2014 Geotechnical Annual Review, Minto Mine, YT

Prepared for

Minto Explorations Ltd.

Prepared by

SRK Consulting (Canada) Inc.
1CM002.028
November 2014

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1 Introduction

On September 16-17, 2014, SRK Consulting (Canada) Inc. completed a geotechnical inspection of the Minto Mine site (Figure 1). The purpose of the inspection was to document the physical condition of the site based on visual observations and to provide geotechnical assessment, noting potential signs of physical instability such as erosion, differential settlement, sloughing or bulging of material, seepage, and so on. The inspection is documented in the photographic compilation provided in Appendix A. This report summarizes the findings and recommendations.

This is the third year of geotechnical inspections of the site completed by SRK, with the first inspection completed in September 2012 (SRK 2012c). Previous inspections were completed by EBA Engineering Consultants Ltd.

This report is in partial fulfillment of the requirements of the existing Water Licence QZ96-006, Amendment 8. Clause 82 of the water licence requires that physical inspections be completed after the spring thaw in May/June of each year and again before the onset of winter in September of each year. The 2014 freshet physical inspection report was completed by Minto Explorations Ltd. (Minto 2014). This report fulfills the September inspection requirements.

Source: Capstone Mining (http://capstonemining.com/s/Minto.asp)

Figure 1: Site Location

2 Conditions

The geotechnical inspection was completed by Peter Mikes, PEng, of SRK. Eamon Mauer of Minto, was SRK's primary contact for information about the activities during the past year.

Weather during the site inspection was mostly sunny, with showers in the afternoon of September 16, 2014. Temperatures were estimated at 5-15 °C. The site was generally dry, with wet patches in low-lying areas.

3 Scope

Table 3.1 provides a list of the facilities that were included as part of the inspection and a list of design reports and monitoring guidance documents that were used to guide the inspection. In addition, previous years' reports were available for review before the site inspection.

As part of the inspection, instrumentation data was reviewed to check for indications of unusual performance or change in trends. Section 4 of this report presents a list of data reviewed, including the last data collection date.

Table 3.1: Facilities Inspected and Guidance Documents

Facility	Design Reports	Monitoring/Inspection Guidance Documents
Dry Stack Tailings Storage Facility (DSTSF)	EBA 2007. Geotechnical Design Report, Dry Stack Tailings Storage Facility, Minto Mine, Yukon. EBA File: 1200173. January 2007.	EBA 2011a. Revision 2011-1 Operation, Maintenance, and Surveillance Manual, Dry Stack Tailings Storage Facility, Minto Mine, YT. EBA File: W14101068.001. January 2011. OMS Manual includes operational inspection frequency and instrumentation triggers for action.
Mill Valley Fill Extension (MVFE)	EBA 2011b. Waste Rock and Overburden Management Plan, Phase IV Development, Minto Mine YT. EBA File: W14101068.015. September 9, 2011. EBA 2011c. Upstream Water Management for the Mill Valley Fill Expansion and Dry Stack Tailings Storage Facility. EBA File: W14101168.013. September 14, 2011.	Minto 2014a. Minto Mine Physical Monitoring Plan, June 2014.
Main Waste Rock Dump (MWD)	EBA 1998. Geotechnical Evaluation Proposed Main Waste Dump, Minto Project, Yukon Territory. EBA File: 0201-95-11509. April 1998.	Performance monitoring and annual inspection requirements detailed in the EBA 1998 design report.
Southwest Waste Dump (SWD)	EBA 2008d. Geotechnical Design Proposed Southwest Waste Dump, Minto Mine, Yukon. EBA File: W14101068.005. September 2008.	EBA 2008d contains minimum monitoring requirements for physical inspections, deformation surveys, and instrumentation monitoring. Instrumentation monitoring plan includes a schedule and threshold warning levels.
Reclamation Overburden Dump (ROD)	EBA 2008a. Geotechnical Design Proposed Reclamation Overburden Dump, Minto Mine, Yukon. EBA File: W14101068.004. February 2008. EBA 2010. Reclamation Overburden Dump Expansion Geotechnical Design Report. EBA File: W14101068.0040. June 29, 2010.	Performance monitoring and annual inspection requirements detailed in the EBA 2010 design report.

Facility	Design Reports	Monitoring/Inspection Guidance Documents
Ice-Rich Overburden Dump (IROD)	EBA, 2006a. Geotechnical Design Ice-Rich Overburden Dump, Minto Mine, Minto, YT. EBA file: 1200173. January 2006. EBA, 2007. Ice-Rich Overburden Dump Containment Berm Inspection Report, Minto Mine Site, Minto Yukon. EBA File: 1200173.001. June 19, 2007.	Long-term monitoring and annual inspection requirements are listed in the EBA 2006 design report.
Ore Stockpiles	none	none
Mill and Camp Site	EBA 1994. Geotechnical Evaluation Mill and Camp Site, Minto Project, Yukon. EBA File: 0201-11509. Dec. 1994.	none
Mill Water Pond (MWP)	Not available	EBA 1997. Construction Quality Assurance Manual for Waste Dumps, Tailings/Water Dam, Mill Water Pond, and Diversion Ditch, Minto Project, Yukon. EBA File 0201-95-11509. August, 1997.
Fuel Containment Facility	Not available	Not available
South Diversion Ditch (SDD)	EBA 2006b. Design Drawings, South Diversion Ditch & Collection Pond. IFC. July 2006. EBA 2012. Pipe Design for South Diversion Ditch Realignment, Minto Mine, YT. EBA File: W14101068.013. May 4, 2012. SRK 2013a. South Diversion Ditch Realignment and Overflow Spillway. SRK Project No.: 1CM002.006.200, February 1, 2013.	None
Minto Creek Detention Structure (MCDS)	EBA 2009. Conveyance Network Detention Structure and Water Collection Sump Design. EBA 2011e. Minto Project: Minto Creek Detention Structure Seepage Monitoring Program. EBA File: W14101068.001. October 25, 2011.	EBA 2011e contains monitoring requirements including frequency, triggers, and responses.
Water Storage Pond Dam (WSP)	EBA 1995. Geotechnical Design Tailings/Water Dam, Minto Project, Yukon. EBA File: 0201-95-11509. Dec. 1995. EBA 2008b. As-built Construction Report, Water Retention Dam, Minto Mine, Minto, YT. EBA File: 1200173.001. April 2008.	Tetra Tech EBA 2014. Operation, Maintenance and Surveillance Manual, Water Storage Pond Dam, Minto Mine, Minto, YT. EBA File: W14103414-01. August 2014.
Big Creek Bridge	Not available	Not available
South Wall Buttress/Main Pit In-Pit Dump	EBA 2011f. Area 1 South Wall Buttress Design Report, Minto Mine, Yukon. EBA File: W141010668.012, July 2011.	Minto 2014a. Minto Mine Physical Monitoring Plan, June 2014.

4 Monitoring and Instrumentation Data

Table 4.1 lists instrumentation data reviewed as part of the inspection, with the date of the most recent data. Changes to the list of instrumentation compared to the last inspection are listed below the table in the notes. Instrumentation plots are provided in Appendix B. Data that has not been updated since the last geotechnical inspection is not included in the appendix.

Table 4.1: Summary of Instrumentation Data

Facility	Instrumentation Type	List of Reviewed Instrumentation	Last Reading Date
Dry Stack Tailings Storage Facility and Mill Valley Fill Extension (DSTSF and MVFE)	Survey Hubs[1]	DSSH06, DSSH10, DSSH12, DSSH14, DSSH15, DSSH17, DSSH18, DSSH19, DSSH20, DSSH21, DSSH22, DSSH23, DSSH24, DSSH25.	Sept 2014
	Inclinometers[2]	DSI-14, DSI-21	Sept 2014
	Piezometers	DSP-5A, DSP-5B, DSP-6A, DSP-6B	August 2014
	Ground Temperature Cables [3]	DST-10, DST-11, DST-13, DST-14, DST-15	August 2014
Main Waste Rock Dump (MWD)	Inclinometers[4]	MDI-2	Sept. 2014
South Waste Dump (SWD)	Survey Hubs	SWD-01, SWD-01A, SWD-02, SWD-02A, SWD-03A, SWD-04A, SWD-05A	August 2014
	Inclinometers	SDI-3	Sept. 2014
	Piezometers	SDP-2, SDP-3, SDP-4	July 2014
	Ground Temperature Cables	SDT-1, SDT-2, SDT-3, SDT-4	July 2014
South Wall Buttress	Survey Hubs	M73, M74, M75, M76, M79, M80, M81	August 2014
Mill Water Pond (MWP)	Survey Hubs[5]	MWPSH-1, MWPSH-2, MWPSH-3, MWPSH-4	May 2009
	Ground Temperature Cables	MWPT-1, MWPT-2	August 2014
Water Storage Pond Dam	Survey Hubs	WSP-1, WSP-3, WSP-4, WSP-5	August 2014
	Piezometers	WDP-2, WDP-3, WDP-3A, WDP-4, WDP-5, WDP-6, WDP-7, WDP-8, WDP-9, WDP-10, WDP-11, WDP-12, WDP-13	August 2014
	Ground Temperature Cables	WDT-1, WDT-2, WDT-3, WDT-4, WDT-5, WDT-6, WDT-7, WDT-8	August 2014

Note(s):

(1) Eight new survey hubs installed on the DSTSF and MVFE (DSSH18 to DSSH25).

(2) 13-DSI-13 was destroyed (sheared) – last reading on June 20, 2013; 13-DSI-16, 13-DSI-17, 13-DSI-19 are non-functional – last reading on November 22, 2013); 13-DSI-18 is non-functional – last reading August 21, 2013); 13-DSI-20 is non-functional, last reading November 15, 2013.

(3) 13-DST-15 malfunction in the spring of 2014 with the last readings taken on March 22, 2014.

(4) Last reading of MDI-1 taken in November 2012.

(5) MWP survey hubs were removed with the last readings taken in 2009.

4.1 Dry Stack Tailings Storage Facility

Movements in the Dry Stack Tailings Storage Facility (DSTSF) were first identified in early 2009. A detailed assessment and history of the physical stability associated with these movements is provided in the letter report "Detailed Review of Foundation Performance at Select Mine Waste Facilities and Main Pit South Wall" (SRK 2012a). The Mill Valley Fill Extension Stage 1 was designed to mitigate the movement and construction of the facility, which began in January 2012 and was nearly completed by March 2013.

Ground temperature profiles from the functional instrumentation are provided in Figures 1 and 2 of Appendix B. Temperature profiles from previous instrumentation that have malfunctioned are included in previous inspection reports. The temperature readings in the instrumentation installed in 2013 show a small cooling trend as the sensors approach equilibrium with the surrounding soils. The profiles indicate that warm permafrost is present at all locations, except in the lower portions of DST-11 and DST-13. DST-11 is located near the crest of the DSTSF, while DST-13 is located approximately 300 m east of the DSTSF in an undisturbed location.

Piezometric data from the DSTSF are presented in Figure 3 of Appendix B. The pressure readings are not thought to be accurate as the temperature profiles indicate that the sensors are frozen. The pressures at DSP-6 remain steady and pressures at DSP-5 appear to be increasing, with the pore water pressure ratio (r_u) at DSP-5B approaching 0.5. A pore water pressure ratio of 0.5 would be similar to the effect of a groundwater table at surface.

Profiles and time-displacement plots from inclinometers with additional data since the 2013 Fall Geotechnical Inspection (SRK 2013b) are presented in Figures 4 to 5 in Appendix B. The results are consistent to those observed during the 2013 data review with no new shear zones or accelerations in movement detected. Table 4.2 provides a summary of the inclinometer results and observations. The locations of the inclinometers are provided in Figure 5 in Appendix B.

Table 4.2: DSTSF Inclinometer Summary

Inclinometer	Comments
DSI-14	Two shear zones are present: • The upper shear zone is located within the top 4 m of native materials beneath the MVFE. The materials in this zone consist of organics and a loose gravel layer. Since the inclinometer installation, the movement rate has shown a decreasing trend with a current velocity of approximately 0.2 mm/day. • The lower shear zone is approximately 3 m above the bedrock contact and consists of ice-rich, medium to high plastic clay materials. Significant ice lenses were noted in the borehole logs within the zone. Movement rates have also decreased with a current velocity of approximately 0.2 mm/day.
DSI-16	• Shear zone located 10 to 15 m above the bedrock contact and consists of ice-rich, high plastic clay materials. Ice descriptions include random and stratified ice inclusions with ice lenses up to 50mm in thickness. Two slickensides were also noted. • The last reading was recorded on November 22, 2013 with a velocity of approximately 0.6 mm/day.
DSI-19	• No shear zone observed.
DSI-20	• Shear zone located 1 - 3 m above the bedrock contact. • The last reading was recorded on October 29, 2013 with a velocity of approximately 0.9 mm /day.

Inclinometer	Comments
DSI-21	• Shear zone located approximately 11 m above the bedrock contact and 1 m below the tailings. The borehole logs note layered ice and soil in this region with 1 to 2 mm ice lenses spaced 5 mm apart and 20% excess ice. • Movement rates of this zone have decreased with a current velocity of approximately 0.03 mm/day.

Survey hub movement data are presented in Figures 6 to 9 of Appendix B and are summarized in Table 4.3. Since the 2013 review, eight new hubs have been installed throughout the DSTSF and MVFE. All hubs with over one year of data show a decreasing velocity trend. Survey hub DSSH25 was observed during the site visit to be disturbed due to heaving caused by frost action as evidenced by exposed concrete

Table 4.3: DSTSF and MVFE Survey Hub Summary

Survey Hub	Fall 2013 Rate of Movement, dNEZ (mm/day)	Current Rate of Movement, dNEZ (mm/day)	Inspection Comment
DSSH06	2.9	1.6	
DSSH10	1.8	1.4	
DSSH12	3.0	1.7	
DSSH14	2.8	1.7	
DSSH15	1.8	1.4	
DSSH17	1.7	0.9	
DSSH18	-	0.6	
DSSH19	-	0.6	
DSSH20	-	no movement	
DSSH21	-	0.9	
DSSH22	-	1.2	
DSSH23	-	1.3	
DSSH24	-	1.2	
DSSH25	-	1.9	Instrument heaved approximately 0.3 m above ground.

4.2 Main Waste Dump

Two inclinometers, MDI-1 and MDI-2, have been installed at the Main Waste Dump. Of the two, only MDI-2 is functional. The last reading of MDI-1 was obtained in November 2012.

Profiles and time displacement plots for both inclinometers are presented in Figure 10 of Appendix B. There is no movement trend detected in MDI-2.

Previous readings from both inclinometers indicate some past movement towards the Main Pit. The MDI-1 profile indicated past movement near the surface (within the rock fill and sand till fill) and was confirmed by site representatives to be the result of a Cat 777 haul truck driving over the instrument location in May 2010. Past movement of MDI-2 was also within rock fill and was

determined to have been the result of the removal of the rock fill placed between the instrument location and the Main Pit (EBA 2011g).

4.3 Southwest Waste Dump

The minimum requirements for the monitoring frequency and instrumentation threshold warning levels are noted in the design report (EBA 2008d). The monitoring requirements were developed before the observation of deformation movements and the installation of additional instrumentation to monitor the movements.

A detailed assessment and history of the physical stability associated with the Southwest Waste Dump (SWD) movements are provided in the letter report "Detailed Review of Foundation Performance at Select Mine Waste Facilities and Main Pit South Wall" (SRK 2012b).

The temperature cables, inclinometers, and piezometers installed at the SWD are intended to monitor foundation conditions along the toe of the slope. Survey hubs were also installed in March 2011 to monitor surface movements along the southeast perimeter.

Survey hub movement data are presented in Figures 11 and 12 of Appendix B. A summary of the current rates of movement compared to 2013 is provided in Table. 4.4. Some of these hubs, as noted in the Table, appear to be disturbed due to heaving caused by frost action as evidenced by exposed concrete (see photographs in Figure 6 of Appendix A). As a result, the movement rates are questionable; however, they are supported by the movement rates observed at SDI-3.

Movements in the northeast corner of the dump (SWD-1, SWD-1A, SWD-2, and SWD 2A) were previously reported to be related to the movements of the south wall of the Main Pit (EBA 2011d). The movement of these hubs have slowed, or are similar, compared to movement rates in the fall of 2013, which may be related to the completion of the South Wall Buttress. Movement rates of the survey hubs further to the south have increased which as noted above, is suspected to partially due to disturbance of the hubs.

Table 4.4: Southwest Waste Dump Survey Hub Summary

Survey Hub	Fall 2013 Rate of Movement, dNEZ (mm/day)	Current Rate of Movement, dNEZ (mm/day)	Inspection Comment
SWD-01	0.3	0.2	Not inspected.
SWD-01A	0.4	0.1	Instrument has heaved approx. 30 cm above ground.
SWD-02	0.4	0.6	Not Inspected.
SWD-02A	0.4	0.5	Not Inspected.
SWD-03A	1.1	2.8	Instrument has heaved 75 cm above ground and is leaning.
SWD-04A	0.1	0.6	Instrument has heaved approx. 55 cm above ground.
SWD-05A	0.4	0.9	Instrument has heaved approx. 90 cm and leaning approx. 30 cm off-center.

Monitoring of inclinometer SDI-3 resumed in April 2014 (after the previous reading in 2012). The profile and time-displacement graphs for this inclinometer are presented in Figure 13 of Appendix B. The displacement profile indicates an upper and lower shear zone. The upper shear zone shows movement that has increased during 2014 up to 0.5 mm/day. The movement is suspected to be related to thawing of the permafrost, which is supported by the slight warming trend in temperature data at SDT-2 and SDT-3. The lower shear zone is located 7 to 10 m above the bedrock contact in an ice-rich zone consisting of stratified ice (frequent 5 to 75 mm thick ice lenses). Movement of the lower shear zone has also increased in 2014 to 0.25 mm/day. The conditions at this shear zone are similar to other movement zones observed at the DSTSF and south wall of the Main Pit believed to be caused by ice creep and/or plastic deformations. Both shear zones have the same direction of movement orientated parallel to the slope of the bedrock surface.

Ground temperatures and pore water pressure data for the SWD are presented in Figures 14 and 15 of Appendix B. The profiles indicate that warm permafrost is present at all locations of the instrumentation. Similar to the DSTSF pore water pressure data, all pressure sensors are frozen and the readings are not thought to be accurate.

4.4 South Wall Buttress

The initial indication of movement in the Main Pit south wall was observed by Minto in April 2009. A waste rock buttress was subsequently designed and constructed. Substantial completion of the buttress was completed in 2013. A detailed assessment and history of the physical stability associated with the Main Pit south wall is provided in the letter report “Detailed Review of Foundation Performance at Select Mine Waste Facilities and Main Pit South Wall” (SRK 2012b).

Survey hub movement data for the Main Pit south wall are presented in Figure 16 of Appendix B. The data indicates that the movement rates have significantly decreased, and are generally showing a decelerating trend. A summary of the survey hub movement rates is provided in Table 4.4. The M74 displacement increased by 0.2 m between two readings taken on June 10 and October 24, 2013. Following the inspection of the hub during the 2014 site visit, it is suspected that the movement may be due to disturbance as a result of frost action and possibly due to haul road construction nearby.

Table 4.5: Main Pit South Wall Survey Hub Summary

Survey Hub	Current Rate of Movement, dNEZ (mm/day)	Inspection Comment
M73	0.3	
M74	0.5	Instrument heaved approx. 30cm above ground, and leaning towards the pit by ~20cm.
M75	0.1	
M76	no movement	
M79	0.1	Not Inspected.
M80	no movement	Not Inspected.
M81	no movement	Not Inspected.

4.5 Mill Water Pond

Instrumentation at the MWP (Mill Water Pond) consists of survey hubs and ground temperature cables. The MWP is no longer in use at the mine and is planned to be decommissioned and backfilled. Locations of the instrumentation are shown in Figure 11 of Appendix A.

The last survey of the survey hubs (MWPSH-1 to 4) was completed in 2009. Previous inspection reports note that the hubs have been removed. Settlement surveys are required as part of the Construction Quality Assurance (CQA) Manual (EBA 1997) under Water Use Licence QZ96-006 and are included in Appendix 7 of that document. The CQA recommends a minimum quarterly survey frequency for the first year and, depending on results, biannually thereafter. It is recommended that the hubs be reinstalled and monitored monthly until consistent results are obtained. The frequency can then be reduced to biannual.

Monitoring of MWP ground temperature data resumed in March 2014 (after the previous reading in 2012). There appears to be no significant change in trends since the readings have resumed; however, additional readings are recommended to confirm. Readings should be collected at the same times each year to allow for simple year-to-year comparisons to be made.

4.6 Water Storage Pond

Instrumentation within the dam at the WSP (Water Storage Pond) consists of eight ground temperature cables, 13 vibrating wire piezometers, and five survey hubs.

Survey hub movement data is presented in Figure 18 of Appendix B. No significant movement was observed.

Ground temperature and piezometric data are presented in Figures 19 to 22 of Appendix B. All temperature sensors are above zero and continue to show a warming trend.

5 Results and Recommendations

Findings of the inspection are documented in the photographic compilation of figures in Appendix A. Nineteen figures provide a record of observations across the site.

A summary of the recommendations is provided in Table 5.1. Recommendations with a high priority for action are highlighted.

Table 5.1: Summary of Recommendations

Area	Appendix A Figure #	Recommendation
General	-	The condition of all survey hubs on site should be reviewed. Hubs experiencing frost heave should be noted and replaced with hubs that are not susceptible to frost heave. Alternate installation methods could include grouting a hub mount to a large boulder, using a deeper post, and/or welding a base plate (1 m x 1 m) to the base of the post and placing in a deep pit excavation backfilled with compacted, non-frost susceptible materials.
Dry Stack Tailings Storage Facility & Mill Valley Fill Extension	2	Regrade the DSTSF overburden surface to promote runoff once the final cover design has been determined and cover the remaining areas of exposed tailings on the south edge of the facility.
	3	Continue to monitor the 2013 crack and settlement area in the MVFE.
	3	Continue to monitor the 2014 crack and install two survey nails/pins (one on each side of the crack) to measure the relative displacement. Consider spray painting lines across the crack to aid in monitoring any future displacement.
Southwest Waste Dump	-	Complete reading of the survey hub and slope inclinometers on at least a monthly and bi-monthly basis, respectively, and continue monitoring ground movement rates. Notify SRK of any other observations or increases in movement that indicate a significant change in dump performance or dump stability.
	6	The tension crack area at the north end of the SWD should be regraded to lessen the dump slope if the north access ramp is to be re-opened to traffic. Regrading of this area is planned as part of the upcoming regrading of the SWD.
	6	The survey hubs at the toe of the dump should be replaced and installed using a different methodology that will mitigate against frost heave. Placement of replacement hubs should consider the avoiding areas of fine sediments prone to pile heaving due to frost action, and regrading of the SWD.
	6	Continue to monitor erosion at the culvert outlet located near the W-15 Detention Structure and maintain a photographic record to inspect for changes in condition.
	6	Continue to monitor sediment accumulation in the culvert at the inlet and outlet. Maintain a photographic record to inspect for changes in condition.
Reclamation Overburden Dump	7	Continue to monitor the slope failure area for further signs of movement or instability.
Mill Site	9	Continue to monitor the retaining wall near the mill's apron feeder tunnel and maintain a photographic record of its condition.
Camp Site	10	Regrade the area above the erosion channels on the camp pad to promote runoff away from these areas.
	10	In addition to the surface regrading, fill the channel by the carpenter's shop with rip-rap or a half culvert to provide a path for the water to drain. In place of the surface grading, consider constructing a small ditch near the slope crest to direct runoff to the drop channel or half culvert.

Area	Appendix A Figure #	Recommendation
Mill Water Pond	-	Re-establish survey hubs and collect monthly data until results are consistent. Reduce monitoring frequency to biannual thereafter (Not required if pond is decommissioned and backfilled).
	12	If the MWP is to be brought back into service the following actions are recommended: • Patch tears in the liner system. • Fill the voids under the tears before patching. • Clean out sediments accumulated in the surface runoff ponds and culverts
South Diversion Ditch	14	Cover the exposed liner as per the channel design.
Minto Creek Detention Structure	15	Continue annual monitoring for further signs of instability or seepage on the downstream slope of the MCDS.
Water Storage Pond Dam	16	Continue regular monitoring of the dam, noting specifically the clarity of the seepage and flow exiting the stilling basin and the seepage rate through the weir.
	16	The discharge point of the water (from the pit, water treatment plant, etc.) influences the seepage pump data at W-3 in the seepage pump house. Options to obtain accurate seepage measurements should be explored such as moving the discharge point a further downstream of the pump house. The issue should be resolved prior to 2015 spring melt.
Big Creek Bridge	17	Continue regular annual monitoring of sediment accumulation in the culverts. If sediments continue to accumulate, clean them out.
South Wall Buttress / In-Pit Dump	18	The tension crack area in the In-Pit Dump should continue to be monitored. A photographic record should be maintained to inspect for changes in condition. Following completion of the buttress, additional survey hubs should be installed along the crest to monitor movement.
	18	Additional survey hubs should be installed along the South Wall Buttress crest to monitor movement.

Note(s):

(1) High priority actions are highlighted in blue.

This report, "2014 Geotechnical Annual Review, Minto Mine, YT", was prepared by 2014 Geotechnical Annual Review, Minto Mine, YT.

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All data used as source material plus the text, tables, figures, and attachments of this document have been reviewed and prepared in accordance with generally accepted professional engineering and environmental practices.

