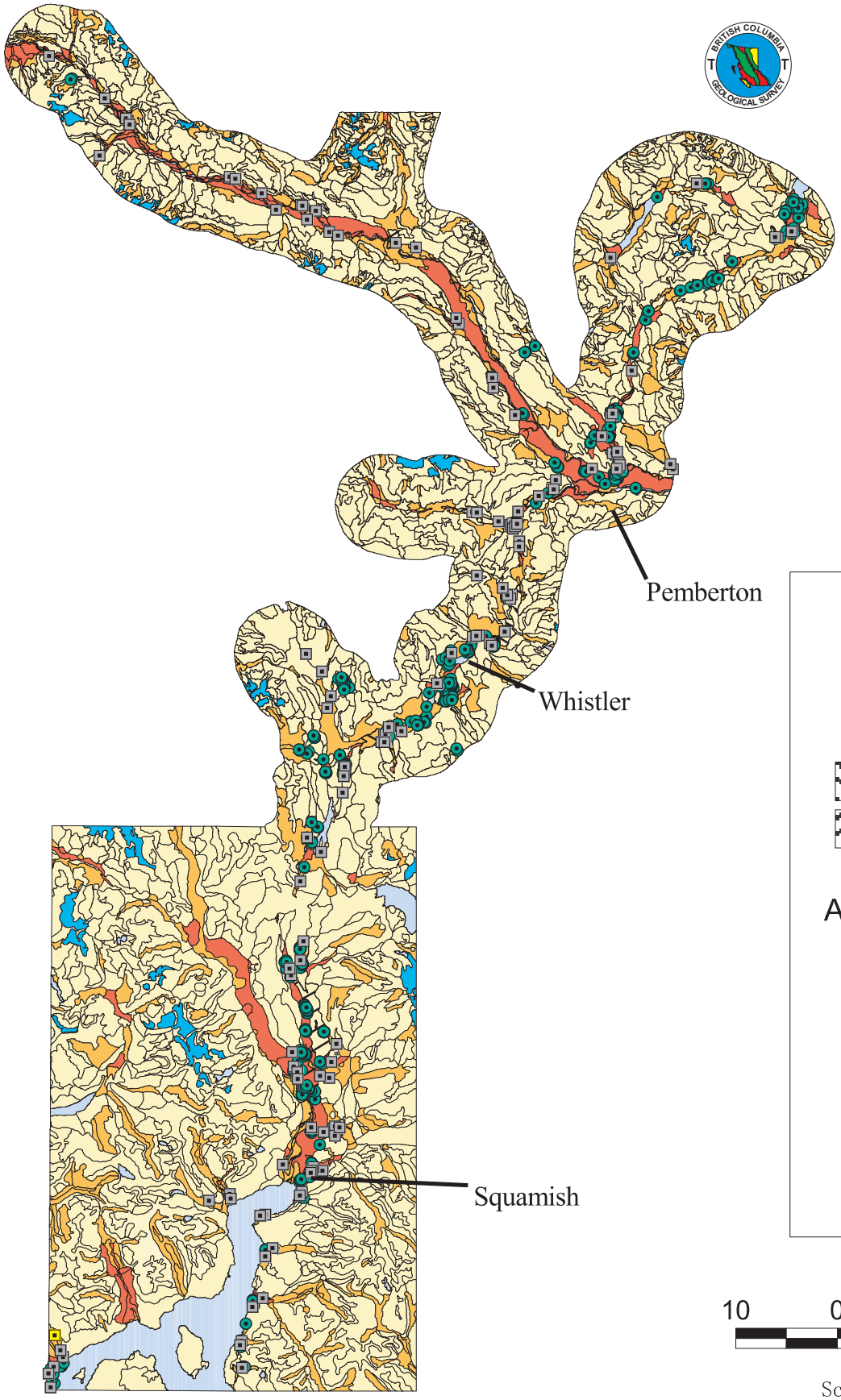
Open File 2001-12

Sea to Sky Aggregate Potential Project

A.S. Hickin. E.D. Brooks, A.B. Dixon-Warren, P.T. Bobrowsky

BRITISH COLUMBIA
Ministry of Energy and Mines
Energy and Minerals Division
Geological Survey Branch



