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REPORT ON

PRELIMINARY DESIGN
WASTE ROCK STORAGE AREA
CARMACKS COPPER PROJECT
WESTERN COPPER CORPORATION
YUKON

Submitted to:
Western Copper Corporation

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1.0 INTRODUCTION

Golder Associates Ltd. (Golder) has been retained by Western Copper Corporation (WCC) and is working in coordination with M3 Engineering and Technology Corporation (M3) to update the geotechnical components of the design for the proposed Carmacks Copper Project. The following report presents the geotechnical design for the proposed Waste Rock Storage Area (WRSA) and includes comments on the WRSA Sediment Pond, and associated surface water ditches.

The scope of work for this report was limited to geotechnical services only. Environmental services that may be required as part of this project are not considered part of this evaluation. Where the design of geotechnical components are based on criteria derived from environmental aspects, such criteria have been provided to Golder and are assumed to be correct.

This report was prepared in a manner consistent with the level of care and skill ordinarily exercised by members of the engineering and science professions currently practicing in the Yukon Territory,. No other warranty, expressed or implied is made. For additional information, reference should be made to the *Important Information and Limitation of this Report* included at the end of this report.

1.1 Project Description

The Carmacks Copper Project is a proposed open pit copper mine located approximately 200 km north of Whitehorse and 40 km northwest of the village of Carmacks, in the Yukon Territory, as shown on Figure 1.

The mine site facilities are expected to include the open pit, heap leach facility, solvent extraction and electro-winning (SX/EW) processing facility, acid plant, waste rock storage area, crushing plant, truck shop, events pond, surface water control structures, haul roads, soil stockpiles, construction camp, and miscellaneous support and maintenance facilities as shown on Figure 2.

The project site is accessed by way of the existing Freegold Road, which is a gravel road, and an exploration site access road. As part of mine development, a new access road is planned to provide access from the Freegold Road to the site.

Portions of the mine are planned for year round operation and other portions will be shutdown for short intervals during winter months. The mining is planned to occur for some 330 days per year and in the middle of the winter may be temporarily stopped. Waste rock mining and loading of the WRSA will occur year round; and mining, loading or stacking of ore on the heap leach facility will be temporarily halted during the coldest weeks of the year, while leaching will continue year round.

The mine life is expected to be 6 years, during which time the operations will produce approximately 60 million tonnes of waste rock, and 13.3 million tonnes of copper ore. Additional information regarding the Project Description can be obtained in the 2006 Project Proposal (Access 2006).

1.2 Site Conditions

The area proposed for the WRSA has a generally subdued topography with an elevation of approximately 730 m at the east or lower end of the WRSA. The ground surface rises gradually to 860 m near or at the west end of the WRSA. The area is naturally covered by the local forest vegetation and the forest cover is very heavy. Several small creeks cross the proposed site and there are no open meadows. The north limit of the WRSA is defined by North Williams Creek which drains the general area and flows to the east towards Williams Creek. The south limit of the storage area would be defined by a 50 m wide buffer zone planned between the WRSA and north limit of the mine open pit area.

1.3 Geologic Conditions

The project site lies within the Yukon Cataclastic Terrane geological area. The copper deposit is in a feldspathic mafic gneiss that is underlain by Upper Triassic deposits of hornblende – biotite granodiorite. The bedrock is overlain by overburden deposits of gravelly sand, silty sand, silt and silty clay. These deposits vary from 1 to 2 m thick on topographical high points on the south east edge of the WRSA to over 90 m thick on the north side of the WRSA site in the North Williams Creek valley. The site is underlain by continuous permafrost which is known to extend to a depth of at least 50 m under the WRSA. The underlying bedrock at depth is not frozen. Preliminary results from site investigations suggest the active layer is 1 to 2 m thick depending on site cover (trees or open cleared areas) and/or slope direction (north or south facing slope).

The groundwater table appears to be located at depth below the continuous permafrost that underlies the site. The groundwater regime appears to be connected to the local creeks and to be flowing towards Williams Creek east of the WRSA.

1.4 Design and Operation

The WRSA has been designed based on the guidelines set out in the B.C. Ministry of Energy, Mines and Petroleum Resources document for the 'Investigation and Design of Mine Dumps, Interim Guidelines, May 1991'. The design is based on a projected capacity of 60 million tonnes of waste rock assuming a unit density of 2 tonnes per cubic meter. Testing to date suggests that the rock that would be placed in the WRSA is not acid generating or metal leaching. Additional testing is planned and will be continued during operations to confirm this trend. The waste rock is a durable granodiorite or biotite gneiss and would be placed by end-dumping starting near the center of the site and progressing to the east limit of the WRSA before progressing to the west side of the storage area in lifts up to 20 meters thick. The design anticipates the WRSA would have sufficient operating space on the working lifts so the slope stability and settlement should not be a concern.

The WRSA was sited at the present location based on a general sitting study completed by Knight Piesold in 1995. Several sites to the north and northwest were investigated and the selected location ranked the most reasonable for stability, minimizing haul distance and minimizing the overall mine footprint.

The WRSA has been sited to the north of the open pit in an area that has a thick overburden layer and is understood to be beyond the area that would be considered for mining with the open pit operation. The north limit of the WRSA was determined by the local drainage and would stay south of North Williams Creek, the first major creek north of the mine area.

1.5 Previous Work

This design was based on field work previously carried out by: Knight and Piesold in 1992, 1995, and 1996, EBA Engineering (EBA) in 1997, Clearwater Consultants Ltd. (CCL), Access Consulting Group (Access) in 2006, Western Copper Corporation (WCC) in 2006 and Golder Associates in 2007. Borehole and thermistor installations from the 2007 Investigation are shown on Figure 3A. All borehole and test pit locations completed in the area of the Waste Rock Storage Area are shown on Figure 3B. The results of this work was documented in reports prepared by Knight Piesold (1993, 1995, 1996, 1996a, and 1997), Hallam Knight Piesold (1995), EBA (2006, 2006a), and Access (2006). Golder has relied on the work in 2007 and on the previous work and assumes there are no major omissions in the previous work. Where available information is limited, or where additional detailed field investigation work may affect the design, attempts have been made to identify the interpretations and assumptions made in this report.

2.0 YUKON REGULATORY REQUIREMENTS

The Waste Rock Storage Area or waste rock dump is to be developed and designed based on the criteria set out in 2005 agreement between 'Western Silver Corporation' (now Western Copper Corporation) and the Government of the Yukon. In particular the agreement sets out for the WRSA, the performance objectives and regulations/guidelines as specified by the Yukon Government (Yukon Government 2005a) and has additionally considered the following design and operational objectives:

- Permanent stability of the WRSA under both operation and closure conditions;
- Physical stability as defined by the guidelines in the B.C. Ministry of Energy, Mines and Petroleum Resources document 'Investigation and Design of Mine Dumps, Interim Guidelines, May 1991'; and
- The waste rock will be managed in a manner to prevent significant impacts downstream based on the 'Guidelines for Metal Leaching and Acid Rock Drainage at Minesites in British Columbia' and 'Guidelines and Recommended Methods for Predictions of Metal Leaching and Acid Rock Drainage at Minesites in British Columbia'.

The WRSA will also be operated in a manner to maintain efficient collection and management of surface water around and on the site of the WRSA. The surface water run off from the WRSA would be directed to a surface water sedimentation pond east and down slope of the WRSA.

3.0 DESIGN OVERVIEW AND PROPOSED OPERATIONS

The design is to be carried out in accordance with the current industry design standards and performance objectives and in accordance to regulations/guidelines specified by the Yukon Government. The WRSA is to be located north of the open pit at the mine site to minimize haul distance. The design will accommodate potential changes in the mine plan, and will be designed to manage surface water from the storage area to a water management and sedimentation pond east of the facility. The WRSA has been designed and will be operated to minimize the effort needed at the end of the mine operation for closure.

The WRSA will cover some 70 hectares and would contain up to 60 million tonnes of waste rock. The waste rock would be placed in the storage area while the mine is operating for approximately 330 days a year. The WRSA would be developed in a series benches which for the current design are proposed at 20 meters. The benches would be developed with internal or interim slopes and final or ultimate bench slopes that would be developed at 1.4 or 1.5 horizontal to 1 vertical (1.4 or 1.5 H: 1 V). The actual slope angle for the benches or lifts of the WRSA will be at or consistent with the angle of repose of the rock material that is placed in the facility. The design anticipates that for the ultimate or external WRSA slopes, 10 to 20 meter wide benches would be developed to create an overall slope of between 2 and 2.25 H: 1 V (bench slopes at 1.4 H to 1 V with set back between benches of 20 m) with total WRSA height of 90 m. The current closure plan does not include resloping of these benches.

The design and operation of the WRSA will leave a facility at the end of the mine life or at closure that is physically stable in the long term (static and seismic stability issues to be considered) and that has been reclaimed to manage any metal leaching considerations and to address issues with surface runoff and erosion. The operational ditches around the facility would be infilled or removed and the water retaining sedimentation pond to the east of the WRSA would be re-contoured so as not to retain water. The flat areas of each bench set back and the flat top area of the WRSA and the surrounding area disturbed by the operation would be vegetated to minimize long term erosion. Natural vegetation of the slopes of the WRSA would be encouraged.

4.0 DESIGN CONSIDERATIONS

4.1 Design Requirements and Criteria

The WRSA will contain up to 60 million tonnes of waste rock. The WRSA has been sited with a 50 m wide buffer zone from the north of the open pit in an area that has a thick overburden layer and is understood to be beyond the area to be mined by the open pit operation. The bedrock increases in elevation from the west to the east along the north edge of the pit and at the northwest corner of the pit, the bedrock is at a depth of 20 m while on the northeast corner of the pit, bedrock is within 5 m of surface. The 50 m set back will be re-evaluated once the pit slope design is completed and the evaluation confirms the pit slopes are stable under the loading of the WRSA. The north limit of the storage area was determined by the local drainage and the WRSA would be operated to stay south of the first major creek north of the mine area.

It is planned that the storage area would be developed in a series of 20 meter high lifts. The 20 m lifts would be developed with interim slopes that would be developed at 1.4 or 1.5 horizontal to 1 vertical (1.4 or 1.5 H: 1 V). The actual slope angle for the face of the intermediate slopes of the WRSA will be defined by the angle of repose of the material as it is dumped. The rock will be placed starting from near the center of the site and progressing to the east limit of the storage area or in a down slope direction.

The WRSA has been laid out to have Factors of Slope Safety for the interim and final bench slopes of 1.0 or 1.1 during operation (and considering local seismic events). At the end of mine life and after reclamation the Factor of Safety for the local or bench slope would be above 1.3. At present it is not anticipated that re-contouring of the external bench slopes will be required. The overall or total slope should have a Factor of Safety of 1.3 to 1.5 (static) during operation and at closure a Factor of Safety of greater than 1.5 (static). The Factor of Safety long term for the maximum design earthquake or seismic events should be in the range of 1.1 to 1.2.

4.2 Operation Sequence

The eastern half of the WRSA footprint would be cleared at least 1 year before pre-production stripping starts in the pit to allow the permafrost under the WRSA footprint to thaw. The remainder of the area would be stripped as or before production mining starts. The thawing of the permafrost is important, as the stability of the intermediate slopes of the WRSA is impacted by the thawing ground and this impacts the slope stability of the initial lift of the WRSA. The ground would be monitored to confirm the permafrost retreats under the WRSA. If local pockets of the permafrost remain in the ground, the interim operations slopes would be flattened locally to less than the angle of repose or a 'small catch berm' would be developed on the east side of the WRSA to 'catch' potential small slope slumps or creep failures that may occur in the initial phase of the operation. As the WRSA expands and the upper lifts of the facility are developed, the permafrost will disappear or the permafrost zone will stabilize under the WRSA. This condition would increase the bench slope stability. The stability of the intermediate slopes would then be defined by the strength of the waste rock and the drained unfrozen soils which underlie the site. This sequencing may allow for a steepening of the slopes as mining progresses. Geotechnical monitoring will occur during operation (Section 9) to predict if in closure the permafrost will move up into the WRSA.

A perimeter surface water ditch system would be developed before and as the WRSA is developed. The series of ditches would surround the WRSA and direct surface water to the main ditch on the north side of the WRSA which would then flow into the WRSA sediment pond to the east of the storage area.

It is proposed to develop the initial lift waste rock starting at elevation 760 m (760 m bench) and filling to the east limit of the storage area. Then, a second lift would be developed starting at the elevation 780 m and this bench would be developed over the eastern half of the WRSA.

As the second lift nears completion, the southeastern portion of the WRSA would be developed to an elevation of 800 m as shown on Figure 4. The 800 m bench would then be extended all the way to the western limit of the WRSA at elevation 800 m. The west portion would then be developed to elevation 860 m in three 20 m thick lifts starting from the southwest edge of the storage area as shown on Figure 5. The access ramp on the south side of the WRSA would be developed to maintain access to the top level of the WRSA. The ramp would 'climb' on the south slope of the WRSA to the top elevation of the WRSA at 860 m. Finally, the waste rock would be placed on the east side of the WRSA area to complete the development of the east half of the footprint as shown on Figure 6. The storage area would be finished out at an elevation of 860 m area as shown on Figure 7. It is anticipated based on the sequencing of the WRSA that there would be adequate space to adjust to minor slope movements and shift dumping to stable portions of the facility. It is proposed that as the operations guidelines or manuals for the WRSA are prepared, criteria would be developed to identify trigger levels when dumping should be slowed or moved to new areas on the dump face.

4.3 Subsurface Conditions

Geotechnical site investigations have previously been carried out by others across the planned area of the WRSA (Knight Piesold, 1992, 1995, and 1996) and by

Golder Associates in 2007. The investigations included a total of 13 boreholes, four large trenches, and 17 test pits as shown on Figure 3B. The borehole logs and test pit records and the results of the laboratory testing from the Golder 2007 field investigation effort are attached in Appendix I.

Based on the site investigation results, the subsurface soil stratigraphy across the area generally consists of the following soil layers:

- Organic peat and/or ash layer;
- Glacio-fluvial/Glacio-lacustrine silts and clays;
- Well-graded compact to dense silty sand and gravelly sand (glacial deposits);
- Weathered bedrock; and
- Unweathered bedrock.

The thickness of soil above the weathered and unweathered bedrock varies substantially over the area from approximately 1 to 2 meters under the southeast corner of the WRSA to over 90 m on the north side of the site and to 70 m to the east of the WRSA. In general, the overburden thickness decreases towards the south or towards the open pit area. The depth to bedrock on the east and north side is such that the WRSA stability will be governed by the overburden soils at the site.

The results of all of the site investigations to date indicated that most of the area planned for the WRSA is underlain by shallow isolated pockets of peat and organic silt. These deposits are typically less than 1.0 m thick and are underlain by compact sand or silty sand and sand deposits. These deposits range from 8 to 10 m thick and are underlain by sandy silt or silt which may vary in thickness from 2 to 9 m thick. In several boreholes, thin silt layers were encountered in the sand layer within 5 m of the ground surface. The silt layers were discontinuous and appeared to be localized. The upper sand deposits also have varying amounts of silt and/or clay, but generally the upper sandy materials appear well graded. At depth under the east portion of the WRSA site, the sands are underlain at depths ranging from 13 to 25 m by a low plasticity silt or silt with trace sand and clay. On the north side of the WRSA, the silt and clayey silt layers are at depths of 7 and 14 m. The silt layer under the west and southwest side of the WRSA were encountered at depths of 10 to 16 m and are typically interlayered with sandy zones which are generally 0.5 to 1 m thick. The interlayered clay, silt and sand deposits then extend to depths of some 70 m at the east limit of the facility, while on the north side the depth to rock appears to vary from 60 m to 90 m.

The investigations also indicated that the site is underlain by permafrost. Typically the permafrost was encountered at depths of about 1 to 2 meters. Further, the boreholes drilled over the WSRA footprint indicated that the groundwater table was located at depths of up to 10 meters and typically at or just above the bedrock that underlies the site at depth. The deep ground water system appears to follow the site topography and flow to the east or down slope. A limited number of permeability tests have been completed in the bedrock that underlies the WRSA and the tests indicate the bedrock has permeability in the order of $1x10^{-4}$ to $1x10^{-5}$ cm/sec.

The results of the site investigation and the review of the site conditions indicate that the sandy deposits which would thaw under the initial loading of waste rock will control the slope stability of the WRSA. The silt zones at depth which are frozen will also influence the slope stability of the WRSA but it is anticipated that the silts are deep enough and should remain frozen. Thus, the results of the investigations indicate that the general foundation conditions under the WRSA which consider the impact of permafrost, bearing capacity and long term settlement are acceptable for the proposed development. The key to the operation of the WRSA will be the impact that the operation will have on the permafrost and the impact the waste rock loading from 20 to 80 m of waste rock will have on the silt strata under the WRSA. These factors are considered in design and would be monitored in the operation of the facility.

4.4 Seismic Criteria

The seismic risk in the Carmacks Copper Project area has previously been characterized by a seismic hazard assessment carried out for the project site (Knight Piesold, 1995), providing probabilistic and deterministic values for the maximum ground acceleration. The evaluation characterized the site as a low risk site due the low level seismic activity recorded in this area of the Yukon.

The evaluation for this phase of the project was based on the more recent 2005 National Building Code Seismic Hazard Calculations. The site remains a low risk site with the peak ground acceleration for the site at 0.055g for the 475-yr return period and 0.076g for the 1000-yr return period.

The seismic loadings or conditions on site were set by the design criteria for the heap leach facility. The design earthquake for the heap leach pad and the associated events pond was selected from the greater or larger event of 50% of the MCE or the 1 in 1,000-yr earthquake. The peak ground acceleration for 50% of the MCE was determined to be 0.055g with a return period of 475 years. The Maximum Design Earthquake (MDE) which was determined to be the 1 in 1,000 year event has a local firm ground acceleration of 0.076g.

5.0 DESIGN

5.1 Slope - Benches and Overall Slope

The Waste Rock Storage Area was evaluated and the design is based on the BC Guidelines for Mine Waste Dumps, May 1991. In order to set out the design for the WRSA, it was determined based on the above guidelines that the facility would be a large facility (at low end of large dumps rating based on volumes) with a moderate overall slope height on a moderate foundation slope of approximately 10% to 14% to the northeast. The storage area is defined as an 'unconfined facility' with no confining gullies or side slopes to act to confine the facility on an intermediate foundation situation with the presence of permafrost being the major foundation stability item. The bench lifts are generally considered favourable and are less than 25 m in height with an ascending construction sequence and a large enough dumping area that the rate of advancement of the front face of the WRSA should be considered slow to moderate.

Settlement is not considered a critical design issue as long as settlement does not impact the slope stability. Settlement would be monitored during operation and as it is in the estimated range of approximately 2 % to 3 % of the overall facility height should not be a concern. The settlement will however impact the planning and sequencing for the closure activities of the facility at the end of the mine life. The settlement would be monitored to make sure that surface water ditches during operations direct run off to the WRSA perimeter ditches on each level or lift, so water flows off the WRSA and does not seep or flow through the waste rock, causing potential stability issues during operations.

The stability evaluation for the WRSA considered the results of the Golder 2007 site investigation and the results from the previous field programs in defining the parameters for the stability evaluation. The strength parameters for the silty sand and silt stratum were assigned based on the results of the recent laboratory work and are summarized on Table 1. The analysis considered that while the silty sand is currently frozen, the construction sequence would allow the silty sand time to thaw and based on the rate of development or the rate of advance of the front / active face of the WRSA, there would be time to allow drainage of the silty sand material so that the drained thaw stable strength parameters were used in design of the slopes of the WRSA facility.

