

**MOUNT POLLEY MINING CORPORATION
MOUNT POLLEY PROJECT
TAILINGS STORAGE FACILITY**

**OPERATION, MAINTENANCE
AND SURVEILLANCE MANUAL
FOR STAGE 1b EMBANKMENT (El. 934m)
(REF. NO. 10162/7-3)**

NOVEMBER 24, 1997

Knight Piésold
CONSULTING ENGINEERS

Access

Box 95-2018

Box 18.

**MOUNT POLLEY MINING CORPORATION
MOUNT POLLEY PROJECT
TAILINGS STORAGE FACILITY**

**OPERATION, MAINTENANCE
AND SURVEILLANCE MANUAL
FOR STAGE 1b EMBANKMENT (El. 934m)
(REF. NO. 10162/7-3)**

NOVEMBER 24, 1997

MP000009

*Suite 1400
750 West Pender Street
Vancouver, British Columbia
Canada V6C 2T8
Telephone (604) 685-0543
Telefax (604) 685-0147
CIS: 72360,477*

Knight Piésold Ltd.
CONSULTING ENGINEERS

GAT # 2819

MOUNT POLLEY MINING CORPORATION
MOUNT POLLEY PROJECT
TAILINGS STORAGE FACILITY

OPERATION, MAINTENANCE
AND SURVEILLANCE MANUAL
FOR STAGE 1b EMBANKMENT (El. 934m)
(REF. NO. 10162/7-3)

This report was prepared by Knight Piésold Ltd. for the account of Mount Polley Mining Corporation. The material in it reflects Knight Piésold's best judgement 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. Knight Piésold accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.



MOUNT POLLEY MINING CORPORATION
MOUNT POLLEY PROJECT
TAILINGS STORAGE FACILITY

OPERATION, MAINTENANCE
AND SURVEILLANCE MANUAL
FOR STAGE Ib EMBANKMENT (El. 934m)

(REF. NO. 10162/7-3)

TABLE OF CONTENTS

	<u>PAGE</u>
SECTION 1.0 INTRODUCTION	1
1.1 SCOPE OF MANUAL	1
1.2 GENERAL FEATURES OF FACILITY	2
1.3 DESIGN BASIS	4
1.4 ACCESS INFORMATION	4
1.5 ASSIGNMENT OF RESPONSIBILITY	5
1.6 INSPECTION FREQUENCIES AND COMMUNICATION	6
1.7 OTHER AGENCIES	6
1.8 TRAINING SCHEDULES	7
1.9 DATA REPORTING	7
1.10 OPERATING LOG	8
1.11 PUBLIC SAFETY	8
1.12 RESTRICTED AREAS	9
1.13 SECURITY PLANS	9
1.14 DISTRIBUTION OF MANUAL	9
1.15 REVISIONS TO MANUAL	10
1.16 REFERENCE DOCUMENTS	10
SECTION 2.0 RESERVOIR OPERATION	13
2.1 GENERAL	13
2.2 RESERVOIR LEVELS AND FLOOD OPERATION	13



	2.3	RESERVOIR FILLING AND DRAWDOWN	14
	2.4	DISCHARGE FACILITIES	14
SECTION 3.0		MAINTENANCE	15
	3.1	GENERAL	15
	3.2	MAINTENANCE REQUIREMENTS	15
SECTION 4.0		SURVEILLANCE	17
	4.1	GENERAL	17
	4.2	INSPECTIONS AND TESTS	17
	4.2.1	General	17
	4.2.2	Routine Inspections	18
	4.2.3	Intermediate Inspections	19
	4.2.4	Equipment Tests	20
	4.2.5	Special Inspections	20
	4.3	INSTRUMENTATION	20
	4.4	INCREASED LEVELS OF SURVEILLANCE	21
SECTION 5.0		EMERGENCY PLANNING AND COMMUNICATIONS	23
		DIRECTORY	
	5.1	GENERAL	23
	5.2	EMERGENCY PLAN	23
	5.3	EMERGENCY SITUATIONS AND RESPONSES	24
	5.4	COMMUNICATION SYSTEMS AND	24
		DIRECTORIES	
	5.5	CONSTRUCTION EQUIPMENT AND	24
		MATERIALS	
	5.6	REVIEWS	25
SECTION 6.0		TAILINGS MANAGEMENT SYSTEM COMPONENTS	26
	6.1	TAILINGS BASIN	26
	6.1.1	General Description	26
	6.1.2	Basin Filling Characteristics	26
	6.1.3	Basin Liners	26



	6.1.4	Monitoring Requirements	27
	6.1.5	On-going Construction	28
6.2		TAILINGS DEPOSITION	28
	6.2.1	Deposition Strategy	28
	6.2.2	Tailings Pipework	29
	6.2.3	Operating Procedures	32
	6.2.4	Monitoring Requirements	37
	6.2.5	Inspection and Maintenance	37
6.3		TAILINGS EMBANKMENTS	39
	6.3.1	General Description	39
	6.3.2	Initial Construction	39
	6.3.3	Embankment Drains	41
	6.3.4	On-going Construction	42
	6.3.5	Instrumentation and Monitoring	44
	6.3.6	Inspection and Maintenance	48
6.4		SEEPAGE COLLECTION PONDS	50
	6.4.1	General Description	50
	6.4.2	System Requirements	50
	6.4.3	Operating Procedures	51
	6.4.4	Monitoring Requirements	51
	6.4.5	Inspection and Maintenance	52
6.5		RECLAIM SYSTEM	52
	6.5.1	General Description	52
	6.5.2	Monitoring Requirements	54
	6.5.3	Inspection and Maintenance	54
6.6		MAKE-UP WATER SUPPLY	56
	6.6.1	General Description	56
	6.6.2	Monitoring Requirements	57
	6.6.3	Inspection and Maintenance	59
6.7		CLOSURE AND RECLAMATION	61
	6.7.1	General	61
	6.7.2	On-going Reclamation	62
	6.7.3	Final Tailings Deposition	62



6.7.4	Closure and Surface Reclamation	63
6.7.5	Final Spillway	63
6.7.6	Long Term Monitoring Requirements	64
6.8	CONTINGENCY PLAN	64
6.8.1	Scope of Contingency Plan	64
6.8.2	Earthquake	64
6.8.3	Extreme Runoff	67
6.8.4	Power Failure	71
6.8.5	Low Temperature	73
6.8.6	Pipeline Leakage or Rupture	74
6.8.7	Pipeline Blockage	75
6.8.8	Avalanche and Debris Slide	76
6.8.9	Fire	76

TABLES

Table 1.1	Design Basis and Operating Criteria
Table 1.2	Summary of Monitoring Requirements
Table 2.1	Reservoir Operating Criteria
Table 3.1	Maintenance Requirements
Table 4.1	Minimum Frequency of Inspections and Tests
Table 5.1	Emergency Situations and Responses
Table 6.1	Summary of Vibrating Wire Piezometers and Trigger Levels
Table 6.2	Survey Monument Co-ordinates - Stage Ib Construction
Table 6.3	Trigger Levels for Survey Monuments

FIGURES

Figure 1.1	Project Location and Access Plan
Figure 6.1	Depth/Area/Capacity/Filling Rate for Tailings Storage Facility
Figure 6.2	Tailings Area Filling Schedule and Staged Construction for 6,500,000 tpy Throughput
Figure 6.3	Groundwater Monitoring Well Location Plan



APPENDICES

Appendix A	As-Built Drawings
Appendix B	Annual Inspection Checklist
Appendix C	Sample Record Sheets
Appendix D	Communications Directory



MOUNT POLLEY MINING CORPORATION

MOUNT POLLEY PROJECT

TAILINGS STORAGE FACILITY

**OPERATION, MAINTENANCE
AND SURVEILLANCE MANUAL
FOR STAGE 1b EMBANKMENT (El. 934m)**

(REF. NO. 10162/7-3)

SECTION 1.0 - INTRODUCTION

1.1 SCOPE OF MANUAL

This Manual provides general information and details of the general features, design basis, operating requirements, monitoring requirements, routine inspection and maintenance requirements, contingency procedures and closure requirements for the Mount Polley Tailings Storage Facility and related structures.

The Stage 1b tailings embankment is functioning as a water storage dam until the start of mining operations, expected in early June, 1997. A separate report, the "Operation, Maintenance and Surveillance Manual for Stage 1a Embankment (El. 927 m)" (Knight Piésold Ref. No. 1627/1) was previously issued as a support document for impounding water. This manual is an updated version of the Stage 1a Operation, Maintenance and Surveillance Manual.

This document contains information such as as-built drawings, depth capacity curves and filling rate curves for the Tailings Storage Facility and associated structures. Comprehensive checklists and procedures for operations, maintenance and annual inspections will be developed in conjunction with mine operating personnel. The manual also provides a brief overview of on-going construction requirements for the tailings basin and embankments.

Additional Operating Manuals for components of related works and equipment completed or supplied by Others are also referenced in this Manual.



1.2 GENERAL FEATURES OF FACILITY

The Tailings Storage Facility provides permanent storage of the tailings produced from milling of copper and gold bearing ore. The principal requirements of the facility are:

- Reliable transport of the tailings from the Millsite to the Tailings Storage Facility.
- Collection and transport of runoff from waste rock storage areas to the Tailings Storage Facility.
- Permanent, secure and total confinement of all solid waste materials within an engineered Tailings Storage Facility.
- Control, collection and removal to the maximum practical extent of free draining liquids from the tailings.
- Provision of make-up water for mine start-up and as required during the winter months so as to facilitate a controlled water balance over the life of the project.
- Inclusion of monitoring features for all aspects of the Tailings Storage Facility to ensure performance goals are achieved.
- Protection of the regional groundwater and surface water flows, both during operations and in the long-term.
- Staged development to distribute capital expenditure over the life of the project.

The general components of the Tailings Storage Facility are summarized below:

- A pipeline system conveys the tailings slurry via gravity from the Millsite to the Tailings Storage Facility. The pipeline system includes a dropbox for surge



protection and for directing runoff into the system and a movable discharge section with spigot offtakes to distribute the tailings from the embankment crest.

- A make-up water supply system comprising an intake on Polley Lake, a pump and a pipeline, provides extra water to the Tailings Storage Facility.
- The Millsite Sump and Southeast Sediment Pond provide additional make-up water to the system. Millsite runoff is directed from the Millsite Sump into the tailings line near the mill. Flows from the Southeast Sediment Pond enter the system at the reclaim booster pump station or at the tailings dropbox.
- Earthfill embankments retain the tailings solids within the facility. The embankments have a vertical chimney drain, with a collector (longitudinal) drain and three outlet drains.
- A low permeability basin liner (natural and constructed) provides containment of process fluids within the facility and minimizes the potential for seepage through the reservoir basin soils.
- A foundation drainage system is included below the Main Embankment to prevent the build-up of any pressures in foundation materials and to collect any seepage from the base of the Tailings Storage Facility.
- Seepage collection ponds excavated in low permeability soils downstream of the embankments store seepage and local runoff that is pumped back into the Tailings Storage Facility.
- Instrumentation is placed in the embankment foundations, fill and drains (including vibrating wire piezometers and survey monuments) to monitor the performance of the facility.



- A reclaim water system including a barge mounted pump station in an excavated channel, a booster pump station and pipeline system provides process water to the mill.
- A system of monitoring wells is installed around the Tailings Storage Facility for groundwater quality monitoring.

These items are shown on the Stage 1a/1b as-built construction drawings which are included in Appendix A.

1.3 DESIGN BASIS

The Tailings Storage Facility was designed using appropriate and conservative design parameters from hazard classification, seismic data, hydrologic studies and geotechnical site investigations. The following basic operating parameters were provided by the Mount Polley Mining Corporation prior to designing the facility:

- | | |
|---|---------------------|
| • Tailings Production Rate | 17,808 tonnes/day |
| • Solids Content from Discharge at Concentrator | 35 percent |
| • Total Mine Reserves | 82.3 million tonnes |

A summary of the design basis and operating criteria for the Tailings Storage Facility is included on Table 1.1.

1.4 ACCESS INFORMATION

The Mount Polley Mine is located in central British Columbia, approximately 60 km northeast of Williams Lake. The main access route is via the paved highway to Likely. The turn to the Mine is located approximately 1.5 km east of Morehead Lake. The Mine is located a further 11 km to the southeast, on the Bootjack Lake Forest Service Road. The location of the Mine and access roads are shown on Figure 1.1.



Access to the Tailings Storage Facility is provided along the road for the tailings and reclaim pipelines which starts at the Millsite. The Main Embankment is located approximately 5 km southeast of the Mine.

The Tailings Storage Facility can also be accessed from the Likely Highway by taking the Gavin Lake Forest Service Road which is approximately 14 km south of Morehead Lake. The Main Embankment is located at approximately km 16 on this road. The Gavin Lake Forest Service Road leads to Likely. A new section of the road, the Bootjack-Morehead Connector Relocation, was constructed where the previously existing road was inside the Tailings Storage Facility.

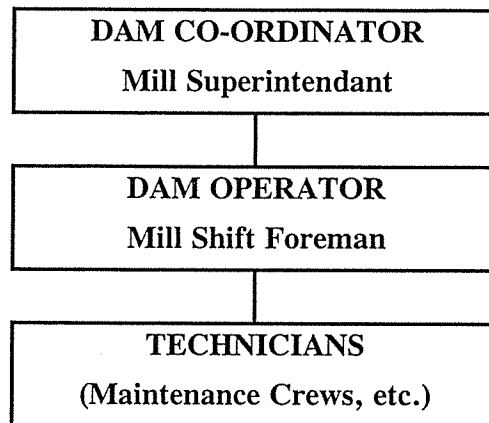
1.5 ASSIGNMENT OF RESPONSIBILITY

The administrative structure for the operation, maintenance and surveillance of the Stage 1b Tailings Storage Facility and related structures is illustrated by the preliminary organizational flow chart shown on the following page.

The responsibility for the day to day operation, maintenance and surveillance of the facility lies with the Dam Co-ordinator. During an emergency, any decisions regarding the procedures to be carried are the responsibility of the Dam Co-ordinator. In the event that the Dam Co-ordinator is not available, the responsibility is then delegated to the Dam Operator.

The Dam Co-ordinator's responsibilities include the preparation of reports covering all aspects of the operation, maintenance and surveillance of the facility. These will serve as a permanent record of operations which may then be available to other persons operating the facility, the Design Engineer or regulatory authorities. The reports shall include all records of maintenance, inspection and monitoring and shall be kept in a centralized location.





Preliminary Organizational Flow Chart

1.6 INSPECTION FREQUENCIES AND COMMUNICATION

The Dam Co-ordinator is responsible for organizing an Annual Inspection and Formal Report on the condition of the Tailings Storage Facility. The Dam Operator, under the direction of the Dam Co-ordinator, is required to conduct a daily visual inspection of the facility. This is in addition to the requirements for surveillance described in Section 4.0. The annual inspection of the entire Tailings Storage Facility will be by a suitably qualified Professional Engineer.

Communication are achieved by radio contact from the Millsite to the Tailings Storage Facility. Telephones are available for off-site communication at the Millsite.

A list of all parties and organizations involved in both the normal and emergency operation of the Tailings Storage Facility is included in Appendix D.

1.7 OTHER AGENCIES

Other relevant agencies involved in the operation, maintenance and surveillance of the Tailings Storage Facility include the Ministry of Employment and Investment (MEI), Ministry of Environment Lands and Parks (MELP), Ministry of Forests (MOF) and Department of Fisheries and Oceans (DFO).



1.8 TRAINING SCHEDULES

Training programs are required for the Dam Co-ordinator and Dam Operators or other person(s) involved in the operation, inspection and surveillance of the Tailings Storage Facility. The training program shall be conducted by a qualified Professional Engineer familiar with the design, operation, maintenance and inspection of all civil and mechanical works associated with the facility.

A refresher course shall be conducted once per year during the annual inspection by the Professional Engineer for all persons involved in the operation, maintenance and surveillance of the Tailings Storage Facility.

1.9 DATA REPORTING

A suitably qualified Professional Engineer shall provide Annual Inspection Reports for the Tailings Storage Facility. These reports shall be filed both at the Mount Polley Mine Site and with MELP, Water Management Branch. The Dam Co-ordinator and Dam Operators shall maintain a daily log of all visual inspections and readings, which shall be filed in the office at the Mine in a central location. This information should be available at all times for review by Government Agencies or other relevant parties. Recommended monitoring requirements for each of the components of the system are discussed in this manual and are summarized on Table 1.2. The overall monitoring program will be subject to operating permits issued by regulatory agencies. Detailed procedures and checklists are included in this manual. The monitoring records shall be filed on-site in an organized manner to allow immediate access.

An annual inspection checklist "Guidelines for Annual Reports" is included in Appendix B.

Water quality monitoring for both groundwater and surface water sources is also required, as discussed in the revised "Groundwater Monitoring Program" report (Knight Piésold Ref. No. 1624/2).



1.10 OPERATING LOG

An Operating Log shall be maintained for each of the components of the Tailings Storage Facility and related structures, including the following:

- Southeast Sediment Pond and Pipeline
- Polley Lake Pump Station and Pipeline
- Tailings Pipeline and T2 Dropbox
- Reclaim Pipeline and Booster Pump Station
- Main Embankment, including the Foundation Drain System and Seepage Collection Pond
- Perimeter Embankment and Seepage Collection Pond

The log should contain a chronological record of all events in order to provide a continuing record of the operating activities, as well as to provide information on possible equipment problems or the development of unusual conditions for each of the components. The logged record shall be maintained by the Dam Co-ordinator or designated operating personnel.

1.11 PUBLIC SAFETY

It is the duty of the person(s) operating the Tailings Storage Facility to report to the Dam Co-ordinator any unsafe working conditions or unsafe conditions relating to the operation of the facility.

Public access shall not be permitted to the Tailings Storage Facility from the Mine and Millsite. However, the Bootjack-Morehead Connector is a forestry road which passes along the downstream side of the Main Embankment Seepage Collection Pond. In the event that emergency services are required, the closest medical emergency station is at the Millsite. Emergencies requiring medical evacuation will be by vehicle or helicopter to Williams Lake. Emergency procedures and protocol shall follow the procedures for the Millsite, as prescribed by the Mount Polley Mining Corporation Emergency Preparedness Plan (EPP). The closest police station is in Williams Lake.



Details of the medical and emergency facilities are included in the Communications Directory in Appendix D.

1.12 RESTRICTED AREAS

Certain areas are restricted to unauthorized workers and include, but may not be limited to, the following:

- T2 Tailings Dropbox
- Reclaim Pump Station
- Southeast Sediment Pond Sump
- Polley Lake Pump Station
- Stage 1b Main and Perimeter Embankments
- Main and Perimeter Embankment Drain Monitoring Sumps
- Main and Perimeter Embankment Seepage Collection Ponds and Seepage Recycle Sumps
- Main and Perimeter Embankment Instrumentation Huts
- Reclaim Barge Pump Station

It is the responsibility of the Dam Co-ordinator to post restricted access signs in the appropriate areas, when and as required.

1.13 SECURITY PLANS

There are no security plans at present other than those required for the Emergency Preparedness Plan, as discussed in Section 5.0.

1.14 DISTRIBUTION OF MANUAL

The following is the distribution list for the Operation, Maintenance and Surveillance Manual for Stage 1b Embankment (El. 934 m):

- One (1) copy for Mount Polley Mining Corporation (Vancouver office)
- One (1) copy for Dam Co-ordinator's office



- One (1) copy for Dam Operator (Mill Shifter's Office)
- Three (3) copies for Comptroller of Water Rights
- One (1) copy for the Regional Water Manager (Williams Lake)
- Two (2) copies for the Director of the Provincial Emergency Program (P.E.P.)
- One (1) copy for the MELP, Dam Safety Engineer
- One (1) copy for the MEI, Geotechnical Manager
- One (1) copy for Design Engineer of Record.

Mount Polley Mining Corporation is responsible for maintaining the record of the location of each copy of the Manual and to ensure all copies are updated as and when required.

1.15 REVISIONS TO MANUAL

Reviews of the Manual will be conducted on an annual basis as per the Emergency Plan outlined in Section 5.0 and as part of the annual inspection for the Tailings Storage Facility. Revisions to the Manual will be made as and when required to reflect current operating, maintenance and surveillance practices. This Manual will be finalized one (1) year after the start of operations.

1.16 REFERENCE DOCUMENTS

The following Knight Piésold documents provide background information to support this report and are available for review:

- 1) Imperial Metals Corp. Mt. Polley Project, "Report on Geotechnical Investigations and Design of Open Pit, Waste Dumps and Tailings Storage Facility", February 19, 1990.
- 2) Imperial Metals Corp. Mt. Polley Project, "Report on 1995 Geotechnical Investigations for Mill Site and Tailings Storage Facility, Ref. No. 1623/1, March 14, 1995.



- 3) Imperial Metals Corp. Mt. Polley Project, Report on Project Water Management, Ref. No. 1624/1, February 6, 1995.
- 4) Imperial Metals Corp. Mt. Polley Project, Groundwater Monitoring Program, Ref. No. 1624/2, June 3, 1996.
- 5) Imperial Metals Corp. Mt. Polley Project, Tailings Storage Facility, Design Report, Ref. No. 1625/1, May 26, 1995.
- 6) Imperial Metals Corp. Mt. Polley Project, Tailings Storage Facility, Site Inspection Manual, Ref. No. 1625/2, May 26, 1995.
- 7) Imperial Metals Corp. Mt. Polley Project, Tailings Storage Facility and Ancillary Works, Part 10 - Technical Specifications, Ref. No. 1625/3, March 25, 1995.
- 8) Imperial Metals Corp. Mt. Polley Project, Tailings Access Road and Tailings/Reclaim Pipelines, Part 6 - Technical Specifications, Ref. No. 1625/4, May 17, 1995.
- 9) Imperial Metals Corp. Mt. Polley Project, Manual on Sampling and Handling Guidelines for Determination of Groundwater Quality, Ref. No. 1625/5, May 19, 1995.
- 10) Imperial Metals Corp. Mt. Polley Project, Response to Review Comments on Tailings Embankment Design, Ref. No. 1625/6, January 25, 1996.
- 11) Imperial Metals Corp. Mt. Polley Project, Response to Review Comments on Groundwater Monitoring Program, Ref. No. 1625/7, September 12, 1996.
- 12) Imperial Metals Corp. Mt. Polley Project, Requirements and Specifications for the 1996 Groundwater Monitoring Program, Ref. No. 1625/8, September 12, 1996.



- 13) Mount Polley Mining Corporation, Mount Polley Project, Tailings Storage Facility, Operation, Maintenance and Surveillance Manual for Stage 1a Embankment (El. 927 m), Ref. No. 1627/1, March 11, 1997.
- 14) Mount Polley Mining Corporation, Mount Polley Project, Tailings Storage Facility, Updated Design Report, Ref. No. 1627/2, June 4, 1997.
- 15) Imperial Metals Corp. Mt. Polley Project, Report on Geotechnical Investigations and Design of Open Pits and Waste Dumps, Ref. No. 1628/1, July 5, 1996.
- 16) Imperial Metals Corp. Mt. Polley Project, Specification for Drilling, Monitoring Well Installations and Related Services, Ref. No. 1628/3, September 18, 1996.
- 17) Mount Polley Mining Corporation, Mount Polley Project, 1996 Groundwater Monitoring Well Installation Program, Ref. No. 1628/4, February 17, 1997.
- 18) Mount Polley Mining Corporation, Mount Polley Project, Polley Lake Pumping System, Ref. No. 1628/5, February 19, 1997.



SECTION 2.0 - RESERVOIR OPERATION

2.1 GENERAL

This section specifies the operating procedures and restrictions which must be followed for the operation of the Tailings Storage Facility reservoir. The operating criteria are summarized on Table 2.1. The Stage 1b embankment initially functioned as a water storage dam to store runoff and make-up water, enabling the milling operations to commence in June, 1997.

The consequence of failure of the Stage 1b embankment is considered to be significant due to the loss of storage, potential damage to downstream structures and possible impact on fisheries habitat due to erosion and siltation. Failure of the Stage 1a/1b embankment would not represent a significant threat to human life or property.

2.2 RESERVOIR LEVELS AND FLOOD OPERATION

(a) Freeboard and Reservoir Levels

The minimum operating and flood levels for the facility are shown on Table 2.1. Adequate freeboard will be maintained so that the design storm event (24 hour PMP) can be contained within the facility. In addition, one metre of freeboard will be maintained above the PMP level for wave run-up (see Section 6.1).

(b) Normal Operation

During normal operation of the facility, tailings and surface runoff from the tailings area catchment will be impounded in the facility. Make-up water originating from the Southeast Sediment Pond and Millsite Sump will flow through the tailings line via gravity and will be discharged into the facility. Additional make-up water from the Polley Lake Pump Station was pumped to the facility through the pipeline which crosses the tailings access road west of the Perimeter Embankment.



The Stage 1b Tailings Storage Facility has a total storage capacity of approximately 9,400,000 cubic metres to the crest at El. 934 metres. Approximately 2,500,000 cubic metres of water will be stored in the facility prior to start-up, corresponding to a pond level at El. 926.5 metres (see Section 6.1).

(c) Flood Operation

No special flood operating procedures are required for the Stage 1b Tailings Storage Facility because there is sufficient capacity to store the design storm event within the facility at all times.

Provisions are included at the Tailings Storage Facility for storing the 24 hour Probable Maximum Precipitation (PMP) event for all stages of operations. Also, the Stage 1b crest elevation of 934 metres includes an allowance to store 2.5 million cubic metres of make-up water in the facility, while maintaining one metre of freeboard for wave run-up.

2.3 RESERVOIR FILLING AND DRAWDOWN

There are no restrictions on the filling of the facility with respect to dam safety. Also, there are no special provisions for emergency drawdown within the impoundment. The only time that the water level is expected to drop is during the commissioning of the mill, when the initial filling of the system occurs. In the event that an unusual or unexpected requirement for drawdown of the pond water is required, drawdown will be facilitated by pumping using the reclaim barge and/or the Polley Lake Pump which could be temporarily relocated to the Tailings Storage Facility.

2.4 DISCHARGE FACILITIES

No discharge facilities have been incorporated in the design because the freeboard required to store the design storm event will be maintained within the facility at all times.



SECTION 3.0 - MAINTENANCE

3.1 GENERAL

Regularly scheduled maintenance will ensure the serviceability and integrity of the Tailings Storage Facility. Maintenance requirements are also defined by inspections or by unsatisfactory performance.

3.2 MAINTENANCE REQUIREMENTS

The maintenance requirements for the Stage 1b Tailings Storage Facility, including all associated facilities and works, are the responsibility of Mount Polley Mining Corporation.

The following items require regular inspection and maintenance to ensure on-going safety and operation of the system:

- Millsite Sump, including decant tower and pipework.
- Runoff collection ditch at base of future waste rock storage area, including removal of slough or debris material.
- Southeast Sediment Pond, including decant tower and pipework.
- Pipe Containment Channel (containing the Tailings and Reclaim pipelines).
- Tailings Pipeline, including the T2 Dropbox and associated pipework.
- Reclaim pipeline, Barge and Booster Pump Station, including all valves and pipework.
- Polley Lake Pump Station, including intake, pumps, flow monitoring equipment and pipeline.
- Seepage collection ponds and pumping systems.

Other items which require periodic maintenance, as determined by inspection and/or performance include:

- Survey control points.
- Surface movement monuments.



- Piezometers and terminal panels.
- Drain Monitoring Sumps.
- Dam slopes, including removal of debris and vegetation.
- Seepage Collection Pond slopes.
- Communication system.

A list of items requiring maintenance for dam safety is included in Table 3.1. Records shall be kept of all maintenance activities in accordance with this Manual so that they may be reviewed during each Annual Inspection or as required at any time during operations.



SECTION 4.0 - SURVEILLANCE

4.1 GENERAL

The continuing satisfactory and safe performance of the Tailings Storage Facility is determined by surveillance which includes detailed monitoring, inspection and testing. All components of the facility are designed for the required design loading conditions and as per the design criteria, relating to the hydrologic parameters and the flow control/release requirements and commitments.

The following subsections discuss the general requirements for the surveillance of the embankments and their related components, including inspections, monitoring, evaluation and correction of any deficiencies for the safe and effective operation of the facility. Detailed inspection and monitoring requirements for each of the components of the Tailings Storage Facility are presented in Section 6.0.

4.2 INSPECTIONS AND TESTS

4.2.1 General

To ensure the serviceability and integrity of the Tailings Storage Facility, all components required for the proper operation and monitoring of the embankments and associated structures shall be regularly inspected. The information obtained during the inspections is to be retained and filed for use in assessing the current condition of the facilities, to detect any deterioration or signs of deterioration, and to determine a program of regular or special maintenance and repair. If at any time an inspection reveals that structures or equipment are inoperative or in a condition which could jeopardize the safety or continued operation of the facility, prompt repair or replacement shall be carried out.

All components essential to the safe operation or to the continued monitoring of the facility shall be operated and/or tested on a regular basis to demonstrate their serviceability and reliability.



The type and scope of inspections and testing requirements for each component of the Stage 1b Tailings Storage Facility are outlined in the following subsections. The minimum frequency of inspections and tests is specified in Table 4.1. The frequency of monitoring for each component is presented on Table 1.2, as previously discussed.

4.2.2 Routine Inspections

Routine inspections provide, to the maximum extent practical, continuous surveillance of the facility. The inspections shall be carried out (under the direction of the Dam Co-ordinator) by a Dam Operator with sufficient training, experience and demonstrated understanding of the operation of the facilities to recognize abnormal and/or potentially dangerous conditions with respect to dam safety. The Dam Operator shall have a working knowledge of the operational and design features of the system relevant to the inspection requirements.

Routine Inspection Checklists are to be used to ensure that all appropriate observations are made and abnormal conditions reported. Photographs should be taken of any abnormal conditions and filed with the inspection reports.

An Inspection Log Form is to be developed and kept on-site at the office of the Dam Co-ordinator for routine inspections. The Log is to be signed by the Dam Operator following each inspection. If abnormal conditions are observed, it is the responsibility of the Dam Operator to identify the nature of the conditions in the Inspection Log and submit the completed checklist describing the conditions in detail to the Dam Co-ordinator. A copy of the checklist is to be sent to the Design Engineer and the Geotechnical Branch of the Ministry of Employment and Investment. The Dam Co-ordinator shall take appropriate action to resolve any abnormal conditions. Any changes or defects which could affect the safety of the facility are to be promptly reported to the Design Engineer, as outlined in the Emergency Preparedness Plan (EPP).



**MOUNT POLLEY MINING CORPORATION
MOUNT POLLEY MINE**

TAILINGS FACILITY INSPECTION LOG

DATE: _____
OPERATOR: _____

Location

Checked

Southeast Sediment Pond
Southeast Sediment Pond decant structure
Southeast Sediment Pond pipeline
Southeast Sediment Pond emergency overflow culvert



Tailings Pipeline and T2 Dropbox
Pipeline ditch



Polley Lake Pump Station pipeline
Polley Lake Pump Station fuel system



Perimeter Embankment Downstream
Perimeter Embankment Upstream
Perimeter Embankment Pipeline



Main Embankment Downstream
Main Embankment Upstream
Main Embankment Pipeline



Reclaim Pipeline and Booster Station
Reclaim barge



Mill Site Sump
Mill Site Sump Pump System
Mill Site Emergency overflow culvert



EMERGENCY TELEPHONE NUMBERS

DON INGRAM

**TIM FISCH
DON PARSONS
CHUCK KELLER
RON MARTEL
ERIC LENEVE
GREG SMYTH**

4.2.3 Intermediate Inspections

(i) Civil and Structural

Inspections of the civil and structural works are to be carried out on an annual basis, or as required if abnormal conditions or a particular hazard arises. The inspections shall be performed according to the schedules listed in Table 4.1.

The extent and detail of the Civil Inspections shall be sufficient to assess the integrity and performance of the civil and structural works and shall be carried out by a suitably qualified person. Civil Inspection Checklists are to be completed with appropriate comments and descriptions.

An inspection report summarizing the results of the inspection shall be prepared.

(ii) Mechanical Equipment

Intermediate inspections shall be performed for all the mechanical equipment according to the schedule listed in Table 4.1. Equipment Inspection Checklists are to be used to ensure that appropriate observations are made and abnormal conditions reported.

The extent and detail of the Equipment Inspections shall be sufficient to assess the integrity and performance of the mechanical equipment and shall be carried out by a suitably qualified person. Intermediate Equipment Inspection Checklists are to be completed with appropriate comments and descriptions.

An inspection report summarizing the results of the inspection shall be prepared.



4.2.4 Equipment Tests

(i) Pumps:

Any pumps (including backups) shall be operated or tested on a regular basis. These tests should be carried out prior to reservoir filling.

(ii) Valves:

Valves should be tested twice per year, or as required, to ensure effective operation.

4.2.5 Special Inspections

Special inspections were required during initial reservoir filling and may be required following a major flood, earthquake or other event which may have affected the operation of the equipment or damaged the facilities. Special inspections may also be required to investigate a problem noted during any inspection or review, or to comply with EPP requirements.

4.3 INSTRUMENTATION

Instrumentation is installed at the Tailings Storage Facility to monitor the performance of the embankment and associated structures, and to detect abnormal conditions relevant to dam safety. The instrumentation is to be maintained in a serviceable and operational state and includes the following:

- Piezometers in the foundation soils, embankment drains and embankment fill zones to monitor pore water pressures.
- Individual outlet pipes for the embankment foundation drains for measuring flows and to enable the collection of water quality samples.



- Surface movement monuments to monitor vertical and lateral movement of the earthfill embankments.

Instrumentation records, and any additions or modifications to the instrumentation is the responsibility of the Dam Co-ordinator. All instrumentation is to be clearly marked and buried in trenches to prevent damage, as shown on the Drawings. The frequency of readings for the instrumentation is shown on Table 1.2.

4.4 INCREASED LEVELS OF SURVEILLANCE

Increased levels of surveillance are required during the construction period, during initial reservoir filling, or during or following any major flood, earthquake, or other event which may affect the operation of the facility. Increased site surveillance shall also be initiated whenever immediate on-site observation is required for the following:

- To rapidly evaluate conditions and to initiate operational or remedial measures to ensure the safety of the facility.
- To implement the EPP.
- To monitor unusual operating conditions for future assessments.

The Design Engineer of Record shall be consulted and/or advised in the event that such circumstances arise requiring increased surveillance. The level of increased surveillance shall then be determined in direct consultation with the Design Engineer. In any case, increased site surveillance shall be maintained until the condition posing the safety concern has been assessed and it has been determined that there is no longer a danger to the facility.

Increased site surveillance will be required, but not limited to, the following conditions or circumstances:



(i) During Initial Reservoir Filling

- To review the preparedness for impounding water.

(ii) Floods

- Reservoir levels exceeding the specified maximum flood levels.
- Excessive rise in the reservoir levels.

(iii) Earthquake

- Immediately following a major earthquake.

(iv) Unusual Observations

- Abnormally high piezometric levels.
- Settlement, cracks and/or slumping of the embankment.
- Sinkholes along slope(s) of the embankment.
- Failure or substantial movement of reservoir slopes.
- Slope failure or seepage flows from the embankment slopes.
- Increased or contaminated flow from foundation drain outlet pipes.
- Damage to any component of the facility.



SECTION 5.0 - EMERGENCY PLANNING AND COMMUNICATIONS

DIRECTORY

5.1 GENERAL

The Emergency Preparedness Plan (EPP) facilitates mobilization of manpower and equipment, and allows emergency officials to establish warning and evacuation procedures for the protection of downstream facilities.

Due to the remote location of the Mount Polley Mine, there is no increased potential for loss of life to the public in the event of failure of the Tailings Storage Facility. As such, the primary intent of the EPP is to minimize environmental impacts associated with failure of the facility and to minimize costs for remediation during operations. At closure the tailings surface will be revegetated and a wetlands area will be constructed, with a spillway to re-establish original flows.

Note: Details of the EPP will be finalized during the first year of operations and will form part of the overall emergency plan for the Mine.

5.2 EMERGENCY PLAN

The operation of the Tailings Storage Facility is the responsibility of the Dam Co-ordinator. During an emergency any decisions regarding the procedures to be carried out for the facility will be made by the Dam Co-ordinator. In the event that the Dam Co-ordinator is not available, responsibility is then delegated to the Dam Operator, General Foreman or other Supervisory Personnel.

The Dam Co-ordinator shall be responsible for briefing the Dam Operator, General Foreman and all Supervisory Personnel on the EPP, including relevant emergency procedures and protocol. The EPP shall be distributed as follows:

- One (1) copy for the Dam Co-ordinator's Office
- One (1) copy for the Office (near office radio and telephone)
- One (1) copy for the Dam Operator (Mill Shifter's Office)



- Three (3) copies for the Comptroller of Water Rights
- One (1) copy for the Regional Water Manager (Williams Lake, B.C.)
- Two (2) copies for the Director of the EPP
- One (1) copy for the Manager of MELP, Water Branch
- One (1) copy for the Design Engineer of Record.

5.3 EMERGENCY SITUATIONS AND RESPONSES

The emergency situations and corresponding responses and action measures to be taken for the Tailings Storage Facility are listed in Table 5.1. This list is subject to change and should be reviewed following the first year of operations.

5.4 COMMUNICATION SYSTEMS AND DIRECTORIES

The communication systems include a listing of all relevant Government Ministries, EPP Personnel, Police authorities and emergency assistance agencies which the Dam Co-ordinator and his supervisory office may need to contact in the event of an emergency. The Communications Directory is included in Appendix D.

5.5 CONSTRUCTION EQUIPMENT AND MATERIALS

Construction equipment will be available at the Mine, approximately 5 km from the Tailings Storage Facility. The equipment will include, but will not be limited to, an excavator, a grader and a bulldozer. The equipment will be used to repair any slumped or scoured areas along embankment slopes, or to construct key cuts, drains or fills, etc.

Materials will be available both at the Tailings Storage Facility and at the Mine for use in repairing or remediating any damaged areas. Local stockpiles of riprap, glacial till and sand and gravel will be available for periodic maintenance or for emergency use. Supplies of cement, plastic sheeting, filter fabric, miscellaneous pipework and spare parts etc. will be available at the Mine.



The tailings solids can also be used for mitigating and controlling seepage losses through foundation materials or fill zones if necessary.

5.6 REVIEWS

A review of the Emergency Plan shall be administered by the Dam Co-ordinator on an annual basis as follows:

- Names and phone numbers of designated officials shall be verified and updated as required.
- All relevant personnel shall be given a refresher briefing on the EPP and routine inspection procedures, particularly with respect to any changes to the EPP or the inspection procedures.
- The EPP shall be reviewed for adequacy following each inspection by the Ministry of Environment, Lands and Parks, Water Management Branch (once every 2 years, or as required).



SECTION 6.0 - TAILINGS MANAGEMENT SYSTEM COMPONENTS

6.1 TAILINGS BASIN

6.1.1 General Description

The tailings basin is located approximately 5 km southeast of the Mine. The basin provides containment of tailings by earthfill embankments on three sides and by natural topography on the northwest side. Containment of process water within the basin is enhanced by a low permeability glacial till liner which typically has a permeability less than 10^{-6} cm/sec.

Clearing, grubbing and topsoil stripping were completed in areas affected by construction, such as embankment footprints, seepage collection ponds, basin liners, borrow areas, reclaim barge channel and road alignments.

6.1.2 Basin Filling Characteristics

The storage characteristics and filling rate for the tailings basin are shown on Figure 6.1. The projected rate at which the basin will fill, combined with storage provisions for make-up and storm water determine the rate of rise for the embankment. The anticipated filling schedule and staged construction sequence is shown on Figure 6.2.

Adjustments to the basin filling curve may be required after operational procedures are established due to variation between actual and projected mill throughput rates and in-situ tailings density. Any adjustments may change the rate of rise for the tailings and embankments. The tailings deposition strategy is described in Section 6.2.

6.1.3 Basin Liners

Most of the tailings basin is blanketed by naturally occurring low permeability glacial till that functions as an in-situ soil liner. Some areas near the Main



Embankment have a thin surficial glacial till cover (less than 2 metres) and are underlain by glaciofluvial/glaciolacustrine sediments. In these areas, the Lower and Upper Basin liners were constructed using imported glacial till which was placed and compacted in lifts. Additional material was placed as a frost protection layer on any areas which were likely to be exposed to freezing temperatures over the winter.

6.1.4 Monitoring Requirements

The tailings basin filling rate (tailings and water) is an important factor when evaluating the performance of the facility. The filling rate is also used as the basis for on-going design of future embankment raises. The pond elevation, depth, area and volume must be closely monitored for the following reasons:

- To ensure that there is a sufficient volume of water available as make-up water while the pond is frozen and precipitation is at a minimum.
- To ensure that the maximum make-up water volume (2.5 million cubic metres) is not exceeded so that there is adequate storage capacity for tailings until construction of the next embankment raise.
- To enable monitoring of the supernatant pond depth/area/volume so that tailings characteristics such as dry density can be determined.
- To monitor water recoveries.
- To enable the correlation of the pond level with other data, such as the piezometer pressures and drain flow quantities.

The filling rate can be monitored using the pond level and the depth/area/capacity curve for the facility. The pond level at the reclaim barge should be recorded on a daily basis on the tailings operator's daily record sheet. The volume of the supernatant pond should be determined semi-annually, once



before freeze-up and once before starting to pump water from Polley Lake. The volume can be determined by sounding the pond depths from a boat.

