McElhanney

APPENDIX E

CVRD
SEWAGE MASTER PLAN
REGIONAL POTENTIAL FOR WASTEWATER GROUND DISPOSAL

EBA REPORT

October 6, 2008 EBA File: N23101297

Comox Valley Regional District
c/o McElhanney Consulting Services Ltd.
495 Sixth Street
Courtenay, BC V9N 6V4

Attention: Ian Whitehead, P.Eng.

Regarding: Regional Potential for Waste Water Ground Disposal
Comox Valley Regional District Liquid Waste Management Plan

Dear Sir:

1.0 INTRODUCTION

EBA Engineering Consultants Limited (EBA) was retained by Dayton & Knight Ltd. on behalf of the Comox Valley Regional District (CVRD) to assess the suitability for in-ground wastewater disposal systems within the regional district boundaries. We understand that Dayton & Knight Ltd. and McElhanney Consulting Services Ltd. are collaborating to develop a Sewage Master Plan for the CVRD and the information provided in this report will help identify areas where this effluent disposal method is feasible and also areas where the site conditions limit the long-term usefulness of this method.

Authorization to carry out this preliminary feasibility assessment was provided by Ian Whitehead on June 26, 2008.

2.0 SCOPE OF SERVICES

As part of this overview assessment, EBA completed the following tasks:

- Reviewed available site information including: regional topography, hydrogeology, bedrock and surficial geology maps, published/unpublished reports and documents from our files, as well as the web-based information on the Ministry of Environment (MoE) files and knowledge from the Vancouver Island Health Authority (VIHA) officer(s);
- Analyzed the available information and incorporated typical screening criteria recommended for in-ground effluent disposal into the a mapping system to display results of the regional soil conditions; and
- Prepared this report summarizing the findings and providing recommendations.

The evaluation reported herein was assessed on a regional basis from available data sources and should serve as an initial guiding tool for preliminary in-ground wastewater disposal planning. Field verification for site specific potential was beyond the scope of this study.

3.0 REGIONAL SETTING

The Comox Valley Regional District is located on the east coast of Vancouver Island between Qualicum Bay, the Oyster River. It is bounded to the west by the Vancouver Island Range and to the east by the Strait of Georgia. The CVRD land area is mostly undeveloped, however, several moderately to highly populated areas exist predominantly east of the Inland Highway with Cumberland as the main exception. The main larger communities and rural residential areas/subdivisions within the CVRD are described below:

- The cities of Courtenay and Comox, located at Comox Harbour, are densely developed by residential properties with isolated parcels of industrial and commercial lands. A large land area classed as rural Agricultural Land Reserve (ALR) is present in the northern reaches of the Courtenay region. Several ALR classed land areas are also present within the Comox municipality boundaries. Both cities are on community water systems and are serviced with drinking water from Puntledge River;
- The Town of Cumberland, a small, long-establised community located east of Comox Lake, comprises largely of residential properties with a few lands zoned for commercial uses. The Town is serviced with community water from Comox Lake;
- The Union Bay area in the southern part of the CVRD consists mostly of residential properties with a few commercial lands. The area is supplied by groundwater from a local community water system (Union Bay Improvement District).
- The Sandwick area, bounded to the south by the City of Courtenay, is serviced with potable water from wells on the Sandwick Improvement District water system. Most properties are zoned for residential land use with a scattering of businesses along Highway 19. Several land parcels within the area remain undeveloped.
- The Marsden/Arden area is a well developed rural residential community with several industrial land parcels and a few tracts of forest (both unmanaged and managed) land. Some properties in the area are self-serviced with domestic water wells, while the rest are on the community system.
- The Saratoga/Miracle Beach area lies in the north end of the CVRD. The area is bounded to the north by the Oyster River, but a thin part of the Saratoga/Miracle Beach service area stretches southward along Highway 19. The area is serviced with both private and public water wells.

- While a couple of small community water supply systems exist on Denman Island, the residents on Denman and Hornby Islands are predominantly self-serviced with private domestic water wells.

Except for Courtenay, Comox and Cumberland, where sanitary and storm sewers are available, the rural communities mostly rely on on-site systems, or small community systems for domestic wastewater disposal.

Residential properties are scattered between these communities. Properties in these less developed areas are predominantly self-serviced with domestic water wells and on-site septic systems.

According to the Geological Survey of Canada surficial geology maps, the overburden soils in the northern CVRD consist primarily of marine deposits of silty, clay, stony clay and till-like mixtures of varying thickness (Oyster River Map 49-1959 and Courtenay Map 32-1960). Overburden soils in the south, however, consist mainly of either terraced fluvial deposits or shore, deltaic and fluvial deposits (Horne Lake Map 1111A). The MoE Soil Classification Maps over the same area indicate gravelly loamy sands/sandy loams and very gravelly loamy sands/sandy loams are the predominant soil types (soil descriptions are provided in more detail in Section 5.0). In many areas, especially the areas west of Highway 19 in the Vancouver Island Ranges, the overburden cover exists merely as a veneer over the underlying bedrock, or is absent altogether.

Upper Cretaceous Nanaimo Group sedimentary rocks dominate the area along the coast while Middle Triassic to Upper Triassic Vancouver Group (Karmutsen Formation) basaltic volcanic rocks are encountered farther inland. Occasional rock exposures within the Vancouver Island Ranges are mapped as either Eocene to Oligocene Mount Washington Plutonic Suite of quartz dioritic intrusive rocks or Early Jurassic to Middle Jurassic Island Plutonic Suite of granodioritic intrusive rocks (GSC – MapPlace).

4.0 METHODOLOGY

Several provincial documents were reviewed in the preparation of this report and provide recommendations for investigating or siting sewage disposal fields,:

- BC Sewerage System Regulation (BC Reg 326/2004, amended 2007) and the Sewerage System Standard Practice Manual (Version 2, September 2007) for sewage discharges less than 22,700 L/day in volume;
- BC Municipal Sewage Regulation (BC Reg 129/99, amended 2006) and the Environmental Impact Study Guideline – A Companion Document to the Municipal Sewage Regulation (December 2000) for sewage discharges greater than 22, 700 L/day in volume; and,

- A Guidebook for British Columbia – Stormwater Planning (2002) for stormwater discharges.

The requirements presented in each document vary with regard to the effluent treatment level involved; however, data are typically reviewed to understand the soil's ability to:

1) infiltrate the predicted sanitary or stormwater effluent volumes; and,
2) attenuate the associated potential contaminants without harmful impact to human or environmental receptors.

EBA identified five constraints we considered to be the most likely influencing factors for the design of in-ground liquid waste disposal. These factors affect the effluent travel time potential environmentally sensitive areas, influence the infiltration capacity and attenuation potential for the soils and govern the long-term performance of effluent treatment process.

These constraints are:

- Slope;
- Drainage;
- Soil texture;
- Depth to bedrock or a restrictive layer below surface; and,
- Proximity to potential environmentally sensitive areas.

To simplify our approach, information obtained from available bedrock and surficial geology mapping and web-based provincial database was reviewed and analyzed. The data was subsequently used to generate a map series to show the classified parameters through Geographic Information System (GIS) processing. A composite map was then generated with information provided by the individual maps to illustrate the in-ground wastewater disposal potentials within the CVRD.

Because the assessment was conducted at a regional scale for planning purposes only and local conditions may vary, site specific conditions should be confirmed through careful field investigation during the development phase.

5.0 CONSTRAINING PARAMETERS EVALUATION

The following sections describe the data sources and results with the prepared constraining parameter assessed.

5.1 SLOPES

Slopes influence horizontal travel of effluent through the subsurface either by increasing the flow gradient and reducing the attenuation time for contaminants, or by interrupting the soil horizon and causing effluent to surface (breakout). Typically, flatter topography is more ideal for wastewater infiltration and steeper slopes have higher potential for effluent breakout.

Figure 1 indicates the terrain slope classification through percent slope within the CVRD boundaries. The slope imagery was based on TRIM map information at a 1:20,000 scale.

Based on the Sewerage System SPM classification system, Table 1 below shows the slope and the associated potential for in-ground liquid waste disposal.

TABLE 1: IN-GROUND LIQUID WASTE DISPOSAL POTENTIAL BASED ON SLOPE

Potential	Slope
Good	0% to 15%
Moderate	> 15% and < 25%
Poor	> 25% and < 35%
Very Poor	> 35%

As shown, the most densely developed areas within the study area are generally characterized by gently sloping topography with ground elevations ranging from sea level to 200 m above mean sea level. The topography becomes moderate to very steep in the Vancouver Island Ranges and elevations can be more than 1000 m above mean sea level.

5.2 DRAINAGE

Drainage indicates the degree of existing water saturation anticipated for an area. Higher drainage rates will not retain moisture and will assist the effluent movement through the soil. In-ground discharge must be avoided where soils with lower drainage potential are unable to convey water away from a disposal field. These soils will easily become saturated creating a risk for surface breakout.

Drainage descriptions for the areas within the CVRD boundaries were based on MoE Technical Report 17 and Soils of Southern Vancouver Island Maps 3, 5 and 6. Although the information provided in the report and on the maps may have some limitations in their applicability, they are considered a useful reference for rating the soil drainage conditions at a regional scale.

Table 2 shows the classified drainage types and their associated potential for in-ground liquid waste disposal based on their definitions below. Figure 2 shows the regional drainage conditions within the CVRD boundaries.

