



February 28, 2006

Kennecott Greens Creek Mining Company
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Mr. Eric Sundberg, P.E.
Civil Engineer - Surface Operations

Dear Mr. Sundberg:

Kennecott Greens Creek Mining Company
Tailings Disposal Facility
2004 - 2005 Southeast Tailings Expansion, Construction Summary

We are pleased to submit ten (10) copies of our report titled “2004 – 2005 Southeast Tailings Expansion, Construction Summary”.

Please feel free to contact us if you have any questions.

Yours truly,

KLOHN CRIPPEN CONSULTANTS LTD.

Robert W. Chambers, P.Eng. (B.C.)
Project Manager

RWC:dl



EXECUTIVE SUMMARY

This report provides a record of the construction for the Southeast Tailings Expansion Areas 1 and 2 (SE1 and SE2) carried out in 2004 and 2005, respectively at Greens Creek Mine. These areas are lined and form part of the Stage 2 Expansion for the existing Tailings Storage Facility.

The scope of work is described for both construction years. However, the construction of the new truck wash structure is not included in this report and the construction of water retention Pond 7 is reported separately. The project organization, weather during construction, equipment used, the construction schedule, and materials used are provided. Construction record drawings based on survey data and visual observations by Klohn Crippen (KC) and Kennecott Greens Creek Mining Company (KGCMC) are also included.

Differences from the original design are described in the report, and possible effects due to the modifications are noted. In general, the modifications are expected to have minor to no effects on the long-term performance of the facility. However, monitoring of the facility is recommended to confirm adequate performance. Recommended monitoring includes reading instrumentation and measuring water flow and quality from foundation and liner drains. This data should be collected and reviewed regularly as part of an integrated monitoring program for the entire facility.

Based on field observations and tests performed by Klohn Crippen and KGCMC, as documented, Klohn Crippen's opinion is that the geotechnical aspects of the construction of the 2004 and 2005 Southeast Tailings Expansion areas achieve the design intent.

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1. INTRODUCTION

Greens Creek Mine is a polymetallic mine located about 18 miles southwest of Juneau, Alaska on northern Admiralty Island (Drawing D-39001). The mine is jointly owned by HECLA and Kennecott Greens Creek Mining Company (KGCMC) and is operated by KGCMC.

Mine tailings are dewatered at the mill site. About one-half of the tailings are used as backfill in the mine, and the remainder is stored on the surface at the Tailings Storage Facility (TSF). A multiple-stage incremental expansion of the TSF began in 2004 and will continue until 2007. The expansion will accommodate the projected tailings storage requirements and increase the storm water handling capacity. Part of the 2005 construction included water retention Pond 7. Pond 7 construction is reported separately.

The 2004 and 2005 TSF expansion work included:

- excavation and grade preparation,
- installation of a groundwater drainage and collection system,
- placement of a geomembrane liner system (with associated granular bedding and service layers),
- installation of drainage collection and monitoring systems,
- construction of surface water and groundwater management structures,
- construction of foundations for a new truck wash and de-gritting basin,
- realignment of the B-Road,
- demolition of the old truck wash and Tank 6,
- decommissioning, relocation, or extension of utilities to Pond 6 or Pond 7 as required upon removal of Tank 6.

In general, the work was carried out near the southeast corner of the TSF and southwest of Pond 6 (Drawing D-39002).

The civil work was designed by Klohn Crippen (KC) with input from KGCMC. The design was originally detailed in the report titled Stage 2 Tailings Facility Expansion – Design Overview for Forest Service Submission, April 8, 2004, and was updated and detailed in late 2004 and early 2005.

Design and construction of the SE1/SE2 expansion was as follows:

- KC designed the earthworks;
- Glacier State constructed the 2004 (SE1) expansion area, except for the liner system;
- Channel Construction constructed the 2005 (SE2) expansion area except for the liner system;
- Northwest Linings and Geotextile Products Inc. (NLGP) designed and installed the lining system for both areas; and
- Aqua-Wash Equipment Ltd. supplied and constructed the new truck wash building and truck wash system.

KGCMC provided overall construction and contract management. KGCMC retained Klohn Crippen to monitor portions of the civil construction. The work observed by Klohn Crippen is indicated on the construction schedules. KGCMC monitored construction when KC was not on site. The construction of the new truck wash building and wash system in 2004 was not monitored by KC. The preparation of the building foundation was monitored by KC.

KGCMC Environment monitored the environmental compliance of the project.

This construction summary report was compiled by Klohn Crippen on behalf of KGCMC, with input from KGCMC and NLGP.

This report is a summary of the 2004 and 2005 construction monitoring. Selected photographs taken during construction are attached in Appendix I. The 2005 construction record drawings were prepared by Klohn Crippen based on input from KGCMC, on observations made during construction and on survey data provided by KGCMC. The 2004 construction record drawings were prepared by KGCMC and are in Appendix VI.

2. SCOPE OF WORK

The key common elements of the 2004 and 2005 construction are as follows:

- Excavate, haul and dispose weak and loose materials from the foundation including peat, organic material, soil, oversize rock, stockpiled waste and other deleterious materials.
- Produce screened sand and crushed rock for use in construction.
- Contour the geomembrane-lined portions of the foundation with a minimum 2% grade and a maximum 33% grade or as directed for field fit.
- Proof-roll the graded foundation. Excavate, remove and replace soft or deleterious materials with compacted rock fill.
- Install a groundwater collection and drainage system in the foundation.
- Place grading (foundation) fill as required for the tailings expansion areas.
- Install new instrumentation and extension of the existing instrument leads in conduits within the foundation or bedding layer and service layer, as directed, with connection to a monitoring system.
- Construct the geomembrane-liner system in the tailings expansion area and portions of the new truck wash site by placing the following: a layer of bedding sand over the prepared foundation; a layer of non-woven geotextile; a layer of HDPE geomembrane; a layer of geocomposite drain; and a service layer of sand or sand and tailings.
- Connect the new liner system to the existing liner system. Construct seepage collection drains for the geocomposite drain layer of the new liner system, and connect them to the existing TSF seepage collection system or other specified collection points.
- Construct geomembrane-lined surface water collection ditches and sediment control ponds along the perimeter of the work area.

Elements specific to 2004 construction included:

- Place grading (foundation) fill as required for the new truck wash, the de-gritting basin, an approach ramp off the TSF and an exit ramp onto the B-Road.
- Realign and construct a section of the B-Road near Mile 1.2. Install culverts, construction of lined interception ditches and French drain(s) along the eastern side of the realigned road section and connect them to existing ditches and drains.
- Install a water supply pipe to the new truck wash reservoir tank, including trenching, pipe welding and trench-backfilling. Relocate service lines (i.e., water, electrical and communication services), including excavation of the utility corridor and utility bedding. Install sub-drains around the building foundation.

Elements specific to the 2005 construction included:

- Relocate electrical, water and communication utilities as directed (not detailed in this report).
- Demolish, decontaminate and remove Tank 6, the old Truck Wash and their respective foundations from Southeast 2.

3. PROJECT ORGANIZATION

Figure 3.1 shows the project organization and key personnel for the 2004 construction work and Figure 3.2 shows the project organization and key personnel for the 2005 construction work.

Contractors retained by KGCMC for related work not covered in this report were as follows:

- Glacier State Contractors Ltd. (Glacier) – to quarry and crush rock for the 2004 and 2005 construction and for general mine use.
- Aqua-Wash Equipment Ltd. (Aqua-Wash) – to supply and construct the new truck wash building, truck wash system and ancillary equipment in 2004.
- Chatham Electrical Inc, (Chatham) – in 2004 and 2005 to supply electrical installation and utility removal and relocation.
- The Pyxis Enterprise (Pyxis) – in 2004 and 2005 to supply electrical construction management for utility installation.
- M3 Engineering (M3) – in 2004 to supply electrical engineering for utility relocations.

4. CONSTRUCTION EQUIPMENT

Construction equipment used by Glacier in 2004 is summarized in Table 4.1. Construction equipment used by Channel in 2005 is summarized in Table 4.2.

Table 4.1 2004 Construction Equipment (Glacier)

EQUIPMENT TYPE	MAKE/MODEL	OWNER	AREA OF WORK
Excavator	Hitachi 450 LHC	Glacier	- Foundation preparation and excavation - Rock crushing - Excavation of pipe trenches
	Hitachi 330LC		
	Hitachi 200 LC		
	Caterpillar 330	KGCMC	
Bulldozer	Caterpillar D8R	Glacier	- Foundation preparation - Spreading and contouring of rock fill - Grading of final surfaces
	Caterpillar D4H LGP		
Front-End Loader	Caterpillar 980G	Glacier	- Loading trucks - Placement of fill
	Caterpillar 966		
Off-Road Rock Truck	Volvo A25C	Glacier	- Hauling fill material
	Moxie 25 Ton	Glacier (rental)	
Vibratory Compactor	Caterpillar CS-563	KGCMC	- Proof-rolling exposed foundation and compacting placed fill
	Ingersoll-Rand CS150	Glacier	
Jaw Crusher	Extec	Glacier	- Producing 6 inch minus rockfill
Soil Screening Plant (2)	Nordberg	Glacier	- Screening bedding and service layer sand at A-Road Pit
Rock Drill	Ingersoll-Rand EMC 580	Glacier	- Drilling quarry high wall
Hydro Seeder	Finn	Glacier	- Watering roads and fill prior to compaction
Grader	Caterpillar	KGCMC	- General site grading
Water Truck	-	KGCMC (rental)	- Watering roads and fill prior to compaction
Pipe Welder	-	KGCMC	- Making connections for HDPE pipe.

Table 4.2 2005 Construction Equipment (Channel)

EQUIPMENT TYPE	MAKE/MODEL	OWNER	AREA OF WORK
Excavator	Caterpillar 315CL	KGCMC	- Foundation preparation and excavation - Rock crushing - Excavation of pipe trenches
	Hitachi 450LC	Channel Construction	
	Caterpillar 330C		
	Hitachi 350		
Bulldozer	Caterpillar D6H XL	KGCMC	- Foundation preparation - Spreading and contouring of rock fill - Grading of final surfaces
	Caterpillar D8K	Channel Construction	
	Caterpillar D10R		
Front-End Loader	Caterpillar 988	Channel Construction	- Loading trucks - Placement of fill
	Volvo L220E		
Off-Road Rock Truck	Volvo A30C (2)	Channel Construction	- Hauling fill material
	Volvo A25C		
	Caterpillar 745		
Highway Dump Truck	Kenworth (2)	Channel Construction	- Hauling fill material
Vibratory Compactor	Caterpillar CS-563C	Channel Construction	- Proof-rolling exposed foundation and compacting placed fill
Forklift	Caterpillar TH 83	Channel Construction	- Placing pipes and geofabrics
	Caterpillar IT 18C		
Backhoe	Caterpillar 416B	KGCMC	- Excavating ditches and instrumentation pits
Jaw Crusher	Extec	Channel Construction	- Producing 6 inch minus rockfill
Soil Screening Plant	Extec	Channel Construction	- Screening bedding and service layer sand at A-Road Pit
Water Truck	Kenworth	Channel Construction	- Watering roads and fill prior to compaction
Pipe Welder		KGCMC	- Making connections for HDPE pipe.

5. CONSTRUCTION SCHEDULE

Figure 5.1 shows the schedule for the 2004 construction by Glacier. Portions of the site excavation were done by Glacier in the spring of 2004 under separate contract to KGCMC, and are not shown on Figure 5.1. Figure 5.2 shows the schedule for the 2005 construction by Channel.

6. WEATHER

The weekly weather conditions during construction are summarized on the construction schedules in Figures 5.1 and 5.2.

6.1 2004 Weather

Weather conditions in June 2004 and the first half of July were generally clear and warm, with infrequent overcast and light rain. Weather conditions in the latter half of July saw increasing cloud and rain. A thunderstorm with heavy rain occurred on July 24, 2004. No significant damage to the tailings facility was observed.

Weather conditions in August alternated between overcast with some light rain, and clear warm conditions. Temperatures were generally lower than in June and July. Heavy rain on the afternoon of August 19, 2004 resulted in minor erosion of the service layer sand in and around the uncompleted liner system drains. This erosion was subsequently repaired by Glacier.

Weather conditions in early September were generally overcast with rain. Anecdotal reports from KGCMC staff indicated an increasing frequency and intensity of rain showers throughout the month. A rain storm on or around September 25, 2004 caused a drainage failure on the B-Road and consequent service layer erosion in the northeast corner of the Southeast 1 Expansion Area. KGCMC reports that this area was repaired in spring of 2005 when the tailings pile was raised to an elevation that would permit access to the eroded area.

6.2 2005 Weather

Weather conditions in late May were generally clear, with infrequent overcast and light rain. Weather conditions in June alternated between overcast and light rain to clear and sunny. July was generally overcast, with frequent rain. August was somewhat drier than July, but

had a couple days towards the end of the month with heavy rain which caused some erosion of the exposed sand service layer. September and October were cooler than the summer months, and had an average amount of rain compared to historical data.

7. MATERIALS

7.1 6-Inch Minus Rock Fill

Source and Production Method

Rock Fill was quarried from Pond No. 7 foundation, about 1,200 ft west of the SE work site. The quarry bedrock is generally a talcy, sericitic phyllite or graphitic phyllite. The rock was fragmented by drill and blast methods, crushed in the quarry, and then stockpiled along the southern edge of the quarry or placed as it was produced. Excess material was stockpiled in Pit 5.

QA/QC Summary

Gradation test results, carried out by Klohn Crippen in 2004, for the 6-inch minus rock fill are summarized in Appendix IV. Glacier did not submit any QC test results. No testing was carried out in 2005. Based on the test results, the 6-inch minus rock fill was generally coarser than the limits specified. However, the material was approved for use in both 2004 and 2005 construction.

7.2 Pit-Run Rock Fill

Source and Production Method

Rock was quarried at Pond 7. The quarry bedrock is generally a talcy, sericitic phyllite or graphitic phyllite. The pit-run rock fill was produced by drill and blast methods and placed in designated areas without additional crushing. The maximum diameter specified for the pit-run rock fill was 3 ft. Pit-run rock fill (as specified) was used in the south west corner of SE2 up to within 1.5 ft of the final grade surface.

QA/QC Summary

QC tests were not required for the pit-run rock fill.

7.3 Sand

Source and Production Method

Sand was borrowed from the pit developed by KGCMC at Mile 1.5 of the A-Road in 2004 and 2005. The sand was screened at the pit. Most of the sand was processed in a 2-deck (3 including a primary grizzly) Extec vibratory screening plant using both 1/2-inch square screens and 3/8-inch slotted screens on the bottom deck.

QA/QC Summary

Gradation tests by KGCMC and KC on samples collected by KC for the sand are summarized in Appendix IV. Samples were collected from the borrow area and as-placed in the Works. Two gradation test results submitted by Channel, on samples collected from the A-Road Pit during sand production are also in Appendix IV. Glacier did not submit any QC test results. Density test results on compacted in-place bedding sand are summarized in Table 7.1 and density test results on compacted in-place service layer sand are summarized in Table 7.2.

Table 7.1 Density Testing for Bedding Sand

DATE	TEST METHOD	DRY DENSITY (PCF) ¹	MOISTURE CONTENT (%) ¹	STD. PROCTOR (%) ²
9-Aug-2004	Nuclear Gauge	133.0	9.3	98.7
9-Aug-2004	Nuclear Gauge	134.0	9.5	99.5
9-Aug-2004	Nuclear Gauge	134.5	9.1	99.9
26-Jun-2005	Rubber Balloon	131.0	7.4	100.2
26-Jun-2005	Rubber Balloon	128.8	7.0	98.5
26-Jun-2005	Rubber Balloon	122.1	8.1	93.4 ³
27-Jun-2005	Rubber Balloon	126.0	5.2	96.4 ³

Notes:

1. The standard Proctor maximum dry density used for the bedding sand was 134.7 pcf at optimum moisture content of 10.3% in 2004 and 130.7 pcf at optimum moisture content of 11.0% in 2005 (tested by Klohn Crippen at KGCMC's 920 Area laboratory).
2. The 2004 specification required a minimum of 95% of Standard Proctor maximum dry density and the 2005 specification required a minimum of 98% of Standard Proctor maximum dry density.
3. The bedding sand received additional compaction after the test was done, and the results were accepted by KC and KGCMC.

Table 7.2 Density Testing for Service Layer Sand

DATE	TEST METHOD	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	STD. PROCTOR (%)
12-Aug-2005	Nuclear Gauge	136.3	7.9	102.9
12-Aug-2005	Nuclear Gauge	132.8	5.9	100.2
12-Aug-2005	Nuclear Gauge	129.5	6.7	97.7
12-Aug-2005	Nuclear Gauge	133.8	8.1	101.0
12-Aug-2005	Nuclear Gauge	133.9	7.8	101.1

Note:

1. The standard Proctor maximum dry density used for the service layer sand in 2005 was 132.5 pcf at optimum moisture content of 11.0% (tested by Klohn Crippen at KGCMC's 920 Area laboratory).

7.4 Drain Gravel

Source and Production Method

Drain gravel used in the foundation and liner system drains was imported by KGCMC to Greens Creek Mine by barge from the Jack Cewe Pit in B.C., Canada and provided for

Glacier and Channel in stockpiles. The drain gravel consisted of sound particles and was uniformly graded, from ¾-inch to ¼-inch diameter, as specified.

QA/QC Summary

Gradation test results for the drain gravel are summarized in Appendix IV. Glacier and Channel were not required to submit QC test results for the drain gravel.

7.5 Geofabrics

Source

KGCMC purchased geofabrics from Northwest Linings and Geotextile Products Inc. (NLGP) of Kent, Washington, and provided them for Glacier and Channel. Summary information for the geofabrics is given in Tables 7.3 and 7.4. Material specification sheets are given in Appendix III.

Table 7.3 2004 Geofabrics

GEOFABRIC	MANUFACTURER / DESCRIPTION	LOCATION / USAGE	INSTALLER
95-mil Non-Woven Geotextile	PermeaTex 4100 non-woven needle punched polypropylene	Liner System	NLGP
80-mil Textured HDPE Geomembrane	Supplied by NLGP	Liner System	NLGP
Geocomposite Drain	PermeaTex Geocomposite	Liner System	NLGP
70-mil Non-Woven Geotextile	SI Geosolutions Geotex 801 non-woven needle punched polypropylene	Foundation Drains, Liner System Drains	Glacier
20-mil Woven Geotextile	SI Geosolutions Geotex 315 woven slit-film polypropylene	B-Road Foundation	Glacier
36-mil Reinforced Polypropylene Geomembrane	Supplied by NLGP	Ditch Lining, Containment Barrier	NLGP / Glacier

Table 7.4 2005 Geofabrics

GEOFABRIC	MANUFACTURER / DESCRIPTION	LOCATION / USAGE	INSTALLER
100-mil Non-Woven Geotextile	SI Geosolutions GEOTEX 1001 nonwoven needle punched polypropylene	Liner System	NLGP/Channel
80-mil Textured HDPE Geomembrane	Huitex HX200 Textured HDPE Geomembrane	Liner System	NLGP/Channel
Geocomposite	Poly Flex 10oz/6oz HDPE Geocomposite	Liner System	NLGP/Channel
100-mil Non-Woven Geotextile	SI Geosolutions GEOTEX 1001 nonwoven needle punched polypropylene	Foundation Drains	Channel
36-mil Reinforced Polypropylene Geomembrane	Supplied by NLGP	Ditch Lining, Containment Barrier	NLGP/Channel

QA/QC Summary

Field quality control testing of the liner system components was carried out by NLGP. Results are given in Appendix IV.

7.6 Drain Pipe

Source

KGCMC provided HDPE drain pipe for Glacier and Channel. Summary information for the drain pipe is given in Tables 7.5 and 7.6. Material specification sheets are given in Appendix III.

Table 7.5 2004 HDPE Drain Pipe

PIPE TYPE	MANUFACTURER / DESCRIPTION	LOCATION / USAGE	INSTALLER
6-Inch Perforated (SDR 9)	PolyPipe	Liner System Drains, Foundation Drains	Glacier
6-Inch Perforated (SDR 11)	PolyPipe	Foundation Drains	Glacier
8-Inch Perforated (SDR 9)	PolyPipe	Liner System Drains	Glacier
8-Inch Perforated (SDR 11)	PolyPipe	Foundation Drains	Glacier
16-Inch Solid	PolyPipe	Truck Wash Drain	Glacier

Table 7.6 2005 HDPE Drain Pipe

PIPE TYPE	MANUFACTURER/ DESCRIPTION	LOCATION/ USAGE	INSTALLER
6-Inch Perforated (SDR 9)	PolyPipe	Liner System Drains, Foundation Drains	Channel
6-Inch Perforated (SDR 11)	PolyPipe	Foundation Drains	Channel
8-Inch Perforated (SDR 9)	PolyPipe	Liner System Drains	Channel
8-Inch Perforated (SDR 11)	PolyPipe	Foundation Drains	Channel

QA/QC Summary

No QA/QC testing was required for the HDPE pipes, however KGCMC inspected several pipe welds for integrity.

8. DESIGN CHANGES BY DESIGN ENGINEER

8.1 2004 Design Changes

The following design changes were made by Klohn Crippen to address field conditions:

- A small section (approximately 4 ft) of the northern end of the geomembrane containment flap on the tailings expansion area perimeter berm was breached to permit drainage into the northern perimeter liner drain.
- The southwest edge of Southeast 1 tailings expansion area was adjusted to accommodate continued use of the old truck wash until 2005.

8.2 2005 Design Changes

The following design changes were made by Klohn Crippen to address field conditions:

- The final design grade on SE2 was field fit to account for bedrock outcrops encountered during the foundation excavation.
- The ditch grade was steepened in the northern portion of the west SE2 ditch to avoid excavating and relocating the 16-inch and 8-inch drain pipes from SE1.
- A rock fill toe berm was constructed along the southeast edge of SE2 to improve the safety factor for potential sliding along the liner.

9. MODIFICATIONS BY OWNER

Modifications initiated by the Owner during the 2004 and 2005 construction are listed in Appendix II and are provided for completeness of the construction record. These modifications were made to make use of available materials, to expedite construction, or at the request of the Contractor. The modifications by Owner should not significantly affect the long-term performance of the facility, and in some cases have enhanced the construction. Also no special performance monitoring is required, beyond that listed in Section 11, as a result of these modifications.

10. INSTRUMENTATION

KGCMC Environment staff installed vibrating wire piezometers and suction lysimeters under the liner in the foundation stratum of the tailings expansion area at two locations in 2004 (see Appendix VI Dwg. 4). Leads from instruments installed during the 2002 tailings expansion were extended through the 2004 and 2005 tailings expansion area underneath the liner to the outer perimeter of the SE2 tailings area (see Drawing D-39015). Installation records are retained on file by KGCMC Environment.

In May, 2005, two vibrating wire piezometers and four suction lysimeters were installed above the liner in the tailings covering the SE1 area. KGCMC reports that one of the vibrating wire piezometers (DH05-20) was destroyed in the fall of 2005.

11. FOLLOW UP WORK

11.1 Monitoring

Instrumentation, drain flow and water quality readings should be consistently taken for performance evaluation of the Southeast area. In this regard, monitoring of the Southeast area of course would be added to the overall quality assurance program for the facility, with appropriate levels of performance accounting, to be completed by the Owner.

Monitoring and inspection items for the Southeast area should include the following:

- Piezometers installed under the liner, to confirm that the foundation French drains are functioning properly and that there is no significant pore pressure build-up under the liner.
- Lysimeters installed under the liner, as a check for leakage through the liner.
- The foundation and tailings piezometers, to ensure that allowable pressures are not exceeded.
- Flow rate, turbidity and chemistry of water from the foundation French drains, to help define seepage patterns, integrity of liner and detect internal erosion. Background profiles should be established for comparison of future data. The flow data should be reviewed against local rainfall data to estimate time lag.
- Flow rate and turbidity of water from the liner drains, to help define seepage patterns, integrity of liner and pipe system, and detect internal erosion. These data should be reviewed against local rainfall data to estimate time lag.
- Visual inspections, to check for deformation of the tailings pile, ditches and related infrastructure.
- Surface ditch inspections, to check for excessive sedimentation or damage and cleaned or maintained as required.
- Visual inspection of the containment and expansion areas, including the new truck wash foundation, to check for indications of excessive settlement, unusual seepages, damage to containment or ditch liners and the like.

Frequency of routine monitoring should be reviewed annually. More frequent monitoring should be carried out following an earthquake or flood or if problems develop. For these special conditions, the appropriate frequency will depend on the severity of the event and should be decided in consultation with qualified design engineers.

12. COMPLIANCE WITH DESIGN

Based on field observations and tests performed by Klohn Crippen and KGCMC, as documented in this report, Klohn Crippen's opinion is that the geotechnical aspects of the construction of the 2004 and 2005 Southeast Tailings Expansion areas achieve the design intent. Construction modifications noted in Section 9 are not significant enough to cause structural integrity issues and overall risk of stability and settlement related problems are considered to be very low.

13. USE OF REPORT

As a mutual protection to Kennecott Greens Creek Mining Company, the public, and ourselves, all reports and drawings are submitted for the confidential information of Kennecott Greens Creek Mining Company, for a specific project and authorization for use and/or publication of data, statements, conclusions, or abstracts from or regarding our reports and drawings is reserved pending our written approval.

This report was prepared by Klohn Crippen Consultants Ltd. for the account of Kennecott Greens Creek Mining Company. The material in it reflects Klohn Crippen's best judgment in light of the information available to it at the time of preparation. Any use which a Third Party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such Third Parties. Klohn Crippen Consultants Ltd. accepts no responsibility for damages, if any, suffered by any Third Party as a result of decisions made or actions based on this report.

KLOHN CRIPPEN CONSULTANTS LTD.

Robert W. Chambers, P.Eng. (B.C.)
Project Manager

Len Murray, P.E.
Senior Geotechnical Engineer

FIGURES

- Figure 3.1 2004 Project Organization Chart**
- Figure 3.2 2005 Project Organization Chart**
- Figure 5.1 2004 Construction Schedule**
- Figure 5.2 2005 Construction Schedule**

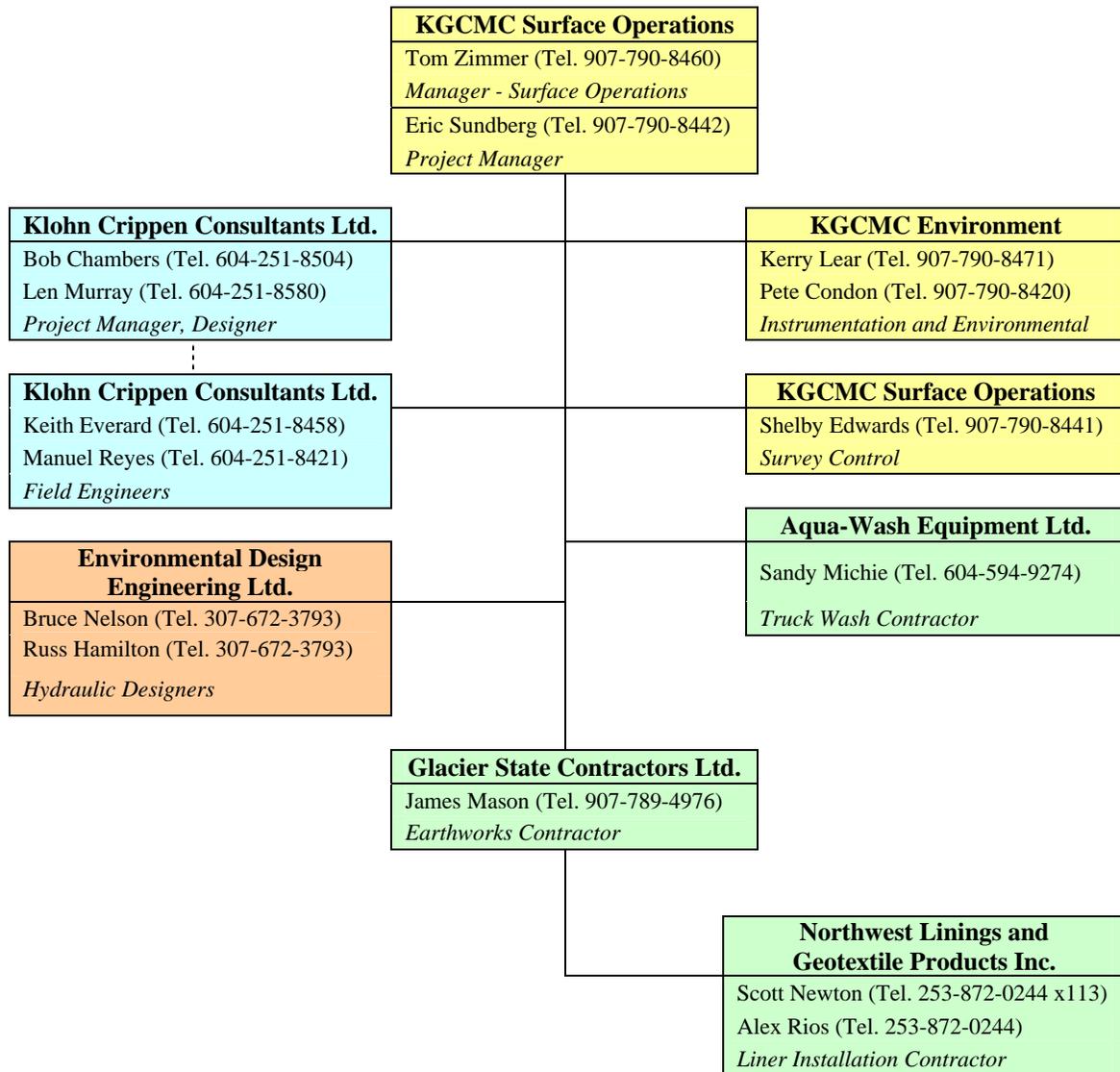


Figure 3.1 2004 Project Organization Chart

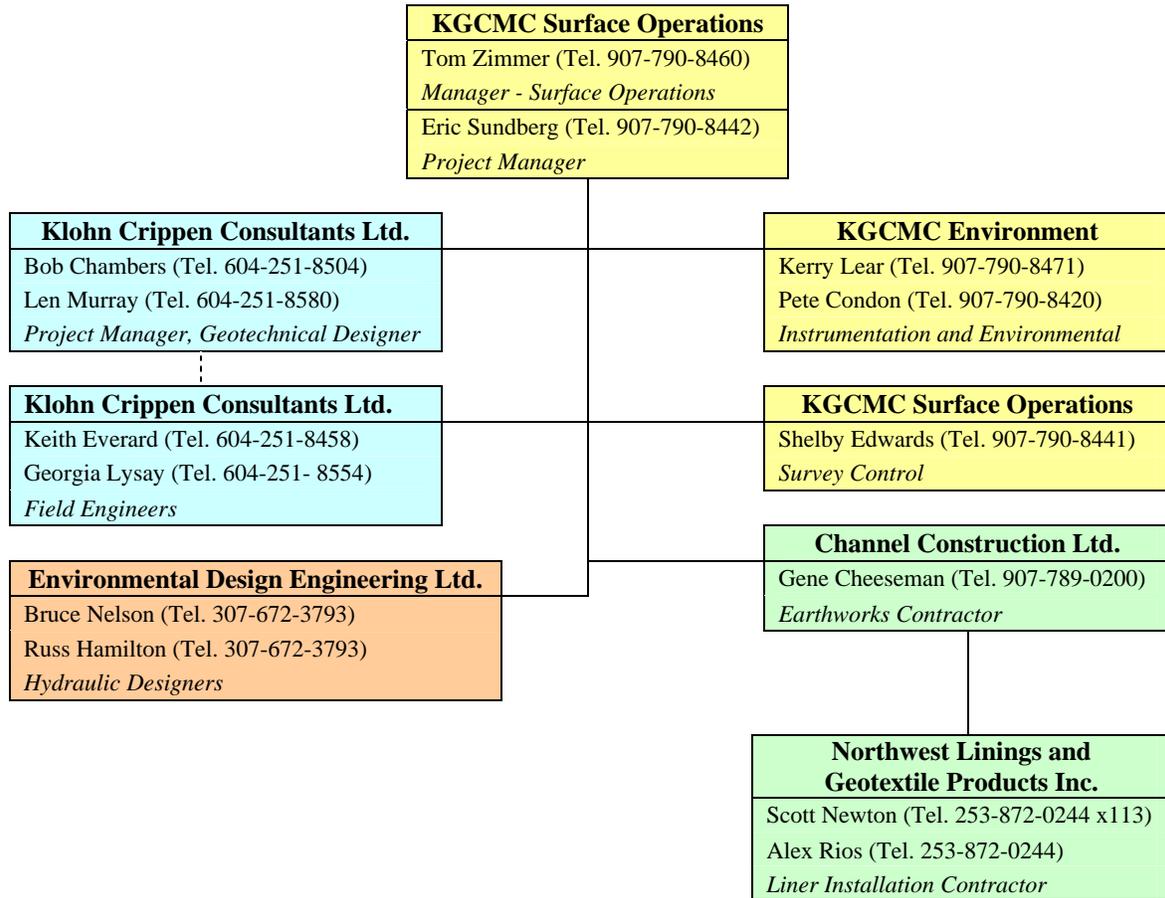


Figure 3.2 2005 Project Organization Chart

APPENDIX I

Selected Photographs

Site Overview

KENNECOTT GREENS CREEK MINING COMPANY
Tailings Disposal Facility
2004 - 2005 Southeast Tailings Facility Construction Summary



Photo 1 (May 13, 2004): Aerial view of south end of Greens Creek Tailings Disposal Facility, including Southeast 1 Expansion Area, New Truck Wash Site, Pond 6 and the Pond 7 Quarry Area.

KENNECOTT GREENS CREEK MINING COMPANY
Tailings Disposal Facility
2004 - 2005 Southeast Tailings Facility Construction Summary



Photo 2 (June 18, 2005): Aerial view of Greens Creek Tailings Disposal Facility, including Southeast 1 Expansion Area with tailings, Southeast 2 Expansion Area with final grade surface, Truck Wash, and Pond 6.



Photo 3 (August 30, 2005): Aerial view of Greens Creek Tailings Disposal Facility, including Southeast 1 Expansion Area with tailings, Southeast 2 Expansion Area with service layer and rock fill toe berm, Truck Wash, and Pond 6.

Foundation Drains



Photo 4 (July 16, 2004): Installation of French drain in foundation along B-Road.



Photo 5 (July 19, 2004): French drain installation in foundation at south end of Truck Wash approach ramp.

KENNECOTT GREENS CREEK MINING COMPANY
Tailings Disposal Facility
2004 - 2005 Southeast Tailings Expansion, Construction Summary



Photo 6 (July 19, 2004): Foundation French drains routed westward in single collector drain toward the Old B-Road.



Photo 7 (July 20, 2004): Foundation French drain collector routed westward through Old B-Road alignment.

KENNECOTT GREENS CREEK MINING COMPANY
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2004 - 2005 Southeast Tailings Expansion, Construction Summary



Photo 8 (July 21, 2004): Foundation French drain stub extending southeast from drain collector along Old B-Road.



Photo 9 (July 23, 2004): Foundation French drain installed in former slurry pit at north side of Tailings Expansion area.



Photo 10 (July 30, 2004): Foundation French drain installed in central portion of Tailings Expansion Area.



Photo 11 (August 30, 2004): Downstream end of foundation collector drain damaged during excavation of Old B-Road.

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2004 - 2005 Southeast Tailings Expansion, Construction Summary



Photo 12 (August 31, 2004): Installation of 2 foundation French drains in southern portion of old B-Road. Downstream end of repaired collector drain foundation in foreground on right hand side.



Photo 13 (June 11, 2005): Installation of foundation French drains in the SE2 expansion.



Photo 14 (June 13, 2005): Placement of drain gravel around foundation French drain perforated pipe in SE2.

Earthworks



Photo 15 (May 24, 2004): Clearing the New Truck Wash foundation. Note piles of oversized rock from Truck Wash excavation in 2004 expansion area.



Photo 16 (June 2, 2004): First lift of rock fill being placed in New Truck Wash foundation.



Photo 17 (July 9, 2004): Foundation fill for New Truck Wash is completed and formwork is underway. Clearing of Tailings Expansion Area is in progress.



Photo 18 (July 21, 2004): Proof-rolled foundation in Truck Wash approach ramp area and upper portion of Tailings Expansion area.

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Tailings Disposal Facility
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Photo 19 (August 2, 2004): Grading fill placed in SE1 Tailings Expansion area.



Photo 20 (August 14, 2004): New Truck Wash building and Water Tank are erected. About 90% of the geomembrane liner system is installed in the Tailings Expansion Area.



Photo 21 (September 1, 2004): Service layer sand is placed over about 90% of the geomembrane liner system. Foundation preparation and filling along the southwest edge of the Tailings Expansion Area is nearly complete.



Photo 22 (July 6, 2005): Prepared foundation in SE2 Tailings Expansion area. The concrete tank pad remained in place as shown on the left of the photo.

KENNECOTT GREENS CREEK MINING COMPANY
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Photo 23 (June 16, 2005): Final grade surface in SE2 Tailings Expansion area.



Photo 24 (June 23, 2005): 2004 SE1 liner pulled back to reveal bedding sand and underlying geotextile.

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Tailings Disposal Facility
2004 - 2005 Southeast Tailings Expansion, Construction Summary



Photo 25 (June 25, 2005): Bedding sand in place over SE2 tailings expansion area.



Photo 26 (July 1, 2005). Installation of liner in SE2 tailings expansion area.

KENNECOTT GREENS CREEK MINING COMPANY
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2004 - 2005 Southeast Tailings Expansion, Construction Summary



Photo 27 August 16, 2005: Rock fill toe berm and service layer sand on SE2 Tailings expansion area.

Instrumentation



Photo 28 (August 3, 2004): Extending 2002 expansion area instrument leads into conduit beneath 2004 Tailings Expansion area.



Photo 29 (August 3, 2004): Monitoring instruments being installed in foundation of 2004 expansion area.

KENNECOTT GREENS CREEK MINING COMPANY
Tailings Disposal Facility
2004 - 2005 Southeast Tailings Expansion, Construction Summary



Photo 30 (September 2, 2004): Routing instrument leads for 2002 and 2004 instruments under the southwest edge of the 2004 expansion area.



Photo 31 (September 6, 2004): Southwest end of instrument lead bundle near Tank 6.



Photo 32 (June 14, 2005): Installation of instrumentation conduit to outside SE2 Tailings Expansion area.



Photo 33 (June 15, 2005): Extension of 2004 instrumentation through conduits placed in 2005.

Liner System Drains

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Photo 34 (August 18, 2004): Liner system drain constructed along the northern edge of the 2004 tailings expansion area.



Photo 35 (August 19, 2004): Liner system drain constructed along eastern edge of 2004 tailings expansion area. HDPE flap to cover separator berm is visible on left.



Photo 36 (August 16, 2004): The liner system drain for the Truck Wash approach ramp (swale in foreground) is routed into the tailings area liner system perimeter drain.



Photo 37 (August 19, 2004): Downstream end of liner system drain constructed along eastern edge of 2004 tailings expansion area.



Photo 38 (August 10, 2005): Installation of SE2 liner drain along west side of SE2 expansion area.



Photo 39 (August 10, 2005): Installation of SE2 liner drain along southeast side of SE2 expansion area.

B-Road Realignment



Photo 40 (July 8, 2004): Upstream end of conveyance pipe installed in B-Road ditch for water routing during construction (the pipe was left in-place). The pipe extends to near the Mile 1.2 culverts.



Photo 41 (July 14, 2004): Placement of woven geotextile and initial lift of rock fill in realigned B-Road section south of Mile 1.2.



Photo 42 (July 14, 2004): Placement of rock fill in exit ramp foundation to the south of the New Truck Wash.



Photo 43 (July 14, 2004): Peat and organic matter in foundation of existing B-Road, vicinity of New Truck Wash exit ramp.

Special Items



Photo 44 (June 7, 2004): Installing a compacted rock fill column where the northeast-most Truck Wash pier footing will be located. Rock columns were constructed beneath each pier footing on the eastern side of the Truck Wash.



Photo 45 (July 1, 2004): Trench excavated in Truck Wash foundation fill for conveyance pipe to de-gritting basin.



Photo 46 (July 20, 2004): Drilling shot-holes in the former quarry high wall. Note slope drainage water trapped behind high wall.



Photo 47 (July 21, 2004): Contractor crews loading the quarry high wall shot holes.



Photo 48 (August 3, 2004): Excavation of liner system anchor trench along eastern edge of expansion area, parallel to the B-Road.



Photo 49 (September 6, 2004): Placement of fill in liner system anchor trench along the B-Road. The anchor trench fill is not compacted.

KENNECOTT GREENS CREEK MINING COMPANY
Tailings Disposal Facility
2004 - 2005 Southeast Tailings Expansion, Construction Summary



Photo 50 (June 1, 2005): Demolition and removal of Tank 6 and old truck wash from SE2 tailings expansion area.

APPENDIX II

Modifications by Owner – Minor Effects

APPENDIX II

Modifications by Owner – Minor Effects

The construction modifications described below should not significantly affect performance of the facility, and in some cases have enhanced the construction. These modifications are identified to provide completeness of the construction record.

Items Common to 2004 and 2005 Construction

- 6-inch minus rock fill supplied for the foundation backfill was coarser than specified (See Figure II-2, item 8A). Klohn Crippen agreed to its use in some portions of the foundation. The construction using the out of specification material was satisfactory, except in areas of overfilling and/or under-compaction. Some minor settlement could occur in the areas of overfilling and/or under-compaction.
- Drain Gravel placed in the foundation drains and liner system drains was not compacted (See Figures II-1 and II-2, item 8B). Klohn Crippen agreed to the use of the uncompacted drain gravel, with the qualification that drain pipe deformation could be greater than expected (with consequent reduced drainage capacity), and that there could be higher maintenance costs in the future.
- Some sections of drain pipe were installed with the pipe ends butted together rather than being welded, or were connected with non-standard fittings (i.e., pipe ends butted together in a larger diameter HDPE sleeve) (See Figures II-1 and II-2, items 8D and 8E). Unwelded connections reduce the flow capacity of the drain pipes and increase the likelihood of material migrating into the drain pipe. The butt-ends of some unwelded drain pipe connections were covered with filter cloth to prevent material migration into the pipes.
- Most of the liner system drains were constructed with a smaller cross-sectional area of drain gravel than specified in the design (See Figure II-1, item 8J). As constructed, most of the liner system drains have a triangular cross section with an average net cross-sectional area of drain gravel of about 4 ft² (versus 13 ft² for the design section). The liner drains are intended to have adequate flow capacity to carry the design flow through the drain gravel, without relying on the added capacity of the perforated drain pipe. The drain pipe would provide additional flow capacity should there be an

unforeseen blockage in the drain gravel. The reduced cross-sectional area of the drain gravel increases reliance on the drain pipe to carry a portion of the design flows. KGCMC should have the project hydrogeologist (EDE) check the adequacy of the as-built condition against the expected inflows into the drains.

- The anchor trench fill was not compacted (See Figure II-1, item 8M). NLGP, liner supplier and installer, recommended wheel compaction with a loader for the material in the anchor trench. However, KGCMC notes that this area is frequently traveled by loaded tailings haul trucks and that no subsidence of the trench has been observed to date. No significant settlement is expected.

2004 Construction

- Slotted HDPE SDR11 drain pipe was installed in the foundation drains and some of the liner system drains, rather than the specified SDR9 drain pipe (See Figures II-1 and II-2, item 8C). Klohn Crippen agreed to the use of the substitute drain pipe, with the qualification that there could be repair requirements or higher maintenance costs in the future.
- Open butted joints, rather than moulded fittings were used to connect secondary and tertiary drain pipe runs to the main drain pipe because no lateral connections were available (See Figures II-1 and II-2, item 8E). Where feasible, a larger sleeve pipe was used and the connections were overlapped with geotextile or filter sock to prevent the entrance of granular material into the pipe connections.
- A positive drainage system for groundwater in the bottom of the former Wide Corner Quarry was not installed (See Figure II-2, item 8F). As a result, the drainage routing from the quarry bottom is unknown, although it is surmised to be through bedrock fissures or remnant shot rock. An existing high-level French drain will likely still function if the phreatic surface in the former quarry rises. A piezometer was installed to provide advanced warning if the phreatic surface rises. Monitoring of the piezometer will provide an indication of the water pressure and a plan for remediation may be required if the pressure exceeds the fill surface elevation.
- A portion of the foundation fill along the southwest edge of the expansion area (i.e., about 800 ft²) was placed in over-thick lifts (i.e., 3 ft or more) before compaction (See Figure II-2, item 11B). This area is at the edge of containment and will have minimal tailings thickness placed on it. Any

settlement should therefore be minor and not affect stability of the tailings pile.