6 References

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Appendix A: Photographic Report

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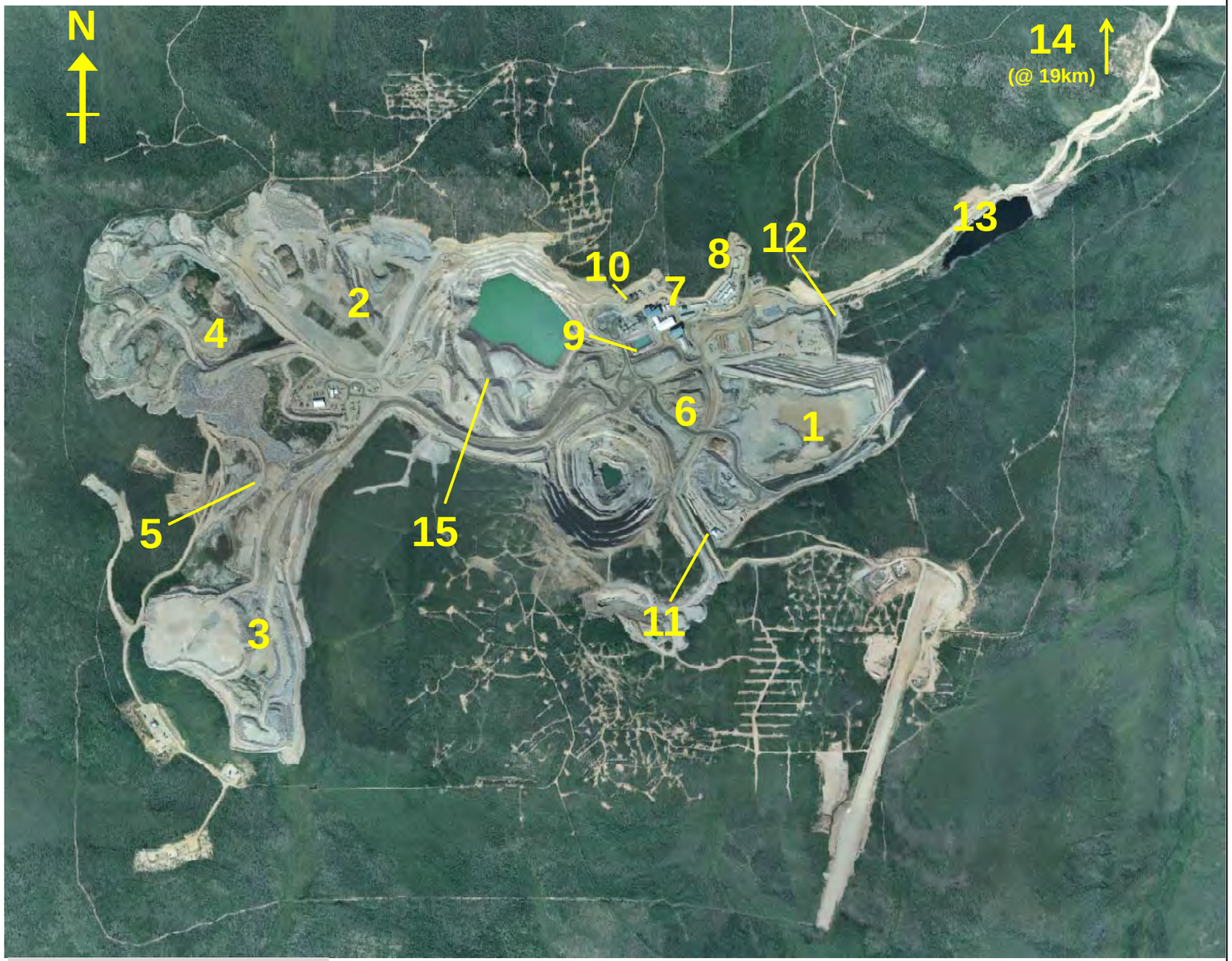

August 2013 Orthophoto.

Inspection Area Number

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Capstone MINTO MINE
OPERATED BY MINTO EXPLORATIONS LTD.

Fall 2014 Geotech Inspection

Minto Mine 2014 Geotechnical Inspection Areas

Job No: 1CM002.012.028

Filename: Minto 2014 Fall Inspection.pptx

Minto Mine

Date: November 2014

Approved: PHM

Figure: 1

1 Dry Stack Tailings Storage Facility – Tailings Cover

- Approximately 2 to 4 meters of overburden was placed over the tailings as a temporary cover during the winter of 2012-13. The cover was designed with 2% grade to drain to the north.
- There are a significant number of thaw bulbs, surface cracking and differential settlement throughout the cover, which can be expected due to the winter placement of the cover materials.
- Since the last SRK inspection in 2013, significant vegetation growth has occurred in the north east corner of the DSTSF, and the cover is significantly drier. The area that was noted to have soft ground conditions and was unwalkable during the 2013 inspection (noted in the plan below) was able to be walked over during this years inspection.

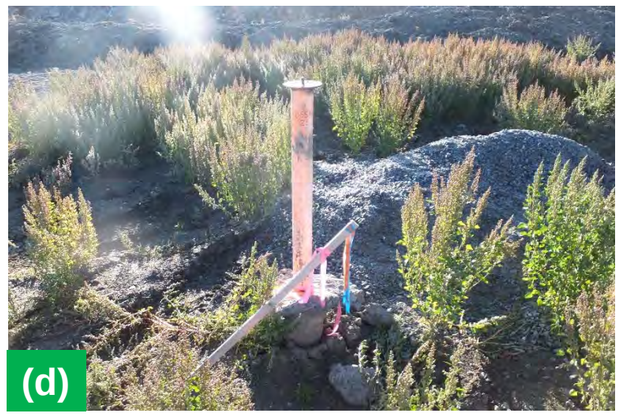
- Photo (a) shows the cover surface from the north east corner.
- Photo (b) shows the cover in the western portion of the DSTSF. There is considerably less vegetation established in the area.
- Photo (c) shows the south edge of the DSTSF where tailings remain exposed at surface on the south slope of the facility adjacent to the Tailings Diversion Ditch. Water was observed to be impounded against the DSTSF on the south side of the facility at various locations. Seep locations and areas where the water was observed to flow beneath the tailings. The water can be attributed to melting snow, recent precipitation and from water not captured by, or flowing under, the Tailings Diversion Ditch.
- Photo (d) shows survey hub DSSH 25, which is experiencing frost heave with approximately 30 cm of cement exposed at its base.

2013 Orthophoto

Photograph vantage point

Recommendations

- The remaining areas of exposed tailings should be covered and the uphill area south of the DSTSF should be regraded as required to control surface drainage, avoid ponding, and limit infiltration of water into the tailings as per Clause 36 and 37 of the water license QZ96-006, Amendment 8.
- The condition of all survey hubs on site should be reviewed. Hubs experiencing frost heave should be noted and replaced with hubs that are not susceptible to frost heave.



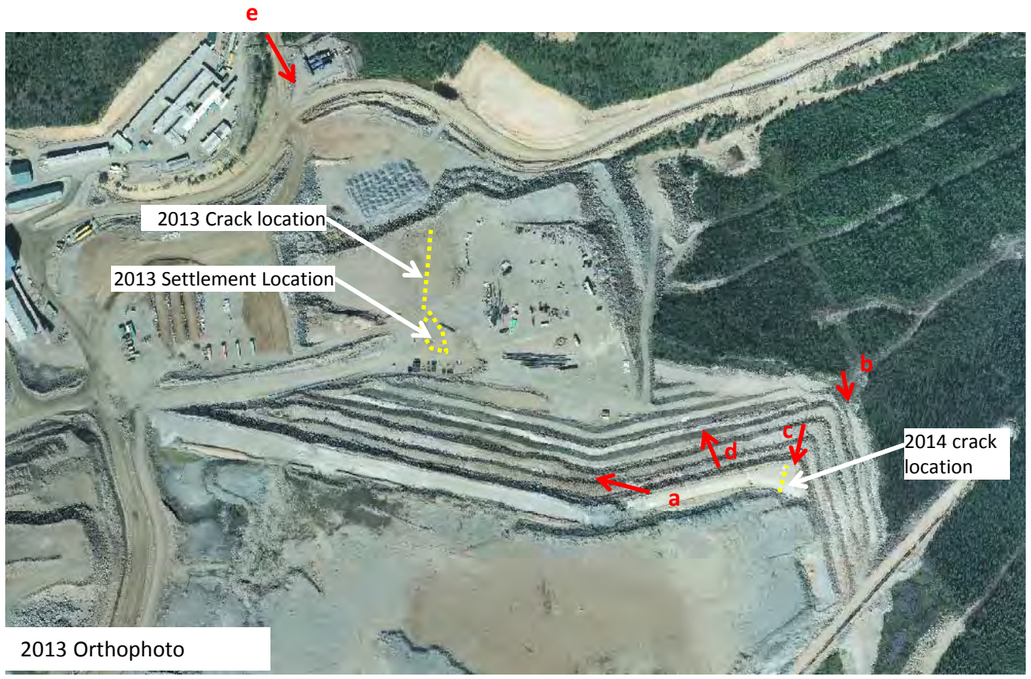
srk consulting VANCOUVER	capstone MINTO MINE OPERATED BY MINTO EXPLORATIONS LTD.	Fall 2014 Geotech Inspection
		Dry Stack Tailings Storage Facility
Job No: 1CM002.012.028 Filename: Minto 2014 Fall Inspection.pptx	Minto Mine	Date: November 2014 / Approved: PHM / Figure: 2

1 Dry Stack Tailings Storage Facility – Waste Rock Shell & Mill Valley Fill Extension

- Photos (a) to (c) show the condition of the waste rock shell and slopes.
  - One tension crack was observed at the northeast corner of the DSTSF at the crest (Photo c) The crack is 2.5 cm wide at its widest point. This area should continue to be inspected to monitor for crack progression.
  - No other signs of instability were observed.

- Photos (d) and (e) show the condition of the Mill Valley Fill Extension.
  - Since the last inspection by SRK in September 2013, the area of settlement and cracking (area noted in plan below) was graded and filled in. The settlement and cracking was believed to be caused by differential settlement between two lifts placed at different times. The newer lift may have been settling within the coarser material at the older outer bench face or due to snow melting (if placed during winter).
  - During the 2014 inspection, the area was rough and undulating. It is unclear if this is due to further settling.

Recommendations
- Continue to monitor the 2013 crack and settlement area.
- Continue to monitor the 2014 crack and install two survey nails/pins (one on each side of the crack) to measure the relative displacement. Consider spray painting lines across the crack to aid in monitoring any future displacement.



Photograph vantage point

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Job No: 1CM002.012.028 Filename: Minto 2014 Fall Inspection.pptx	Minto Mine	**Dry Stack Tailings Storage Facility – WR Shell and MVFE**		
		Date: November 2014	Approved: PHM	Figure: 3

1 Dry Stack Tailings Facility – Tailings Diversion Ditch

Source: 2013 Orthophoto

Photograph vantage point

- Since the last SRK inspection in September 2013, construction of the eastern portion of the Tailings Diversion Ditch has been substantially completed according to the EBA design outlined in the memo, “Upstream Water Management for the Mill Valley Fill Expansion and Dry Stack Tailings Storage Facility” dated 2011.
- In general, the berm and ditch appeared functional, with conditions in the western portion similar to those observed in previous inspections. No signs of instability or ditch obstructions were noted.

(a) View of the upstream portion of the channel. The area remains unchanged compared to 2013 inspection.
(b) View of the upstream end of the recently constructed eastern portion of the TDD. The channel generally consists of a layer of GCL overlain by rip-rap with a minimum channel depth (compared to the downslope berm of 1.5 m). A small flow of water (<0.1 L/s) was entering the ditch at the time of the inspection.
(c) View of the eastern portion of the ditch looking east. No visible signs of flow could be observed.
(d) View of the downstream end of the eastern portion of the TDD looking northeast.

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Fall 2014 Geotech Inspection

Dry Stack Tailings Storage Facility - TDD

Job No: 1CM002.012.028

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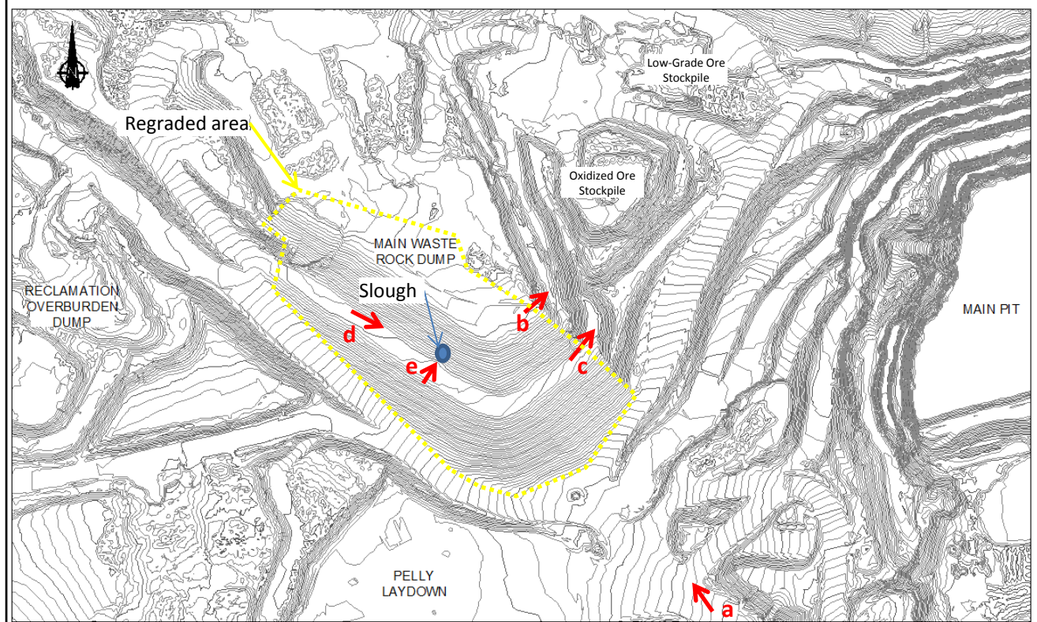
Minto Mine

Date: November 2014 | Approved: PHM | Figure: 4

2 Main Waste Dump

- Reclamation activities at the dump were completed between 2011 and 2012 with re-contouring of portions of the dump slopes. The regraded area is noted in the plan below. The regraded slopes have been covered and revegetated with different vegetation prescriptions placed on different portions of the cover.
- No signs of instability were observed.

- Photo (a): Overview of the Main Waste Dump and Low Oxide Stockpile looking northwest.
- Photos (b) and (c): View of the Oxidized Ore Stockpile.
- Photos (b) and (c): View of the dump toe. Minor rills and gullies are present at the base of the regraded slope where vegetation is not yet established. No signs of instability were observed.
- Photo (d): View of the regraded slope taken from the mid-bench toe. Minor rills and gullies are present at the base of the slope. No signs of instability were observed.
- Photo (e): Location of the small surficial slough noted in the previous 2012 and spring 2013 inspections. The slough is contained within the cover material with minor bulging present at the base of the slope. The slough appears to be self-healing and no action is required.



Source: Figure 1, EBA letter "Main Waste Rock Dump – 2011 Annual Review, Minto Mine, YT", dated September 30, 2011.

Photograph vantage point

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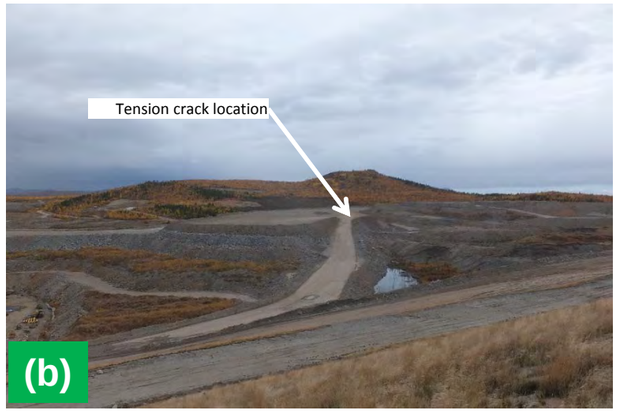
		Main Waste Dump
Job No: 1CM002.012.028 Filename: Minto 2014 Fall Inspection.pptx	Minto Mine	Date: November 2014 / Approved: PHM / Figure: 5

3 Southwest Waste Dump



2013 Orthophoto

Photograph vantage point

At the time of the inspection, dumping was actively taking place in the east of the Ice-Rich Overburden Dump. Waste placement in the SWD is near completion with regrading activities planned to begin in the late fall.

a) View of the SWD taken from the Main Waste Dump.

b) View of the north end of the SWD. Tension cracks were noted near the top of the ramp that has been deactivated to traffic (location noted on the 2013 Orthophoto).

c) Close up view of the tension cracks.
   - The cracks are approximately 15 m long, up to 2.5 cm wide, and orientated parallel to the crest. The cracks are located within 5 m of the crest.

- No other signs of instability (slumping, bulging, tension cracks, differential settlement) were observed throughout the SWD.

d) View of the W-15 detention structure area looking east. Condition of the area are the same as that reported in 2013. Water entering the W-15 Detention Structure Area from the SWD toe water was clear.

e) View of the outlet of the culvert at the NE corner of the dump and east of the Pelly Laydown area. Large diameter boulders have been placed on the slope below the culvert to mitigate erosion. The appearance of the boulders are unchanged compared to previous photos taken in 2012 and 2013. Sediment is accumulating inside of the culvert, with some cobbles present with diameters up to 8 inches observed. No change was observed compared to the 2013 inspection.

f) Photos (f1) to (f4) show survey hubs SWD01A, SWD03A, SWD04A and SWD05A. Each are experiencing frost heave as evidenced by the exposed concrete. The length of concrete exposed are: 30 cm, 75 cm, 55 cm, and 90 cm, respectively.

Recommendations

- The tension crack area should be regraded to lessen the dump slope if the north access ramp is to be activated. Regrading of this area is planned as part of the upcoming regrading of the SWD.
- The survey hubs at the toe of the dump should be replaced and installed using a different methodology that will mitigate against frost heave.
- Continue to monitor erosion at the culvert outlet and sediment accumulation within the culvert and maintain a photographic record to inspect for changes in condition.

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Fall 2014 Geotech Inspection

Southwest Waste Dump

Job No: 1CM002.012.028

Filename: Minto 2014 Fall Inspection.pptx

Minto Mine

Date: November 2014

Approved: PHM

Figure: 6

4 Reclamation Overburden Dump

- Photos (a) and (b) show the shallow slope failure noted in the Spring 2014 Geotechnical inspection. Previous year's inspections noted localized slumping, discontinuous tension cracks, and erosion gullies within the area. The scarp is within approximately 5 m of the original crest. The failure has not compromised the overall dump slope angle and as a result, the failure is not expected to reduce the overall stability of the dump.
- Other areas of the ROD remain the same as noted in previous years' inspections:
  - Slumping, settlement and tension cracks are expected in the dump as it is constructed with frozen overburden with thawing expected.
  - Discontinuous tension cracks and differential settlement observed along the perimeter crest.
  - Ground undulation is typically 0.3 m and is prevalent throughout the facility.

Recommendations

- Continue to monitor the slope failure area for further signs of movement or instability.

Source: August 2013 Orthophoto

Photograph vantage point

5 Ice Rich Overburden Dump

- A containment berm constructed of coarse waste rock is present on the north, east and south sides of the dump.
- Since the previous years' inspection, additional waste rock has been placed outside of the berm up to the crest elevation as part of the Southwest Waste Dump Expansion (Zero and Low Grade Waste).

- Photo (c) shows the waste material that has now encapsulating the berm.

- No signs of instability were observed along the containment berm.
- No pooled water was observed against the berm indicating that water inside of the berm is still able to drain through the berm as per the original design intent.

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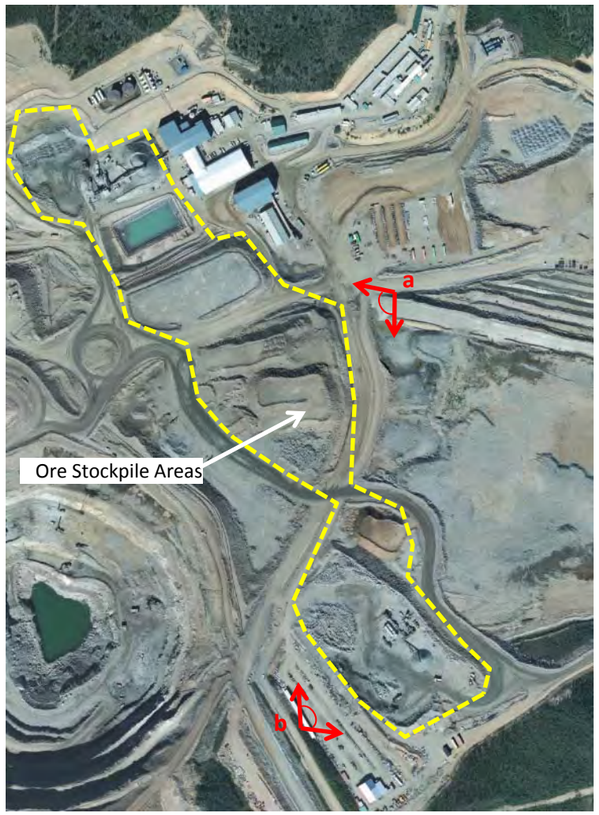
		Reclamation and Ice Rich Overburden Dumps
Job No: 1CM002.012.028 Filename: Minto 2014 Fall Inspection.pptx	Minto Mine	Date: November 2014 · Approved: PHM · Figure: 7

6 Ore Stockpiles



Photograph vantage point

Source: August 2013 orthophoto

- The ore stockpile area was investigated briefly in passing. All slopes appeared in good condition: no slumping, bulges, cracks, or other signs of instability were observed.

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		Ore Stockpiles
Job No: 1CM002.012.028 Filename: Minto 2014 Fall Inspection.pptx	Minto Mine	Date: November 2014 · Approved: PHM · Figure: **8**

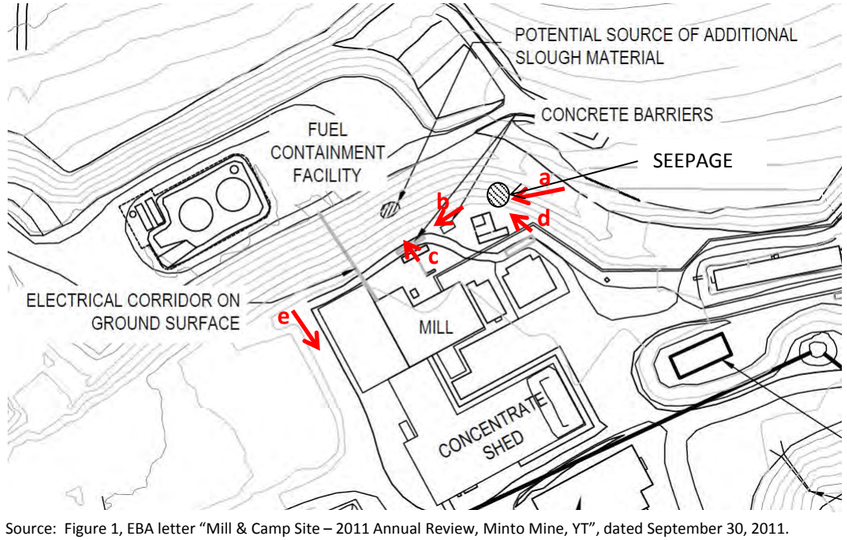
7 Mill Site

Conditions of the mill area are the same as those reported in previous site inspections.

a) The slope above the main mill site appears stable. Safety berms at the top of the slope are in good condition.
b) East end of the mill slope looking west. Eroded sand/gravel is generally present at the base of the slope with occasional cobbles/boulders up to 300 mm.
c) As noted in previous inspections, a small slough is present near the center of the slope approximately 10 m east of the electrical corridor. Some materials have raveled down the slope and the concrete barriers at the toe are approaching the capacity for containment. East end of the mill slope looking north.
d) Two small seeps observed in previous inspections were dry during the inspection. The seep location is noted in the plan below.
e) First identified in the Spring 2014 inspection, the retaining wall at the mill's apron feeder tunnel appears to be tilting forward with a potential to overtop. There was no noticeable change in condition between the fall and spring inspection photographs.

Recommendations

- Continue to monitor the retaining wall near the mill's apron feeder tunnel and maintain a photographic record of its condition.



Source: Figure 1, EBA letter "Mill & Camp Site – 2011 Annual Review, Minto Mine, YT", dated September 30, 2011.

↗ Photograph vantage point

srk consulting VANCOUVER	capstone MINTO MINE OPERATED BY MINTO EXPLORATIONS LTD.	Fall 2014 Geotech Inspection
		Mill Site
Job No: 1CM002.012.028 Filename: Minto 2014 Fall Inspection.pptx	Minto Mine	Date: November 2014 · Approved: PHM · Figure: 9

8 Camp Site

a) & b) Slope above the main camp site appears stable.
- Eroded sand/gravel is generally present at the base of the slope with occasional cobbles/boulders up to 300 mm.

c) View of the new camp site looking north. No signs of instability in this area.
d) View of the seep at the northwest corner of the camp expansion.
e) & f) Erosion channels present south of the camp site near the carpenters shop. Conditions are similar to the Fall 2013 inspection.

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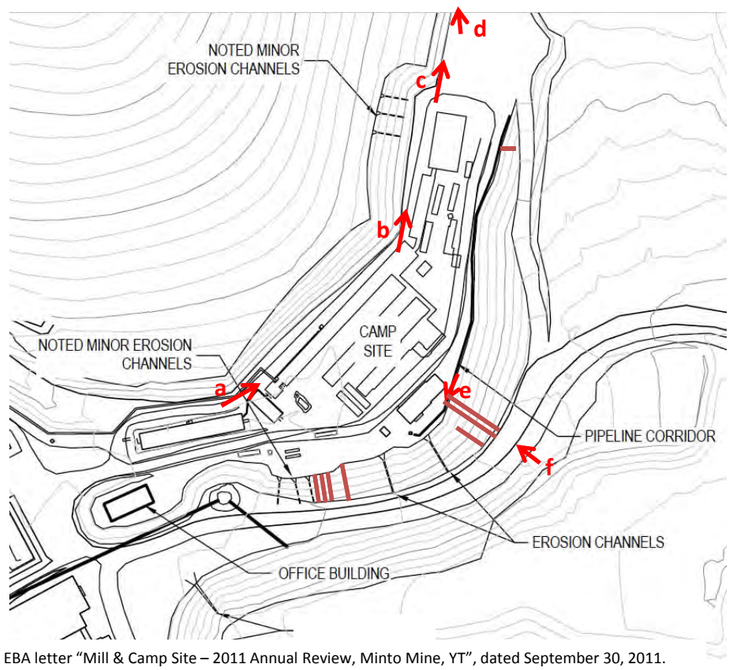
Recommendations
- The area above the erosion channels on the camp pad should be regraded to promote runoff away from the channels.
- The channel by the carpenter's shop should be filled with rip-rap or a half culvert to provide a path for the water to drain.
- It is recommended that these actions be completed in the following year. In place of the surface grading, a small ditch could be constructed near the slope crest to direct runoff to the drop channel or half-culvert.



