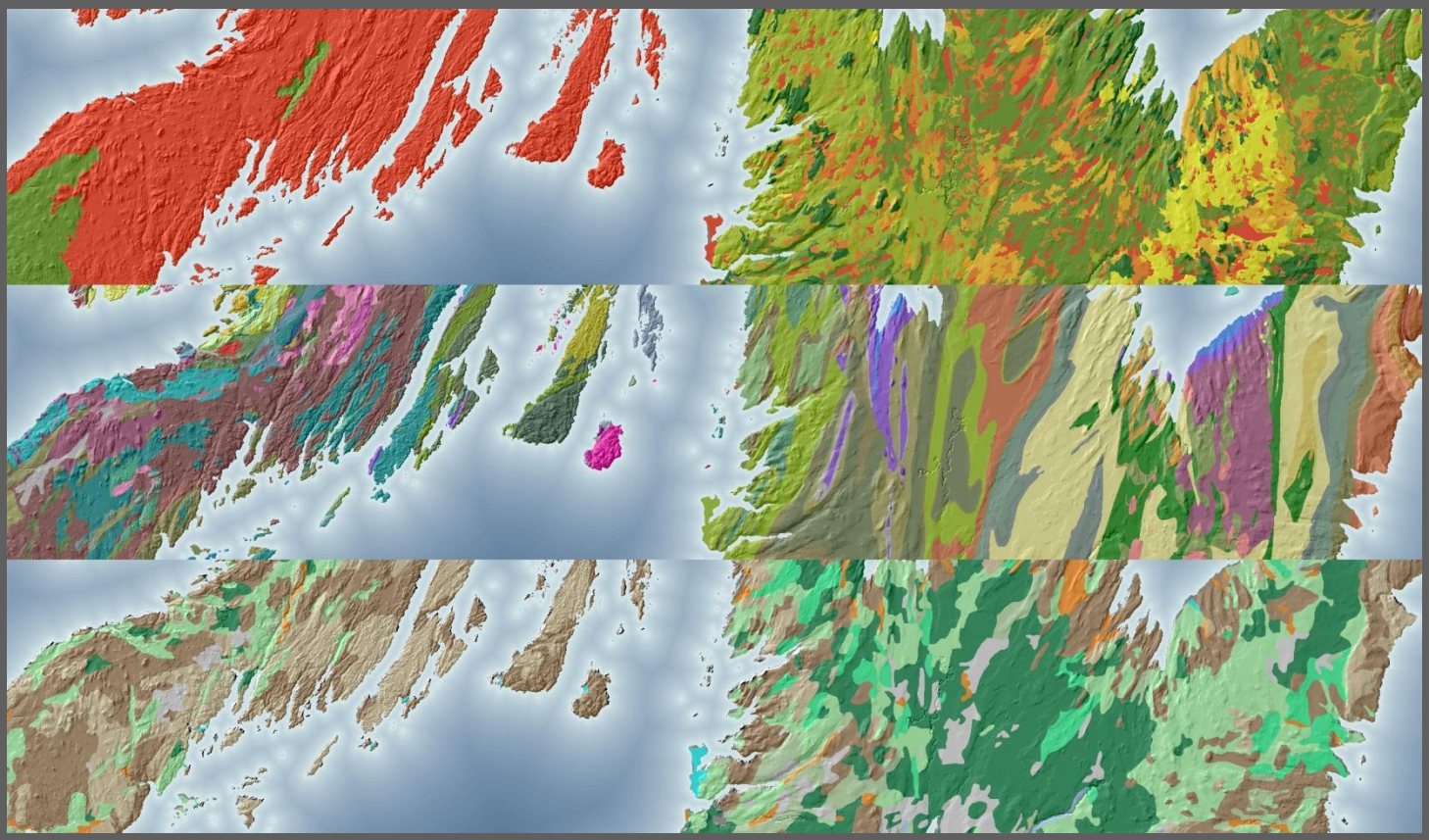
Groundwater Vulnerability Mapping Eastern Newfoundland

Task 1: Data Compilation



123102.00 ● Task 1 Final Report ● October 2013

ISO 9001
Registered Company

Prepared for:

Water Resources Management Division
Department of Environment and Conservation
Government of Newfoundland and Labrador

Prepared by:

CBCL LIMITED
Consulting Engineers

Final Report	Mary Bishop	October 2013	Colin Walker
Draft Report	Mary Bishop	April 2013	Colin Walker
Issue or Revision	***Reviewed By:***	***Date***	***Issued By:***

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October 23, 2013

Ms. Dorothea Hanchar, M.Sc.
Groundwater Resources Manager
Water Resources Management Division
Department of Environment and Conservation
4th Floor, West Block, Confederation Building
PO Box 8700
St. John's, NL A1B 4J6

Dear Ms. Hanchar:

RE: Groundwater Vulnerability Mapping - Final Report # 1- Data Compilation

On behalf of CBCL Limited, I am pleased to submit the Final Report for the above noted project. If you have any questions or concerns, please contact the undersigned.

Yours very truly,

CBCL Limited

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Solving today's problems with tomorrow in mind

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Project No: 123102.00

CANADA'S BEST MANAGED COMPANIES

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CHAPTER 1 INTRODUCTION

1.1 Background

CBCL Limited (CBCL) was retained by the Water Resources Management Division of the Department of Environment and Conservation (ENVC) to complete a Groundwater Vulnerability Delineation and Mapping study for Eastern Newfoundland. Groundwater is an essential resource for the island of Newfoundland. According to ENVC, approximately 29% of people in Newfoundland rely on groundwater as a source of potable water. ENVC has recognized the value of Newfoundland's groundwater resources and has implemented this study to provide a basis for the protection of the province's groundwater resources.

Groundwater vulnerability is a measure of the likelihood for contaminants to enter an aquifer, and the influence of transport and attenuation along a groundwater flow path. Groundwater vulnerability is a function of the hydrogeologic setting, and some definitions are extended to include the influence of land use on the likelihood of contaminant release. For the purposes of this report, "aquifer vulnerability" will be used to describe the physical factors governing groundwater contamination by anthropogenic sources, and "land use-vulnerability" will be used to incorporate land use information and the influence of natural geochemical phenomena such as elevated arsenic or uranium concentrations.

Aquifer vulnerability is determined primarily by the rate of transport of contaminants through confining layers and the rate of transport through an aquifer. The thickness and grain size distribution of unconsolidated materials control the former, and the aquifer and contaminant properties control the latter. These and other factors can be further subdivided to provide a means of quantifying aquifer vulnerability. Methods to determine aquifer vulnerability have been the subject of study and application in other jurisdictions for over forty years.

1.2 Scope of Work

In preparation of aquifer vulnerability mapping, data from the province and Natural Resources Canada (NRCan) have been collated, formatted, and trimmed to the Eastern Newfoundland study area. This report presents the data that have been compiled into the project geodatabase, and provides a discussion on the potential application of the data. This report forms Task 1, the first of three components. Subsequent reports provide details on the study area hydrogeology (Task 2), and the aquifer vulnerability assessment (Task 3).

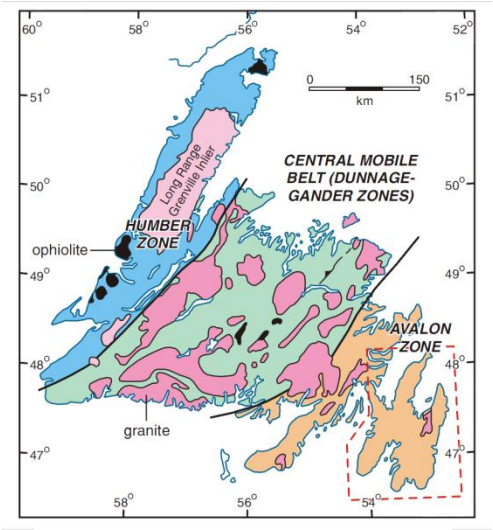
CHAPTER 2 DATA LAYERS

2.1 Study Area, Digital Elevation Model and Sources of Data

ENVC has subdivided the Island of Newfoundland into three study areas, corresponding to principal tectonic divisions. Table 2.1 provides a summary of these study areas. This study is concerned with the Eastern Newfoundland Study Area, shown on Figure 1.

Table 2.1: Tectonic Zones of Newfoundland

Tectonic Zone	Hydrogeological Study Area
Avalon	Eastern Newfoundland
Dunnage-Gander (Central Mobile Belt)	Central Newfoundland
Humber	Western Newfoundland



Inset A: Tectonic Zones of Newfoundland (from: King, A.F., 1988)

Inset 'A' shows the principal tectonic divisions of Newfoundland. The study area comprises the Burin, Bonavista and Avalon Peninsulas, and has been defined for the purposes of this study using geologic contacts to define its western boundary. The western boundary extends from Fortune Bay in the south to Bonavista Bay in the north, and follows the eastern edge of the Devonian and Carboniferous granite intrusion shown on provincial mapping.

Vector topographic data (1:50,000) were downloaded from Natural Resources Canada National Topographic series mapping (NRCAN - CanVec) to compile base mapping and provide topographic elevation data. Elevation contours, available at 5 metre intervals, were analyzed in ArcGIS to provide an updated digital elevation model, shown on Figure 1. The digital elevation model was compiled with a 20 metre cell size. This cell size provides the basis for all subsequent raster mapping at the regional scale.

Remaining data were compiled primarily from existing provincial sources available through web portals, or provided directly by the province's geomatics personnel. Pumping test data were digitized by CBCL and compiled from printed reports on file with ENVC. Table 2.2 provides a summary of the data and GIS map layers that have been compiled.

Bonavista Bay

Trinity Bay

Conception Bay

John's

366

Fortune Bay

Placentia Bay

Saint Mary's Bay

St. Pierre

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LEGEND

Study Area Boundary

Figure 1

Study Area and Digital Elevation Model

Coordinate System: NAD 1983 UTM Zone 21N
Projection: Transverse Mercator
Datum: North American 1983
Units: Meter

N
W E
S

CBCL LIMITED
Consulting Engineers

0 5 10 20 30 40
km

1:1,000,000 @ 11 x 17

Table 2.2: Data Sources

Description	Source(s)	Hydrogeology of Eastern NL (Task 2)	Groundwater Vulnerability Mapping (Task 3)
Topography	NRCan CanVec / this study	Updated Digital Elevation Model	n/a
Quaternary Geology	NL Mineral Resources Branch web portal	Identification of potential surficial aquifers	Quaternary Material Index
Bedrock Geology	NL Mineral Resources Branch pers. comm.	Analysis of Variance (ANOVA) of Depth Normalized Yield ($\bar{Q}$)	$\bar{Q}$ Index
Soils Mapping	Agriculture and Agri-Food Canada	n/a	Surface Soils Drainage Index
Hydrostratigraphic Units	AMEC, 2013	Bedrock groupings and well yield by age	n/a
Watershed Mapping	DEM Analysis (this study)	Study Area Divisions	Study Area Divisions
Pumping Test Data	Digitization of ENVC reports and records (this study)	Association of bedrock units with hydraulic conductivity range	n/a
Drilled Well Data	NL Drilled Well Database	Association of bedrock polygons with $\bar{Q}$ using geospatial Analysis of Variance (ANOVA); Association of quaternary polygons with depth to bedrock using ANOVA	$\bar{Q}$ Index Depth to Bedrock Index
Slope	DEM analysis (this study)	Precursor to groundwater recharge analysis	Slope Index
Precipitation	NL Water Resources web portal	Comparison with soil types, rock types, and baseflow	n/a
Base Mapping	NRCan CanVec (CBCL geodatabase)	Map display	Map display
Baseflow / Recharge	Water Survey of Canada (this study)	Establish recharge for selected watersheds.	Recharge Index for focus study areas.
Groundwater Chemistry	ENVC and Water Resources Branch / Site Specific Reporting	n/a	Background quality index for site-specific analysis of groundwater suitability
Land Use	NL Mineral Resources Branch and NL Water Resources branch web portals; CBCL geodatabase; Municipal Data	n/a	Potential contaminant source index for analysis of site-specific groundwater suitability

Reporting on the Hydrogeology of Eastern Newfoundland (AMEC, 2013) was reviewed to identify data and trends relevant to the current work. The data from that work was incorporated into the geodatabase for vulnerability mapping and additional hydrogeological analysis.

The master geodatabase was developed as a stand-alone file and was transmitted to ENVC via DVD upon completion of Task 3 (Vulnerability Mapping). The base map and geodatabase structures are shown in Table A1, Appendix A.

2.2 Quaternary Geology

Quaternary mapping for the study area was available at the provincial scale, shown on Figure 2. Eskers and sandy areas are overlain with quaternary mapping to allow for differentiation of fine and coarse grained materials, and to help identify well sorted and stratified deposits of sand and gravel. The use of quaternary mapping for vulnerability analysis generally follow the concepts introduced in the Hydrogeology of Eastern Newfoundland (AMEC, 2013).

2.3 Bedrock Geology

Figure 3 shows detailed bedrock geology mapping as provided by the province's mineral resources branch, and corresponds to mapping presented in the Hydrogeology of Eastern Newfoundland (AMEC, 2013). Legend information is provided in AMEC (2013). A master list of bedrock units within the study area has been extracted from the provincial data, and is provided in Table B1, Appendix B. Geologic descriptions from provincial mapping and from the provincial geodatabase of detailed bedrock geology were used to determine a simplified bedrock type. Simplified bedrock types are as follows:

- Conglomerate;
- Sandstone;
- Limestone;
- Siltstone;
- Shale;
- Metamorphic;
- Volcanic; and
- Plutonic.