TABLE 1: Material Properties for Waste Rock and Foundation Soils

Material Type	Bulk Unit Weight (kN/m^3)	Cohesion (kN/m^2)	Phi (Degrees)
Bedrock	20	0	40
Silty Sand (Thawing)	22.8	33	10
Silty Sand (Frozen)	19.6	0	34
Silty Sand (Thawed)	19.6	0	28
Waste Rock (Surcharge < 200 kPa)	19.6	0	36
Waste Rock (Surcharge > 200 kPa)	19.6	0	38
Clay or Silt (Thawing)	18.0	33	0
Clay or Silt (Frozen)	18.0	30	10

The waste rock was assigned a conservative friction angle for confining pressures of less than 200 kPa corresponding to slope heights less than 10 m. The friction angle was set at 36 degrees with a unit weight of 19.6 kN/m^3. The values were increased with increasing confining pressure above 200 kPa. The field investigations indicated that in the north and east directions, bedrock was at a great enough depth that it would not impact the stability of the WRSA facility (i.e. deep failures of overall WRSA slope would not pass through bedrock).

5.2 Slope Stability Results

The stability of the WRSA was modeled using the computer program SLOPE/W by Geo Studio produced by Geo-SLOPE International Ltd. The geotechnical criteria used for the design included a bench slope angle of 1.4 H: 1V with a bench set back of from 15 to 20 meters and bench height of 20 meters.

The minimum Factors of Safety for deep seated failure used in the design were:
F.S. ≥ 1.3 to 1.5 for static during the operations period;
F.S. ≥ 1.5 for static at closure; and
F.S. ≥ 1.0 for seismic during the operation period and in closure.

The WRSA was split into the following zones or material types for the foundation and waste rock:

Material 1: Bedrock
Material 2: Silty Sand (Thawing)
Material 3: Silty Sand (Frozen)
Material 4: Silty Sand (Thawed)
Material 5: Waste Rock (Surcharge < 200 kPa)
Material 6: Waste Rock (Surcharge > 200 kPa)
Material 7: Clay Layer

For the purpose of this analysis, two conditions were considered:

- **Case 1:** Thawing of the upper silty sand layer which results in a weakening of the foundation soils resulting from permafrost degradation and the development of excess pore water pressures in the thawing silty / clay layer and in the thin silt layers within the silty sand strata; and

- **Case 2:** The silty sand layer is thawed and the permafrost (frozen foundation soil conditions) stabilizes within the silty sand layer and the base or bottom of the new or re-established active layer is located above the regional phreatic surface. The soil within the active zone consists of silty sand with only thin thawed silt layers and the clay layer at depth remains frozen.

The thawing of the silty sand and deep clay layer was modeled with a thaw weakened silty sand layer (Material 3 - thawing silty sand) and a thawing clay (Material 7 – clay layer).

The results of this evaluation for these foundation conditions resulted in a global failure of the overall slope with factors of safety less than 1.0 for both the static and seismic cases (FoS = 0.9 static and FoS = 0.8 seismic). This case was not considered further as thawing to the depth of the clay layer would not be expected.

The second condition evaluated assumed that the shallow soils below the WRSA were thawed and stable and the soils at depth remained frozen. The frozen conditions were applied to the silty sand layer (Material 3) and the clay layer (Material 7), with the upper silty sand (Material 2) thawed and stable in the active zone. The phreatic surface was assumed to be below the active layer.

Three failure modes were analyzed for this condition for both static and seismic conditions - single bench failure, double bench failure and global failure. Global failure modes were analyzed for both a single 20 m lift and the complete WRSA configuration. The results of the analysis are presented in Table 2 and 3. The results indicate that if the silty sand and clay remain frozen and the upper silty sand thaws and is thaw stable, the WRSA has Factors of Safety that are above the minimums suggested by the BC Guidelines for Design of Waste Dumps. Thus, the design and successful operation of the WRSA will depend on the permafrost conditions at the site. The monitoring planned for the WRSA will be important to confirm a safe operation of the WRSA. Further, the results suggest that the WRSA slopes may be steepened in later stages of the operation as the behavior of the permafrost is understood.

TABLE 2: Factors of Safety for Static Condition

Failure Mode	FOS
Global Failure – Single Lift	1.7
Single Bench Failure	1.2
Double Bench Failure	1.7
Global Failure – Overall Slope	1.5

TABLE 3: Factors of Safety for Seismic Condition

Failure Mode	FOS
Global Failure – Single Lift	1.3
Single Bench Failure	1.1
Double Bench Failure	1.5
Global Failure	1.2

Appendix II presents selected plots from the slope stability analysis.

The evaluation indicated that if the operational sequence is such that the silty sand remains frozen, the intermediate bench slope will be stable and the Factors of Safety will be in the same range as for the thawed conditions.

It is suggested that the WRSA be developed with an overall slope of 2.0 H or 2.25 H to 1 V. This would allow for adjustments to the slope configuration depending on the monitoring to be placed under the WRSA and on the local dump benches. The proposed WRSA layout allows for 20 m wide bench set back at present to achieve the above overall WRSA slope. The evaluation for this configuration indicates that the overall Factor of Safety is at the upper end of the range suggested by the BC guidelines for Mine Waste Dumps. This conservative approach is recommended until the behaviour of the permafrost is understood under the WRSA.

The key to the design of the WRSA is the fill sequencing that will fill initially into the east area of the WRSA with two 20 m high benches and then filling will shift to the west end of the WRSA footprint. The silty sand layer in the east area is 16 to 20 m thick and is underlain by a silty clay or clayey silt. In the event that the clayey silt thaws, it will not be thaw stable and would develop excess pore water pressures which will reduce the above factors of safety and local instability may occur. While it is not anticipated the permafrost would thaw to these depths, it is important to monitor the behaviour of the material as it is loaded by the waste rock. If the clayey silt does not thaw, it is still anticipated that the material would have some minor loss of strength and there would be minor creep of the foundation soils. Thus, the monitoring will determine if the clayey silt thaws. The development sequence is such that there will be a year or two after the initial filling, before the final lifts are placed in the east portion of the WRSA. This will allow time to respond if the slope configuration needs to be modified. The filling sequence on the north slope is also sequenced to allow modification if needed.

6.0 CONSTRUCTION SEQUENCE

Based on the WRSA design, proposed dumping sequence and the frozen silty sand beneath the WRSA, it is anticipated that during the pre-production pit stripping phase the following construction activities would be carried out across the WRSA footprint and sediment pond areas:

- general site development and site preparation removing all trees and stripping the area down to the mineral soil over the area to average depths of 30 to 50 cm;
- stockpiling the material in a selected area north or west of the WRSA;
- site grading with construction of the surface water perimeter ditch and the internal ditches and french drains;
- excavation and construction of surface water sediment pond east of the WRSA;
- installation of instrumentation;
- construction of required section of main mine haul road in WRSA footprint; and
- start of the stripping and grading the west portion of the WRSA before the start of production of the mine operation.

The clearing of the east portion of the WRSA as noted above is proposed for at least 1 year before pre-production stripping for the open pit starts and this will allow time to install several ditches or french type drains to drain the upper silty sand that underlies the overall footprint of the WRSA.

The site drains or ditches would direct water or run off to the main perimeter ditch system on the north side of the WRSA. The north perimeter ditch will ultimately direct surface water flows to the WRSA sediment pond east of the site. It is anticipated that to ensure the silty sand under the WRSA drains some of the french drains will be installed at depths of 3 to 5 m as shown on Figure 8. The french drains would be placed below grade with a coarse drain rock core and a sandy surround to allow the drains to function as the waste rock is placed.

During the production phase (year 1 and on), it is anticipated that the following construction activities would be carried out:

- Placement of the waste rock in the first bench to completion and the start of the 780 m bench on the east site; and
- Completion of the installation of the monitoring instrumentation on the benches as the WRSA is developed.

7.0 SURFACE WATER MANAGEMENT

A Preliminary Surface Water Management Plan (Golder, November 2007) and a Construction Surface Water Management Plan (Golder, March 2008a) were developed for the project and site. The plan included design recommendations for the WRSA and the area around the perimeter of the WRSA. The plan minimizes the project related impacts to surface water and minimizes the quantity of contact water across the site. The plan details surface water management structures that collect or divert surface water to storage and treatment facilities.

The surface water management plan sets out the objectives for the surface water management strategy for the WRSA. The features (ditches etc.) in the plan direct non-contact surface water from the area around the perimeter of the facility away from the disturbed areas towards North Williams Creek on the north side of the WRSA. Contact surface water from the WRSA or the immediate disturbed areas would be collected and conveyed through a series of perimeter ditches into the WRSA sedimentation pond for treatment (removal of suspended solids), prior to discharge to the environment. There will also be the option of reusing the water as part of mine operations (e.g. dust control or make-up water for operation of the heap leach facility), or, if necessary, treatment of the water in the on-site treatment plant, prior to discharge to the environment.

The plan sets out that unlined diversion ditches will be used where expected flow velocities are less than 1 m/s, and riprap and geotextile lined ditches will be constructed anywhere expected flow velocities are in excess of 1 m/s. In addition, any life of mine or long term surface water diversion drains will be lined with riprap.

The surface water management plan has provided the criteria for the design of the sediment pond which is to capture runoff for the 1 in 10 year, 24-hour, rainfall event, plus snowmelt. In addition, the sediment pond has been designed with a dead storage capacity equal to 50 per cent of the runoff storage. The proposed storage capacity of the sediment pond is 45,000 m^3 based on the current management strategy for the north portion of the project area.

For normal operations, it is proposed that the sediment pond will have a riser decant structure that will be used to slowly draw down the stored water allowing sufficient time for the settling of suspended sediment. For extreme events, a riprap lined spillway will convey the 1 in 200 year return flood event, plus snowmelt, with a minimum freeboard of 1 m, to prevent overtopping of the embankment. The decant structure and spillway will discharge downstream into a plunge pool, then to North Williams Creek and finally to Williams Creek.

8.0 OPERATIONAL CONSIDERATIONS

The pre-production construction and the initial stages of the operation of the WRSA has been set out with the anticipation that pre-production site work will result in thawing of the permafrost in the upper silty sand strata and any silt layers in the upper soils beneath the WRSA. The sequence and pace of the placement of the waste rock is set to allow an opportunity to monitor the waste rock slopes and the performance of the site. The monitoring planned will enable the operations group to collect information on the re-stabilizing permafrost and to provide changes, if needed, in the operation as required. The sequencing of waste rock on the west and north portion also allows time for modifications to the procedures to complete the WRSA in a successful manner.

During operation, a series of samples of the waste rock will be collected to complete an operational set of kinetic tests to confirm the initial test data which suggests that acid rock drainage and metal leaching will not be a concern with the rock placed in the WRSA during operation and in closure. The testing would be set up to allow the operation to monitor where waste rock is placed in the storage area so if required, measures can be implemented to address any potential concerns. Based on testing to date this should not be an issue and no changes to the operation are anticipated and therefore would be no impact on the currently proposed closure plan for the WRSA.

9.0 MONITORING AND LONG TERM PERFORMANCE

The construction or fill sequence of the WRSA is set to develop an initial 20 m thick bench starting at the 760 m contour in the middle of the overall WRSA footprint with the dumping progressing east and down slope. The waste rock material would be placed over a larger bench area and the slope would be monitored. The second bench would be developed starting further west at the 780 m contour and would progress east and stop 20 m short of the end point of the initial bench. The initial bench would have been instrumented with survey settlement and movement hubs. At present the dump sequence has not been finalized and trigger levels to move dumping from one area of the WRSA face to another area has not been set. The trigger levels which would set alarms would be based on the guidelines in the Operations and Monitoring Manual developed by BC Mine Waste Rock Pile Research Committee, May 1991. The guidelines indicate that if movements greater than 50 cm per day are recorded in an area, the mine would be required to move operations to alternative dump areas within the WRSA. It is anticipated that once the fill sequence is finalized by WCC operations personnel, a detailed set of guidelines would be prepared for the facility based on the BC guidelines. It is anticipated that the detailed plan would include the installation and monitoring of survey hubs and wire line extensometers to provide an indication of the bench movement and along with monitoring of data from the piezometers and thermistors under the WRSA and around the WRSA. The overall performance of the facility would be reviewed daily by mine staff.

Geotechnical monitoring of the WRSA throughout operations will evaluate the performance of the facility and would determine if the operating conditions are as assumed in the design. Further, due to the continuing development or continuous dumping at the WRSA, observations on the performance of the initial stages may provide useful information for optimizing subsequent stages of development.

It is anticipated that instrumentation installed within, and beneath the WRSA will consist of the following and as shown on Figures 9 and 10.

- *Thermistors*: Placed beneath the WRSA in boreholes up to 20 m deep under the east and north portions of the site. These instruments will provide a profile of ground temperature with depth for use in assessing changes to frozen ground and permafrost conditions beneath the WRSA, and the resulting impact to geotechnical stability and groundwater seepage conditions and thus the stability of the bench slopes.

- *Vibrating Wire Piezometers*: These are to be placed within the foundation drains and in the boreholes with the thermistors beneath the east and north portions of the WRSA. These instruments will provide information regarding pore pressure levels within the foundation soils beneath the structures, for use in monitoring geotechnical stability.

- *Survey Monuments*: Installed on the final surface of each intermediate bench. These relatively simple reflectors will provide a means by which to detect settlements, deformations or slope movements.

- *Wireline Extensometers*: Wireline extensometers will be used to monitor movements of the active dump crests during dumping.

A detailed monitoring plan would be developed by the mine to establish monitoring frequencies and reporting responsibilities. The plan would set out trigger levels and action items if movement or the measurements approach 50% of the trigger level and then 80% of the trigger level. The plan would identify staff that would be responsible to respond to the warnings provided by the monitoring system. The proposed layout of the instrumentation under and on the east and north side of the WRSA is shown on Figure 9 and Figure 10. The final plans for the WRSA slope monitoring would be developed in conjunction with the preparation of the dumping and monitoring plans to be developed by the mine.

The monitoring of the surface water quality and quantity would be set out in the final surface water management plan. It is anticipated that as a minimum, the surface water quality would be monitored on a regular basis during spring runoff and after major storms or when there is active discharge of water to the surrounding environment.

10.0 CLOSURE PLAN

Revegetation of the general site and the WRSA would follow the general guidelines for reclamation in the Yukon. The plan would be to provide fall seeding to flat areas on the WRSA and to encourage lodgepole pine on south and east facing slopes and white spruce on the north slopes of the WRSA. The flat surfaces of the WRSA would be covered with 0.3 to 0.5 m of the organic material that was stripped from the area before mining. This material will have been stockpiled around the area and would be moved onto the site at closure to encourage re-vegetation. The initial seeding would include native seed mixtures to minimize erosion and provide time for the natural trees to re-vegetate the area. While revegetation would be encouraged on the WRSA slopes, it is not proposed at this time to reseed these areas. If areas of erosion are noted, the slopes may be seeded. The objective of the cover would be to minimize erosion and to return the area to a vegetative cover similar to the current tree cover in the area.

Since the testing to date indicates that neither acid generation nor metal leaching will occur in the WRSA, the cover will not be designed as an evapo-transpiration type cover. Instead the objective of the cover would be to minimize erosion and to return the area to a vegetative cover similar to the current tree cover on the area. Establishment of the cover would commence during the later stages of mine operation in areas of the WRSA where the final design elevations have been achieved. This will allow additional time to monitor the success of the initial cover application and if necessary refine the soil and seed application techniques before completing the application of the cover.

Surface water (snow melt and rain water) will be managed off the west side of the WRSA down the main access ramp, and on the east and north sides of the WRSA in lined rock engineered channels. The drainage ditches and the sediment pond to the east of the WRSA would be removed from service or de-built once the above revegetation is established and is successful and suspended solids are not an issue in surface run off flows.

There are several tasks and research projects that will be carried out during the operation in order to improve the potential success of the revegetation. The work would be to classifying the soils which create the optimum growing conditions and which fertilizers provide the best initial boost to growth and how long should the fertilizer be placed as the long term goal is to have the vegetation self sustaining without the need for on-going care or maintenance. This work may require small test plots managed by the mine that would be reported in the annual mine environmental summary reports.

11.0 CLOSURE

We trust the above information is sufficient for your needs at this time. Should you require additional information or further clarification, please do no hesitate to contact us.

GOLDER ASSOCIATES LTD.

ORIGINAL SIGNED BY

John Hull, P.Eng
Principal

ORIGINAL SIGNED BY

Fiona Esford, P.Eng
Project Manager

Reviewed by:

ORIGINAL SIGNED BY

Andy Haynes, P.Eng. (BC)
Associate

JAH/AJH/FCE/mrb/lw/mrb
Attachments
O:\final\2006\1413\06-1413-077\doc. 066\doc. 066 rev. 1 rpt-0415_08 wcc carmacks copper proj-design waste rock storage area.doc

REFERENCES

Access Consulting Group, 2006. “Project Proposal – Revision No. 1, Carmacks Copper Project, Yukon Territory,” prepared for Western Copper Corporation, dated September 2006.

Clearwater Consultants Ltd., 2006. “Final Draft Memorandum CCL-CC7, Carmacks Copper Project – Water Balance Update”, Ref. No. 044.03, dated February 10, 2006.

EBA Engineering Consultants Ltd., 2006. “Preliminary Review of Existing Information - Waste Rock Dump”, dated April 2006.

EBA Engineering Consultants Ltd., 2006a. “Response to Review Questions - Waste Rock Storage Area”, dated May 2006.

Golder Associates Ltd, 2008. “2007 Geotechnical Investigation Report, Carmacks Copper Project” submitted to Western Copper Corporation, April 4, 2008.

Golder Associates Ltd, 2008a. “Draft - Construction Surface Water Mangement Plan, Carmacks Copper Project” submitted to Western Copper Corporation, March 3, 2008.

Golder Associates Ltd, 2007. “Preliminary Surface Water Management Plan, Carmacks Copper Project” submitted to Western Copper Corporation, November 29, 2007.

Hallam Knight Piesold Ltd., 1995. “Western Copper Holdings Limited, Carmacks Copper Project Detailed Report on Stability of Waste Rock Storage Facility”, Ref. No. 1783/4, IEE Addendum No. 3, dated October 1995.

Knight Piesold Ltd., 1993. “Report on 1992 Surficial Geotechnical Investigation”, Ref. No. 1782/4, prepared for Western Copper Holdings Limited, Carmacks Copper Project, dated May 1993.

Knight Piesold Ltd., 1995. “Report on Preliminary Design”, Ref. No. 1783/1, Vol. I of II Main Report and Vol. II of II Appendices, prepared for Western Copper Holdings Limited, Carmacks Copper Project, dated May 1, 1995.

Knight Piesold Ltd., 1996. "Western Copper Holdings Limited, Carmacks Copper Project, Report on 1996 Geotechnical and Hydrogeological Site Investigations", (Ref. No. 1784/1), prepared for Western Copper Holdings Ltd., dated June 1996.

Knight Piesold Ltd., 1996a. "Report on Detailed Design", Ref. No. 1784/2, prepared for Western Copper Holdings Limited, Carmacks Copper Project, dated August 14, 1996.

Knight Piesold Ltd., 1997. "Western Copper Holdings Limited, Carmacks Copper Project, Report on Detailed Design of Waste Rock Storage Area", Ref. No. 1785/2, prepared for Western Copper Holdings Limited, dated May 30 1997.

Yukon Government, 2005a. "Carmacks Copper project Agreement Between Western Silver Corporation and Government of Yukon", dated May 2005.

Yukon Government, 2005b. "Proposed Carmacks Copper Mining Project: *Yukon Environmental Assessment Act* (EAA), Additional Information Requirements", dated December 2005.

