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

# REPORT ON STAGE 3 CONSTRUCTION
**(REF. NO. 11162/14-3)**

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# MOUNT POLLEY MINING CORPORATION
# MOUNT POLLEY MINE
# TAILINGS STORAGE FACILITY

## REPORT ON STAGE 3 CONSTRUCTION
## (REF. NO. 11162/14-3)

## SECTION 1.0 - INTRODUCTION

### 1.1 PROJECT DESCRIPTION

The Mount Polley gold and copper mine is owned and operated by Mount Polley Mining Corporation (MPMC). It is located in central British Columbia, 56 kilometres northeast of Williams Lake, as shown on Figure 1.1. Ore is crushed and processed by selective flotation to produce a copper-gold concentrate. The current mill throughput rate is approximately 20,000 tonnes per day (7.3 million tonnes per year). The mine has been in production since June 13, 1997, but MPMC recently announced that operations will be suspended at the end of September, 2001 due to low copper and gold prices. An overall site plan of the Mount Polley Mine is shown on Drawing 11162-13-100.

Mill tailings are discharged as a slurry into the Tailings Storage Facility, which has been designed to provide environmentally secure storage of the solid and liquid components. The sub-aerial method of deposition is used to discharge tailings onto the beach from frequently rotated points around the perimeter of the facility. This produces a deposit that comprises numerous thin layers of tailings. The separation of liquids from solids is maximized and supernatant water and drainage flows are intercepted and recycled back to the mill for re-use in the process.

Knight Piésold Ltd. was originally engaged by Imperial Metals Corporation to provide engineering services for the design of the Tailings Storage Facility in 1989. Over the period since, Knight Piésold Ltd. has provided the following services:

- Detailed design of all stages of the Tailings Storage Facility and Ancillary Works completed to date.
- Preparation of contract documents and technical specifications for all stages of the Tailings Storage Facility construction to date.
- Construction supervision and quality assurance/quality control (QA/QC) for all stages of the Tailings Storage Facility completed to date.
- Site investigations and evaluations for engineering design and construction materials suitability.
- Consulting services on all aspects of the operation and monitoring of the Tailings Storage Facility.

The tailings embankments were recently raised under Stage 3 construction to El. 942.5 m. Work started in April 2000 and finished in August 2001. Knight Piésold Ltd. provided design, construction supervision and quality assurance/quality control (QA/QC) services for the embankment raise. Knight Piésold Ltd. also conducted on-going reviews of all instrumentation and monitoring records during construction and completed an annual inspection of the facility. The annual inspection is documented in a separate report. This report gives the details of Stage 3 construction.

## 1.2 TAILINGS STORAGE FACILITY

The Tailings Storage Facility is comprised of the following:

- A pipeline system conveys the tailings slurry via gravity from the Millsite to the Tailings Storage Facility. This system includes movable discharge sections with one end dump discharge to distribute the tailings along the embankment crest.

- A make-up water supply system provides extra water to the Tailings Storage Facility. This serves as a temporary storage and transfer point prior to pumping to the mill. This system comprises an intake and pump at Polley Lake and a pipeline to convey water to the Tailings Storage Facility. The water is discharged into the Tailings Storage Facility near the West abutment of the Perimeter Embankment.

- A Millsite Sump and Southeast Sediment Pond provide additional make-up water to the system by collecting drainage from the millsite and Southeast Waste Dump. 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 T2 Tailings Drop Box.

- Graded earthfill and rockfill embankments with internal filters and drains retain the tailings solids in the Tailings Storage Facility. The embankments have been raised in stages by a combination of centreline and modified centreline approaches. A 5 metre high downstream rockfill buttress has been constructed at the Main Embankment to enhance embankment stability. This buttress is located from the valley bottom to El. 920 m.

- A low permeability basin liner (natural and constructed) covers the base of the entire facility to provide containment of process fluids and to minimize the potential for seepage through the underlying soils.

- A foundation drain and pressure relief well system located downstream of the Stage 1B Main Embankment prevent the build-up of pore pressure in foundation and collect seepage from the base of the Tailings Storage Facility.

- Seepage collection ponds located downstream of the Main and Perimeter Embankments were excavated in low permeability soils to store water collected from the embankment drains and from local runoff. Water from these ponds is pumped back into the Tailings Storage Facility and ultimately to the mill for use in the milling process.

- Instrumentation in the tailings, embankments and foundations, including vibrating wire piezometers, survey monuments, slope inclinometers and the measurement of drain flows, is used to monitor the performance of the Tailings Storage Facility.

