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<b><i>Knight Piésold</i></b> <b>CONSULTING</b>  <i>Knight Piésold Ltd.</i> <i>Tel: +1 (604) 685-0543</i> <i>1400 - 750 West Pender St</i> <i>Fax: +1 (604) 685-0147</i> <i>Vancouver, BC V6C 2T8</i> <i>Fax: +1 (604) 687-2203</i> <i>CANADA</i> <i>www.knightpiesold.com</i>	<b>DATE:</b>	Sept 2/99	<b>FILE NO.:</b>	11162/12.01
	<b>TIME:</b>		<b>REF NO.:</b>	9/2255
	<b>OPERATOR:</b>	wj	<b>PAGES:</b>	1 of 10
	<b>SENDER:</b>	John Wilkinson	<b>APPROVED:</b>	<i>KJB</i>

<b>TO:</b>	Ministry of Energy & Mines, Mines Branch, Victoria	<b>FAX :</b>	
<b>ATTN:</b>	George Headley	cc:	Brian McBride, MEM, Prince George Eric LeNeve, MPMC
<b>SUBJECT:</b>	Trial Downstream Cycloned Sand Berm		<i>GRIT 3340</i>

Dear George,

Attached please find a letter from Knight Piésold to Eric LeNeve of Mt. Polley Mining Corporation regarding the proposed trial downstream cycloned sand berm, to be located along the perimeter embankment of the Tailings Storage Facility. The attached letter describes the purposes of the trial, the proposed arrangement of the berm, the type of information that is required from the trial, and the approximate costs.

Construction of the trial berm is scheduled to start late this week, and will likely continue for a few weeks, with piezometer readings, sampling, and CPT and laboratory testing continuing during and after the cycloning period. The purpose of this fax is to inform you of the trial berm arrangement and to invite you to visit the Mt. Polley Mine site at some point over the next two to three weeks to observe the performance of the berm and review any collected data. For your information, I am intending to be on site for most of the week of September 13<sup>th</sup>, and I would be pleased to visit the trial berm with you during this period.

Please contact our office if you have any questions regarding the trial or if you would like to coordinate our site visits any further.

Best Regards,

*The content of this communication is confidential. If you are not the intended recipient, please notify us immediately. Unauthorized use or disclosure of this communication or its content is unlawful.*

***Knight Piésold***  
CONSULTING

***Knight Piésold Ltd.***

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Our Reference No: 11162/12.01

Number: 9/1883

July 7, 1999

COPY

Mr. Eric LeNeve  
Mt. Polley Mining Corp  
P.O. Box 12  
Likely, B.C.  
VOL 1N0 BC

Dear Eric:

**Re: Mount Polley Project**  
**Trial Downstream Cycloned Sand Berm**

Knight Piésold Ltd. is pleased to provide the following plan of work for the proposed construction and monitoring of a trial berm consisting of cycloned tailings material at the Mount Polley Mine. The trial sand berm will be located on a section of the downstream face of the existing Stage 2B Perimeter Embankment of the Tailings Storage Facility (TSF). Information to be drawn from this trial study is needed to finalize design concepts and issues involved in the permitting and use of cycloned tailings in on-going construction of the TSF embankments. The TSF is currently permitted and constructed to the Stage 2B elevation of 937 m.a.s.l.

**Background**

The Knight Piésold Report titled 'Evaluation of Cycloned Tailings for Embankment Construction' (Ref. No. 11162/11-1, Rev. 0) provided a preliminary evaluation of the use of cycloned tailings sand for construction of the TSF embankments. Geotechnical characteristics of trial cyclone outputs illustrated that the sand is well-suited for embankment fill. A Preferred Option was chosen for use of cycloned sand as embankment fill which took into account material availability, geotechnical concerns and capital costs. This Preferred Option incorporates cycloned tailings both upstream and downstream of the retained core zone and involves construction of a confining berm along the downstream toe of the embankment, as well as a system of ditches to collect seepage downstream of the confining berm.



