**Appendix I: Marathon PGM-Cu Project - Process Solids Management Facility – Conceptual Closure Plan (Knight Piesold)**

Knight Piésold
CONSULTING

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March 1, 2012

Ms. Tabatha LeBlanc
Environmental Manager
Stillwater Canada Inc.
Suite 1005, 715 Hewitson St.
Thunder Bay, ON, Ontario
Canada, P7B 4A3

Dear Tabatha,

**Re: Combined Storage Area PSMF and MRSA Conceptual Closure Plan**



This letter provides a summary of the conceptual closure plan for the Combined Storage Area Process Solids Management Facility (PSMF) and Mine Rock Storage Area (MRSA) at the Marathon PGM-Cu project. Reclamation and closure of the PSMF and MRSA will be based on the requirements as set out by the "Ontario Mining Act, Regulation 240/00. The conceptual design for the closure of the PSMF and MRSA has been developed with full consideration of reclamation and closure. The primary objectives for the PMSF and MRSA closure plan are summarized as follows:

- Ensure safe and secure storage of process solids and mine rock in perpetuity
- Minimize dust generation from the process solids and mine rock surfaces
- Safely route runoff and stream flows through, around and off the PSMF and MRSA
- Ensure that the surface water flows from the facilities are of suitable quality
- Minimize the visual impact of the facilities on the surrounding environment

The proposed reclamation work remains to be reviewed with SCI to confirm that it coincides with the overall reclamation strategy for the site.

## PSMF Closure Concept

For the closure of the PSMF and associated structures, the following general items are included:

- Contour the downstream slopes of the PSMF embankments, cut slopes, access routes, other disturbed areas, etc., as necessary to remove any areas of concentrated runoff leading to erosion and sediment production
- Establish vegetation on re-graded embankment areas
- Minimize standing water on top of the PSMF
- Establish vegetative cover over the surface of the process solids
- Decommission process solids delivery and distribution systems
- Decommission the water reclaim and excess water release systems
- Other infrastructure not required beyond mine closure will be dismantled and removed
- Provide ongoing monitoring of the PMSF for a period of time sufficient to confirm suitable water quality and ongoing stability of the facility

To the maximum extent possible, progressive reclamation of the PSMF and associated structures will be implemented, especially with respect to Cell 2 after the process solids deposition has been transitioned to the Satellite Pits. The reclamation and closure plan will be a living document that will be updated throughout the project life to reflect changing conditions and the input of the government regulators.

It is important that long-term physical and geochemical stability be maintained within the PMSF and that surface water is managed, in order to protect the downstream environment. A post-closure monitoring program will include an annual inspection of the PMSF for a prescribed period (i.e. 5 years) to confirm that the completed closure measures are meeting expectations.

Figure 1 shows the general post closure arrangement for the PMSF and design criteria are summarized in Table 1. The details are described below.



**PSMF Conceptual Closure Details**

**Process Solids Cells 1** - Type 1 and Type 2 process solids will be deposited in Cell for the first year of operations. During year 2 of operations Type 2 process solids in Cell 1 will be capped with a layer of Type 1 process solids and process solids deposition to Cell 1 will cease. Cell 1 will then be utilized for water management through the end of operations. At closure the operating pond level will be lowered through pumping to the Primary Pit, and water will be treated prior to discharge if required. Once dewatering is complete the embankment elevations at the west and east ends of Cell 1 will be lowered to re-establish the existing drainage to the west. Select areas of process solids surface will be re-graded and drainage channels to the spillway will be established and lined with rip-rap or mine rock from the excavation of the Cell 1 embankments. Access over the process solids surface will be constructed as required using the excavated embankment materials. The access will be dual purpose and will be constructed to also form wind breaks over the surface. The process solids surface will be seeded for reclamation. Specific reclamation work proposed for Cell 1 includes the following:

- Dewatering the operating pond
- Reduce the west and east embankments to El. 322 and 324 m, respectively
- Re-grading grading of selected process solids surface areas
- Installation of drainage channels to the spillway
- Installation of wind breaks to reduce dusting
- Seeding of the process solids surface

**Process Solids Cells 2** - Type 1 and Type 2 process solids will be deposited to Cell 2 during the first 10 years of operations. Process solids deposition to Cell 2 will cease in approximately Year 10 of operations. Type 2 process solids deposited to centre of Cell 2 will be capped with a layer of Type 1 process solids and the operating pond level will be lowered through reclaim to the Plant and pumping to Cell 1. Discharge of the Type 1 process solids will be carried out such as to promote natural drainage to the south side of Cell 2 at the existing spillway. Further re-grading of the beaches may be required following operations. Drainage channels to the spillway will be established and lined with rip-rap or mine rock from the excavation of the Cell 1 embankments at closure. Access over the process solids surface will be constructed as required using this excavated Cell 1 embankment materials. The access will be dual purpose and will be constructed to also form wind breaks over the surface. The process solids surface will be seeded for reclamation. It is anticipated that reclamation test pads will be establish in Cell 2 during operations to confirm the seeding and growth medium required for vegetation to adequately establish itself on the process solids surface. Specific reclamation work proposed for Cell 2 includes the following:

- Dewatering the operating pond
- Re-grading of selected process solids surface areas
- Installation of drainage channels to the spillway
- Installation of wind breaks to reduce dusting
- Seeding of the process solids surface

**Downstream Embankment Slopes** - The downstream slopes of the embankments associated with the PSMF will be progressively reclaimed during construction, including slope trimming, placement of surface soils and seeding. Water bars and ditches on crests and benches will also be constructed as required to control runoff and prevent erosion. Overall slope stability requirements will be addressed in the initial design and construction. Specific reclamation work proposed for the embankments includes the following:

- Grading the embankment crests and slopes
- Placement of surface soils on the embankment crests and slopes
- Seeding the embankment crests and slopes

**Satellite Pits** - Type 2 mine rock will be placed in Satellite Pits 2, 3 and 4 during the last half of operations (years 6 to 10). During the last 2 years of operations Type 1 and Type 2 process solids will be deposited to Satellite Pits 2 and 3 (years 10 to 12). Type 2 materials will be deposited subaqueous in the satellite pits at a minimum of 4 m below the pit rim. At closure the operating ponds in the Satellite Pits will be pumped to the primary pit and the Satellite Pits will be capped with Type 1 mine rock. The Satellite Pit surfaces will be reclaimed with surface soils and seeded. Drainage from Satellites Pit 2, 3 and 4 will be established to the north into the Primary Pit. Satellite Pit 5 will be developed as a lake for fisheries compensation at closure. Excavation and diversion work will be completed to connect Satellite Pit 5 to the watershed to the south. Specific reclamation work proposed for the Satellite Pits includes the following:

- Dewatering the operating ponds
- Placement of Type 1 mine rock to cap Satellite Pits 2, 3 and 4
- Placement of surface soils over Satellite Pits 2, 3 and 4
- Seeding of Satellite Pits 2, 3 and 4
- Grading and excavation to connect Satellite Pit 5 to the southern drainage

**Primary Pit** - Type 2 mine rock will be placed in the Primary Pit at closure. Following placement of the Type 2 mine rock, the operating ponds in Cell 1 and the satellite pits will be pumped to the Primary Pit to cover the Type 2 mine rock with water. Drainage from the surrounding area will maintain water cover over the Type 2 mine rock and establish a lake. Specific reclamation work proposed for the Primary Pit which includes the following:

- Placement of Type 2 mine rock in the Pit
- Flooding of the Pit

**Other Infrastructure** - All other infrastructure, including process solids and water pipeline systems, water treatment plant, etc. will be decommissioned and removed from the site. Access roads not required for post closure monitoring will be re-graded and seeded for reclamation.

**Water Management Summary** - In summary, post closure water management for the PSMF will be as follows:

- Runoff from Cell 2 will continue to drain to Cell 1 through the existing spillway
- Runoff from Cell 1 (including Cell 2) will continue to report to the spillway at the northwest abutment for discharge. However, the spillway outlet channel to Hare Lake will be decommissioned and flows will be redirected back to Stream 6 through a new section of spillway outlet channel.
- Runoff from Satellite Pits 2, 3 and 4 will drain to the Primary Pit
- Satellite Pit 5 will be developed as a lake and connected to the watershed to the south

## MRSA Closure Concept

For the closure of the MRSA and associated structures, the following general items are included:

- Contour the intermediate slope benches, stockpile crest areas, access routes, other disturbed areas, etc., as necessary to remove any areas of concentrated runoff leading to erosion and sediment production
- Minimize standing water on top of MRSA
- Establish vegetative cover over the crest and slope benches
- Decommission and remove the runoff water management systems
- Other infrastructure not required beyond mine closure will be dismantled and removed
- Provide ongoing monitoring of the MRSA for a period of time sufficient to confirm suitable water quality and ongoing stability of the facility



To the maximum extent possible, progressive reclamation of the MRSA and associated structures will be implemented. The reclamation and closure plan will be a living document that will be updated throughout the project life to reflect changing conditions and the input of the government regulators.

It is important that long-term physical stability be maintained within the MRSA and that surface water is managed, in order to protect the downstream environment. A post-closure monitoring program will include an annual inspection of the MRSA for a prescribed period (i.e. 5 years) to confirm that the completed closure measures are meeting expectations.

Figure 2 shows the general post closure arrangement for the MRSA and design criteria are summarised in Table 1. The details are described below.

## MRSA Conceptual Closure Details

**Slope and Crest** - The slope benches and crest will be progressively reclaimed during construction, including trimming, grading, and placement of surface soils and seeding. Water bars and ditches will be constructed as required to control runoff and prevent erosion. Wind breaks will be constructed on the crest areas to reduce dust generation. Overall slope stability requirements will be addressed in the initial design and construction. Specific reclamation work for the slope and crest which remains to be confirmed with SCI includes the following:

- Grading the slope benches and crests
- Placement of surface soils slope benches and crests
- Seeding the embankment crests and slopes
- Installation of wind breaks on the crest to reduce dusting

**Runoff Catch Basins** - At closure runoff catch basins will be dewatered and removed. Collected runoff in the catch basins will be treated and released to the environment. Accumulated sediment in the catch basins will be excavated and transferred to Cell 1 or a Satellite Pit for storage. The catch basin embankments will be breached and contoured to suit the surrounding topography. The basin and embankment areas will be re-graded and seeded and the existing stream beds will be restored. Specific reclamation work proposed for the catch basins includes the following:

- Dewatering the catch basin ponds
- Removal of sediment
- Removal and/or grading of the catch basin embankments
- Grading of the catch basin areas
- Seeding the catch basin and embankment areas

**Other Infrastructure** - All other infrastructure, including runoff water management pipeline systems, water treatment, etc. will be decommissioned and removed from the site. Access roads not required for post closure monitoring will be re-graded and seeded for reclamation.