TABLE 2: IN-GROUND LIQUID WASTE DISPOSAL POTENTIAL BASED ON DRAINAGE	
Potential	**Drainage**
Good	Well drained
Moderate	Moderately well drained or rapidly drained
Poor	Imperfectly drained
Very Poor	Poorly or very poorly drained

Note: Drainage descriptions as defined on the Soils of Southern Vancouver Island Maps:
Well drained – no excess moisture for most of the year.
Moderately well drained – excess moisture for a short but significant period of the year.
Rapidly drained – soil holds little moisture after rain.
Imperfectly drained – soil remains wet in subsurface horizons for moderately long periods during the year.
Poorly drained – excess moisture throughout soil for a large part of the year.
Very poorly drained – free water remains at or within 30 cm of the surface most of the year.

As shown on Figure 2, a wide range of soil types with different drainage properties characteristics are present within the CVRD boundaries and are summarized below:

- Soils within the most populated areas are predominantly classified as either well drained or imperfectly drained with scatterings of rapidly drained or moderately well drained soils.
- Poorly drained soils can be found on Denman and Hornby Islands, in areas near the Comox Harbour and also along Highway 19 south of the Oyster River.
- Very poorly drained soils are common in areas where wetlands are present and thick organic materials are encountered.

5.3 SOIL TEXTURE

Soil texture is closely related to soil drainage. Areas which are considered to have good potential for in-ground effluent disposal require the unsaturated soils transmit effluent at high enough rates for infiltration and lateral dispersion. At the same time, the soils should transmit slowly enough that the residence time within the soils is sufficient to allow attenuation processes such as dispersion, dilution, sorption and biodegradation to occur before the treated effluent reaches a sensitive receptor.

As a result, soil texture will influence the permeability and the hydraulic conductivity of a soil. Hydraulic conductivity is a measure of the ability of a soil to transmit water through the size of the pore spaces and degree of interconnectivity. Silts and clays typically have slow to very slow hydraulic conductivities (10^{-5} to 10^{-13} m/s) while sands or silty sands have hydraulic conductivities ranging from about 10^{-3} to 10^{-6} m/s. Gravels or gravelly sands can conduct water at higher hydraulic conductivities of more than 10^{-3} m/s (Freeze and Cherry, 1979).

Highly permeable soils are not necessary the good medium for in-ground wastewater disposal as they may not provide sufficient contact time for the soils to absorb the applied nutrients and remove the pathogenic organism or other pollutants from the wastewater. When the hydraulic loading is high, however, impermeable soils may cause the released effluent to accumulate and eventually run off the surface.

Soil descriptions for the areas within the CVRD were also based on MoE Technical Report 17 and Soils of Southern Vancouver Island, Maps 3, 5. For ease of interpretation, the common soil texture was used as the soil description and the secondary soils were not considered; therefore, local soil descriptions may be slightly different from what is shown in Figure 3.

Table 3 below shows the relationship between soil textures and the interpreted potential for in-ground liquid waste disposal. A more detailed soil description is provided in Appendix A.

TABLE 3: IN-GROUND LIQUID WASTE DISPOSAL POTENTIAL BASED ON SOIL TEXTURE

Potential	Soil Texture
Good	Sand, loamy sand, sandy loam, loam, silt, silt loam
Moderate	Gravelly sandy loam, very gravelly sandy loam
Poor	Sandy clay loam, silty clay loam, clay loam
Very Poor	Sandy clay, silty clay, clay

Soils of fluvial, marine and moraine origin are the primary soil associations in the developed areas within the CVRD boundaries. These fluvial and moraine soils, which are characterized by very gravelly loamy sand/sandy loam to gravelly loamy sand/sandy loam textures, would likely have moderately high hydraulic conductivities. The common soil textures of marine deposits vary from place to place. For example, where Kye and Bowser soils are characterized by loamy sand or silty/gravelly sandy loam textures, the rest of the soils in the marine group are reported to have a silty clay texture, which would result in a lower hydraulic conductivity.

Colluvial deposits over steep slopes are common in the Vancouver Island Ranges. These deposits are reported to have gravelly loam or gravelly sandy loam/gravelly loamy sand textures, which would also likely have a relatively moderate to high hydraulic conductivity.

Organic soil types are also referenced, but these are limited in area and are scattered within the CVRD. Organic soils are characterized by thick mesic materials at or near the surface, which give a very low hydraulic conductivity.

5.4 RESTRICTIVE LAYERS AND BEDROCK

The unsaturated soil zone provides storage for effluent disposal within the subsurface. Unsaturated soil depth is affected locally by a shallow restrictive horizon such as a near-surface water table, bedrock, a cemented layer, or a thick organic layer. Once the storage volume is exceeded, the area floods and effluent breakout occurs.

Information about the depth to shallow bedrock was based on the GSC surficial geology maps (Maps 49-1959, 32-1960 and 1111A) on which bedrock outcrops and outcrops with patches of thin overburden are outlined. Notes on cemented (duric) or dense, compact layers and shallow bedrocks included in the MoE Technical Report 17 and on the Soils of Southern Vancouver Island Maps were also reviewed. A map showing areas of overburden in various thickness and shallow bedrock is included as Figure 4.

Based on the Sewerage System SPM, Table 4 shows the soil depth above a restrictive layer (cemented/compact layer or bedrock) and the associated potential for in-ground liquid waste disposal.

TABLE 4: POTENTIAL BASED ON DEPTH OF SOIL ABOVE A RESTRICTIVE LAYER OR BEDROCK

Potential	Depth of Soil Above a Restrictive Layer or Bedrock
Good	> 1.0 m
Moderate	0.5 to 1.0 m
Poor	0.1 to 0.5 m
Very Poor	thick organic materials at or near surface, bedrock outcrop and outcrop with thin patches of overburden

As shown, a large percentage of the developed areas within the CVRD boundaries are underlain by relatively thick (more than 1 m) of overburden over a relatively impervious horizon; however, site specific soil thickness may vary. Detailed site characterization should be conducted when siting or designing disposal fields.

5.5 POTENTIAL ENVIRONMENTALLY SENSITIVE AREAS

Aquifers, wells, local water bodies and watercourses are considered to be potential environmentally sensitive receptors to effluent contamination when the in-ground wastewater disposal systems are improperly designed and sufficient effluent treatment is not available. Figure 5 shows potentially environmentally sensitive areas within the CVRD.

The BC Water Resource Atlas is the main public information source for water well locations and records. Historically well record submissions by the drillers have been on a voluntary basis and the records on the current BC Water Resource Atlas files may be incomplete and not up-to-date. Some well locations shown may also never have been successfully completed as wells, or they may have since been abandoned because the property is now serviced by a community water system. A site specific well survey should be completed to confirm local water wells in use near a proposed waste water disposal field.

Based on the information provided in the BC Water Resource Atlas, 17 aquifers have been mapped within the Comox Valley Regional District boundaries. The MoE classifies BC aquifer vulnerability based on type, thickness and extent of geologic materials overlying the aquifer, depth to water (or top of confined aquifers), and the type of aquifer materials. The vulnerability classification indicates the potential exists for a surface contaminant to enter into the aquifer flow system. Nine aquifers are mapped within the CVRD boundaries have been classified as having high vulnerability, three are classified as moderate and the remaining aquifers are classified as having low vulnerability to surface contamination.

Waste water ground disposal should be approached cautiously over a potentially vulnerable aquifer; however, waste water disposal can still successfully occur even in a highly vulnerable aquifer so long as no potable water wells or surface water bodies receiving groundwater are at risk to adverse impact from the waste water disposal operations.

Setbacks are typically recommended for environmentally sensitive areas, but the setback distances vary depending on the applicable regulation and treatment system considered. Site specific sensitive area delineation and setback allowance should be completed prior actual disposal field siting process.

According to a study conducted in 2003 for preliminary liquid waste management planning for the rural communities of Marsden/Arden, Saratoga/Miracle Beach and Sandwick, there had been concerns about septic issues in the aforementioned communities and also complaints about effluent in deep ditches in the Marsden/Arden area. Septic system failures within these areas had also been reported to the Vancouver Island Health Authority (VIHA) and the failures are mainly due to local high water tables and unsatisfactory site soil conditions. These areas are presented on Figure 5 in yellow.

6.0 POTENTIAL FOR WASTE WATER DISPOSAL TO GROUND

Figure 6 presents a composite map showing the above-described parameters in an attempt to identify the appropriate areas on a relative basis for long-term effluent disposal. Specific areas are designated as good, moderate, poor and very poor potential for in-ground liquid waste disposal. This figure takes into consideration information about soil texture, overburden thickness and bedrock outcrops, slope, drainage and sensitive areas.

Aquifers, as environmentally sensitive areas, have not been included in this composite regardless of their vulnerability because they are not considered to constrain potential ground disposal of effluent.

The potential for in-ground liquid waste disposal has been defined such that the potential is limited by the classification of the most constraining parameter. For example, an area that had one out of the four properties considered "very poor", even if the remainder were 'good', was classified as "very poor".

Table 5 below summarizes the constraining parameters and their associated potentials for in-ground waste water disposal planning.

TABLE 5: POTENTIAL WASTE WATER GROUND DISPOSAL MODEL

Property	Good Potential	Moderate Potential	Poor Potential	Very Poor Potential
Slopes	0% to < 15%	> 15% to < 25%	> 25% to < 35%	> 35%
Drainage	well drained	moderately well drained or rapidly drained	imperfectly drained	poorly or very poorly drained
Soil Texture	sand, loamy sand, sandy loam, loam, silt, silt loam	gravelly sand, very gravelly sand	sandy clay loam, silty clay loam, clay loam	sandy clay, silty clay, clay
Depth of Soil above Restrictive Layer	> 90 cm	60 to 90 cm	0.30 to 0.60 cm	0.15 to 0.30 cm
Sensitive Areas	Water wells, coastline, environmentally sensitive areas such as creeks, or problem areas identified by Vancouver Island Health Authority			

As shown on Figure 6, several 'good' areas exist for ground disposal based on the information reviewed. Some of the areas are located either in a rural area or within the highly developed part of Courtenay, but there are several areas with good potential near the conjunctions of the Puntledge River and the Tsolum River and near the head of the Courtenay River, which are all within the ALR's and detailed subsurface investigations are recommended to more fully understand the site specific conditions in these areas.