- KGCMC used a shingled geomembrane flap to provide containment along the east side of the truck wash approach ramp over the liner anchor trench and the west side of the B-Road fill (See Figure II-1, item 8G). The flap is outside of the current footprint of the tailings pile. To function adequately as an operational containment feature, the following must apply: the flap must extend high enough to contain all of the approach ramp fills; there must be adequate overlap between adjacent geomembrane shingles; and, the lower end of the flap must be far enough westward such that all intercepted water flows freely to the west in containment. This is not a geotechnical issue, but may become an environmental issue if contaminated water escapes through the shingled flap.
- The overall grading of liner foundation is less than the specified 2% in some locations and the northwest area may be grading to the north and not to the south (See Figure II-2, item 8H). This may reduce the flow but should not adversely affect the overall performance of the liner system.
- Liner system drainage from the Truck Wash approach ramp area is routed into the tailings perimeter liner drain rather than to the perimeter surface ditch (See Figure II-1, item 8I). KGCMC decided not to re-grade the foundation in the area north and west of the degritting basin to correct the routing. Because the perimeter liner drain was not intended to carry the drainage from the approach ramp area, it may not have adequate capacity. This is a minor concern that will likely be corrected when the truck wash facility is removed upon mine closure. However, KGCMC should have the designer (EDE) check the adequacy of the as-built condition. Meanwhile, KGCMC should monitor flow conditions in the drain pipe and assess whether the drain can handle the extra flow. This drainage item was subsequently changed in 2005 construction. An RPP lined ditch now directs all of this flow to Pond 6.
- The northern end of the tailings expansion area perimeter berm and the geomembrane containment flap are misaligned with surface drainage from the 2002 expansion area (See Figure II-1, item 8K). KGCMC decided not to re-align the perimeter berm and flap. As a result, water captured on the east side of the misaligned section must be drained through the perimeter liner seepage drain along the north side of the expansion area, thus placing extra flow load on the liner seepage collection system.

- Boulders and other materials identified for excavation and removal in the truck wash exit ramp foundation were left in place (See Figure II-1, item 8L). As a result, loss of fill into the boulder interstices could induce minor settlement, and, unidentified soft or compressible soil left in place could induce settlements. This is considered to be of minor consequence. KGCMC should maintain the ramp, as required.
- A foundation level French drain was installed around the perimeter of degritting basin (See Figure II-1, item 8N). This will allow detection of leakage through the degritting basin or splash apron.
- When placed and spread, the crushed rock fill was observed to segregate (See Figure II-2, item 14A). To avoid the loss of bedding sand into the rock fill, “fine” crushed rock was placed at final grade on the foundation fill for the truck wash and in the western part of the tailings expansion area, and formed a satisfactory surface after compaction. In other portions of the work area where segregated coarse rock was exposed at final grade, the surface was graded and re-compacted, and formed a satisfactory final surface. Any remaining areas with segregated coarse rock at final grade were covered with a thin (nominal 2 inch) layer of bedding sand, flooded with water to wash the sand into the pores, and then re-compacted. The final result was deemed satisfactory for long and short term.
- About 100 shot holes were drilled and blasted in the former quarry highwall and quarry bottom in the tailings expansion area to give a uniform foundation grade and to improve foundation drainage (See Figure II-2, item 14B). Run-of-mine oversize rock from the truck wash excavation that was too large to load and haul was drilled and blasted. The fragmented rock from both blasts was relocated onto the tailings pile for use in temporary road construction on the tailings pile.
- Columns of compacted 6-Inch Minus Rock Fill were constructed in the foundation of the new truck wash at the locations of the 4 eastern pier footings (See Figure II-2, item 14C). The arrangement and spacing of the pier footings were taken from the available Aqua-Wash/PND drawings and located in the field by KGCMC survey. The rock columns are founded on a dense, hard stratum of gravelly marine silt and clay and provide a continuous bearing column of rock fill to the base of the pier footing at nominal El. 195 ft. The initial rock fill lift in each column was nominally 12 inches to 18 inches thick and bucket-compacted because of groundwater flow into the excavations. Subsequent lifts were nominally 12 inches thick and densified by 4 to 6 passes of a 12-ton vibratory compactor.

- An area of soft foundation soil near the northeast corner of the 2004 tailings expansion area was identified during proof-rolling of the foundation (See Figure II-2, item 14D). Consequently, an area about 20 ft wide and 60 ft long (parallel to the southern edge of the 2002 expansion area) was excavated to a depth of about 12 ft to 15 ft, and a variety of materials including boulders and soil-bentonite slurry were removed. The material removed from the excavation concurs with the observed backfill materials during 2002 construction (Klohn Crippen, 2002). Anecdotal information from KGCMC staff suggest that this was a soil-bentonite slurry mixing pit used during construction of the slurry wall on the east side of the B-Road in 2000. The bouldery material encountered in the excavation appears to extend underneath the 2002 expansion area, and could contain some soil-bentonite slurry. The extent of the soil-bentonite slurry mixing pit underneath the 2002 expansion area is not known.
- A substantial groundwater flow (not estimated) from the northern wall of the excavation was initially encountered. The groundwater flow diminished after several days to a constant rate estimated at about 3 US gpm. A French drain was installed in the excavation to route seepage water westward into the coarse, run-of-pit rock in the former quarry bottom. The excavation was backfilled with crushed rock fill.
- During foundation preparation in the northeast corner of the 2004 expansion area, a peat pocket was uncovered and subsequently removed (See Figure II -2, item 14E). The peat was up to about 15 ft wide and 5 ft to 7 ft thick and extended underneath the southeast corner of the 2002 liner at or near the nominal toe of the tailings pile (largely underneath the temporary “ditch flap” liner extension installed in 2002). The peat was overlain by bedding sand and soil. Under the supervision of KGCMC, the peat was removed down to the elevation of the sand and gravel foundation soil layer. The excavation extended about 8 ft to 10 ft northward under the 2002 liner. The pocket appeared to narrow considerably at the back (northern) end of the excavation. There could be more peat underneath the southeast corner of the 2002 liner, however, the bulk of the peat appeared to have been removed. The excavation was backfilled with 6-Inch Minus Rock Fill. A review of 2002 expansion construction records (Klohn Crippen, 2002) indicates that soft or deleterious soil within the planned 2002 expansion footprint was excavated and replaced with rock fill. Because the peat pocket was substantively beneath the temporary ditch liner “flap” at the southeast corner of the 2002 expansion, it is likely that this peat pocket was an isolated spoil remnant.

- Where the B-Road right-of-way was widened in the vicinity of Mile 1.2, the initial lift of rock fill was up to about 5 ft thick with only minimal compaction from construction equipment (See Figure II-2, item 11C). In addition, 2 ft to 3 ft of peat was left in-place in the foundation of the existing B-Road between about Mile 1.1 and Mile 1.2. As a result, the realigned B-Road could experience non-uniform settlement in some locations, particularly where there are abrupt grade changes (due to impulse loading from heavy traffic). In general, the road fill is relatively thick (except in the southern portion of the realigned area) and will be trafficked by heavily loaded haul trucks and equipment before the final grade is completed, which will reduce the ultimate amount of settlement. Post-construction settlement of foundation fill can be remediated by localized filling to grade, if required, and by routine grading and maintenance.
- The lowermost (southwest) portion of the main foundation drain was damaged during excavation. After being repaired, the drain gravel was not fully encapsulated by non-woven geotextile and was in contact with the sandy gravel foundation soils that may contain some fines. This drain ceased flowing several days later although this was likely not related to the drain repair, but rather to excavation of the old B-Road fill and the installation of two additional drains nearby. Flows developed in the newly installed drains.

2005 Construction

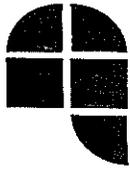
- The soft clay layer encountered in the foundation of the SE2 work area was excavated. The area was backfilled with compacted pit-run rock fill to 12 to 18 inches below final grade and then with compacted 6-inch minus rock fill up to final grade.
- The first lift of 6-inch minus rock fill placed in the foundation of SE2 was placed in lifts thicker than specified (from 3 ft to 5 ft in some locations), and was compacted without the addition of water. The owner approved this placement procedure for the first lift, citing that the uneven foundation stratum and wet soil conditions did not permit placement of 1 ft to 2 ft lifts. The placement of 2 ft lifts and the use of water prior to compaction was enforced by the owner on subsequent lifts. Minor settlement could occur in these areas.
- Not all reinforcing steel ends on Tank 6 concrete pad were trimmed off before placing grading fill. The ends varied from about 12 inches to 48 inches in length. This is a minor issue as the ends were covered with rock

fill below the bedding layer. This record is provided for future reference. No action is needed.

- The bedding sand and service layer sand contained more than the specified maximum of 5% fines (material passing the No. 200 sieve.) The fines content ranged from 3% to 10% with an average of 7% (see figure in Appendix IV). The fines could potentially clog the geocomposite and reduce the drainage capacity of the liner system. Similarly, increased fines in the bedding sand and service sand layers somewhat decreases the flow capacity through these layers.

APPENDIX III

Material Specification Sheets



Northwest Linings & Geotextile Products, Inc.
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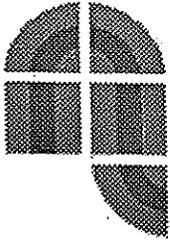
PermeaTex Nonwoven Geotextiles

The PermeaTex 4000 Series consists of nonwoven, polypropylene, needlepunched geotextile products that are recommended for drainage, filtration, separation, and reinforcement applications. Specific areas of use are subdrainage under roadways and playing fields, foundations, railway construction, rock buttresses, and slope drains. These geotextile products are resistant to ultraviolet degradation and to biological and chemical environments found in normal soil areas.

MATERIAL PROPERTIES	TEST METHOD	ENGLISH UNIT	PermeaTex Products										
			4030	4035	4040	4045	4050	4060	4070	4080	4100	4120	4160
			Minimum Average Roll Values										
Physical													
Weight (Typical)	ASTM D3776	oz. / s.y.	3.1	3.5	4	4.5	5	6	7	8	10	12	16
Thickness	ASTM D1777	mils											
Mechanical													
Grab Tensile	ASTM D4632	lbs	80	95	110	120	150	160	180	205	250	300	380
Grab Elongation	ASTM D4632	%	50	50	50	50	50	50	50	50	50	50	50
Puncture Strength	ASTM D4833	lbs	30	60	65	70	85	90	105	130	160	180	240
Trapezoidal Tear	ASTM D4533	lbs	25	40	50	50	60	65	75	85	100	115	145
Mullen Burst	ASTM D3786	psi	130	200	215	240	275	315	350	400	510	600	800
Hydraulic													
Apparent Opening Size	ASTM D4751	U.S. Sieve	50	70	70	70	70	80	80	80	100	100	100
Water Flow Rate	ASTM D4491	gpm / s.f.	150	150	140	120	115	110	100	90	80	75	50
Permittivity	ASTM D4491	sec -1	2.00	2.20	2.00	1.80	1.40	1.60	1.50	1.40	1.20	1.00	0.70
Permeability	ASTM D4491	cm / sec	0.22	0.25	0.22	0.22	0.23	0.24	0.34	0.38	0.30	0.29	0.27
Endurance													
UV Resistance (500 hours)		% retained	70	70	70	70	70	70	70	70	70	70	70
PACKAGING INFORMATION													
Standard Roll Width (Lineal Feet)			15	15	15	15	15	15	15	15	15	15	15
Standard Roll Length (Lineal Feet)			360	360	360	360	360	300	300	300	300	300	300
Standard Roll Area (Square Yards)			600	600	600	600	600	500	500	500	500	500	500
Other Roll Widths Available			12.5	12.5	12.5	12.5	12.5	12.5	12.5				

Note: PermeaTex Geotextile Products are manufactured by various manufacturers for distribution by Northwest Linings. PermeaTex is a trade name of Northwest Linings and any use of this name without the express written consent of Northwest Linings is strictly prohibited.





**NORTHWEST LININGS &
GEOTEXTILE PRODUCTS, Inc.**

"Helping to Protect the Environment"

21000 77th Avenue South

Kent, WA 98032

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HDPE Textured Specifications

PROPERTY	Frequency ¹	TEST METHOD	HR40 mil	HR60 mil	HR80 mil	HR100 mil
Thickness- (nominal) (mils)			40	60	80	100
Thickness- (min. average.) (mils)	per roll	D1593	38	57	76	95
• Lowest individual.			36	54	72	90
TENSILE PROPERTIES (min. average.)	50,000 SF	D638 Type IV Specimaen @ 2 in/min				
• Yield Strength (lb/in)			84	126	168	210
• Break Strength (lb/in)			60	90	120	150
• Break Elongation (%)			12	12	12	12
• Yield Elongation (%)			100	100	100	100
Tear Resistance (min. average.) (lb)	50,000 SF	D1004	28	42	56	70
Puncture Resistance (min. average.) (lb)	50,000 SF	D4833 FTMS 101/Method 2065 ²	60	90	120	150
Carbon Black Content (range) (%)	50,000 SF	D1603/D4218	2.0-3.0	2.0-3.0	2.0-3.0	2.0-3.0
Carbon Black Dispersion	50,000 SF	D5596	Note	Note	Note	Note
Density (min. average.) (g/cc)	Resin Batch	D1505/D792	0.940	0.940	0.940	0.940
Stress Crack Resistance (hr)	Resin Batch	D5397 (App.)	200	200	200	200
Dimensional Stability (max. average.) (%)	Resin Batch	D1204	±2	±2	±2	±2
Seam Properties		D4437				
1. Shear Strength, lb/in			80	120	160	200
2. Peel Strength, lb/in			59 & FTB	88 & FTB	118 & FTB	147 & FTB

1 = Testing frequencies are rounded to the nearest full roll.

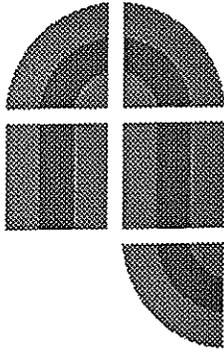
2 = FTMS has been replaced with 4833. Value shown for comparison purposes only. Carbon Black Dispersion for 10 different views: all 10 in Categories 1 or 2.

The information and data contained herein are believed to be accurate and reliable. Northwest Linings makes no warranty of any kind and accepts no responsibility for the results obtained through application of this information

"Celebrating 31 Years of Service 1973 - 2004"

KLOHN CRIPPEN





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"Helping to Protect the Environment"

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PermeaTex GC200-2-4060 / GC200-2-4080

GEOCOMPOSITE PROPERTIES

PROPERTY	TEST	UNITS	MINIMUM ₂ GC200-2-4060	MINIMUM ₂ GC200-2-4080
Transmissivity ₁ (15,000 psf)	ASTM D 4716	M ₂ /sec Gal/min/ft	1 x 10 ⁻⁴ typical 0.48	4 x 10 ⁻⁵ typical 0.19
Ply Adhesion	ASTM D 413 or F 904	Lb. / in	1.0	1.0

COMPONENT PROPERTIES₃

GEONET PermeaTex GN200	TEST	UNITS	GC200
Density	ASTM D 1505	G/cm ³	0.94
Carbon Black Content	ASTM D 4218	%	2.0
Thickness	ASTM D 5199	Inches mils	0.200 200
Mass Per Unit Area	ASTM D 5261	Lbs./ft ²	0.162
Transmissivity ₁	ASTM D 4716	M ₂ /sec	1 x 10 ⁻³ @ 15,000 psf
Tensile Strength	ASTM D 5035	Lbs./in	45

GEOTEXTILE	TEST	UNITS	PermeaTex 4060	PermeaTex 4080
Fabric Weight(Typical)	ASTM D 5261	Oz / yd ²	6	8
Mullen Burst	ASTM D 3786	lb/in ²	350	450
Grab Strength	ASTM D 4632	Lbs.	160	203
Puncture	ASTM D 4833	Lb	90	130
Water Flow Rate	ASTM D 4491	Gal/min/ft ²	110	110
AOS	ASTM D 4751	Sieve size mm	70 - 0.210	100 - 0.150

NOTES:

1. Measured using water @ 20 degrees C (68 F) with a gradient of one, between two steel plates, after one hour. Value may vary, based on dimensions of the Transmissivity specimen and specific laboratory.
2. These values represent minimum acceptable test values for a roll as tested according to Northwest Linings Manufacturing Quality Control Manual. Individual test specimen values are not addressed in the specification.
3. Component properties are tested prior to the lamination process. They cannot be tested on the final product.

The information and data contained herein are believed to be accurate and reliable. Northwest Linings makes no warranty of any kind and accepts no responsibility for the results obtained through application of this information.

"Celebrating 30 Years of Service 1973 - 2003"

KLOHN CRIPPEN



DOUBLE-SIDED GEOCOMPOSITES ENGLISH UNITS



GEOCOMPOSITE PROPERTIES

Minimum Average Values

Property	Test Method	GC-06D-2.0	GC-08D-2.0	GC-06D-2.5	GC-08D-2.5
Transmissivity, (MD), gal/min-ft metal plate/geocomposite/metal plate hydraulic gradient, $i = 1$ normal pressure = 10,000 lb/ft ²	ASTM D 4716	0.4 ($0.8 \times 10^{-4} \text{ m}^2/\text{sec}$)	0.2 ($4.0 \times 10^{-5} \text{ m}^2/\text{sec}$)	1.0 ($2.0 \times 10^{-4} \text{ m}^2/\text{sec}$)	0.5 ($1.0 \times 10^{-4} \text{ m}^2/\text{sec}$)
Ply Adhesion, lb/in	ASTM D 7005	1	1	1	1
Roll Dimensions					
1. Roll Width, ft		13.5	13.5	13.5	13.5
2. Roll Length, ft		250	200	175	150

COMPONENT PROPERTIES

Geonet

Thickness, mil	ASTM D 5199	200	200	250	250
Density, min., g/cc	ASTM D 1505	0.940	0.940	0.940	0.940
Carbon Black Content, %	ASTM D 1603	1.5 - 3.0	1.5 - 3.0	1.5 - 3.0	1.5 - 3.0
Tensile Strength, (Peak, MD), lb/in	ASTM D 5035	45	45	60	60
Transmissivity, (MD), gal/min-ft metal plate/net/metal plate hydraulic gradient, $i = 1$ normal pressure = 10,000 lb/ft ² seat time = 15 minutes	ASTM D 4716	5.0 ($1.0 \times 10^{-3} \text{ m}^2/\text{sec}$)	5.0 ($1.0 \times 10^{-3} \text{ m}^2/\text{sec}$)	7.2 ($1.5 \times 10^{-3} \text{ m}^2/\text{sec}$)	7.2 ($1.5 \times 10^{-3} \text{ m}^2/\text{sec}$)

Geotextile

Unit Weight, oz/yd ²	ASTM D 5261	6	8	6	8
Grab Strength, lb	ASTM D 4632	160	200	160	200
Grab Elongation, %	ASTM D 4632	50	50	50	50
Tear Strength, lb	ASTM D 4533	65	80	65	80
Puncture Strength, lb	ASTM D 4833	90	120	90	120
Permittivity, sec ⁻¹	ASTM D 4491	1.3	1.3	1.3	1.3
AOS, MaxARV	ASTM D 4751	70 sieve	80 sieve	70 sieve	80 sieve
UV Stability, % ret. (500 hr.)	ASTM D 4355	70	70	70	70

The above property values, unless otherwise specified, are the minimum acceptable average test results for any roll based on the specified test methods and do not refer to an individual test specimen. Geotextile property values are Minimum Average Roll values, except for AOS, which is Maximum Average Roll Value. Geonet and Geotextile properties are tested prior to lamination. This data is provided for informational purposes only and is not intended as a warranty or guarantee. Poly-Flex, Inc. assumes no responsibility in connection with the use of this data. These values are subject to change without notice. REV. 03/05



DOUBLE-SIDED GEOCOMPOSITES METRIC UNITS

GEOCOMPOSITE PROPERTIES

Minimum Average Values

Property	Test Method	GC-06D-2.0	GC-08D-2.0	GC-06D-2.5	GC-08D-2.5
Transmissivity, (MD), m ² /sec metal plate/geocomposite/metal plate hydraulic gradient, i = 1 normal pressure = 480 kPa	ASTM D 4716	0.8 x 10 ⁻⁴ (5.0 l/min-m)	4.0 x 10 ⁻⁵ (2.5 l/min-m)	2.0 x 10 ⁻⁴ (12 l/min-m)	1.0 x 10 ⁻⁴ (6.2 l/min-m)
Ply Adhesion, kN/m	ASTM D 7005	0.17	0.17	0.17	0.17
Roll Dimensions					
1. Roll Width, m		4.1	4.1	4.1	4.1
2. Roll Length, m		76.2	61	53.4	45.7

COMPONENT PROPERTIES

Geonet

Thickness, mm	ASTM D 5199	5.1	5.1	6.3	6.3
Density, min., g/cc	ASTM D 1505	0.940	0.940	0.940	0.940
Carbon Black Content, %	ASTM D 1603	1.5 - 3.0	1.5 - 3.0	1.5 - 3.0	1.5 - 3.0
Tensile Strength, (Peak, MD), kN/m	ASTM D 5035	7.9	7.9	10.5	10.5
Transmissivity, (MD), m ² /sec metal plate/net/metal plate hydraulic gradient, i = 1 normal pressure = 480 kPa seat time = 15 minutes	ASTM D 4716	1.0 x 10 ⁻³ (62 l/min-m)	1.0 x 10 ⁻³ (62 l/min-m)	1.5 x 10 ⁻³ (89 l/min-m)	1.5 x 10 ⁻³ (89 l/min-m)

Geotextile

Unit Weight, g/m ²	ASTM D 5261	203	271	203	271
Grab Strength, N	ASTM D 4632	712	890	712	890
Grab Elongation, %	ASTM D 4632	50	50	50	50
Tear Strength, lb	ASTM D 4533	289	356	289	356
Puncture Strength, N	ASTM D 4833	400	534	400	534
Permittivity, sec ⁻¹	ASTM D 4491	1.3	1.3	1.3	1.3
AOS, MaxARV, mm	ASTM D 4751	0.212	0.180	0.212	0.180
UV Stability, % ret. (500 hr.)	ASTM D 4355	70	70	70	70

The above property values, unless otherwise specified, are the minimum acceptable average test results for any roll based on the specified test methods and do not refer to an individual test specimen. Geotextile property values are Minimum Average Roll values, except for AOS, which is Maximum Average Roll Value. Geonet and Geotextile properties are tested prior to lamination. This data is provided for informational purposes only and is not intended as a warranty or guarantee. Poly-Flex, Inc. assumes no responsibility in connection with the use of this data. These values are subject to change without notice. REV. 03/05

GEOTEX® 1001

GEOTEX 1001 is a polypropylene, staple fiber, needlepunched nonwoven geotextile manufactured at one of SI Geosolutions' facilities that has achieved ISO-9002 certification for its systematic approach to quality. The fibers are needed to form a stable network that retains dimensional stability relative to each other. The geotextile is resistant to ultraviolet degradation and to biological and chemical environments normally found in soils. GEOTEX 1001 conforms to the property values listed below¹ which have been derived from quality control testing performed by one of SI Geosolutions' GAI-LAP accredited laboratories:

MARV²

PROPERTY	TEST METHOD	ENGLISH	METRIC
Physical			
Mass/Unit Area	ASTM D5261	8.5 oz/yd ²	288 g/m ²
Thickness	ASTM D5199	100 mils	2.5 mm
Mechanical			
Grab Tensile Strength	ASTM D4632	250 lbs	1112 N
Grab Elongation	ASTM D4632	50%	50%
Puncture Strength	ASTM D4833	150 lbs	668 N
Mullen Burst	ASTM D3786	460 psi	3171 kPa
Trapezoidal Tear	ASTM D4533	100 lbs	445 N
Wide Width Tensile	ASTM D4595	1200 lbs/ft	17.5 kN/m
Endurance			
UV Resistance @ 500 hrs	ASTM D4355	70%	70%
Hydraulic			
Apparent Opening Size (AOS) ³	ASTM D4751	100 US Std. Sieve	0.150 mm
Permittivity	ASTM D4491	1.20 sec ⁻¹	1.20 sec ⁻¹
Permeability	ASTM D4491	0.30 cm/sec	0.30 cm/sec
Water Flow Rate	ASTM D4491	85 gpm/ft ²	3463 l/min/m ²
Roll Sizes		180 in x 100 yds	4.57 m x 91.5 m

NOTES:

- ¹ The property values listed below are effective 12/2003 are subject to change without notice.
- ² Values shown are in weaker principal direction. Minimum average roll values are calculated as the typical minus two standard deviations. Statistically, it yields a 97.7% degree of confidence that any samples taken from quality assurance testing will exceed the value reported.
- ³ Maximum average roll value. Statistically, it yields a 97.7% degree of confidence that samples taken from quality assurance testing will be below the value reported.

SELLER MAKES NO WARRANTY, EXPRESS OR IMPLIED, CONCERNING THE PRODUCT FURNISHED HEREUNDER OTHER THAN AT THE TIME OF DELIVERY IT SHALL BE OF THE QUALITY AND SPECIFICATION STATED HEREIN. ANY IMPLIED WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE IS EXPRESSLY EXCLUDED, AND, TO THE EXTENT THAT IT IS CONTRARY TO THE FOREGOING SENTENCE, ANY IMPLIED WARRANTY OF MERCHANTABILITY IS EXPRESSLY EXCLUDED. ANY RECOMMENDATIONS MADE BY SELLER CONCERNING THE USES OR APPLICATIONS OF SAID PRODUCT ARE BELIEVED RELIABLE AND SELLER MAKES NO WARRANTY OF RESULTS TO BE OBTAINED. IF THE PRODUCT DOES NOT MEET SI GEOSOLUTIONS' CURRENT PUBLISHED SPECIFICATIONS, AND THE CUSTOMER GIVES NOTICE TO SI GEOSOLUTIONS BEFORE INSTALLING THE PRODUCT, THEN SI GEOSOLUTIONS WILL REPLACE THE PRODUCT WITHOUT CHARGE OR REFUND THE PURCHASE PRICE.



Huikwang Corporation

HUITEX HX Series – Textured High Density Polyethylene Geomembrane Data sheet

HUITEX HX Series geomembrane is made of premium virgin HDPE resin with either one or two sides textured surfaces, the high quality resin used is designed specifically for geomembrane production along with adequate carbon black, antioxidant, and stabilizers to have superior mechanical properties and outstanding long-term resistance to aggressive chemical, environmental stress crack, and UV radiation.

HUITEX HX series geomembrane provide an excellent frictional characteristics than the smooth products and retain most of the properties of HD series geomembrane.

		Minimum Values				
Property	Test Method	HX075	HX100	HX150	HX200	HX250
Thickness, mm	ASTM D5199					
Minimum Average Values		0.75	1.00	1.50	2.00	2.50
Lowest Individual Reading		0.64	0.85	1.28	1.70	2.30
Asperity Height, mm	GRI GM12	0.25	0.25	0.25	0.25	0.25
Density, g/cm ³	ASTM 1505/D792	0.94	0.94	0.94	0.94	0.94
Tensile Properties (each direction)	ASTM D6693					
	Type IV specimen					
	@ 50 mm/min					
1.Strength at Yield, kN/m width		11	15	23	30	38
2.Strength at Break, kN/m width		8	13	16	21	26
3.Elongation at Yield, %	G.L. 33 mm	13	13	13	13	13
4.Elongation at Break, %	G.L. 51 mm	100	100	100	100	100
Tear Resistance, N	ASTM D1004	98	135	200	250	312
Puncture Resistance, N	ASTM D4833	240	270	410	534	800
Carbon Black Content, %	ASTM D1603	2.0	2.0	2.0	2.0	2.0
Carbon Black Dispersion	ASTM D5596	Cat.2	Cat.2	Cat.2	Cat.2	Cat.2
Oxidative Induction Time, min	ASTM D 3895 (200°C; O ₂ , 1 atm)	100	100	100	100	100
		Nominal Values				
Melt Flow Index, g/10 min	ASTM D1238 (190°C, 2.16kg)	<1.0	<1.0	<1.0	<1.0	<1.0
Dimensional Stability, %	ASTM D1204 (100°C; 1 hour)	≠	≠	≠	≠	≠
Low Temperature Brittleness, °C	ASTM D746	<-77	<-77	<-77	<-77	<-77
Stress Crack Resistance, hrs	ASTM 5397 (Appendix)	>400	>400	>400	>400	>400
		Roll Dimensions				
Width, m		7	7	7	7	7
Length, m		198	152	128	98	80
Area, m ²		1386	1064	896	686	532
Net Weight, kg (Approx.)		1040	1064	1344	1372	1400
40' container, rolls		12	12	12	12	12

This information is provided for reference purposes only and is not intended as a warranty or guarantee. Huikwang Corporation (HKC) assumes no liability in connection with the use of this information. HKC reserves the right to change the specifications contained herein without notice. Please contact HKC for the latest version of specifications.

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GEOSYNTHETICS

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Extra High Molecular Weight (EHMW) High Density Polyethylene for use in industrial applications such as underground fire mains, mining, landfill, water reclamation or sewer.

➤ *Other dimensional standards or custom requirements available.*

TYPICAL PHYSICAL PROPERTIES			
<u>PROPERTY</u>	<u>ASTM</u>	<u>*NOMINAL VALUES</u>	
	<u>TEST METHOD</u>	<u>SI UNITS</u>	<u>ENGLISH UNITS</u>
Density, Natural	D1505	0.946 gm/cc	--
Density, Black	D1505	0.955 gm/cc	--
Melt Index (190°C/2.16 kg)	D1238	0.07 gm/10 min.	--
Flow Rate (190°C/21.6 kg)	D1238	8.5 gm/10 min.	--
Tensile Strength @Ultimate	D638	34.5 MPa	5,000 psi
Tensile Strength @ Yield	D638	24.1 MPa	3,500 psi
Ultimate Elongation	D638	>800%	>800%
Flexural Modulus	D790	938 MPa	136,000 psi
2% Secant			
Environmental Stress Crack Resistance (ESCR)			
F ₀ , Condition C	D1693	>10,000 hrs.	>10,000 hrs.
PENT	F1473	>100 hrs.	>100 hrs.
Brittleness Temperature	D746	<-117°C	<-180°F
Hardness, Shore D	D2240	64	64
Vicat Softening Temperature	D1525	124°C	255°F
Izod Impact Strength (Notched)	D256	0.37 KJ/m	7 ft – lb _f /in
Volume Resistivity	D991	>10 ¹⁵ ohm-cm	--
Thermal Expansion Coefficient		2x10 ⁻⁴ cm/cm/°C	1.0x10 ⁻⁴ in/in/°F
CELL CLASSIFICATION:	D3350	345464C	Grade PE34
MATERIAL CLASSIFICATION:	D1248	Type III Category 5	Class C
PPI HYDROSTATIC DESIGN BASIS:	D2837	11.0 MPa @ 23°C	1,600 psi @ 73.4°F
(As listed in PPI TR-4)		5.5 MPa @ 60°C	800 psi @ 140°F

*Nominal values are intended to be guides only, and not as specification limit.

PolyPipe, Inc.

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POLYPIPE[®] EHMW Pipe
 Pipe Data and Pressure Ratings – IPS

Pressure Rating		Class 265 DR7		Class 200 DR9		Class 160 DR11		Class 130 DR13.5		Class 100 DR17		Class 80 DR21		Class 65 DR26		Class 50 DR32.5	
Nominal Pipe Size	OD Size, inches	Min. Wall, inches	Weight, lbs/ft														
½"	0.840	0.120	0.12	0.093	0.10	0.076	0.08	---	---	---	---	---	---	---	---	---	---
¾"	1.050	0.150	0.18	0.117	0.15	0.095	0.13	---	---	---	---	---	---	---	---	---	---
1"	1.315	0.188	0.29	0.146	0.23	0.120	0.20	---	---	---	---	---	---	---	---	---	---
1 ¼"	1.660	0.237	0.46	0.184	0.37	0.151	0.31	0.123	0.26	---	---	---	---	---	---	---	---
1 ½"	1.900	0.271	0.60	0.211	0.49	0.173	0.41	0.141	0.34	---	---	---	---	---	---	---	---
2"	2.375	0.339	0.94	0.264	0.76	0.216	0.64	0.176	0.53	0.140	0.43	---	---	---	---	---	---
3"	3.500	0.500	2.05	0.389	1.66	0.318	1.39	0.259	1.15	0.206	0.93	0.167	0.76	0.135	0.62	---	---
4"	4.500	0.643	3.38	0.500	2.74	0.409	2.29	0.333	1.91	0.265	1.54	0.214	1.26	0.173	1.03	0.138	0.83
5"	5.375	0.768	4.83	0.597	3.91	0.489	3.27	0.398	2.72	0.316	2.20	0.256	1.80	0.207	1.47	0.165	1.19
5"	5.563	0.795	5.17	0.618	4.18	0.506	3.51	0.412	2.91	0.327	2.35	0.265	1.93	0.214	1.57	0.171	1.27
6"	6.625	0.946	7.34	0.736	5.93	0.602	4.97	0.491	4.13	0.390	3.34	0.315	2.74	0.214	1.57	0.171	1.27
7"	7.125	1.018	8.49	0.792	6.86	0.648	5.75	0.528	4.78	0.419	3.86	0.339	3.17	0.274	2.58	0.219	2.08
8"	8.625	1.232	12.43	0.958	10.05	0.784	8.43	0.639	7.00	0.507	5.66	0.411	4.64	0.332	3.78	0.265	3.05
10"	10.750	1.536	19.31	1.194	15.62	0.977	13.09	0.796	10.88	0.632	8.79	0.512	7.20	0.413	5.88	0.331	4.74
12"	12.750	1.821	27.17	1.417	21.97	1.159	18.41	0.944	15.30	0.750	12.36	0.607	10.13	0.490	8.27	0.392	6.67
14"	14.00	2.000	32.76	1.556	26.49	1.273	22.20	1.037	18.45	0.824	14.91	0.667	12.22	0.538	9.97	0.431	8.04
16"	16.00	2.286	42.79	1.778	34.60	1.455	28.99	1.185	24.09	0.941	19.47	0.762	15.96	0.615	13.02	0.492	10.51
18"	18.00	2.571	54.15	2.000	43.79	1.636	36.70	1.333	30.49	1.059	24.64	0.857	20.20	0.692	16.48	0.554	13.30
20"	20.00	2.857	66.85	2.222	54.06	1.818	45.30	1.481	37.64	1.176	30.42	0.952	24.94	0.769	20.35	0.615	16.42
22"	22.00	---	---	2.444	65.41	2.000	54.82	1.630	45.55	1.294	36.81	1.048	30.17	0.846	24.62	0.677	19.86
24"	24.00	---	---	2.667	77.85	2.182	65.24	1.778	54.21	1.412	43.80	1.143	35.99	0.923	29.30	0.738	23.64
28"	28.00	---	---	---	---	2.545	88.80	2.074	73.78	0.647	59.62	1.333	48.87	1.077	39.88	0.862	32.17
30"	30.00	---	---	---	---	2.727	101.93	2.222	84.70	1.765	68.44	1.429	56.11	1.154	45.78	0.923	36.93
32"	32.00	---	---	---	---	---	---	2.370	96.37	1.882	77.87	1.524	63.84	1.231	52.09	0.985	42.02
36"	36.00	---	---	---	---	3.273	146.78	2.667	121.96	2.118	98.55	1.714	80.79	1.385	65.92	1.108	53.19
42"	42.00	---	---	---	---	---	---	---	---	2.471	134.14	2.000	109.97	1.615	89.73	1.292	72.39
48"	48.00	---	---	---	---	---	---	---	---	---	---	2.286	143.63	1.846	117.19	1.477	94.55
54"	54.00	---	---	---	---	---	---	---	---	---	---	2.571	181.78	2.077	148.32	1.662	119.67

PolyPipe, Inc.

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POLYPIPE® EHMW Pipe
Pipe Data and Pressure Ratings – DIPS

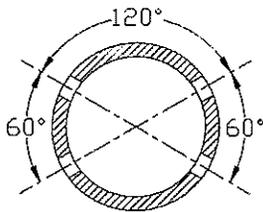
Pressure Rating		Class 265 DR7		Class 200 DR9		Class 160 DR11		Class 130 DR13.5		Class 100 DR17		Class 80 DR21		Class 65 DR26		Class 50 DR32.5	
Nominal Pipe Size	OD Size, inches	Min. Wall, inches	Weight, lbs/ft														
3"	3.96	0.566	2.62	0.440	2.12	0.360	1.78	0.293	1.48	0.233	1.19	0.189	0.98	0.152	0.80	0.122	0.64
4"	4.80	0.686	3.85	0.533	3.11	0.436	2.61	0.356	2.17	0.282	1.75	0.229	1.44	0.185	1.17	0.148	0.95
6"	6.90	0.986	7.96	0.767	6.43	0.627	5.39	0.511	4.48	0.406	3.62	0.329	2.97	0.265	2.42	0.212	1.95
8"	9.05	1.293	13.69	1.006	11.07	0.823	9.28	0.670	7.71	0.532	6.23	0.431	5.11	0.348	4.17	0.278	3.36
10"	11.10	1.586	20.59	1.233	16.65	1.009	13.95	0.822	11.60	0.653	9.37	0.529	7.81	0.427	6.27	0.342	5.06
12"	3.20	1.886	29.12	1.467	23.55	1.200	19.73	0.978	16.40	0.776	13.25	0.629	10.86	0.508	8.86	0.406	7.15
14"	15.30	2.186	39.12	1.700	31.64	1.391	26.51	1.133	22.03	0.900	17.80	0.729	14.59	0.588	11.91	0.471	9.61
16"	17.40	2.486	50.60	1.933	40.92	1.582	34.29	1.289	28.49	1.024	23.02	0.829	18.87	0.669	15.40	0.535	12.43
18"	19.50	2.786	63.55	2.167	51.39	1.773	43.07	1.444	35.79	1.147	28.92	0.929	23.70	0.750	19.34	0.600	15.61
20"	21.60	3.086	77.98	2.400	63.06	1.964	52.84	1.600	43.91	1.271	35.48	1.029	29.09	0.831	23.73	0.665	19.15
24"	25.80	---	---	2.867	89.96	2.345	75.39	1.911	62.64	1.518	50.62	1.229	41.50	0.992	33.86	0.794	27.32
30"	32.00	---	---	---	---	---	---	2.370	96.37	1.882	77.87	1.524	63.84	1.231	52.09	0.985	42.02
36"	38.30	---	---	---	---	---	---	---	---	2.253	111.55	1.824	91.45	1.473	74.61	1.178	60.20
42"	44.50	---	---	---	---	---	---	---	---	2.618	150.59	2.119	123.45	1.712	100.73	1.369	81.27
48"	50.80	---	---	---	---	---	---	---	---	---	---	2.419	160.88	1.954	131.27	1.563	105.91

- NOTES
- PolyPipe® EHMW Pipe is manufactured in accordance with the following standards:
 - ◆ ½" IPS through 3" IPS, products are manufactured in accordance with ASTM D3035.
 - ◆ 4" IPS through 63" IPS, products are manufactured in accordance with ASTM F714.
 - ◆ Metric sizes also available.
 - ◆ Coiled pipe available through 6" OD and straight lengths available in 40' and 50' lengths.
 - ◆ Products tested and certified to NSF Standard 61 are available upon request.
 - ◆ Factory Mutual (FM) pipe available upon request (*Refer to B-1007 for approved sizes*).
 - Pressures are based on using water at 23°C (73.4°F) and are determined per ASTM D3035 or F714.
 - Service factors should be utilized to compensate for the effect of substances other than water and for higher temperatures.
 - The above weights for IPS and DIPS sizes are calculated in accordance with Plastics Pipe Institute (PPI) TR-7, using a value of 0.955 for density.
 - Available with color-coded striping.
 - Some sizes are special order. Call for availability on sizes or DR's not shown.

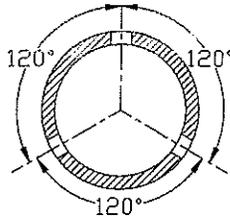
PolyPipe, Inc.

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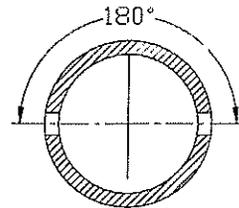
POLYPIPE® PERFORATED PIPE



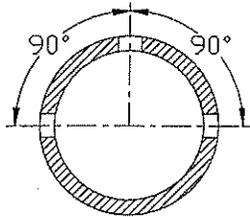
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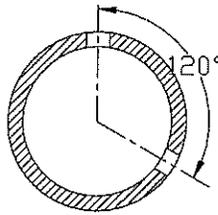
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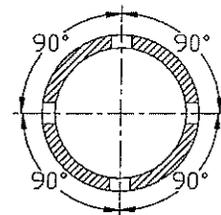
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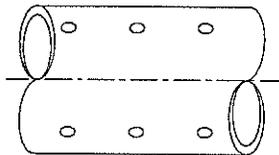
STYLE D



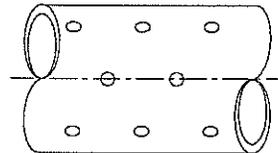
STYLE E



STYLE F



NON STAGGERED



STAGGERED

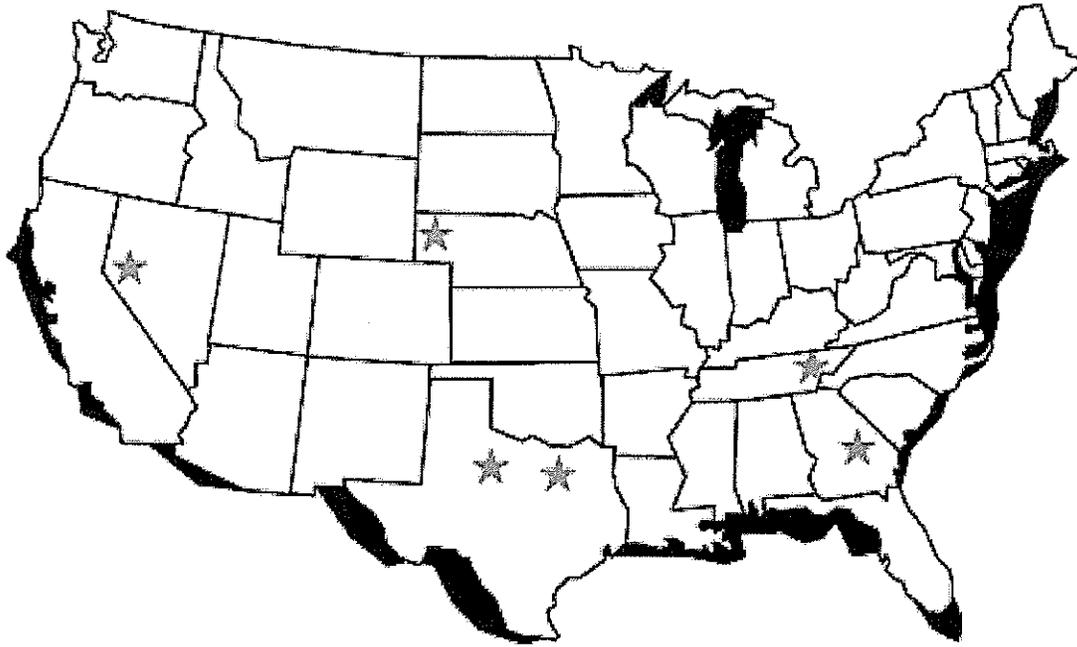
PIPE SIZE AND DR PERFORATION CAPABILITIES*

OD Nominal	Dimension Ratio							
	7	9	11	13.5	17	21	26	32.5
4								
5								
6								
7								
8								
10								
12								

* Shaded sizes are available. Hole sizes may vary from 1/4" to 5/8" diameter. Plant capabilities should be verified prior to ordering. Contact us if your perforation pattern is not shown.

PolyPipe, Inc.