**Water Management Summary** - Runoff water from the MRSA will drain to the Pic River and Primary Pit. It is assumed that prior to closure or during the post closure period (5 years) water quality monitoring data will illustrate that runoff water is suitable for discharge to the environment.



## Capital Cost Estimate

A preliminary capital cost estimate has been developed for the conceptual closure plan for the PSMF and MRSA. The cost estimate is summarized in Table 2. The cost estimate is based on neat line quantities and estimated unit rates. The estimate is in net present dollars and no escalation has been applied for future work. In addition, no salvage value has been applied to any materials.

If you have any questions or require additional information please contact us.

Yours truly,
**KNIGHT PIESOLD LTD.**

| Signed: | | Approved: | |
|---|---|---|---|
| | Craig Hall, P.Eng.<br>Senior Geological Engineer | | Ken D. Embree, P.Eng.<br>Managing Director |

Attachments:

| | |
|---|---|
| Table 1 Rev A | Conceptual Closure Plan Design Criteria |
| Table 2 Rev A | Conceptual Closure Plan Preliminary Capital Cost Estimate |
| Figure 1 Rev A | Combined Storage Area PSMF Conceptual Closure Arrangement |
| Figure 2 Rev A | Mine Rock Storage Area Conceptual Closure Arrangement |

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Kevin McCarthy
Don Emms
Dan Turk
Leif Nelson (True Grit)
Brian Fraser (Ecometrix)