A large portion of the areas which is mapped as 'moderate' potential are either within the much less developed parts of the CVRD between the communities or within the highly populated areas in Courtenay, Comox or Cumberland. As expected, areas in the Vancouver Island Range are largely mapped as to have a 'very poor' potential for in-ground disposal with a few areas being 'poor'.

Due to the regional level of information reviewed, areas that are mapped as poor or very poor may still have the potential for in-ground liquid waste disposal depending on the site specific conditions, discharge size, type of system and degree of treatment considered.

To assess a specific area or property within the Comox Valley Regional District beyond the screening level provided in this document, the following site specific issues may be important for further field investigation or other evaluation:

- Topography and percentage slopes on a local scale. Care should be taken not to place a waste water disposal field near moderately sloping areas or other features (pits, ditches) where breakout might occur;

- Soil infiltration capacity. In-situ testing should be conducted within the proposed waste water disposal fields either through permeameter, infiltrometer or percolation testing methods;
- Characterization of site specific soils and depths to restrictive horizons, bedrock and seasonal high water table, as these factors can vary significantly within short distances;
- Presence or absence of potential environmentally sensitive features such as local wet areas, proximity to streams, tributaries or other water bodies. Establish appropriate setbacks;
- Survey and locate private or community water wells in the investigation, particularly when the proposed waste water disposal field will overly an identified highly vulnerable aquifer (per Figure 5). Ideally, wells should be upgradient with regard to the direction of groundwater flow with appropriate setbacks; and,
- Degree of effluent loading in the area and potential deleterious impacts from increasing the load based on predictive modelling or monitoring of baseline water chemistry.

This list may not be all inclusive. Reference should be made to the applicable provincial regulations or guidance documents for the specific requirements needed based on volume of waste water proposed for disposal.

7.0 CLOSURE

Interpretations presented herein are based on information provided in part by others and has not been field verified. The interpretation of this information is for the general area of the Comox Valley Regional District and site specific conditions may change the potential for in-ground liquid waste disposal.

This report has been prepared based on the scope of service described for the use of the Comox Valley Regional District and Dayton & Knight, which includes distribution as required for the purposes for which this assessment was commissioned. The assessment has been carried out under generally accepted engineering practice. No other warranty is made, either express or implied. Engineering judgement has been applied in developing the interpretations in this report.

This report was prepared by personnel with professional experience in investigations of this nature. Reference should be made to the 'Environmental Report – General Conditions', attached in Appendix A, that form part of this report.

We would be pleased to provide guidance and further specific recommendations during the next phase of development planning. Should you have any questions or comments, please contact our office at your convenience.

Respectfully Submitted;

EBA Engineering Consultants Ltd.

Prepared by:

Carol Ma, B.Sc., GIT
Intermediate Hydrogeologist

Shelley Bayne, M.Sc., P.Geo.
Hydrogeologist

Attachments:

Figures 1 to 6
Appendix A: Subsurface Soil Descriptions
Appendix B: Environmental Report – General Conditions

REFERENCES

BC Water Resources Atlas – website

BC Aquifer Classification Database – website

BC Ministry of Environment. Technical Report 17, Soils of Southern Vancouver Island, Maps 3, 5 and 6.

BC Ministry of Environment. 1999 – last amended 2006. BC Municipal Sewage Regulation (BC Reg 129/99, amended 2006).

BC Ministry of Environment. 2000. Environmental Impact Study Guideline – A Companion Document to the Municipal Sewage Regulation, 29 pp.

BC Ministry of Environment. 2002. A Guidebook for British Columbia – Stormwater Planning, 244 pp.

BC Ministry of Health. 2004 – last amended 2007. BC Sewerage System Regulation (BC Reg 326/2004, amended 2007)

BC Ministry of Health. 2004. Sewerage System Standard Practice Manual (Version 2, September 2007), 216 pp.

Comox Valley Citizen's Action on Recycling and the Environment. 2003. Preliminary Liquid Waste Management Planning in the Rural Communities of Marsden/Arden, Saratoga/Miracle Beach and Sandwick.

Comox Valley Regional District. 2003. The City of Courtenay Annexation Area Map.

Environmental Canada – Climate Normal Data – website

Freeze R.A. and Cherry J.A. 1979. Groundwater. Prentice-Hall Inc., New Jersey, 604 pp.

Geological Survey of Canada – MapPlace - website

Geological Survey of Canada. 1959. Surficial Geology – Oyster River, British Columbia. Map 49-1959.

Geological Survey of Canada. 1960. Surficial Geology – Courtenay, British Columbia. Map 32-1960.

Geological Survey of Canada. 1963. Surficial Geology – Horne Lake, British Columbia. Map 1111A.

FIGURES

APPENDIX

APPENDIX A – SUBSURFACE SOIL DESCRIPTIONS

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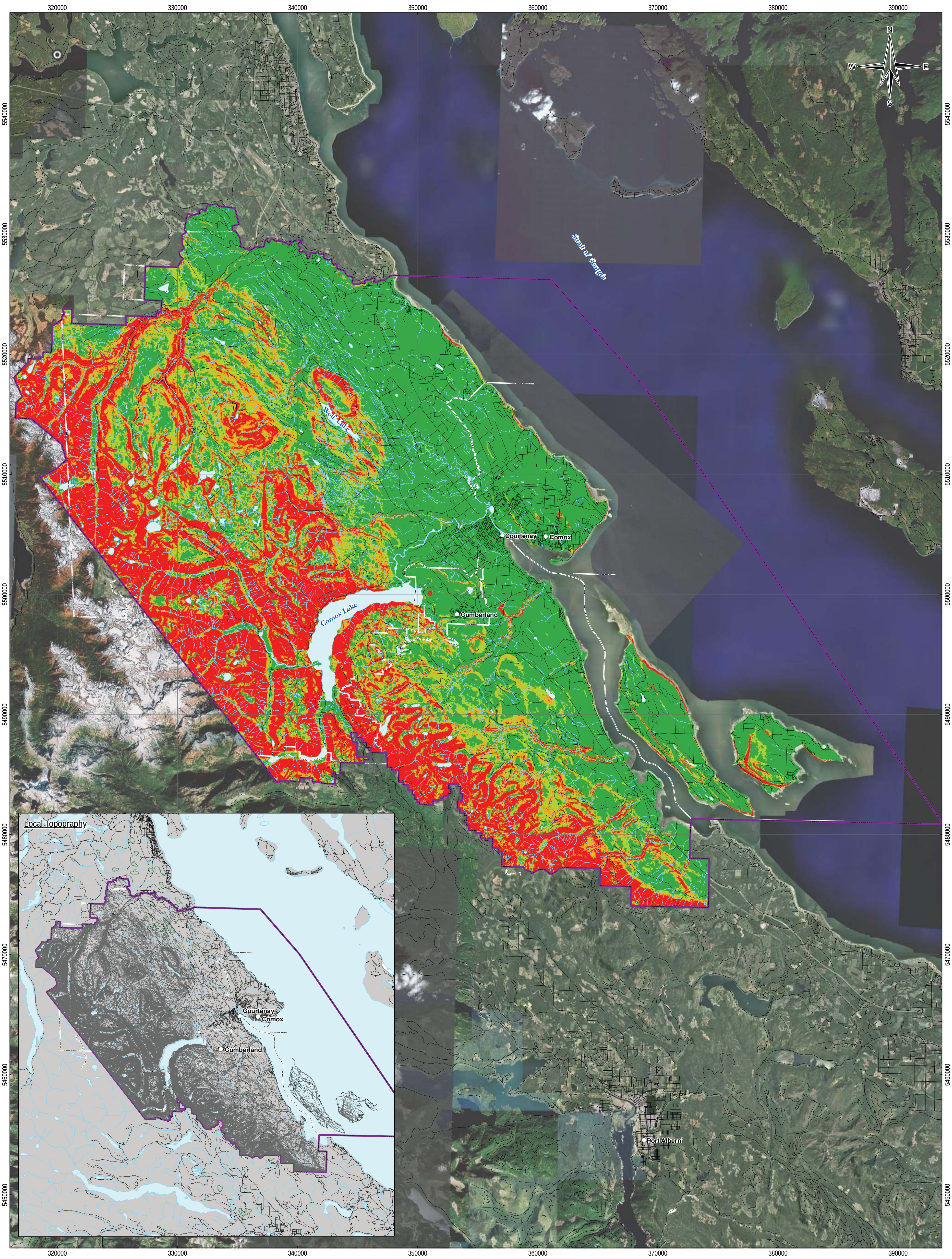


LEGEND

- Populated Places
- Road Network
- Contour (20m)
- CVRD Boundary
- Municipal Boundary

Water Features

- Wetland
- Watercourse
- Waterbody

Percent Slope

- 0 - 15
- >15 - 25
- >25 - 35
- >35

DISCLAIMER

Topographic information presented herein are based on 20 m interval and site specific slopes may vary.

NOTES

Base data source: BC TRIM, NTS 1:50K, ESRI Data Maps, Stats Canada, Google Earth Pro, McElhanney.