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CONSULTING**Construction of the Trial Sand Berm**

Figure 1 illustrates the proposed location for the trial cycloned sand berm ("Sand Berm") on the downstream face of the Perimeter Embankment, facing the Perimeter Embankment Seepage Collection Pond. The Sand Berm will be constructed in two phases, as illustrated in Figures 1 and 2. The existing access road running along the toe at Elevation 931m will be re-aligned for approximately 120 metres to allow vehicular traffic around the toe of the proposed berm. This will require approximately 900 cubic metres of Zone T material. The Sand Berm will be constructed above three outlet drains previously placed in the embankment in order to collect seepage water from chimney and longitudinal drains and direct it towards the seepage collection pond. These outlet drains will act as spine drains below the Sand Berm and their effect will be directly measurable by comparison of pore pressure monitoring results between instrumentation planes D and F. Type 2 geotextile filter fabric (8 oz./sq.yd.) will be extended over all outlet drain gravels in the area to be covered by the berm.

Figures 1 and 2 illustrate other major components of the two phases of Sand Berm construction:

**Confining Berms**

A free-draining confining berm, 120 metres in length and 1.5 metres in height, consisting of Zone T Mine Rock, will be constructed to a crest elevation of approximately 932.5m along the existing access road to contain the ultimate toe of the berm. Two small confining berms on the embankment slope bench (Elev. 934), 0.5 metres in height, will also be placed to prevent travel of cycloned sand along the bench. The total volume of material needed for the confining berms is estimated to be 600 cubic metres.

**Pore Pressure Monitoring Instruments**

Piezometers will be installed on two vertical planes cutting through the Sand Berm: one set of piezometers will be located on a plane coincident with Outlet Drain #4 (Section 1) and the other at a 20 metre distance from the nearest outlet drain (Section 2). RST vibrating-wire piezometers, Model VW2100L, which are capable of measuring pore pressures between -15 and +25 psi (-100 and +170 kPa), are recommended and will be read and recorded using a manual readout device. To

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minimize disturbance and provide good quality data, all piezometers will be installed prior to cyclone sand placement, on wood or steel posts driven into the existing embankment. These posts will be clearly marked at 0.5 metre elevation increments to allow for surveying of the cycloned sand and further interpretation of data.

Water Management

Drainage ditches, excavated in low permeability till, will surround the Sand Berm in order to collect seepage and direct it to the Collection Pond. A culvert or suitable drain pipe will be installed across the existing access road. The existing drain monitoring sump will monitor flow through the outlet drains and a weir will be installed to measure flow through the seepage collection ditches. All tailings water will report to the Seepage Collection Pond for recycle to the tailings impoundment.

Phase I Deposition of Cycloned Tailings

Once preparations are complete, deposition of approximately 2900 cubic metres of cycloned sand can be achieved through placement of one or two operating cyclones on the crest of the existing embankment. Figure 1 illustrates a plan view of and sections through the berm following Phase I of construction, assuming a 3.5:1 angle of repose for the cycloned sand.

Regular (minimum twice daily) monitoring of piezometric data and outlet drain flow will take place during Phase I deposition and will continue until full drainage of the berm has occurred. It is anticipated that drainage of the sand will continue for up to 10 days.

Phase II Deposition of Cycloned Tailings

Deposition of approximately 3000 cubic metres of cycloned sand will then be undertaken to reach the configuration shown in the Figure 2 plan and sections. A 3.5:1 downstream slope and a 4:1 upstream slope allows for a 4m wide berm crest at Elevation 938m. Monitoring of piezometer, outlet drain and seepage flow will continue through Phase II and beyond until stabilized conditions are observed.

**Monitoring of the Trial Sand Berm**

All 10 piezometers will be monitored regularly over the period from initial cycloning of tailings until pore pressure conditions stabilize in the trial berm. The outlet drain monitoring sump will record outlet drain flow and a weir will monitor flow through

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the drainage ditches constructed downstream of the trial berm. Sampling of cyclone output will determine underflow versus overflow split. An accurate determination of the material split for the cyclone will be done by directly measuring the concurrent flow rates and pulp densities from the underflow and overflow, through a timed discharge of the two streams.