- A reclaim water system, comprised of a barge mounted pump station in an excavated channel, an in-line booster pump station and a pipeline for recycling process water to the mill, is used to remove water from the Tailings Storage Facility for use in the mill process.

- A system of monitoring wells installed around the Tailings Storage Facility is used for groundwater quality monitoring.

This description of the Tailings Storage Facility components has been included for information purposes. Work was not undertaken on all of the components during the Stage 3 construction program.

## 1.3 SCOPE OF REPORT

This report documents the Stage 3 construction. It includes a discussion of the construction methods used to complete the work, the results of quality assurance tests carried out during construction and a review of the new instrumentation and monitoring results from the construction program. Summaries and recommendations from the instrumentation reviews are included. The report also includes a complete and updated set of drawings issued as "As Constructed" for Stage 3.

## SECTION 2.0 - STAGE 3 CONSTRUCTION

### 2.1 GENERAL

The Stage 3 raise of the Mount Polley Mine Tailings Storage Facility was constructed in 2000 and 2001. The work consisted mostly of raising the embankments but also included a small amount of work on the tailings basin and tailings distribution system. Drawing 11162-13-102 provides an overall plan view of the embankments and the facility and outlines the limits of the Stage 3 raise. The Stage 3 Main Embankment Plan is shown on Drawing 11162-13-210. Main Embankment sections are shown on Drawing 11162-13-215. The Stage 3 Perimeter Embankment Plan is presented on Drawing 11162-13-120 while the Perimeter Embankment sections are shown on Drawing 11162-13-125. The Stage 3 South Embankment plan and section are shown on Drawing 11162-13-130.

Construction of the embankment raises were split between Stage 3A and Stage 3B. Stage 3A construction consisted of the following:

- Completion of the South and Main Embankments to El. 942.5 m from Chainage 6+50 to 9+50 and from Chainage 15+00 to 28+00.
- Upstream Zone CS placement to El. 942.5 m from Chainage 32+00 to 44+50.
- Downstream Zone F, T and C placement to El. 942.5 m from Chainage 28+00 to 32+00.
- Zone S placement to approximate El. 941.3 m from Chainage 28+00 to 44+50.

Stage 3B construction consisted of the following:

- Downstream Zone C placement to minimum El. 937 m from Chainage 32+00 to 39+00 and from Chainage 40+00 to 44+50.
- Downstream Zone T placement to El. 942.5 m from Chainage 32+00 to 39+00 and from Chainage 40+00 to 44+75.
- Downstream Zone F placement to El. 942.5 m from Chainage 32+00 to 44+75.
- Zone S placement to El. 942.5 m from Chainage 28+00 to 44+75.

The continuity of Zones C and T is interrupted between Chainages 39+00 and 40+00 by the Stage 2C downstream cycloned sand trial berm. The berm was covered with Zone F to minimize the potential for erosion of the fine grained cycloned sand. This area of the Perimeter Embankment is shown on Section 1 on Drawing 11162-13-125.

Knight Piésold Ltd. provided construction supervision and technical direction of the work under the management and administration of MPMC. The earthworks were completed by MPMC, Tercon Contracting Limited (TCL) of Kamloops, Lake Excavating Limited (LEL) of Williams Lake and 153 Mile Contracting Limited (153 Mile) of Williams Lake.

## 2.2 SCOPE OF WORK

### 2.2.1 General

The Stage 3 construction program comprised work on the following main areas:

- Investigations
- Tailings Embankments
- Basin Liner
- Tailings Discharge System
- Instrumentation

A description of each of the main components of the Stage 3 construction program is presented in the following sub-sections.

### 2.2.2 Investigations

Materials investigations were completed in 2000 and 2001 to support construction and design of the Tailings Storage Facility. Borrow Areas 2 and 3, located downstream of the Main Embankment left (east) abutment and Borrow Area 5, upstream of the South Embankment, were investigated to determine the availability and suitability of Zone S material. A total of

80 boreholes (DH01-01 to 80) were drilled in April, 2001. The results of the borrow area investigations are presented in Appendix A.

### 2.2.3 Tailings Embankments

The Stage 3 construction program included raising the Main, Perimeter and South Embankments to El. 942.5 m. The Stage 3 Main Embankment is approximately 1,300 metres long, with a maximum height of about 32 metres. The Stage 3 Perimeter Embankment is approximately 1,700 metres long, with a maximum height of about 15 metres. The South Embankment is approximately 300 metres long, with a maximum height of about 3 metres.

The scope of work for construction of the embankments included the following:

- Survey control of embankment construction.
- Foundation preparation to ensure a tie-in with competent natural ground.
- Placement and compaction of the fill materials in their respective zones in accordance with the Technical Specifications.
- Evaluation of embankment materials through detailed lab testing. The material testing was completed in the site soils laboratory and at an independent laboratory.

