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# MEMO

**To** Luke Moger
Mine Operations
Mount Polley Mining Corporation

**From** Jennifer Brash / Todd Martin

**AMEC File No.** VM00560

**Date** 14 June 2011

**Cc** Daryl Dufault

**Reviewed by:** Michael Davies

**Subject** **Mount Polley Mine Project**
**Tailings Storage Facility Instrumentation**
**Review and Recommendations**

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## 1.0 INTRODUCTION

Mount Polley is a copper and gold mine owned by Imperial Metals Corporation and operated by the Mount Polley Mining Corporation (MPMC). MPMC is currently constructing the Stage 7 raise of their Tailings Storage Facility (TSF) embankment. The design and construction monitoring of the TSF embankment from mine start up to early 2011 had been completed under the direction of Knight Piesold Limited (KP). AMEC Earth and Environmental, a division of AMEC Americas (AMEC), assumed the role of engineer-of-record for the TSF embankment as of 28 January 2011.

The objective of this memorandum is to review the state of existing instrumentation within the TSF, identify any site conditions of potential geotechnical concern, and propose instrumentation program changes and site investigations as required to conform to TSF monitoring recommendations. This evaluation was based on the 2006 Dam Safety Review1, the 2010 TSF Annual Inspection Report2, and KP's 2010 proposed instrumentation repair plan3, and AMEC's review of instrumentation data and coverage as described herein.

## 2.0 BACKGROUND

The Mount Polley mine is located 56 km northeast of Williams Lake, British Columbia. Operations began in 1997 and have continued to the present, with the exception of a temporary shutdown for economic reasons occurring between 2001 and 2005. The mine currently processes ore at a mill throughput rate of 20,000 tonnes per day. Tailings are deposited as

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[1] AMEC 2006, report to Imperial Metals Corporation, "Dam Safety Review Mt. Polley Mine – Tailings Storage Facility", December 2006

[2] Knight Piesold, 2011, report to Mount Polley Mining Corporation. "Tailings Storage Facility Report on 2010 Annual Inspection", 25 January 2011.

[3] Knight Piesold, 2010, letter report to Mount Polley Mining Corporation. "Mount Polley Tailings Storage Facility Instrumentation Repair, Productivity Upgrade and Remote Monitoring Capacity", 22 July 2010.

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slurry into a TSF comprised of a 4.2 km long earth and rockfill embankment (Figure 1). The embankment is formed of three sections of consistent modified centerline design but varying heights (Main, 45 m high; Perimeter, 27 m high; and South, 17 m high). The Stage 7 embankment raise, to be constructed in the summer of 2011, will uniformly increase the TSF embankment crest elevation to 960.5 m, a height increase of 2.5 m.

Historical data indicates that, to date, 93 piezometers have been installed along nine monitoring planes. Of the 93 piezometers, approximately half currently function. Piezometers have been installed in the TSF embankment fills, foundations, and tailings deposits. Five slope inclinometers were installed near the downstream toe of the Main embankment, of which four currently function. Replacement of non-functioning instrumentation was initially recommended in the 2006 dam safety review (AMEC, 2006) and that recommendation is echoed in this submission.

## 2.1 Existing Instrumentation

Piezometer installation at the Mount Polley TSF appears to have comprised two phases. Initially, piezometers were installed prior to and during starter dam construction targeting foundation soils, starter dam 'till core' fill, upstream fill, filter zones, drainage zones, and deposited tailings. Subsequently, piezometers were installed at consistent elevations of approximately 938 m and 949 m within the Main embankment (i.e. during the associated dam raises). At the South and Perimeter embankments, only the starter dam set and upper 949 m elevation set of piezometers were installed due to the lower embankment heights (higher founding levels). Thus far, inclinometer installation has been limited to five located in the downstream center toe of the Main embankment.

The Main embankment contains the majority of existing instrumentation, with 66 piezometers (38 currently functioning) and all five (four currently functioning) inclinometers installed to date. Piezometer damage appears to be concentrated in the foundations (8 of 18 still functioning), tailings (4 of 9 still functioning), upstream tailings fills (4 of 9 still functioning), and to a lesser extent the till core fills (10 of 16 still functioning). Piezometers installed within the drain and filter systems have for the most part remained operational, with 12 of 14 remaining functional. Five inclinometers are clustered in the vicinity of the Main embankment seepage collection pond, with one (SI01-01) not functioning due to mechanical damage and another (SI01-02, located under the downstream toe of the rockfill shell within the current buttress) showing 'slight deviations' (KP, 2011)[4]. Existing functioning Main embankment instrumentation is shown on Figures 2 and 3.

The Perimeter embankment contains a total of 17 piezometers (11 functioning) and no inclinometers (Figure 4). Non-functioning piezometers are primarily concentrated within the foundation drains. Additionally, only one functioning piezometer exists within the foundation soils.

The South embankment contains a total of 10 piezometers (8 functioning) and no inclinometers (Figure 5). Currently, only one functioning piezometer exists within the foundation soils and

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[4] As stated in the KP report, "*inclinometer SI01-02 is showing slight deviations (approximately 4 mm) at an approximate depth of 10 m below ground in the lacustrine silts*". The zones of movement are indicated on Figures 14 and 15.

upstream compacted tailings. However, this relative lack of instrumentation is primarily due to the comparatively low height of this structure.

### 2.2 Analysis of Historical Piezometer Data

Instrumentation of the Mount Polley TSF began in 1996 with a limited number of piezometers. The data currently available for AMEC review covers a 14 year period (1996 to Summer 2010), during which many additional piezometers were installed and many piezometers became non-functional. This historical data was reviewed to determine behaviour patterns within the various embankment fill and foundation units as the impoundment water level and embankment fill levels increased. Identification and evaluation of such patterns provides an important context to determination of the need (or lack thereof) for replacements for inoperative installations, new installations needed to establish redundancy, and new installations needed to obtain information where none has been obtained previously.

An overview of existing piezometer data is provided below and illustrated on Figures 7 through 13. Data from inclinometer SI01-02 is plotted on Figures 14 and 15.

#### 2.2.1 Embankment Drains

Several drainage systems were installed within the Mount Polley TSF embankment. Foundation drains, downstream toe drains, and chimney drains were all instrumented with piezometers at various locations within the three TSF embankment sections. Figure 7 shows the historical data recorded in all drain system instruments. In general, piezometers show consistent overall flat-line trends over time (i.e. all continue to record their installation elevation even as water levels increased within the TSF). This agrees with the expectation that a functioning drainage system would not allow accumulation of water head.

#### 2.2.2 Till Core

Compacted glacial till was used to form both a wide starter dam and the successive narrower core raises in all embankments. Both the starter dam and narrow core portions of all three TSF embankment sections have been instrumented with vibrating wire piezometers.

Historical data from the Starter Dam piezometers (Figure 8) shows a general trend of sharply increasing pressures during the early timeframe when the overlying fill levels were low and construction equipment impacts were easily felt by nearby piezometers, in the form of construction-induced pore pressure response. The till fill piezometers show a long term trend of gradual pore pressure increase, with more significant transient pore pressure increases (due to construction of dam raises), and subsequent pore pressure declines, within the context of the long term increasing trend. With increasing time and greater depth of burial of the piezometer tips relative to the dam crest where raise construction occurs, the magnitude of transient pore pressure become more muted when compared to the absolute fill and water levels. All piezometers have recorded pressures less than the overlying fill levels since 2002. Currently, when compared to the overlying embankment fill levels, the five functioning piezometers in this region show pore pressure ratios[5] (Ru) values of between 0 and 0.1. It can be seen in Figure 8

[5] The pore pressure ratio, Ru, is defined as the ratio of pore pressure to total vertical pressure, and is a means of normalizing pore pressures.

that pore pressures in all of the Starter Dam till piezometers, as expressed in elevation head, are below the level of the tailings pond, and that the rate of the long term trend of increasing pressures is much lower than the overall rate of rise of the tailings pond. This is indicative of a downward hydraulic gradient, which can positively influence long-term embankment stability.

Those piezometers in the narrow, raised portion of the core (Figure 9) display similar general trends to the Starter Dam piezometers with initial sharp increases in recorded pressure as fill was placed in their immediate vicinity and lesser and more muted transient pressure responses to fill addition as their depth of burial increases. Figure 9 shows that, in the 2007 construction season, pore pressures in recently installed till fill piezometers actually registered pressure heads in excess of the tailings pond level, the pore pressures being governed by construction rather than the tailings pond level. Currently, when compared to the overlying embankment fill levels, the 9 functioning piezometers in the Main and Perimeter embankment central cores (i.e. above the starter dam embankment) show pore pressure ratios between 0 and 0.1. The two functioning piezometers within the South embankment core zone show elevated pore pressure ratio values of 0.2 to 0.3, with absolute measured pressure heads roughly reflecting the last measured pond level. Given their relative position within the embankment, it is expected that the till fill piezometers installed above the starter dam, in the central, narrower portion of the core, would be more responsive to the tailings pond level than those piezometers in the downstream portion of the till starter embankment.

From a stability perspective, as evaluated in limit equilibrium stability analyses, it is the pore pressures registered in the till fill piezometers in the starter dam embankment that are of significance in terms of potential slip surface geometries yielding the lowest (i.e. most critical) factors of safety values in stability evaluations.

### 2.2.3 Filters

To maintain integrity of the core, filter zones are installed between the till core and downstream rockfill shell units within the Mount Polley TSF embankment. Five piezometers have been installed in this unit between elevations of 945 and 949 m with at least one instrument in each of the three TSF embankment sections. Figure 10 shows the historical data recorded in all filter instruments. In general, piezometers show consistent overall flat-line trends over time (i.e. all continue to record their installation elevation even as water levels increased within the TSF). This agrees with the expectation that filters permit water flow and perform a drainage function also, thereby not allowing accumulations of water head. Four of five functioning filter zone piezometers show zero pore pressure. The remaining piezometer shows a pore pressure ratio of 0.1.

Piezometer E1-01-01 (Plane E, Main embankment, refer to section on Figure 3) shows a persistent (over the last 4 months of recorded data) increase of 3 m of water pressure head above its installation elevation. This elevation is consistent with levels recorded in nearby till core and upstream fill piezometers, possibly indicating that the filter is not functioning effectively as a drainage zone. However, this is unlikely to be of concern given the drainage capacity of the Zone C rockfill shell immediately to the downstream.

### 2.2.4 Upstream Fill

Compacted tailings, rockfill, or till core materials have been used to form fills upstream of the core in the Mount Polley TSF embankments. Vibrating wire piezometer data exists for this variable fill unit from 12 piezometers installed in the Main and Perimeter embankments. One piezometer is shown for the South embankment, but no data is available. Historical data from the upstream fill piezometers (Figure 11) shows a variety of trends, likely reflecting the variety of materials used in construction. In general, pressure is observed to increase as fill and water levels increase. This is an expected result. Currently, when compared to the overlying embankment fill levels, the six functioning piezometers in this region show pore pressure ratios between 0 and 0.2. Two piezometers show pressure levels consistent with the measured pond level.