Sampling and testing of outlet water quality will also be carried out at least once during Phase I and twice during Phase II. Elevation markers on the piezometer posts and a final survey will determine the typical angle of repose for cycloned sand material.

**Geotechnical Testing**

A seismic Cone Penetration Testing program will be performed on tailings on the upstream side of the existing embankment and on cycloned sand on the downstream side. Triaxial shear tests are also to be performed on samples taken from the trial berm. Testing of permeability versus confining pressure and consolidation parameters will be carried out in addition to grain size distribution analyses. These tests will provide geotechnical data essential to the design of the TSF embankments using cycloned tailings.

**Schedule for Construction and Monitoring**

Construction would begin in early August, 1999 and be complete by the end of the same month. A tentative schedule is shown in Table 1. Based on the conservative assumptions of a 35% underflow split, 85% availability of the cyclone(s), a production rate of 20,000 tpd and a dry density of 1.6 tonnes/cubic metres, a single cyclone will deposit approximately 930 cubic metres of cycloned sand per day. Thus, with a single cyclone operating, Phase I deposition is expected to last 3 days, followed by a 10 day interruption to monitor drainage and 4 more days for completion of Phase II. The scenario of a single cyclone was used for the schedule in Table 1, however it may be possible to use two operating cyclones, which would decrease deposition time by 50 percent.

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CONSULTING**Costs**

Estimated costs for the construction materials, piezometer equipment, CPT and water quality testing programs are provided in Table 2.

**Summary**

The trial study described above will evaluate techniques proposed to construct the TSF embankments using cycloned sand. Pore pressure, water management and geotechnical data from the trial berm will provide valuable insight into the behaviour of cycloned sand when used as embankment material when an impermeable core zone is retained. Concerns regarding stability of a cycloned sand embankment and the implications of tailings settlement on the sloping embankment core zone will be addressed with representative data collected during this trial study.

We trust the attached tables and figures provide the information you require. Please feel free to contact me should you have any questions or further requests.

Yours very truly,  
**KNIGHT PIÉSOLD LTD.**

**ORIGINAL SIGNED BY  
K.J. BROUWER**

Ken J. Brouwer, P.Eng.  
Director

/JEV

Enclosure

TABLE I  
MOUNT POLLEY MINING CORPORATION - MOUNT POLLEY MINE  
PROPOSED CONSTRUCTION AND MONITORING SCHEDULE

ID	Task Name	Duration	Start	Finish	01 August	08 August	15 August	22 August	29 August														
					S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T
1	Access Road Re-Alignment	2d	01-08-99	02-08-99	[Bar]																		
2	Construction of Confining Berms	2d	03-08-99	04-08-99		[Bar]																	
3	Construction of Seepage Collection Ditches	2d	03-08-99	04-08-99		[Bar]																	
4	Installation of Piezometers	1d	04-08-99	04-08-99		[Bar]																	
5	Phase I Cycloning	3d	05-08-99	07-08-99					[Bar]														
6	Monitoring	27d	05-08-99	31-08-99																			
7	Phase II Cycloning	4d	18-08-99	21-08-99																			
8	Seismic CPT Program	3d	22-08-99	24-08-99																			

