



Ministry of Transportation and Infrastructure

Geotechnical and Materials Engineering

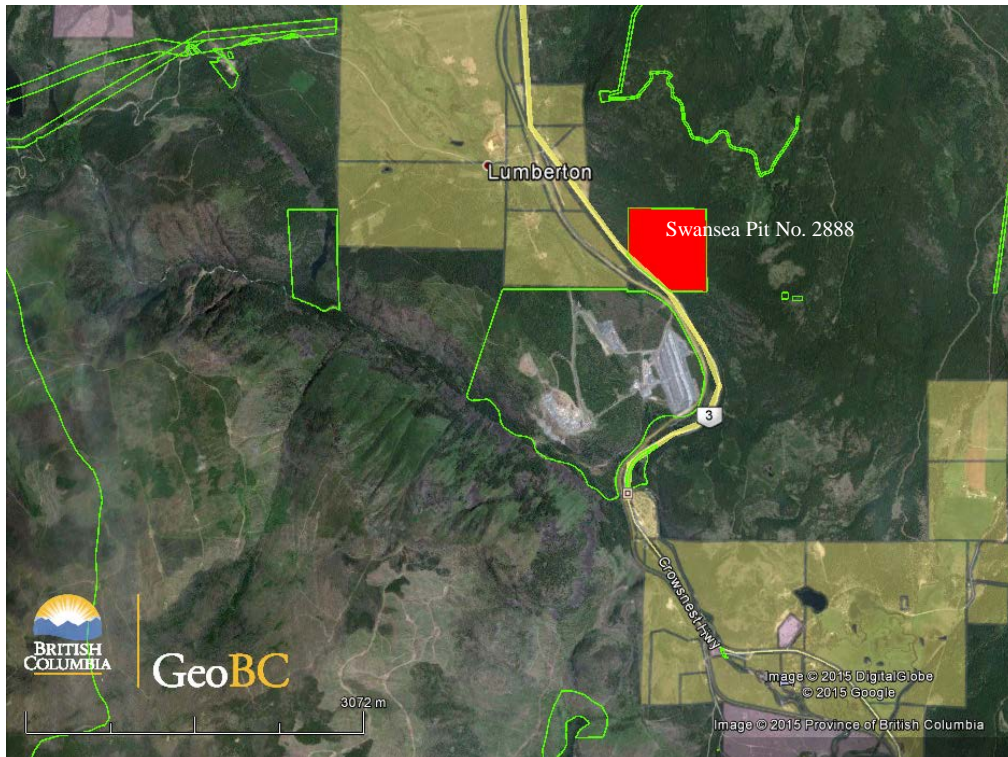
Southern Interior Region

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Swansea Pit No. 2888

2017 Technical Information Report

Location: The pit is located 16km south of Cranbrook adjacent to Hwy 3 on the east side.



Legal Description: The pit is contained within Part of District Lot 12992, Kootenay District, and is a Section 16 Map Reserve by the Ministry of Transportation and Infrastructure. The geographic coordinates for the pit are UTM Grid Zone 11, 582900m E, 5474200m N.

Gradation: The average and range of laboratory samples as well as oversize rock field estimates for material from the 2007 testing program at Swansea are as follows for Test Pits 07-01 through 07-09, 07-13 to 07-14, 07-16 to 07-17, 07-19, 07-21 to 07-24 and 07-29 (suitability boundary):