N

Pits
Wells

Pit Potential
High
Moderate

Aggregate Classification
Primary
Secondary
Tertiary
Ice
Water

10 0 10 20 Kilometers

Scale 1:150,000

North American Datum 1927
Universal Transverse Mercator Projection
Zone 10

Sea-to-Sky Aggregate Resource Potential Mapping Project

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The Sea-to-Sky region, north of Vancouver, British Columbia, is currently experiencing competing land use options which range from the development of scarce, but economically important aggregate resources to complete conservation and preservation of the natural resources. However, with the continued urban growth of communities such as the Villages of Whistler and Pemberton and the City of Squamish, coupled with a potentially successful bid for the 2010 Winter Olympics, pressure on the existing local aggregate reserves will eventually reach a critical stage. To address these concerns, the Ministry of Energy and Mines with funding assistance from the Corporate Resource Inventory Initiative (CRII), British Columbia Assets and Lands (BCAL), and Ministry of Transportation and Highways (MoTH), initiated a joint project to assess, at a reconnaissance level, the aggregate potential of the Sea-to-Sky corridor.

Sea-to-Sky Aggregate Resource Potential Mapping Project

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The following text accompanies the digital data for the Sea-to-Sky Aggregate Resource Potential Map; BCGS Open File 2001-12. The information provided herein details the procedures and methodology used to assess the aggregate potential of landform polygons within the study area.

Aggregate resource potential maps provide guidelines for users of the data to eventually evaluate and manage aggregate resources. These maps are intended to provide "first approximation" estimates of aggregate potential in specific regions. The potential rankings provided correspond to landform polygons specific to this study and must not be compared with the results of other aggregate potential mapping projects. During the compilation of existing data, which was subsequently used in the generation of our estimates, the accuracy and integrity of the data collected from other agencies was assumed to be high, and as such, neither the authors of the map nor the Geological Survey Branch (Ministry of Energy and Mines) are responsible for any inaccuracies, omissions, and errors resulting from this work.

The methodology for this study follows procedures and provincial standards established and detailed elsewhere (Bobrowsky *et al*., 1996). The process consists of three parts which can be summarized as follows:

I. data acquisition and compilation;
II. fieldwork;
III. polygon ranking.

Data from a number of sources must be located, compiled and evaluated to produce an integrated interpretive product such as an Aggregate Resource Potential map. Information such as geotechnical reports, surficial and bedrock geology, water-well logs, drill reports, as well as consulting reports, will all contribute to a better evaluation of the surficial geology landform data (illustrated in polygon style). Sources of this information include various levels of government, crown corporations, municipalities, and industry.

The following layers of data were compiled for the Sea-To-Sky study:

- surficial materials (primary and secondary components of landform polygons in map form; 1:50,000 scale)
- texture of surficial materials (primary and secondary modifiers of landform polygon labels in map form; 1:50,000 scale)
- landform expression (primary and secondary modifiers of landform polygon labels in map form; 1:50,000 scale)
- quality (qualitative) and thickness (quantitative) of aggregate
- polygon area (map form; 1:50,000 scale)
- bedrock geology (map form; 1:50,000 scale)
- presence/absence of aggregate operations
- overburden thickness (quantitative)

The base map used to classify aggregate potential relies on polygon data denoting surficial geology/terrain/landform information according to British Columbia provincial

Resource Inventory Committee standards. For the purposes of this study, a 1:50,000 scale terrain map was prepared from airphoto interpretation of surficial landforms, materials, and textures by J.M. Ryder & Associates Terrain Analysis Inc. following the methodology of Howes and Kenk's (1997) 'Terrain Classification System for British Columbia' and RIC (1996) 'Guidelines and Standards to Terrain Mapping in British Columbia'. This information was then digitized according to RIC (1997) 'Standards for Digital Terrain Data Capture in British Columbia'. Finally, all the polygonal data was then analyzed on a polygon-by-polygon basis for aggregate potential.