ISSUED FOR REVIEW

CVRD SEWERAGE MASTER PLAN

Terrain Slope Classes

PROJECTION: UTM Zone 10	DATUM: NAD83

Scale: 1:150,000

5 2.5 0 5

Kilometres

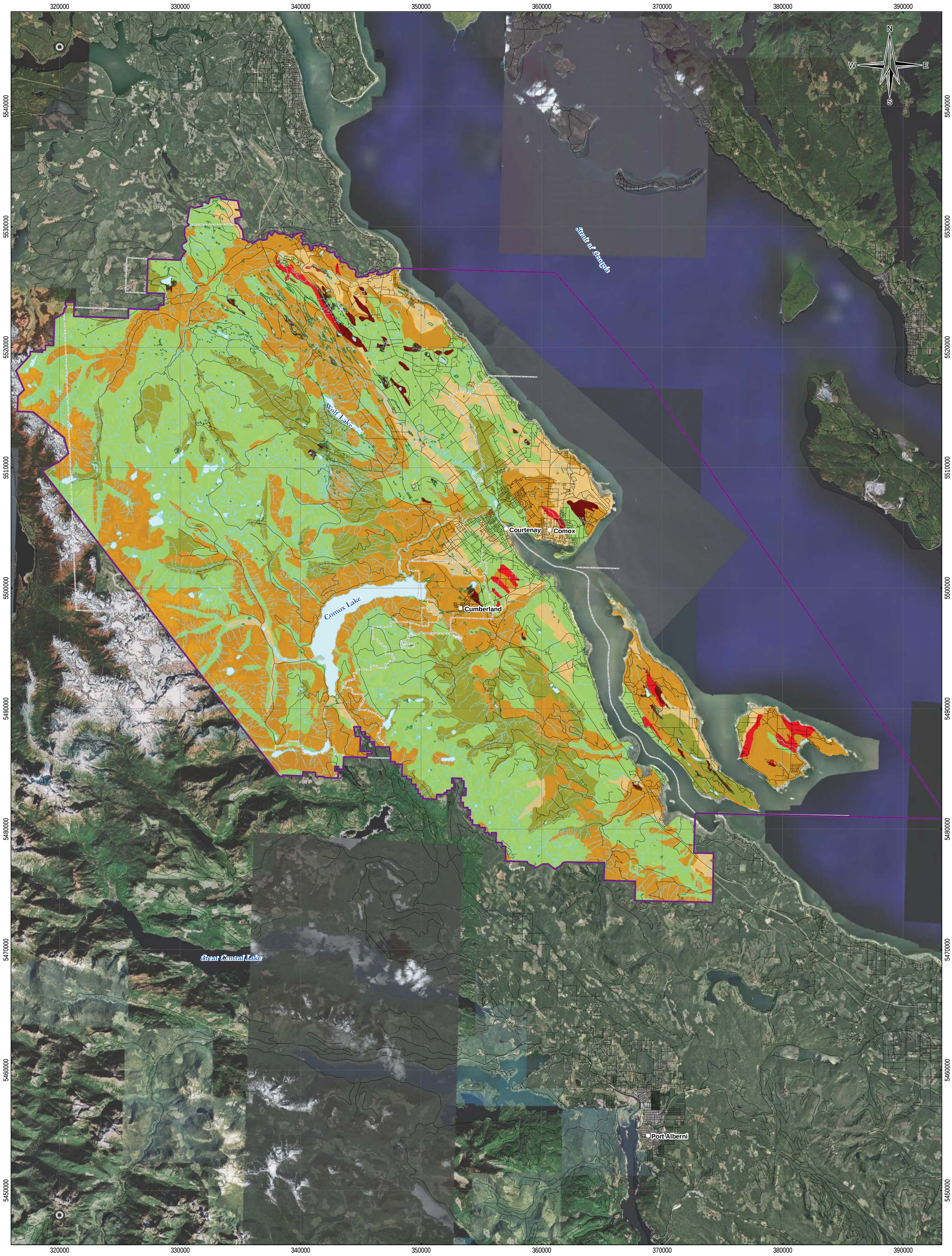
EBA Engineering Consultants Ltd. eba

FILE NO.: N23101297_Comox_Figure1.mxd

PROJECT NO.	DWN	CKD	REV
N23101297	MEZ	SB	0

OFFICE	DATE
EBA-VANC	October 3, 2008

Figure 1



LEGEND

Populated Places
Road Network
CVRD Boundary
Municipal Boundary

Water Features
Wetland
Watercourse
Waterbody

Drainage
Very Poorly Drained
Poorly Drained
Imperfectly Drained
Rapidly Drained
Moderately Well Drained
Well Drained

DISCLAIMER
Interpretated drainge presented herein are based on available regional mapping and site specific properties may vary

NOTES
Base data source:
Soils of Southern Vancouver Island (Sheets 3, 5 & 6)
BC Minstry of Environment Technical Report 17
NTS 1:50k, BC Trim, ESRI Data Maps, Stat Canada, Googel Earth Pro, McElhanney

ISSUED FOR REVIEW

CVRD SEWERAGE MASTER PLAN

Drainage

PROJECTION: UTM Zone 10
DATUM: NAD83

Scale: 1:150,000
5 2.5 0 5
Kilometres

EBA Engineering Consultants Ltd.

FILE NO.: N23101297_Comox_Figure2.mxd

PROJECT NO.: N23101297
DWN: MEZ
CKD: SB
REV: 0

OFFICE: EBA-VANC
DATE: October 3, 2008

Figure 2

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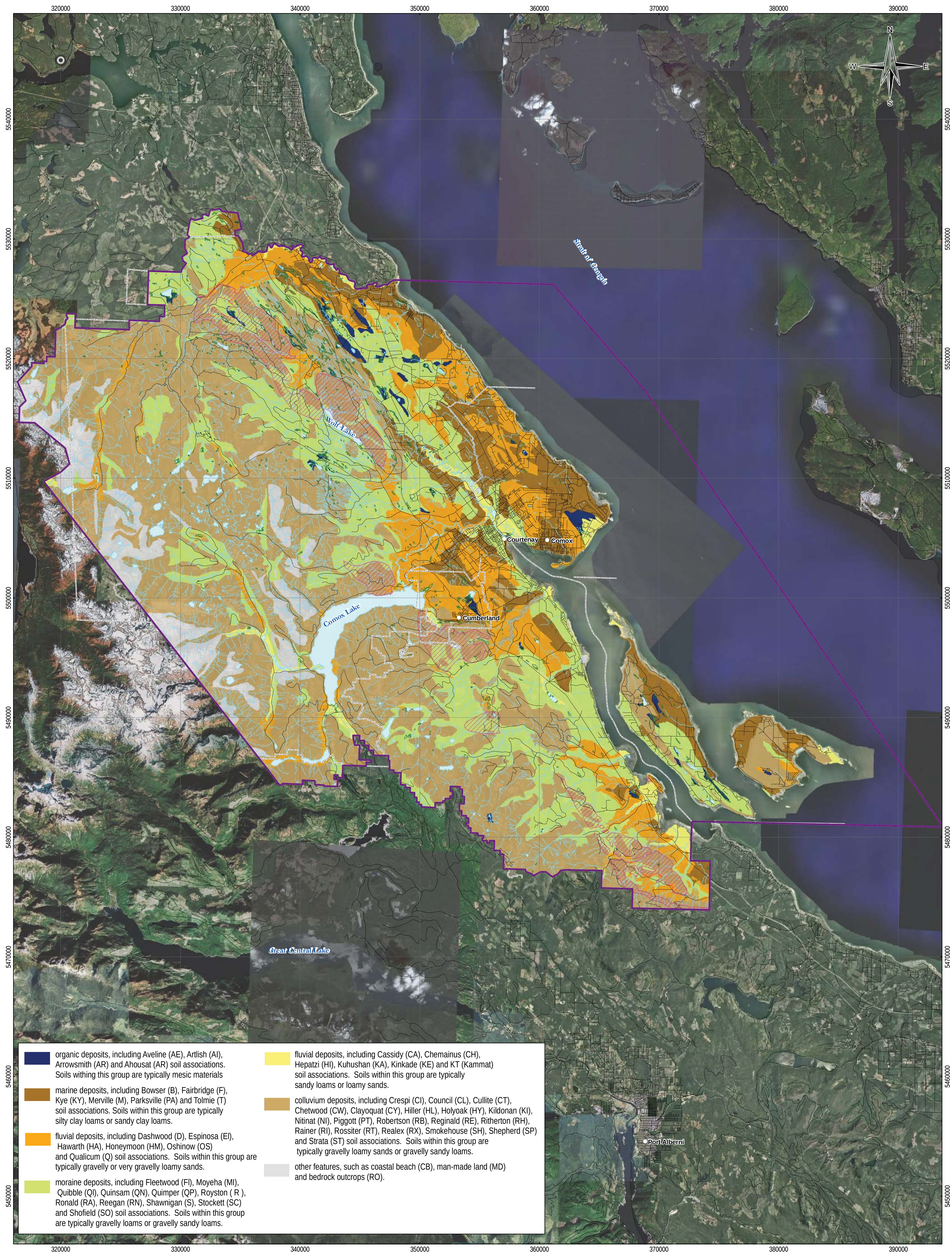

LEGEND

- Populated Places
- Road Network
- CVRD Boundary
- Municipal Boundary
- Bedrock

Water Features

- Wetland
- Watercourse
- Waterbody

DISCLAIMER

Interpreted soils presented herein are based on avaialable regional mapping and site specific soil conditions may vary.

CVRD SEWERAGE MASTER PLAN

Soil Description and Bedrock Areas

PROJECTION	DATUM
UTM Zone 10	NAD83

Scale: 1:150,000

5 2.5 0 5

Kilometres

EBA Engineering Consultants Ltd.