IMPORTANT INFORMATION AND LIMITATIONS OF THIS REPORT

Standard of Care: Golder Associates Ltd. (Golder) has prepared this report in a manner consistent with that level of care and skill ordinarily exercised by members of the engineering and science professions currently practising under similar conditions in the jurisdiction in which the services are provided, subject to the time limits and physical constraints applicable to this report. No other warranty, expressed or implied is made.

Basis and Use of the Report: This report has been prepared for the specific site, design objective, development and purpose described to Golder by the Client. The factual data, interpretations and recommendations pertain to a specific project as described in this report and are not applicable to any other project or site location. Any change of site conditions, purpose, development plans or if the project is not initiated within eighteen months of the date of the report may alter the validity of the report. Golder can not be responsible for use of this report, or portions thereof, unless Golder is requested to review and, if necessary, revise the report.

The information, recommendations and opinions expressed in this report are for the sole benefit of the Client. No other party may use or rely on this report or any portion thereof without Golder's express written consent. If the report was prepared to be included for a specific permit application process, then upon the reasonable request of the client, Golder may authorize in writing the use of this report by the regulatory agency as an Approved User for the specific and identified purpose of the applicable permit review process. Any other use of this report by others is prohibited and is without responsibility to Golder. The report, all plans, data, drawings and other documents as well as all electronic media prepared by Golder are considered its professional work product and shall remain the copyright property of Golder, who authorizes only the Client and Approved Users to make copies of the report, but only in such quantities as are reasonably necessary for the use of the report by those parties. The Client and Approved Users may not give, lend, sell, or otherwise make available the report or any portion thereof to any other party without the express written permission of Golder. The Client acknowledges that electronic media is susceptible to unauthorized modification, deterioration and incompatibility and therefore the Client can not rely upon the electronic media versions of Golder's report or other work products.

The report is of a summary nature and is not intended to stand alone without reference to the instructions given to Golder by the Client, communications between Golder and the Client, and to any other reports prepared by Golder for the Client relative to the specific site described in the report. In order to properly understand the suggestions, recommendations and opinions expressed in this report, reference must be made to the whole of the report. Golder can not be responsible for use of portions of the report without reference to the entire report.

Unless otherwise stated, the suggestions, recommendations and opinions given in this report are intended only for the guidance of the Client in the design of the specific project. The extent and detail of investigations, including the number of test holes, necessary to determine all of the relevant conditions which may affect construction costs would normally be greater than has been carried out for design purposes. Contractors bidding on, or undertaking the work, should rely on their own investigations, as well as their own interpretations of the factual data presented in the report, as to how subsurface conditions may affect their work, including but not limited to proposed construction techniques, schedule, and safety and equipment capabilities.

Soil, Rock and Groundwater Conditions: Classification and identification of soils, rocks, and geologic units have been based on commonly accepted methods employed in the practice of geotechnical engineering and related disciplines. Classification and identification of the type and condition of these materials or units involves judgment, and boundaries between different soil, rock or geologic types or units may be transitional rather than abrupt. Accordingly, Golder does not warrant or guarantee the exactness of the descriptions.

Special risks occur whenever engineering or related disciplines are applied to identify subsurface conditions and even a comprehensive investigation, sampling and testing program may fail to detect all or certain subsurface conditions. The environmental, geologic, geotechnical, geochemical and hydrogeologic conditions that Golder interprets to exist between and beyond sampling points may differ from those that actually exist. In addition to soil variability, fill of variable physical and chemical composition can be present over portions of the site or on adjacent properties. **The professional services retained for this project include only the geotechnical aspects of the subsurface conditions at the site, unless otherwise specifically stated and identified in the report.** The presence or implication(s) of possible surface and/or subsurface contamination resulting from previous activities or uses of the site and/or resulting from the introduction onto the site of materials from off-site sources are outside the terms of reference for this project and have not been investigated or addressed.

Soil and groundwater conditions shown in the factual data and described in the report are the observed conditions at the time of their determination or measurement. Unless otherwise noted, those conditions form the basis of the recommendations in the report. Groundwater conditions may vary between and beyond reported locations and can be affected by annual, seasonal and meteorological conditions. The condition of the soil, rock and groundwater may be significantly altered by construction activities (traffic, excavation, groundwater level lowering, pile driving, blasting, etc.) on the site or on adjacent sites. Excavation may expose the soils to changes due to wetting, drying or frost. Unless otherwise indicated the soil must be protected from these changes during construction.

Sample Disposal: Golder will dispose of all uncontaminated soil and/or rock samples 90 days following issue of this report or, upon written request of the Client, will store uncontaminated samples and materials at the Client's expense. In the event that actual contaminated soils, fills or groundwater are encountered or are inferred to be present, all contaminated samples shall remain the property and responsibility of the Client for proper disposal.

Follow-Up and Construction Services: All details of the design were not known at the time of submission of Golder's report. Golder should be retained to review the final design, project plans and documents prior to construction, to confirm that they are consistent with the intent of Golder's report.

During construction, Golder should be retained to perform sufficient and timely observations of encountered conditions to confirm and document that the subsurface conditions do not materially differ from those interpreted conditions considered in the preparation of Golder's report and to confirm and document that construction activities do not adversely affect the suggestions, recommendations and opinions contained in Golder's report. Adequate field review, observation and testing during construction are necessary for Golder to be able to provide letters of assurance, in accordance with the requirements of many regulatory authorities. In cases where this recommendation is not followed, Golder's responsibility is limited to interpreting accurately the information encountered at the borehole locations, at the time of their initial determination or measurement during the preparation of the Report.

Changed Conditions and Drainage: Where conditions encountered at the site differ significantly from those anticipated in this report, either due to natural variability of subsurface conditions or construction activities, it is a condition of this report that Golder be notified of any changes and be provided with an opportunity to review or revise the recommendations within this report. Recognition of changed soil and rock conditions requires experience and it is recommended that Golder be employed to visit the site with sufficient frequency to detect if conditions have changed significantly.

Drainage of subsurface water is commonly required either for temporary or permanent installations for the project. Improper design or construction of drainage or dewatering can have serious consequences. Golder takes no responsibility for the effects of drainage unless specifically involved in the detailed design and construction monitoring of the system.

PROJECT

WESTERN COPPER CORPORATION
CARMACKS COPPER PROJECT
YUKON TERRITORY

TITLE

LOCATION PLAN

Golder Associates
Abbotsford, BC

PROJECT No.	06-1413-077		FILE No.	K061413077-6000-05
DESIGN			SCALE AS SHOWN	REV. 0
CADD	K.D.J.	22-JAN-06		
CHECK	F.C.E.	15-APR-08	FIGURE 1	
REVIEW	J.A.H.	15-APR-08		

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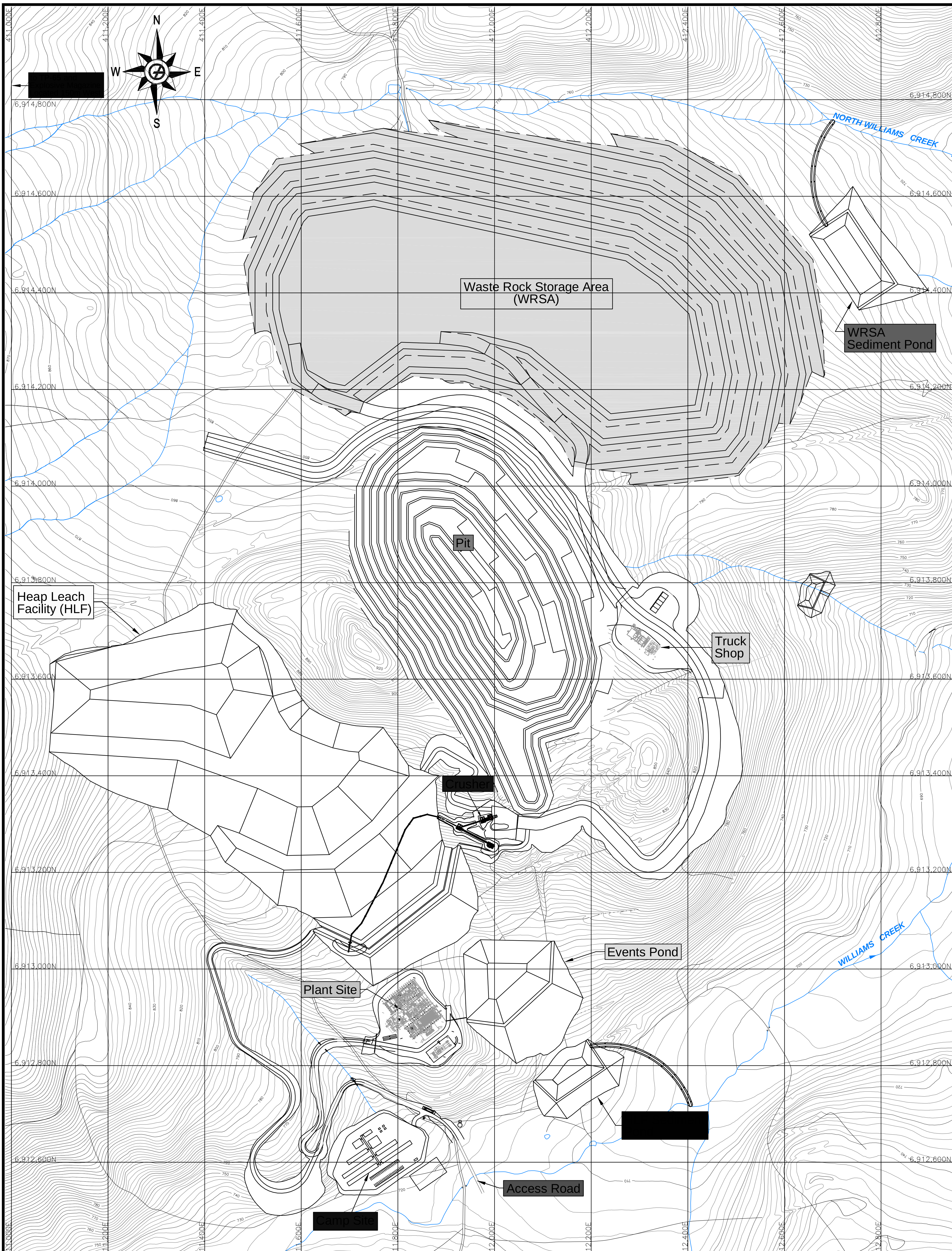

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SCALE (m)

NOTES

1.) Elevations Shown are in metres above Mean Sea Level.
2.) Grid Coordinates Shown in UTM NAD 83, Zone 8.

REFERENCES

1.) M3 Engineering Ltd., CAD Files: 100-CI-010P5.dwg, Dated March 13th, 2008.
2.) Eagle Mapping Ltd., CAD Files: SH1-UTM.dwg to SH9-UTM.dwg, Dated November 1st, 2007.
3.) Western Copper Corporation, CAD File: End_Of_Yr_06.dwg, Dated March 30th, 2007.

PROJECT
WESTERN COPPER CORPORATION
CARMACKS COPPER PROJECT
YUKON TERRITORY

TITLE
SITE PLAN

Golder Associates
Greater Vancouver Office, BC

PROJECT No. 06-1413-0077		FILE No.P071413077-06A.DWG	
DESIGN	J.A.H.	10-MAR-08	SCALE AS SHOWN	REV. 0
CADD	S.S.S.	10-MAR-08	
CHECK	F.C.E.	15-APR-08	FIGURE 2
REVIEW	J.A.H.	15-APR-08	

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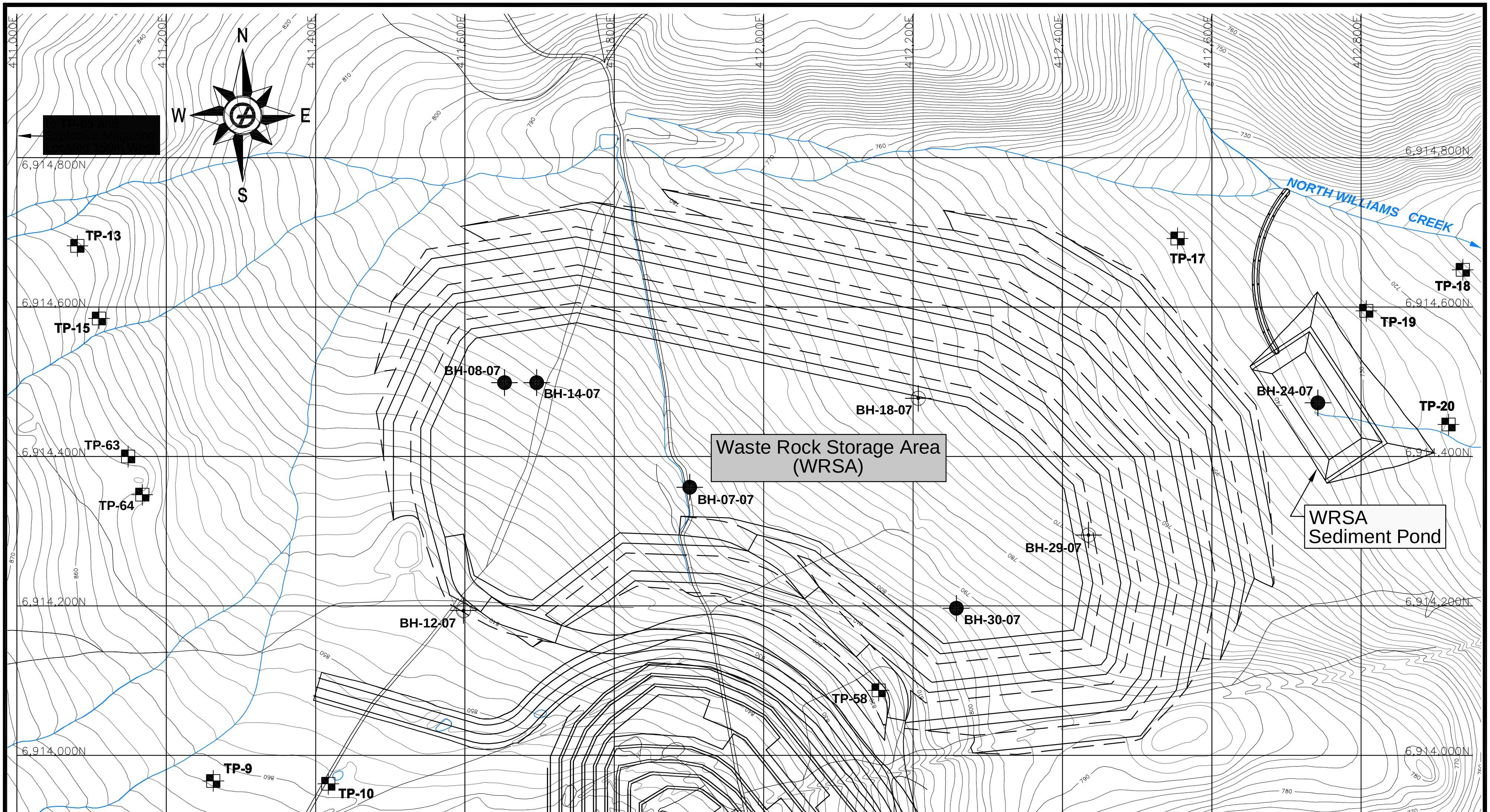

LEGEND

BH-32-07	Approximate Borehole Location
BH-29-07	Approximate Location of Borehole with Thermistor Installation
TP-64	Approximate Test Pit Location

NOTES

1.) Elevations Shown are in metres above Mean Sea Level.
2.) Grid Coordinates Shown in UTM NAD 83, Zone 8.

REFERENCES

1.) M3 Engineering Ltd., CAD Files: 100-CI-010P5.dwg, Dated March 13th, 2008.
2.) Eagle Mapping Ltd., CAD Files: SH1-UTM.dwg to SH9-UTM.dwg, Dated November 1st, 2007.
3.) Western Copper Corporation, CAD File: End_Of_Yr_06.dwg, Dated March 30th, 2007.

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SCALE (m)

PROJECT

WESTERN COPPER CORPORATION
CARMACKS COPPER PROJECT
YUKON TERRITORY

TITLE

2007 INVESTIGATION LOCATIONS

Golder Associates
Abbotsford, BC

PROJECT No. 06-1413-077			PHASE 1000	TASK
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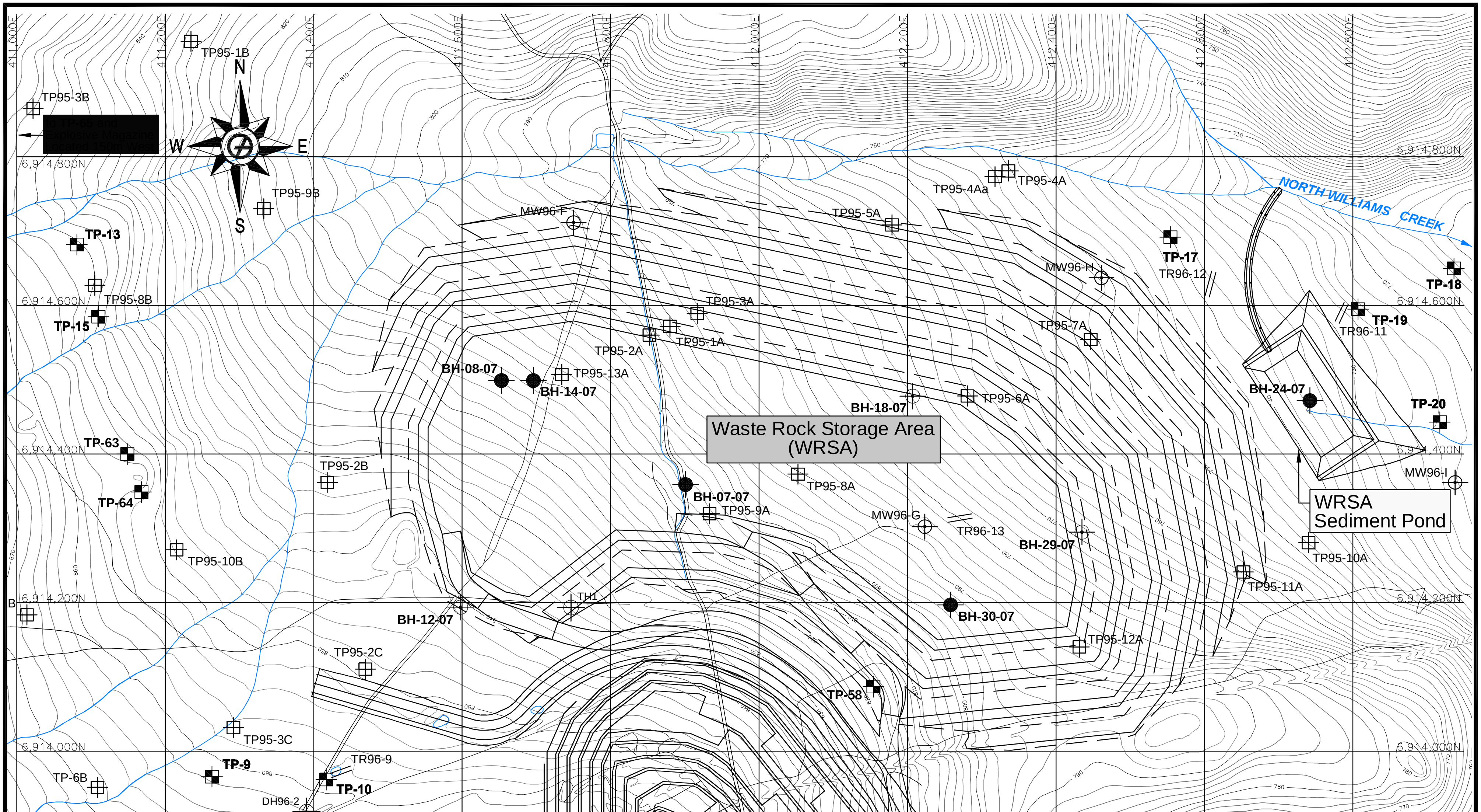
REVIEW	J.A.H.	15-APR-08		



LEGEND

BH-32-07 Approximate Borehole Location

BH-29-07 Approximate Location of Borehole with Thermistor Installation

TP-64 Approximate Test Pit Location

Approximate Test Pit Location by others

Approximate Investigation Trench Location by others

Approximate Test Hole/Drill Hole/Rock Core Location by others

Approximate Test Hole Location by others

NOTES

1.) Elevations Shown are in metres above Mean Sea Level.
2.) Grid Coordinates Shown in UTM NAD 83, Zone 8.