Source: Figure 1, EBA letter "Mill & Camp Site – 2011 Annual Review, Minto Mine, YT", dated September 30, 2011.

Photograph vantage point
Erosion Channels added in 2011 site visit
Erosion Channels added in 2012 site visit
Erosion Channels added in Spring 2013 site visit

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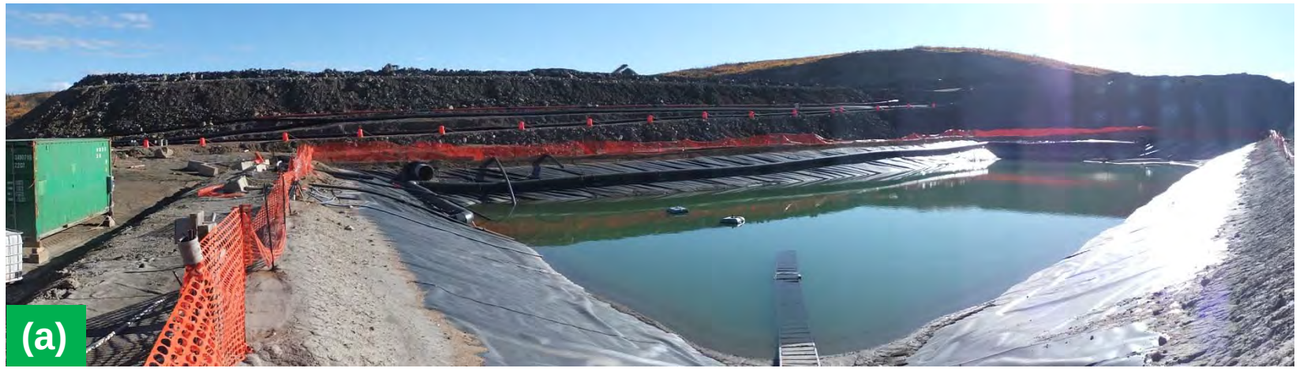
		Camp Site
Job No: 1CM002.012.028 Filename: Minto 2014 Fall Inspection.pptx	Minto Mine	Date: November 2014 / Approved: PHM / Figure: **10**

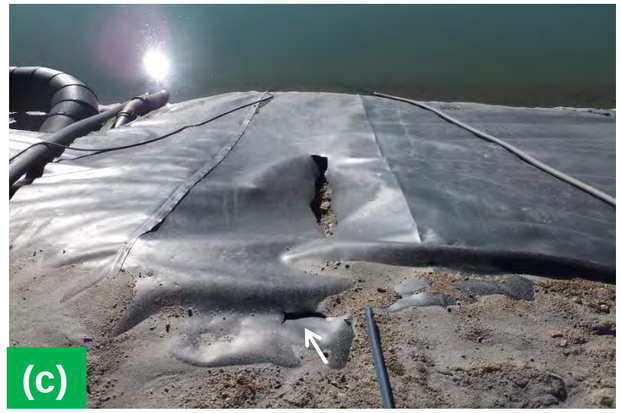
9 Mill Water Pond

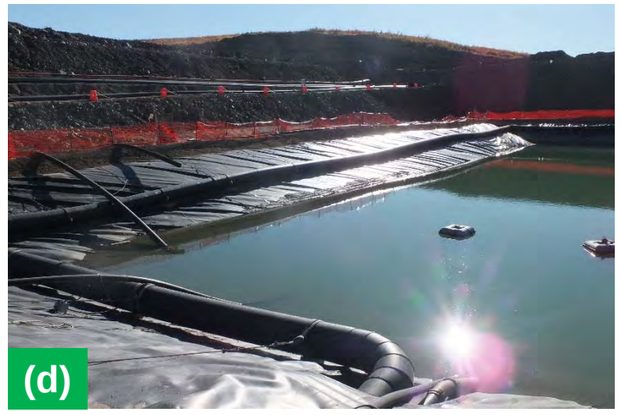
The Mill Water Pond is no longer in service.

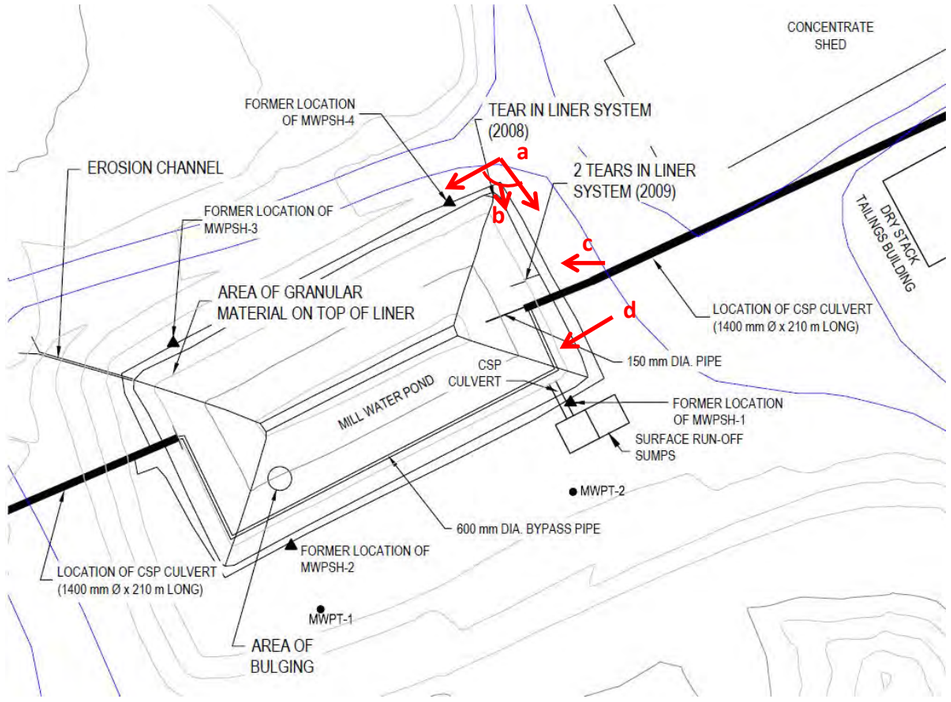
Conditions of the Mill Water Pond are unchanged compared to the 2012 and Fall 2013 inspections.

a) Panoramic view of the Mill Water Pond. Tears in the liner system are the same as reported in previous inspections. No new tears or liner defects were observed.
b) View of the tear in the liner at the north corner of the pond. The tear is approximately 1 m in length and first noted in the 2008 inspection.
c) Two tears in the liner midway along the northeast edge of the pond. These tears were first observed in 2009. The largest tear is approximately 1.5 m in length and is parallel to the slope. The smaller tear (white arrow) is approximately 0.5 m in length and orientated across the slope. A void is present beneath the slope that in previous inspections has been noted to be increasing in size due to water penetration from surface.
d) View of the south east side of the pond and by-pass pipe. The bypass pipe and metal clamps are resting on pieces of plywood placed on top of the liner.









Photograph vantage point

Source: Figure 1, EBA letter "Mill Water Pond – 2011 Annual Review, Minto Mine, YT", dated September 30, 2011.

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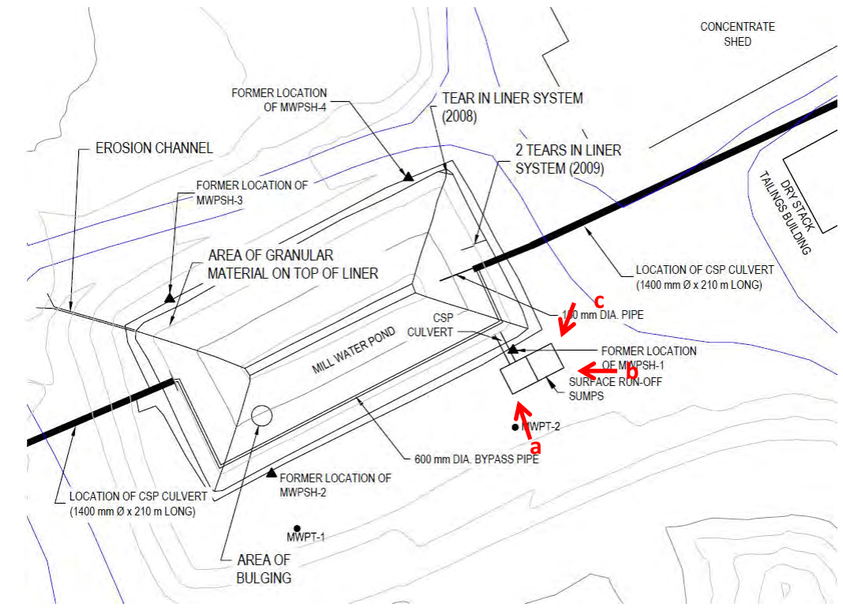
		Mill Water Pond
Job No: 1CM002.012.028 Filename: Minto 2014 Fall Inspection.pptx	Minto Mine	Date: November 2014 · Approved: PHM · Figure: **11**

9 Mill Water Pond

- Photos show the condition of the surface runoff ponds south east of the Mill Water Pond. Conditions are unchanged compared to the 2012 and 2013 inspections.
- There are significant sediments in both ponds, each culvert, and outside the ponds to the east.

Recommendations
If the Mill Water Pond is to be brought back into service the following actions are recommended:

- The liner tears should be patched the next time a liner crew is onsite. For the liner tear noted in Photo (c), Figure 14, sand should be placed to fill the void beneath the tear.
- The sediments accumulated in the surface runoff ponds and culverts should be cleaned out.



Source: Figure 1, EBA letter "Mill Water Pond – 2011 Annual Review, Minto Mine, YT", dated September 30, 2011.

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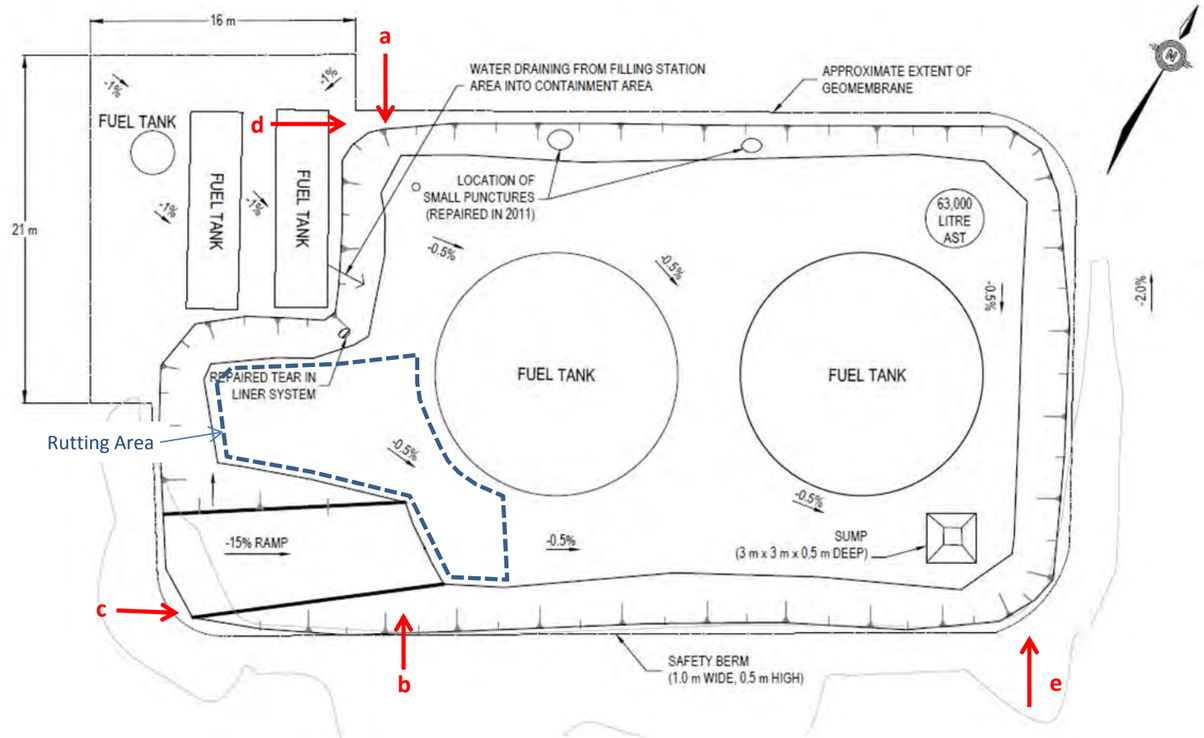
Job No: 1CM002.012.028 Filename: Minto 2014 Fall Inspection.pptx	Minto Mine	**Mill Water Pond**
		Date: November 2014 / Approved: PHM / Figure: **12**

10 Fuel Containment Facility



Observations

- Photos (a) to (e) show the condition of the liner on each side of the facility.
- Conditions of the facility appear to be the same as reported in the 2012 review.
- No tears or defects in the liner were observed.
- Minor pooling was observed. The facility appears to drain into containment area as per design.
- No new rutting observed. Ruts are present in the southern half of the facility. Rutting is significant (approximate 2-3 inches deep) between the two tanks where equipment was turning. No liner is exposed as a result of the trafficking.

Recommendations

- No actions required.
- The bedding layer over the geomembrane (150 mm thick) was not meant for heavy equipment. Vehicle access should be limited to the occasional visit with low ground pressure equipment.

Source: Figure 1, EBA letter "Fuel Containment Facility – 2011 Annual Review, Minto Mine, YT", dated September 30, 2011.

↗ Photograph vantage point

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		Fuel Containment Facility
Job No: 1CM002.012.028 Filename: Minto 2014 Fall Inspection.pptx	Minto Mine	Date: November 2014 · Approved: PHM · Figure: **13**

11 South Diversion Ditch

Source: 2013 Orthophoto

Photograph vantage point

- The South Diversion Ditch was inspected between the areas shown in Photos (a) to (e) adjacent to the Airport Laydown area. The pipeline intake structure at the Photo (c) location diverts water to the confluence area located near the Main Pit. The pipeline alignment was not inspected during the site visit.
- The lined ditch upstream of the intake structure was constructed to the design outlined in the "South Diversion Ditch Collection Pond IFC drawings, Figures SD1 through SD3, dated July 2007.
- Since the September 2013 inspection, the following conditions have changed:
  - Ditch vegetation have been removed to improve the ditch capacity.
  - The three large boulders at the overflow spillway have been removed as recommended in the Fall 2013 inspection as to not impede flow.
- No signs of instability were noted along the side-slopes.

a) View of the inlet structure at the upstream end of the ditch.
b) View from the inlet structure looking downstream.
c) View of the inlet structure to two 16" HDPE diversion pipes and the overflow spillway. Note the boulders have been moved to the side of the spillway.
d) Exposed liner at the top of the west bank. Conditions the same as noted in previous inspections.
e) View looking upstream taken from near the downstream end of the channel.

Recommendations

- All areas of exposed liner should be covered to protect the liner and prevent degradation.

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		South Diversion Ditch
Job No: 1CM002.012.028 Filename: Minto 2014 Fall Inspection.pptx	Minto Mine	Date: November 2014 / Approved: PHM / Figure: **14**

12 Minto Creek Detention Structure

- Since the Fall 2013 inspection, a new intake structure has been installed. Otherwise conditions are generally the same as previous inspections.
- No signs of instability were noted along the downstream slopes and no seepage was observed downstream of the Minto Creek Detention Structure (MCDS). The surface cracking noted in previous inspections were less noticeable due to recent equipment trafficking along the east and south ends of the facility.

- The seepage entering the MCDS from the Mill Valley Fill Extension (MVFE) was clear. There appears to be some sediment accumulation upstream of the structure; however, conditions along the flow path into the MCDS are similar compared to 2012 and 2013 inspection photographs, and there are no sediments observed immediately downstream of the MVFE toe.

a) View of the MCDS looking southwest.
b) View of the south side of the MCDS. Excavator traffic along the south end of the crest has created some rutting; however, the upstream slope/berm are functional and in generally good condition.
c) View of the new intake structure at the northeast corner of the facility.
d) View of the overflow spillway looking south. Same as noted in previous inspections, some exposed GCL is present on the upstream side of the spillway.

Recommendations
- Continue regular annual monitoring for further signs of instability or seepage on the downstream slope of the MCDS.

Photograph vantage point

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		Minto Creek Detention Structure
Job No: 1CM002.012.028 Filename: Minto 2014 Fall Inspection.pptx	Minto Mine	Date: November 2014 / Approved: PHM / Figure: **15**

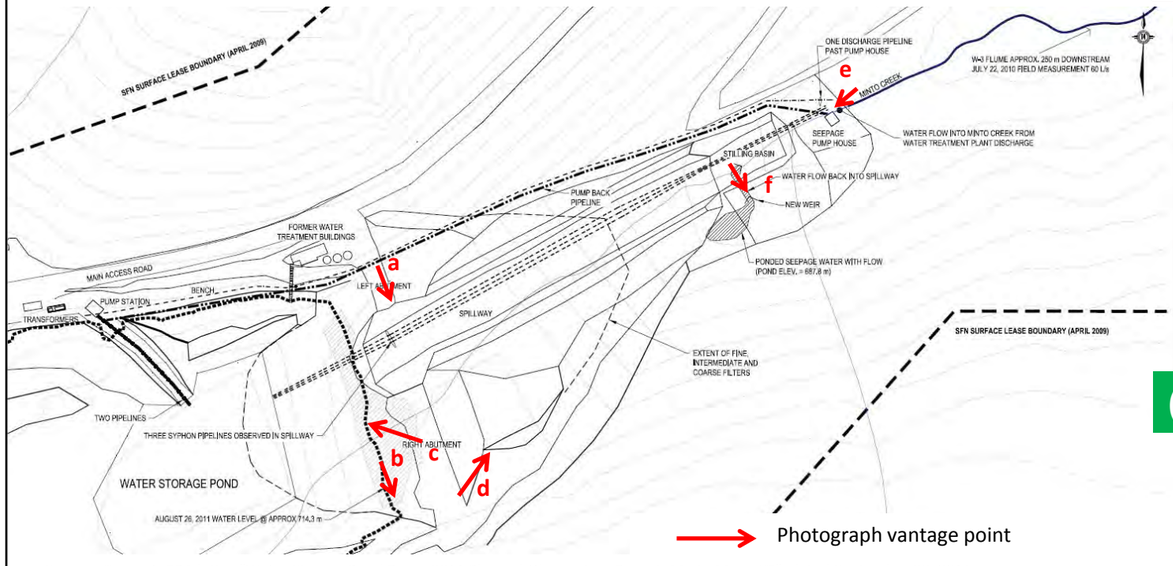
13 Water Storage Pond Dam

- Conditions of the dam are unchanged since the Fall 2013 inspection.

a) a) & b) View of the crest, upstream slope and south abutment. These areas (including the north abutment) show no signs of instability (settlement, bulging, slumping).
c) View of the culvert outlet and Water Storage Pond Dam (WSP) bank immediately east of the water treatment building. The outlet was undercut with additional fill placed to secure the slope. Beneath the culvert, geotextile was placed and secured with rip-rap. The area appears unchanged compared to the 2013 inspection.
d) View of the downstream slope and spillway. Three 200 mm diameter siphon pipelines are present in the spillway that run from the WSP to the pump house. No signs of instability, settlement or erosion were observed on the downstream slopes or abutment areas.
e) View of the stilling basin upstream of the seepage pump house. The seepage water was clear with no turbidity. No accumulation of sediments was observed.
f) View of the weir present on the downstream side of the ponded seepage water to measure/monitor flow from the dam toe. The estimated flow rate at the time of inspection was 1 L/s.
    - Condition of the seepage water appears unchanged compared to the 2013 inspection.
    - Water flow could not be heard in the rockfill adjacent to the seep.
    - The water was clear with no turbidity. Rocks in the pond contain a thin coating of fine rusty-brown sediments. The sediments are thought to be due flushing of weathered rip-rap from local run-off on the downstream toe.

Recommendations

- Continue regular monitoring of the dam, noting specifically the clarity of the seepage and flow exiting the stilling basin, and the seepage rate through the weir.
- As noted in previous inspections, the seepage pump flow rates at W-3 in the seepage pump house appears to be influenced by discharge from other sources (the pit, water treatment plant, etc.). Options to obtain accurate seepage measurements should be reviewed. One solution would be to move the discharge point of water a minimum of 20 m down stream of the sump.



Source: Figure 1, EBA letter "Water Storage Pond Dam– 2011 Physical Observation Report, Minto Mine, YT", dated September 30, 2011.

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Fall 2014 Geotech Inspection

Water Storage Pond Dam

Job No: 1CM002.012.028

Filename: Minto 2014 Fall Inspection.pptx

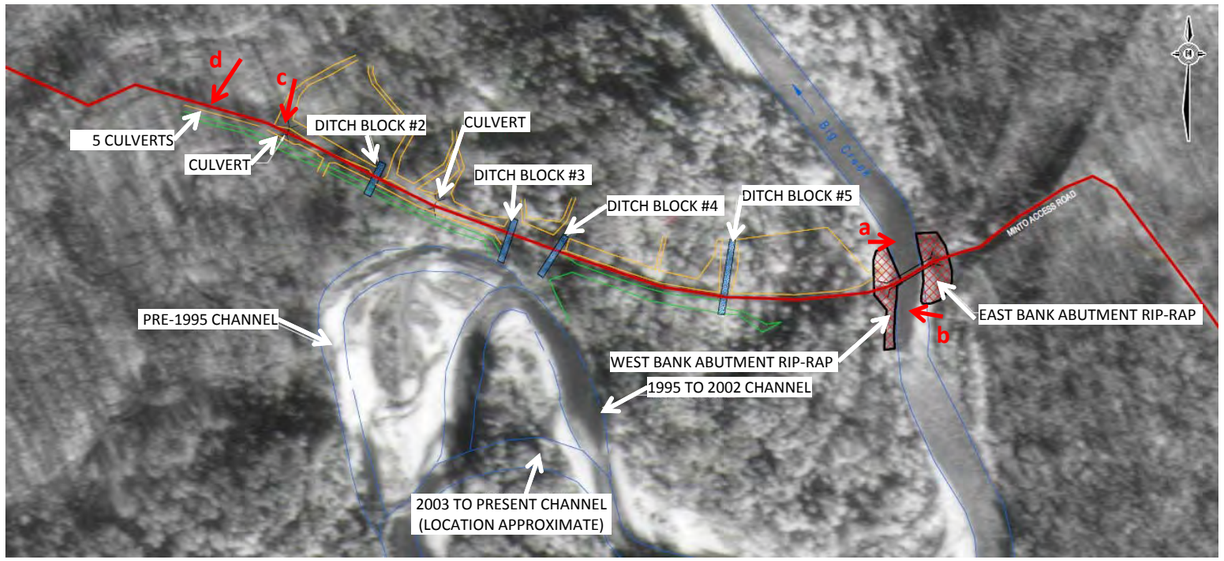
Minto Mine

Date: November 2014

Approved: PHM

Figure: **16**

14 Big Creek Bridge



Source: Figure 1, EBA letter "Big Creek Bridge– 2011 Annual Review, Minto Mine, YT", dated September 30, 2011.

Photograph vantage point

- Photos (a) and (b) show east and west abutments, respectively. The bridge abutments and road approaches are in good condition, no signs of instability were observed.
- Consistent with previous inspections, Ditch Block #1 has not been constructed, Ditch Blocks #2 through #5 are in good condition.
- Conditions of the culverts are unchanged since the previous Fall 2013 inspection.
- The first culvert west of the bridge is in satisfactory condition. The north end of the culvert has been dented by a large rock. It appears that a compacted bedding layer has not been placed outside the culvert.
- Photo (d) shows the downstream end of the 2nd culvert west of the bridge. Sediment accumulation should continue to be monitored and cleaned out if sediments continue to accumulate.
- Photo (d) shows 5 culverts, each with diameter of 1.1 m. The culverts are in satisfactory condition, with no blockages at either end.

Recommendations

- Continue regular annual monitoring of sediment accumulation in the culverts, and clean out if sediments continue to accumulate.

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		Big Creek Bridge
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15 Main Pit, South Wall Buttress & In-Pit Dumps

Photo a: View of the Main Pit, South Wall Buttress and In-Pit Dump taken from the north west corner of the pit.
Photos b and c: View of the tension cracks on the In-Pit Dump located west of the South Wall Buttress. This area has been blocked off and is inaccessible to equipment. Cracks on the In-Pit Dump are up to 50 cm wide with a 40 cm elevation difference across the crack. The movement is believed to be due to the large dump height, with the material end dumped directly into the pit water.

2013 Orthophoto

Recommendations

- The tension crack area should be continue to be visually monitored. A photographic record should be maintained to inspect for changes in condition.
- Additional survey hubs should be placed on the South Wall Buttress to monitor movement.