07-07-99 M:\1162\12\DATAMP\SCHED.MPP

**TABLE 2**

**MOUNT POLLEY MINING CORPORATION**  
**MOUNT POLLEY MINE**

**COST ESTIMATE FOR TRIAL DOWNSTREAM**  
**CYCLONED-SAND BERM**

MA11162125BCOSTS.XLS

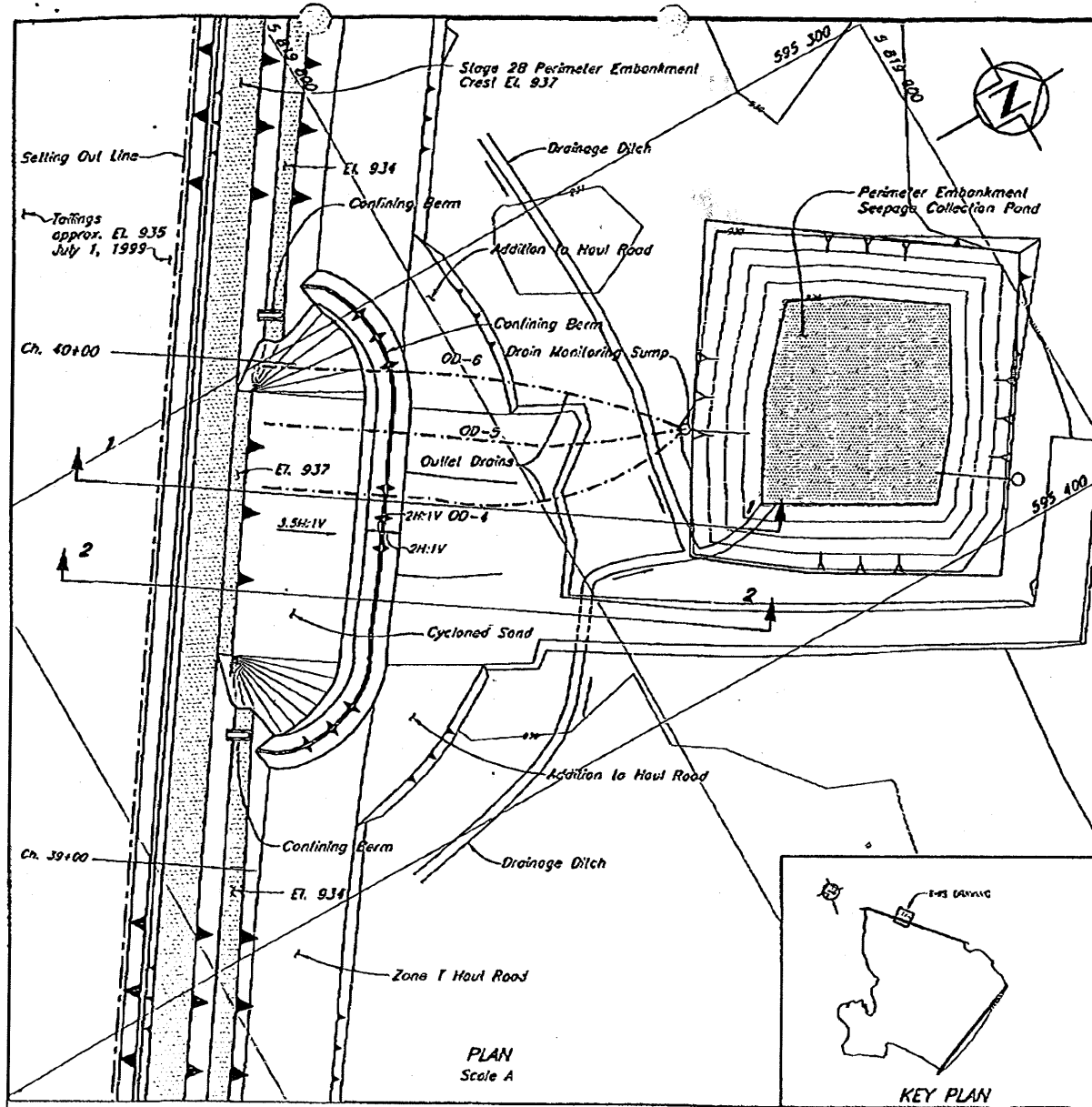
Item	Quantity	Unit Rate	Cost
<b><u>Construction Material</u></b>			
Confining Berm (Zone T)	600 m <sup>3</sup>	\$ 8.75 / m <sup>3</sup>	\$ 5,250
Access Road Diversion (Zone T)	900 m <sup>3</sup>	\$ 8.75 / m <sup>3</sup>	\$ 7,875
<b>Subtotal</b>			<b>\$ 13,125</b>
<b><u>Piezometers</u></b>			
Piezometer Number	Lead Length (m)		
D2-PE1-02	40		
D2-PE1-03	33.5		
D2-PE1-04	32.5		
D2-PE1-05	31.5		
D2-PE1-06	25.5		
F2-PE1-01	40		
F2-PE1-02	33.5		
F2-PE1-03	32.5		
F2-PE1-04	31.5		
F2-PE1-05	25.5		
Piezometers	10	\$ 830	\$ 8,300
Piezometer Cable	350 m	\$ 2.30 / m	\$ 805
<b>Subtotal</b>			<b>\$ 9,105</b>
<b><u>CPT and Water Quality Testing</u></b>			
Seismic CPT Program			\$ 11,600
Water Quality Tests	3	\$ 750 ea.	\$ 2,250
<b>Subtotal</b>			<b>\$ 13,850</b>
<b>Total Estimated Cost</b>			<b>\$ 36,080</b>