2406 N. I-35 | P.O. Box 390 | Gainesville, TX 76241
 Phone 940.665.1721 | 800.433.5632 | Facsimile 940.668.8612
 Sales Facsimile 940.668.2704 | www.polypipeinc.com



Gainesville Plant

P.O. Box 390
 2406 N. I-35
 Gainesville, TX 76241-0390
 (940) 665-1721
 (800) 433-5632
 Fax: (940) 668-8612
 Sales Fax: (940) 668-2704

Erwin Plant

P.O. Box 199
 1050 Industrial Drive South
 Erwin, TN 37650
 (423) 743-9116
 Fax: (423) 743-8419

Roaring Springs Plant

P.O. Box 298
 11000 Hwy. 70 South
 Roaring Springs, TX 79256
 (806) 348-7551
 (877) 771-8330
 Fax: (806) 348-7905

Fernley Plant

230 Lyon Drive
 Fernley, NV 89408
 (775) 575-5454
 Fax: (775) 575-6960

Sandersville Plant

P.O. Box 784
 995 Waco Mill Road
 Sandersville, GA 31082
 (478) 553-0576

Kimball Plant

3405 PolyPipe Road
 Kimball, NE 69145
 (308) 235-4828
 Fax: (308) 235-2938



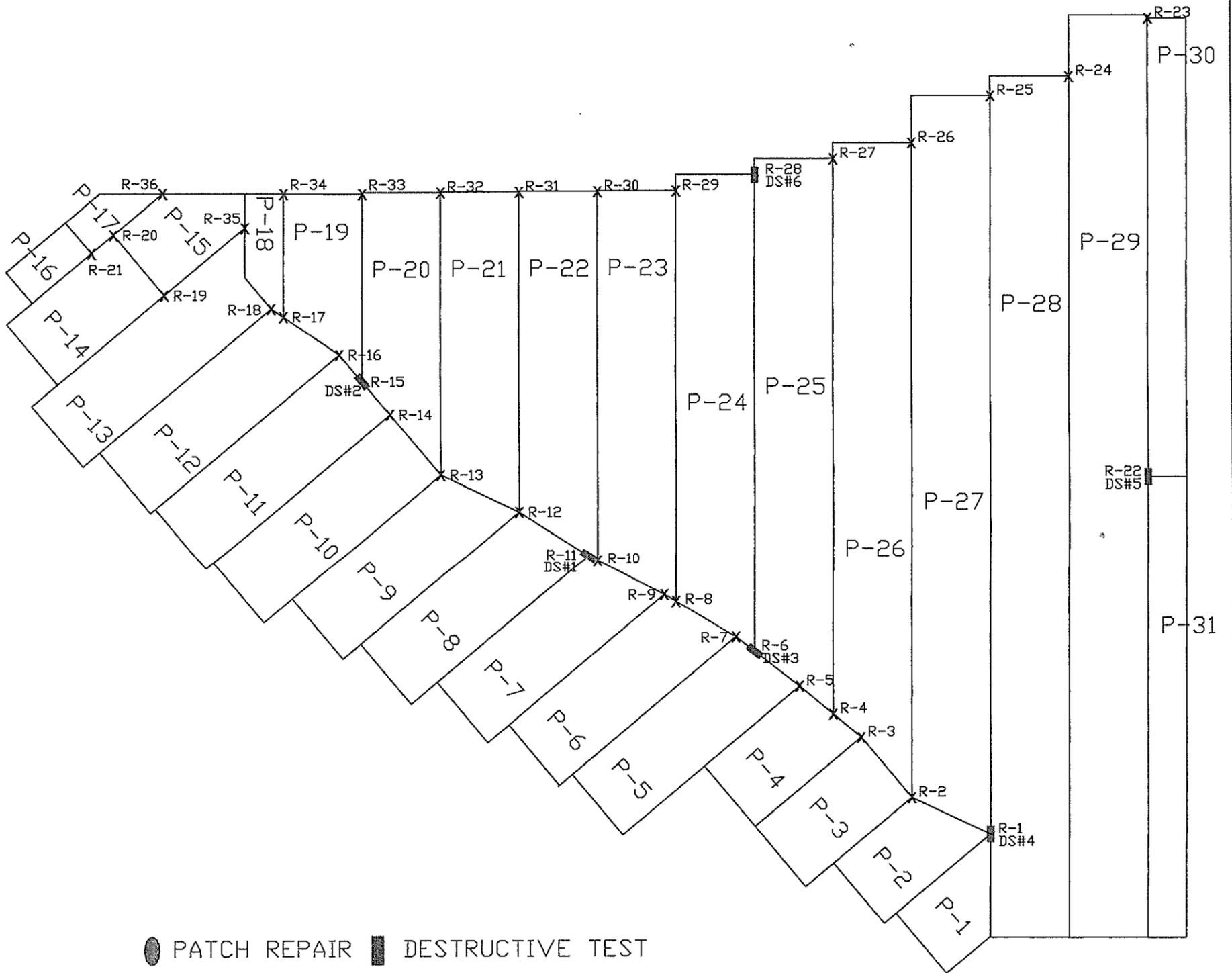
PolyPipe® is an active member of the Plastics Pipe Institute, AWWA, AGA and ASTM.

ISO 9001:2000



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APPENDIX IV
QC and QA Data



- PATCH REPAIR ■ DESTRUCTIVE TEST
- ✕ BEAD REPAIR ⊙ PIPE BOOT

AS-BUILT 80-MIL TEXTURED HDPE LINER PANEL LAYOUT
SOUTHEAST EXPANSION - AREA 2

SHEET NO.	DETAIL 	NORTHWEST LININGS & GEOTEXTILE PRODUCTS, Inc. www.northwestlinings.com 21000 77TH AVE. SOUTH KENT, WA. 98032 (253) 872-0244 (253) 872-0245 FAX	JOB NAME: GREENS CREEK MINE 2005	JOB NO. N00045
			DATE: 11 4 05	CHECKED:
			BY:	SCALE: 1" = 40'

Geosynthetic Installation Certificate of Acceptance

Project Name: Greens Creek mine Tailing expansion Date: 7-02-05
Project Location: Juneau AK.
Type of Project: Mining

Geosynthetic Products Installed By Northwest Linings Personnel

Geomembranes: HDPE LLDPE PVC Polypropylene Other _____
Thickness: 20 Mil 30 Mil 36 Mil 40 Mil 45 Mil 60 Mil 80 Mil
Surface: Smooth Textured Reinforced Non-Reinforced
Geotextiles: Non-Woven Woven Type: 10 02
 Geocomposite Product: _____
 GCL Product: _____

Owners Project Information:

Owner Representative: Eric Sundberg
General Contractor: Channel Construction
Contractors Representative: Gene Cheeseman
Project Authorized Representative: _____

I, the undersigned a duly authorized representative of: _____
do hereby takeover and accept the work described above from the date hereof, subject to the exceptions below, and confirm that the installation of the subject geosynthetic products has been completed in accordance with the specifications and the terms and conditions and conditions of the contract. There is no apparent damage to the installed geosynthetic products, nor is there any interference within or without the surrounding works.

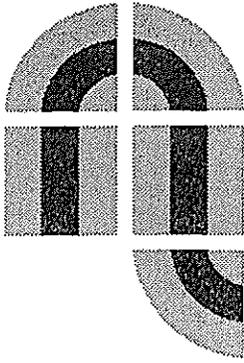
Exceptions: _____

Project Authorized Representative:

Gene Cheeseman V. President
Print Name Title
 7-2-05
Signature Date

Northwest Linings Representative:

Alex Riös Supervisor
Print Name Title
Alexandro S. Riös 7-02-05
Signature Date



**NORTHWEST LININGS &
GEOTEXTILE PRODUCTS, Inc.**

"Helping to Protect the Environment"

21000 77th Avenue South
Kent, WA 98032

CONSTRUCTION SAFETY MEETING MINUTES

Project Name: Greens Creek Mine Tailing Date: 6-27-05

Location: Juneau AK. Supervisor: Alex Rios

Attendees (Signatures):

<u>[Signature]</u>	_____	_____
<u>Mess Rios</u>	_____	_____
<u>Florentino Lucas</u>	_____	_____
<u>Alex Rios</u>	_____	_____
_____	_____	_____

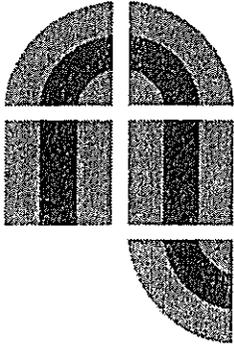
Safety Items Discussed:

- | | | |
|---|--|--|
| <input checked="" type="checkbox"/> Site Specific Items: | <input checked="" type="checkbox"/> Wet Plastic | <input checked="" type="checkbox"/> Extruder |
| <input checked="" type="checkbox"/> Wedge Welder | <input checked="" type="checkbox"/> First Aid | <input checked="" type="checkbox"/> Proper Cutting |
| <input checked="" type="checkbox"/> Generator | <input checked="" type="checkbox"/> Lifting/Pulling Techniques | <input type="checkbox"/> |
| <input checked="" type="checkbox"/> Spreader Bar/Heavy Equip. | <input checked="" type="checkbox"/> Anchor Trenches | <input type="checkbox"/> |

Comments/Concerns/Notes from Meeting:

Alejandro S. Rios
Supervisor Signature

6-27-05
Date



**NORTHWEST LININGS &
GEOTEXTILE PRODUCTS, Inc.**

"Helping to Protect the Environment"

21000 77th Avenue South
Kent, WA 98032

(253) 872-0244 • (800) 729-6954

FAX: (253) 872-0245

www.northwestlinings.com

info@northwestlinings.com

CERTIFICATE OF ACCEPTANCE OF SOIL SUB GRADE SURFACE

PROJECT: Greens Creek Mine Tailing Expansion
LINER TYPE/QTY: 80 mil HDPE / 80,000 sqft / 10 oz fabric 82500 sqft
OWNER: Greens Creek Mine / Geo Composite 78300 sqft
LOCATION: Juneau AK

I, the undersigned, a duly appointed representative of Northwest Linings & Geotextile Products, Inc. have visually observed the soil sub grade surface described below, and found it to be an acceptable surface on which to install geomembrane.

Northwest Linings & Geotextile Products, Inc. accepts no responsibility for the composition or character of the soil, nor any underlying conditions present at the sight, including, but not limited to, those arising out of improper compaction, use of improper soil materials, or the presence of underlying harmful objects of any kind. This acceptance is based solely upon a visual inspection of the completed sub grade preparation.

This acceptance is based upon the present condition of the sub grade preparation and Northwest Linings & Geotextile Products, Inc. accepts no responsibility for restoration of the sub grade preparation, upon physical harm or change, including, but not limited to, that caused by man, animal, or machinery. Neither does Northwest Linings & Geotextile Products, Inc. accept responsibility for restoration of the sub grade preparation upon the occurrence of any Act of God, including but not limited to, rain, wind, hail, snow, flood, or earthquake.

Area Being Accepted: Tailing Expansion

NORTHWEST LININGS REPRESENTATIVE:

Date: 7-02-05
Signature: Alejandro S. Rios
Name/Title: Alex Rios | Supervisor

OWNERS REPRESENTATIVE:

Date: 7-2-05
Company: Channel Const.
Signature: [Signature]
Name/Title: Gene Cheeseman | V. President

PANEL PLACEMENT FORM FOR NWL

PROJECT NAME: Greenscreek mine tailing
 MATERIAL DESCRIPTION: 80 mil HDPE texture

PROJECT NUMBER: N00048

DATE/TIME	PANEL NUMBER	ROLL NUMBER	PANEL LENGTH	PANEL WIDTH	COMMENTS/ PANEL LOCATION
6-27-05	1	0704	40'	26'	W. side slope
6-27-05	2	0704	45'	26'	W. side slope
6-27-05	3	0704	45'	26'	W. side slope
6-27-05	4	0704	45'	26'	W. side slope
6-27-05	5	0704	75'	26'	W. side slope
6-27-05	6	0709	75'	26'	W. side slope
6-27-05	7	0709	75'	26'	W. side slope
6-27-05	8	0709	75'	26'	W. side slope
6-27-05	9	0709	75'	26'	W. side slope
6-27-05	10	0703	75'	26'	W. side slope
6-27-05	11	0703	78'	26'	W. side slope
6-27-05	12	0707	80'	26'	W. side slope
6-29-05	13	0703	90'	26'	W. side slope

PANEL PLACEMENT FORM FOR NWL

PROJECT NAME: Greens Creek Mine Tailing

PROJECT NUMBER: W00048

MATERIAL DESCRIPTION: 80 mil HDPE Texture

DATE/TIME	PANEL NUMBER	ROLL NUMBER	PANEL LENGTH	PANEL WIDTH	COMMENTS/ PANEL LOCATION
6-29-05	14	0704	45'	26'	W. side Slope Butt
6-29-05	15	0707	35'	26'	W. side Bottom Butt
6-29-05	16	0709	26'	13'	W. side Slope Butt
6-29-05	17	0710	30'	13'	W. side Bottom Butt
6-29-05	18	0711	30'	26'	W. N. corner
6-29-05	19	0705	45'	26'	N. side (N. to S.)
6-29-05	20	0802	70'	26'	N. side (N. to S.)
6-29-05	21	0713	90'	26'	N. side (N. to S.)
6-29-05	22	0712	110'	26'	N. side (N. to S.)
6-29-05	23	0711	130'	26'	N. side (N. to S.)
6-29-05	24	0711	155'	26'	N. side (N. to S.)
6-29-05	25	0712	180'	26'	N. side (N. to S.)
6-29-05	26	0713	205'	26'	N. side (N. to S.)

PANEL PLACEMENT FORM FOR NWL

PROJECT NAME: Greenscreek Mine Tailing
 MATERIAL DESCRIPTION: Geo Composite

PROJECT NUMBER: W00049

DATE/TIME	PANEL NUMBER	ROLL NUMBER	PANEL LENGTH	PANEL WIDTH	COMMENTS/ PANEL LOCATION
7-01-05	1	0043	200'	14.5"	
7-01-05	2	0029	200'	14.5"	
7-01-05	3	0030	200'	14.5"	
7-01-05	4	0019	200'	14.5"	
7-01-05	5	0002	200'	14.5"	
7-01-05	6	0042	200'	14.5"	
7-01-05	7	0008	200'	14.5"	
7-01-05	8	0014	200'	14.5"	
7-01-05	9	0041	200'	14.5"	
7-01-05	10	0026	200'	14.5"	
7-01-05	11	0006	200'	14.5"	
7-01-05	12	00015	200'	14.5"	
7-01-05	13	0027	200'	14.5"	
7-01-05	14	0034	200'	14.5"	

PANEL PLACEMENT FORM FOR NWL

PROJECT NAME: GreensCreek Mine Tailing
 MATERIAL DESCRIPTION: Geo Composite

PROJECT NUMBER: 110045

DATE/ TIME	PANEL NUMBER	ROLL NUMBER	PANEL LENGTH	PANEL WIDTH	COMMENTS/ PANEL LOCATION
7-01-05	15	0035	200	14.5"	
7-01-05	16	0031	200	14.5"	
7-01-05	17	0004	200	14.5"	
7-01-05	18	0017	200	14.5"	
7-01-05	19	0040	200	14.5"	
7-01-05	20	0016	200	14.5"	
7-01-05	21	0025	200	14.5"	
7-01-05	22	0011	200	14.5"	
7-01-05	23	0028	200	14.5"	
7-01-05	24	0039	200	14.5"	
7-01-05	25	0036	200	14.5"	
7-01-05	26	0010	200	14.5"	
7-01-05	27	0009	200	14.5"	
7-01-05	28				
7-01-05	29				

PANEL PLACEMENT FORM FOR NWL

PROJECT NAME: Greens Creek Mine Tailings
 MATERIAL DESCRIPTION: 10 oz fabric

PROJECT NUMBER: N0002/g

DATE/TIME	PANEL NUMBER	ROLL NUMBER	PANEL LENGTH	PANEL WIDTH	COMMENTS/ PANEL LOCATION
6-27-05	1	75298	300'	15'	
6-27-05	2	40213	300'	15'	
6-27-05	3	75296	300'	15'	
6-27-05	4	75315	300'	15'	
6-27-05	5	75277	300'	15'	
6-27-05	6	75282	300'	15'	
6-28-05	7	75311	30	15'	
6-28-05	8	75276	30	15'	
6-28-05	9	40217	30	15'	
6-28-05	10	75649	30	15'	
6-28-05	11	75278	30	15'	
6-28-05	12	75309	30	15'	
6-28-05	13	75280	30	15'	

PANEL SEAMING FORM

PROJECT NAME: Greens Creek Mine Tailing
 NWLG PROJECT # N00048
 NWLG SUPERINTENDANT: Alex Rios
 MATERIAL DESCRIPTION: 80 mil HDPE texture

DATE: 6 127 105
 SHEET 1 of 5

DATE/TIME	SEAM NUMBER	PANEL NUMBERS	SEAM LENGTH	SEAMER INITIALS	MACHINE NUMBER	TEMP SETTING	WEATHER	WIND MPH	AMBIENT TEMP	COMMENTS
6 127 105	1	1 / 2	30'	FL	94	800°	cloudy	0	65°	
6 127 105	2	2 / 3	45'	FL	94					
6 127 105	3	3 / 4	45'	FL	94					
6 127 105	4	4 / 5	45'	FL	94					
6 127 105	5	5 / 6	75'	FL	94					
6 127 105	6	6 / 7	75'	M.C.	57					
6 127 105	7	7 / 8	75'	FL	94					D.S.#1 (bottom)
6 127 105	8	8 / 9	75'	M.C.	57					
6 127 105	9	9 / 10	75'	FL	94					
6 127 105	10	10 / 11	76'	FL	94					
6 127 105	11	11 / 12	90'	FL	94					
6 129 105	12	12 / 13	90'	FL	94					
6 129 105	13	13 / 14	45'	FL	94	800°	cloudy	0	65°	

PANEL SEAMING FORM

PROJECT NAME: Greens Creek Mine Tailing
 NWLG PROJECT # N00048
 NWLG SUPERINTENDANT: Alex Pios
 MATERIAL DESCRIPTION: 80 mil HDPE Texture

DATE: 6/29/05
 SHEET 2 of 5

DATE/TIME	SEAM NUMBER	PANEL NUMBERS	SEAM LENGTH	SEAMER INITIALS	MACHINE NUMBER	TEMP SETTING	WEATHER	WIND MPH	AMBIENT TEMP	COMMENTS
6/29/05	14	13/15	45'	FL	94	800°	Cloudy	0	60°	
6/29/05	15	14/15	26'	FL	94					Buff seam
6/29/05	16	16/17	13'	FL	94					Buff seam.
6/29/05	17	14/16	26'	FL	94					
6/29/05	18	14/17	20'	FL	94					
6/29/05	19	15/17	12'	FL	94					
6/29/05	20	18/19	30'	FL	94					
6/29/05	21	19/20	60'	M.C.	57					D.S.H 2
6/29/05	22	20/21	80'	FL	94					
6/29/05	23	21/22	100'	M.C.	57					
6/29/05	24	22/23	120'	FL	94					
6/29/05	25	23/24	142'	M.C.	57					
6/29/05	26	24/25	168'	FL	94	800°	Cloudy	0	60°	D.S.H 3

PANEL SEAMING FORM

PROJECT NAME: Greens Creek Mine Tailing
 NWLG PROJECT # N100045
 NWLG SUPERINTENDANT: Alex Riös
 MATERIAL DESCRIPTION: 80 mil HDPE texture

DATE: 6/29/05

SHEET 3 of 5

DATE/TIME	SEAM NUMBER	PANEL NUMBERS	SEAM LENGTH	SEAMER INITIALS	MACHINE NUMBER	TEMP SETTING	WEATHER	WIND MPH	AMBIENT TEMP	COMMENTS
6/29/05	27	25/26	193'	FL	94	800'	cloudy	0	65°	
6/29/05	28	26/27	220'	M.C.	57					
6/29/05	29	27/28	250'	M.C.	57					
6/29/05	30	28/29	30'	M.C.	57					
6/29/05	31	28/29	280'	M.C.	57					
6/29/05	32	30/31	13'	M.C.	57					
6/29/05	33	29/30	150'	M.C.	57					
6/29/05	34	29/31	150'	M.C.	57	800'	cloudy	0	65°	
6/30/05	35	2/27	26'	FL	94				60°	W. Tie-in
6/30/05	36	3/26	26'	FL	94					
6/30/05	37	4/26	10'	FL	94					
6/30/05	38	4/25	16'	FL	94					
6/30/05	39	5/25	15'	FL	94	800'	cloudy	0	60°	W. Tie-in

PANEL SEAMING FORM

PROJECT NAME: Greens Creek Mine Tailing
 NWLG PROJECT # N00044
 NWLG SUPERINTENDANT: Alex Riös
 MATERIAL DESCRIPTION: 80 mil HDPE Terflex

DATE: 6/30/05
 SHEET 4 of 5

DATE/ TIME	SEAM NUMBER	PANEL NUMBERS	SEAM LENGTH	SEAMER INITIALS	MACHINE NUMBER	TEMP SETTING	WEATHER	WIND MPH	AMBIENT TEMP	COMMENTS
6/30/	40	5/24	10'	FL	94	800°	cloudy	0	60°	W. Tie-in
6/30/	41	6/24	22'							
6/30/	42	7/23	26'							
6/30/	43	8/22	26'							
6/30/	44	9/21	21'							
6/30/	45	10/20	26'							
6/30/	46	11/20	8'							
6/30/	47	11/19	20'							
6/30/	48	12/19	15'							
6/30/	49	12/18	10'							
6/30/	50	13/18	20'							W. Tie-in
6/30/	51	15/old liner	37'							N. Tie-in
6/30/	52	17/old liner	20'	FL	94	800°	cloudy	0	60°	N. Tie-in

PANEL SEAMING FORM

PROJECT NAME: Greens Creek Mine Tailings
 NWLG PROJECT # N00048
 NWLG SUPERINTENDANT: Alex Rio
 MATERIAL DESCRIPTION: 80 mil HDPE Texture

DATE: 6/30/05
 SHEET 5 of 5

DATE/TIME	SEAM NUMBER	PANEL NUMBERS	SEAM LENGTH	SEAMER INITIALS	MACHINE NUMBER	TEMP SETTING	WEATHER	WIND MPH	AMBIENT TEMP	COMMENTS
6/30/05	53	30 old lines	15'	M.C.	13	800°	cloudy	0	65°	old liner and new lines N. Tie-in
6/30/05	54	29 O.L.	26'	M.C.						
6/30/05	55	28 O.L.	26'							
6/30/05	56	27 O.L.	26'							
6/30/05	57	26 O.L.	26'							
6/30/05	58	25 O.L.	26'							D.S.#6
6/30/05	59	24 O.L.	26'							
6/30/05	60	23 O.L.	26'							
6/30/05	61	22 O.L.	26'							
6/30/05	62	21 O.L.	26'							
6/30/05	63	20 O.L.	26'							
6/30/05	64	19 O.L.	26'							
6/30/05	65	18 O.L.	30'	M.C.	13	800°	cloudy	0	65°	O.L. and N.L. N. Tie-in

NORTHWEST LININGS / NON DESTRUCTIVE TEST LOG

PROJECT NAME: Greens Creek Mine Tailing
 NWLG PROJECT # 1100045
 NWLG SUPERINTENDANT: Alex Pios
 MATERIAL DESCRIPTION: 60 MIL HDPE Texture

DATE: 6 130105
 SHEET 1 of 4

DATE/ TIME	SEAM #	TESTER INITIALS	AIR PRESSURE TESTING						VACUUM BOX PASS / FAIL	COMMENTS / LOCATION
			START PRESSURE	START TIME	ENDING PRESSURE	ENDING TIME	PRESSURE LOSS	PASS/ FAIL		
6 130105	1/2	R.C.	30	10:00	30	10:05	-0	P		
6 130105	2/3	R.C.	30	10:05	30	10:10				
6 130105	3/4	R.C.	30	10:10	30	10:15				
6 130105	4/5	R.C.	30	10:15	30	10:20				
6 130105	5/6	R.C.	30	10:20	30	10:25				
6 130105	6/7	R.C.	30	10:25	30	10:30				
6 130105	7/8	R.C.	30	10:35	30	10:40				
6 130105	8/9	R.C.	30	10:40	30	10:45				
6 130105	9/10	R.C.	30	10:45	30	10:50				
6 130105	10/11	R.C.	30	10:50	30	10:55				
6 130105	11/12	R.C.	30	11:00	30	11:05				
6 130105	12/13	R.C.	30	11:05	30	11:10				
6 130105	13/14	R.C.	30	11:10	30	11:15				
6 130105	13/15	R.C.	30	11:15	30	11:20				
6 130105	14/15	R.C.	30	11:20	30	11:25				
6 130105	14/16	R.C.	30	11:25	30	11:30				
6 130105	14/17	R.C.	30	11:30	30	11:35	0	P		

NORTHWEST LININGS / NON DESTRUCTIVE TEST LOG

PROJECT NAME: Greens Creek Mine Tailing
 NWLG PROJECT # N00048
 NWLG SUPERINTENDANT: Alex Riös
 MATERIAL DESCRIPTION: 30 mil HDPE Textur

DATE: 6/30/05
 SHEET 2 of 3

DATE/ TIME	SEAM #	TESTER INITIALS	AIR PRESSURE TESTING						VACUUM BOX PASS / FAIL	COMMENTS / LOCATION
			START PRESSURE	START TIME	ENDING PRESSURE	ENDING TIME	PRESSURE LOSS	PASS/ FAIL		
6/30/05	16/17	R.C.	30	11:30	30	11:35	-0	P		
6/30/05	15/17	R.C.	30	11:35	30	11:40	-0	P		
6/30/05	30/31	R.C.	30	1:00	30	1:05	-0	P		
6/30/05	31/29	R.C.	30	1:00	30	1:05	-0	P		
6/30/05	0 ^v /30	R.C.	30	1:10	30	1:15	-0	P		O.L (old liner) N. Tie-in
6/30/05	30/29	R.C.	30	1:10	30	1:15	-0	P		
6/30/05	0 ^v /29	R.C.	30	1:10	30	1:15	-0	P		N. Tie-in
6/30/05	29/28	R.C.	30	1:15	30	1:20	-0	P		
6/30/05	0 ^v /29	R.C.	30	1:15	30	1:20	-0	P		N. Tie-in
6/30/05	28/27	R.C.	30	1:20	30	1:25	-0	P		
6/30/05	0 ^v /27	R.C.	30	1:20	30	1:25	-0	P		N. Tie-in
6/30/05	27/26	R.C.	30	1:25	30	1:30	-0	P		
6/30/05	0 ^v /26	R.C.	30	1:25	30	1:30	-0	P		N. Tie-in
6/30/05	26/25	R.C.	30	1:30	30	1:35	-0	P		
6/30/05	0 ^v /25	R.C.	30	1:30	30	1:35	-0	P		N. Tie-in
6/30/05	25/24	R.C.	30	1:35	30	1:40	-0	P		
6/30/05	0 ^v /24	R.C.	30	1:35	30	1:40	-0	P		N. Tie-in

NORTHWEST LININGS / NON DESTRUCTIVE TEST LOG

PROJECT NAME: Greens Creek Mine Tailing
 NWLG PROJECT # N00048
 NWLG SUPERINTENDANT: Alex Pios
 MATERIAL DESCRIPTION: 80 mil HDPE Texture

DATE: 6/30/05

SHEET 3 of 4

DATE/TIME	SEAM #	TESTER INITIALS	AIR PRESSURE TESTING						VACUUM BOX PASS/FAIL	COMMENTS / LOCATION
			START PRESSURE	START TIME	ENDING PRESSURE	ENDING TIME	PRESSURE LOSS	PASS/FAIL		
6/30/05	24/23	R.C.	30	1:50	30	1:55	-0	P		
6/30/05	0V/23	R.C.	30	1:50	30	1:55	-0	P		No Tie-in
6/30/05	23/22	R.C.	30	1:55	30	2:00	-0	P		
6/30/05	0V/22	R.C.	30	1:55	30	2:00	-0	P		N. Tie-in
6/30/05	22/21	R.C.	30	2:10	30	2:15	-0	P		
6/30/05	0V/21	R.C.	30	2:10	30	2:15	-0	P		No Tie-in
6/30/05	21/20	R.C.	30	2:15	30	2:20	-0	P		
6/30/05	0V/20	R.C.	30	2:15	30	2:20	-0	P		No Tie-in
6/30/05	20/19	R.C.	30	2:20	30	2:25	-0	P		
6/30/05	0V/19	R.C.	30	2:20	30	2:25	-0	P		No Tie-in
6/30/05	19/18	R.C.	30	2:30	30	2:35	-0	P		
6/30/05	0V/18	R.C.	30	2:30	30	2:35	-0	P		N. Tie-in
6/30/05	18/17	R.C.	30	2:45	30	2:50	-0	P		W. Tie-in
6/30/05	0V/17	R.C.	30	2:50	30	2:55	-0	P		No Tie-in
6/30/05	17/16	R.C.	30	3:00	30	3:05	-0	P		No Tie-in
6/30/05	16/15	R.C.	30	3:10	30	3:15	-0	P		W. Tie-in
6/30/05	15/14	R.C.	30	3:10	30	3:15	-0	P		W. Tie-in

DESTRUCTIVE TEST LOG

PROJECT NAME:

NWLG PROJECT #

NWLG SUPERINTENDANT:

MATERIAL DESCRIPTION:

Green Creek Mine tailing

1100048

Alex Rios

gomit texture HDP

DATE: 1 / 1

SHEET of

DATE / TIME	SAMPLE I.D. SHOW I.D. ON AS BUILT	SEAM #	TEST MACHINE I.D.	TESTER INITIALS	PEEL VALUES LBS/IN			TENSILE VALUE		LAB PASS / FAIL PEEL / TENSILE	
					INSIDE TRACK	OUTSIDE TRACK	PASS / FAIL	LBS / IN	PASS / FAIL		
6-130105	OP.FL. 44 DS#1	D-7-P8	#6197	R.C.	1	155	159	P.	228	P.	
					2	186	183	P.	228	P.	
					3	169	176	P.			
					4						
					5						
6-130105	OP.MC. DS#2 WEDGE 57	P-19 P-20	#6197	R.C.	1	160	175	P.	200	P.	
					2	140	150	P.	235	P.	
					3	157	150	P.			
					4						
					5						
6-130105	DS#3 WEDGE 67	P-24 P-25	#6197	R.C.	1	150	150	P.	225	P.	
					2	139	139	P.	230	P.	
					3	155	155	P.			
					4						
					5						
6-130105	DS#4 WEDGE 57	P-27 P-28	#6197	R.C.	1	150	150	P.	200	P.	
					2	157	157	P.	235	P.	
					3	155	155	P.			
					4						
					5						
6-130105	DS#5 WEDGE 13	P-29 P-30	#6197	R.C.	1	150	163	P.	200	P.	
					2	155	165	P.	235	P.	
					3	163	150	P.			
					4						
					5						
6-130105	DS#6 WEDGE 13	P-25 P-26	#6197	R.C.	1	156	149	P.	222	P.	
					2	149	150	P.	222	P.	
					3	144	155	P.			
					4						
					5						

Northwest Liner Repair Report

Project Name:

Greens Creek Mine Tailing

NWL Project #:

N00048

NWL Superintendent:

Alex Rio's

Material Description:

80 mil HDPE Texture

DATE: 6 130 05

SHEET 1 of

Repair Date/Time	Repair ID # Locate ID # on as built	Panel/Seam #	Extruder #	Operator	TYPE OF REPAIR/DETAILS/LOCATION (i.e., DT Patch, Rock Hole, Burn Out, Failed Seam, Etc.)	Repair VBOX Date	Repair Passed VBOX
6 130 05	1	22, 23, 1, 2		M.C.	2'x6' patch over X and DS#4 40' from W. Berm.	6-30-05	✓
6 130 05	2	26, 27, 2, 3		M.C.	X. Bead 40' from W. Berm.	6-30-05	✓
6 130 05	3	26, 3, 4		M.C.	T. Bead 40' from W. Berm.	6-30-05	✓
6 130 05	4	25, 26, 4		M.C.	T. Bead on W. Tie-in	6-30-05	✓
6 130 05	5	25, 4, 5		M.C.	T. Bead on W. Tie-in	6-30-05	✓
6 130 05	6	24, 25, 5		M.C.	2'x6' patch over T. and DS#3 169' from N. Tie-in	6-30-05	✓
6 130 05	7	24, 5, 6		M.C.	T. Bead 70' from W. Berm.	6-30-05	✓
6 130 05	8	23, 24, 6		M.C.	T. Bead on W. Tie-in	6-30-05	✓
6 130 05	9	23, 6, 7		M.C.	T. Bead 70' from W. Berm.	6-30-05	✓
6 130 05	10	22, 23, 7		M.C.	T. Bead on W. Tie-in	6-30-05	✓
6 130 05	11	7, 8, 22		M.C.	2'x6' patch over T. and DS#2	6-30-05	✓
6 130 05	12	21, 22, 8, 9		M.C.	X. Bead on W. Tie-in	6-30-05	✓
6 130 05	13	20, 21, 9, 10		M.C.	X. Bead on W. Tie-in	6-30-05	✓
6 130 05	14	20, 10, 11		M.C.	T. Bead on W. Tie-in	6-30-05	✓
6 130 05	15	19, 20, 11		M.C.	2'x6' patch 60' from N. Tie-in	6-30-05	✓
6 130 05	16	19, 11, 12		M.C.	T. Bead on W. Tie-in	6-30-05	✓

Northwest Liner Repair Report

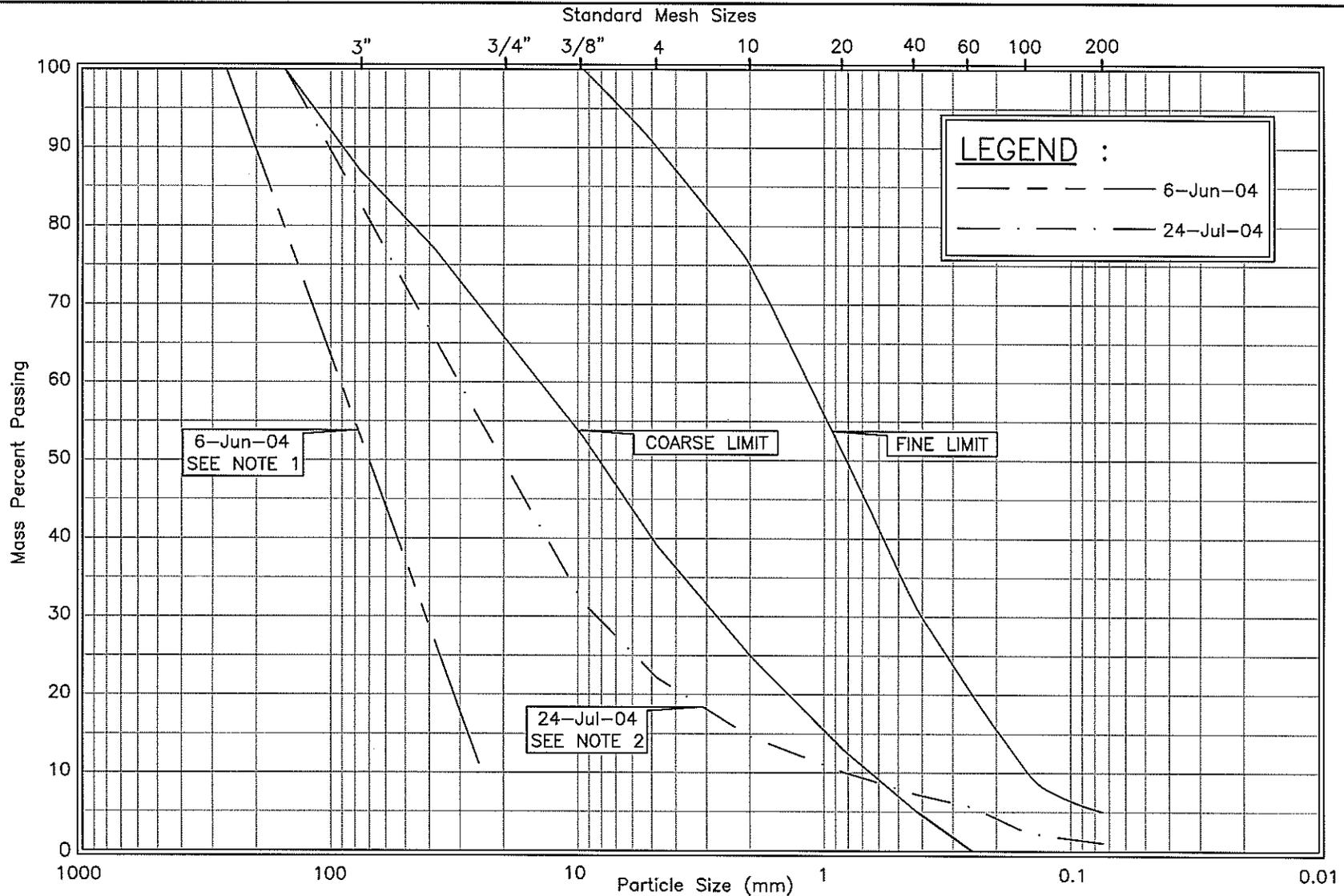
Project Name:
 NWL Project #:
 NWL Superintendent:
 Material Description:

Green's Creek Mine Tailings
N00649
Alex Rios
80 mil HDPE Texture

DATE: 6 130 05

SHEET 2 of

Repair Date/Time	Repair ID # Locate ID # on as built	Panel/Seam #	Extruder #	Operator	TYPE OF REPAIR/DETAILS/LOCATION (i.e., DT Patch, Rock Hole, Burn Out, Failed Seam, Etc.)	Repair VBOX Date	Repair Passed VBOX
6.130.05	17	12, 19, 18	305	M.C.	T. Bead on W. Tie-in	6-30-05	P
6.130.05	18	12, 13, 18	305	M.C.	T. Bead on W. Tie-in	6-30-05	
6.130.05	19	13, 14, 15	305	M.C.	T. Bead 40' from W. Berm.	6-30-05	
6.130.05	20	14, 16, 17	305	M.C.	T. Bead 40' from W. Berm.	6-30-05	
6.130.05	21	14, 16, 17	305	M.C.	T. Bead 20' from W. Berm.	6-30-05	
6.130.05	22	30, 31, 29	305	M.C.	2'x6' patch over T. and D.S.#6 ON East Berm.	6-30-05	
6.130.05	23	Old liner 29, 30	305	M.C.	T. Bead on N. Tie-in	6-30-05	
6.130.05	24	28, 29	305	M.C.	T. Bead on N. Tie-in	6-30-05	
6.130.05	25	27, 28	305	M.C.	T. Bead on N. Tie-in	6-30-05	
6.130.05	26	26, 27	305	M.C.	T. Bead on N. Tie-in	6-30-05	
6.130.05	27	25, 26	305	M.C.	T. Bead on N. Tie-in	6-30-05	
6.130.05	28	25, 24	305	M.C.	2'x6' patch over T. and D.S.#6 ON N. Tie-in	6-30-05	
6.130.05	29	24, 23	305	M.C.	T. Bead on N. Tie-in	6-30-05	
6.130.05	30	23, 22	305	M.C.	T. Bead on N. Tie-in	6-30-05	
6.130.05	31	22, 21	305	M.C.	T. Bead on N. Tie-in	6-30-05	
6.130.05	32	21, 20	305	M.C.	T. Bead on N. Tie-in	6-30-05	P



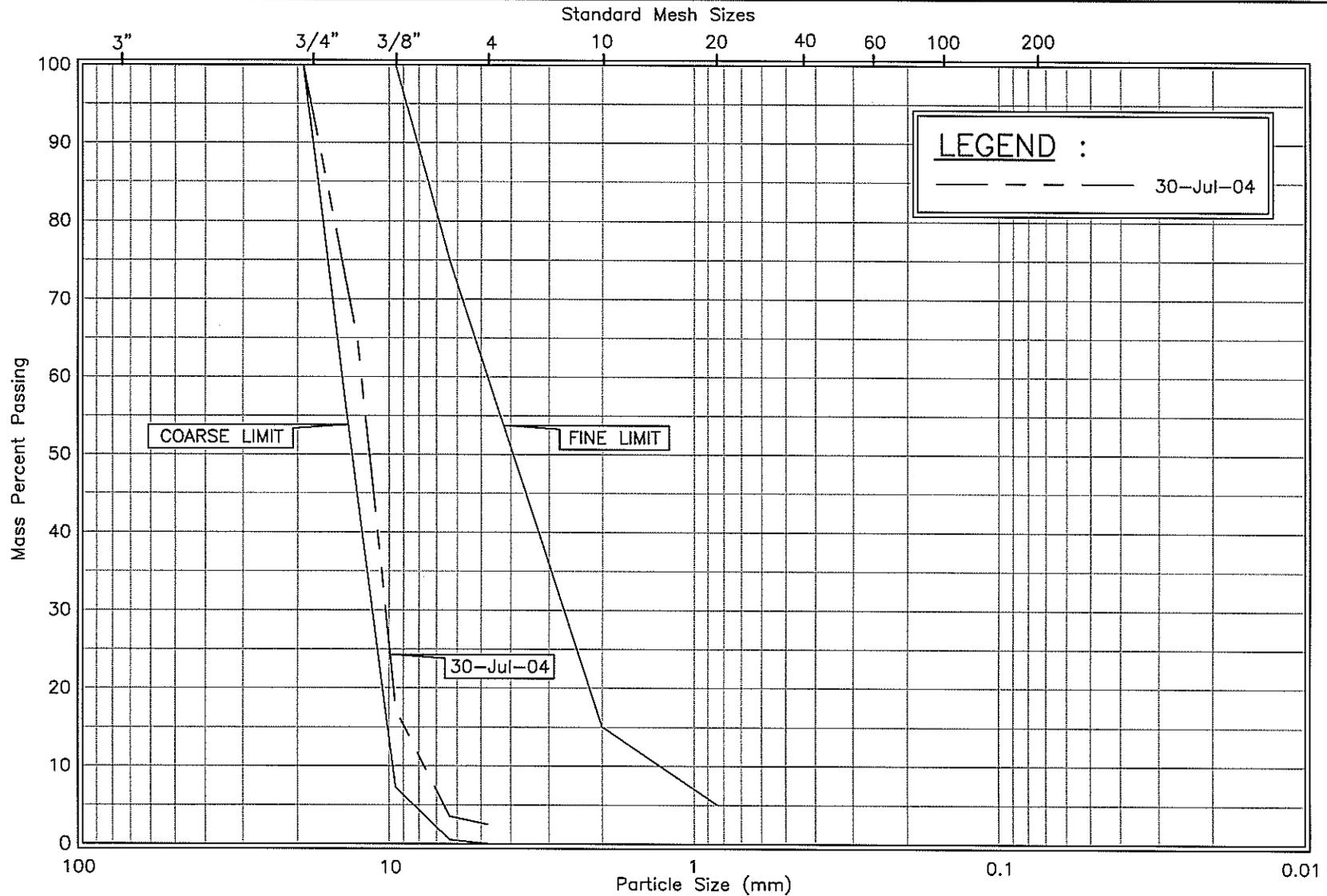
NOTES :

1. ESTIMATED GRADATION OF PLUS 1-INCH SAMPLE FRACTION (1,436 lb) BY HAND-SORTING AND VISUAL ESTIMATION.
2. 3/8-inch PLUS FRACTION NOT SIEVED - VISUAL ESTIMATE OF GRADATION ONLY.