Laboratory Samples

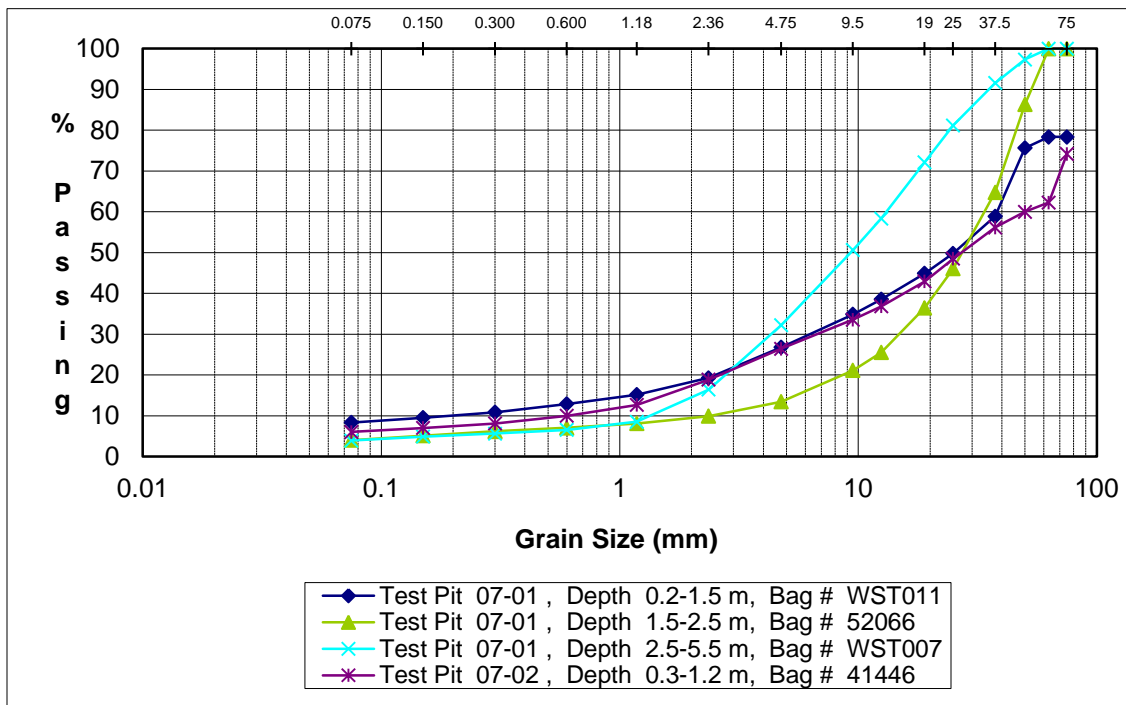
Classification:	Average (%)	Range (%)
Gravel (4.75-75mm)	79	62-88
Sand (0.075-4.75mm)	16	8-31
Fines (<0.075mm)	5.7	2.7-10.6

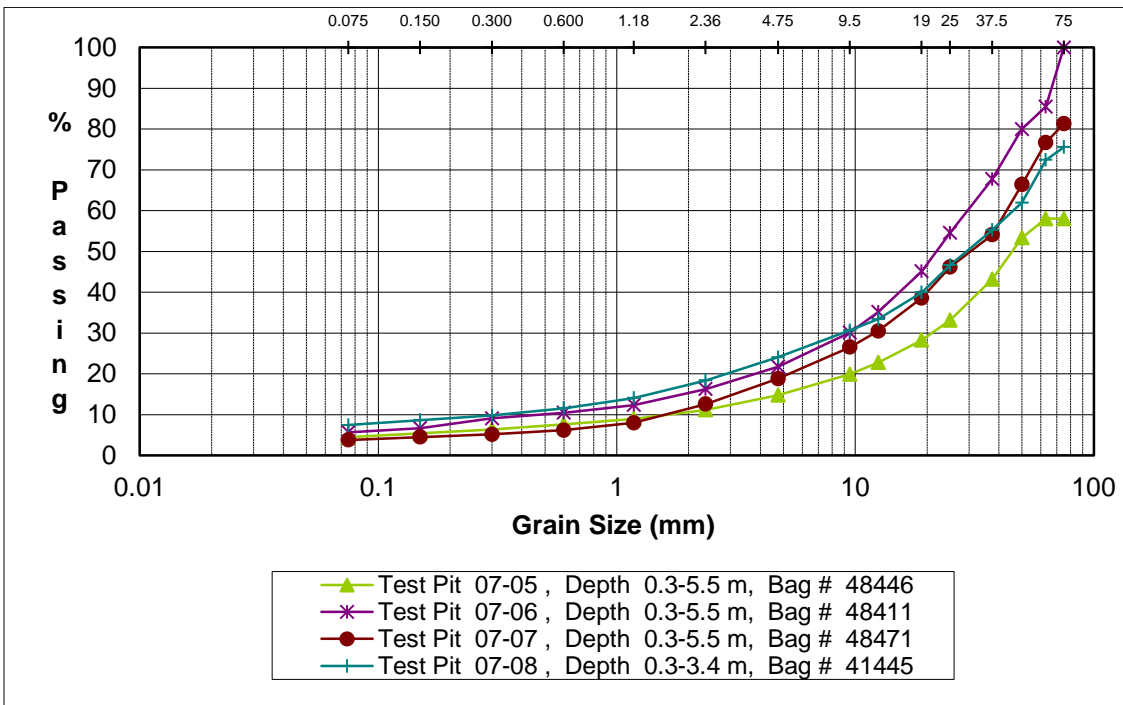
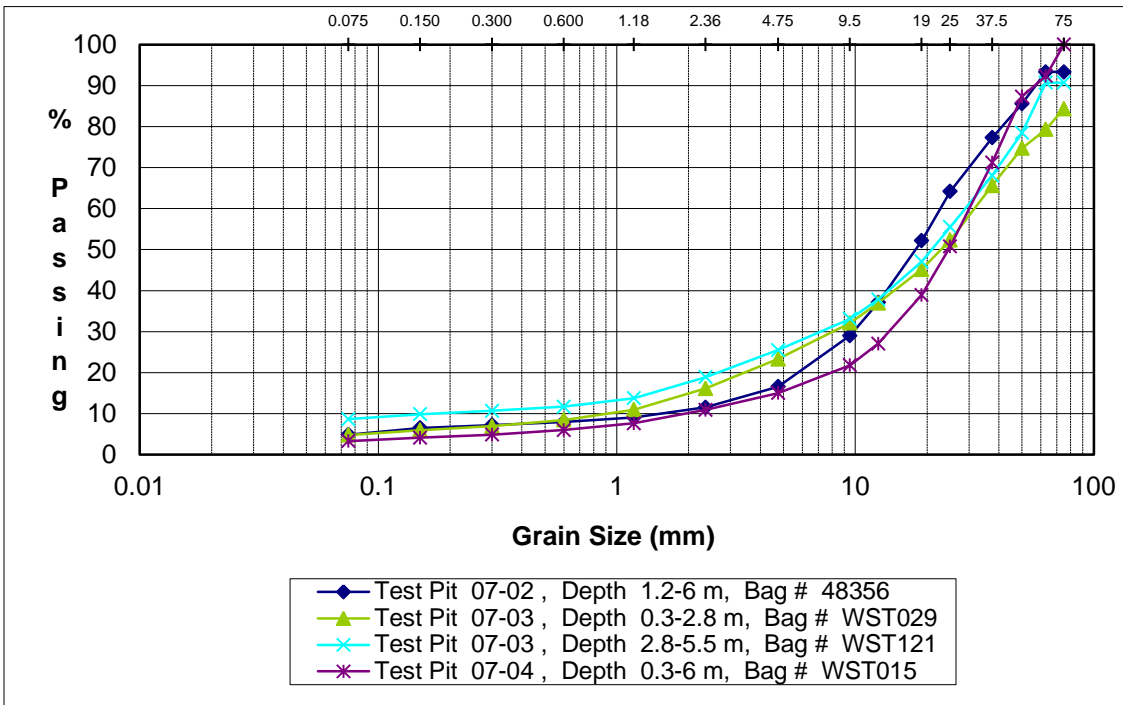
Oversize Field Estimates

