



1516 Robertson Avenue
Nelson, B.C.
V1N 1C6

Sitkum Project No: 11-864

SNOW WODEN PIT #2870

Technical Information Report

LOCATION:

The site is located approximately 4.5 km south of Burton, B.C. Highway No. 6; access is off of Burton FSR then turn onto Snow FSR at 3km near the junction of Woden FSR (refer to Figure 1).

BC Albers: 1581932, 581121

Geographic: 49°56'40"N, 117°52'31"W

UTM 11N: 437205m E, 5532907m N

LEGAL DESCRIPTION:

Snow Woden Pit has been recently acquired by the Ministry of Transportation & Infrastructure (no pit number has been assigned yet). The total map reserve (Crown Lands File No. 4404967) is approximately 12.2 hectares on those portions of Lots 67 to 70, 96, 99 and 100, Kootenay District, Plan 862.

GRADATION:

A total of 32 test pits were dug in the fall of 2011, 31 of which had samples taken with a total of 34 sample bags submitted for laboratory analysis. Two suitability areas were determined based on the 2011 field sampling and laboratory analysis; "Area A" and "Area B" (refer to Figure 3). Area A includes test pits 11-01 to 11-21 and Area B includes test pits 11-22 to 11-31.

The average and range of gradations for samples obtained from the mining areas identified from the 2011 Test Pits are as follows:

Suitability Area: “Area A”**Test Pits 11-01 to 11-21****Laboratory Samples**

Classification:	Average (%)	Range (%)
Gravel (4.75-75mm)	59	25 - 74
Sand (0.075-4.75mm)	38	24 - 75
Fines (<0.075mm)	3	0 - 7

Oversize Field Estimates

Classification:	Average (%)	Range (%)
Boulders (>375mm)	1.2	0 - 2
Cobbles (150-375mm)	6	0 - 7
Cobbles (75-150mm)	13	0 - 18

The maximum size rock was 750 mm.

Aggregate Quality:

Field and laboratory testing indicate “Area A” is suitable for further development (refer to Figure 3 and Appendix). The quality tests were performed on an average sample from a number of test pits within the suitability area. A summary of aggregate quality tests performed on samples obtained from the site are as follows:

TEST	AVERAGE	RANGE
Micro-deval (% loss)	18.23%	16 – 19%
Micro-deval (combined) Lab crush (% loss)	10.2%	n/a
MgSO4 coarse (% loss)	.34%	n/a
MgSO4 fine (% loss)	2.6%	n/a
Sand Equivalent	79.78	77 - 82
Bulk Relative Density (coarse fraction)	2.58	n/a
Bulk Relative Density (fine fraction)	2.58	n/a
Absorption (coarse fraction)	1.70%	n/a
Absorption (fine fraction)	1.24%	n/a

The Micro-deval had an average test result of 18% loss from the combined test results, so it meets standard specifications for durability for Class 2 medium asphalt mix. A lab crush was done on oversize up to 75mm (-25mm) on a combined sample from Area A which significantly increased the durability to 10.2 % loss which meets standard specifications for

Class 1 asphalt mix. In addition MgSO₄ on both the fine and coarse fraction was performed on a combined sample which resulted in a .34% loss on the coarse portion and a 2.58% loss on the fine portion indicating that the average sample meets standard specifications for Class 1 asphalt mix. The coarse fraction had a Bulk Relative Density of 2.58 g/cm³ and water absorption of 1.7%, meeting Standard Specs for Paving Aggregates. The fine fraction had a Bulk Relative Density of 2.58 g/cm³ and absorption of 1.24%, which meets standard specifications for asphalt mix.

Suitability Area A products:

Suitability Area A was defined based upon topographic and gradational characteristics from test pit results (refer to Figure 3). The following products are considered viable within this area:

1. Class 1 paving aggregates
2. 25 mm WGB
3. Selected Granular Sub-Base aggregates (SGSB)
4. Winter sands

GRANULAR VOLUME:

Suitability Area “Area A”

Minimum quantities evaluated are based on average depth of gravel within the suitability area (5.2 m), and a total area of approximately 82,000 m² within Area A (based on 2011 field work). The water table was encountered in several of the test pits within Area A; at approximately 3.9 m in TP11-01, at 6.5 m in TP11-06, at 3.9 m in TP11-11, at 5.8 m in TP11-15, TP11-16 and TP11-17, at 4.5 m in TP11-19, at 4.4 m in TP11-20. The toe of the upper slope in the eastern portion of the site was notably moist to wet with depth at a till and/or bedrock interface underlying the aggregate deposit. Based on topography and the deepest test pits, a maximum gravel depth of 10 m is estimated within Area A. There is an average of 0.3 m of overlying topsoil, which will be stockpiled and reserved for reclamation. The area has been recently logged, so no additional clearing of brush would be required.

Minimum Evaluated Gravel – Area A	426,400 m ³
Maximum Evaluated Gravel – Area A	800,000 m ³
Estimated topsoil	25,000 m ³

Suitability Area: “Area B”**Test Pits 11-22 to 11-31****Laboratory Samples**

Classification:	Average (%)	Range (%)
Gravel (4.75-75mm)	60	54 - 74
Sand (0.075-4.75mm)	36	23 - 43
Fines (<0.075mm)	4	2 - 9

Oversize Field Estimates

Classification:	Average (%)	Range (%)
Boulders (>375mm)	2.7	1 - 6
Cobbles (150-375mm)	7.5	5 - 15
Cobbles (75-150mm)	14	10 - 18

The maximum size rock was 800 mm.