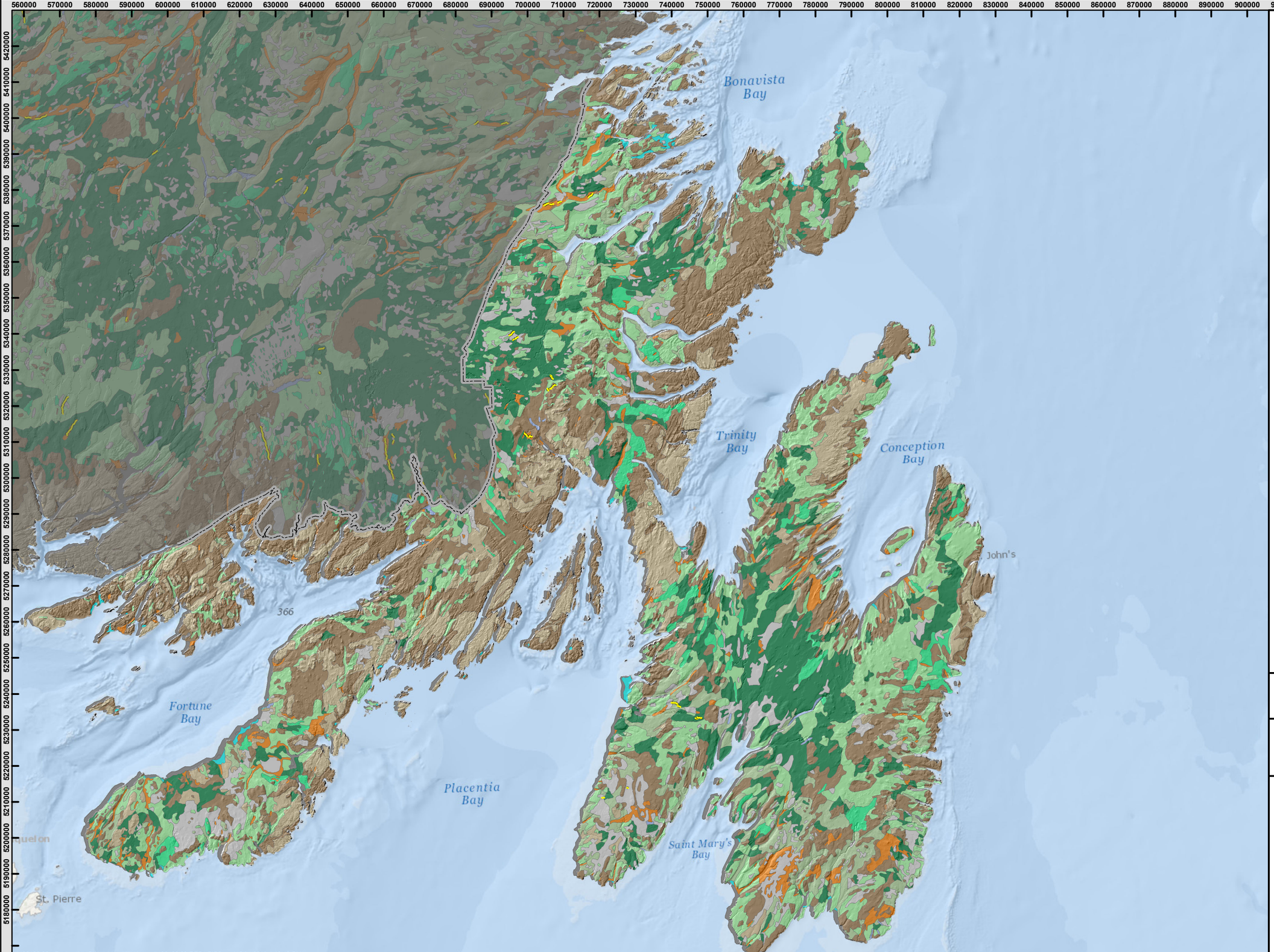
The assessment of flow characteristics of each simplified rock type using the geological description and depth-normalized well yield data for each polygon is described under Task 2.

2.4 Soils

Soil mapping was obtained from Agriculture and Agri-foods Canada, shown on Figure 4. Data for the western part of the study area was available at the regional level, but data for the eastern part of the study area was available in greater detail. Mapping and analysis for this study focused on the drainage characteristics of soil units, as shown on Figure 4.

2.5 Hydrostratigraphic Units

Figure 5 shows the hydrostratigraphic units (HUs) as defined by AMEC (2013), grouped into sedimentary, plutonic, volcanic, and metamorphic strata. Sedimentary rocks are further subdivided by age, and for Late Neoproterozoic formations, sandstone and conglomerate are distinguished from siltstone and shale



LEGEND

- Study Area Boundary
- Esker
- Ablation drift
- Alluvium
- Bog
- Colluvium
- Drift poor
- Exposed bedrock
- Glaciofluvial
- Glaciolacustrine
- Glaciomarine and marine
- Rogen moraine
- Till blanket
- Till, undifferentiated

Figure 2

Quaternary Geology

Coordinate System: NAD 1983 UTM Zone 21N
Projection: Transverse Mercator
Datum: North American 1983
Units: Meter

N W E S

0 5 10 20 30 40 km

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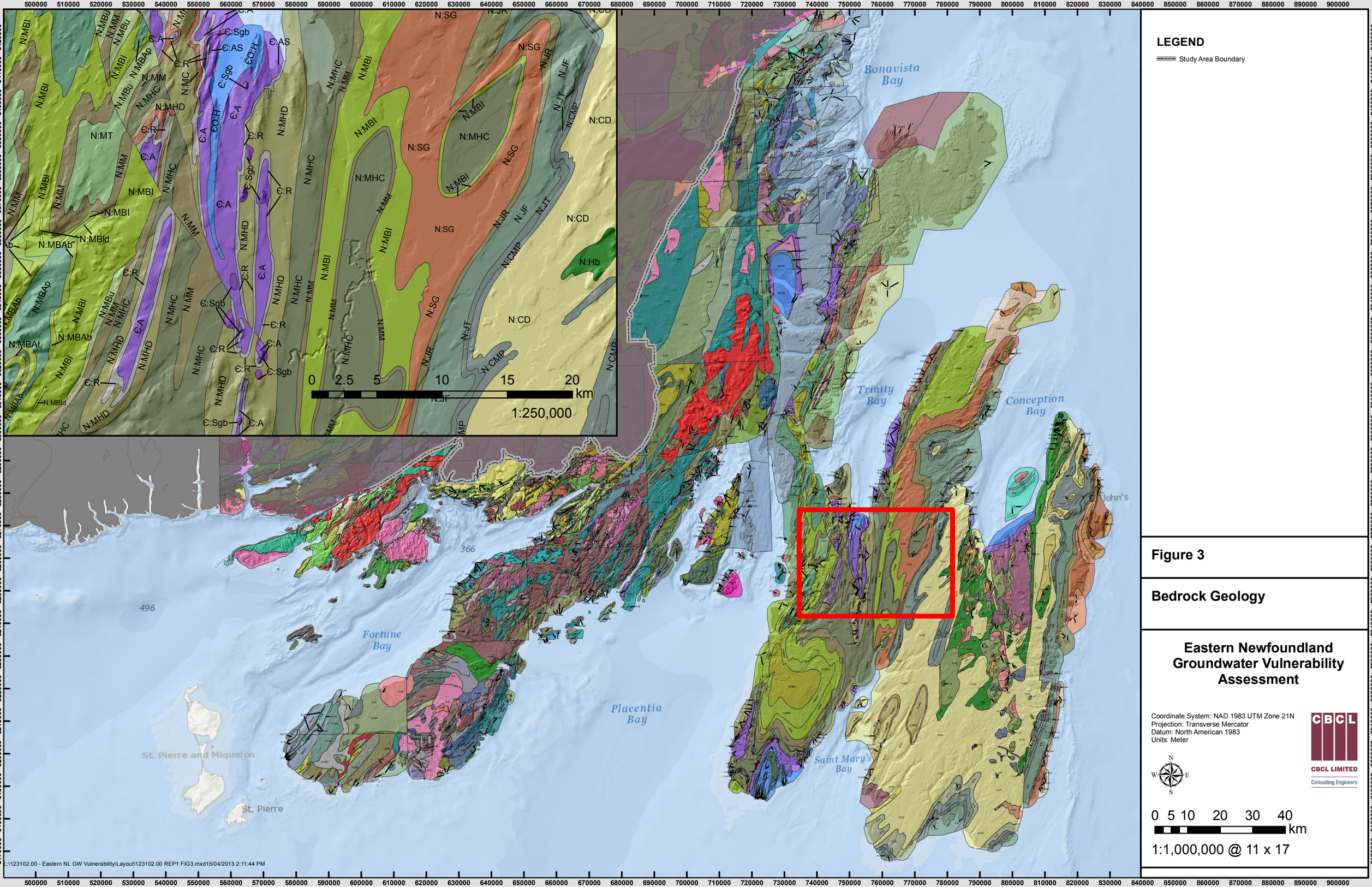
CBCL LIMITED
Consulting Engineers



LEGEND

Study Area Boundary

Figure 3

Bedrock Geology

Eastern Newfoundland Groundwater Vulnerability Assessment

Coordinate System: NAD 1983 UTM Zone 21N
Projection: Transverse Mercator
Datum: North American 1983
Units: Meter

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0 5 10 20 30 40 km

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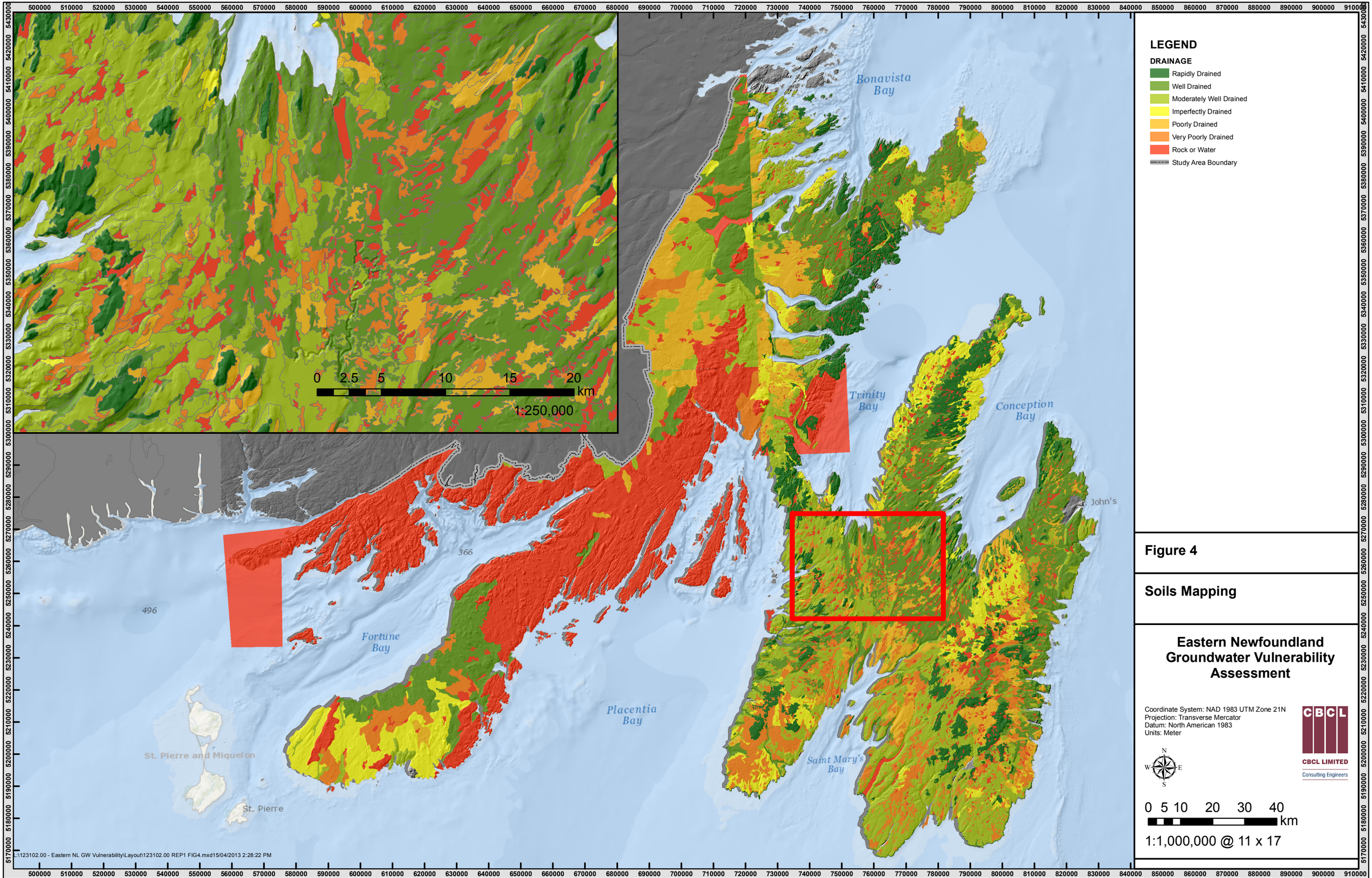
Bonavista Bay
Trinity Bay
Conception Bay
Placentia Bay
Fortune Bay
Saint Mary's Bay
St. Pierre and Miquelon
St. Pierre
St. John's
366
496
0 2.5 5 10 15 20
km
1:250,000
0 5 10 20 30 40
km
1:1,000,000 @ 11 x 17
N
W
E
S
LEGEND
DRAINAGE
Rapidly Drained
Well Drained
Moderately Well Drained
Imperfectly Drained
Poorly Drained
Very Poorly Drained
Rock or Water
Study Area Boundary
Figure 4
Soils Mapping
Eastern Newfoundland Groundwater Vulnerability Assessment
Coordinate System: NAD 1983 UTM Zone 21N
Projection: Transverse Mercator
Datum: North American 1983
Units: Meter
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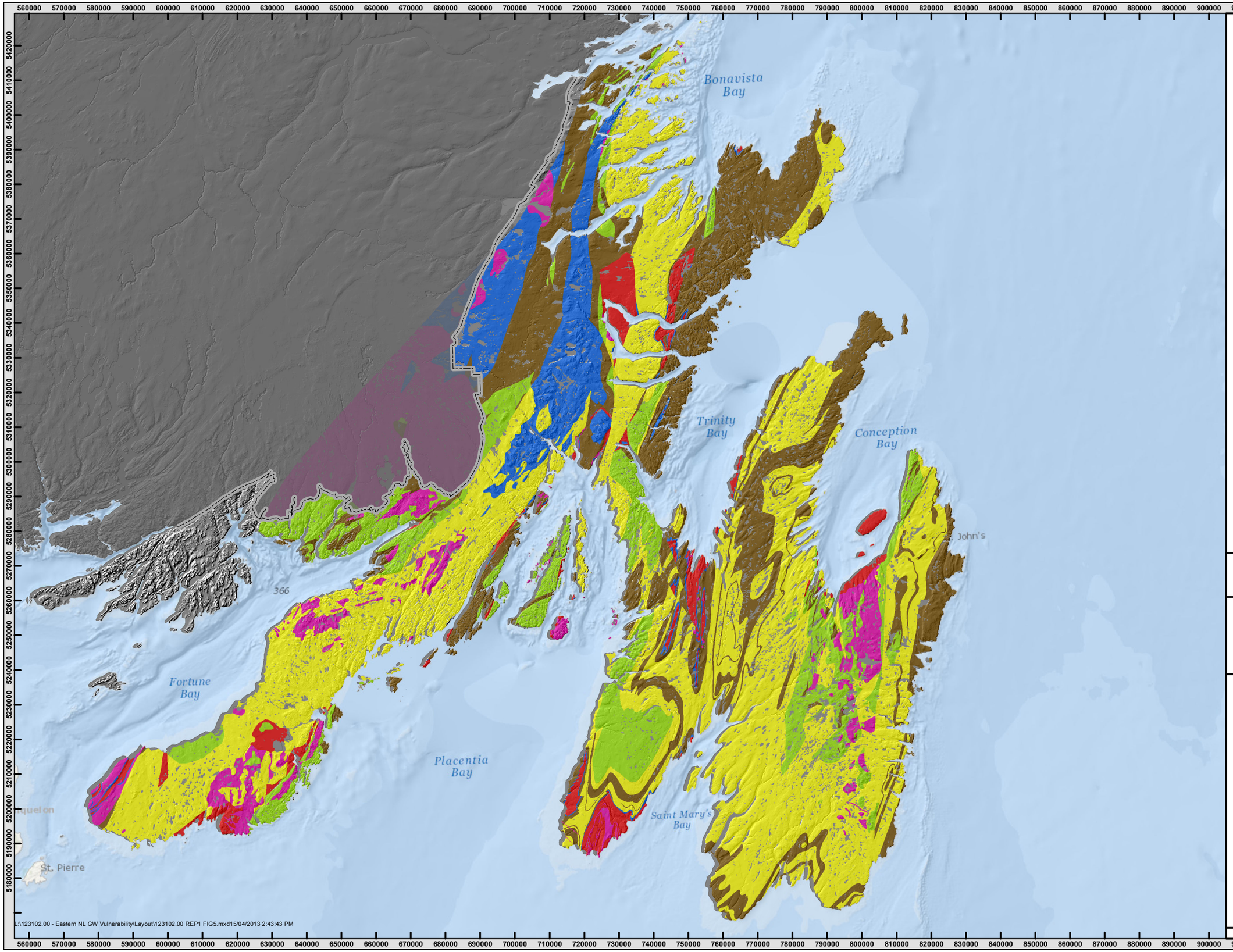

LEGEND

- Study Area Boundary

Hydrostatigraphic Unit

- Late Neoproterozoic Silstone and Shale
- Late Neoproterozoic Sandstone and Conglomerate
- Cambrian Sedimentary
- Volcanic
- Plutonic
- Metamorphic

Figure 5

Hydrostratigraphic Units

(after AMEC, 2012)

Eastern Newfoundland Groundwater Vulnerability Assessment

Coordinate System: NAD 1983 UTM Zone 21N
Projection: Transverse Mercator
Datum: North American 1983
Units: Meter

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Consulting Engineers

0 5 10 20 30 40 km

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strata. Median well yields did not show strong differentiation between the mapped HUs. Additional resolution and detail are introduced to the existing conceptual model as part of Task 2.