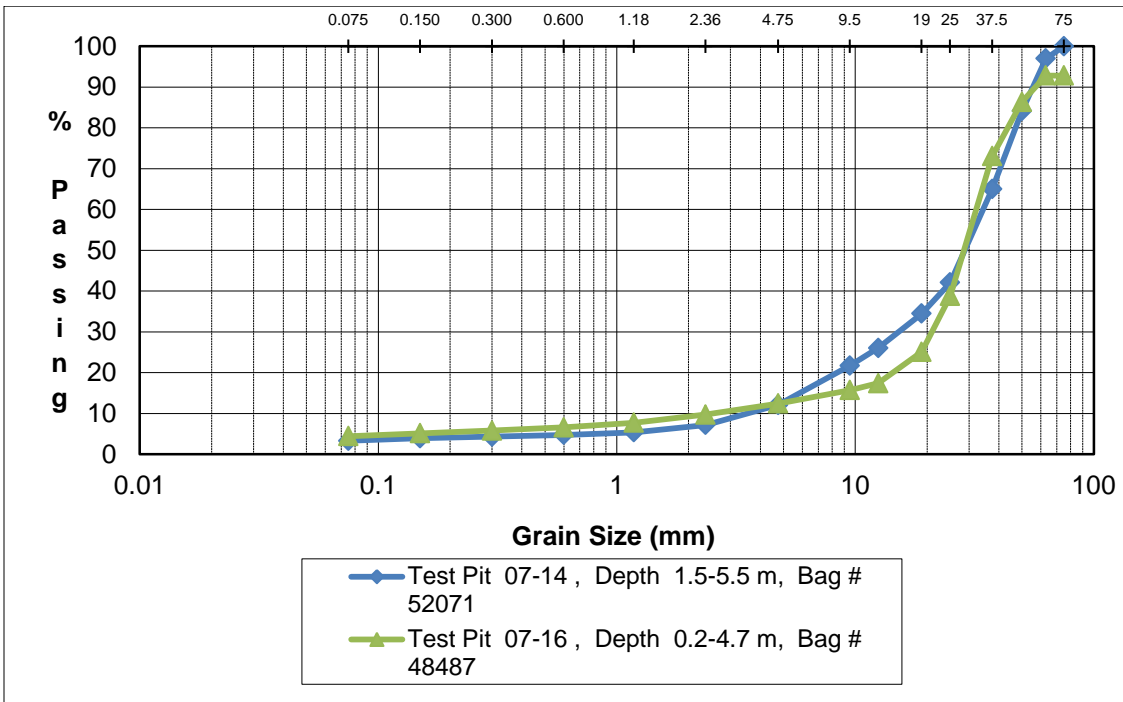
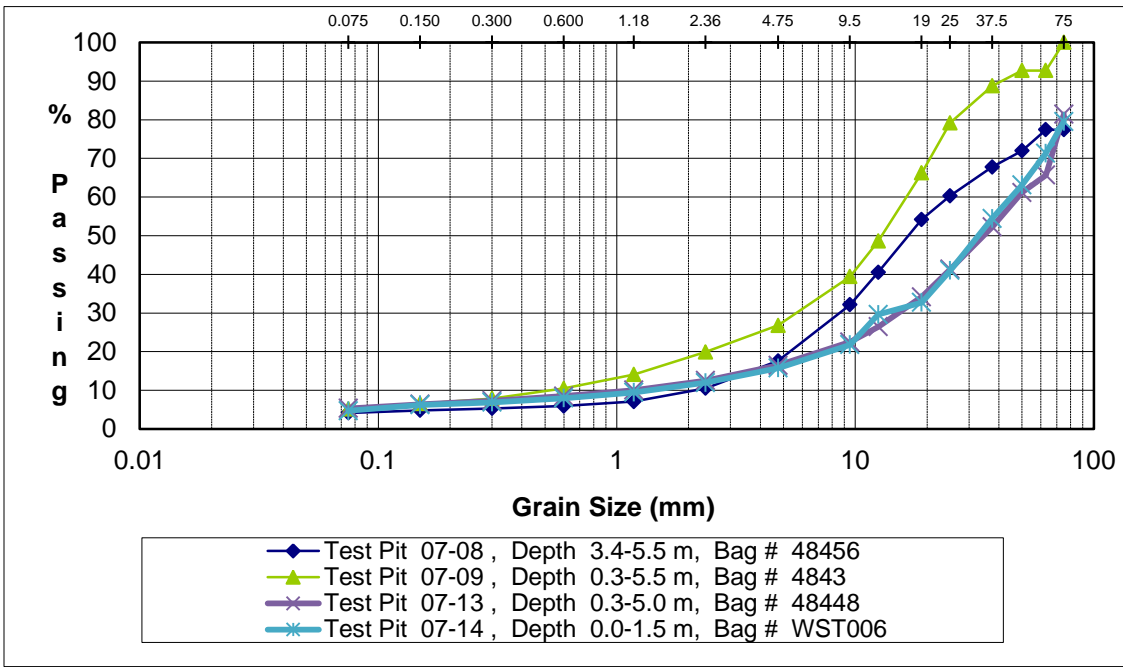
Classification:	Average (%)	Range (%)
Boulders (>375mm)	<1	0-2
Cobbles (150-375mm)	3	0-5
Cobbles (75-150mm)	5	0-7