FILE NO. N23101297_Comox_Figure3.mxd

PROJECT NO.	DWN	CKD	REV
N23101297	MEZ	SB	0

OFFICE	DATE
EBA-VANC	October 3, 2008

Figure 3

NOTES

Base data source: BC Geol. Survey Canada Maps 49-1959, 32-1960 and 1111A, Soils of Southern Vancouver Island (Sheets 3, 5 & 6)
BC Minstry of Environment Technical Report 17, NTS 1:50k, BC Trim, ESRI Data Maps, Stat Canada, Google Earth Pro, McElhanney

ISSUED FOR REVIEW

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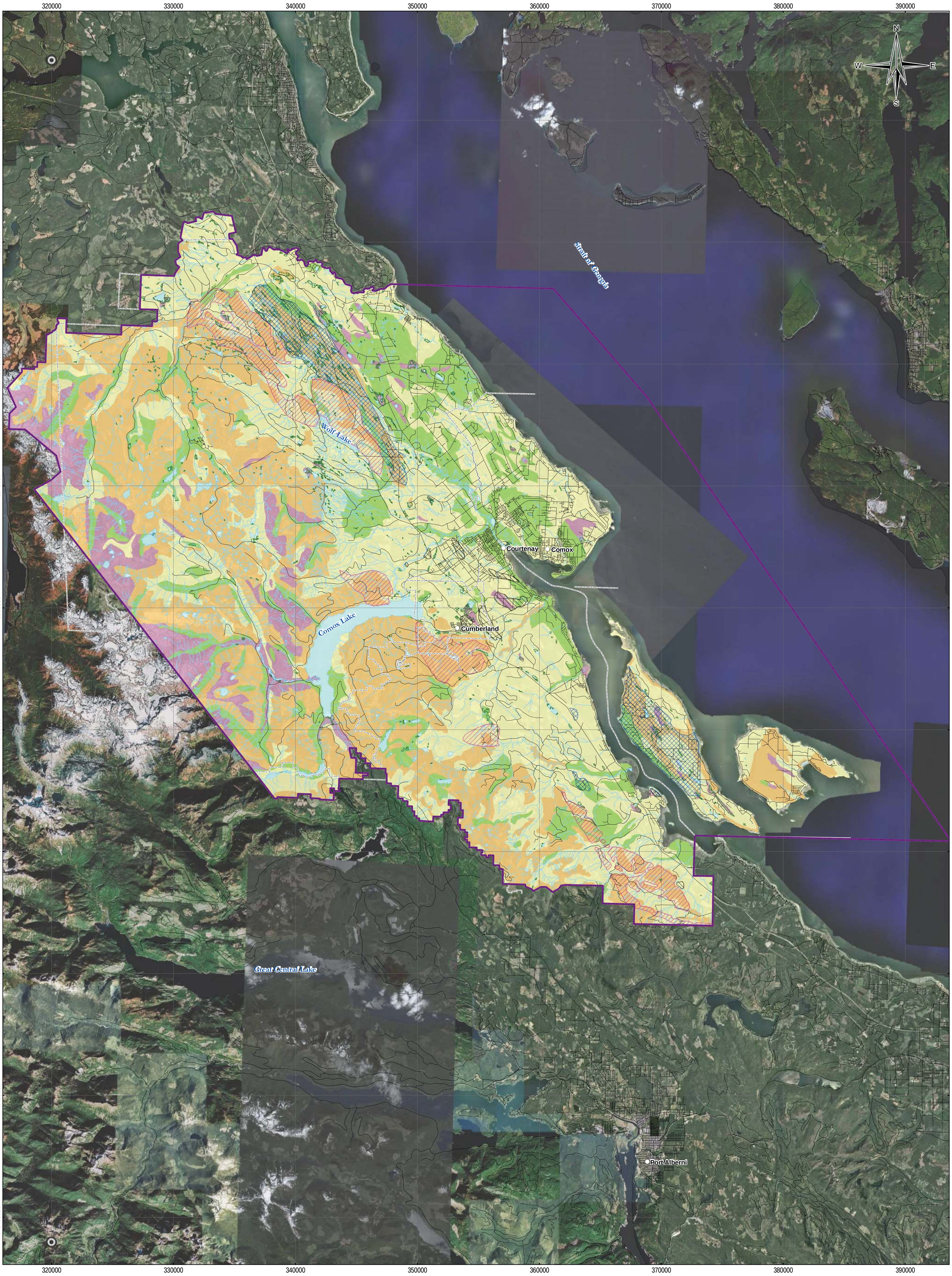

LEGEND

Populated Places

Road Network

CVRD Boundary

Municipal Boundary

Surficial Geology

Bedrock

Shallow Overburden (<1.5m) Over Bedrock

Both Shallow Overburden (<1.5m) Over Bedrock and Bedrock are Present

Water Features

Wetland

Watercourse

Waterbody

Depth of Soil Above Bedrock/Restrictive Layer

At Surface

0.1 to 0.5 m

0.5 to 1.0 m

>1.0 m

NOTES

Base data source:
BC Geol. Survey Maps 49-1959, 32-1960 and 1111A
Soils of Southern Vancouver Island (Sheets 3, 5 and 6)
BC Ministry of Environment Technical Report 17.
NTS 1:50K, BC TRIM, ESRI Data Maps, Stats Canada, Google Earth Pro, McElhanney

DISCLAIMER

Interpreted soil depths presented herein are based on available regional mapping and site specific conditions may vary.

ISSUED FOR REVIEW

CVRD SEWERAGE MASTER PLAN

Depth of Soil Above Bedrock/Restrictive Layer

PROJECTION	DATUM
UTM Zone 10	NAD83

Scale: 1:150,000

5 2.5 0 5

Kilometres

EBA Engineering Consultants Ltd.

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N23101297	MEZ	SB	0
OFFICE	DATE		
EBA-VANC	October 3, 2008		

Figure 4

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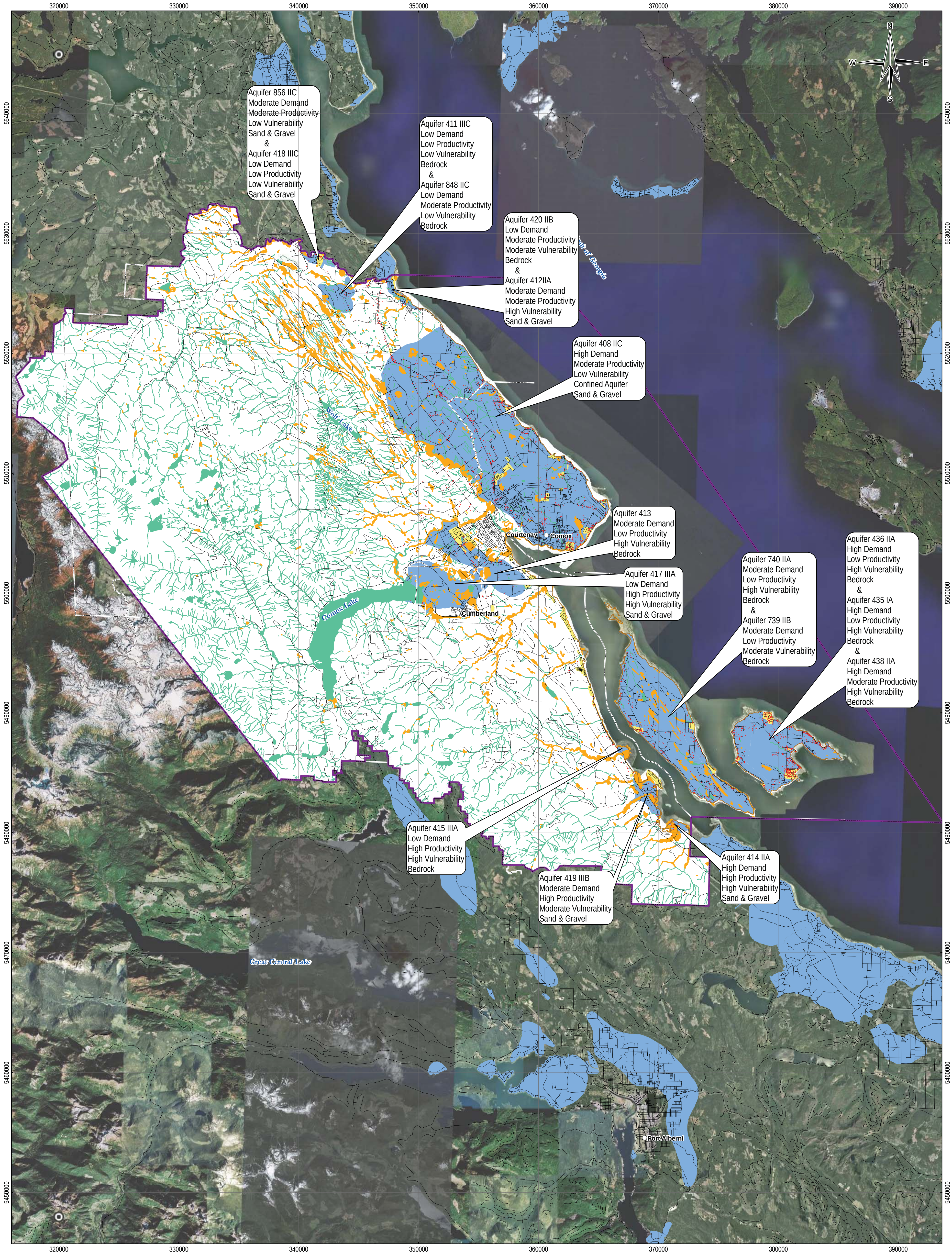


LEGEND

- Populated Places
- CVRD Boundary
- Municipal Boundary
- Road Network
- Aquifer

Water Features

- Wetland

Sensitive Areas (30m Buffers)

- Coastline
- Water Wells
- Coastal Bluff, Riparian and Wetlands
- Waterbody, Stream and Watercourse
- VIHA-Identified Problem Areas

DISCLAIMER

Interpreted sensitive areas presented herein are based on information provided by others and site specific conditions may vary.

