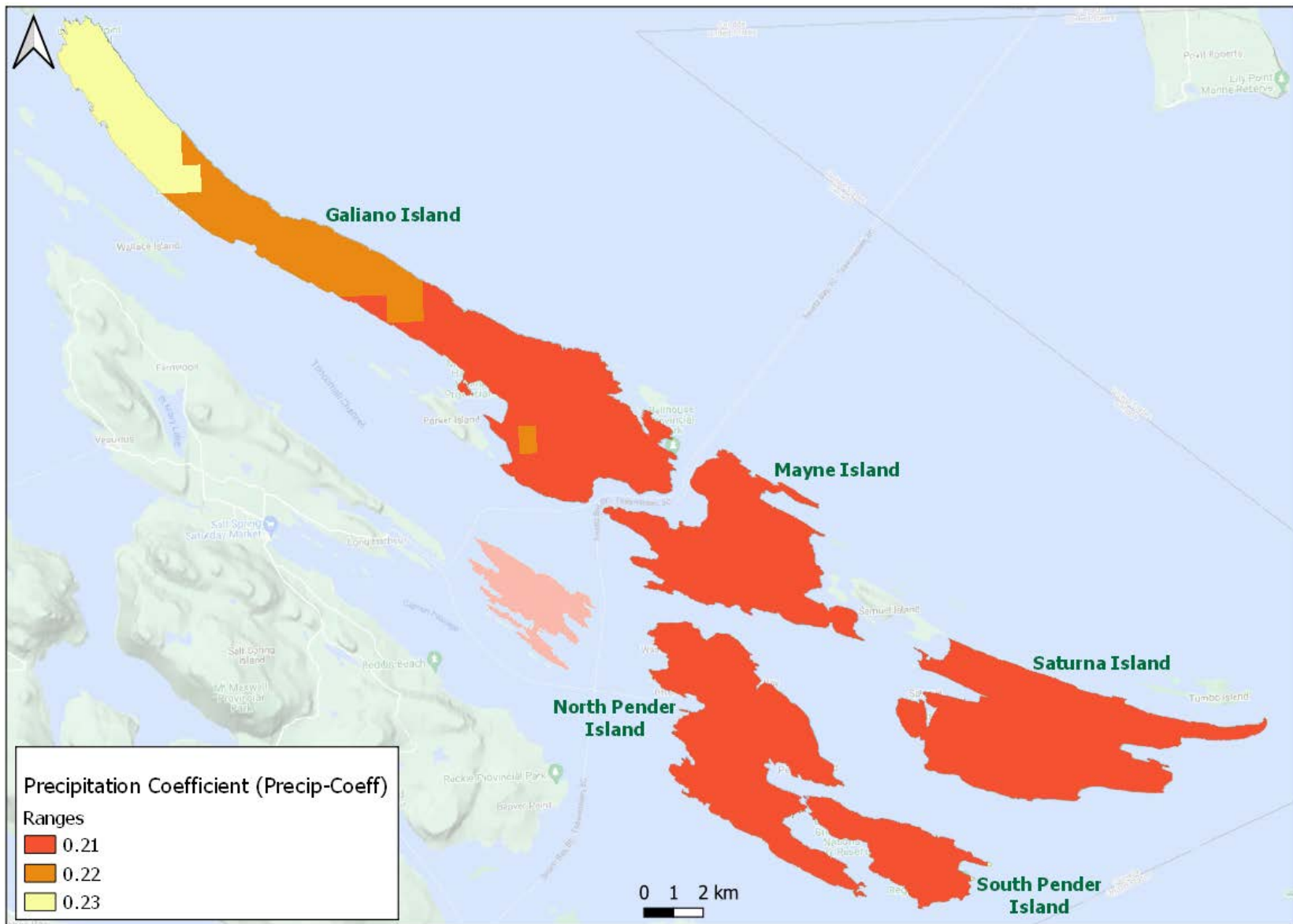


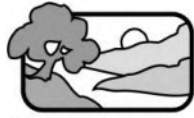












DATE: August 31, 2021

FROM: William Shulba, P.Geo, Senior Freshwater Specialist  
Alex Hedley, Watershed Ecosystems Technologist, UVic Co-Op Student  
Local Planning Services

SUBJECT: **Groundwater Recharge Mapping Project: Precipitation Interception Potential Manual**

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## **BACKGROUND**

Freshwater is a unique amenity in the Islands Trust Area with inherent vulnerabilities to a changing climate. Residents of the Islands Trust Area, First Nations, and British Columbians in general are experiencing climate driven freshwater vulnerabilities such as drought, wildfire, ecosystem loss, and flooding that are directly affecting livelihoods and businesses - challenging the sustainability of communities and watershed resilience.