NOT FOR CONSTRUCTION DRAFT

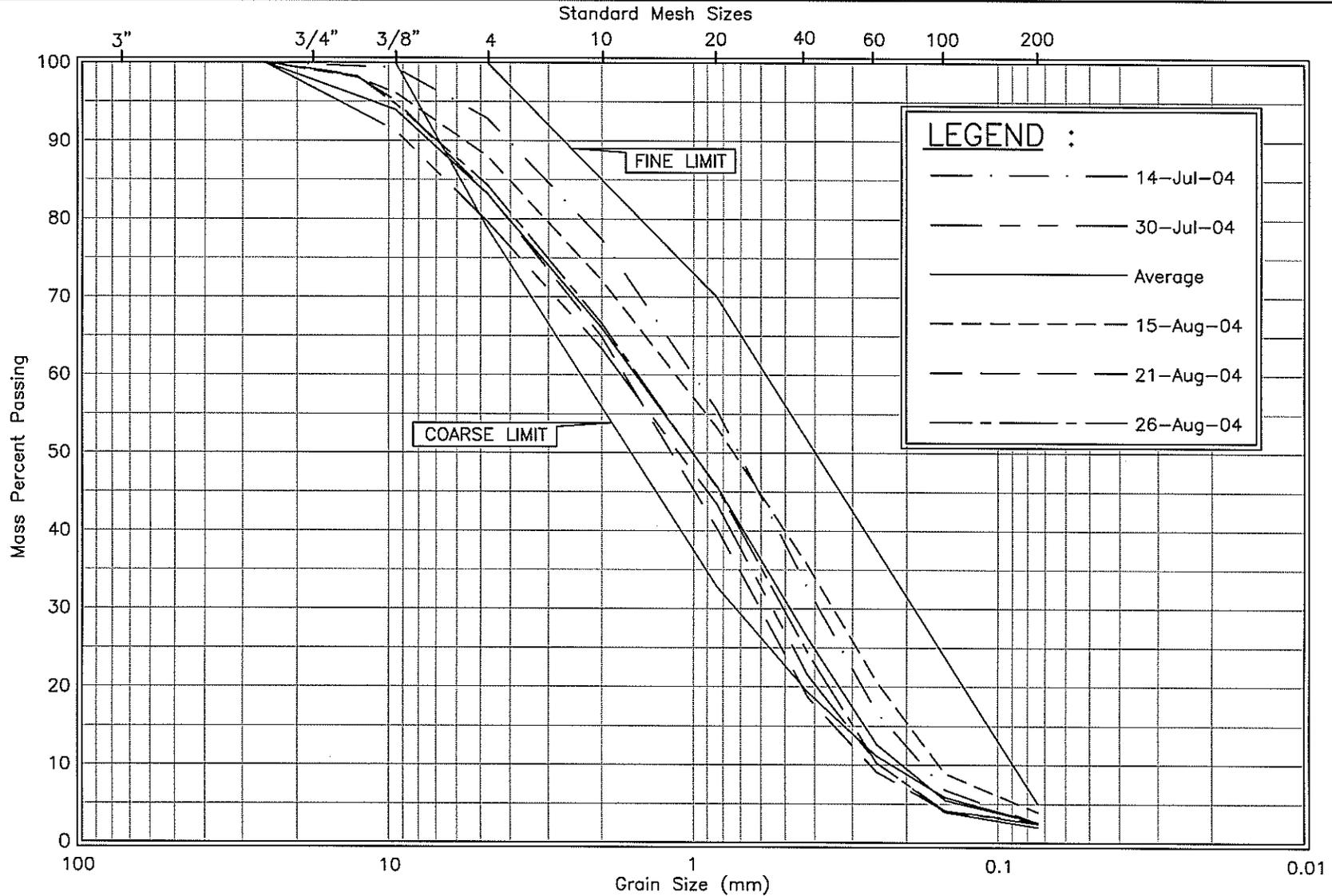
AS A RESULT OF OUR OBLIGATION TO OUR CLIENT, THE PUBLIC AND THE ENVIRONMENT, WE HEREBY CERTIFY THAT THE INFORMATION CONTAINED ON OUR DRAWING IS A TRUE AND ACCURATE REPRESENTATION OF THE PROJECT AND MATERIALS TO BE CONSTRUCTED. THESE DRAWINGS AND SPECIFICATIONS ARE THE PROPERTY OF KLOHN CRIPPEN AND ARE NOT TO BE REPRODUCED OR COPIED IN ANY MANNER WITHOUT OUR WRITTEN APPROVAL.	CLIENT KENNECOTT GREENS CREEK MINING COMPANY	SCALE: PROJECT 2004 TAILINGS STORAGE FACILITY EXPANSION
	 KLOHN CRIPPEN	TITLE 6-INCH MINUS ROCK FILL GRADATION
		FIG. No. FIGURE 9.1

KRM-11-11



NOT FOR CONSTRUCTION DRAFT

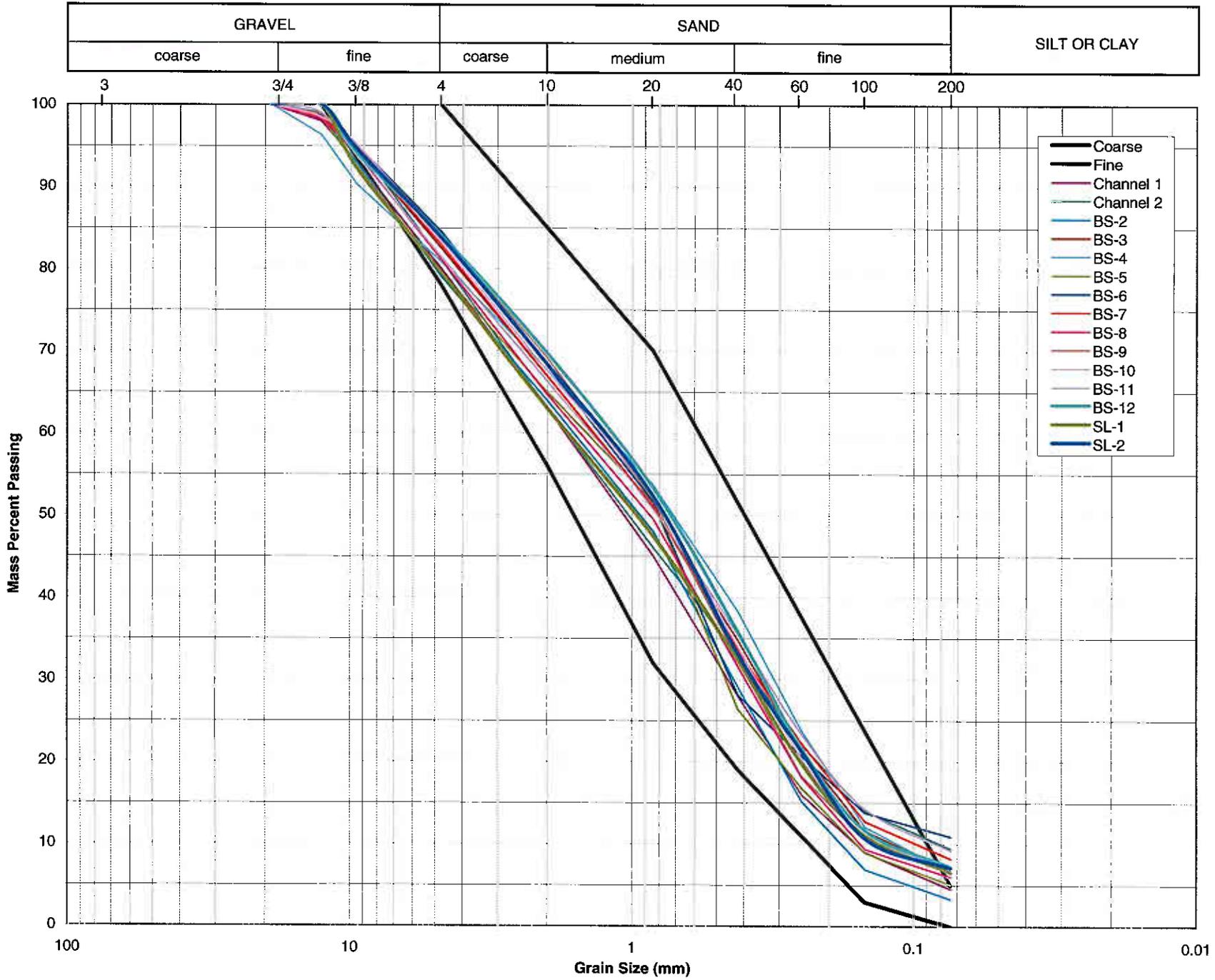
<small>AS A MINERAL PRODUCTION OF THE STATE OF ARIZONA THIS DOCUMENT IS HEREBY OFFICIALLY RECORDED UNDER THE PROVISIONS OF ARIZONA STATUTES TITLE 24 CHAPTER 4 ARTICLE 1 SECTION 1 AND THE RECORDS ACT OF THE STATE OF ARIZONA REC'D 11/28/04 10:58 AM COUNTY OF MARICOPA</small>	CLIENT KENNECOTT GREENS CREEK MINING COMPANY	PROJECT 2004 TAILINGS STORAGE FACILITY EXPANSION
	 KLOHN CRIPPEN	TITLE DRAIN GRAVEL GRADATION
	PROJECT No. M07802A36	FIG. No. FIGURE 9.3



NOT FOR CONSTRUCTION DRAFT

SCALE:

<small>AS A MINIMUM PROTECTION TO OUR CLIENT, THE RESULTS AND CONCLUSIONS OF ANY TESTING AND ANALYSIS SUBMITTED FOR OUR REVIEW ARE THE PROPERTY OF KLOHN CRIPPEN AND ARE NOT TO BE REPRODUCED OR TRANSMITTED IN ANY FORM OR BY ANY MEANS, ELECTRONIC OR MECHANICAL, INCLUDING PHOTOCOPYING, RECORDING, OR BY ANY INFORMATION STORAGE AND RETRIEVAL SYSTEM.</small>	CLIENT KENNECOTT GREENS CREEK MINING COMPANY	PROJECT 2004 TAILINGS STORAGE FACILITY EXPANSION
	 KLOHN CRIPPEN	TITLE BEDDING SAND GRADATION
PROJECT No. M07802A36		FIG. No. FIGURE 9.2



2005 Bedding Sand / Service Layer Sand Gradation

R&M PROJECT NUMBER: 051128

R & M ENGINEERING, INC.
ENGINEERS SURVEYORS
6205 Cleaver Highway, P.O. Box 34278, Juneau, Alaska 99901

PROJECT : Greens Creek Mine Tailings Expansion

CLIENT: Channel Construction

MATERIAL TYPE: Fill Material - Sand

DATE RECEIVED: 27-May-05

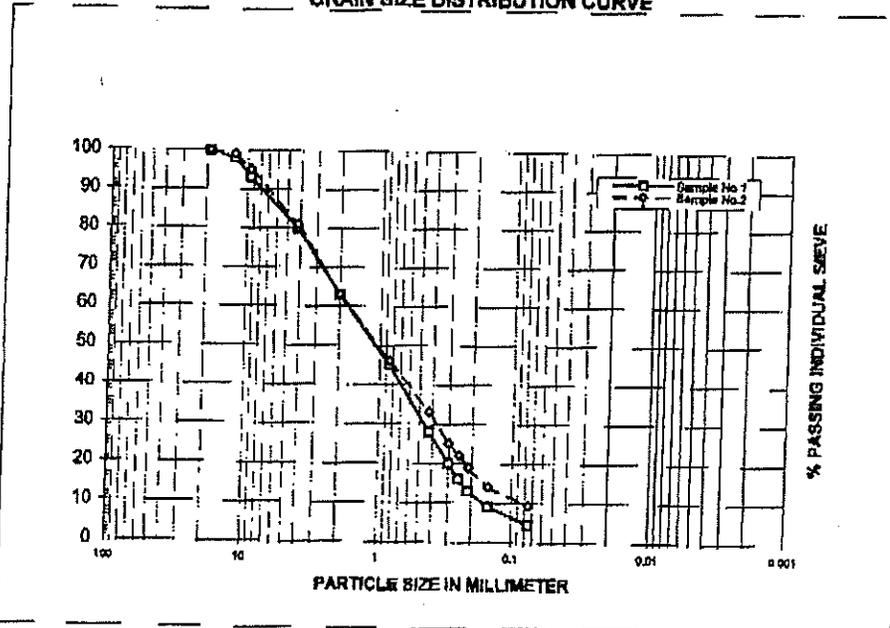
SAMPLE SOURCE: Channel Stockpile

DATE REPORTED: 31-May-05

SAMPLE SUBMITTED BY: Gene Cheeseman

Moisture	N.A.	Required	N.A.	Required	Required	Required
SIEVE SIZE	Percent passing	specs	Sample	specs	specs	specs
	Sample		No.2			
	No.1					
3/4 "	100		100			
1/2 "	98		99			
3/8 "	93		95			
No 4	80		81			
No 10	63		63			
No 20	45		46			
No 40	28		33			
No 60	20		25			
No 80	16		22			
No 100	13		19			
No 200	9		14			
	4.5		9.4			

GRAIN SIZE DISTRIBUTION CURVE



R&M PROJECT NUMBER: 051128



PROJECT : Greens Creek Mine Tailings Expansion

CLIENT: Channel Construction

MATERIAL TYPE: Fill Material - Sand

DATE RECEIVED: 27-May-05

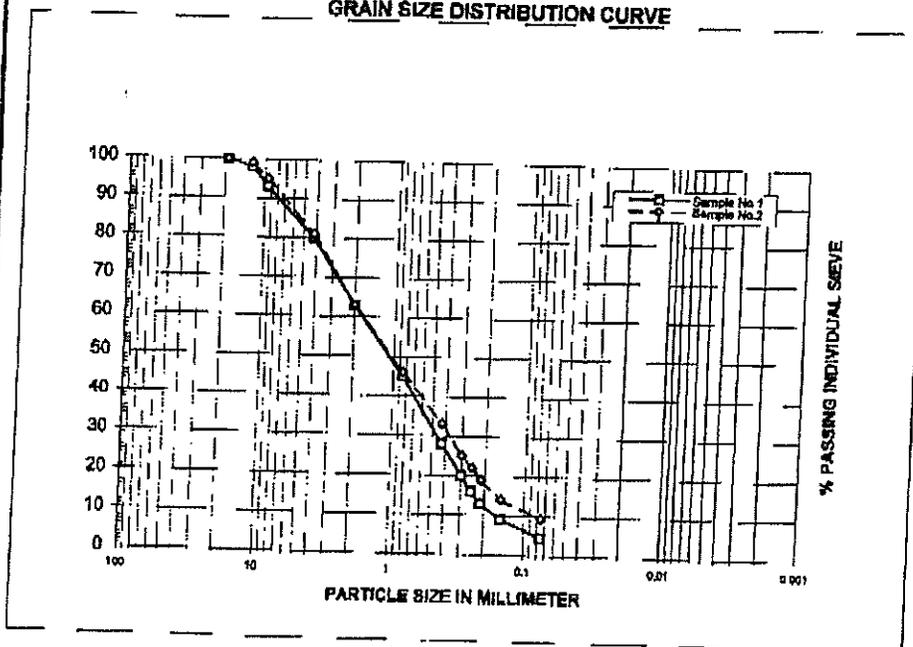
SAMPLE SOURCE: Channel Stockpile

DATE REPORTED: 31-May-05

SAMPLE SUBMITTED BY: Gene Cheeseman

Moisture	N.A.	Required	N.A.	Required	Required	Required
SIEVE SIZE	Percent passing	specs	Sample	specs	specs	specs
	Sample		No.2			
	No.1					
3/4 "	100		100			
1/2 "	98		99			
3/8 "	93		95			
No 4	80		81			
No 10	63		63			
No 20	45		46			
No 40	28		33			
No 60	20		25			
No 80	16		22			
No 100	13		19			
No 200	9		14			
	4.5		9.4			

GRAIN SIZE DISTRIBUTION CURVE

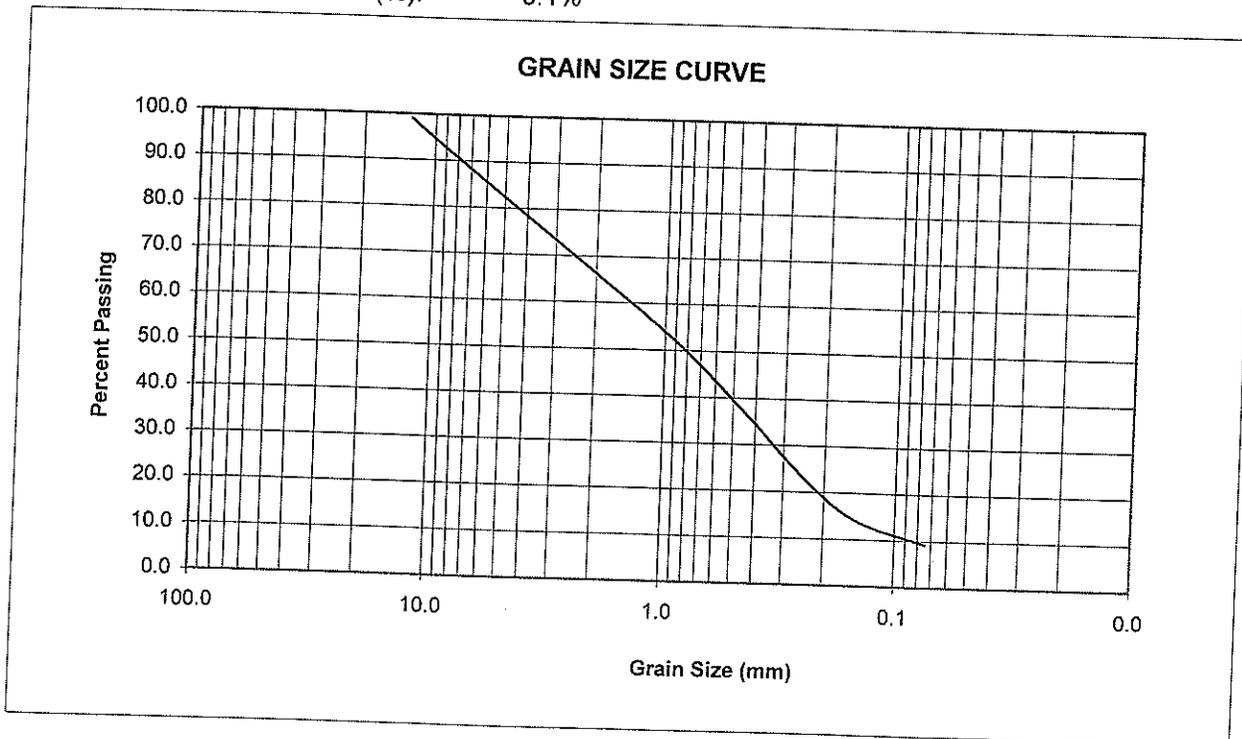


Grainsize Distribution Curve Information

Material	Bedding Sand			
Date	24-Jun-05			
Location	A-Road Pit			
Sample No	BS-11			
Elevation	n/a			
Tare Wt. (Plate)	627	Tare Wt.	2470	(g)
Dry Wt. + Tare	2345	Ttl Smple+Tare (Wet)	20832	(g)
Washed Dry Wt+Tare	2198	Ttl Smple+Tare (Dry)	19380	
Dry Wt	1571	Ttl Smple (Dry)	16910	(g)
Fines Removed	147.0	Water Content	8.6	(%)

Mertric Size (mm)	(inches)	Wt Retained (grams)	Wt Finer Than (grams)	% Passing
		0	1720.0	100.0
12.7	1/2	17.0	1703.0	99.0
9.5	3/8	90.0	1613.0	93.8
4.8	4	213.0	1400.0	81.4
2.0	10	260.0	1140.0	66.3
0.84	20	269.0	871.0	50.6
0.42	40	261.0	610.0	35.5
0.25	60	208.0	402.0	23.4
0.149	100	157.0	245.0	14.2
0.074	200	87.0	158.0	9.2
PAN	PAN	11.0		

Total Dry (g): 1573.0 From sieve
 Total Dry (g): 1571.0 From initial weighting
 Net Diff. (g): 2.0
 Net Diff. (%): 0.1%



R&M PROJECT NUMBER: 051128

R & M ENGINEERING, INC.
ENGINEERS GEOLOGISTS SURVEYORS

PROJECT : Greens Creek Mine Tailings

SUBMITTED BY: Gene Cheeseman

CLIENT: Channel Construction

DATE RECEIVED: June 23, 2005

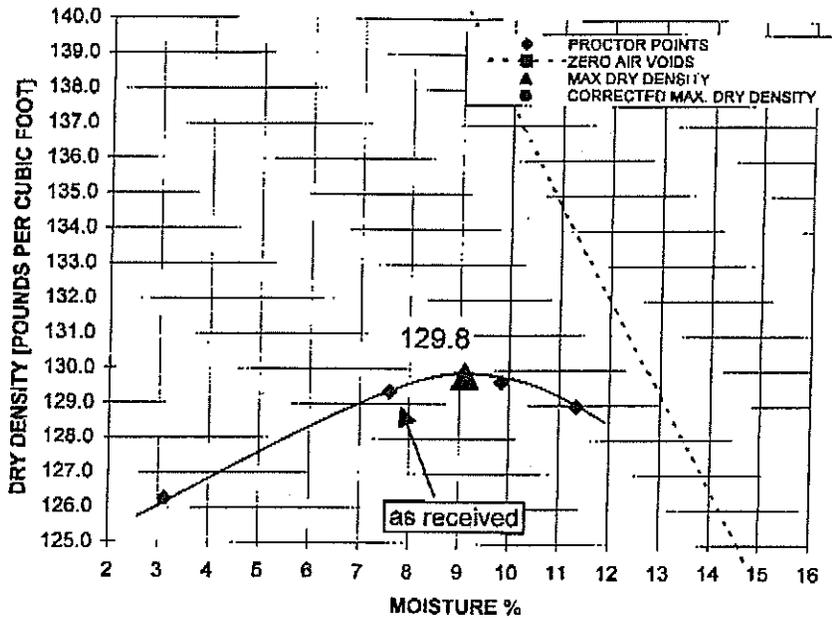
SOURCE: Greens Creek

DATE FINISHED: June 25, 2005

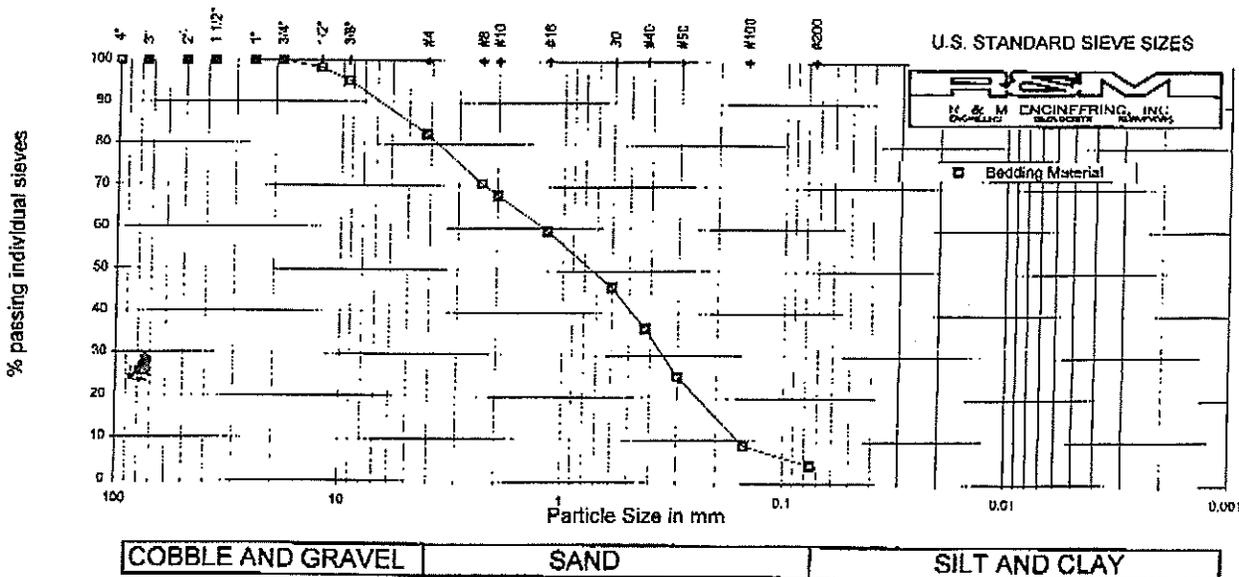
Optimum moisture: 9.1 % | Max. dry density 129.8 lbs/cu. foot | Corr. max. dry density N.A. lbs/cu. foot | Spc. Grav. 2.86

SIEVE SIZE	Percent passing of Bedding Material	Required specs
3/4 "	100	
1/2 "	98	
3/8 "	95	
No 4	82	
No 8	71	
No 10	68	
No 16	59	
No 30	46	
No 40	36	
No 50	25	
No 100	9	
No 200	4.2	

MODIFIED PROCTOR DENSITY



Grain size distribution for soils of the Greens Creek Mine Tailings



POLYFLEX, INC.

2000 W. Marshall Drive Grand Prairie, Texas 75051 USA

888-765-9359

972-337-7113

FAX 972-337-7233

CERTIFICATION DOCUMENTS

To: Northwest Linings
21000 77th Avenue South
Kent, WA. 98032

Date: 8/11/2005
Poly-Flex Proj #: 250272
Customer PO: 2023
Project Name: Renton Closure
Order #: 670073
670304

Attn: Julie McKinney

Number of pages including cover: 15

Departure Date: 4/15/2005
Destination: Kent, WA
Carrier:

Trip No: 219793
219794
Freight: PPD

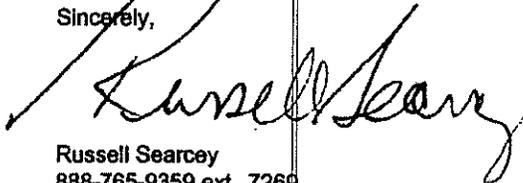
Additional Notes:

Distribution of Documents:

Shipment Inspection Sheet: 2
Roll Certification: 12
Resin Certification:
Other:

Attached please find documents for the above referenced shipment. Please let us know if you have any questions.

Sincerely,



Russell Searcey
888-765-9359 ext. 7269

CERTIFICATION SHEET

DATE: April 18, 2005

POLY-FLEX, INC.

PROJECT NO: 250272

ORDER NO: 670073

2000 W. Marshall Drive
Grand Prairie, Texas 75051

TRIP NO: 219793

CERTIFIED BY: *E. R. K.*

TEST DESCRIPTION						TRANSMISSIVITY	PEEL	
ASTM METHOD						D4716	D7005	
(modifications)							TOP	BOTTOM
UNITS						$\times 10^{-3}$ sq. m / s	ppi	ppi
SPECIFICATION						0.04	1.0	1.0
COMPOSITE ROLL NUMBER		GEO-NET ROLL NUMBER		GEOTEXTILE TOP	GEOTEXTILE BOTTOM			
C1006-2-05	1-200	GNC-200-05	35	5249492	5225562	0.50	2.6	6.8
C1006-2-05	2-200	GNC-200-05	35	5249483	5225562			
C1006-2-05	3-200	GNC-200-05	35	5249483	5225563			
C1006-2-05	4-200	GNC-200-05	36	5249483	5225558			
C1006-2-05	5-200	GNC-200-05	36	5249483	5223628			
C1006-2-05	6-200	GNC-200-05	36	5249536	5223628			
C1006-2-05	7-200	GNC-200-05	31	5249536	5223659			
C1006-2-05	8-200	GNC-200-05	31	5249536	5245557			
C1006-2-05	9-200	GNC-200-05	32	5249498	5223631			
C1006-2-05	10-200	GNC-200-05	32	5249498	5223636	0.33	4.6	3.5
C1006-2-05	11-200	GNC-200-05	32	5249498	5223624			
C1006-2-05	12-200	GNC-200-05	30	5249498	5223624			
C1006-2-05	13-200	GNC-200-05	30	5249564	5223638			
C1006-2-05	14-200	GNC-200-05	30	5249564	5223660			
C1006-2-05	15-200	GNC-200-05	29	5249564	5223640			
C1006-2-05	16-200	GNC-200-05	29	5249564	5223640			
C1006-2-05	17-200	GNC-200-05	29	5249480	5223647			

*Transmissivity test is performed at gradient of 1.0, normal pressure of 10,000 psf, between metal plates for a seat time of 15 minutes.

CERTIFICATION SHEET

DATE: April 18, 2005

POLY-FLEX, INC.

PROJECT NO: 250272

ORDER NO: 670073

2000 W. Marshall Drive
Grand Prairie, Texas 75051

TRIP NO: 219793

CERTIFIED BY: *[Signature]*

TEST DESCRIPTION		THICKNESS	MASS/AREA	CARBON-BLACK	ULTIMATE TENSILE STRENGTH	*TRANSMISSIVITY	DENSITY
ASTM METHOD		D5199	D5261	D1603	D5035	D4716	D1505
(modifications)		avg		min			
UNITS		mils	lbs / sq. ft.	%	ppi	x10 ⁻³ sq. m / s	gm/cc
SPECIFICATION		200	0.162	2	45	1	0.940
ROLL NUMBER							
GNC-200-05	25-620	200	0.187	2.5	61		0.949
GNC-200-05	26-620	200	0.187	2.5	61		0.949
GNC-200-05	27-620	200	0.187	2.5	61		0.949
GNC-200-05	28-620	200	0.187	2.5	61		0.949
GNC-200-05	29-620	200	0.187	2.5	61		0.949
GNC-200-05	30-620	200	0.187	2.4	57	2.09	0.947
GNC-200-05	31-620	200	0.186	2.4	57		0.947
GNC-200-05	32-620	200	0.186	2.4	57		0.947
GNC-200-05	33-620	200	0.186	2.4	57		0.947
GNC-200-05	35-620	200	0.186	2.4	57		0.947
GNC-200-05	36-620	200	0.186	2.4	57		0.947

*Transmissivity test is performed at gradient of 1.0, normal pressure of 10,000 psf, between metal plates for a seat time of 15 minutes.

CERTIFICATION SHEET

DATE: April 18, 2005

POLY-FLEX, INC.

PROJECT NO: 250272

ORDER NO: 670073

2000 W. Marshall Drive
Grand Prairie, Texas 75051

TRIP NO: 219793

CERTIFIED BY: 

TEST DESCRIPTION	Product	Unit Weight	Grab Tensile	Puncture	AOS	Flow Rate	
ASTM METHOD		D5261	D4632	D4833	D4751	D4491	
(modifications)							
UNITS		oz/yd ²	lb	lb		gal/min/ft ²	
SPECIFICATION		10	265	165	100 sieve	75	
Textile Roll Number							
SI10	5223624	GTS-10-0300	11.80	320	187	100	85
SI10	5223625	GTS-10-0300	11.80	320	187	100	85
SI10	5223626	GTS-10-0300	11.80	320	187	100	85
SI10	5223628	GTS-10-0300	11.80	320	187	100	85
SI10	5223629	GTS-10-0300	11.80	320	187	100	85
SI10	5223631	GTS-10-0300	11.80	320	187	100	85
SI10	5223633	GTS-10-0300	11.80	320	187	100	85
SI10	5223636	GTS-10-0300	11.80	320	187	100	85
SI10	5223638	GTS-10-0300	11.20	314	204	100	85
SI10	5223640	GTS-10-0300	11.20	314	204	100	85
SI10	5223647	GTS-10-0300	11.20	314	204	100	85
SI10	5223656	GTS-10-0300	11.20	314	204	100	85
SI10	5223659	GTS-10-0300	11.20	314	204	100	85
SI10	5223660	GTS-10-0300	10.90	308	198	100	85
SI10	5225558	GTS-10-0300	11.00	323	184	100	85
SI10	5225560	GTS-10-0300	11.00	323	184	100	85
SI10	5225562	GTS-10-0300	13.20	363	199	100	85

Poly-Flex

Material Shipment Roll List

Tractor # _____ Trailer # _____ Date: 15-Apr-05 TRIP 219793

Drop # 1 Drop # _____ Drop # _____ Drop # _____
 Poly-Flex # 250272(670073) Poly-Flex # _____ Poly-Flex # _____ Poly-Flex # _____
 Customer: Northwest linings Customer: _____ Customer: _____ Customer: _____
 Destination: Kent, wa Destination: _____ Destination: _____ Destination: _____
 Carrier: American Carrier: _____ Carrier: _____ Carrier: _____

	Net	Roll Number	Weight	Roll Description
1	200 MIL	C1006-2-05- 0001- 200	950	13.5' X 200' X 10/06oz Dbl Cust
2	200 MIL	C1006-2-05- 0002- 200	960	13.5' X 200' X 10/06oz Dbl Cust
3	200 MIL	C1006-2-05- 0003- 200	970	13.5' X 200' X 10/06oz Dbl Cust
4	200 MIL	C1006-2-05- 0004- 200	982	13.5' X 200' X 10/06oz Dbl Cust
5	200 MIL	C1006-2-05- 0005- 200	976	13.5' X 200' X 10/06oz Dbl Cust
6	200 MIL	C1006-2-05- 0006- 200	970	13.5' X 200' X 10/06oz Dbl Cust
7	200 MIL	C1006-2-05- 0007- 200	1,018	13.5' X 200' X 10/06oz Dbl Cust
8	200 MIL	C1006-2-05- 0008- 200	1,016	13.5' X 200' X 10/06oz Dbl Cust
9	200 MIL	C1006-2-05- 0009- 200	989	13.5' X 200' X 10/06oz Dbl Cust
10	200 MIL	C1006-2-05- 0010- 200	989	13.5' X 200' X 10/06oz Dbl Cust
11	200 MIL	C1006-2-05- 0011- 200	970	13.5' X 200' X 10/06oz Dbl Cust
12	200 MIL	C1006-2-05- 0012- 200	990	13.5' X 200' X 10/06oz Dbl Cust
13	200 MIL	C1006-2-05- 0013- 200	958	13.5' X 200' X 10/06oz Dbl Cust
14	200 MIL	C1006-2-05- 0014- 200	1,000	13.5' X 200' X 10/06oz Dbl Cust
15	200 MIL	C1006-2-05- 0015- 200	995	13.5' X 200' X 10/06oz Dbl Cust
16	200 MIL	C1006-2-05- 0016- 200	990	13.5' X 200' X 10/06oz Dbl Cust
17	200 MIL	C1006-2-05- 0017- 200	910	13.5' X 200' X 10/06oz Dbl Cust
18	200 MIL	C1006-2-05- 0018- 200	979	13.5' X 200' X 10/06oz Dbl Cust
19	200 MIL	C1006-2-05- 0019- 200	1,000	13.5' X 200' X 10/06oz Dbl Cust
20	200 MIL	C1006-2-05- 0021- 200	925	13.5' X 200' X 10/06oz Dbl Cust
21	200 MIL	C1006-2-05- 0023- 200	940	13.5' X 200' X 10/06oz Dbl Cust
22	200 MIL	C1006-2-05- 0024- 200	920	13.5' X 200' X 10/06oz Dbl Cust
23	200 MIL	C1006-2-05- 0026- 200	930	13.5' X 200' X 10/06oz Dbl Cust
24	200 MIL	C1006-2-05- 0029- 200	930	13.5' X 200' X 10/06oz Dbl Cust
25				
26				
27			23,257	
28				

I certify that all loading requirements and roll conditions were inspected and approved.

 C.E.M.
 Truck Loader

CERTIFICATION SHEET

DATE: April 18, 2005

POLY-FLEX, INC.

PROJECT NO: 250272

ORDER NO: 670304

2000 W. Marshall Drive
Grand Prairie, Texas 75051

TRIP NO: 219794

CERTIFIED BY: *Earl*

TEST DESCRIPTION						*TRANSMISSIVITY		PEEL	
ASTM METHOD						D4716		D7005	
(modifications)								TOP	BOTTOM
UNITS						x10 ⁻³ sq. m / s		ppi	ppi
SPECIFICATION						0.04		1.0	1.0
COMPOSITE ROLL NUMBER		GEO-NET ROLL NUMBER		GEOTEXTILE TOP	GEOTEXTILE BOTTOM				
C1006-2-05	20-200	GNC-200-05	28	5249480	5225560				
C1006-2-05	22-200	GNC-200-05	33	5249489	5223629				
C1006-2-05	25-200	GNC-200-05	25	5249487	5223652				
C1006-2-05	27-200	GNC-200-05	26	5249534	5223649				
C1006-2-05	28-200	GNC-200-05	27	5249534	5223626				
C1006-2-05	30-200	GNC-200-05	27	5249534	5223637	0.38		6.1	3.1
C1006-2-05	31-200	GNC-200-05	22	5249491	5223635				
C1006-2-05	32-200	GNC-200-05	22	5249491	5223630				
C1006-2-05	33-200	GNC-200-05	23	5249491	5223630				
C1006-2-05	34-200	GNC-200-05	23	5249491	5223655				
C1006-2-05	35-200	GNC-200-05	23	5249490	5223632				
C1006-2-05	36-200	GNC-200-05	24	5249490	5223634				
C1006-2-05	37-200	GNC-200-05	24	5249490	5223634				
C1006-2-05	38-200	GNC-200-05	24	5249490	5223646				
C1006-2-05	39-200	GNC-200-05	698	5249490	5223639				
C1006-2-05	40-200	GNC-200-05	698	5249539	5223639	0.47		6.0	2.9
C1006-2-05	41-200	GNC-200-05	698	5249539	5225561				

*Transmissivity test is performed at gradient of 1.0, normal pressure of 10,000 psf, between metal plates for a seat time of 15 minutes.

CERTIFICATION SHEET

DATE: April 18, 2005

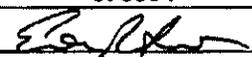
POLY-FLEX, INC.

2000 W. Marshall Drive
Grand Prairie, Texas 75051

PROJECT NO: 250272

ORDER NO: 670304

TRIP NO: 219794

CERTIFIED BY: 

TEST DESCRIPTION		THICKNESS	MASS/AREA	CARBON-BLACK	ULTIMATE TENSILE STRENGTH	*TRANSMISSIVITY	DENSITY
ASTM METHOD		D5199	D5261	D1603	D5035	D4716	D1505
(modifications)		avg		min			
UNITS		mils	lbs / sq. ft.	%	ppi	$\times 10^{-3}$ sq. m / s	gm/cc
SPECIFICATION		200	0.162	2	45	1	0.940
ROLL NUMBER							
GNC-200-05	19-620	200	0.187	2.3	57		0.949
GNC-200-05	22-620	200	0.187	2.5	61	1.5	0.949
GNC-200-05	23-620	200	0.187	2.5	61		0.949
GNC-200-05	24-620	200	0.187	2.5	61		0.949
GNC-200-05	25-620	200	0.187	2.5	61		0.949
GNC-200-05	26-620	200	0.187	2.5	61		0.949
GNC-200-05	27-620	200	0.187	2.5	61		0.949
GNC-200-05	28-620	200	0.187	2.5	61		0.949
GNC-200-05	33-620	200	0.186	2.4	57		0.947
GNC-200-05	352-520	200	0.178	2.9	61		0.950
GNC-200-05	355-520	200	0.178	2.9	61		0.950
GNC-200-05	698-620	200	0.173	2.6	56		0.954
GN-200-05	271-350	200	0.182	2.6	57		0.953
GN-200-05	272-350	200	0.184	2.6	57		0.953
GN-200-05	273-350	200	0.184	2.6	57		0.953

*Transmissivity test is performed at gradient of 1.0, normal pressure of 10,000 psf, between metal plates for a seat time of 15 minutes.

CERTIFICATION SHEET

DATE: April 18, 2005

POLY-FLEX, INC.

PROJECT NO: 250272

ORDER NO: 670304

2000 W. Marshall Drive
Grand Prairie, Texas 75051

TRIP NO: 219794

CERTIFIED BY: 

TEST DESCRIPTION	Product	Unit Weight	Grab Tensile	Puncture	AOS	Flow Rate	
ASTM METHOD		D5261	D4632	D4833	D4751	D4491	
(modifications)							
UNITS		oz/yd ²	lb	lb		gal/min/ft ²	
SPECIFICATION		10	265	165	100 sieve	75	
Textile Roll Number							
SI10	5223626	GTS-10-0300	11.80	320	187	100	85
SI10	5223627	GTS-10-0300	11.80	320	187	100	85
SI10	5223629	GTS-10-0300	11.80	320	187	100	85
SI10	5223630	GTS-10-0300	11.80	320	187	100	85
SI10	5223632	GTS-10-0300	11.80	320	187	100	85
SI10	5223634	GTS-10-0300	11.80	320	187	100	85
SI10	5223635	GTS-10-0300	11.80	320	187	100	85
SI10	5223637	GTS-10-0300	11.80	320	187	100	85
SI10	5223639	GTS-10-0300	11.80	320	187	100	85
SI10	5223646	GTS-10-0300	11.20	314	204	100	85
SI10	5223649	GTS-10-0300	11.20	314	204	100	85
SI10	5223652	GTS-10-0300	11.20	314	204	100	85
SI10	5223655	GTS-10-0300	11.20	314	204	100	85
SI10	5225560	GTS-10-0300	11.30	345	212	100	85
SI10	5225561	GTS-10-0300	11.30	345	212	100	85

Poly-Flex

Material Shipment Roll List

Tractor #	_____	Trailer #	_____	Date:	15-Apr-05	TRIP	219794
Drop #	1	Drop #	_____	Drop #	_____	Drop #	_____
Poly-Flex #	250272(670304)	Poly-Flex #	_____	Poly-Flex #	_____	Poly-Flex #	_____
Customer:	Northwest Linnings	Customer:	_____	Customer:	_____	Customer:	_____
Destination:	Kent, wa	Destination:	_____	Destination:	_____	Destination:	_____
Carrier:	American	Carrier:	_____	Carrier:	_____	Carrier:	_____

	Net	Roll Number	Weight	Roll Description
1	200 MIL	C1006-2-05- 0020- 200	985	13.5' X 200' X 10/06oz Dbl Cust
2	200 MIL	C1006-2-05- 0022- 200	975	13.5' X 200' X 10/06oz Dbl Cust
3	200 MIL	C1006-2-05- 0025- 200	940	13.5' X 200' X 10/06oz Dbl Cust
4	200 MIL	C1006-2-05- 0027- 200	930	13.5' X 200' X 10/06oz Dbl Cust
5	200 MIL	C1006-2-05- 0028- 200	925	13.5' X 200' X 10/06oz Dbl Cust
6	200 MIL	C1006-2-05- 0030- 200	925	13.5' X 200' X 10/06oz Dbl Cust
7	200 MIL	C1006-2-05- 0031- 200	920	13.5' X 200' X 10/06oz Dbl Cust
8	200 MIL	C1006-2-05- 0032- 200	920	13.5' X 200' X 10/06oz Dbl Cust
9	200 MIL	C1006-2-05- 0033- 200	950	13.5' X 200' X 10/06oz Dbl Cust
10	200 MIL	C1006-2-05- 0034- 200	925	13.5' X 200' X 10/06oz Dbl Cust
11	200 MIL	C1006-2-05- 0035- 200	915	13.5' X 200' X 10/06oz Dbl Cust
12	200 MIL	C1006-2-05- 0036- 200	910	13.5' X 200' X 10/06oz Dbl Cust
13	200 MIL	C1006-2-05- 0037- 200	925	13.5' X 200' X 10/06oz Dbl Cust
14	200 MIL	C1006-2-05- 0038- 200	930	13.5' X 200' X 10/06oz Dbl Cust
15	200 MIL	C1006-2-05- 0039- 200	940	13.5' X 200' X 10/06oz Dbl Cust
16	200 MIL	C1006-2-05- 0040- 200	925	13.5' X 200' X 10/06oz Dbl Cust
17	200 MIL	C1006-2-05- 0041- 200	910	13.5' X 200' X 10/06oz Dbl Cust
18	200 MIL	C1006-2-05- 0042- 200	935	13.5' X 200' X 10/06oz Dbl Cust
19	200 MIL	C1006-2-05- 0043- 200	920	13.5' X 200' X 10/06oz Dbl Cust
20	200 MIL	C2-6-2-05- 0315- 250	1,030	13.5' X 250' X 06oz Dbl
21	200 MIL	C2-6-2-05- 0319- 250	1,030	13.5' X 250' X 06oz Dbl
22	200 MIL	GN-200-05- 0271- 350	915	14' X 350' X Net
23	200 MIL	GN-200-05- 0272- 350	920	14' X 350' X Net
24	200 MIL	GN-200-05- 0273- 350	910	14' X 350' X Net
25				
26				
27			22,510	
28				

I certify that all loading requirements and roll conditions were inspected and approved.

C.E.M.
Truck Loader

APPENDIX V

Technical Specifications

KENNECOTT GREENS CREEK MINING COMPANY (KGCMC)
Stage 2 Construction - 2005
Section 4.0 - Technical Section
Contract No. P05001-CW1 Civil Works

TECHNICAL SPECIFICATIONS

for

2005 Stage 2 Construction

Prepared by:

Klohn Crippen Consultants Ltd.
Suite 500 – 2955 Virtual Way
Vancouver, BC Canada V6M 4X6

Approved for Construction, 13 April 2005

Len Murray, P.E. (AK)

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SECTION 4.1 – GENERAL

1. BACKGROUND

1. Greens Creek Mine is jointly owned by Kennecott Minerals and Hecla Mining Company. The mine is operated by Kennecott Greens Creek Mining Company (Owner). The mine is located within Admiralty Island National Monument about 18 miles southwest of Juneau, Alaska.
2. Tailings generated at the mine are dewatered. A portion of the dewatered tailings are used for underground backfill and the rest are placed on surface in a “dry” tailings disposal facility (TDF) near the port facilities at Hawk Inlet.
3. An expansion of the TDF is required to accommodate the continued dry tailings placement. The planned expansion work incorporates five separate areas around the perimeter of the TDF, which will be commissioned over a period of several years starting in 2004. The work planned for 2005 includes construction of the Southeast Expansion – Area 2 and the Pond 7 Storm Water Facility.
4. The Southeast Expansion – Area 2 will include the demolition and salvage/disposal of two structures (Tank 6 and Wheel Wash) and associated surface equipment, underground utilities, placement of a geofabric liner on prepared grade (with associated granular bedding and service layers), connection of the new liner to existing liner(s), installation of drainage collection and monitoring systems, and the construction of surface water and groundwater management structures.
5. The Pond 7 Storm Water Facility will include excavation in soil and rock, processing of rock fill (blasted by others), construction of a compacted rock fill berm, placement of a geofabric liner on prepared grade (with associated granular bedding and service layers), construction of an inlet structure, a pump housing, an emergency spillway and installation of water routing pipes, monitoring systems and associated utilities. Some blasting or rock breaking may be required, as well as oversize boulder haulage.
6. Other work related to the TDF expansion will be done concurrently, including construction of a temporary drainage ditch from Pond 6 to Pond 7 and utility relocations.
7. The Owner will require the Contractor to use established on-site work permitting and isolation procedures for the Work.

2. SCOPE OF WORK

1. Mobilization and Demobilization.
2. Develop the sand borrow site, including: clear, grub and strip the borrow area; deck salvageable timber; haul overburden to Pit 7; provide water and sediment control; quarry, screen and haul (about 3 miles) bedding sand from the 1.5 Mile A-Road Borrow and stockpile the screened product as directed.
3. Re-route and commission all required operating utilities (water lines), including trenching, bedding, pipe placement, HDPE pipe welding and trench-backfilling, as directed. Decommission out-of-service

utility stubs or ends as directed. The work shall include a significant amount of utility and equipment relocation and decommissioning and shall be done in consultation with the Owner and/or Sub-contractors. The location and elevation of all re-routed utilities must be surveyed by the Contractor.

4. Contractor will provide trenching and install pipe chases for electrical cable routes. Electrical cables and communication lines will be installed by Others. Upon completion of electrical cable pulls, some minor contouring completion will be required at the utility outlets.
5. Demolish (dismantle and salvage re-usable materials where feasible) the Old Truck Wash Facility and Tank 6, including electrical and pump equipment, doors, reinforced concrete foundations and foundation grout. All demolished or salvaged equipment or parts (other than soil, rock or concrete) must be decontaminated (spray-washed) before removal from the Site. Salvage and/or dispose of materials to designated sites, within 1.5 miles distance. Decommission out-of-service utility stubs or ends as directed.
6. Crush blasted or fragmented rock in the Pond 7 quarry to the required size(s) and stockpile within 1 mile from site, as directed. Fragment bedrock and oversize rock as directed to a size that can be crushed or hauled.
7. Receive, organize and provide storage for all pipe materials and geosynthetic products. Limited products supplies will dictate efficient material usage by the Contractor.
8. The scope of work for the Pond 7 Storm Water Facility is as follows:
 - a) Prepare the pond basin and foundation.
 - i. As required, clear, grub, strip and remove oversize, organics and other deleterious materials identified by the Owner from the Work footprint. Organic materials and peat shall each be segregated during excavation for separate removal and disposal.
 - ii. Blast and excavate high spots in the quarry bottom remaining from the drill/blast operations. Install foundation drains as directed. Excavate the emergency spillway and inlet structure as directed (will require drilling and blasting).
 - iii. Construct the compacted rock fill berms as required to form the pond basin. Pour a concrete footing (mud slab), assemble and install the embedded pump caisson and inlet pipe in the berm.
 - iv. Place compacted structural rock fill in the quarry bottom and slopes as required to form the pond basin.
 - v. Contour the basin invert to slope uniformly to the southwest.
 - vi. Place a layer of bedding material (and graded soil filters where required) over the prepared basin grade for the liner installation.
 - vii. Assist with installation of the Owner-supplied leakage detection system and instrumentation within or below the bedding layer, as directed. Allow up to 2 full days to complete.