Aggregate Assessment Parameters

1. **Texture** refers to the size, shape and sorting of particles in clastic sediments found on the surface.

2. **Surficial Materials** are defined as non-lithified, unconsolidated sediments. Such materials are classified according to their mode of formation, reflecting the processes that were likely responsible for their deposition.

3. **Surface Expression** refers to the morphological form, or patterns of forms expressed by surficial materials on the surface of the land (e.g. ridges, terraces, plains). A surface expression may also describe the thickness of the surficial material, or the relationship to underlying substrate.

4. **Gravel Quality** is a qualitative assessment reflecting the degree of post extraction treatment likely required to prepare the gravel for commercial use. Natural aggregate was classed into one of three quality categories visually by the project geologist. The total thickness of each quality category (quality A, quality B, quality C) was established by ranking the sedimentary units described in well logs, summing the thickness of the units, and then providing a cumulative summary of each category.

5. **Maximum Gravel Thickness** is the estimated total thickness of sediment from the ground surface to bedrock as determined from well logs and drill data. This information is available only where drill holes intercept bedrock. Where more than one drill hole is present in a polygon, thickness is first averaged, then ranked.

6. **Minimum Gravel Thickness** is the minimum thickness of sediment at a drill hole location. Because some drill holes do not intercept bedrock, the total thickness of the sediment package cannot be determined. Where more than one drill hole is present in a polygon, thickness is first averaged, then ranked.

7. **Gravel Thickness** is the thickness (meters) of the sediment cover obtained from drill logs for map sheets 92G/11 and 92G/14. Where more than one drill hole is present in a polygon, thickness is first averaged, then ranked.

8. **Area** refers to the geographic area that individual polygons occupy within the study boundaries as determined using GIS.

9. **Bedrock** refers to bedrock geology and can often be a source of crushed aggregate. As such it was included qualitatively in the overall ranking process. No consideration was given to the inherent physical or mechnical properties of the rock and therefore the true suitability of the bedrock for crushed aggregate purposes.

10. **Pits** refer to aggregate operations and were ranked for their relative potential for future production. Ranking was based on such factors as size of current operation, type of pit (e.g. borrow, commercial), material, and project geologist estimate of the future reserve.

The process of ranking the various data layers follows one approach: high potential, good quality, etc. parameters could score as high a value as 5, whereas low potential, low quality, etc. parameters could score as low a value as 0. All other parameters were scored between the two end member values. Category boundaries for each parameter are based on a study by study basis, depend on sample size, data distribution and are established collectively by the project authors.

Table 1. Primary (geol1_rank) and secondary (geol2_rank) landform polygon categories and ranking as derived from 1:50,000 scale terrain base maps. Traditionally, glaciofluvial and fluvial deposits represent the most sought after material for natural aggregates. Such deposits generally contain moderate to well-sorted boulders, cobbles, gravel and sand. Less suited deposits and hence lower ranked materials are generally poorly-sorted, may contain fine sediment, and/or are unusable as a source of aggregate for other reasons. Lower categories are expectedly such deposits as lake and wind blown accumulations.

Ranking	Landform
5	Glaciofluvial
4	Fluvial
3	Undifferentiated, Morainal, Colluvial
2	Lacustrine, Eolian
1	Organic, Bedrock, Anthropogenic
0	Water, Ice

Table 2. Primary (text1_rank) and secondary (text2_rank) landform textural categories and rankings. Higher rankings are reserved for material that will likely require the least post extraction processing. Lower ranks are assigned to textures that are generally poorly-sorted and contain fine sediment such as silt.