REFERENCES

1.) M3 Engineering Ltd., CAD Files: 100-CI-010P5.dwg, Dated March 13th, 2008.
2.) Eagle Mapping Ltd., CAD Files: SH1-UTM.dwg to SH9-UTM.dwg, Dated November 1st, 2007.
3.) Western Copper Corporation, CAD File: End_Of_Yr_06.dwg, Dated March 30th, 2007.

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SCALE (m)

PROJECT
WESTERN COPPER CORPORATION
CARMACKS COPPER PROJECT
YUKON TERRITORY

TITLE
BOREHOLE AND TEST PIT LOCATIONS

Golder Associates
Abbotsford, BC

PROJECT No. 06-1413-077			PHASE 1000	TASK
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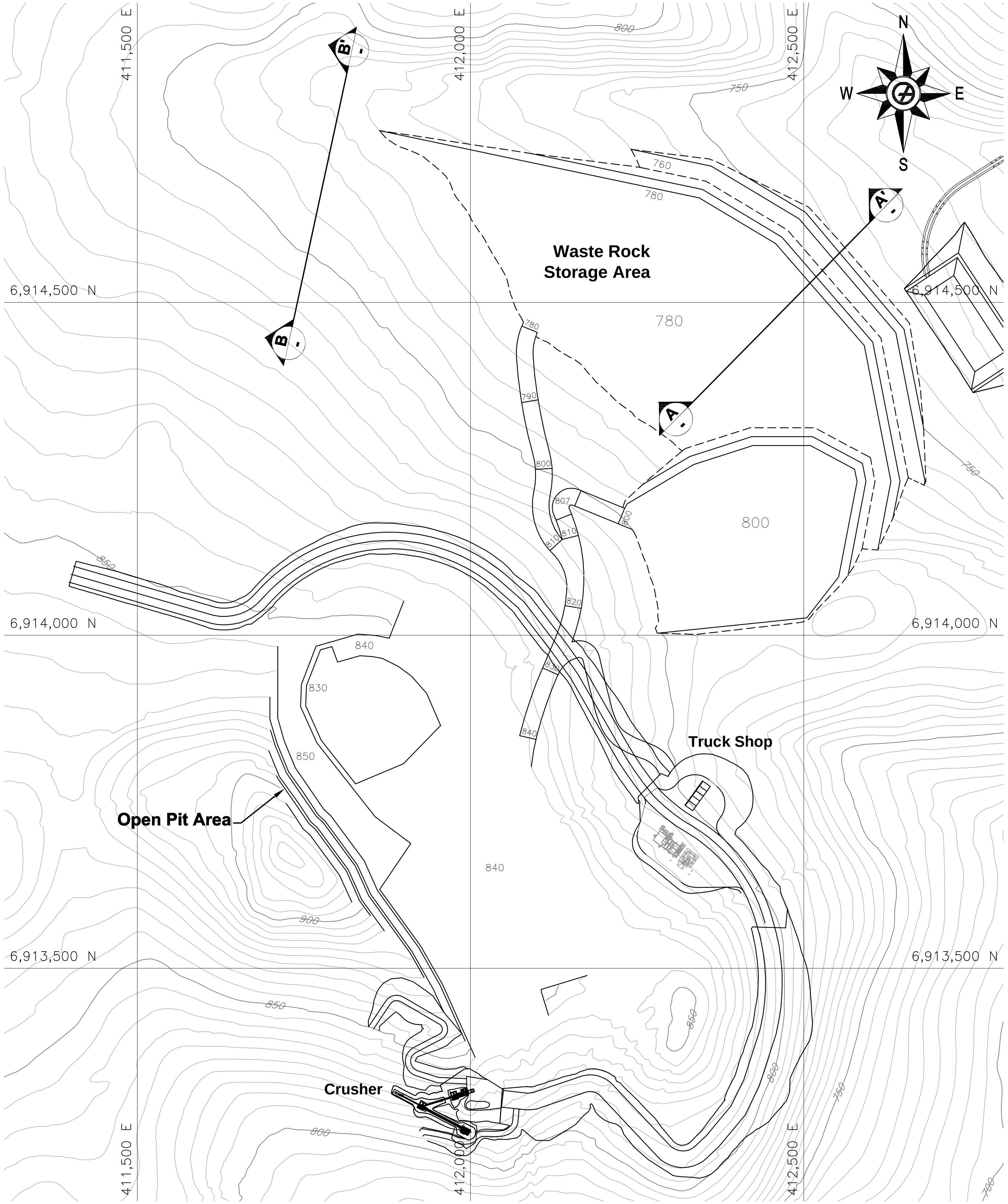
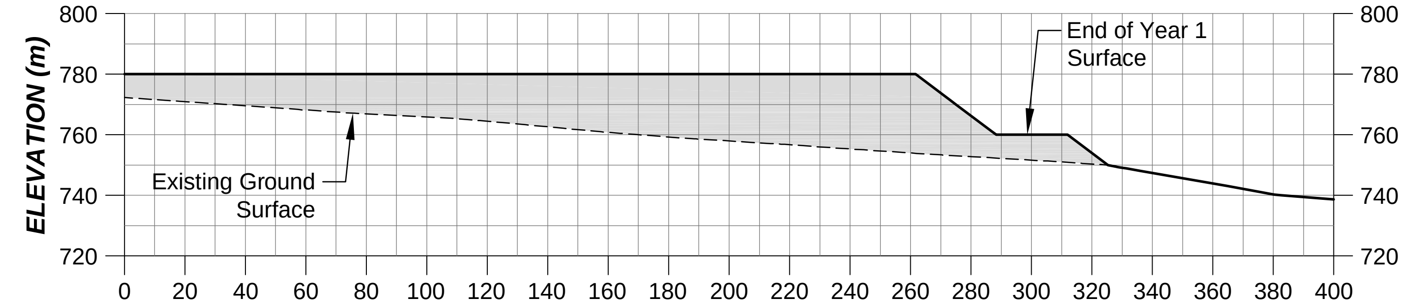
REVIEW	J.A.H.	15-APR-08		



1 PLAN - END OF YEAR 1
See Scale A



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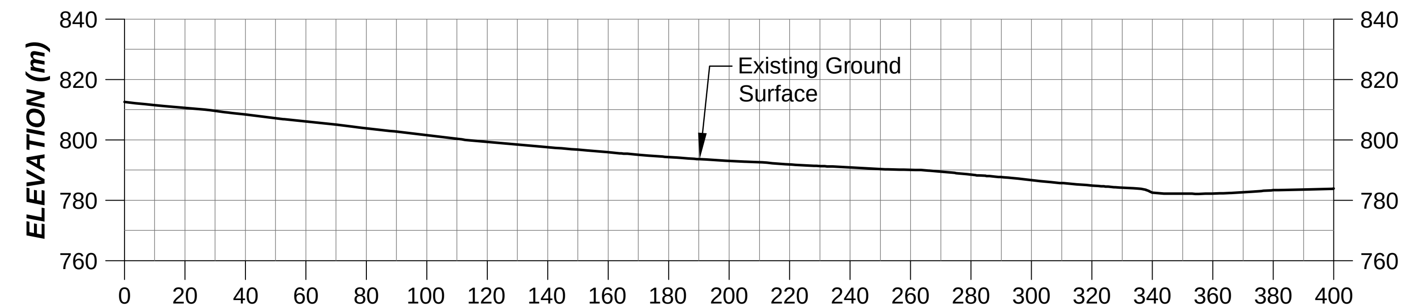

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DRAFT
For Discussion Purposes Only

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0 100
SCALE B (m)

REFERENCE

1.) INDEPENDENT MINING CONSULTANTS, INC., CAD File: End_Of_Yr_01.dwg, Dated: March 2007.

PROJECT
WESTERN COPPER CORPORATION
CARMACKS COPPER PROJECT
YUKON TERRITORY

TITLE
PIT AND WRSA
END OF YEAR 1

Golder Associates
Abbotsford, BC

PROJECT No.	06-1413-077		PHASE	6000	TASK	5000
DESIGN	J.A.H.	29-JAN-08	FILE No.	P061413077-6000-01		
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CHECK	F.C.E.	15-APR-08	**FIGURE 4**			
REVIEW	J.A.H.	15-APR-08				

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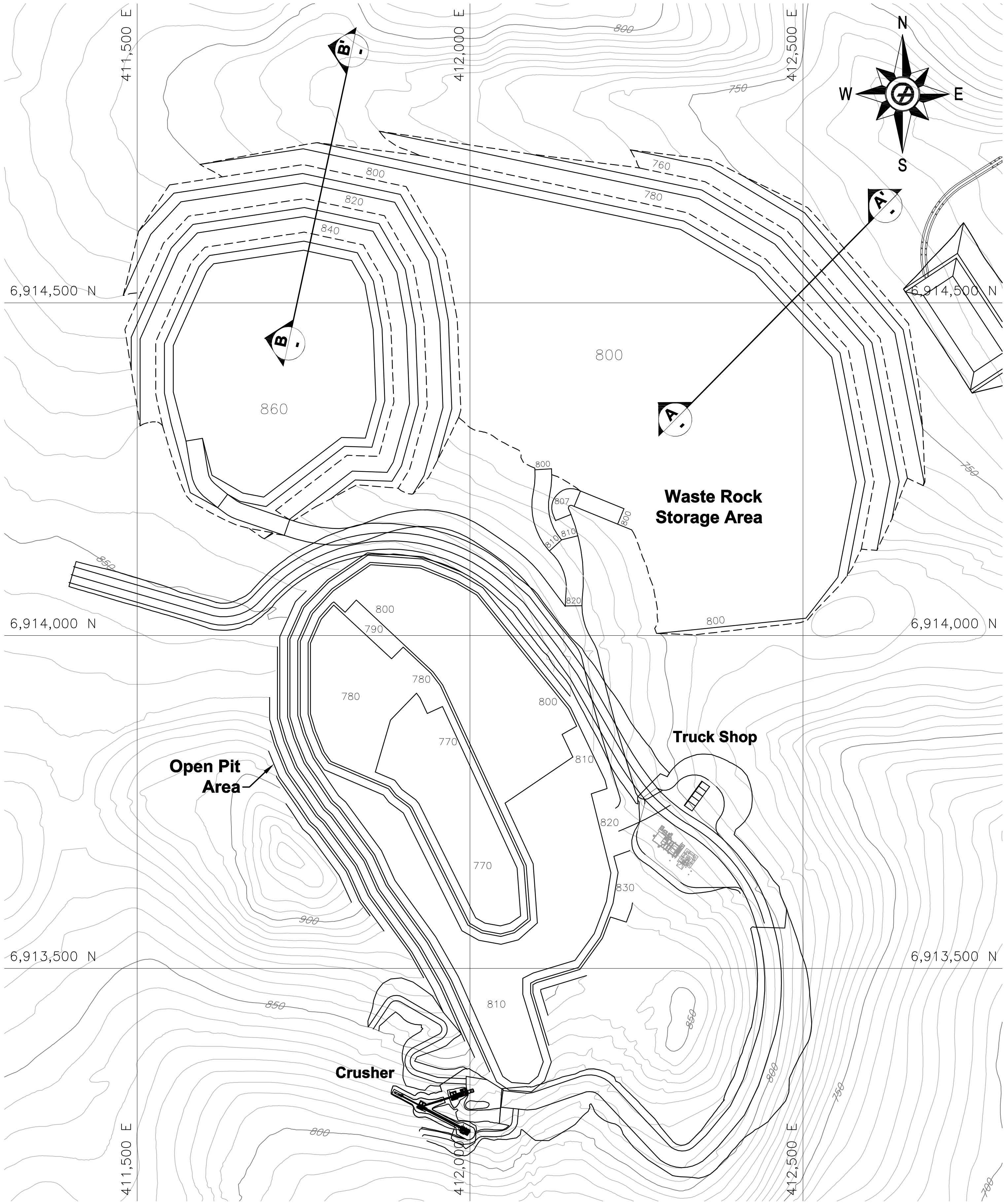

2 PLAN - END OF YEAR 3
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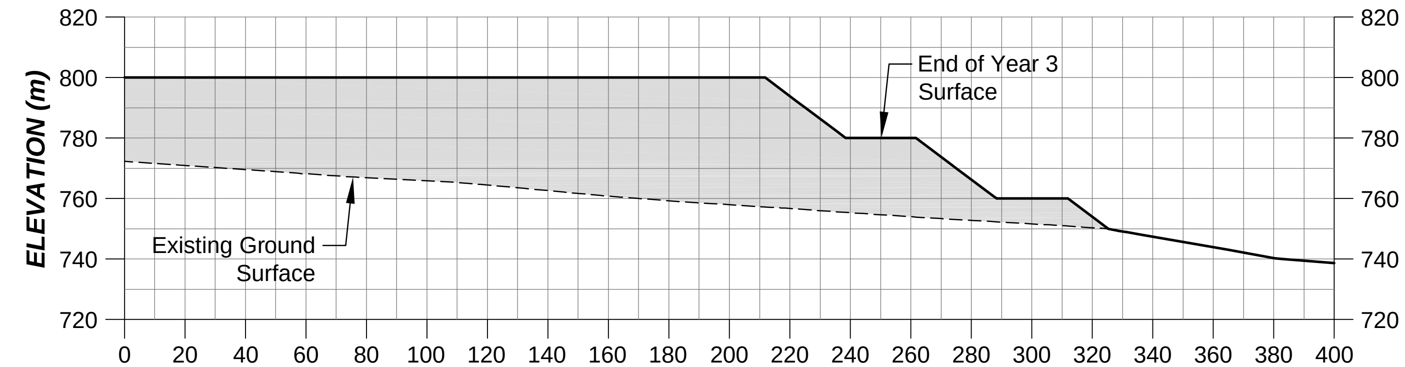

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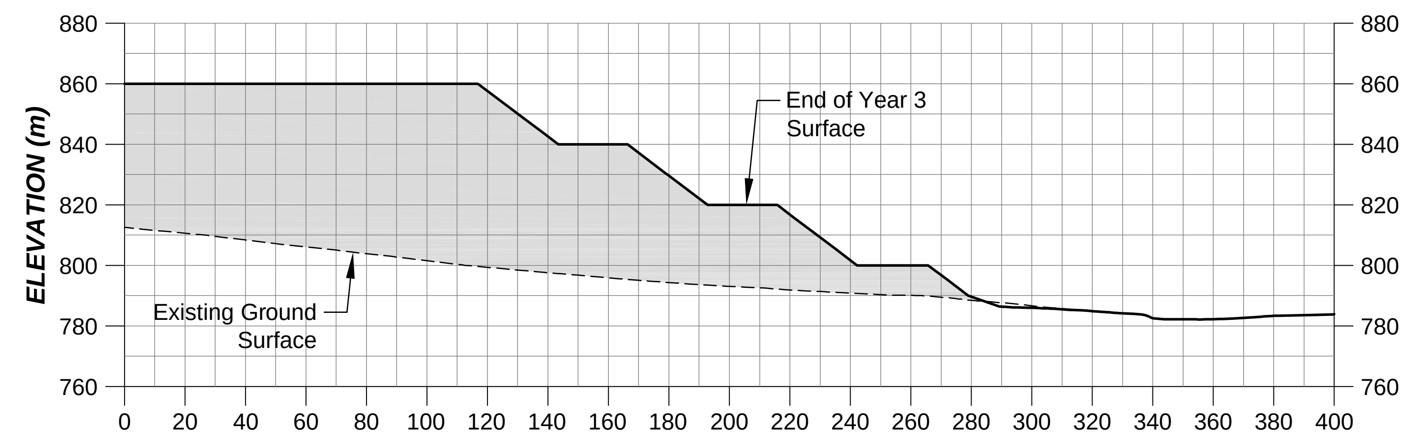

B SECTION B-B'
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DRAFT
For Discussion Purposes Only

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SCALE B (m)

REFERENCE

1.) INDEPENDENT MINING CONSULTANTS, INC., CAD File: End_Of_Yr_03.dwg, Dated: March 2007.