### 2.2.5 Tailings

Fourteen piezometers were installed within the upstream beached tailings deposits adjacent to all three TSF embankment sections. Figure 12 shows that tailings piezometers exhibit a general trend of initially reflecting water level increases (as tailings are deposited immediately above them), before adopting a more modestly increasing trend, whereby the rate of pore pressure rise is less than the rate of rise of the tailings pond, indicating hydraulic head drop is occurring within the upstream tailings beach. Those piezometers most recently installed appear to record the pond water elevation, while previously installed piezometers record values 5 m to 13 m below the pond level. This is indicative of a downward hydraulic gradient, with pore pressures in the tailings near the dam somewhat below hydrostatic. This is consistent with the presence of drains installed immediately upstream of the core zone, and therefore indicates the upstream drains are functional and providing some, if not all, of their intended influence on the facility.

### 2.2.6 Foundation Soils

The foundation soils at all three TSF embankments have been instrumented with 22 piezometers installed within various soil units and at a variety of depths beneath the downstream portion of the embankments. Historical data from the foundation piezometers (Figure 13) shows a general trend of little to no response to dam construction (i.e. minimal indication of transient construction-induced pore pressures), nor to the rising level of the tailings pond. Currently, when compared to the overlying embankment fill levels, the nine functioning piezometers in this region show pore pressure ratios between 0and 0.2. All functioning foundation piezometers show heads roughly equivalent to the ground surface elevation at their location. This indicates a combination of low seepage from the tailings impoundment and effective drainage of seepage that is occurring.

### 2.2.7 Summary of Observed Piezometric Trends by Zone

A summary of observed piezometric trends to date, as illustrated on Figures 7 through 13, is given in Table 2.1 below. For each zone, an evaluation of the need (or lack thereof) for additional piezometer installations is summarized. Recommendations for additional installations are provided in Section 3.

## 2.3 Geotechnical Issues Requiring Additional Confirmation

In the course of AMEC's review of the existing Mount Polley TSF information, and instrumentation coverage, three geotechnical issues have been identified that warrant further investigation and clarification, in terms of site investigations and expansion of instrumentation coverage:

1. *Glaciolacustrine foundation soils*: The 2006 Dam Safety Review (AMEC, 2006) and 2010 Dam Safety Inspection (KP, 2011) both highlighted the significance of any potential of pre-sheared (i.e. low strength) planes within the glaciolacustrine soils present within the Mount Polley TSF foundation soils and recommended additional testing be undertaken to improve characterisation of these soils. Specifically, the concern would be associated with any laterally continuous, high plastic clay varves within the glaciolacustrine soils that, if pre-sheared to a low residual shear strength, would represent a weak planar feature within the foundation that would largely govern stability. Further, even if not pre-sheared, such clay varves could be driven to a low shear strength as a result of movements induced by the ongoing raising of the dam, thus making it important to monitor displacement patterns within these soils. It was movement (about 4 mm) within this foundation soil type noted by KP (2011) to have occurred in inclinometer SI01-02 (see Figures 14 and 15).

2. *Perimeter embankment crack:* The 2010 Dam Safety Inspection (KP, 2011) observed a crack at the eastern portion of the Perimeter embankment (at station 3+400 m) within the downstream rockfill shell. It is currently uncertain whether this crack is indicative of embankment slope movement (possibly related to till borrow excavation operations to the downstream, and/or foundation glaciolacustrine soils), or merely reflects localized rockfill settlement.

3. *South embankment foundation conditions*: AMEC's recent review of foundation conditions has revealed that very little information exists within the ultimate South embankment downstream toe area.

Investigation and instrumentation programs to address these issues are outlined in Section 3.0.

***Table 2.1: Summary of Observed Piezometric Trends***

| Zone | Observed Trends | Comments | Proposed Adjustments |
|---|---|---|---|
| Compacted till core – starter embankment (Fig. 8) | Progressively reduced response to dam raising. Very slow long term rising trend, much slower than rate of rise of tailings pond. | Behaviour is as expected. Pore pressures are relatively low (Ru values in range of 0 to 0.1). | Two replacements for inoperative piezometers recommended for Main embankment. |
| Compacted till core – narrow section above starter embankment (Fig. 9) | As per above, except these piezometers are more likely to be influenced by rising tailings pond level. | Behaviour is as expected. | None. Central core zone not significant in terms of stability. Piezometer leads in core introduce potential for core defects. No further piezometers are needed in the central till core of the dam. |
| Embankment drainage zones (Fig. 7) | No change over time, no response to tailings pond level. | Indicate drains are functioning properly. | Not at this time. |

**Table 2.1: Summary of Observed Piezometric Trends (cont'd)**

| Zone | Observed Trends | Comments | Proposed Adjustments |
|---|---|---|---|
| Filter zones piezometers (Fig. 10) | Stable readings, except for one piezometer. | Except for one piezometer, indicate filters are well drained. | None. These piezometers are only feasible for installation during fill placement. |
| Upstream fill piezometers (Fig. 11) | Generally below tailings pond elevation, indicative of downward seepage gradient upstream of the core. | Behaviour is as expected, and is similar to that indicated in the tailings piezometers. | Not at this time. |
| Tailings piezometers (Fig. 12) | Below tailings pond elevation, and rising at a slower rate than tailings pond rise. Indicating a downward seepage gradient. | Downward gradient consistent with under-drainage to upstream of the core. | Not at this time. |
| Foundation piezometers (Fig. 13) | Most indicate no perceptible response to rising tailings pond level, and minimal to no response to episodes of dam raising. | Indicated behaviour is favourable. | Additional piezometer coverage required – several as replacements for inoperative piezometers. Nine functional foundation piezometers insufficient. |

## 3.0 PROPOSED STAGE 7 INSTRUMENTATION AND INVESTIGATION PROGRAM

The recommended site investigation and instrumentation installation program for 2011 is summarized in Tables 3.1 and 3.2, illustrated on the attached Figures 1 to 6, and described below. Recommended 2011 activities include completion and installation of 16 geotechnical drillholes, 22 vibrating wire piezometers, 4 inclinometers, ten test pits, and geotechnical mapping to be completed by the AMEC site engineer. Actual instrumentation locations, numbers, and depths will be confirmed in the field by AMEC and MPMC personnel based on accessibility considerations.

**Table 3.1: Summary of Stage 7 Instrumentation Plan – Vibrating Wire Piezometers**

| Instrument ID | Location[1] | Tip Target Unit |
|---|---|---|
| A3-PE03-01 | A – Main Embankment Center South | Glacial Till Soil |
| A3-PE03-02 | | Glaciolacustrine Soils |
| A3-PE03-03 | | Glacial Till Soil |
| A3-PE03-04 | | Glaciolacustrine Soils |
| B3-PE03-01 | B – Main Embankment Center North | Glaciolacustrine Soils |
| B3-PE03-02 | | |
| C3-PE03-01 | C – Main Embankment South | Glaciolacustrine Soils |
| C3-PE03-02 | | |
| E3-PE03-01 | E – Main Embankment South | Till Core Fill |
| E3-PE03-02 | | Glaciolacustrine Soils |
| E3-PE03-03 | | Glacial Till Soil |
| E3-PE03-04 | | Glaciolacustrine Soils |

***Table 3.1: Summary of Stage 7 Instrumentation Plan – Vibrating Wire Piezometers (cont'd)***

| Instrument ID | Location[1] | Tip Target Unit |
|---|---|---|
| F3-PE03-01 | F – South Embankment West | Foundation Soils |
| F3-PE03-02 | | |
| F3-PE03-03 | | |
| F3-PE03-04 | | |
| G3-PE03-01 | G – Perimeter Embankment West | Glacial Till Soil |
| G3-PE03-02 | | |
| H3-PE03-01 | H – Perimeter Embankment East | Glacial Till Soil |
| H3-PE03-02 | | |
| J3-PE03-01 | J – Perimeter Embankment East (New) | Glacial Till Soil |
| K3-PE03-01 | K – Main Embankment North (New) | Glaciolacustrine Soils |

*Note:*
1. *Letter refers to instrumentation plane shown on Figure 1.*

***Table 3.2: Summary of Stage 7 Instrumentation Plan Slope Inclinometers***

| Instrument ID | Location[1] |
|---|---|
| SI11-01 | C – Main Embankment South |
| SI11-02 | H – Perimeter Embankment East |
| SI11-03 | J – Perimeter Embankment East (New Section) |
| SI11-04 | K – Main Embankment North (New Section) |

*Note:*
*1. Letter refers to instrumentation plane shown on Figure 1.*

Piezometers should be installed using a sonic drill rig (where possible) to drill to depth and retrieve continuous overburden core samples, thus allowing characterisation of foundation soils (in particular, examination of the glaciolacustrine unit) and identification of appropriate piezometer tip installation locations by the AMEC field engineer. Given that the piezometer installations will target generally low hydraulic conductivity materials, grouted-in piezometers can be used, a technique that allows for more rapid installation, particularly when there are multiple piezometers to be installed in a single borehole.

Slope inclinometers will be grouted into completed sonic drillholes. Where the use of a sonic method is not possible (e.g. very coarse rockfill), an alternative drill method may be used, although experience at other sites (e.g. Huckleberry) has demonstrated that sonic drilling methods are effective at penetrating relatively well-graded waste rock. Throughout the drilling process, it is recommended that impacting the embankment till core and filter units be minimized in order to maintain its integrity and prevent development of detrimental water flow pathways. It will be necessary to identify the locations of drainage pipework and to ensure that such features are not impacted by the planned boreholes. Care should be taken to clearly mark instrument locations, protect piezometer leads, and prevent damage during installation and subsequent dam construction activities.

### 3.1 Confirmation of Specific Geotechnical Issues

1. Glaciolacustrine foundation soils: The glaciolacustrine foundation soils of the Main embankment will be investigated using both test pits and the sonic drill rig. Five test pits will be excavated by a CAT 320 or similar excavator in the downstream vicinity of the Main embankment. Exposed soils within the test pits will be examined by the AMEC site engineer for incidence, thickness, and continuity of clay varves, and any signs of pre-shearing. The sonic drill rig will complete nine holes for the installation of piezometers and inclinometers in the downstream toe area of the Main embankment (Figures 2, 3, and 6). Holes will be drilled using the existing rockfill buttress as a platform. As previously noted, the sonic method will allow sample recovery for both detailed inspection and laboratory testing purposes.

2. Perimeter embankment crack: At the location of the Perimeter embankment crack, foundation conditions will be investigated using a sonic drill rig to complete two holes to bedrock or firm glacial till. Holes will be located both on the embankment crest and adjacent to the downstream embankment toe at chainage 3+400 (i.e. the location of the observed crack). When complete, an inclinometer will be installed in the crest hole while a piezometer will be installed in the toe hole (at the locations shown in Figures 1 and 6). The inclinometer within the downstream rockfill shell will assist in determining the existence, extent, and rate of slope movements along this portion of the dam, and how such movements might be affected by downstream borrow excavation. The exposed faces within the till borrow pit to the downstream of the crack area will be inspected by the AMEC site engineer for any presence of glaciolacustrine soils.