Protection of recharge areas and preservation of groundwater resources is a commitment of Islands Trust Council. It is imperative that freshwater sustainability is a key lens through which Islands Trust planning decisions are made. To facilitate this, the Islands Trust has supported and coordinated freshwater research projects, advocated for water literacy, provided open public access to freshwater data, and coordinated with the Province on initiatives.

Water shortage issues are an ever-present concern for many individuals in the Islands Trust area. In a survey conducted in 2016, more than 40% of people indicated they have concerns about exhausting their household freshwater supply (Islands Trust, 2021). Changing precipitation patterns projections are expected to result in longer drought periods during the summer, and more intense precipitation events in the wetter seasons, resulting in a reduced quality of drinking water (Pinna Sustainability, 2020).

Climate change related issues such sea-level rise and storm surge flooding are expected to worsen the salt water intrusion issues found on the islands (Islands Trust, 2021). Even with freshwater concerns abound, mitigation for these water related issues is possible. Understanding how groundwater and freshwater resources are replenished, by way of groundwater recharge potential, is one-step towards easing these concerns.

## **PURPOSE**

Groundwater recharge is one of the primary factors controlling limits on groundwater withdrawal (Döll & Flörke, 2005, as cited in Mohan et al., 2018). To determine the groundwater recharge potential of the Islands Trust area, multiple variables, including soil and vegetation characteristics, need to be considered (Mohan et al., 2018). Forest canopies have been known to intercept as much as 10-40% of the total rainfall (Horman et al., 1996, as cited in Murakami, 2006). As such, quantifying and mapping the influence of vegetation characteristics and their influence on precipitation interception is important for assessing groundwater recharge potential.

The purpose of this investigation on precipitation interception potential is to assess the spatial variability of interception potential in the Islands Trust area, to develop a greater understanding of groundwater recharge potential. With a greater understanding on where groundwater recharge potential is low or high, appropriate water management strategies can be developed based on this information.

## OBJECTIVES

The precipitation interception potential map will be developed with the successful execution of four key objectives.

1. Perform a literature review to determine which vegetation characteristics contribute significantly to precipitation interception.
2. Using the Vegetation Resource Inventory (VRI), to assess vegetation interception characteristics that correspond to VRI attribute data available in the Islands Trust region.
3. Create a weighting scheme, that assigns importance to the VRI attributes to precipitation interception.
4. Input the VRI attributes, and associated attribute items, into a GIS with their assigned weights to create a surface representing precipitation interception potential for the Islands Trust area.

## GOALS

The primary goal is to create a precipitation interception potential surface for the Islands Trust area that accurately represents real-world precipitation interception. The precipitation interception potential surface can then be combined with other groundwater recharge data to create a comprehensive groundwater recharge surface for the entirety of the Islands Trust area. The successful completion of this product will allow for more informed decisions on current and future water management strategies, supporting the Islands Trust mandate to preserve and protect.

## ANALYSIS

### Variables of Interception

Variables of Interception was the name given to the general forest features that were determined to be significant to rainfall interception processes. The variables of interception included 1) Canopy Closure, 2) Forest Cover Type, and 3) Herb Storage Capacity. Each of the variables of interception were assigned a weight describing their relative importance to rainfall interception. Together, these weights add up to 1.

**Table 1.** Variables of Interception assigned weights.

Variable of Interception	Assigned Weight
Canopy Closure	0.64
Forest Cover Type	0.26
Herb Storage Capacity	0.1

### Attributes of Interception

Attributes are the VRI data categories that contribute to each of the three aforementioned variables of interception. The VRI attributes used include Label Line 4 Index Classes (for crown closure), Shrub Crown Closure, Shrub Cover Pattern, Land Cover Class Code 1, Land Cover Class Code 2, Land Cover Component Percentage 1, Land Cover Component Percentage 2, Herb Cover Type, and Herb Cover Percentage. These attributes were assigned a weight indicating their importance to the variable of interception they belong to (See Figure 1). A shapefile containing fields for attribute items and attribute item ratings is provided for each of the attributes contributing to interception.