Ranking	Landform Texture
5	cobbly gravel, blocky pebbles, gravelly
4	rubbly, sandy, sandy gravel, gravelly sand, bouldery gravel, gravelly boulders
3	angular fragments, blocky rubble, bouldery, sandy rubble, rubbly sand, silty gravel
2	blocky, fine sand, rubbly blocks, mixed fragments

1	muddy sand, fines, gravelly silt, mud mixed fragments and sand, sand. silty rubbly blocks, silty
0	unknown

Table 3. Primary (exp1_rank) and secondary (exp2_rank) landform expression categories and rankings. Priority and hence higher values were assigned to those landforms which reflect thicker deposits on more stable (low angle) slopes in addition to those landforms which traditionally are known to host aggregates (e.g. terraces and fans). The flexibility of the BC Terrain Classification System for landform expression ultimately results in a wide variety of descriptors.

Ranking	**Landform Expression**
5	blanket, blanket fan, blanket on gentle slope, blanket rolling, fan level, fan on moderate slope, fan on gentle slope, fan plain, fan terrace, gently sloping fan, level fan, plain fan, plain terrace, ridge terrace, rolling blanket, terrace, terrace level, terrace plain, terrace undulating
4	apron blanket, apron fan, blanket and mantle of variable thickness, blanket apron, blanket cone, blanket on moderate slope, blanket on moderately steep slope, blanket ridge, blanket ridge on moderately steep slope, blanket subdued, blanket undulating, cone blanket, cone fan, cone on moderately steep sloped blanket, fan, fan apron, fan cone, fan cone on gentle slope, fan on gentle slope, gentle sloping blanket, hummocky blanket, hummocky fan, level, mantle of variable thickness and blanket, moderately steep sloped blanket, moderately steep sloped blanket cone, moderately steep sloped ridge blanket, plain, plain undulating, ridge blanket, ridge blanket rolling, subdued blanket, terrace steep sloped fan, terrace undulating steep slope, undulating
3	apron, apron hummocky, apron level, apron ridge, blanket cone veneer, blanket on moderately steep sloped veneer, blanket ridge and mantle of variable thickness, blanket rolling veneer, blanket veneer, blanket veneer on moderate slope, cone, cone on moderate slope, cone on moderately steep slope, cone on moderately steep to moderate slope, gentle slope, gentle to moderate slope, hummocky moderate slope, hummocky ridge, hummocky ridge rolling, hummocky ridged steep slope, hummocky rolling, hummocky rolling ridged, hummocky subdued, hummocky undulating, mantle of variable thickness and ridges, mantle of variable thickness undulating, moderate hummocky slope, moderate hummocky undulating slope, moderate slope, moderate sloped ridge, moderate to gentle slope, moderate to moderately steep slope, moderately sloped blanket veneer, moderately sloped ridge, moderately steep hummocky slope, moderately steep rolling slope, moderately steep slope, moderately steep sloped ridge, moderately steep sloped veneer blanket, moderately steep to gentle slope, moderately steep to moderate slope, ridge, ridge hummocky, ridge hummocky rolling, ridge on moderately steep slope, ridge rolling, ridge subdued apron, rolling, rolling moderately steep slope,

	rolling ridge, rolling ridge on moderate slope, rolling ridge on moderately steep slope, rolling steep sloped ridge, subdued, subdued hummocky, subdued ridge, subdued ridge hummocky, undulating, undulating gentle slope, undulating hummocky, undulating hummocky moderate slope, undulating hummocky moderately steep slope, undulating hummocky ridge, undulating moderate to moderately steep slope, undulating moderately steep slope, undulating ridge, undulating rolling, undulating rolling hummocky, veneer and moderately steep sloped blanket, veneer blanket, veneer blanket on moderately steep slope
2	fan veneer, hummocky, hummocky moderately steep slope, hummocky steep slope, hummocky undulating moderately steep slope, hummocky undulating steep slope, mantle of variable thickness, mantle of variable thickness and veneer, mantle of variable thickness on moderately steep ridge, moderately steep to moderate hummocky slope, moderately steep to moderate sloped veneer, moderately steep to steep hummocky slope, moderately steep sloped mantle of variable thickness, ridge steep slope, rolling mantle of variable thickness, steep hummocky slope, steep sloped ridge, steep subdued slope, subdued steep slope, veneer and mantle of variable thickness, veneer blanket cone, veneer cone
1	apron veneer, moderately steep sloped veneer, moderately steep to steep slope, moderately steep to steep sloped ridge, steep slope, steep to moderately steep slope, undulating moderately steep sloped veneer, veneer, veneer apron, veneer on gentle slope, veneer on moderate slope, veneer on moderately steep slope, veneer on moderately steep to moderate slope, veneer on steep slope, veneer subdued
0	unknown