As-built construction details for the embankments are shown on the drawings included with this report.

### 2.2.4 Basin Liner

The basin liner was expanded at the right (southwest) abutment of the Main Embankment, as shown on Drawing No. 11162-13-130. This was completed during Stage 3A construction and the basin liner was subsequently buried by tailings in early 2001. Details of this fill placement is presented in Section 2.5.7

### 2.2.5 Tailings Discharge System

The scope of work for the tailings discharge system during Stage 3 construction included upstream cycloned sand placement between Chainage 32+00 and 44+50 at the Perimeter Embankment. In addition, the pipeline and discharge locations were relocated periodically in order to minimize interference with embankment construction.

### 2.2.6 Instrumentation

Groundwater monitoring wells GW00-01, 02 and 03 were installed downstream of the South Embankment in the summer of 2000 to monitor ground water flows in this area. Locations of the groundwater monitoring wells are shown on Drawing 11162-13-254, while borehole logs are presented in Appendix A.

Slope Inclinometers SI01-01 and 02 were installed at the downstream toe of the Main Embankment in July of 2001 to monitor any movements in the foundation below the embankment. Locations of the slope inclinometers are shown on Drawing 11162-13-250 and drill hole logs are presented in Appendix A.

A total of seven (7) vibrating wire piezometers were installed during Stage 3 construction to monitor pore pressures in the foundation and the performance of the Zone F filter. The locations of the installed piezometers are shown on Drawings 11162-13-250, 251 and 254 and on Table 2.2.

Six survey monuments were installed on the Main and Perimeter Embankments to monitor any settlement that occurs on the embankments. Drawings 11162-250 and 251 show the as constructed locations of the survey monuments.

## 2.3 CONSTRUCTION SEQUENCE AND RESPONSIBILITIES

Construction of the Stage 3A embankment raise commenced in April 2000 and was completed in March 2001. MPMC was responsible for:

- Foundation preparation at the Perimeter Embankment from Chainage 28+00 to 32+00.
- Fill surface preparation at the Perimeter Embankment from Chainage 28+00 to 44+50.
- A portion of borrow area development.
- Cycloned sand placement.
- Relocation of tailings pipelines and appurtenances.
- Fill placement of Zones F, C and T from Chainage 28+00 to 32+00 and fill placement of Zone S from Chainage 28+00 to 44+50.

TCL was responsible for:

- Foundation preparation at the Main and South Embankments.
- Fill surface preparation at the Main and South Embankments.
- A portion of borrow area development.
- Fill placement at the Main and South Embankments.

The work began with the placement of cyclone underflow (Zone CS) upstream of the Main and Perimeter Embankment crests. The Basin Liner was constructed in August 2000 and TCL carried out the work on the Main and South Embankment through to the end of September. Work at the site than ceased during October and MPMC commenced embankment fill placement in November 2000. This portion of fill placement was finished by the end of March 2001.

Construction of the Stage 3B embankment raise was carried out on the Perimeter Embankment, commencing in May 2001 and completed at the end of August 2001. MPMC was responsible for:

- Fill surface preparation at the Perimeter Embankment.

- Borrow area development.
- Relocation of tailings pipelines and appurtenances.
- Fill placement of Zones C and T.
- A portion of Zone S fill placement.
- A portion of Zone F fill placement.

LEL was responsible for:

- A portion of Zone S fill placement.
- A portion of Zone F fill placement.

153 Mile was responsible for:

- A portion of Zone F fill placement.

## 2.4 CONSTRUCTION SUPERVISION AND QUALITY ASSURANCE

Knight Piésold Ltd. provided construction quality assurance and control (QA/QC) services and QC lab testing for Stage 3 construction of the Tailings Storage Facility. MTS Testing Services Ltd., of Prince George, British Columbia carried out lab testing for the borrow area investigation in 2001. Key items addressed by Knight Piésold Ltd. included:

- Foundation inspection and approval prior to fill placement.
- Assessment of borrow material suitability.
- Inspection of fill placement procedures.
- In-situ testing of the placed and compacted fill for moisture content and density.
- Collection and testing of control and record samples at the required frequencies.
- Installation and monitoring of instrumentation.

The QA/QC procedures were similar to previous construction programs. During placement of fill materials, Control (prior to placement) and Record (after compaction)

samples of the materials were collected for laboratory testing. Control testing was typically carried out on materials in borrow pits or from source locations to determine their suitability for use in the work. Record testing was typically performed on materials after placement and compaction to document the level of workmanship achieved and to ensure that the design objectives were met.