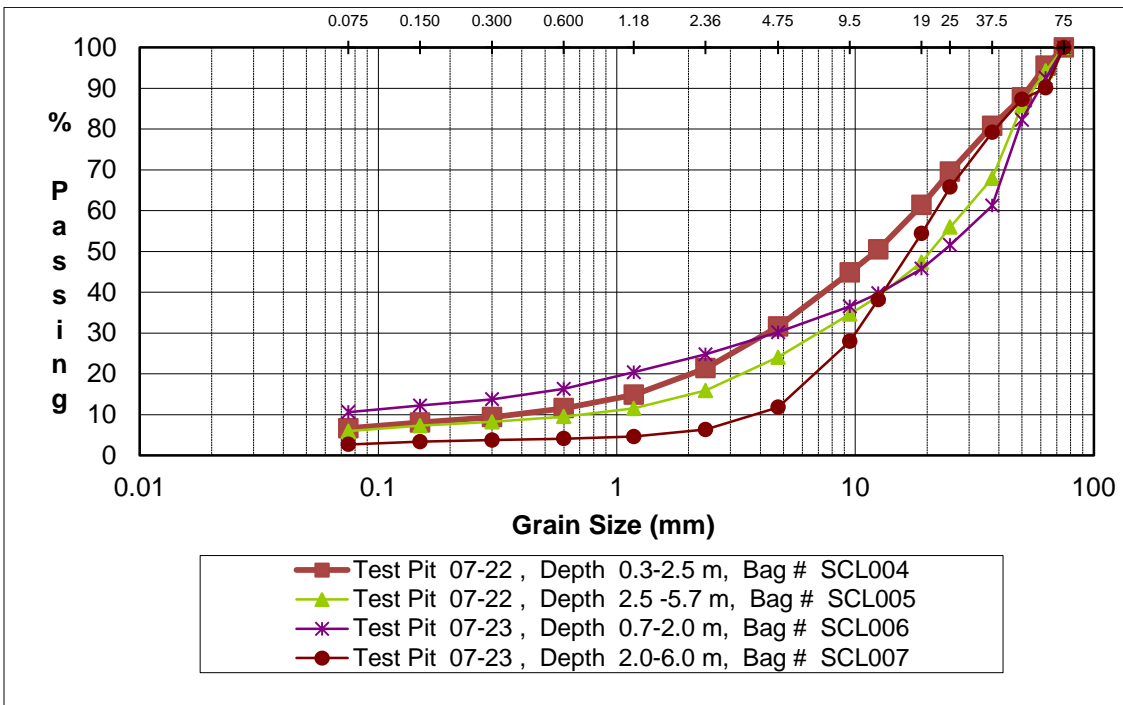
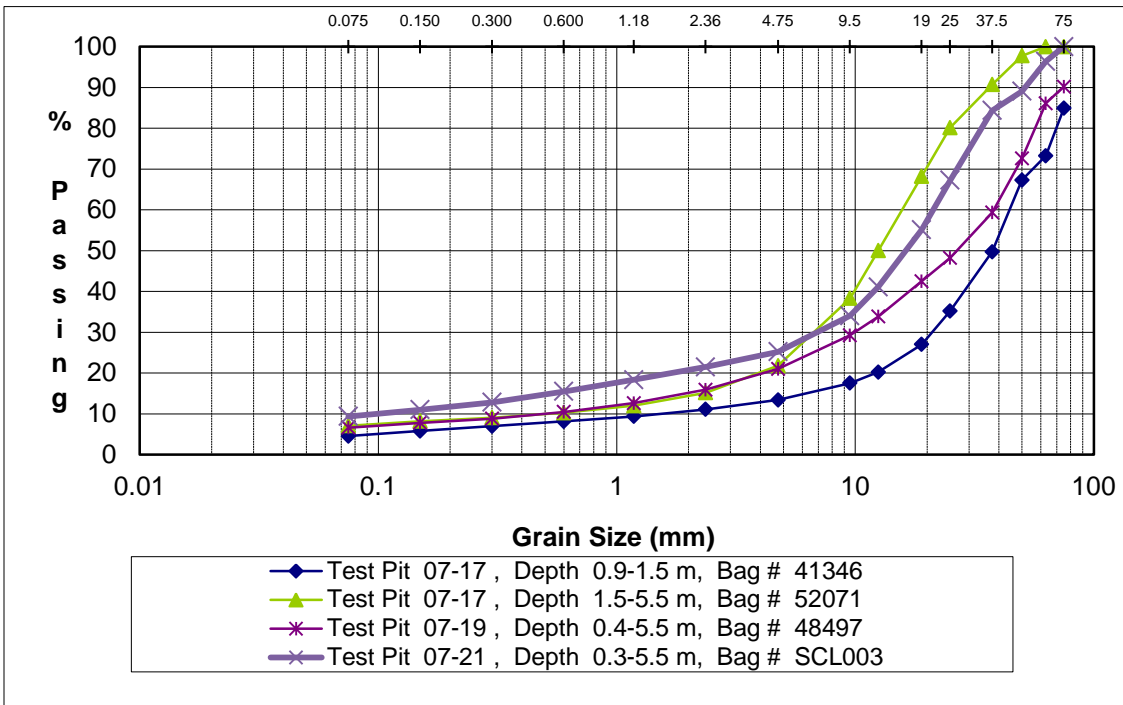
The maximum size rock observed was 400 mm.