**Notes:**

1. Unit rate for load, haul, dump, spread and compact of Zone T material.
2. Piezometers are vibrating-wire, RST Model VW2100L rated from -15 to +25 psi, connected to existing readout panel at site via standard non-vented direct burial cable.
3. Estimate for Seismic CPT Program from Conetec Investigations Ltd.
4. Costs of geotechnical testing associated with Trial Sand Berm are included in budget for 11162/12, Task 300.

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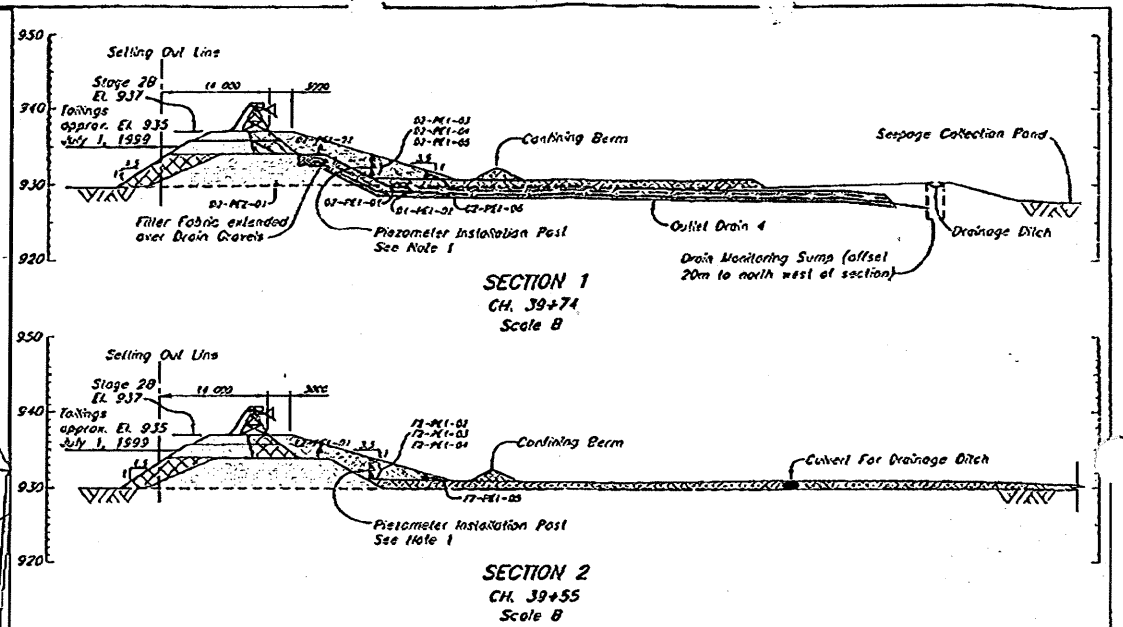
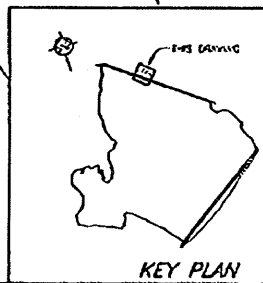