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		South Wall Buttress
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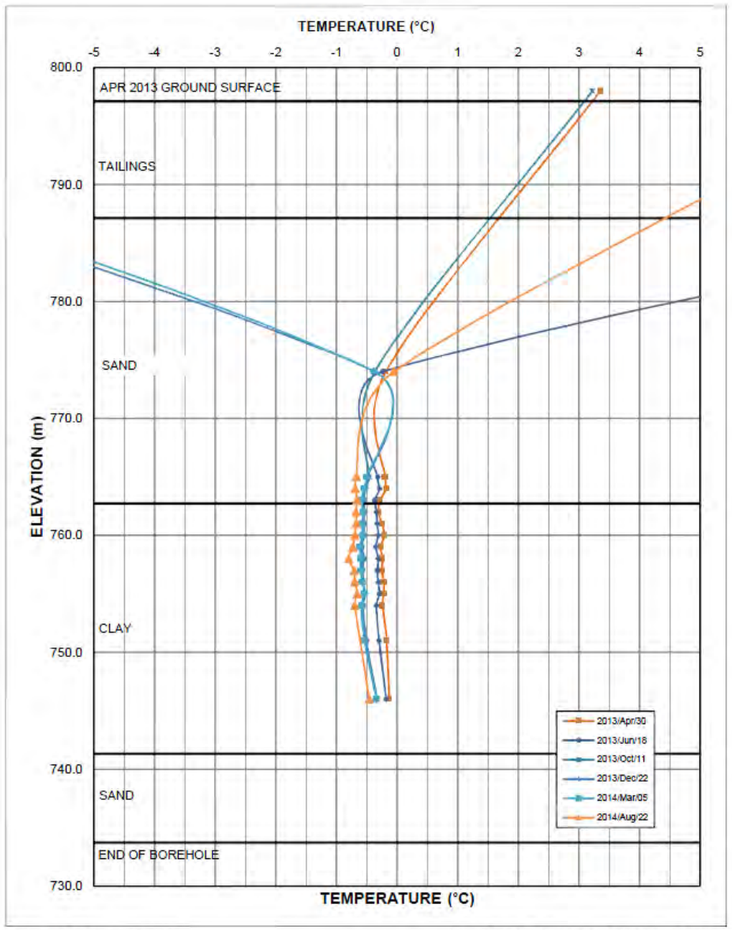
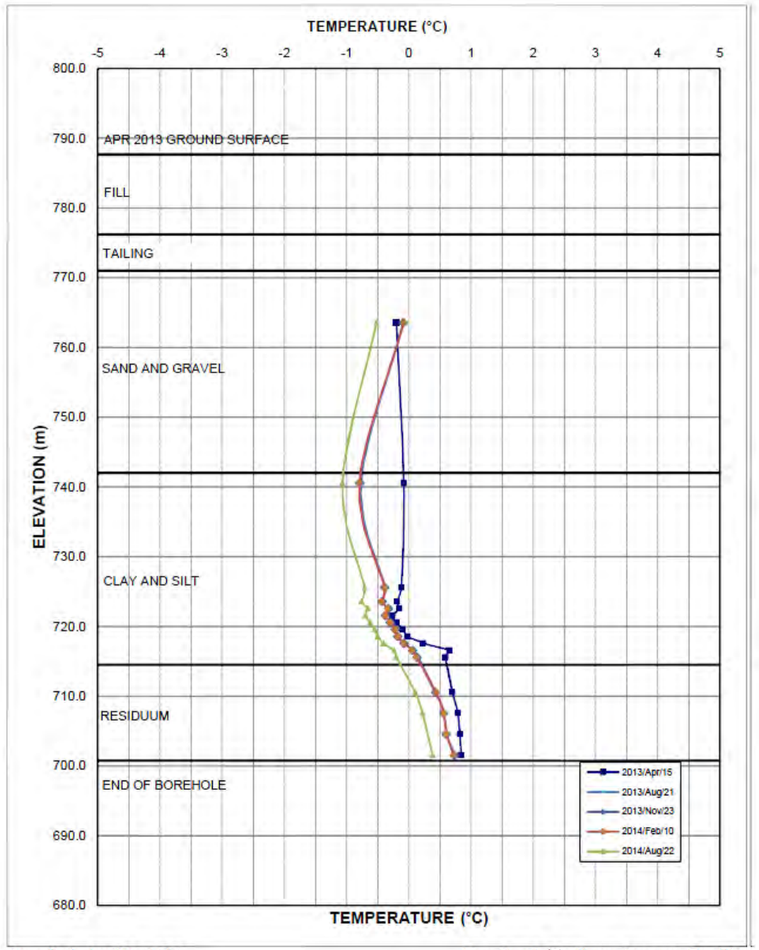
Appendix B: Monitoring Instrumentation Data



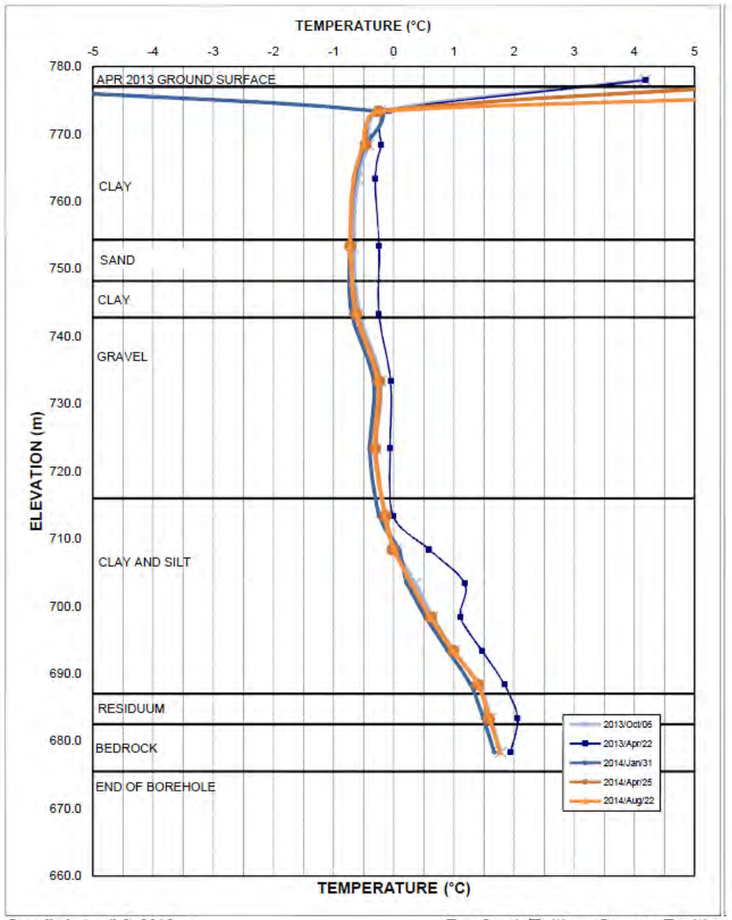
Installed: April 17, 2013

Dry Stack Tailings Storage Facility
Ground Temperature Profile - DST-10



Installed: April 5, 2013

Dry Stack Tailings Storage Facility
Ground Temperature Profile - DST-11



Installed: April 2, 2013

Dry Stack Tailings Storage Facility
Ground Temperature Profile - DST-13

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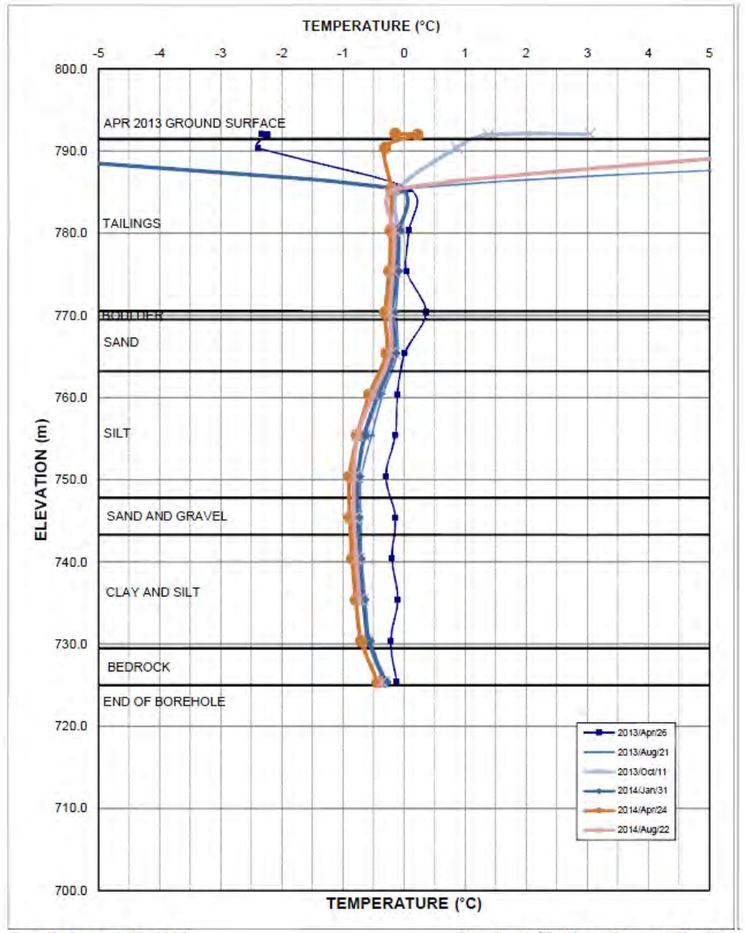
DSTSF Thermistors (1 of 2)

Job No: 1CM002.012.028
Filename: Minto 2014 Fall Inspection.ppt

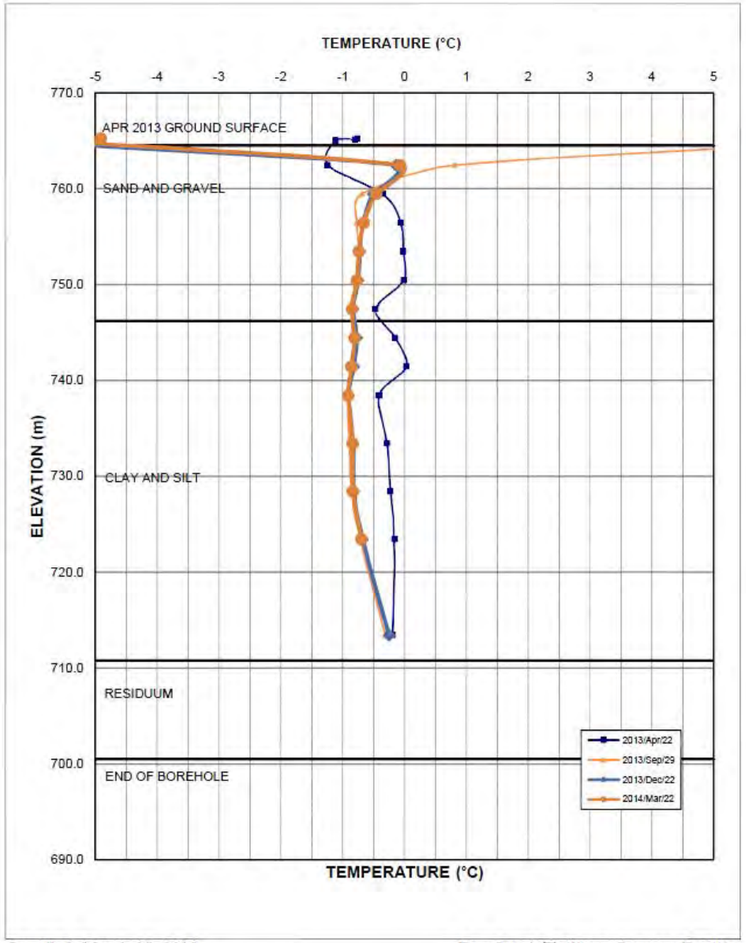
Minto Mine

Date: November 2014
Approved: PHM
Figure: **1**



Installed: April 12, 2013

Dry Stack Tailings Storage Facility
Ground Temperature Profile - DST-14



Installed: March 25, 2013

Dry Stack Tailings Storage Facility
Ground Temperature Profile - DST-15

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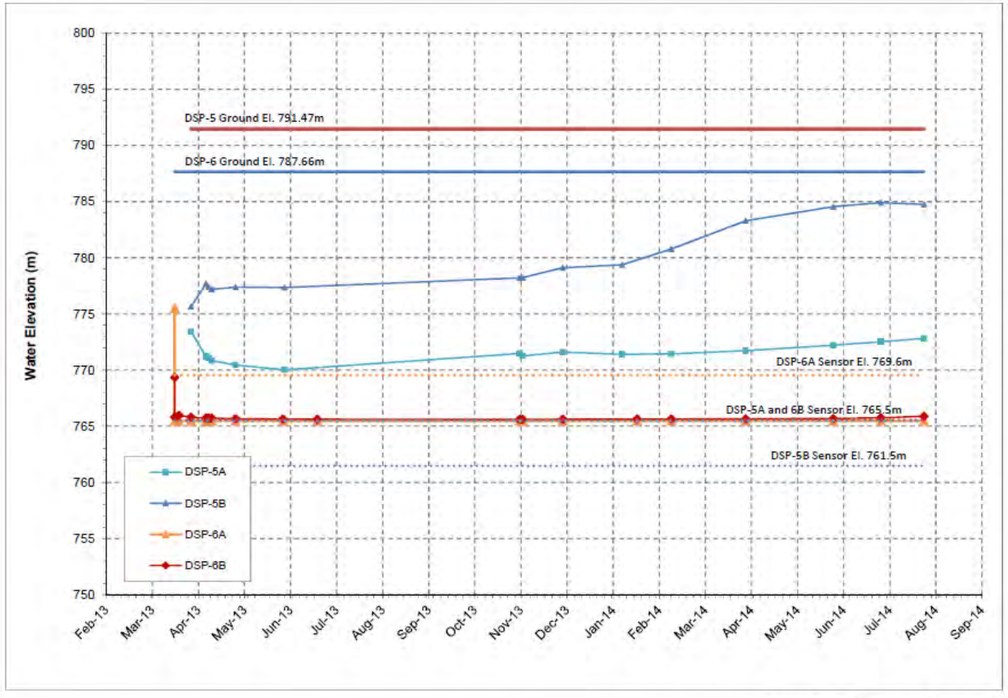
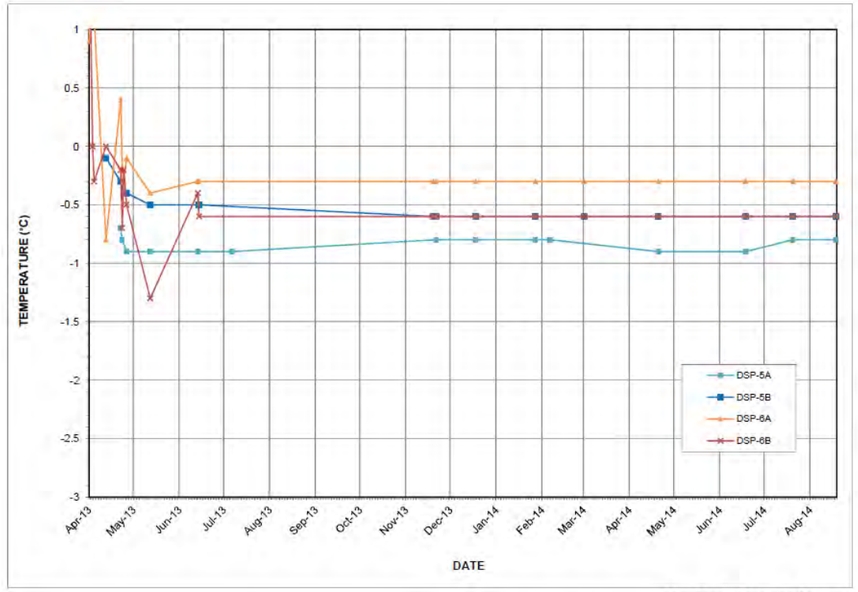
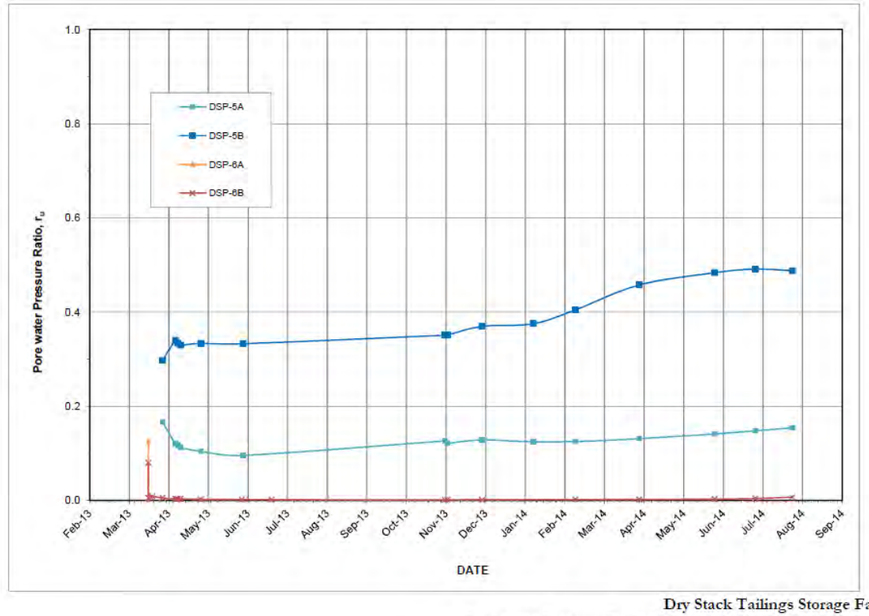
Job No: 1CM002.012.028 Filename: Minto 2014 Fall Inspection.ppt	Minto Mine	**DSTSF Thermistors (2 of 2)**
		Date: November 2014 / Approved: PHM / Figure: **2**



Dry Stack Tailings Storage Facility
Instrument Water Elevation - DSP-5A, DSP-5B, DSP-6A, DSP-6B



Dry Stack Tailings Storage Facility
Piezometer Sensor Temperatures - DSP-5A, DSP-5B, DSP-6A, DSP-6B



Dry Stack Tailings Storage Facility
Pore water Pressure Ratio - DSP-5A, DSP-5B, DSP-6A, DSP-6B

Notes:

- Water pressure elevations may not be accurate as barometric pressures were estimated and temperature sensors indicate frozen conditions.
- DSP-5 piezometer sensors are installed at the same location as the DST-14 ground temperature cable presented in Figure 2.
- DSP-6 piezometer sensors are installed at the same location as the DST-11 ground temperature cable presented in Figure 1.

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		DSTSF Piezometers		
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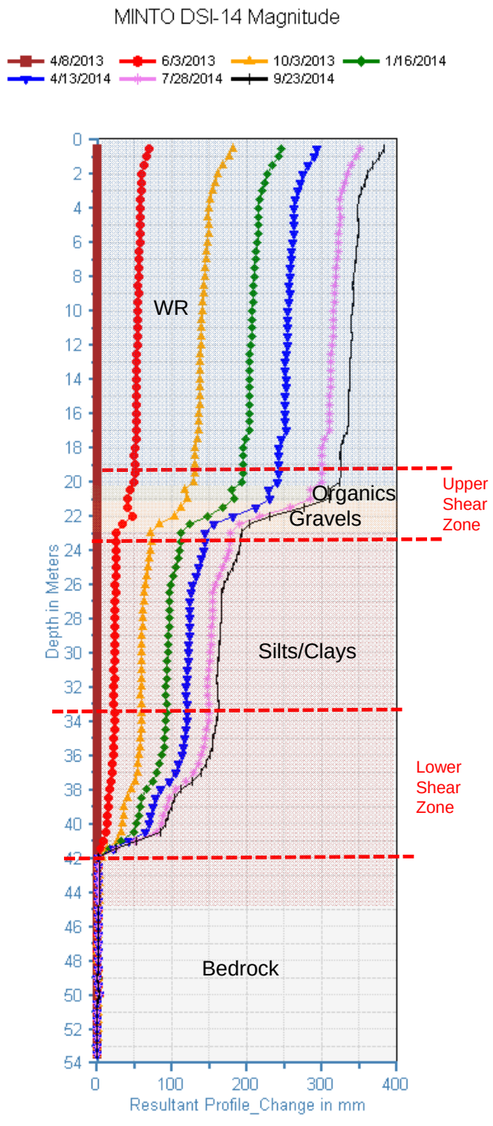
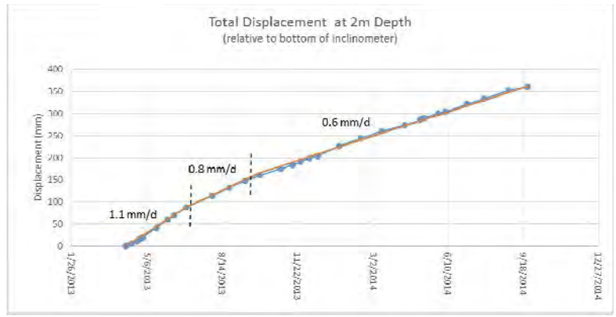
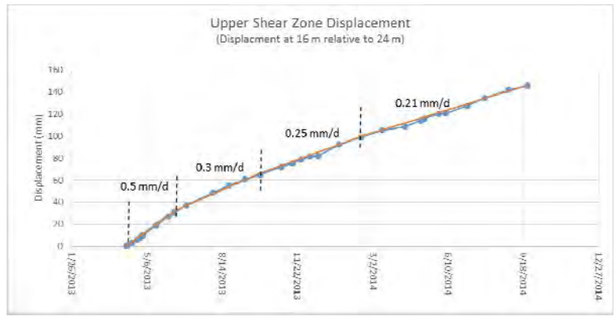
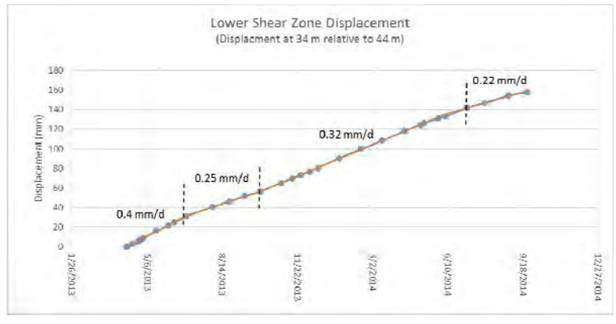


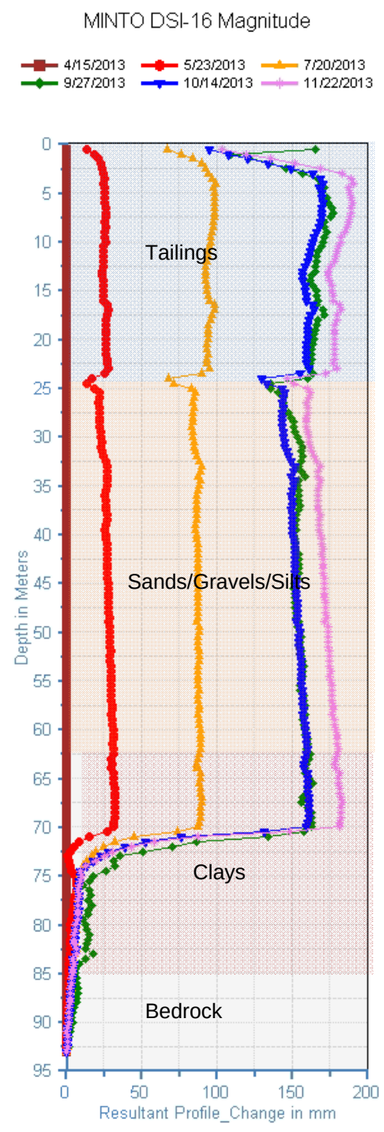






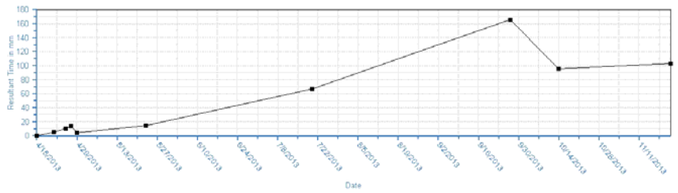
Ice lenses noted in borehole log:

- 10 mm thick at 31m;
- 75 mm thick at 34 m;
- 125 mm thick at 38 m;
- 50 mm thick at 39 m.



DSI-16

Magnitude Displacement between top and bottom of inclinometer (mm)



Borehole log features between depths 70 m and 75m:

- Soil generally consists of CLAY, some silts and sands/gravel, high plasticity, moist, stiff.
- Ice descriptions include stratified and random ice formations. Ice lenses are noted up to 50 mm in thickness and orientated at 20 degrees.
- Two slickensides noted at 73 m and 78 m.