3. South embankment foundation conditions: South embankment foundation conditions will be investigated using both test pits and the sonic drill rig. Five test pits will be excavated by a CAT 320 or similar excavator in the downstream vicinity of the South embankment. Exposed soils within the test pits will be examined and characterised by the AMEC site engineer, with selected samples taken for potential laboratory testing. The sonic drill rig will complete two holes to bedrock or firm glacial till along the existing instrumentation plane F (Figure 5). Piezometers will be installed in each hole upon completion.

A minimum of five samples of glaciolacustrine soils from each Main embankment hole (i.e. 10 samples total) will be carefully collected, packaged, and shipped to the Edmonton AMEC laboratory. The laboratory personnel will inspect all samples and, in conjunction with an AMEC design engineer, select several for index characterisation, direct shear testing, and any additional testing deemed necessary. Additional samples may be collected from the Perimeter and South embankment holes and submitted for lab testing at the discretion of the AMEC site and design engineers.

## 4.0 CONCLUSIONS AND RECOMMENDATIONS

The Mount Polley TSF has had a significant amount of instrumentation placed within its embankments over its life to date. However, the instrumentation system has experienced a considerable amount of instrument failure during ongoing construction where it has seen roughly ½ of all piezometers lost over time. The existing historical instrumentation data has been reviewed and all observed behaviour agrees with design expectations, which is a favourable conclusion. At the same time, there remains a lack of full characterization of foundation soils conditions, pore pressures, and potential movements within glaciolacustrine soils. Instrumentation installation efforts will therefore be focussed on enhancing the understanding of these issues. The complete recommended 2011 program of instrument replacement and site investigation will comprise 16 geotechnical drillholes, 22 vibrating wire piezometers, 4 inclinometers, 10 test pits, and geotechnical mapping to be completed by the AMEC site engineer. The recommended program would be consistent with the levels of dam safety stewardship discussed between AMEC and MPMC upon AMEC assuming the role of engineer of record for the TSF.

Respectfully submitted,

**AMEC Earth & Environmental,**
**a division of AMEC Americas Limited**

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*Reviewed by:*

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Principal Geotechnical Engineer

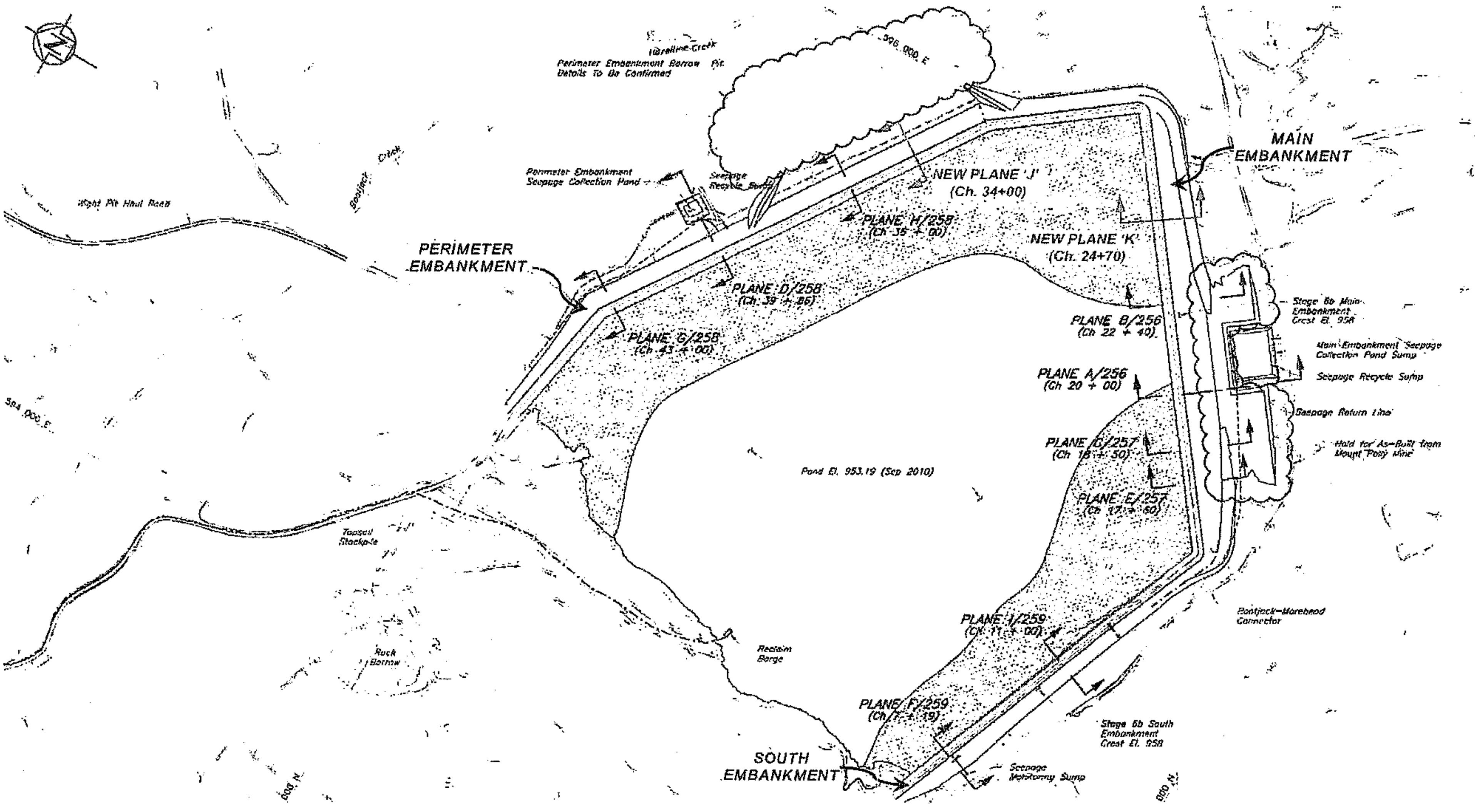
Todd E. Martin, P.Eng., P.Geo.
Principal Geotechnical Engineer

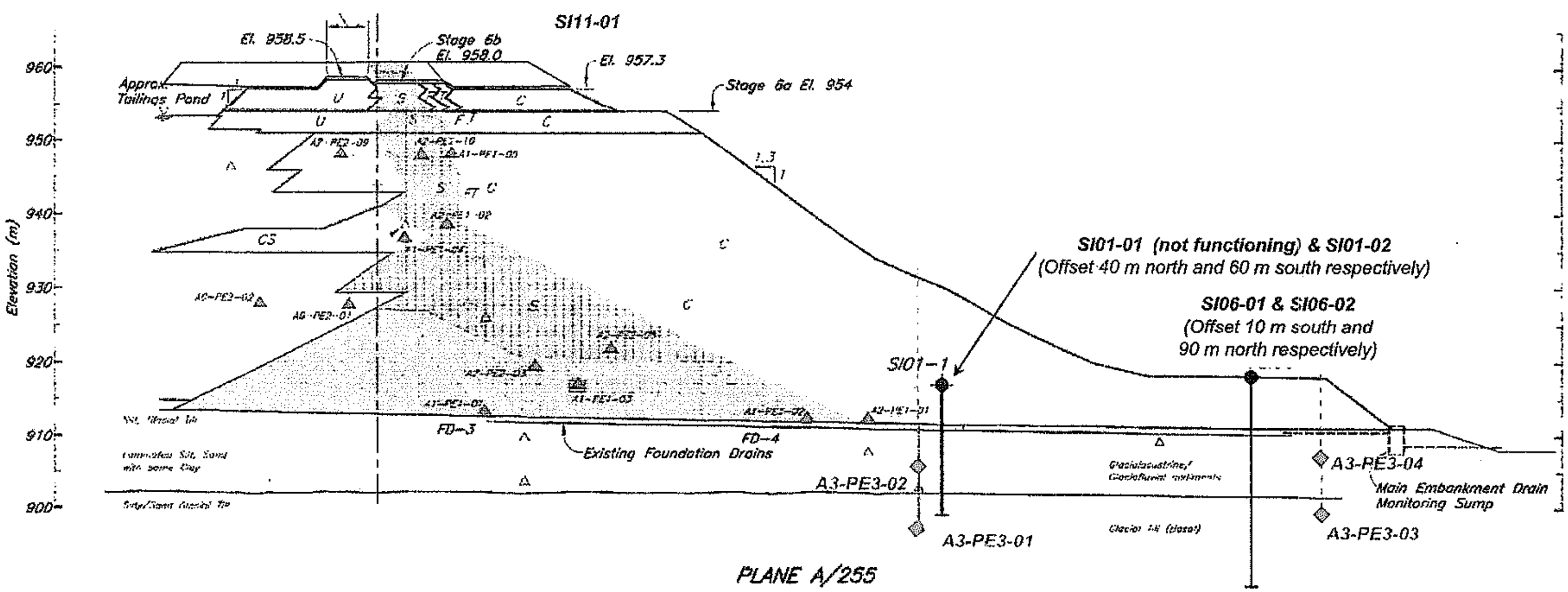
List of Attachments:

- Figure 1 – Site Plan
- Figure 2 – Main Embankment Planes A&B
- Figure 3 – Main Embankment Planes C&E
- Figure 4 – Perimeter Embankment Planes D,G,H
- Figure 5 – South Embankment Planes F&I
- Figure 6 – Proposed New Planes J&K
- Figure 7 – Embankment Drain Piezometer Records
- Figure 8 – Starter Dam Till Core Piezometer Records
- Figure 9 – Upper Narrow Till Core Piezometer Records
- Figure 10 – Filter Piezometer Records
- Figure 11 – Upstream Fill Piezometer Records
- Figure 12 – Tailings Piezometer Records
- Figure 13 – Foundation Soil Piezometer Records
- Figure 14 – Cumulative Displacement vs. Depth Inclinometer SI01-02
- Figure 15 – Down Hole Inclinometer Cumulative Displacement SI01-02