PROJECT
WESTERN COPPER CORPORATION
CARMACKS COPPER PROJECT
YUKON TERRITORY

TITLE
PIT AND WRSA
END OF YEAR 3

PROJECT No. 06-1413-077		PHASE 6000	TASK 5000
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CADD	J.S.D. 29-JAN-08	SCALE AS SHOWN	REV. 0
CHECK	F.C.E. 15-APR-08	FIGURE 5	
REVIEW	J.A.H. 15-APR-08		

Golder Associates
Abbotsford, BC

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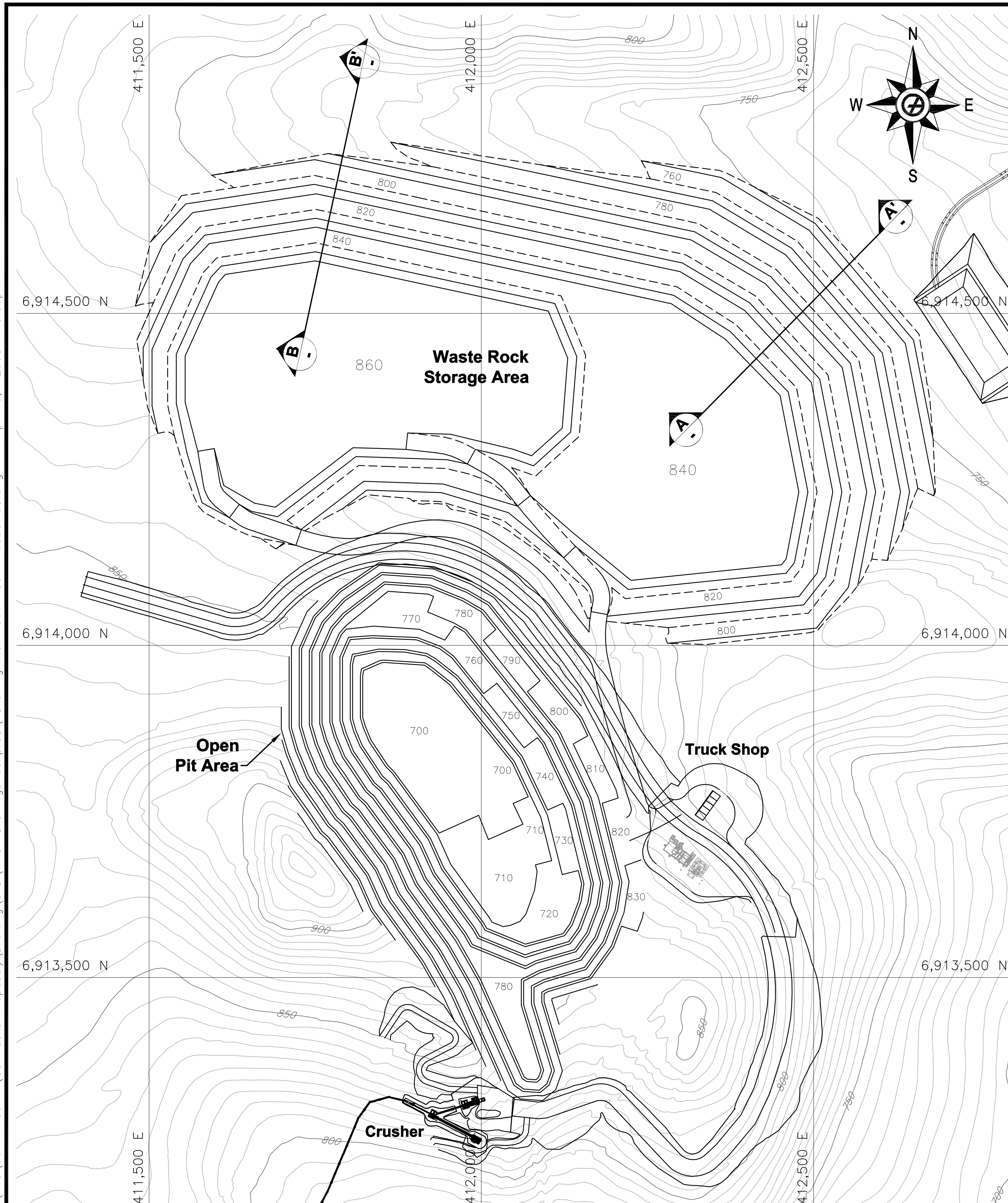

3 **PLAN - END OF YEAR 5**
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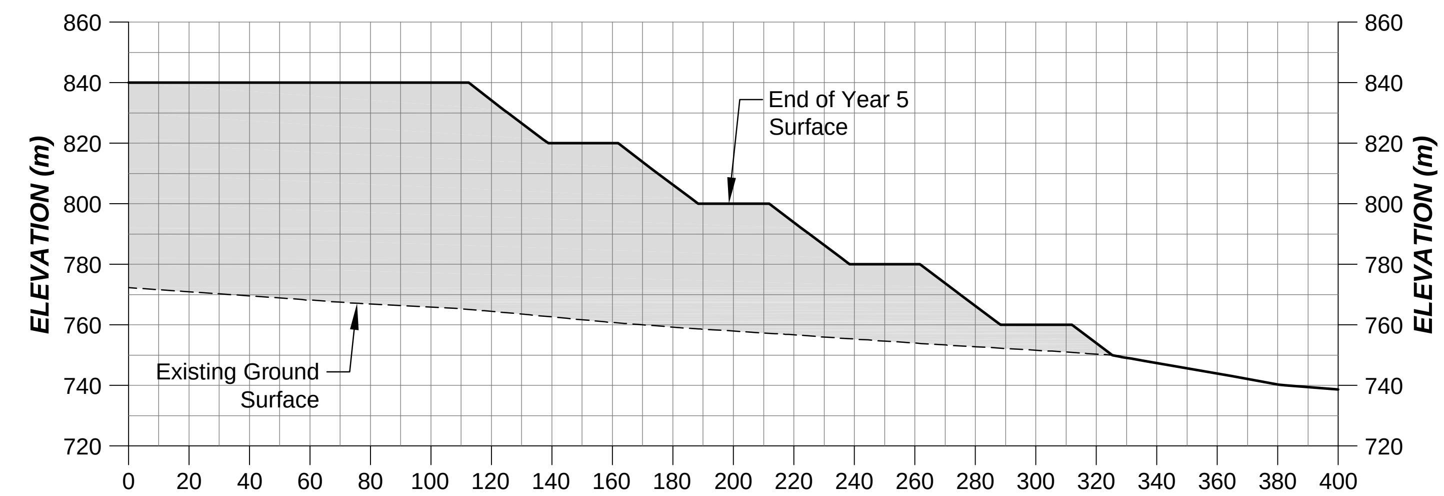

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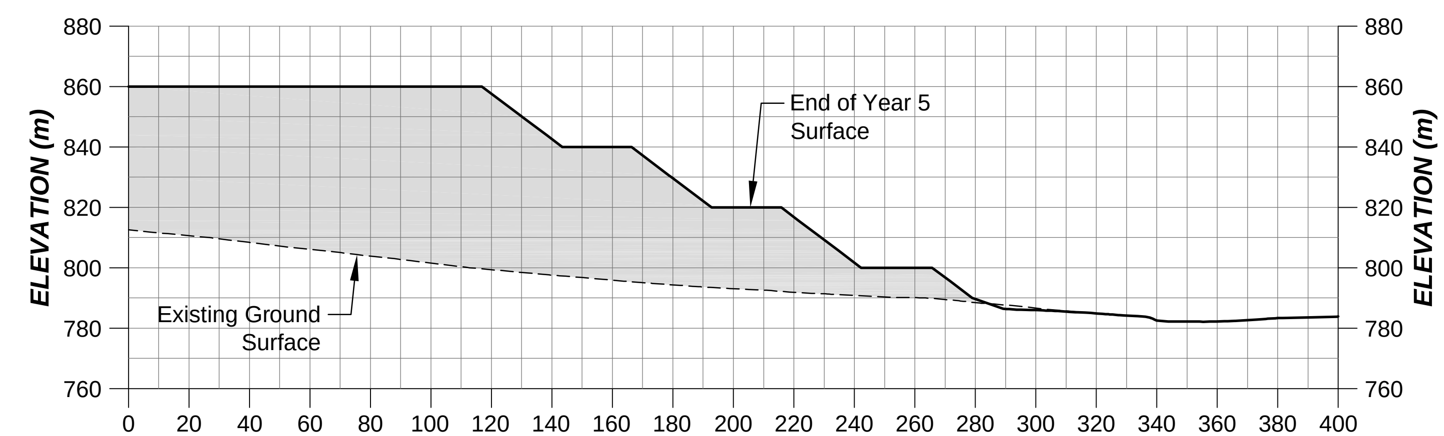


B **SECTION B-B'**
See Scale B

DRAFT
For Discussion Purposes Only

0 250
SCALE A (m)

0 100
SCALE B (m)

REFERENCE

1.) INDEPENDENT MINING CONSULTANTS, INC., CAD File: End_Of_Yr_05.dwg, Dated: March 2007.

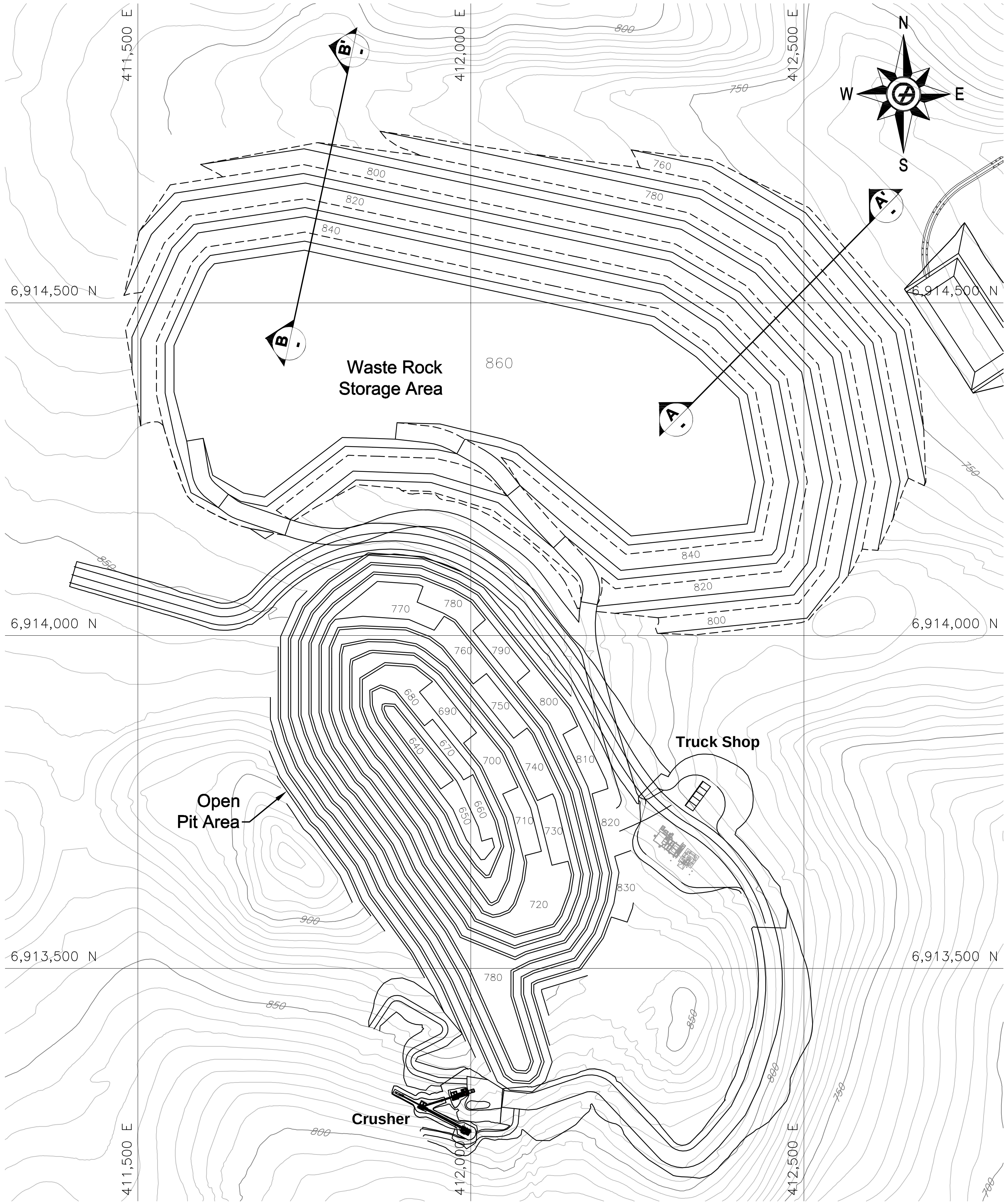
PROJECT
WESTERN COPPER CORPORATION
CARMACKS COPPER PROJECT
YUKON TERRITORY

TITLE
PIT AND WRSA
END OF YEAR 5

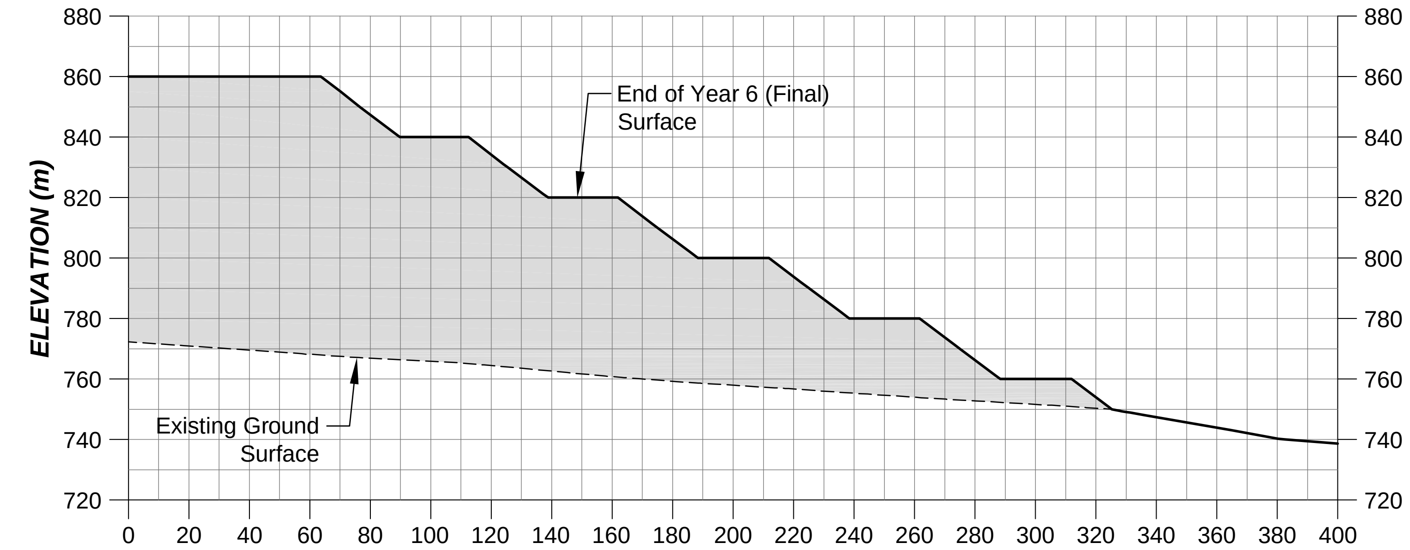
Golder Associates
Abbotsford, BC

PROJECT No.	06-1413-077	PHASE 6000	TASK 5000
DESIGN	J.A.H. 29-JAN-08	FILE No. P061413077-6000-03	
CADD	J.S.D. 29-JAN-08	SCALE AS SHOWN	REV. 0
CHECK	F.C.E. 15-APR-08	FIGURE 6	
REVIEW	J.A.H. 15-APR-08		

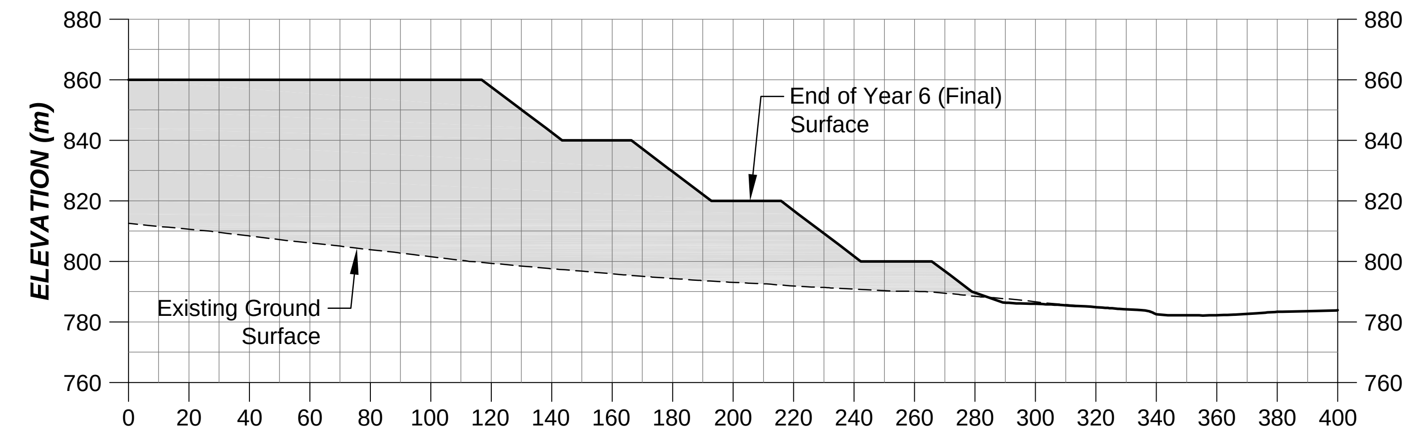
N:\Active\Year 2006\413\061-413077 (Carmacks Proposal)\Drafting\CAD\WRSA Drawings 03Apr08\ Drawing file: P061413077-6000-03.dwg Apr 15, 2008 - 5:06pm



4 **PLAN - END OF YEAR 6**
See Scale A



A **SECTION A-A'**
See Scale B



B **SECTION B-B'**
See Scale B

DRAFT
For Discussion Purposes Only

0 250
SCALE A (m)

0 100
SCALE B (m)

REFERENCE

1.) INDEPENDENT MINING CONSULTANTS, INC., CAD File: End_Of_Yr_06.dwg, Dated: March 2007.

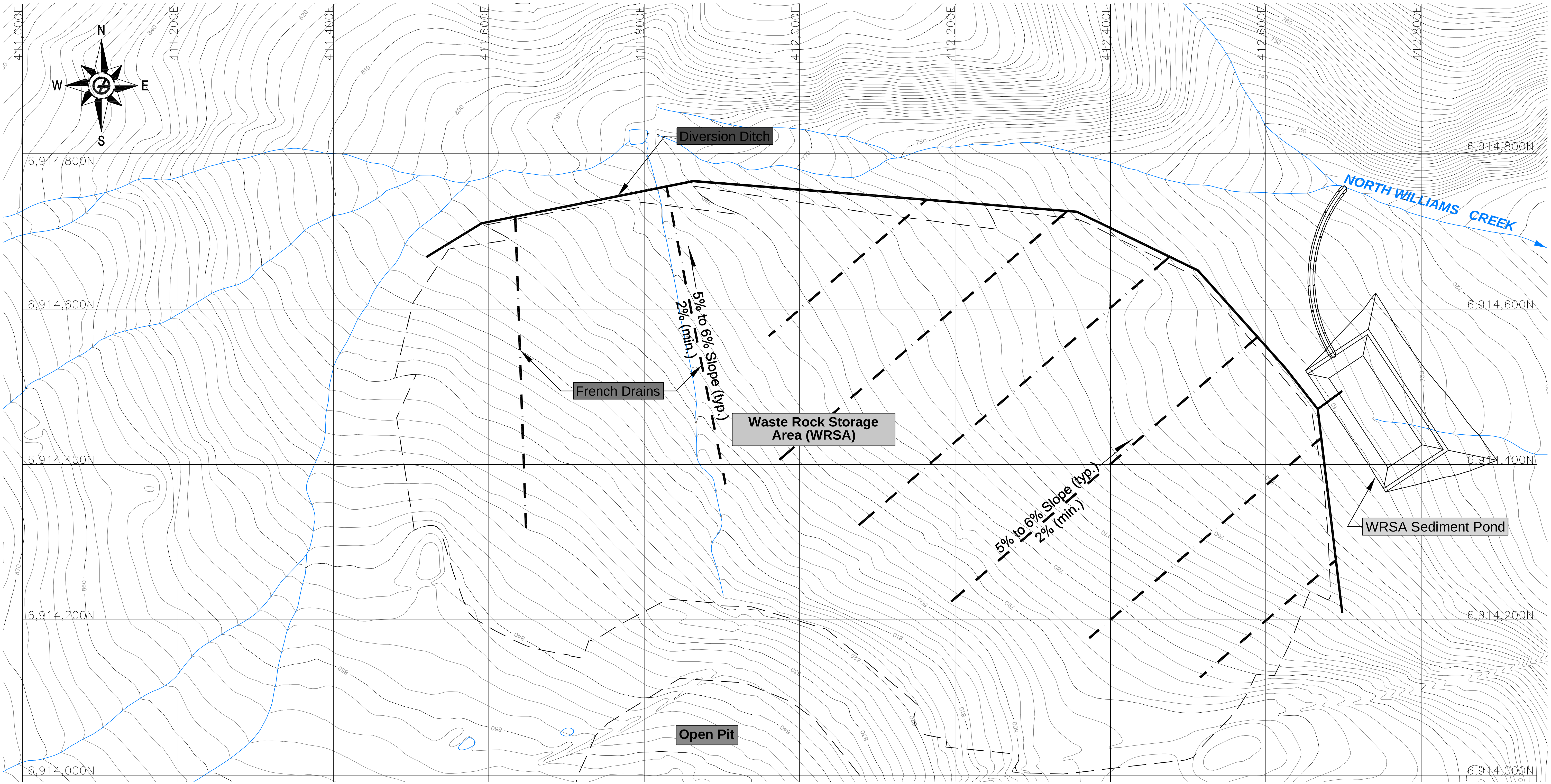
PROJECT
WESTERN COPPER CORPORATION
CARMACKS COPPER PROJECT
YUKON TERRITORY

TITLE
PIT AND WRSA
END OF YEAR 6 (FINAL)

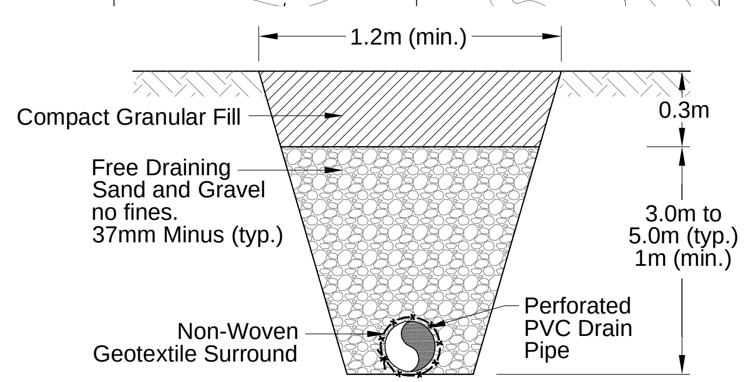
Golder Associates
Abbotsford, BC

PROJECT No. 06-1413-077		PHASE 6000	TASK 5000
DESIGN	J.A.H.	29-JAN-08	FILE No. P061413077-6000-04
CADD	J.S.D.	29-JAN-08	SCALE AS SHOWN	REV. 0
CHECK	F.C.E.	15-APR-08	FIGURE 7
REVIEW	J.A.H.	15-APR-08	

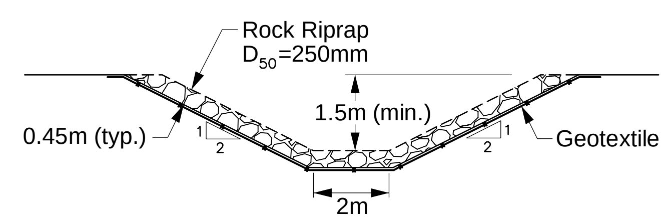
N:\Active\Year 2006\413\061-413077 (Carmacks Proposal)\Drafting\CAD\WRSA Drawings 03Apr08\ Drawing file: P061413077-6000-04.dwg Apr 15, 2008 - 5:11pm



0 400
SCALE (m)



FRENCH DRAIN DETAIL
Scale 1:30



DIVERSION DITCH DETAIL
Scale 1:200

LEGEND

- Approximate French Drain Location (dash-dot line)
- Approximate Diversion Ditch Location (solid line)

NOTES
1.) Elevations Shown are in metres above Mean Sea Level.
2.) Grid Coordinates Shown in UTM NAD 83, Zone 8.