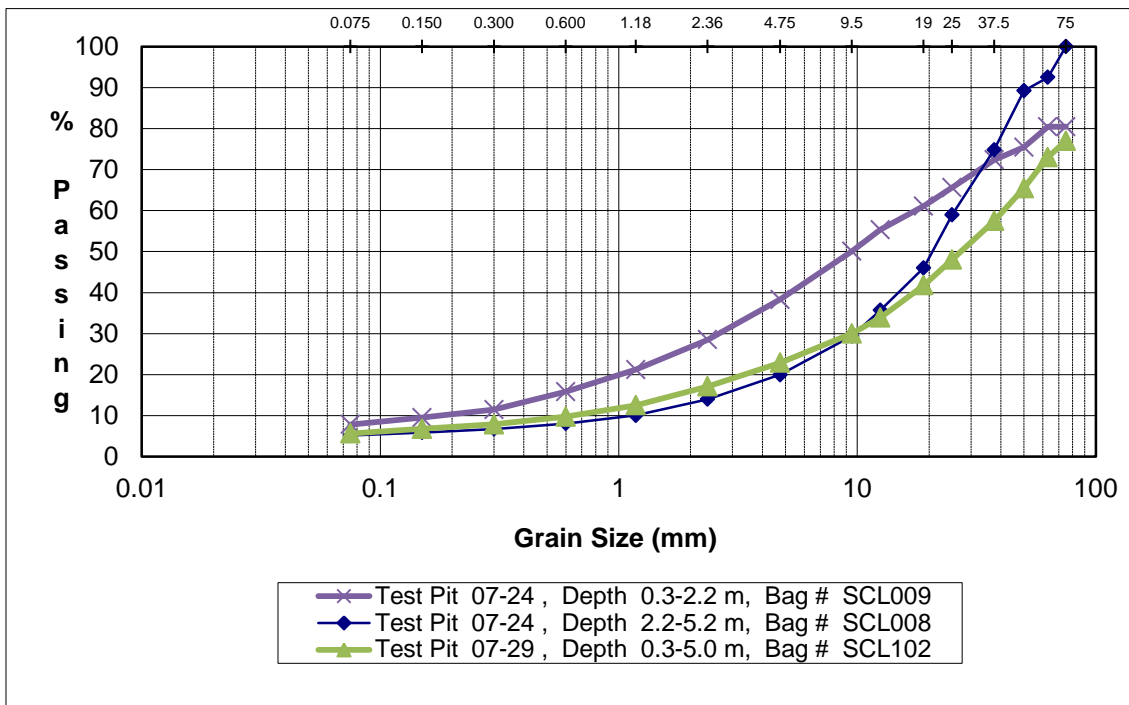
Aggregate Gradation Charts:











Summary of Test Pit Logs are located below:

1	OF		4		AGGREGATE LOG										
PROJECT:			Swansea Pit Investigation					SAMPLED BY:			Tedd Robertson/SCL				
PIT #:								METHOD:			Excavator Hitachi 225				
DISTRICT:			Rocky Mountain					DATE:			November 22/07				
TH / TP	DEPTH (m)		SAMPLE	SOILS CLASS	ESTIMATED GRADATION			ESTIMATED ROCK 75mm				SAND TYPE			REMARKS
	FROM	TO			BAG No.	G	S	F	MAX SIZE	75mm 150mm	150mm 375mm	375mm	F	M	
07 - 01	0.0	0.2	NS	TS											WPT 352
	0.2	1.5	WST011	GP-GM	70	20	10	500	3	3	<1	C/M			>fines are mostly silt in 0.2-1.5m layer
				GP-GM	73.2	18.5	8.3								
	1.5	2.5	MOT 52066	GP-GM	86	7	7	300	2	2	0	C			>significant clay in fines below 1.5m
				GW	86.6	9.4	4								
	2.5	5.5	WST-007	GP-GM	80	13	7	250	2	1	0	C			>lots of collapsing of pit walls
				GW	67.8	28.3	3.9								>photos 379-381
07 - 02	0.0	0.3	NS	TS											WPT 351
	0.3	1.2	41446	GP-GM	60	30	10	550	6	2	<1	C/M			>less clay in fines than 07-01
				GW-GM	73.6	20.4	6								
	1.2	6.0	48356	GP-GM	75	15	10	300	3	1	0	C>M			>below 1.2m it varied from ~60-80% G with silty sand matrix (trace clay)
				GW	83.4	11.7	3.3								
07 - 03	0.0	0.3	NS	TS											WPT 350
	0.3	2.8	WST 029	GP-GM	70	20	10	570	2	2	<1	M-C			>more clay in fines below 2.8m
				GW	76.7	18.5	4.8								
	2.8	5.5	WST 121	GP-GM	75	15	10	400	2	1	<1	C			>photos 384, 385, 386
				GP-GM	74.5	16.9	8.6								
07 - 04	0.0	0.3	NS	TS											WPT 349
	0.3	6.0	WST015	GP-GM	75	15	10	450	6	4	<1	C>F			>common 200-450mm in TS
				GP	85	11.7	3.3								>fines are mostly silt with minor clay
															>photos 387, 388, 389
07 - 05	0.0	0.3	NS	TS											WPT 348
	0.3	5.5	48446	GP-GM	65	25	10	530	5	2	1	C>F			>one 750cm boulder on surface near TH
				GP	85.2	10.3	4.4								>excessive collapsing of sidewalls
															>60-75% G overall, fines are mostly silt with minor clay
07 - 06	0.0	0.3	NS	TS											WPT 347
	0.3	5.5	48411	GP-GM	75	15	10	400	7	3	<1	C>F			>quite consistent throughout
				GP-GM	78.3	16.1	5.7								>photos 393, 394, 395
07 - 07	0.0	0.3	NS	TS											WPT 346
	0.3	5.5	48477	GP-GM	70	20	10	500	8	5	1	C>F			
				GW	81.2	15	3.8								
07 - 08	0.0	0.3	NS	TS				530							WPT 345
	0.3	3.4	41445	GP-GM	75	15	10	500	7	4	<1	F>C			>more clay below ~3.4m
				GP-GM	75.9	16.6	7.4								
	3.4	5.5	48456	GP-GM	65	25	10	400	5	2	<1	F>C			
				GW	82.4	13.5	4.2								
07 - 09	0.0	0.3													WPT 375
	0.3	5.5	4843	GP-GM	70	22	8	430	6	3	≤1	F>C			>clast lithology is mixed sed/igneous
				GP-GM	73.2	21.6	5.2								>photos 400, 401, 402