**Table 2.** Canopy Closure Attributes and assigned weights.

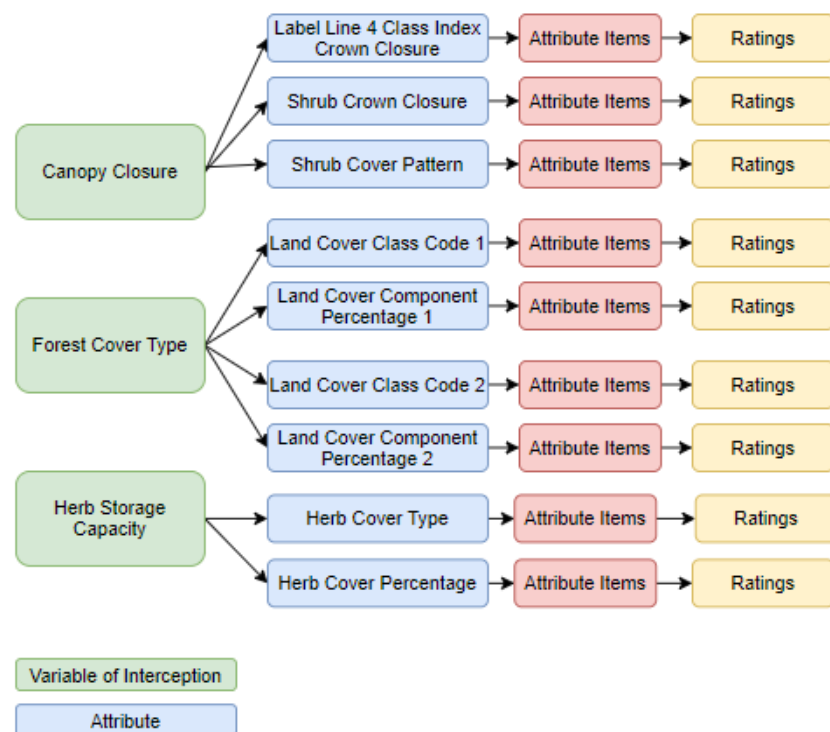
VRI Attribute	Assigned Weight
LINE_4_CLASSES_INDEXES (Crown Closure)	0.72
SHRUB_CROWN_CLOSURE	0.14
SHRUB_COVER_PATTERN	0.14

**Table 3.** Forest Cover Type Attributes and assigned weights.

VRI Attribute	Assigned Weight
LAND_COVER_CLASS_CD_1	0.42
EST_COVERAGE_PCT_1	0.42
LAND_COVER_CLASS_CD_2	0.08
EST_COVERAGE_PCT_2	0.08

**Table 4.** Herb Storage Capacity Attributes and assigned weights.

VRI Attribute	Assigned Weight
HERB_COVER_TYPE	0.5
HERB_COVER_PCT	0.5



**Figure 1.** Flowchart describing of hierarchy of interception variables, attributes, attribute items, and ratings.

### Attribute Items

Attribute items are the class codes or descriptors found within each attribute in the VRI. These include numeric and text characters. Refer to Excel document for attribute item information.

### Attribute Item Ratings

Attribute item ratings are the interception values assigned to each of the attribute items found within the VRI. The attribute item ratings range between 1 and 0, with a precision of two decimal places. Refer to Excel document for attribute item rating information.

### Weighting Method

Variables of interceptions and attributes were both assigned weights, which, together, add to 1. Weights were calculated using the analytical hierarchy process (AHP), which is a method that allows for pairwise comparison based on relative importance (Aragon et al., 2012). Values of 9 represent extreme importance relative to other variables or attributes, 7 indicates very strong importance, 5 indicates strong importance, 3 indicates moderate importance, and 1 indicates equal importance between variables or attributes. The importance scheme used to calculate weights can be seen below (Tables 5 to 8). The resulting weights, as well as the rating values assigned to the attribute items, can be seen in the provided Excel file.

**Table 5.** AHP table for weighting variables of interception.

	Canopy Closure	Forest Cover Type	Herb Storage Capacity
Canopy Closure	1	3	5
Forest Cover Type	1/3	1	3
Herb Storage Capacity	1/5	1/3	1

**Table 6.** AHP table for weighting VRI canopy closure attributes.

	LINE_4_CLASSES_INDEXES (Crown Closure)	SHRUB_CROWN_CLOSURE	SHRUB_COVER_PATTERN
LINE_4_CLASSES_INDEXES (Crown Closure)	1	5	5
SHRUB_CROWN_CLOSURE	1/5	1	1
SHRUB_COVER_PATTERN	1/5	1	1