Table 4. The cumulative thickness (in meters) of high quality gravel rankings (qualA_rank). Quality A aggregate generally consists of well-sorted sand and gravel deposits that will likely require little post extraction processing.

Ranking	**Thickness Quality A**
5	≥ 9 (m)
4	≥ 5 - <9 (m)
3	≥ 3 - <5 (m)
2	≥ 1 - <3 (m)
1	> 0 - <1 (m)
0	0 or unknown

Table 5. The cumulative thickness (in meters) of moderate quality gravel rankings (qualB_rank). Quality B aggregate generally consists of moderately-sorted sand and gravel deposits containing little or no fine material.

Ranking	**Thickness Quality B**
5	≥13 (m)

4	≥ 6 - <13 (m)
3	≥ 4 - <6 (m)
2	≥ 1 - <4 (m)
1	> 0 - <1 (m)
0	0 or unknown

Table 6. The cumulative thickness (in meters) of poor quality gravel rankings (qualC_rank). Quality C aggregate generally consists of poorly sorted sand and gravel deposits that may or may not contain appreciable amounts of silt, clay or organic material. Such deposits would likely require considerable processing including as washing, crushing and sorting to make them suitable for use.

Ranking	**Thickness Quality C**
5	≥16 (m)
4	≥ 10 - <16 (m)
3	≥ 4 - <10 (m)
2	≥ 2 - <4 (m)
1	> 0 - <2 (m)
0	0 or unknown

Table 7. The maximum thickness reflects the sediment cover from ground surface to bedrock (max_rank). Maximum thickness can only be established when drill holes intercept the bedrock.

Ranking	**Maximum Thickness**
5	≥22 (m)
4	≥ 15 - <22 (m)
3	≥ 8 - <15 (m)
2	≥ 4 - <8 (m)
1	> 0 - <4 (m)
0	0 or unknown

Table 8. The minimum thickness of sediment cover (min_rank). Minimum thickness is the depth from the ground surface to the bottom of a drill hole in cases where bedrock was not intercepted, and therefore the maximum thickness cannot be inferred.

Ranking	**Minimum Thickness**
5	≥26 (m)
4	≥ 18 - <26 (m)
3	≥ 14 - <18 (m)
2	≥ 7 - <14 (m)
1	> 0 - <7 (m)

0	0 or unknown

Table 9. Gravel thickness categories and ranking from the map sheets 92G/11 and 92G/14. Total thickness is an estimate, from drill holes, for the thickness of the sediment over bedrock.

Ranking	**Total thickness**
5	≥19 (m)
4	≥ 14 - <19 (m)
3	≥ 10 - <14 (m)
2	≥ 5 - <10 (m)
1	> 0 - <5 (m)
0	0 or unknown

Table 10. Overburden thickness category and ranking (over_rank). Overburden is the material that must be removed to access the usable aggregate. Sediment described as quality C is considered overburden when it occurs at the surface.

Ranking	**Overburden Thickness**
5	0 (m)
4	> 0 - <1 (m)
3	≥ 1 - <3 (m)
2	≥ 3 - <7 (m)
1	≥ 7 (m)
0	Unknown

Table 11. Polygon area categories and ranking (area_rank).