REFERENCES

1.) M3 Engineering Ltd., CAD Files: 100-CI-010P5.dwg, Dated March 13th, 2008.
2.) Eagle Mapping Ltd., CAD Files: SH1-UTM.dwg to SH9-UTM.dwg, Dated November 1st, 2007.
3.) Western Copper Corporation, CAD File: End_Of_Yr_06.dwg, Dated March 30th, 2007.

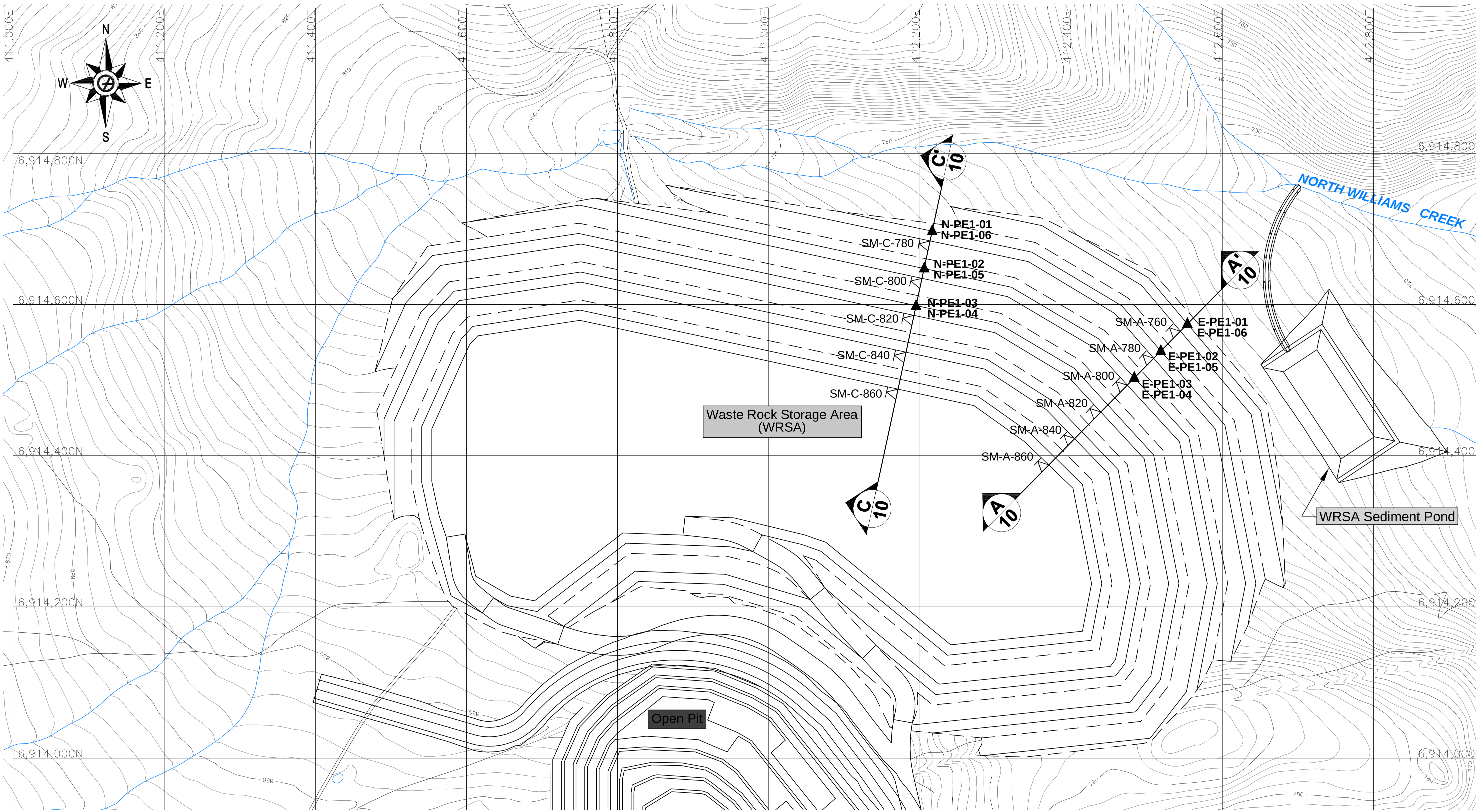
PROJECT
WESTERN COPPER CORPORATION
CARMACKS COPPER PROJECT
YUKON TERRITORY

TITLE
WASTE ROCK STORAGE AREA FRENCH DRAIN ARRANGEMENT

PROJECT No.	06-1413-077	PHASE 6000	TASK 5000	
DESIGN	J.A.H.	04-MAR-08	FILE No. P061413077-6000-07	
CADD	S.S.S.	06-MAR-08	SCALE AS SHOWN	REV. 0
CHECK	F.C.E	15-APR-08	FIGURE 8	
REVIEW	J.A.H.	15-APR-08		

Golder Associates
Abbotsford, BC

N:\Active\Year 2006\413\061-413077 (Carmacks Proposal)\Drafting\CAD\WRSA Drawings 03Apr08\ Drawing file: P061413077-6000-07.dwg Apr 15, 2008 - 5:24pm



LEGEND

▲ Proposed Foundation Piezometer

⊼ Proposed Surface Movement Monument Location

NOTES

1.) Elevations Shown are in metres above Mean Sea Level.
2.) Grid Coordinates Shown in UTM NAD 83, Zone 8.

REFERENCES

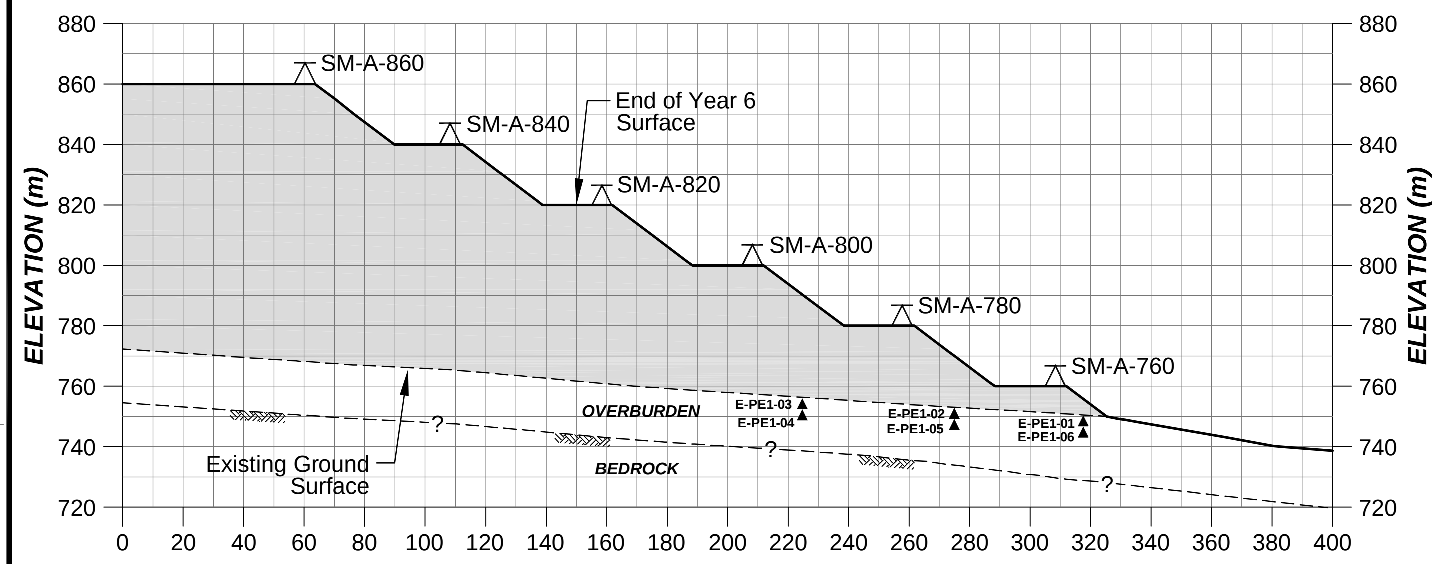
1.) M3 Engineering Ltd., CAD Files: 100-CI-010P5.dwg, Dated March 13th, 2008.
2.) Eagle Mapping Ltd., CAD Files: SH1-UTM.dwg to SH9-UTM.dwg, Dated November 1st, 2007.
3.) Western Copper Corporation, CAD File: End_Of_Yr_06.dwg, Dated March 30th, 2007.

PROJECT
WESTERN COPPER CORPORATION
CARMACKS COPPER PROJECT
YUKON TERRITORY

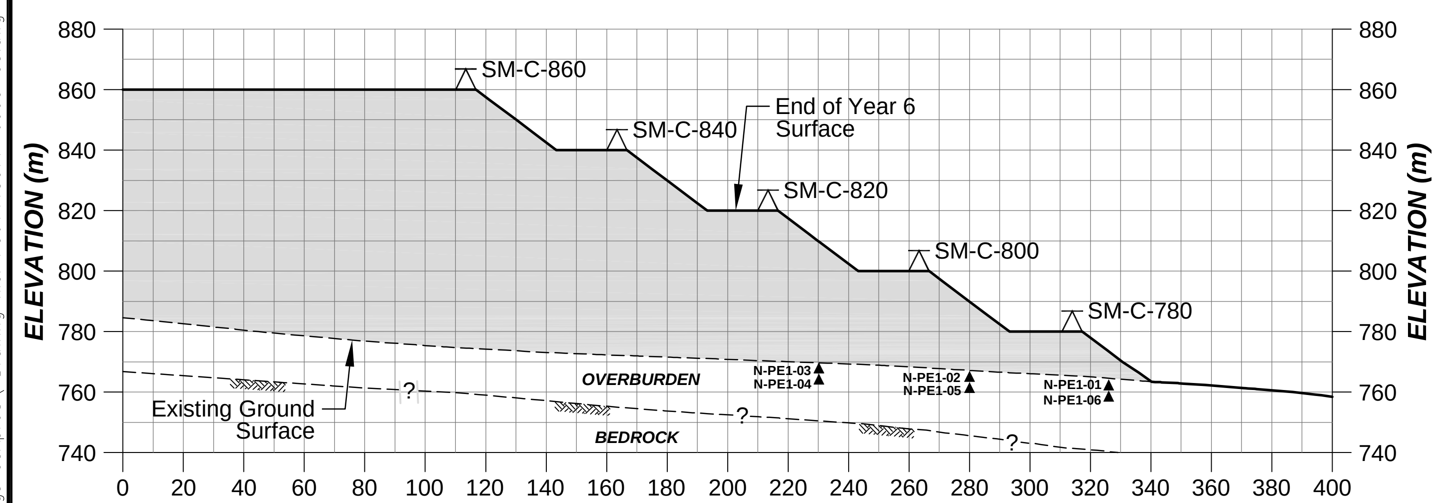
TITLE
WASTE ROCK STORAGE AREA INSTRUMENTATION PLAN

Golder Associates
Abbotsford, BC

PROJECT No.	06-1413-077	PHASE 6000	TASK 5000	
DESIGN	J.A.H.	04-MAR-08	FILE No. P061413077-6000-06	
CADD	S.S.S.	04-MAR-08	SCALE AS SHOWN	REV. 0
CHECK	F.C.E.	15-APR-08	FIGURE 9	
REVIEW	J.A.H.	15-APR-08		



A SECTION A-A'



C SECTION C-C'

LEGEND

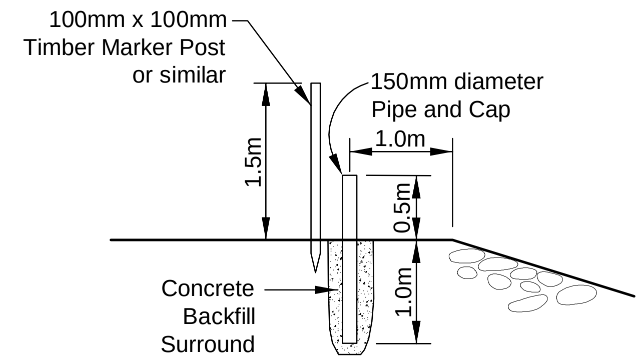
- **E-PE1-01** — Area (see below); Number I.D.; Type of Instrumentation (PE- Piezometer electric; vibration wire type piezometer)
- N-PE1-01 ▲ — Proposed Foundation Piezometer
- SM-A-840 — Proposed Surface Movement Monument Location

NOTES

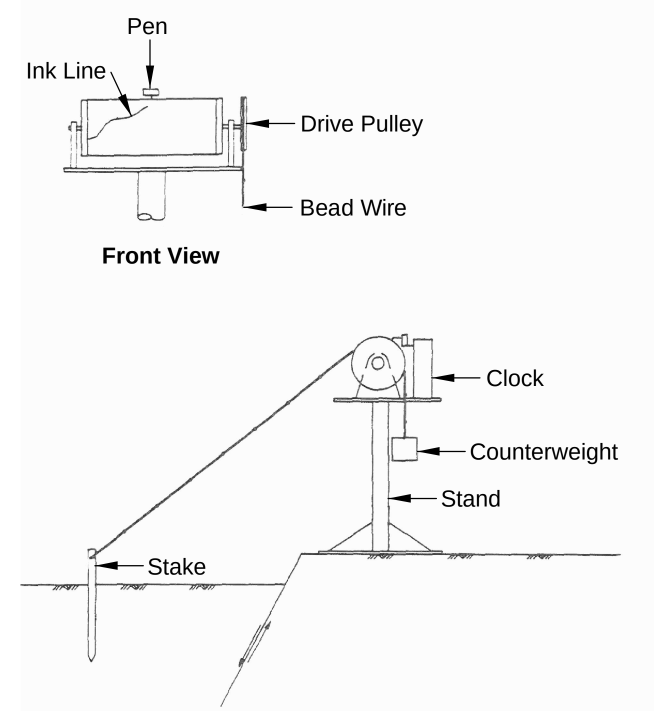
1. Section locations shown in plan on Figure 9.
2. Trenches to be excavated in original ground only.
3. Bedding and backfill for piezometer leads trenches to comprise fine grained soil designed by the Engineer with all particles exceeding 25mm removed.
4. Surface movement monument installed as lifts are completed.

REFERENCE

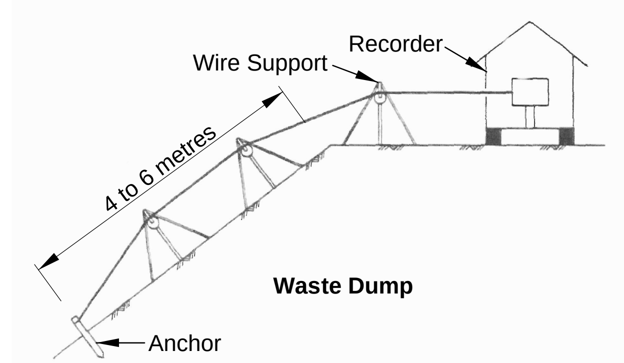
1.) INDEPENDENT MINING CONSULTANTS, INC., CAD File: End_Of_Yr_06.dwg, Dated: March 2007.



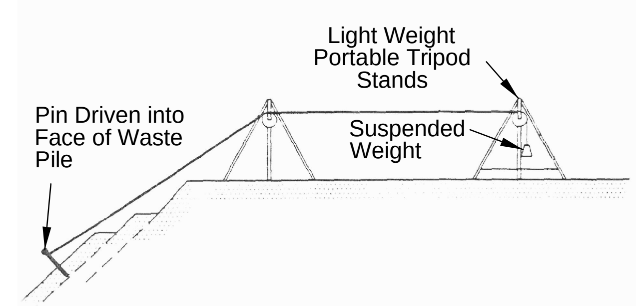
DETAIL A - TYPICAL SURFACE MOVEMENT MONUMENT
N.T.S.