2.6 Watershed Mapping

Existing watershed mapping for the province was generated by the Water Survey of Canada, comprising regional basin groupings and individual watershed delineations for selected watersheds associated with hydrometric stations. CBCL completed a slope, flow accumulation, and flow direction analysis using geospatial tools. Flow data were used to delineate watersheds with areas exceeding 10 km^2. Although many smaller coastal watersheds were also delineated as part of this process, delineation of all watersheds at local scales was beyond the scope of this study.

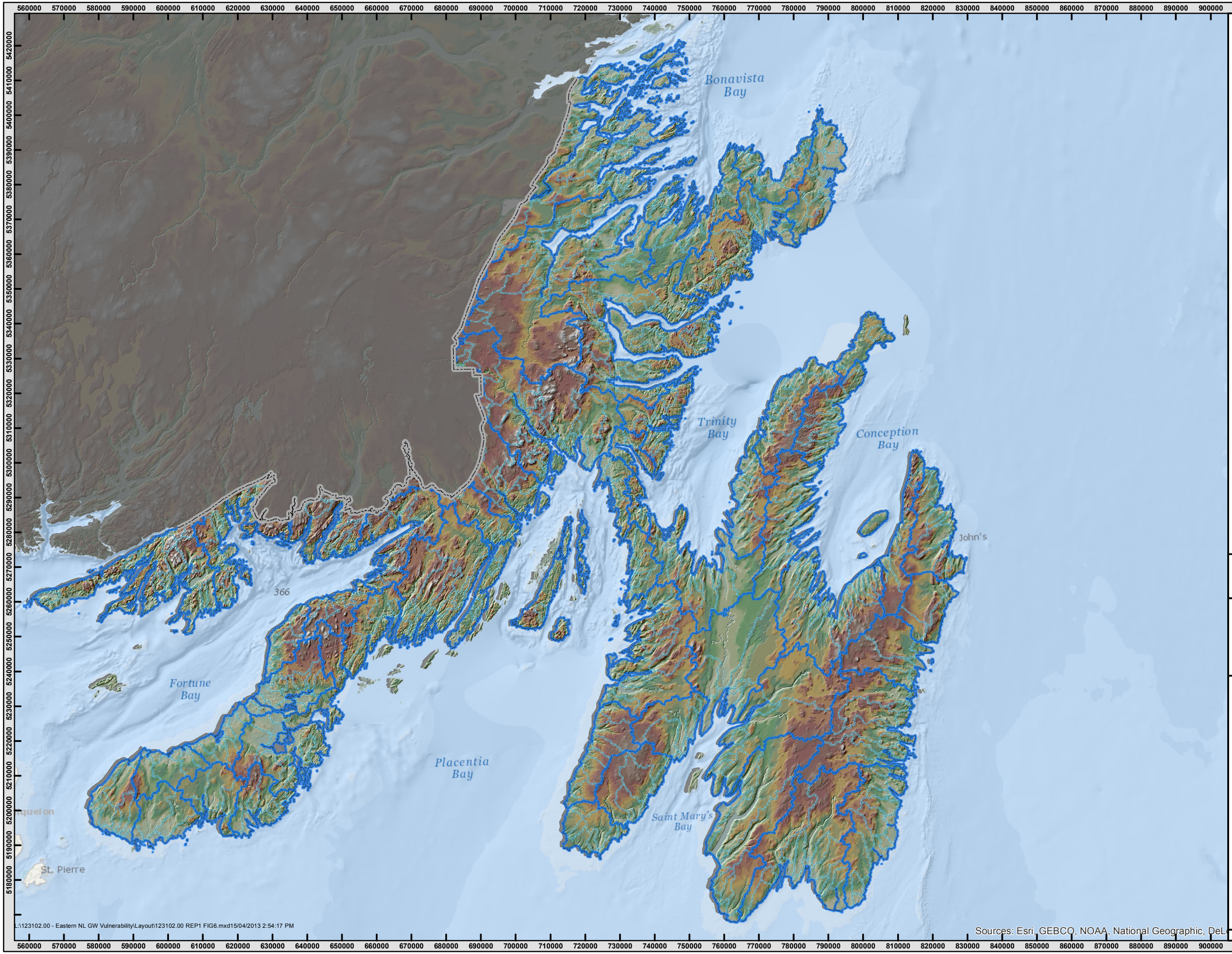
Preliminary watershed mapping is shown on Figure 6. Watershed boundaries were based on the results of DEM and slope analysis, and contain minor variations from surface water mapping at local scales. The results nevertheless provide generalized drainage areas which can be used to define local study areas. As the western boundary of the study area is based on a geologic divide, watersheds along the western boundary of the study area have been truncated, and represent only partial drainage areas. Watersheds generated as part of this analysis generally corresponded well with the published boundaries of 45 watersheds for which hydrometric data has been collected by the Water Survey of Canada.

Watershed mapping was overlain with the DEM, quaternary geology, and bedrock geology mapping to determine watershed-basin groupings. Groupings are shown in bold on Figure 6. The intent of watershed grouping was to identify watershed and ground-watershed areas with common regional recharge and discharge zones. Delineation of basin groupings was based primarily on regional topographic trends and shared bay / ocean discharge zones. Geologic boundaries were considered when grouping watersheds in some locations, and small coastal watersheds were generally grouped with larger nearby systems. Basin Groupings are used as study area boundaries for more detailed mapping as part of Task 3.

2.7 Pumping Test Data

Reports on file with ENVC were collated to extract pumping test data collected at sites within the Eastern Newfoundland study area. Pumping test reports included some Level II Groundwater Investigations under the province's guideline for reporting for proposed subdivision developments (ENVC, 2010). Other data was drawn from four regional reports (Nolan, Davis and Associates Limited, 1981; Nolan, Davis and Associates Limited, 1982; FracFlow Consultants Inc., 1984; Golder Associates, 1985), describing the hydrogeology of Eastern Newfoundland on the Avalon Peninsula, Burin Peninsula, Trinity Bay area, and Bonavista Bay area.

A total of 166 records were compiled. CBCL entered the data into a geodatabase file showing the well location, designation, community, well construction details, and transmissivity. Transmissivities were converted into units of m^2/day. Well coordinates, if not provided in the report, were generated for 68 of the records based on mapping in each report, with an estimated accuracy of +/- 100 metres. Collated pumping test data are shown on Tables C1, C2, and C3 in Appendix C.



LEGEND

- Study Area Boundary
- Basin / Watershed Group
- Watershed (>10 km2)

Figure 6

Preliminary Watershed Mapping

Eastern Newfoundland Groundwater Vulnerability Assessment

Coordinate System: NAD 1983 UTM Zone 21N
Projection: Transverse Mercator
Datum: North American 1983
Units: Meter

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0 5 10 20 30 40 km

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Pumping test coordinates were joined with detailed geology mapping to determine the mapped formation underlying each pumping test location. This data is analyzed as part of Task 2, used to help generate the Bedrock and Quaternary indices for vulnerability mapping. Figure 7 shows pumping test locations and associated bedrock geologic units.

2.8 Drilled Well Data

Drilled well data for the province were extracted to show those within the Eastern Newfoundland Study area, shown on Figure 8. A total of 12,485 records were extracted from the provincial data set. Records with yield and depth data, and showing a georeferencing method of "map" or "GPS" were considered sufficiently accurate to conduct a geospatial analysis of the data, comprising 3,532 well records. Well records were joined to underlying bedrock units in order to associate yield and depth to bedrock data with bedrock type and individual polygons in the study area. The results of this analysis are presented under Task 2.

2.9 Slope Analysis

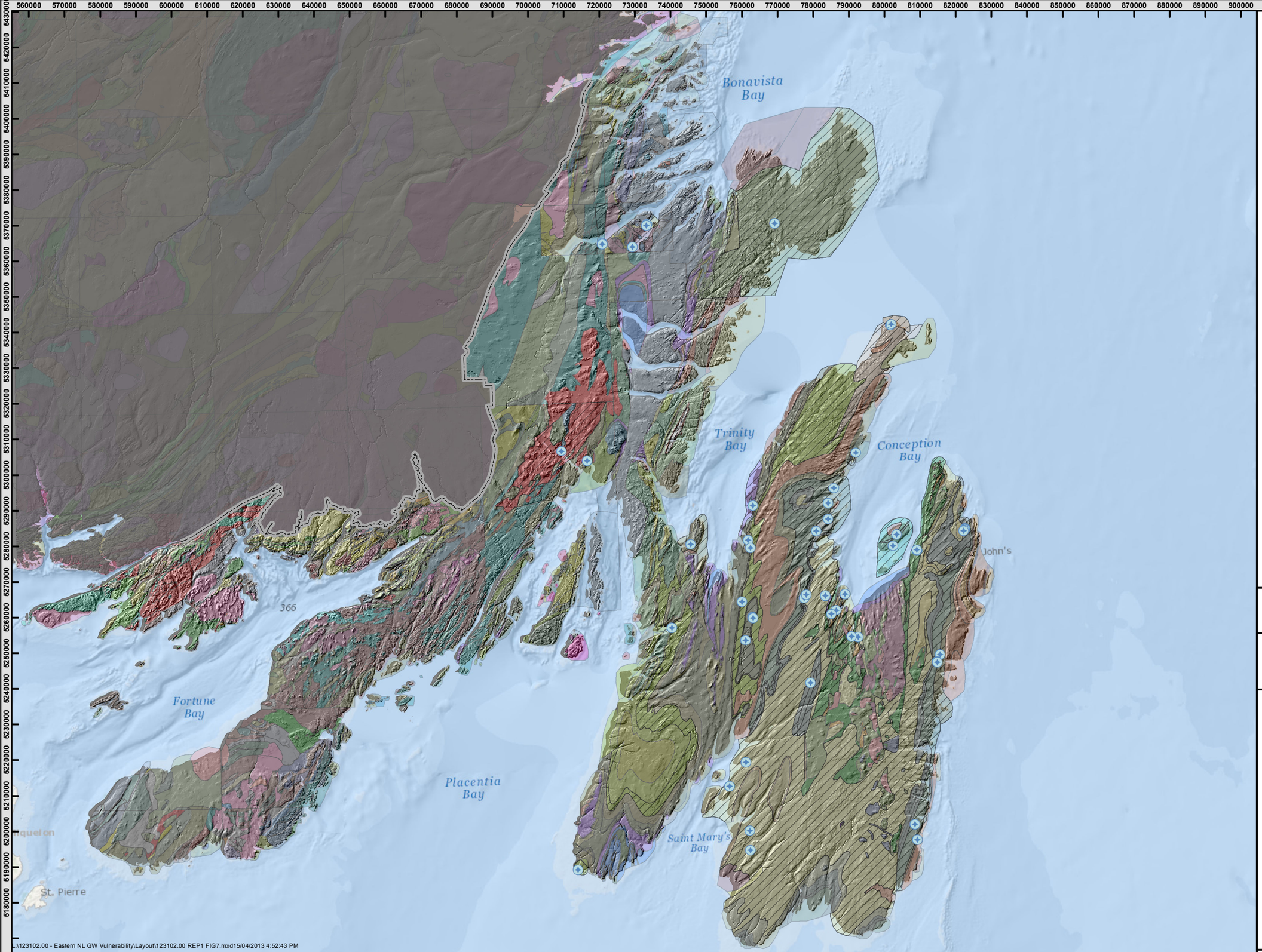
The DEM was processed in ArcGIS to produce a raster map of slope, shown on Figure 9. Slope data were converted to an index and included in groundwater vulnerability mapping as part of Task 3. The slope analysis was used to generate raster maps of flow direction and flow accumulation, which were in turn used to delineate watersheds for the study area.

2.10 Precipitation

The province's Water Resources portal provides a map of precipitation completed in 1995. As a digital version and original data for this map are no longer available, the image from the web portal was digitized in ArcGIS, shown on Figure 10.

2.11 Basemap and Topographic Data

An example of base mapping and topographic data is shown on Figure 11. This data will be used as needed for detailed study area map layouts.