2		OF		4		AGGREGATE LOG											
PROJECT:		Swansea Pit Investigation						SAMPLED BY:		Tedd Robertson/SCL							
PIT #:								METHOD:		Excavator Hitachi 225							
DISTRICT:		Rocky Mountain						DATE:		November 23/07							
TH / TP	DEPTH (m)		SAMPLE	SOILS CLASS	ESTIMATED GRADATION			ESTIMATED ROCK 75mm				SAND TYPE		REMARKS			
	FROM	TO			BAG No.	G	S	F	MAX SIZE	75mm 150mm	150mm 375mm	375mm	F		M	C	
07 - 13	0.0	0.3	NS	TS											WPT 379		
	0.3	5.0	48448	GP-GM	75	17	8	530	7	3	<1			C	>less clay than adjacent TH07-01		
				GP-GM	83.5	11.1	5.3										
07 - 14	0.0	0.3	NS	TS											WPT 409		
	0.3	1.5	WST006	GP-GM	77	15	8	500	7	4	<1			M>C	>less silt at depth		
				GW	84.3	11.1	4.7										
	1.5	5.2	48431	GP-GM	75	15	10	350	4	2	0			M>C	>fines are silt>>clay		
				GW	87.9	8.8	3.3								>photos 415-418		
07 - 16	0.0	0.2	NS	TS											WPT 385		
	0.2	4.7	48487	GP-GM	80	12	8	350	4	2	0			F>C	>significant clay in fines		
				GP	87.6	8	4.4								>excessive caving in, no signs of change		
															>photos 423, 426		
07 - 17	0.0	0.2	NS	TS											WPT 383		
	0.2	0.9	NS	ML	10	20	70	400	2	2	0			F>C	>GM turns wet below		
	0.9	1.5	41346	GP-GM	70	17	13	450	4	4	<1			F>C	where more clay present		
				GP	86.4	9.1	4.5										
	1.5	5.5	52071	GP-GM	75	15	10	350	5	2	<1			F>C	>photo 427		
				GP-GM	78.2	14.7	7.1										
07 - 19	0.0	0.4	NS	TS											WPT 392		
	0.4	5.5	48497	GP-GM	70	20	10	400	5	3	<1			F>C	>photos 431-433		
				GP-GM	79	14.4	6.6										