Both Control and Record testing were used as a basis for modifying the construction procedures as and when necessary. Estimated quantities are also summarized on Table 2.1 with the Control and Record testing requirements and frequencies. Control test results are summarized in Appendix B. Record test results are discussed throughout this report and are summarized in Figures 2.1 to 2.17 and tabulated in Appendix C.

A minor portion of the work was completed in winter and required intensive monitoring. However, the work was carried out at all times in accordance with the Technical Specifications, as described in the "Tender Documents for Stage 3 Tailings Facility Construction, Ref. No. 11162/13-2", April 14, 2000. The QA/QC program confirmed this compliance with the Technical Specifications and the field and laboratory test results indicate that the design objectives were achieved, as discussed in Section 2.5.

## 2.5 EARTHWORKS

### 2.5.1 General

Stripping and preparatory work was completed on all foundation and abutment areas to ensure that a good tie-in was achieved with the natural ground and with the Stage 2C embankment. Organic debris and topsoil were removed according to the Technical Specifications. Foundation approval was required by the Engineer prior to the placement of any fill material.

Earthworks for the Stage 3 Tailings Storage Facility construction comprised the following zones and materials:

- Zone S - fine grained glacial till.
- Zone CS - cycloned sand.
- Zone F - processed gravel and sand filter.
- Zone T - select rockfill transition zone.
- Zone C - rockfill zone.
- Basin Liner - fine grained glacial till.

The gradation requirements for the fill materials are shown on Drawing 11162-13-104. Results of these, together with density, moisture content and other tests, are discussed in the following sections.

### 2.5.2 Zone S

Zone S forms the low permeability core and seal zones for the Main, Perimeter and South Embankments. The material used in Zone S was fine grained glacial till from Borrow Area No. 2, which is located downstream of the left (East) abutment of the Main Embankment.

The Specification for Zone S material required placement and compaction in maximum 300 mm thick horizontal lifts. The compaction specification was 95 percent of the Standard Proctor maximum dry density.

Record tests on the compacted Zone S fill included the following:

- Moisture Content (ASTM D2216)
- Particle Size Distribution (ASTM D422)
- Laboratory Compaction (ASTM D698)
- Specific Gravity (ASTM D854)
- Atterberg Limits (ASTM D4318)
- Field Density by Nuclear Methods (ASTM D2922)
- Field Moisture Content by Nuclear Methods (ASTM D3017)

A total of nine(9) complete Record Tests of Zone S material were made. An additional 379 field density and moisture content tests were made by the nuclear densometer.

The particle size analyses showed that the Zone S glacial till is a well-graded sandy silt with some clay and gravel. All of the test results were within the specified limits for the material. The gradation curves of the Zone S Record Tests are shown on Figure 2.1.

Atterberg limits testing was carried out on five samples. The plastic limits of these samples ranged from 13.4 to 14, with a median of 13.7. The liquid limits ranged from 22.5 to 24.5, with a median of 24.4. The plasticity index ranged from 8.8 to 10.8, with a median of 10.0. The material is classified as CL in the Unified Soil Classification System (inorganic clay of low to medium plasticity).

The median field moisture content as measured with the nuclear densometer was 10.2 percent, while the median optimum moisture content was 8.8 percent. The median deviation from the optimum moisture content was 1.7 percent wet of optimum. Material too wet for direct placement in the Zone S fill was avoided in the borrow areas.

The median field dry density, as measured with the nuclear densometer, was 2109 kg/m$^3$, while the median Standard Proctor maximum dry density was 2115 kg/m$^3$. Percent compaction values for all nine Record Tests ranged from 98 percent to 105 percent. The median percent compaction from the nuclear densometer tests was 99.1 percent. These results indicate that the compaction specification of 95 percent was achieved. Each lift of Zone S was tested prior to the placement of the next lift. If any test failed to meet the compaction requirements, the area in question was re-compacted until the minimum compaction requirements were met. Of the 379 nuclear densometer tests, only one failed the compaction requirement. The material in this area was allowed to remain in place based on visual inspections carried out by the Engineer.

Histograms were generated to illustrate the results of the field density and moisture content testing. The histograms in Figures 2.2 to 2.4 present the field moisture content, Standard Proctor optimum moisture content and deviation from optimum for the Zone S Record samples, while Figures 2.5 to 2.7 show the measured field dry density, the Standard Proctor maximum dry density and the corresponding percent compaction. Figures 2.8 to 2.11 display the results of 379 field density and moisture content tests conducted in Zone S with the nuclear densometer during Stage 3 construction.

Specific gravity was determined for five samples. The median result was 2.62, which is consistent with values measured on similar materials during previous construction programs.