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**TABLE 1**

**STILLWATER CANADA INC.**
**MARATHON PGM-Cu PROJECT**

**COMBINED STORAGE AREA PSMF AND MRSA CONCEPTUAL CLOSURE PLAN**
**CONCEPTUAL CLOSURE PLAN DESIGN CRITERIA**

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| Item | | Design Criteria | Reference |
|---|---|---|---|
| **1.0** | **General Design Criteria** | | |
| 1.1 | Codes and Standards | • Canadian Dam Association (CDA) Dam Safety Guidelines (2007)<br>• Mining Association of Canada (MAC) Guide to Management of Tailings Facilities (1998)<br>• Ministry of Natural Resources Lakes and Rivers Improvements Act (LRI Act) (2011)<br>• Ontario Mining Act, Regulation 240/00 | KP<br>KP<br>KP<br>KP |
| 1.2 | Site Elevation | • Approximately 260 to 400 mASL | KP |
| 1.3 | Meteorological Parameters | • Average Annual Precipitation: 827 mm<br>• Mean Annual Evaporation: 513 mm | Calder<br>Calder |
| 1.4 | Drainage | • Major Watersheds: 2<br>• Sub Watersheds: 7<br>• Spring Runoff Period: April | Calder<br>Calder<br>Calder |
| 1.5 | Geology | • Rock Types: Deposit - Variety of gabbroic rocks, PSMF - Syenites<br>• Depth to Bedrock: 1.5 to 13.4 m below ground surface<br>• Depth to Water Table: 0 to 2.4 m below ground surface | KP<br>KP<br>KP |
| **2.0** | **Combined Storage Area PSMF Closure Details** | | |
| 2.1 | Cell 1 | • Type 2 process solids to be capped with Type 1 process solids during year 2 of operations<br>• Operating pond to be pumped down, water treated and discharged to Primary Pit at closure<br>• Process solids surface to be seeded for reclamation<br>• Select placement of riprap and mine rock to establish drainage to spillway at west side of Cell 1 to Stream 6 drainage<br>• Placement of mine rock to construct wind breaks and variances in topography<br>• Placement of surface soils on placed mine rock and seeding for reclamation | SCI<br>KP<br>KP<br>KP<br>KP<br>KP |
| 2.2 | Cell 2 | • Water cover to be reduced during last years of operations and local process solids beaches to be established for reclamation<br>• Type 2 process solids to be capped with Type 1 process towards end of deposition to Cell 2<br>• Process solids surface to be seeded for reclamation<br>• Reclamation of process solids surface to continue through closure commencing during last years of operations on local process solids beaches<br>• Select placement of riprap and mine rock to establish drainage to spillway at south side of Cell 2 to Cell 1<br>• Placement of mine rock to construct wind breaks and variances in topography<br>• Placement of surface soils on placed mine rock and seeding for reclamation | SCI<br>SCI<br>SCI<br>KP<br>KP<br>KP |
| 2.3 | Downstream Embankment Slopes | • Bench Height = 30 m<br>• Bench Slope = 2H:1V<br>• Bench Width = 3 m<br>• Overall Slope = 2.1H:1V<br>• Maximum Height = varies with topography (5 to 75 m)<br>• Concurrent reclamation of final downstream slopes during final stages of construction<br>• Trimming of downstream slopes during construction to prepare surface for reclamation<br>• Placement of surface soils and seeding for reclamation<br>• Construction of water bars and ditches on crest and benches to control runoff and prevent erosion<br>• Minimum requirements for long-term stability included in initial design and construction | KP |
| 2.4 | Satellite Pits | • Type 1 material to cover Type 2 material at closure<br>• Water ponds to be pumped to Primary Pit<br>• Surface of Satellite Pits 2, 3 and 4 to be reclaimed | KP |
| 2.5 | Water Management | • Runoff water from Cell 2 to drain to Cell 1 via the spillway at the south side of Cell 2<br>• Runoff water from Cell 1 to Stream 6 drainage via the spillway at the west side of Cell 1<br>• Drainage channels to be graded and lined with riprap or mine rock to establish drainage to spillways<br>• Drainage to Stream 6 to be restored for post closure runoff water management<br>• Runoff water management monitoring at spillway outlet from Cell 1<br>• Runoff water from Satellite Pits 2, 3 and 4 to Primary Pit<br>• Satellite Pit 5 to be connected to watershed to the south | KP |
| 2.6 | Process Solids Delivery and Distribution Systems | • Process solids delivery and distribution pumps and pipelines decommissioned and removed from site<br>• Process solids pipeline roads not required post-closure to be re-graded and seeded for reclamation | KP |
| 2.7 | Reclaim and Excess Water Systems | • Ancillary structures to be decommissioned and removed from site<br>• Water transfer pumps and pipelines to be decommissioned and removed from site<br>• Reclaim pumps and pipelines to be decommissioned and removed from site<br>• Pipeline roads not required for post-closure to be regraded and seeded for reclamation | KP |
| 2.8 | Ongoing Monitoring | • Ongoing monitoring of PSMF to be carried out for period of 5 years following completion of closure measures | KP |
| **3.0** | **MRSA Closure Details** | | |
| 3.1 | Slopes | • Bench Height = 30 m<br>• Bench Slope = 2H:1V<br>• Bench Width = 10 m<br>• Overall Slope = 2.2H:1V<br>• Maximum Height = varies with topography (85 to 180 m)<br>• Grading of slope benches and crest during construction to prepare surfaces for reclamation<br>• Placement of surface soils and seeding for reclamation<br>• Minimum requirements for long-term stability included in initial design and construction | KP |
| 3.2 | Catch Basins | • Catch basin embankments to breached and contoured to suit surrounding topography<br>• Re-grading and re-vegetation of basin and embankment areas<br>• Existing stream beds to be restored | KP |
| 3.3 | Water Management | • Runoff water to drain to Primary Pit and Pic River<br>• Grading and construction of water bars and ditches on crest and benches to control runoff and prevent erosion | KP |
| 3.4 | Runoff Water Management Systems | • Water treatment to be decommissioned and removed from site<br>• Water transfer pumps and pipelines to be decommissioned and removed from site<br>• Access roads not required for post-closure to be re-graded and seeded for reclamation | KP |
| 3.5 | Ongoing Monitoring | • Ongoing monitoring of MRSA to be carried out for period of 5 years following completion of closure measures | KP |

I:\1\01\00446\03\A\Correspondence\NB12-00078 - PSMF & MRSA Conceptual Closure Plan\DRAFT\[Table 1 - CSA PSMF and MRSA Closure Criteria.xls]Table 1-Closure Design Criteria

**NOTES:**

1. DESIGN CRITERIA BASED ON INFORMATION FROM HISTORIC REPORTS, APPLICABLE REGULATIONS AND PERVIOUS EXPERIENCE .

| REV | DATE | DESCRIPTION | PREP'D | CHK'D | APP'D |
|---|---|---|---|---|---|
| A | 01MAR'12 | ISSUED WITH LETTER NB12-00078 (DRAFT) | CNH | KDE | KDE |

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**TABLE 2**

**STILLWATER CANADA INC.**
**MARATHON PGM-Cu PROJECT**

**COMBINED STORAGE AREA PSMF AND MRSA CONCEPTUAL CLOSURE PLAN**
**CONCEPTUAL CLOSURE PLAN PRELIMINARY CAPITAL COST ESTIMATE**