LEGEND

- Pumping Test Data
- Geologic Units with Pumping Test Data
- Study Area Boundary

Figure 7

Pumping Tests and Geologic Units

Eastern Newfoundland Groundwater Vulnerability Assessment

Coordinate System: NAD 1983 UTM Zone 21N
Projection: Transverse Mercator
Datum: North American 1983
Units: Meter

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0 5 10 20 30 40 km

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Wabana
Bishop's Cove
Torbay
Logy Bay-Middle Cove-Outer Cove
Portugal Cove-St. Philip's
St. John's
Cupids
Brigus
Paradise
Conception Bay South
Mount Pearl
Petty Harbour-Maddox Cove
Colliers
Conception Harbour
Avondale
Holyrood
0 2.5 5 10 15 20 km
1:250,000

Bonavista Bay
Trinity Bay
Conception Bay
St. John's
Mount Pearl
366
496
Fortune Bay
Placentia Bay
St. Pierre and Miquelon
St. Pierre
Saint Mary's Bay

LEGEND

- Mapped Water Well Record
- Study Area Boundary
- City

Figure 8

Drilled Wells and Geologic Units

Eastern Newfoundland Groundwater Vulnerability Assessment

Coordinate System: NAD 1983 UTM Zone 21N
Projection: Transverse Mercator
Datum: North American 1983
Units: Meter

N W E S

CBCL LIMITED
Consulting Engineers

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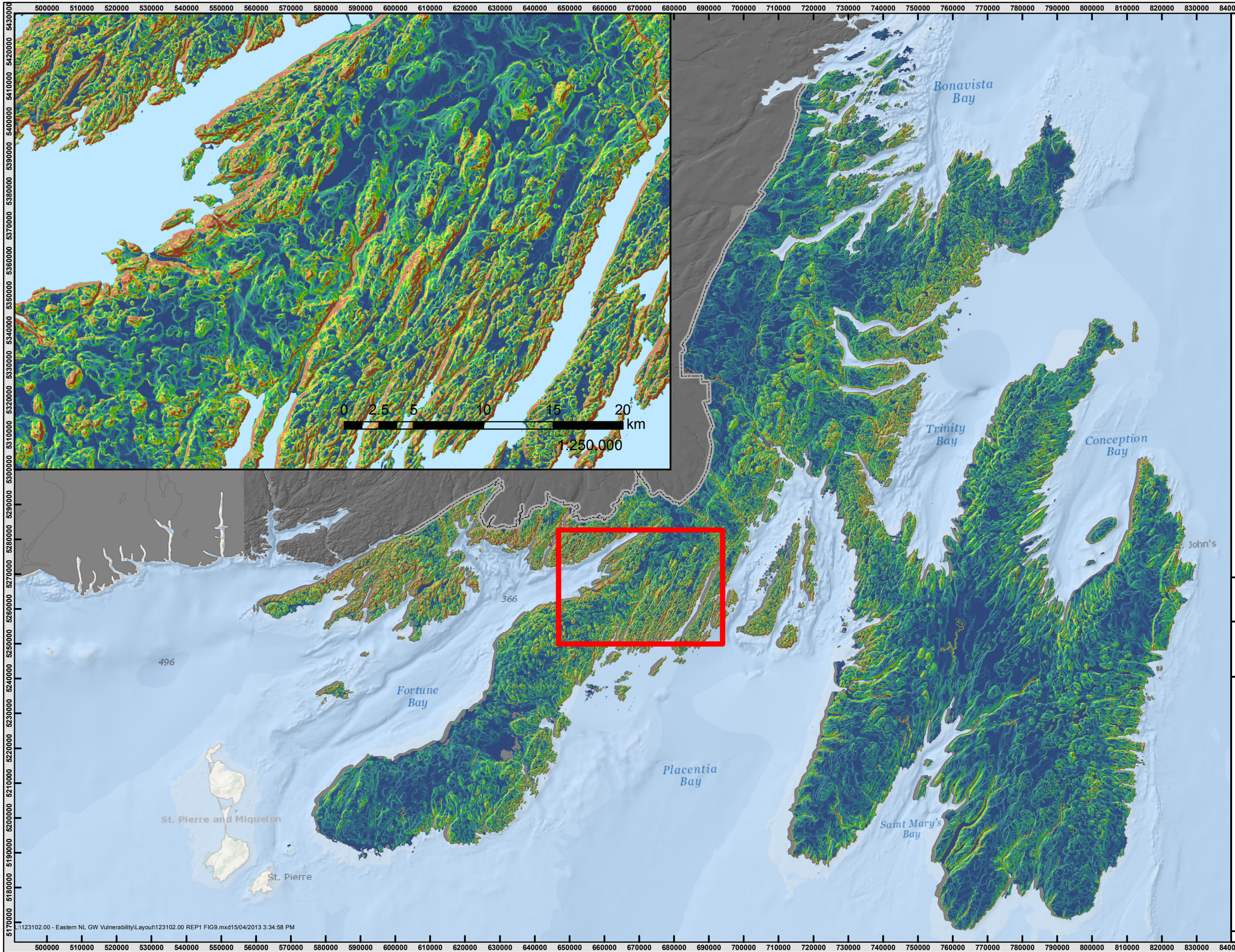
\\123102.00 - Eastern NL GW Vulnerability\Layout\123102.00 REP1 FIG8.mxd15/04/2013 4:28:37 PM



LEGEND

Study Area Boundary

% Slope

High : 241.14

Low : 0

Figure 9

Slope Analysis

Eastern Newfoundland Groundwater Vulnerability Assessment

Coordinate System: NAD 1983 UTM Zone 21N
Projection: Transverse Mercator
Datum: North American 1983
Units: Meter

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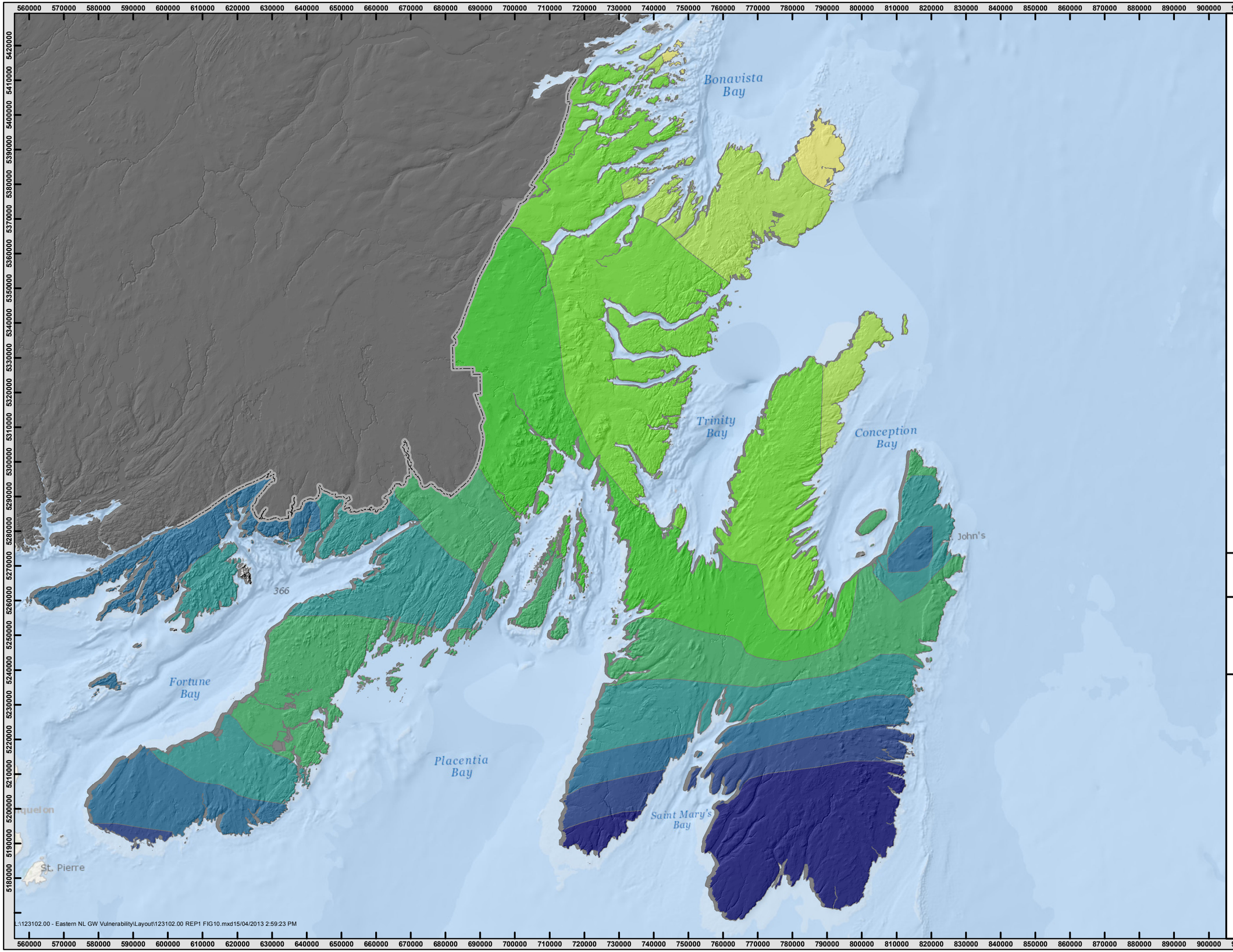

LEGEND

Study Area Boundary

PRECIPITATION_MM

- 950
- 951 - 1050
- 1051 - 1150
- 1151 - 1250
- 1251 - 1350
- 1351 - 1450
- 1451 - 1550
- 1551 - 1650
- 1651 - 1750

Figure 10

Precipitation (after ENVC, 1995)

Eastern Newfoundland Groundwater Vulnerability Assessment

Coordinate System: NAD 1983 UTM Zone 21N
Projection: Transverse Mercator
Datum: North American 1983
Units: Meter

N W E S

0 5 10 20 30 40 km

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LEGEND

- Protected Well Heads
- Public Water Intakes
- Public Well Head
- City
- Town
- Village
- Transmission Line
- Arterial Highway
- Regional Road
- Road
- Street
- Forest Access Road
- Watercourse
- Town Boundaries
- Waterbody
- String Bog
- Wetland
- Public Water Supply Area
- Wooded Area

Figure 11

Topographic Mapping

Eastern Newfoundland Groundwater Vulnerability Assessment

Coordinate System: NAD 1983 UTM Zone 21N
Projection: Transverse Mercator
Datum: North American 1983
Units: Meter

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0 0.350.7 1.4 2.1 2.8 km

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APPENDIX A

Geodatabase and Base Map Layout Structures

Table A1: Basemap Layout and Geodatabase Structure

Data Group	Data Layer
HUs EASTERN NL	HUs EASTERN NL
WELLS AND PUMPING TESTS	Pumping Tests
	Drilled Wells Database
	Pumping Tests-Geology Joined
	Wells-Geology Joined
GEOLOGY - LINE and POINT LAYERS	Drill Cores
	Granite Geochemistry
	Volcanic Geochemistry_Major
	Volcanic Geochemistry_Traces
	Eskers
	Fault Lines
	Quarries
TOWNS and PLACES	Points of Interest
	Water Body Lables
	CANVEC_50 k Named Features
	CITY
	TOWN
	VILLAGE
	Town Boundaries
INFRASTRUCTURE	CANVEC_50 k Building POINT
	CANVEC_50 k Building POLYGON
	CANVEC_50 k Tank POINT
	CANVEC_50 k Tank POLYGON
	CANVEC_50 k Transmission Line
	Roads
	Forest Access Roads
GEOLOGY ANNOTATION	Bedrock Annotation
	Leader Lines
MARINE OVERLAY	MARINE OVERLAY
CANVEC 50k Contours_Metric	Contour Lines
HYDROLOGY & WETLANDS	Baseflow_POINT
	Recharge_Continuous
	Recharge_Grouped
	Water Stations
	Precipitation_1995
	WSC Watersheds

Table A1 (cont'd): Basemap Layout and Geodatabase Structure

Data Group	Data Layer
HYDROLOGY & WETLANDS	CANVEC 250k Single Line Watercourse
	CANVEC 250k Inland Water
	CANVEC 50k Single Line Watercourse
	CANVEC 50k Inland Water
	Watershed_Basin
	Waterhsed_Major
	Watershed_All
	CANVEC 50k String Bog
	CANVEC 50k Wetland
WATER SUPPLY AREAS	Protected Well Heads
	Public Water Intakes
	Public Well Heads
	Public Water Supply Area
GEOLOGY - POLYGON LAYERS	NL Soils
	Surficial Geology
	CANVEC_50k Sand
	Bedrock Geology
	Bedrock Geology Detailed
	Bedrock Geology Detailed Geolegend
WOODED AREAS	WOODED AREAS
NATIONAL PARKS	NATIONAL PARKS
PROVINCIAL PROTECTED AREA	PROVINCIAL PROTECTED AREA
LANDMASS, DEM and HILLSHADE	CANVEC_50k Landmass
	DEM_20m
	DEM_20m Hillshade
	Analysis Area Clipper
ANALYSIS	Slope
	Flow Accumulation
	Flow Direction
	Outlets
VULNERABILITY*	Soils Index
	Quaternary Index
	Bedrock Index
	Slope Index
	Precipitation Index
	Recharge Index
	Vulnerability Index
SUITABILITY*	Baseline Chemistry Index
	Land Use Index
	Suitability Index

*to be completed as part of Task 3

APPENDIX B

Bedrock Geology Units in the Eastern Newfoundland Study Area

Table B1. Geologic Units in the Study Area

SUPERGROUP	GROUP	FORMATION	MEMBER	ROCKTYPE	ROCK_SIMP
		(001M/0315 Dev or earlier granitoid intrusion)		plutonic	PLUTONIC
		(001M/0315 Dev or earlier mafic intrusions)		hypabyssal mafic	PLUTONIC
		(001M/04/0170a undivided Cambrian shales and limestones)			SHALE
		(001M/04/0170a undivided late Proterzoic intrusives)			PLUTONIC
		(002C/12/0054 biotite granodiorite)		plutonic intermediate	PLUTONIC
		(002C/13/0055 diabase dykes)		hypabyssal mafic	PLUTONIC
		(002C/13/0055 granite porphyry)			PLUTONIC
		(002D/0271 sandstone)		siliciclastic sandstone	SANDSTONE
		(002D/0271 unnamed granite and granodiorite)			PLUTONIC
		(002D/09/0260 gabbro and diabase)		hypabyssal mafic	PLUTONIC
		(002D/09/0260 gabbro and diabase)		hypabyssal mafic	PLUTONIC
		(NFLD/2246 dark-grey fine and medium grained gabbro)		plutonic mafic	PLUTONIC
		(NFLD/2246 equigranular, hornblende-biotite granite)		plutonic	PLUTONIC
		(NFLD/2568 early and middle Cambrian rocks)			PLUTONIC
		(NFLD/2568 Middle Cambrian black and grey shale and siltstone)		sedimentary marine	SHALE

Table B1. Geologic Units in the Study Area

SUPERGROUP	GROUP	FORMATION	MEMBER	ROCKTYPE	ROCK_SIMP
		(NFLD/2568 undivided shale and Slate)		siliciclastic marine	SHALE
		(NFMAP 96-22 Devonian intrusions)		plutonic intermediate	PLUTONIC
		(NFMAP 96-22 Devonian intrusions)		plutonic ultramafic	PLUTONIC
		(NFMAP 96-22 Unnamed gabbro)		plutonic mafic	PLUTONIC
		Anchor Drogue granodiorite		plutonic intermediate	PLUTONIC
		Cape Freels Granite		plutonic felsic	PLUTONIC
		Cinq Isles Formation		siliciclastic non-marine	SANDSTONE
		Clancey's Pond Complex		volcanic felsic	VOLCANIC
		Deer End formation		sedimentary	SHALE
		Gaultois Granite		plutonic felsic	PLUTONIC
		Grand Beach Complex		volcaniclastic	VOLCANIC
		Great Bay de l'Eau Formation		hornfels	METAMORPHIC
		Great Bay de l'Eau Formation		siliciclastic non-marine conglomerate	CONGLOMERATE
		Great Bay de l'Eau Formation		volcanic mafic non-marine	VOLCANIC
		Harbour Breton Granite	Jerseymans Harbour and Northeast Arm bodies	plutonic felsic	PLUTONIC
		Harbour Breton Granite	Taylor Bay stock	plutonic felsic	PLUTONIC
		Hardy's Cove granite		plutonic felsic	PLUTONIC
		Hardy's Cove granite		plutonic intermediate	PLUTONIC
		Indian Point granite		plutonic felsic	PLUTONIC
		Loughlins Hill Gabbro			PLUTONIC
		Middle Ridge Granite		plutonic felsic	PLUTONIC