**Table 7.** AHP table for weighting VRI forest cover type attributes

	LAND_COVER_CLASS_CD_1	EST_COVERAGE_PCT_1	LAND_COVER_CLASS_CD_2	EST_COVERAGE_PCT_2
LAND_COVER_CLASS_CD_1	1	1	5	5
EST_COVERAGE_PCT_1	1	1	5	5
LAND_COVER_CLASS_CD_2	1/5	1/5	1	1
EST_COVERAGE_PCT_2	1/5	1/5	1	1

**Table 8.** AHP table for weighting VRI herb storage capacity attributes.

	HERB_COVER_TYPE	HERB_COVER_PCT
HERB_COVER_TYPE	1	1
HERB_COVER_PCT	1	1

## RESULTS

### Precipitation Interception VRI Attributes on Hornby, Denman and Gabriola Island

Hornby, Denman and Gabriola Island are comprised of 876 polygons containing VRI data. The following list provides VRI attribute data found on these islands that are of interest to canopy precipitation interception potential. Additionally, the number of polygons containing data and total area containing data on these attributes are provided.

**1. Land Cover Class Code 1 (LAND\_COVER\_CLASS\_CD\_1):**

Land Cover Class Code 1 data is found in 822 of 876 polygons (93.8%) on the islands. This class has data in 118.48 km<sup>2</sup> of the total 127.77 km<sup>2</sup> area of the islands (92.7%).

**2. Land Cover Component Percentage 1 (EST\_COVERAGE\_PCT\_1):**

Land Cover Component Percentage 1 data is found in 874 of 876 polygons (99.7%). This class has data in 126.89 km<sup>2</sup> of the total 127.77 km<sup>2</sup> area of the islands (99.3%).

**3. Land Cover Class Code 2 (LAND\_COVER\_CLASS\_CD\_2):**

Land Cover Class Code 2 data is found in 46 of 876 polygons (5.3%). This class has data in 3.54 km<sup>2</sup> of the total 127.77 km<sup>2</sup> area of the islands (2.8%).

**4. Land Cover Component Percentage 2 (EST\_COVERAGE\_PCT\_2):**

Land Cover Component Percentage 1 data is found in 52 of 876 polygons (5.9%). This class has data in 4.38 km<sup>2</sup> of the total 127.77 km<sup>2</sup> area of the islands (3.4%).

**5. Label Line 4 Index Classes (LINE\_4\_CLASSES\_INDEXES):**

Label Line 4 Index Classes data is found in 792 of 876 polygons (90.4%). This class has data in 120.92 km<sup>2</sup> of the total 127.77 km<sup>2</sup> area of the islands (94.6%).

**6. Shrub Crown Closure (SHRUB\_CROWN\_CLOSURE):**

Shrub Crown Closure data is found in 465 of 876 polygons (53.1%). This class has data in 74.61 km<sup>2</sup> of the total 127.77 km<sup>2</sup> area of the islands (58.4%).

**7. Shrub Cover Pattern (SHRUB\_COVER\_PATTERN):**

Shrub Cover Pattern data is found in 465 of 876 polygons (53.1%). This class has data in 74.61 km<sup>2</sup> of the total 127.77 km<sup>2</sup> area of the islands (58.4%).

**8. Herb Cover Type (HERB\_COVER\_TYPE):**

Herb Cover Type data is found in 549 of 876 polygons (62.7%). This class has data in 82.95 km<sup>2</sup> of the total 127.77 km<sup>2</sup> area of the islands (64.9%).

**9. Herb Cover Percentage (HERB\_COVER\_PCT):**

Herb Cover Percentage data is found in 549 of 876 polygons (62.7%). This class has data in 82.95 km<sup>2</sup> of the total 127.77 km<sup>2</sup> area of the islands (64.9%).

## DISCUSSION

The complete set of data including interception variable weights, attribute weights, attribute items, and attribute item ratings, are included in a provided Excel file. This file has six sheets, including an overview sheet with the full set of weights and ratings, a CSV data format sheet, a canopy closure data sheet, a forest cover type data sheet, a herb storage capacity data sheet, and an attribute item rating sheet.

The spatial data for attribute item and attribute item rating data is included in shapefiles. There is a separate shapefile for each island, containing attribute fields (containing the attribute items), and attribute item rating fields. A naming key for the field names is provided in the section below. Maps displaying the spatial distribution of VRI attribute data on Denman, Hornby, and Gabriola have also been provided.