NOTES

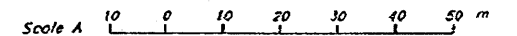
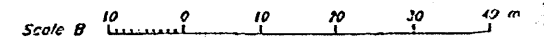
1. Piezometers attached to vertical posts before cycloning of tailings begins. Recommended RST Model VV-2100L Piezometer, able to measure pore pressures between -15 and +25 psi.
2. Section 1 corresponds to Instrumentation Plane "D" on Drgs. 10162-9-151 and 10162-9-152, Rev. 2, from the Report on 1998 Construction and Annual Inspection, Ref. No. 11162/10-1.
3. Piezometers D2-PE1-01 and D2-PE1-02 no longer function.

LEGEND

- Plane I.D. (A, B etc.)
- Area (0-Tailings, 1-Drain, 2-Embankment)
- A0-PE1-01—Number I.D.
- Pressure Roving (1-Low, 2-High)
- Type of Instrumentation (PE—Piezometer electric, SM—Survey Monument)
- A1-PE1-01▲ Previously installed piezometer (See Note 3)
- A2-PE2-06▲ Piezometers installed in Cycloned Sand Berm



ZONE	LOCATION	MATERIAL TYPE	PLACEMENT AND COMPACTION REQUIREMENTS
5	Core Zone	Glacial till	Placed, moisture conditioned and spread in maximum 300 mm thick layers (after compaction). Vibratory compaction to 95% of Standard Proctor maximum dry density or as approved by the Engineer.
8	Fill Zone	Glacial till, glaciolacustrine or granular material	Placed, moisture conditioned and spread in maximum 1000 mm thick layers (after compaction). Vibratory compaction to 92% of Standard Proctor maximum dry density or as approved by the Engineer.
7	Transition Zone	Mine Rock	Placed and spread in maximum 600 mm thick layers. Compaction as directed by the Engineer.
1	Outlet Drain	Filter Sand	Placed and spread carefully around filter fabric/drain gravel. Compaction as directed by the Engineer.
6	Outlet Drain	Drain Gravel	Placed and spread carefully around seepage collection pipes. Compaction as directed by the Engineer.
3	Cyclone Sand	Cyclone Underflow	To be determined