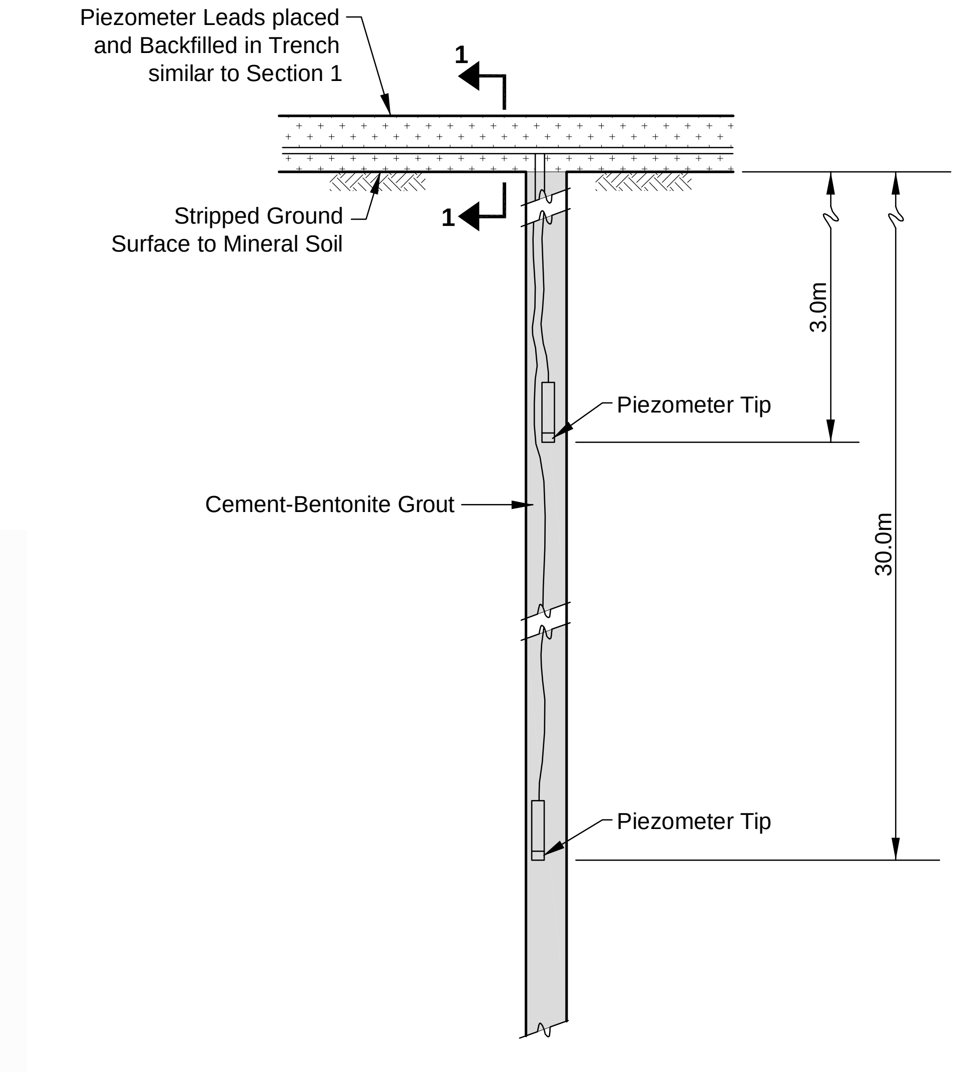
SINGLE STAND WIRE EXTENSOMETER
N.T.S.



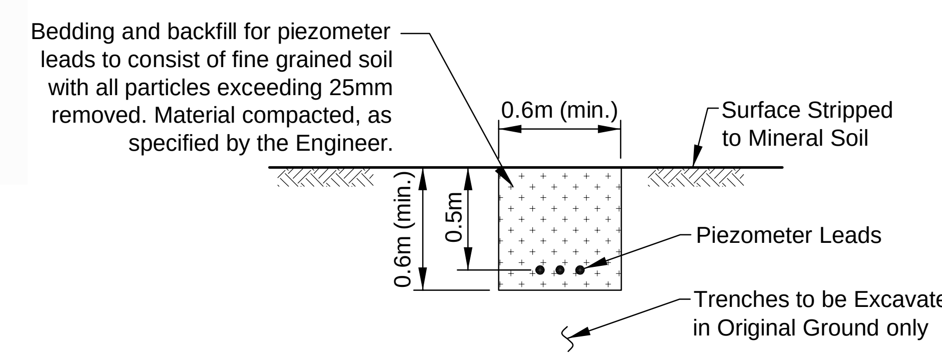
MULTIPLE STAND WIRE EXTENSOMETER USED TO MONITOR MOVEMENT OF THE INCLINED SURFACE OF A DUMP
N.T.S.



TWO STAND WIRE EXTENSOMETER
N.T.S.



DETAIL B - TYPICAL INSTALLATION OF PIEZOMETERS IN BOREHOLES
N.T.S.



SECTION 1 - TYPICAL SECTION THROUGH PIEZOMETER LEAD TRENCH
N.T.S.

0 100
SCALE (m)

PROJECT
WESTERN COPPER CORPORATION
CARMACKS COPPER PROJECT
YUKON TERRITORY

TITLE
WASTE ROCK STORAGE AREA INSTRUMENTATION SECTIONS AND DETAILS

Golder Associates
Abbotsford, BC

PROJECT No. 06-1413-077			PHASE 6000	TASK 5000
DESIGN	J.A.H.	29-JAN-08	FILE No. P061413077-6000-05	
CADD	J.S.D.	29-JAN-08	SCALE AS SHOWN	REV. 0
CHECK	F.C.E.	15-APR-08	FIGURE 10	
REVIEW	J.A.H.	15-APR-08		

APPENDIX II

SLOPE STABILITY ANALYSIS

Factors of Safety for Static Condition

Failure Mode	FOS	Figure No.
Global Failure – Single Lift	1.4	App. II - 1
Single Bench Failure	1.1	App. II - 2
Double Bench Failure	1.6	App. II - 3
Global Failure – Overall Slope	1.4	App. II - 4

Factors of Safety for Seismic Condition

Failure Mode	FOS	Figure No.
Global Failure – Single Lift	1.2	App. II - 5
Single Bench Failure	1.0	App. II - 6
Double Bench Failure	1.4	App. II - 7
Global Failure – Overall Slope	1.2	App. II - 8

REVISION DATE: BY: FILE:

SLOPE STABILITY ANALYSIS: FIRST 20 m LIFT

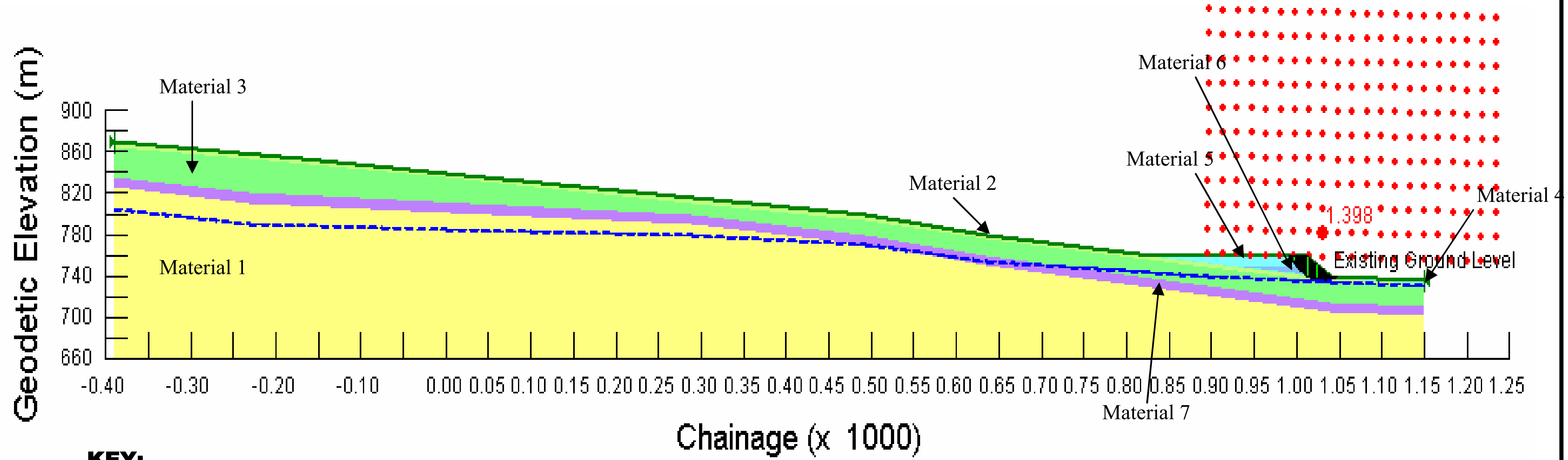
SLOPE GRADIENT: 1.4H : 1V

BENCH WIDTH: 20 m

STATIC CONDITIONS – GLOBAL FAILURE

FROZEN CONDITION

Factor of Safety: 1.4



KEY:

Material 1: Bed Rock (Thawed)
Bulk Unit Weight: 20 kN/m3
Phi: 40 deg

Material 2: Silty Sand (Thawing)
Bulk Unit Weight: 22.8 kN/m3
Cohesion: 33 kN/m2
Phi: 10 deg

Material 3: Silty Sand (Frozen)
Bulk Unit Weight: 19.6 kN/m3
Cohesion: 0 kN/m2
Phi: 34 deg

Material 4: Silty Sand (Thawed)
Bulk Unit Weight: 19.6 kN/m3
Cohesion: 0 kN/m2
Phi: 34 deg

Material 5: Rock Fill (Surcharge < 200kPa)
Bulk Unit Weight: 19.6 kN/m3
Cohesion: 0 kN/m2
Phi: 36 deg

Material 6: Rock Fill (Surcharge > 200kPa)
Bulk Unit Weight: 19.6 kN/m3
Cohesion: 0 kN/m2
Phi: 38 deg

Material 7: Clay (Frozen)
Bulk Unit Weight: 18.0 kN/m3
Cohesion: 30 kN/m2
Phi: 10 deg

PROJECT
WASTE ROCK STORAGE AREA
CARMACKS COPPER, YUKON

TITLE
WRSA SLOPE STABILITY

Golder Associates

PROJECT No. 06-1413-077			PHASE / TASK No.	6000/5000
DESIGN	JJC	13FEB07	SCALE NTS	REV.
CADD			**App. II - 1**	
CHECK	JH	13FEB07		
REVIEW				

REVISION DATE: BY: FILE:

SLOPE STABILITY ANALYSIS: COMPLETE WRSA CONFIGURATION

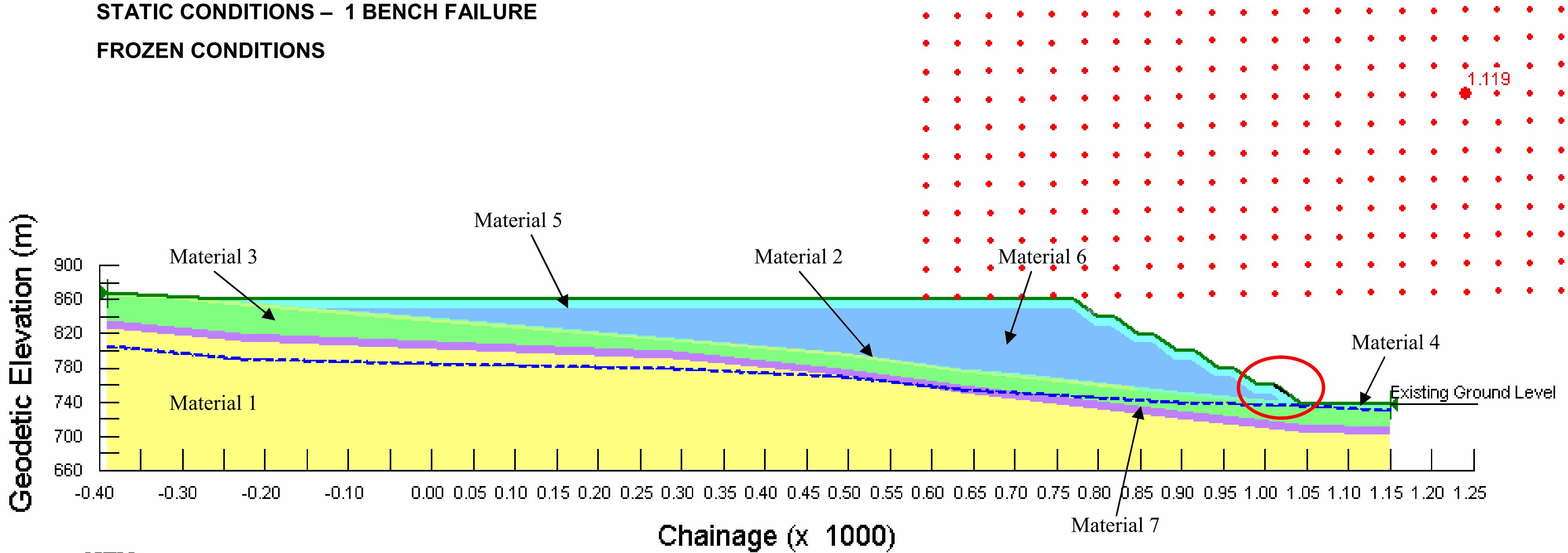
Factor of Safety: 1.1

SLOPE GRADIENT: 1.4H : 1V

BENCH WIDTH: 20 m

STATIC CONDITIONS – 1 BENCH FAILURE

FROZEN CONDITIONS



KEY:

Material 1: Bed Rock (Thawed)
Bulk Unit Weight: 20 kN/m3
Phi: 40 deg

Material 2: Silty Sand (Thawing)
Bulk Unit Weight: 22.8 kN/m3
Cohesion: 33 kN/m2
Phi: 10 deg

Material 3: Silty Sand (Frozen)
Bulk Unit Weight: 19.6 kN/m3
Cohesion: 0 kN/m2
Phi: 34 deg

Material 4: Silty Sand (Thawed)
Bulk Unit Weight: 19.6 kN/m3
Cohesion: 0 kN/m2
Phi: 34 deg

Material 5: Rock Fill (Surcharge < 200kPa)
Bulk Unit Weight: 19.6 kN/m3
Cohesion: 0 kN/m2
Phi: 36 deg

Material 6: Rock Fill (Surcharge > 200kPa)
Bulk Unit Weight: 19.6 kN/m3
Cohesion: 0 kN/m2
Phi: 38 deg

Material 7: Clay (Frozen)
Bulk Unit Weight: 18.0 kN/m3
Cohesion: 30 kN/m2
Phi: 10 deg

PROJECT

WASTE ROCK STORAGE AREA
CARMACKS COPPER, YUKON

TITLE

WRSA SLOPE STABILITY

Golder Associates

PROJECT No. 06-1413-077			PHASE / TASK No.	6000/5000
DESIGN	JJC	22FEB08	SCALE NTS	REV.
CADD			**App. II - 2**	
CHECK	JH	13FEB07		
REVIEW				

REVISION DATE: BY: FILE:

SLOPE STABILITY ANALYSIS: COMPLETE WRSA CONFIGURATION

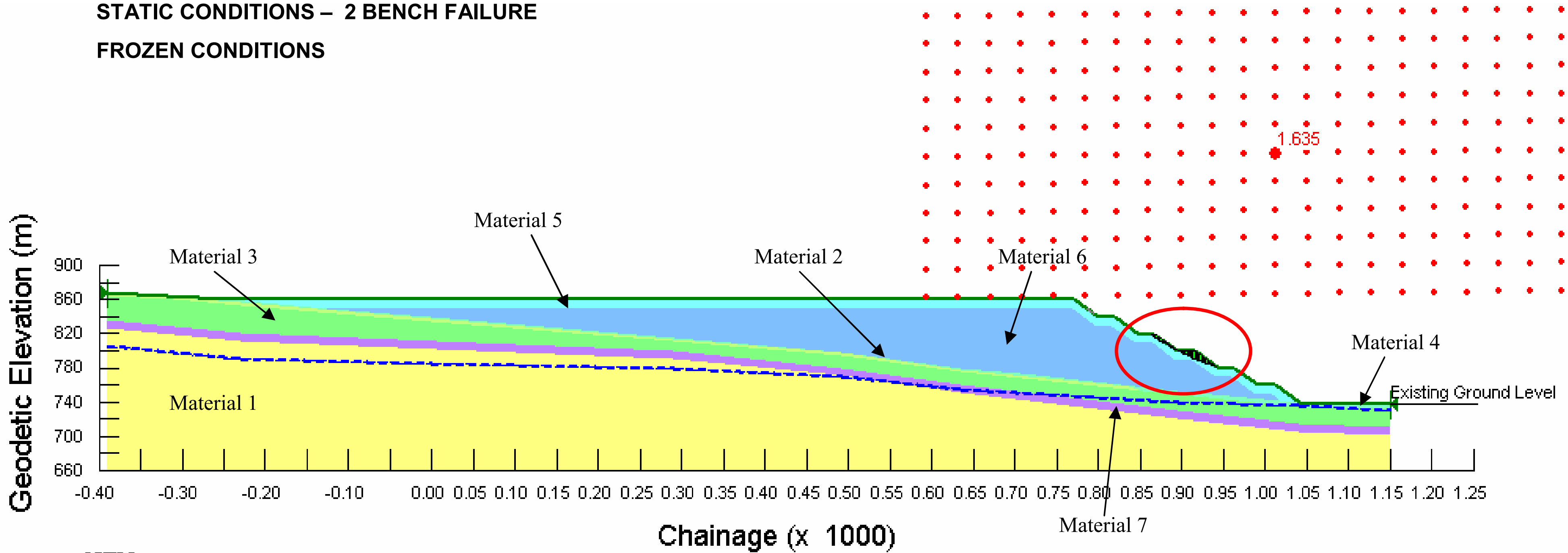
Factor of Safety: 1.6

SLOPE GRADIENT: 1.4H : 1V

BENCH WIDTH: 20 m

STATIC CONDITIONS – 2 BENCH FAILURE

FROZEN CONDITIONS



KEY:

Material 1: Bed Rock (Thawed)
Bulk Unit Weight: 20 kN/m3
Phi: 40 deg

Material 2: Silty Sand (Thawing)
Bulk Unit Weight: 22.8 kN/m3
Cohesion: 33 kN/m2
Phi: 10 deg

Material 3: Silty Sand (Frozen)
Bulk Unit Weight: 19.6 kN/m3
Cohesion: 0 kN/m2
Phi: 34 deg

Material 4: Silty Sand (Thawed)
Bulk Unit Weight: 19.6 kN/m3
Cohesion: 0 kN/m2
Phi: 34 deg

Material 5: Rock Fill (Surcharge < 200kPa)
Bulk Unit Weight: 19.6 kN/m3
Cohesion: 0 kN/m2
Phi: 36 deg

Material 6: Rock Fill (Surcharge > 200kPa)
Bulk Unit Weight: 19.6 kN/m3
Cohesion: 0 kN/m2
Phi: 38 deg

Material 7: Clay (Frozen)
Bulk Unit Weight: 18.0 kN/m3
Cohesion: 30 kN/m2
Phi: 10 deg

PROJECT: WASTE ROCK STORAGE AREA CARMACKS COPPER, YUKON				
TITLE: WRSA SLOPE STABILITY				
Golder Associates	PROJECT No. 06-1413-077		PHASE / TASK No. 6000/5000	
	DESIGN	JJC	22FEB08	SCALE NTS	REV.
	CADD			App. II - 3
	CHECK	JH	13FEB07	
	REVIEW			