6.1.5 On-going Construction

Additional clearing, grubbing and topsoil stripping will be required for areas affected by future construction programs. The procedures established during Stage 1a/1b construction should be followed during future work programs.

The Basin Liners were delineated from exploration trenches. Additional areas that require a basin liner may be identified during future construction programs, as the basin expands. Exploration trenches should also be used to delineate these areas and the liner materials should be placed as per the Drawings. All exploration trenches must be backfilled in compacted lifts using low permeability soils. A mound of glacial till with a minimum thickness of 750 mm should be placed above all backfilled exploration trenches. Additional material for a frost protection layer will be required if any liner areas will be exposed over the winter. Detailed design drawings and Specifications will be required for each on-going construction phase.

6.2 TAILINGS DEPOSITION

6.2.1 Deposition Strategy

The main objectives of the tailings deposition strategy are:

- To maximize the storage capacity of the facility.
- To maintain the supernatant pond in the area of the reclaim barge so as to maximize the amount of clean process water available for reclaim.
- To establish free draining tailings beaches adjacent to the embankments to facilitate future embankment raises and to enhance embankment stability.



These objectives will be met by discharging tailings through a series of valved offtakes (spigots) which will distribute the total flow over a significant length. Initial deposition will take place from the Main Embankment using a movable discharge section placed to cover the basin liners and to fill the lowest area of the tailings basin. The movable discharge section will be relocated as required until a tailings beach is established over the length of the embankment.

Tailings will be discharged into make-up water already stored in the facility at start-up (approx. El. 926.5 metres). A beach will gradually develop. Discharge from the Main Embankment must be continued until the beach is established over the full length of the Main Embankment. Following this, deposition can commence from the Perimeter Embankment.

Sequential rotation of tailings discharge will be started after beaches have developed over the full length of the Perimeter and Main Embankments. This will be accomplished by regularly relocating the movable discharge section and allowing inactive areas of the tailings beach to partially dry and consolidate. Low flows and sanding in the tailings pipeline are avoided because all of the discharge is from a small group of closely spaced embankment offtakes located at the end of the pipeline.

6.2.2 Tailings Pipework

Pipework for the Tailings Storage Facility has been designed for an average annual throughput rate of 6.5 million tonnes/year (approx. 17,808 tonnes/day) at a solids content of 35 percent, together with up to 500 l/sec of surface runoff from the Millsite Sump and Southeast Sediment Pond.

Tailings will be delivered to the Tailings Storage Facility by gravity as a slurry from the concentrator through a single HDPE pipeline. HDPE pipe can accommodate requirements for changes in the length, line and grade of the pipeline route and has good abrasion resistance and low installation cost. A concrete tailings dropbox (T2) with a high level overflow is included for surge



protection and to allow additional surface runoff and overflow from the reclaim booster pump station to be added into the tailings pipeline. Two tailings pipeline outlet stubs are provided at the dropbox. One is a spare, which has been sealed with a blind flange. It will be used when an additional or alternate tailings pipeline is required.

The tailings pipeline is approximately 7000 metres long. It has been laid in the pipe containment channel adjacent to the tailings access road and along the inside crest of the Perimeter and Main Embankments. The tailings pipeline has a variable downhill slope to ensure drainage, with maximum and minimum grades of 8.0 and 0.5 percent, respectively. The pipeline will be flat (0 percent) from the start of the Perimeter Embankment to the end of the Main Embankment. The pipeline includes the following components:

- Approximately 200 metres of 30 inch (762 mm) DR15.5 HDPE exiting the concentrator.
- Approximately 1,420 metres of 22 inch (559 mm) DR17 HDPE to the T2 Dropbox.
- 80 metres of 30 inch (762 mm) DR15.5 HDPE exiting the T2 Dropbox.
- Approximately 5,300 metres of 24 inch (610 mm) DR15.5 HDPE to the end of the Main Embankment.

On-going monitoring of the tailings pipework is required and modifications will be implemented as necessary.

Tailings will be discharged from the Perimeter and Main Embankments through a series of spigot offtakes, as discussed below.

- Mark 1 (M1) dump valves - There are two M1 dump valves. One is located at the northwest corner of the Tailings Storage Facility and the other is located between the Perimeter and Main Embankments. These



dump valves consist of a 24 inch (610 mm) rubber lined steel tee which can be isolated by two 24 inch knife gate valves. The dump valves enable 100 percent of the tailings flows to be discharged directly into the facility from a single point. These offtakes may be required prior to start-up (for runoff) and for selective basin filling at start-up, when the tailings pipeline on the embankments needs to be flushed, repaired or relocated or when normal spigotted discharge cannot be carried out.

- Movable Discharge Section - A movable discharge section will be used for tailings discharge. The movable discharge section consists of six 6 inch (150 mm) HDPE offtakes evenly spaced over approx. 200 metres. A section of heavy duty hose (Material Handling Hose) is attached to each offtake and discharges into a sacrificial section of 18 inch (457 mm) HDPE pipe which is laid down the upstream embankment slope and is anchored to the embankment fill. Tailings will discharge through the end of the pipe or through notches cut at 1 metre intervals up this pipe. The movable discharge section will be used at start-up in place of the Mark 2, 3 and 4 offtakes (discussed below).
- Mark 2 (M2) offtakes - The original design of the discharge system included M2 offtakes evenly spaced between the Mark 3 offtakes. The M2 offtakes consist of a pipe saddle with a 6 inch (150 mm) HDPE offtake and pinch valve. The M2 offtakes are identical to the M3 offtakes. These M2 offtakes will be added in the future to increase operational flexibility and to improve tailings beach development.
- Mark 3 (M3) offtakes - The original design of the discharge system included a full diameter 24 inch (610 mm) knife gate valve (KGV) located immediately downstream of a group of M2 offtakes. This combination of an M2 offtake and a knife gate valve was designated M3. Closure of the M3 knife gate valve allowed tailings to be discharged from the group of M2 offtakes immediately upstream of the M3 knife gate valve. The movable discharge section (to be used instead of the M3 offtakes) can be placed at the flanged connections

located at the original M3 locations. The M3 offtakes will be added in the future to increase operational flexibility and to improve tailings beach development.

- Mark 4 (M4) Pipeline Termination – The original design of the discharge system included a full diameter discharge (M4) provided for flushing the pipeline at its final downstream end. The M4 pipeline termination will not be required when the movable discharge section is in use because the last offtake will be at the pipeline termination. If the discharge system is revised to include the M2 and M3 offtakes the M4 pipeline termination may be required.

The pipeline is restrained from excessive movement by anchor blocks, pipe clamps, guide posts and local burial. The location and number of restraints was determined during installation and should be modified as required, based on operating experience.

6.2.3 Operating Procedures

6.2.3.1 Tailings Pipeline and T2 Dropbox

The T2 Dropbox has been modified to improve flow in the tailings pipeline. The tailings pipeline now bypasses the T2 Dropbox. However, the pipeline is connected to the dropbox by a bifurcation located downstream of the dropbox. The function of the T2 Dropbox is therefore for surge protection and overflow control, and to provide an inlet for surface runoff, as discussed in Section 6.2.3.2.

The tailings pipeline and T2 Dropbox operate without external adjustments.

6.2.3.2 Surface Runoff

Additional water from surface runoff is collected at two locations. The first source is runoff from the Millsite. Water collected in the Millsite Sump is



pumped into the 30 inch tailings pipeline immediately adjacent to the sump. In the future, water will be directed into the 22 inch tailings line through a Tee located just downstream of the transition from the 30 inch DR 15.5 to 22 inch DR 17 HDPE pipe.

The second source of surface runoff water is the Southeast Sediment Pond. Runoff from the waste dump flows into this pond and is then directed to the T2 Dropbox or the Reclaim Booster Pumpstation Sump.

Operation of the Millsite Sump and Southeast Sediment Pond is discussed in Section 6.6.

6.2.3.3 Tailings Discharge Control

Tailings discharge can be controlled by adjusting the number and location of offtakes. Flow through individual offtakes can be controlled by clamping the Material Handling Hose or by installing a blind flange on the offtake. Any offtakes which are not used must be located at the front end of the discharge section to avoid sanding. The optimum number of offtakes will be determined based on performance of the system, but initial deposition should utilize all six offtakes. Some experimentation with the spigotting system may be required before optimal configurations are determined.

Discharge from each spigot is carried down the upstream face of the embankment through a section of material handling hose into a sacrificial HDPE pipe. Tailings will flow through the end of the pipe until it is submerged by the accreting tailings surface. Tailings will then exit from the pipe through a series of slots in the pipe crown. The slots also allow air entry into the pipeline, thereby mitigating surge and vacuum conditions that might otherwise develop.

When the M2 and M3 offtakes are installed at a later date, the general location of tailings discharge will be controlled by opening and closing the M3 knife gate valves. These valves must be left either fully open or fully closed to avoid damage to them by abrasion.



The flow of tailings from the header offtakes (M2 and M3) is controlled by adjusting the pinch valves on the 6 inch (150 mm) HDPE offtake lines. Similar to the movable discharge section, the discharge from each spigot is carried down the face in a sacrificial HDPE pipe with tailings discharged through a series of holes in the crown of the pipe. For the full discharge system, with all M2 and M3 offtakes installed, only the group of embankment offtakes located between the two adjacent M3 knife gate valves in operation should be used at a time. The location or distribution can be varied by closing individual pinch valves or selected knife gate valves on the headers. As above, some experimentation with the spigotting system may be required before optimal configurations are determined.

During pipeline filling and draining, air may enter or leave the system through vent holes in the pipeline at the M1 dump valves, open offtakes, the vent at the T2 Dropbox or the M4 tailings header pipeline termination (if installed).

6.2.3.4 General Rules

A key to the satisfactory operation of the Tailings Storage Facility is an awareness of several operating rules:

- Never leave the tailings pipeline with all valves closed. Permanent blockage due to sanding may occur, with overflow at the T2 Dropbox. In addition, damage may occur to pipework components due to high pressures that can develop. There must be an open pathway for tailings to exit before the tailings system is filled or spigots are relocated.
- Inspect the tailings pipeline system on a daily basis. Repairs or adjustments must be made as soon as possible to prevent future problems and to minimize the potential for concentrator shutdown.
- If all M2 and M3 offtakes are installed, sequence tailings discharge by moving downstream. Generally, tailings discharge should be moved to



offtakes in the downstream direction. This enhances draining and is particularly important under freezing conditions. The pipeline must be fully flushed prior to relocating the discharge upstream.

All offtakes downstream of the knife gate valve below the section in operation should remain open to allow the unused section of the pipeline to drain. When a new section is put into operation, the offtake valves in the new section must first be opened and flow established prior to shutting off the offtakes in the section previously in operation.

- Maintain non-erosive laminar flow over the tailings beaches. Turbulent, highly erosive flow results in poor solid/liquid separation of the tailings. Spigots causing problems should be closed or throttled. Additional spigots should be opened or installed as required.
- Flush the pipeline prior to shutdown or relocation. The pipeline should be fully flushed by discharging water through the pipeline and allowing it to drain. No operator intervention is required during shutdown.
- Reduce the number of discharge points in use during prolonged cold spells. More concentrated discharge may be required if freezing problems are encountered or if access becomes difficult.

6.2.3.5 Emergency Procedures

Regular inspection of the pipeline with occasional disassembly will ensure that most problems are identified before emergency situations develop. A rupture or leak may continue for many hours before it is observed and local erosion of the pipe containment channel or embankment fill may occur. There are two possible emergency situations associated with the tailings pipework system:



Rupture of the tailings system.

The most likely location for rupture is at valves, joints or fittings within the pipeline or at connections to structures. If a rupture occurs, it may be possible to by-pass it with a temporary pipe, or to continue operations by allowing controlled spillage while repairs are being made. Under some circumstances, shutdown may be required.

Blockage of the tailings system.

Blockage may result from a number of causes:

- Foreign material in the system.
- Failure to open enough valves to allow full flow.
- Local low flow velocities resulting in sanding of the pipeline.
- Blockage of spigots due to insufficient number of discharge holes in the outlet pipe.
- Vacuum collapse of 6 inch (150 mm) spigot pipes.
- Failure of pipeline component (rubber gasket, sleeve, etc.).

Should a blockage occur in the tailings line, it may result in the flow of tailings from the T2 Dropbox to the overflow pond if tailings production in the concentrator is not stopped. The level sensors in the dropbox will warn the operators if the dropbox is going to spill. The overflow pond is sized for the volume of tailings in the pipe between the concentrator and the dropbox. If this volume is surpassed, the tailings will flow out of the overflow pond into the pipe containment channel and will move further downstream.

Should blockage occur in the spigot pipework, flow will be taken up by other spigots that are open. The blocked spigot may become completely sanded in and it may be necessary to remove it from service for flushing or replacement.

If a blockage occurs, these procedures should be followed:



- If possible, commence discharge from another upstream location.
- Carry out all necessary repairs or remedial measures.
- Determine the cause of the blockage and take action to return the affected pipeline to service.
- Recommence normal operations.

As above, a blockage may possibly be by-passed with a temporary pipe and operations continued while repairs are being made. Under some circumstances, shutdown of the concentrator may be required.

6.2.4 Monitoring Requirements

A daily tailings operator record sheet will be developed on site. This sheet should include the following information for the tailings system:

- Tonnes of tailings solids discharged to the Tailings Storage Facility.
- Average solids content (percent), or solids pulp density.
- Tailings discharge locations, by spigot numbers or chainage.
- Duration of any shutdown.
- Elevation of the tailings supernatant pond at the reclaim barge.
- Extent of beach development, including location (by chainage) and width.

6.2.5 Inspection and Maintenance

During initial operations, careful inspection and observation of the pipework components is essential. Most inspection and maintenance activities are observational and the following minimum requirements are recommended:

Daily

- Inspect the Millsite Sump and Southeast Sediment Pond, record water levels and note which inlet pipes are in operation (see Section 6.6).



- Inspect the operation of the T2 Dropbox and record any operating problems.
- Inspect the tailings and reclaim pipelines in the pipe containment channel.
- Record if the tailings discharge is through the dump valve(s), spigots, or from the end of the pipeline. Note and record which spigots are in operation at the Tailings Storage Facility.
- Inspect the spigots for blockage, rupture, vacuum collapse, leaks, excessive movement, pinching, etc. Record any obvious operating problems.
- Note where the system is snorting or whistling or where any flattening or kinking of the pipeline is observed.
- Note any areas of excessive erosion and relocate discharge as required. Select the best location for relocation by observing tailings beach and pond locations.
- Note the water clarity in the basin.
- Record the monitoring requirements (throughput, solids content etc.) as above.

Monthly

- For a short period, allow maximum discharge through the M1 dump valve(s) and the end of the pipeline (M4 header pipeline termination if installed) to flush out any accumulated debris.
- Review beach development and implement modifications to the tailings discharge as required.



Annually (or During Scheduled Concentrator Shutdown)

- Inspect all pipework, bends and fittings for wear or abrasion. Replace as required.
- Remove accumulated debris from valves, reducers and offtakes.
- Carry out maintenance as recommended by fitting and valve suppliers.
- Review beach development and implement modifications to the tailings discharge as required.

Sample record sheets and an annual inspection checklist are included in Appendix C. These sheets may be modified in conjunction with Mine personnel.

6.3 TAILINGS EMBANKMENTS

6.3.1 General Description

The Tailings Storage Facility has been designed with zoned earthfill embankments to an ultimate height of approx. 53 metres. The embankments include vertical chimney drains and upstream toe drains to allow the controlled removal of process water from the tailings. The crest length at the final stage of development at El. 965 metres will be about 4,400 metres. The embankment will be constructed in stages using a combination of local borrow materials and mine waste to maintain the minimum freeboard requirements above the rising tailings surface.

6.3.2 Initial Construction

The initial construction program comprised the Stage 1a/1b Main and Perimeter Embankments to El. 934 metres using the following materials:



- The core (Zone S) and downstream zones (Zone B) were constructed from locally borrowed glacial till. Three borrow areas were utilized, one within the tailings basin (Original Borrow Area) and two downstream of the Main Embankment left abutment (Alternate and Future Borrow Areas).
- The chimney drain components were constructed using processed rock, crushed and screened at the Millsite and at the rock borrow area. The materials were hauled to the embankment for placement.
- Foundation drains were constructed using processed rock, crushed and screened at the Millsite and trucked to the embankment.
- Vibrating wire piezometers are installed in the foundation soils, the drains and in the fill to allow monitoring of the embankment pore pressures.

The core zone (Zone S) is connected to a low permeability glacial till liner within the tailings basin. The glacial till liner exists naturally and was constructed in areas where the natural thickness is less than 2 metres. A foundation drain system was installed under the downstream zone (Zone B) of the Main Embankment. The foundation drains discharge into the Seepage Collection Pond, as discussed in Section 6.4.

The Stage 1a/1b embankments will provide sufficient storage volume and suitable freeboard for tailings for approximately one year of production. There is also capacity to store the 1997 spring freshet, stormwater, make-up water from the Polley Lake pump station and additional surface runoff water from the Millsite Sump and Southeast Sediment Pond.



6.3.3 Embankment Drains

6.3.3.1 General Description

The embankments have drains that help to collect and convey water from the foundation soils and from the tailings mass to the seepage collection ponds. The embankment drains include a foundation drain system (Main Embankment only) and a chimney drain system. Upstream toe drains will be installed during future construction programs.

6.3.3.2 Foundation Drains

A system of four foundation drains (FD-1 to FD-4) was installed in the foundation soils at the Main Embankment. The foundation drains comprise 4 inch (100 mm) perforated CPT pipes set in coarse gravel that is surrounded by filter fabric. The gravel was obtained by crushing and screening rock at the Millsite. The foundation drains are connected to the Drain Monitoring Sump with solid 6 inch (150 mm) HDPE pipes that enable monitoring of flows and water clarity for each drain.

6.3.3.3 Chimney Drain System

A chimney drain system was installed in Zone B at the Main Embankment. The system comprises a vertical chimney drain with a longitudinal (collector) drain and three outlet (conveyance) drains. The chimney drain system for Stage 1a/1b extends from El. 915.7 metres to El. 929 metres. The chimney drain was constructed using filter sand obtained from crushing and screening rock at the Millsite and at the rock borrow area. The longitudinal and outlet drains include 6 inch (150 mm) perforated CPT pipes set in coarse gravel that is surrounded by filter fabric. The gravel and filter fabric are encapsulated by filter sand. The outlet drains currently daylight on the downstream face of the Stage 1a/1b Main Embankment. The outlet drains will be extended to the Drain Monitoring Sump during Stage 2 construction with solid 6 inch (150

mm) HDPE pipes to enable monitoring of flows and water clarity for each drain.

The Perimeter Embankment chimney drain system will be installed during Stage 2 construction in 1998. The South Embankment chimney drain system will be installed during Stage 3 Construction in 2000.

6.3.4 On-going Construction

6.3.4.1 Modified Centreline Construction

The Main and Perimeter Embankments will be expanded using the modified centreline construction method after a review of the first year of operations. Modified centreline construction is characterized by the placement of embankment fill zones on drained tailings adjacent to the upstream face of the embankment. The South Embankment will also be built using the modified centreline construction method.

A detailed review of all monitoring data is required prior to issuing design drawings for each stage of construction. For all future construction programs, design drawings, Technical Specifications and a Site Inspection Manual must be prepared and supervision of the construction must be carried out by a suitably qualified Engineer.

6.3.4.2 Selection of Fill Materials

On-going construction of the embankments will be carried out as a part of mine development. The current concept is that the embankments will be zoned using the following materials:

- Glacial till for Zone S, which is the core zone.
- Glacial till for Zone B, which is the downstream zone for Stage 1a/1b and for the upstream side of the embankments.



- Random fill for Zone C, which is the downstream zone for additional raises. Random fill may include waste rock provided from open pit mine development.
- Select waste rock for the transition zone.
- Waste rock or sandy gravel for the coarse bearing layer, on which the first upstream raise will be placed.
- Filter Sand for the extension of the Chimney Drains and installation of the Upstream Toe Drains.
- Drain Gravel for the Chimney and Upstream Toe Drains.
- Cycloned sand may be produced and could be incorporated on the upstream side of the embankments to enhance drainage.

Glacial till will be obtained from local borrow areas. Preference is to be given to suitable areas within the basin in order to minimize haul distances and to increase the storage capacity of the facility. Random fill will consist of glacial till or other approved materials. Waste rock from the mine may be used as random fill for Zone C in the future. Zone T, Filter Sand and Drain Gravel may be obtained from processing waste rock at the mine or from borrow areas containing suitable materials.

6.3.4.3 Construction Procedures

All on-going construction activities will require careful attention to detail and thorough inspection to ensure that the requirements for quality control are fulfilled. To achieve the design objectives, all work must be carried out to the specifications and standards established for Stage 1a/1b construction and in full accordance with the provisions for testing and inspections contained in the Site Inspection Manual.



6.3.5 Instrumentation and Monitoring

6.3.5.1 General Description

Vibrating wire piezometers, survey monuments, drain monitoring sumps and groundwater monitoring wells have been provided for monitoring the facility.

Piezometers - A total of 22 vibrating wire piezometers were installed on three instrumentation planes (A, B and C) at the Main Embankment during Stage 1a/1b construction.

- 6 piezometers were installed in boreholes (two at each plane) to monitor pore pressures in the foundation soils.
- 5 piezometers were installed in the foundation drains beneath Zone B to monitor the performance of the drains.
- 3 piezometers were installed at the base of the chimney drain (one at each plane) to monitor its performance.
- 8 piezometers were installed in glacial till fill for long term monitoring of embankment pore pressures.

One piezometer has been installed in fill on Plane D at the Perimeter Embankment.

All piezometers and readout equipment supplied for Stage 1a/1b were supplied by SINCO. The piezometers are Model No. 52611030 with a 100 psi maximum reading capability. Additional piezometers will be installed in the embankment fill materials and drain zones during future construction programs.



The piezometer leads will be located on the Stage 1b embankment crest. They will be extended in trenches to the Instrumentation Monitoring Huts after full downstream foundation preparation is completed during Stage 2 construction. The leads will be hard wired into SINCO terminal panels. The piezometers are monitored using a portable readout box, SINCO Model No. 52611900.

Piezometer readings are recorded manually and pore pressures are calculated using spread sheets set up by Knight Piésold. Currently, the weekly readings are sent by fax for input and review by Knight Piésold. In the future, the data will be input on site and summaries will be sent to Knight Piésold for review.

Drain Monitoring Sumps - The foundation drains for the Stage 1b Main Embankment were installed with separate solid HDPE conveyance pipes that enable the monitoring of flow rates in the Drain Monitoring Sumps. Water clarity can also be observed and samples can be collected for water quality.

Survey Monuments - A survey monument has been installed near the downstream shoulder of the Stage 1b Main Embankment crest at each of the three Main Embankment instrumentation planes. The monuments provide reference points to monitor any displacement of the embankment from its initial position.

New survey monuments are to be installed at each instrumentation plane for each future embankment raise. Survey control points were established during Stage 1a/1b construction.

Monitoring Wells - Monitoring wells have been installed around the perimeter of the Tailings Storage Facility, as shown on Figure 6.3. The monitoring requirements for these wells are described in the Knight Piésold document "Manual on Sampling and Handling Guidelines for Determination of Groundwater Quality" (Knight Piésold Ref. No. 1625/5).



Details of the initial instrument locations and installations are shown on Drawing Nos. 1625.220 and 1625.221. Additional instrumentation planes will be added as the embankments are extended.

6.3.5.2 Monitoring Requirements

Vibrating Wire Piezometers

A summary of the Stage 1b vibrating wire piezometers is presented on Table 6.1 with trigger levels, which if exceeded, will require investigation and possible contingency or remedial actions.

The piezometer specifications and details, including the calculations used to determine the pore pressures, are available at the Mine. The spreadsheet set up to monitor the piezometers is based on the calibrations provided by the manufacturer. A sample piezometer monitoring sheet is included in Appendix C.

Survey Monuments and Control Points

A summary of the original survey data for the three Main Embankment survey monuments is presented on Table 6.2. A sample survey monument monitoring sheet is included in Appendix C. The procedure for calculating embankment movement is also shown on this sheet. Trigger levels and the required appropriate actions are summarized on Table 6.3.

Survey control points established for Stage 1a/1b construction will act as survey control for all features at the Tailings Storage Facility, including staff gauges for monitoring the pond level and the survey monuments on the embankment. New survey control points will be established as required.



Drain Flows

A sample drain flow monitoring sheet is included in Appendix C. This sheet has a column for each of the four Main Embankment foundation drains. Total flows are taken as the sum of the four drains. There is also a column for water clarity.

The above listed tables and sheets will be reviewed and updated as part of the ongoing design for each embankment raise.

6.3.5.3 Monitoring Schedule

The following schedule for monitoring of the tailings embankments is a minimum requirement (included on Table 1.2):

Weekly (after fresh water storage commences)

- Read piezometers and record data. Include barometric pressure.
- Monitor flow rates from conveyance pipes in Drain Monitoring Sump and comment on water clarity while monitoring drain flow rates.
- Record flow rates from the Chimney Drain outlet drains at the Main Embankment.
- Record water levels in monitoring wells GW96-9 and MP89-234.

Monthly

- Compile all piezometer data, develop graphical plots and have a qualified Engineer review all data. Forward a brief report to the Design Engineer, including the data and plots.



- Compile the Foundation Drain flow rate data from the conveyance pipes in the Drain Monitoring Sump. Also, comment on water clarity. Forward a brief report to the Design Engineer.
- Compile the flow rate data from the Chimney Drain outlets. Also, comment on water clarity. Forward a brief report to the Design Engineer.

Quarterly

- Complete a survey of all movement monuments and calculate displacements (if any). Compile the survey data and forward a copy to the Design Engineer. Also, check the survey control points established during Stage 1a/1b construction and add new control points, as required.
- Record water levels in all monitoring wells. Compile the data, develop graphical plots and have a qualified Engineer review all data. Forward a brief report to the Design Engineer, including the data and plots.
- Determine the extent of the tailings beach development and forward a brief report to the Design Engineer.

Annually

- Review the performance of all piezometers and arrange to replace any essential units that have failed.

6.3.6 Inspection and Maintenance

The following schedule for inspection and maintenance of the tailings embankments is a minimum requirement:



Daily

- Inspect the upstream face of the embankment for excessive erosion caused by tailings discharge or by the discharge of water pumped back from the Seepage Collection Ponds.
- Relocate the tailings discharge points, or place additional protective riprap as necessary.
- Inspect the outlets from the chimney drain. Note any flows.

Weekly or Following a Major Storm

- Inspect the entire embankment along both crests and along the downstream toe for any signs of erosion or damage.

Annually

- Annual inspection of the embankment and review of the instrumentation monitoring by a Professional Engineer familiar with the design and operating criteria for the facility and the on-going embankment construction requirements.
- Annual inspection should be included in a general inspection of the Tailings Storage Facility to assess overall performance.

After a Significant Earthquake

- Follow the contingency procedures of Section 6.8.
- Arrange for an inspection of the facility by a Registered Professional Engineer familiar with the project.



6.4 SEEPAGE COLLECTION PONDS

6.4.1 General Description

Seepage collection ponds are located beyond the final downstream toe of the Main and Perimeter Embankments. Foundation and Chimney Drain flows are collected, along with local runoff and runoff diverted from disturbed areas downstream of the embankments. Flows are conveyed from the drain monitoring sumps through an 8 inch (200 mm) solid HDPE pipe into the seepage collection ponds. The water is pumped over the embankments, back into the Tailings Storage Facility.

6.4.2 System Requirements

The Seepage Collection Pond storage capacities are summarized below.

The Main Embankment Seepage Collection Pond has a storage capacity of 36,000 cubic metres (to the invert of the 450 mm overflow culverts). It has a dead storage of 10,500 cubic metres below the invert of the seepage recycle sump inlet pipe and a maximum operating storage volume of 25,500 cubic metres. The depth/capacity curve is shown on Drawing No. 1625.214.

The Perimeter Embankment seepage collection pond has a maximum storage capacity of 5,000 cubic metres below the maximum operating level of El. 928 metres. The dead storage is 1,000 cubic metres and the maximum operating storage volume is 4,000 cubic metres. An overflow culvert has been installed. The depth/capacity curve is shown on Drawing No. 1625.214.

Recycle pumps inside the sumps control the water level in the seepage collection ponds. Level sensors control the pumping frequency. Normally, only one pump will be operating. The pump systems were designed by Others. Appropriate Specifications, Operating Manuals, etc. are available at the Mine.



The pumps discharge into 6 inch (150 mm) HDPE pipes which are extended over the embankments. The pressure ratings for the HDPE pipes are DR17 at the Main Embankment and DR 26 at the Perimeter Embankment. The discharge pipes will need to be moved for each future embankment raise.

Provision is made in the seepage recycle sumps for surge flow and for pipeline drainage. Pipeline drainage will normally only be required during freezing conditions.

6.4.3 Operating Procedures

The operating procedures for the seepage recycle sumps will be established by the Mine. Supervision required to operate the seepage collection ponds and recycle sumps is expected to be minimal.

6.4.4 Monitoring Requirements

The following are minimum requirements for the Seepage Collection Ponds:

- The pond levels must be recorded on a regular basis to ensure that the levels are low and there is no risk of discharge through the overflow culverts. Also, the level must be kept low so that the drain flows can be monitored. Daily monitoring of the pond levels is recommended during the spring freshet and high rainfall storm events.
- Record the average recycle sump pumpback flow rates on a weekly basis. Compile the pumpback data from the recycle sumps and forward a brief report to the Design Engineer on an annual basis.
- Confirm daily that the power supply for the pumps is in working condition. If the power supply is interrupted, the operators must monitor the pond levels more closely to ensure that process water is not released through the overflow culverts. Portable pumps must be used to recycle the process water as required.



6.4.5 Inspection and Maintenance

Routine inspection and maintenance of the recycle pumps should be as per the manufacturers' recommendations. Water levels and pump settings are to conform to all manufacturers' recommendations, including pump cycle frequency.

The discharge pipelines should be inspected on a monthly basis to ensure that the systems drain when the pumps are stopped. All valves should be checked and confirmation made that they are in working order, especially during freezing periods.

6.5 RECLAIM SYSTEM

6.5.1 General Description

Water accumulates in the Tailings Storage Facility as the tailings settle and consolidate. Additional input includes runoff from within the tailings catchment area and runoff diverted to the facility. Most of the process water for the mill is provided by recycling this water from a floating barge pumpstation located in an excavated channel in the Tailings Storage Facility. A booster pumpstation is located approximately at the midpoint on the hydraulic profile of the pipeline. The pump systems for the reclaim barge and booster pump stations were designed by Others.

For an annual mill throughput rate of 6.5 million tonnes, the average daily throughput is 17,808 tonnes/day. At 35 percent solids, the milling process requires water at the rate of 7,800 US gpm. The reclaim system has been designed for a flow of 8,000 US gpm.

Reclaim water will be pumped from the barge to the mill in a 24 inch (610 mm) pipeline in two steps, as follows:



- From the barge to the booster pumpstation - The 24 inch reclaim pipeline has approximately 300 m of steel pipe leaving the barge, with various sections of 24 inch HDPE up to the booster pumpstation. The DR (dimensional ratio) of the HDPE pipe increases uphill as the pressure head reduces.
- From the booster pumpstation to the mill - The 24 inch pipeline is comprised of various sections of 24 inch HDPE from the booster pumpstation to the mill. As for the lower section, the DR (dimensional ratio) of the HDPE pipe increases uphill as the pressure head reduces. There is no steel pipe on this section.

The barge is located in a channel excavated adjacent to the access road. The pump on the barge is connected to a ball joint on the access road via a 40 foot long 24 inch steel pipeline. The ball joint has a maximum operating range of 15 degrees.

As the water level in the Tailings Storage Facility rises (and with it the barge), the pitch of the 40 foot steel pipe will flatten as it approaches the level of the ball joint. Before the ball joint is inundated, the barge, ball joint and the 40 foot steel pipe will need to be relocated to a new ramp at a higher elevation. The 40 foot steel pipe will then be reconnected to the on-shore steel pipeline which will need to be shortened by the removal of some steel pipe sections at the Victaulic couplings. The sections of the steel pipe which are removed when the pipe is shortened will need to be added to the uphill end of the steel pipe such that the 300 foot steel pipe length is always maintained. The 24 inch (610 mm) HDPE pipe will need to be shortened to accommodate this.

The ball joint and ramp configuration will require relocation at three metre elevation increments. Additional access ramps will be constructed as required. The reclaim pipeline will be set on the access road and fixed in place using anchor blocks, as shown on Drawing No. 1625.223.

The barge (by Others) will be provided with an access walkway, a heated enclosure, flow meter(s), pressure sensors, de-icing piping and visual alarms. A drain valve on the barge will allow the entire reclaim pipeline to be drained if required for maintenance, for barge relocation, or during a prolonged shutdown under extreme cold conditions. Drainage will be directed to the pond or through the de-icing pipework.

Details of the reclaim barge design and pump control system are included elsewhere in a manual provided by the barge manufacturer. Control and monitoring of the barge operation will be carried out from the mill control room, although local control will be available at the reclaim barge and booster pumpstations.

6.5.2 Monitoring Requirements

Daily record sheets for the operation of the barge and booster pumpstations should include the following:

- Instantaneous flow rates
- Total volumes pumped
- Line pressure in pump at the discharge manifolds

Additional monitoring requirements may be set out in an Operating Manual provided by the barge and pump manufacturer (such as identification of running units, running time for individual pump motors, current drawn by pump motors and pump/motor bearing temperatures).

6.5.3 Inspection and Maintenance

The reclaim barge and pipework will be included in the overall planned maintenance program for the mine. Procedures listed below will supplement this program.



Daily

- Inspection of the pipeline for leaks or excessive movement, especially at fixed connections (the on-shore ball joint and the booster pumpstation).
- Onboard inspection of the barge as set out in the reclaim Barge Operating Manual. Checks of the pumps, de-icing equipment, mooring, lighting, flexible ball joint and walkway.
- Excessive snow must be removed. Adjustments to the mooring are to be made as required.
- Inspection of the booster pumpstation, including checks of the pump, de-icing requirements, etc.

Weekly

- Assess the need for barge relocation and ensure that any required excavation is complete and that pipes, mooring lines, anchors, winches, etc. are in place and readily available.
- Inspect the reclaim barge access road for stability and erosion, especially on the side where the pipeline is located.

Annually

- An annual structural inspection of the barge should be carried out to assess and repair any damage resulting from corrosion, grounding and general wear and tear.
- Winterizing the barge and booster pumpstation prior to the end of summer should be carried out in accordance with Section 6.8.5.



Major Storm Event

- Major storm events (wind, rain, snow) and significant runoff require that more frequent inspections are conducted. Mooring lines may require adjustment, snow or ice may need to be removed, or a temporary relocation of the barge may be required.

6.6 MAKE-UP WATER SUPPLY

6.6.1 General Description

In addition to the reclaim water obtained from tailings consolidation and local runoff, additional process water for the mill will be provided by a make-up water supply system which has three sources, as follows:

- Fresh water from Polley Lake. The mine is permitted to annually extract up to one million cubic meters of water from Polley Lake during the spring freshet period (typically April/May). The Polley Lake pumping system provides this make-up water. The system includes a submerged intake connected to an on-shore diesel pump. Water will be pumped to the Tailings Storage Facility in an HDPE pipeline, which has varying pressure (DR) ratings. The maximum pumping capacity of the system is approximately 5,500 US gpm. The pipeline is laid on grade on the access road. Water will exit the pipeline through an open end discharge onto natural ground in the Tailings Storage Facility. Riprap will be installed to dissipate the energy of the discharge water stream and to reduce erosion within the tailings basin.

Details of the pump are included in a manual provided by the manufacturer. Control and monitoring of the pump will be carried out at the pump.

- Runoff from the Millsite. The Millsite area is graded so that all runoff is directed to the Millsite Sump. In the future, water will be collected in a manhole. The normal operating level is the invert of the bottom inlet at the manhole (El. 1102.7 metres). The water level should be kept at this low level so that storage capacity for the design storm event is available in the sump. Discharge from the manhole will be conveyed to the tailings line in an 8 inch (200 mm) HDPE pipeline. The pipeline is buried through the Millsite area and runs in the pipe containment channel, where it is connected to the 22 inch DR17 HDPE tailings line via a prefabricated Tee in a section of the pipeline that flows by gravity (non-pressurized flow). Currently, water is pumped into the 30 inch tailings line immediately adjacent to the Millsite Sump. The water level must be maintained at the bottom inlet on the manhole at all times.
- Runoff from Southeast Waste Dump. Runoff is collected in a ditch that flows to the Southeast Sediment Pond. Water is decanted through a manhole which has four valved inlet pipes which can be used to control the water level in the sediment pond. The normal operating level is the invert of the second inlet at the manhole (El. 1054.5 metres). The water shall not be permitted to rise above this so that storage capacity for the design storm event is available in the pond. A 10 inch (250 mm) DR21 HDPE discharge pipeline runs from the manhole to the reclaim booster sump. By using manually operated valves at the sump, the water can be directed to the sump, if sufficiently clear, or into the T2 Dropbox.

6.6.2 Monitoring Requirements

Daily record sheets for the operation of the make-up water system components should include the following:



Polley Lake Pumpstation

1. Flows in Hazeltine Creek.
2. Polley Lake water level.
3. Instantaneous flow rates.
4. Total volume pumped.
5. Location, flow rate and water quality of any seeps.

Additional requirements may be set out in an Operating Manual provided by the pump manufacturer (such as running time for pump, pump/motor bearing temperatures).

Millsite Sump

1. Flows being pumped or exiting the decant.
2. Water Level.
3. Identification of which inlets are open and which inlets are actively discharging water.
4. Comments on water clarity.
5. Location, flow rate and water quality of any seeps.

Southeast Sediment Pond

1. Flows exiting the decant.
2. Water Level.
3. Identification of which inlets are open and which inlets are actively discharging water.
4. Comments on water clarity.
5. Identification of whether water is being discharged into the reclaim booster station sump or the T2 dropbox.



6.6.3 Inspection and Maintenance

The components of the make-up water system and associated pipework will be included in the overall planned maintenance program for the mine. Procedures listed below will supplement this program.

Daily (While Operating)

Polley Lake Pumpstation

- Inspection of the pipeline for leaks or excessive movement.
- Inspection of the pump as set out in the appropriate Operating Manual.
- Inspection of pipeline outlet channel, riprap and possible erosion.

Millsite Sump

- Inspection of manhole and inlet pipework (or pump).
- Inspection of 8 inch (200 mm) pipeline and connection to tailings line.

Southeast Sediment Pond

- Inspection of manhole and inlet pipework.
- Inspection of 10 (250 mm) inch pipeline, the connection at the reclaim sump and the valves.

Weekly

- Assess the total volume of water pumped from Polley Lake and confirm whether more pumping is allowed or required.
- Assess the Polley Lake pumping system intake for clogging, siltation, etc.



- Inspect the embankment sections of the Millsite Sump and Southeast Sediment Pond, including the embankment crest, fill slopes and toes for signs of instability and evidence of seepage.
- Inspect the collection ditch at the base of the Southeast Sediment Pond.

Annually

- An annual inspection of the Polley Lake pumping system intake, the pump and the pipeline should be conducted. A report should be prepared, including all pumping data.
- The Polley Lake pump should be winterized or removed when pumping is finished.
- A report on the status of the Millsite Sump should be prepared, including all measured water levels and seepage locations.
- A report on the status of the Southeast Sediment Pond should be prepared, including all measured water levels, seepage locations and the status of the runoff collection ditch.

Major Storm Event

- Major storm events (wind, rain, snow) and significant runoff require that more frequent inspections be conducted. The Polley Lake intake, pump, access road and pipeline should be inspected for possible damage and power interruption.
- Additional inlets may need to be opened at the Millsite Sump (or pumping capacity) and Southeast Sediment Pond manholes. Observations should be made at the T2 Dropbox to ensure that the tailings pipeline capacity is not being exceeded due to high inflows from the make-up water supply ponds. It may be necessary to redirect

the discharge from one or both of the ponds through the overflow culverts.

- The embankment sections of the Millsite Sump and Southeast Sediment Pond should be inspected if the water level rises above normal operating levels. Inspection should include the inside slopes after the water level drops.
- Snow or ice may need to be removed from all of the locations discussed above.

Additional inspection and maintenance requirements may be developed during operations.

6.7 CLOSURE AND RECLAMATION

6.7.1 General

The Tailings Storage Facility and associated structures will be reclaimed as part of on-going mine operations and finally at closure of the mine. The primary objective for reclamation will be to return the Tailings Storage Facility to an equivalent pre-mining use and capability. The following objectives are implicit in achieving this goal:

- Long-term preservation of water quality within and downstream of the decommissioned operations.
- Long-term stability of the tailings impoundment.
- Regrading and reclamation of all access roads, ponds, ditches and borrow areas that are not required beyond mine closure.
- Removal and proper disposal of all pipelines, structures and equipment not required beyond mine closure.



- Long-term stabilization of all exposed erodable materials.
- After mining ceases, natural integration of disturbed lands into the surrounding landscape and to the greatest extent practicable, restoration of the area's natural appearance.
- Establishment of a self-sustaining vegetative cover consistent with existing forestry, grazing and wildlife needs

Based on these objectives and on ongoing operational and reclamation experience a detailed Closure and Reclamation Plan will be developed.