Ranking	**Area**
5	≥ 245 (ha)
4	≥ 129 - <245 (ha)
3	≥ 72 - <129 (ha)
2	≥ 36 - <72 (ha)
1	≥ 0 - <36
0	Water

Table 12. Bedrock geology categories and ranking (lith_rank). Generally, plutonic assemblages received a higher rank than metamorphic, volcanic and sedimentary rock. Because geotechnical test data of the bedrock are not available, the scores are qualitative and low in value. Abbreviations follow traditional bedrock geology acronyms found on maps.

Ranking	**Bedrock**

3	di, Ekd, JKg, JKPdi, JKqd, Kgd, Kqd, KTgd, LJgd, LJqd, LKgd, LKqm, Mqd, Mqm, Qal
2	JKd, LKqd, MKd, MKgb, MKgd,
1	JKCy, JKCyw, JKgd, lKG, lKGpd, lmJHL, loKG, luKTC, Mb, Mgn, MJBR, Mqm, Mv, PBEL, PG, uTrCH, uTRCw, uTrw

Final Rankings

Final ranking for individual polygons was achieved in a 3-step process. First, undesirable polygons were eliminated from the final polygon rankings. Undesirable polygons included all those containing water and ice, (ranked 0 in the surficial sediment parameter).

The second step was to generate a weighted algorithm which combines all the individual parameters for each polygon. Because some parameters are considered more important with regards to aggregate potential than others, these must receive a weighting factor that increases the influence of the ranking in the final value. The following algorithm was used to evaluate polygons in this study:

Total Polygon Value = 3(Primary Surficial Material Rank) + 3(Secondary Surficial Material Rank) + 2(Quality A Rank) + 2(Primary Texture Rank) + 2(Overburden Rank) + (Secondary Texture Rank) +(Primary Landform Expression Rank) +(Secondary Landform Expression Rank) + (Minimum Thickness Rank) + (Maximum Polygon Rank) + (Thickness Rank) + (Quality B Rank) + (Quality C Rank) + (Area Rank) + (Bedrock Rank)

The study areas consisted of 2289 polygons. From this total 111 represented water and ice and were removed from the algorithm. The resulting 2178 polygons generated final values that range from 8 to 82. High score values indicate high potential and vice versa. The final distribution of scores was divided into the following three categories:

Class	**Final Values**	**% of Polygons***	**% of Map Area**
Primary	≥50	7.0	5.8
Secondary	≥ 31 - <50	23.8	13.2
Tertiary	<31	69.9	75.2

*% of Polygons does not include polygons of ice or water.

Finally, all polygons that host current or historic extraction operations (Pits) were further evaluated to show their potential for further aggregate production. Unfortunately, this added information can only be applied to those polygons with pits. A rank of 1 indicates a high potential, 2 a moderate potential, and 3 a low potential. High potential was assigned to an active commercial pit with additional reserves. A moderate potential was applied to smaller commercial operations, operations in less desirable material, and/or operations with moderate reserves. A low potential pit was given to inactive, non-

commercial, borrow pits, and/or pits with limited or no reserves. A polygon with more than one operation will receive the highest pit rank to represent the potential of the polygon.

Acknowledgment

As this project integrated information from many different sources, it is difficult to acknowledge all the individuals that contributed to this study. Information was provided by BC Agriculture and Land Reserve, BC Hydro, BC Rail, Capilano Highway Services, Howe Sound School District, Groundwater Section/Water management Branch. Ministry of Environment, Ministry of Transportation and Highways, Pemberton Dyking District, Resort Municipality of Whistler, Squamish Forest District, Thurber Consultants, and Western Forest Products. The project was jointly funded by the Corporate Resource Inventory Initiative (CRII), British Columbia Assets and Lands (BCAL), Ministry of Transportation and Highways (MoTH), and Ministry of Energy and Mines.