KENNECOTT GREENS CREEK MINING COMPANY (KGCMC)

Stage 2 Construction - 2005

Section 4.0 - Technical Section

Contract No. P05001-CW1 Civil Works

- b) Prepare the bedrock foundation for the future outfall tank and water treatment plant. Form and pour reinforced concrete slab-on-grade foundations for Owner-provided Tank 7 and pH Tank. Install Tank 7 and the pH Tank and connect them to associated piping.
 - c) Construct forms and pour concrete for the pond emergency spillway. Install cement-grouted rock dowels, each not longer than 5 lineal feet, as directed. The Owner will supply cement for grout and concrete at the work site.
 - d) Install the pond basin liner, including:
 - i. Install geotextile or geocomposite drain over the bedding layer, as required.
 - ii. Install HDPE geomembrane over the geotextile or geocomposite.
 - iii. Connect the liner to the pond inlet structure, spillway and pump inlet.
 - iv. Construct an access ramp of granular fill down onto the pond invert, and place a service layer of sand and 6-inch minus rockfill over the geomembrane. Low ground pressure vehicles will be required over all lined areas.
 - e) Build and grade road access, install culverts and drainage ditches and finalize road grades after construction is completed. Install safety guards along the access roads.
 - f) Install gabion baskets, armoring and liner protection in the pond inlet structure. Install the pond water reclaim intake and all other associated hardware for the water reclaim system.
 - g) Install pumps, pipes, casings, utilities and all other appurtenances as required to operate the pond.
 - h) Excavate the drainage ditch from Pond 6 to Pond 7 and connect it to the Pond 7 inlet structure. Place armor in the ditch as directed.
 - i) Place specified fill in the spillway channel (could require geofabric installation) as directed.
9. The scope of work for the Southeast Expansion – Area 2 is as follows:
- a) Excavate and backfill test pits as directed to investigate foundation conditions in conjunction with the Geotechnical Engineer. Allow two full days for foundation investigations.
 - b) Prepare foundation including the following:
 - i. As required: clear, grub, and strip; fragment and remove oversize boulders and bedrock; and, excavate organic materials, mineral soil, tailings and other deleterious materials identified by the Owner from the Work footprint. All materials in this area will be considered contaminated.
 - ii. Remove settling pond and salvage road materials for re-use; provide alternative drainage for ditch water flowing into the Site or pumping systems as required to keep all work areas from flooding.

- iii. Relocate and/or decommission service lines as directed (generally water), including trench excavation, decontamination, bedding of utilities, backfilling and survey of installations.
 - iv. Install foundation drainage including pipe collection system, including tie-in to existing foundation drains. Repair and rehabilitate existing drains as required.
 - v. Contour all soil, bedrock and fill surfaces in the area to achieve specified grades.
 - vi. Place a layer of bedding sand over the prepared grade for the liner installation.
 - vii. Install new or extend existing instrumentation and leads in conduits within or over the bedding layer and service layer, and connect to a monitoring system, all as directed. Allow two days for this item.
- c) Install new liner including the following:
- i. Install geotextile over the bedding layer.
 - ii. Install HDPE geomembrane over the geotextile.
 - iii. Install geocomposite drain over the HDPE geomembrane.
 - iv. Connect new liner system to old liner system on the northeast side of the expansion area.
 - v. Construct seepage collection drains and connect to the geocomposite drain layer of the new liner.
 - vi. Connect the new seepage collection drains to the existing TDF seepage collection system or other specified collection points.
 - vii. Place a service layer of sand/tailings over the geocomposite drain.
- d) Connect the new seepage collection system to the existing drainage system.
- e) Extend the new lined perimeter ditch along the margin of SE Area 2.
- f) Place "guard rail" boulders or other safety berm along the shoulder of the access road, as directed. Boulders shall be obtained from stockpiles within the tailings area, as directed by Owner.
10. Re-establish haulage and maintenance access along the south perimeter of the tailings area, or any other areas disturbed during the Work, as directed.
11. The remaining Pond 7 quarry development will be carried out in early 2005 under contract by Others, and will provide some of the fill materials for the 2005 construction work.

3. LIST OF TECHNICAL SPECIFICATIONS AND CONSTRUCTION DRAWINGS FOR 2005 WORK

3.1 TECHNICAL SPECIFICATIONS

Section 4.1	General
Section 4.2	Measurement and Payment
Section 4.3	Mobilization and Demobilization
Section 4.4	Demolition
Section 4.5	Clearing and Excavation
Section 4.6	Foundation Preparation and Fill
Section 4.7	Foundation Liner
Section 4.8	Drainage System

3.2 DRAWINGS

D-39001	Location Plan
D-39002	General Arrangement
D-39010	Southeast 2 Existing Conditions
D-39011	Southeast 2 Final Grading - Plan
D-39012	Southeast 2 Sections and Details Sheet 1 of 2
D-39013	Southeast 2 Sections and Details Sheet 2 of 2
D-39020	Pond 7 Existing Condition - Plan
D-39021	Pond 7 Excavation Section Lines 1, 2 and 3
D-39022	Pond 7 Excavation Section Lines 4 and 5
D-39023	Pond 7 Excavation Section Lines 6, 7 and 8
D-39024	Pond 7 Excavation Section Lines 9 and 10
D-39025	Pond 7 Grading Surface – Plan and Berm Layout
D-39026	Pond 7 Section and Details
D-39027	Pond 7 Spillway Channel Plan
D-39028	Pond 7 Spillway Sections A, D, E and Detail
D-39029	Pond 7 Spillway Sections B, C and Details
D-39031	Utilities - Step 1 (Pre-Construction)
D-39032	Utilities - Step 2 (Excavation)
D-39033	Utilities - Step 3 (Final Arrangement)
GCM0203-1	Pond 7 Inlet Gabion Structure (by EDE)
350-19-220	Tailing Area Power Distrib. + Control Electrical Details (This Drawing shows transformer pad details)

4. DEFINITIONS AND INTERPRETATIONS

The following definitions and interpretations shall apply to the Technical Specifications:

1. The Project means the total construction contemplated of which the Work may be the whole or part.

2. The Work means the total construction and related services required by the Contract Documents.
3. Owner means Kennecott Greens Creek Mining Company (KGCMC) and any person duly authorized to act on its behalf.
4. Words importing the singular shall include the plural and vice versa and words importing the masculine gender shall include the feminine and words importing persons, shall include bodies corporate.
5. Plant means, as distinguished from work, anything and everything, except persons, used by the Contractor in the performance of the Work.
6. Site means the place where the work is being performed and the immediate vicinity thereof.
7. Where the words shown, indicated, detailed, specified, or words of a similar import are used, such words shall refer to the Specifications and/or Drawings unless expressly stated otherwise.
8. Drawing, means all drawings, plans, sketches and maps issued with the Specifications or subsequently as provided for in the Contract and includes any drawings submitted by the Contractor if signed as approved by the Owner.
9. Where the words directed, permitted, approved, accepted, required, satisfactory, rejected, or words of similar import are used such words shall refer to the direction, permission, approval, acceptance, requirements, satisfaction or rejection in writing by the Owner unless expressly stated otherwise.
10. Environmental Management System (EMS) means the Owner's ISO 14001 environmental standards and procedures for management, reporting and compliance with applicable environmental regulations.

5. CONSTRUCTION MANAGEMENT

1. Construction management functions will be established and directed by the Owner through the Manager. Without limiting the role of the Manager described elsewhere in the Contract Documents, the Manager will work with the Contractor to:
 - a) Achieve the required results for the Owner.
 - b) Assess that the constructed facilities meet the design criteria.
 - c) Periodically review progress against the approved construction schedule.
 - d) Monitor project costs against established budgets.
 - e) Observe and collect all reporting requirements from Contractor operations for compliance with the Owner's safety, production, and environmental programs.
 - f) Adhere to the approved construction schedule.

2. The Contractor shall attend Project Coordination and Safety meetings with the Owner and other Contractors weekly, or more frequently if required.

6. SITE POLICIES

Without limiting Contractor responsibilities described elsewhere in the Contract Documents, the Contractor agrees to comply with and pay all costs associated with the following Environmental Management System (EMS) requirements and Site procedures (also see Sections 2 and 3 of the Contract Documents):

1. The Contractor shall have an established Safety, Health, and Environment Action Plan (SHEAP).
2. Any spills are to be dealt with immediately utilizing appropriate containment and clean up procedures. Any release to the environment is to be reported immediately to the Owner. The Owner may be required to make notification to Government environmental authorities. No mixing of spilled materials is permitted. The Contractor's shop area will be maintained and kept free of waste build up and have covered waste barrels to limit accumulating rain water in any containers.
3. Any equipment coming into contact with tailings must be washed prior to exiting the impoundment area (particularly the tires, fenders and undercarriage). The Owner's truck wash may be used provided it does not interfere with mining operations. All wash effluent shall be contained and disposed of in an approved manner, in accordance with the EMS. The Contractor shall clean the Truck Wash floor and pads of excessive amounts of material build-up from his equipment.
4. The Contractor shall be responsible for implementing sediment control measures, to the satisfaction of the Owner. Run-off from upstream slopes and all areas in the Work is to be managed or collected for settling/screening-out of any solids before release of discharges from the Site. Discharges of any kind outside of the tailings area containment system will not be allowed under any circumstances.
5. Natural conditions such as extreme storm events should be anticipated and corrective measures taken to mitigate the effects on the Work area drainage systems. Additional monitoring for safety and the environment may be required. Loss of production time as a direct result of wind, precipitation, freezing, or other adverse weather conditions (as determined by the Owner) and the related costs are the Contractor's responsibility and deemed to be included in the unit prices for the Work.
6. The Owner will have a representative/designate on Site during the period of the project who will oversee environmental monitoring as required under the relevant permits and Project specific sediment control measures. The Owner will schedule any necessary sample collection and provide regular assessments of the performance of sediment control measures. The Contractor is responsible for compliance with all KGCMC standards and regulatory requirements.
7. The removal of trees is prohibited on the Project. No live or dead trees are to be removed outside of the Project boundaries without prior authorization from the Owner.
8. Drip pans shall be used whenever oil, diesel fuel, gasoline, hydraulic fluid and other such items may leak or spill, and are to be emptied on a regular basis into designated waste disposal containers only.
9. All oil or liquid fuel will be kept in tightly closed labeled containers designated for that use at all times to eliminate spillage. The Contractor is responsible for transporting fuel and oil from the Owner's

supply depot at Hawk Inlet to the Work area. All fuel and oil storage will have an impervious natural or man-made containment berm/sump to enable storage of 110% of the capacity of the containers stored within. Construction or purchase of such equipment will be the responsibility and expense of the Contractor.

10. The Owner will provide waste oil totes and several empty drums for oil filters, oily rags, etc. These are to be maintained and kept closed during the Project by the Contractor. At completion, or as required, the totes and drums will be removed from the Work site by the Owner for disposal. Different waste types (i.e., fuel, oil, glycol) must be stored in separate containers – mixing is not permitted.
11. The Contractor will provide equipment for and satisfactorily carry out the approved dust abatement program.
12. The Contractor's shop, lay-down and office areas shall be kept clean and tidy. On-going garbage generated by the Project is to be disposed of in the appropriate locations as directed by the Owner, including:
 - a) Clean non-hazardous debris and putrescible (food) garbage is to be disposed of daily in a location specified by the Owner;
 - b) Sanitary discharge shall not be allowed to flow onto the ground or into a fresh watercourse. Portable Toilets shall be supplied by the Owner. The Owner, as per the normal schedule presently being used on Site, will empty the unit(s).
13. All Work sites shall be kept clean and cleaned-up prior to completing the job. Normal cleanup will include:
 - a) Cleanup of all work areas, haulage routes, lay-down areas, etc.
 - b) Removal of all garbage, cans, drums, hose, pipe, used oil filters and other such items to approved locations.
 - c) Emptying, removal and cleanup of any contaminated run-off control systems and surrounding areas into approved disposal areas.
14. If extra precautions beyond those agreed upon, prior to the start of Work, are required to prevent environmental damage the actual and reasonable cost of providing such precautions will be at the Owner's expense.
15. In the case of an emergency condition, the Owner reserves the right to enter the Work area and perform the necessary cleanup at the Owner's expense. If the said emergency condition occurs as a result of the negligence or willful misconduct of the Contractor, the Contractor will bear the cost of the cleanup and all fines or penalties levied by Government agencies for the condition.
16. Construction vehicles shall not have priority status on the mine roads at any time, particularly during scheduled times for bus traffic, as per the Owner road rules policy. This will occur at the beginning and end of each daily Owner shift. The construction schedule shall not have priority over any Owner operation for site facilities such as haulage, port or water facilities. Further, the Contractor shall ensure

sufficient time for loading and off-loading of equipment and supplies to absolutely ensure no departure delays of the barge or other transport vessels.

17. All safety policies of the Owner outlined elsewhere in the Contract Document shall be followed, including the use of personal protective equipment (steel toed boots/shoes, hard hats and safety glasses and others as required). The Contractor will receive training for KGCMC's "STOP" program to assess risks and avoid workplace injuries.
18. KGCMC is ISO 14001 certified and maintains high environmental and safety standards. The Contractor will receive KGCMC training on the Environmental Management System and site specific safety aspects at the Site. The Contractor is responsible to have all personnel trained in the environmental and safety standards before commencement of the Work.
19. From time to time the Work will require the coordination of activities between the Contractor and the Owner or Others. Notwithstanding any policies, contracts, agreements or the like, the Contractor shall cooperate fully with the Owner or Others, as directed by the Owner, to execute cooperative work in a timely manner and achieve the desired result for the Owner.

7. SUBMITTALS

Without in any way limiting submittal requirements contained elsewhere in the Contract Documents, the Contractor shall submit the following information for the Owner's approval. Work shall not start until applicable approvals are obtained in writing.

7.1 BEFORE WORK STARTUP

1. Construction Schedule showing the critical path per Article 3.14 of the Special Conditions. The Contractor should assume at least 5% weather delay downtime when planning and scheduling the work.
2. Certification of hazard communication training.
3. List of all employees proposed for the work, including name, age, and number of years working experience, social security number and position (title).
4. List of all plant, equipment, and materials proposed for the Work and requiring off-loading at Hawk Inlet, including size, weight, and axle loads for barge transport.
5. Copy of site specific safety plan, JSA's (Job Safety Analysis) and SHEAP.
6. Signed MSHA 5000-23 forms for all employees. Contractor must have an MSHA number.
7. Signed certification of substance testing.

8. Documentation indicating that all construction equipment meets the MSHA minimum operating standards.
9. Contractor's predicted fuel and oil consumption requirements.
10. Survey methodology, equipment list, and qualifications of surveyor. Owner will confirm software compatibility with the Contractor to produce Owner formatted as-built drawings. Survey information will be electronically collected and backed up, to ensure efficiency, accuracy and compatibility with Owner's survey software.
11. A dust abatement plan for Owner approval.
12. The Owner will supply the Contractor with AutoCAD format electronic drawing files of the grading plan. The Contractor shall produce shop drawings that include layout points for use during construction. The construction layout produced by the Contractor shall conform to the final grading plan in the Drawings, except where prior written approval of any change is received from the Owner.
13. List of personnel or sub-contractors providing the HDPE liner installation services. The liner manufacturer must approve the personnel installing the liner to satisfy all manufacturer warranties.
14. Layout of access roads for construction of the Work.

7.2 DURING THE WORK

1. Copies of Daily Contractor Tool Box Safety meeting minutes and Daily Equipment Pre-shift cards.
2. Copies of employee's incident reports of injury or property damage. Notification to the Owner is required immediately following any incident, with a written incident report submitted to the Owner as soon as practical, but no later than the end of shift.
3. Updates of medical reports for incident status as received.
4. Written property damage reports (by end of shift) with immediate notification to the Owner.
5. Written near miss incident reports (by end of shift) with immediate notification to the Owner.
6. Copies of completed required work permits, including excavation, hot work, confined space entry, etc.
7. Copies of completed spill reports as per Owner spill policies with immediate notification to Owner and initiation of spill cleanup as a priority over the Work.
8. Copies of Daily load counts reports and equipment used. Monthly reports of total manhours on site (due on the first of every month).
9. Timely Change Order requests.

10. Daily Contractor completion / manpower sheets, showing labor and equipment hours worked on each task as well as details on any delays or breakdowns, signed and submitted to the Owner by noon the following work day.
11. Baseline surveys before starting and upon completing each component of the Work, in a timely fashion, to demonstrate compliance with design requirements and for payment and record purposes.
12. Weekly Report submitted with the weekly Construction Schedule update showing Work Completed, Work Planned, Problems Encountered, and Plan for Resolution.
13. Manufacturer construction approvals.
14. Timely submission of invoices.

7.3 AT COMPLETION OF THE WORK

1. As-built survey information of all aspects of the completed Work.
2. Timely submission of Final Invoice.
3. Manufacturer liner installation approval signoff.
4. Request for release for site cleanup.

8. SURVEY LAYOUTS

Layout surveys shall be accurate to +/- 1 inch for plan locations and +/- 1 inch for elevations.

9. PRIORITY USE OF FACILITIES

The Contractor is advised that Owner operations have priority for all site facilities and barge deliveries at Hawk Inlet.

10. HAZARDOUS MATERIALS

The importation of all hazardous materials to the Site must have prior approval of the Owner. The Contractor shall minimize the use of these materials to the greatest extent possible. All hazardous wastes shall be handled in accordance with the Owner's Environmental Management System and shall be removed from the Site at Project completion at no cost to the Owner, unless indicated otherwise by the Owner. MSDS sheets must be kept in the Contractors site office for all chemical products used in the Work.

END OF SECTION 4.1

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SECTION 4.2 – MEASUREMENT AND PAYMENT

PART 1 – GENERAL

1.1 SCOPE

1. Measurement and payment for all items in Schedule 1 - Quantities and Prices are covered hereunder.
2. Any work called for in the Specifications, or shown on the Drawings, or which is necessary for the completion of the Work, which is not specifically listed as a separate pay item in Schedule 1 shall be deemed incidental to the Work and no separate measurement or payment will be made for such work, but the cost of all such incidental work shall be included in the prices entered for the various pay items appearing in Schedule 1.
3. Measurement and payment applies only to final approved construction. Temporary works will not be measured for payment.
4. The amount of work to be done with respect to each pay item has been estimated as set out in Schedule 1. Notwithstanding, the Owner reserves the right to increase or decrease the amount of any work item as required and the Contractor shall make no claim for anticipated profit, for loss of profit, for damages, or for any extra payment whatsoever, except as provided for in the Contract.

1.2 MEASUREMENT

1. If quantities are stated on the Drawings, they are provided as information only.
2. Where an item has been measured as a lump sum, the Contractor is responsible for determining all related costs necessary to complete the lump sum item including that of labor, material, equipment and Plant.
3. Where an item has been measured as a unit quantity, the quantity is subject to measurement after the item under consideration has been satisfactorily completed. Work measured under a given pay item shall not be measured again under the same pay item or a different pay item. The final quantity for the item shall be the installed quantity as agreed with the Owner.
4. The Contractor shall be responsible for all aspects of measurement for payment. The methods of measurement shall be in accordance with standards normally accepted by the construction industry for the respective types of work.
5. The Contractor shall obtain prior approval of his quantity survey methods including presentation format and details. This approval may require that the Owner participate in, or direct, the carrying out of the surveys. The Owner will conduct such check surveys as it considers necessary. If errors and omissions are found in the Contractor surveys, the Contractor shall rectify them forthwith.
6. A given type of work shall not proceed until relevant initial surveys are completed by the Contractor and have been approved in writing.

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7. No work shall be undertaken that would preclude verification of any initial condition surveys or inspections.
8. The Contractor shall prepare all monthly estimates and a final statement of work performed together with such supporting data and computations as are deemed necessary by the Owner to determine the accuracy of the estimates, all of which shall be submitted in an approved format.
9. All original field notes, electronic files, quantity computations, cross sections and other records taken by the Contractor, or required by the Owner for the purpose of quantity surveys, shall be furnished promptly to the Owner and shall become the property of the Owner.
10. In addition to the aforementioned surveys, the Contractor shall submit a Daily Report (as described in Section 4.1) containing a complete and accurate account of the previous day's progress to help support quantity estimates for interim payments and schedule progress.

1.3 PAYMENT

1. Payment for the Work will be made at the respective lump sums, provisional sums and unit rates stated in Schedule 1- Quantities and Prices.
2. Except as otherwise specifically provided, the prices entered in Schedule 1 for the various items of work shall constitute full compensation for supplying, operating and maintaining all temporary works, equipment, material, labor, supervision and all other costs for performing all the work required by the Contract. Payment under the various pay items will only be made for work satisfactorily completed in accordance with the Contract requirements. Survey based quantities will be confirmed by the Owner.
3. No separate measurement or payment will be made for any items not specifically stated in Schedule 1 including:
 - a) travel time, under any circumstance;
 - b) pollution prevention or control, spill cleanup and waste disposal except as otherwise provided under Section 4.1;
 - c) survey control;
 - d) Contractor's security;
 - e) delays due to weather or Owner's operations except if provided by the General Conditions;
 - f) delays due to equipment servicing and breakdown, or material availability;
 - g) consumables;
 - h) attending safety meetings, safety or environmental training, inspections or audits; and,
 - i) obtaining permits.

1.4 PAYMENT FOR EXTRA WORK

1. "Extra Work" means the furnishing of materials and/or equipment and/or the doing of work not directly or by implication called for by the Contract.
2. The Owner, without invalidating the Contract, may order extra work, or make changes by altering or adding to the Work, and the Contract Sum shall be adjusted accordingly. All such work shall be executed under the conditions of the Contract, except that any claim for extension of time caused thereby shall be adjusted at the time the Change Order for Extra Work is prepared.
3. In giving instructions, the Owner shall have authority to make minor changes to the Work not involving extra costs, and not inconsistent with the purposes of the construction, and such changes shall not be considered as Extra Work.
4. The price to be paid for any Extra Work shall be determined by the Owner, using one or more of the methods specified in the General Conditions of Contract.
5. It is expressly agreed and understood that no claim for an addition to the Contract Sum shall be valid except by agreement of a written Change Order, signed by the Owner.
6. If the conditions under which the Contract is to be performed should be substantially changed, and the Contractor should feel that he is entitled to extra compensation, he shall make written claim to the Owner for such extra compensation within 48 hours of such change; otherwise, such claim need not be considered by the Owner.

1.5 PROVISIONAL SUMS

Use of provisional sums requires approval in writing from the Owner. The method of payment for work on Provisional Sum items will be on a time and materials basis as set out in the Special Conditions or as otherwise agreed in writing between Contractor and Owner. Some, all or none of the allowances may be used and the Contractor shall have no claim on any allowance not used.

1.6 CONTRACTOR'S PAYMENT TO OWNER

1. The Contractor shall reimburse the Owner, for any costs incurred due to:
 - a) Overtime work (beyond the agreed work schedule for this contract) performed by the Owner's site staff to suit the convenience of the Contractor.
 - b) Employment of site staff by the Owner after the stipulated time for completion if such employment is rendered necessary by failure of the Contractor to complete the Work by the stipulated time.
 - c) Redesign of any portion of the Work made necessary by a Contractor's error.
 - d) Rental rates on equipment borrowed from the Owner.

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- e) Materials purchased from the Owner.
- f) \$200 per cubic yard for concrete quantities in excess of 110% of neat line requirements.
- g) Up to \$10,000 per key employee transferred from site without Owner approval, if, in the Owner's opinion, the change of personnel has a significant delay or cost impact to the Work.
- h) \$2,000 per day or portion thereof penalty for late completion of the a) Step 1 bypasses, b) demolition, c) Liner installations, or d) Project completion date. See Contract Schedule Milestones in Section 3.0 Special Conditions, Section 3.14 – Schedule.
- i) \$10,000 per day or portion thereof for any uncontrolled fuel or petroleum by-product spill.

1.7 STANDBY

1. Any paid standby time will require approval and will apply only during delays caused by or requested by the Owner. The sum of work hours and standby hours due to approved delays shall not exceed eight hours per day or 40 hours per week.
2. During standby time the Contractor shall clean the work site and engage in any other work as approved or directed.

PART 2 – PAY ITEMS

2.1 MOBILIZATION AND DEMOBILIZATION

1. Mobilization shall be estimated to the Juneau AML dock site and shall include the costs of: insurance; permits; moving personnel, supplies and equipment; providing temporary roads and facilities; setup, and all other preparation for performing the Work. Owner will cover expenses from AML in Juneau to the Hawk Inlet port by barge only. Mobilization costs shall also include time for personnel to be indoctrinated into the Owner's safety and environmental management system program (allow for 2 days of training at the site) at start up and during the Work as new personnel arrive on Site.

The Owner will provide, free of charge: fuel for project equipment only at the Hawk Inlet fuel farm, room and board as available at the KGCMC camp (dorm-room style accommodations), and passenger ferry service between Auke Bay and Young Bay.

2. Mobilization will not be considered complete and will not be paid until all completed MSHA employee training documentation has been provided to the Owner. Time is of the essence. The liner crew shall receive MSHA training before arriving on site.
3. Demobilization will be considered complete when all labor, equipment, Plant, temporary facilities and surplus and waste materials have been removed from Site and the work areas have been cleaned and graded, all to the satisfaction of the Owner. The limits of cleanup, final grading and drainage include the areas of borrow, stockpiles, permanent work, temporary work, and lay-down and adjacent grounds

thereof, that have been disturbed by the Contractor. Owner will cover expenses for AML freight barge from Hawk Inlet to the AML Juneau dock.

4. The lump sum tendered shall be relative to the costs involved but shall not exceed 10% of the Total Bid Amount.
5. Mobilization will be 60% of the lump sum price for this pay item. Demobilization will be paid at 40% of the lump sum price.
6. Progress payments will be made against the lump sum price in proportion to the completed mobilization activities making adjustments for any advanced monies.

2.2 DEMOLITION

1. Demolition of specified structures and facilities shown on the Drawings and disposal of related demolition materials, carried out in accordance with the submitted and approved demolition plan, will be measured as a lump sum item.
2. All preparation work, demolition and decontamination activities and disposal of the demolition debris or salvage materials shall be included in the bid price.
3. Approved excavation and fill for the demolition work will be measured and paid under the appropriate unit rates in Schedule 1.

2.3 EXCAVATION

1. Measurement of excavation, by machine or by hand, will be made to the nearest cubic yard of the bank volume. Bank volume shall mean material volume in-place before excavation including natural ground, stockpiles and waste piles.
2. Measurement will be made to the lines and levels shown on the Drawings or approved by the Owner.
3. Clearing, grubbing and stripping are considered incidental to the Work and will not be measured, except that required for developing the 1.5 Mile A-Road Borrow Area. Measurement will be made of the approved plan area of 1.5 Mile A-Road Borrow Area, that is satisfactorily cleared, grubbed, stripped, logs decked, stumps and woody debris piled and burned or otherwise disposed of; all in an approved manner.
4. Temporary measures to control groundwater and surface water, and compliance with the environmental management system are considered incidental to the work and will not be measured.

2.4 ROCK FRAGMENTATION

1. Measurement of rock fragmentation by drilling, blasting, barring, wedging or other quarrying techniques will be made to the nearest cubic yard of bank volume. Bank volume shall mean material

volume in-place before fragmentation including intact bedrock formations, or any rock-block or boulder greater than 3 ft average diameter.

2. Measurement will be made to the lines and levels shown on the Drawings or approved by the Owner.
3. Fragmentation includes the execution of controlled blasting, line drilling, smooth blasting or pre-shearing in areas where rock damage due to blasting is to be minimized.
4. Controlled perimeter blasting is required in the Pond 7 permanent spillway and the liner system anchors in bedrock.

2.5 FILLS

1. The Owner will provide the following materials for the Work only:
 - a) drain gravel of the specified gradation, in stockpiles at Hawk Inlet; and,
 - b) an estimated 9,790 stockpiled cubic yards of 6-inch minus rockfill in 3 separate stockpiles in the Pond 7 area. The Contractor shall assume that 7,500 compacted cubic yards of the final volume of 6-inch minus rockfill in the permanent Work is obtained from these existing stockpiles in the Pond 7 area.

The Contractor shall process and/or supply all other fill materials.

2. Use of the stockpiled fill shall require prior approval. Due to limited available space fill stockpiles may impinge onto the Work area. No measurement will be made of stockpiled materials that require removal from the Work area, during or at completion of the Work.
3. Measurement will be made to the nearest cubic yard of approved fills satisfactorily placed and compacted to the lines and levels shown on the Drawings or approved by the Owner. The measurement will reflect in-place volumes after compaction.
4. Fills placed beyond the approved or specified lines and levels will not be measured for payment.
5. Temporary measures to control groundwater and surface water, quality control and quality assurance testing and compliance with the environmental management system are considered incidental to the work and will not be measured. Contractor will be responsible to prevent any damage to fill areas from runoff and provide sediment controls.

2.6 PERMANENT STOCKPILES

1. Measurement will be made to the nearest cubic yard of material (by survey) meeting the specified gradation, stockpiled in an approved manner at an Owner-designated location not more than 1 mile from Pond 7.
2. Measurement will be made of the stockpiled material that is not used for the permanent work.

2.7 OVERHAUL

1. Measurement will be made to the nearest cubic yard-mile for overhaul in excess of 1.5 miles one-way, of excavated and fill materials. Measurement will be based on bank volume for excavated materials and on the volume of materials placed and compacted to specified requirements for fill materials.
2. The Contractor shall obtain prior approval for each piece of work that will require overhaul.

2.8 GEOFABRICS

1. The Owner will supply geofabrics for the Work only. Geofabric shall mean all geosynthetics, including geomembrane, geotextile, geogrid and geocomposite products only. The Contractor is responsible for all other consumables related to supporting the liner installations.
2. Measurement will be made to the nearest square yard of approved geofabrics satisfactorily placed and projected to the lines and levels shown on the Drawings or approved by the Owner. Measurement will be to the weld line where new and existing geofabrics are joined.
3. Measurement will be based on true surface area excluding folds, overlaps and anchoring trenches.
4. Supply and installation of fabric to concrete fasteners will not be measured but considered incidental to the Work.
5. Geofabric used in permanent pipe installation will not be measured separately for payment and will be considered incidental to the Work.

2.9 PIPE

1. The Owner will supply all pipe and conduit (including culverts), HDPE pipe fusion machine, fittings and culvert inlet boxes for the permanent Work only.
2. Measurement will be made to the nearest foot of the installed length of approved pipe, satisfactorily installed and protected from damage by subsequent construction.
3. Separate measurement will be made to the neat lines or approved lines, for trench excavation and fills.
4. Measurement of culverts will not include inlet and outlet works.
5. Contractor shall provide a qualified HDPE pipe welder, to be approved by Owner.

2.10 CONCRETE

1. Concrete will be provided by the Owner without cost to the Contractor, delivered to the work site for the permanent Work only.

2. Measurement for payment of Concrete will be in cubic yards calculated from neat dimensions indicated on the Drawings or authorized in writing by the Owner. Concrete placed beyond dimensions indicated or authorized will not be measured.
3. No deductions will be made for volume of concrete displaced by reinforcing steel.
4. Formwork will not be measured for payment.
5. Supply and installation of concrete reinforcement and bedrock anchor bolts, and bolt grouting will not be measured but considered incidental to the Work.
6. No separate measurement will be made for areas requiring concrete repair as a result of damage caused by Contractor during his construction activity.

2.11 PROVISIONAL SUMS

1. Measurement for work on Provisional Sum items will be made on a time and material basis, with labor and equipment hours spent directly on the work measured to the nearest 15 minutes.
2. Payment for work on Provisional Sum items will be made out of the applicable Provisional Sums in Schedule 1, on a time and materials basis as set out in the Special Conditions. Any impact costs on other Contractor operations due to work on Provisional Sum items will be considered incidental to the Work.
3. Owner will provide instruments, tubing, conduit, membrane and the like for the Leak Detection System.

2.12 LUMP SUMS

1. Payment for each Lump Sum item in Schedule 1 will be made only upon satisfactory completion of the work prescribed in that item.
2. The installation of reinforced concrete or mass concrete associated with the Work in each Lump Sum item will be measured and paid separately.
3. Owner will provide pipes, gaskets, seals, battens and the like for installation of the Water Reclaim System.
4. Owner will provide gabion baskets (empty) for installation in the Pond 7 inlet structure.
5. Owner will provide Tank 7 and the pH Tank, and associated fittings, valves and the like for connection to the associated pipes.

END OF SECTION 4.2

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SECTION 4.3 – MOBILIZATION AND DEMOBILIZATION

PART 1 - GENERAL

(not applicable)

PART 2 - PRODUCTS

(not applicable)

PART 3 – EXECUTION

3.1 MOBILIZATION

Mobilization shall be to the Juneau AML Dock Site (Owner will cover the AML barge only transport from Juneau to Hawk Inlet) and shall include all costs required to:

1. Mobilize all Plant, labor, tools, supplies, materials, equipment, supervision, technical personnel, and other services required for completion of the Work;
2. Furnish or construct on Site additional or temporary access, facilities or utilities which are not shown on the Drawings or are not provided by the Owner but which are deemed necessary for the Work, including but not limited to:
 - a) Access roads, yards, and work areas (including upgrades to existing infrastructure).
 - b) Temporary buildings for administration, storage or workshops.
 - c) Power generation and distribution systems.
 - d) Temporary lighting, as required.
3. Transport equipment from Hawk Inlet, setup, assemble, and have ready for work at the first scheduled work location.

3.2 COMMENCEMENT AND COORDINATION

Mobilization shall commence as established in the approved construction schedule and proceed expeditiously thereafter. The Contractor shall co-ordinate the scope, scheduling and execution of mobilization activities with the Owner and AML in Juneau.

3.3 DESIGNATED AREAS

Temporary access roads, yards, work areas and all the facilities and utilities installed therein shall be located in the designated areas shown in Schedule F of the Form of Proposal and approved by the Owner. Lay-down and stockpile areas will be identified at the pre-bid site visit.

3.4 EMPLOYEE TRAINING

The Contractor shall perform all MSHA training of its employees before arrival on Site and shall not use scheduled construction time for these purposes. The Contractor shall obtain an MSHA number before mobilizing. The Owner will give additional and specific on-site training for safety (MSHA requirements) and for the Owner's Environmental Management System (EMS) ISO 14001 program. Allow for 1 full day of site specific training for all personnel prior to work.

3.5 DEMOBILIZATION

Demobilization shall be from the last scheduled work location on Site and shall include all costs required to:

1. Demobilize all Plant, labor, tools, supplies, materials, equipment, supervision, technical personnel and other services used in the Work. Owner will cover AML barge only transport of equipment back to Juneau.
2. Unless otherwise specified or approved, remove temporary access, facilities and utilities not required by the Owner to remain on Site.
3. Remove any surplus consumables and waste materials stockpiled on Site during performance of the Work to an area designated by the Owner, including but not limited to debris from clearing and grubbing operations, and geofabric liner materials. All materials (consumables) brought to site shall be demobilized from site.

3.6 END OF WORK CONDITION

Restoration shall be to the satisfaction of the Owner, but at a minimum will include cleanup and grading of spoil dumps, lay-down areas, stockpile and process areas, haul routes and the like, as well as disturbed areas immediately adjacent to the Work. Seeding, if required, will be done using the Owner's equipment and supplies, and is considered incidental to the Demobilization work.

PART 4 – MEASUREMENT AND PAYMENT

For Measurement and Payment see Section 4.2.

END OF SECTION 4.3

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SECTION 4.4 - DEMOLITION

PART 1 – GENERAL

1.1 DESCRIPTION

1. The work covered in this section consists of supplying all labour, materials and equipment for:
 - a) Removal of approximately 700 cy of contaminated sludge/sediment from inside of Tank 6 and disposal within the tailings disposal facility in coordination with the Owner.
 - b) Removal and salvage of equipment and materials of the Old Truck Wash, truck wash sediment tank and Tank 6. Removal and salvage of utility pipes and conduits, valves and similar items located above ground or above the base level of concrete foundations, as applicable. Salvaged items shall be decontaminated by pressure washing at an approved location on site. Cleaned items shall be placed in an approved disposal/storage site.
 - c) Removal of approximately half of Tank 6 concrete foundation and the complete concrete foundations of the Truck Wash and all other local concrete pads. The portion of Tank 6 foundation concrete remaining in place shall be at least 1-ft below liner foundation level. Reinforcing steel shall be trimmed flush with the surfaces of all demolished pieces of concrete. The concrete shall be placed within the tailings disposal facility where directed. The reinforcing steel shall be decontaminated by pressure washing and placed in an approved disposal site.
 - d) Local excavations and fills as required and approved.
 - e) Materials to be salvaged shall be identified by the Owner at the pre-bid site meeting - attendance is mandatory.
 - f) Removal and salvage of all electrical and plant equipment to storage at Pit 5 in coordination with Owner and Others (flowmeters, pumps, MCC room components, transformer...)
2. The Owner will identify known hazardous materials. Nonetheless, the Contractor shall pay special attention during its inspection and during the work to identify hazardous materials and shall obtain Owner's direction for demolition and disposal, including but not limited to insulation.
3. The Contractor shall:
 - a) Isolate, with the Owner, any pipe works or electrical utilities that connect to the Demolition area;
 - b) Undertake a detailed pre-demolition inventory to verify existing conditions;
 - c) Design demolition techniques and sequences;

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- d) Co-operate with the Owner in preventing damage to all buried utilities and repair if damaged;
 - e) Remove all demolition materials to approved disposal or salvage areas, within 1.5 miles of the site, including contaminated soils, as designated by the Owner;
 - f) Decontaminate, by pressure washing, all materials to be removed from within containment;
 - g) Take care not to damage remaining utilities; and
 - h) Provide and install barricades, safety fencing and erosion controls at the work site as required.
3. All demolition materials are the property of the Owner.

1.2 DEFINITIONS

Not required.

1.3 STANDARDS

- 1. MSHA Regulations;
- 2. Alaska Building Code; and
- 3. All other applicable Local, State or Federal Regulations, Codes or Standards.

1.4 RECORDS AND SUBMITTALS

- 1. Submissions with the Bid
 - a) The Contractor shall undertake its own detailed inspection of the facilities to be demolished and decontaminated and shall submit the results of that inspection with the bid.
 - b) The Contractor shall submit with the bid a plan and schedule for demolition of the specified structures.
- 2. Submission Before Performing the Work
 - a) Fourteen days prior to commencing any demolition, the Contractor shall verify with the Owner the total extent of demolition, decontamination, removal and disposal. The

Contractor shall submit a detailed plan and schedule for demolition and disposal/salvage of materials.

- b) Should demolition procedures require the use of temporary structural support, 7 days prior to implementation, submit engineering details of such support.

1.5 PROTECTION

1. Protect existing utilities, objects and structures not requiring demolition and, in the event of damage, immediately notify the Owner and make all repairs and/or replacements necessary to the satisfaction of Owner at no additional cost to the Owner.
2. Take precautions to support affected structures and if safety of adjacent structures appears to be endangered, cease operations and notify the Owner.

PART 2 – PRODUCTS

(not applicable)

PART 3 - EXECUTION

3.1 GENERAL

1. The Contractor shall undertake work in accordance with approved plans.
2. All demolition materials shall be removed to Owner approved disposal or salvage sites. Items leaving containment shall be decontaminated by pressure washing.
3. All equipment to be approved by the Owner before the commencement of the Work.

3.2 DEMOLITION OF STEEL STRUCTURES

1. Execute all demolition in a manner approved by the Owner. Salvage in good order all designated equipment to storage and ensure electrical isolation prior to work.
2. Remove all sheathing, roofing, walls, plates, fasteners and all other items identified in the approved work plan.
3. Take all necessary steps and precautions not to damage any salvageable materials identified by the Owner.
4. Execute the Work in a manner consistent with safety regulations, including the provision of fall protection, scaffolding, shoring and braces as required.

3.3 DEMOLITION OF CONCRETE STRUCTURES

1. Execute all demolition by means other than blasting, except as permitted by the Owner.
2. Remove all concrete and reinforcing steel as indicated in the approved plan. The edge of the cavity or excavation shall be trimmed to a stable angle in accordance with applicable safety regulations. All adjoining pipes/wires/utilities shall be neatly trimmed at the edge of the excavation. Pipes with flowing water shall be capped in an approved manner.
3. Take all necessary preventative measures to avoid spilling materials by using suitable transportation vehicles, avoiding overloading and otherwise exercise due care. In the event of spillage, clean the affected areas to the satisfaction of the Owner at no additional cost to the Owner.
4. Break concrete within the demolition limits by mechanical means, such as drilling, wedging, jackhammer, hydraulic splitter and any other means approved by the Owner, and trim the reinforcing steel from the concrete pieces. Keep the reinforcing steel separate from other materials.
5. At the end of each day's work, leave the structures in safe condition so that no part is in danger of toppling or falling. Provide a safety barrier which meets the requirements of MSHA.
6. Demolish to minimize dusting. Keep materials wetted to the satisfaction of the Owner.
7. Provide protection from flying materials during demolition for all area personnel.

3.4 SAFETY

1. Unless otherwise specified, carry out demolition work in accordance with MSHA Regulations and the Owner's safety procedures.

3.5 CLEAN UP

1. At the end of each day's activity or completion of a work area, remove all debris, waste, construction materials and equipment from the work area. Leave the work area clean and dust free to avoid polluting the environment.
2. Remove all demolished materials, equipment, rubble and debris from the Site and maintain the Site in a neat and orderly condition to the approval of Owner.

3.6 EXCAVATION AND BACKFILL

1. Excavation and backfill shall be performed in accordance with the requirements of MSHA regulations.
2. Excavation procedures shall be adopted which will not, at any time, adversely affect the stability of any slope.

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3. The Contractor shall use special care and attention while working near the edge of the Southeast Expansion – Area 1 tailings storage area so as to not undermine, de-stabilize or damage the liner foundation or drainage system, except as directed.
4. Remove grout in the foundation underneath the south side of Tank 6, as directed to attain grade and drainage. Grouting records are not available.
5. The Contractor shall provide stable excavation slopes at the end of demolition. Temporary backfill may be required to satisfy applicable regulations or the use of trench boxes.

PART 4 - MEASUREMENT AND PAYMENT

For Measurement and Payment see Section 4.2.

END OF SECTION 4.4

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SECTION 4.5 – CLEARING AND EXCAVATION

PART 1 - GENERAL

1.1 DESCRIPTION

1. Clearing and Excavation includes the following:
 - a) Clear, grub and strip the footprint area, where required.
 - b) Relocate existing piping, utilities and services.
 - c) Fragmentation of bedrock and oversize rock.
 - d) Remove soil, peat, and loose or fragmented rock to specified or approved grade lines.
 - e) Sub-excavate to competent ground as directed.
 - f) Dispose of materials.

1.2 DEFINITIONS

1. Common Excavation: excavation of all materials including peat, clay, silt, sand, gravel, boulders or loose rock smaller than 3-ft average diameter and friable or weathered rocks that can be ripped with a 300 horsepower crawler tractor equipped with a single shank, short tip ripper. Common Excavation also includes contaminated materials, existing stockpiles, waste piles, sub-excavation of localized soft or permeable zones in foundation areas as directed by the Owner.
2. Rock Fragmentation: loosening and fragmentation of bedrock formations, detached rock blocks or boulders greater than 3-ft average diameter by drilling, blasting, barring, wedging and other quarrying techniques.
3. Contaminated Materials: rock, mineral soil, peat or any other material that is not satisfactory for construction or out-of-containment disposal or storage, in accordance with KGCMC's Environmental Management System. A material may be considered contaminated because of its initial composition (i.e., pyritic bedrock or boulders) or because of subsequent contamination with a foreign substance (i.e., tailings contamination of natural soil).
4. Excavation Line: the line within which no unexcavated material shall be permitted to remain.
5. Over Excavation: excavation beyond the excavation line.
6. Dental Excavation: the removal of loose, friable or weak materials encountered after the exposure of Rock Excavation faces.
7. Perimeter Holes: a row of neatly and uniformly drilled holes along the excavation line.

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8. Controlled Blasting: blasting techniques in which hole dimensions and patterns, and the size, distribution, detonation delay and type of explosives are designed to break rock neatly to the excavation line and to prevent fracturing and loosening of rock beyond the excavation line. Examples of techniques used in controlled blasting are:
 - a) Line Drilling: the Perimeter Holes are closely spaced and left uncharged to provide a plane of weakness toward which the blast can break.
 - b) Smooth Blasting (post-splitting): the Perimeter Holes are lightly charged and simultaneously detonated as the last delay of a blasting set.
 - c) Pre-Splitting (pre-shearing): the Perimeter Holes are lightly charged and simultaneously detonated in advance of burden holes. The perimeter holes shall be detonated at least several milliseconds in advance of the burden holes if they are detonated in the same set as the burden holes.
9. Clearing: work involving cutting of trees, brush or vegetative growth to not more than 1 ft above ground surface, dealing with previously uprooted trees and stumps, slash left from previous filling or excavation activities, bucking and trimming of all timber, and collecting these materials for mulching, burning or disposal in an area designated by the Owner. Any salvaged timber shall be decked in 24' lengths and shall become the property of the Owner.
10. Grubbing: work involving excavation and removal of stumps and roots to not less than 1 ft below ground level and collecting these materials for mulching or disposal in an area designated by the Owner.
11. Stripping: work involving excavation and removal of top soil (not including peat) down to the top of the underlying mineral soil or rock, collecting the materials and hauling them to an area designated by the Owner.