Variables of Interception included:

- Canopy Closure
- Forest Cover Type
- Herb Storage Capacity

**Table 9.** Canopy Closure Attributes and associated items.

Descriptive Name	Attribute Name (in Excel File)	Shapefile Attribute Table Field Name (short form)	Shapefile Attribute Rating Field Name
Label Line 4 Index Classes	LINE_4_CLASSES_INDEXES (Crown Closure)	L4	L4_CRWN_R
Shrub Crown Closure	SHRUB_CROWN_CLOSURE	S_CRWN	S_CRWN_R
Shrub Cover Pattern	SHRUB_COVER_PATTERN	S_CVR_P	S_CVR_P_R

**Table 10.** Forest Cover Type Attributes and associated items.

Descriptive Name	Attribute Name (in Excel File)	Shapefile Attribute Table Field Name (short form)	Shapefile Attribute Rating Field Name
Land Cover Class Code 1	LAND_COVER_CLASS_CD_1	LAND_CD1	LAND_CD1_R
Land Cover Component Percentage 1	EST_COVERAGE_PCT_1	EST_PCT1	EST_PCT1_R
Land Cover Class Code 2	LAND_COVER_CLASS_CD_2	LAND_CD2	LAND_CD2_R
Land Cover Component Percentage 2	EST_COVERAGE_PCT_2	EST_PCT2	EST_PCT2_R

**Table 11.** Herb Storage Capacity Attributes and associated items.

Descriptive Name	Attribute Name (in Excel File)	Shapefile Attribute Table Field Name (short form)	Shapefile Attribute Rating Field Name
Herb Cover Type	HERB_COVER_TYPE	H_TYPE	H_TYPE_R
Herb Cover Percentage	HERB_COVER_PCT	H_PCT	H_PCT_R



## SUMMARY

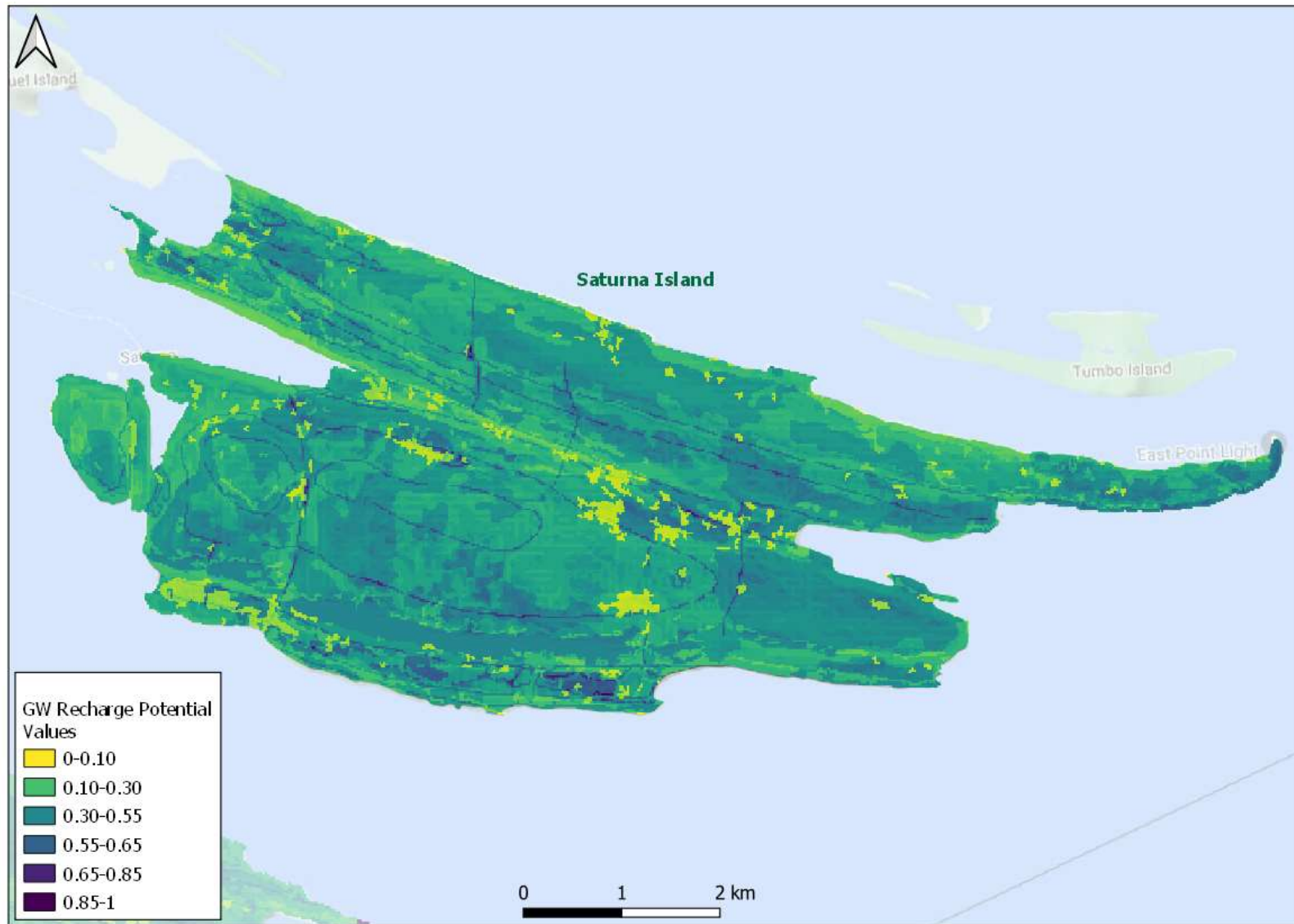
The Groundwater Sustainability Science Program's (GWSS) purpose is to provide foundational knowledge and scientific inquiry into groundwater quality, quantity, and vulnerabilities to support evidence-based decision-making. By estimating the balance between groundwater recharge and human and ecological water use and the impacts of climate change, groundwater availability assessments provide information to facilitate improved watershed protection and freshwater preservation through Islands Trust's planning services, and . Planning tools include covenants, development permit areas, zoning, density bonusing, and subdivision servicing regulations. Decisions, authorizations, approvals, and planning by other responsible agencies will be better informed through this work, directly addressing the Islands Trust object of coordinating with other governments. Data acquired through the GWSS has also extending benefits to the Islands Trust Conservancy informing regional conservation planning.