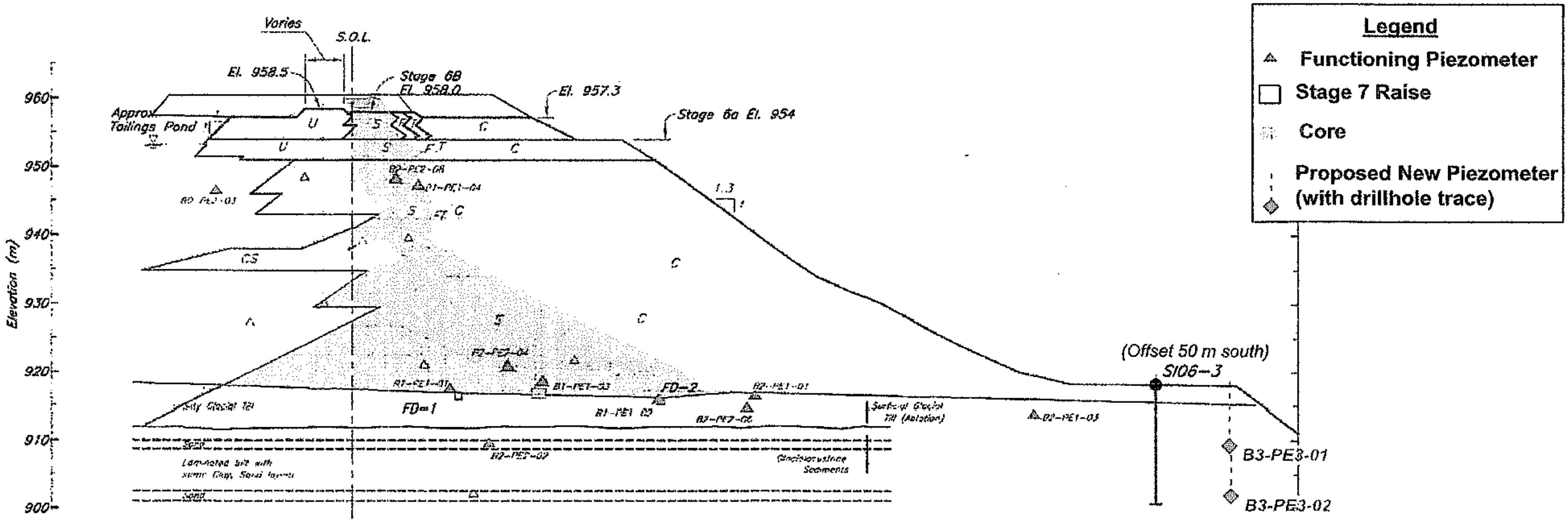
FIGURES

# FIGURE 1 – Site Plan



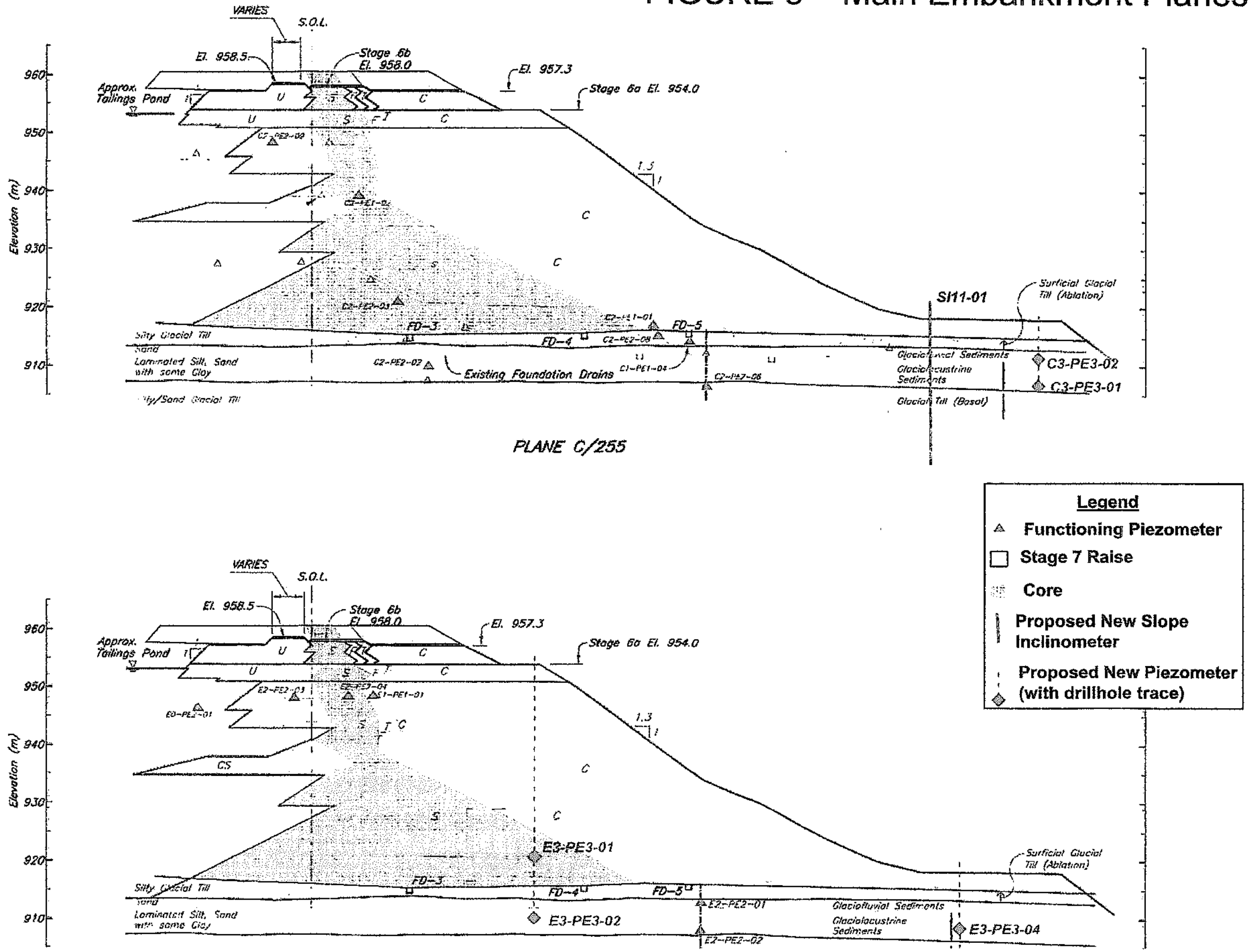


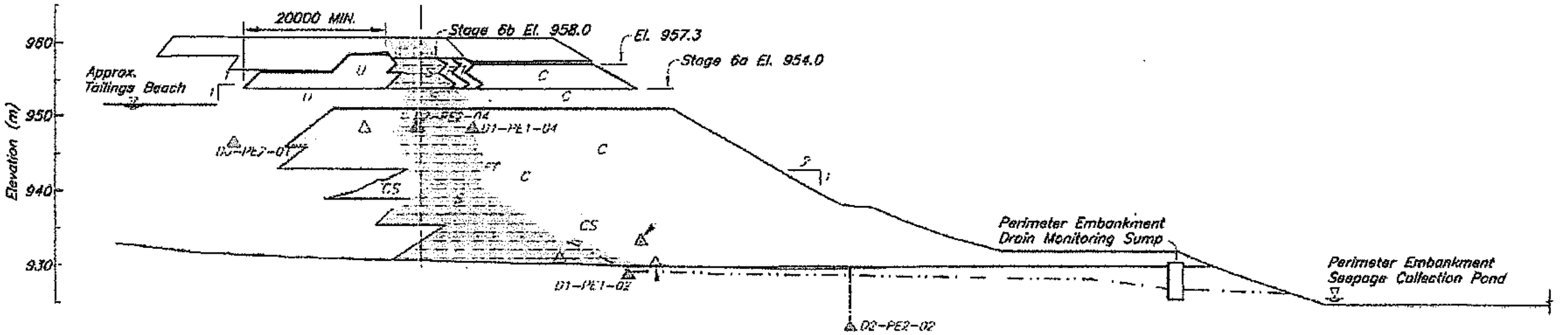

PLANE A/255



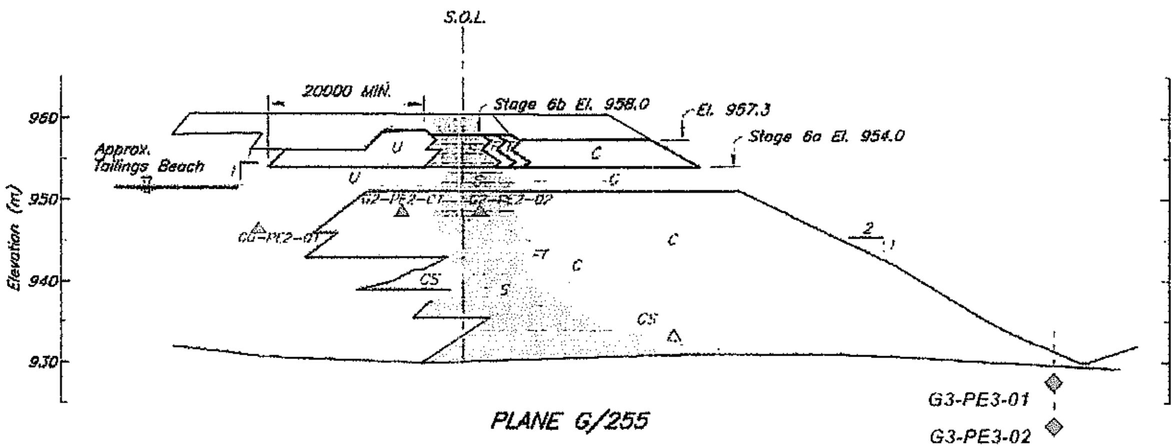

PLANE B/255

# FIGURE 3 – Main Embankment Planes C&E

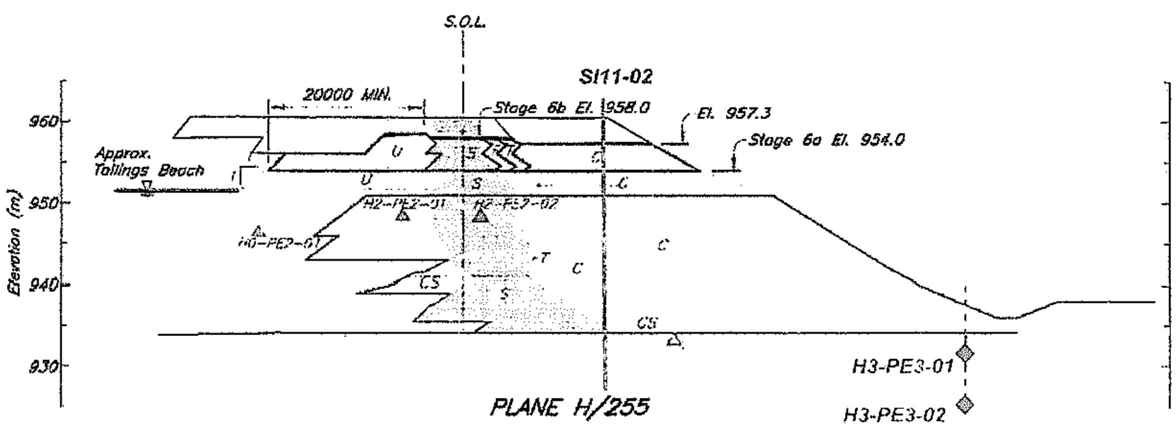





PLANE D/255




PLANE G/255