Table B1. Geologic Units in the Study Area

SUPERGROUP	GROUP	FORMATION	MEMBER	ROCKTYPE	ROCK_SIMP
		Mount Margaret Gabbro			PLUTONIC
		Newport Granite		plutonic felsic	PLUTONIC
		Old Woman stock		plutonic felsic	PLUTONIC
		Pass Island Granite		plutonic felsic	PLUTONIC
		Pools Cove Formation		siliciclastic non-marine	SANDSTONE
		Pools Cove Formation		siliciclastic non-marine conglomerate	CONGLOMERATE
		Rocky Ridge Formation		volcanic felsic	VOLCANIC
		Sall the Maid Granite		plutonic intermediate	PLUTONIC
		Seal Cove Gabbro		plutonic mafic	PLUTONIC
		Spanish Room Formation		sedimentary marine	SANDSTONE
		St. Lawrence Granite		plutonic felsic	PLUTONIC
		Terra Nova Granite		plutonic felsic	PLUTONIC
		Terrenceville Formation		siliciclastic non-marine conglomerate	CONGLOMERATE
		Tickle Point Formation		volcanic felsic non-marine	VOLCANIC
	(NFLD/1680 diabase and dioritic dikes)			hypabyssal mafic	PLUTONIC
	(NFLD/1680 diabase, diorite and gabbro sills)			hypabyssal mafic	PLUTONIC
	Ackley Granite Suite			plutonic felsic	PLUTONIC
	Ackley Granite Suite	Hungry Grove-Rencontre Lake granites		hypabyssal felsic	PLUTONIC
	Ackley Granite Suite	Hungry Grove-Rencontre Lake granites		plutonic felsic	PLUTONIC
	Ackley Granite Suite	Tolt			PLUTONIC
	Adeyton Group	Bonavista Formation		sedimentary marine	SHALE

Table B1. Geologic Units in the Study Area

SUPERGROUP	GROUP	FORMATION	MEMBER	ROCKTYPE	ROCK_SIMP
	Adeyton Group	Brigus Formation		siliciclastic marine shale	SHALE
	Adeyton Group	Smith Point Formation		sedimentary marine	LIMESTONE
	Bell Island Group	Little Bell Island Formation		sedimentary marine	SANDSTONE
	Bell Island Group	Redmans Formation		sedimentary marine	METAMORPHIC
	Belleoram Granite			hypabyssal felsic	PLUTONIC
	Belleoram Granite			plutonic felsic	PLUTONIC
	Belleoram Granite		Red Head Porphyry	hypabyssal felsic	PLUTONIC
	Berry Hills Granite			plutonic	PLUTONIC
	Burin Group			volcanic mafic marine	VOLCANIC
	Burin Group	Beaver Pond Formation		volcaniclastic mafic	VOLCANIC
	Burin Group	Corbin Head Formation		volcaniclastic	VOLCANIC
	Burin Group	Pardy Island Formation		volcanic mafic marine	VOLCANIC
	Burin Group	Path End Formation		volcanic mafic	VOLCANIC
	Burin Group	Port au Bras Formation			VOLCANIC
	Burin Group	Port au Bras Formation		volcanic mafic	VOLCANIC
	Burin Group	Port au Bras Formation		volcaniclastic mafic	VOLCANIC
	Burin Group	Sculpin Point Formation			SANDSTONE
	Burin Group	Wandsworth Formation		igneous	PLUTONIC
	Burin Group	Wandsworth Formation		plutonic	PLUTONIC
	Cape Roger Mountain Granite				PLUTONIC
	Cape Roger Mountain Granite			plutonic	PLUTONIC
	Cape Roger Mountain Granite			plutonic intermediate	PLUTONIC
	Clarenville Granite				PLUTONIC
	Conception Group	Briscal Formation		sedimentary marine	SANDSTONE
	Conception Group	Drook Formation			SHALE
	Conception Group	Drook Formation	Bauline Line Member	volcanic marine	VOLCANIC

Table B1. Geologic Units in the Study Area

SUPERGROUP	GROUP	FORMATION	MEMBER	ROCKTYPE	ROCK_SIMP
	Conception Group	Drook Formation	Biscay Member	volcanic mafic marine	BASALT
	Conception Group	Drook Formation	Cape English Member	sedimentary marine	SANDSTONE
	Conception Group	Drook Formation	Clam Cove Member	sedimentary	SILTSTONE
	Conception Group	Drook Formation	Peter's River Member	sedimentary marine	SANDSTONE
	Conception Group	Drook Formation	Torbay Member	sedimentary marine	SANDSTONE
	Conception Group	Gaskiers Formation		sedimentary marine	SILTSTONE
	Conception Group	Mall Bay Formation		siliciclastic siltstone	SILTSTONE
	Conception Group	Mistaken Point Formation			SILTSTONE
	Connaigre Bay Group	Doughball Point Formation		volcanic mafic	VOLCANIC
	Connaigre Bay Group	Downs Point Formation		siliciclastic non-marine	SANDSTONE
	Connaigre Bay Group	Downs Point Formation		volcanic felsic non-marine	VOLCANIC
	Connaigre Bay Group	Sam Head Formation		siliciclastic marine	SILTSTONE
	Connaigre Bay Group?			metamorphic	METAMORPHIC
	Connaigre Bay Group?			volcaniclastic mafic	VOLCANIC
	Connecting Point Group			hypabyssal mafic	PLUTONIC
	Connecting Point Group			mixtite	SILTSTONE
	Connecting Point Group			siliciclastic black shale	SHALE
	Connecting Point Group			siliciclastic conglomerate	CONGLOMERATE
	Connecting Point Group			siliciclastic marine	SILTSTONE
	Connecting Point Group			siliciclastic marine conglomerate	CONGLOMERATE
	Connecting Point Group			siliciclastic marine sandstone	SANDSTONE
	Connecting Point Group			siliciclastic marine shale	SHALE
	Connecting Point Group			siliciclastic sandstone	SANDSTONE

Table B1. Geologic Units in the Study Area

SUPERGROUP	GROUP	FORMATION	MEMBER	ROCKTYPE	ROCK_SIMP
	Connecting Point Group			siliciclastic siltstone	SILTSTONE
	Connecting Point Group			volcanic felsic	VOLCANIC
	Connecting Point Group			volcanic mafic marine	VOLCANIC
	Connecting Point Group			volcaniclastic felsic	VOLCANIC
	Cross Hills Plutonic Suite				PLUTONIC
	Cross Hills Plutonic Suite			hypabyssal mafic	PLUTONIC
	Cross Hills Plutonic Suite			plutonic	PLUTONIC
	Cross Hills Plutonic Suite			plutonic felsic	PLUTONIC
	Cross Hills Plutonic Suite			plutonic intermediate	PLUTONIC
	Cross Hills Plutonic Suite			plutonic mafic	PLUTONIC
	Deep Water Point Granodiorite				PLUTONIC
	Deep Water Point Granodiorite			hypabyssal mafic	PLUTONIC
	Deep Water Point Granodiorite			plutonic	PLUTONIC
	Deep Water Point Granodiorite			plutonic felsic	PLUTONIC
	Furbys Cove Intrusive Suite			hypabyssal	PLUTONIC
	Furbys Cove Intrusive Suite			plutonic felsic	PLUTONIC
	Furbys Cove Intrusive Suite			plutonic intermediate	PLUTONIC
	Grole Intrusive Suite			plutonic mafic	PLUTONIC
	Harbour Main Group				PLUTONIC
	Harcourt Group	Elliotts Cove Formation		sedimentary marine	SHALE
	Harcourt Group	Manuels River Formation		hypabyssal mafic	PLUTONIC
	Harcourt Group	Manuels River Formation		sedimentary marine	SHALE
	Hare Bay Gneiss			migmatite	PLUTONIC
	Holyrood Intrusive Suite				PLUTONIC
	Holyrood Intrusive Suite			plutonic felsic	PLUTONIC

Table B1. Geologic Units in the Study Area

SUPERGROUP	GROUP	FORMATION	MEMBER	ROCKTYPE	ROCK_SIMP
	Inlet Group			hornfels	PLUTONIC
	Inlet Group			siliciclastic marine shale	SHALE
	Inlet Group	Bay View Formation		sedimentary marine	SHALE
	Inlet Group	Pleasant View Formation		sedimentary marine	SHALE
	Inlet Group	Salt Pond Formation		sedimentary marine	SHALE
	Iona Islands Intrusive Suite			igneous	PLUTONIC
	Iona Islands Intrusive Suite			plutonic mafic	PLUTONIC
	Lockers Bay Granite			plutonic felsic	PLUTONIC
	Long Harbour Group	Andersons Cove Formation		hypabyssal mafic	PLUTONIC
	Long Harbour Group	Andersons Cove Formation		sedimentary	SANDSTONE
	Long Harbour Group	Andersons Cove Formation		siliciclastic	METAMORPHIC
	Long Harbour Group	Andersons Cove Formation		siliciclastic marine	SILTSTONE
	Long Harbour Group	Andersons Cove Formation		siliciclastic marine sandstone	SANDSTONE
	Long Harbour Group	Andersons Cove Formation		volcanic	VOLCANIC
	Long Harbour Group	Belle Bay Formation		hornfels	PLUTONIC
	Long Harbour Group	Belle Bay Formation		siliciclastic non-marine	VOLCANIC
	Long Harbour Group	Belle Bay Formation		volcanic felsic non-marine	VOLCANIC
	Long Harbour Group	Belle Bay Formation		volcaniclastic	VOLCANIC
	Long Harbour Group	English Harbour East Formation		volcanic	VOLCANIC
	Long Harbour Group	English Harbour East Formation		volcanic felsic	VOLCANIC
	Long Harbour Group	English Harbour East Formation		volcanic mafic	VOLCANIC
	Long Harbour Group	English Harbour East Formation		volcaniclastic	VOLCANIC
	Long Harbour Group	Grand Le Pierre Formation		volcanic felsic	VOLCANIC

Table B1. Geologic Units in the Study Area

SUPERGROUP	GROUP	FORMATION	MEMBER	ROCKTYPE	ROCK_SIMP
	Long Harbour Group	Mooring Cove Formation		siliciclastic non-marine sandstone	SANDSTONE
	Long Harbour Group	Mooring Cove Formation		volcanic felsic non-marine	VOLCANIC
	Long Harbour Group	Mooring Cove Formation		volcanic mafic	VOLCANIC
	Long Harbour Group	Mooring Cove Formation		volcanic marine	VOLCANIC
	Long Harbour Group	Mooring Cove Formation		volcanic non-marine	VOLCANIC
	Long Harbour Group	Rencontre Formation		hornfels	PLUTONIC
	Long Harbour Group	Rencontre Formation		siliciclastic marine	SANDSTONE
	Long Harbour Group	Rencontre Formation		siliciclastic non-marine	SANDSTONE
	Long Harbour Group	Rencontre Formation		siliciclastic non-marine conglomerate	CONGLOMERATE
	Long Harbour Group	Rencontre Formation		siliciclastic non-marine sandstone	SANDSTONE
	Long Harbour Group	Rencontre Formation		volcaniclastic felsic	VOLCANIC
	Long Harbour Group	Snooks Tolt Formation		volcanic	VOLCANIC
	Long Harbour Group	Snooks Tolt Formation		volcanic felsic	VOLCANIC
	Long Harbour Group	Snooks Tolt Formation		volcanic mafic	VOLCANIC
	Long Harbour Group	Southern Hills Formation			VOLCANIC
	Long Harbour Group	Southern Hills Formation		volcanic felsic	VOLCANIC
	Long Harbour Group	Southern Hills Formation		volcaniclastic	VOLCANIC
	Louil Hills Intrusive Suite			plutonic	PLUTONIC
	Louil Hills Intrusive Suite			plutonic mafic	PLUTONIC
	Louil Hills Intrusive Suite		Louil Hills Granite	plutonic felsic	PLUTONIC
	Love Cove Group			metavolcanic	METAMORPHIC
	Love Cove Group			siliciclastic black shale	SHALE
	Love Cove Group			volcanic felsic	VOLCANIC
	Love Cove Group			volcanic intermediate	VOLCANIC

Table B1. Geologic Units in the Study Area

SUPERGROUP	GROUP	FORMATION	MEMBER	ROCKTYPE	ROCK_SIMP
	Love Cove Group			volcanic mafic	VOLCANIC
	Love Cove Group			volcaniclastic	VOLCANIC
	Love Cove Group	Grandy's Pond formation			VOLCANIC
	Love Cove Group	Grandy's Pond formation		sedimentary	METAMORPHIC
	Love Cove Group	Grandy's Pond formation		volcanic mafic	VOLCANIC
	Love Cove Group	Grandy's Pond formation		volcaniclastic felsic	VOLCANIC
	Marystown Group			metavolcanic	METAMORPHIC
	Marystown Group			volcanic	VOLCANIC
	Marystown Group	Barasway Formation			PLUTONIC
	Marystown Group	Barasway Formation		hypabyssal	PLUTONIC
	Marystown Group	Barasway Formation		hypabyssal felsic	PLUTONIC
	Marystown Group	Calmer Formation		volcanic	VOLCANIC
	Marystown Group	Cashel Lookout Formation			VOLCANIC
	Marystown Group	Cashel Lookout Formation		volcanic	VOLCANIC
	Marystown Group	Cashel Lookout Formation		volcanic felsic	VOLCANIC
	Marystown Group	Cashel Lookout Formation		volcanic mafic	VOLCANIC
	Marystown Group	Creston Formation			VOLCANIC
	Marystown Group	Garnish Formation		volcanic mafic	VOLCANIC
	Marystown Group	Grand Bank Sequence		siliciclastic sandstone	SANDSTONE
	Marystown Group	Grand Bank Sequence		volcanic	VOLCANIC
	Marystown Group	Harbour My God Point Formation			VOLCANIC
	Marystown Group	Harbour My God Point Formation		volcanic	VOLCANIC
	Marystown Group	Harbour My God Point Formation		volcanic mafic	VOLCANIC
	Marystown Group	Hare Hills Tuff		volcanic felsic	VOLCANIC
	Marystown Group	Lamaline Basalts		volcanic mafic	VOLCANIC
	Marystown Group	Mount Lucy Anne Formation		volcanic felsic	VOLCANIC
	Marystown Group	Mount Lucy Anne Formation		volcanic mafic	VOLCANIC
	Marystown Group	Mount Saint Anne Formation		volcanic	VOLCANIC