MOUNT POLLEY MINING CORPORATION  
 MOUNT POLLEY MINE  
 PERIMETER EMBANKMENT  
 TRIAL CYCLONED SAND BERM  
 PHASE I

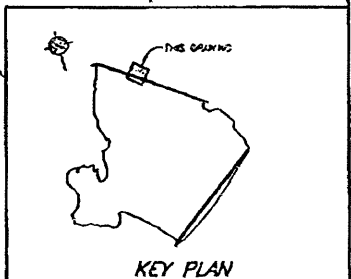
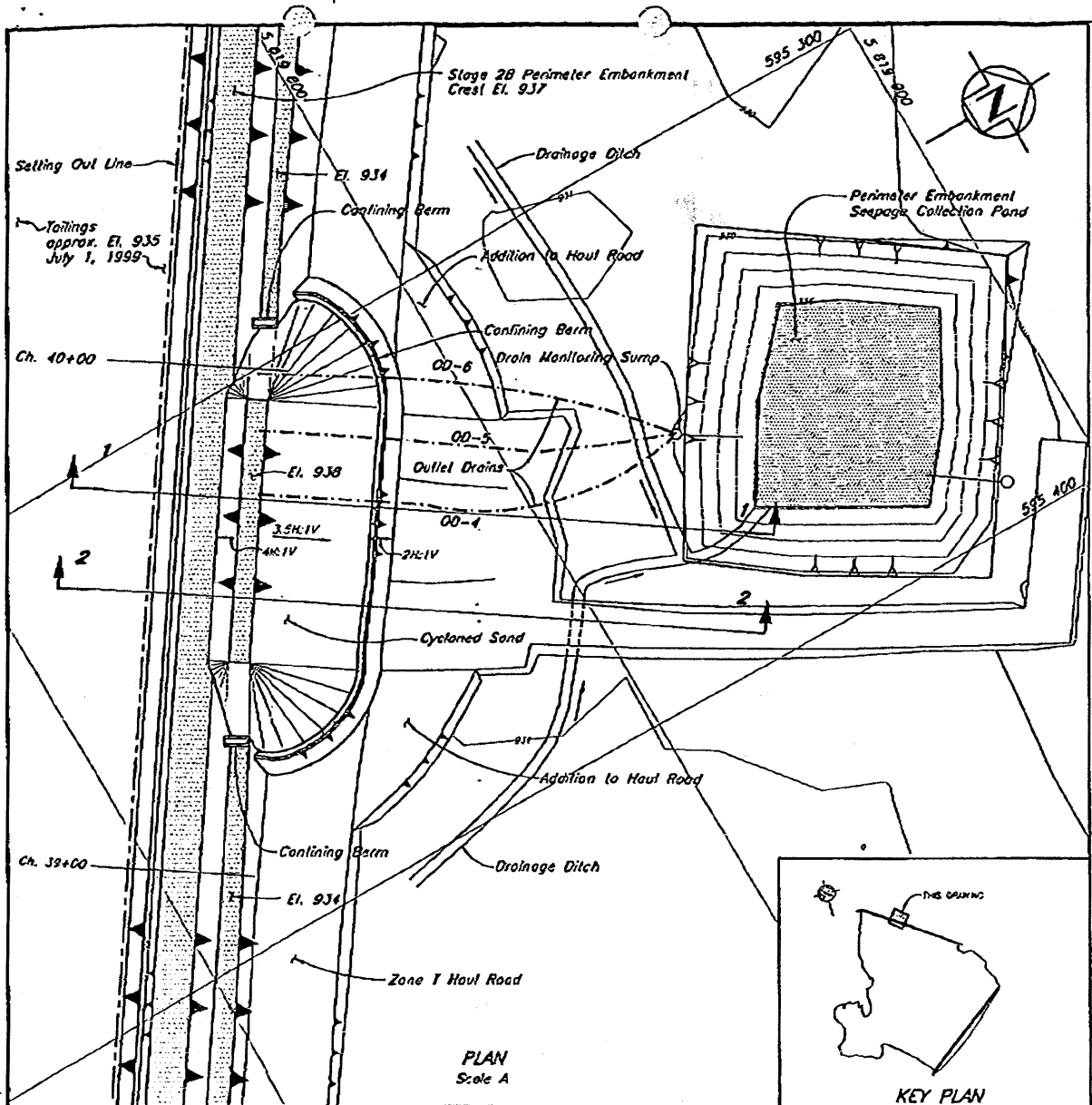
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PROJECT NO. 11162/12  
 REV. NO. 1  
 DATE 10/12/99

FIGURE 1

NO.	DATE	DESCRIPTION	BY	CHKD	APP'D
1	10/12/99	ISSUED FOR LETTER PERMIT #1162	JV	ESR	[Signature]
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3					