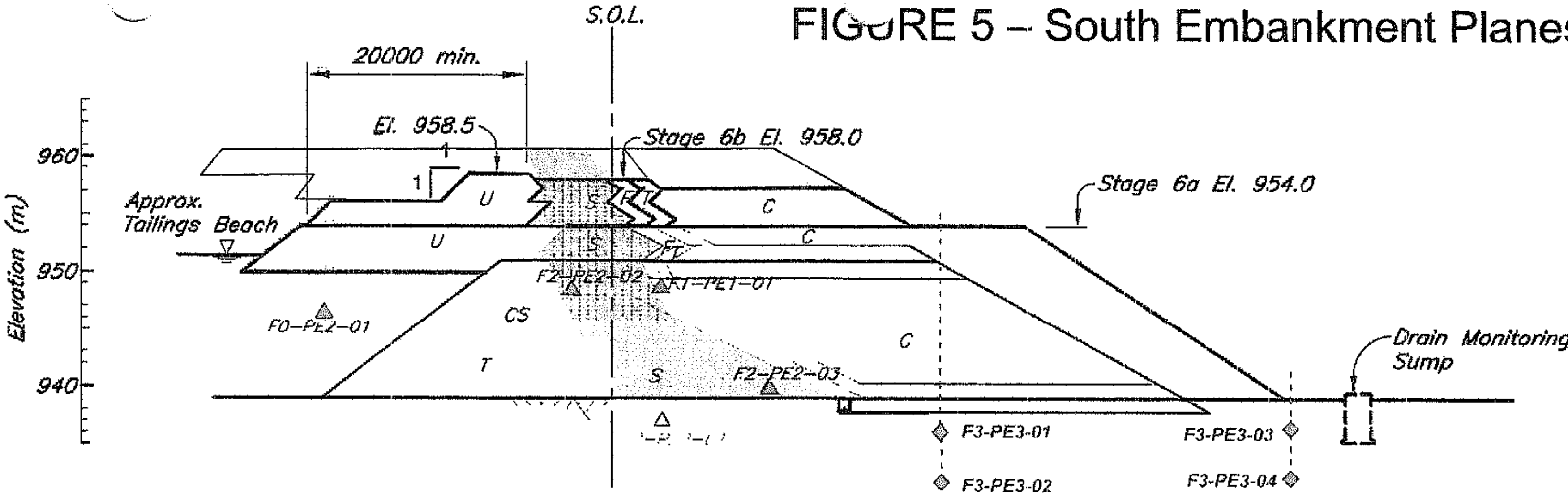



PLANE H/255

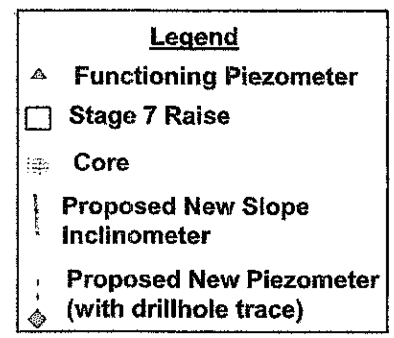
**Legend**

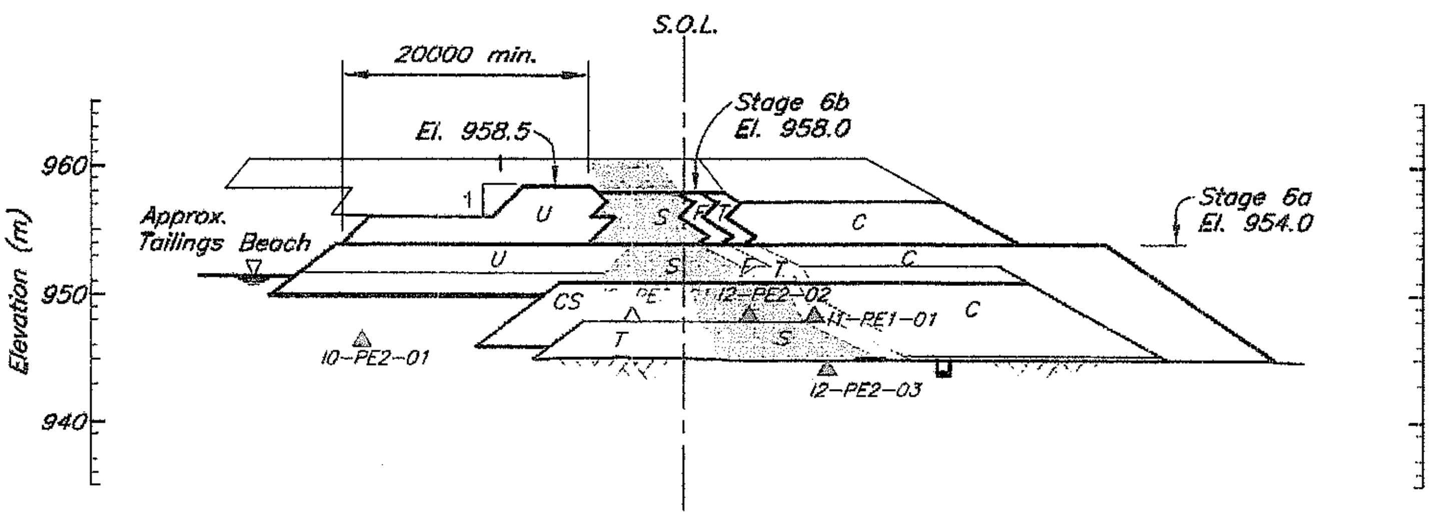
- Functioning Piezometer
- Stage 7 Raise
- Core
- Proposed New Slope Inclinometer
- Proposed New Piezometer (with drillhole trace)

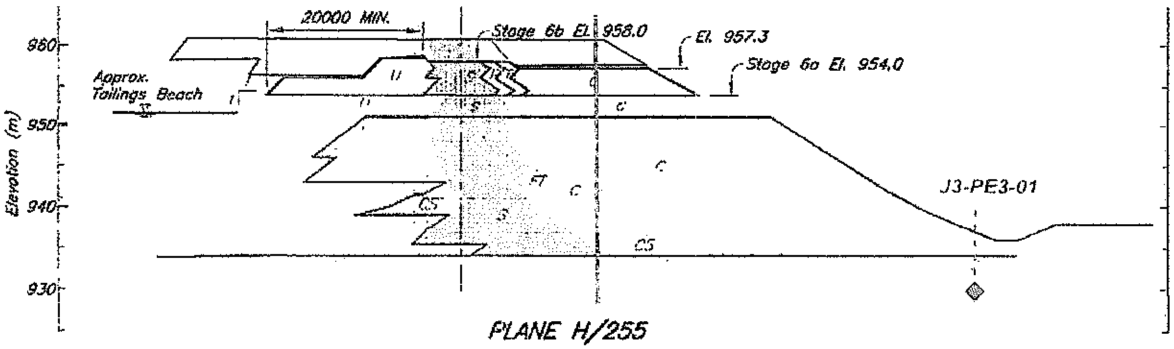
# FIGURE 5 – South Embankment Planes F&I