Aggregate Quality:

Field and laboratory testing indicate “Area B” is suitable for further development (refer to Figure 3 and Appendix). The quality tests were performed on an average sample from a number of test pits within the suitability area. A summary of aggregate quality tests performed on samples obtained from the site are as follows:

TEST	AVERAGE	RANGE
Micro – deval (combined)	16.82%	15 – 18%
Sand Equivalent	76.45	70 - 82
Bulk Relative Density (coarse fraction)	2.60	n/a
Bulk Relative Density (fine fraction)	2.58	n/a
Absorption (coarse fraction)	1.56%	n/a
Absorption (fine fraction)	1.42%	n/a

The Micro-deval had an average test result of 16.82% loss from the combined test results, meeting standard specifications for durability for Class 1 and 2 medium asphalt mix. The coarse fraction had a specific gravity of 2.6 g/cm³ and water absorption of 1.56% meeting standard specs for paving aggregates. The fine fraction had a specific gravity of 2.58 g/cm³ and water absorption of 1.42%, which meets standard specifications for asphalt mix.

Suitability Area B products:

Suitability Area B was defined based upon topographic and gradational characteristics from test pit results (refer to Figure 3). The following products are considered viable within this area:

1. Class 1 paving aggregates
2. 25 mm WGB
3. Selected Granular Sub-Base aggregates (SGSB)
4. Winter sands

GRANULAR VOLUME:**Suitability Area “Area B”**

Minimum quantities evaluated are based on average depth of gravel within the suitability area (5 m), and a total area of approximately 22,000 m² within Area B (based on 2011 field work). The water table was encountered in several of the test pits within Area B; at approximately 4.0 m in TP 11-28 and TP11-30 (at a bedrock interface underlying the aggregate deposit). Based on topography and the deepest test pits, a maximum gravel depth of 7 m is estimated within Area B. There is an average of 0.3 m of overlying topsoil, which will be stockpiled and reserved for reclamation.

Minimum Evaluated Gravel – Area B	110,000 m ³
Maximum Evaluated Gravel – Area B	150,000 m ³
Estimated topsoil	6,000 m ³

PIT DEVELOPMENT DISCUSSION AND RECOMMENDATIONS

General:

- The water table was encountered in 11 test pits at an average depth of 4.6 m during the 2011 test pit sampling. Specifically, water was encountered at approximately 3.9 m in TP11-01, at 6.5 m in TP11-06, at 3.9 m in TP11-11, at 5.8 m in TP11-15, TP11-16 and TP11-17, at 4.5 m in TP11-19, at 4.4 m in TP11-20, at 4.0 m in TP 11-28 and TP11-30, and at 2.0 m in TP11-32 (at a till and/or bedrock interface underlying the aggregate deposit).
- Two areas of interest have been outlined as “wildlife tree reserves” on the attached pit development plan; these were reserved during the logging on site. These sites are not to be disturbed during development.
- All vegetation, topsoil, and overburden must be stripped a minimum of 2 m back from active pit faces. Topsoil and overburden is to be stockpiled and seeded with grass, and reserved for reclamation. Removal of this material is not permitted.
- Processed granular material (aggregate) is recommended to be stockpiled on the existing developed pit floor to the north.
- All reject material resulting from aggregate production is to be placed in neat, easily accessible stockpiles free of deleterious material (i.e. wood waste).
- Burning of stock piled woody debris from the areas of new development should be performed during suitable weather conditions, with applicable permits in place. An excavator would be useful for additional piling and sorting for the large burn piles at the time of burning.
- At the completion of mining, all slopes shall be trimmed to a consistent, minimum slope of 1.5:1 with native granular material, and stockpiled topsoil will be replaced. Area will be seeded with a local forest mix as required.

CLOSURE

Discussions and recommendations presented above are based on a field investigation, and on additional information provided by Ministry of Transportation, which was reviewed at the time of this assessment. This report has been prepared for use by Ministry of Transportation, which includes distribution as required for purposes for which the assessment was commissioned. The assessment has been carried out in accordance with generally accepted geotechnical practice. Geotechnical judgment has been applied in developing the recommendations in this report. No other warranty is made, either expressed or implied.

Sitkum trusts that the information presented above meets your current requirements. If you have any questions, or require further information, please do not hesitate to contact the undersigned.

Yours truly,

Sitkum Consulting Ltd.

Prepared by:

Reviewed by:

Jennifer Sabeau, P.Geo.
Project Geoscientist

Wayne Miller, P.Geo. Eng.L.
Engineering Geologist – Principal

TEST PIT PHOTOGRAPHS





Test Pit 11-08



Test Pit 11-08 material



Test Pit 11-11



Test Pit 11-11 material



Test Pit 11-13



Test Pit 11-13 material



Test Pit 11-17



Test Pit 11-17 material



Test Pit 11-23



Test Pit 11-23 material



Test Pit 11-25



Test Pit 11-25 material



Test Pit 11-28



Test Pit 11-28 material



Test Pit 11-31



Test Pit 11-31 material