CVRD SEWERAGE MASTER PLAN

Environmentally Sensitive Areas

PROJECTION	DATUM
UTM Zone 10	NAD83

Scale: 1:150,000

5 2.5 0 5

Kilometres

EBA Engineering Consultants Ltd.

FILE NO.
N23101297_Comox_Figure5.mxd

PROJECT NO.	DWN	CKD	REV
N23101297	MEZ	SB	0

OFFICE	DATE
EBA-VANC	October 3, 2008

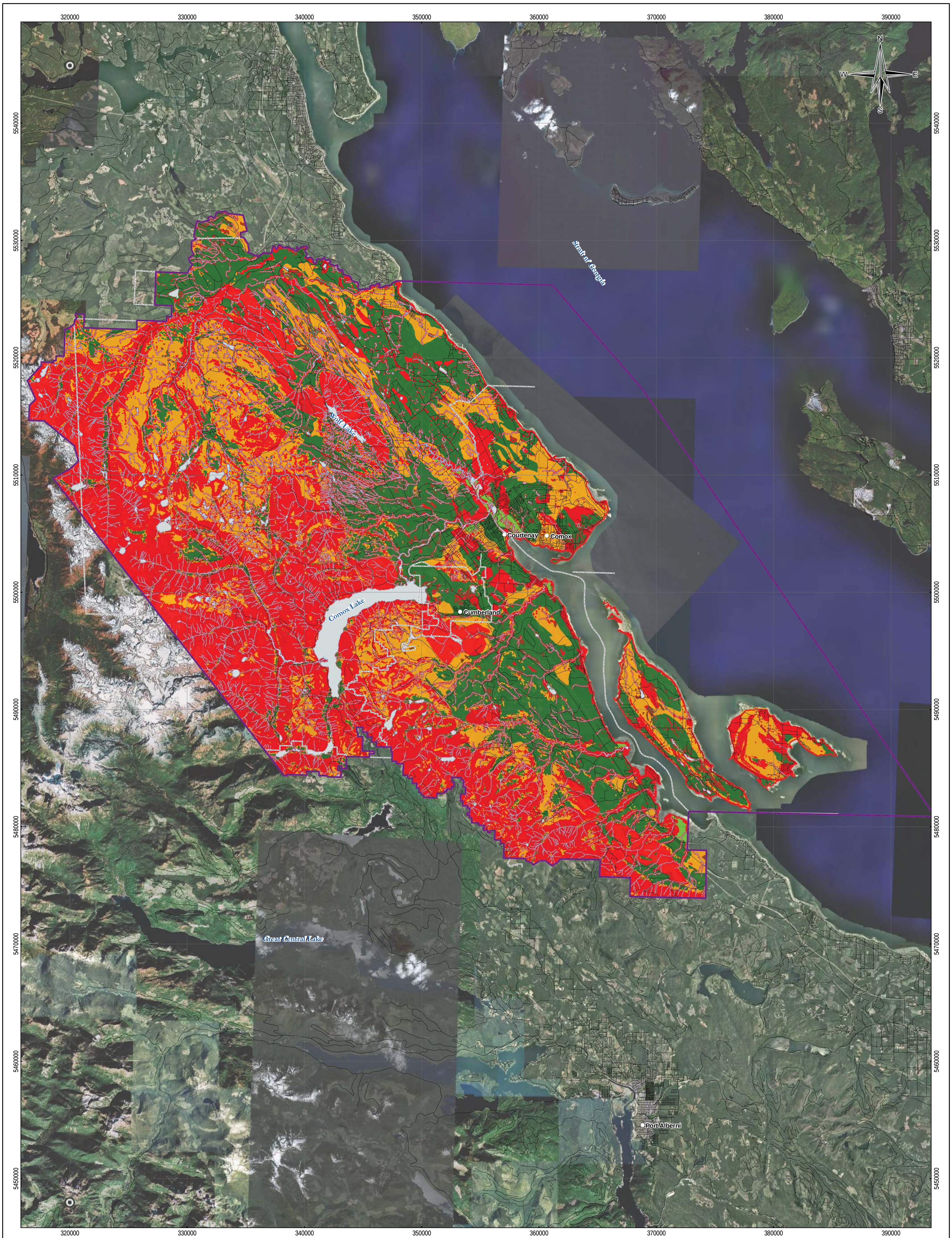
Figure 5

NOTES

Base data source: BC TRIM, 1:50K NTS, ESRI Data Maps, Stats Canada,
Land and Resource Data Warehouse, CVRD Habitiat Atlas, Google Earth Pro, McElhanney

ISSUED FOR REVIEW

Q:\Vancouver\GIS\ENVIRONMENTAL\N231\N23101297_Comox\Maps\N23101297_Comox_Figure6_22x34.mxd



LEGEND

- Populated Places
- CVRD Boundary
- Municipal Boundary
- Road Network

Water Features

- Wetland
- Watercourse
- Waterbody

Development Potential

- Good
- Moderate
- Poor
- Very Poor

NOTES

Base data source:
BC Geol. Survey Maps 49-1959, 32-1960 and 1111A
Soils of Southern Vancouver Island (Sheets 3, 5 and 6)
BC Ministry of Environment Technical Report 17.
NTS 1:50K, BC TRIM, ESRI Data Maps, Stats Canada, Google Earth Pro, McElhanney

DISCLAIMER

Interpretations presented herein are based on information provided in part by others and has not been field verified. The interpretation of this information is for the general area of the Comox Valley Regional District and site specific properties may change the potential for in-ground liquid waste disposal.

ISSUED FOR REVIEW

CVRD SEWERAGE MASTER PLAN

Waste Water Ground Disposal Potential

PROJECTION: UTM Zone 10
DATUM: NAD83

Scale: 1:150,000
5 2.5 0 5
Kilometres

FILE NO.: N23101297_Comox_Figure6.mxd

EBA Engineering Consultants Ltd.

PROJECT NO.	DWN	CKD	REV
N23101297	MEZ	SB	0

OFFICE: EBA-VANC
DATE: October 3, 2008

Figure 6

APPENDIX A: SUBSURFACE SOIL DESCRIPTION

Soil Type	Soil Assoc. Component	Most Common Texture	Parent Material	Soil Association Component Description
Ahousat	AS1	mesic	organic - 40 to 160 cm	-
	AS2			organic material deeper than 160 cm is most common
	AS7			Organic material deeper than 160 cm is most common
Arrowsmith	AR1	mesic (organic)	Organic - 40 to 160 cm, although occasionally >160 cm	-
	AR2			less common soil consists of deep (>160 cm) organic material
	AR7			Organic material deeper than 160 cm is most common
Artlish	AI1	mesic (organic)	Organic - 40 to 160 cm	-
	AI2			less common soil consists of deep (>160 cm) organic material
Aveline	AE1	mesic (organic)	Organic - 40 to 160 cm, although occasionally >160 cm	-
	AE2			less common soil consists of deep (>160 cm) organic material
	AE7			Organic material deeper than 160 cm is most common
Bowser	B1	silty/gravelly sandy loam	Marine - within 1 m	Dense, compact subsoil layers restrict previousness to slow
	B4			less common soil contains a moderately to strongly cemented subsoil layer
	B7			less common soil is poorly drained
Cassidy	CA1	very gravelly loamy sand	Fluvial - 50 to 100 cm	A strong, cemented duric layer between 75 and 100 cm
	CA4			less common soil consists of recently deposited materials
	CA7			the most common soil consists of recently deposited material and contains a fluctuating water table
Chemalnus	CH1	loam	Fluvial - 100 to 150 cm	-
	CH4			less common soil consists of recently deposited materials. Little or no soil development is evident
Chetwood	CW1	gravelly loamy sand	Colluvium - at depths greater than 150 cm	-
	CW2			less common soil occurs in climatically and/or edaphically drier locations
	CW3			less common soil has a mottled, very dark brown, strongly podzolized solum due to its occurrence in climatically and/or edaphically wetter locations
	CW8			less common soil occurs on very steep, unstable slopes.
Clayoquat	CY1			-
	CY8	gravelly sand	colluvium - greater than 1 m thick	less common soil has a dark reddish brown to dark brown strongly podzolized solum
Cotter	CI1	gravelly sandy loam	colluvium - at depths greater than 150 cm	-
	CI2			less common soil has a podzolized, strong brown to yellowish red solum due to its occurrence in climatically and/or edaphically drie locations
Council	CL1	gravelly loamy sand	colluvium - at depths greater than 150 cm	-
Cullite	CT1	gravelly sandy loam	Colluvium - at depths greater than 150 cm	-
	CT2			less common soil is only weakly podzolized due to its occurrence in climatically and/or edaphically drier locations
	CT3			common soil has a reddish-brown to dark reddish brown, strongly podzolized solum due to its occurrence in climatically and/or edaphically wetter locations
Dashwood	D1	very gravelly loamy sand/gravelly sandy loam	Fluvial - 100 to 120 cm	A strong, cemented duric layer between 50 and 90 cm
	D2			less common soil is only weakly podzolized due to its occurrence in climatically and/or edaphically drier locations
	D4			less common soil contains orstein cementing in the upper B horizons.
	D7			soils without strongly cemented layers form a major part of the soil component