1.3 CODES AND STANDARDS

1. The Contractor shall comply with all applicable MSHA regulations and local, state or federal regulations, and notwithstanding these regulations, the Contractor shall also comply with the Owner's blasting standards.
2. The Contractor shall maintain explosives and detonator magazine logs registering the receipt and consumption of explosives, detonators and accessories.
3. Daily work permits and equipment pre-shift cards will be completed by Contractor.

1.4 SUBMITTALS

1. The Contractor shall submit the information requested in Section 4.1 – General and the following information for approval. Work shall not start until applicable approvals are obtained in writing from the Owner.

2. Excavation

The Contractor shall submit plans and descriptions of methods and sequences for common, peat and rock excavation of the work areas.

3. Blasting

At least 14 days before the start of blasting on the site, the Contractor shall submit the following:

- a) copies of valid Blaster's Certificates for the Contractor's blasting supervisor and blasters;
- b) a blasting safety plan;
- c) a commercial description and technical information of the proposed blasting products (explosives, detonator, fuses, etc.);
- d) location, design and capacity of explosives and detonator magazines, along with procedures for the handling of explosives on and off site; and,
- e) a copy of all required permits.
- f) After the blasting program begins, the Contractor shall maintain and make available at the magazine or other location as required to the Owner:
 - i. explosives and detonator magazine logs registering the receipts and consumption of explosives, detonators, and accessories; and,
 - ii. daily shift records showing drilling patterns, detonation delay sequences, and the type and quantity of explosives per hole, per delay, and per blast.

1.5 BLASTING SUPERVISOR

The Contractor shall provide and nominate a Blasting Supervisor responsible for the implementation of the methods and procedures designated in the rock excavation plan. The Blasting Supervisor shall:

- a) have a valid blaster's certificate;
- b) have at least 5 years experience in the use of explosives on surface rock excavation projects of a similar nature; and,
- c) direct the activities of all blasting operations and other blasters on site.

PART 2 – PRODUCTS

(not applicable)

PART 3 – EXECUTION

3.1 METHODS

1. The Contractor shall conform to the following general guidelines for all excavation activities:
 - a) Develop excavation methods, techniques, and procedures with due consideration for safety, environmental hazards and the nature of materials to be excavated.
 - b) Take precautions to preserve in an undisturbed condition all materials outside the Excavation Lines.
 - c) Avoid excavation beyond the Excavation Lines shown on the Drawings unless otherwise approved.
 - d) Dispose of all excavated material in the areas designated and approved by the Owner. Under no circumstance shall water, tailings or deemed contaminated material from within the Tailings Facility be discharged, ponded, or stockpiled outside of the Facility.
 - e) The tailings, waste or contaminated materials and water, as well as any of the demolished structures or equipment within the Tailings Facility could be acidic or contain hazardous substances from the native rock or from any subsequent milling or processing. The Contractor shall provide all necessary safety equipment for their staff, and shall comply with all applicable health and safety regulations.
 - f) The construction of temporary roads, ramps, or fills to allow equipment access to certain areas could be required, and shall be identified by the Contractor before the start of excavation. The Contractor shall be responsible for construction, deconstruction and safe disposal of all such temporary structures in approved areas, all at no extra cost to the Owner.
 - g) Spill response and cleanup materials will be kept at the site for emergency response to spills from equipment, particularly outside of containment.

3.2 UTILITIES

1. Most utility installation, relocation, or tie-in work is expected to be performed by the Contractor, as directed by the Owner. Utility installations will utilize standard industry bedding and compaction practices and all underground utilities installed will be demarcated with hazard tape 2 feet above the fill bedding and be located by survey for record drawings.
2. An approved “dig permit” from the Owner is required for any excavation. The Contractor shall request dig permits from the Owner, in writing, not less than 72 hours before commencing any excavation. The Owner will work with the Contractor to establish the location and extent of any buried utilities. The Contractor shall immediately cease work and inform the Owner when unknown utilities are encountered, or if utilities are not located as indicated in the dig permit, and perform repairs as directed. Owner-approved isolation/lock-out procedures (energy isolation) shall be used

around live systems, and must be coordinated with the Owner. Excavation scheduling will be paramount to the successful construction schedule.

3. Damage caused by Contractor negligence shall be satisfactorily repaired at no cost to the Owner.
4. The Contractor shall obtain an approved dig permit from the Owner where work involves breaking into or connecting to existing services or working in close proximity to utility locations. All utility tie-ins will utilize the Owner's isolation standards and lockout procedures to protect personnel and property.
5. All utilities removed from the work area shall be pressure washed, cut into appropriate lengths and placed into Owner-provided rubbish bins at the Site. Owner will deliver and remove the rubbish bins.
6. All abandoned utilities that will remain in the Work area shall be neatly terminated at the margin of the Work and capped or plugged as directed.
7. The Contractor shall record the position and elevation by survey of all existing, re-routed and abandoned service lines encountered in the Work.
8. Hand excavation will be required within 2 ft of any known or suspected live utilities or utilities to be salvaged or modified. Live electrical utilities will be isolated before excavations if within 10 ft of the Work.

3.3 CLEARING, GRUBBING AND STRIPPING

1. The Contractor shall confirm the clearing limits by having its surveyor lay out and flag the clearing lines. The Owner will inspect and confirm the clearing limits with the Contractor before the start of Work. Clearing outside the specified or approved areas shall not be carried out without the Owner's prior written approval.
2. After clearing is completed, Contractor shall identify hazard trees outside the clearing area that pose a safety concern, and submit a plan showing the location of the hazard trees to the Owner within 24 hours of clearing completion. No further work will be permitted in the cleared area until the hazard trees have been dealt with in an approved manner.
3. All cutting and clearing activities shall be performed in strict accordance with the Timber Settlement Contract in force at the Site. All recoverable timber shall be decked in 24' lengths.
4. Top soil shall be excavated from the Work area to the approved depths and limits and hauled for disposal in designated disposal areas. Trucks shall have sealed boxes to avoid leakage and spillage during transport.
5. All necessary water control and sediment control measures within and around the excavations are considered incidental to the Work. Pumps may be required to control runoff during storms. It will be the responsibility of the Contractor to provide personnel throughout the work to maintain drainage and sediment controls, even on off days, if needed.
6. Woody debris shall be piled and burned in an approved manner.

7. Woody debris and waste that is not designated for burning shall be disposed of in stable piles with lifts not more than 3 ft thick, and compacted with a minimum of 3 passes of loaded construction equipment. Organics shall be spread or crushed to avoid nesting and void formation.
8. After excavations, the Contractor shall notify the Owner, so quantity confirmation can be made by Owner survey, prior to work proceeding.

3.4 COMMON EXCAVATION

1. Common materials (including peat) shall be excavated from the Work area to the approved depths and limits and hauled to the designated disposal areas less than one mile away. Peat shall be segregated during excavation and stockpiled separately from other materials. Trucks shall have sealed boxes to avoid leakage and spillage during transport.
2. All necessary water control and sediment control measures within and around the excavation are considered incidental to the Work. Pumps may be needed for runoff control at times.
3. Areas with unacceptable soil or material shall be sub-excavated as directed by the Owner.
4. The entire foundation area shall be excavated to the approved lines or as directed before commencement of fill placement, except in the case of sub-excavations that could pose a safety hazard.
5. Excavation tolerances shall be +0 inches to -6 inches of specified or approved lines and levels.
6. After excavations, the Contractor shall notify the Owner, so quantity confirmation can be made by Owner survey, prior to work proceeding.

3.5 ROCK FRAGMENTATION

1. Rock fragmentation shall be carried out as necessary to remove bedrock (or to fragment boulders or rock-blocks) and to shape the bedrock surface to the lines and levels shown on the Drawings. All rock fragmentation will be subject to review and approval by the Owner before and during the excavation.
2. The rock is described as graphitic phyllite, sericite/chlorite phyllite, or argillite. The phyllite is moderately hard and is dissected by steeply-dipping folia. The argillite is very hard. Both rock types could be jointed, fractured or locally sheared. Dilation of folia or joints, or fracturing from previous blasting could be encountered in the spillway channel of Pond 7 or other areas. The distribution of rock types within the Work area is available from the Owner. The removal of intact rock is expected to require drilling and blasting. Ripping with heavy equipment is not considered a practical fragmentation technique, unless localized. Large boulders or oversize rock may be fragmented by drill and blast techniques or by an excavator -mounted pneumatic rock breaker.
3. Blasting Safety

The Contractor shall provide, adopt and implement safety measures to satisfy the Owner's blasting standards and established regulatory policy, such as:

- a) Signaling and warning systems for labour and equipment prior to blasting.
- b) Blasting mats, screens, fences or barriers for protection against flying rock during blasting.
- c) Specific temporary support required on all exposed rock faces. Measures may include scaling, meshing, bolting, shotcreting and/or other techniques. No other work shall take place until the support measures are in place.

4. Blasting Procedures

The following procedures shall apply to all blasting operations:

- a) The production blast design shall be submitted to the Owner at least 24 hours before the planned blast.
- b) The blast design shall include sketches and comments showing the physical location and dimensions of the planned blast as well as all relevant drilling, charging, and delay data.
- c) The blast shall not proceed without:
 - i. the Owner's approval; and,
 - ii. the presence of the Blasting Supervisor.
- d) The accuracy and control of blasting operations shall be evaluated by the evidence of perimeter hole traces and regularity of the excavation planes. The Contractor shall be prepared to alter any aspects of the blasting cycle to improve the blast control.
- e) The maximum allowable Overbreak shall be 6 inches on final edges and surfaces. Fractured rock due to Overbreak may require removal from the excavation, as directed by the Owner.
- f) Excavation tolerances shall be +0 inches to -6 inches of specified or approved lines and levels.
- g) All excavation surfaces shall be scaled and barred to remove loose, shattered, and "drummy" materials. All overhangs shall be removed. After the installation of temporary rock support (if required), the Owner may inspect the exposed faces and, as required, instruct the Contractor to perform additional work.
- h) Rock fragmentation shall not be done outside the excavation lines shown on the Drawings unless otherwise approved. Should the Contractor require excavation beyond the lines and levels shown on the Drawings, then the additional excavation:
 - i. Shall be subject to the Owner's approval.
 - ii. Shall be subject to the same controls and restrictions applicable to the required excavations.
 - iii. Shall be performed at the Contractor's cost.

- iv. May require to be replaced with structural fills or concrete as determined by the Owner and at no cost to the Owner.

3.6 CONTAMINATED MATERIALS EXCAVATION

1. Contaminated materials shall be excavated from the Work as directed and hauled to the designated disposal areas less than one mile away. Trucks shall have sealed boxes to avoid leakage and spillage during transport. Daily haulage logs will be required and surveys approved by the Owner to confirm volumes
2. All necessary water control and sediment control measures within and around the excavation are considered incidental to the Work.

PART 4 – MEASUREMENT AND PAYMENT

For Measurement and Payment see Section 4.2.

END OF SECTION 4.5

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SECTION 4.6 – FOUNDATION PREPARATION AND FILL

PART 1 – GENERAL

1.1 DESCRIPTION

1. Proof-roll soil and fractured bedrock foundations.
2. Backfill sub-excavations using specified rockfill or other approved materials.
3. Placement of specified fill materials.
4. Additional foundation preparation and fill placement in the Southeast Expansion – Area 2 (SE 2) includes the following:
 - a) Expose and prepare the edge of the existing liner system for connection to the new liner system.
 - b) Install and extend French drains to provide underdrainage for the liner foundation.
 - c) Install or extend instrumentation as directed.
 - d) Initial shaping of the perimeter collection ditches and maintain operational surface ditches to avoid flooding or operational delays during construction.
5. Installation of Pond 7 leak detection system.
6. Install/assist with instrument installation under and above SE 2 liner.

1.2 CODES AND STANDARDS

The latest version of the following Codes and Standards shall apply.

TEST METHOD	DESCRIPTION
ASTM D422	Standard Test Method for Particle-Size Analysis of Soil
ASTM D1140	Standard Test Method for Amount of Material in Soils Finer Than the No. 200 (75 µm) Sieve
ASTM D4318	Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils
ASTM D2216	Standard Test Method for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass
ASTM D698	Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort
ASTM D2922	Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
ASTM D2167	Standard Test Method for Density and Unit Weight of Soil in Place by Rubber Balloon Method.
ASTM D1556	Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method

PART 2 – PRODUCTS

2.1 GENERAL

1. Fill materials shall consist of hard durable rock or soil particles that are not subject to deterioration during handling or in the long-term due to freeze-thaw conditions.
2. Fill materials shall be free of organic matter or other deleterious materials.
3. Materials from required excavations, which are suitable for construction, either directly or by selective excavation, shall be used for construction.
4. The specified gradations apply to materials placed in the Work following compaction.
5. Drain Gravel and all monitoring instruments, leads, conduits, and the like, including the Pond 7 leak detection system, will be provided by the Owner.

2.2 FILL MATERIALS

1. Fill gradations shall be as follows:

PARTICLE SIZE	FILL TYPE AND % FINER THAN (BY WEIGHT)					
	U.S. Sieve Size (inches/No.)	6-inch Minus Rockfill		Sand		Tailings – Supplied by Owner
		coarse	fine	coarse	fine	
6 inch	100					
3 inch	87					
1.5 inch	77					
1 inch	70					
3/4 inch	65					
1/2 inch						
3/8 inch	53	100	100			
1/4 inch						
# 4	39	90	78	100		
# 10	25	75	56	85		
# 20	13	51	32	70		
# 40	5	31	19			
#60	0	20	11		100	
# 100		10	6		90 - 100	
# 200		5	3	5	80 - 90	

- (1) The fill materials shall be well-graded within the specified gradation limits.
- (2) “Well graded” means good representation of all sizes of particles from the coarsest to the finest.

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2. Pit-run rockfill shall be clean well graded material, free of organics, with not more than 5% by weight of the particles passing the No. 200 sieve. Maximum particle size shall not be greater than 80% of the lift thickness at any given location. Approved over-sized boulders, of average diameter not exceeding specified lift thickness, may be placed in designated and approved areas, provided they are adequately embedded in the surrounding compacted fill, to the Owner's satisfaction.
3. Select rockfill shall be clean well graded material, free of organics, with 16-inch maximum particle size, a D50 of 6-inches and not more than 5% by weight of the particles passing the 1-inch sieve. Maximum particle size shall not be greater than 80% of the lift thickness at any given location. Approved over-sized boulders, of average diameter not exceeding specified lift thickness, may be placed in designated and approved areas, provided they are adequately embedded in the surrounding compacted fill, to the Owner's satisfaction.
4. Drain gravel shall be hard, durable, ¾-inch to ¼-inch clean, crushed rock.
5. Pyritic rock will not be allowed in construction of the Work, including drains, roads, berms or foundations.

2.3 WATER

1. Uncontaminated water shall be used for construction. At no time shall process water or storm water be used for construction.

PART 3 - EXECUTION

3.1 EXISTING 6-INCH MINUS ROCKFILL STOCKPILES

1. There is an estimated 9,790 cubic yards (s. cy.) of 6-inch minus rockfill available in existing stockpiles in the Pond 7 area. The Contractor shall assume that the recoverable 6-inch minus rockfill will comprise 7,500 compacted cubic yards (c. cy.) of the permanent Work
2. The Contractor shall use all of the stockpiled material in the permanent Work, with the exception of material that is deemed by the Owner to be contaminated.
3. Incidental handling and temporary stockpiling of the material from existing stockpiles will not be measured separately for payment.

3.2 GRADE PREPARATION

1. Grade shall be prepared to the lines shown on the Drawings. With prior approval, grade lines may be adjusted in the field to suit local topography or ground conditions or to minimize the use of backfill material, provided final grades fall between 2% and 33%, and are free of abrupt or sharp changes unless otherwise specified. In general, adjustments to grade lines which increase the tailings or water storage capacity of the area will be acceptable provided there are no additional costs to the Owner.

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2. All exposed excavation surfaces shall be smooth, firm, unyielding, proof-rolled and compacted with a minimum of 6 overlapping passes of a 12-ton vibratory compactor. The Contractor shall adjust the number of passes and moisture condition the soil as necessary to achieve the required compaction. The prepared surface shall be approved before the placement of fill to bring the area back up to specified grade levels.
3. Loose, friable, or weak materials encountered after exposure of rock surfaces shall be removed to the satisfaction of the Owner
4. Fill used to raise excavation surfaces to required grades shall consist of pit run rockfill, except for the final 1.5 ft which shall be 6-inch minus rockfill, placed in the specified manner unless otherwise directed.
5. On the northeast edge of the Southeast Expansion area, hand excavation will be required within 2 ft of the existing liner and cleaning by water jetting or the like, to expose the edge of the existing liner and make it suitable for connection to the new liner system. The liner shall be exposed a minimum width of 5 ft beyond the approved weld line where the new liner will join the existing liner. Damaged liner shall be repaired.
6. In areas where road fill will be placed over soft soil, the Contractor shall place Owner-provided woven geotextile on the foundation, in an approved manner, before placing the road fill.

3.3 GRADE LINES

1. The prepared surfaces at the required grade lines, whether on original ground or on structural fill, shall be free of ruts formed by vehicular traffic, shall have no sharp protruding rocks or foreign objects, and shall be protected from flooding, standing water, erosion and freezing prior to the placement of the bedding layer.
2. All finished surfaces shall be within the specified tolerances and shall have gradual and smooth grade transitions as required for the installation of the liner system.

3.4 INSTRUMENTATION

1. Prior to or during installation of the bedding sand layer, the Contractor shall assist the Owner with installation of new monitoring wells, lysimeters and piezometers within the liner footprint, and extension of the associated ducts and cabling from new and existing instruments to an area outside the limits of the liner, as directed. In addition, the Contractor shall relocate the existing instrument monitoring hut, or place a new hut, provided by the Owner.
2. The Contractor shall excavate trenches, install ducts and cabling, and backfill trenches back to the required grade lines as directed by the Owner.
3. The Owner will provide all instruments and associated hardware.
4. The Contractor shall coordinate its other operations around the instrumentation work. The Work shall be carried out with care and caution for the protection of the instruments.

3.5 FRENCH DRAINS

1. Groundwater collection drains, also known as French drains, may be required in areas where seepage is uncovered during the foundation preparation work. The French drains consist of filter-sock wrapped, perforated HDPE pipe installed in a trench backfilled with drain gravel, and with the pipe and drain gravel enclosed in prescribed non-woven geotextile filter. The layout and total length of the French drains may differ from that indicated on the Drawings depending on ground conditions.
2. In the SE2 Area, the pipe shall consist of 8-inch diameter SDR9 perforated HDPE pipe.
3. In the Pond 7 Area, the pipe shall consist of 6-inch diameter SDR9 perforated HDPE pipe.

3.6 FILL PLACEMENT

1. Drain gravel will be supplied free of charge (for use in the Work only) to the Contractor in a stockpile at Hawk Inlet and/or other locations closer to the Work site. The Contractor shall be responsible for loading from the stockpile(s) and hauling to the placement areas. In addition, haulage operations from the camp area will be restricted to between 5 a.m. and 7:30 p.m. due to camp operations and sleeping personnel and shall follow all applicable Owner road rules. Contractor shall use all materials efficiently and reduce any waste of the products.
2. All fills shall be placed incrementally in horizontal lifts starting from the lowest ground levels, unless otherwise approved.
3. All fills are susceptible to particle segregation during placing and spreading, especially the 6-inch minus and pit run rockfills. The Contractor shall use placing and spreading methods that prevent segregation from occurring, or provide an approved method of repairing segregation prior to compacting the materials.
4. The bedding layer shall be placed in one lift and compacted as described in the table below. The Contractor shall adjust the number of passes and moisture condition the soil as required to achieve the specified compaction. Moisture conditioning shall be carried out during or immediately before compacting each lift, with the water content of the placed material being as uniform as practicable throughout the layer. Compaction testing shall be carried out by the Contractor for acceptance of the work, with the Owner confirming with duplicate testing as needed.
5. Hand operated compactors shall be used within 2 ft of buried conduits, utilities, existing liner or similar sensitive structures.
6. At least 4 hours notice shall be provided to the Owner before placing bedding material in any area and the Work shall not start until approval has been obtained.
7. Due to the cost of production, bedding material thickness shall not exceed 1 inch more than the specified layer thickness at any location, and then only if the occurrence is localized in nature as determined by the Owner. Excess material in the bedding layer shall be salvaged and reused elsewhere in the Work or stockpiled for future use by Others at no additional cost to the Owner.

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8. The Contractor shall prevent surface water runoff or water from any other source from eroding fill materials placed for the Work, and shall immediately repair any damage resulting from such erosion, at no cost to the Owner.
9. All materials whether in permanent works or in stockpiles shall have a smooth final contour that sheds runoff and shall be stable. Secondary earthwork will be required to leave the storage sites, as well as any sediment control structures needed for the piles, in good order to the Owner's satisfaction. This work will not be measured.
10. The fills shall be placed as follows:

FILL DESCRIPTION	AS PLACED MOISTURE CONTENT	LIFT THICKNESS (IN) ⁽²⁾	MINIMUM DENSITY STANDARD PROCTOR % ⁽¹⁾	MINIMUM PASSES/LIFT & COMPACTOR TYPE
Sand (bedding)	as required	6	98	4, 12t vibratory roller
Sand (service layer – initial lift)	moist	12	method spec →	2, approved low ground pressure equipment, and 4, 12t roller (no vibration)
Sand or Tailings ⁽³⁾ (service layer – second lift)	moist ⁽³⁾	12	method spec →	4, 12t vibratory roller
Sand (service layer in single lift – Pond 7 only)	moist	18	method spec →	2, approved low ground pressure equipment, and 4, 12t roller (no vibration)
Drain Gravel (pipe bedding)	moist	6	method spec →	locally, if directed
Drain Gravel (bedding)	moist	12	95	4, hand operated compactor
Sand (trench backfill and pipe bedding)	moist	6	95	4, hand operated compactor
6-in. Minus Rockfill (foundations and roads)	wet	12	method spec →	4, 12t vibratory roller
6-in. Minus Rockfill (service layer)	wet	6	method spec →	4, 12t vibratory roller
6-in. Minus Rockfill (service layer – Pond 7 only)	wet	6	method spec →	4, 12t roller (no vibration)
Pit-run Rockfill (berm)	wet	36	method spec →	6, 12t vibratory roller
Pit-run Rockfill (roads)	moist	18	method spec →	4, 12t vibratory roller

(1) At optimum Standard Proctor moisture content.

(2) Fills within 2 ft of sensitive structures, as determined by the Owner, shall be hand compacted with lift thickness varied accordingly.

(3) Tailings to be ±2% of optimum moisture content.

3.7 COMPACTION EQUIPMENT

1. Smaller hand operated compactors shall be used in restricted areas (such as small depressions in the ground surface) and adjacent to instruments, pipes, wells, existing liner or as directed.
2. Notwithstanding the above requirements, the equipment and compaction procedures employed by the Contractor shall be subject to Owner's approval.

3.8 WATERING EQUIPMENT

1. Equipment used to apply water to granular fill materials shall be designed to apply water uniformly. Water tank trucks shall be equipped with positive shutoff valves such that leakage from the nozzles will not occur when the equipment is not operating. In the event that leaks do occur, they shall be repaired immediately.
2. Watering equipment shall be capable of continuously delivering sufficient water immediately in front of the compaction equipment to saturate the lift or foundation being compacted but not allow uncontrolled surface water runoff. A fresh water source will be made available at Hawk Inlet.

3.9 RESTRICTIONS DUE TO WEATHER AND SUSPENSION OF OPERATIONS

1. The Contractor shall not place any fill when conditions for such operations are unsatisfactory due to rainfall, snow, freezing temperatures, fire hazard, or any other reason.
2. Where operations have been discontinued by the Contractor or suspended by the Owner, the effects of snow, rain, low temperatures, desiccation, or other adverse conditions shall be assessed by the Owner and the surficial layers of fill or foundation treated or replaced to the satisfaction of the Owner before resumption of fill placement.
3. In freezing conditions, the Contractor shall:
 - a) Not commence placing fill in air temperatures below 32°F;
 - b) Cease placing fill if air temperature drops below 28°F;
 - c) Not place frozen fill, incorporate snow or place fill on frozen surfaces; and
 - d) Remove frozen fill and scarify the fill or foundation surface and recompact the surface prior to placing additional material.
4. No payment will be made for any remedial work necessary for the resumption of fill operations.

3.10 SEDIMENT AND DRAINAGE CONTROL

1. The Contractor shall provide equipment and facilities such as silt fences, pumps and settling ponds as required to control drainage around the work site and to prevent the discharge of sediment from construction and precipitation run-off from entering any natural water course downstream of the Site.

2. Sediment and drainage controls shall be to the satisfaction of the Owner.

3.11 QUALITY CONTROL

1. The Contractor shall be responsible for the quality of placed fill. The Owner may undertake quality assurance testing of in-place fill, including laboratory and field tests.
2. The Contractor shall give the Owner every opportunity to make such tests and shall render such assistance as is necessary to enable sampling and testing to be carried out expeditiously. The making of such tests by the Owner or the time taken to interpret the results shall not constitute grounds for a claim by the Contractor.
3. Testing shall be performed in accordance with the principles and methods prescribed by the American Society for Testing and Materials (ASTM) and other such recognized authorities.
4. Notwithstanding any quality assurance testing carried out by the Owner, the Contractor shall be responsible for performing such field tests as are necessary to control the quality of the fill in accordance with the Contract Documents.
5. As a minimum, the Contractor shall conduct the following quality control testing program on the compacted bedding material.

FILL DESCRIPTION	TESTS AND FREQUENCY (1 Test Per Vol. In yd ³)			
	MOISTURE CONTENT	IN-SITU DENSITY	GRADATION	STANDARD PROCTOR
Bedding Sand	500	500	500	2000

6. Testing shall be carried out across the full length, width and depth of the various fill zones so as to fully represent the overall quality of the structure.
7. The Contractor shall submit test results promptly, complete with measurements and calculations while earthworks are being constructed. Test results shall be referenced as to date, fill type, location, and elevation. Where in-place density and moisture content are determined by nuclear density gauge, periodic calibrations of the equipment shall be provided by volumetric density measurements and oven dry moisture contents as directed. Test results shall be reported to the Owner within 24 hours of the completion of each test.
8. The Contractor shall conduct regular topographic surveys to demonstrate the placement of fill to the specified lines, levels and tolerances. The Owner may from time to time conduct check surveys. Survey results shall be reported to the Owner within 24 hours of the completion of each survey.
9. If on the basis of the sampling and testing or if in the opinion of the Owner an area of the fill does not meet the specified requirements, such fill shall be removed and replaced with conforming material at no cost to the Owner. Rejection of fill material by the Owner may be made at source, on transporting vehicles, or in place.

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10. Final acceptance of earthworks will be made only after materials have been dumped, spread, moisture conditioned, compacted and quality control tests and surveys have demonstrated compliance with the specified requirements.
11. Initial stockpile surveys/quantities will be supplied to the Contractor, and confirmation of volumes will be the Contractor's responsibility to avoid any material shortages. The Contractor shall be responsible for maintaining and efficiently utilizing the stockpiled materials for Work related use only to avoid any material shortages. The Contractor shall always use the closest available materials and disposal sites unless otherwise directed. The Contractor shall promptly inform the Owner of any potential material shortages. A material shortage will not be a basis for claiming additional compensation on account of a delay due to the material shortage.

PART 4 - MEASUREMENT AND PAYMENT

For Measurement and Payment see Section 4.2.

END OF SECTION 4.6

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SECTION 4.7 – FOUNDATION LINER

PART 1 – GENERAL

1.1 DESCRIPTION

1. The foundation geofabric liner system will be installed over a bedding layer Southeast Expansion – Area 2, and in Pond 7, as follows:
 - a) In Southeast Expansion –Area 2 the liner system consists of the following components, from bottom to top: non-woven geotextile; textured HDPE geomembrane; geocomposite drain; and, a lower service layer of specified sand. An upper service layer consisting of sand or “dry” tailings will be placed in the Southeast Expansion – Area 2.
 - b) In Pond 7, the liner system consists of the following components, from bottom to top: non-woven geotextile; textured HDPE geomembrane; and, a service layer of specified sand and rockfill. A layer of geocomposite drain shall be substituted with the non-woven geotextile underneath the geomembrane in instances where the bedding layer ultimately overlays bedrock on the pond slopes, or as directed. A service layer of sand will be placed on the invert and lower slopes of the pond. A layer of 6-inch minus rockfill armor will be placed over the service layer sand.

1.2 CODES AND STANDARDS

The latest version of the following Codes and Standards shall apply for the installation and field testing of the geofabric materials. The Standards applicable to the service layer are listed in Technical Section 4.6.

TEST TYPE	TEST METHOD	DESCRIPTION
Field Seam Test	ASTM D4437	Standard Practice for Determining the Integrity of Field Seams Used in Joining Flexible Polymeric Sheet Geomembranes
Field Seam Test	ASTM D4884	Standard Test Method for Strength of Sewn or Thermally Bonded Seams of Geotextiles
Field Seam Test	ASTM D5641	Standard Practice for Geomembrane Seam Evaluation by Vacuum Chamber
Field Seam Test	ASTM D6365	Standard Practice for the Non-Destructive Testing of Geomembrane Seams using the Spark Test
Field Seam Test	ASTM D6392	Standard Test Method for Determining the Integrity of Non-Reinforced Geomembrane Seams Produced Using Thermo-Fusion Methods
Installation Damage	ASTM D5818	Standard Practice for Obtaining Samples of Geosynthetics from a Test Section for Assessment of Installation Damage

1.3 SUBMITTALS

1. In preparing submittals, the Contractor shall recognize the need to be totally self-sufficient with regard to supply of labor, equipment and materials (other than the geofabrics and fills, which are provided by the Owner), for installing the liners within the approved schedule. Late completion of this work is subject to penalty.
2. The Contractor shall submit, with the bid, a list of personnel who will install the liner system. The Contractor shall obtain approval from the liner manufacturer to use the designated personnel, as required to satisfy manufacturer warranties. The Contractor shall submit construction methods in accordance with Section 4.1 and progress reports from the manufacturer's representative confirming proper installation. KGCMC strongly recommends the use of the material supplier (Northwest Lining and Geotextile Products) as the liner installation firm. Preferred consideration will be given for the use of the material supplier in bid evaluations, due to the historical use and specific material knowledge of the supplier.
3. The Contractor shall submit, with the bid, a list of equipment that will be used to place the liner and the service layer materials. In this submittal the Contractor shall provide commentary that demonstrates that the liner equipment is adequate to handle the load of placing the liners and that the service layer spreading and compacting equipment will not damage the liner.
4. The Contractor shall submit, with the bid, its method of connecting the new liner to the existing liner.
5. The Contractor shall submit, with the bid, a program of quality control testing to ensure that the existing liner along the connecting seam meets the tensile strength and strain properties as specified by the manufacturer for the existing liner (or approved equivalent) when it was originally supplied as new. The Contractor will supply all portable power generation units needed to perform the liner installation, as well as all required leads, extensions cords, ties, visquine and repair materials as required.
6. At least 14 days prior to starting geomembrane installation, the Contractor shall submit, for approval, a panel layout drawing which indicates at minimum the configuration of the liner panels and the general location of field seams.

PART 2 – PRODUCTS

2.1 GEOFABRICS

1. The Owner will provide the following geofabrics from Northwest Linings and Geotextile Products Inc., Kent, WA, or approved equivalent:
 - a) 100-mil SI Geosolutions Geotex 1001 non-woven geotextile,
 - b) 60-mil SI Geosolutions Geotex 601 non-woven geotextile,
 - c) 80-mil HDPE textured geomembrane, textured both sides, and,
 - d) 200-mil PermeaTex GC200-2-4080 geocomposite.

2.2 SERVICE LAYER

For specifications regarding the sand, tailings, or other materials that are required for the service layer and bedding layer, refer to Technical Section 4.6.

PART 3 – EXECUTION

3.1 GENERAL

1. The geotextile fabric, geomembrane liner, and geocomposite drain will be supplied and warehoused by the Owner and will be provided to the Contractor free of charge for the Work only. The Contractor shall supply and warehouse all other materials required to install the geofabric products. The Owner supplied liner will be kept in storage at Hawk Inlet or another location closer to the Work. The Contractor shall be responsible for material pick up from storage, transport to the placement location and protection of all materials once moved to the work site.
2. The Contractor shall accept responsibility of the liner supplies in storage and confirm quantities prior to the installation to avoid any delays or material shortages. The Contractor shall utilize the material supplies effectively to minimize waste and handle the materials to protect the liner integrity during transportation, installation and after installation and service layer installation.
3. The Contractor shall protect the geofabrics from direct sunlight, ultraviolet rays, excessive heat, mud, dirt, dust, debris and rodents during transport and storage.
4. The Contractor shall engage the services of an experienced technician/crew from the geofabric materials supplier who will directly supervise or perform the installation of its company's products. The supplier representative shall be on site at least one full day prior to the placement of any geofabric materials for safety training and shall remain on site until 100% of the liner system geofabrics have been installed and approved by the Owner.
5. The Contractor shall maintain in good repair and condition the equipment necessary to complete all liner installations, including power supplies and welding machines and accessories to avoid schedule delays or unnecessary repair work.
6. The Contractor shall provide spare welders and generators sufficient to prevent lost time due to equipment breakdown.
7. All geofabric materials shall be installed and quality assurance field tested in strict accordance with the manufacturer's recommended procedures. In instances of conflicts between these technical specifications and the manufacturer's procedures, the more onerous requirements shall prevail unless otherwise directed by the Owner.
8. Soft-soled safety footwear is required for all personnel who walk on the liner components to protect the liner from damage.
9. The Contractor shall exercise due caution to prevent injury to personnel, due to slipping on the liner, particularly when it is wet.

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10. The Contractor shall arrive on site prepared to handle rain water collecting on the liner and have pre-made sand bags to hold the liner down during windy conditions. The Contractor is responsible to protect the liner from all weather damage, particularly from wind. The Contractor will be back charged for time and materials, if damage occurs from weather related incidents.
11. The Contractor shall remove construction debris from the Site and dispose of it in an environmentally responsible and legal manner.
12. Vehicular traffic shall not be permitted directly on the geofabrics.
13. The Contractor will supply sufficient personnel to facilitate liner installation while on site.

3.2 GEOFABRIC INSTALLATION

1. The Contractor shall excavate and expose the existing liner system and, in consultation with the Owner, shall determine the appropriate location along which to weld the new liner system to the existing liner system. In Southeast Expansion – Area 2, the non-woven geotextile of the new liner system that underlies the geomembrane shall be lapped not less than 4 feet over the non-woven geotextile of the existing liner system.
2. Seams shall be welded in accordance with manufacturer's recommendations. If resin is used for seam welding, the physical properties of the resin shall be the same as, or better than, those used in the manufacture of the geofabric.
3. Do not proceed with geomembrane panel placement and seaming when ambient temperatures are below 23°F, or above 104°F, during precipitation, in the presence of excessive moisture (e.g. fog, dew), nor in the presence of high winds.
4. Protect installed geofabrics from displacement, damage, or deterioration before, during and after placement of material layers.
5. Replace damaged, torn, or permanently twisted panels to approved condition. Remove rejected damaged panels from the site.
6. Keep seaming to a minimum. Orient seams up and down slopes. Horizontal seams must be more than 5 ft down slope from the toe of any slope.
7. Keep seam areas clean and free of moisture, dust, dirt, debris and foreign material.
8. Repair minor tears and pinholes in the geomembrane by patching until non-destructive testing is successful. Patches shall be round or oval in shape, made of the same geomembrane material, and extend a minimum of 3 inches beyond the edge of the defect.

3.3 GEOMEMBRANE QUALITY CONTROL

1. Test and document geomembrane seams as the seaming work progresses by non-destructive methods over their full length. Repair seams which do not pass non-destructive testing. Reconstruct seam between failed location and any passed test location, until non-destructive testing is successful.
2. Test and document seams in strength and peel at beginning of each seaming period, and at least once every 4 hours if the welding operation is interrupted, for each seaming apparatus and seamer used that day. Also test at least two samples from each panel, with samples taken from extra material, such that the panel is not damaged and the blanket geometry is not altered.
3. If the seam test specimen fails in seam, repeat on new specimen. If the new specimen fails in seam, material shall not be used for seaming until deficiencies are corrected and two consecutive successful test seams are achieved.
4. Test the seams by non-destructive methods over their full length, using vacuum test unit or air pressure test (ASTM D 4437 and ASTM D 5641).
5. Provide the test results to the Owner for each shift's production, including documentation of non-destructive testing and repairs at the end of each shift.

3.4 SERVICE LAYER

1. Conditions contained in Section 4.6 for the bedding layer shall also apply to the service layer.
2. The sand is susceptible to particle segregation during placing and spreading. The Contractor shall use placing and spreading methods that prevent segregation from occurring, or provide an approved method of repairing segregation prior to compacting the material.
3. Service Layer Arrangement
 - a) In areas to be overlain by tailings and where prepared grade is less than 10%, the first 1 ft of sand service layer shall be overlain by compacted "dry" tailings.
 - b) In areas to be overlain by tailings and where grade is 10% or steeper, the first 1 ft of sand service layer shall be overlain by a second 1 ft layer of service layer sand (for a total of 2 ft of sand).
 - c) In SE 2 area where the service layer sand will be overlain by 6-inch minus rockfill, the first 1-ft of sand service layer shall be overlain by a second 1 ft layer of service layer sand (for a total of 2 ft of sand), measured perpendicular to the liner.
 - d) In SE 2 area where the service layer sand will be overlain by 6-inch minus rockfill and the area is underneath a future road or haulage corridor, the first 1 ft of sand service layer shall be overlain by a second 1 ft layer of service layer sand (for a total of 2 ft of sand), and then a Geogrid and non-woven geotextile before placement of rockfill.
 - e) In Pond 7 invert the total service layer thickness is 2 ft, consisting of 1.5 ft of prescribed sand covered with a layer of 6-inch minus rockfill. The service layer sand shall be placed in a single

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1.5 ft thick lift and compacted as prescribed in Section 4.6. The 0.5 ft thick layer of 6-inch minus rockfill on top of the service layer shall be compacted as prescribed in Section 4.6. The prescribed rockfill layer shall not be placed or compacted until the sand layer is compacted in accordance with the specification.

- f) In Pond 7, the service layer sand and rockfill shall be placed without compaction on the pond slopes as shown on the Drawings.
4. The Owner will provide a stockpile of "dry" tailings within 0.5 miles of the site. The Contractor shall be responsible for protecting the "dry" tailings supply pile from rainfall and runoff by tarping, ditching and similar measures. The Contractor shall dispose of any unsuitably wet tailings from the stockpile and replace it with "dry" tailings, at no cost to the Owner, provided the wet condition was due to Contractor's negligence. Tarping materials shall be readily available and maintained during the project period over the tailings stockpile (account for wind and rain).
5. The Contractor will not be allowed access over the tailings service layer after placement is completed. Erosion and sediment controls will be a priority to maintain the surface integrity of the service layer and tailings. Perimeter surface runoff controls during liner tie-ins and construction shall be maintained to avoid flooding or unplanned spills.
6. The service layer sand, 6-inch minus rockfill, tailings, and other materials shall be placed as specified in Section 4.6. No equipment larger than a Caterpillar D5 wide track (low ground pressure) dozer or equivalent shall be used for placing the service layer. Compaction of the first lift above the geocomposite shall be done with a dozer initially and then with a smooth drum roller, with the vibrator turned off.
7. No placement or compaction of service layer material shall be carried out unless the Owner's Representative is present.

PART 4 - MEASUREMENT AND PAYMENT

For Measurement and Payment see Section 4.2.

END OF SECTION 4.7

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SECTION 4.8 – DRAINAGE SYSTEM

PART 1 - GENERAL

1.1 DESCRIPTION

1. In Southeast – Area 2 only, the liner and tailings pile drainage system shall comprise pipe drains and lined surface ditches at the perimeter of the new liner installation, except where the new liner is connected to the old liner along the northeast edge.
2. The pipe drains consist of perforated HDPE pipe embedded in drain gravel covered with geotextile. The pipe drains will collect seepage water from the geocomposite and service layer of the liner and direct it to Pond 6.
3. Ditches shall be lined with reinforced polypropylene geomembrane. Velocity breaks consisting of small piles of clean rock shall be placed at intervals along the ditches, as directed.

PART 2 – PRODUCTS

2.1 GENERAL

1. The drain gravel, the drain pipe, the geomembrane liner, and ancillaries will be supplied by the Owner to the Contractor free of charge for the Work only. The materials will be stored at Hawk Inlet.

2.2 DRAIN GRAVEL

1. The drain gravel shall be clean, durable rock as described in Section 4.6 - Foundation Preparation and Fill.

2.3 DRAIN PIPE

1. In the SE2 area, perforated drain pipe for the collection drains shall consist of 8-inch diameter SDR9 HDPE pipe wrapped in a filter sock.
2. In the Pond 7 area only, perforated drain pipe for the French drains shall consist of 6-inch diameter SDR9 HDPE pipe wrapped in filter sock.
3. The drain pipe between Pond 7 invert and the wet well shall consist of 24-inch diameter SDR11 solid HDPE pipe.

2.4 SURFACE DITCH LINER BEDDING

1. Sand bedding (see Section 4.6) or non-woven geotextile (see Section 4.7) shall be used as required.

2.5 SURFACE DITCH LINER

1. The surface ditch liner shall consist of 36-mil reinforced polypropylene (RPP36) geomembrane from Northwest Linings and Geotextile Products Inc., Kent, WA, or approved equivalent.

2.6 VELOCITY BREAKS

1. Clean rock pieces, nominal 3-inch to 6-inch size, shall be used to construct velocity breaks, as directed.

PART 3 - EXECUTION

3.1 GENERAL

1. The Contractor shall be responsible for pick up of Owner supplied materials from storage and transport to the placement location.
2. Support of open trenches and excavations shall be in accordance with applicable laws and regulations.
3. The Contractor shall exercise due caution to prevent injury to personnel, particularly due to slipping on the liner when it is wet.
4. High winds and rain can occur at the site. The Contractor shall secure and protect all materials and installations of liner during construction to prevent wind-lifting, tearing or water damage to in-place bedding materials.

3.2 DRAIN GRAVEL

1. Drain gravel shall be placed as described in Section 4.6.

3.3 DRAIN PIPE

1. A pipe fusion machine will be made available to the Contractor at no charge. The Contractor shall be responsible for operating and maintaining the machine while in its possession. Pipe fusion and installation shall be in accordance with the manufacturer's requirements and to the Owner's satisfaction. Fusion welding shall be carried out by an experienced qualified welder, approved by the Owner. The Contractor will not receive extra compensation for any delays caused by Owner supplied equipment, if malfunctions occur. It remains the Contractor's responsibility to complete the work and keep the schedule.
2. Install temporary anchorage as required until permanent anchorage is constructed by Others.
3. The Contractor shall ensure that at least one set of pipe perforations coincide with the pipe invert when buried.

4. Molded connections shall be used to connect secondary pipe drains into the perimeter pipe drain.

3.4 SURFACE DITCH LINER BEDDING

1. Sand bedding or geotextile shall be placed as required to provide protection for the surface ditch liner from underlying rockfill.

3.5 SURFACE DITCH LINER

1. The geomembrane shall be installed in general accordance with Section 4.7. The use of scrap HDPE pieces from the main liner installation may be acceptable but requires Owner approval.

3.6 VELOCITY BREAKS

1. Small piles of clean rock shall be placed across the width of the ditch invert at regular intervals as directed.

PART 4 - MEASUREMENT AND PAYMENT

For Measurement and Payment see Section 4.2.