3 OF 4															
AGGREGATE LOG															
PROJECT:		Swansea Pit Investigation						SAMPLED BY:		Tedd Robertson/SCL					
PIT #:								METHOD:		Excavator Cat 325					
DISTRICT:		Rocky Mountain						DATE:		November 26/07					
TH / TP	DEPTH (m)		SAMPLE	SOILS CLASS	ESTIMATED GRADUATION			ESTIMATED ROCK 75mm				SAND TYPE			REMARKS
	FROM	TO			BAG No.	G	S	F	MAX SIZE	75mm 150mm	150mm 375mm	375mm	F	M	
07 - 21	0.0	0.3	NS	TS											WPT 377
	0.3	5.5	SCL003	GP-GM	65	27	8	400	5	3	<1	F>C			>variable bedding ~0.5m thick with more or less >150mm in it: 60-75% rock overall >photos 438, 439, 440
				GP-GM	74.8	15.8	9.4								
07 - 22	0.0	0.3	NS	TS											WPT 393
	0.3	2.5	SCL004	GP-GM	65	25	10	630	5	3	<1	F>C			>much more clay in fines below ~2.5m
				GW-GM	68.4	24.9	6.6								
	2.5	5.7	SCL005	GP-GM	65	23	12	500	5	3	<1	F>C			>likely a bit less clay at bottom >photos 442-444
				GW-GM	75.9	18.1	5.9								
07 - 23	0.0	0.2	NS	TS											WPT 390
	0.2	0.7	NS	ML	20	25	55	200	2	1	0	F			>increased clay in fines below 2.0m
	0.7	2.0	SCL006	GM1	60	25	15	500	3	2	<1	F>C			(wet below 2.0m)
				GP-GM	69.8	19.6	10.6								
	2.0	6.0	SCL007	GP-GM	70	20	10	400	2	2	<1	C			>photos 445, 446, 447
				GW	88.2	9.1	2.7								
07 - 24	0.0	0.2	NS	TS											WPT 413
	0.3	2.2	SCL009	GM1	60	28	12	500	5	3	<1	F>C			>increased clay content below (wet)
				GW-GM	61.7	30.5	7.8								
	2.2	5.2	SCL008	GP-GM	70	20	10	500	5	3	<1	C			>photos 448-451
				GP-GM	80.1	14.8	5.1								

4 OF 4															
AGGREGATE LOG															
PROJECT:		Swansea Pit Investigation						SAMPLED BY:		Tedd Robertson/SCL					
PIT #:								METHOD:		Excavator Cat 325					
DISTRICT:		Rocky Mountain						DATE:		November 27/07					
TH / TP	DEPTH (m)		SAMPLE	SOILS CLASS	ESTIMATED GRADUATION			ESTIMATED ROCK 75mm				SAND TYPE			REMARKS
	FROM	TO			BAG No.	G	S	F	MAX SIZE	75mm 150mm	150mm 375mm	375mm	F	M	
07 - 29	0.0	0.3	NS												WPT 376
	0.3	5.0	SCL102	GP-GM	70	20	10	615	5	3	<1	F>C			>excessive caving in >photos 481-484
				GP-GM	77.1	17.3	5.6								

Aggregate Quality: A summary of aggregate quality tests performed on pit run samples from the tested area are as follows:

TEST	AVERAGE	RANGE
Micro – Deval	9.6	8.1-11.0
Sand Equivalent	68	60-79
Bulk Relative Density	COARSE	FINE
	2.649g/cm ³	2.613g/cm ³
Absorption	1.11%	1.51%

Petrography:

Petrographic analysis in 2007 indicates that 64% of the rock types on the coarse fraction were fair to good in quality consisting of 54 % sedimentary, 33 % metamorphic and 11% igneous rock types.

Granular Volume:

Estimated Volume:

Minimum Evaluated (reserve area)	100,000 m ³
Estimated Maximum (lowering pit floor)	200,000 m ³
Estimated Overburden (1m)	5,000m ³

- Minimum quantities evaluated were based on average depth of suitable 2007 test pits (5.8 m) and an area of 49,500 m² for the Suitability Area.

Borrow material estimated volume: 76,000m³

- Borrow material area is identified on the Pit Development Plan
- Some tree removal may be necessary to access borrow material, the requirements of which will be the responsibility of the contractor
- Borrow area can be mined to a **maximum depth of 3m**

Pit Development and Recommendations:

- The mining area has been previously developed by the Ministry of Transportation and Infrastructure (MoTI). Any additional development will be the responsibility of the contractor and shall be completed as per the pit development plan or as directed by the Ministry Representative.
- The crusher is recommended to be located as identified on the Pit Development Plan, set up east of the existing pit face on the pit floor. Development can take place towards the northwest into the existing pit faces.

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- Processed aggregate is recommended to be stockpiled on the lower pit floor. The lower pit floor may have to be prepared for stockpile base due to the waste and ditching material stockpiled on the existing pit floor.
- Due to the large amount of oversize present, a primary crusher capable of reducing 375x450mm will be required.
- In order to obtain suitable borrow material, tree removal is required for the area as indicated on the Pit Development Plan and the area, once cleared, can only be mined to a depth of **3m**.
- At the completion of mining, active pit faces shall be sloped to a minimum of 1 ½:1 with granular material. **Reject material from aggregate production is not to be used to slope or infill pit faces without the prior approval of the Ministry Gravel Resource Manager.**

Samantha Kinniburgh
Senior Aggregate Resource Specialist

Photos:

Test Pit 07-01



Test Pit 07-02



Test Pit 07-03



Test Pit 07-14



Test Pit 07-29



View of excavated pit area, potential crusher site location.