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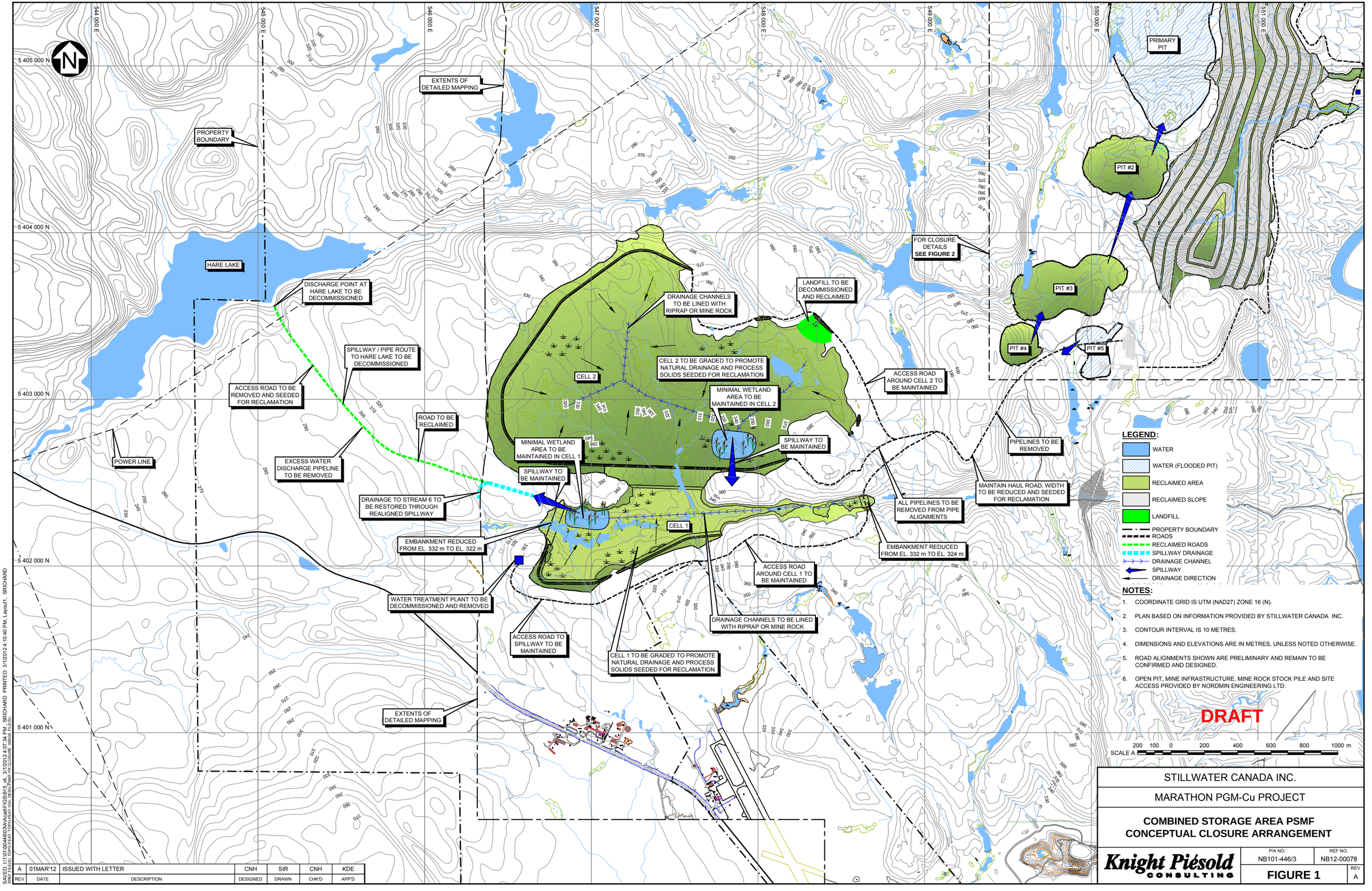
| Item | Description | Unit | Unit Price ($) | Capital Estimate | | Comments |
|---|---|---|---|---|---|---|
| | | | | Quantity | Cost ($) | |
| **1.0** | **Mobilization and Demobilization** | | | | | |
| 1.1 | Mobilization (4% of Items 2 to 4) | Lump Sum | 4% | 1 | $473,000 | |
| 1.2 | Demobilization (2% of items 2 to 4) | Lump Sum | 2% | 1 | $237,000 | |
| | **Subtotal** | | | | **$710,000** | |
| **2.0** | **Combined Storage Area - PSMF Storage Cells** | | | | | |
| ***2.1*** | ***Earthworks*** | | | | | |
| 2.1.1 | Removal/Re-grading of Cell 1 Embankments | $m^3$ | 3.50 | 105,200 | $368,000 | Embankments at the West and East ends of Cell 1 will be reduced in elevation to restore drainage to the west |
| 2.1.2 | Re-grade Cell 1 Process Solids Surface for Drainage | $m^2$ | 0.80 | 377,000 | $302,000 | |
| 2.1.3 | Re-grade Cell 1 Downstream Slope | $m^2$ | 0.80 | 78,000 | $62,000 | Concurrent reclamation during operations |
| 2.1.4 | Re-grade Cell 2 Process Solids Surface for Drainage | $m^2$ | 0.80 | 536,100 | $429,000 | |
| 2.1.5 | Re-grade Cell 2 Downstream Slope | $m^2$ | 0.80 | 313,700 | $251,000 | Concurrent reclamation during operations |
| 2.1.6 | Re-grade - Spillway to Hare Lake | $m^2$ | 0.80 | 41,400 | $33,000 | |
| 2.1.7 | Re-grade and Track walk disturbed areas - Roads, pads and misc. areas. | $m^2$ | 0.80 | 122,000 | $98,000 | |
| 2.1.8 | Place Soil Layer on Cell 1 Downstream Embankment Slopes | $m^2$ | 1.50 | 78,000 | $117,000 | Concurrent reclamation during operations |
| 2.1.9 | Place Soil Layer on Cell 2 Downstream Embankment Slopes | $m^2$ | 1.50 | 313,700 | $471,000 | Concurrent reclamation during operations |
| 2.1.10 | Excavate Drainage Channels | lin. m | 6.50 | 3,400 | $22,000 | |
| 2.1.11 | Supply, Haul and Place Riprap for Drainage Channels | lin. m | 10.50 | 3,400 | $36,000 | |
| 2.1.12 | Place Fill for Access and Wind Breaks on Cell 1 Beach | lin. m | 15.00 | 640 | $10,000 | |
| 2.1.13 | Place Fill for Access and Wind Breaks on Cell 2 Beach | lin. m | 15.00 | 3,000 | $45,000 | |
| | **Item Subtotal** | | | | **$2,244,000** | |
| ***2.2*** | ***Re-vegetation*** | | | | | |
| 2.2.1 | Re-vegetate Cell 1 Process Solids | $m^2$ | 0.30 | 377,000 | $113,000 | |
| 2.2.2 | Re-vegetate Cell 1 Downstream Slope | $m^2$ | 0.30 | 78,000 | $23,000 | Concurrent reclamation during operations |
| 2.2.3 | Re-vegetate Cell 2 Process Solids | $m^2$ | 0.30 | 536,100 | $161,000 | Concurrent reclamation at end of operations |
| 2.2.4 | Re-vegetate Cell 2 Downstream Slope | $m^2$ | 0.30 | 313,700 | $94,000 | Concurrent reclamation during operations |
| 2.2.5 | Re-vegetate Embankment Crests | $m^2$ | 0.30 | 42,400 | $13,000 | |