APPENDIX A: SUBSURFACE SOIL DESCRIPTION

Soil Type	Soil Assoc. Component	Most Common Texture	Parent Material	Soil Association Component Description
Espinosa	EI3	gravelly loamy sand	fluvial - at depths greater than 140 cm	less common soil has a dark reddish brown, strongly podzolized solum due to its occurrence in climatically and/or edaphically wetter locations
	EI8			strongly cemented horizon are not present . Less common soil is very weakly developed are usually occurs on recently deposited gravel bars and fans
Falrbridge	F1	silty clay loam	Marine - within 1 m	Dense, compact subsoil layers restrict previousness to slow
	F3			less common soil has a strong, strong brown to reddish brown, strongly podzolized solum due to its occurrence in climatically and/or edaphically wetter locations. A clay accumulation horizon is also present below depth of 50 cm
Fleetwood	FI1	gravelly loam	Moraine - 90 to 120 cm	-
	FI3			less common soil has a strong brown to reddish brown, strongly podzolized solum due to its occurrence in climatically and/or edaphically wetter locations
	FI7			cemented (duric) horizons are absent in the most common soils
Hawarth	HA1	very gravelly loamy sand	Fluvial - depths between 1.5 and 2 m	A strong, cemented duric layer between 50 and 90 cm
	HA2			less common soil is only weakly podzolized due to its occurrence in climatically and/or edaphically drier locations
	HA4			less common soil contains a podzolized, reddish-brown cemented layer in the upper solum
	HA5			less common soil is between 50 and 100 cm thick over bedrock
	HA7			soils without strong cemented horizons are most common
	HA8			strongly cemented horizons are not present. Less common soil is very weakly developed and usually occurs on recently deposited alluvium
Hepatzi	HI2	very gravelly loamy sand	fluvial - at depths greater than 140 cm	a strongly cemented duric layer between 80 and 140 cm. Less common soil occurs in climatically and/or edaphically drier locations
Hiller	HL1	gravelly loamy sand	sandstone or conglomerate between 40 and 80 cm from surface	-
	HL2			less common soil occurs in climatically and/or edaphically drier locations and has an organic matter enriched surface (Ah) layer >1 cm thick
	HL3			less common soil has a strong brown to reddish brown, strongly podzolized solum due to its occurrence in climatically and/or edaphically wetter locations
	HL5			less common soil is between 50 and 100 cm thick over bedrock
	HL6			the most common soil is between 10 and 50 cm thick over bedrock. Inclusions of soils between 50 and 100 cm to bedrock also occur
Holyoak	HY1	gravelly loam	shale or siltstone bedrock between 50 and 100 cm from surface	-
Honeymoon	HM1	very gravelly loamy sand	Fluvial - between 1.5 and 2 m	-
	HM3			less common soil lack an organic matter enriched (Ah) surface horizon
	HM4			cemented (duric) horizons are absent in the less common soils
	HM7			cemented (duric) horizons are absent in the most common soils
	HM8			less common soil is between 50 and 100 cm thick over bedrock
Kammat	KT4	sandy loam/loamy sand	fluvial - 80 to 120 cm	less common soil is very weakly developed due to active disturbance by shifting stream channels and/or flooding
	KT7			most common soil except for mottling, is very weakly developed due to active disturbance by shifting stream channels and/or flooding. Less common soil sometimes contains excess moisture due to a permanently high water table
Kildonan	KI2	gravelly sandy loam	Colluvium - at depths greater than 150 cm	less common soil is only weakly podzolized due to its occurrence in climatically and/or edaphically drier locations
	KI3			less common soil has a dark brown to dark reddish brown, strongly podzolized solum due to its occurrence in climatically and/or edaphically wetter locations
Kinkade	KE1	sandy loam/loamy sand	Fluvial - 80 to 120 cm	-
	KA1			-
	KA4			less common soil is very weakly developed due to active disturbance by shifting stream channels and/or flooding

APPENDIX A: SUBSURFACE SOIL DESCRIPTION

Soil Type	Soil Assoc. Component	Most Common Texture	Parent Material	Soil Association Component Description
Kuhushan	KA7	sandy loam/loamy sand	Fluvial - 80 to 120 cm	all soils are very weakly developed due to active disturbance by shifting stream channels and/or flooding. Most common soil is mottled in the subsoil while some of the less common soil contains excess moisture due to permanently high water tables
Kye	KY1	loamy sand	Marine - 80 to 120 cm	
	KY2			less common soil is only weakly podzolized due to its occurrence in climatically and/or edaphically drier locations
Merville	M1	silt loam/loam at surface; silty clay in the underlying till	marine - within 1 m	Dense, compact subsoil layers restrict previousness to slow
	M3			less common soil lacks an organic matter enriched (Ah) surface horizon. It occurs in climatically and/or edaphically wetter locations
Moyeha	MI1	gravelly sandy loam	Moraine - 110 to 150 cm	A strong, cemented to indurated layer between 70 and 110 cm
	MI3			less common soil has a dark reddish brown to reddish brown, strongly podzolized solum due to its occurrence in climatically and/or edaphically wetter locations
	MI5			less common soil is between 50 and 100 cm thick over bedrock
Nitinat	NI1	gravelly sandy loam	bedrock between 50 and 100 cm from surface	-
	NI3			less common soil has a dark reddish brown to reddish -brown, strongly podzolized solum due to its occurrence in climatically and/or edaphically wetter locations
	NI5			less common soil is between 50 and 100 cm thick over bedrock
	NI6			the most common soil is generally between 10 and 50 cm thick over bedrock. Inclusions of soils between 50 and 100 cm to bedrock also occur
Oshinow	OS1	very gravelly loamy sand	fluvial - 100 to 150 cm	A strongly cemented layer between 50 and 100 cm
Parksville	PA1	sandy loam/silty clay	Marine - within 1 m	dense, compact subsoil layers restrict previousness to slow
Piggott	PT1	gravelly loamy sand	sandstone or conglomerate between 50 and 100 cm from surface	-
	PT5			less common soil is between 10 and 50 cm thick over bedrock
	PT6			most common soil is between 10 and 50 cm thick over bedrock. Inclusions of soils between 50 and 100 cm to bedrock also occur
Qualicum	Q1	very gravelly loamy sand	fluvial - depths between 1.5 and 2 m	a strongly to moderately cemented layer between 50 and 90 cm
	Q2			less common soil occurs in climatically and/or edaphically drier locations and has an organic matter enriched surface (Ah) layer >1 cm thick
	Q7			strongly cemented horizons are absent in the less common soil
	Q8			strongly cemented horizons are absent. Less common soil is very weakly developed and usually occurs on recently deposited alluvium

APPENDIX A: SUBSURFACE SOIL DESCRIPTION

Soil Type	Soil Assoc. Component	Most Common Texture	Parent Material	Soil Association Component Description
Quibble	QI2	gravelly sandy loam	moraine - 120 to 150 cm	less common soil occurs in climatically and/or edaphically drier locations
	QI3			les common soil has a dark reddish brown to black, strongy podzolized solum due to its occurrence in climatically and/or edaphically wetter locations. The subsoil is strongly mottled
	QI5			less common soil is between 50 and 100 cm thick over bedrock
Quimper	QP1	gravelly loam	Moraine - 120 to 150 cm	A cemented or indurated layer between 70 and 120 cm
	QP3			less common soil has a strong brown to reddish-brown, strongly podzolized solum due to its occurrence in climatically and/or edaphically wetter locations
	QP5			less common soil is between 50 and 100 cm thick over bedrock
Quinsam	QN1	gravelly sandy loam	Moraine - 120 to 150 cm	A cemented to indurated layer between 70 and 120 cm
	QN2			less common soil occurs in climatically and/or edaphically drier locations
	QN4			strongly cemented horizons are absent in the less common soil
	QN5			less common soil is between 50 and 100 cm thick over bedrock
Rainier	RI1	gravelly sandy loam	bedrock between 50 and 100 cm from surface	-
	RI2			less common soil occurs in climatically and/or edaphically drier locations
	RI5			less common soil is between 10 and 50 cm thick over bedrock
	RI6			the most common soil is between 10 and 50 cm thick over bedrock. Inclusions of soils between 50 and 100 cm to bedrock also occur or consist of organic materials (>10 cm thick) over bedrock
Realex	RX1	very gravelly sand	bedrock between 50 and 100 cm from surface	-
	RX8			less common soil is strongly podzolized. Less common soil is between 10 and 50 cm thick over bedrock
Reegan	RN1	gravelly loam	Moraine - 90 to 120 cm	A moderately to strongly cemented layer between 60 and 90 cm
	RN2			less common soil is only weakly podzolized due to its occurrence in climatically and/or edaphically drier locations
	RN4			strongly cemented (duric) horizons are absent in the less common soil
	RN5			less common soil is between 50 and 100 cm thick over bedrock
	RN7			strongly cemented (duric) horizons are absent in the most common soil
Reginald	RE6	gravelly sandy loam	bedrock between 50 and 100 cm from surface	the most common soil is between 10 and 50 cm thick over bedrock. Less common soils between 50 and 100 cm to bedrock also occur as do soils consisting of organic material (>10 cm) thick over bedrock
Ritherton	RH1	gravelly sandy loam	bedrock between 50 and 100 cm from surface	-
	RH2			less common soil occurs in climatically and/or edaphically drier locations. Less common soil is between 10 and 50 cm thick over bedrock
	RH5			less common soil is between 50 and 100 cm thick over bedrock
	RH6			the most common soil is between 10 and 50 cm thick over bedrock. Inclusions of soils between 50 and 100 cm to bedrock also occur or consist of organic materials (>10 cm thick) over bedrock
	RH7			less common soil is between 10 and 50 cm thick over bedrock or consists of organic material (>10 cm thick) over bedrock
Robertson	RB2	gravelly sandy loam	bedrock between 50 and 100 cm from surface	less common soil is only weakly podzolized due to its occurrence in climatically and/or edaphically drier locations
	RB5			less common soil is between 10 and 50 cm thick over bedrock
	RB6			the most common soil is between 10 and 50 cm thick over bedrock. Inclusions of soils between 50 and 100 cm to bedrock also occur
	RB7			less common soil is between 10 and 50 cm thick over bedrock
Rock Outcrop	RO	-	-	-