Preliminary Review of the project published in Fieldwork 2000:

Hickin, A.S., Brooks, E.B., Dixon-Warren, A.B., Bobrowsky, P.T. (2001): Sea-to-Sky Aggregate Potential Mapping Project; *B.C. Ministry of Energy and Mines*, Paper 2001-1, p. 411-421.

References:

Bobrowsky, P.T., Massey, N.W.D., and Matysek, P.F. (1996): Aggregate Forum, developing an inventory that works for you! Report proceedings March 30-31, 1995; *BC Ministry of Energy Mines and Petroleum Resources*, Information Circular 1996-6.

Other Sources of Information

Bobrowsky, P.T., Massey, N.W.D., and Matysek, P.F. (1996a): Aggregate Forum, developing an inventory that works for you! Report proceedings March 30-31, 1995; *BC Ministry of Energy Mines and Petroleum Resources*, Information Circular 1996-6.

Howes, D.E. and Kenk, E. (1997): Terrain classification system for British Columbia (revised edition); *BC Ministry of Environment, Lands, and Parks*, Survey and Resource Mapping Branch, MOE Manual 10.

Resource Inventory Committee (RIC), (1996): Guildelines and standards to terrain mapping in British Columbia; Province of BC, Publication #12.

Resource Inventory Committee (RIC), (1997): Standards for digital terrain data capture in British Columbia; Province of BC.

Read me Text File

Important Information

All data is referenced in geographic coordinates derived from NAD27 reference maps. Users of NAD83 referenced TRIM data may have to make appropriate conversions before using this data or offsets of up to 200 metres may occur.
Projection - Geographic.

The following notes are provided to assist users getting started with the Sea-to-Sky aggregate potential Mapping project.

Project Information File

The project information file is a text document that explains the methodology used to complete the aggregate potential of the Sea-to-Sky Mapping project. It is advised that the user review this document before manipulating, modifying, or otherwise interpreting the project results.

Getting Started:

The project data and products will arrive on the CD-ROM with the project zipped (compressed). In order to work with the project data, the information must be unzipped using WinZip shareware. This can be downloaded from the Internet (www.winzip.com).

4. Double click on the sea-to-sky aggregate potential.zip icon
5. Agree to the terms of the WinZip agreement.
6. Click on the Extract Icon in the tool bar at the top of the screen.
7. Browse the pop-up menu (left side of the menu) to assign where the project information will be saved.
8. Click on the Extract Icon on the right side of the pop-up menu.

This will decompress the files and save them to the users' computer. A list of all files is located at the bottom of this document and should be reviewed to ensure that all components of this project are available.

Opening the project:

4. Open Arc View (double click on ArcView icon)
5. From the pop-up menu select: Open Existing Project
6. Browse the CD-ROM drive and select: sea-to-sky aggregate potential.apr

Project will open.

4. On the left side of the screen click on: Views
5. Double click on: Aggregate Potential

This will open the view window and display the map with all the available themes. The following table identifies and summarizes the different theme coverages.

Theme	Description
Aggregate potential classification	Land form polygon base map
pits	The location of aggregate pits
wells	The location of drilled wells
pit_potential	Highlights (hatching) displaying the aggregate potential of polygons hosting aggregate pits.

Viewing the Aggregate Potential Map:

With the project open, the map may be manipulated to view the different attributes.

Turning a theme on/off

1. To turn a theme ON (to make it visible) locate theme list on the left side of the screen (Note: Default settings will display all themes).
2. Choose the theme(s) of interest and click the small box beside the theme title.

A check mark will appear in the box and the data associated with that theme will be displayed on the map. To turn the theme OFF click on the check mark and the theme will be removed from the map.

Viewing Data Tables

1. Each of the themes has an associated data table. To view the tables locate the theme list on the left side of the screen.
2. Highlight the theme by clicking on the theme of interest (do not click on the check mark). This makes this theme the active layer.
3. Click on the Theme menu in the tool bar at the top of the screen.
4. Scroll down to the Table sub-menu.