The results from the Precipitation Interception Potential has identified an ecosystem approach to determining groundwater recharge potential in the Islands Trust Area by providing an essential method into the Islands Trust Area Groundwater Recharge Potential Mapping project, part of the Groundwater Sustainability Science Program.

## REFERENCES

- Aragon, T. J., Dalnoki-Veress, F., & Shiu, K. (2012). *Deriving Criteria Weights for Health Decision Making: A Brief Tutorial*. <https://escholarship.org/uc/item/4366g5pv#page-8>
- Islands Trust. (2021). *Climate change*. <https://islandstrust.bc.ca/programs/climate-change/>
- Islands Trust. (2021). *Freshwater sustainability*. <https://islandstrust.bc.ca/programs/freshwater-sustainability/>
- Mohan, C., Western, A. W., Wei, Y., & Saft, M. (2018). Predicting groundwater recharge for varying land cover and climate conditions – a global meta-study. *Hydrology and Earth System Sciences*, 22, 2689–2703. <https://doi.org/10.5194/hess-22-2689-2018>
- [Pinna Sustainability. \(2020\). Climate projections for Islands Trust area. https://islandstrust.bc.ca/wp-content/uploads/2020/07/ITC\\_ClimateProjectionsReport\\_Final.pdf](https://islandstrust.bc.ca/wp-content/uploads/2020/07/ITC_ClimateProjectionsReport_Final.pdf)

## **APPENDIX 10: Groundwater Recharge Potential Maps**



Groundwater Recharge Potential for Saturna Island

## **APPENDIX 11: Previous Studies**

Source	Study Islands	Report	Published Date	BY	FOR
EcoCat	Denman Island	Report Valens Creek Stepped-Pool Design Report for Denman Conservancy Association.pdf	Jul-01	Eakins Hydrological Consulting, D.E. Reksten Hydrologic Engineer, Clark Hydrological Services	Denman Conservancy Association, Denman Island, B.C.
		Report Preliminary Review of Groundwater Conditions and Availability, Denman Island, British Columbia.pdf	May-79	British Columbia Ministry of Environment, groundwater section, hydrology division	British Columbia Ministry of Environment, water Investigation branch
		Report Memo Update of Denman Island Report.pdf	Jun-86	Ministry of Environment	Ministry of Lands Parks and Housings
		Report Memo Site Selection Fillongley Park, Denman Island.pdf	Sep-79	Ministry of Environment	Ministry of Lands Parks and Housings
		Report Letter-report Wells at schools on Hornby and Denman Islands for School District 71.pdf	Oct-83	Pacific Hydrology Consultant LTD	McElhanney Engineering Services LTD
		Report Letter-report Pump testing of a well on Denman Island for School District No. 71.pdf	May-87	Pacific Hydrology Consultant LTD	McElhanney Engineering Services LTD
		Report Drinking Water Source Assessment Summary Report Denman Island Highways Yard.pdf	Oct-01	British Columbia Building Corporation	
		Report Construction and Testing of Observation Well WR-268-81 Contract No. 72 Denman Island, B.C..pdf	Jan-83	Groundwater Section Water Management Branch Ministry of Environment	