APPENDIX A: SUBSURFACE SOIL DESCRIPTION

Soil Type	Soil Assoc. Component	Most Common Texture	Parent Material	Soil Association Component Description
Ronald	RA1	gravelly loam	Moraine - 100 to 130 cm	A strong to moderately cemented layer between 60 and 100 cm
	RA2			less common soils only weakly podzolized due to its occurrence in climatically drier locations
	RA5			less common soil is between 50 and 100 cm thick over bedrock
	RA7			most common soil does not contain cemented (duric) layers
Rossiter	RT1	gravelly sandy loam	bedrock between 50 and 100 cm from surface	-
	RT3			less common soil has a dark reddish brown, strongly podzolized solum due to its occurrence in climatically and/or edaphically wetter locations
	RT5			most common soil is between 10 and 50 cm thick over bedrock. Inclusions of soils between 50 and 100 cm to bedrock also common
	RT6			the most common soil is between 10 and 50 cm thick over bedrock. Inclusions of soils between 50 and 100 cm to bedrock also occur
Royston	R7	gravelly loam	- 90 to 120 m	a moderately cemented layer occasionally between 60 and 90 cm
Shawnigan	S2	gravelly sandy loam/very gravelly sandy loam	Moraine - 110 to 130 cm	less common soil has an organic matter-enriched surface (Ah) horizon greater than 10 cm thick
	S3			less common soil has a strong brown to reddish brown, strongly podzolized solum due to its occurrence in climatically and/or edaphically wetter locations
Shepherd	SP5	gravelly loamy sand	bedrock between 50 and 100 cm from surface	less common soil is between 10 and 50 cm thick over bedrock
Shofield	SO1	gravelly sandy loam	Moraine - 100 to 150 m	A strongly to moderately cemented layer between 50 and 100 cm
	SO2			less common soil occurs in climatically and/or edaphically drier locations
	SO3			less common soil has a dark reddish brown to black strongly podzolized solum due to its occurrence in climatically and/or edaphically wetter locations
	SO5			less common soil is between 50 and 100 cm thick over bedrock
Smokehouse	SH2	gravelly loamy sand	bedrock between 50 and 100 cm from surface	less common soil occurs in climatically and/or edaphically drier locations. Less common soil is between 10 and 50 cm thick over bedrock
	SH5			less common soil is between 10 and 50 cm thick over bedrock
	SH6			the most common soil is between 10 and 50 cm thick over bedrock. Inclusions of soils between 50 and 100 cm to bedrock also occur or consist of organic materials (>10 cm thick) over bedrock
Stockett	SC3	gravelly sandy loam	Moraine - 100 to 150 cm	A strongly to moderately cemented layer between 50 and 100 cm
Strata	ST1	gravelly loamy sand	bedrock between 50 and 100 cm from surface	-
	ST3			less common soil has a strong brown to reddish brown, strongly podzolized solum due to its occurrence in climatically and/or edaphically wetter locations
	ST5			less common soil is between 10 and 50 cm thick over bedrock
	ST6			the most common soil is between 10 and 50 cm. Inclusions of soils between 50 and 100 cm to bedrock also occur
Tolmie	T1	sandy clay loam	Marine - within 1 m	-
	T4			less common soil occupies higher areas with very moderately restricted drainage

APPENDIX

APPENDIX B – ENVIRONMENTAL REPORT - GENERAL CONDITIONS

ENVIRONMENTAL REPORT – GENERAL CONDITIONS

This report incorporates and is subject to these "General Conditions".

1.0 USE OF REPORT

This report pertains to a specific site, a specific development, and a specific scope of work. It is not applicable to any other sites, nor should it be relied upon for types of development other than those to which it refers. Any variation from the site or proposed development would necessitate a supplementary investigation and assessment.

This report and the assessments and recommendations contained in it are intended for the sole use of EBA's client. EBA does not accept any responsibility for the accuracy of any of the data, the analysis or the recommendations contained or referenced in the report when the report is used or relied upon by any party other than EBA's client unless otherwise authorized in writing by EBA. Any unauthorized use of the report is at the sole risk of the user.

This report is subject to copyright and shall not be reproduced either wholly or in part without the prior, written permission of EBA. Additional copies of the report, if required, may be obtained upon request.

2.0 LIMITATIONS OF REPORT

This report is based solely on the conditions which existed on site at the time of EBA's investigation. The client, and any other parties using this report with the express written consent of the client and EBA, acknowledge that conditions affecting the environmental assessment of the site can vary with time and that the conclusions and recommendations set out in this report are time sensitive.

The client, and any other party using this report with the express written consent of the client and EBA, also acknowledge that the conclusions and recommendations set out in this report are based on limited observations and testing on the subject site and that conditions may vary across the site which, in turn, could affect the conclusions and recommendations made.

The client acknowledges that EBA is neither qualified to, nor is it making, any recommendations with respect to the purchase, sale, investment or development of the property, the decisions on which are the sole responsibility of the client.

2.1 INFORMATION PROVIDED TO EBA BY OTHERS

During the performance of the work and the preparation of this report, EBA may have relied on information provided by persons other than the client. While EBA endeavours to verify the accuracy of such information when instructed to do so by the client, EBA accepts no responsibility for the accuracy or the reliability of such information which may affect the report.

3.0 LIMITATION OF LIABILITY

The client recognizes that property containing contaminants and hazardous wastes creates a high risk of claims brought by third parties arising out of the presence of those materials. In consideration of these risks, and in consideration of EBA providing the services requested, the client agrees that EBA's liability to the client, with respect to any issues relating to contaminants or other hazardous wastes located on the subject site shall be limited as follows:

1. With respect to any claims brought against EBA by the client arising out of the provision or failure to provide services hereunder shall be limited to the amount of fees paid by the client to EBA under this Agreement, whether the action is based on breach of contract or tort;
2. With respect to claims brought by third parties arising out of the presence of contaminants or hazardous wastes on the subject site, the client agrees to indemnify, defend and hold harmless EBA from and against any and all claim or claims, action or actions, demands, damages, penalties, fines, losses, costs and expenses of every nature and kind whatsoever, including solicitor-client costs, arising or alleged to arise either in whole or part out of services provided by EBA, whether the claim be brought against EBA for breach of contract or tort.

4.0 JOB SITE SAFETY

EBA is only responsible for the activities of its employees on the job site and is not responsible for the supervision of any other persons whatsoever. The presence of EBA personnel on site shall not be construed in any way to relieve the client or any other persons on site from their responsibility for job site safety.

5.0 DISCLOSURE OF INFORMATION BY CLIENT

The client agrees to fully cooperate with EBA with respect to the provision of all available information on the past, present, and proposed conditions on the site, including historical information respecting the use of the site. The client acknowledges that in order for EBA to properly provide the service, EBA is relying upon the full disclosure and accuracy of any such information.

6.0 STANDARD OF CARE

Services performed by EBA for this report have been conducted in a manner consistent with the level of skill ordinarily exercised by members of the profession currently practicing under similar conditions in the jurisdiction in which the services are provided. Engineering judgement has been applied in developing the conclusions and/or recommendations provided in this report. No warranty or guarantee, express or implied, is made concerning the test results, comments, recommendations, or any other portion of this report.

7.0 EMERGENCY PROCEDURES

The client undertakes to inform EBA of all hazardous conditions, or possible hazardous conditions which are known to it. The client recognizes that the activities of EBA may uncover previously unknown hazardous materials or conditions and that such discovery may result in the necessity to undertake emergency procedures to protect EBA employees, other persons and the environment. These procedures may involve additional costs outside of any budgets previously agreed upon. The client agrees to pay EBA for any expenses incurred as a result of such discoveries and to compensate EBA through payment of additional fees and expenses for time spent by EBA to deal with the consequences of such discoveries.

8.0 NOTIFICATION OF AUTHORITIES

The client acknowledges that in certain instances the discovery of hazardous substances or conditions and materials may require that regulatory agencies and other persons be informed and the client agrees that notification to such bodies or persons as required may be done by EBA in its reasonably exercised discretion.

9.0 OWNERSHIP OF INSTRUMENTS OF SERVICE

The client acknowledges that all reports, plans, and data generated by EBA during the performance of the work and other documents prepared by EBA are considered its professional work product and shall remain the copyright property of EBA.

10.0 ALTERNATE REPORT FORMAT

Where EBA submits both electronic file and hard copy versions of reports, drawings and other project-related documents and deliverables (collectively termed EBA's instruments of professional service), the Client agrees that only the signed and sealed hard copy versions shall be considered final and legally binding. The hard copy versions submitted by EBA shall be the original documents for record and working purposes, and, in the event of a dispute or discrepancies, the hard copy versions shall govern over the electronic versions. Furthermore, the Client agrees and waives all future right of dispute that the original hard copy signed version archived by EBA shall be deemed to be the overall original for the Project.

The Client agrees that both electronic file and hard copy versions of EBA's instruments of professional service shall not, under any circumstances, no matter who owns or uses them, be altered by any party except EBA. The Client warrants that EBA's instruments of professional service will be used only and exactly as submitted by EBA.

The Client recognizes and agrees that electronic files submitted by EBA have been prepared and submitted using specific software and hardware systems. EBA makes no representation about the compatibility of these files with the Client's current or future software and hardware systems.