### 2.5.3 Zone CS

Zone CS consists of cycloned tailings sand which was placed in the upstream zone of the Perimeter Embankment by mechanical methods. The material was spread in horizontal lifts up to 1000 mm thick and then compacted with a 10-ton vibratory roller augmented with truck traffic. KP field personnel were on site during the compaction of the final lift only. The compaction of the first lift was carried out while KP field personnel were not on site.

Record tests on Zone CS consisted of:

- Particle Size Distribution (ASTM D422)
- Field Density by Nuclear Methods (ASTM D2922)
- Moisture Content by Nuclear Methods (ASTM D3017)

A total of five (5) particle size distribution tests were made on Zone CS material. An additional 19 field density and moisture content tests were carried out with the nuclear densometer on the final lift of the material.

The particle size analyses showed that Zone CS is a uniform silty sand. All of the test results were within the specified limits for the material. The gradation curves are shown on Figure 2.12.

The median field moisture content, as measured with the nuclear densometer, was 4.8 percent and the range of moisture contents was from 3.8 to 6.2 percent. The material was placed and shaped in the fall of 2000 and the spring of 2001 and the final lift was not compacted and tested until July 2001. As a result, the moisture contents reported here are lower than freshly placed materials.

The median field dry density of the Zone CS material, as measured with the nuclear densometer, was 1611 kg/m$^3$.

Histograms illustrating the results from the 19 nuclear densometer field moisture content and field density tests were generated. These are shown on Figures 2.13 and 2.14.

### 2.5.4 Zone F

Zone F forms the filter zone immediately downstream of Zone S on the Main and Perimeter Embankments. The material used in Zone F was mine waste rock which was crushed at the millsite.

The Specification for Zone F called for placement and compaction in maximum 600 mm thick horizontal lifts. However, due to difficulties experienced in placing these lifts on the sloping downstream surface of Zone S (see Drawing 11162-13-125), the specification was modified in the field to allow for placement in a 1000 mm thick lift on the slope. The Zone F fill placement was carefully monitored to ensure that segregation did not occur. Compaction was achieved with a 10 ton vibratory smooth drum roller running up and down the slope.

Record tests on Zone F consisted of:

- Particle Size Distribution (ASTM D422)
- Moisture Content (ASTM D2216)

A total of forty two (42) particle size distribution tests were completed on Zone F. These tests showed that Zone F consists of a well-graded gravel and sand. Thirteen of the Zone F test results fell outside of the specified coarse limit for particle sizes smaller than 5 mm. However, in a check with the particle sizes in Zone S, an adequate filter relationship between Zone S and Zone F was confirmed and the material was allowed to remain in place. Gradation curves are shown on Figure 2.15.

Twelve Zone F samples were tested for moisture content. The median field moisture content, as measured in the laboratory, was 4.5 percent and the range of moisture contents was from 2.3 percent to 8.4 percent.

### 2.5.5 Zone T

Zone T is a transition zone immediately downstream of Zone F in the Main and Perimeter Embankments. The material used in Zone T was select rockfill which was quarried from the Rock Borrow.

The Specification for Zone T required placement and compaction in maximum 600 mm thick horizontal lifts. However, for reasons similar to Zone F, the specification was modified in the field to allow for placement in a 1000 mm thick lift on the sloping face of the embankment. Fill placement was carefully monitored to ensure that segregation did not occur. Compaction was achieved with a 10 tonne vibratory smooth drum roller on the slope.

Record tests on Zone T consisted of:

- Particle Size Distribution (ASTM D422)
- Moisture Content (ASTM D2216)

A total of eighteen (18) Zone T samples were tested for particle size distribution. These tests showed that Zone T consists of a well-graded gravel with some cobbles and trace sand. Gradation curves are shown on Figure 2.16. One of the Zone T record test results fell slightly outside of the specified coarse limit for particle sizes greater than 100 mm. This will not affect the behavior of Zone T and the material was left in place.

Seven Zone T samples were tested for moisture content. The median field moisture content, as measured in the laboratory, was 3.6 percent and the range of moisture contents was from 1.4 percent to 4.4 percent.

### 2.5.6 Zone C

Zone C is a rockfill zone immediately downstream of Zone T in the Main and Perimeter Embankments. The material used in Zone C was rockfill which was quarried from the Rock Borrow.

The Specification for Zone C called for placement and compaction in maximum 1000 mm thick horizontal lifts. This was followed and compaction was achieved with a 10 ton vibratory smooth drum roller augmented with 85 tonne haul trucks.