6.7.2 On-going Reclamation

As part of the on-going reclamation program, additional topsoil from annual construction activities may be salvaged and stockpiled at the Tailings Storage Facility or at the Mine. Soil surveys and volumes will be updated to ensure that at mine closure a topsoil stockpile of sufficient capacity is available for the anticipated reclamation needs.

An on-going reclamation program may include final reclamation of all excavated surfaces and fill slopes as they are completed, including the Millsite Sump and Southeast Sediment Pond.

6.7.3 Final Tailings Deposition

During operations, tailings will be deposited from the crest of the Perimeter and Main Embankments. This will result in the development of a tailings beach which slopes to the west abutment of the South Embankment. The current concept is that tailings deposition during the final phase of operations will continue to be managed in such a way as to produce a final tailings beach consistent with post-closure surface drainage requirements and the location of a spillway channel at the west abutment of the South Embankment.



6.7.4 Closure and Surface Reclamation

At closure of the Tailings Storage Facility, it is currently envisaged that the tailings surface will be decommissioned so as to develop a mixed forested/wetlands complex with a gradual transition towards a ponded area at the final spillway. This would require covering of the tailings embankments and the upland portions of the exposed tailings beach with a layer of soil stockpiled during operations. The topsoil would be revegetated with indigenous species of conifer and deciduous trees, willow and marsh land grasses. Ultimately, all water would be routed over the tailings surface, through the wetlands and the final spillway.

Pipework for the tailings and reclaim systems will systematically be removed once all water quality and pit flooding requirements have been met. Similarly, the seepage collection ponds and recycle pumps would be retained until monitoring results indicate that drainage flows and seepage from the tailings area are of suitable quality for direct release to the environment. At that time, the seepage collection ponds could be decommissioned and the pumps be removed. The groundwater monitoring wells and piezometers in the tailings embankment would be retained for use as long term monitoring devices.

6.7.5 Final Spillway

The final spillway would be constructed in competent ground at the west abutment of the South Embankment and discharge to the Edney Creek North tributary drainage. The elevation of this spillway and outflow channel would be designed to establish a set water elevation for the wetlands on the tailings surface. The final spillway will be designed later on in the mine life, when the final configuration of the Tailings Storage Facility is known and a Detailed Closure and Reclamation Plan has been approved.



6.7.6 Long-term Monitoring Requirements

On-going monitoring of all reclamation measures will be carried out post closure, to confirm that the reclamation objectives are being achieved and sustained.

6.8 CONTINGENCY PLAN

6.8.1 Scope of Contingency Plan

The potential consequences of emergency situations and plausible natural disasters are reviewed in this section. Contingency procedures to mitigate the effects of possible loss of tailings material or process water from the containment facilities are described.

The following events or situations are considered:

- Earthquake
- Extreme rainfall or snowmelt runoff
- Power failure
- Extreme low temperature
- Extreme snowfall
- Leakage and component failure
- Pipeline Blockage
- Avalanche or debris slide
- Fire

6.8.2 Earthquake

6.8.2.1 General

The Mount Polley site is located within the Northern B.C. source zone (NBC), close to the boundary with the Southeastern B.C. source zone (SBC). Two earthquake events were considered in the design:



- The Design Basis Earthquake (DBE) used for operations is the 1 in 475 year return period event. This is appropriate for significant hazard risk structures for which some damage may occur but complete failure is not expected.
- The Maximum Design Earthquake (MDE) for closure of the tailings facility has been taken as 50% of the Maximum Credible Earthquake, which is the largest predicted event.

The peak ground motions for each event are summarized as follows:

	Design Basis <u>Earthquake (DBE)</u>	Maximum Design <u>Earthquake (MDE)</u>
Earthquake magnitude, Ms	6.5	6.5
Peak horizontal acceleration (g)	0.037	0.065

6.8.2.2 Potential Impacts and Mitigating Design Features

The occurrence of a significant earthquake could result in damage to, or failure of earthworks or pipelines, loss of electric power or triggering of avalanches or debris slides. The consequences of such occurrences are discussed below.

Design of the tailings area embankments included an assessment of their stability and potential displacement resulting from earthquake loadings, with the facilities considered to be significant hazard structures. The design ensures that the embankment would continue to function as designed, following a Design Basis Earthquake.

6.8.2.3 Contingency Procedures

Major Earthquake Event (Modified Mercalli Intensity VI or greater)

Recognition:

Magnitude 7.5 or greater (characterized by difficulty standing; hanging objects quiver, masonry cracks; waves on ponds; some minor injuries)

Action:

- Immediately stop tailings discharge and the pumping of reclaim water and of all process solutions.
- Immediate inspection of the tailings embankments, seepage collection pond embankments and Millsite Sump and Southeast Sediment Pond for obvious deformation, movement or seepage.
- Immediate inspection of all pipelines, manhole sumps, spillways, ditches and pump stations for cracking, rupture, leakage or other obvious damage.
- Initiate continuous monitoring of tailings embankment piezometers. Use data loggers as required, until steady state pore water pressures are re-established.
- Check monitoring wells for changes in groundwater levels.
- Arrange for an immediate inspection by a suitably qualified Engineer familiar with the design of the facility.
- Operations can commence following written approval by the Engineer and the completion of all necessary repairs.



Minor Earthquake Event (Modified Mercalli Intensity V or less)

Recognition:

Felt outdoors as well as indoors (characterized by liquid disturbed; small objects displaced; doors swing open or close; pictures move).

Action:

- Inspect all pipelines, manhole sumps, spillways, ditches and pump stations for cracking, rupture, leakage or other obvious damage.
- Inspect tailings embankments, seepage collection pond embankments and Millsite Sump and Southeast Sediment Pond for obvious deformation, movement or seepage.
- Initiate monitoring of tailings embankment piezometers. Use data loggers as required, until steady state pore-water pressures are re-established.
- Check monitoring wells for changes in groundwater levels.
- If any sign of damage or leakage is observed arrange for an inspection by a suitably qualified Engineer familiar with the design of the facility.

Operations may recommence following all necessary repairs.

6.8.3 Extreme Runoff

6.8.3.1 General

During normal operations, sufficient storage capacity will be maintained within the Tailings Storage Facility at all times to fully contain the 24 hour Probable Maximum Precipitation (PMP) runoff of 679,000 cubic metres. The facility



was also designed to store 2,500,000 cubic metres of make-up water. This additional storage capacity may be available to supplement any flood runoff requirements.

The Millsite Sump and Southeast Sediment Pond have sufficient storage capacity to contain the 1 in 10 year 24 hour storm event, provided that the pond levels are kept at the minimum level at all times. In the event that water is in the ponds prior to an extreme event, the storage capacities can be increased by selectively routing flows to the tailings pipeline.

A system of inspections will be carried out to mitigate any potential adverse consequences of extreme runoff, including the following:

6.8.3.2 Inspection Prior to the End of Summer

Roadways, culverts and ditches:

- Clean-out and regrade as necessary.
- Maintain safety berms.
- Maintain equipment marker posts.
- Maintain snow fences.
- Repair riprap.

Tailings Pipeline

- Check all valves, connections and anchor points.
- Maintain marker posts.
- Ensure pipeline is restrained against thermal contraction.
- Ensure sufficient room exists for prolonged discharge through a full diameter dump valve into the Tailings Storage Facility from the closest point to the mill.



Piezometers and standpipes

- Read all water levels and pressure sensors.
- Install marker posts.

Seepage Collection Ponds

- Clean-out and regrade as necessary.
- Repair riprap.

Seepage Recycle Sumps

- Winterize pumps in accordance with manufacturer's recommendations.
- Change pump operating sequence and water level probe settings for winter operation, if required.

Reclaim Barge Pumpstation

- Winterize in accordance with manufacturer's recommendations and appropriate Operating Manual.
- Check and if necessary activate de-icing system.
- Change pump operating sequence and water level probe settings for winter operation, if required.
- Complete sufficient excavation of barge channel for next 6 months of operations.
- Relocate barge if warranted to minimize moves during winter.

Booster Sump Pumpstation

- Winterize in accordance with manufacturer's recommendations and appropriate Operating Manual.
- Change pump operating sequence and water level probe settings for winter operation, if required.

Millsite Sump

- Clean-out and regrade as necessary.
- Inspect manhole and pipework.
- Repair riprap.

Southeast Sediment Pond and Ditch

- Clean-out and regrade as necessary.
- Inspect manhole and pipework.
- Repair riprap.

6.8.3.3 Inspection Immediately Prior to Heavy Rainfall

On announcement of a heavy rain warning the following procedures will be adopted:

- Inspect all facilities, remove debris and repair as necessary.
- Draw down ponds to the maximum practicable extent.
- Monitor rise in water levels during the event.
- Maintain facilities as necessary during event.
- Ensure that recycle pumps are operating continuously.
- If necessary, close inlets or valves on manhole sumps that are about to be fully submerged.

In the event that the seepage collection pond levels reach the overflow culverts, advise the regulatory authorities, take water samples prior to and during the discharge, all in accordance with permitting requirements.

6.8.3.4 Inspection and Remedial Work after Major Storm Events

After any major storm event, a thorough inspection of all ditches, culverts, ponds, spillways, channels and other water control facilities will be carried out as outlined above. Necessary repairs will be carried out as soon as reasonably

possible to reduce the chance of aggravating any existing deficiencies during subsequent storm events.

Excess water stored on the tailings surface may be drawn down as required by water requirements in the mill.

6.8.4 Power Failure

6.8.4.1 General

For the duration of a total power outage all electrical systems except for those connected to standby generators will cease operation. A power failure would have only a minor impact on the Tailings Storage Facility and its associated works as described below.

6.8.4.2 Systems Affected and Mitigating Measures

Systems within the scope of this manual that would be affected by a loss of power to pumps include:

- Tailings discharge pumps and pipeline
- Reclaim barge and associated pumps
- Reclaim booster sump and associated pumps
- Seepage collection pond pumps
- Groundwater recovery well pumps (if required)

Lighting, instrumentation, heating and flow monitoring functions would also be affected.

Tailings Discharge

A stoppage in the discharge of tailings to the Tailings Storage Facility will have no adverse impact. The tailings pipeline will fully drain into the facility by gravity. No action is required. In the event that surplus clean water is available



in the mill, the pipeline should be flushed by gravity. To ensure complete drainage of the pipeline, especially under freezing conditions, operators should open all valves in the pipeline before leaving the pipeline in the desired start-up condition with one or several valves open for discharge.

Reclaim Barge

Power failure will result in loss of the ability to reclaim water to the mill. This will be of little concern as a total power failure will also shut down the mill. Additional consequences will be the loss of water flows for de-icing the barge periphery and failure of barge heating and lighting. Under normal shutdown conditions the discharge line from the barge to the booster sump will remain full. During a prolonged power failure under freezing conditions, this pipeline will need to be drained to avoid freezing. Valves at the barge allow the pipe to be drained directly to the surface pond or back through the de-icing pipework. Drainage should begin through the de-icing pipework at or before the time a visible skin of ice has formed around the barge and with sufficient flow to keep the ice clear. Drainage is unnecessary during non-freezing conditions.

If power shutdown is further prolonged under severe freezing conditions, consideration should be given to providing local water circulation using a diesel operated pump, or the minimizing of ice growth around the barge by use of insulating panels laid on the water surface.

Reclaim Booster Pump Station

As described above, a power failure will result in loss of the ability to reclaim water to the mill head tank for process use. This will be of little concern as a total power failure will also shut down the mill. Additional consequences will be the failure of the reclaim sump heating and lighting. Under normal shutdown conditions the discharge line from the booster sump to the mill would remain full. In the event of a prolonged power failure during freezing conditions, this pipeline would need to be drained to avoid freezing. Once the sump is filled to capacity, excess water will overflow into the T2 Dropbox,

along with gravity drainage from the Southeast Sediment Pond. From the dropbox, the water will enter the tailings pipeline and will flow to the Tailings Storage Facility. In the event that emptying of the sump is required, portable pumps will be required. Drainage is not necessary during non-freezing conditions.

Seepage Collection Pond Pumps

Loss of power to the pumps will result in a rise in water level if significant inflows are occurring. The pond will normally be operated with a maximum possible freeboard. The release of any water would commence once the overflow culvert invert levels were reached. Water quality monitoring would need to be conducted in accordance with permit requirements.

Should the release of such water be prohibited, temporary pumps must be provided to return excess water to the facility, over the embankment crest.

Under normal operations (and in the event of a power failure) pump control valves will allow the pipelines to drain back to the seepage collection ponds. If a prolonged (greater than one hour) power outage occurs during cold conditions, the pipeline should be checked to ensure that it has drained fully.

Groundwater Recovery Wells

If groundwater recovery well pumps have been installed, loss of power may result in temporary groundwater movement past these wells.

6.8.5 Low Temperature

Prolonged periods of sub-zero temperatures can effect the operation of the Tailings Storage Facility in a number of ways:

- Ice build-up in pipelines resulting in partial or complete blockage.



- Ice build-up restricting or diverting inflows to pipes, culverts and conduits.
- Thermal contraction of pipe work laid on the ground.
- Malfunction of valves and flow meters.

Design features included to mitigate the effects of low temperatures include the following:

- Burial of pipelines wherever practical.
- Free draining pipelines with drain valves at any low spots.
- Anchorage of HDPE pipelines laid on grade.
- Thermal tracing of critical valves and pipelines.
- Automatic draining of selected pumped pipelines.
- Provision for discharge of tailings into the facility from the full diameter dump valve located at the point closest to the mill.
- Provision for shut off of discharge to pipelines with small inflows and significant potential for freezing.

Operating features that will further mitigate effects of low temperatures include:

- Modification of pumping rates to ensure continuous flows sufficient to avoid freezing.
- Batch discharge of high flows followed by pipeline drainage where continuous low flows might be prone to freezing.

6.8.6 Pipeline Leakage or Rupture

Several pipelines flow between the Millsite and Tailings Storage Facility, around the Tailings Storage Facility, or are entirely located within the facility itself, including:

- Tailings discharge pipeline (Millsite to T2 Dropbox).
- Tailings discharge pipeline (T2 Dropbox to tailings).



- Millsite Sump discharge pipeline.
- Southeast Sediment Pond discharge pipeline.
- Seepage recycle pipelines (seepage collection ponds to tailings).
- Polley Lake make-up water (Polley Lake pump intake to tailings).

Pipeline leakage gives rise to two concerns:

- The possibility of erosive damage to works.
- The possibility of escape of process liquids to surface or groundwater.

Failure of the tailings pipeline, reclaim water pipeline, seepage recycle pipelines or the Polley Lake pipeline would occur in catchments outside of the tailings storage facility, including the Polley Lake, Bootjack Lake and Edney Creek catchments. Failures would be easily repaired.

Routine daily and weekly pipeline inspections and early repair of visible leaks or investigation of seeps or wet spots in the area of buried pipelines will minimize the possibility of uncontrolled spillage from pipelines.

Both the tailings and reclaim pipelines can be continuously monitored for any sudden changes in pressure or flow. Such a change could occur in the event of a pipeline rupture or blockage condition.

6.8.7 Pipeline Blockage

Pipeline blockage may result from one of a number of factors:

- Debris intrusion into a pipeline.
- Solids build-up including ice formation.
- Pipeline collapse or component failure.
- Unexpected valve closure.
- Blockage of inlet.
- Faulty operating practise.
- Thermal movement resulting in pinching of pipeline.



- Crushing of the pipeline by a vehicle.

Design features employed to minimize the potential for blockage include.

- Provision of isolating valves, couplings and access points into pipelines at critical areas to allow inspection and clearing.
- Provision for complete draining of pipelines when not in use.
- Separation of pipeline from vehicular traffic.
- Control room monitoring and alarms based on flows and pressures.

In addition, operation inspection and maintenance procedures outlined in other sections of this manual have been designed to minimize the potential for blockage of pipelines.

6.8.8 Avalanche and Debris Slide

The project area is in relatively gentle topography which is not prone to avalanches or debris slides. Therefore, the storage capacity of the tailings basin is not likely to be affected by such events. However, the tailings and reclaim pipe containment channel and the Southeast Sediment Pond runoff collection ditch could become filled with debris and overtop. Any portion of the canals which are damaged or blocked by avalanche debris would be repaired with on-site equipment.

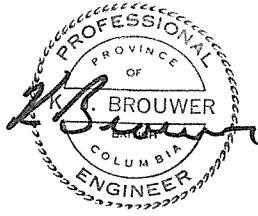
If necessary, areas of possible impact will be barricaded off and signs posted to prevent the entry of vehicular traffic and to warn of the possible occurrence of avalanches.

6.8.9 Fire

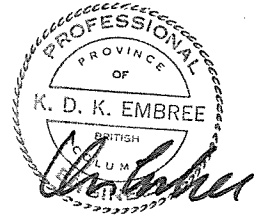
Fire would have no significant impact on the continuing operation of the tailings facility. Damage to mill facilities would likely result in tailings discharge being halted together with pumping of reclaim from the barge. In the event of damage to seepage recycle pumps, temporary installations may



be required to recycle water over the embankment before discharge occurs over the spillway.



Ken J. Brouwer, P.Eng.
Director



Ken D. Embree, P.Eng.
Senior Engineer

TABLE 1.1**MOUNT POLLEY MINING CORPORATION****MOUNT POLLEY PROJECT****TAILINGS STORAGE FACILITY****DESIGN BASIS AND OPERATING CRITERIA**

j:\job\report\1627\3-tbl1-1.doc

06/09/97 1:58 PM

ITEM	DESIGN CRITERIA
1.0 GENERAL DESIGN CRITERIA	
Scope	Generally applicable to all components and structures.
Regulations	MEI MELP (Water Management Branch)
Codes and Standards	NBC and related codes CAN/CSA HSRC (Health, Safety and Reclamation Code for Mines in B.C.) ASTM ACI ANSI
Design Life	14 Years
Operational Criteria:	
General	NBC where relevant
Rainfall/Precipitation:	Section 2.1 (Ref. No. 1627/2)
Seismic:	
DBE (operations)	M = 6.5, A max. = 0.037 g
MDE (closure)	M = 6.5, A max. = 0.065 g
2.0 TAILINGS BASIN	
Site Selection	Section 4.0 (Ref. No. 1627/2) <ul style="list-style-type: none"> • Capacity and filling characteristics. • Hydrology and downstream water usage. • Hydrogeology and groundwater regime. • Aesthetics and visual impact. • Foundation conditions. • Construction requirement. • Closure and reclamation requirements. • Capital and operating costs.
Geological and Geotechnical Conditions	Section 5.0 (Ref. No. 1627/2).
Basin Liner	<ul style="list-style-type: none"> • Compacted glacial till with frost protection layer required in areas with <2 m in-situ glacial till. • Liner placed in 3 - 150 mm lifts. • Liner compacted to 95% Std. Proctor max. dry density (ASTM D698) at optimum moisture content minus 1% to plus 2%.
Embankment Foundation Drains	<ul style="list-style-type: none"> • Installed in Main Embankment Foundation. • Geotextile wrapped 1000 mm x 800 mm gravel/drain with 100 mm perforated CPT drain pipe. • Drain conveyance pipes are solid HDPE. • Discharge to Main Embankment Seepage Collection Pond via Drain Monitoring Sump.
Stripping	<ul style="list-style-type: none"> • Required at areas directly affected by construction (embankments, basin liners, seepage collection ponds, reclaim barge channel, stockpiles, roads etc.).



TABLE 1.1

MOUNT POLLEY MINING CORPORATION

MOUNT POLLEY PROJECT

TAILINGS STORAGE FACILITY

DESIGN BASIS AND OPERATING CRITERIA

		<ul style="list-style-type: none"> Remove organic soil to topsoil stockpiles.
3.0 TAILINGS EMBANKMENT		
Function		<ul style="list-style-type: none"> Storage of tailings and process water for design life. Provide storage for 24 hour PMP storm. Provision for routing PMF at closure.
Embankment Crest Width		8 m starter dam and 8 m final dam.
Embankment Height (Max):	Stage 1b	22 m (Crest El. 934 m)
	Final	53 m (Crest El. 965 m)
Embankment Crest Length:	Starter	1000 m
	Final	4500 m
Design Tonnage		6,500,000 tpy (17,808) tpd
Solids Content of Tailings Stream		35% (before Millsite and waste dump runoff added to tailings stream)
Freeboard:	Operations	24 hour PMP event (679,000 m ³) plus 1.0m wave runoff on 2.5 million m ³ operational storage pond.
	Closure	Sufficient to provide routing of PMF plus wave run-up.
Storage Capacity		84.5 million tonnes.
Tailings Density:	Year 1	1.1 t/m ³
	Year 2	1.2 t/m ³
	Year 3-13	1.3 t/m ³
Tailings Specific Gravity		2.78
Borrow Material Properties		Section 6.3 and 6.4 (Ref No 1627/2)
Construction Diversion		Not required.
Emergency Spillway Flows:	Operations	Not required.
	Closure	Design flow for routing PMF event.
Filling Rate		Figure 6.1 and 6.2 (Ref. No. 1627/2)
Fill Material Properties		Drg. No. 1625.212
Compaction Requirements		Drg. No. 1625.211
Geotechnical Data		Sections 5.0 and 6.0 (Ref. No. 1627/2)
Stability Analysis		Section 6.8 (Ref. No. 1627/2)
Seepage Analysis		Section 6.9 (Ref. No. 1627/2)
Sediment Control		Primary control from Main Embankment. Main Embankment Seepage Collection Pond provides secondary sediment control.
Seepage Control		Seepage collection ponds and pumpback well systems.
Seismic Parameters		Section 2.3 (Ref. No. 1627/2)
Spillway Discharge Capacity		Not required during operations.
Settlement		Section 6.6 and 6.7 (Ref. No. 1627/2)
Surface Erosion Protection		Revegetation with grasses on final embankment slope.
4.0 PIPEWORKS		
4.1 Tailings Delivery and Discharge Pipework		Section 8.0 (Ref. No. 1627/2).
Function		Transport tailings slurry and Millsite and waste dump runoff to Tailings Storage Facility (TSF).

TABLE 1.1**MOUNT POLLEY MINING CORPORATION****MOUNT POLLEY PROJECT****TAILINGS STORAGE FACILITY****DESIGN BASIS AND OPERATING CRITERIA**

Tailings Pipeline	<ul style="list-style-type: none"> Free draining, gravity flow pipeline. Butt fusion welded HDPE with 30" DR15.5, 22" DR17 and 24" DR15.5 sections.
Spigots	<ul style="list-style-type: none"> Movable discharge section placed on tailings embankment crest.
Flow Rate	<ul style="list-style-type: none"> Design throughput 900 tonnes/hr dry solids. Slurry solids content 35%. Design flow 19.6 cfs (0.55m³/s). Increases to 23.8cfs (0.67m³/s) at 30% solids content with addition of 4.2cfs storm water runoff.. Waste dump and Millsite runoff will be added to tailings stream, increasing flow and decreasing solids content.
Spill Containment: <ul style="list-style-type: none"> - Mill site to Bootjack Creek - Bootjack Creek Crossing - Bootjack Creek to TSF 	<ul style="list-style-type: none"> Pipeline laid in pipe containment channel. There is an overflow pond for the T2 dropbox. Pipeline sleeved in pipe containment channel. Pipeline laid in pipe containment channel.
4.2 Reclaim Water System	
Function	Primary source of water for milling process. (Pump and Barge System designed by Others.)
Reclaim Barge	<ul style="list-style-type: none"> Prefabricated pump station on barge in excavated channel in TSF. Local and remote control from Millsite.
Reclaim Pipeline	<ul style="list-style-type: none"> 24" pipeline with a steel section at the reclaim barge and HDPE with varying pressure ratings along length.
Reclaim Booster Pump Station	<ul style="list-style-type: none"> Prefabricated pump station located between TSF and Millsite. Identical pumps, sensors and controls at reclaim barge for ease of maintenance.
Spill Containment	<ul style="list-style-type: none"> See Item 4.1 above, same for all pipelines. Booster pump station has closed sump.
4.3 Seepage Recycle System	
Function	Returns seepage and foundation drain flows to TSF.
Drain Monitoring Sumps	Flow quantity and water quality measurements on individual drains.
Seepage Collection Ponds	<ul style="list-style-type: none"> Sized to hold 10 times max. weekly seepage flow quantity. Excavated in low permeability natural soil liner, operated as groundwater sink.
Seepage Recycle Pumps	<ul style="list-style-type: none"> Set in vertical pump sumps. Submersible pumps. System by Others. Pumps discharge back to TSF via 150 mm HDPE pipes.
5.0 MAKE-UP WATER SUPPLY	
5.1 General	
Function	To direct runoff from the Millsite and Southeast Sediment pond to the TSF, providing additional water for recycle to the mill. Also, to implement the Polley Lake Pump Station when and as required to meet the project Water Management Plan objectives.
5.2 Millsite Sump	

TABLE 1.1

MOUNT POLLEY MINING CORPORATION

MOUNT POLLEY PROJECT
TAILINGS STORAGE FACILITY

DESIGN BASIS AND OPERATING CRITERIA

Catchment Area	Approx. 20 ha direct catchment, plus pit dewatering.
Design Storm	1.5 x 1 in 10 yr. 24 hour event runoff (6,000 m ³)
Sump Cross-Section	3:1 inside slope, 2:1 outside slope, 4m crest width.
Normal Operating Level	1102.7 m
Maximum Operating Level	1106.2 m
Flow Control Structures	See Dwg. No. 1625.232 for layout details.
Discharge Pipe	300 mm HDPE DR 21 to plant or tailings line.
Flow Monitoring	None.
5.3 Southeast Sediment Pond	
Catchment Area	Approx. 150 ha direct catchment.
Design Storm	1 in 10 yr. 24 hour event runoff (25,000 m ³)
Sump Cross-Section	3:1 inside slope, 2:1 outside slope, 4m crest width.
Normal Operating Level	1054.5 m
Maximum Operating Level	1057.4 m
Flow Control Structures	See Dwg. No. 1625.232 for layout details.
Discharge Pipe	250mm HDPE DR 21 to Reclaim sump or T2 dropbox
Flow Monitoring	None.
5.4 Polley Lake Pump Station	
	Ref. No. 1628/5
Max. Volume to be extracted	1,000,000 m ³ annually
Period for water extraction	Freshet
Max. Intake Velocity	0.11 m/s
Intake Screen Opening	0.1 inch (No. 8 Mesh wire cloth)
Spill Containment at Pump	Collection into a Holding Basin
Discharge Pipe	22 ½ inch ID, 350 ft of 19 ½ inch ID and 5200 ft of 17 ½ inch ID pipe.
Max. Flow	5,500 US GPM
Flow Monitoring	Flows in Hazeltine Creek, water level on Polley Lake, pumping hours times measured flow rate.
Security and Access	Signs for buried or submerged components, buoys attached to intake in Polley Lake.
6.0 INSTRUMENTATION AND MONITORING	
6.1 General	
Function	To quantify environmental conditions and performance characteristics of the TSF to ensure compliance with design objectives.
6.2 Geotechnical Instrumentation and Monitoring	
Piezometers	<ul style="list-style-type: none"> • Measure pore pressures in drains, foundations, fill materials and tailings. • Vibrating wire piezometers. • Installed by qualified technical personnel. • Three instrumentation planes for Main Embankment and one for Perimeter Embankment.
Survey Monuments	<ul style="list-style-type: none"> • Deformation and settlement monitoring of embankments.

TABLE 1.1**MOUNT POLLEY MINING CORPORATION****MOUNT POLLEY PROJECT**
TAILINGS STORAGE FACILITY**DESIGN BASIS AND OPERATING CRITERIA**

6.3 Flow Monitoring	<ul style="list-style-type: none">• To provide data for on-going water balance calculations.• Drain flows regularly monitored.• Reclaim and seepage pump systems flow meters.• Tailings output monitored at millsite.• Streamflow monitoring.
6.4 Water Quality Monitoring	<ul style="list-style-type: none">• To ensure environmental compliance.• Water quality samples taken at regular intervals from sediment ponds, drains (at drain monitor sump), groundwater monitoring wells, seepage ponds and tailings pond.• Upstream and downstream samples for impact analysis.
6.5 Hydrometeorology	<ul style="list-style-type: none">• Operator weather station for input to water balance calculations.• Precipitation (rain and snow).• Evaporation.• Air quality monitoring (dust, etc.).
6.6 Operational Monitoring	<ul style="list-style-type: none">• Quantify operation of tailings storage facility.• Rate of tailings accumulation in terms of mass and volume.• Tailings characteristics and water recovery.• Supernatant pond (depth, area and volume).
7.0 CLOSURE REQUIREMENTS	
7.1 General	Return impoundment to equivalent pre-mining use and productivity by establishing a wetland area adjacent to a final spillway and re-vegetating remainder of tailings surface with indigenous species of trees, shrubs and grasses adjacent to embankment, grading to aquatic species along and adjacent to final pond.
7.2 Spillway	Two stage spillway with lower channel outlet designed to pass 1 in 200 yr. 24 hour flood event and upper wider outlet section designed to pass Probable Maximum Flood without overtopping embankments.

Notes:

1. The closure plan will remain flexible during operations to allow for future changes in the mine plan and to incorporate information from on-going reclamation programs.



TABLE 1.2

MOUNT POLLEY MINING CORPORATION
MOUNT POLLEY PROJECT
TAILINGS STORAGE FACILITY

SUMMARY OF MONITORING REQUIREMENTS

J:\JOB\DATA\10162-7\REPORTS\16273MON.XLS

COMPONENT	MONITORING RECOMMENDED	FREQUENCY
Tailings Basin	Elevation of Supernatant Pond	Daily ^[1]
	Volume of Supernatant Pond	Semi-annually
Tailings Deposition	Tailings discharged to facility (tonnes)	Daily ^[1]
	Solids Content or Pulp Density	Daily ^[1]
	Discharge Locations	Daily ^[1]
	Shutdown times and durations	Daily [1]
	Tailings Beach Development	Quarterly
Tailings Embankments	Piezometers (vibrating wire)	Weekly
	Foundation Drain Flows	Weekly
	Outlet Drain Flows	Weekly
	Monitoring Well Levels (GW96-9, MP89-234)	Weekly
	All Monitoring Well Levels	Quarterly
Seepage Collection Ponds (Main and Perimeter Embankments)	Survey Monuments and Control Points	Quarterly
	Power supply check	Daily ^[1]
	Pond Levels	As required ^[2]
Reclaim System	Pumpback Flows	Weekly
	Instantaneous Flow Rate	Daily ^[1]
	Volume Pumped	Daily ^[1]
Make-up Water Supply Polley Lake Pumping System	Line pressure at pump manifold	Daily ^[1]
	Flows in Hazeltine Creek	Daily ^{[1],[4]}
	Polley Lake Water Level	Daily ^{[1],[4]}
Millsite Sump	Instantaneous Flow Rate	Daily ^{[1],[4]}
	Volume Pumped	Daily ^{[1],[4]}
	Flows exiting the decant	Daily ^[1]
	Water level in sump	Daily ^[1]
	Identification of operating inlets	Daily ^[1]
Southeast Sediment Pond	Comments on water clarity	Daily ^[1]
	Inspection for seepage.	Weekly
	Flows exiting the decant	Daily ^[1]
	Water level in pond	Daily ^[1]
	Identification of operating inlets	Daily ^[1]
	Comments on water clarity	Daily ^[1]
	Identification of where water directed to	Daily ^[1]
	Inspection for seepage.	Weekly

Notes : [1] Items should be recorded daily on Tailings Operator Record Sheet.

[2] As required to ensure that there is no discharge through overflow culverts.

[3] Reporting requirements are provided in the text.

[4] Only required while operating.



Adequate storage is provided to store runoff from the 24 hour PMP storm event. Storm events in excess of this can be contained by the extra one metre of freeboard provided for wave run-up or by extra freeboard provided as the embankment is raised to Stage Ib El. 934 m.

TABLE 2.1 (CONT'D)

RESERVOIR OPERATING CRITERIA

During a flood event when the normal maximum operating level is exceeded the following shall be recorded every three (3) hours:

- precipitation
- reservoir level

If the reservoir levels exceed the maximum flood level (i.e. the storm exceeds the 24 hour PMP event), then the downstream area must be evacuated immediately and access restricted, as per the Emergency Preparedness Plan (EPP).

3. Reservoir Filling and Drawdown Rates:

There are no restrictions on the filling rate for the reservoir.

Drawdown is not anticipated. If required, the drawdown rate will be provided by a suitably qualified Professional Engineer.

4. Discharge Facilities and Release Rates:

There is no provision for discharge or release because adequate freeboard will be maintained at all times.

Detailed design basis and criteria are included on Table 1.1



TABLE 3.1

MOUNT POLLEY MINING CORPORATION
MOUNT POLLEY PROJECT
TAILINGS STORAGE FACILITY

MAINTENANCE REQUIREMENTS

J:\JOB\REPORT\1627\3-TBL3-1.XLS

6/12/97 16:47

ITEM	FREQUENCY		
	As Required	Annual	5 Years
EARTHFILLS AND FOUNDATIONS ⁽¹⁾			
Piezometers	x		
Surface Movement Monuments	x		
Terminal Panel (for piezometers)		x	
Fill slopes	x		
PIPELINES			
Pipelines	x		
Tailings / Reclaim Pipe Containment Channel	x		
T2 Dropbox Overflow Pond	x		
DISCHARGE STRUCTURES			
Diversion Ditches	x		
Control Structures - manholes, etc.		x	
Outlet Structures - valves, flow meters		x	
AUXILIARY EQUIPMENT			
Seepage Collection Pump(s)		x	
Diesel powered portable pump used at Polley Intake Only		x	

Notes:

1. Includes fill slopes at Main Embankment plus Millsite Sump and Southeast Sediment Pond.



TABLE 4.1

MOUNT POLLEY MINING CORPORATION
MOUNT POLLEY PROJECT
TAILINGS STORAGE FACILITY

MINIMUM FREQUENCY OF INSPECTIONS AND TESTS

J:\JOB\REPORT\1627\3-TBL4-1.XLS

6/12/97 16:54

ITEM	INSPECTION FREQUENCY	
	Weekly	Annually
1. INSPECTIONS:		
a. Routine	x	
b. Intermediate		
- earthfills	x	
- pipelines	x	
- civil		x
- mechanical equipment		x
- electrical equipment		x
2. TESTS:		
a. Portable Generators / Pumps		
- no load		x
- under full load		x
b. Valves / Flowmeters		x
3. EPP TESTS *:		
a. Communications Tests		x
b. Operational Tests		x

* EPP = Emergency Preparedness Plan



TABLE 5.1

MOUNT POLLEY MINING CORPORATION

MOUNT POLLEY PROJECT

TAILINGS STORAGE FACILITY

EMERGENCY SITUATIONS AND RESPONSES

I. EMERGENCY SITUATIONS:

EMERGENCY

RESPONSE (SEE BELOW)

1. DAM BREACH

Steps 1 to 5 inclusive.

Large and rapidly increasing uncontrolled release of water due to failure of the dam.

2. POTENTIAL DAM BREACH

Steps 1 to 5 inclusive.

Any condition that could result in dam failure and uncontrolled release of water from the reservoir.

3. EARTHQUAKE

The Dam Co-ordinator shall

An earthquake alert exists or if an earthquake is felt at the Mine Site.

immediately direct a dam inspection and take the following action:

- a. Severe Damage
- b. Significant Damage
- c. Minor Damage
- d. No Damage

Steps 3 to 5 inclusive.

Steps 3 to 5 inclusive.

File written report.

File written report.



TABLE 5.1 (CONT'D)

EMERGENCY SITUATIONS AND RESPONSES

4. FLOODS

- | | | |
|---|---------------------------------|-------------------------|
| - | Slumping of dam slopes. | Steps 1 to 5 inclusive. |
| - | Significant seepage or springs. | Steps 1 to 5 inclusive. |

5. CRIMINAL ACTION

- | | | |
|---|--|---|
| - | Destruction or threat of Dam or associated structures. | The Dam Co-ordinator shall notify the R.C.M.P. and take action as required. |
|---|--|---|

II. RESPONSE PROCEDURES:

Due to the remote location of the Tailings Storage Facility, the response procedures and all necessary remedial action shall be the entire responsibility of on-site personnel. The relevant Government Ministries and Officials shall be notified as soon as practically possible. The following is a preliminary listing of protocol to be followed in the event of an emergency, as detailed above:

STEP 1:

In the event of an emergency the Dam Co-ordinator shall be notified immediately by radio page or direct communication.

STEP 2:

The Dam Co-ordinator shall contact the following Supervisory Personnel:



TABLE 5.1 (CONT'D)

EMERGENCY SITUATIONS AND RESPONSES

<u>Personnel:</u>	<u>Radio Call No.:</u>
(a) Dam Coordinator (Don Parsons or Eric Leneve)	170.430 or 170.790
(b) Dam Operator (Don Ingram or Tim Fisch)	170.430 or 170.790
(c) Technician (Ron Martel)	170.430 or 170.790
(d) Technician (Greg Smith)	170.430 or 170.790
(e) Technician (Jamie Stevenson)	170.430 or 170.790

STEP 3:

The designated Supervisory Personnel above, or other, shall contact the relevant off-site personnel, including Government Ministry representatives and Regional Authorities (e.g. R.C.M.P.), as necessary.

STEP 4:

The Dam Co-ordinator or Dam Operator, under instruction from the Dam Co-ordinator, shall complete a brief status report describing the nature of the emergency and recommendations for immediate action. If the nature or severity of the emergency is uncertain, or if there are any uncertainties regarding the action to be taken, then the following person(s) who have expertise in earthfill dams, should be contacted for assistance:

(a) Ken Brouwer, Knight Piesold Ltd.	Office Ph: 604 - 685 - 0543 Home Ph: 604 - 986 - 3359
(b) Bruce Brown, Knight Piesold Ltd.	Office Ph: 604 - 685 - 0543 Home Ph: 604 - 984 - 9522
(c) Jeremy Haile, Knight Piesold Ltd.	Office Ph: 604 - 685 - 0543 Home Ph: 604 - 984 - 7851



TABLE 5.1 (CONT'D)

EMERGENCY SITUATIONS AND RESPONSES

STEP 5:

If the Dam Co-ordinator, or designated replacement, considers the emergency to be serious and urgent, then he will advise the following personnel on the status of the emergency and of the action to be taken:

- | | | |
|-----|--|-------------------|
| (a) | Provincial Emergency Program | Ph: (800)663-3456 |
| (b) | MELP, Water Management Branch,
Dam Safety Officer | Ph: (250)387-3263 |
| (c) | MEI, Geotechnical Branch | Ph: (250)952-0485 |
| (d) | MEI, Mines Inspector | Ph: (250)565-4246 |
| (e) | RCMP, Williams Lake, B.C. | Ph: (250)392-6211 |

III. POSSIBLE ACTION:

The necessary action to be taken in an emergency will depend on the type of emergency and may include, but not be limited to the following:

1. EVACUATION

Require immediate evacuation of areas downstream of the Tailings Storage Facility in the event of Dam Breach or full reservoir.

2. EQUIPMENT AND MATERIALS

Require the immediate mobilization of all necessary equipment from the Mine Site to repair any damage, repair dam slopes or slumping areas, etc.



TABLE 5.1 (CONT'D)

EMERGENCY SITUATIONS AND RESPONSES

3. RESERVOIR LOWERING

Require the immediate lowering of the reservoir by mobilizing and commissioning pump(s) as required. An emergency spillway may be permitted in natural ground on the left or right abutment. *In no case shall the reservoir be lowered by excavating through the earthfill.*

4. INSPECTION

Require a site inspection within 24 hours in the event of significant deterioration of embankment fill, or structures, etc. which may affect the integrity of the system.



TABLE 6.1

MOUNT POLLEY MINING CORPORATION
MOUNT POLLEY PROJECT
TAILINGS STORAGE FACILITY

SUMMARY OF VIBRATING WIRE PIEZOMETERS AND TRIGGER LEVELS

J:\JOB\DATA\1627\REPORTS\16273MON.XLS

18-Jun-97 13:24

Piezometer Identification Number	Serial Number	Tip El. (m)	Zone Monitored	Trigger Level		
				Frequency (Hz)	Pressure (m H ₂ O)	Elevation (m)
A1-PE1-01	64100	913.0	Foundation Drain	3000	2.0	915.0
A1-PE1-02	64096	912.1	Foundation Drain	3040	2.0	914.1
A1-PE1-03	64105	917.2	Chimney Drain	3015	2.0	919.2
A2-PE2-01	64104	903.7	Foundation, depth approx. 9.0 m	2875	15.0	918.7
A2-PE2-02	64103	909.8	Foundation, depth approx. 2.9 m	3000	8.9	918.7
A2-PE2-03	64101	919.4	Fill			
A2-PE2-04	64099	926.1	Fill (Stopped functioning)			
A2-PE2-05	64102	921.9	Fill			
B1-PE1-01	64107	917.3	Foundation Drain	3090	2.0	919.3
B1-PE1-02	64106	916.0	Foundation Drain	3080	2.0	918.0
B1-PE1-03	64118	918.7	Chimney Drain	3115	2.0	920.7
B2-PE2-01	64110	902.0	Foundation, depth approx. 15.0	2840	21.0	923.0
B2-PE2-02	64116	909.5	Foundation, depth approx. 7.9 m	2865	13.9	923.4
B2-PE2-03	64109	921.0	Fill			
B2-PE2-04	64108	921.0	Fill			
B2-PE2-05	64113	921.7	Fill			
C1-PE1-01	64111	914.7	Foundation Drain	3070	2.0	916.7
C1-PE1-02	64115	916.6	Chimney Drain	3070	2.0	918.6
C2-PE2-01	64117	907.5	Foundation, depth approx. 8.2 m	2860	14.2	921.7
C2-PE2-02	64119	910.5	Foundation, depth approx. 5.2 m	2955	11.2	921.7
C2-PE2-03	64112	921.0	Fill			
C2-PE2-05	64114	924.8	Fill			
D1-PE1-01	64097	---	Not required for Stage Ib.	---	---	---
D2-PE1-01	64096	931.0	Fill			

Notes:

- 1) Trigger level is the level at which the monitoring frequency must be increased (daily) and when contingency or remedial plans must be developed.
- 2) The trigger level for foundation piezometers is approx. 6.0 metres above ground and is based on the level where the factor of safety is approaching 1.1.
- 3) The trigger level for drain piezometers is approx. 2.0 metres of head.
- 4) Fill piezometers have no set trigger level, but must be closely monitored for pressure increases.