Source	Study Islands	Report	Published Date	BY	FOR
		Report Completion report Drilling of water supply wells at schools on Hornby and Denman Island.pdf	Dec-83	PACIFIC HYDROLOGY CONSULTANTS LTD	School District No. 71 (Courtenay)
		Report British Columbia Buildings Corporation Denman Island Highways Yard Drinking water Field Assessment	Jul-01	British Columbia Buildings Corporation	
	Gabriola Island	Comparison of DRASTIC and DRASTIC-Fm methodologies.pdf	Mar-14	Vancouver Island University	Ministry of Forests Lands and Natural Resource Operations, West Coast Region, Nanaimo, British Columbia
		Report A Review of Groundwater Conditions on Gabriola Island.pdf	Aug-78	Groundwater Section Hydrology Division	Province of British Columbia, Ministry of the Environment, Water Investigations Branch
		Report Completion Report Pump Testing of Wells 1, 2, and 3 on Jenkins Subdivision Gabriola Island, B.C..pdf	Dec-71	W.L. Brown, P. Eng. R. A. Dakin p. Eng.	Gabriola Wildwood Status LTD
		Report Gabriola Island Final Report Assessment and Mapping of Streams of Gabriola Island 1997-98.pdf	Apr-98	Northern Aquatics	Heartlands Conservancy Society and Urban Salmon Habitat Program, Ministry

Source	Study Islands	Report	Published Date	BY	FOR
					of Environment, Lands and Parks (Fisheries Section)
		Report Gabriola Island Hydrochemical Data Worksheet 1 and 2 of 2.pdf	Map		
		Report Habitat of Groundwater Gabriola Island, British Columbia - Final Report.pdf	Jan-75	ROBINSON, ROBERTS & BROWN LTP.	Department of Lands, Forests and Water Resources, Water Resources Service, Groundwater Division
		Report Habitat of Groundwater Gabriola Island, British Columbia.pdf	Sep-72	ROBINSON, ROBERTS & BROWN LTP.	Department of Lands, Forests and Water Resources, Water Resources Service, Groundwater Division
		Report Memo Gabriola Island Community Plan, Fault Zones.pdf	Jun-79	Ministry of Environment, Groundwater section	Ministry of Environment, Water Investigation Branch
	Hornby Island	Report A Preliminary Groundwater Assessment of a Crown Land Parcel on Hornby Island, 1993.pdf	Oct-93	Groundwater Section Hydrology Branch Water Management Division	
	Hornby Island	Report A Preliminary Review of Groundwater Conditions on Hornby Island, B.C..pdf	Oct-84	Groundwater Section, Water Management	

Source	Study Islands	Report	Published Date	BY	FOR
				Branch, Ministry of Environment	
		Report Completion report Drilling of water supply wells at schools on Hornby and Denman Island.pdf	Dec-83	Pacific Hydrology Consultants Ltd	School District No. 71 (Courtenay)
		Report Contract 75 - Construction and Testing of Observation Wells, Coombs and Hornby Island, BC Well Nos. 287 and 288.pdf	Feb-85	Groundwater Section Water Management Branch	
		Report Groundwater Conditions on Hornby Island 1989 Update and Review.pdf	Aug-89	Groundwater Section, Water Management Branch, Ministry of Environment	Groundwater Section, Water Management Branch, Ministry of Environment
		Report Groundwater Conditions on Hornby Island, British Columbia - 1989 Update and Review.pdf	Aug-89	Groundwater Section, Water Management Branch, Ministry of Environment	Groundwater Section, Water Management Branch, Ministry of Environment
		Report Groundwater development proposed nine-hole golf course, Hornby Island, BC..pdf	Sep-89	W.L. Brown, P. Eng.	Arris Consultant LTD.
		Report Hornby Island Domestic Well Monitoring Study.pdf	Sep-10	Ministry of Environment, Water Stewardship Division Vancouver Island Regional Operations Branch	