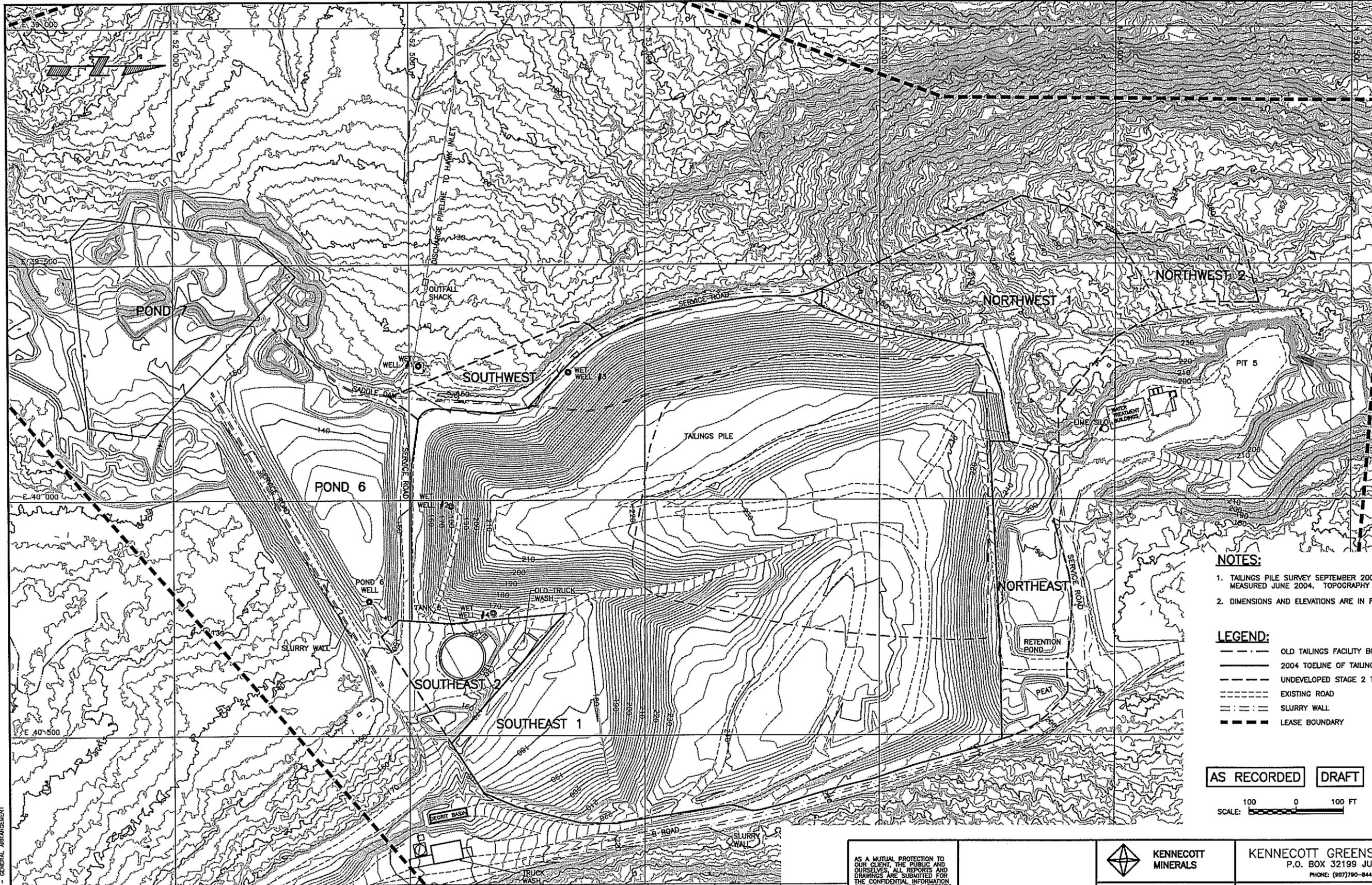
END OF SECTION 4.8

APPENDIX VI

2004 Construction Record Drawings by KGCMC

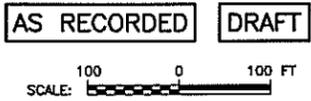
- DWG 2 General Arrangement**
- DWG 3 Southeast Area 1 – Excavation Plan**
- DWG 4 Southeast Area 1 – Liner Location Plan**
- DWG 5 Southeast Area 1 – Sections and Details 1 of 3**
- DWG 6 Southeast Area 1 – Sections and Details 2 of 3**
- DWG 7 Southeast Area 1 – Sections and Details 3 of 3**

Date: 12/16/2005
 Scale: 1"=400'
 Drawing File: N:\071802\A38 - 2004 Construction Monitoring\100 Design\110 Drawings\KGC\MC_Record_Drawing_Feb2005\Dwg2-RB.dwg (written)
 Author: Pond2enters - GENERAL ADMINISTRATION



- NOTES:**
1. TAILINGS PILE SURVEY SEPTEMBER 2004. OUTLYING AREA TOPOGRAPHY MEASURED JUNE 2004. TOPOGRAPHY PROVIDED BY KGC/MC.
 2. DIMENSIONS AND ELEVATIONS ARE IN FEET UNLESS NOTED OTHERWISE.

- LEGEND:**
- OLD TAILINGS FACILITY BOUNDARY
 - 2004 TOELINE OF TAILINGS FACILITY
 - - - UNDEVELOPED STAGE 2 TAILINGS AREA
 - EXISTING ROAD
 - - - SLURRY WALL
 - LEASE BOUNDARY



REVISIONS	DWG NO.	DESCRIPTION	DATE	BY	PROJ.	CLIENT
	Dwg2-RB	2004 CONSTRUCTION RECORD	Dec. 21, 2005			
	Dwg2-RA	2004 CONSTRUCTION RECORD				

AS A MUTUAL PROTECTION TO OUR CLIENT, THE PUBLIC AND OURSELVES, ALL REPORTS AND DRAWINGS ARE SUBMITTED FOR THE CONFIDENTIAL INFORMATION OF OUR CLIENT FOR A SPECIFIC PROJECT AND AUTHORIZATION FOR USE AND/OR PUBLICATION OF DATA, STATEMENTS, CONCLUSIONS OR ABSTRACTS FROM OR REGARDING OUR REPORTS AND DRAWINGS IS RESERVED PENDING OUR WRITTEN APPROVAL.

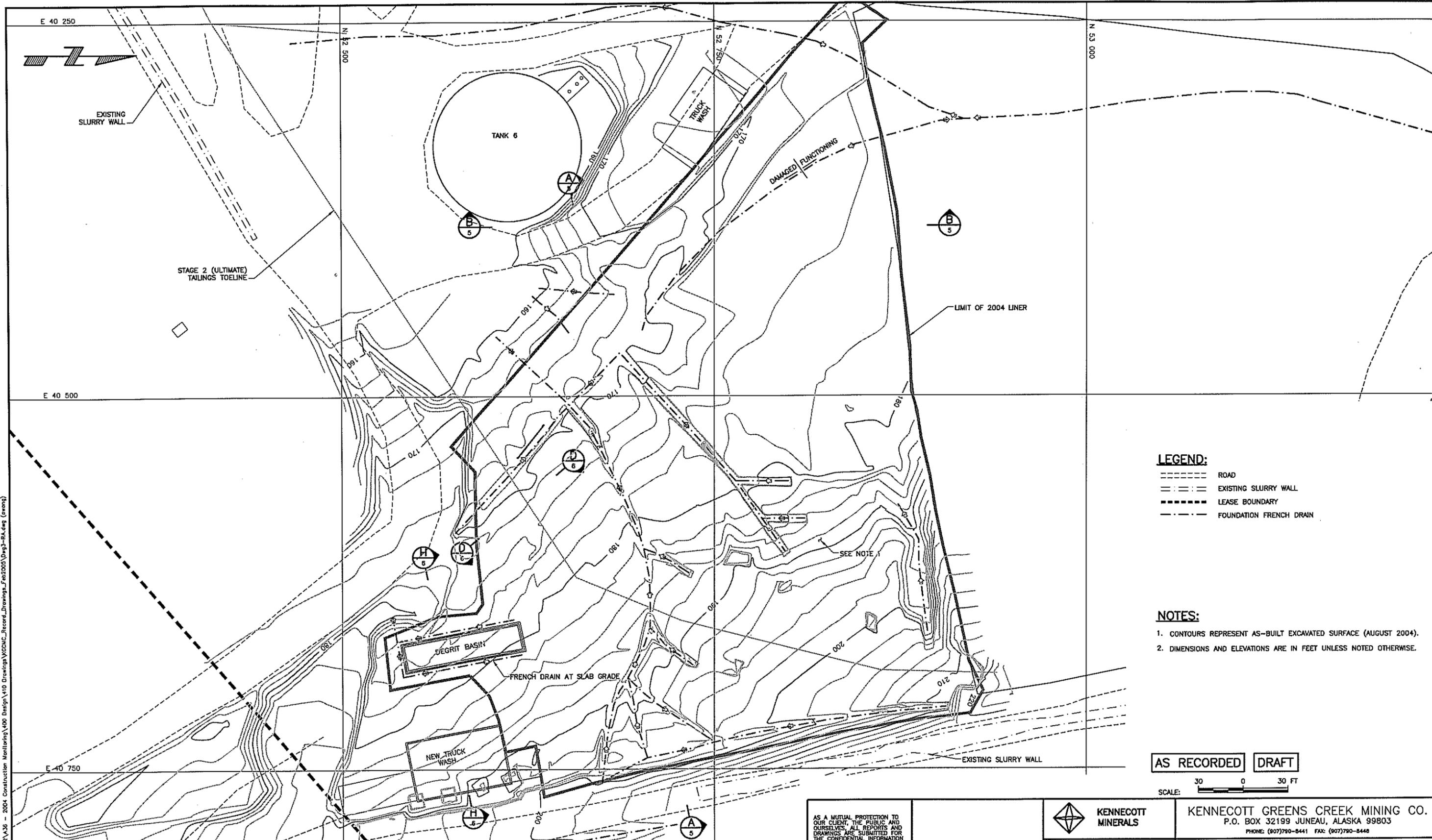
KENNECOTT MINERALS

DATE: _____
 DRAWING BY: _____
 DESIGN BY: _____
 REVIEWED BY: _____
 PROJ OR REF: _____

KENNECOTT GREENS CREEK MINING CO.
 P.O. BOX 32199 JUNEAU, ALASKA 99803
 PHONE: (907)790-8441 FAX: (907)790-8448

TITLE: **GENERAL ARRANGEMENT**

DWG. 2 SHEET: 1 OF 1



LEGEND:

- ROAD
- EXISTING SLURRY WALL
- LEASE BOUNDARY
- FOUNDATION FRENCH DRAIN

NOTES:

1. CONTOURS REPRESENT AS-BUILT EXCAVATED SURFACE (AUGUST 2004).
2. DIMENSIONS AND ELEVATIONS ARE IN FEET UNLESS NOTED OTHERWISE.

AS RECORDED **DRAFT**



Time: 7/14/05
 Date: 7/14/05
 Scale: 1"=50'
 Drawing File: M:\072802\A-35 - 2004 Construction Monitoring\00 Design\110 Drawings\K00C\Record_Drawing_Fwd\005\03-RA.dwg (among)

REVISIONS	Dwg3-RA	2004 CONSTRUCTION RECORD	Dec. 21, 2005			
DWG NO.	DESCRIPTION		DATE	BY	PROJ.	CLIENT

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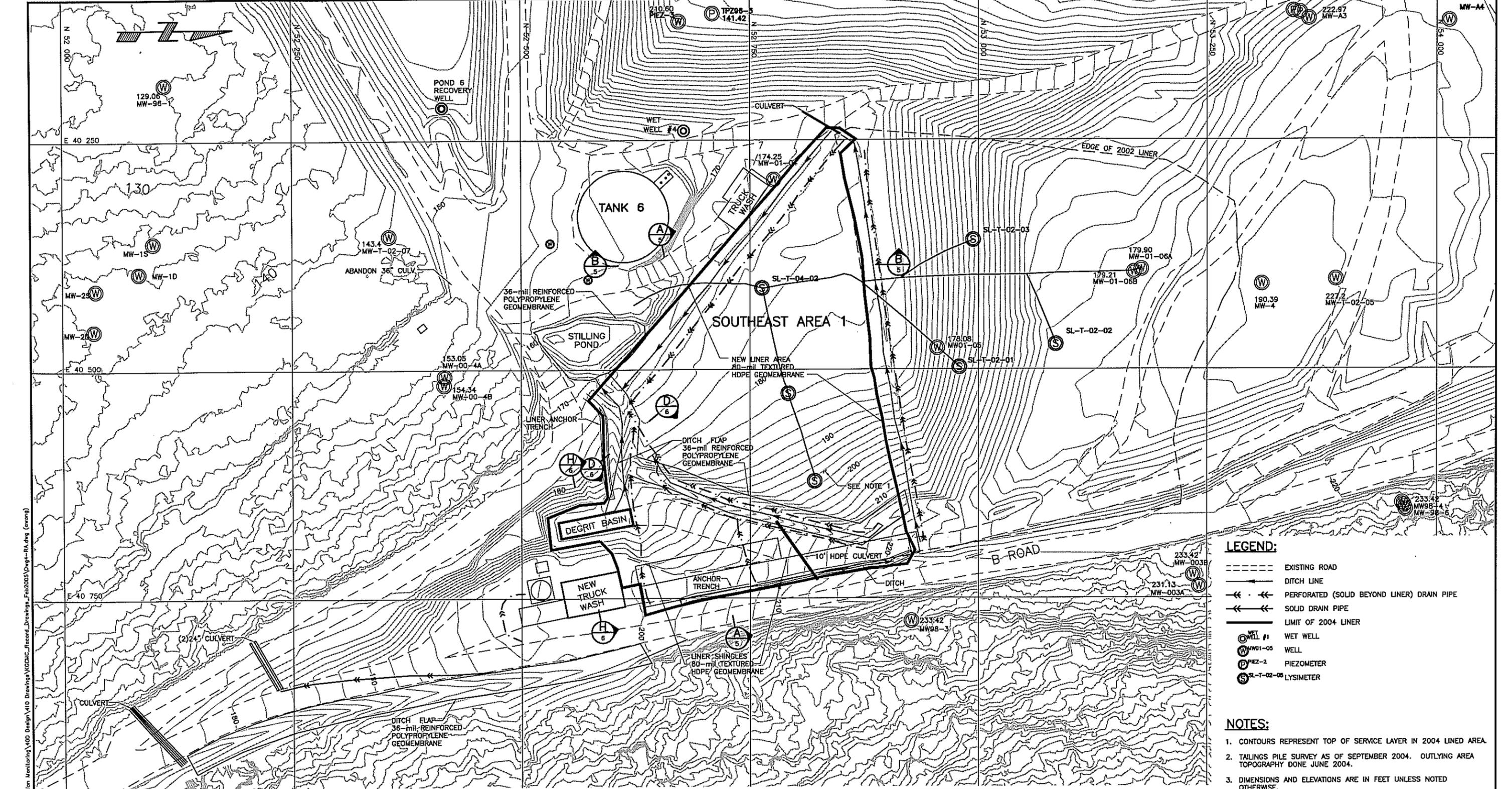
KENNECOTT MINERALS

DATE: _____
 DRAWING BY: _____
 DESIGN BY: _____
 REVIEWED BY: _____
 PROJ OR REF: _____

KENNECOTT GREENS CREEK MINING CO.
 P.O. BOX 32199 JUNEAU, ALASKA 99803
 PHONE: (907)790-8441 FAX: (907)790-8448

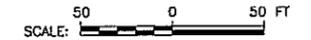
TITLE: **SOUTHEAST AREA 1 EXCAVATION PLAN**

DWG. 3 SHEET: 1 OF 1



- LEGEND:**
- EXISTING ROAD
 - - - DITCH LINE
 - PERFORATED (SOLID BEYOND LINER) DRAIN PIPE
 - SOLID DRAIN PIPE
 - LIMIT OF 2004 LINER
 - WET WELL
 - WELL
 - PIEZ-2 PIEZOMETER
 - SL-T-02-05 LYSIMETER

- NOTES:**
1. CONTOURS REPRESENT TOP OF SERVICE LAYER IN 2004 LINED AREA.
 2. TAILINGS PILE SURVEY AS OF SEPTEMBER 2004. OUTLYING AREA TOPOGRAPHY DONE JUNE 2004.
 3. DIMENSIONS AND ELEVATIONS ARE IN FEET UNLESS NOTED OTHERWISE.



AS RECORDED DRAFT

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KENNECOTT MINERALS

DATE: _____
 DRAWING BY: _____
 DESIGN BY: _____
 REVIEWED BY: _____
 PROJ OR REF: _____

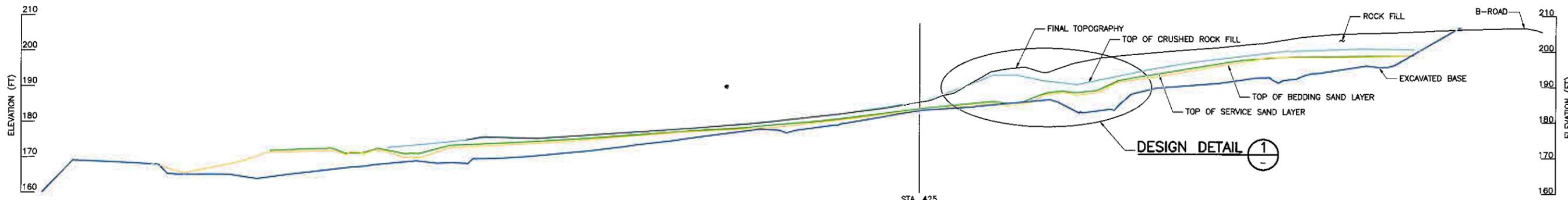
KENNECOTT GREENS CREEK MINING CO.
 P.O. BOX 32199 JUNEAU, ALASKA 99803
 PHONE: (907)790-8441 FAX: (907)790-8448

TITLE: **SOUTHEAST AREA 1 LINER LOCATION-PLAN**

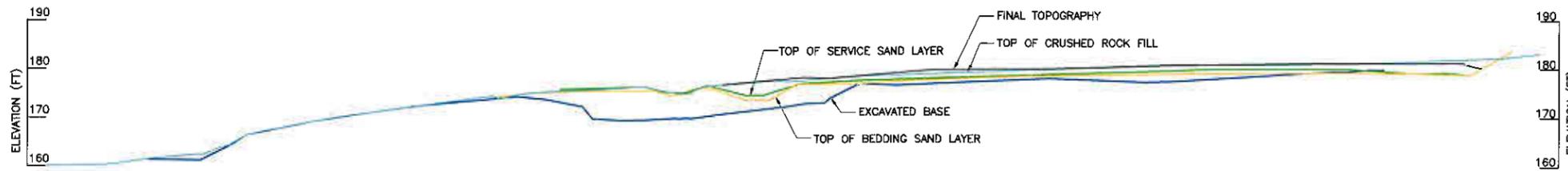
DWG. 4 SHEET: 1 OF 1

REVISIONS	DWG NO.	DESCRIPTION	DATE	BY	PROJ.	CLIENT
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	Dwg4-RA	2004 CONSTRUCTION RECORD				

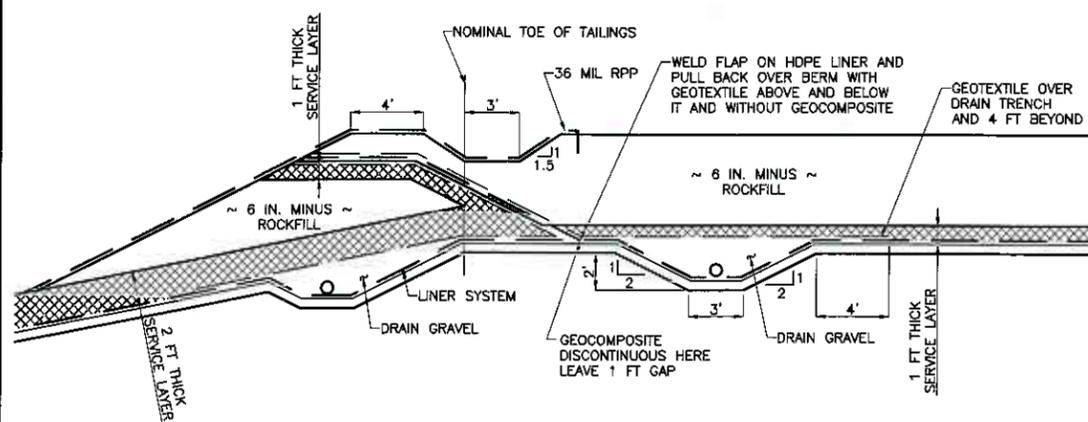
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 Date: 12/28/2005
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SECTION A
SCALE A

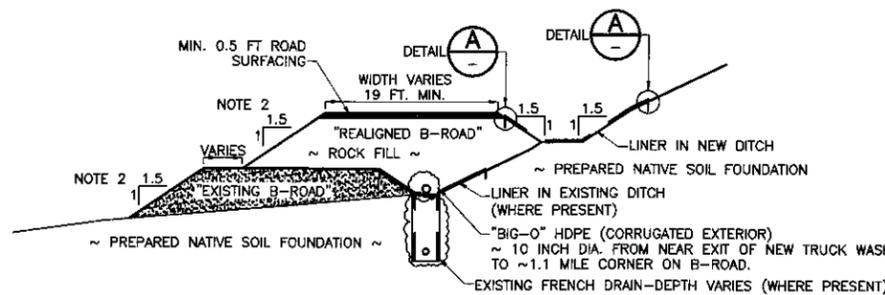


SECTION B
SCALE A



DESIGN DETAIL 1
SCALE B

NOTE:
AS-BUILT DIMENSIONS WERE APPROX. AS SHOWN, BUT LOCALLY COULD VARY BY (-)15% TO (+)15% OF SPECIFIED. VARIATIONS WERE ACCEPTED DURING CONSTRUCTION.



REALIGNED B-ROAD - TYPICAL SECTION
NTS

NOTES:

- 1) FILL THICKNESS AND GRADE VARIES IN REALIGNED AND EXISTING B-ROADS.
- 2) ROAD FILLS AND DITCH SLOPES TO BE AT 1.5 H:1 V OR FLATTER.
- 3) AS-BUILT DIMENSIONS WERE APPROX. AS SHOWN, BUT LOCALLY COULD VARY BY (-)20% TO (+)20% OF SPECIFIED. VARIATIONS WERE ACCEPTED DURING CONSTRUCTION.



DETAIL A
NTS

LEGEND:

- EXCAVATED BASE
- TOP OF BEDDING SAND LAYER
- TOP OF SERVICE SAND LAYER
- TOP OF CRUSHED ROCK FILL
- FINAL TOPOGRAPHY

NOTES:

1. THE UPPER 1 FT OF SERVICE LAYER IS SAND WHERE GROUND SLOPES $\geq 10\%$ AND WHERE REQUIRED AS BASE FOR 6 INCH MINUS ROCKFILL; AND IS TAILINGS WHERE GROUND SLOPES ARE LESS THAN 10% WITHIN THE TAILINGS IMPOUNDMENT.
2. ALL SLOTTED PIPE IS WRAPPED IN FILTER CLOTH.
3. DRAIN GRAVEL BACKFILL WAS PLACED AROUND SLOTTED PIPE.
4. DIMENSIONS AND ELEVATIONS ARE IN FEET UNLESS NOTED OTHERWISE.



AS RECORDED DRAFT

REVISIONS	DWG NO.	DESCRIPTION	DATE	BY	PROJ.	CLIENT
	Dwg5-Rb	2004 CONSTRUCTION RECORD	Dec. 21, 2005			
	Dwg5-RA	2004 CONSTRUCTION RECORD				

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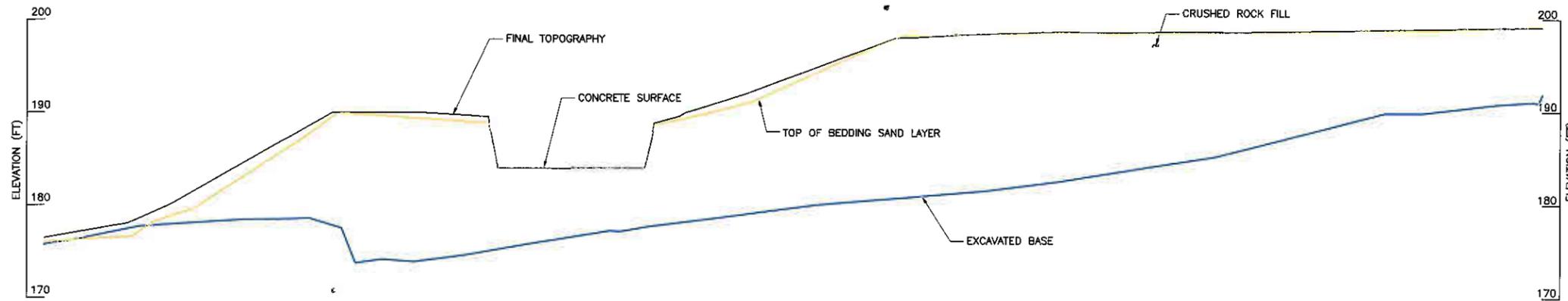
KENNECOTT MINERALS

DATE: _____
DRAWING BY: _____
DESIGN BY: _____
REVIEWED BY: _____
PROJ OR REF: _____

KENNECOTT GREENS CREEK MINING CO.
P.O. BOX 32199 JUNEAU, ALASKA 99803
PHONE: (907)790-8441 FAX: (907)790-8448

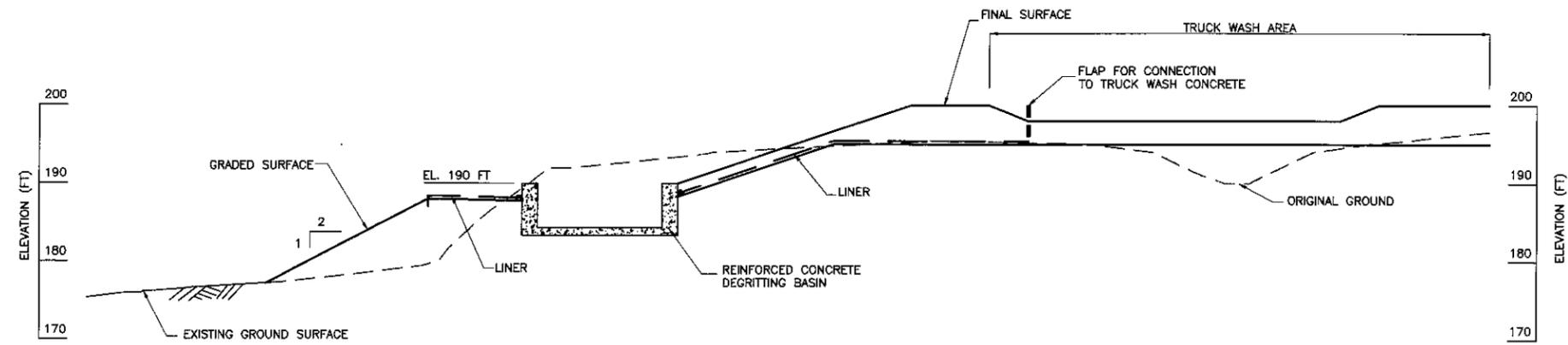
TITLE: SOUTHEAST AREA 1 SECTIONS AND DETAILS

DWG. 5 SHEET: 1 OF 3



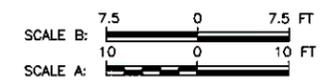
- LEGEND:**
- EXCAVATED BASE
 - - - TOP OF BEDDING SAND LAYER
 - - - TOP OF SERVICE SAND LAYER
 - - - TOP OF CRUSHED ROCK FILL
 - FINAL TOPOGRAPHY

SECTION H
SCALE B



DESIGN DETAIL H
SCALE A

NOTE:
AS-BUILT DIMENSIONS WERE APPROX. AS SHOWN, BUT LOCALLY COULD VARY BY (-)15% TO (+)15% OF SPECIFIED. VARIATIONS WERE ACCEPTED DURING CONSTRUCTION.



AS RECORDED **DRAFT**

REVISIONS	DWG NO.	DESCRIPTION	DATE	BY	PROJ.	CLIENT
	Dwg6-RB	2004 CONSTRUCTION RECORD	Dec. 21, 2005			
	Dwg6-RA	2004 CONSTRUCTION RECORD				

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KENNECOTT MINERALS

DATE: _____
DRAWING BY: _____
DESIGN BY: _____
REVIEWED BY: _____
PROJ OR REF: _____

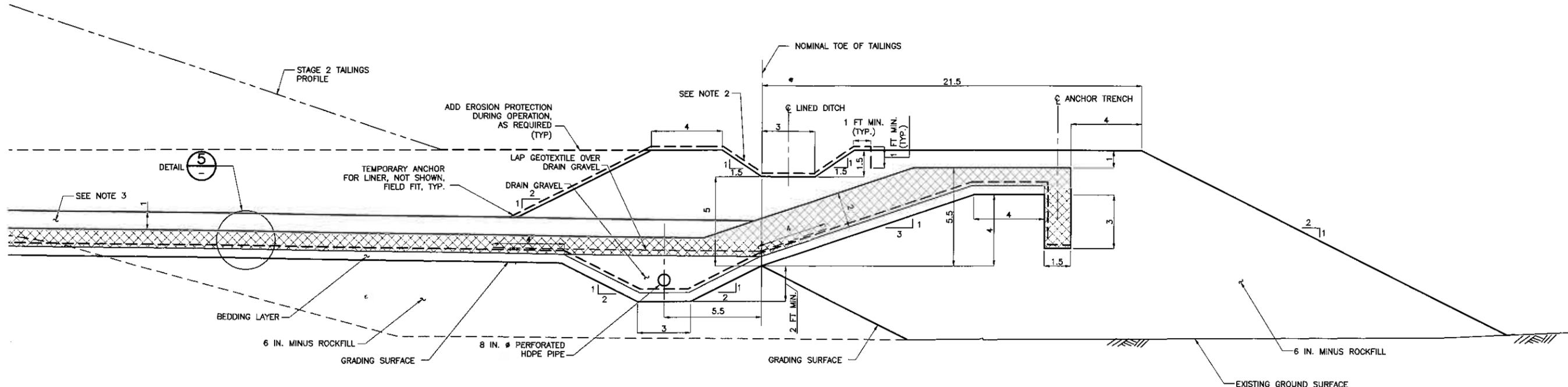
KENNECOTT GREENS CREEK MINING CO.
P.O. BOX 32199 JUNEAU, ALASKA 99803
PHONE: (907)790-8441 FAX: (907)790-8448

TITLE: **SOUTHEAST AREA 1 SECTIONS AND DETAILS**

DWG. 6 SHEET: 2 OF 3

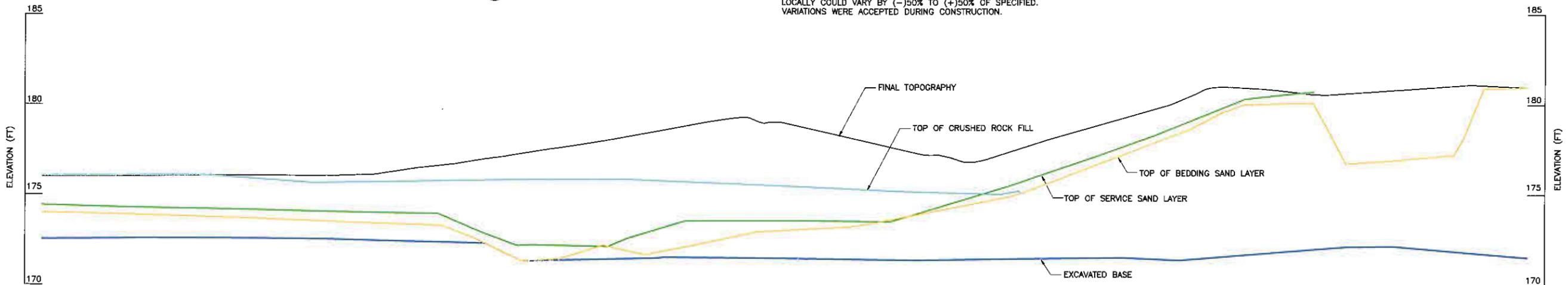
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Time: 13:00:37
 Date: 12/15/2005
 Drawing File: M:\007802\A36 - 2004 Construction Monitoring\00 Design\410 Drainage\KSC\Record_Drawings\Fig-2005\Draw-RA.dwg (weng)



DESIGN DETAIL D TYPICAL SECTION IN FILL
SCALE A

NOTE:
AS-BUILT DIMENSIONS WERE APPROX. AS SHOWN, BUT LOCALLY COULD VARY BY (-)50% TO (+)50% OF SPECIFIED. VARIATIONS WERE ACCEPTED DURING CONSTRUCTION.



SECTION D
SCALE A

LEGEND:

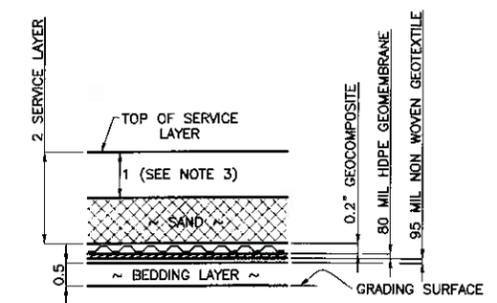
- EXCAVATED BASE
- TOP OF BEDDING SAND LAYER
- TOP OF SERVICE SAND LAYER
- TOP OF CRUSHED ROCK FILL
- FINAL TOPOGRAPHY

NOTES:

1. DIMENSIONS AND ELEVATIONS ARE IN FEET UNLESS NOTED OTHERWISE.
2. LINER IS 36 MIL RPP.
3. THE UPPER 1 FT OF SERVICE LAYER IS SAND WHERE GROUND SLOPES $\geq 10\%$ AND WHERE REQUIRED AS BASE FOR 6 INCH MINUS ROCKFILL; AND IS TAILINGS WHERE GROUND SLOPES ARE LESS THAN 10% WITHIN THE TAILINGS IMPOUNDMENT.
4. ALL SLOTTED PIPE IS WRAPPED IN FILTER CLOTH.
5. DRAIN GRAVEL BACKFILL WAS PLACED AROUND SLOTTED PIPE.



AS RECORDED DRAFT



DETAIL 5 LINER SYSTEM DETAIL
SCALE: NTS

NOTE:
AS-BUILT DIMENSIONS WERE APPROX. AS SHOWN, BUT LOCALLY COULD VARY BY (-)30% TO (+)30% OF SPECIFIED. VARIATIONS WERE ACCEPTED DURING CONSTRUCTION.

REVISIONS

DWG NO.	DESCRIPTION	DATE	BY	PROJ.	CLIENT
Dwg7-RB	2004 CONSTRUCTION RECORD	Dec. 21, 2005			
Dwg7-RA	2004 CONSTRUCTION RECORD				

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KENNECOTT MINERALS

DATE: _____
 DRAWING BY: _____
 DESIGN BY: _____
 REVIEWED BY: _____
 PROJ OR REF: _____

KENNECOTT GREENS CREEK MINING CO.
 P.O. BOX 32199 JUNEAU, ALASKA 99803
 PHONE: (907)790-8441 FAX: (907)790-8448

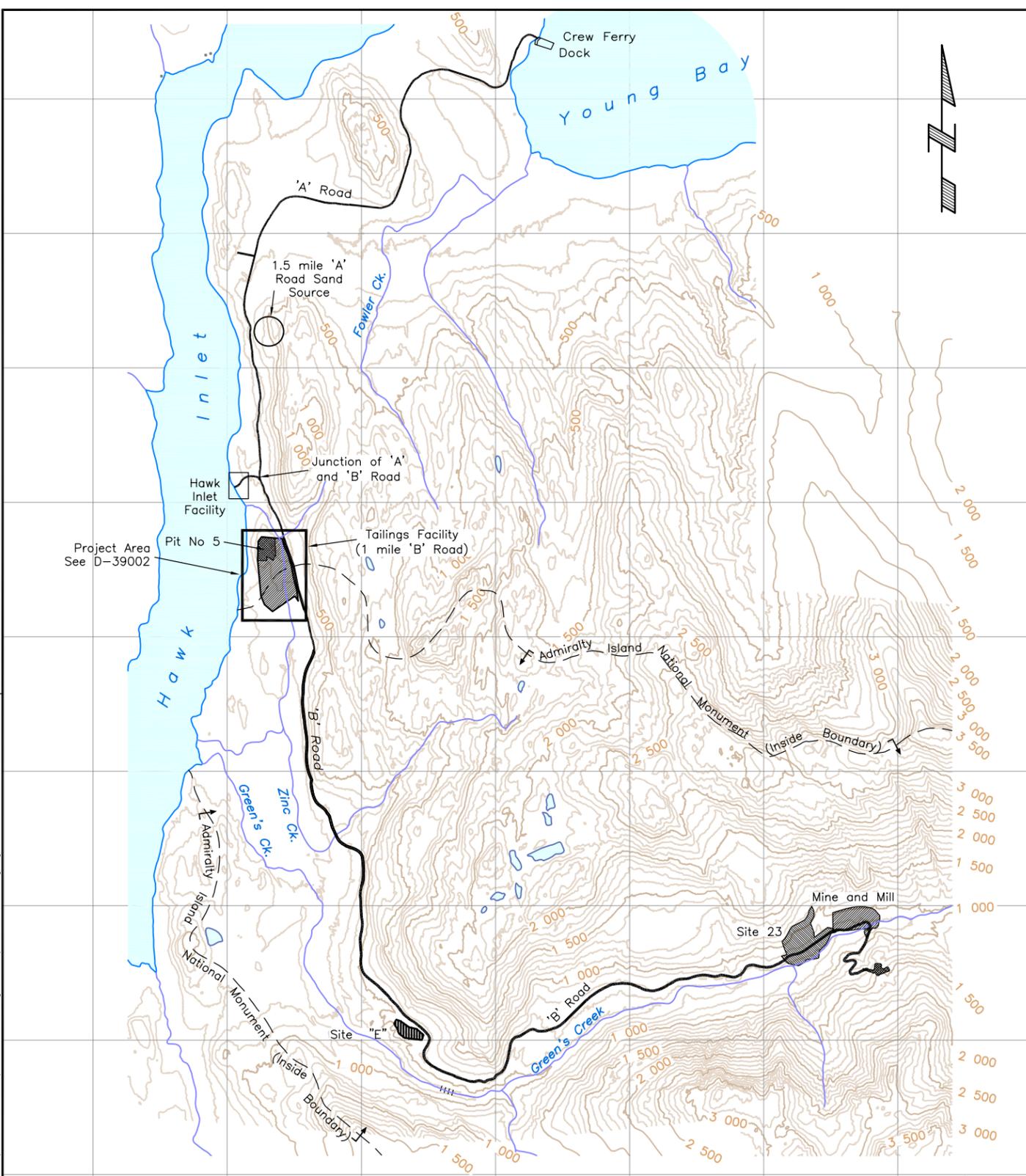
TITLE: **SOUTHEAST AREA 1 SECTIONS AND DETAILS**

DWG. 7 SHEET: 3 OF 3

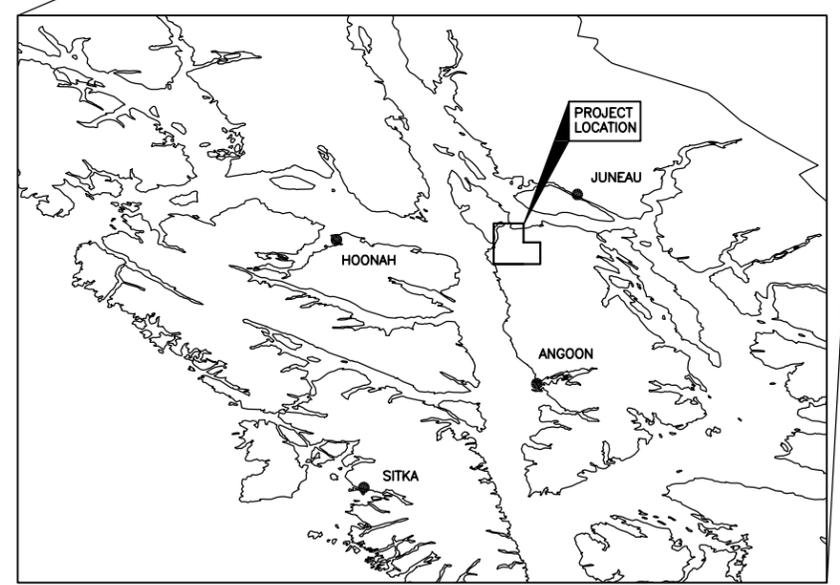
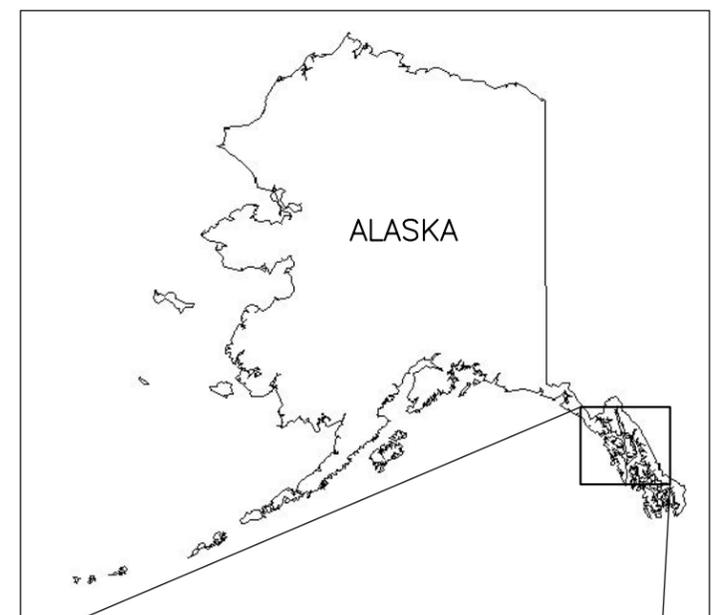
DRAWINGS

- D-39001 Location Plan**
- D-39002 General Arrangement**
- D-39009 Southeast 2 – Excavated Surface - Plan**
- D-39011 Southeast 2 – Liner Surface – Plan**
- D-39012 Southeast 2 – Sections and Details – Sheet 1 of 2**
- D-39013 Southeast 2 – Sections and Details – Sheet 2 of 2**
- D-39014 Southeast 2 – Liner Surface and Rock Fill Berm – Plan**
- D-39015 Southeast 2 – Liner Surface and Utilities – Plan**

Time: 13:31:44
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 Source: N:\M07802A\40 - 2005 Construction\300 External Data\KGCMC site drawing\05102A\KGCMC site drawing.dwg



PLAN
SCALE A



KEY PLAN
SCALE: NTS

- NOTES:**
1. BASE PLAN PROVIDED BY KGCMC, OCTOBER 2005.
 2. CONTOUR INTERVAL IS 100 FT.
 3. ELEVATIONS ARE IN FEET UNLESS NOTED OTHERWISE. COORDINATES AND ELEVATIONS ARE REFERENCED TO MINE DATUM.

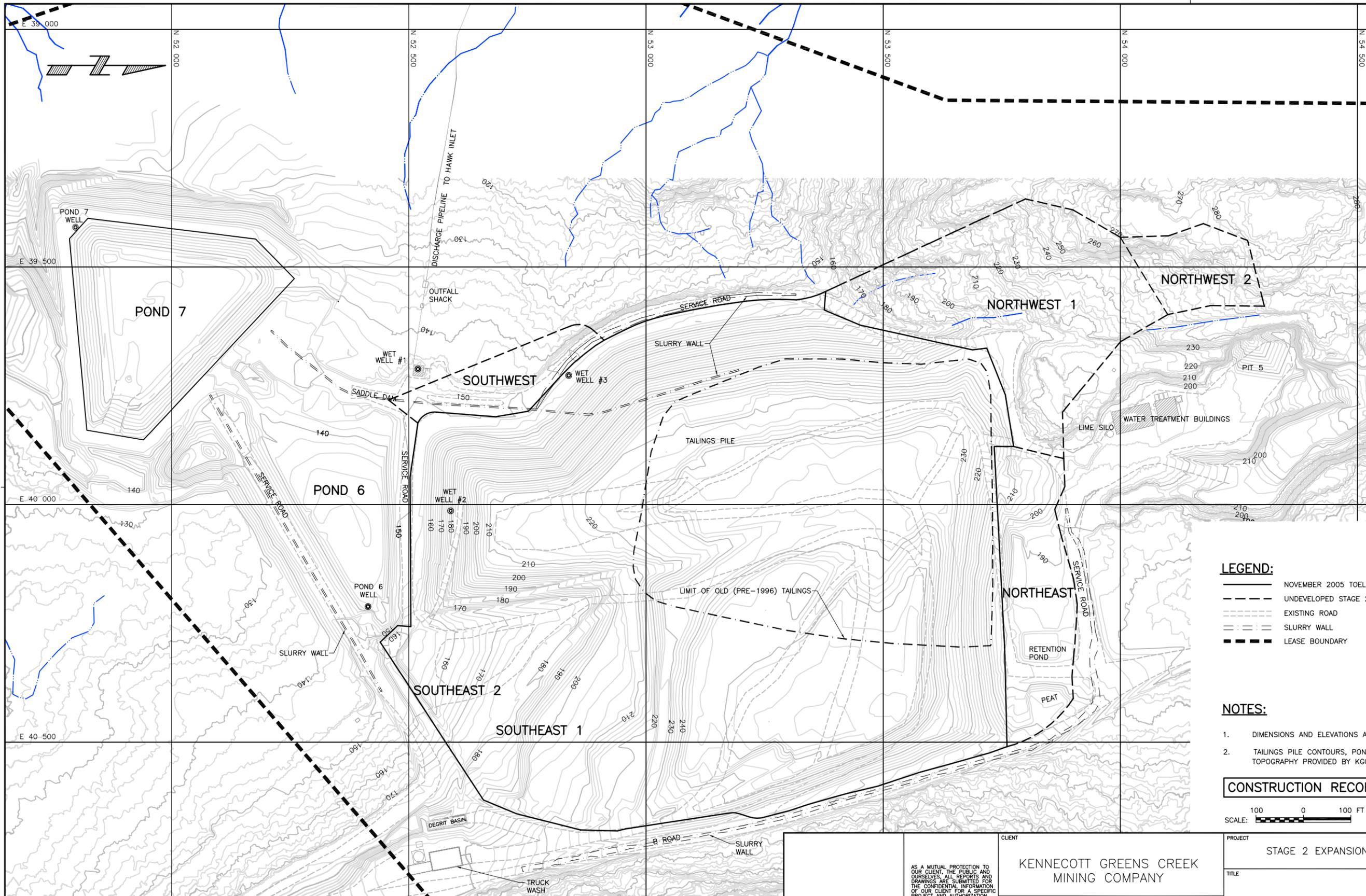


CONSTRUCTION RECORD

NO.	DATE	ISSUE / REVISION	DRAWN	CHK'D	DESIGN	APP'D
1	FEB 28, 2006	CONSTRUCTION RECORD				
0	APR 13, 2005	APPROVED FOR CONSTRUCTION				

<small>AS A MUTUAL PROTECTION TO OUR CLIENT, THE PUBLIC AND OURSELVES, ALL REPORTS AND DRAWINGS ARE SUBMITTED FOR THE CONFIDENTIAL INFORMATION OF OUR CLIENT FOR A SPECIFIC PROJECT AND AUTHORIZATION FOR USE AND/OR PUBLICATION OF DATA, STATEMENTS, CONCLUSIONS OR ABSTRACTS FROM OR REGARDING OUR REPORTS AND DRAWINGS IS RESERVED PENDING OUR WRITTEN APPROVAL.</small>	CLIENT	KENNECOTT GREENS CREEK MINING COMPANY	
PROJECT	STAGE 2 EXPANSION OF TAILINGS FACILITY		
TITLE	LOCATION PLAN		
SCALE	PROJECT No.	DWG. No.	REV.
AS SHOWN	M07802A39	D-39001	1

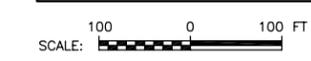
CANCEL PRINTS BEARING PREVIOUS REVISION



- LEGEND:**
- NOVEMBER 2005 TOELINE OF TAILINGS FACILITY
 - - - UNDEVELOPED STAGE 2 TAILINGS AREA
 - EXISTING ROAD
 - · - · - SLURRY WALL
 - LEASE BOUNDARY

- NOTES:**
1. DIMENSIONS AND ELEVATIONS ARE IN FEET UNLESS NOTED OTHERWISE.
 2. TAILINGS PILE CONTOURS, POND 7 CONTOURS AND BASE TOPOGRAPHY PROVIDED BY KGCMC (OCTOBER 2005).