TABLE 6.2

MOUNT POLLEY MINING CORPORATION
MOUNT POLLEY PROJECT
TAILINGS STORAGE FACILITY

SURVEY MONUMENT COORDINATES - STAGE Ib CONSTRUCTION

J:\JOB\REPORT\1627\3-TBL6-2.XLS

6/18/97 13:27

Survey Monument ⁽¹⁾	Monument Location	Survey Date	Northing (m)	Easting (m)	Elevation (m)
STAGE Ib - INITIAL SURVEY COORDINATES					
			N _o	E _o	El _o
A2-SM-02	Plane A				
B2-SM-01	Plane B				
C2-SM-03	Plane C				

Notes

1. Survey monument locations shown on Drawing Nos. 1625.220 and 1625.221.
2. A sample monitoring sheet, complete with displacement calculations, is included in Appendix C.
3. Refer to Table 6.3 for displacement trigger levels and actions.

TABLE 6.3

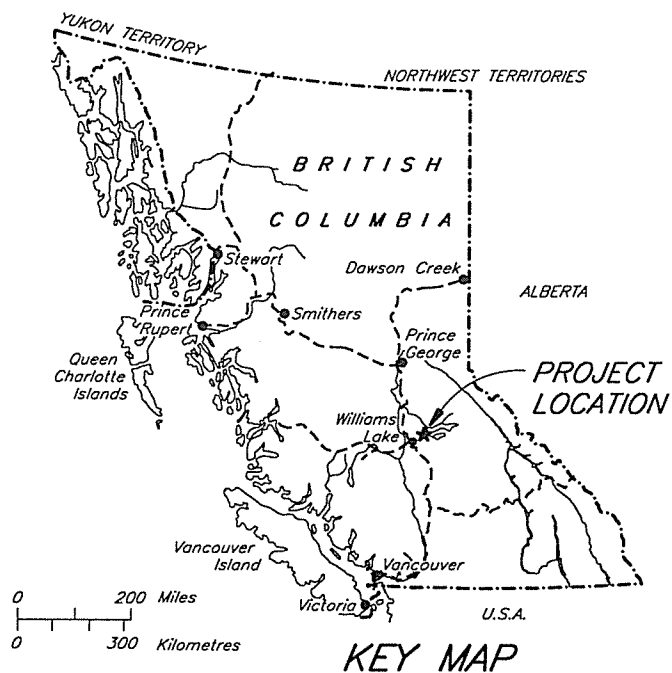
MOUNT POLLEY MINING CORPORATION
MOUNT POLLEY PROJECT
TAILINGS STORAGE FACILITY

TRIGGER LEVELS FOR SURVEY MONUMENTS

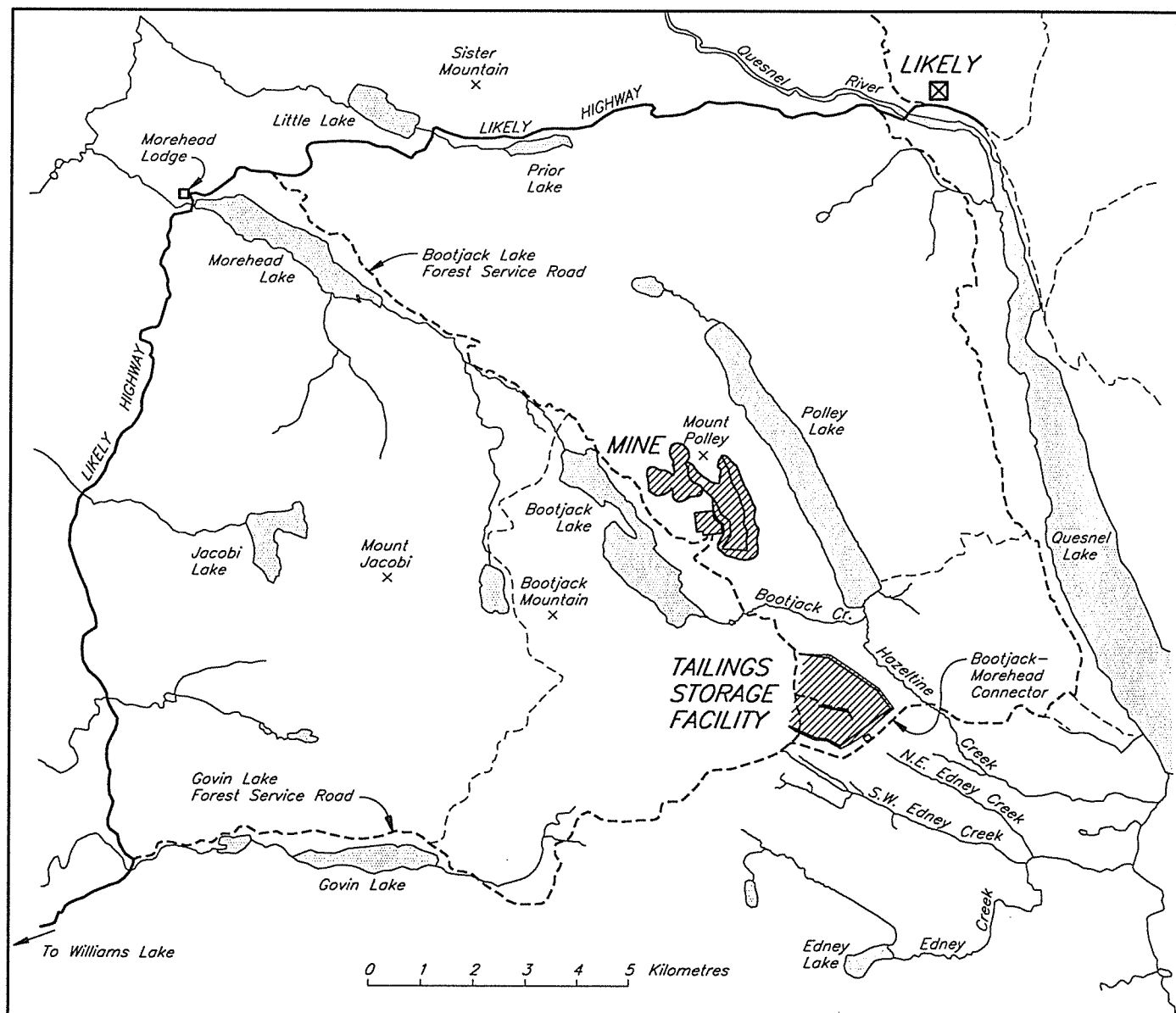
J:\JOB\REPORT\1627\3-TBL6-2.XLS

6/18/97 13:27

DISPLACEMENT TYPE	DESCRIPTION	LEVEL	MAGNITUDE OF DISPLACEMENT	ACTION
Settlement	Loss of fill elevation associated with small displacements in upstream or downstream direction.	1	$\Delta E l = -0.01$ to -0.02	Continue survey and inspections.
		2	$\Delta E l = -0.02$ to -0.05	See Contingency 1.
		3	$\Delta E l > -0.05$	Inspect embankment for cracking, sloughing or slumping, If observed, complete actions for Contingency 2. If not, notify Design Engineer, increase survey frequency to monthly and complete daily inspections.
Crest Movement	Displacement in the upstream or downstream directions, associated with minor changes in embankment crest elevation.	1	$D_{xy} = \pm 0.03$	Slight deformations in the downstream direction may occur during initial basin filling. Continue inspections and surveys.
		2	$D_{xy} = \pm 0.05$	See Contingency 1.
		3	$D_{xy} > 0.05$	Inspect embankment for cracking, sloughing or slumping, If observed, complete actions for Contingency 2. If not, notify Design Engineer increase survey frequency to monthly and complete daily inspections.
Contingency Actions				
1	Inspect the embankment crest and slopes for cracking, sloughing or slumping. If any of these are noted see Contingency 2. Otherwise continue with survey and inspection as per Table 4.2. Forward results to the Design Engineer immediately.			
2	Cracks, sloughing or slumping found; determine size of affected area and photograph. Collect baseline measurements (e.g. length of crack, separation amount of movement, and rate of movement- if any). Closely inspect the embankment crest and slopes for other deformations, and the tailings beach for sinkholes or for unusual tailings or water movement or disturbance. Contact the Design Engineer with this information immediately. Inspect again, and determine if cracking or movement is continuing or accelerating. Arrange for additional survey monuments and increase frequency of inspection to twice daily. Survey daily until it is determined if displacements are continuing or accelerating. Arrange for an inspection by a suitably qualified Engineer.			



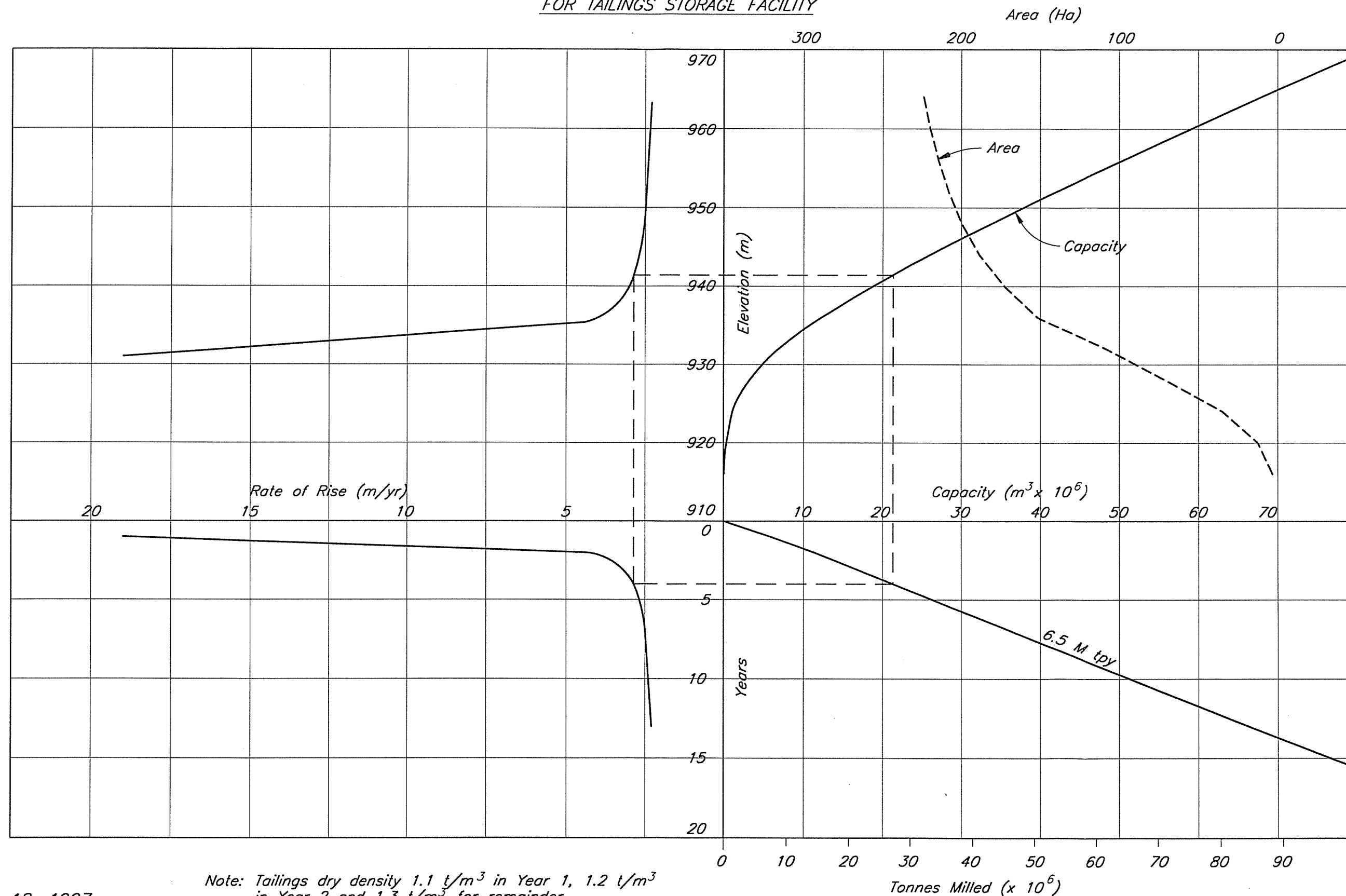
MOUNT POLLEY MINING CORPORATION
MOUNT POLLEY PROJECT
PROJECT LOCATION AND ACCESS PLAN



Apr. 18, 1997
 KNIGHT PIESOLD LTD.
 CONSULTING ENGINEERS

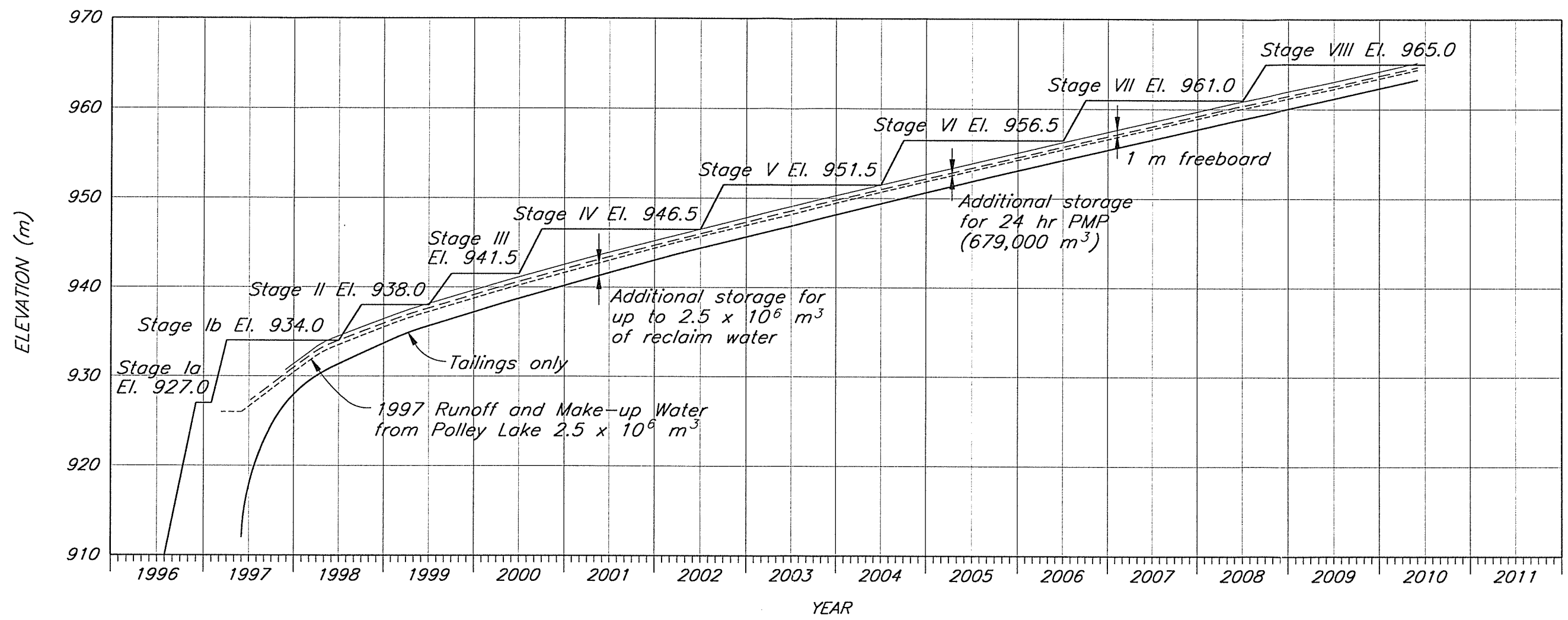
FIGURE 1.1

MOUNT POLLEY MINING CORPORATION
MOUNT POLLEY PROJECT
DEPTH/AREA/CAPACITY/FILLING RATE
FOR TAILINGS STORAGE FACILITY



Note: Tailings dry density 1.1 t/m³ in Year 1, 1.2 t/m³ in Year 2 and 1.3 t/m³ for remainder.

MOUNT POLLEY MINING CORPORATION
MOUNT POLLEY PROJECT
TAILINGS AREA FILLING SCHEDULE AND STAGED CONSTRUCTION
FOR 6,500,000 tpy THROUGHPUT

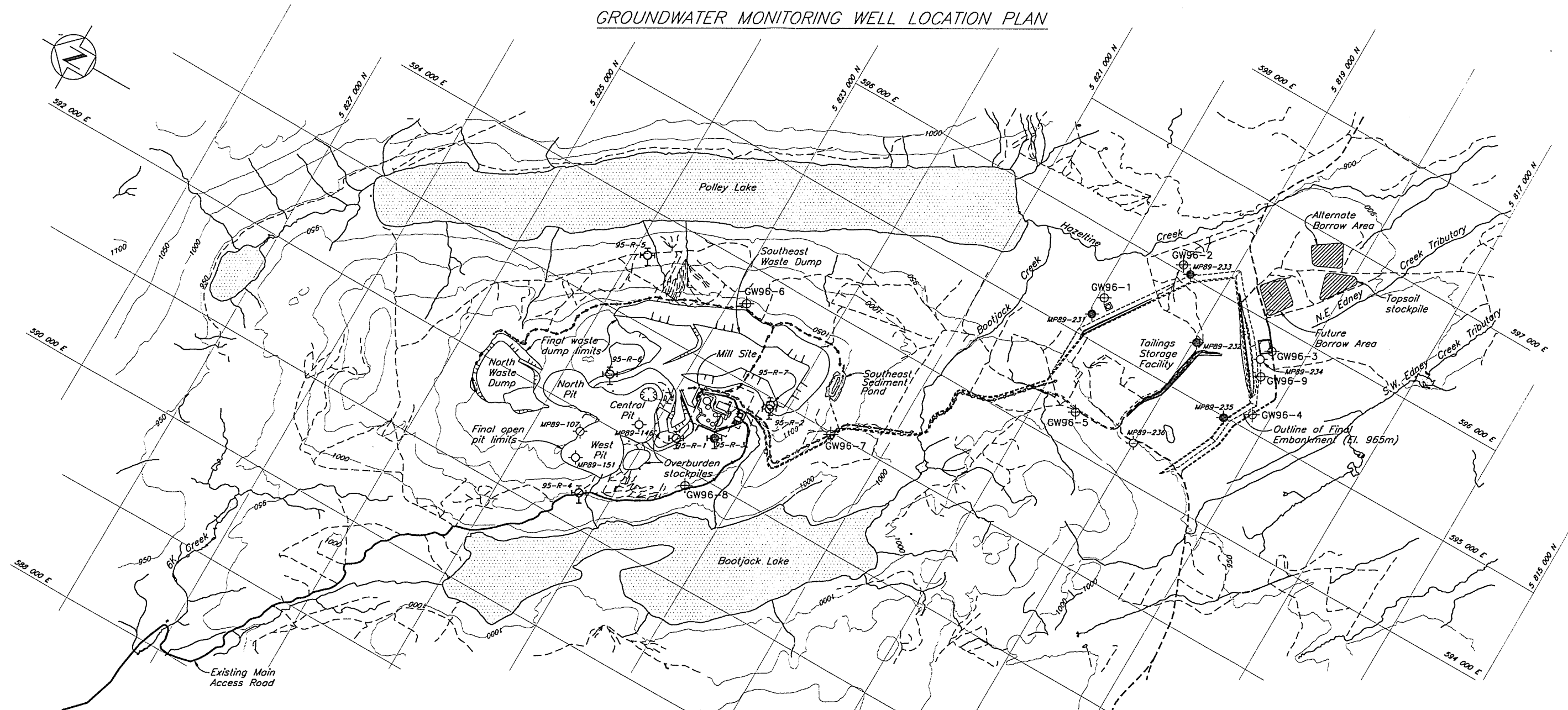


NOTES

1. All construction periods shown are for July through September, except Stage Ib, which is February through March.
2. Filling schedule based on tailings dry density of 1.1 t/m³ in Year 1, 1.2 t/m³ in Year 2 and 1.3 t/m³ for remainder.
3. Embankment crest elevations for each of the staged expansions will be determined annually based on tailings production, in-situ density and water management requirements.

CAD FILE: \PROJECT\1627\FIG\B9 Plot 1=1

MOUNT POLLEY MINING CORPORATION
MOUNT POLLEY PROJECT
GROUNDWATER MONITORING WELL LOCATION PLAN



NOTES

1. Open Pits and Waste Dumps are shown in their final configurations.
2. 1989 Monitoring Wells consist of 38 mm PVC with slotted screens.
3. 1995 Monitoring Wells consist of 110mm PVC well pipe installed primarily as a water supply source. Wells are screened at multiple intervals.
4. Monitoring installation 95-R-3 has been blocked at a depth of approximately 70 metres below the collar. This installation is no longer operable as a screen interval is not accessible.
5. 1996 Monitoring Wells consist of 50 mm PVC with one slotted screen section.
6. All previously installed monitoring wells with the tailing basin have been decommissioned.

LEGEND

- MP89-107 1989 Groundwater Monitoring Well
- GW96- 1996 Groundwater Monitoring Well
- Decommissioned / Lost Groundwater Well
- 95-R-4 1995 Groundwater Supply Well



Well Status			
Identification	Status	Identification	Status
MP89-107	Unknown	GW96-1A	Good
MP89-146	Unknown	GW96-1B	Good
MP89-151	Unknown	GW96-2A	Good
MP89-231	Lost/Decommissioned	GW96-2B	Good
MP89-232	Decommissioned	GW96-3A	Good
MP89-233	Lost/Decommissioned	GW96-3B	Good
MP89-234	Good	GW96-4A	Good
MP89-235	Lost/Decommissioned	GW96-4B	Good
MP89-236	Broken, Repairable	GW96-5A	Good
95-R-1	Good	GW96-5B	Good
95-R-2	Good	GW96-6	Good
95-R-3	Blocked	GW96-7	Good
95-R-4	Good	GW96-8A	Good
95-R-5	Good	GW96-8B	Good
95-R-6	Good	GW96-9	Good
95-R-7	Good		

APPENDIX A

AS-BUILT DRAWINGS



MOUNT POLLEY MINING CORPORATION
MOUNT POLLEY PROJECT
TAILINGS STORAGE FACILITY

DRAWING LIST

J:\JOB\DATA\10162-7\MISC\KDE-DRG.XLS

24-Nov-96

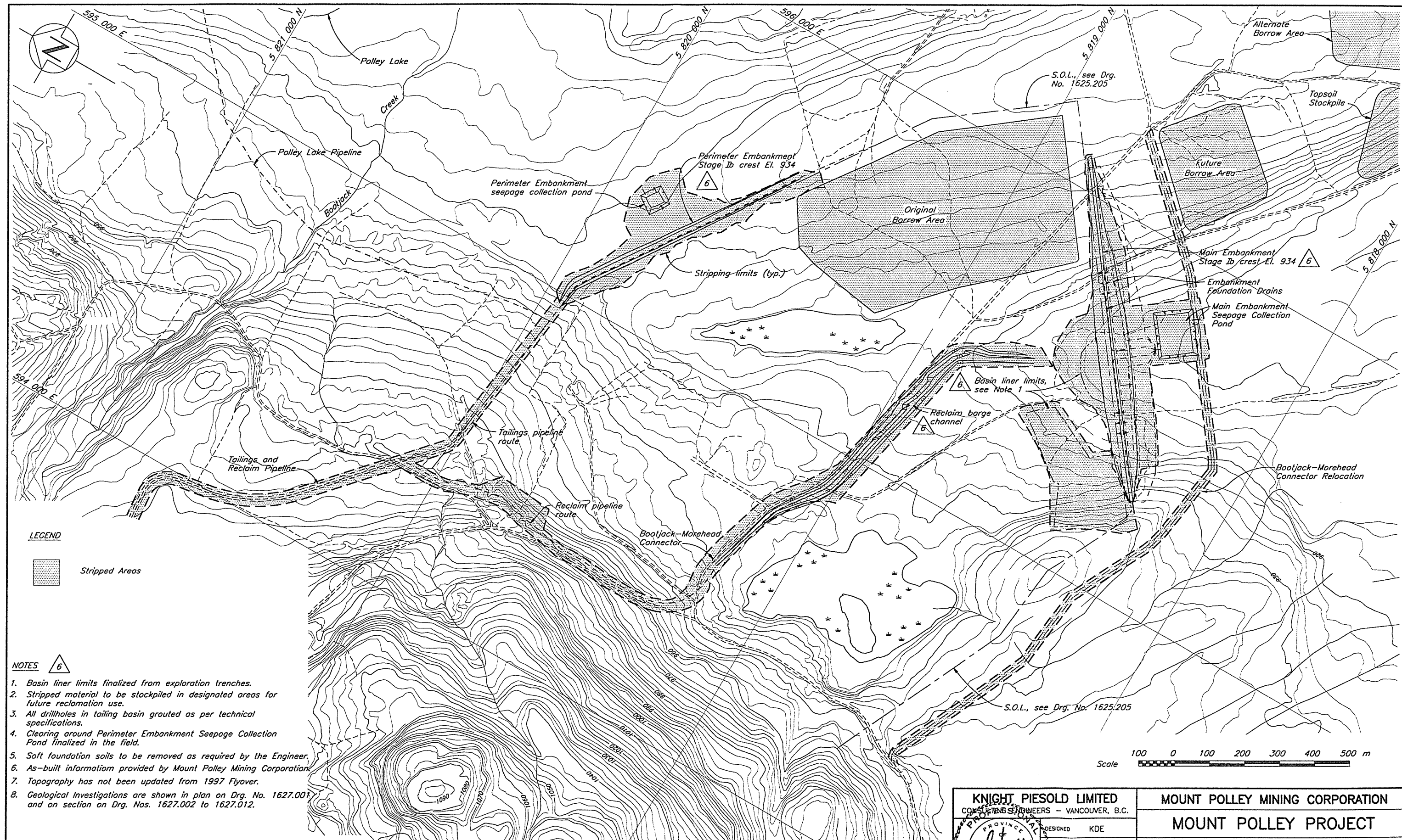
KP No.	Drawing No.	Rev. No.	Title	Plot Scale	Date Issued
D19	1625.200	5	Overall Site Plan	1=20	14-Aug-97
D18	1625.201	6	Tailings Storage Facility - Basin Preparation and Basin Liner	1=5	30-May-97
D20	1625.202	6	Tailings Storage Facility - Foundation Preparation and Basin Liner - Sections and Details	1=5	30-May-97
D17	1625.205	6	Tailings Storage Facility - Stage 1b Tailings Impoundment - General Arrangement	1=5	30-May-97
D51	1625.206	1	Tailings Storage Facility - Reclaim Barge Channel Excavation Details	1=2	30-May-97
D55	1625.207	1	Tailings Storage Facility - Tailings Dam Chimney Drain	1=2.5	30-May-97
D31	1625.210	5	Tailings Storage Facility - Main and Perimeter Embankments - Plan	1=2.5	30-May-97
D21	1625.211	7	Tailings Storage Facility - Tailings Embankment - Sections and Details	1=0.5	30-May-97
D30	1625.212	2	Tailings Storage Facility - Material Specifications	1=1	30-May-97
D22	1625.213	7	Tailings Storage Facility - Sediment Control and Seepage Collection	1=2.5	30-May-97
D23	1625.214	7	Tailings Storage Facility - Sediment Control and Seepage Collection - Sections and Details	1=0.5	30-May-97
D26	1625.218	7	Tailings Storage Facility - Tailings Distribution and Reclaim System - Plan	1=5	30-May-97
D27	1625.219	7	Tailings Storage Facility - Tailings Distribution and Reclaim System - Sections and Details	1=0.2	25-Jul-97
D28	1625.220	7	Tailings Storage Facility - Instrumentation	1=2.5	30-May-97
D29	1625.221	4	Tailings Storage Facility - Instrumentation - Sections and Details	1=0.02	30-May-97
D42	1625.222	2	Tailings Storage Facility - Tailings Impoundment - Tailings and Reclaim Pipework Plan	1=5	14-Aug-97
D40	1625.223	1	Tailings Storage Facility - Reclaim Pipeline Details	1=0.02	30-May-97
D39	1625.224	1	Tailings Storage Facility - Tailings Distribution System - Details	1=0.05	30-May-97
D41	1625.225	2	Tailings Storage Facility - Tailings Pipework Details Drop Box No 2	1=0.02	14-Aug-97
D52	1625.226	2	Tailings Storage Facility - Reclaim Booster Pump Station Area - General Arrangement	1=0.25	14-Aug-97
D48	1625.228	2	Tailings Storage Facility - Tailings Impoundment - Tailings and Reclaim Pipework Profiles	1=10	14-Aug-97
D32	1625.230	5	Drainage Plan - Mine Site	1=5	8-May-97
D34	1625.231	6	Drainage Plan - Mill Site	1=1.25	30-May-97
D33	1625.232	5	Drainage Plan - Sections and Details	1=0.1	8-May-97
D6	1628.001	2	Pumping System - Plan, Profile and Section General Arrangement	1=5	19-Feb-97



- NOTES
- 1. Millsite layout as per CSFM Engineering.
 - 2. As-built information from Mount Polley Mining Corporation.
 - 3. Topography has not been updated from 1997 Flyover.



										* SIGNATURES AND PROFESSIONAL SEAL ON PREVIOUS REVISION				3			
										KNIGHT PIESOLD LIMITED CONSULTING ENGINEERS - VANCOUVER, B.C.				MOUNT POLLEY MINING CORPORATION			
										* 							



LEGEND

 Stripped Areas

NOTES 6

1. Basin liner limits finalized from exploration trenches.
2. Stripped material to be stockpiled in designated areas for future reclamation use.
3. All drillholes in tailing basin grouted as per technical specifications.
4. Clearing around Perimeter Embankment Seepage Collection Pond finalized in the field.
5. Soft foundation soils to be removed as required by the Engineer.
6. As-built information provided by Mount Polley Mining Corporation.
7. Topography has not been updated from 1997 Flyover.
8. Geological Investigations are shown in plan on Drg. No. 1627.001 and on section on Drg. Nos. 1627.002 to 1627.012.

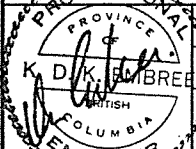
DRG. NO.	DESCRIPTION
1625.205	TSF - STAGE 1b IMPOUNDMENT - GENERAL ARRANGEMENT

REV.	DATE	DESCRIPTION	APPROVED
6	MAY 30/97	AS-BUILT LINERS, EMBANKMENTS, PONDS, AND BARGE CHANNEL	KJB
5	MAY 24/96	ISSUED FOR CONSTRUCTION	
4	APR 11/96	RE-ISSUED FOR TENDER	

REV.	DATE	DESCRIPTION	APPROVED
3	APRIL 1/96	NOTE 4 AND STRIPPING LIMITS	
2	MAR 25/96	UPDATE ROADS & DRAINAGE	
1	JULY 27/95	NOTE 4 AND STRIPPING LIMITS	
0	JUNE 2/95	ISSUED FOR TENDER	

KNIGHT PIESOLD LIMITED
CONSULTING ENGINEERS - VANCOUVER, B.C.

DESIGNED KDE
DRAWN RDT
CHECKED KJB
APPROVED KJB

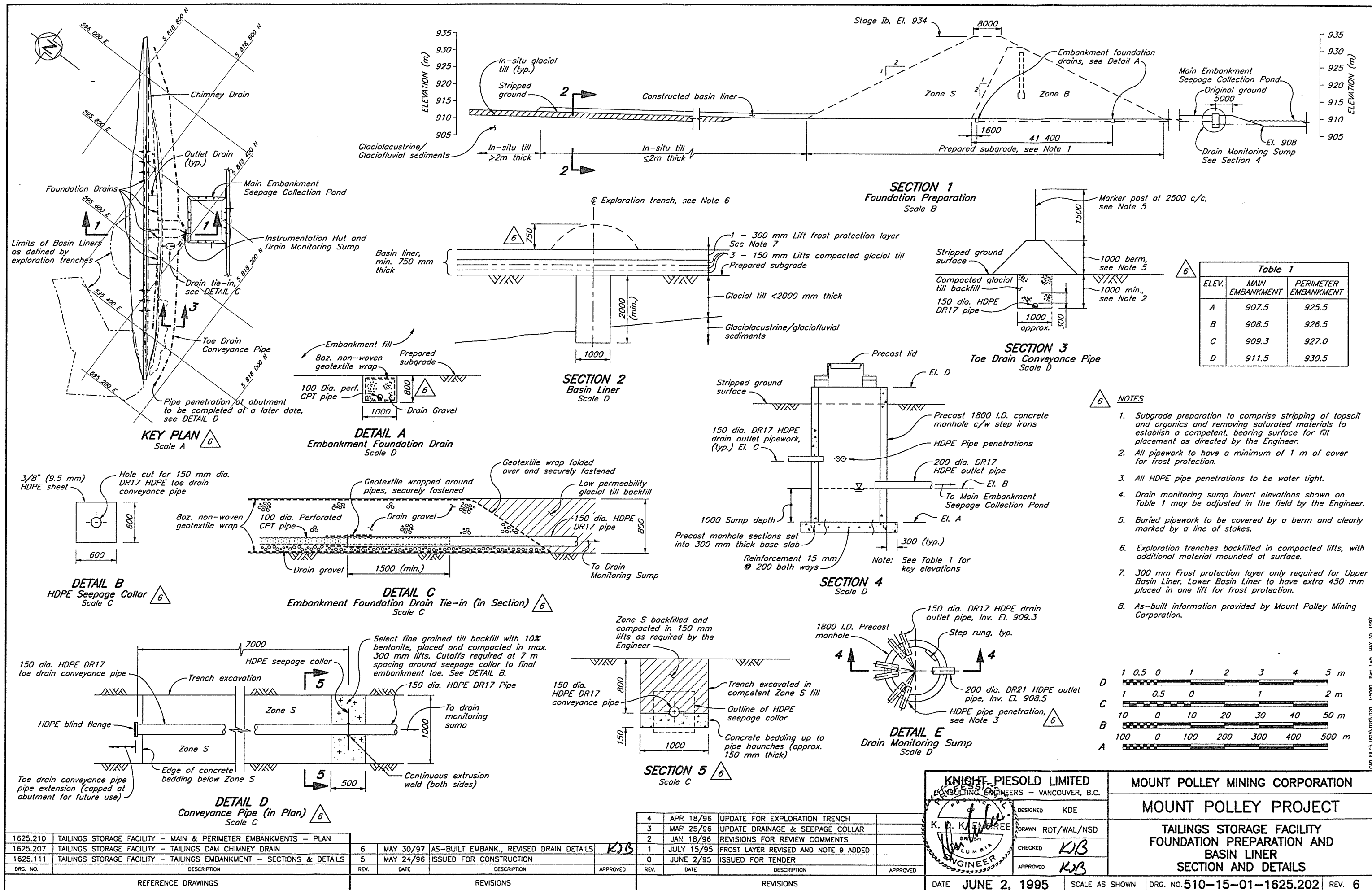


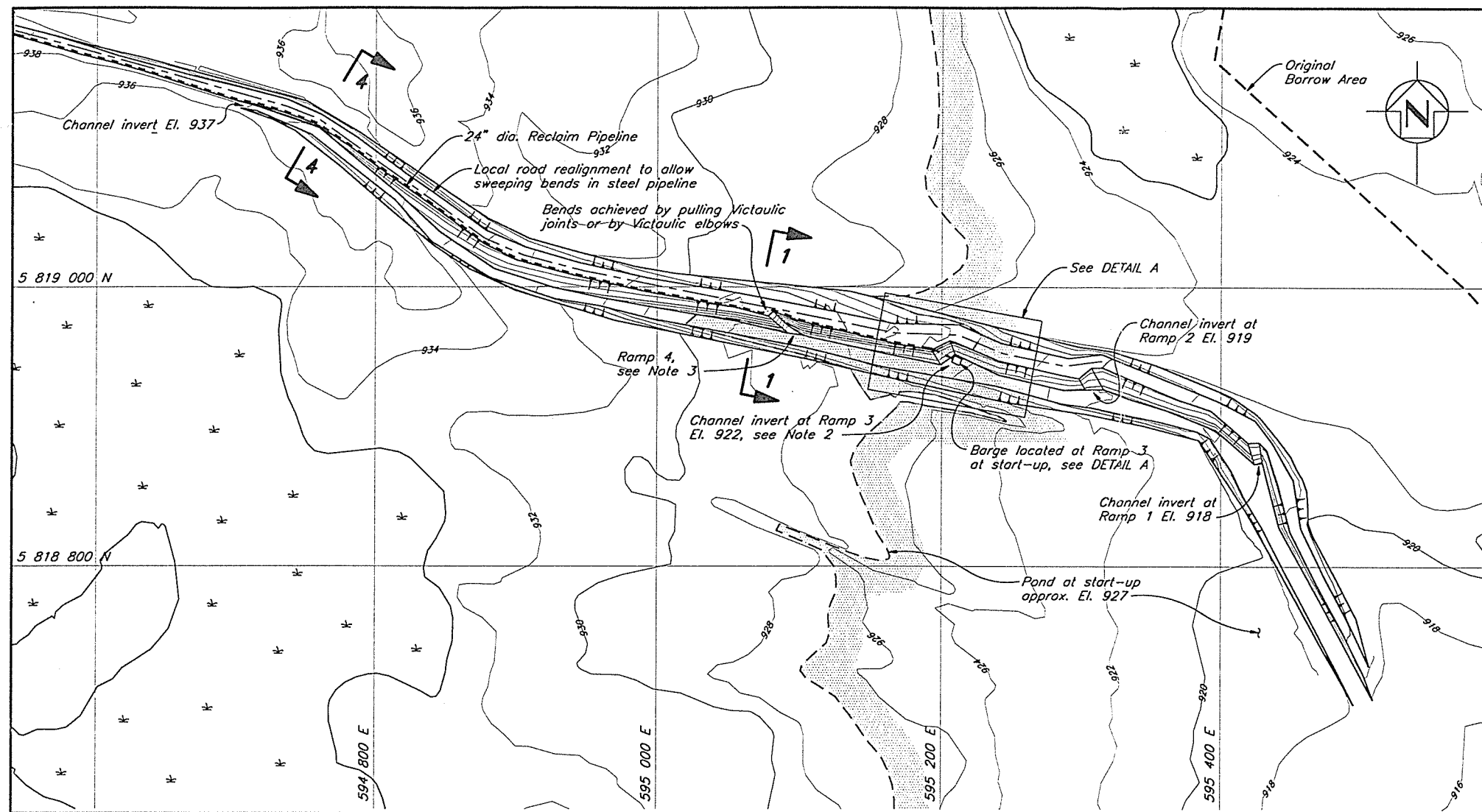
MOUNT POLLEY MINING CORPORATION

MOUNT POLLEY PROJECT

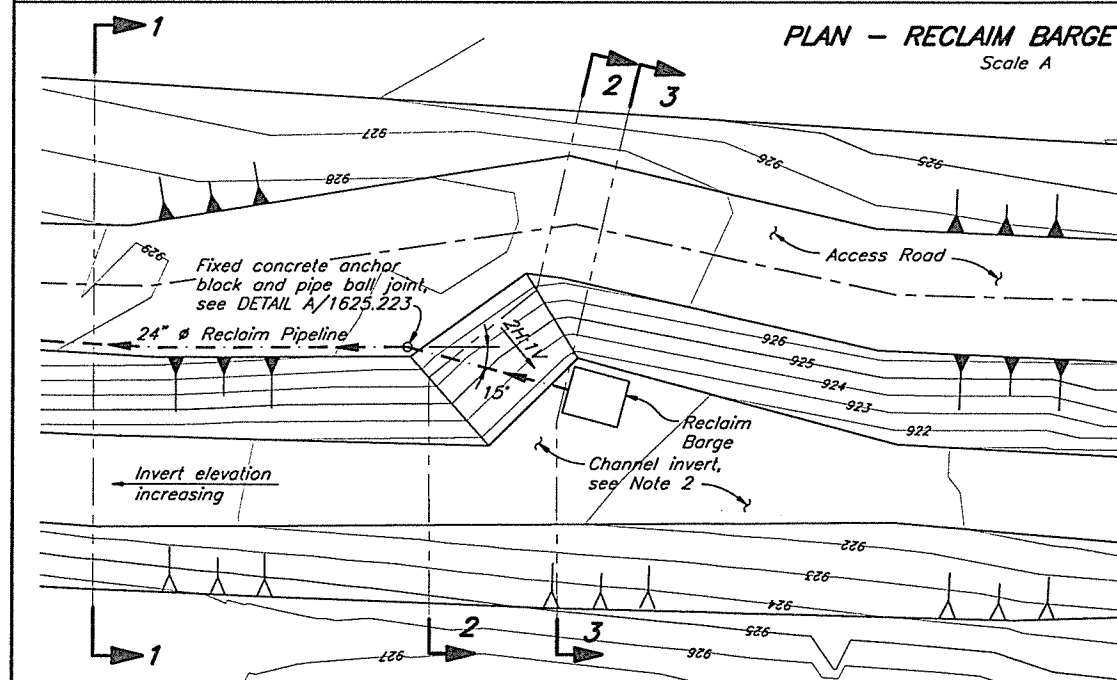
**TAILINGS STORAGE FACILITY
BASIN PREPARATION
AND BASIN LINER**

C:\DWG FILES\1625\01\510-11-01-1625.DWG 1:50000 PLOT 1-5 MAY 30, 1997





PLAN - RECLAIM BARGE CHANNEL
Scale A



DETAIL A
BARGE ACCESS RAMP
Scale C

1625.223	TSF - RECLAIM PIPELINE DETAILS
1625.222	TSF - TAILINGS IMPOUNDMENT - TAILINGS & RECLAIM PIPEWORK - PLAN
1625.218	TSF - TAILINGS DISTRIBUTION & RECLAIM SYSTEM - PLAN
DRG. NO.	DESCRIPTION

REFERENCE DRAWINGS

REV.	DATE	DESCRIPTION	APPROVED
------	------	-------------	----------

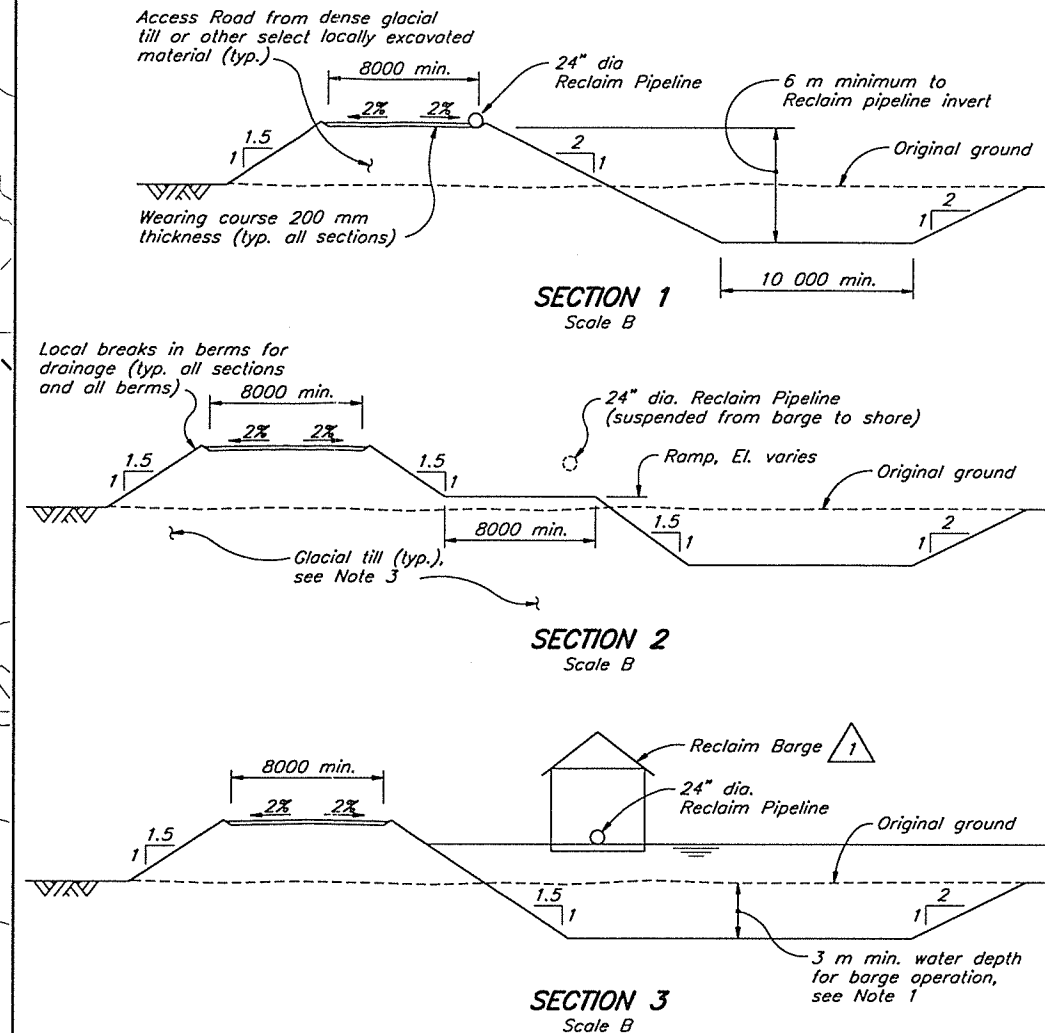
REVISIONS

NOTES

1. Barge requires a minimum water depth of 3 m for operation and can operate over a 3 m range (see Drg. No. 1625.223).
2. Pond level at start-up approx. El. 927, with initial access road and ball joint at El. 928 and channel invert at El. 922 or lower.
3. Additional access ramps to be added as required at 3 m elevation increments. If the initial ramp is moved down channel from the assumed start-up location, additional reclaim pipe will be required.
4. Compacted glacial till placed along the barge channel excavation when higher permeability soils encountered (to meet basin liner requirements), as directed by the Engineer.
5. As-built information provided by Mount Polley Mining Corporation.
6. Topography has not been updated for 1997 Flyover.
7. Pipeline alignments to be updated based on as-built survey.