Source	Study Islands	Report	Published Date	BY	FOR
		Report Hornby Island Groundwater Protection Pilot Project Phase II Report Draft.pdf	May-02	Eleanor N.M. Kneffel	Islands Trust and the Ministry of Water, Land & Air Protection
		Report Hornby Island Groundwater Protection Project Phase III Final Progress Report.pdf	Mar-04	Ron McMurtrie, Project Coordinator	Islands Trust and Regional District of Comox-Strathcona
		Report Letter Sorensen well test - Lot A, Plan 21814, Hornby Island.pdf	Apr-80	McElhanney Surveying & Engineering Ltd	Mr. E. Livingstone,
		Report Memo Preliminary Assessment of Groundwater Conditions Vacant Crown Land, Hornby Island.pdf	Mar-92	BC Environment Water Management Division	BC Environment Water Management Division
		Report Memo Site Selection, Tribune Bay Park, Hornby Island.pdf	Jul-79	BC Environment, Groundwater Section, Hydrology Division	BC Environment, Groundwater Section, Hydrology Division
		Report Preliminary Groundwater Investigation of Hornby Island.pdf	Jun-76	Groundwater Section	Groundwater Section, Hydrology Devieion
		Report Preliminary Notes on Groundwater of Hornby Island.pdf	Sep-74	E. Thorn	

Source	Report	Published Date	BY	FOR
Other Sources	HYDROLOGY ASSESSMENT HORNBY ISLAND FIRE HALL	Jul-15	H2O Environmental Ltd	Simcic and Uhrich Architects
	A PRELIMINARY GROUNDWATER ASSESSMENT OF A CROWN LAND PARCEL ON HORNBY ISLAND - 1993	Oct-93	Groundwater Section Hydrology Branch, Water Management Division	
	Geochemical evolution of groundwater on Saturna Island, British Columbia	2001	D.M. Allen.1 Department of Earth Sciences, Simon Fraser University, Burnaby, BC V5A 1S6, Canada. M. Suchy. Dillon Consulting, Box 978, Iqaluit, Nunavut X0A 0H0, Canada.	
	Groundwater Recharge Model for Gabriola Island	Dec-16	R. Burgess and D.M. Allen Department of Earth Sciences, Simon Fraser University	Regional District of Nanaimo
	Hydrogeology of Coats Marsh, Gabriola Island (2015—2020)			
	Hydrogeological Conceptual Model	Apr-13		
	Results of the Groundwater Geochemistry Study on Hornby Island, British Columbia	Apr-02	D.M. Allen and G.P. Matsuo Department of Earth Sciences Simon Fraser University	Islands Trust Victoria, B.C.

Source	Report	Published Date	BY	FOR
	The Hydrogeology of Salt Spring Island	Jan-15	Department of Earth Sciences Simon Fraser University	
	Water Budget Project : RDN Phase One (Gabriola, DeCourcy & Mudge Islands)	Apr-13	SRK Consulting (Canada) Inc	Regional District of Nanaimo
	Characterizing Recharge to Fractured Bedrock in a Temperate Climate	2010	Canterbury University	
	Trends in groundwater levels in British Columbia	May-13	Simon Fraser University	
	Denman and Hornby Islands, Water Allocation Plans	Jul-94	Regional water management	Province Of British Columbia, Ministry Of Environment, Lands And Parks, Vancouver Island Region

Additionally, we have reviewed the following studies and sources of information:

- A Review of Groundwater Conditions Galiano Island, MoE Water Management Branch, 1983
- Pumping and Sampling of Obs. well 258 communication, MoE Water Management Branch, 1993
- Assessment of Groundwater Availability and Quality, MoE Water Management Branch, 1998
- Georgina Water Works Review, MoE Water Investigations Branch, 1968

- Drilling Construction and Testing of Observation Well WR 258-80, MoE Inventory and Engineering Branch, 1980
- Mayne Island Wells Field Study, MoE Water Management Branch, 1986
- Groundwater Potential Magic Lake Estates, MoE Water Management Branch, 1977
- Port Washington Watershed Analysis, MoE Water Investigations Branch, 1977
- Geology of North and South Pender Island, unknown, unknown (post 2002)
- Galiano Groundwater Study, Waterline Resources Inc., 2011
- Southern Gulf Islands Groundwater Sustainability Strategy, Islands Trust, 2019
- Ecocat – Provincial Database
- Henderson, James D. An ecosystem approach to groundwater management in the Gulf Islands. Calgary, 1997.