Table B1. Geologic Units in the Study Area

SUPERGROUP	GROUP	FORMATION	MEMBER	ROCKTYPE	ROCK_SIMP
	Marystown Group	Mount Saint Anne Formation		volcanic felsic	VOLCANIC
	Marystown Group	Taylors Bay Formation			VOLCANIC
	Marystown Group	Taylors Bay Formation		volcanic	VOLCANIC
	Marystown Group	Tilt Hills Formation		volcanic	VOLCANIC
	Marystown Group	Tilt Hills Formation		volcanic mafic	VOLCANIC
	Marystown Group	Unnamed Breccia			VOLCANIC
	Musgravetown Group			sedimentary	SANDSTONE
	Musgravetown Group	Big Head Formation			CONGLOMERATE
	Musgravetown Group	Big Head Formation		siliciclastic marine conglomerate	CONGLOMERATE
	Musgravetown Group	Bull Arm Formation			PLUTONIC
	Musgravetown Group	Bull Arm Formation		hypabyssal mafic	PLUTONIC
	Musgravetown Group	Bull Arm Formation		plutonic intermediate	PLUTONIC
	Musgravetown Group	Bull Arm Formation		sedimentary	SANDSTONE
	Musgravetown Group	Bull Arm Formation		siliciclastic marine conglomerate	CONGLOMERATE
	Musgravetown Group	Bull Arm Formation		volcanic	VOLCANIC
	Musgravetown Group	Bull Arm Formation		volcanic felsic	VOLCANIC
	Musgravetown Group	Bull Arm Formation		volcanic intermediate	VOLCANIC
	Musgravetown Group	Bull Arm Formation		volcanic mafic	VOLCANIC
	Musgravetown Group	Cannings Cove Formation			CONGLOMERATE
	Musgravetown Group	Crown Hill Formation			CONGLOMERATE
	Musgravetown Group	Crown Hill Formation		sedimentary	CONGLOMERATE
	Musgravetown Group	Crown Hill Formation		siliciclastic conglomerate	CONGLOMERATE
	Musgravetown Group	Crown Hill Formation		siliciclastic marine conglomerate	CONGLOMERATE
	Musgravetown Group	Crown Hill Formation		siliciclastic marine siltstone	SILTSTONE
	Musgravetown Group	Crown Hill Formation		volcanic	VOLCANIC

Table B1. Geologic Units in the Study Area

SUPERGROUP	GROUP	FORMATION	MEMBER	ROCKTYPE	ROCK_SIMP
	Musgravetown Group	Deadmans Cove Formation		siliciclastic sandstone	SANDSTONE
	Musgravetown Group	Heart's Content Formation		sedimentary marine	SHALE
	Musgravetown Group	Jigging Cove Formation		sedimentary	SANDSTONE
	Musgravetown Group	Maturin Ponds Formation		sedimentary marine	SANDSTONE
	Musgravetown Group	Rocky Harbour Formation			PLUTONIC
	Musgravetown Group	Rocky Harbour Formation		hornfels	PLUTONIC
	Musgravetown Group	Rocky Harbour Formation		hypabyssal mafic	PLUTONIC
	Musgravetown Group	Rocky Harbour Formation		sedimentary	SANDSTONE
	Musgravetown Group	Rocky Harbour Formation		sedimentary marine	SANDSTONE
	Musgravetown Group	Rocky Harbour Formation		siliciclastic conglomerate	CONGLOMERATE
	Musgravetown Group	Rocky Harbour Formation		siliciclastic sandstone	SANDSTONE
	Musgravetown Group	Rocky Harbour Formation		siliciclastic siltstone	SILTSTONE
	Musgravetown Group	Rocky Harbour Formation		volcanic mafic	VOLCANIC
	Musgravetown Group	Trinny Cove Formation			SANDSTONE
	Musgravetown Group	Undivided Sedimentary rocks		sedimentary	SANDSTONE
	Musgravetown Group	Upper Rocky Harbour Formation	Cape Bonavista Facies	siliciclastic marine sandstone	SANDSTONE
	Musgravetown Group	Wild Cove formation		sedimentary	SANDSTONE
	North West Brook Complex			plutonic felsic	PLUTONIC
	Powder Horn Diorite Complex				PLUTONIC
	Ragged Islands Intrusive Suite				PLUTONIC
	Ragged Islands Intrusive Suite			plutonic intermediate	PLUTONIC
	Red Island Granite			plutonic intermediate	PLUTONIC
	Red Island Granite			plutonic mafic	PLUTONIC
	Signal Hill Group	Bay de Verde Formation	Baccalieu Member		CONGLOMERATE

Table B1. Geologic Units in the Study Area

SUPERGROUP	GROUP	FORMATION	MEMBER	ROCKTYPE	ROCK_SIMP
	Signal Hill Group	Bay de Verde Formation	Cooks Cove Member	siliciclastic marine sandstone	SANDSTONE
	Signal Hill Group	Bay de Verde Formation	Grates Cove Member	siliciclastic siltstone	SILTSTONE
	Signal Hill Group	Bay de Verde Formation	Old Perlican Member		SANDSTONE
	Signal Hill Group	Blackhead Formation		siliciclastic marine sandstone	SANDSTONE
	Signal Hill Group	Blackhead Formation	Maddox Cove Member	siliciclastic marine siltstone	SILTSTONE
	Signal Hill Group	Cape Ballard Formation		siliciclastic marine	SANDSTONE
	Signal Hill Group	Cape Ballard Formation		siliciclastic marine siltstone	SILTSTONE
	Signal Hill Group	Cappahayden Formation		siliciclastic marine siltstone	SILTSTONE
	Signal Hill Group	Cuckold Formation			CONGLOMERATE
	Signal Hill Group	Ferryland Head Formation		sedimentary	SANDSTONE
	Signal Hill Group	Ferryland Head Formation	High Rocks Member	siliciclastic marine sandstone	SANDSTONE
	Signal Hill Group	Flat Rock Cove Formation	Piccos Brook Member	sedimentary marine	SANDSTONE
	Signal Hill Group	Gibbett Hill Formation			SILTSTONE
	Signal Hill Group	Gibbett Hill Formation		siliciclastic sandstone	SANDSTONE
	Signal Hill Group	Quidi Vidi Formation			SANDSTONE
	Simmons Brook Intrusive Suite			plutonic felsic	PLUTONIC
	Simmons Brook Intrusive Suite			plutonic intermediate	PLUTONIC
	Spread Eagle Gabbro			plutonic mafic	PLUTONIC
	St. John's Group	Fermeuse Formation		sedimentary marine	SHALE
	St. John's Group	Renews Head Formation		sedimentary marine	SANDSTONE
	St. John's Group	Trepassey formation		sedimentary marine	SANDSTONE
	Swift Current Intrusive Suite	Swift Current Gabbro		plutonic mafic	PLUTONIC

Table B1. Geologic Units in the Study Area

SUPERGROUP	GROUP	FORMATION	MEMBER	ROCKTYPE	ROCK_SIMP
	Swift Current Intrusive Suite	Swift Current Granite		plutonic	PLUTONIC
	Unnamed Devonian Intrusions				PLUTONIC
	Unnamed Diabase and Gabbro Dikes			hypabyssal mafic	PLUTONIC
	Wabana Group	Grebes Nest Point Formation		sedimentary marine	SHALE
	Whalesback Gabbro				PLUTONIC
	Youngs Cove Group	Chamberlains Brook Formation		siliciclastic marine shale	SHALE
	Youngs Cove Group	Chapel Island Formation		hornfels	PLUTONIC
	Youngs Cove Group	Chapel Island Formation		siliciclastic marine	SILTSTONE
	Youngs Cove Group	Random Formation		siliciclastic marine sandstone	SANDSTONE
	Youngs Cove Group	Random Formation		siliciclastic quartzite	METAMORPHIC
	Youngs Cove Group	Salmonier Cove Formation		siliciclastic marine shale	SHALE
Surficial deposits				sedimentary	QUATERNARY
Surficial deposits				siliciclastic	QUATERNARY

APPENDIX C

Pumping Test Data in the Eastern Newfoundland Study Area

Table C1. Pumping Test Data

Community	Well Name/Description	Year Drilled	Well Depth (m)	Casing di. (mm)	Casing Length (m)	Test Date	Duration (hrs)	Static W.L. (m)	Total dd (m)	Average Test Rate (L/min)	Transmissivity (m2/day)	Storativity	Calculated Safe Yield (L/min)
Admiral's Beach	9793	1977	32.31	150	4.57	12/10/1977	24						
Admiral's Beach	9794	1977	48.77	150	4.87	12/10/1977	24	24.4	3.84	56.78	4.7	12.6	34
Admiral's Beach	9791	1979	61	150	4.27	15/02/1980	83.5	12.9	10.1	75-85	2.1	10.1	50
Admiral's Beach	9792	1979	76	150	6.71	15/02/1980	49	19.4	2.9	50-55	5	2.9	35
Admiral's Beach	Well #3		12.9										50
Admiral's Beach	Well #5		19.4										35
Bay de Verde							19.5						3.4
Bay Roberts							22			5			2
Bellevue	Well #1	1992	122	150	7.5	23/02/1993	72	4.32	10	45.5	1.19		45
Bellevue	Well #2	1992	122	150	7.5	28/02/1993	48	4.02	2.7	36.4	3.53		57
Bishops Cove							24			5			5
Blackhead			92	150		10/09/2002	72			66.5	34.56		60 - 65
Blaketown	Well located approx 100 m from Route 80 (Well 12585)	1995	131.6	152	6.9	25/01/1992	24	4.33	82.3	29.5	0.393		29.2
Blaketown			69				23	2.1		6.5	0.1728		7
Bloomfield	Well ID 3404	1986	62.5	150	6.71	03/12/1986	24	1.5	27.7	27	1.6		20
Brigus South			67				23	9.4		10	2.448		9
Broad Cove							20			15.9			5.5
Bryants Cove							22			35			27.3
Bryants Cove							18			19.6			18.2
Bunyan's Cove	off road to Peter's cove (next to Kirk Tucker residence)	1986	32	150		19/03/1986	24	3.35	18.99	113.4	33.4		270
Bunyan's Cove	near old sawmill off main road (abandoned)	1986	125	150		19/03/1986	24	5.5	25.13	9	0.23		12
Bunyan's Cove	Well ID#21890 (municipal supply but listed as domestic in drilled db; can't find this ID in dwd)	2005	38.1	150	10.65	19/10/2005	72	5.2	1.1	172	4.0752634		139
Calvert			36				5	8		37			12
Canning's Cove	250 to 300 m from Government Wharf	1987	103.7	150	1	11/10/1987	24	artesian	91.3	11.4	0.045		9
Canning's Cove		1989	43.9	150	8.2	23/01/1989	24	4	1.77	36	5.45		13.5
Canning's Cove							21			73			68

Table C1. Pumping Test Data

Community	Well Name/Description	Year Drilled	Well Depth (m)	Casing di. (mm)	Casing Length (m)	Test Date	Duration (hrs)	Static W.L. (m)	Total dd (m)	Average Test Rate (L/min)	Transmissivity (m2/day)	Storativity	Calculated Safe Yield (L/min)
Cape St. Mary's		1987	107.9	150		08/04/1994		66.8	3	18.2	0.0000184 m3/sec		30
Cappahayden	15963	2003	60.96	150	12.5	29/11/2003	24	1.2	7.65	20.5	0.70848		21.5
Cappahayden	10m on w side of Route 10		58	150		08/05/2003	48	5.75	46	7.571	225.2988	10.7	3.41
Cavendish	12145	1969	60.35	150	approx. 6	28/09/1994	24	4.76	34.9	19.34	0.269		18.9
Cavendish							8.7			9			11
Come By Chance							17			23			22
Conception Harbour / Lower Bacon Cove		1988	97	150		06/03/1988	24	4.7	39.3	9	0.105		3
Conception Harbour / Lower Bacon Cove		1990	61	150	12.2	20/08/1991	72	1.8	37.6	89	0.965		38
Conception Harbour / Lower Bacon Cove	Healy's Pond Rd. Well (WS-G-0186)	1987	46.2	150	17	18/05/1988		2.2	5.8	68	1136		approx. 13
Dildo							32.7			114			182
Dildo							24			55			77
Dildo South							9.8			32			30
Dildo South							6			33			32
Dildo South							19			18			18
Dildo South							20			11			7
Dunfield	#1						24			28			23
Dunfield	#2						8.5			41			9
Dunfield	#3						2			23			7
Elliston							20			14			7
Fogo							25			68			68
Freshwater	Well #3, Wallace Snow's Well, Well ID #12510	1987	80	150	6.71	24/03/1987		8.3	21	75			75
Freshwater	Covage's Lane Well		26	150			24			19	0.0000159	.0001-0.0	12 - 14
Freshwater							22			23			16
Freshwater							20			9			07-Jan
Georgetown	Well #2, Well ID #13960		122	150		31/03/1989	24	4.3	81	6.8-4.6	0.236		2-4
Georgetown	community well, well id#15113		75.3	150	12.5	22/10/1990	24	5.15	8.3	91	2.88		90
Grates Cove	Proposed municipal well, Well ID#13805	1988	60.4	150	9.2	01/02/1989	24	19.2	4	50	8.236		20

Table C1. Pumping Test Data

Community	Well Name/Description	Year Drilled	Well Depth (m)	Casing di. (mm)	Casing Length (m)	Test Date	Duration (hrs)	Static W.L. (m)	Total dd (m)	Average Test Rate (L/min)	Transmissivity (m2/day)	Storativity	Calculated Safe Yield (L/min)
Grates Cove	New water supply well	2010	60.96	150	8.84	18/01/2011	24		9.07	20.8	0.0000281 m2/sec	0.0117	3.8
Grates Cove							20			91			64
Grates Cove							20			64			50
Great Codroy		1988	61.9	150	7.3	21/06/1988				144	18.35		114
Greens Harbour		1988	109.7	150	14.33	24/03/1988	24	6.2	65.5	15.5	0.141		3.3
Greens Harbour							7			64			41
Greens Harbour							16			32			16
Greens Harbour							6.7			14			6
Greens Harbour							6			5			18
Greens Harbour							6			20			55
Hants Harbour							7			27			30
Harbour Grace	Thicket Road (Well ID 12358)	1994	116	150	12.8	30/10/1995	24	6.11	70.84	39	0.217		17.3
Harbour Grace	Harbour Grace South (Well ID 12359)	1994	116	150	8.53	04/12/1996	48	30.2	53.97	35	0.184		17.5
Harbour Grace							8.5			6			5
Harbour Grace							24			23			30
Hopeall	Charles Cumby Well, Well ID#12250	1994	36.6	150	10.4	01/12/1994	24	4.97	6.5	59.1	0.0000277 m3/sec		40.9
Jean de Baie	Water Supply #1					14/02/1989				82.7	1		8
Lance Cove - Bell Island			96.3	150		22/10/1987	24	7.9	32.9	41	1.71		60 - 70
Little Harbour							17			39			36
Little Harbour							21			2			<2
Little Harbour							22			8			7
Long Harbour	EPCM Area water supply well at long harbour processing plant (Well 1, 2 and 3)	2010	48.8	150	6.8	23/07/2010	72	5.6	3.12	28.4	7.46	0.00065	7.7
Long Harbour			91.4	150	6.8	05/08/2010	72	4.8	30.94	17.4	1	0.00065	7.1
Long Harbour			91.44	150	6.8	16/08/2010	72	2.4	17.4	28.4	2.81	0.0009	26.7
Lower Island Cove							8.5			20			20
Lower Island Cove							11.5			8			8
Lower Island Cove							21			114			91
Makinsons	Well ID # 14016, Taylor's Back Well	1999	122	150	12.8	21/11/1999	24	3.94	18.8	13.6	0.2		12.4