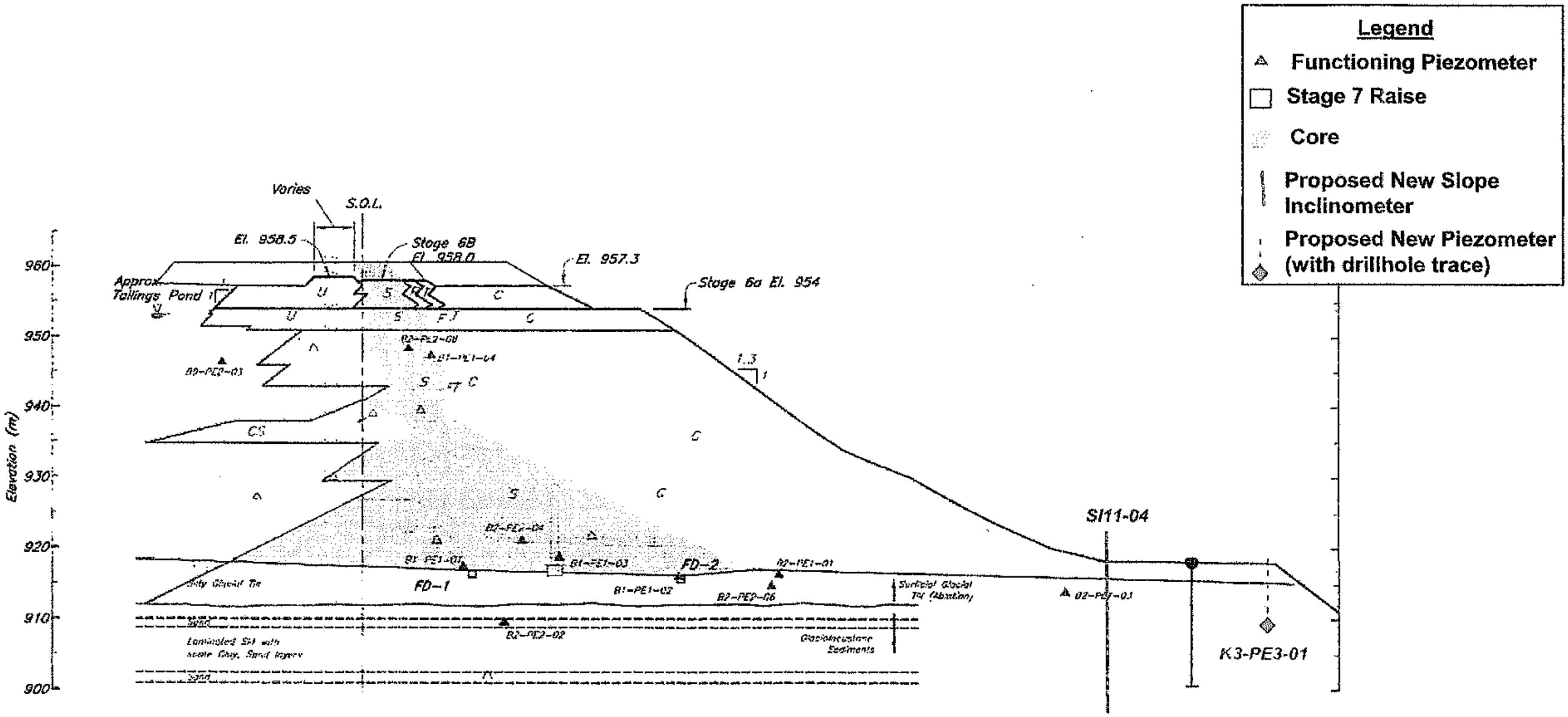

PLANE F/255



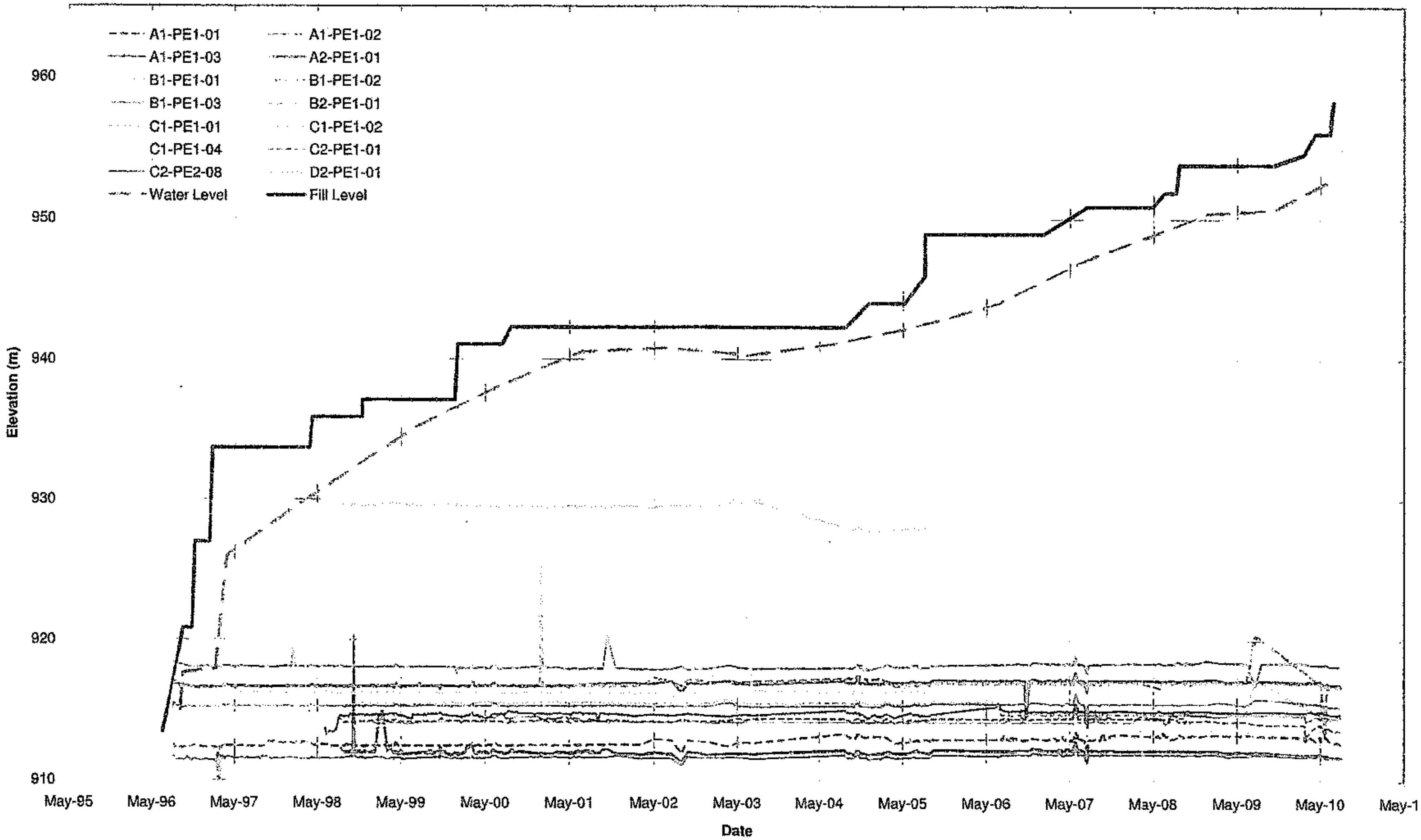



**NEW PLANE "J" (at crack location, cross-section shown above is taken from plane H for illustrative purposes)**

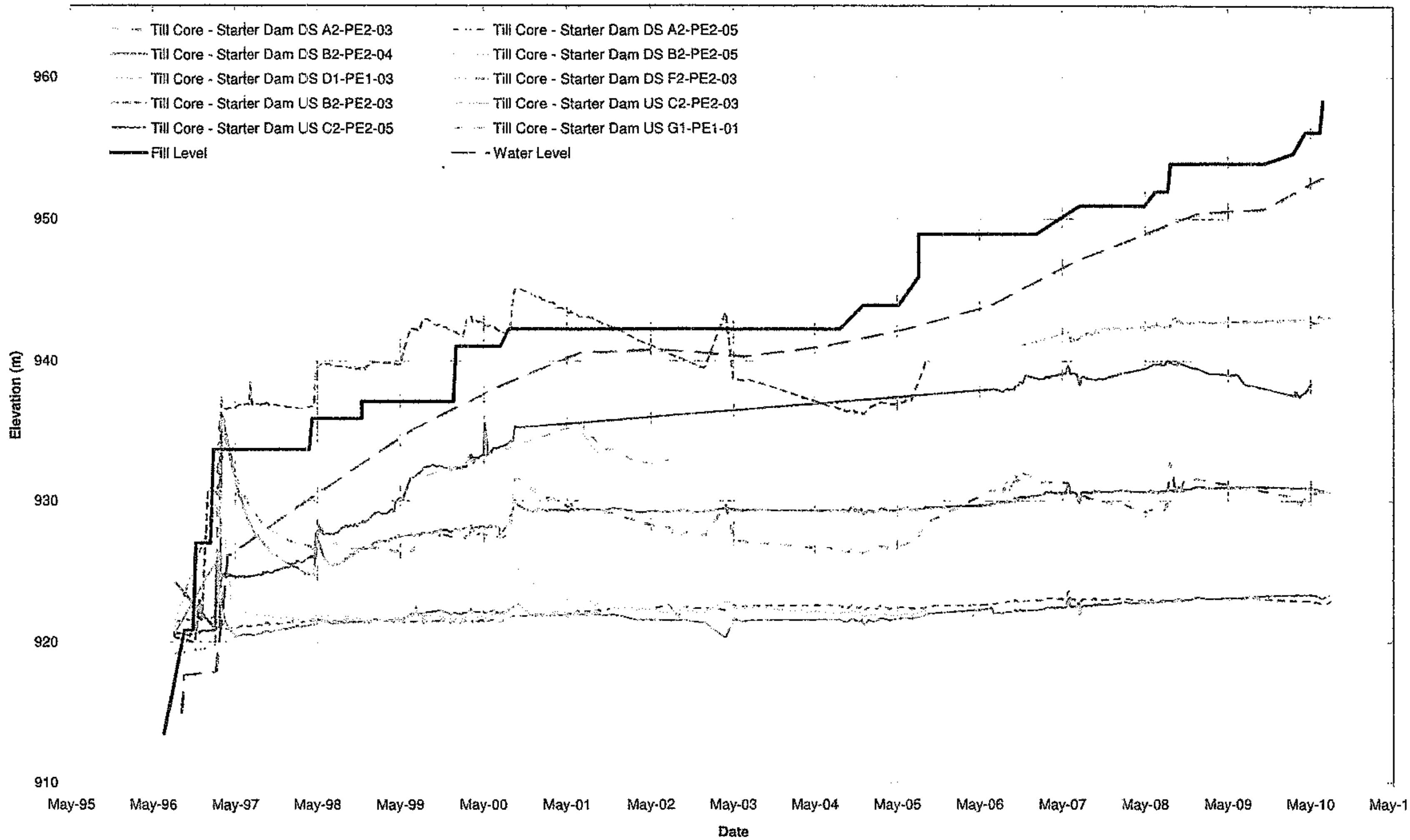



**NEW PLANE "K" (located near northeast corner of Main embankment, cross-section shown above is taken from plane B for illustrative purposes)**