SLOPE STABILITY ANALYSIS: COMPLETE WRSA CONFIGURATION

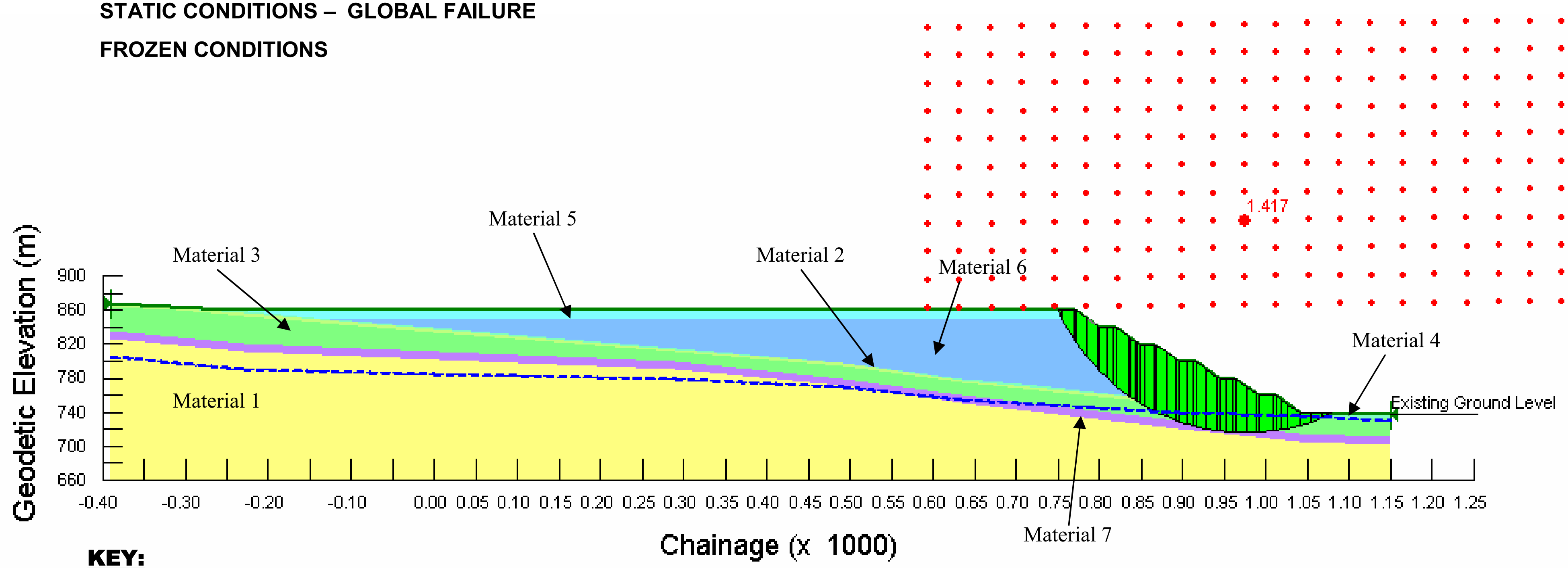
Factor of Safety: 1.4

SLOPE GRADIENT: 1.4H : 1V

BENCH WIDTH: 20 m

STATIC CONDITIONS – GLOBAL FAILURE

FROZEN CONDITIONS



KEY:

Material 1: Bed Rock (Thawed)
Bulk Unit Weight: 20 kN/m3
Phi: 40 deg

Material 2: Silty Sand (Thawing)
Bulk Unit Weight: 22.8 kN/m3
Cohesion: 33 kN/m2
Phi: 10 deg

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Bulk Unit Weight: 19.6 kN/m3
Cohesion: 0 kN/m2
Phi: 34 deg

Material 4: Silty Sand (Thawed)
Bulk Unit Weight: 19.6 kN/m3
Cohesion: 0 kN/m2
Phi: 34 deg

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Bulk Unit Weight: 19.6 kN/m3
Cohesion: 0 kN/m2
Phi: 36 deg

Material 6: Rock Fill (Surcharge > 200kPa)
Bulk Unit Weight: 19.6 kN/m3
Cohesion: 0 kN/m2
Phi: 38 deg

Material 7: Clay (Frozen)
Bulk Unit Weight: 18.0 kN/m3
Cohesion: 30 kN/m2
Phi: 10 deg

PROJECT

WASTE ROCK STORAGE AREA
CARMACKS COPPER, YUKON

TITLE

WRSA SLOPE STABILITY

Golder Associates

PROJECT No. 06-1413-077			PHASE / TASK No.	6000/5000
DESIGN	JJC	13FEB07	SCALE NTS	REV.
CADD			**App. II - 4**	
CHECK	JH	13FEB07		
REVIEW				

REVISION DATE: BY: FILE:

SLOPE STABILITY ANALYSIS: FIRST 20 m LIFT

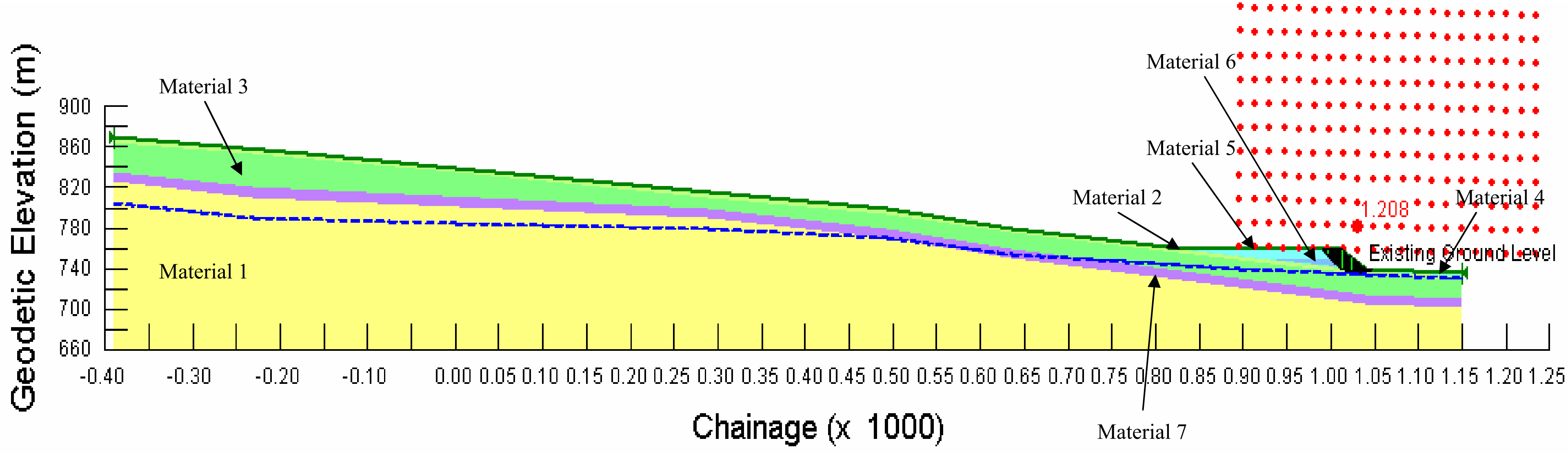
SLOPE GRADIENT: 1.4H : 1V

BENCH WIDTH: 20 m

SEISMIC CONDITIONS – GLOBAL FAILURE

FROZEN CONDITION

Factor of Safety: 1.2



KEY:

Material 1: Bed Rock (Thawed)
Bulk Unit Weight: 20 kN/m3
Phi: 40 deg

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Bulk Unit Weight: 22.8 kN/m3
Cohesion: 33 kN/m2
Phi: 10 deg

Material 3: Silty Sand (Frozen)
Bulk Unit Weight: 19.6 kN/m3
Cohesion: 0 kN/m2
Phi: 34 deg

Material 4: Silty Sand (Thawed)
Bulk Unit Weight: 19.6 kN/m3
Cohesion: 0 kN/m2
Phi: 34 deg

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Cohesion: 0 kN/m2
Phi: 36 deg

Material 6: Rock Fill (Surcharge > 200kPa)
Bulk Unit Weight: 19.6 kN/m3
Cohesion: 0 kN/m2
Phi: 38 deg

Material 7: Clay (Frozen)
Bulk Unit Weight: 18.0 kN/m3
Cohesion: 30 kN/m2
Phi: 10 deg

PROJECT
WASTE ROCK STORAGE AREA
CARMACKS COPPER, YUKON

TITLE
WRSA SLOPE STABILITY

Golder Associates

PROJECT No. 06-1413-077			PHASE / TASK No. 6000/5000	
DESIGN	JJC	13FEB07	SCALE NTS	REV.
CADD			**App. II - 5**	
CHECK	JH	13FEB07		
REVIEW				

REVISION DATE: BY: FILE:

SLOPE STABILITY ANALYSIS: COMPLETE WRSA CONFIGURATION

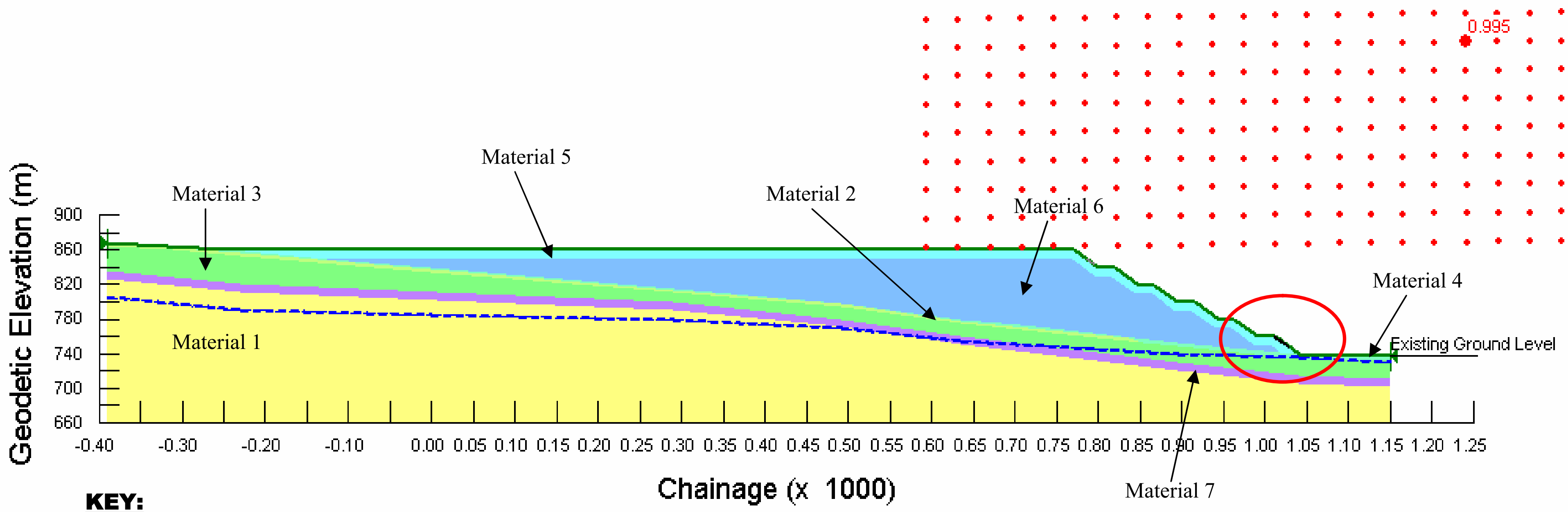
Factor of Safety: 1.0

SLOPE GRADIENT: 1.4H : 1V

BENCH WIDTH: 20 m

SEISMIC CONDITIONS – 1 BENCH FAILURE

FROZEN CONDITIONS



KEY:

Material 1: Bed Rock (Thawed)
Bulk Unit Weight: 20 kN/m3
Phi: 40 deg

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Cohesion: 0 kN/m2
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Cohesion: 0 kN/m2
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Cohesion: 0 kN/m2
Phi: 36 deg

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Bulk Unit Weight: 19.6 kN/m3
Cohesion: 0 kN/m2
Phi: 38 deg

Material 7: Clay (Frozen)
Bulk Unit Weight: 18.0 kN/m3
Cohesion: 30 kN/m2
Phi: 10 deg

PROJECT
WASTE ROCK STORAGE AREA
CARMACKS COPPER, YUKON

TITLE
WRSA SLOPE STABILITY

Golder Associates

PROJECT No. 06-1413-077			PHASE / TASK No. 6000/5000	
DESIGN	JJC	13FEB07	SCALE NTS	REV.
CADD			App. II - 6	
CHECK	JH	13FEB07		
REVIEW				

REVISION DATE: BY: FILE:

SLOPE STABILITY ANALYSIS: COMPLETE WRSA CONFIGURATION

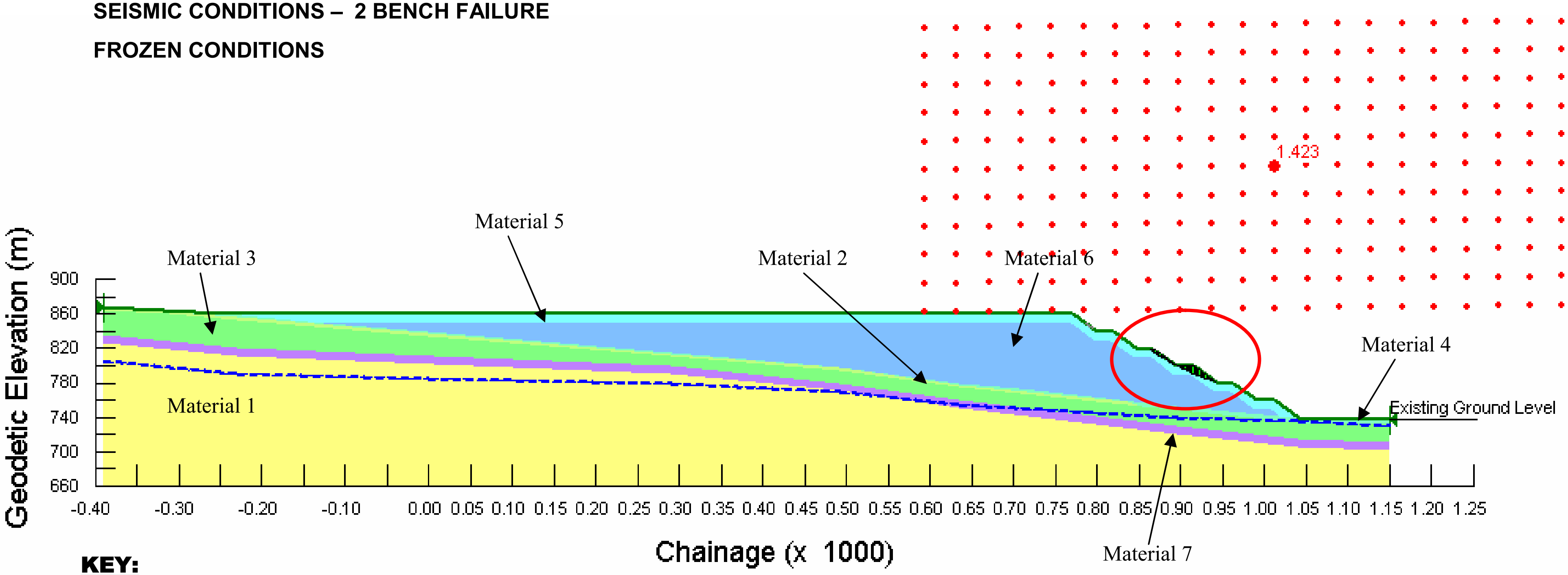
Factor of Safety: 1.4

SLOPE GRADIENT: 1.4H : 1V

BENCH WIDTH: 20 m

SEISMIC CONDITIONS – 2 BENCH FAILURE

FROZEN CONDITIONS



KEY:

Material 1: Bed Rock (Thawed)
Bulk Unit Weight: 20 kN/m3
Phi: 40 deg

Material 2: Silty Sand (Thawing)
Bulk Unit Weight: 22.8 kN/m3
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Bulk Unit Weight: 18.0 kN/m3
Cohesion: 30 kN/m2
Phi: 10 deg

PROJECT	WASTE ROCK STORAGE AREA CARMACKS COPPER, YUKON			
TITLE	WRSA SLOPE STABILITY			
Golder Associates	PROJECT No. 06-1413-077		PHASE / TASK No. 6000/5000	
	DESIGN JJC	13FEB07	SCALE NTS	REV.
	CADD		App. II - 7	
	CHECK JH	13FEB07		
	REVIEW			

SLOPE STABILITY ANALYSIS: COMPLETE WRSA CONFIGURATION

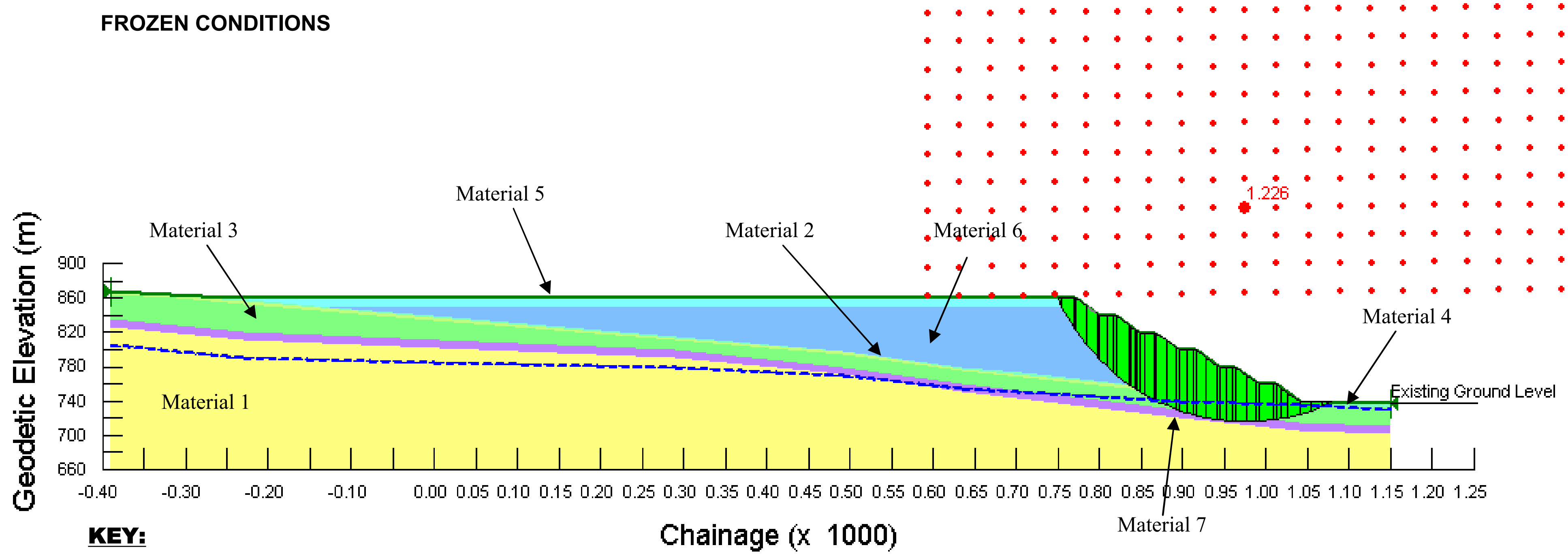
Factor of Safety: 1.2

SLOPE GRADIENT: 1.4H : 1V

BENCH WIDTH: 20 m

SEISMIC CONDITIONS – GLOBAL FAILURE

FROZEN CONDITIONS



KEY:

Material 1: Bed Rock (Thawed)
Bulk Unit Weight: 20 kN/m3
Phi: 40 deg

Material 2: Silty Sand (Thawing)
Bulk Unit Weight: 22.8 kN/m3
Cohesion: 33 kN/m2
Phi: 10 deg

Material 3: Silty Sand (Frozen)
Bulk Unit Weight: 19.6 kN/m3
Cohesion: 0 kN/m2
Phi: 34 deg

Material 4: Silty Sand (Thawed)
Bulk Unit Weight: 19.6 kN/m3
Cohesion: 0 kN/m2
Phi: 34 deg

Material 5: Rock Fill (Surcharge < 200kPa)
Bulk Unit Weight: 19.6 kN/m3
Cohesion: 0 kN/m2
Phi: 36 deg

Material 6: Rock Fill (Surcharge > 200kPa)
Bulk Unit Weight: 19.6 kN/m3
Cohesion: 0 kN/m2
Phi: 38 deg

Material 7: Clay (Frozen)
Bulk Unit Weight: 18.0 kN/m3
Cohesion: 30 kN/m2
Phi: 10 deg

PROJECT	WASTE ROCK STORAGE AREA CARMACKS COPPER, YUKON			
TITLE	WRSA SLOPE STABILITY			
Golder Associates	PROJECT No. 06-1413-077			PHASE / TASK No. 6000/5000
	DESIGN	JJC	13FEB07	SCALE NTS REV.
	CADD			App. II - 8
	CHECK	JH	13FEB07	
	REVIEW			