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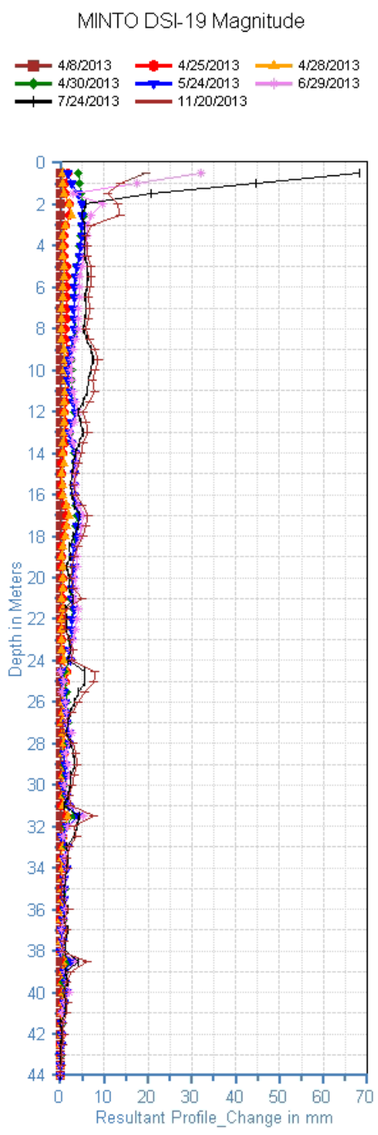
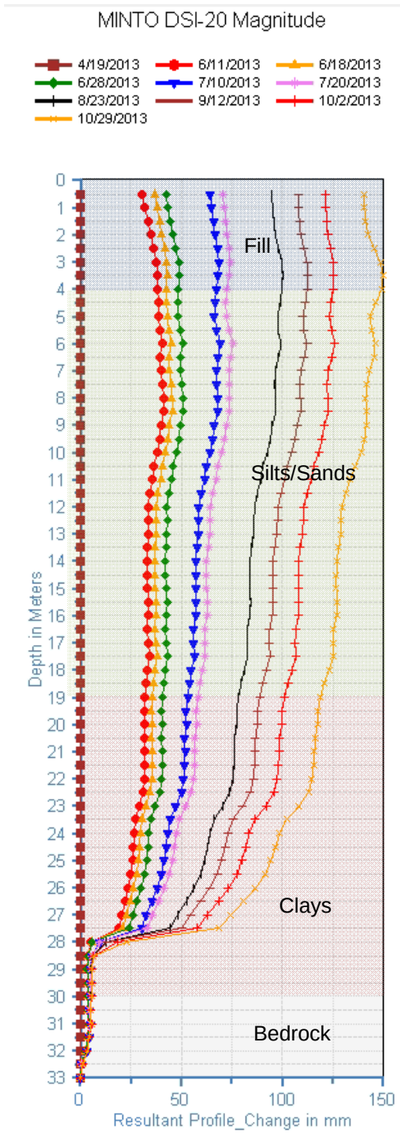
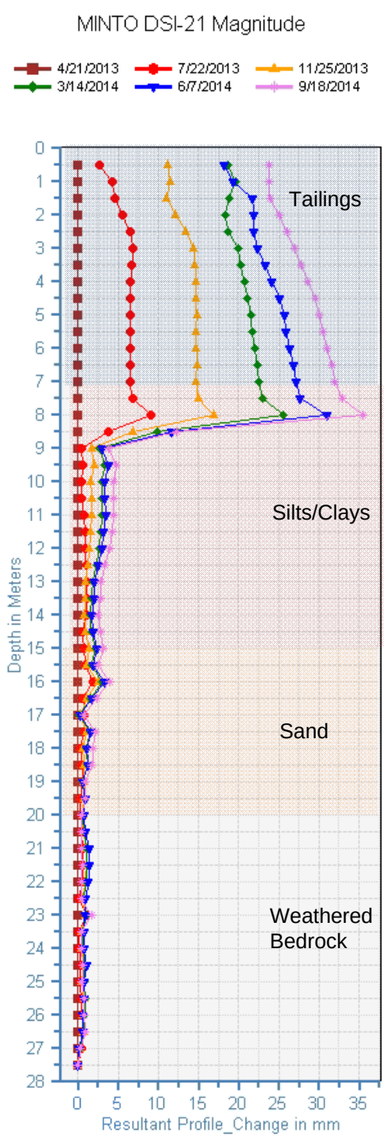
		Date: November 2014	Approved: PHM
		Figure: **4**	

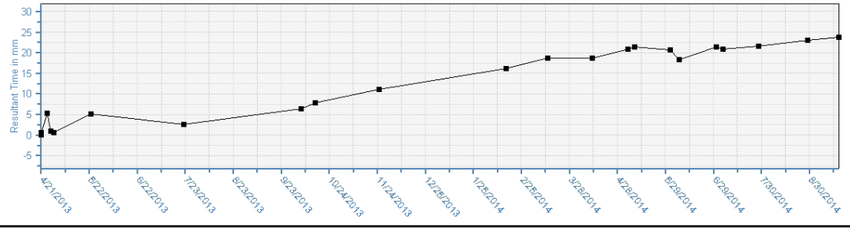




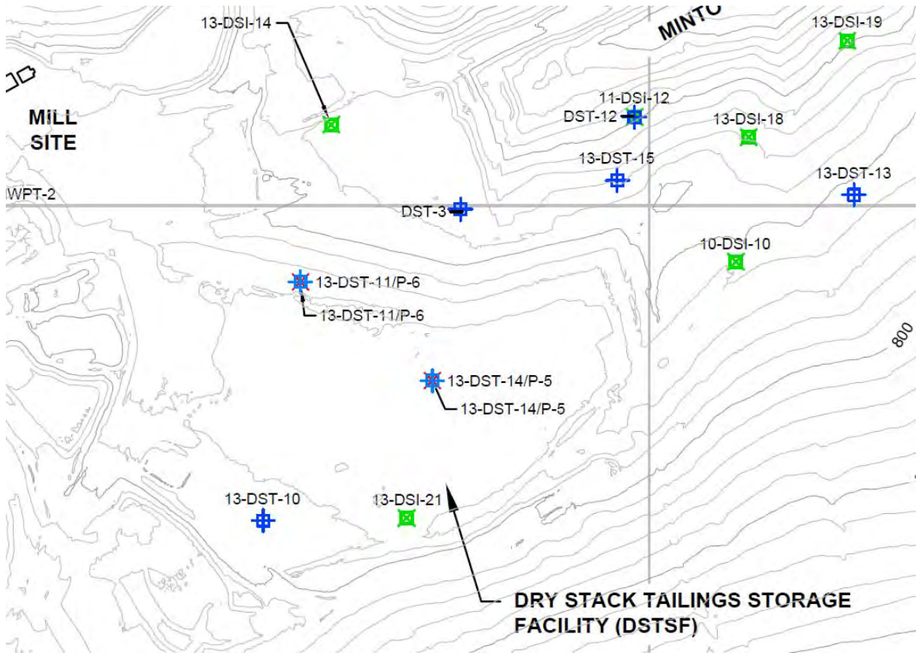


DSI-21

Magnitude Displacement between top and bottom of inclinometer (mm)



@ 7-8m: Layered ice+soil, 1-2 mm lenses with 5mm soil separation, 20% excess ice.



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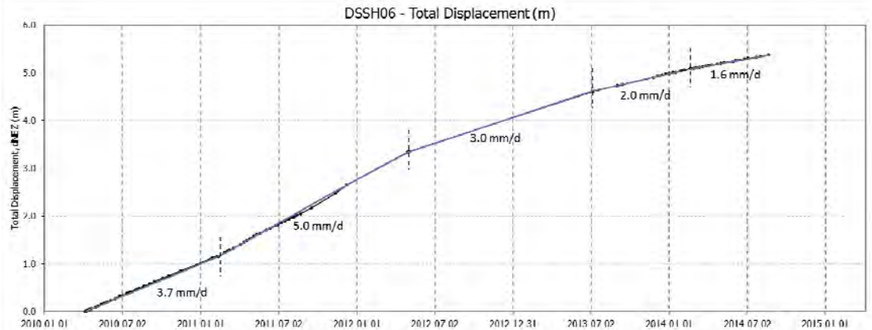
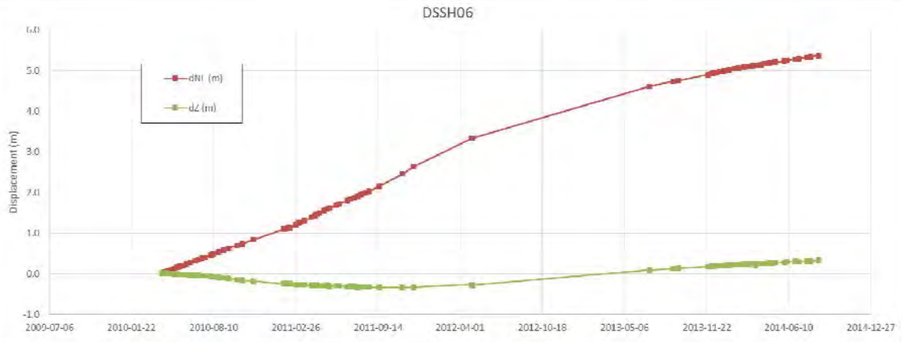
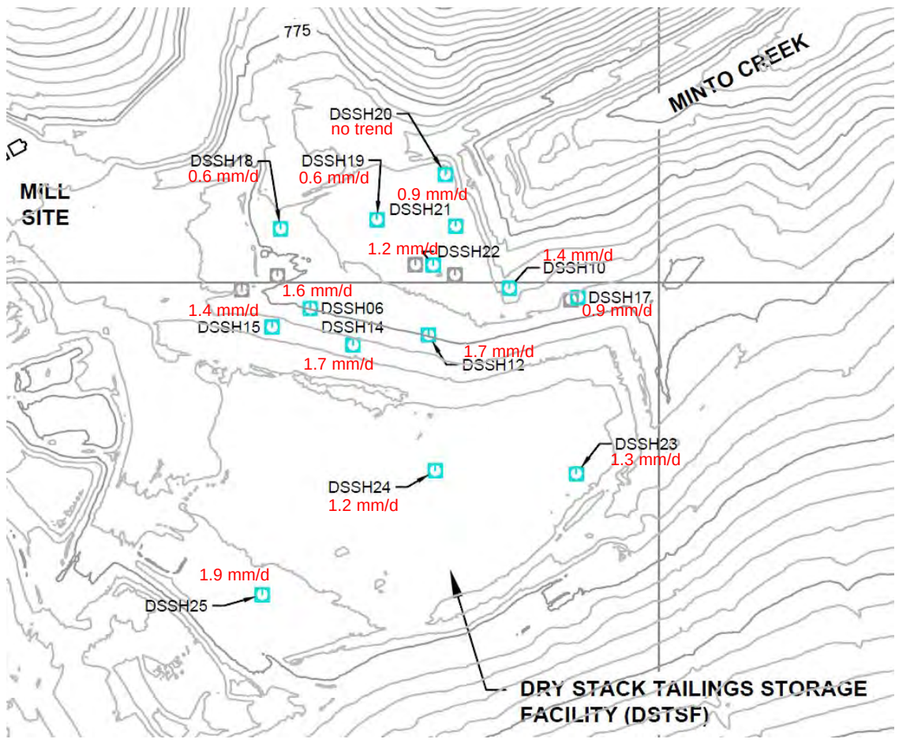
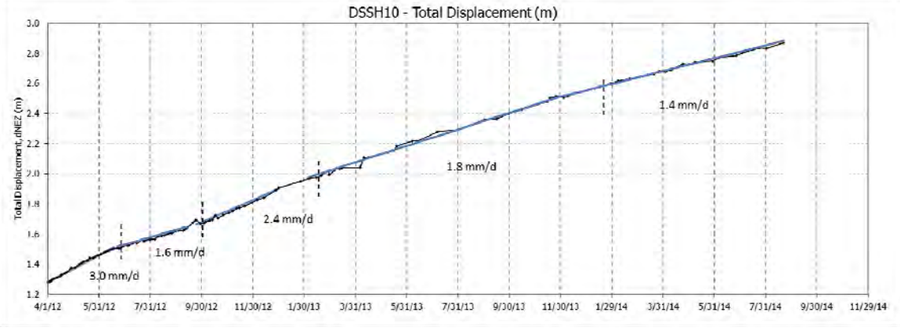
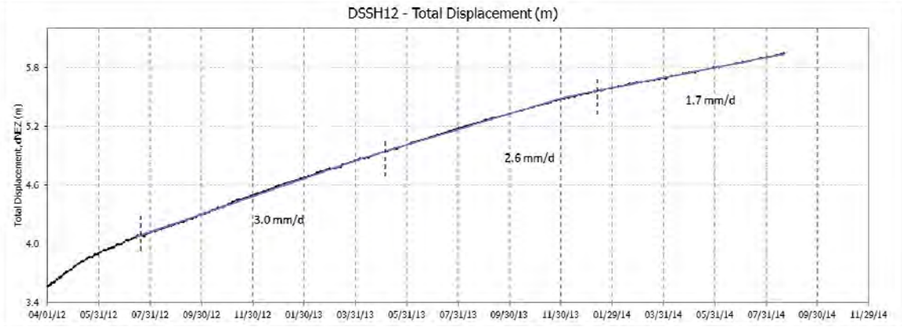
		Date: November 2014	Approved: PHM / Figure: **5**











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		DSTSF Survey Hubs (1 of 4)
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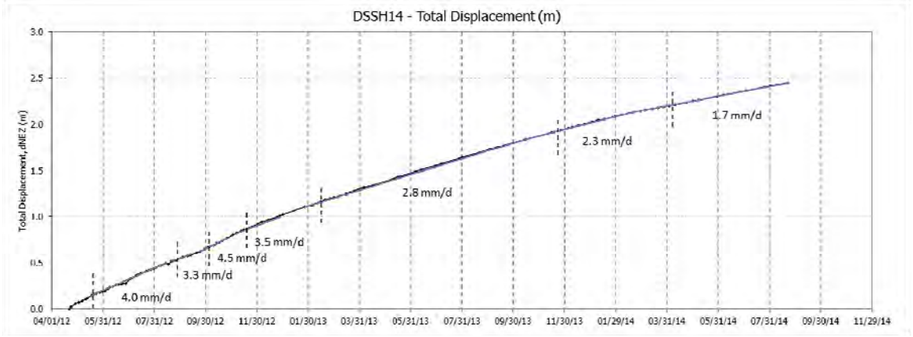

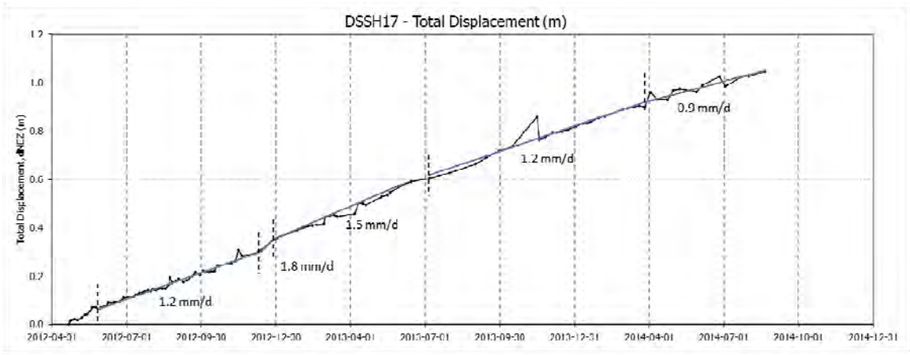

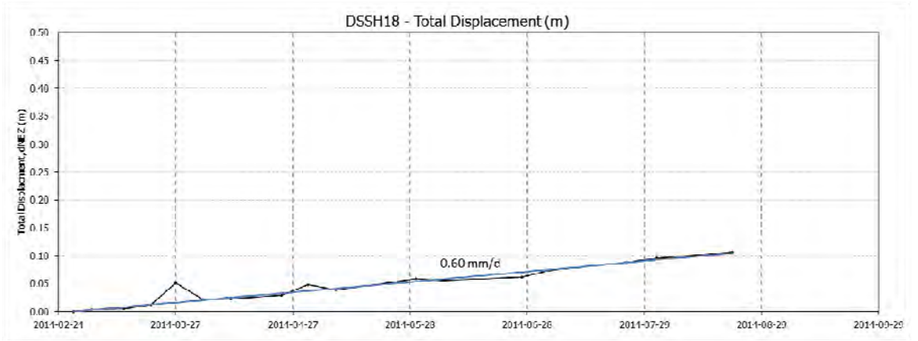

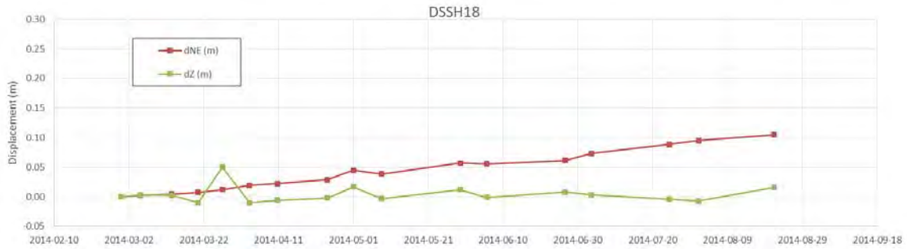

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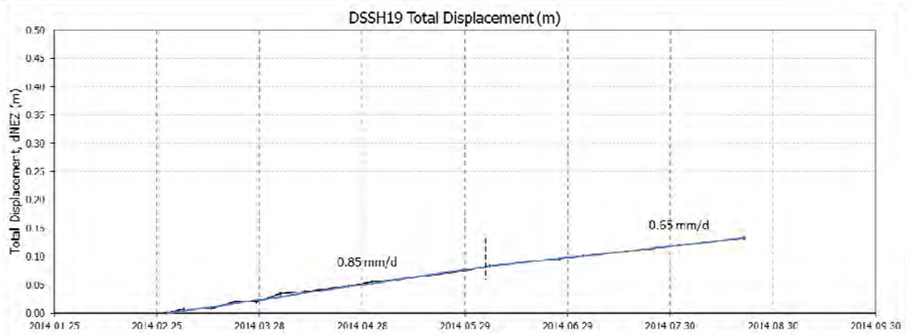
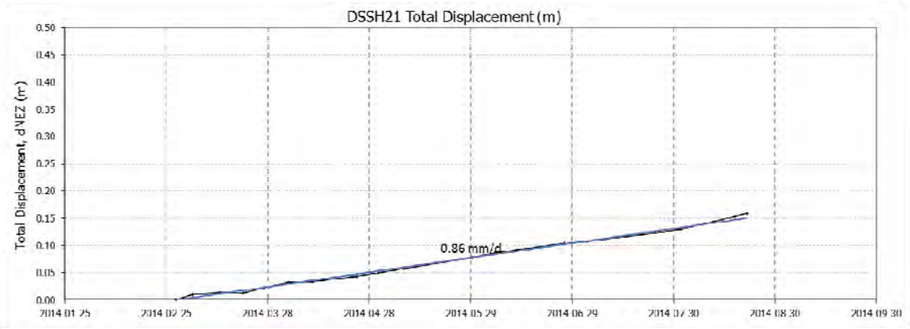
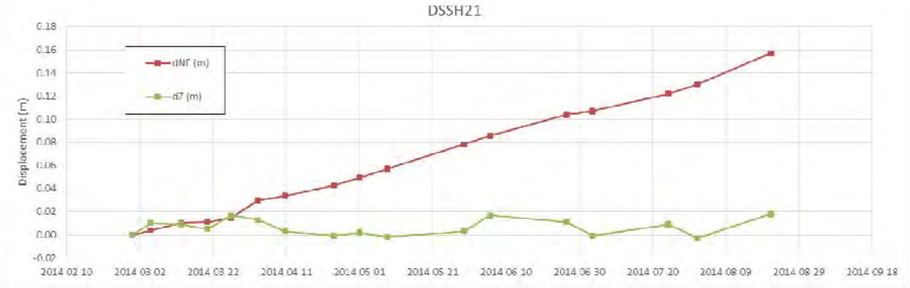
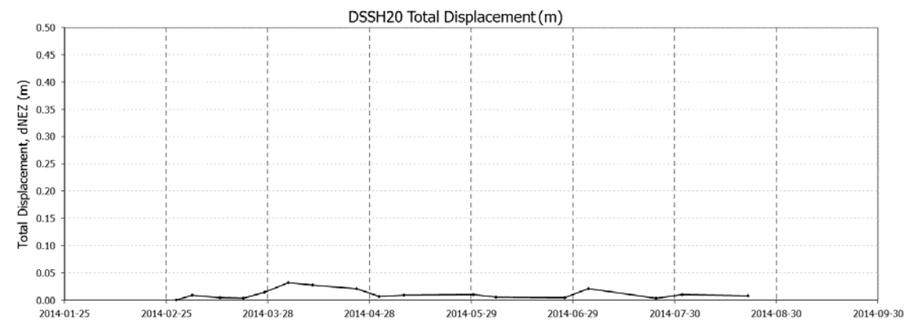
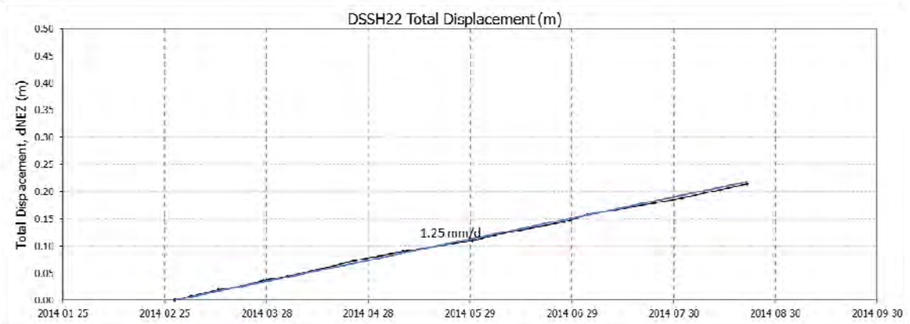
Job No: 1CM002.012.028 Filename: Minto 2014 Fall Inspection.ppt	Minto Mine	Date: November 2014	Approved: PHM	Figure: **7**

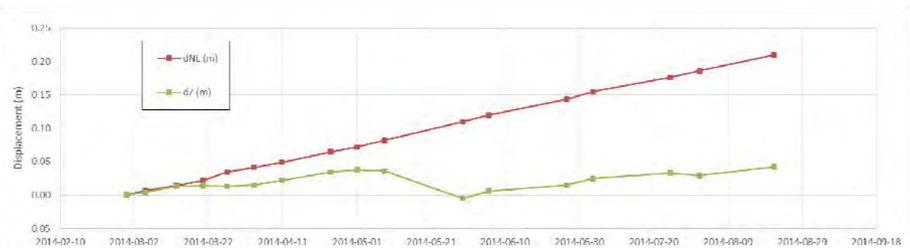












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		DSTSF Survey Hubs (3 of 4)
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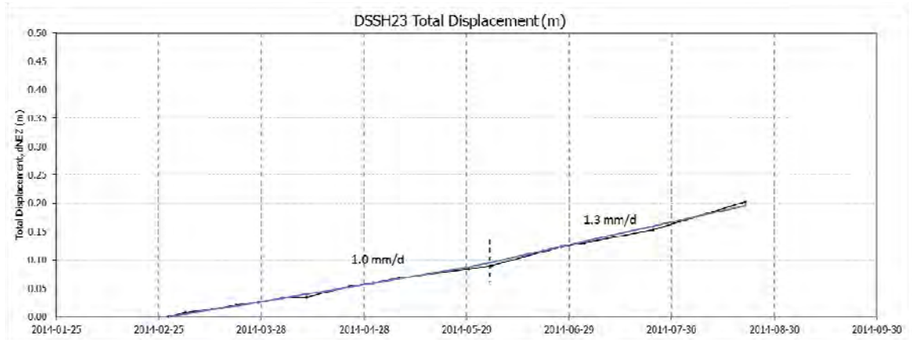