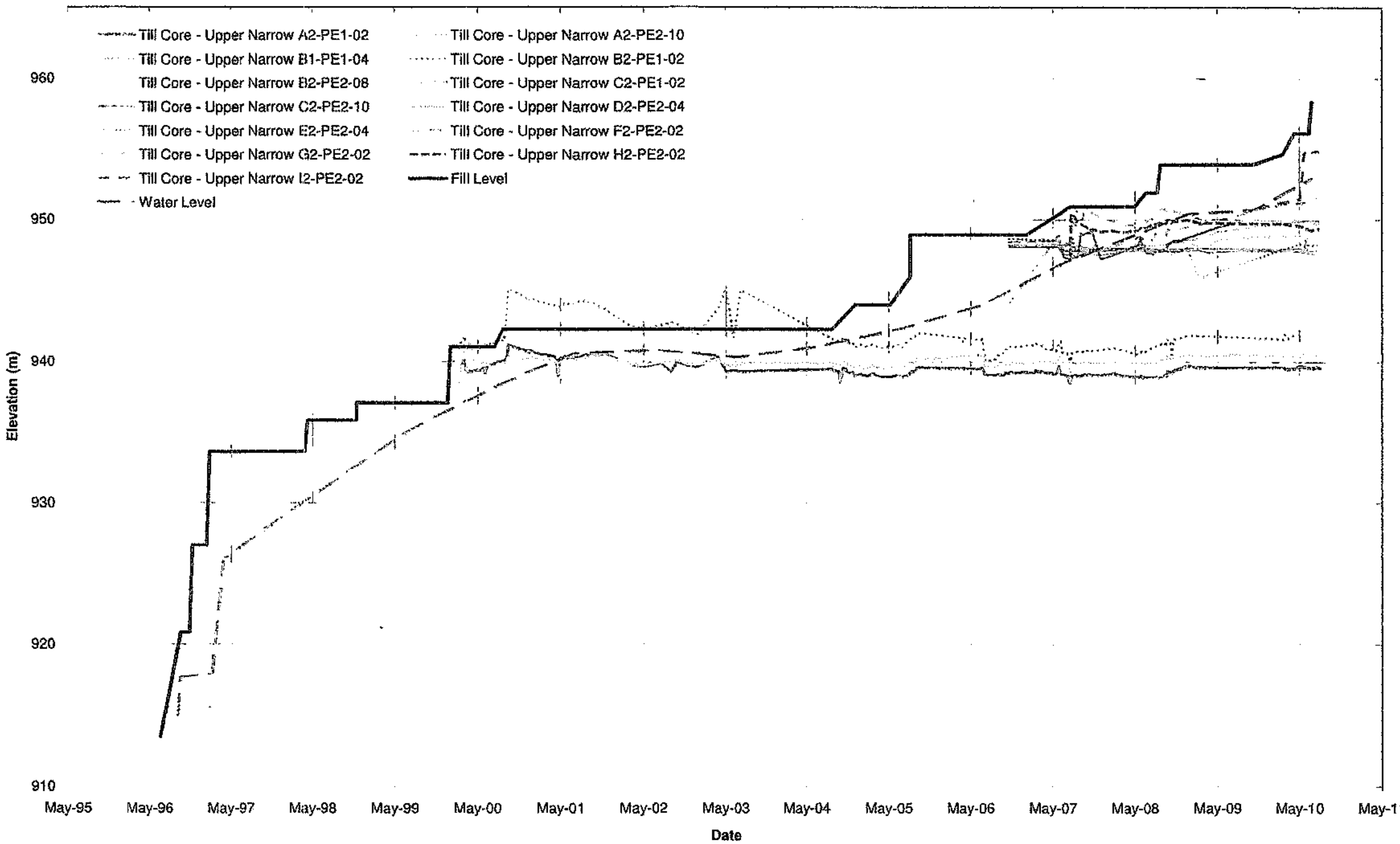
# Figure 7: Drain Piezometers



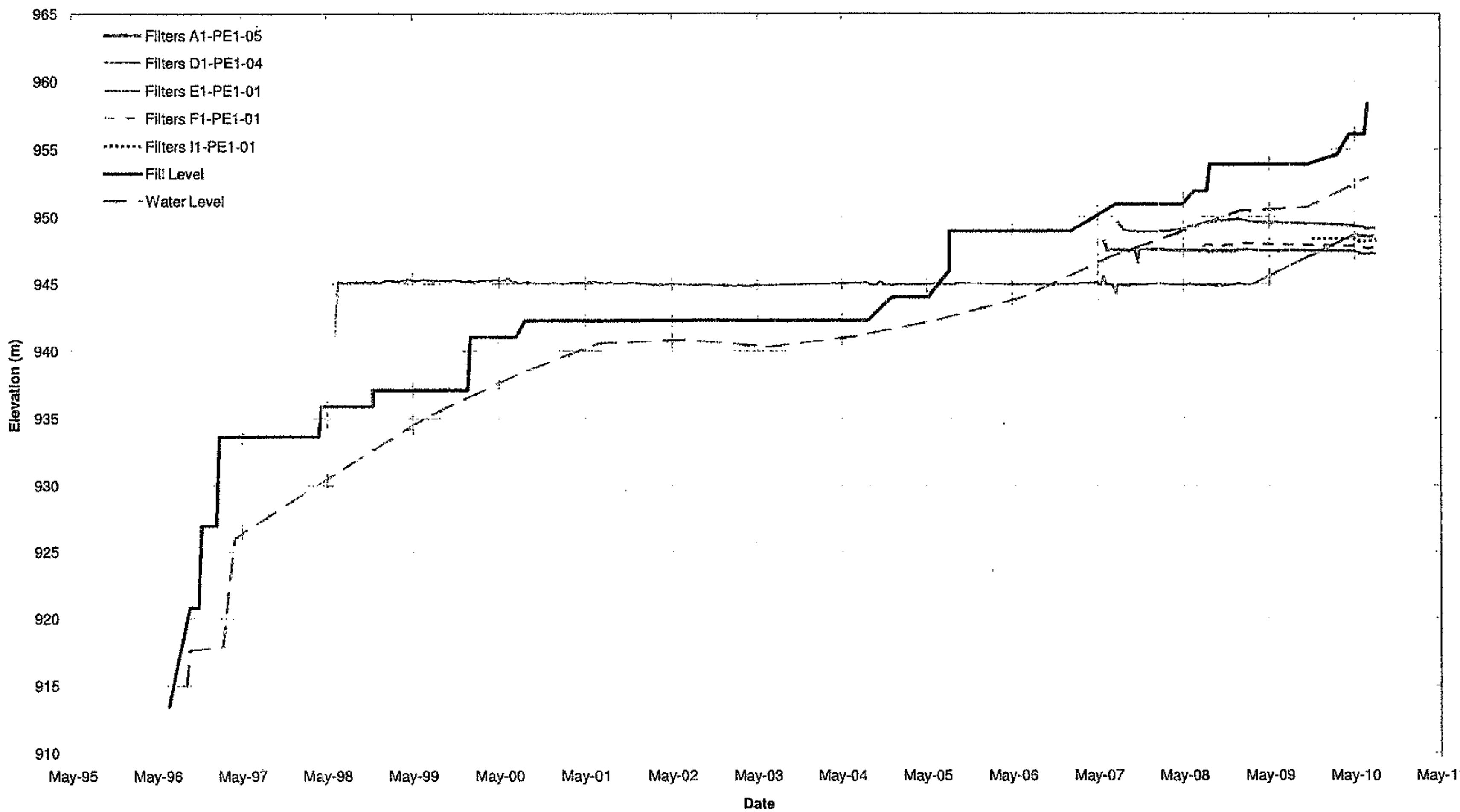
## Figure 8: Till Core - Starter Dam Piezometers



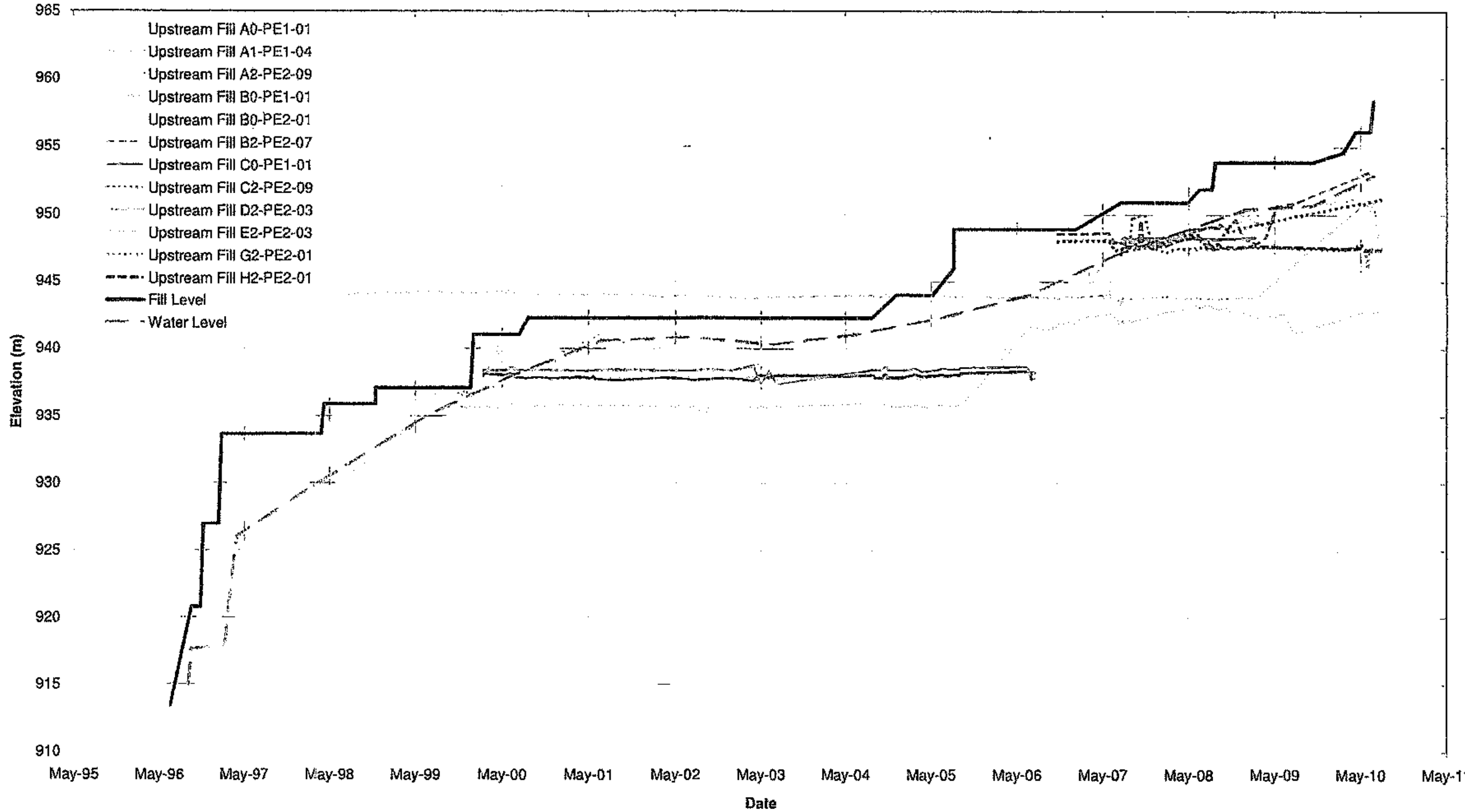
## Figure 9: Till Core - Upper Narrow Section Piezometers