| 2.2.6 | Re-vegetate Spillway to Hare Lake | $m^2$ | 0.30 | 41,400 | $12,000 | |
| 2.2.7 | Re-vegetate Misc. Access Roads, Pads and Areas | $m^2$ | 0.30 | 122,000 | $37,000 | |
| | **Item Subtotal** | | | | **$453,000** | |
| ***2.3*** | ***Dewatering, Pipework and Appurtenances*** | | | | | |
| 2.3.1 | Dewater Cell 1 to Primary Pit | Lump Sum | 100,000 | 1 | $100,000 | Cell 1 to be dewatered to Primary Pit |
| 2.3.2 | Decommission and Remove Water Treatment Plant | Lump Sum | 120,000 | 1 | $120,000 | |
| 2.3.3 | Remove Cell 2 Reclaim Water Pipeline and Pumps | Lump Sum | 40,000 | 1 | $40,000 | |
| 2.3.4 | Remove Cell 1 Water Transfer Pipeline and Pumps | Lump Sum | 15,000 | 1 | $15,000 | |
| 2.3.5 | Remove Type 1 Process Solids Delivery Pipeline | Lump Sum | 120,000 | 1 | $120,000 | |
| 2.3.6 | Remove Type 2 Process Solids Discharge Pipeline | Lump Sum | 35,000 | 1 | $35,000 | |
| 2.3.7 | Remove Excess Water Discharge Pipeline and Pumps | Lump Sum | 30,000 | 1 | $30,000 | |
| | **Item Subtotal** | | | | **$460,000** | |
| | **Subtotal** | | | | **$3,157,000** | |
| **3.0** | **Combined Storage Area - Satellite Pits** | | | | | |
| ***3.1*** | ***Earthworks*** | | | | | |
| 3.1.1 | Transfer Stockpiled Type 2 Mine Rock to Primary Pit | $m^3$ | 1.00 | 5,000,000 | $5,000,000 | |
| 3.1.2 | Cap Satellite Pit 2 with Type 1 Mine Rock | $m^3$ | 1.00 | 421,300 | $421,000 | Capping of satellite pits to be confirmed with SCI |
| 3.1.3 | Cap Satellite Pit 3 with Type 1 Mine Rock | $m^3$ | 1.00 | 589,200 | $589,000 | Capping of satellite pits to be confirmed with SCI |
| 3.1.4 | Cap Satellite Pit 4 with Type 1 Mine Rock | $m^3$ | 1.00 | 83,400 | $83,000 | Capping of satellite pits to be confirmed with SCI |
| 3.1.5 | Place Soil Layer on Satellite Pit 2 | $m^2$ | 1.50 | 105,400 | $158,000 | |
| 3.1.6 | Place Soil Layer on Satellite Pit 3 | $m^2$ | 1.50 | 147,300 | $221,000 | |
| 3.1.7 | Place Soil Later on Satellite Pit 4 | $m^2$ | 1.50 | 20,900 | $31,000 | |
| 3.1.8 | Grading and Excavation to Connect Satellite Pit 5 to the Southern Drainage | Lump Sum | 500,000 | 1 | $500,000 | Place holder estimate, closure strategy to be confirmed with SCI & Ecometrix |
| | **Item Subtotal** | | | | **$7,003,000** | |
| ***3.2*** | ***Re-vegetation*** | | | | | |
| 3.2.1 | Re-vegetate Satellite Pit 2 | $m^2$ | 0.30 | 105,400 | $32,000 | |
| 3.2.2 | Re-vegetate Satellite Pit 3 | $m^2$ | 0.30 | 147,300 | $44,000 | |
| 3.2.3 | Re-vegetate Satellite Pit 4 | $m^2$ | 0.30 | 20,900 | $6,000 | |
| | **Item Subtotal** | | | | **$82,000** | |
| ***3.3*** | ***Dewatering, Pipework and Appurtenances*** | | | | | |
| 3.3.1 | Transfer Operating Ponds from Satellite Pits 2 and 3 to Primary Pit | Lump Sum | 45,000 | 1 | $45,000 | Satellite Pits to be dewatered to Primary Pit |