REVISIONS

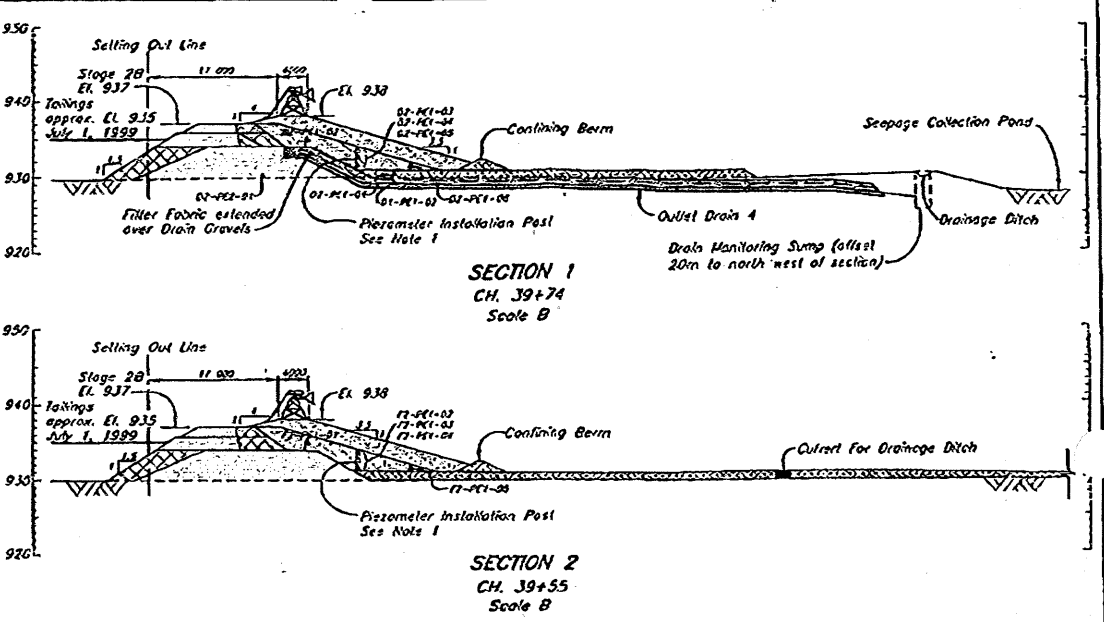


**NOTES**

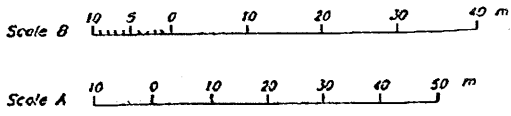
1. Piezometers attached to vertical posts before cycloning of tailings begins. Recommended RSI Model YH-2100L Piezometer, able to measure pore pressures between -15 and +25 psi.
2. Section 1 corresponds to Instrumentation Plane "D" on Drgs. 10162-9-151 and 10162-9-152, Rev. 2, from the Report on 1998 Construction and Annual Inspection, Ref. No. 11162/10-1.
3. Piezometers D2-PE1-01 and D2-PE1-02 no longer function.

**LEGEND**

- Plane I.D. (A, B etc.)
- Area (0-Tailings, 1-Drain, 2-Embankment)
- AG-PE1-01-Number I.D.
- Pressure Rating (1-Low, 2-High)
- Type of Instrumentation (PE-Piezometer electric, SM-Survey Monument)
- A1-PE1-01 Previously installed piezometer (See Note 3)
- A2-PE2-05a Piezometers installed in Cycloned Sand Berm



ZONE	LOCATION	MATERIAL TYPE	PLACEMENT AND COMPACTION REQUIREMENTS
	Core Zone	Glacial till	Placed, moisture conditioned and spread in maximum 300 mm thick layers (after compaction). Vibratory compaction to 95% of Standard Proctor maximum dry density or as approved by the Engineer.
	Fill Zone	Glacial till, glacialoastine or granular material	Placed, moisture conditioned and spread in maximum 1000 mm thick layers (after compaction). Vibratory compaction to 92% of Standard Proctor maximum dry density or as approved by the Engineer.
	Transition Zone	Mine Rock	Placed and spread in maximum 600 mm thick layers. Compaction as directed by the Engineer.
	Outlet Drain	Filter Sand	Placed and spread carefully around filter fabric/drain gravel. Compaction as directed by the Engineer.
	Outlet Drain	Drain Gravel	Placed and spread carefully around seepage collection pipes. Compaction as directed by the Engineer.
	Cyclone Sand	Cyclone Underflow	To be determined



**MOUNT POLLEY MINING CORPORATION**  
**MOUNT POLLEY MINE**  
**PERIMETER EMBANKMENT TRIAL CYCLONED SAND BERM PHASE 2**

**Knight Piesold CONSULTING**

PROJECT NO. 11162/12 REF. NO. 1 REV. 0  
**FIGURE 2**

NO.	DATE	DESCRIPTION	DESIGNED	CHECKED	DATE	APPROVED
0	10/2/99	ISSUED FOR LETTER REPORT 8/1/99				