The table of information is then displayed for all attributes associated with the active theme.

Identifying an Object

1. Each object on the map has attributes, which can be viewed interactively. Click on the desired theme (make active).
2. Click on the Identify icon in the tool bar at the top of the screen (appears as a small "i").
3. Click on the object of interest on the map (polygon, pit, well, etc.).

A table will appear with a summary of the attributes associated with the selected object.

Viewing photographs

1. Most pits are accompanied by a number of photographs. To view the photographs click on the pits theme (make active) in the theme list on the left side of the screen.
2. Click the Hot Links Tool icon in the tool bar at the top of the screen (appears as a lightning bolt).
3. Click on the pit of interest (cursor will change to a lightning bolt indicating that the photos can be displayed).

The photographs associated with the selected pit will be displayed.

Citation

The proper citation for this publication is recommended as follows:

Hickin, A.S., Brooks, E.D., Bobrowsky, P.T. (2001): Sea-to-Sky aggregate potential map; *B.C. Ministry of Energy and Mines*, Open File 2001-12

File List

Read me File.doc
Project Information.doc
Sea_to_Sky.pdf
SeatoSky_summary.doc

agg_ poly.dbf	ASH00-015_pic.tif	ASH00-038_pic.tif	ASH00-064_pic.tif	pit_potential.sbn
agg_poly.avl	ASH00-016_pic.tif	ASH00-039_pic.tif	ASH00-065_pic.tif	pit_potential.sbx
agg_poly.sbn	ASH00-017_pic.tif	ASH00-040_pic.tif	ASH00-069_pic.tif	pit_potential.shp
agg_poly.sbx	ASH00-018_pic.tif	ASH00-041_pic.tif	ASH00-070_pic.tif	pit_potential.shx
agg_poly.shp	ASH00-019_pic.tif	ASH00-042_pic.tif	ASH00-071_pic.tif	pits.avl
agg_poly.shx	ASH00-020_pic.tif	ASH00-043_pic.tif	ASH00-073_pic.tif	pits.dbf
ASH00-001_pic.tif	ASH00-021_pic.tif	ASH00-045_pic.tif	ASH00-074_pic.tif	pits.sbn
ASH00-002_pic.tif	ASH00-022_pic.tif	ASH00-047_pic.tif	ASH00-075_pic.tif	pits.sbx
ASH00-003_pic.tif	ASH00-023_pic.tif	ASH00-048_pic.tif	ASH00-076_pic.tif	pits.shp
ASH00-004_pic.tif	ASH00-024_pic.tif	ASH00-049_pic.tif	ASH00-077_pic.tif	poly_class.avl
ASH00-005_pic.tif	ASH00-027_pic.tif	ASH00-050_pic.tif	ASH00-078_pic.tif	sea-to-sky aggregate potential.apr
ASH00-006_pic.tif	ASH00-028_pic.tif	ASH00-051_pic.tif	ASH00-079_pic.tif	Surficial_Material1.avl
ASH00-007_pic.tif	ASH00-029_pic.tif	ASH00-052_pic.tif	ASH00-080_pic.tif	Surficial_Material2.avl
ASH00-008_pic.tif	ASH00-030_pic.tif	ASH00-053_pic.tif	ASH00-081_pic.tif	wells.avl
ASH00-009_pic.tif	ASH00-031_pic.tif	ASH00-056_pic.tif	ASH00-082_pic.tif	wells.dbf
ASH00-010_pic.tif	ASH00-032_pic.tif	ASH00-058_pic.tif	ASH00-083_pic.tif	wells.sbn
ASH00-011_pic.tif	ASH00-033_pic.tif	ASH00-059_pic.tif	No_photo_pic.tif	wells.sbx
ASH00-012_pic.tif	ASH00-034_pic.tif	ASH00-060_pic.tif	pit.shx	wells.shp
ASH00-013_pic.tif	ASH00-035_pic.tif	ASH00-061_pic.tif	pit_potential.avl	wells.shx
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