| 3.3.2 | Remove Type 1 Process Solids Delivery Pipeline | Lump Sum | 17,000 | 1 | $17,000 | |
| 3.3.3 | Remove Type 2 Process Solids Delivery Pipeline | Lump Sum | 17,000 | 1 | $17,000 | |
| 3.3.4 | Remove Reclaim Water Pipeline and Pumps | Lump Sum | 17,000 | 1 | $17,000 | |
| | **Item Subtotal** | | | | **$96,000** | |
| | **Subtotal** | | | | **$7,181,000** | |
| **4.0** | **Mine Rock Storage Area** | | | | | |
| ***4.1*** | ***Earthworks*** | | | | | |
| 4.1.1 | Grading of Intermediate Slope Benches - includes drainage and water bars | $m^2$ | 0.80 | 149,000 | $119,000 | Concurrent reclamation during operations |
| 4.1.2 | Place Soil Layer on Intermediate Slope Benches | $m^2$ | 1.50 | 149,000 | $224,000 | Concurrent reclamation during operations |
| 4.1.3 | Grading of Crest Areas - includes drainage and water bars | $m^2$ | 0.80 | 247,000 | $198,000 | |
| 4.1.4 | Place Soil Layer on Crest Areas | $m^2$ | 1.50 | 247,000 | $371,000 | |
| 4.1.5 | Place Fill for Wind Breaks on Crest | lin. m | 7.00 | 800 | $6,000 | |
| 4.1.6 | Removal/Re-grading of Catch Basin Embankments | $m^3$ | 3.50 | 52,800 | $185,000 | |
| 4.1.7 | Transfer Sediment from Catch Basins to Cell 1 or Satellite Pit | $m^3$ | 8.00 | 17,600 | $141,000 | |
| 4.1.8 | Re-grading of Catch Basins to Restore Drainage | $m^2$ | 0.80 | 35,100 | $28,000 | |
| | **Item Subtotal** | | | | **$1,244,000** | |
| ***4.2*** | ***Re-vegetation*** | | | | | |
| 4.2.1 | Re-vegetate Intermediate Slope Benches | $m^2$ | 0.30 | 149,000 | $45,000 | Concurrent reclamation during operations |
| 4.2.2 | Re-vegetate Crest Area | $m^2$ | 0.30 | 247,000 | $74,000 | |
| 4.2.3 | Re-vegetate Catch Basin Areas | $m^2$ | 0.30 | 48,000 | $14,000 | |
| | **Item Subtotal** | | | | **$133,000** | |
| ***4.3*** | ***Dewatering, Pipework and Appurtenances*** | | | | | |
| 4.3.1 | Dewater Catch Basins | Lump Sum | 15,000 | 1 | $15,000 | |
| 4.3.2 | Decommission and Remove Water Treatment Plant | Lump Sum | 60,000 | 1 | $60,000 | |
| 4.3.3 | Remove Stormwater Management Pipework | Lump Sum | 40,000 | 1 | $40,000 | |
| | **Item Subtotal** | | | | **$115,000** | |
| | **Subtotal** | | | | **$1,492,000** | |
| **5.0** | **Engineering** | | | | | |
| 5.1 | Detailed Engineering, Construction Supervision and Testing (5% of Items 2 to 4) | Item | 5% | 1 | $592,000 | |
| | **Subtotal** | | | | **$592,000** | |
| **6.0** | **Post Closure Monitoring** | | | | | |
| 6.1 | Annual Inspection of PSMF (Initial 5 yr Period) | Years | 50,000 | 5 | $250,000 | |
| 6.2 | Annual Inspection of MRSA (Initial 5 yr Period) | Years | 50,000 | 5 | $250,000 | |
| | **Subtotal** | | | | **$500,000** | |
| | **Total** | | | | **$13,632,000** | |