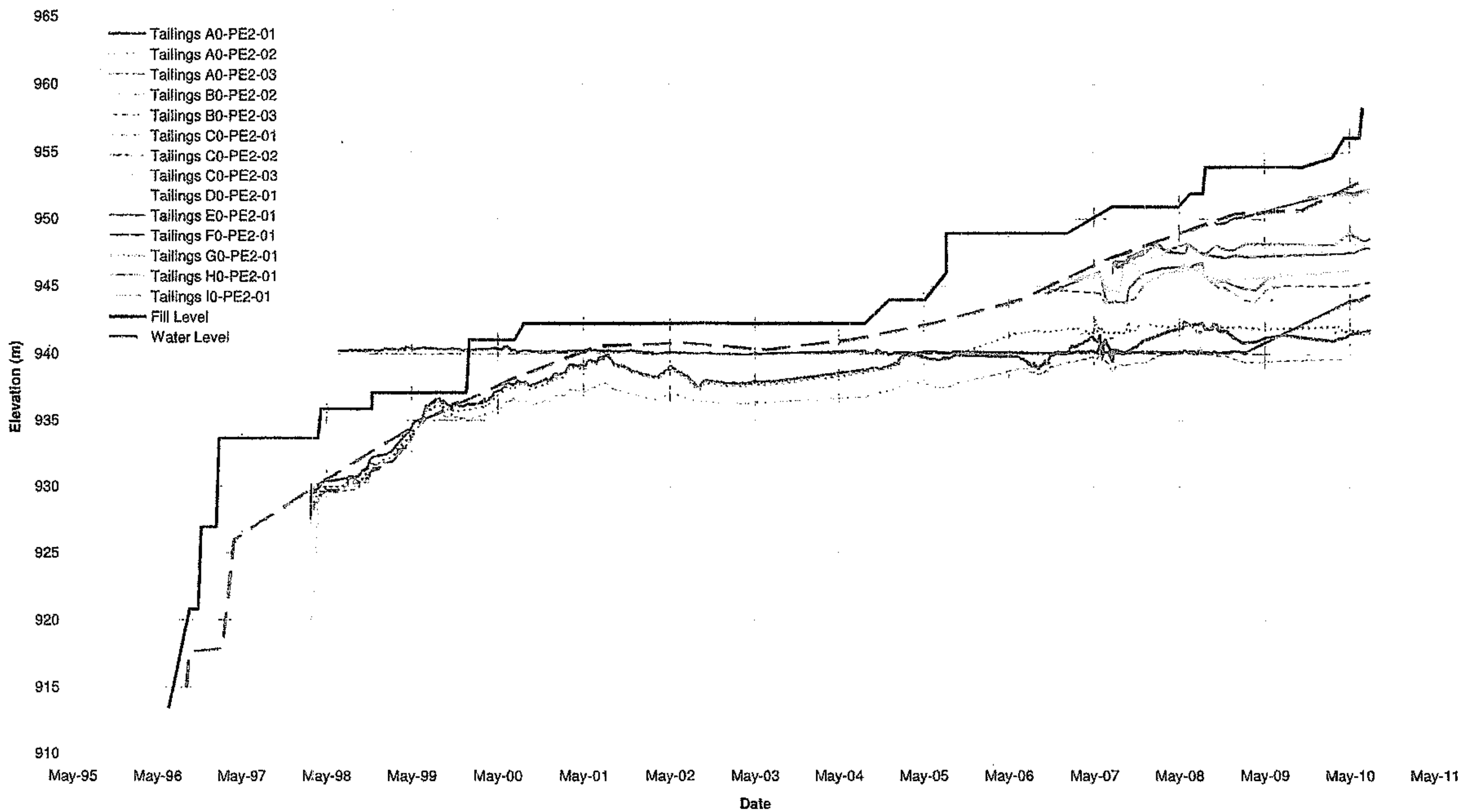
## Figure 10: Filter Piezometers



# Figure 11: Upstream Fill Piezometers



# Figure 12: Tailings Piezometers



## Figure 13: Foundation Piezometers

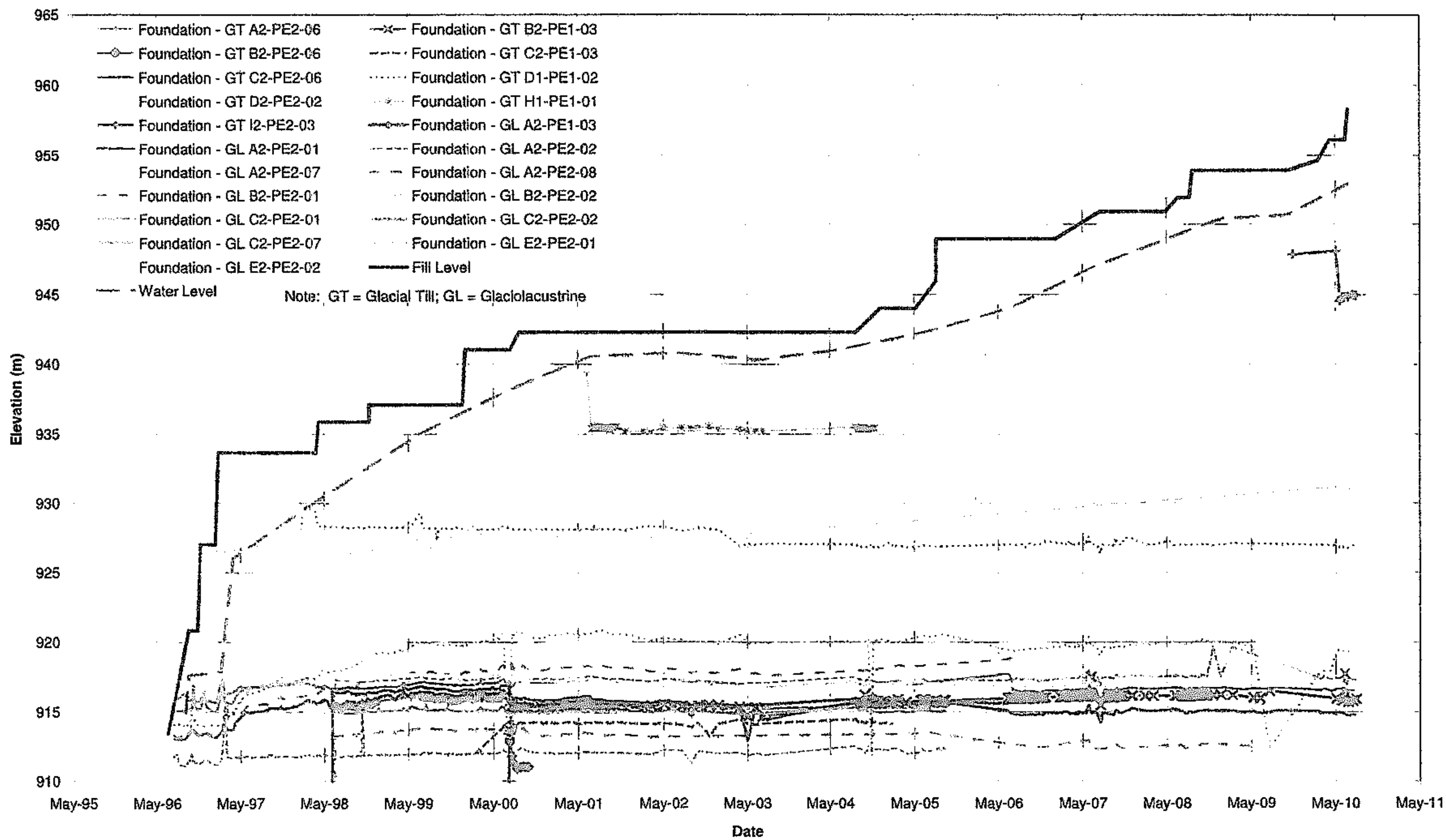
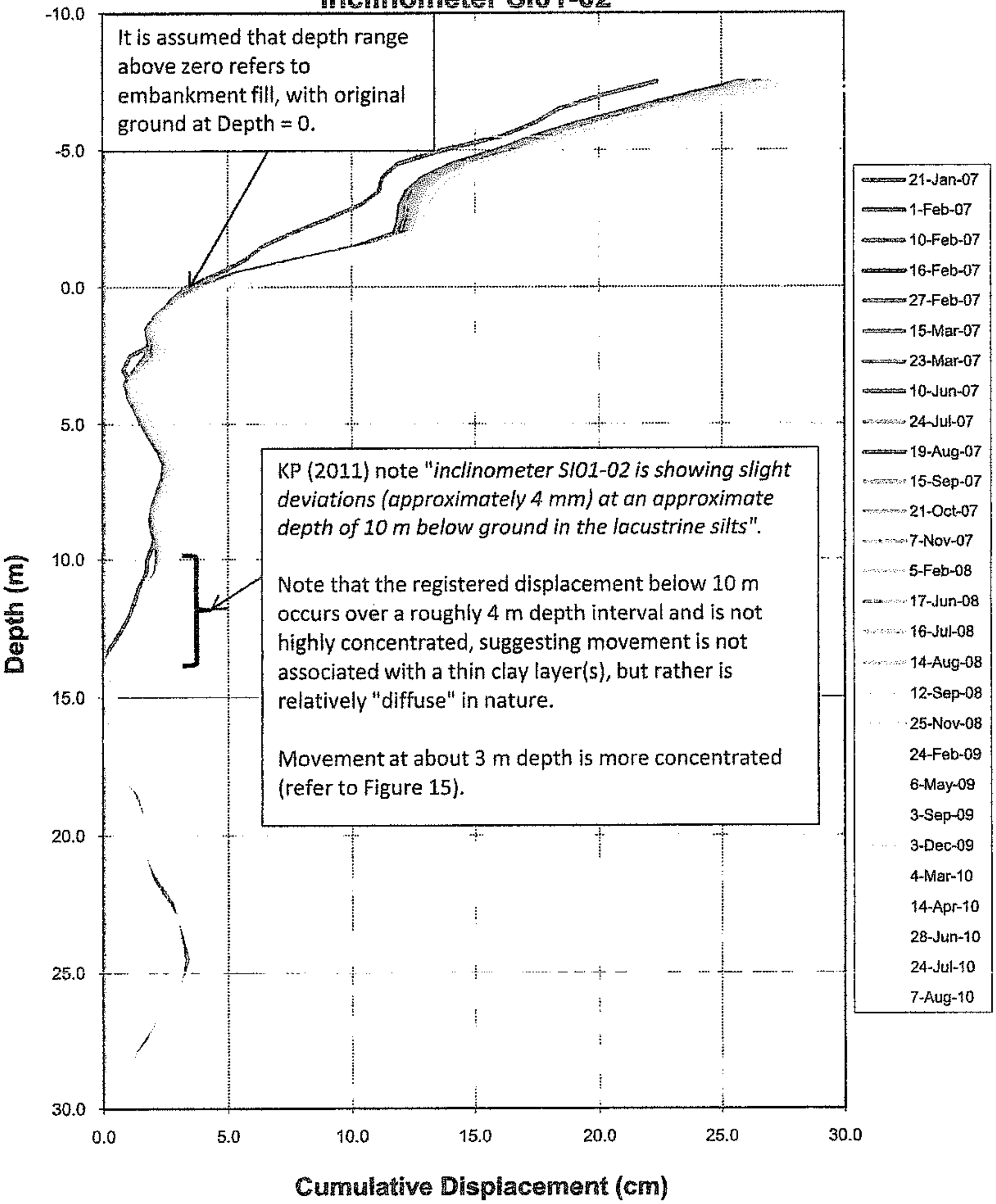
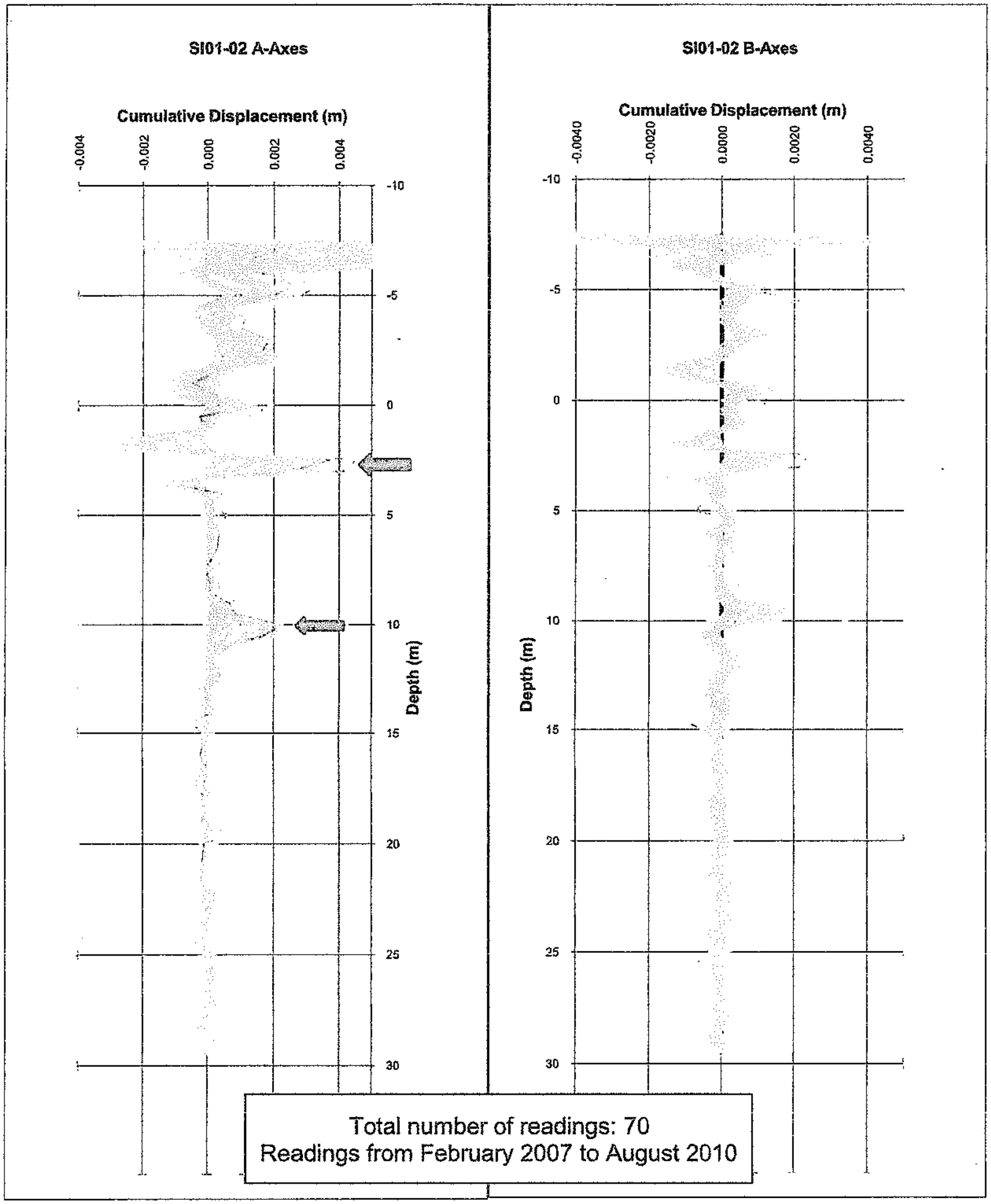


**FIGURE 14**
**Cumulative Displacement vs. Depth**
**Inclinometer SI01-02**






Block arrows indicate zones of inferred shear within the glaciolacustrine soils.

MOUNT POLLEY MINING CORPORATION
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**TAILINGS STORAGE FACILITY STAGE 6B**
**DOWN HOLE INCLINOMETER**
**CUMULATIVE DISPLACEMENT SI01-02**

**FIGURE 15**