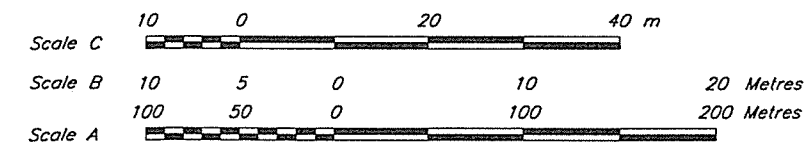
1	MAY 30/97	AS-BUILT RECLAIM BARGE CHANNEL	KJB
0	JULY 15/96	ISSUED FOR CONSTRUCTION	
REV.	DATE	DESCRIPTION	APPROVED

REVISIONS



SECTION 4, 1625.218, 1625.222
Scale B

SECTION 5, 1625.218, 1625.222
Scale B



KNIGHT PIESOLD LIMITED
CONSULTING ENGINEERS - VANCOUVER, B.C.

DESIGNED: HPD
DRAWN: NSD
CHECKED: KJB
APPROVED: KJB

DATE: JULY 15, 1996

MOUNT POLLEY MINING CORPORATION

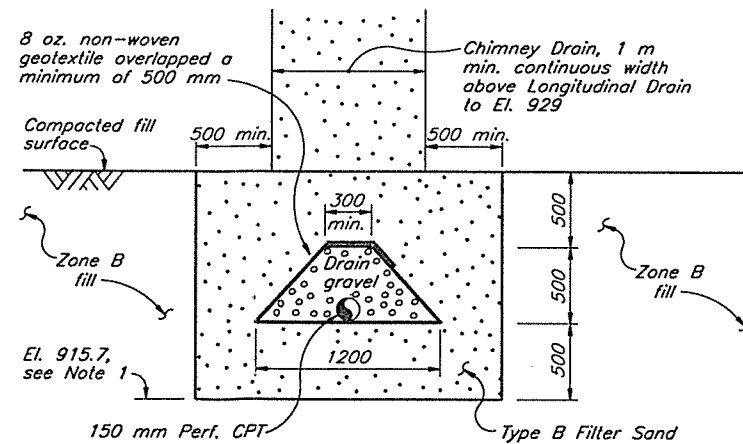
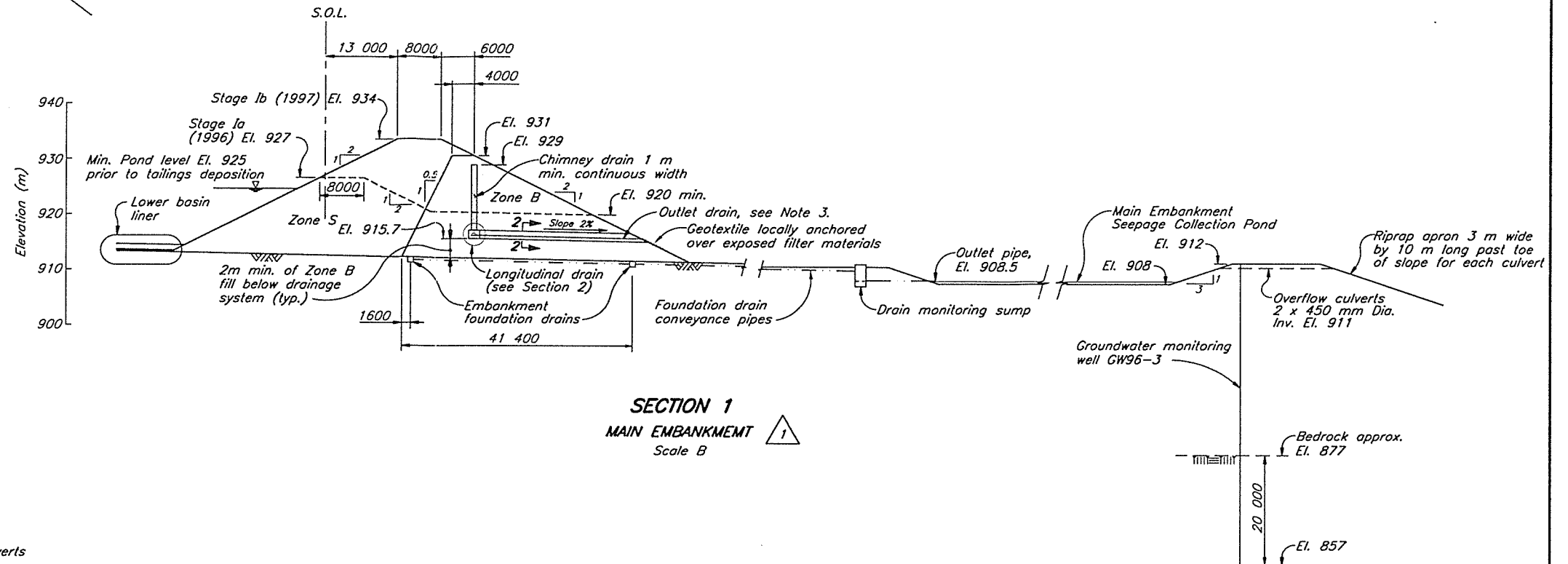
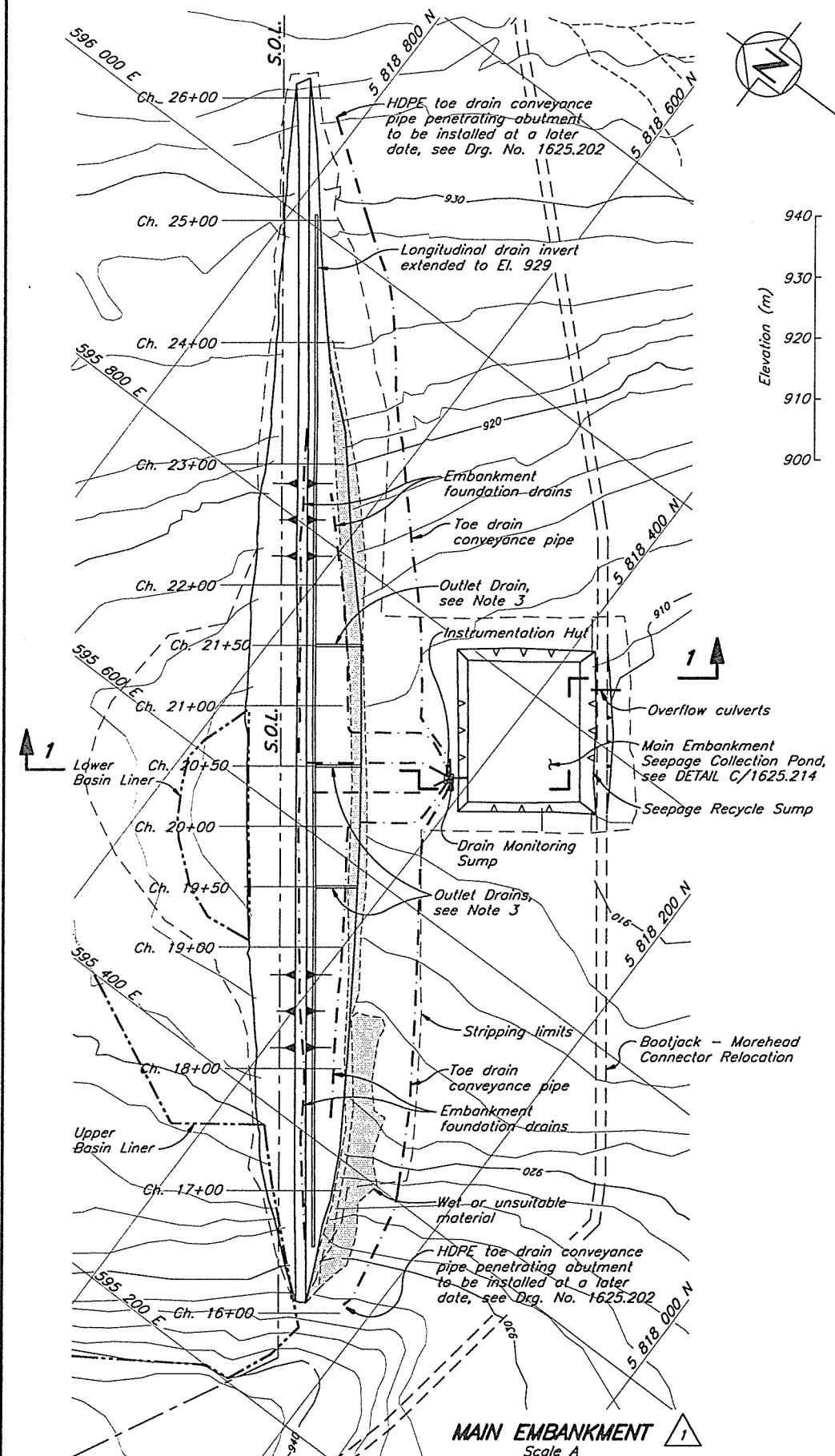
MOUNT POLLEY PROJECT

**TAILINGS STORAGE FACILITY
RECLAIM BARGE CHANNEL
EXCAVATION DETAILS**

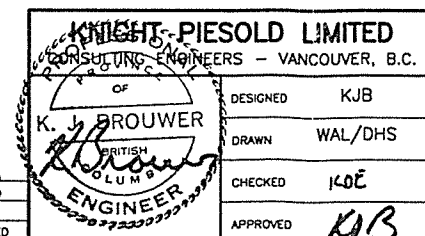
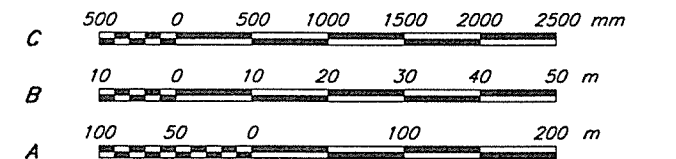
SCALE AS SHOWN

DRG. NO. 1625.206

REV. 1

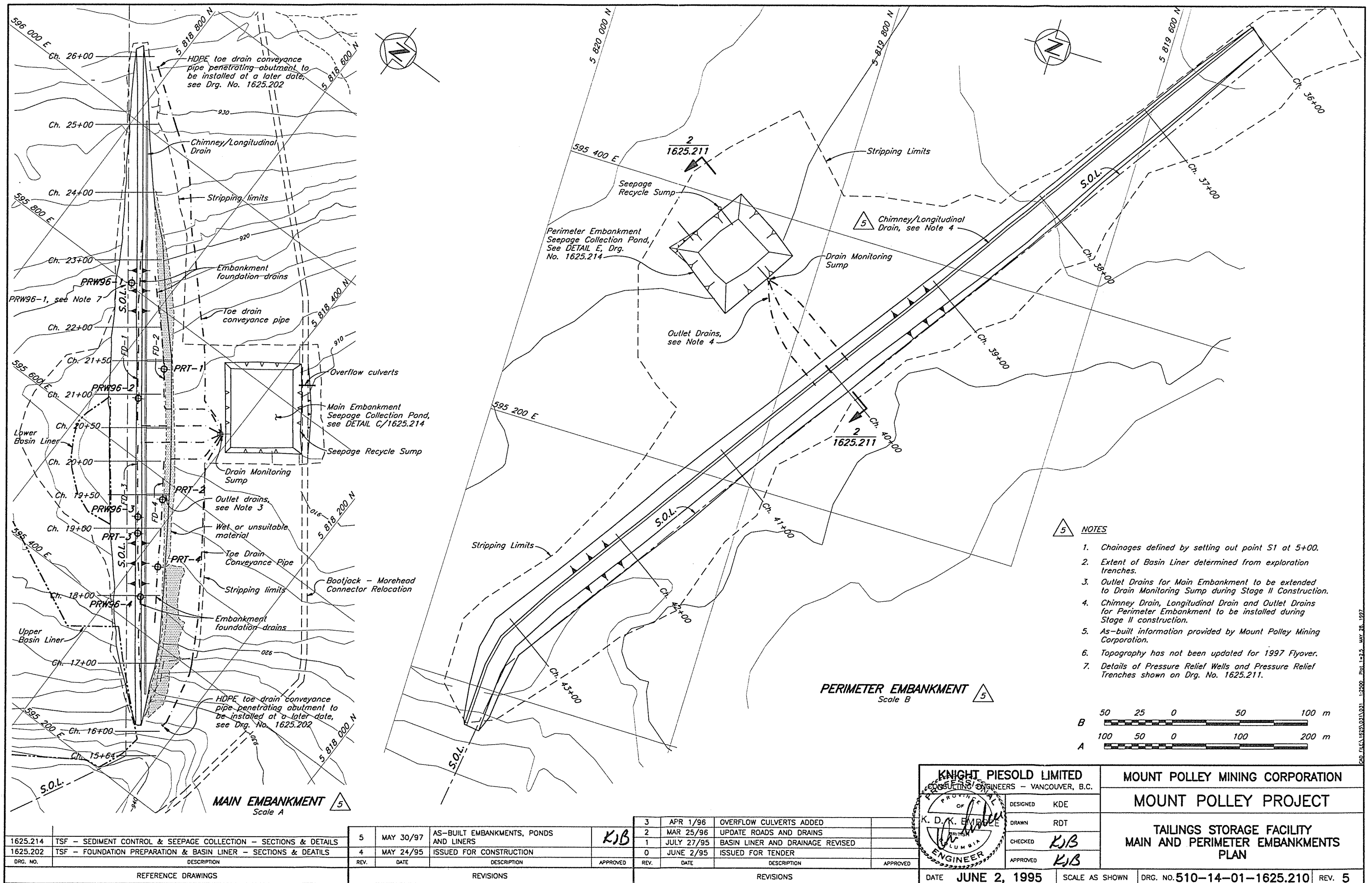


- NOTES
1. Longitudinal drain installed with invert El. 915.7 m approx. Ch. 18+50 to 23+00. On the right abutment, (Ch. 16+00 to 18+50) it was installed to invert El. 929 m in placed and compacted Zone B fill. On the left abutment (Ch. 23+00 to 25+25) it was installed in original ground, following the prepared ground surface.
 2. HDPE toe drain conveyance pipe to be installed at later date. To be bedded with concrete as shown on Drg. No. 1625.202.
 3. Outlet drains to be extended to Drain Monitoring Sumps during Stage II construction.
 4. As-built information provided by Mount Polley Mining Corporation.
 5. Topography has not been updated for 1997 Flyover.



MOUNT POLLEY MINING CORPORATION
MOUNT POLLEY PROJECT
TAILINGS STORAGE FACILITY
TAILINGS DAM CHIMNEY DRAIN

DATE SEPT. 4, 1996 SCALE AS SHOWN DRG. NO. 1625.207 REV. 1



1625.214	TSF - SEDIMENT CONTROL & SEEPAGE COLLECTION - SECTIONS & DETAILS
1625.202	TSF - FOUNDATION PREPARATION & BASIN LINER - SECTIONS & DETAILS
DRG. NO.	DESCRIPTION

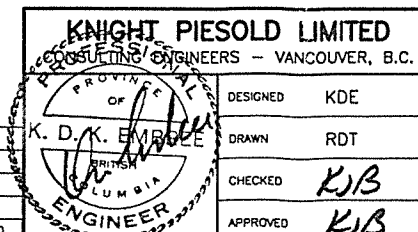
REFERENCE DRAWINGS

5	MAY 30/97	AS-BUILT EMBANKMENTS, PONDS AND LINERS
4	MAY 24/95	ISSUED FOR CONSTRUCTION
REV.	DATE	DESCRIPTION

REVISIONS

3	APR 1/96	OVERFLOW CULVERTS ADDED
2	MAR 25/96	UPDATE ROADS AND DRAINS
1	JULY 27/95	BASIN LINER AND DRAINAGE REVISED
0	JUNE 2/95	ISSUED FOR TENDER
REV.	DATE	DESCRIPTION

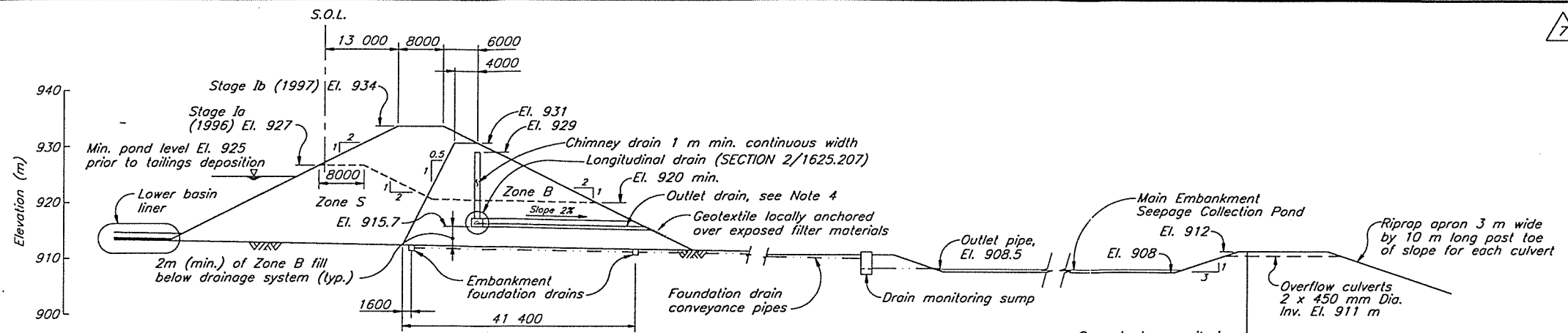
REVISIONS



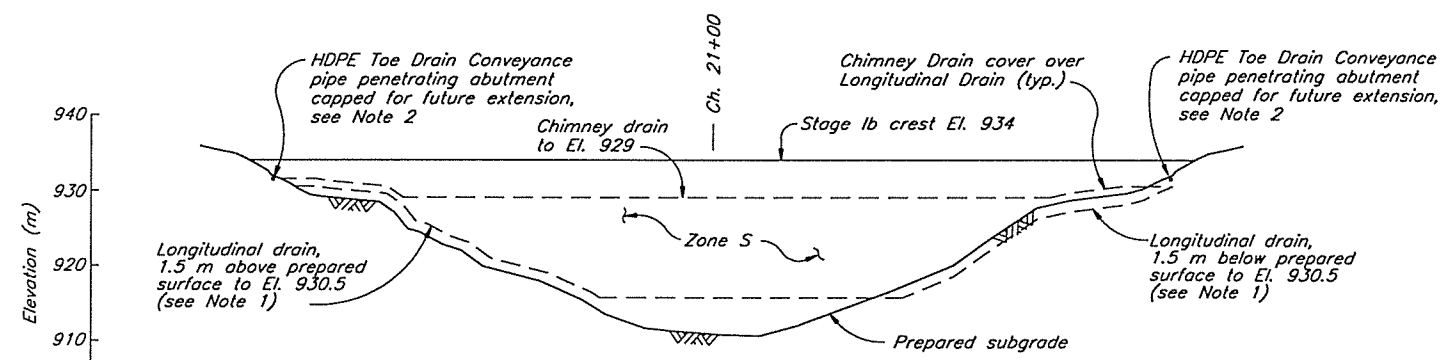
DATE JUNE 2, 1995

SCALE AS SHOWN

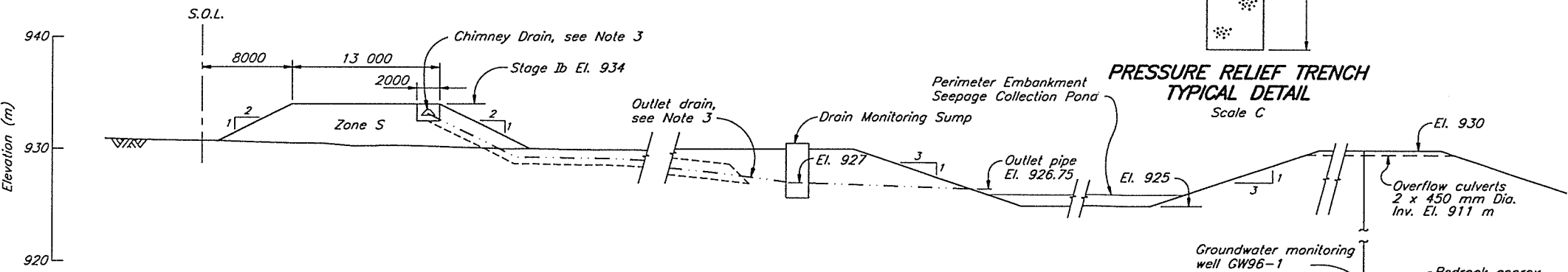
MOUNT POLLEY MINING CORPORATION
MOUNT POLLEY PROJECT
TAILINGS STORAGE FACILITY MAIN AND PERIMETER EMBANKMENTS PLAN
DRG. NO. 510-14-01-1625.210
REV. 5



MAIN EMBANKMENT
Scale A

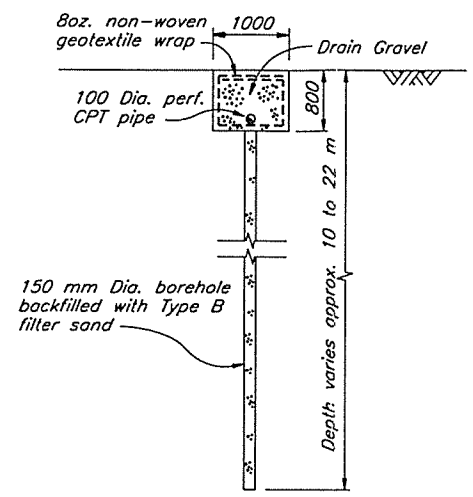


LONGITUDINAL SECTION OF MAIN EMBANKMENT
(Looking Downstream)
N.T.S.



PERIMETER EMBANKMENT
Scale B

PRESSURE RELIEF TRENCH
TYPICAL DETAIL
Scale C



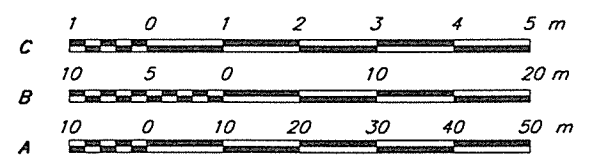
PRESSURE RELIEF WELL
TYPICAL DETAIL
Scale C

ZONE	MATERIAL TYPE	PLACEMENT AND COMPACTION REQUIREMENTS
Blanket/Toe Drain	Filter sand	Placed and spread in maximum 1.0 m thick layers. Vibratory compaction as directed by the Engineer.
Foundation Drain	Drain Gravel	Placed and compacted as shown on the Drawings.
S	Glacial till	Placed, moisture conditioned and spread in maximum 300 mm thick layers (after compaction). Vibratory compaction to 98% of Standard Proctor maximum dry density or as approved by the Engineer.
B	Glacial till	Placed, moisture conditioned and spread in maximum 600 mm thick layers (after compaction). Vibratory compaction to 98% of Standard Proctor maximum dry density or as approved by the Engineer.
Chimney Drain	Type B Filter Sand	Placed and spread in maximum 600 mm thick layers. Compaction as directed by the Engineer.

7

NOTES

- Longitudinal drain installed with invert El. 915.7 m approx. Ch. 18+50 to 23+00. On the right abutment, (Ch. 16+00 to 18+50) it was installed to invert El. 929 m in placed and compacted Zone B fill. On the left abutment (Ch. 23+00 to 25+25) it was installed in original ground, following the prepared ground surface.
- HDPE toe drain conveyance pipes for Main Embankment to be installed at a later date. Details shown on Drg. No. 1625.202.
- Chimney drain, longitudinal drain and Outlet drains for Perimeter Embankment to be installed during Staged II Construction.
- Outlet drains to be extended to Drain Monitoring Sumps during Stage II construction.
- Fill placement rates to be modified by the Engineer if excess pore pressures monitored in fill or foundation piezometers.
- Groundwater monitoring wells to be installed by others.
- As Built Information provided by Mount Polley Mining Corporation.



DRG. NO.	DESCRIPTION
1625.207	TSF - TAILINGS DAM CHIMNEY DRAIN
1625.202	TSF - FOUNDATION PREPARATION & BASIN LINER - SECTIONS & DETAILS

REV.	DATE	DESCRIPTION	APPROVED
7	MAY 30/97	AS-BUILT EMBANKMENTS AND PONDS	KJB
6	SEP 4/96	STAGE Ia ADDED, MODIFIED DRAINAGE DETAIL	
5	MAY 28/96	ISSUED FOR CONSTRUCTION	

REV.	DATE	DESCRIPTION	APPROVED
4	APR 19/96	EMBANKMENT EROSION PROTECTION	
3	APR 11/96	RE-ISSUED FOR TENDER	
2	APR 1/96	OVERFLOW CULVERTS ADDED	
1	MAR 22/96	UPDATE DRAINAGE	
0	JUNE 2/95	ISSUED FOR TENDER	

KNIGHT-PIESOLD LIMITED
CONSULTING ENGINEERS - VANCOUVER, B.C.

DESIGNED: KDE
DRAWN: WAL/VY
CHECKED: KJB
APPROVED: KJB

K. D. KEMPEE
ENGINEER

MOUNT POLLEY MINING CORPORATION

MOUNT POLLEY PROJECT

**TAILINGS STORAGE FACILITY
TAILINGS EMBANKMENT
SECTIONS AND DETAILS**

UNIFIED SOIL CLASSIFICATION SYSTEM

PROJECT: *ZONE - S AND B*
MATERIAL - *GLACIAL TILL*

The plot shows the grain size distribution for the material. The Y-axis is labeled 'PERCENT FINER BY WEIGHT' and ranges from 0 to 100. The X-axis is labeled 'GRAIN SIZE IN MILLIMETRES' and ranges from 500 to 0.001. The plot also includes sieve opening sizes in inches and US standard sieve sizes. A solid line represents the grain size distribution curve, which is labeled 'Zone S Coarse Limit'. A dashed line represents the 'Zone B Coarse Limit'. A triangle with the number '2' inside is located on the plot.

BOULDERS		COBBLES		GRAVEL		SAND			SILT			CLAY							
				Coarse	Fine	Coarse	Medium	Fine	Coarse	Medium	Fine								
24"	12"	6"	4"	3"	2"	1 1/2"	1"	3/4"	3/8"	3/16"	1/8"	4"							
				SIEVE OPENING IN INCHES				US STANDARD SIEVE SIZES											
								8	10	16	20	30	40	50	60	100	140	200	

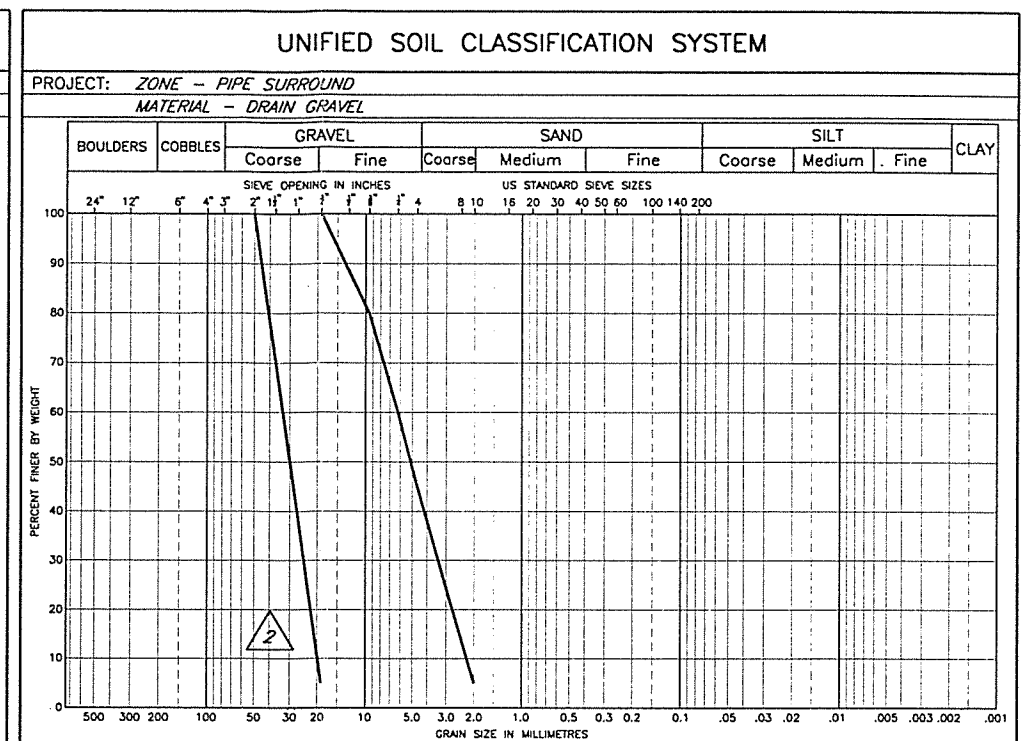
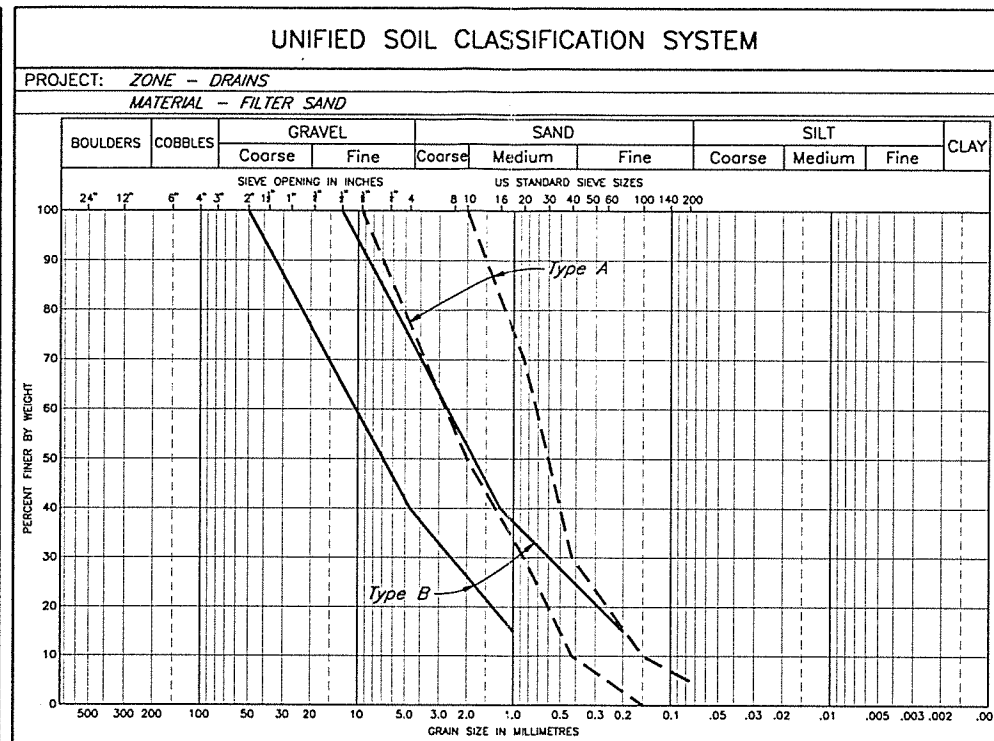
PERCENT FINER BY WEIGHT

GRAIN SIZE IN MILLIMETRES

Zone S Coarse Limit

Zone B Coarse Limit

2



UNIFIED SOIL CLASSIFICATION SYSTEM

PROJECT: ZONE - BASIN LINER

MATERIAL - GLACIAL TILL

The plot shows the grain size distribution for the material. The y-axis represents Percent Finer by Weight (0 to 100). The x-axis represents Grain Size in Millimetres (500 to 0.075) and Sieve Opening in Inches (24 to 0.075). The plot includes curves for Coarse Limit 150 mm Lifts and Coarse Limit 650 mm Frost Protection Layer. A triangle symbol with the number 2 is present in the upper right quadrant.