Record tests on Zone C consisted of Particle Size Distribution (ASTM D422). A total of five(5) Record Tests were completed on Zone C. The results showed that Zone C is a well graded cobbly gravel with trace boulders and sand. All of the test results were within the specified limits for Zone C. Gradation curves are shown on Figure 2.17.

### 2.5.7 Basin Liner

The Basin Liner was constructed out of locally borrowed glacial till placed in three 150 mm thick lifts to a total thickness of 450 mm. The material in each lift was compacted to a dry density of greater than 92 percent of the Standard

Proctor maximum dry density. A 300 mm thick layer of till, nominally compacted, was then placed over the liner as frost protection.

No laboratory testwork was conducted on the Basin Liner material. The material quality and lift and compaction control was made by thorough and continuous visual inspections during construction.

## 2.6 EMBANKMENT DRAIN SYSTEMS

Foundation Drain FD-5 was extended to the right abutment of the Main Embankment in order to control a small groundwater seep observed in the area and to provide a conduit for local runoff. The as-built location of the drain extension is presented on Drawing 11162-13-250.

## 2.7 TAILINGS DISCHARGE SYSTEM

The tailings discharge system includes a single HDPE pipeline approximately 7,000 metres in length from the Millsite to the left (west) abutment of the Perimeter Embankment. Downstream of this, the system included pipework to route the tailings through cyclones for Zone CS construction, or to a number of discharge points on the embankment crest.

Construction activities related to the tailings discharge system included the following:

- Operation of Krebs 20" cyclones at the embankment crest and in Borrow Area No. 4 to supply material for Zone CS at the Perimeter Embankment.
- Discharge of tailings from various points around the perimeter of the facility to establish beaches.

## 2.8 INSTRUMENTATION AND MONITORING

### 2.8.1 General

Construction activities related to instrumentation and monitoring systems included installing the following:

- Vibrating wire piezometers
- Groundwater monitoring wells
- Slope inclinometers
- Survey monuments

Details of these installations are presented in the following sub-sections.

### 2.8.2 Vibrating Wire Piezometers

A total of seven(7) vibrating wire piezometers were installed during Stage 3 construction, as summarized below and on Table 2.3. Details of the as-built piezometer locations are shown on Drawings 11162-13-250, 251, 254, 258 and 259 with instrumentation details shown on Drawing 11162-13-256.

Three(3) piezometers were installed in the foundation under the Zone C buttress (one each at Planes A, B and C) to monitor pore pressures in the foundation.

One(1) piezometer was installed in the foundation under the South Embankment (Plane F) to monitor pore pressures in the foundation.

Three(3) piezometers were installed in the Zone F (one each at Planes D, G and H) to monitor the performance of the filter.

No unexpected or anomalous pore pressures were observed while monitoring these or the previously installed vibrating wire piezometers during construction. Some of the piezometers in the Zone S fill responded to the

increased load from the additional material placed on the embankments. However, the increases did not result in any delays in construction.

The pore pressures in the tailings reflected the pond level. A total of 59 vibrating wire piezometers have been installed at the Tailings Storage Facility. Of these, 53 remain in operation. The results of all piezometer monitoring are discussed in detail in the KP document "Report on 2000 and 2001 Annual Inspection", (Ref. No. 11162/14-2, October 3, 2001) and in the site progress reports.

### 2.8.3 Groundwater Monitoring Wells

Three(3) groundwater monitoring wells were installed downstream of the South Embankment during Stage 3 construction to monitor groundwater quality and water levels to the South of the Tailings Storage Facility. The borehole logs and installation details are presented in Appendix A. The as-built locations are shown on Drawing 11162-13-254 and are also provided on Table 2.2.

MPMC staff measure the piezometric levels within the wells and collect samples for water quality testing. The results of the water quality monitoring have been reported by MPMC in the report "2000 Annual Environmental Report, Effluent permit 11678". This report has been submitted to the appropriate agencies (Ministry of Environment, Lands and Parks and Ministry of Energy, Mines and Northern Development).

### 2.8.4 Slope Inclinometers

Two(2) slope inclinometers were installed immediately downstream of the Stage 3 Main Embankment to monitor any movements within the foundation materials. The borehole logs and installation details are presented in Appendix A. The as-built locations are shown on Drawing 11162-13-250 and are also presented on Table 2.2.

KP engineering staff monitored the slope inclinometers five times in August, 2001. This initial monitoring creates an average base file, to which all subsequent monitoring is compared. The first readings of these inclinometers are scheduled for November, 2001.

### 2.8.5 Survey Monuments

Six(6) survey monuments were installed on the crests of the Main and Perimeter Embankments to monitor any future settlements of the crest. The as-built locations are shown on Drawings 11162-13-250, 251 and 254 and are tabulated on Table 2.2. The installation details are presented on Drawing 11162-13-256.