Table C1. Pumping Test Data

Community	Well Name/Description	Year Drilled	Well Depth (m)	Casing di. (mm)	Casing Length (m)	Test Date	Duration (hrs)	Static W.L. (m)	Total dd (m)	Average Test Rate (L/min)	Transmissivity (m2/day)	Storativity	Calculated Safe Yield (L/min)
Makinsons	Turks Water Rd.	1993	91.44	150	10.67	14/10/1993	24	3.81	24.64	41	1.39		47
Makinsons			93				21	3.1		22.5	0.9216		30
Markland	Well #3, intersection of Gully and Griffins Rd (Well id 12440)	1995	79	150	13.5	05/11/1995	24	0.1	8.5	38.6	1.2		46.7
Markland	Parsons property	1994	152.5	150		23/09/1994	24	8.9	11.5	27.2	0.62		26
Marysvale			122				48	6.4					15 - 18
Musgravetown	#1						3.1			32			
Musgravetown	#2						23			36			18 - 23
Musgravetown	#3						24			23			18 - 23
New Chelsea							2			91			55
New Harbour							7.5			2			2
New Harbour							8			9			7
New Harbour													36
North Harbour	Well #1	1991	93	150	5.8	16/11/1992	24	2.6	37.5	25	0.18		8
North Harbour	Same as above; well deepened to 152 in 1992	1992	152	150		22/10/1993	24	3.1	29.4	45.4	0.41		32
O'Donnells	Well 12136	1994	152.6	150	19	20/09/1994	24	13	31.5	22.7	0.19		13.7
O'Donnells			93				23	9.3		14.5	0.3312		15
Port Rexton	Lockston Path Provincial Park (Well ID 13061)	1996	213	150	19.2	26/11/1996	24	5.69		17.5	0.0000025 m2/sec		8
Renews - Cappahayden			62					5.5					25
Salmon Cove							8			191			>455
Salmon Cove							8.8			18			18
Salmon Cove							19			14			18
Salmon Cove							17.5			39			36
Salmon Cove							20			18			3
Salmon Cove							16			114			32
Salmon Cove							22			55			5
Salmon Cove							24			32			32
Salmon Cove							20			32			23
Salmon Cove							23			27			45
Salmon Cove							24			205			>227

Table C1. Pumping Test Data

Community	Well Name/Description	Year Drilled	Well Depth (m)	Casing di. (mm)	Casing Length (m)	Test Date	Duration (hrs)	Static W.L. (m)	Total dd (m)	Average Test Rate (L/min)	Transmissivity (m2/day)	Storativity	Calculated Safe Yield (L/min)
Salmon Cove							23			27			27
Salmon Cove							12			23			27
Salmon Cove							13			23			23
Salmonier	salmonier correctional institute	1995	91.4	150	13.4	20/10/1995	72	2.7	35.4	136	4.22		129
Salvage							70			91			55 - 68
Sandringham	#1						12			91			
Sandringham	#2						36			136			
Shoal Harbour							70			123			295
St. Mary's	Well #1	1989	64	150		04/04/1990	72	0.297		30	144.6 L/min/M		
St. Mary's	Well #2	1989	45.5	150	6	09/09/1989	72			20 gl/m	130.5 L/min/M		>228
Swift current		1992	73	150	6.7	18/11/1992	24	Gr. Surface	4.4	90.8	0.0000628 m3/sec		115
Swift current							21			15			14
Tickle Cove							20			23			23
Tilton							19.6			23			18
Tilton							13			11			14
Upper Island Cove							17			36			57
Upper Island Cove							11.25			7			5
Upper Island Cove							24			36			91
Victoria							13			36			36
Western Bay							7.75			7			5
Western Bay							21			68			68
Western Bay							20			114			409
Wabana - Bell Island	Scotia Road Well (Well ID 27080)	2009	91.5	150	25.6	18/03/2009	72	25.05	56.4	74	51.7		50
Wabana - Bell Island	Well #12 - Main Street					26/12/1995							302
Wabana - Bell Island	Well #13, Scotia					5/02/99							227
Wabana - Bell Island	Well #4, Davidson												189
Wabana - Bell Island	Well #11, Fancy Hill												83.28
Wabana - Bell Island	Well #3, Kavanaugh's												41.64
Wabana - Bell Island	Well #1, Kelloways												26.5

Table C1. Pumping Test Data

Community	Well Name/Description	Year Drilled	Well Depth (m)	Casing di. (mm)	Casing Length (m)	Test Date	Duration (hrs)	Static W.L. (m)	Total dd (m)	Average Test Rate (L/min)	Transmissivity (m2/day)	Storativity	Calculated Safe Yield (L/min)
Wabana - Bell Island	Dr. Walter Templman Hospital	1980	91.5	150	12.2	03/07/1980	72		48	61			75
Waterford River Basin	Well 1526 Site A		26				24	0.8		9.5	4.32		10 - 15
Waterford River Basin	Well 1529 Site B (Donovans)		32				5.5	2.9		3	0.1584		1 - 2
Waterford River Basin	Well 1527 Site C		37				24	3.2		9.6	0.2016		8 - 10
Waterford River Basin	Well 1531 Site D		19				21.7			8.2	0.432		8 - 12
Waterford River Basin	Well 1522 Site E (Obser. Well in bedrock)		25				2.5	4.3		17.7	0.2016	0.0002	8 - 12
Waterford River Basin	Site F		43				22.8	0.3		20.8	0.2736		6 - 12
Waterford River Basin	Well 1527 (Kilbride)		107				60	1		14.8	1.0224		6 - 10
Whiteway							21			14			11
Witless Bay / Holyrood	Well #3 (ID 12903)	1997	92.5	250	6.4	03/03/1996	48	3.69	5.3	500	0.0002879 m3/sec		350 - 400
Witless Bay / Holyrood	Well 97-2, adjacent to Centennial Field Ball Park on Salmonier Line		91.5	150		04/09/1997	72	3.3	9.5	360	0.0001157		350-400

LEVEL II GW ASSESSMENTS:

Whitbourne	Goose Pond Properties	2012	91.44	152	12.3	28/10/2012	24	2.01		9	0.035		2.50
Whitbourne	Amber Drive (owned by Paul and Sandra Nolan)	2012	121.92	152	12.3	28/10/2012	24	2.01		9	0.035		2.50
Whitbourne	Goose Pond Development	2010	91.44	152	6	19/01/2011	24	1.61		4.55	0.22		9.09
Bristol's Hope	Well #1	2012	91	150	10.2	27/08/2012	24	7.21	41.06	36	4.69		8.9
Bristol's Hope	Well #2	2012	79	150	10.1	27/08/2012	24	9.91	19.4	14.2	0.46		8.7
St. Phillip's (Ocean's Edge Subdivision)	Well #1	2011	54.87	152	5.7	15/01/2012	72	6.6	40.7	136	5.62	2.3E-05	25
St. Phillip's (Ocean's Edge Subdivision)	Well #2	2011	121.92	152	5.9			6.55			5.62	2.3E-05	25
St. Phillip's (Ocean's Edge Subdivision)	Well #3	2012	79.25	152	12.3	21/04/2012	72	3.55	10.25	30	5.96	1.4E-05	25
St. Phillip's (Ocean's Edge Subdivision)	Well #4	2012	85.34	152	12.3			0.934			5.96	1.4E-05	25
Logy Bay - Middle Cove - Outer Cove	Well #1	2012	54.86		6.7	22/05/2012		1.5			2.8		10
Logy Bay - Middle Cove - Outer Cove	Well #2	2012	91.44		6.7	22/05/2012	24	3			0.3		10

Table C1. Pumping Test Data

Community	Well Name/Description	Year Drilled	Well Depth (m)	Casing di. (mm)	Casing Length (m)	Test Date	Duration (hrs)	Static W.L. (m)	Total dd (m)	Average Test Rate (L/min)	Transmissivity (m2/day)	Storativity	Calculated Safe Yield (L/min)
Logy Bay - Middle Cove - Outer Cove	Well#3	2012	91.44		6.7	22/05/2012		4.2			0.1		10
Logy Bay - Middle Cove - Outer Cove	Well#4	2012	60.96		6.7	22/05/2012	48	4.4			1.7		10
Logy Bay - Middle Cove - Outer Cove	Well#5	2012	91.44		6.7	22/05/2012		8.8			0.1		10
Logy Bay - Middle Cove - Outer Cove	Well#6	2012	91.44		6.7	22/05/2012		5.2			0.2		10
Bay Bulls	Bay bulls lifestyle centre	2011	115.82	150	6.1	31/03/2011	24	5.18	95.67	3.8	0.13		3
Bay Bulls	Bristol Landing #1	2010	152.4		14	27/07/2010	24	0.55	44.31	3.78	0.07	1.3E-05	1.8
Bay Bulls	Bristol Landing #2	2010	152.4		14			1.68	9.96		0.07	1.3E-05	1.8

Table C2. Pumping Well Lithology and Water Quality

Community	Well Name/Description	Water Quality	Lithology	Additional Notes
Admiral's Beach	9793	Elevated color, pH, iron	Overburden (3.3m thick) conisting of glacial till, sandy gravelly silt underlain by Shale and siltstone with minor amounts of fine grained sandstone; highly fractured	Well was dry; no investigation conducted
Admiral's Beach	9794	Elevated color, pH, iron	Overburden (3m thick) conisting of sitly sand and gravel till underlain by Shale/sandstone (highly fractured)	
Admiral's Beach	9791	No exceedances	Silty sand and gravel (3 m thick) underlain by shale/siltstone & stratified sandstone	
Admiral's Beach	9792	No exceedances	silty sand and gravel (4.9 m thick) underalin by shale/siltstone & stratified sandstone	
Admiral's Beach	Well #3			
Admiral's Beach	Well #5			
Bay de Verde				
Bay Roberts				
	Well #1	No exceedances	sand and gravel (7 m thick) underlain by grey sandstone	
Bellevue	Well #2	No exceedances	sand and gravel (7 m thick) underlain by grey sandstone	
Bishops Cove				
Blackhead			Area underlain by ground morain, mainly stony glaical till with silt to gravel, mainly thin and discontinuous (may be up to 4 - 6 m thick). Local b/r is part of the Hodgewater Group and consists of grey to green siltstone, arkose and slate with minor conglomerate.	Wells in this area typically have yields ranging from 12.6 - 68.2 L/min, with a mean yield of 29.5 L/min
	Well located approx 100 m from Route 80 (Well 12585)			
Blaketown				
Bloomfield	Well ID 3404	elevated levels of sodium	red topsoil (0.6 m thick) underlain by brown overburden (to 2.44m) and grey bedrock	
Brigus South				
Broad Cove				
Bryants cove				
	off road to Peter's cove (next to Kirk Tucker residence)	elevated levels of iron and manganese	Brown overburden (10 m) underlain by grey bedrock	
Bunyan's Cove	near old sawmill off main road (abandoned)	elevated levels of iron and manganese	brown overburden (9m) underlain by grey bedrock	
	Well ID#21890 (municipal supply but listed as domestic in drilled db; can't find this ID in dwd)	elevated levels of iron and manganese	highly fractured rock	
Calvert				
Canning's Cove	250 to 300 m from Government Wharf			

Table C2. Pumping Well Lithology and Water Quality

Community	Well Name/Description	Water Quality	Lithology	Additional Notes
Canning's Cove				
Canning's Cove				
Cape St. Mary's				
Cappahayden	15963	elevated iron		
Cappahayden	10m on w side of Route 10	elevated turbidity, pH and coliform		
Cavendish	12145			
Cavendish				
Come By Chance				
Conception Harbour / Lower Bacon Cove				
Conception Harbour / Lower Bacon Cove		No samples collected		
Conception Harbour / Lower Bacon Cove	Healy's Pond Rd. Well (WS-G-0186)			
Dildo				
Dildo				
Dildo South				
Dildo South				
Dildo South				
Dildo South				
Dunfield	#1			
Dunfield	#2			
Dunfield	#3			
Elliston				
Fogo				
Freshwater	Well #3, Wallace Snow's Well, Well ID #12510			
Freshwater	Covage's Lane Well		Exposed b/r in area of well; well is called in 4 -6 m of overburden. The Freshwater area is underlain by extensive b/r outcropping or b/r concealed by thin veneer of topsoil. Local b/r is part of the Hodgewater Group, consisting of grey to green siltstone, arkose, and slate with minor conglomerate.	typical yields in this b/r range from 0 to 409 L/min with a mean yield of approx 28 L/min

Table C2. Pumping Well Lithology and Water Quality

Community	Well Name/Description	Water Quality	Lithology	Additional Notes
Freshwater				
Freshwater				
Georgetown	Well #2, Well ID #13960	eleveated levels of iron and manganese		
Georgetown	community well, well id#15113			
Grates Cove	Proposed municipal well, Well ID#13805	elevated concentrations of manganese	gravel and boulders (7 m thick) underlain by grey b/r	
Grates Cove	New water supply well	elevated concentrations of manganese	Overburden is thin (<5m) discontinuous layer of ground moraine; general b/r in Grates Cove is Late PreCambrian sedimentary rocks of the Gibbett Hill Formation consisting of thickly bedded light grey sandstone and thinly bedded greenish grey sandstones, siltstones and tuff.	
Grates Cove				
Grates Cove				
Great Codroy				
Greens Harbour		elevated levels of iron and manganese	brown gravel and boulders (10 m thick) underlain by red b/r	
Greens Harbour				
Greens Harbour				
Greens Harbour				
Greens Harbour				
Greens Harbour		elevated levels of iron and manganese	brown gravel and boulders (10 m thick) underlain by red b/r	
Hants Harbour				
Harbour Grace	Thicket Road (Well ID 12358)		gravel and boulders (9m thick) underlain by grey b/r	
Harbour Grace	Harbour Grace South (Well ID 12359)		grey b/r	
Hopeall	Charles Cumby Well, Well ID#12250			
Jean de Baie	Water Supply #1			
Lance Cove - Bell Island		elevated levels of manganese and sodium		
Little Harbour				
Little Harbour				
Little Harbour				
Long Harbour	EPCM Area water supply well at long harbour processing plant (Well 1, 2 and 3)	eleveated levels of iron and manganese	continuous cover (1.5 - 6m thick) of glacial till comprised of fine material with some sand and gravel. b/r is of the gibbett hill formation consisting mainly of grey snadstone and tuff.	