BOULDERS		COBBLES		GRAVEL		SAND			SILT			CLAY
Coarse	Fine	Coarse	Medium	Fine	Coarse	Medium	Fine	Coarse	Medium	Fine		
24"	12"	6"	4"	3"	2"	1 1/2"	1"	3/4"	3/8"	3/16"	1/8"	4
SIEVE OPENING IN INCHES												US STANDARD SIEVE SIZES
												8 10 16 20 30 40 50 60 100 140 200

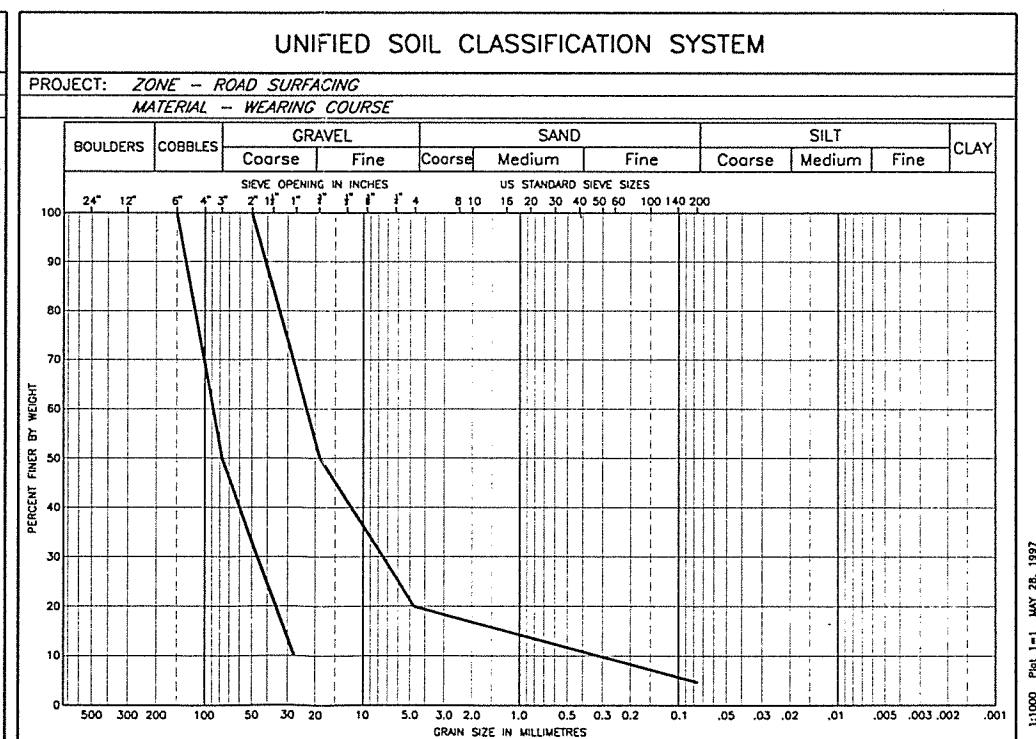
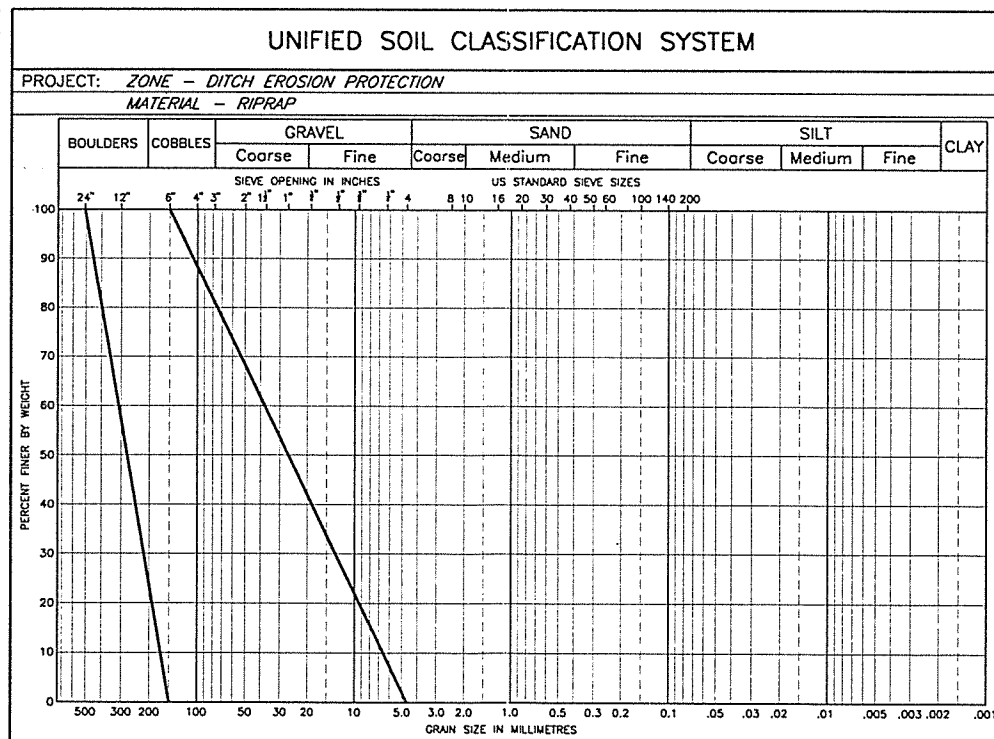
PERCENT FINER BY WEIGHT

GRAIN SIZE IN MILLIMETRES

Coarse Limit 150 mm Lifts

Coarse Limit 650 mm Frost Protection Layer

2



DRG. NO.	DESCRIPTION	REV.	DATE	DESCRIPTION	APPROVED
REFERENCE DRAWINGS		REVISIONS			

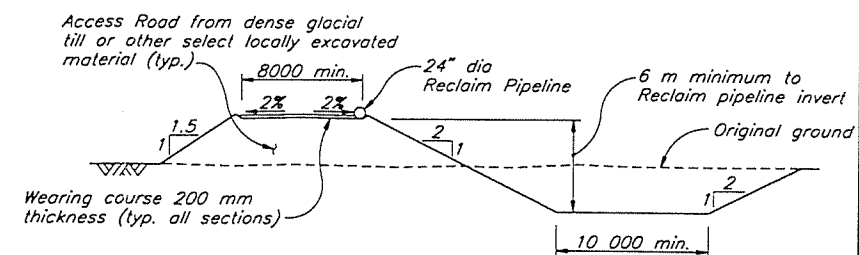
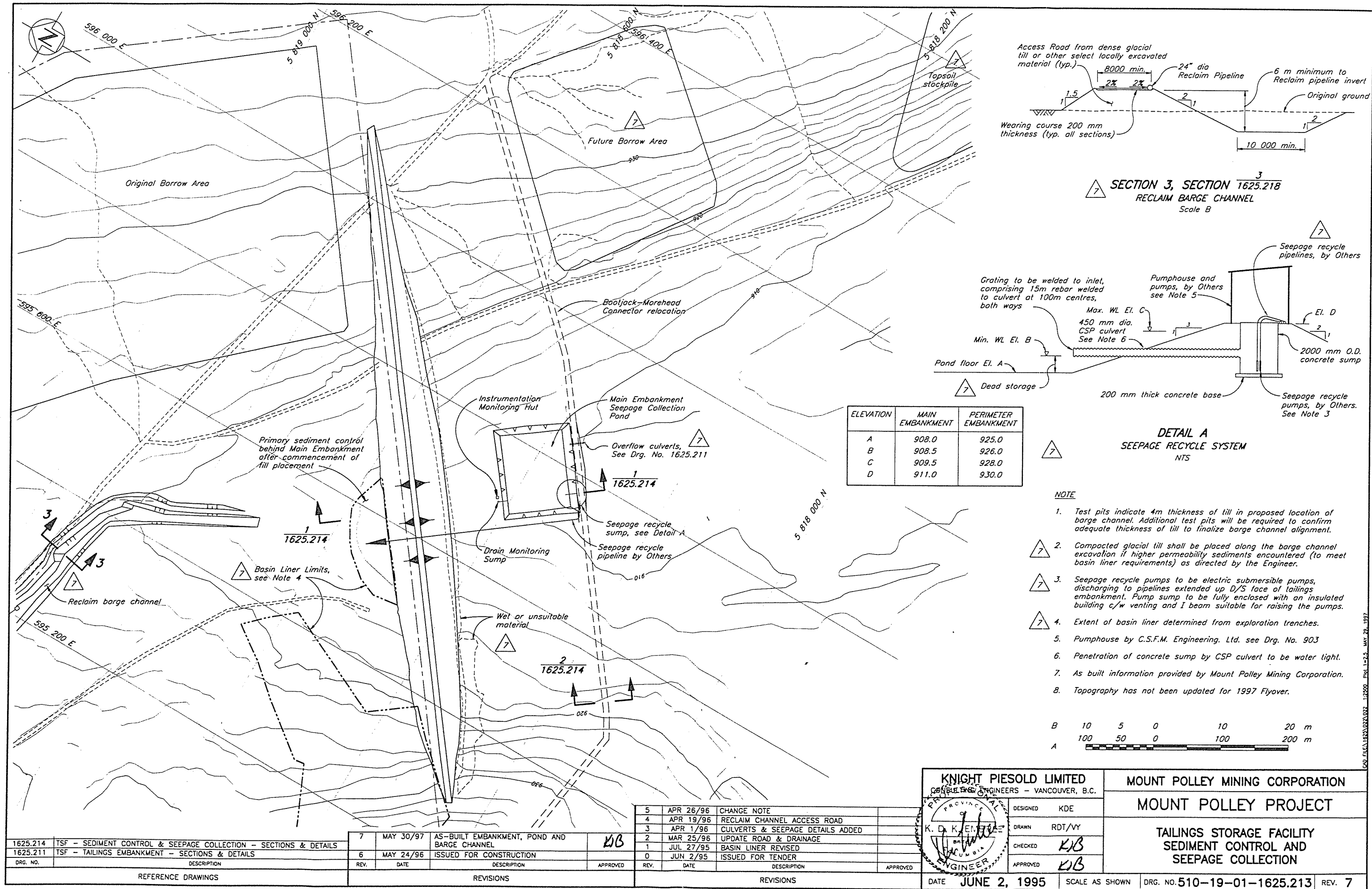
KNIGHT PIESOLD LIMITED
CONSULTING ENGINEERS - VANCOUVER, B.C.

K. D. K. EMPEREE
BRITISH COLUMBIA
ENGINEER

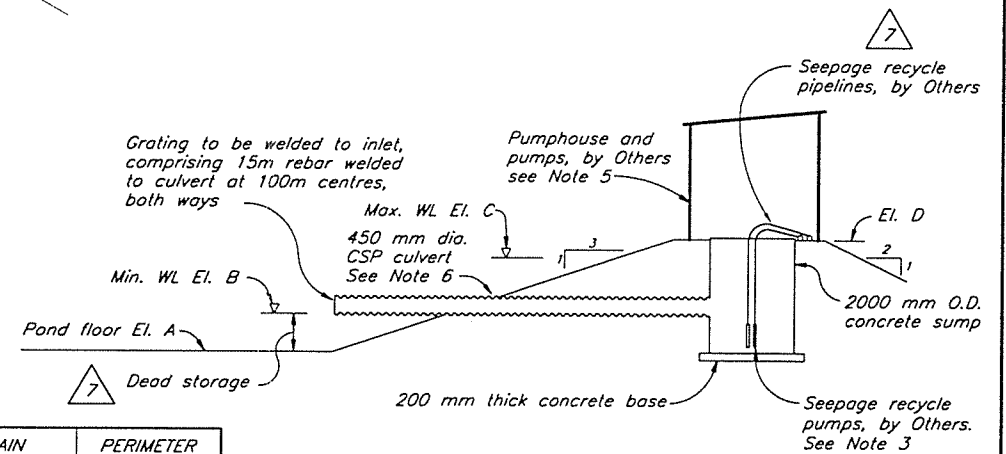
DESIGNED KDE
DRAWN RDT
CHECKED **KJB**
APPROVED **KJB**

DATE **JUNE 2, 1995** SCALE AS

DATE	JUNE 2, 1995	SCALE AS SHOWN	DRG. NO. 510-14-03-1625.212	REV. 2
------	--------------	----------------	-----------------------------	--------



SECTION 3, SECTION 1625.218
RECLAIM BARGE CHANNEL
Scale B



ELEVATION	MAIN EMBANKMENT	PERIMETER EMBANKMENT
A	908.0	925.0
B	908.5	926.0
C	909.5	928.0
D	911.0	930.0

DETAIL A
SEEPAGE RECYCLE SYSTEM
NTS

NOTE

1. Test pits indicate 4m thickness of till in proposed location of barge channel. Additional test pits will be required to confirm adequate thickness of till to finalize barge channel alignment.
2. Compacted glacial till shall be placed along the barge channel excavation if higher permeability sediments encountered (to meet basin liner requirements) as directed by the Engineer.
3. Seepage recycle pumps to be electric submersible pumps, discharging to pipelines extended up D/S face of tailings embankment. Pump sump to be fully enclosed with an insulated building c/w venting and I beam suitable for raising the pumps.
4. Extent of basin liner determined from exploration trenches.
5. Pump house by C.S.F.M. Engineering, Ltd. see Drg. No. 903
6. Penetration of concrete sump by CSP culvert to be water tight.
7. As built information provided by Mount Polley Mining Corporation.
8. Topography has not been updated for 1997 Flyover.



DRG. NO.	DESCRIPTION
1625.214	TSF - SEDIMENT CONTROL & SEEPAGE COLLECTION - SECTIONS & DETAILS
1625.211	TSF - TAILINGS EMBANKMENT - SECTIONS & DETAILS

REV.	DATE	DESCRIPTION	APPROVED
7	MAY 30/97	AS-BUILT EMBANKMENT, POND AND BARGE CHANNEL	KJB
6	MAY 24/96	ISSUED FOR CONSTRUCTION	

REV.	DATE	DESCRIPTION	APPROVED
5	APR 26/96	CHANGE NOTE	
4	APR 19/96	RECLAIM CHANNEL ACCESS ROAD	
3	APR 1/96	CULVERTS & SEEPAGE DETAILS ADDED	
2	MAR 25/96	UPDATE ROAD & DRAINAGE	
1	JUL 27/95	BASIN LINER REVISED	
0	JUN 2/95	ISSUED FOR TENDER	

KNIGHT PIESOLD LIMITED
CONSULTING ENGINEERS - VANCOUVER, B.C.

DESIGNED: KDE
DRAWN: RDT/WY
CHECKED: KJB
APPROVED: KJB

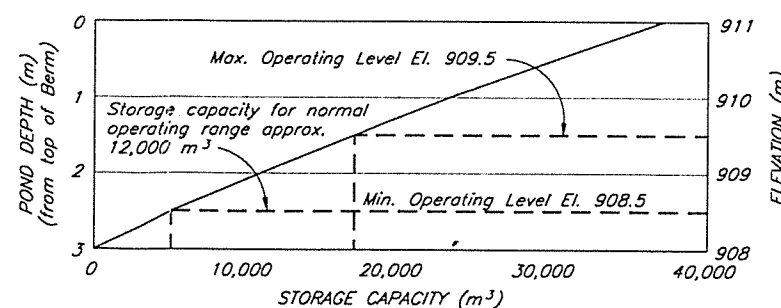
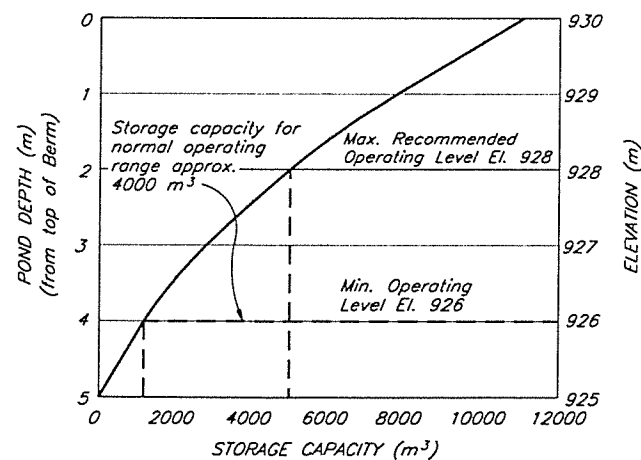
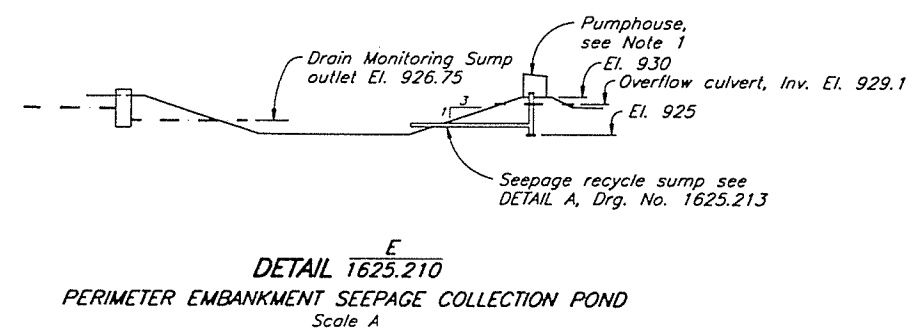
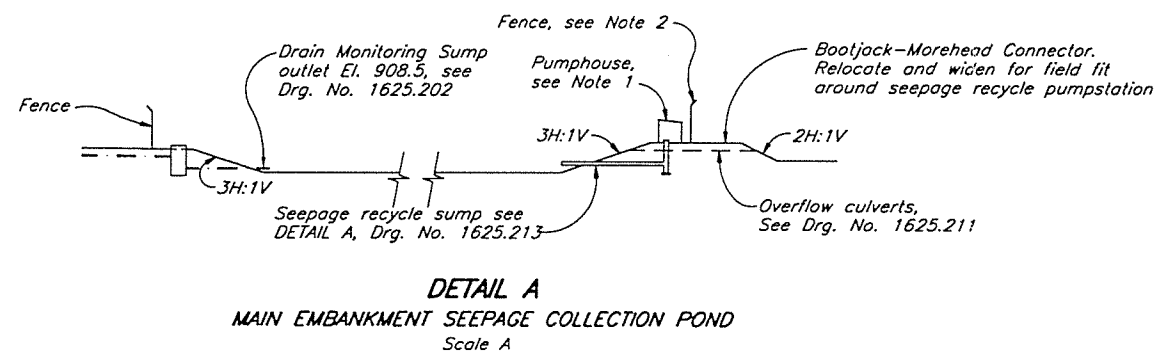
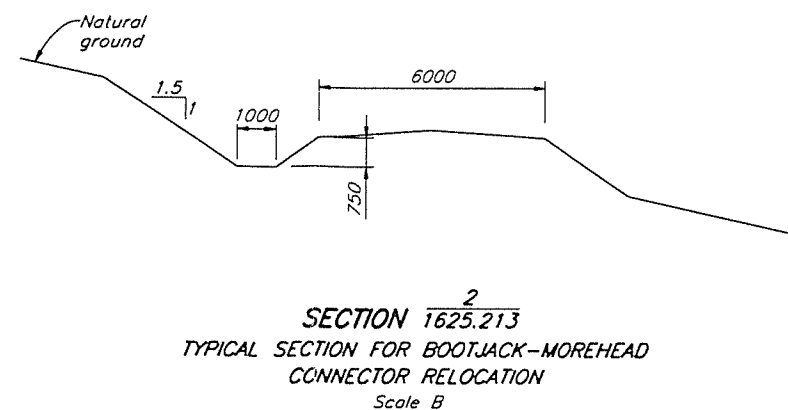
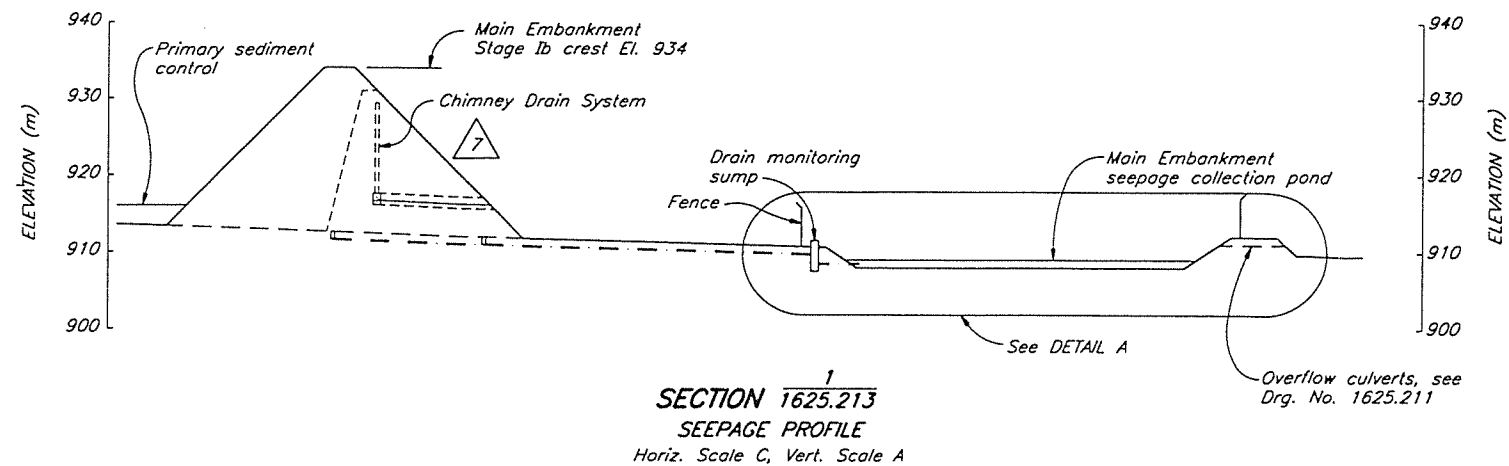
DATE: JUNE 2, 1995

MOUNT POLLEY MINING CORPORATION

MOUNT POLLEY PROJECT

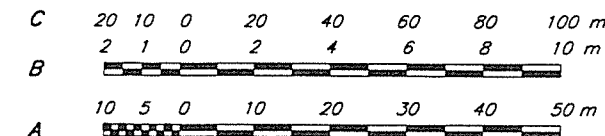
**TAILINGS STORAGE FACILITY
SEDIMENT CONTROL AND
SEEPAGE COLLECTION**

SCALE AS SHOWN
DRG. NO. 510-19-01-1625.213
REV. 7



NOTES

1. Pumphouse by C.S.F.M. Engineering Ltd. see Drg. No. 903
2. Fence to be six feet high, chain link with 2 inch galvanized posts and two six foot wide access gates. Not yet installed (May 27, 1997)
3. As-built information provided by Mount Polley Mining Corporation.



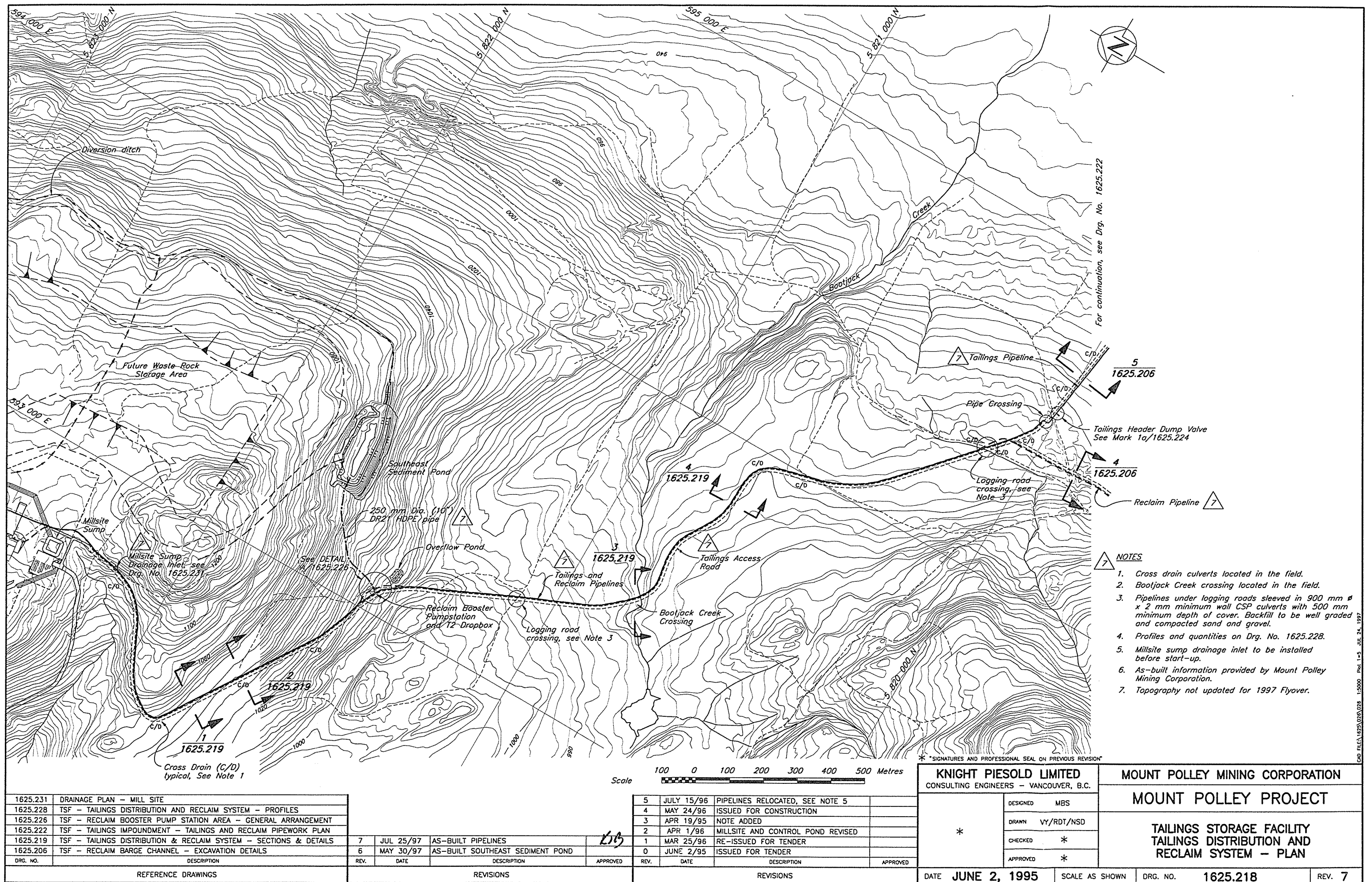
1625.213	TSF - SEDIMENT CONTROL AND SEEPAGE COLLECTION
1625.211	TSF - TAILINGS EMBANKMENT - SECTIONS AND DETAILS
1625.210	TSF - MAIN AND PERIMETER EMBANKMENTS - PLAN
1625.202	TSF - FOUNDATION PREPARATION & BASIN LINER - SECTIONS & DETAILS
DRG. NO.	DESCRIPTION
REFERENCE DRAWINGS	

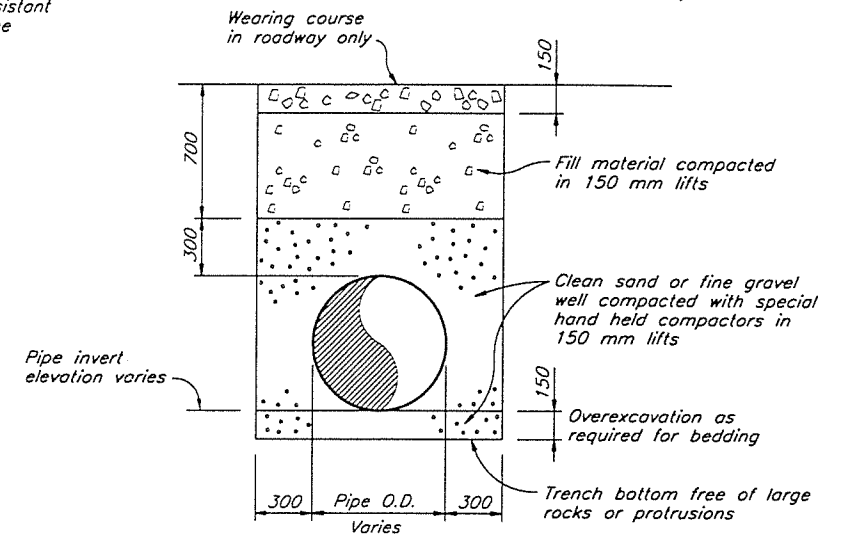
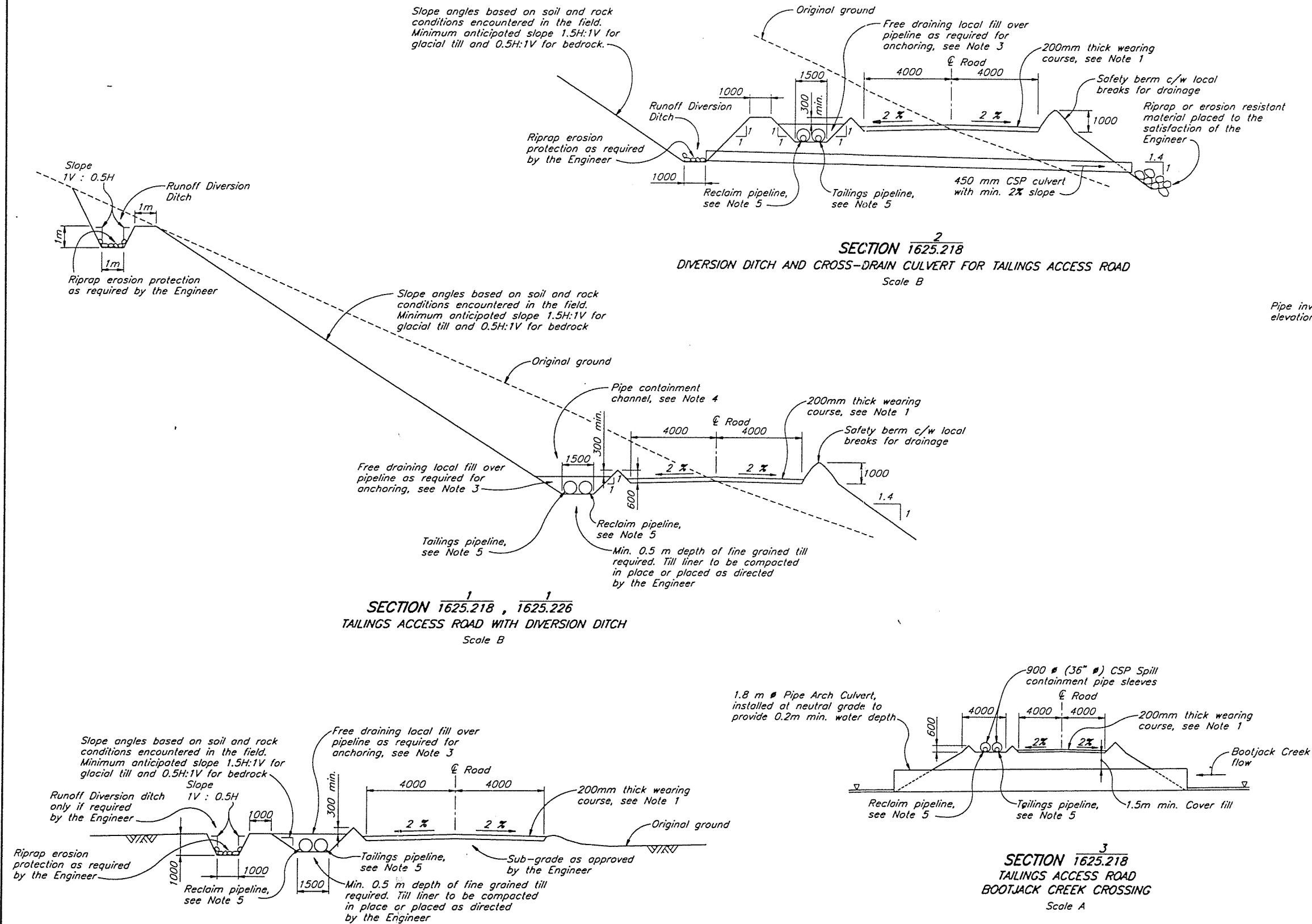
7	MAY 30/97	AS-BUILT PONDS	KJB
6	JUN 6/96	FENCE NOTE ADDED	
5	MAY 24/96	RE-ISSUED FOR CONSTRUCTION	
REV.	DATE	DESCRIPTION	APPROVED
REVISIONS			

4	APR 1/96	OVERFLOW CULVERTS ADDED	
3	MAR 22/96	UPDATE DRAINAGE AND ROAD	
2	SEPT. 5/95	ISSUED FOR CONSTRUCTION	
1	JULY 27/95	RIPRAP APRON ADDED	
0	JUNE 2/95	ISSUED FOR TENDER	
REV.	DATE	DESCRIPTION	APPROVED
REVISIONS			

KNIGHT PIESOLD LIMITED	
CONSULTING ENGINEERS - VANCOUVER, B.C.	
DESIGNED	KDE
DRAWN	VY/NSD
CHECKED	KJB
APPROVED	KJB
DATE	JUNE 2, 1995

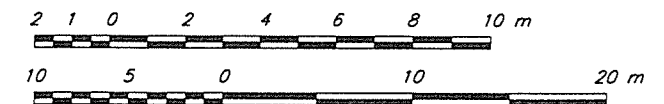
MOUNT POLLEY MINING CORPORATION	
MOUNT POLLEY PROJECT	
TAILINGS STORAGE FACILITY	
SEDIMENT CONTROL AND SEEPAGE	
COLLECTION - SECTIONS AND DETAILS	
DRG. NO.	510-19-02-1625.214
REV.	7





NOTES

1. Wearing course required for Tailings Access Road, Reclaim Barge Access Road and Bootjack-Morehead connector relocation only.
2. For crossing under road, tailings and reclaim pipelines to be installed in individual 900 mm (min.) dia. culverts laid under road with 500 mm min. cover. Culverts laid immediately downslope of cross-drain.
3. Spacing of fill for anchoring to be determined in the field by the Engineer. Anchor posts or concrete anchor blocks can be substituted for local fill.
4. Trench width may vary locally to accommodate additional pipelines or structures in the trench.
5. Tailings and reclaim pipelines crossed over immediately up-gradient of T2 Dropbox and where the pipelines split at the Tailings Storage Facility.
6. Runoff Diversion Ditches may require periodic cleaning.
7. Tailings access road design was modified by Mount Polley Mining Corporation. Road cross-section may vary from that shown.



SECTION 1625.218, 1625.226
TAILINGS ACCESS ROAD WITH DIVERSION DITCH ON FLAT GROUND
Scale B

1625.226	TSF - RECLAIM BOOSTER PUMP STATION AREA - GENERAL ARRANGEMENT	7	MAY 30/97	NOTES UPDATED	KJB
1625.218	TSF - TAILINGS DISTRIBUTION & RECLAIM SYSTEM - PLAN	6	APR. 29/97	TAILINGS ACCESS ROAD WAS NOT BUILT TO THIS DESIGN	
DRG. NO.	DESCRIPTION	REV.	DATE	DESCRIPTION	APPROVED
REFERENCE DRAWINGS		REVISIONS			

5	JULY 15/96	PIPELINES RELOCATED	
4	MAY 28/96	ISSUED FOR CONSTRUCTION	
3	APR 26/96	REVISE DRAINAGE DITCHES	
2	APR 19/96	SECTIONS REVISED	
1	MAR 22/96	RE-ISSUED FOR TENDER	
0	JUNE 2/95	ISSUED FOR TENDER	
REV.	DATE	DESCRIPTION	APPROVED
REVISIONS			

KNIGHT-PIESOLD LIMITED
CONSULTING ENGINEERS - VANCOUVER, B.C.

DESIGNED: MBS/HPD
DRAWN: VY
CHECKED: KJB
APPROVED: KJB

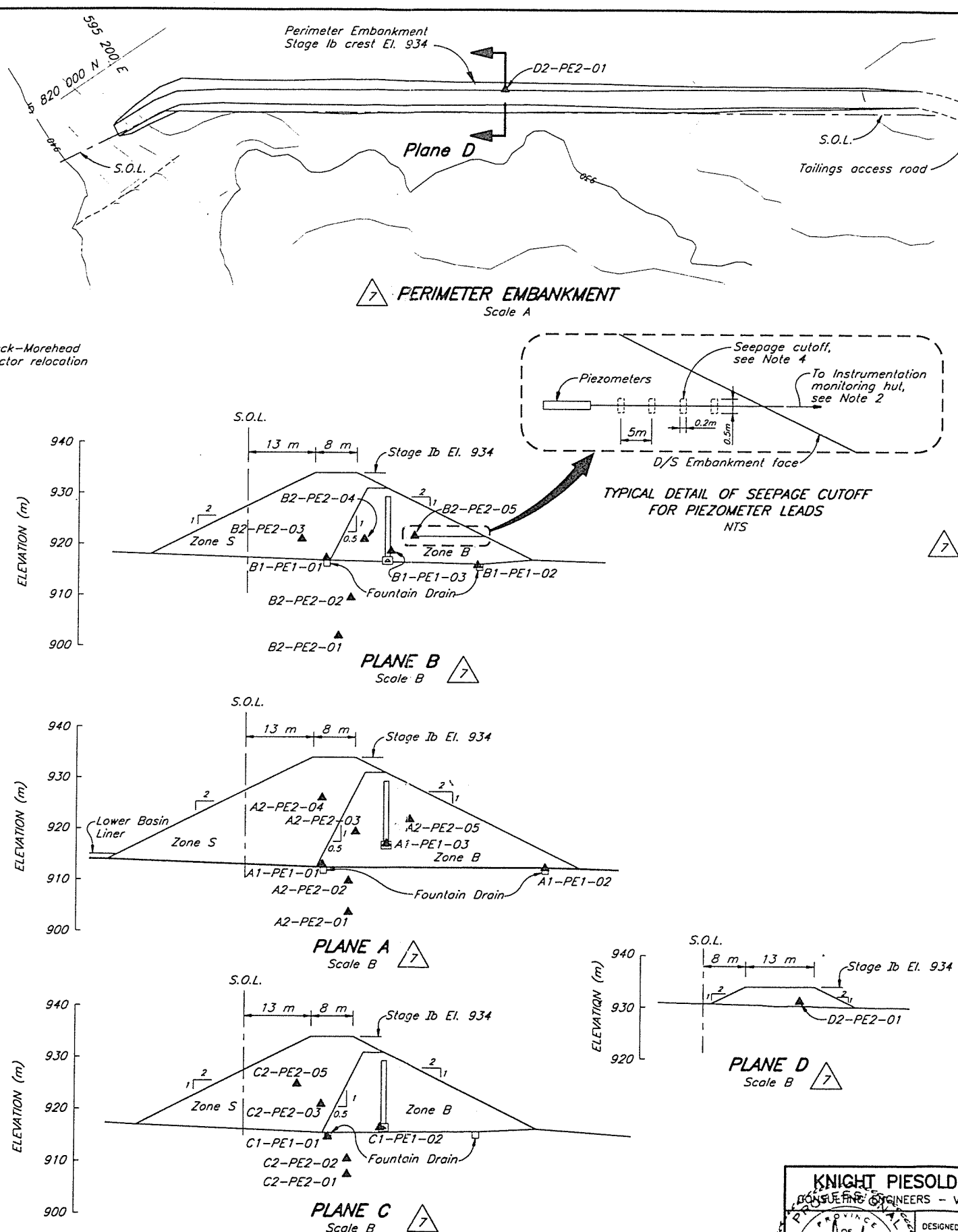
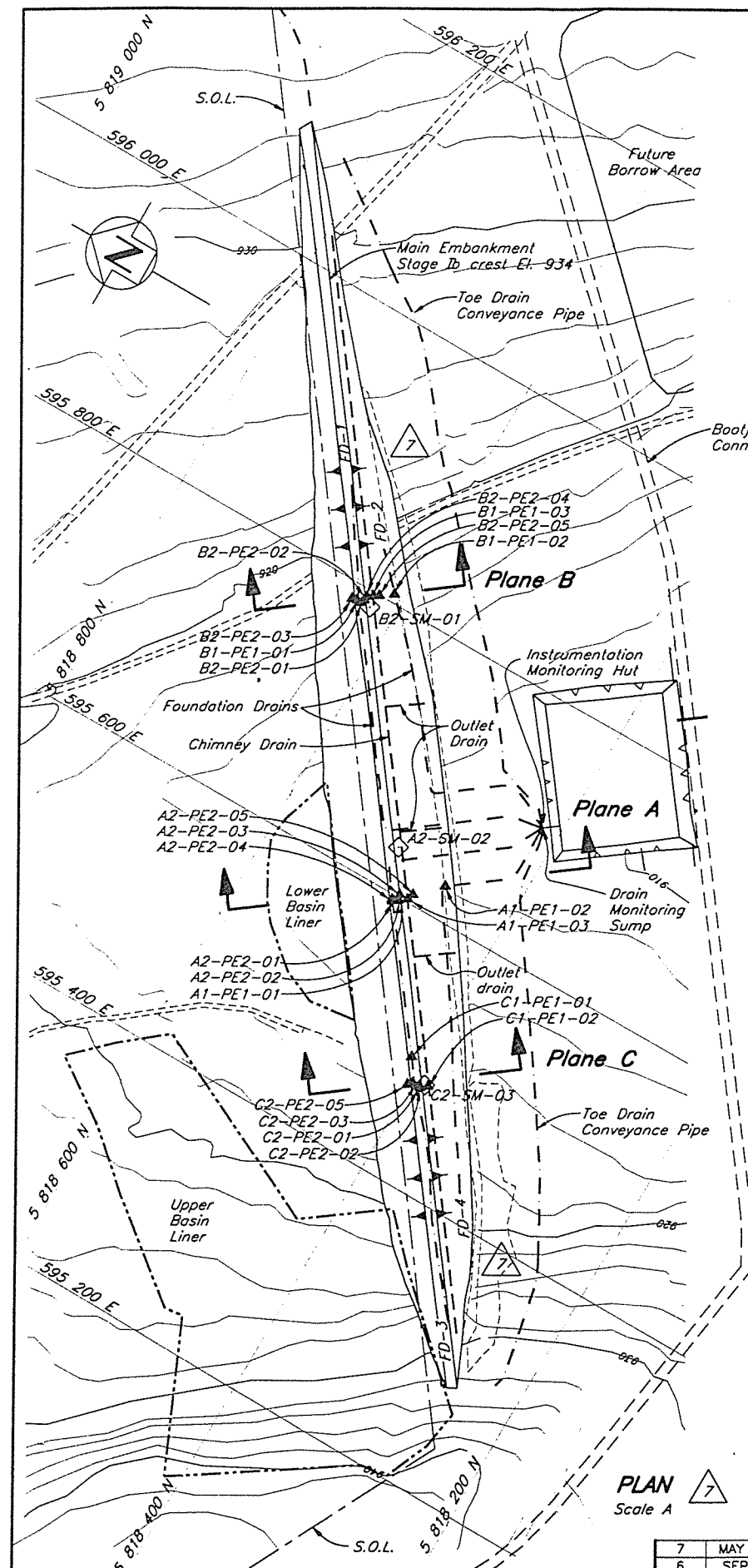
DATE: JUNE 2, 1995

MOUNT POLLEY MINING CORPORATION

MOUNT POLLEY PROJECT

**TAILINGS STORAGE FACILITY
TAILINGS DISTRIBUTION AND
RECLAIM SYSTEM - SECTIONS AND DETAILS**

SCALE AS SHOWN
DRG. NO. 510-61-02-1625.219
REV. 7



PIEZOMETER No.	LEAD LENGTH (m)	NORTHING	EASTING	ELEV.
A1-PE1-03	200	5 818 476.8220	595 602.380	917.17
A1-PE1-01	175	5 818 486.650	595 595.060	912.99
A1-PE1-02	150	5 818 456.420	595 626.250	912.14
A2-PE2-01	200	5 818 482.710	595 598.140	903.7
A2-PE2-02	200	5 818 482.710	595 598.140	909.8
A2-PE2-03	175	5 818 484.196	595 598.140	919.43
A2-PE2-04	200	5 818 487.510	595 595.995	926.07
A2-PE2-05	175	5 818 475.061	595 607.560	921.87
B1-PE1-03	305	5 818 622.780	595 797.260	918.69
B1-PE1-01	300	5 818 632.550	595 787.910	917.27
B1-PE1-02	275	5 818 609.040	595 806.770	915.95
B2-PE2-01	325	5 818 628.270	595 787.880	902.00
B2-PE2-02	325	5 818 627.470	595 790.660	909.50
B2-PE2-03	325	5 818 636.530	595 786.970	921.00
B2-PE2-04	330	5 818 626.940	595 794.190	921.00
B2-PE2-05	325	5 818 619.014	595 799.804	921.70
C1-PE1-01	325	5 818 410.500	595 496.070	914.70
C1-PE1-02	330	5 818 410.500	595 496.070	916.60
C2-PE2-01	350	5 818 392.410	595 478.240	907.50
C2-PE2-02	350	5 818 392.410	595 478.240	910.50
C2-PE2-03	325	5 818 399.106	595 478.824	920.97
C2-PE2-05	325	5 818 402.343	595 475.326	924.84
D1-PE1-01 *	90	-	-	-
D2-PE2-01	85	5 818 768.104	595 506.055	931.00

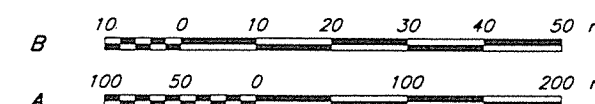
* D1-PE1-01 to be installed during Stage II construction.