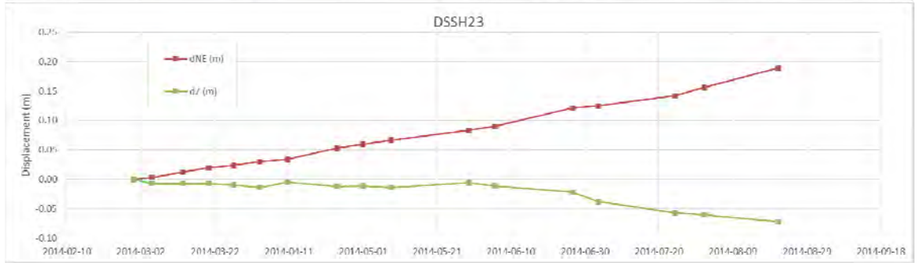

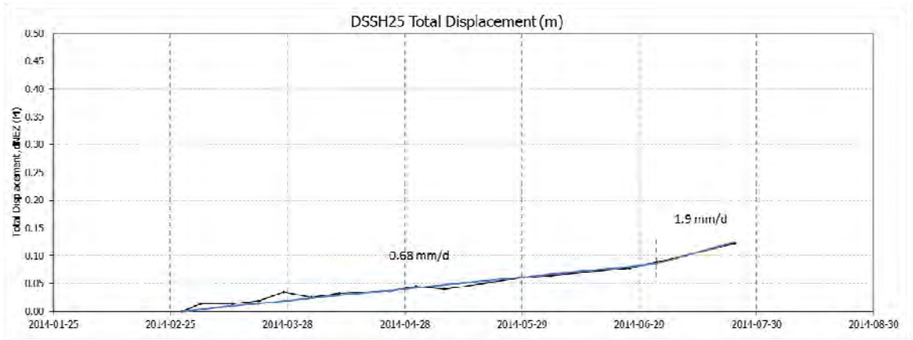

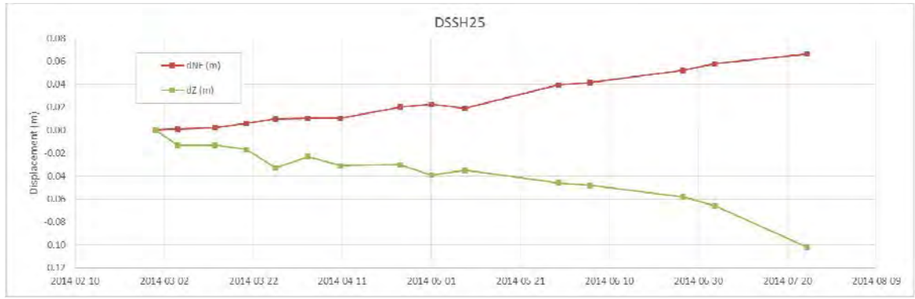

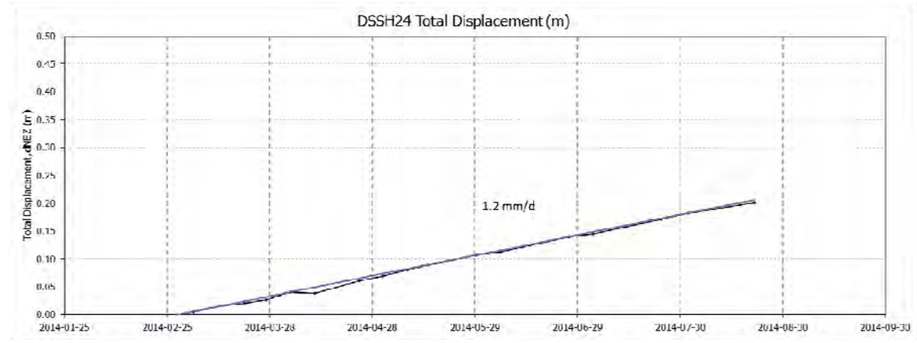

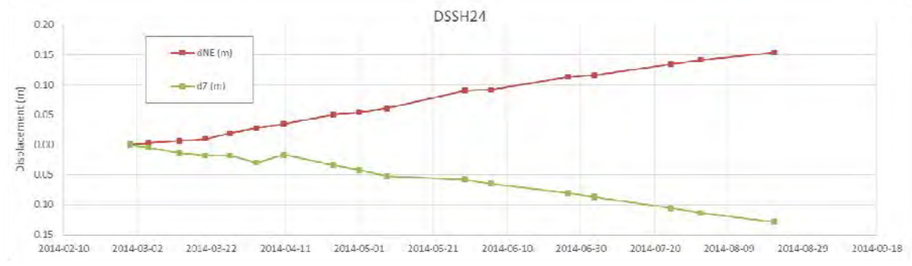

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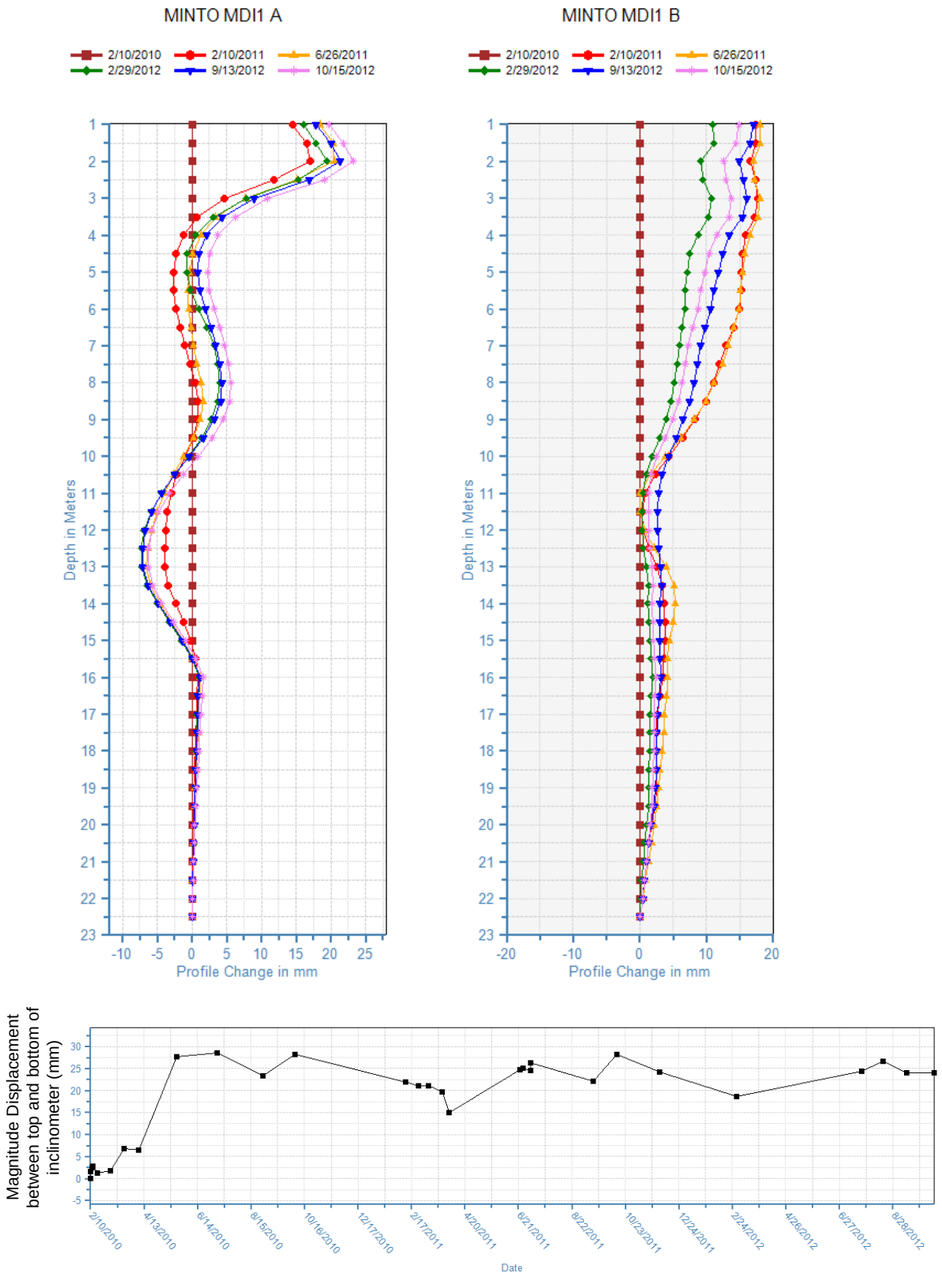
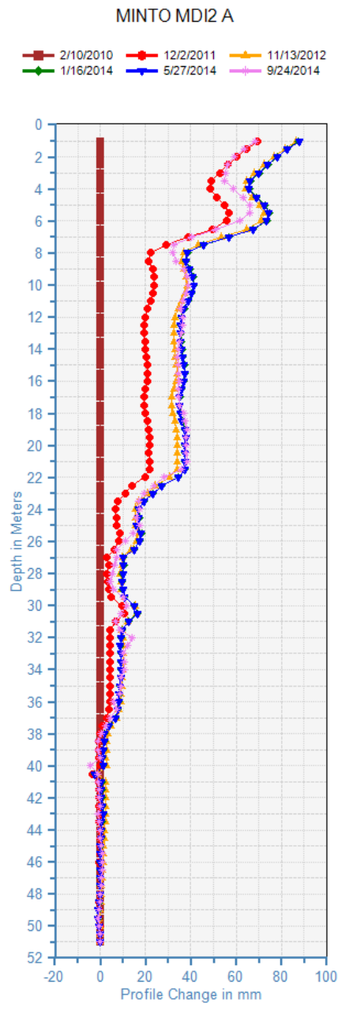
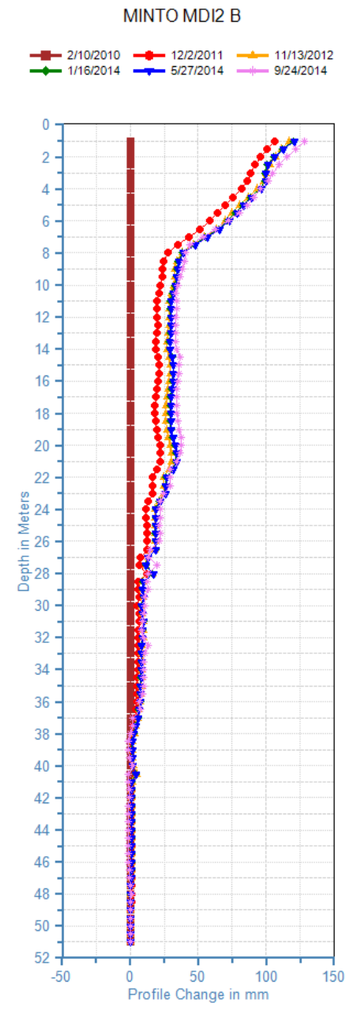
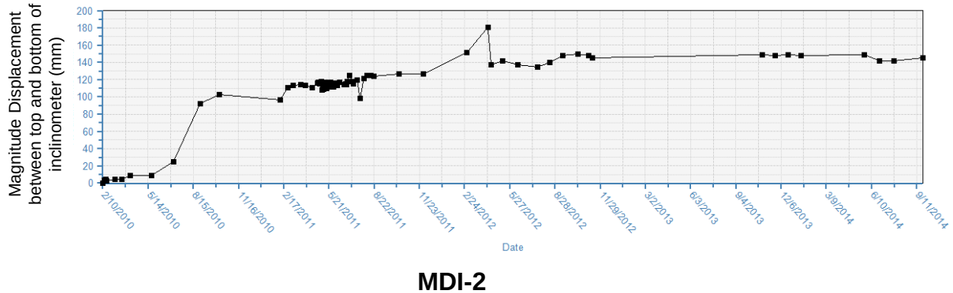
		DSTSF Survey Hubs (4 of 4)		
Job No: 1CM002.012.028 Filename: Minto 2014 Fall Inspection.ppt	Minto Mine	Date: November 2014	Approved: PHM	Figure: **9**



MDI-1

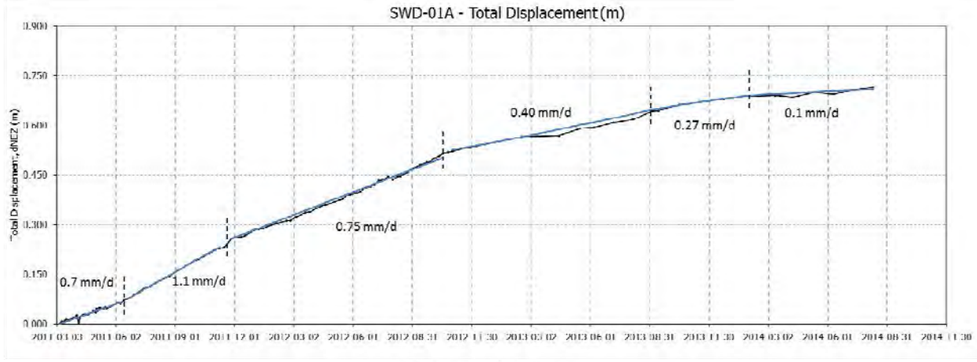




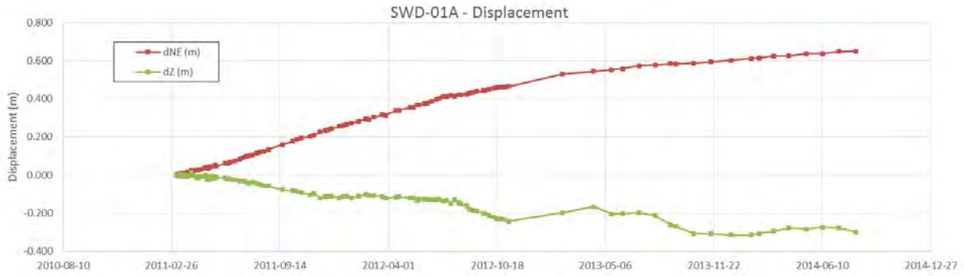


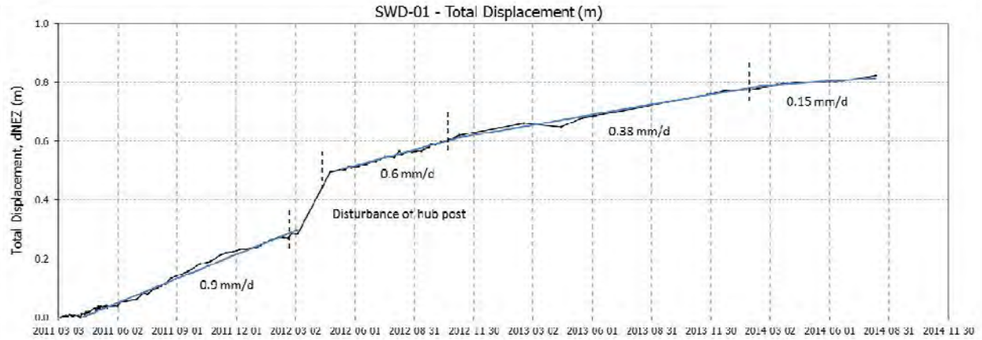
MDI-2

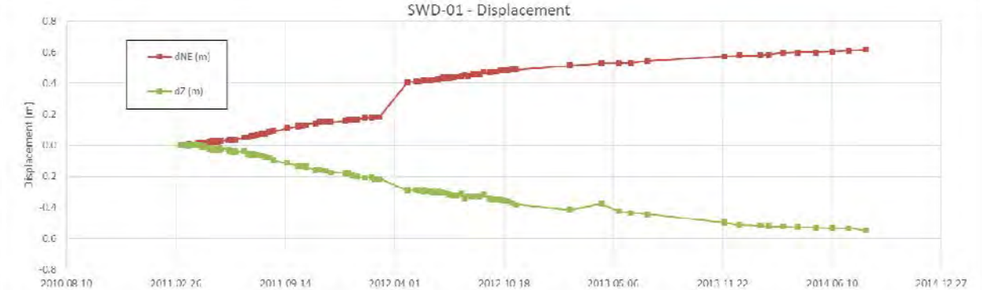
srk consulting VANCOUVER	capstone MINTO MINE OPERATED BY MINTO EXPLORATIONS LTD.	2014 Geotechnical Annual Review
		Main Waste Dump Inclinometers
Job No: 1CM002.012.028 Filename: Minto 2014 Fall Inspection.ppt	Minto Mine	Date: November 2014 / Approved: PHM / Figure: **10**

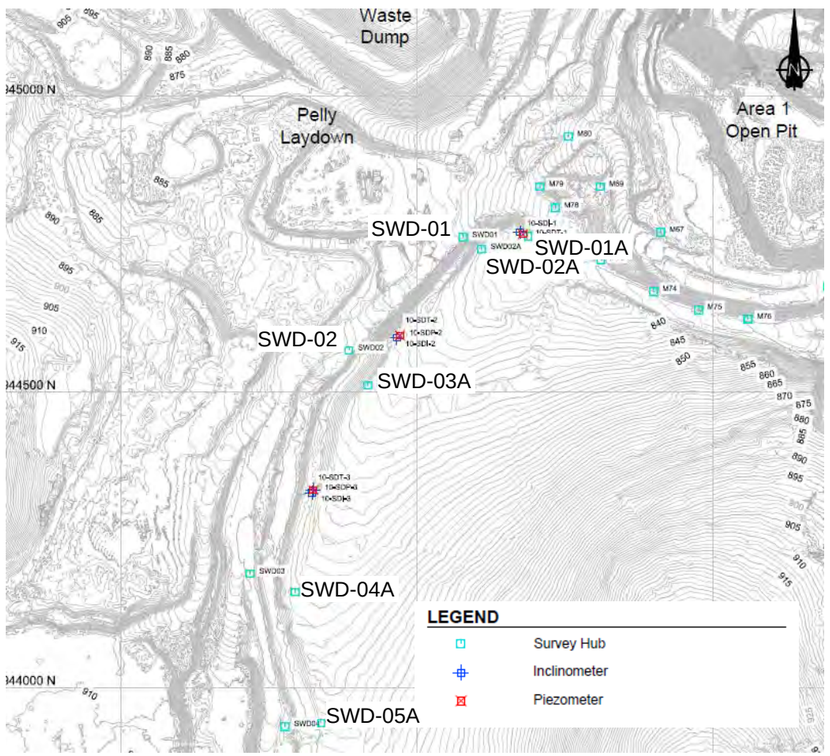


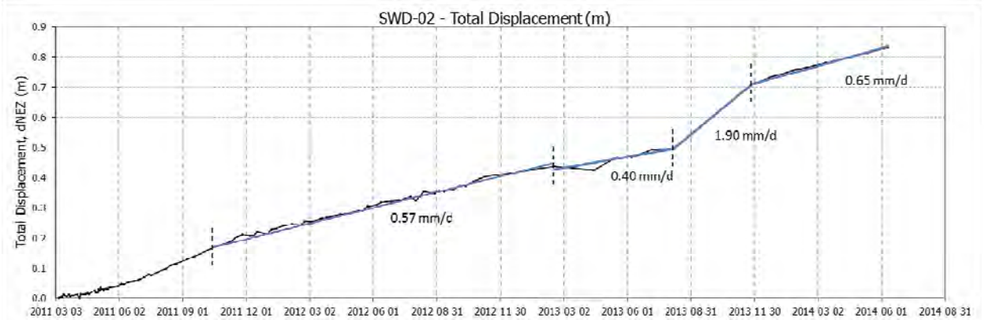
View of SWD-01A; heaved 30 cm out of the ground.



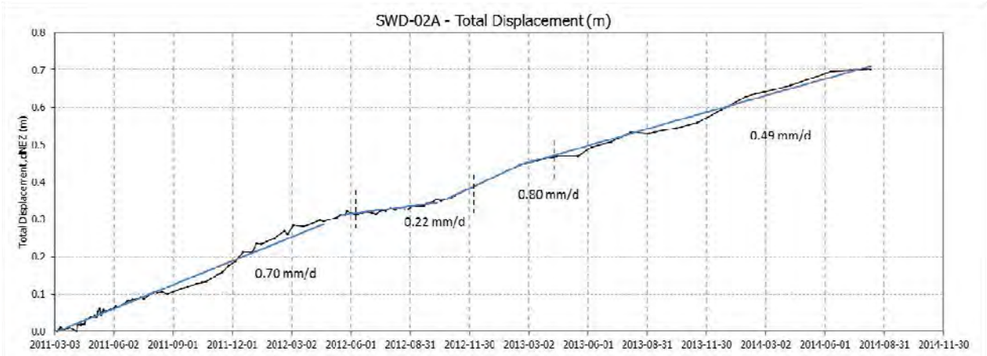


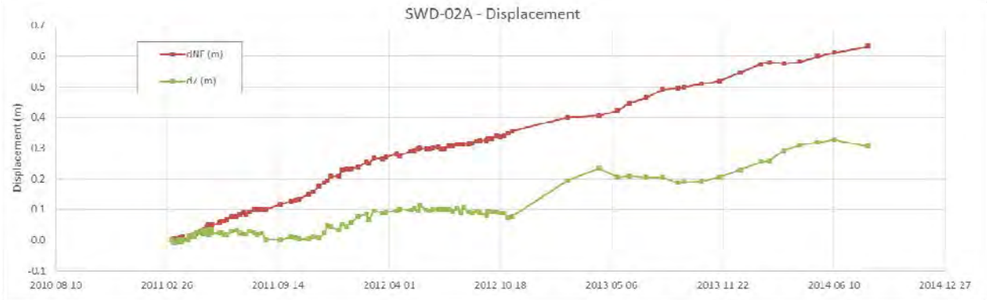


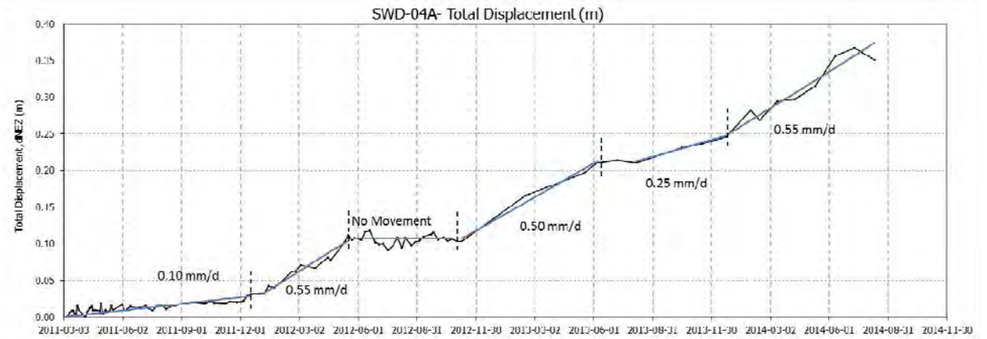


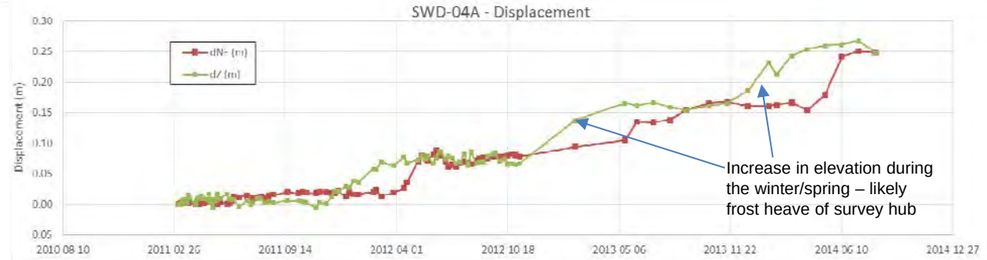


srk consulting VANCOUVER	capstone MINTO MINE OPERATED BY MINTO EXPLORATIONS LTD.	2014 Geotechnical Annual Review	
		Southwest Waste Dump Survey Hub Instrumentation (1 of 2)	
Job No: 1CM002.012.028 Filename: Minto 2014 Fall Inspection.ppt	Minto Mine	Date: November 2014	Approved: PHM / Figure: **11**

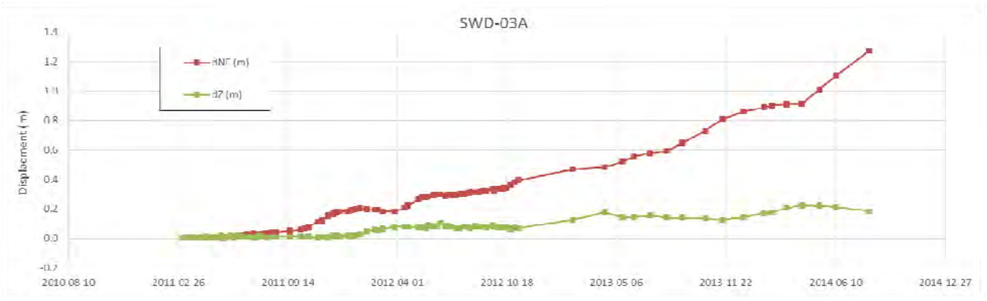


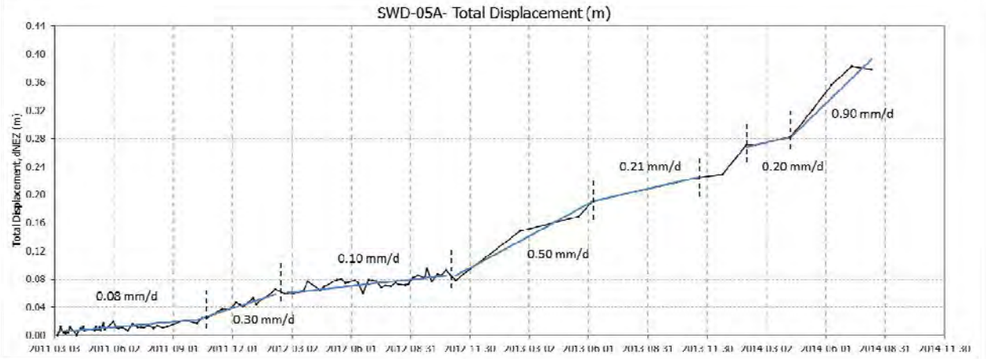


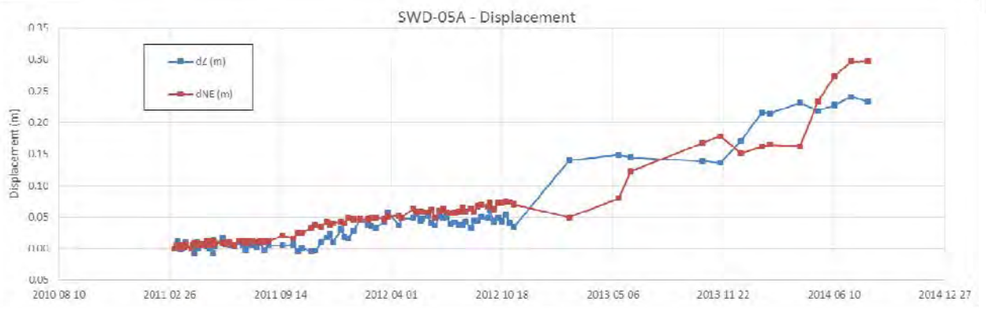




View of SWD-04A; heaved 55 cm out of the ground.







View of SWD-05A; heaved 30 cm out of the ground.

View of SWD-03A; leaning and heaved 75cm out of the ground.

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2014 Geotechnical Annual Review

Southwest Waste Dump Survey Hub Instrumentation (2 of 2)

Job No: 1CM002.012.028

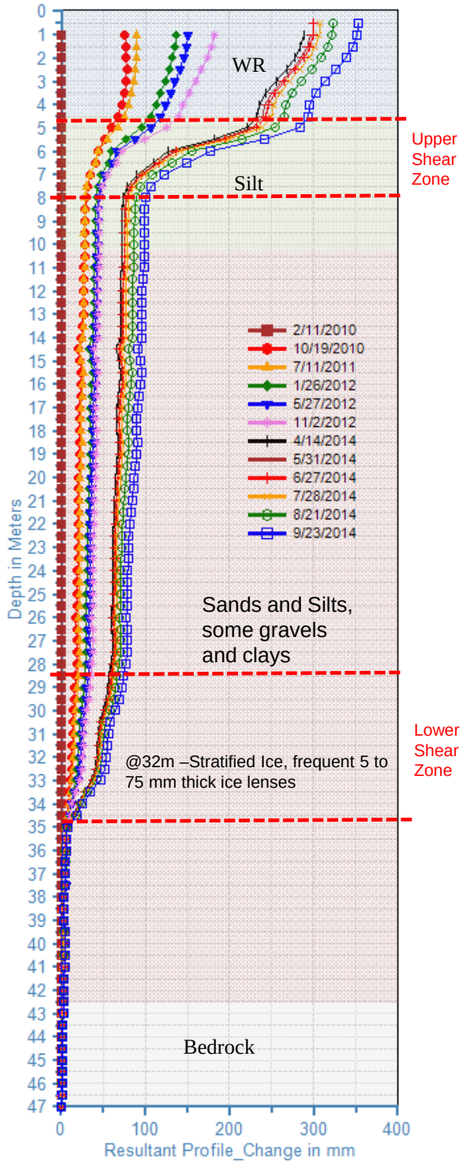
Filename: Minto 2014 Fall Inspection.ppt