CONSTRUCTION RECORD



Date: 3/1/2006
 Scale: 1"=50'(PS)
 Drawing File: M:\M07802A\39 - 2005 Tailings Facility Design & Specifications\400 Design\412 As Built\0-39002-RT.dwg (hutton)
 Area: Pond Footcounr=GENERAL ARRANGEMENT.rvt-1A

NO.	DATE	ISSUE / REVISION	DRAWN	CHK'D	DESIGN	APP'D
1	FEB. 28, 2006	CONSTRUCTION RECORD				
0	APR 13, 2005	APPROVED FOR CONSTRUCTION				

AS A MUTUAL PROTECTION TO OUR CLIENT, THE PUBLIC AND OURSELVES, ALL REPORTS AND DRAWINGS ARE SUBMITTED FOR THE CONFIDENTIAL INFORMATION OF OUR CLIENT FOR A SPECIFIC PROJECT AND AUTHORIZATION FOR USE AND/OR PUBLICATION OF DATA STATEMENTS, CONCLUSIONS OR ABSTRACTS FROM OR REGARDING OUR REPORTS AND DRAWINGS IS RESERVED, PENDING OUR WRITTEN APPROVAL.

CLIENT
KENNECOTT GREENS CREEK MINING COMPANY



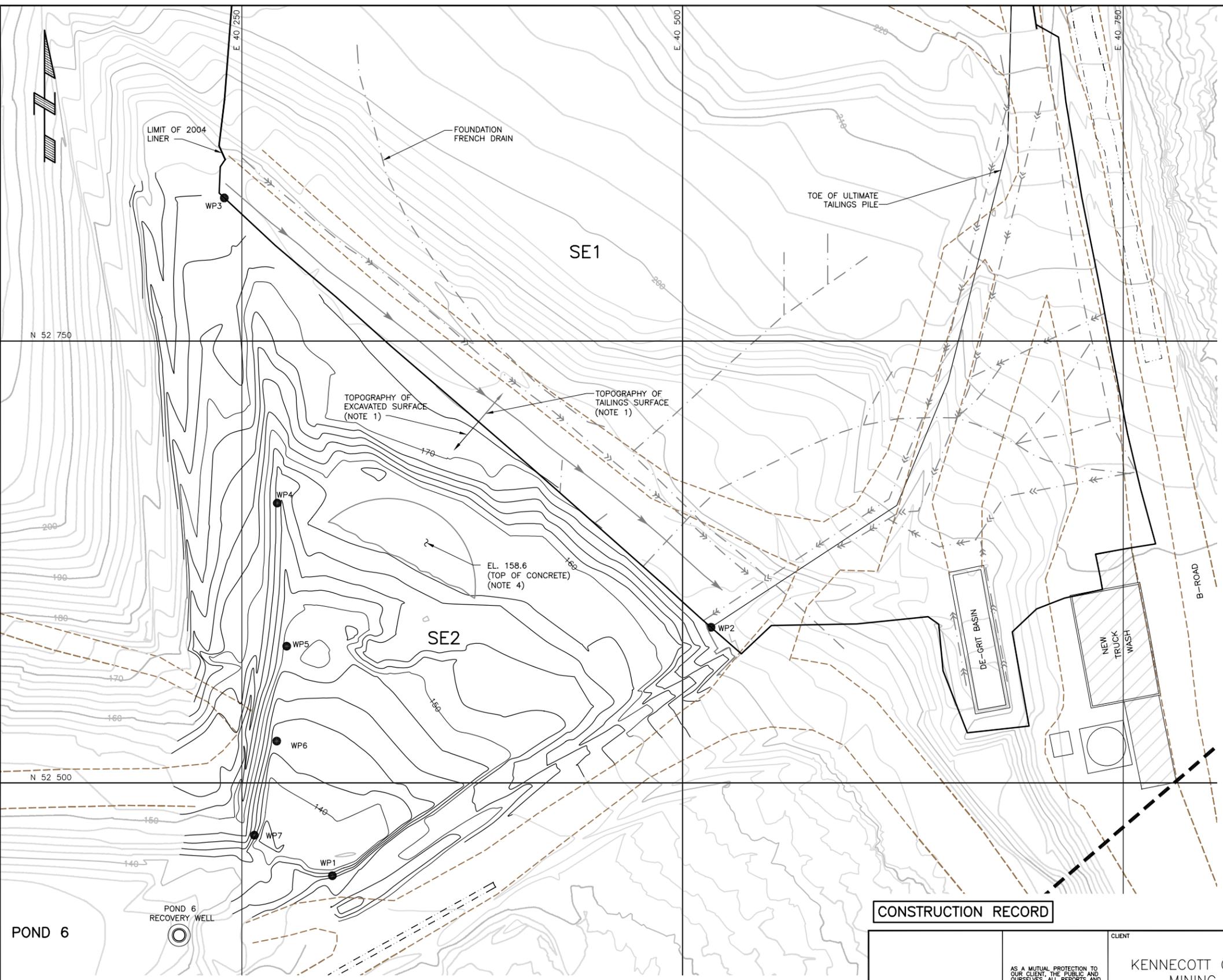
PROJECT
 STAGE 2 EXPANSION OF TAILINGS FACILITY

TITLE
 GENERAL ARRANGEMENT

SCALE AS SHOWN	PROJECT No. M07802A39	DWG. No. D-39002	REV. 1
-------------------	--------------------------	---------------------	-----------

CANCEL PRINTS BEARING PREVIOUS REVISION

I:\mine\12-11-06\3712006 Date: 3/1/2006 Scale: 1"=100' (P.S.) Drawing file: M07802A39 - 2005 Tailings Facility Design & Specifications\00 Design\412 As Built\0-39009-RA.dwg (hutton) Xrefs: subarea2.dwg



WORK POINTS ON LAYOUT REFERENCE LINE

WORK POINT	EAST	NORTH
WP1	40301.3	52447.6
WP2	40516.1	52588.1
WP3	40240.0	52831.1
WP4	40270.1	52658.4
WP5	40275.4	52577.4
WP6	40269.8	52523.7
WP7	40257.1	52470.5

LEGEND:

- EXISTING ROAD
- SLURRY WALL
- LEASE BOUNDARY
- FRENCH DRAIN
- PERFORATED ABOVE LINER DRAIN PIPE
- DITCH LINE

NOTES:

1. OUTLYING AREA TOPOGRAPHY CURRENT AS OF OCTOBER 2005. SOUTHEAST 2 EXCAVATED SURFACE TOPOGRAPHY WAS PROVIDED BY KGCMC (JUNE 2005).
2. DIMENSIONS AND ELEVATIONS ARE IN FEET UNLESS NOTED OTHERWISE.
3. THERE WERE BURIED SERVICES NEAR AND ALONG THE WEST EDGE OF SE2, SOME OF WHICH WERE FOUNDED ON COMPRESSIBLE PEAT. THESE SERVICES WERE PRESERVED AND RE-ROUTED AS REQUIRED ON TO COMPETENT FOUNDATION, AND EXTENDED TO POND 6. ALIGNMENT OF THE WEST SIDE OF SE2 WAS ADJUSTED IN THE FIELD, AS DIRECTED, TO MINIMIZE TAILINGS AND PEAT EXCAVATION AND TO ESTABLISH A FIRM BASE FOR THE SERVICE LINES.
4. CONCRETE FROM TANK 6 FOUNDATION REMAINED IN PLACE AS SHOWN.



CONSTRUCTION RECORD

DRAWING NO.	REFERENCE DRAWING	NO.	DATE	ISSUE / REVISION	DRAWN	CHK'D	DESIGN	APP'D
A	FEB. 28, 2006			CONSTRUCTION RECORD				

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CLIENT
KENNECOTT GREENS CREEK MINING COMPANY



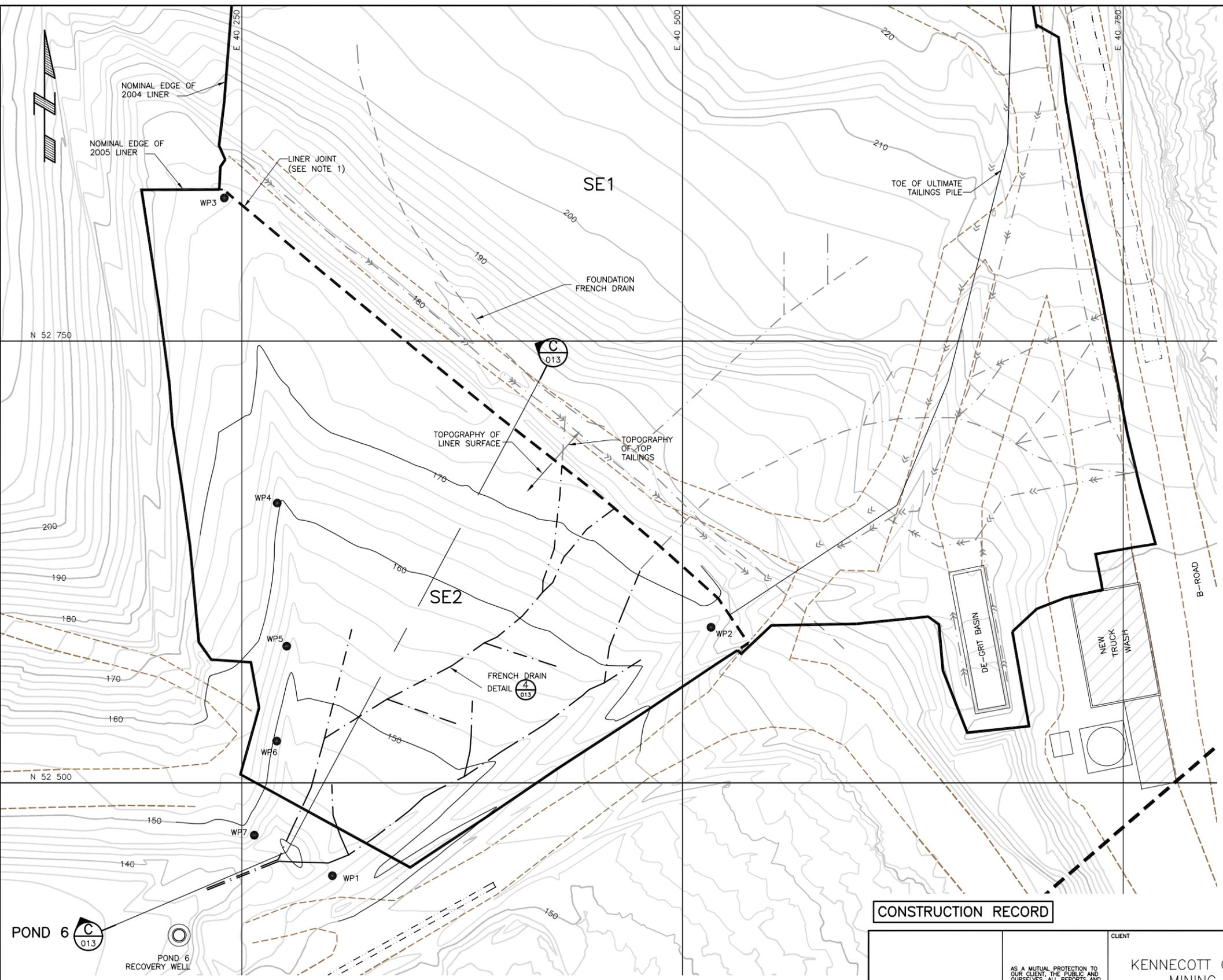
PROJECT
 STAGE 2 EXPANSION OF TAILINGS FACILITY

TITLE
 SOUTHEAST 2 EXCAVATED SURFACE PLAN

SCALE	PROJECT No.	DWG. No.	REV.
AS SHOWN	M07802A39	D-39009	A

CANCEL PRINTS BEARING PREVIOUS REVISION

I:\mine\12\2006\37\2006\Date: 3/1/2006
 Scale: 1"=100'
 Drawing: M07802A39 - 2005 Tailings Facility Design & Specifications\00 Design\412 As Built\0-39011-R1.dwg (hutton)
 Author: acorn@kci.com



WORK POINTS ON LAYOUT REFERENCE LINE

WORK POINT	EAST	NORTH
WP1	40301.3	52447.6
WP2	40516.1	52588.1
WP3	40240.0	52831.1
WP4	40270.1	52658.4
WP5	40275.4	52577.4
WP6	40269.8	52523.7
WP7	40257.1	52470.5

LEGEND:

- EXISTING ROAD
- SLURRY WALL
- LEASE BOUNDARY
- FRENCH DRAIN

NOTES:

1. CONNECTION OF SOUTHEAST 2 LINER TO SOUTHEAST 1 LINER WAS FIELD FIT.
2. DIMENSIONS AND ELEVATIONS ARE IN FEET UNLESS NOTED OTHERWISE.
3. CONSTRUCTION RECORD TOPOGRAPHY UPDATED AS FOLLOWING:
 - A. TAILINGS PILE CONTOURS AND BASE TOPOGRAPHY PROVIDED BY KGCMC (OCTOBER 2005).
 - B. SOUTHEAST 2 CONTOURS ARE TOP OF LINER PROVIDED BY KGCMC (SEPTEMBER 2005).
 - C. LOCATIONS OF FRENCH DRAINS AND LINER DRAINS PROVIDED BY KGCMC (NOVEMBER 2005).



CONSTRUCTION RECORD

NO.	DATE	ISSUE / REVISION	DRAWN	CHK'D	DESIGN	APP'D
1	FEB. 28, 2006	CONSTRUCTION RECORD				
0	APR 13, 2005	APPROVED FOR CONSTRUCTION				

AS A MUTUAL PROTECTION TO OUR CLIENT, THE PUBLIC AND OURSELVES, ALL REPORTS AND DRAWINGS ARE SUBMITTED FOR THE CONFIDENTIAL INFORMATION OF OUR CLIENT FOR A SPECIFIC PROJECT AND AUTHORIZATION FOR USE AND/OR PUBLICATION OF DATA, STATEMENTS, CONCLUSIONS OR ABSTRACTS FROM OR REGARDING OUR REPORTS AND DRAWINGS IS RESERVED PENDING OUR WRITTEN APPROVAL.

CLIENT
 KENNECOTT GREENS CREEK MINING COMPANY

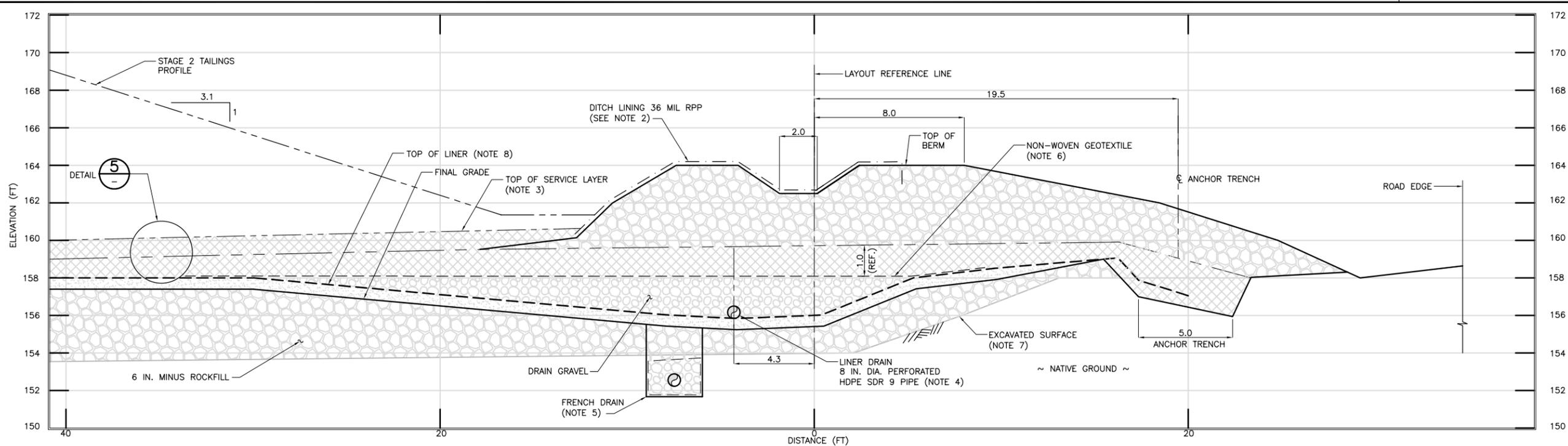


PROJECT
 STAGE 2 EXPANSION OF TAILINGS FACILITY

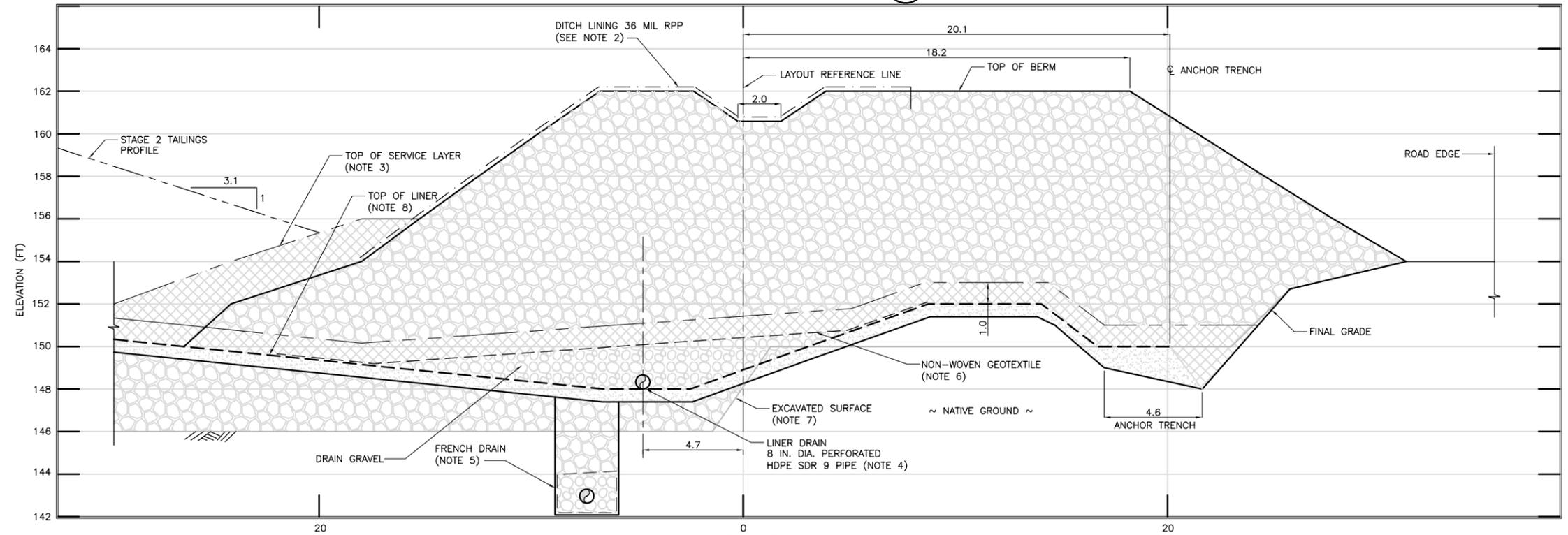
TITLE
 SOUTHEAST 2 LINER SURFACE PLAN

SCALE AS SHOWN	PROJECT No. M07802A39	DWG. No. D-39011	REV. 1
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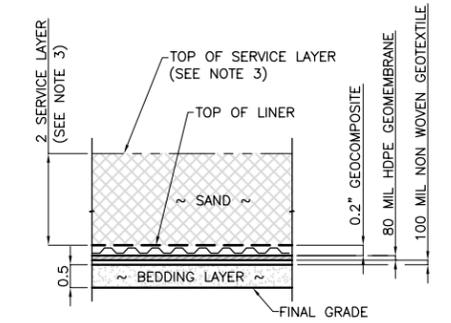
DRAWING NO.	REFERENCE DRAWING
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SECTION D TYPICAL SECTION IN FILL
SCALE A 014



SECTION E TYPICAL SECTION IN CUT
SCALE A 014



DETAIL 5 LINER SYSTEM DETAIL
SCALE: NTS

- NOTES:**
- DIMENSIONS AND ELEVATIONS ARE IN FEET UNLESS NOTED OTHERWISE.
 - SAND BEDDING WAS PLACED AS REQUIRED. LINER IS 36 MIL REINFORCED POLYPROPYLENE (RPP).
 - SERVICE LAYER CONSISTS OF 2 TO 3 FEET OF SAND THROUGHOUT SE2. OWNER'S REPRESENTATIVE WAS PRESENT DURING PLACEMENT OF SERVICE LAYER.
 - ALL PERFORATED PIPE WAS WRAPPED IN FILTER SOCK AND BACKFILLED WITH DRAIN GRAVEL.
 - FRENCH DRAINS WERE INSTALLED BELOW THE LINER AS DIRECTED.
 - 100 MIL NON-WOVEN GEOTEXTILE WAS SI GEOSOLUTIONS GEOTEX 1001.
 - REFER TO DWG. D-39009 FOR EXCAVATED SURFACE CONTOURS.
 - REFER TO DWG. D-39011 FOR TOP OF LINER CONTOURS.
 - ALL DIMENSIONS ARE TAKEN FROM SURVEY DATA AND CONTOURS, NOT MEASURED IN THE FIELD.



LEGEND:

	SERVICE LAYER		BEDDING SAND
	DRAIN GRAVEL		6 INCH MINUS ROCKFILL

NO.	DATE	ISSUE / REVISION	DRAWN	CHK'D	DESIGN	APP'D
3	FEB. 28, 2006	CONSTRUCTION RECORD				
2	AUG. 23 2005	REVISED BERM AND SAND ZONE	LH		NAM	RWC
1	AUG. 12 2005	REVISED BERM HEIGHT ELEVATIONS OF SECTION D & E				
0	APR 13, 2005	APPROVED FOR CONSTRUCTION				

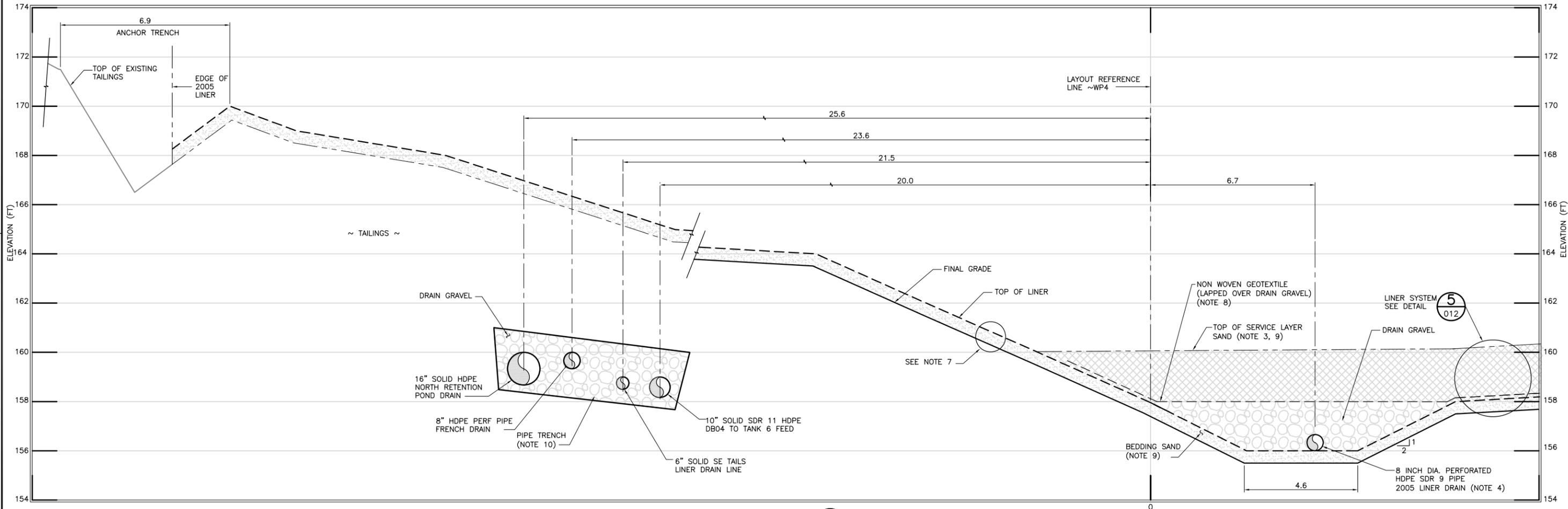
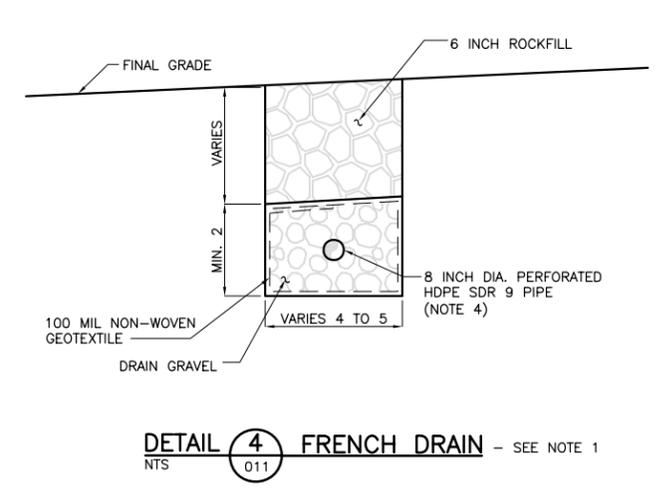
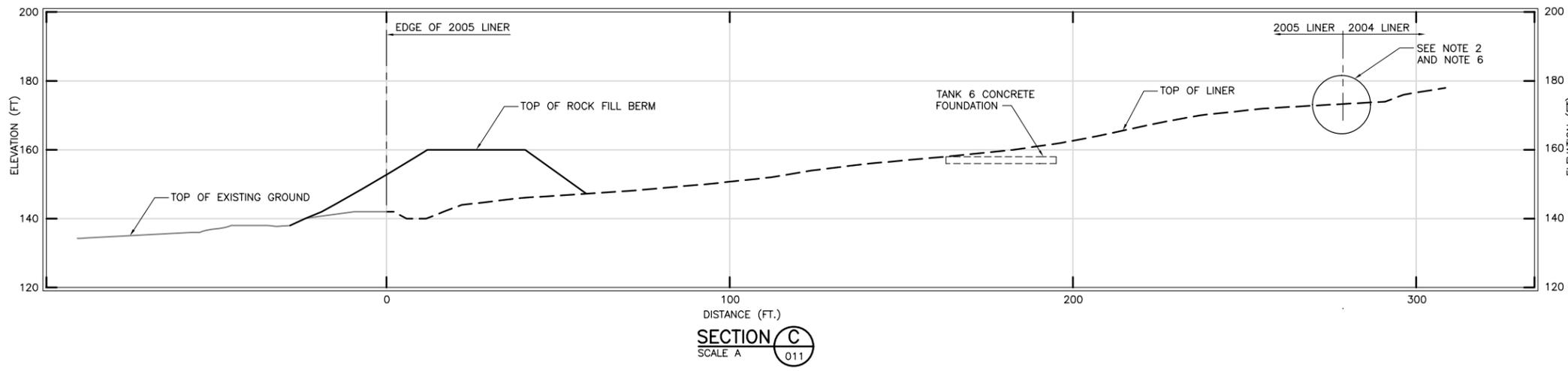
CONSTRUCTION RECORD

<p>AS A MUTUAL PROTECTION TO OUR CLIENT, THE PUBLIC AND OURSELVES, ALL REPORTS AND DRAWINGS ARE SUBMITTED FOR THE CONFIDENTIAL INFORMATION OF OUR CLIENT FOR A SPECIFIC PROJECT AND AUTHORIZATION FOR USE AND/OR PUBLICATION OF DATA, STATEMENTS, CONCLUSIONS OR ABSTRACTS FROM OR REGARDING OUR REPORTS AND DRAWINGS IS RESERVED, PENDING OUR WRITTEN APPROVAL.</p>	CLIENT	KENNECOTT GREENS CREEK MINING COMPANY	
	PROJECT	STAGE 2 EXPANSION OF TAILINGS FACILITY	
	TITLE	SOUTHEAST 2 SECTIONS AND DETAILS SHEET 1 OF 2	
	SCALE	PROJECT No.	DWG. No.
	AS SHOWN	M07802A39	D-39012
	REV.		3



Time: 13:51:53
 Date: 3/1/2006
 Drawing File: \\M07802\A39 - 2005 Tailings Facility Design & Specifications\400 Design\412 A4 Builts\Feb 28 As Built\0-39012-R3.dwg (In-Station)

CANCEL PRINTS BEARING PREVIOUS REVISION



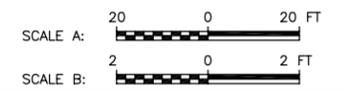
- NOTES:**
- SE2 FRENCH DRAINS WERE TIED INTO SE1 FRENCH DRAINS.
 - GRADING FILL AND LINER SYSTEM WERE FIELD FIT TO BLEND FROM EXISTING LINER TO LINER PLACED ON NEW GRADING SURFACE.
 - SERVICE LAYER CONSISTS OF 2 TO 3 FEET OF SAND THROUGHOUT SE2.
 - ALL PERFORATED PIPE WAS WRAPPED IN FILTER SOCK AND BACKFILLED WITH DRAIN GRAVEL.
 - DIMENSIONS AND ELEVATIONS ARE IN FEET UNLESS NOTED OTHERWISE.
 - EXISTING DITCH WAS BACKFILLED WITH SAND.
 - BEDDING SAND WAS PLACED UNDER THE LINER SYSTEM ON THE 2H:1V SLOPE ON THE EXISTING TAILINGS.
 - NON-WOVEN GEOTEXTILE WAS 100 MIL SI GEOSOLUTIONS GEOTEX 1001.
 - BEDDING SAND AND SERVICE LAYER SAND IN SE2 HAS FINES CONTENT >5%. AVERAGE FINES CONTENT WAS AROUND 7%.
 - ALL UTILITIES ARE IN THE SAME TRENCH FROM THE OLD LOCATION OF WW4 TO POND 6. POSITIONS OF PIPES NORTH OF WW4 WERE UNDISTURBED.
 - ALL DIMENSIONS ARE TAKEN FROM SURVEY DATA AND CONTOURS, NOT MEASURED IN THE FIELD.

NO.	DATE	ISSUE / REVISION	DRAWN	CHK'D	DESIGN	APP'D
1	FEB. 28, 2006	CONSTRUCTION RECORD				
0	APR 13, 2005	APPROVED FOR CONSTRUCTION				

CONSTRUCTION RECORD

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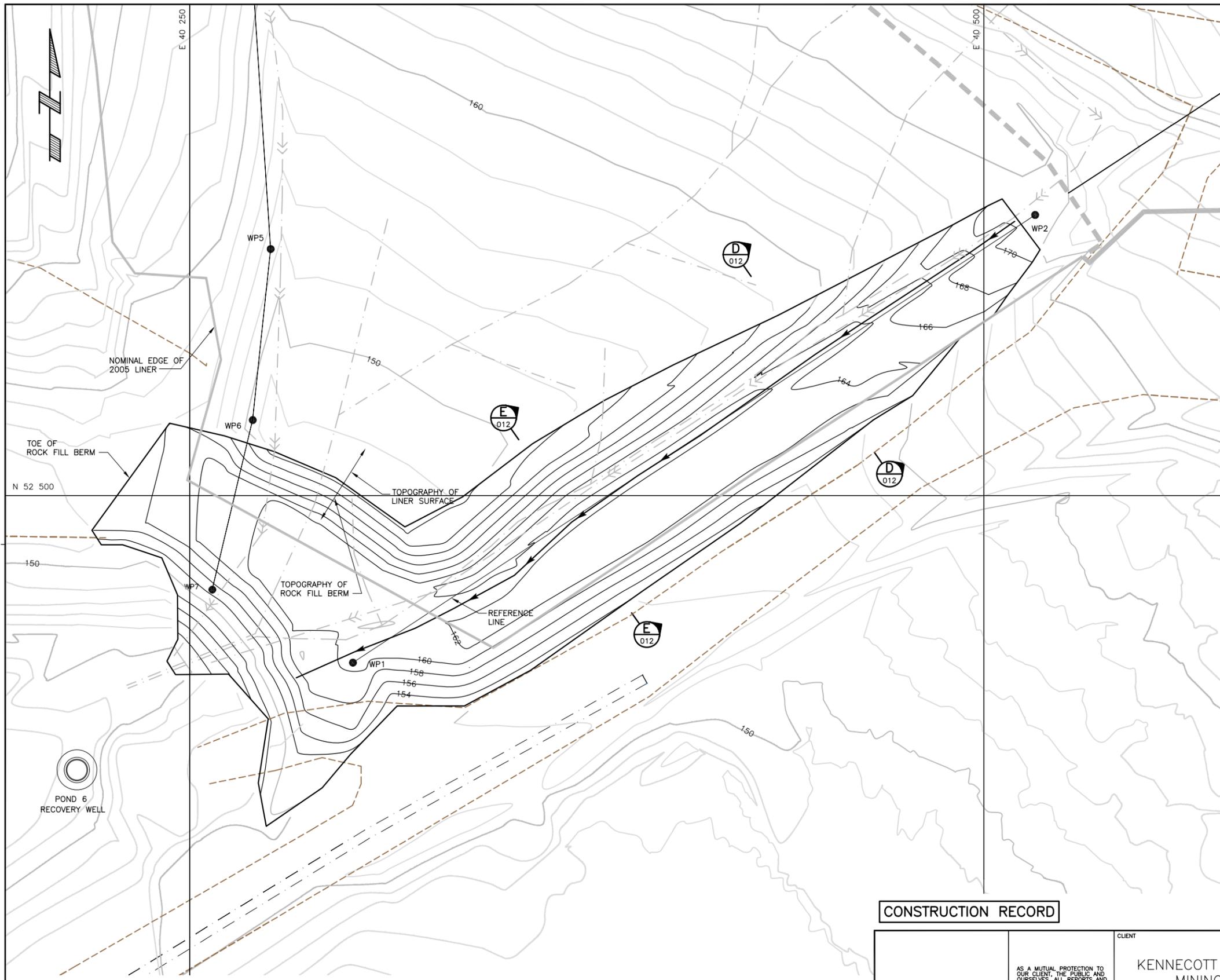
CLIENT
KENNECOTT GREENS CREEK MINING COMPANY



PROJECT STAGE 2 EXPANSION OF TAILINGS FACILITY			
TITLE SOUTHEAST 2 SECTIONS AND DETAILS SHEET 2 OF 2			
SCALE AS SHOWN	PROJECT No. M07802A39	DWG. No. D-39013	REV. 1

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Date: 3/1/2006
Scale: 1"=20'(PS)
Drawing File: M:\M07802\A39 - 2005 Tailings Facility Design & Specifications\A00 Design\412 As Built\A-39013-R1.dwg (hurton)

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 Drawing File: M:\07802A39 - 2005 Tailings Facility Design & Specifications\00 Design\412 As Built\0-39014-RA.dwg (hutton)



**WORK POINTS
ON LAYOUT REFERENCE LINE**

WORK POINT	EAST	NORTH
WP1	40301.3	52447.6
WP2	40516.1	52588.1
WP3	40240.0	52831.1
WP4	40270.1	52658.4
WP5	40275.4	52577.4
WP6	40269.8	52523.7
WP7	40257.1	52470.5

LEGEND:

- EXISTING ROAD
- SLURRY WALL
- FRENCH DRAIN
- PERFORATED DRAIN PIPE
- DITCH LINE

NOTES:

1. DIMENSIONS AND ELEVATIONS ARE IN FEET UNLESS NOTED OTHERWISE.
2. CONSTRUCTION RECORD TOPOGRAPHY UPDATED AS FOLLOWS:
 - A. TAILINGS PILE CONTOURS AND BASE TOPOGRAPHY PROVIDED BY KGCMC (OCTOBER 2005).
 - B. SOUTHEAST 2 CONTOURS ARE TOP OF LINER PROVIDED BY KGCMC (SEPTEMBER 2005).
 - C. BERM CONTOURS PROVIDED BY KGCMC (AUGUST 2005).

SCALE: 25 0 25 FT

CONSTRUCTION RECORD

AS A MUTUAL PROTECTION TO OUR CLIENT, THE PUBLIC AND OURSELVES, ALL REPORTS AND DRAWINGS ARE SUBMITTED FOR THE CONFIDENTIAL INFORMATION OF OUR CLIENT FOR A SPECIFIC PROJECT AND AUTHORIZATION FOR USE AND/OR PUBLICATION OF DATA, STATEMENTS, CONCLUSIONS OR ABSTRACTS FROM OR REGARDING OUR REPORTS AND DRAWINGS IS RESERVED PENDING OUR WRITTEN APPROVAL.

CLIENT
**KENNECOTT GREENS CREEK
 MINING COMPANY**



PROJECT
 STAGE 2 EXPANSION OF TAILINGS FACILITY

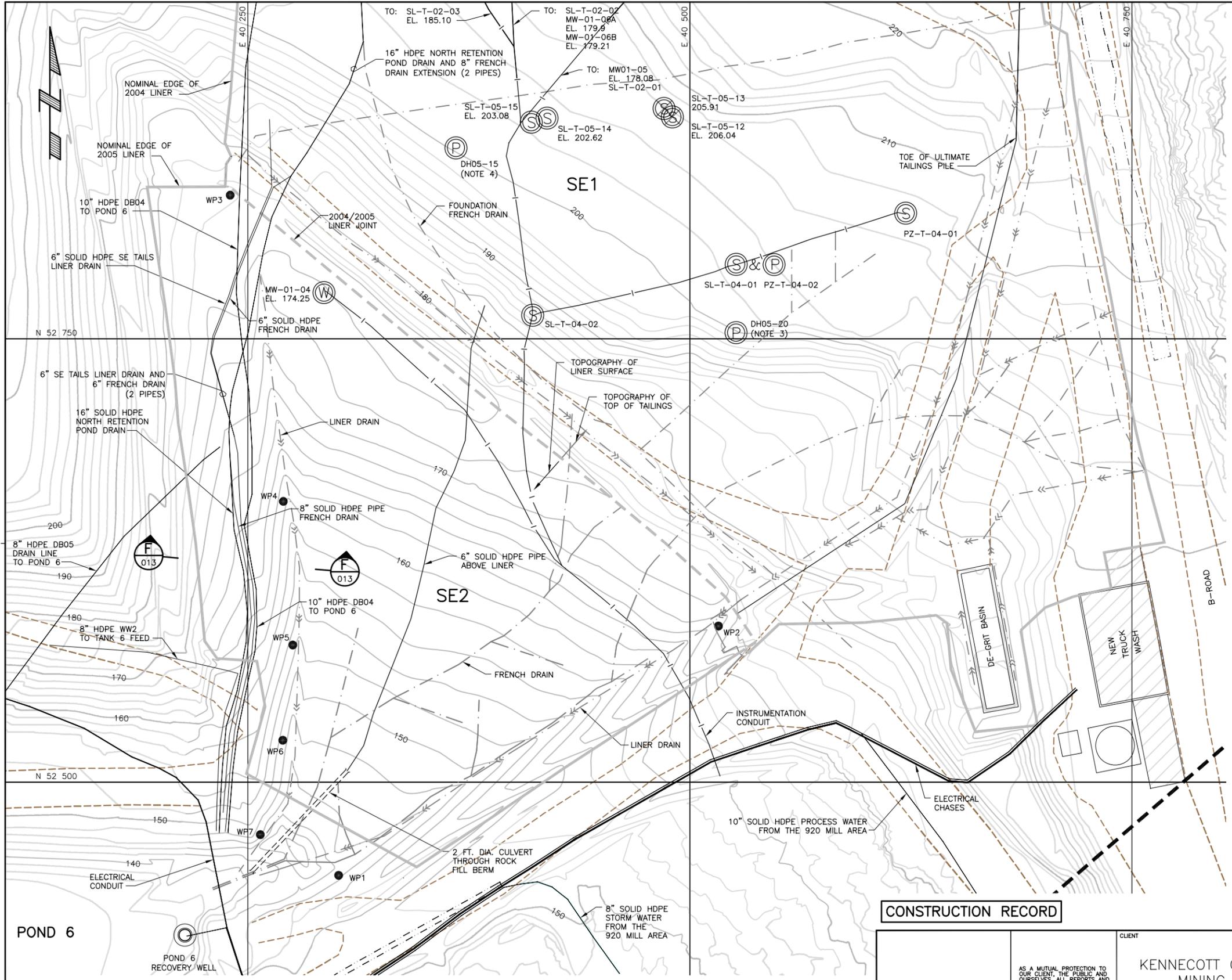
TITLE
 SOUTHEAST 2
 LINER SURFACE AND ROCK FILL BERM
 PLAN

SCALE AS SHOWN	PROJECT No. M07802A39	DWG. No. D-39014	REV. A
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A	FEB. 28, 2006	CONSTRUCTION RECORD	DRAWN	CHK'D	DESIGN	APP'D
NO.	DATE	ISSUE / REVISION				

DRAWING NO. REFERENCE DRAWING

CANCEL PRINTS BEARING PREVIOUS REVISION



**WORK POINTS
ON LAYOUT REFERENCE LINE**

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WP4	40270.1	52658.4
WP5	40275.4	52577.4
WP6	40269.8	52523.7
WP7	40257.1	52470.5

LEGEND:

- EXISTING ROAD
- - - SLURRY WALL
- LEASE BOUNDARY
- - - FRENCH DRAIN
- - - PERFORATED DRAIN PIPE
- PIPES (AS NOTED)
- INSTRUMENTATION CONDUIT
- (P) PIEZOMETER
- (S) SUCTION LYSIMETER
- (W) MONITORING WELL

NOTES:

1. DIMENSIONS AND ELEVATIONS ARE IN FEET UNLESS NOTED OTHERWISE.
2. CONSTRUCTION RECORD TOPOGRAPHY UPDATED AS FOLLOWING:
 - A. TAILINGS PILE CONTOURS AND BASE TOPOGRAPHY WERE PROVIDED BY KGCMC (OCTOBER 2005).
 - B. SOUTHEAST 2 CONTOURS ARE TOP OF LINER PROVIDED BY KGCMC (NOVEMBER 2005).
 - C. LOCATIONS OF UTILITIES WERE PROVIDED BY KGCMC (NOVEMBER 2005).
3. PIEZOMETER DH05-20 WAS DESTROYED IN FALL 2005.
4. THE INSTRUMENT CABLES FOR PIEZOMETER DH05-15 AND SUCTION LYSIMETERS SL-T-05-12 TO 15 DO NOT RUN THROUGH THE CONDUITS WITH THE OTHER SE1 INSTRUMENTS. THEY ARE MEASURED ON THE SURFACE OF THE TAILINGS.



CONSTRUCTION RECORD

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CLIENT
**KENNECOTT GREENS CREEK
MINING COMPANY**



PROJECT
STAGE 2 EXPANSION OF TAILINGS FACILITY

TITLE
SOUTHEAST 2
LINER SURFACE AND UTILITIES
PLAN

SCALE AS SHOWN	PROJECT No. M07802A39	DWG. No. D-39015	REV. A
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NO.	DATE	ISSUE / REVISION	DRAWN	CHK'D	DESIGN	APP'D
A	FEB. 28, 2006	CONSTRUCTION RECORD				

DRAWING NO.	REFERENCE DRAWING
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I:\mine\12327\30 Date: 3/1/2006 Scale: 1"=100' Plotting file: M07802A39.dwg Author: jacob@kci.com