NOTES

- Piezometers are vibrating type, RST model VW-2100 with a pressure rating of 100 psi or equivalent, connected to a readout panel via standard non-vented model VW-232 direct burial cable.
- Piezometer leads are to be extended to Instrumentation Monitoring Hut after foundation preparation for final embankment during Stage II construction.
- Future survey monuments not shown. A minimum of 2 monuments will be installed for each embankment raise.
- Seepage cutoffs placed at 5m intervals with 10% bentonite added to fine grained till backfill, see Drg. No. 1625.221.
- As-built information provided by Mount Polley Mining Corporation.
- Topography has not been updated for 1997 flyover.
- Installation details for borehole piezometers as shown on Drg. No. 1625.221.

LEGEND

- Plane I.D. (A, B etc.)
- Area (0-Tailings, 1-Drain, 2-Embankment)
- A0-PE1-01 - Number I.D.
- Pressure Rating (1-Low, 2-High)
- Type of Instrumentation (PE-Piezometer electric, SM-Survey Monument)
- A1-PE1-01 Embankment drain piezometer (Foundation drain and Chimney drain)
- A2-PE2-01 Embankment foundation and fill piezometer
- A2-SM-01 Embankment survey monument



1625.221 TSF - INSTRUMENTATION - SECTIONS AND DETAILS
DRG. NO.

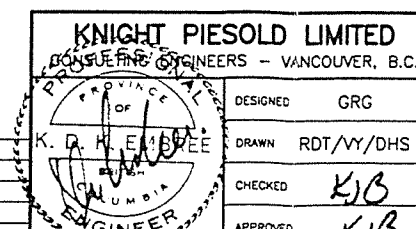
REFERENCE DRAWINGS

REV.	DATE	DESCRIPTION	APPROVED
7	MAY 30/97	AS-BUILT PIEZOMETER LOCATIONS	
6	SEP 4/96	REVISED PIEZO. LOCATIONS	
5	MAY 24/96	ISSUED FOR CONSTRUCTION	
4	APR 1/96	PIEZOMETER INFORMATION ADDED	

REVISIONS

REV.	DATE	DESCRIPTION	APPROVED
3	MAR 25/96	ROAD UPDATED	
2	JAN 18/96	REVISED SEEPAGE COLLECTION POND	
1	JUL 27/95	BASEIN GROUNDWATER DRAINS REVISED	
0	JUN 2/95	ISSUED FOR TENDER	

REVISIONS



DATE JUNE 2, 1995

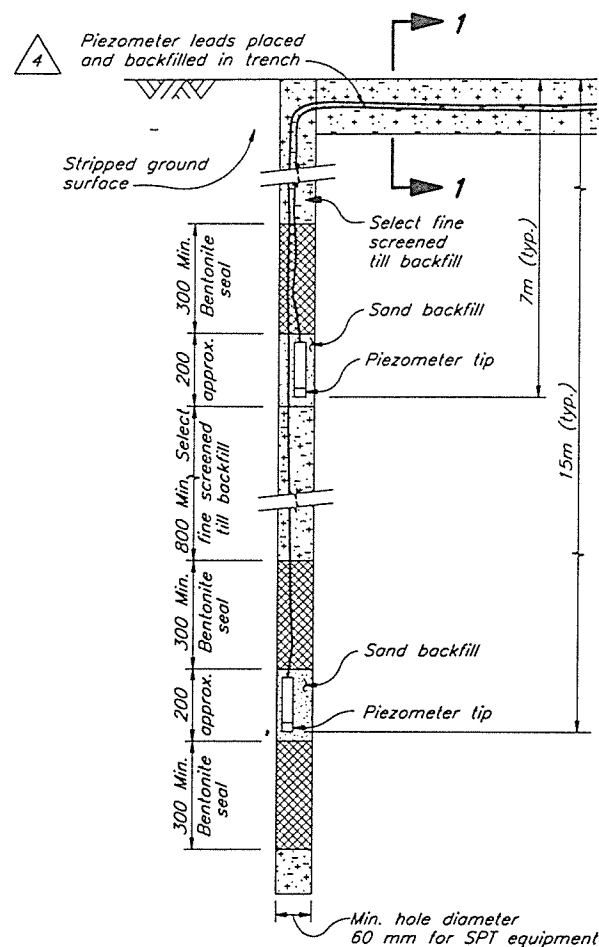
DESIGNED GRG
DRAWN RDT/VY/DHS
CHECKED KJB
APPROVED KJB

MOUNT POLLEY MINING CORPORATION

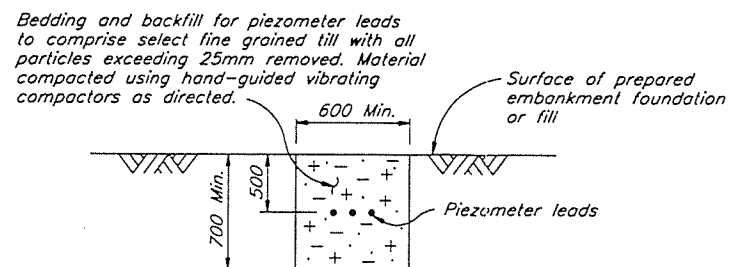
MOUNT POLLEY PROJECT

TAILINGS STORAGE FACILITY
INSTRUMENTATION

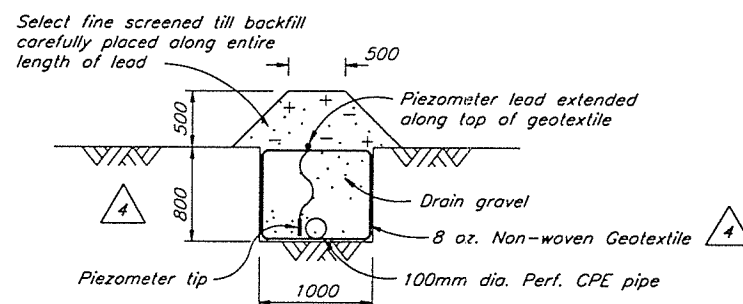
SCALE AS SHOWN DRG. NO. 510-77-01-1625.220 REV. 7



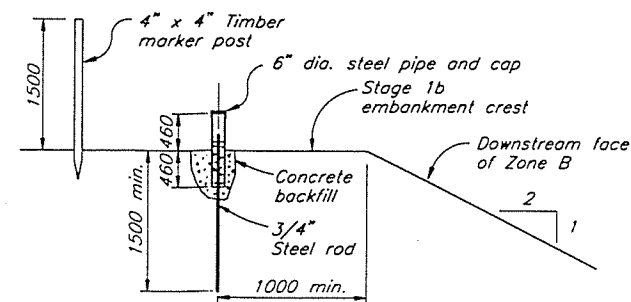
DETAIL A
INSTALLATION OF PIEZOMETERS
IN BOREHOLES
N.T.S.



SECTION 1
TYPICAL SECTION THROUGH PIEZOMETER LEAD
TRENCH IN PREPARED EMBANKMENT FOUNDATION
OR IN ZONE S AND B FILL
N.T.S.



DETAIL C
TYPICAL PIEZOMETER INSTALLATION IN
EMBANKMENT FOUNDATION DRAIN OR TOE DRAIN
N.T.S.



DETAIL OF
SURFACE MOVEMENT MONUMENT
N.T.S.

NOTES

1. Dimensions are in millimeters unless otherwise noted.
2. Tailings piezometers to be installed during future investigation programs.

Scale 1000 500 0 1000 2000 mm

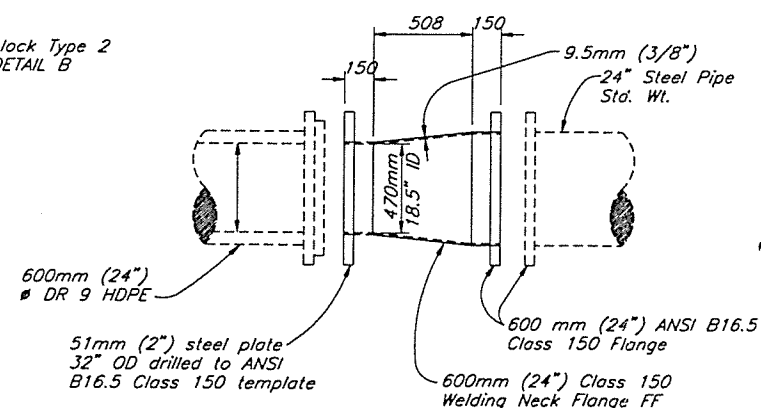
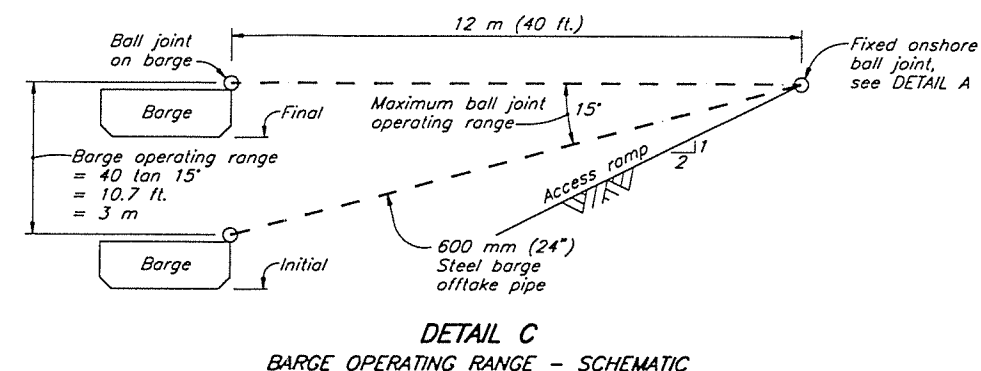
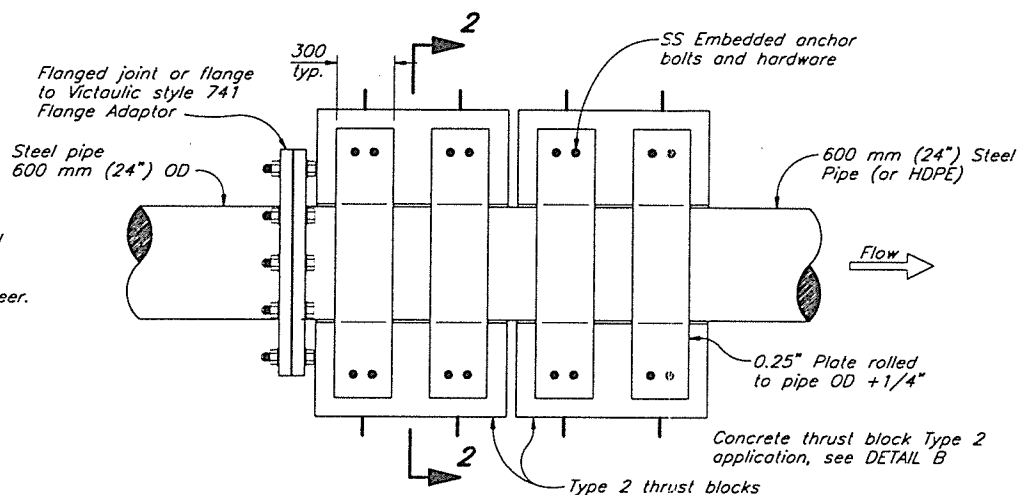
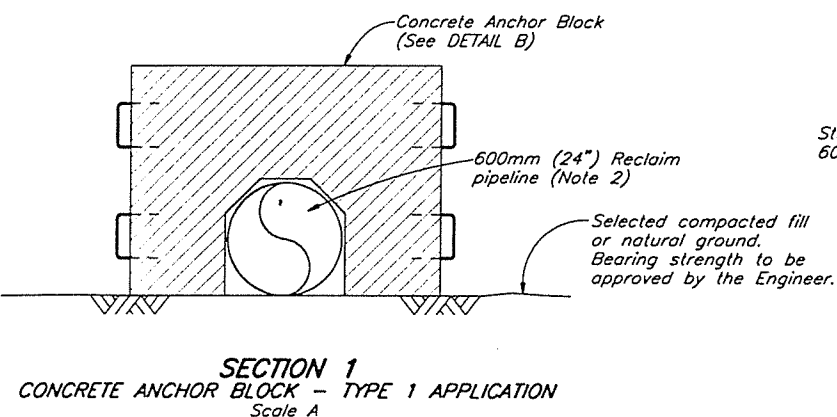
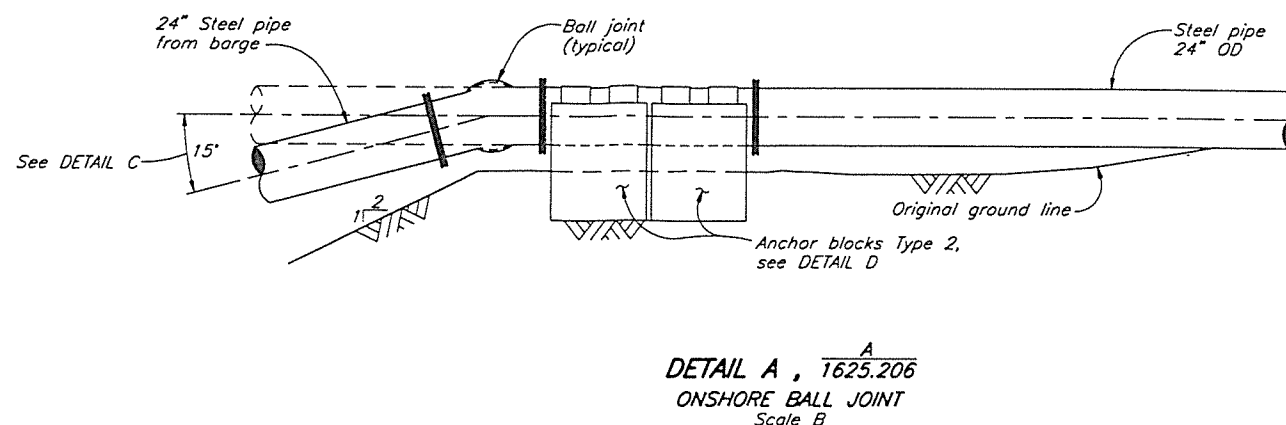
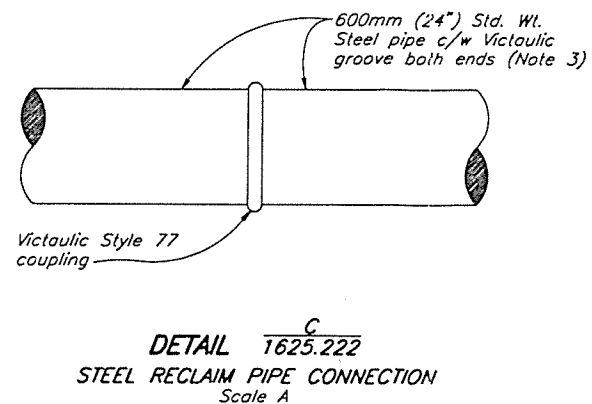
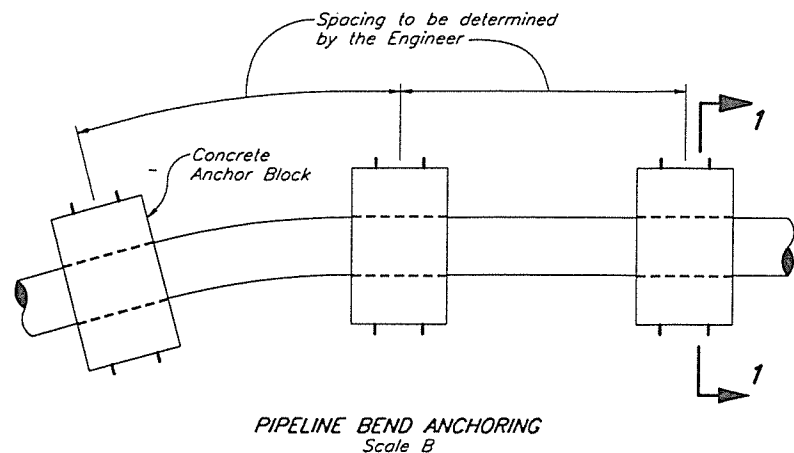
1625.220	TAILINGS STORAGE FACILITY - INSTRUMENTATION
DRG. NO.	DESCRIPTION
REFERENCE DRAWINGS	

REV.	DATE	DESCRIPTION	APPROVED
REVISIONS			

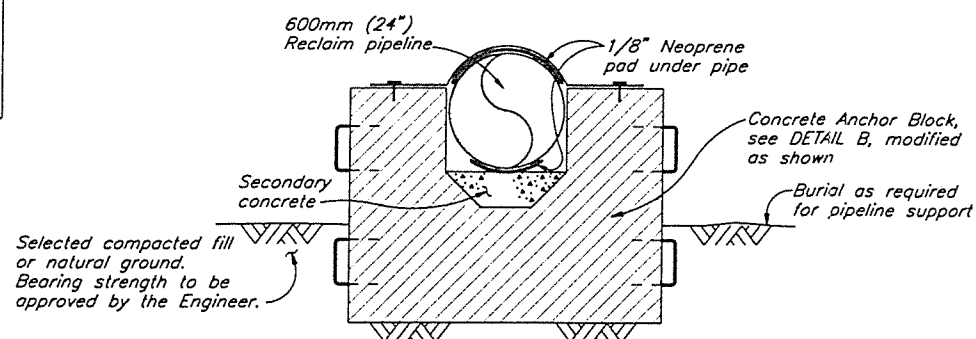
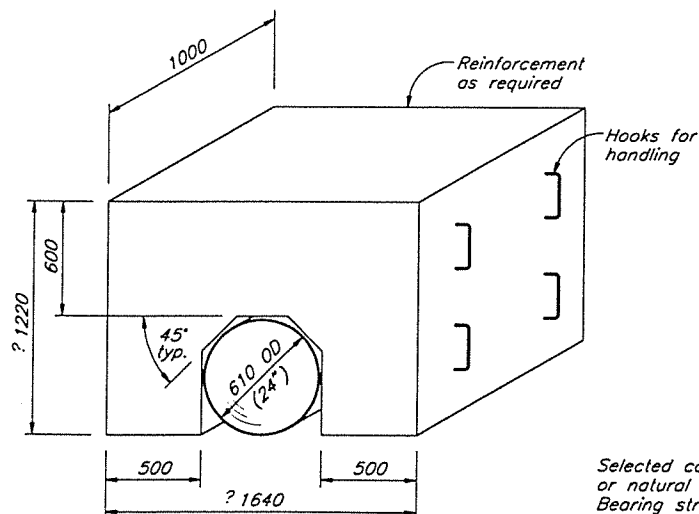
4	MAY 30/97	PARSHALL FLUME DELETED	
3	MAR 24/96	ISSUED FOR CONSTRUCTION	
2	APR 1/96	NOTE ADDED	
1	JAN. 18/96	GROUNDWATER DRAINS REMOVED	
0	JUNE 2/95	ISSUED FOR TENDER	
REV.	DATE	DESCRIPTION	APPROVED
REVISIONS			

KNIGHT PIESOLD LIMITED CONSULTING ENGINEERS - VANCOUVER, B.C.	
DESIGNED	KDE/MBS
DRAWN	VY
CHECKED	KJB
APPROVED	KJB
DATE JUNE 2, 1995	

MOUNT POLLEY MINING CORPORATION	
MOUNT POLLEY PROJECT	
TAILINGS STORAGE FACILITY INSTRUMENTATION SECTIONS AND DETAILS	
SCALE AS SHOWN	DRG. NO. 510-77-02-1625.221
REV. 4	



- NOTES**
- Concrete anchoring blocks to be used at barge ball joint and at locations where pipeline changes from steel to HDPE.
 - Anchor blocks may be used for reclaim or tailings pipeline as required by the Engineer. Modifications will be required for pipe diameter other than 24".
 - Victaulic grooves to be rolled if pipe wall thickness is less than 0.375".



B	2000	1000	0	2000	4000 mm
A	1000	500	0	1000	2000 mm

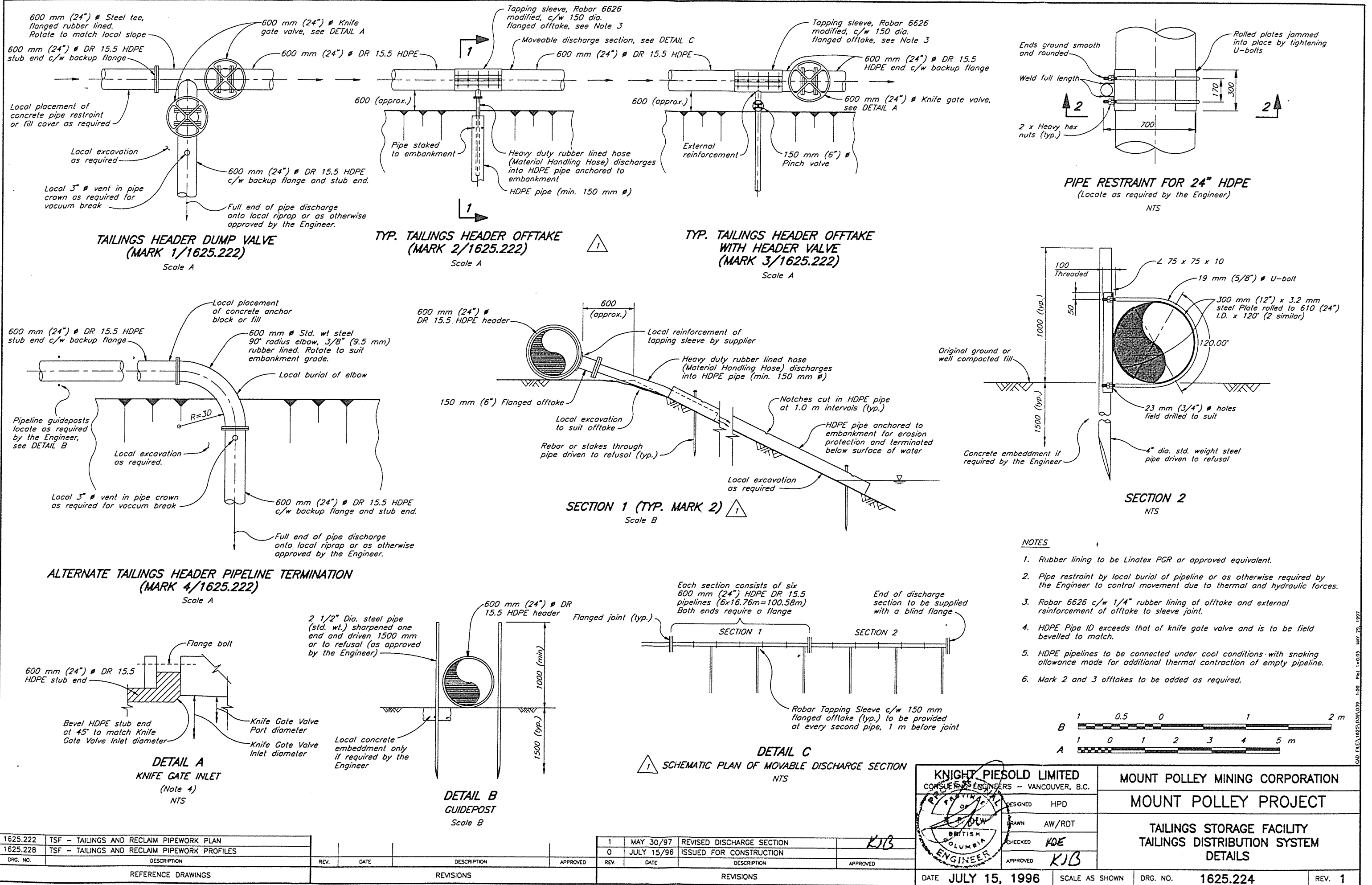
1625.224	TAILINGS DISTRIBUTION SYSTEM - DETAILS
1625.222	TAILINGS IMPOUNDMENT - TAILINGS AND RECLAIM PIPEWORK PLAN
1625.206	TSF - RECLAIM BARGE CHANNEL - EXCAVATION DETAILS
DRG. NO.	DESCRIPTION
REFERENCE DRAWINGS	

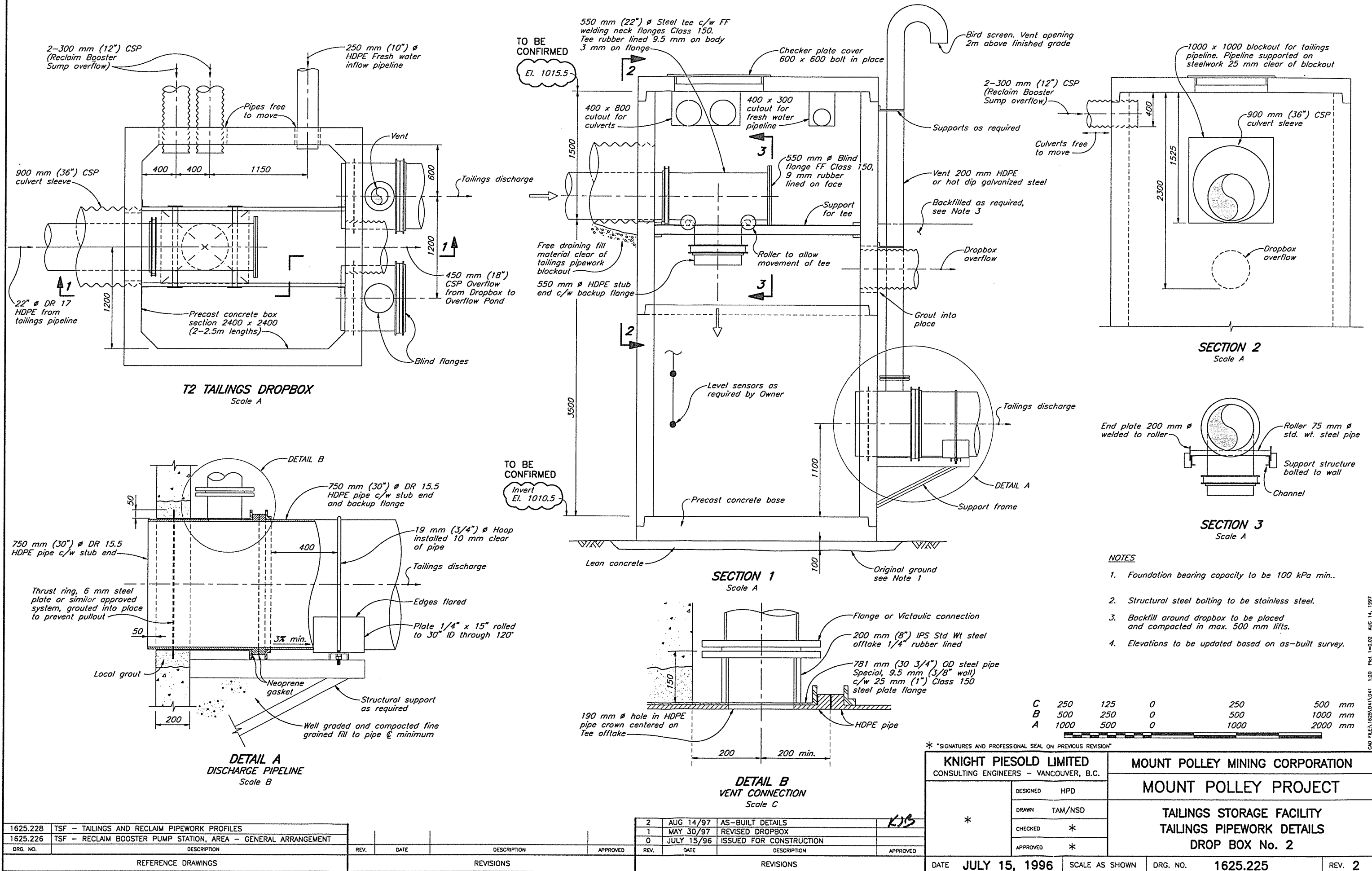
REV.	DATE	DESCRIPTION	APPROVED
1	MAY 30/97	REFERENCE TO DRAWINGS REVISED	KJB
0	JULY 15/96	ISSUED FOR CONSTRUCTION	

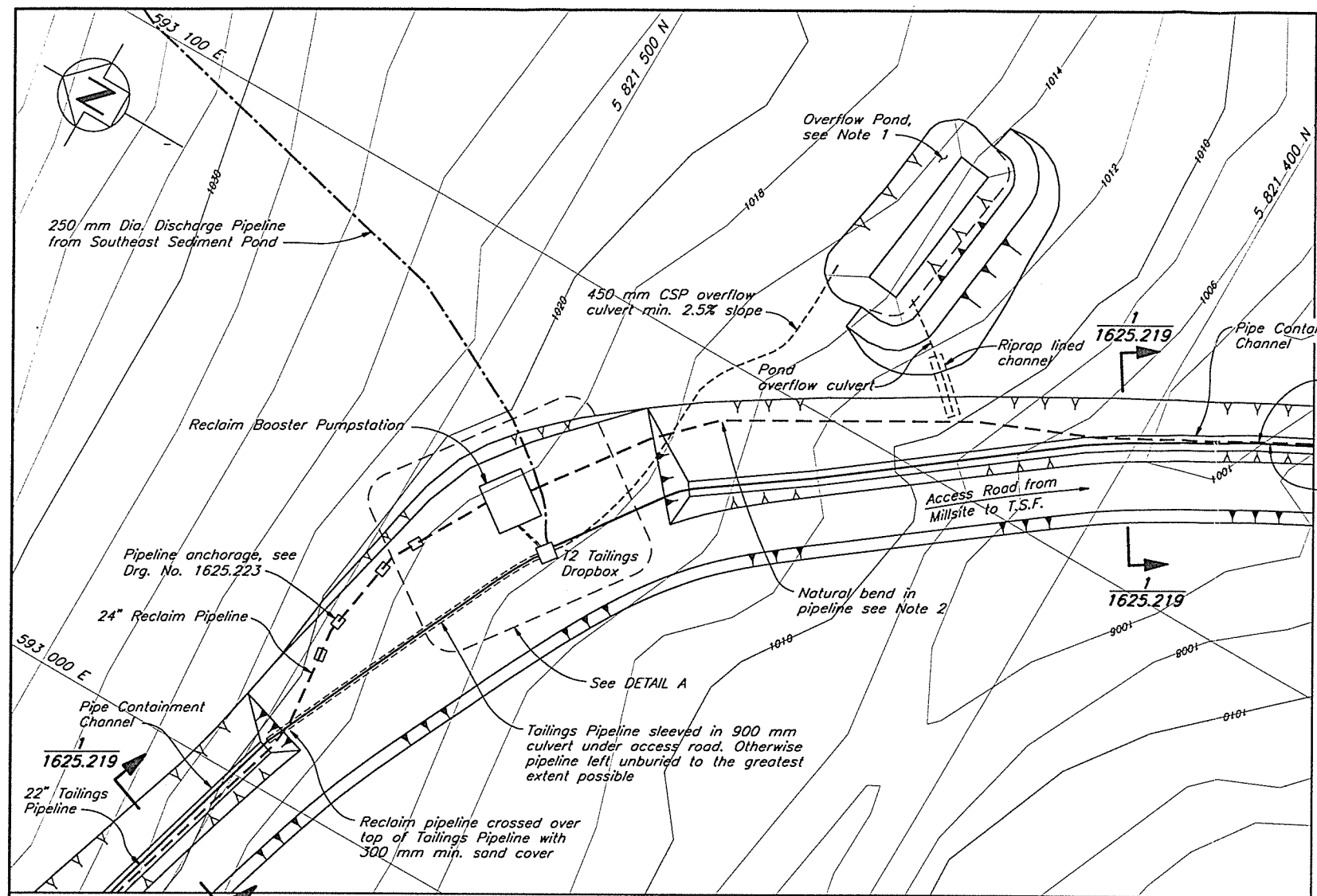
REV.	DATE	DESCRIPTION	APPROVED
1	MAY 30/97	REFERENCE TO DRAWINGS REVISED	KJB
0	JULY 15/96	ISSUED FOR CONSTRUCTION	

KNIGHT PIESOLD LIMITED CONSULTING ENGINEERS - VANCOUVER, B.C.	
DESIGNED	HPD/NM
DRAWN	AW/RDT/NSD
CHECKED	KJC
APPROVED	KJB

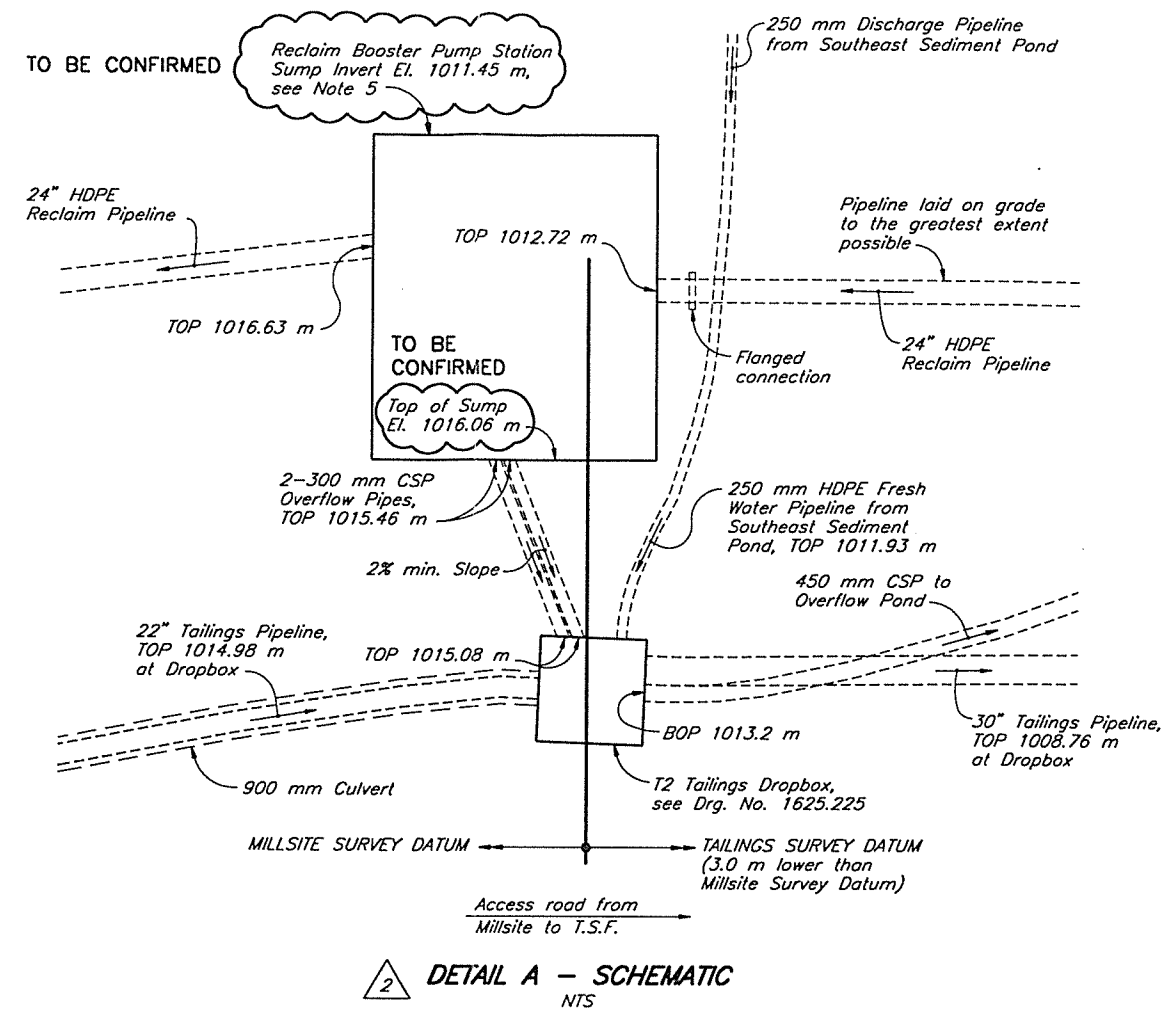
MOUNT POLLEY MINING CORPORATION	
MOUNT POLLEY PROJECT	
TAILINGS STORAGE FACILITY RECLAIM PIPELINE DETAILS	
DATE	JULY 15, 1996
SCALE	AS SHOWN
DRG. NO.	1625.223
REV.	1







DETAIL A - SCHEMATIC
RECLAIM BOOSTER PUMPSTATION, T2 TALINGS DROPBOX AND OVERFLOW POND



DETAIL A - SCHEMATIC
NTS

NOTES

- The 500 m³ capacity of the Overflow Pond, is sufficient to contain the contents of the upstream tailings pipeline. Pond located by Mount Polley Mining Corporation.
- Radius of natural bends in HDPE pipelines not to be less than 25 pipe diameters.
- Tailings and Reclaim pipelines uniformly graded between pipe containment channel and structures without high or low points.
- Details of pipelines into Reclaim Booster Pumpstation sump determined in conjunction with CSFM.
- Invert of pipe containment channel is assumed to be 1 m below local road elevation.
- Local riprap required where 450 mm CSP overflow culvert exits overflow pond.
- Top of discharge culvert for overflow pond to be 1000 mm below top of overflow pond.
- As-built information provided by Mount Polley Mining Corporation.
- Topography not updated by 1997 Flyover.
- Pipeline elevations from Tailings Storage Facility to T2 Dropbox and Booster Pumpstation are based on Tailings Survey Datum (3.0 m lower than Millsite Datum). Survey control break is shown at the T2 Dropbox and Booster Pumpstation.