## 2.9 DESIGN MODIFICATIONS

Knight Piésold Ltd. employs a strict procedure for making design modifications (changes or substitutions) in the field. All design change requests are submitted in writing by the Resident Engineer to the Knight Piésold Ltd. Vancouver Office for review and evaluation. If approved by the Project Principal, the design change request is forwarded to the Owner and Contractor in a formal, written decision.

Some modifications to the design and Technical Specifications were implemented during the Stage 3 construction program in order to adapt to site conditions. All modifications were approved on a technical basis by Knight Piésold Ltd. and on a permitting basis by the appropriate regulatory agencies. All modifications were also accepted and approved by Mount Polley Mining Corporation prior to their implementation.

The documentation associated with design modifications for Stage 3 construction are presented in Appendix E. Some minor modifications were made during Stage 3 construction other than those included in Appendix E. These modifications will have no significant impact on the design and operation of the facility. These were treated as “field fit” solutions and were not required

to go through the formal design modification process. Field fits and approved design changes are shown on the as-built drawings.

## SECTION 3.0 - CONCLUSIONS AND RECOMMENDATIONS

Stage 3 of the Mount Polley Mine Tailings Storage Facility was split into Stages 3A and 3B and constructed between April 2000 and August 2001. The construction program included the completion of the Main, Perimeter and South Embankments to El. 942.5 m. Technical supervision of the work included QA/QC testing and monitoring of instrumentation. This confirmed that the work was completed and the facility was performing in accordance with the design objectives. A few minor deviations from the Technical Specifications were made in the Zones F and T fill, as described in the report. However, each such case was carefully evaluated and determined to have no adverse affect on the facility.

An updated operating performance review has been made of the Tailings Storage Facility and it is presented in a separate document entitled "Report on 2000 and 2001 Annual Inspection" (Ref. No. 11162/14-2, October 3, 2001). From this, Knight Piésold Ltd. recommends that the pond level in the Tailings Storage Facility be closely monitored to ensure that the water level does not encroach on the required freeboard of the Stage 3 embankments. The reclaim barge and reclaim line should also be closely monitored to ensure that they remain in good working order.

## SECTION 4.0 - REFERENCES

A complete listing of all Knight Piésold Ltd. reports prepared for the Mount Polley Mine Project is shown below. These reports 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, Ref. No. 1621/1, February 19, 1990.

2) Imperial Metals Corp. Mt. Polley Project, Report on Project Water Management, Ref. No. 1624/1, February 6, 1995.

3) 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.

4) Imperial Metals Corp. Mt. Polley Project, Tailings Storage Facility and Ancillary Works, Part 10 - Technical Specifications, Ref. No. 1625/3, March 25, 1995.

5) Imperial Metals Corp. Mt. Polley Project, Tailings Access Road and Tailings/ Reclaim Pipelines, Part 6 - Technical Specifications, Ref. No. 1625/4, May 17, 1995.

6) Imperial Metals Corp. Mt. Polley Project, Manual on Sampling and Handling Guidelines for Determination of Groundwater Quality, Ref. No. 1625/5, May 19, 1995.

7) Imperial Metals Corp. Mt. Polley Project, Tailings Storage Facility, Design Report, Ref. No. 1625/1, May 26, 1995.

8) Imperial Metals Corp. Mt. Polley Project, Tailings Storage Facility, Site Inspection Manual, Ref. No. 1625/2, May 26, 1995.

9) Imperial Metals Corp. Mt. Polley Project, Response to Review Comments on Tailings Embankment Design, Ref. No. 1625/6, January 25, 1996.

10) Imperial Metals Corp. Mt. Polley Project, Groundwater Monitoring Program, Ref. No. 1624/2, June 3, 1996.

11) 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.

12) Imperial Metals Corp. Mt. Polley Project, Response to Review Comments on Groundwater Monitoring Program, Ref. No. 1625/7, September 12, 1996.

13) Imperial Metals Corp. Mt. Polley Project, Requirements and Specifications for the 1996 Groundwater Monitoring Program, Ref. No. 1625/8, September 12, 1996.

14) Imperial Metals Corp. Mt. Polley Project, Specification for Drilling, Monitoring Well Installations and Related Services, Ref. No. 1628/3, September 18, 1996.

15) Mount Polley Mining Corporation, Mount Polley Project, 1996 Groundwater Monitoring Well Installation Program, Ref. No. 1628/4, February 17, 1997.

16) Mount Polley Mining Corporation, Mount Polley Project, Polley Lake Pumping System, Ref. No. 1628/5, February 19, 1997.