I:\1\01\00446\03\A\Correspondence\NB12-00078 - PSMF & MRSA Conceptual Closure Plan\DRAFT\[Table 2_PSMF & MRSA Closure Cost Estimate.xls]Closure Cost Estimate

**NOTES:**

1. QUANTITIES ARE NEAT LINE ESTIMATES.
2. UNIT RATES ARE ESTIMATES ONLY GIVEN IN CANADIAN DOLLARS.
3. ESTIMATES FOR UNIT RATES ARE IN NET PRESENT DOLLARS AND NO ESCALATION HAS BEEN APPLIED FOR FUTURE WORK.

| REV | DATE | DESCRIPTION | PREP'D | CHK'D | APP'D |
|---|---|---|---|---|---|
| A | 01MAR'12 | ISSUED WITH LETTER NB12-00078 (DRAFT) | CNH | RDW | KDE |




**NOTES:**

1. COORDINATE GRID IS UTM (NAD27) ZONE 16 (N).
2. PLAN BASED ON INFORMATION PROVIDED BY STILLWATER CANADA INC.
3. CONTOUR INTERVAL IS 10 METRES.
4. DIMENSIONS AND ELEVATIONS ARE IN METRES, UNLESS NOTED OTHERWISE.
5. ROAD ALIGNMENTS SHOWN ARE PRELIMINARY AND REMAIN TO BE CONFIRMED AND DESIGNED.
6. OPEN PIT, MINE INFRASTRUCTURE, MINE ROCK STOCK PILE AND SITE ACCESS PROVIDED BY NORDMIN ENGINEERING LTD.

DRAFT

SCALE A 200 100 0 200 400 600 800 1000 m

| REV | DATE | DESCRIPTION | DESIGNED | DRAWN | CHK'D | APP'D |
|---|---|---|---|---|---|---|
| A | 01MAR'12 | ISSUED WITH LETTER | CNH | SIR | CNH | KDE |

STILLWATER CANADA INC.

MARATHON PGM-Cu PROJECT

**COMBINED STORAGE AREA PSMF CONCEPTUAL CLOSURE ARRANGEMENT**

Knight Piésold CONSULTING

| P/A NO. | REF NO. |
|---|---|
| NB101-446/3 | NB12-00078 |

**FIGURE 1** REV A

SAVED: I:\1\01\00446\03\A\Acad\FIGS\B16_rA , 3/1/2012 4:07:42 PM , SRICHARD PRINTED: 3/1/2012 4:13:05 PM, Layout1, SRICHARD
XREF FILE(S): TOPO-FEAT; TOPO-CONT-2m; DESG-PSMF-YR CLOSURE IMAGE FILE(S):

549 500 E | 550 000 E | 550 500 E | 551 000 E | 551 500 E | 552 000 E

5 407 000 N | 5 406 500 N | 5 406 000 N | 5 405 500 N | 5 405 000 N | 5 404 500 N | 5 404 000 N | 5 403 500 N

RUNOFF CATCH BASINS TO BE BREACHED, REGRADED RECLAIMED. LOCAL STREAM BEDS TO BE RESTORED

POWER LINE

PIC RIVER

PROPERTY BOUNDARY

MRSA CREST TO BE GRADED AND SEEDED FOR RECLAMATION

SLOPE BENCHES GRADED AND SEEDED FOR RECLAMATION (CONCURRENT RECLAMATION DURING OPERATIONS)

OUTLET FROM PRIMARY PIT TO BE CONFIRMED

PRIMARY PIT TO BE FLOODED AT CLOSURE

RUNOFF WATER MANAGEMENT PIPEWORK TO BE REMOVED FROM ACCESS ROAD

WATER TREATMENT PLANT TO BE DECOMMISSIONED AND REMOVED

RUNOFF CATCH BASINS TO BE BREACHED, REGRADED RECLAIMED. LOCAL STREAM BEDS TO BE RESTORED

SATELLITE PITS #2, #3 AND #4 TO DRAIN TO PRIMARY PIT

PROPERTY BOUNDARY

ACCESS ROAD ALONG TOE OF MRSA TO BE MAINTAINED

PIT #2

PIT #3

PIT #4

PIT #5

SATELLITE PITS #2, #3 AND #4 TO BE CAPPED WITH TYPE 1 MINE ROCK AND RECLAIMED

SATELLITE PIT #5 TO BE FLOODED FOR FISH HABITAT

SATELLITE PIT #5 TO DRAIN TO THE SOUTH

PLANT INFRASTRUCTURE DECOMMISSIONED AND REMOVED

**LEGEND:**

- WATER
- WATER (FLOODED PIT)
- RECLAIMED AREA/CREST
- RECLAIMED SLOPE
- PROPERTY BOUNDARY
- ROADS
- RECLAIMED ROADS
- SPILLWAY DRAINAGE
- DRAINAGE CHANNEL
- SPILLWAY
- DRAINAGE DIRECTION
- WATER TREATMENT PLANT

**NOTES:**

1. COORDINATE GRID IS UTM (NAD27) ZONE 16N AND IS IN METRES.
2. PLAN BASED ON INFORMATION PROVIDED BY STILLWATER CANADA INC.
3. CONTOURS ARE IN METRES. CONTOUR INTERVAL IS 10 METRES.

DRAFT

SCALE A 100 50 0 100 200 300 400 500 m

| REV | DATE | DESCRIPTION | DESIGNED | DRAWN | CHK'D | APP'D |
|---|---|---|---|---|---|---|
| A | 01MAR'12 | ISSUED WITH LETTER | CNH | SIR | CNH | KDE |

STILLWATER CANADA INC.

MARATHON PGM-Cu PROJECT

**MINE ROCK STORAGE AREA**
**CONCEPTUAL CLOSURE ARRANGEMENT**

Knight Piésold CONSULTING

P/A NO. NB101-446/3 | REF NO. NB12-00078

**FIGURE 2** | REV A