LEGEND

TOP Top of Pipe
BOP Bottom of Pipe

Scale 10 5 0 10 20 30 40 50 Metres

1625.225	TSF - TAILINGS PIPEWORK DETAILS - DROP BOX No. 2
1625.223	TSF - RECLAIM PIPELINE DETAILS
1625.219	TSF - TAILINGS DISTRIBUTION & RECLAIM SYSTEM - SECTIONS & DETAILS
1625.218	TSF - TAILINGS DISTRIBUTION & RECLAIM SYSTEM - PLAN
DRG. NO.	DESCRIPTION

REFERENCE DRAWINGS

REV.	DATE	DESCRIPTION	APPROVED
------	------	-------------	----------

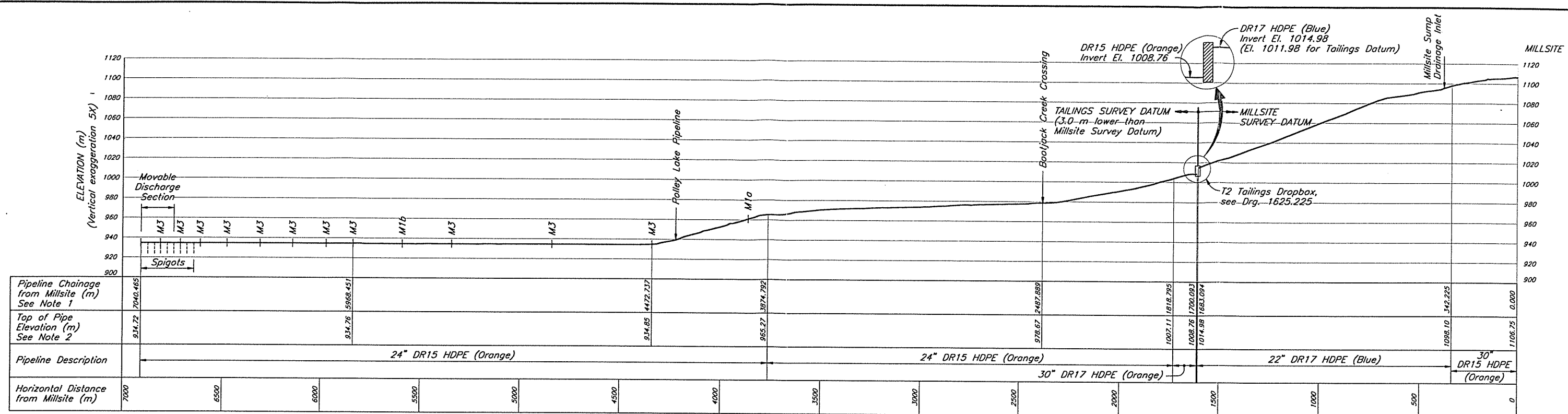
REVISIONS

2	AUG 14/97	AS-BUILT PIPELINES	
1	MAY 30/97	REVISED LOCATION	
0	JULY 15/96	ISSUED FOR CONSTRUCTION	
REV.	DATE	DESCRIPTION	APPROVED

REVISIONS

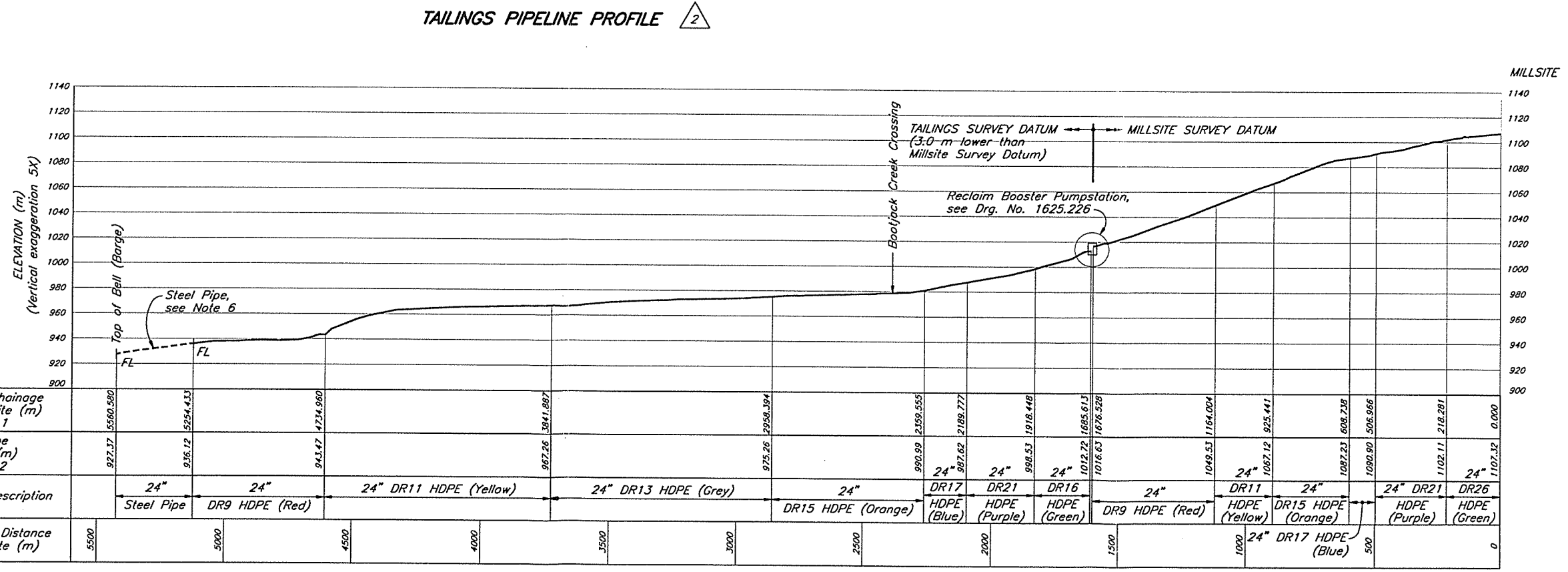
* SIGNATURES AND PROFESSIONAL SEAL ON PREVIOUS REVISION

*	DESIGNED	HPD/NM	KNIGHT PIESOLD LIMITED CONSULTING ENGINEERS - VANCOUVER, B.C.	MOUNT POLLEY MINING CORPORATION	
	DRAWN	VY		MOUNT POLLEY PROJECT	
	CHECKED	*		TAILINGS STORAGE FACILITY RECLAIM BOOSTER PUMP STATION AREA	
	APPROVED	*		GENERAL ARRANGEMENT	
DATE		JULY 15, 1996	SCALE AS SHOWN	DRG. NO.	1625.226
				REV.	2



- 2 NOTES**
- Pipeline chainage is based on top of pipe (TOP) As-Built Survey.
 - Pipeline elevations from Tailings Storage Facility to T2 Dropbox and Reclaim Booster Pumpstation are based on Tailings Survey Datum (3.0 m lower than Millsite Datum). Survey control break is shown at T2 Dropbox and Booster Pumpstation.
 - Flanges in pipelines must be supported off the ground if pipelines are dragged into position.
 - Any section of HDPE pipeline damaged during installation by a local reduction in wall thickness of 10% or more cut out and replaced.
 - Reclaim pipeline installed only to original ground at El. 925 m. Additional ramps for barge to be added as required.
 - All steel and HDPE DR9 pipeline to be moved with each barge relocation.
 - Butt fusion joining of lower DR pipe to higher DR pipe requires end of lower DR pipe to be bevelled to same inside diameter as higher DR pipe.
 - Tailings offtakes (Mark 1 to 4) are shown on Drg. No. 1625.224.
 - Mark 2 and 4 offtakes not installed. Replaced by Movable Discharge Section.
 - Mark 3 offtakes not installed. Flanged connections left for future use.

- LEGEND**
- FL Flange Joints
 - M1 Mark 1 Offtake (2)
 - M2 Mark 2 Offtake
 - M3 Mark 3 Offtake (10)
 - M4 Mark 4 Offtake
 - DR9 HDPE Pipe Dimensional Ratio (typical)



1625.226	TSF - RECLAIM BOOSTER PUMP STATION AREA - GENERAL ARRANGEMENT
1625.225	TSF - TAILINGS PIPEWORK DETAILS - DROP BOX NO. 2
1625.224	TSF - TAILINGS DISTRIBUTION SYSTEM - DETAILS
1625.206	TSF - RECLAIM BARGE CHANNEL - EXCAVATION DETAILS
DRG. NO.	DESCRIPTION

REV.	DATE	DESCRIPTION	APPROVED

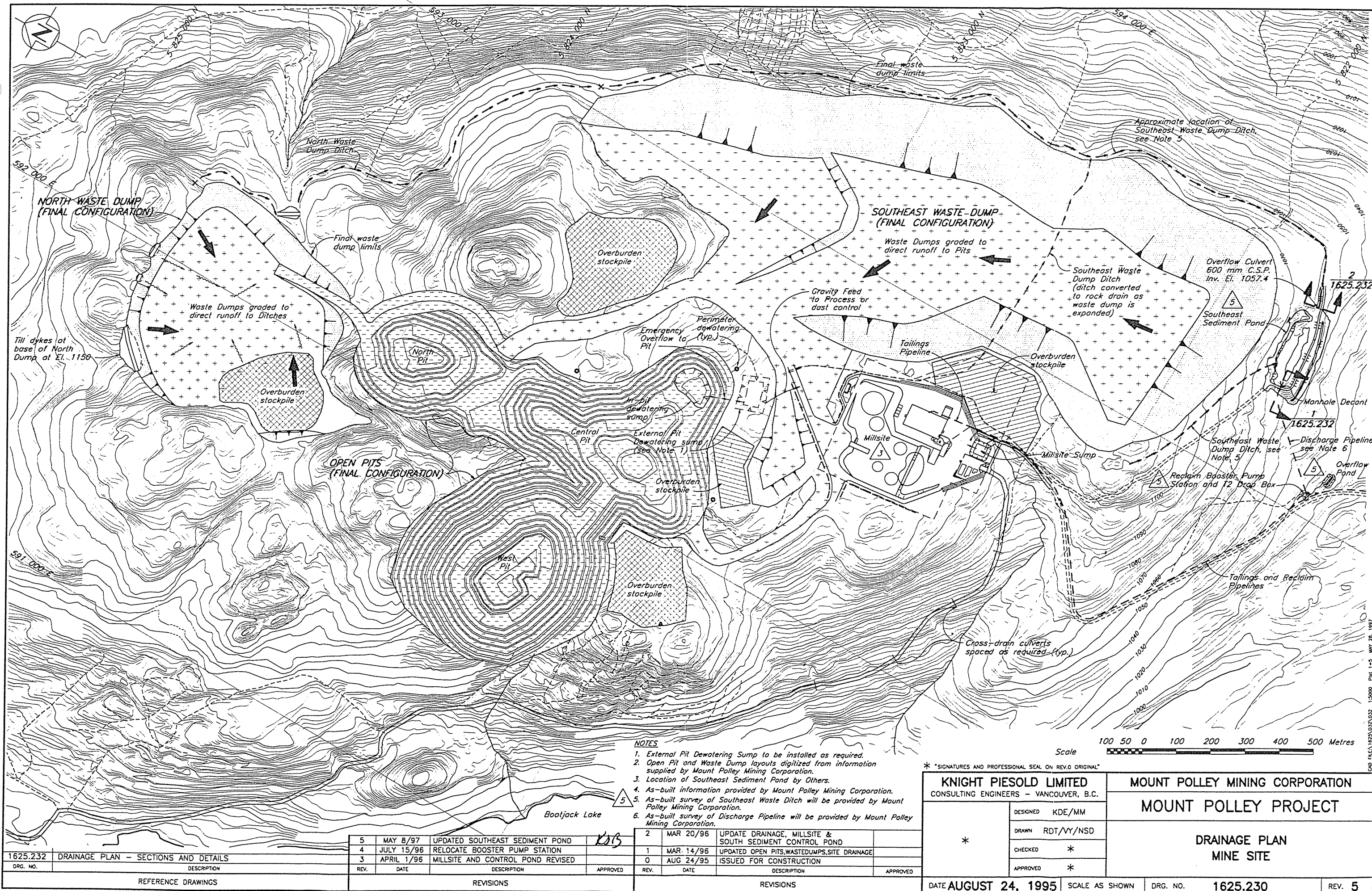
REV.	DATE	DESCRIPTION	APPROVED
2	AUG 14/97	AS-BUILT PIPELINES	
1	MAY 30/97	REVISED DROPBOX/PUMPSTATION LOCATIONS	
0	JULY 15/96	ISSUED FOR CONSTRUCTION	

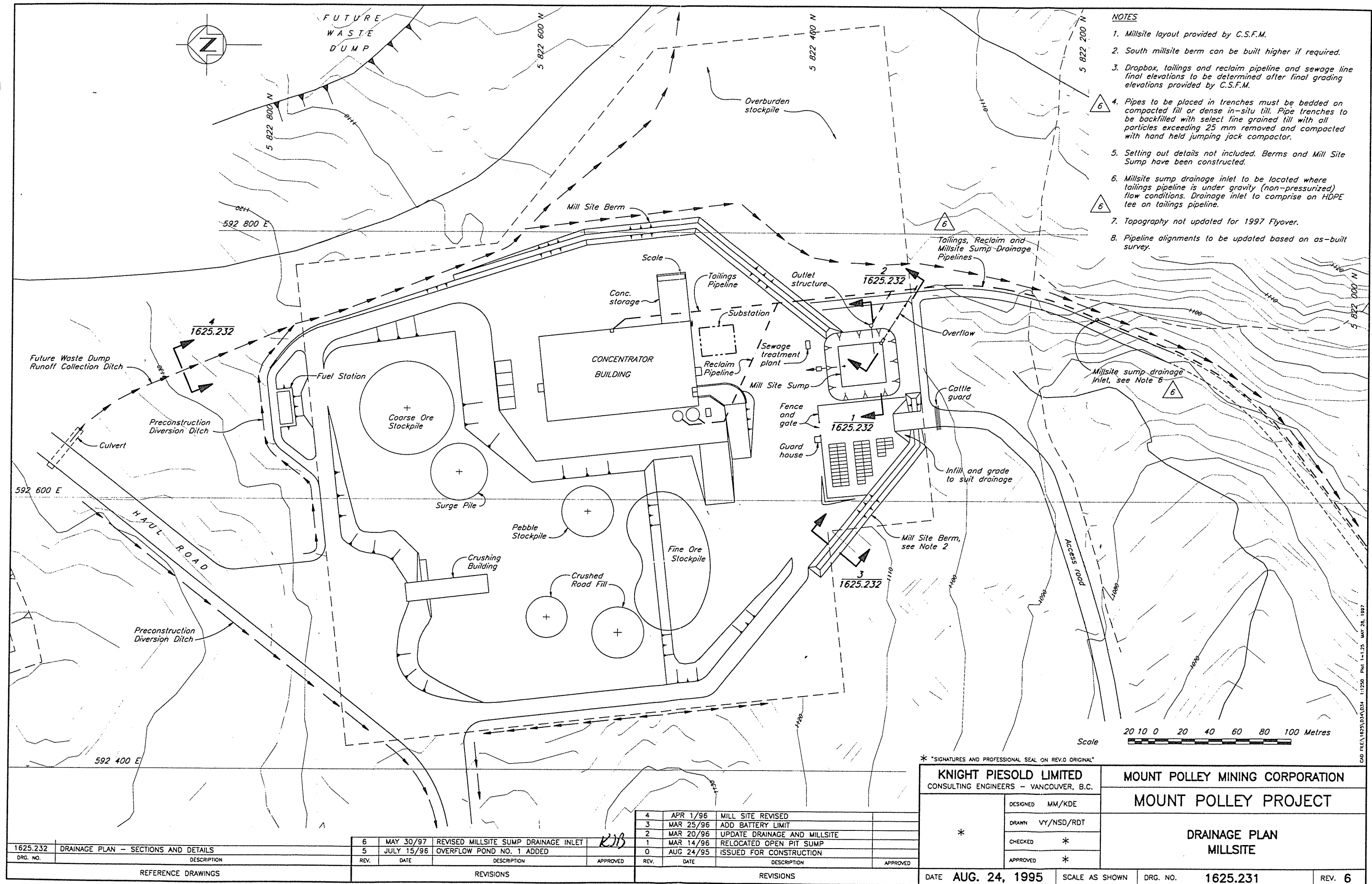
* SIGNATURES AND PROFESSIONAL SEAL ON PREVIOUS REVISION

	DESIGNED	HPD
	DRAWN	NAR
	CHECKED	*
	APPROVED	*

KNIGHT PIESOLD LIMITED CONSULTING ENGINEERS - VANCOUVER, B.C.		MOUNT POLLEY MINING CORPORATION MOUNT POLLEY PROJECT	
DATE JULY 15, 1996		SCALE AS SHOWN	
DRG. NO. 1625.228		REV. 2	

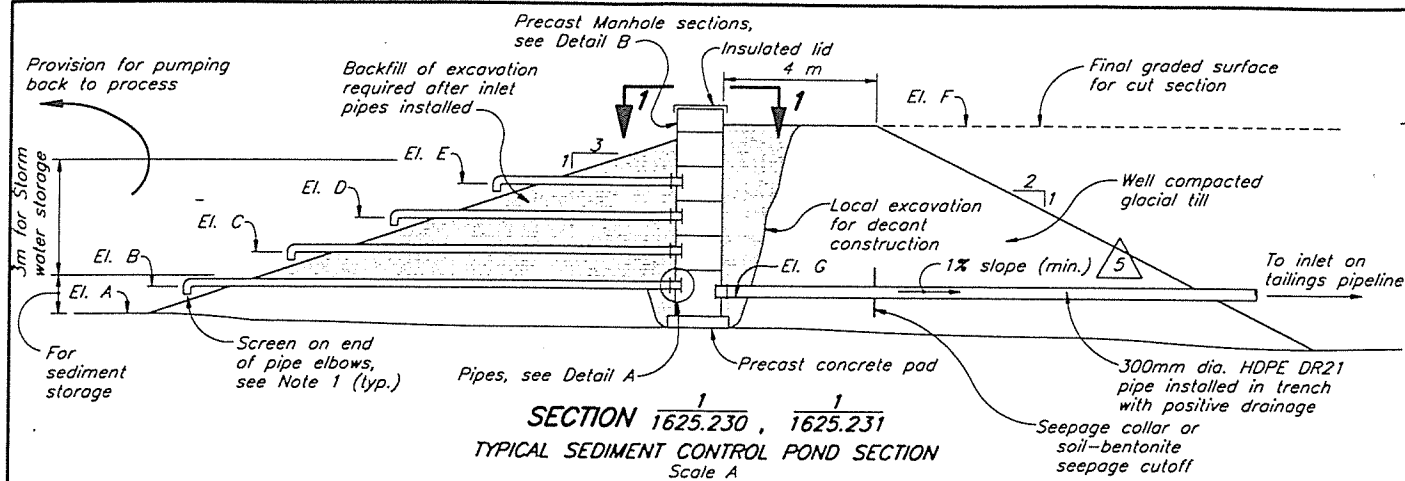
CAD FILE: 1625.228.dwg 1:10000 Plot 1:10 AUG 14, 1997





- NOTES**
1. Millsite layout provided by C.S.F.M.
 2. South millsite berm can be built higher if required.
 3. Dropbox, tailings and reclaim pipeline and sewage line final elevations to be determined after final grading elevations provided by C.S.F.M.
 4. Pipes to be placed in trenches must be bedded on compacted fill or dense in-situ till. Pipe trenches to be backfilled with select fine grained till with all particles exceeding 25 mm removed and compacted with hand held jumping jack compactor.
 5. Setting out details not included. Berms and Mill Site Sump have been constructed.
 6. Millsite sump drainage inlet to be located where tailings pipeline is under gravity (non-pressurized) flow conditions. Drainage inlet to comprise on HDPE tee on tailings pipeline.
 7. Topography not updated for 1997 Flyover.
 8. Pipeline alignments to be updated based on as-built survey.

<div>1625.232</div> <div>DRAINAGE PLAN - SECTIONS AND DETAILS</div> <div>DRG. NO. DESCRIPTION</div> <div>REFERENCE DRAWINGS</div>	<div>6 MAY 30/97 REVISED MILLSITE SUMP DRAINAGE INLET</div> <div>5 JULY 15/96 OVERFLOW POND NO. 1 ADDED</div> <div>REV. DATE DESCRIPTION</div> <div>REVISIONS</div>	<div>4 APR 1/96 MILL SITE REVISED</div> <div>3 MAR 25/96 ADD BATTERY LIMIT</div> <div>2 MAR 20/96 UPDATE DRAINAGE AND MILLSITE</div> <div>1 MAR 14/96 RELOCATED OPEN PIT SUMP</div> <div>0 AUG 24/95 ISSUED FOR CONSTRUCTION</div> <div>REV. DATE DESCRIPTION</div> <div>REVISIONS</div>	<div>* SIGNATURES AND PROFESSIONAL SEAL ON REV.0 ORIGINAL</div> <div>KNIGHT PIESOLD LIMITED</div> <div>CONSULTING ENGINEERS - VANCOUVER, B.C.</div> <div>DESIGNED MM/KDE</div> <div>DRAWN VY/NSD/RDT</div> <div>CHECKED *</div> <div>APPROVED *</div> <div>DATE AUG. 24, 1995</div>	<div>MOUNT POLLEY MINING CORPORATION</div> <div>MOUNT POLLEY PROJECT</div> <div>DRAINAGE PLAN</div> <div>MILLSITE</div> <div>SCALE AS SHOWN</div> <div>DRG. NO. 1625.231</div> <div>REV. 6</div>
---	---	--	---	--



SECTION 1625.231
TYPICAL DITCH SECTION
Scale A

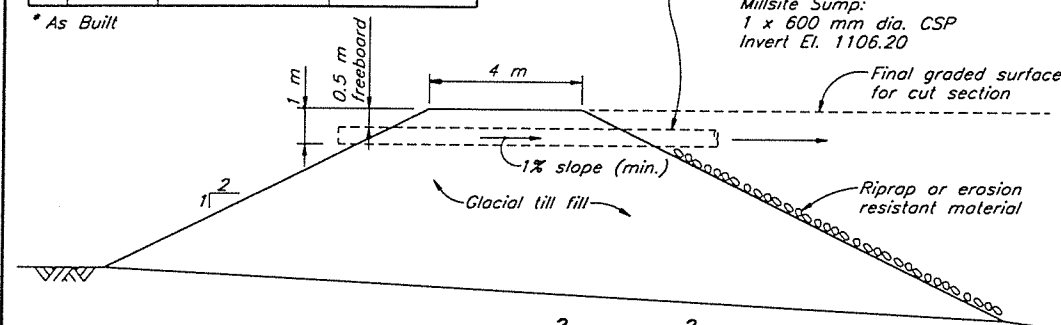
DITCH DIMENSIONS		
Ditch	W(m)	D(m)
All Mill Site Diversion Ditches	1.0	0.35
All Waste Dump Ditches	1.0	0.6

5 NOTES

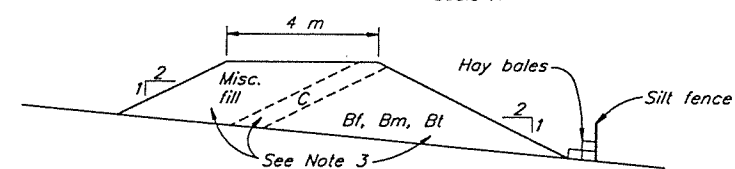
1. Pipe elbows provided for oil skimming.
2. Sediment control pond fill sections to be constructed using suitable glacial till materials from local excavations.
3. Fill sections to be constructed in max. 0.5 m lifts and compacted prior to the placement of the next lift.
4. Silt fence and hay bales provided for sediment control.
5. Rockfill to comprise clean coarse gravel and cobbles.
6. All pond excavations and fill sections to be completed in low permeability glacial till materials.

El.	Millsite Sump*	Southeast Sediment Pond*	Pit Dewatering Sump
A	1100.00	1052.20	To Be Determined
B	1100.91	1053.56	
C	1101.81	1054.42	
D	1102.70	1055.29	
E	1103.61	1056.18	
F	1107.40	1058.00	
G	1100.56	1053.37	

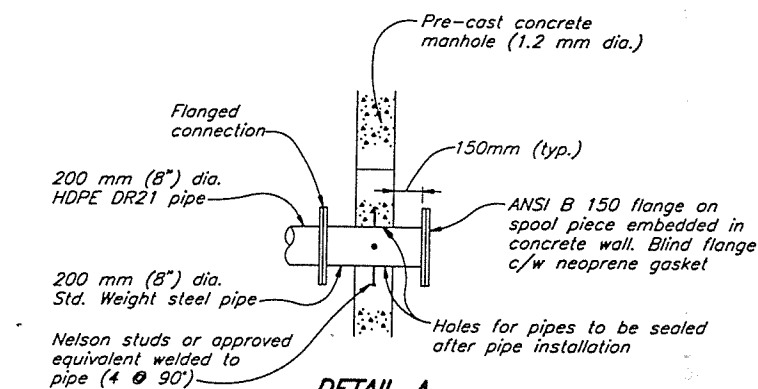
* As Built



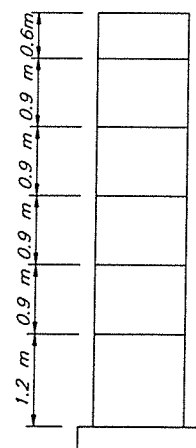
SECTION 1625.230, 1625.231
TYPICAL SEDIMENT CONTROL POND OVERFLOW CULVERT
Scale A



SECTION 1625.231
MILLSITE BERM SECTION
Scale A



DETAIL A
Scale C



DETAIL B
TYPICAL MANHOLE SECTIONS
FOR 5 m DEEP POND
NTS

DETAIL A
Scale C

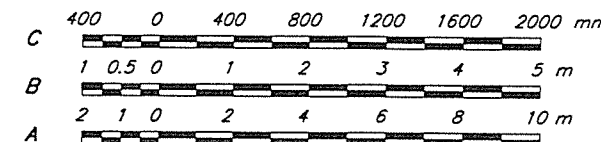
525.230	DRAINAGE PLAN - MINE SITE
525.231	DRAINAGE PLAN - MILL SITE
DRG. NO.	DESCRIPTION
REFERENCE DRAWINGS	

5	MAY 8/97	ELEVATIONS MODIFIED	
4	JULY 15/96	DETAIL AND ELEVATIONS MODIFIED	
3	APR 1/96	UPDATE SEDIMENT CONTROL POND	
2	MAR 20/96	UPDATE SEDIMENT CONTROL POND	
1	MAR 14/96	UPDATE DITCHES AND NOTE 3 ADDED	
0	AUG 24/95	ISSUED FOR CONSTRUCTION	
REV.	DATE	DESCRIPTION	APPROVED

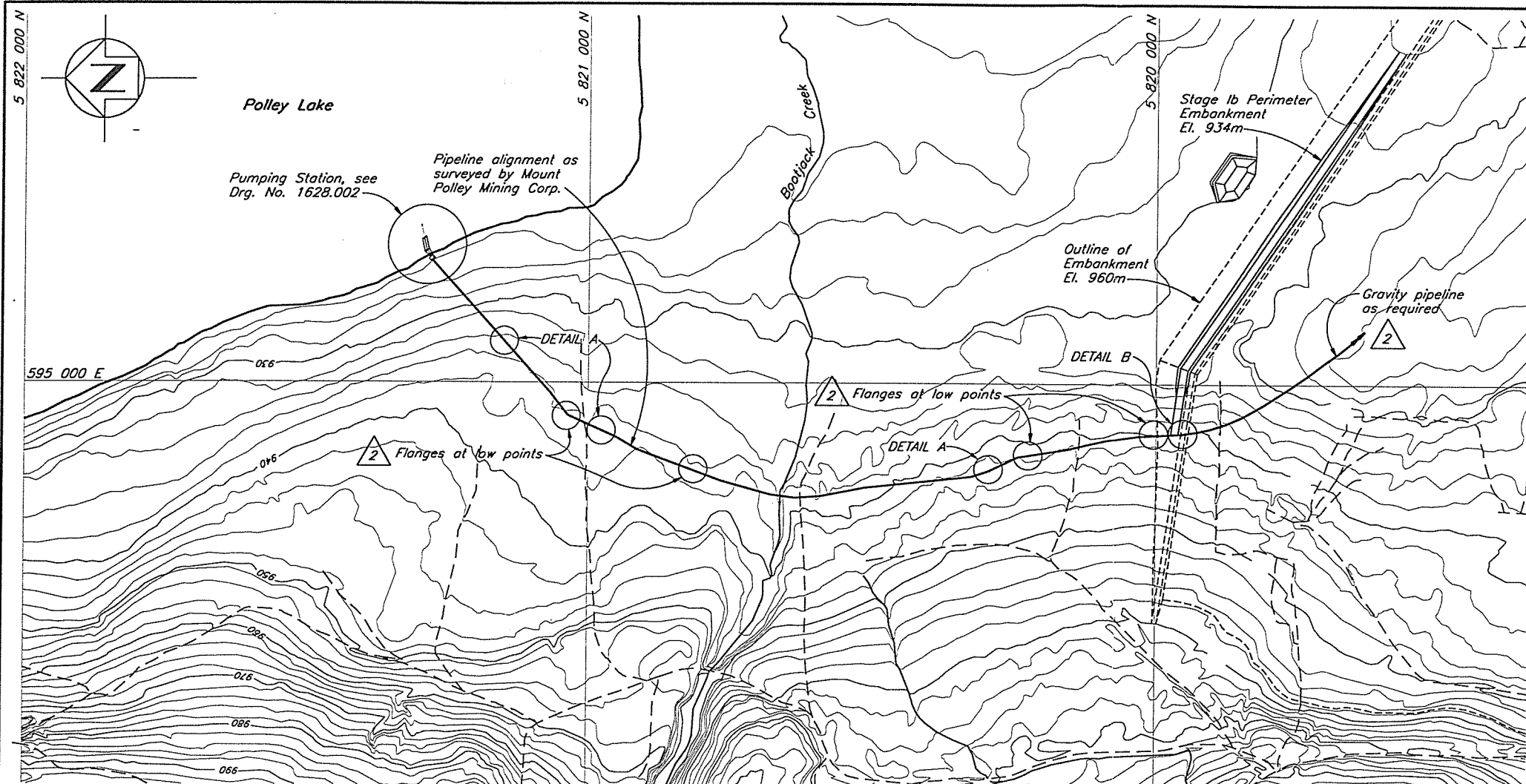
* "SIGNATURES AND PROFESSIONAL SEAL ON REV.0 ORIGINAL"

KNIGHT PIESOLD LIMITED CONSULTING ENGINEERS - VANCOUVER, B.C.	
*	DESIGNED KDE/MM
	DRAWN RDT/NSD
	CHECKED *
	APPROVED *

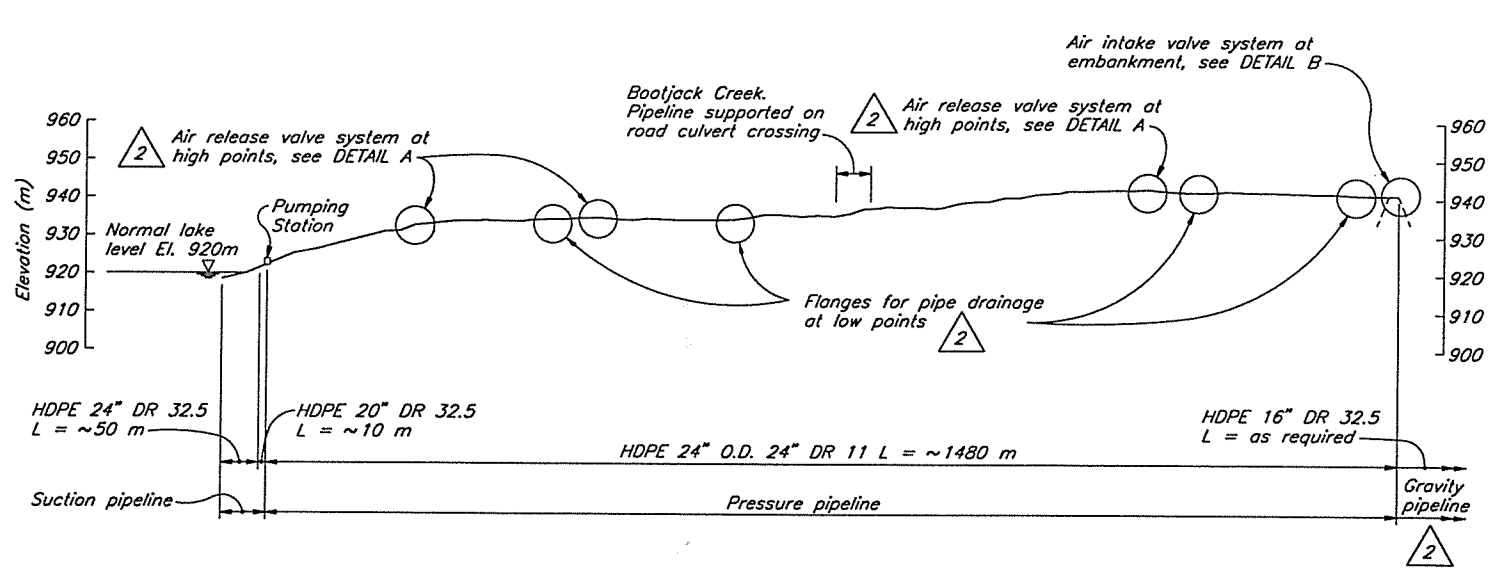
MOUNT POLLEY MINING CORPORATION	
MOUNT POLLEY PROJECT	
DRAINAGE PLAN SECTIONS AND DETAILS	
DATE AUGUST 24, 1995	SCALE AS SHOWN
DRG. NO. 1625.232	REV. 5



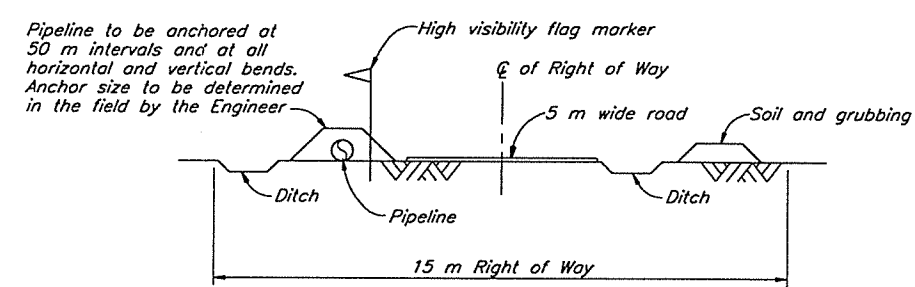
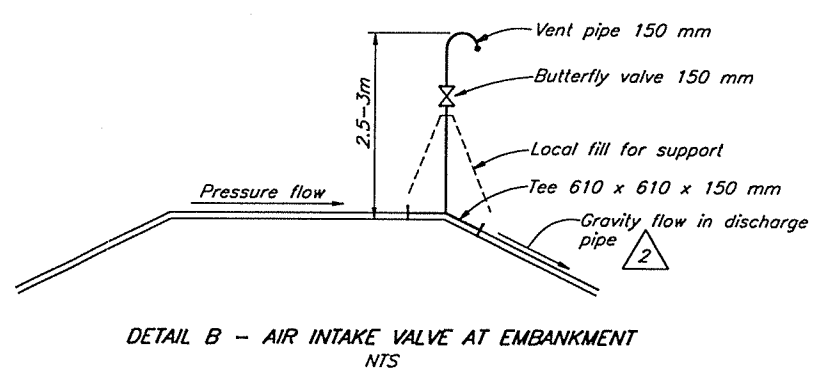
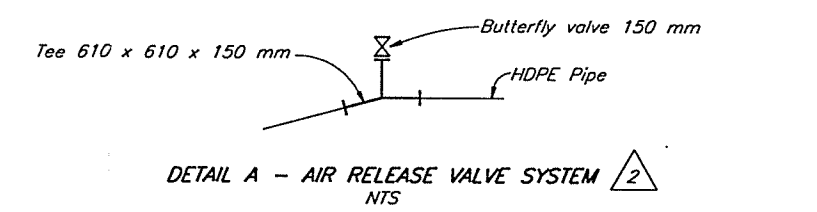
CAD FILE: 1625.231.DWG 1:100 Plot 1-0.1 STD. 1 MAY 26, 1997



PLAN
Scale A

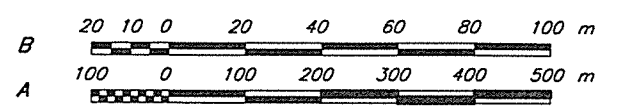


PIPELINE PROFILE
Horiz. Scale A, Vert. Scale B



NOTES

1. Pumping system has been designed for a maximum extraction rate of 8 000 USgpm. The extraction rate will be controlled by the pipeline I.D. and lengths selected for installation by Mount Polley Mining Corporation.
2. Pipeline profile is based on centreline of access road.
3. Pipeline may be constructed with some high sections. Air release valves required as shown.
4. Flanges to be provided at low points for pipe drainage, cleaning, and protection against freezing during prolonged shut down periods.
5. Air intake valve system required at embankment to facilitate drainage. Additional air intakes may be required at high points.
6. All air release/intake systems to be protected against freezing during pumping.
7. Elevations on pipeline profile are from survey data and do not correspond accurately to topographic contours.
8. Valves to be AWWA quality.



* SIGNATURES AND PROFESSIONAL SEAL ON REV.D ORIGINAL

KNIGHT PIESOLD LIMITED CONSULTING ENGINEERS - VANCOUVER, B.C.		MOUNT POLLEY MINING CORPORATION MOUNT POLLEY PROJECT	
*	DESIGNED	NM	PUMPING SYSTEM PLAN, PROFILE AND SECTION GENERAL ARRANGEMENT
	DRAWN	TAM	
	CHECKED	*	
	APPROVED	*	
DATE AUG. 13, 1996		SCALE AS SHOWN	DRG. NO. 1628.001
			REV. 2

1628.002	PUMPING STATION - GENERAL ARRANGEMENT	REV.	DATE	DESCRIPTION	APPROVED
0					
1					
2					

APPENDIX B

ANNUAL INSPECTION CHECKLIST



Ministry of Energy, Mines and Petroleum Resources

GUIDELINES FOR ANNUAL REPORTS

Tailings Impoundments

Statement

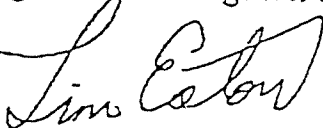
Tailings impoundments involve two important aspects of public concern and the additional concern of the safety of the workers. Structural stability of dams and impoundments is essential because, if failure occurs, large volumes of water and/or semi-fluid tailings would be released causing a serious threat to life and property and accompanying pollution problem. The other aspect of concern is the possibility of pollution during the operational and post-operational periods due to controlled discharges (by overflowing or decanting) and seepage downstream of the tailings dam.

Every operating and closed mine shall prepare and submit an annual report on operations and stability of all tailings dams and related works.

The report shall provide information and engineering details of the following:

- Plan and representative cross sections.
- Site photographs.
- Climatic review.
- Summary of past years' construction with a description of any problems and stabilization.
- Water balance review.
- Freeboard and storage availability (based on 200 year flood or the permitted design flood, whichever is more severe).
- Water discharge system, volumes and quality.
- Seepage occurrence and water quality.
- Surface water control and surface erosion.
- Construction control and instrumentation review.
 - o Phreatic surfaces and piezometric data.
 - o Settlement.
 - o Lateral movement.
- Stability review and analysis (safety factors).

For major tailings impoundments as described in Part 9.1.3 of the Health, Safety and Reclamation Code for Mines in British Columbia, the report shall be submitted by a qualified geotechnical engineer registered as a Professional Engineer (P.Eng.) in British Columbia.



Tim Eaton, P.Eng.

Manager, Geotechnical Engineering

October 1993

APPENDIX C

SAMPLE RECORD SHEETS



<i>Knight Piesold Ltd.</i> Consulting Engineers		VIBRATING WIRE PIEZOMETER MONITORING SHEET		
		Project: Mount Polley		Project No:
Dam (Fill) Elevation	PLANE	ZONE S	ZONE B	Date: _____ Time: _____ Readings By: _____ Barometer: _____
	A (Ch. 20+00)			
	B (Ch. 22+40)			
	C (Ch. 18+50)			
D (Ch. 40+00)				
Pond Elevation				
Weather: _____				
Piezometer Identification:	Serial Number:	Readings		Comments
		Temperature (°C)	Frequency (Hz)	
A1-PE1-01	64100			
A1-PE1-02	64096			
A1-PE1-03	64105			
A2-PE2-01	64104			
A2-PE2-02	64103			
A2-PE2-03	64101			
A2-PE2-04	64099			
A2-PE2-05	64102			
B1-PE1-01	64107			
B1-PE1-02	64106			
B1-PE1-03	64118			
B2-PE2-01	64110			
B2-PE2-02	64116			
B2-PE2-03	64109			
B2-PE2-04	64108			
B2-PE2-05	64113			
C1-PE1-01	64111			
C1-PE1-02	64115			
C2-PE2-01	64117			
C2-PE2-02	64119			
C2-PE2-03	64112			
C2-PE2-05	64114			
D1-PE1-01	64097	-----	-----	Not required for Stage Ib.
D2-PE1-01	64096			
Notes:				

J:\JOB\DATA\1627\REPORTS\IPZSHEET.XLS

MOUNT POLLEY MINING CORPORATION
MOUNT POLLEY PROJECT
TAILINGS STORAGE FACILITY

SURVEY MONUMENT COORDINATES - RECORD OF DISPLACEMENTS

J:\JOB\REPORT\1627\3-TBLL4.DOC

6/10/97

STAGE 1b - ONGOING SURVEY						RECORD OF DISPLACEMENTS ⁽²⁾						
	Observations	Date	N _n	E _n	El _n	ΔN	ΔE	ΔEl	D _{xy}	D _{xyz}	D _{xy-total}	D _{xyz-total}
A2-SM-02												
B2-SM-01												
C2-SM-03												
A2-SM-02												
B2-SM-01												
C2-SM-03												
A2-SM-02												
B2-SM-01												
C2-SM-03												
A2-SM-02												
B2-SM-01												
C2-SM-03												
A2-SM-02												
B2-SM-01												
C2-SM-03												

Notes:

1. Calculate displacements as shown below:

Total Displacement from initial survey (06 - Feb - 97)

$$\Delta N = N_n - N_0$$

$$\Delta E = E_n - E_0$$

$$\Delta El = El_n - El_0$$

$$D_{xy-total} = (\Delta N^2 + \Delta E^2)^{1/2}$$

$$D_{xyz-total} = (\Delta N^2 + \Delta E^2 + \Delta El^2)^{1/2}$$

Displacement between readings

$$\Delta N = N_{(n+1)} - N_n$$

$$\Delta E = E_{(n+1)} - E_n$$

$$\Delta El = El_{(n+1)} - El_n$$

$$D_{xy} = (\Delta N^2 + \Delta E^2)^{1/2}$$

$$D_{xyz} = (\Delta N^2 + \Delta E^2 + \Delta El^2)^{1/2}$$

Comments on calculations

1. Coordinate system is (Easting, Northing, Elevation) = f(x,y,z)
2. Coordinate system is as shown on Drawings

MAIN EMBANKMENT FOUNDATION DRAIN FLOW MONITORING

10-Jun-97

[illegible]

APPENDIX D

COMMUNICATIONS DIRECTORY



APPENDIX D

COMMUNICATIONS DIRECTORY

<u>NAME</u>	<u>ADDRESS</u>	<u>TELEPHONE</u>
MOUNT POLLEY MINE	Box 12 Likely, BC V0L 1N0	(250) 790-2215

SITE PERSONNEL:

Dam Co-ordinator

- | | |
|---------------|------|
| • Don Parsons | Home |
| • Eric Leneve | Home |

Dam Operator

- | | |
|--------------|------|
| • Don Ingram | Home |
| • Tim Fisch | Home |

Technical

- | | |
|-------------------|------|
| • Ron Martel | Home |
| • Greg Smyth | Home |
| • Jamie Stevenson | Home |

TECHNICAL ADVISORS:

Knight Piésold Ltd.	Suite 1400 750 West Pender St. Vancouver, BC, V6C 2T8	Office (604) 685-0543
---------------------	---	-----------------------



(a)	Ken Brouwer	Home
(b)	Bruce Brown	Home
(c)	Jeremy Haile	Home

OTHER AGENCIES

- R.C.M.P. Williams Lake, BC (250) 392-6211
- Comptroller of Water Rights, Victoria, BC (250) 387-6945
- Director of Provincial Emergency Program, Victoria, BC (800) 663-3456
- BC Water Management, Regional Manager, Williams Lake, BC (250) 398-4553
or (250) 398-4296
- MELP, Water Management Branch (Dam Safety Engineer), Victoria, BC (250)
387-3263
- MEI, Geotechnical Branch, Victoria, BC (250) 952-0480