Table C2. Pumping Well Lithology and Water Quality

Community	Well Name/Description	Water Quality	Lithology	Additional Notes
Long Harbour	EPCM Area water supply well at long harbour processing plant (Well 1, 2 and 3)	eleveated levels of iron and manganese	continuous cover (1.5 - 6m thick) of glacial till comprised of fine material with some sand and gravel. b/r is of the gibbett hill formation consisting mainly of grey snadstone and tuff.	
Long Harbour	EPCM Area water supply well at long harbour processing plant (Well 1, 2 and 3)	eleveated levels of iron and manganese	continuous cover (1.5 - 6m thick) of glacial till comprised of fine material with some sand and gravel. b/r is of the gibbett hill formation consisting mainly of grey snadstone and tuff.	
Lower Island Cove				
Lower Island Cove				
Lower Island Cove				
Makinsons	Well ID # 14016, Taylor's Back Well			
Makinsons	Turks Water Rd.			
Makinsons				
Markland	Well #3, intersection of Gully and Griffins Rd (Well id 12440)		till (2.7 m thick) underlain by slate and quartz	
Markland	Parsons property		Overburden (12 m thick) underlain by bedrock	
Marysvale				
Musgravetown	#1			
Musgravetown	#2			
Musgravetown	#3			
New Chelsea				
New Harbour				
New Harbour				
New Harbour				
North Harbour	Well #1			
North Harbour	Same as above; well deepened to 152 in 1992			
O'Donnells	Well 12136		19 m of overburden underlain by b/r	
O'Donnells				
Port Rexton	Lockston Path Provincial Park (Well ID 13061)		Area underlain by rocks of the musgravetown group, comprised of red, green and grey siltstone, conglomerate and slate and some minor lava and tuff. Very little overburden in this area.	wells in this b/r generally have mod. Yields ranging from 2 to 295 L/min with a mean of 23 L/min
Renews-Cappahayden				
Salmon Cove				
Salmon Cove				

Table C2. Pumping Well Lithology and Water Quality

Community	Well Name/Description	Water Quality	Lithology	Additional Notes
Salmon Cove				
Salmon Cove				
Salmon Cove				
Salmon Cove				
Salmon Cove				
Salmon Cove				
Salmon Cove				
Salmon Cove				
Salmon Cove				
Salmon Cove				
Salmon Cove				
Salmon Cove				
Salmon Cove				
Salmonier	salmonier correctional institute		green to grey siltstone	
Salvage				
Sandringham	#1			
Sandringham	#2			
Shoal Harbour				
St. Mary's	Well #1			
St. Mary's	Well #2			
Swift current		elevated manganese		
Swift current				
Tickle Cove				
Tilton				
Tilton				
Upper Island Cove				
Upper Island Cove				
Upper Island Cove				
Victoria				
Western Bay				
Western Bay				
Western Bay				

Table C2. Pumping Well Lithology and Water Quality

Community	Well Name/Description	Water Quality	Lithology	Additional Notes
Wabana - Bell Island	Scotia Road Well (Well ID 27080)	elevated manganese	brown overburden (1m thick) underlain by fractured shale	
Wabana - Bell Island	Well #12 - Main Street			
Wabana - Bell Island	Well #13, Scotia			
Wabana - Bell Island	Well #4, Davidson			
Wabana - Bell Island	Well #11, Fancy Hill			
Wabana - Bell Island	Well #3, Kavanaugh's			
Wabana - Bell Island	Well #1, Kelloways			
Wabana - Bell Island	Dr. Walter Templman Hospital			artesian well
Waterfrod River Basin	Well 1526 Site A			
Waterfrod River Basin	Well 1529 Site B (Donovans)			
Waterfrod River Basin	Well 1527 Site C			
Waterfrod River Basin	Well 1531 Site D			
Waterfrod River Basin	Well 1522 Site E (Obser. Well in bedrock)			
Waterfrod River Basin	Site F			
Waterfrod River Basin	Well 1527 (Kilbride)			
Whiteway				
Witless Bay / Holyrood	Well #3 (ID 12903)			
Witless Bay / Holyrood	Well 97-2, adjacent to Centennial Field Ball Park on Salmonier Line			

LEVEL II GW ASSESSMENTS:

Whitbourne	Goose Pond Properties	elevated levels of manganese	Till (0 - 2.44); Shale/Slate (2.44 - 16); Green Rock (16 - 18); Shale/slate (18 - 94.11)	
Whitbourne	Amber Drive (owned by Paul and Sandra Nolan)	elevated levels of manganese	till (0 - 4.57); Shale/Slate (4.57 - 121.92)	
Whitbourne	Goose Pond Development	Elevated levels of iron	till (0 - 2); bedrock (2 - 91.44)	

Table C2. Pumping Well Lithology and Water Quality

Community	Well Name/Description	Water Quality	Lithology	Additional Notes
Bristol's Hope	Well #1		glacial till (0 - 3.6); sandstone (3.6 - 91)	
Bristol's Hope	Well #2		topsoil/fill (0 - 5.8); sandstone (5.8 -0 79)	
St. Phillip's (Ocean's Edge Subdivision)	Well #1		till (0 - 0.05); Volcanic Tuff (3.05 - 54.87)	
St. Phillip's (Ocean's Edge Subdivision)	Well #2		till (0 - 3.66); volcanic tuff (3.66 - 121.92)	
St. Phillip's (Ocean's Edge Subdivision)	Well #3		clay (0 - 0.5); volcanic tuff (0.5 - 64); volcanic tuff with quartz (64 - 79.25)	
St. Phillip's (Ocean's Edge Subdivision)	Well #4		clay (0 - 0.5); volcanic tuff (0.5 - 79)	
Logy Bay - Middle Cove - Outer Cove	Well #1		overburden (0 - 2.43); siltstone/sandstone (2.43 - 54.86)	
Logy Bay - Middle Cove - Outer Cove	Well #2	elevated levels of iron, manganese, color and turbidity	overburden (0 - 1.82); siltstone/sandstone (1.82 - 91.44)	
Logy Bay - Middle Cove - Outer Cove	Well#3		overburden (0 - 1.82); siltstone/sandstone (1.82 - 91.44)	
Logy Bay - Middle Cove - Outer Cove	Well#4	elevated levels of iron, manganese, color and turbidity	overburden (0 -1.82); siltstone/sandstone (1.82 - 91.44)	
Logy Bay - Middle Cove - Outer Cove	Well#5		overburden (0 - 4.88); siltstone/sandstone (4.88 - 91.44)	
Logy Bay - Middle Cove - Outer Cove	Well#6		overburden (0 -1.82); siltstone/sandstone (1.82 - 91.44)	
Bay Bulls	Bay bulls lifestyle centre	elevated levels of iron and manganese	till and cobbles (0 - 4.57); sandstone (4.57 - 115.82)	
Bay Bulls	Bristol Landing #1	elevated levels of iron and manganese	till and cobbles (0 - 13.1); shale (13.1 - 152.4)	
Bay Bulls	Bristol Landing #2	elevated levels of iron and manganese	till and cobbles (0 - 13.7); shale (13.7 - 152.4)	

Table C3. Pumping Test Summary

TOWN	WELL_ ID	LAT_dms	LONG_dms	COORD_METH	STRAT1	STRAT2	Transmissivity (m2/d)	Well_ Depth (m)	K_Calc (m/s)
Admiral's Beach	9794	47 01 03.25	-53 37 32.67	1:16000 Map	SHALE	SANDST	4.7	48.8	1.12E-06
Admiral's Beach	9791	47 01 03.22	-53 37 28.43	1:16000 Map	SHALE	SILTST	2.1	61.0	3.98E-07
Admiral's Beach	9792	47 01 03.22	-53 37 28.43	1:16000 Map	SHALE	SILTST	5.0	76.0	7.61E-07
Bay Bulls		47 19 25.8	-52 49 27.2	Drilled well record	SANDST		0.1	115.8	1.30E-08
Bay Bulls		47 18 22.4	-52 49 74.5	Drilled well record	SHALE		0.1	152.4	5.32E-09
Bay Bulls		47 18 19.1	-52 49 68.8	Drilled well record	SHALE		0.1	152.4	5.32E-09
Blackhead		47 50 37.42	-53 05 56.32	1:50000 Map	SILTST	SLATE	34.6	92.0	4.35E-06
Blaketown	12585	47 28 55.43	-53 32 56.12	1:50000 map			0.4	131.6	3.46E-08
Bloomfield	3404	48 23 16.76	-53 54 11.28	1:50000 Map			1.6	62.5	2.96E-07
Bristol's Hope		47 42 69.8	-53 12 41.8	Drilled well record	SANDST		4.7	91.0	5.97E-07
Bristol's Hope		48 23 16.76	-53 54 11.28	Drilled well record	SANDST		0.5	79.0	6.74E-08
Bunyan's Cove		48 23 60	-54 01 01	dwd			33.4	32.0	1.21E-05
Bunyan's Cove		48 23 60	-54 01 01	dwd			0.2	125.0	2.13E-08
Canning's Cove		48 26 40.87	-53 50 44.43	1:50000 map			0.05	103.7	5.02E-09
Canning's Cove		48 26 28.85	-53 50 50.91	1:50000 map			5.5	43.9	1.44E-06
Cappahayden		46 53 60	-52 57 00	dwd			225.3	58.0	4.50E-05
Cavendish	12145	47 43 21.83	-53 29 34.35	1:50000 map			0.3	60.4	5.16E-08
Conception Harbour / Lower Bacon Cove		47 29 18.75	-53 09 56.79	1:50000 map			0.1	97.0	1.25E-08
Conception Harbour / Lower Bacon Cove		47 26 59.43	-53 12 05.05	1:50000 map			1.0	61.0	1.83E-07
Conception Harbour / Lower Bacon Cove		47 26 26	-53 13 09	community			1136.0	46.2	2.85E-04
Freshwater		47 45 23.71	-53 11 14.62	1:1600 Map	SILTST	SLATE	1.4	26.0	6.10E-07
Georgetown		47 29 12.21	-53 14 19.69	1:50000 Map			0.24	122.0	2.24E-08
Georgetown		47 29 13.52	-53 14 20.9	1:50000 Map			2.9	75.3	4.43E-07
Grates Cove		48 09 37.00	-52 56 40.35	1:50000 Map	SANDST	SILTST	8.2	60.4	1.58E-06
Grates Cove		48 09 47.01	-52 56 30.02	1:2500 Map	SANDST	SILTST	3.3	61.0	6.19E-07
Great Codroy		47 51 08	-59 16 07	community			18	61.9	3.43E-06
Greens Harbour		47 38 11.04	-53 30 58.85	1:50000 Map			0.14	109.7	1.49E-08
Harbour Grace	12358	47 39 03.38	-53 15 38.12	1:50000 Map			0.22	116.0	2.17E-08
Harbour Grace	12359	47 40 49.51	-53 12 54.79	1:50000 Map			0.18	116.0	1.84E-08
Lance Cove - Bell Island		47 36 13.92	-52 58 40.37	1:50000 Map			1.7	96.3	2.06E-07

Table C3. Pumping Test Summary

TOWN	WELL_ID	LAT_dms	LONG_dms	COORD_METH	STRAT1	STRAT2	Transmissivity (m2/d)	Well_Depth (m)	K_Calc (m/s)
Logy Bay - Middle Cove - Outer Cove		47 38 19.7	-52 42 22.8	Water Well Record	SILTST	SANDST	2.8	54.9	5.91E-07
Logy Bay - Middle Cove - Outer Cove		47 38 14.0	-52 42 26.3	Water Well Record	SILTST	SANDST	0.30	91.4	3.80E-08
Logy Bay - Middle Cove - Outer Cove		47 38 08.3	-52 42 27.2	Water Well Record	SILTST	SANDST	0.10	91.4	1.27E-08
Logy Bay - Middle Cove - Outer Cove		47 38 09.6	-52 42 20.1	Water Well Record	SILTST	SANDST	1.7	61.0	3.23E-07
Logy Bay - Middle Cove - Outer Cove		47 38 03.2	-52 42 32.5	Water Well Record	SILTST	SANDST	0.10	91.4	1.27E-08
Logy Bay - Middle Cove - Outer Cove		47 37 58.4	-52 42 42.9	Water Well Record	SILTST	SANDST	0.20	91.4	2.53E-08
Long Harbour		47 25 23.18	-53 48 48.48	1:50000 Map	SANDST	VOLC	7.5	48.8	1.77E-06
Long Harbour		47 25 23.18	-53 48 48.48	1:50000 Map			1.0	91.4	1.27E-07
Long Harbour		47 25 23.18	-53 48 48.48	1:50000 Map			2.8	91.4	3.56E-07
Makinsons		47 29 00.82	-53 19 05.27	1:50000 Map			1.4	91.4	1.76E-07
O'Donnells	12136	47 04 36.12	-53 33 38.66	1:50000 Map			0.19	152.6	1.44E-08
St. Phillips		47 35 20.7	-52 53 20.6	Water Well Record	VOLC		5.6	54.9	1.19E-06
St. Phillips		47 35 19.9	-52 53 22.0	Water Well Record	VOLC		5.6	121.9	5.34E-07
St. Phillips		47 35 27.5	-52 53 25.1	Water Well Record	VOLC		6.0	79.3	8.70E-07
St. Phillips		47 35 28.1	-52 53 23.6	Water Well Record	VOLC		6.0	85.3	8.08E-07
St. Mary's		46 51 15.88	-53 33 29.91	1:50000 Map			208	64.0	3.77E-05
St. Mary's		46 54 14.87	-53 33 29.35	1:50000 Map			187	45.5	4.77E-05
Wabana - Bell Island	27080	47 37 56.9	-52 57 43	Water Well Record	SHALE		52	91.5	6.54E-06
Whitbourne		47 26 29.4	-53 30 44.3	Water Well Record	SHALE	SLATE	0.04	91.4	4.43E-09
Whitbourne		47 26 21.4	-53 30 41.2	Water Well Record	SHALE	SLATE	0.04	121.9	3.32E-09
Whitbourne		47 26 19.6	-53 30 37.3	Water Well Record			0.22	91.4	2.78E-08
Salmonier		47 16 10.60	-53 18 33.62	1:50000 Map	SILTST		4.2	91.4	5.34E-07
Bunyan's Cove	21890	48 23 51.47	-54 01 04.50	1:50000 Map			41	38.1	1.24E-05
Markland	12440	47 23 02.81	-53 32 30.91	1:50000 Map	SLATE		1.2	79.0	1.76E-07
Markland		47 23 02.81	-53 32 30.91	1:50000 Map	SLATE		0.62	152.5	4.71E-08
Cappahayden	15963	46 51 39.72	-52 56 39.67	1:50000 Map			0.71	58.0	1.41E-07
Makinsons	14016	47 29 30.36	-53 18 34.87	1:50000 Map			0.20	122.0	1.90E-08
North Harbour		47 51 07.92	-54 06 18.28	1:50000 Map			0.18	93.0	2.24E-08
North Harbour		47 51 07.92	-54 06 18.28	1:50000 Map			0.41	152.0	3.12E-08
Bellevue		47 37 55.89	-53 43 50.97	1:50000 Map	SANDST		1.2	122.0	1.13E-07

Table C3. Pumping Test Summary

TOWN	WELL_ ID	LAT_dms	LONG_dms	COORD_METH	STRAT1	STRAT2	Transmissivity (m2/d)	Well_ Depth (m)	K_Calc (m/s)
Bellevue		47 37 55.89	-53 43 50.97	1:50000 Map	SANDST		3.5	122.0	3.35E-07
Hopeall	12250	47 36 57.84	-53 30 31.52	1:50000 Map			2.4	36.6	7.56E-07
Cape St. Mary's		46 49 20.82	-54 11 41.67	1:50000 map			1.6	107.9	1.71E-07
Swift current		47 52 46.08	-54 12 01.99	1:50000 map			5.4	73.0	8.61E-07
Witless Bay / Holyrood	12903	47 22 44.64	-53 07 26.37	1:50000 Map			25	92.5	3.11E-06
Witless Bay / Holyrood		47 22 52.12	-53 08 55.21	1:50000 Map			10.0	91.5	1.26E-06
Port Rexton	13061	48 25 55.81	-53 21 41.10	1:50000 Map	SILTST	CONGL	0.2	213.0	1.17E-08