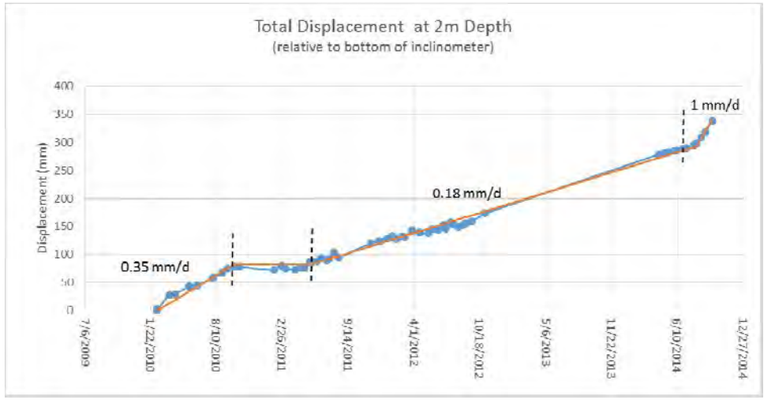
Minto Mine

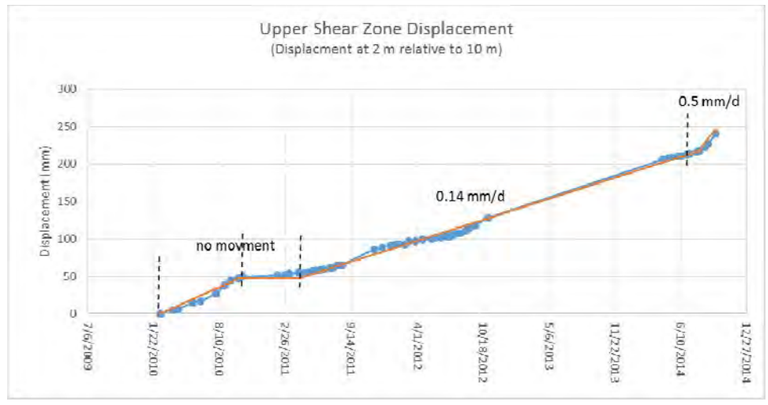
Date: November 2014

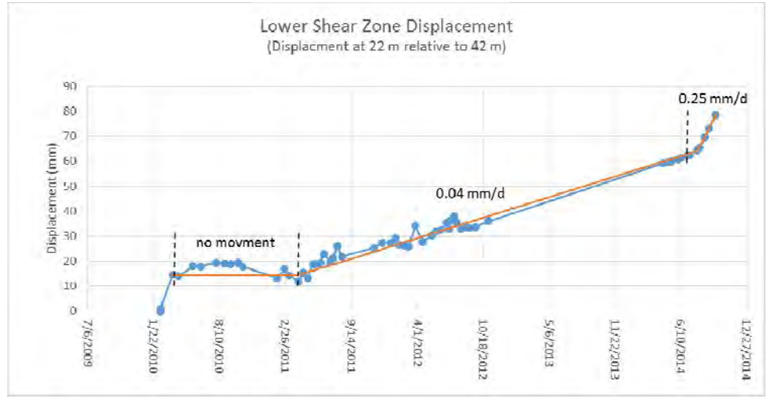
Approved: PHM

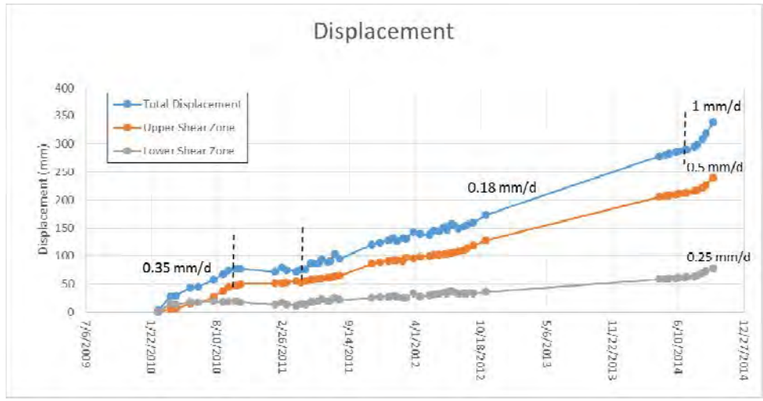
Figure: **12**

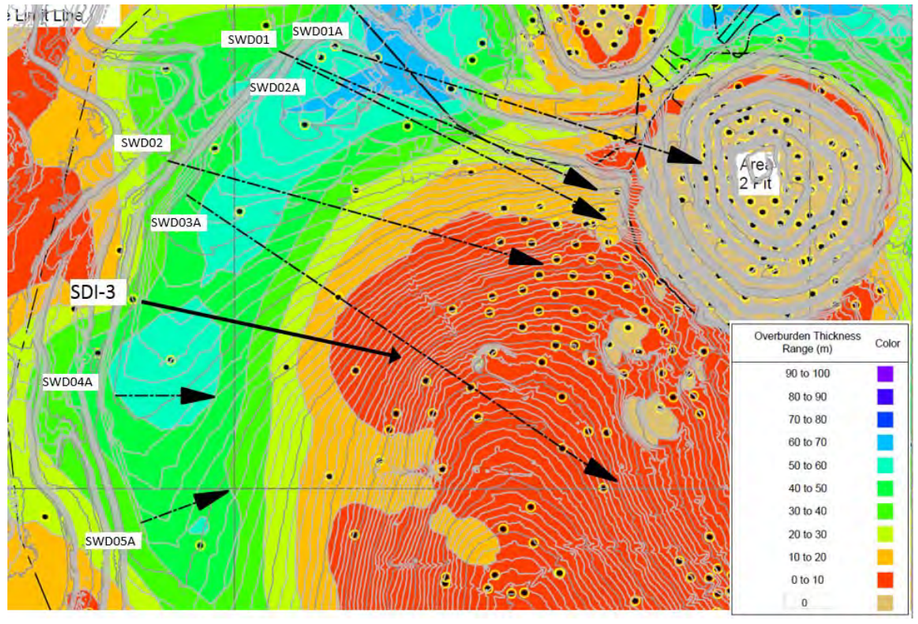










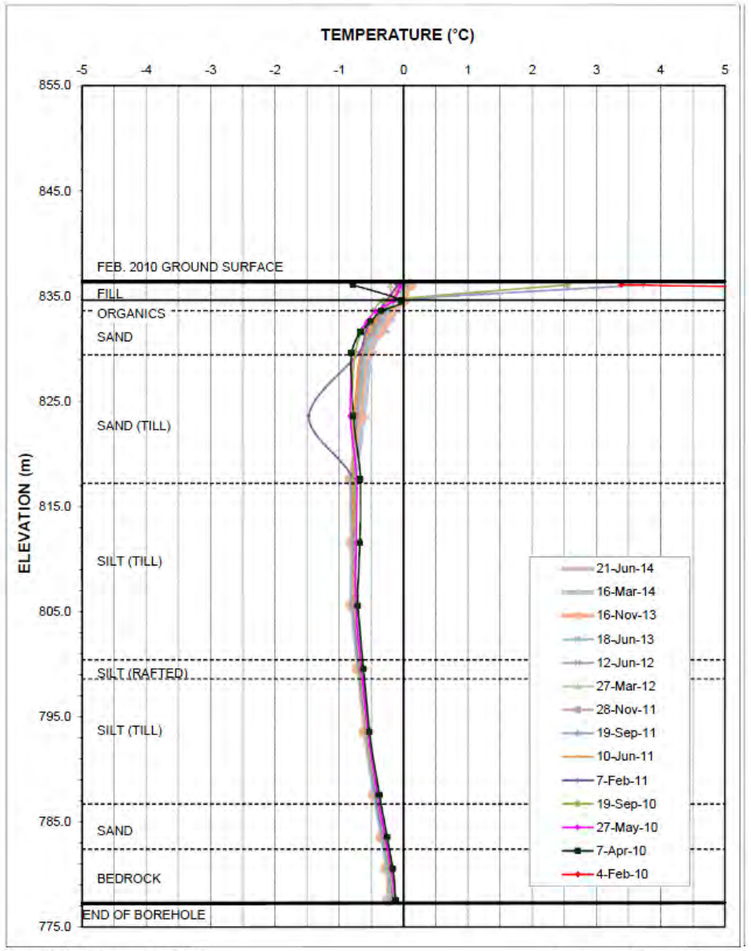


Summary of the SWD survey hub and SDI-3 inclinometer cumulative displacement vectors.

NOTES:

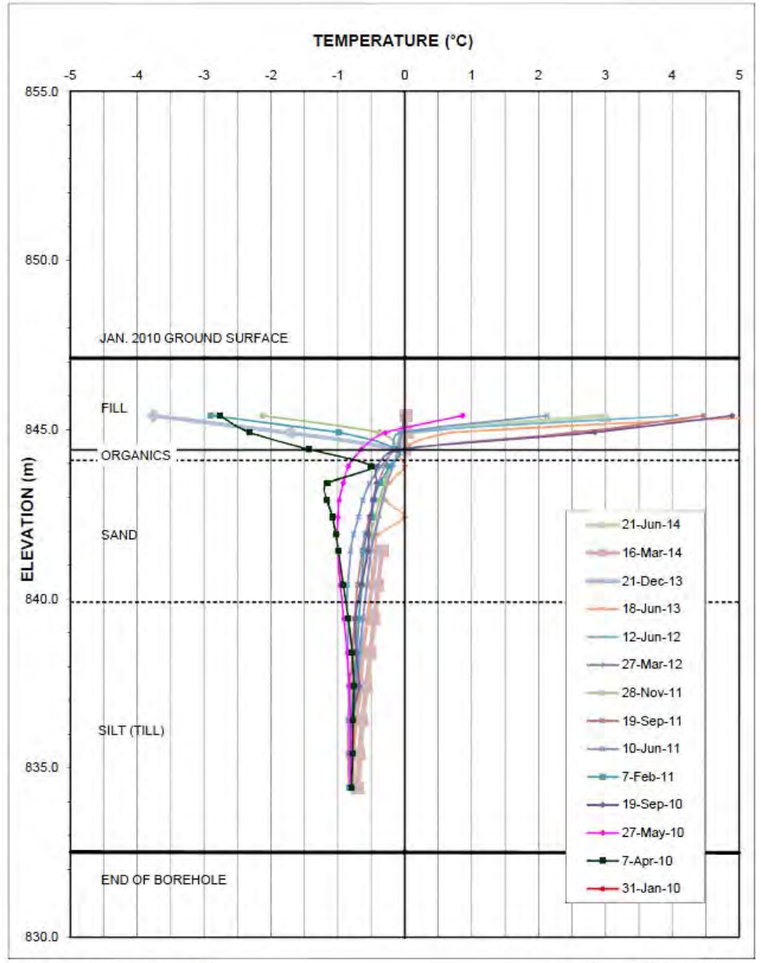
1. The scale of the vectors have been exaggerated and are indented only to indicate the direction of movement, which generally follows the slope of the bedrock surface.
2. The upper and lower shear zones at SDI-3 have the same direction of movement.

srk consulting VANCOUVER	capstone MINTO MINE OPERATED BY MINTO EXPLORATIONS LTD.	2014 Geotechnical Annual Review
		Southwest Waste Dump Inclinometer (SDI-3)
Job No: 1CM002.012.028 Filename: Minto 2014 Fall Inspection.ppt	Minto Mine	Date: November 2014 / Approved: PHM / Figure: **13**



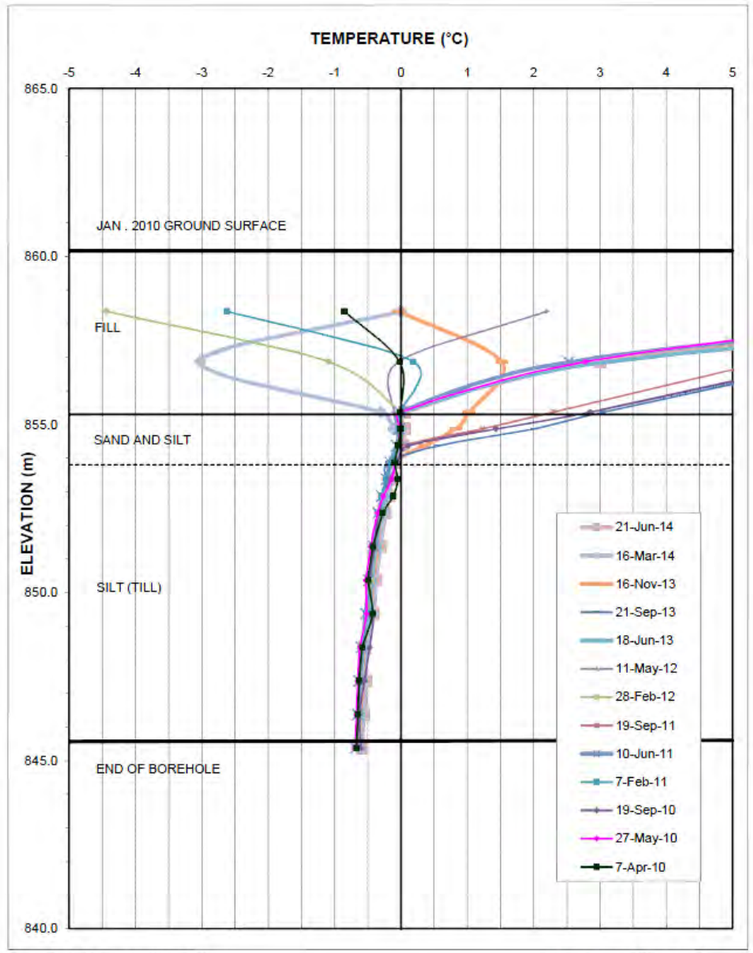
Installed: February 4, 2010

Southwest Waste Dump
Ground Temperature Profile - SDT-1



Installed: January 31, 2010

Southwest Waste Dump
Ground Temperature Profile - SDT-2



Installed: January 28, 2010

Southwest Waste Dump
Ground Temperature Profile - SDT-3

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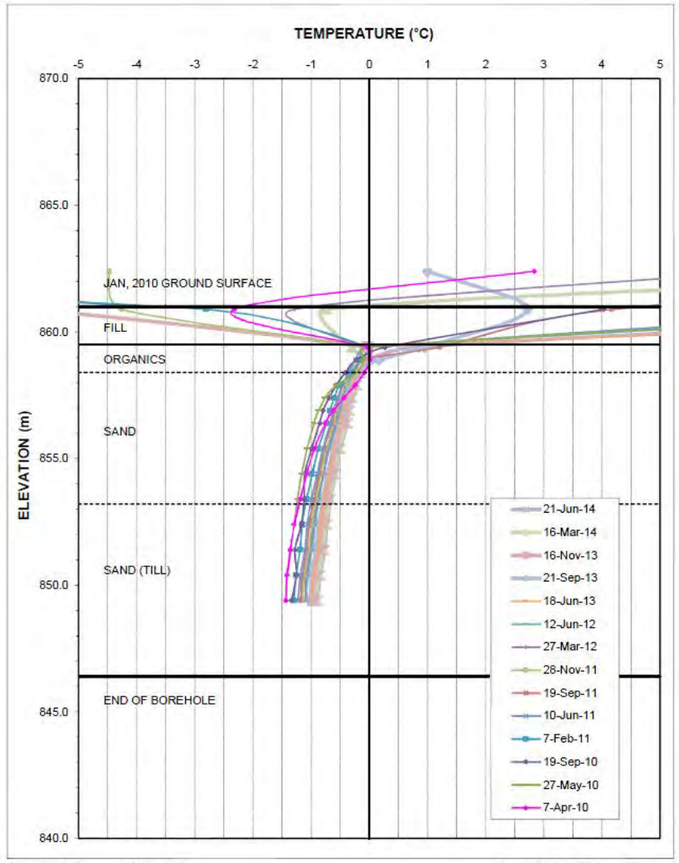
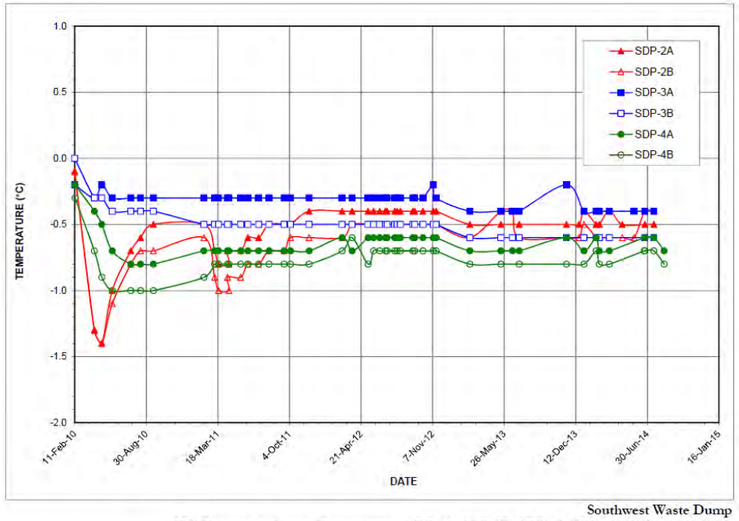
Job No: 1CM002.012.028 Filename: Minto 2014 Fall Inspection.ppt	Minto Mine	**Southwest Waste Dump Ground Temperature Sensors**	
		Date: November 2014	Approved: PHM / Figure: **14**

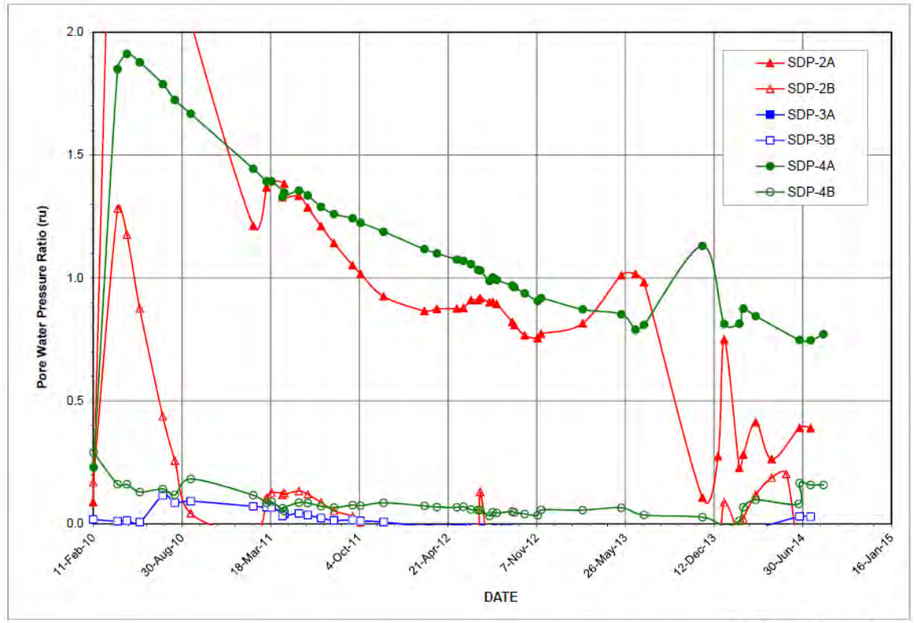


Installed: January 30, 2010

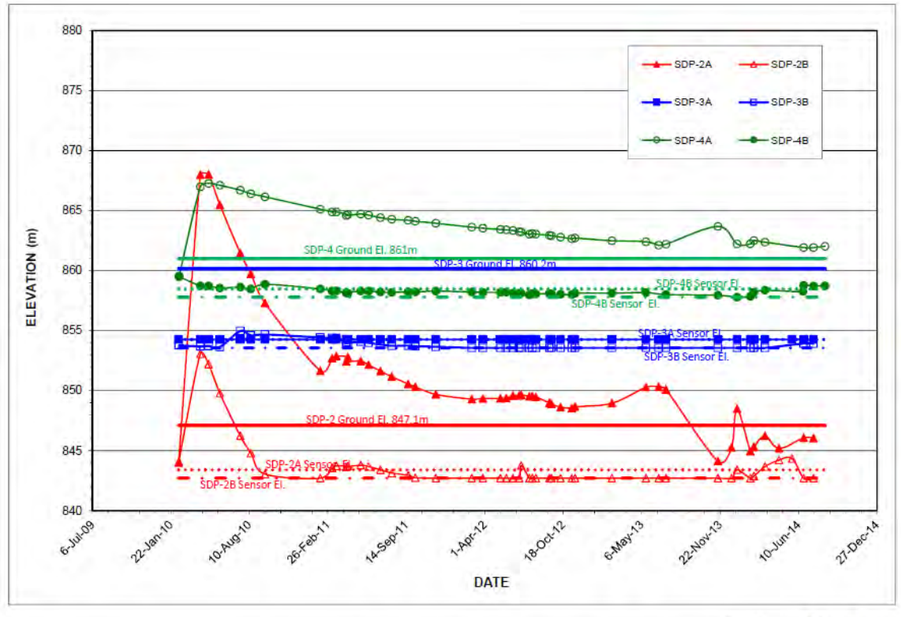
Southwest Waste Dump
Ground Temperature Profile - SDT-4



Southwest Waste Dump
VW Piezometer Sensor Temperature - SDP-2A, SDP-2B, SDP-3A, SDP-3B, SDP-4A, SDP-4B



Southwest Waste Dump
Pore Water Pressure Ratio - SDP-2A, SDP-2B, SDP-3A, SDP-3B, SDP-4A, SDP-4B



Southwest Waste Dump
Instrument Water Elevation - SDP-2A, SDP-2B, SDP-3A, SDP-3B, SDP-4A, SDP-4B

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2014 Geotechnical Annual Review

SW Waste Dump Temperature and Piezometer Sensors

Job No:	1CM002.012.028
Filename:	Minto 2014 Fall Inspection.ppt

Minto Mine

Date:	Approved:	Figure:
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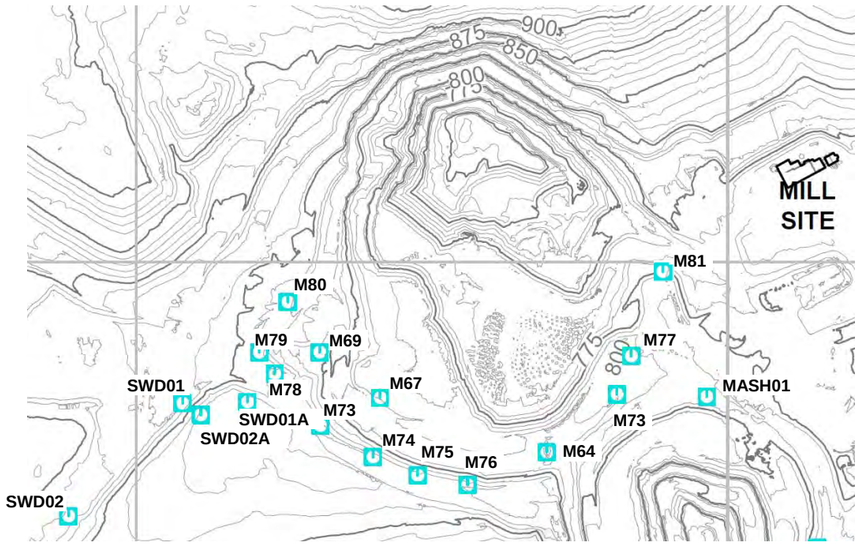
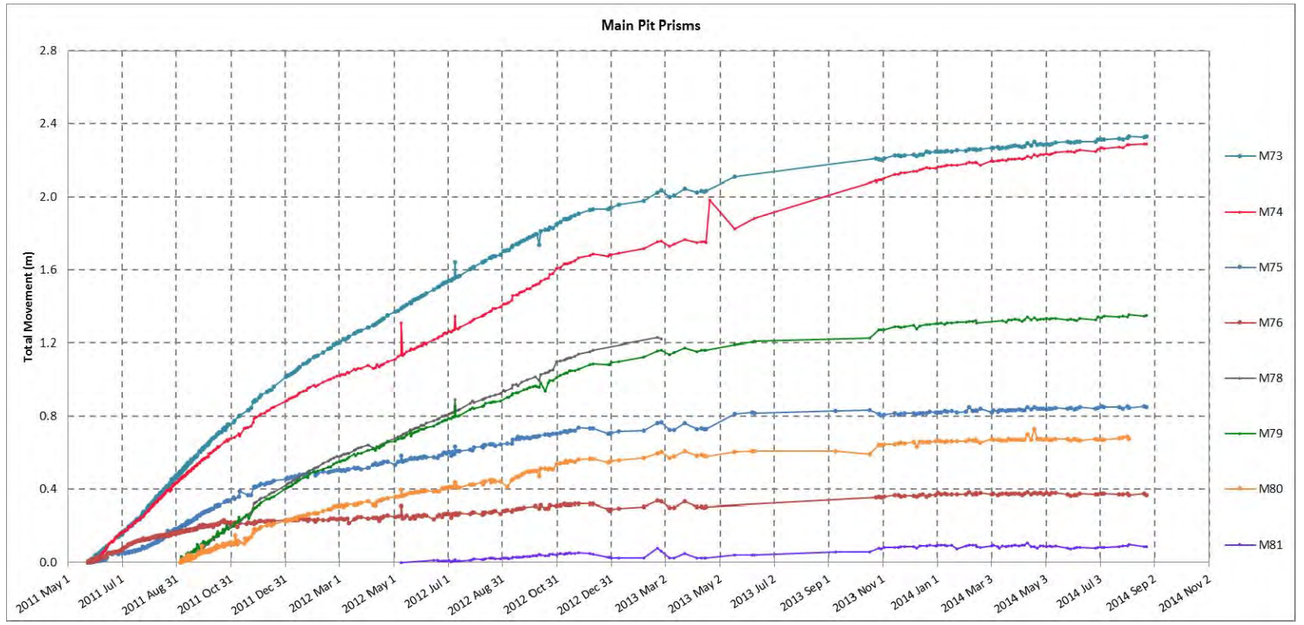


Survey Hub Locations



Survey Hub	Current Rate of Movement, dNEZ (mm/day)	Inspection Comment
M73	0.3	
M74	0.5	Heaved approx. 30cm above ground, and leaning towards the pit by ~20cm.
M75	0.1	
M76	no movement	
M79	0.1	Not Inspected.
M80	no movement	Not Inspected.
M81	no movement	Not Inspected.