17) Mount Polley Mining Corporation, Mount Polley Project, Tailings Storage Facility, Operation, Maintenance and Surveillance Manual for Stage Ia Embankment (El. 927 m), Ref. No. 1627/1, March 11, 1997.

18) Mount Polley Mining Corporation, Mount Polley Project, Tailings Storage Facility and Ancillary Features, May 1, 1997 Site Inspection, Ref. No. 1627/4, June 3, 1997.

19) Mount Polley Mining Corporation, Mount Polley Project, Tailings Storage Facility, Updated Design Report, Ref. No. 1627/2, June 4, 1997.

20) Mount Polley Mining Corporation, Mount Polley Project, Tailings Storage Facility, Operation, Maintenance and Surveillance Manual for Stage Ib Embankment (El. 934 m), Ref. No. 10162/7-3, June 18, 1997.

21) Mount Polley Mining Corporation, Mount Polley Mine, Tailings Storage Facility and Ancillary Features, May 1, 1997 Site Inspection, Ref. No. 10162/7-4, June 3, 1997.

22) Mount Polley Mining Corporation, Mount Polley Mine, Report on Stage Ia/Ib Construction, Ref. No. 10162/7-5, August 14, 1997.

23) Mount Polley Mining Corporation, Mount Polley Mine, Tender Documents for Stage 2A Tailings Facility Construction, Ref. No. 10162/9-1, October 9, 1997.

24) Mount Polley Mining Corporation, Mount Polley Mine, Stage 2A Tailings Facility Construction, Selected Excerpts from Reference Information, Ref. No. 10162/9-2, November 11, 1997.

25) Mount Polley Mining Corporation, Mount Polley Mine, Report on On-going Construction Requirements, Ref. No. 10162/9-3, January 29, 1998.

26) Mount Polley Mining Corporation, Mount Polley Mine, Contract Documents for Stage 2A Tailings Facility Construction, Ref. No. 10162/9-4, June 26, 1998.

27) Mount Polley Mining Corporation, Mount Polley Mine, 1998 Annual Inspection Report, Ref. No. 10162/9-5, June 26, 1998.

28) Mount Polley Mining Corporation, Mount Polley Mine, 1998 Construction and Annual Inspection, Ref. No. 11162/10-1, June 16, 1999.

29) Mount Polley Mining Corporation, Mount Polley Mine, Report on Cycloned Sand Construction of Stage 3 and On-going Stages of the Tailings Storage Facility, Ref. No. 11162/12-2, December 13, 1999.

30) Mount Polley Mining Corporation, Mount Polley Mine, Project Procedures Manual for Stage 2C and 3 TSF (Ref. No. 11162/13-1, Rev. 0), March 15, 2000

31) Mount Polley Mining Corporation, Mount Polley Mine, Contract Documents for Construction of Stage 3 TSF (Ref. No. 11162/13-2, Rev. 2), June 8, 2000

32) Mount Polley Mining Corporation, Mount Polley Mine, Operation, Surveillance and Maintenance Manual for Stage 3 (El. 944) Embankment (Ref. No. 11162/13-3, Rev. A) DRAFT, August 17, 2000

33) Mount Polley Mining Corporation, Mount Polley Mine, Addendum to Report on Cycloned Sand Construction of Stage 3 and On-going Stages of the TSF (Ref. No. 11162/13-4, Rev. 0), May 11, 2000

34) Mount Polley Mining Corporation, Mount Polley Mine, Report on 1999 Construction (Ref. No. 11162/13-5, Rev. 0), August 30, 2000

35) Mount Polley Mining Corporation, Mount Polley Mine, Stage 3 TSF Selected Excerpts from Reference Information (Ref. No. 11162/13-6, Rev. 0), April 20, 2000

36) Mount Polley Mining Corporation, Mount Polley Mine, Site Inspection Manual for Stage 3 Construction of the Main and South Embankments (Ref. No. 11162/13-7, Rev. 0), June 23, 2000

37) Mount Polley Mining Corporation, Mount Polley Mine, TSF Rock Borrow Bench Stability Assessment (Ref. No. 11162/13-8, Rev. A), August 18, 2000

38) Mount Polley Mining Corporation, Mount Polley Mine, Report on 1999 Annual Inspection (Ref. No. 11162/13-9, Rev. 0), October 16, 2000

39) Mount Polley Mining Corporation, Mount Polley Mine, Report on 2000 and 2001 Annual Inspection (Ref. No. 11162/14-2, Rev. 0), October 3, 2001

## SECTION 5.0 - CERTIFICATION

This report was prepared and approved by the undersigned.

Prepared by:

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Approved by:

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