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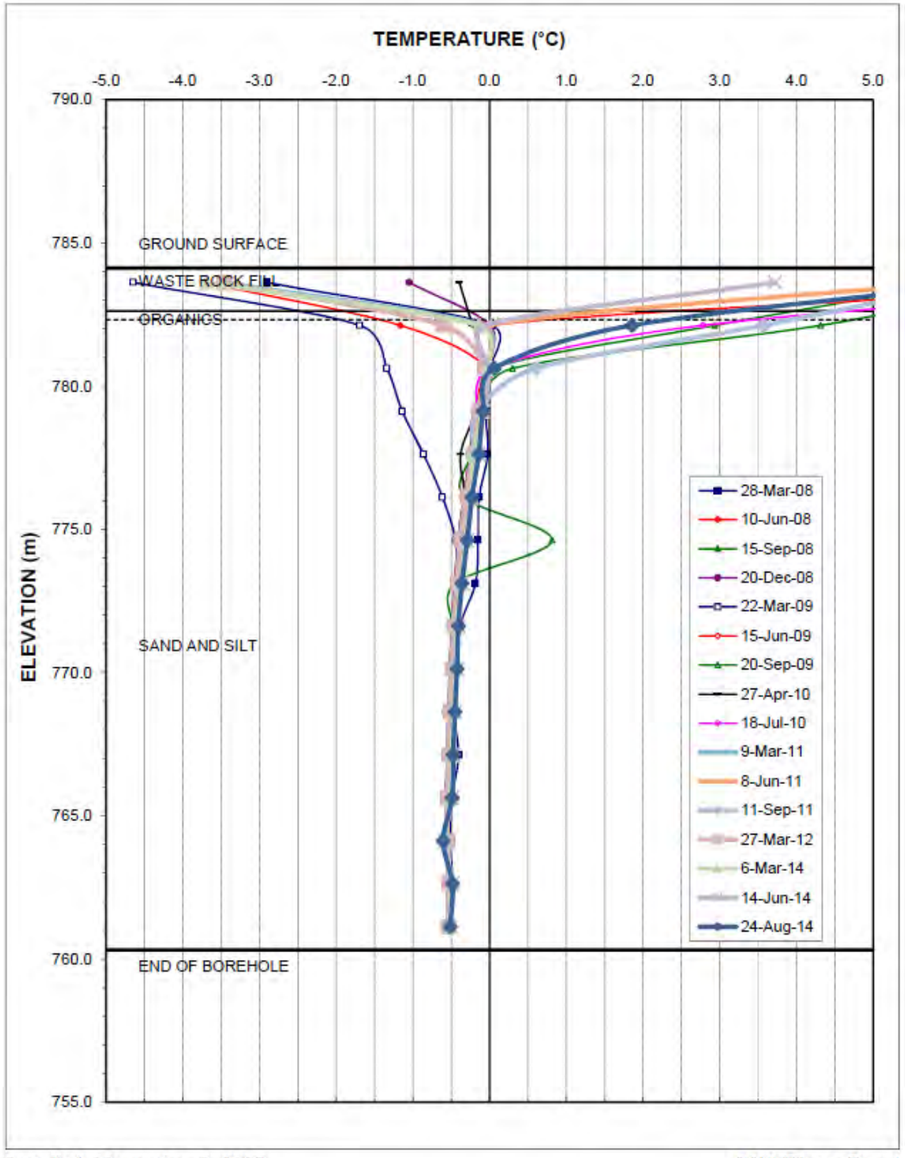
2014 Geotechnical Annual Review

Main Pit South Wall Survey Hubs

Job No: 1CM002.012.028
Filename: Minto 2014 Fall Inspection.ppt

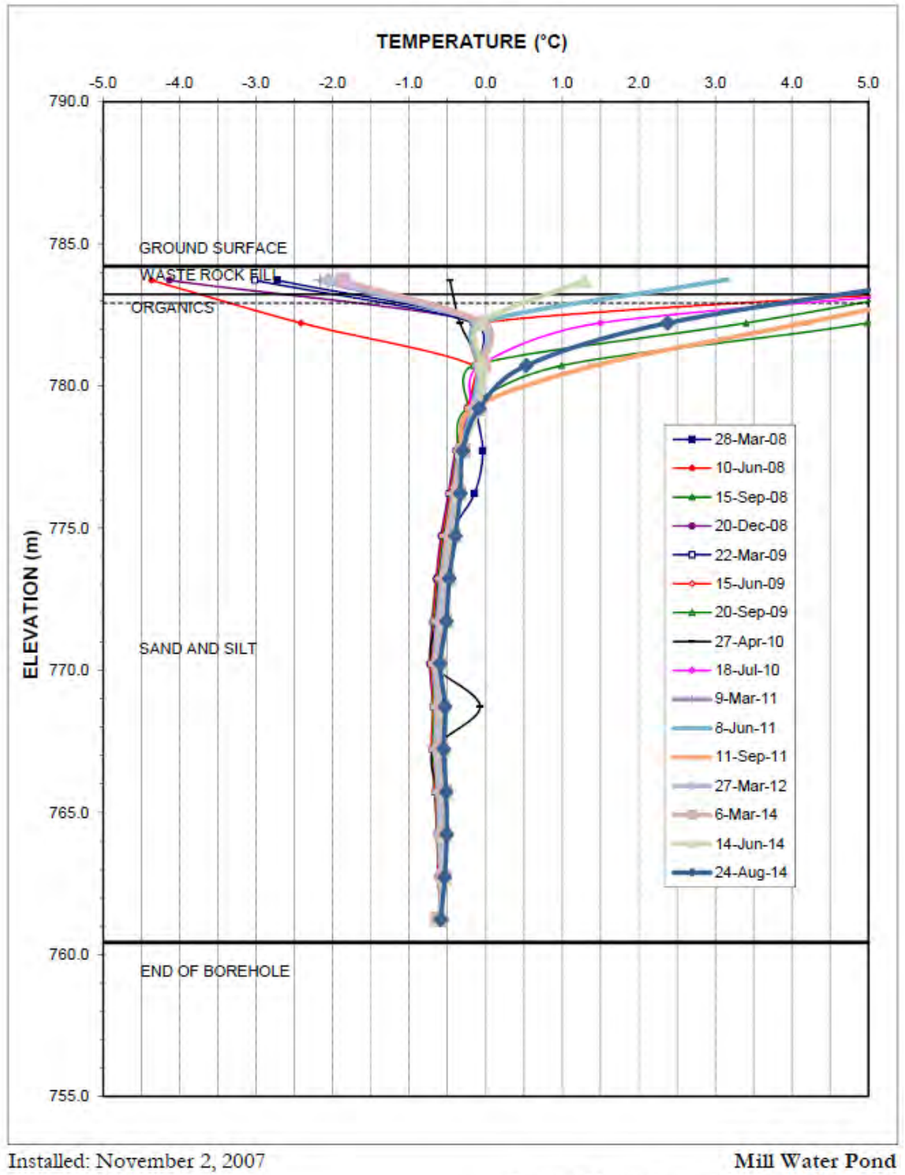
Minto Mine

Date: November 2014
Approved: PHM
Figure: **16**



Installed: November 2, 2007

Mill Water Pond
Ground Temperature Profile - MWPT-1



Installed: November 2, 2007

Mill Water Pond
Ground Temperature Profile - MWPT-2

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Job No: 1CM002.012.028
Filename: Minto 2014 Fall Inspection.ppt

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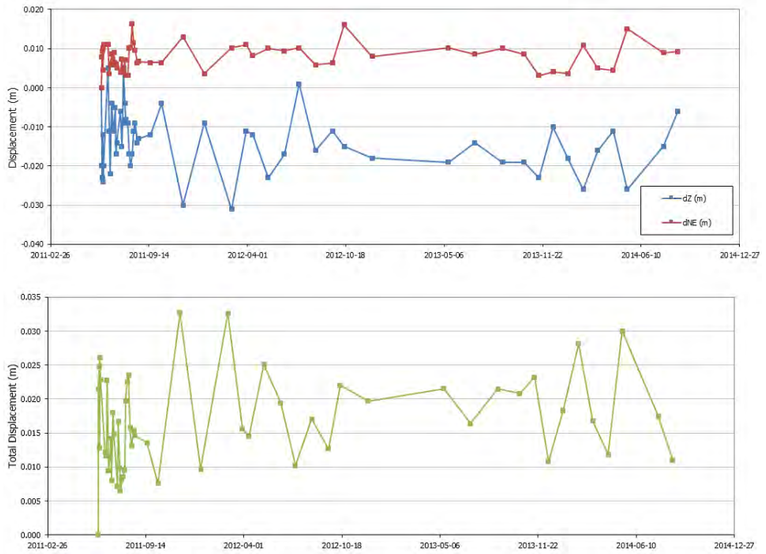
Minto Mine

2014 Geotechnical Annual Review

Mill Water Pond Ground Temperature Sensors

Date:	Approved:	Figure:
November 2014	PHM	17

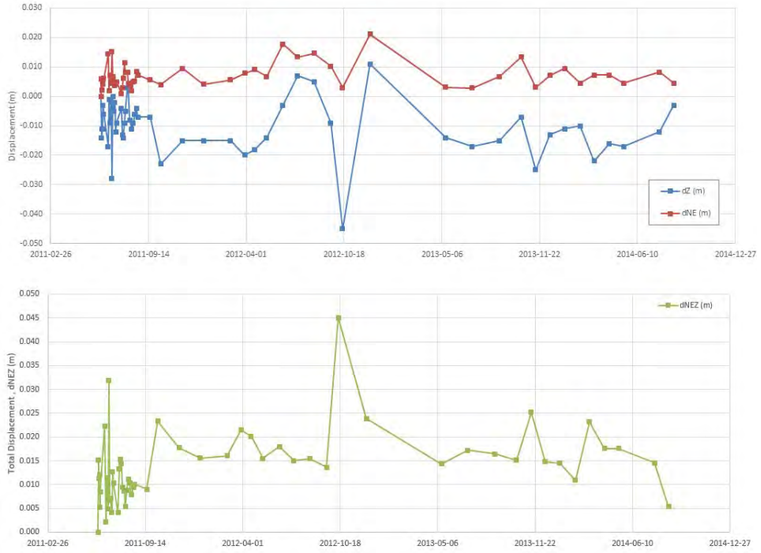
WSP-1



WSP-2

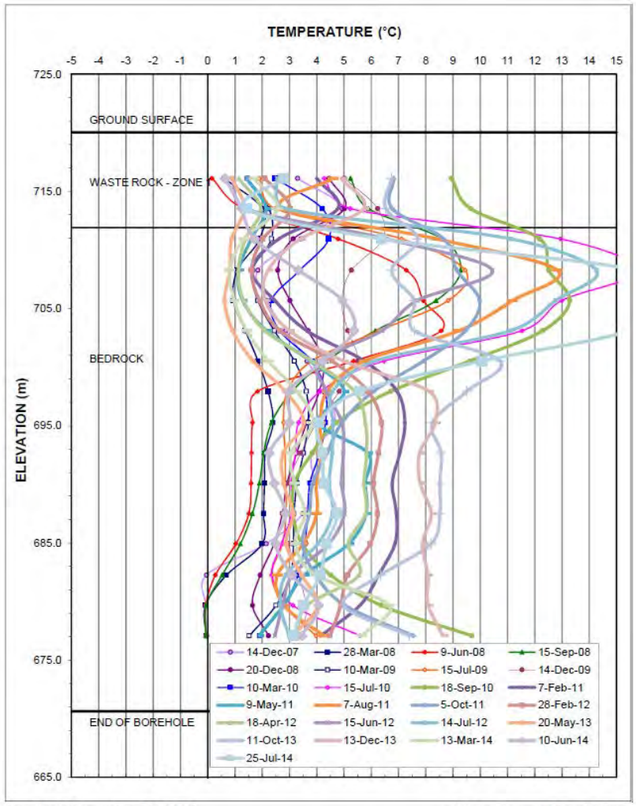
WSP-3

WSP-4



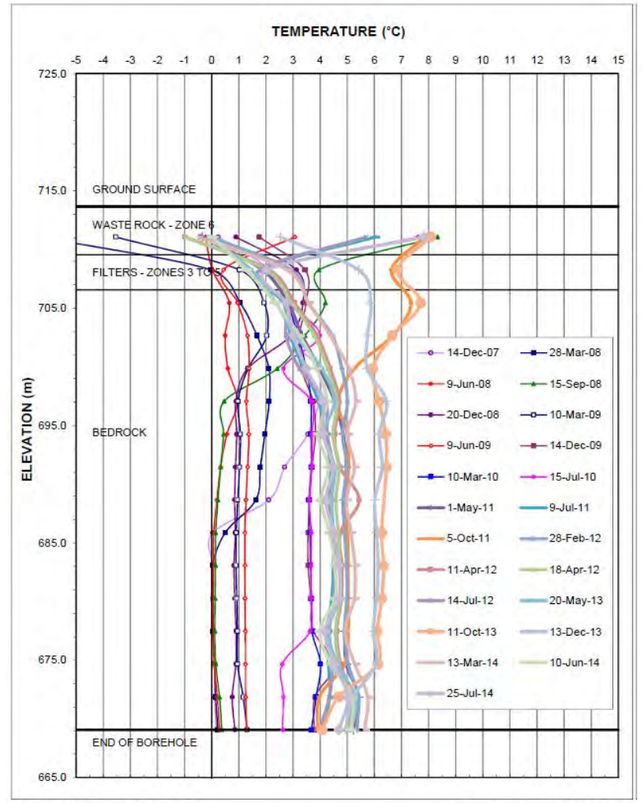
WSP-5

srk consulting VANCOUVER	capstone MINTO MINE OPERATED BY MINTO EXPLORATIONS LTD.	2014 Geotechnical Annual Review	
Job No: 1CM002.012.028 Filename: Minto 2014 Fall Inspection.ppt	Minto Mine	**Water Storage Pond Survey Hubs**	
		Date: November 2014	Approved: PHM / Figure: **18**



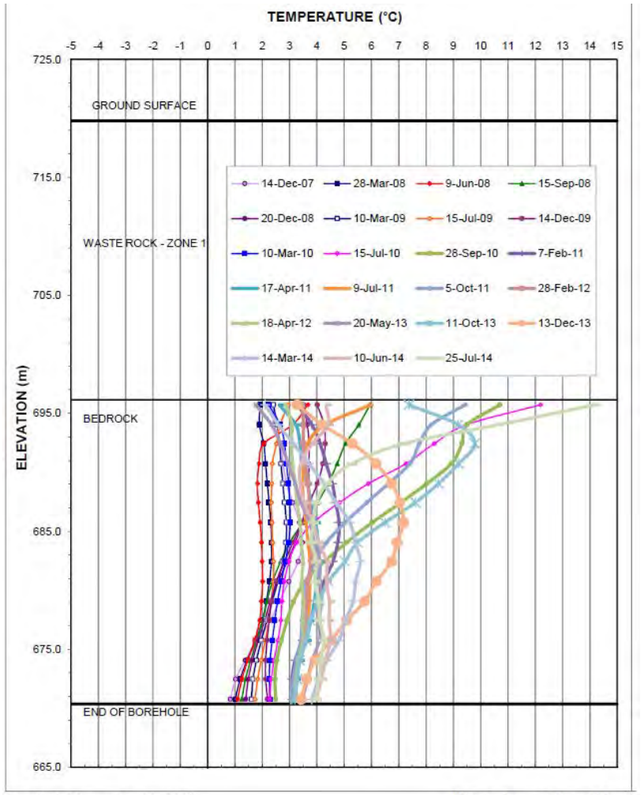
Installed: November 16, 2007

Water Storage Pond Dam
Ground Temperature Profile - WDT-1



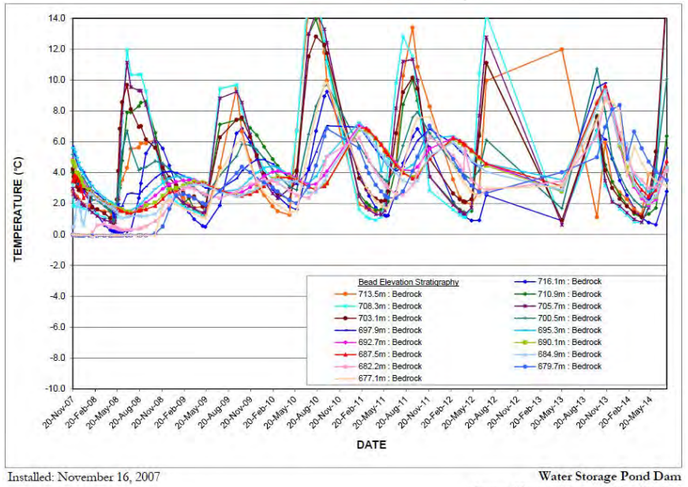
Installed: November 7, 2007

Water Storage Pond Dam
Ground Temperature Profile - WDT-2



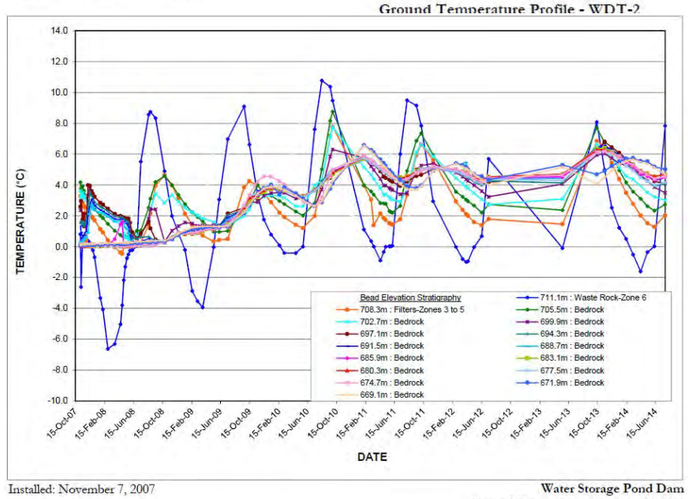
Installed: November 11, 2007

Water Storage Pond Dam
Ground Temperature Profile - WDT-3



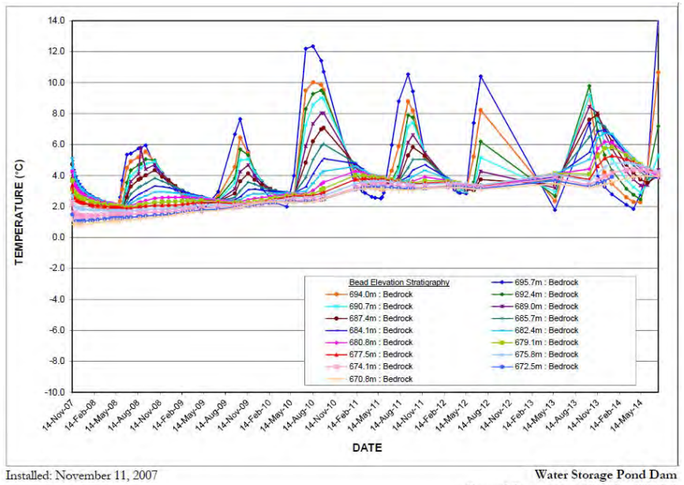
Installed: November 16, 2007

Water Storage Pond Dam
Ground Temperature Profile - WDT-1



Installed: November 7, 2007

Water Storage Pond Dam
Ground Temperature Profile - WDT-2



Installed: November 11, 2007

Water Storage Pond Dam
Ground Temperature Profile - WDT-3

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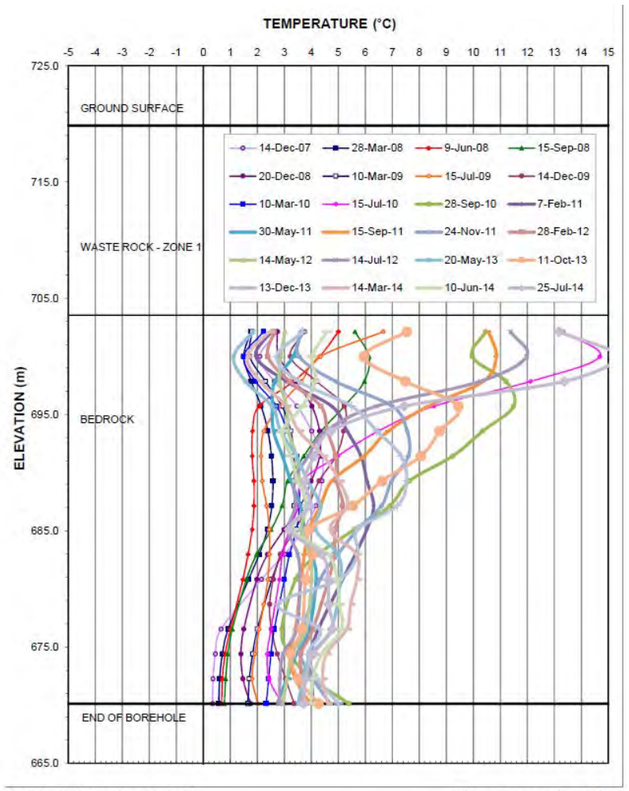
2014 Geotechnical Annual Review

Water Storage Pond Ground Temperature Sensors (1 of 3)

Job No: 1CM002.012.028
Filename: Minto 2014 Fall Inspection.ppt

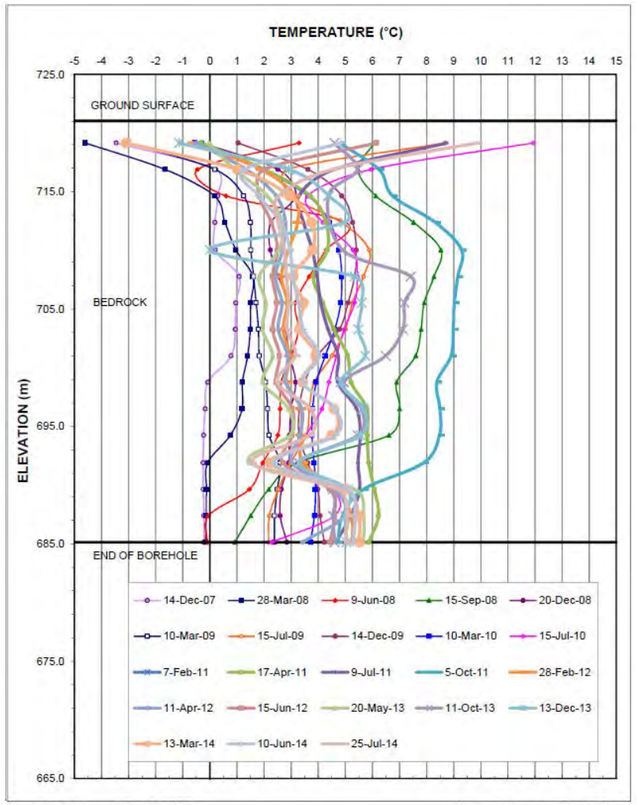
Minto Mine

Date: November 2014
Approved: PHM
Figure: **19**



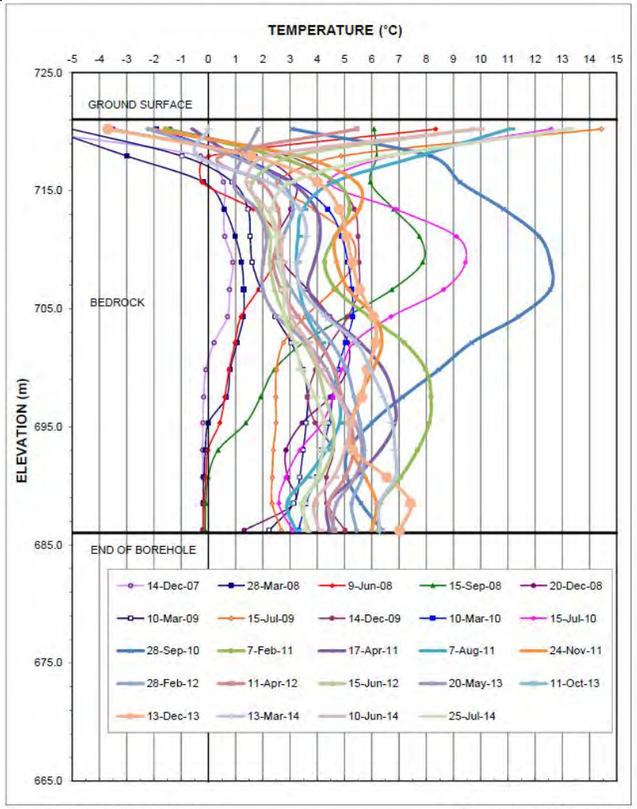
Installed: November 10, 2007

Water Storage Pond Dam
Ground Temperature Profile - WDT-4



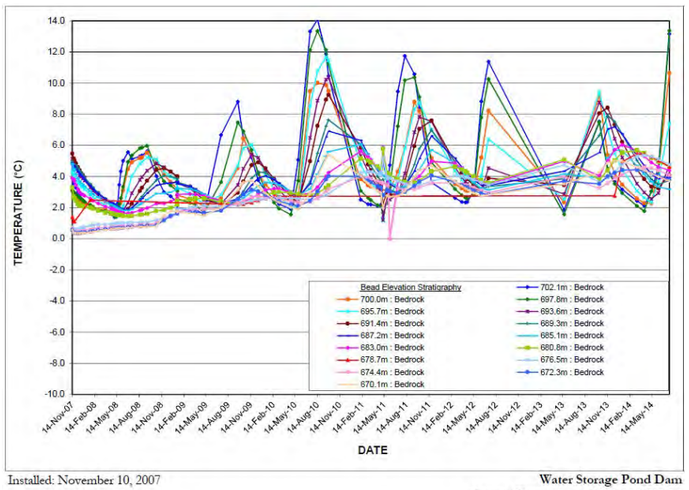
Installed: November 13, 2007

Water Storage Pond Dam
Ground Temperature Profile - WDT-5



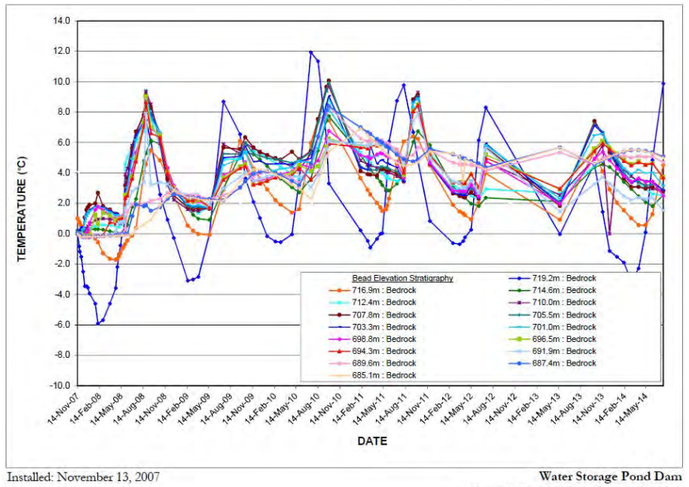
Installed: November 13, 2007

Water Storage Pond Dam
Ground Temperature Profile - WDT-6



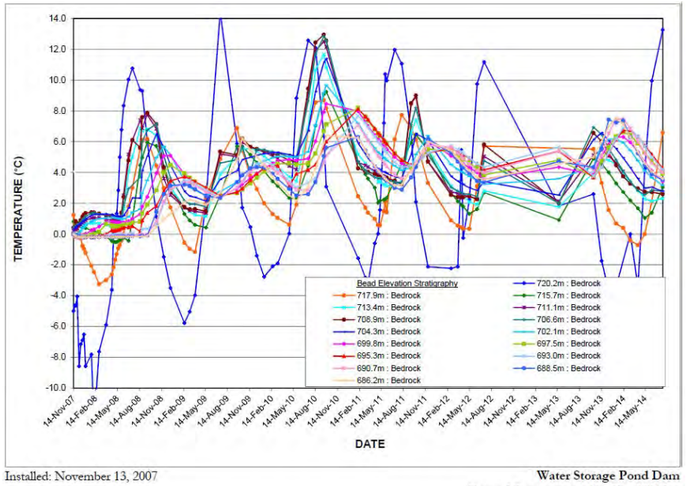
Installed: November 10, 2007

Water Storage Pond Dam
Ground Temperature Profile - WDT-4



Installed: November 13, 2007

Water Storage Pond Dam
Ground Temperature Profile - WDT-5



Installed: November 13, 2007

Water Storage Pond Dam
Ground Temperature Profile - WDT-6

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Water Storage Pond Ground Temperature Sensors (2 of 3)

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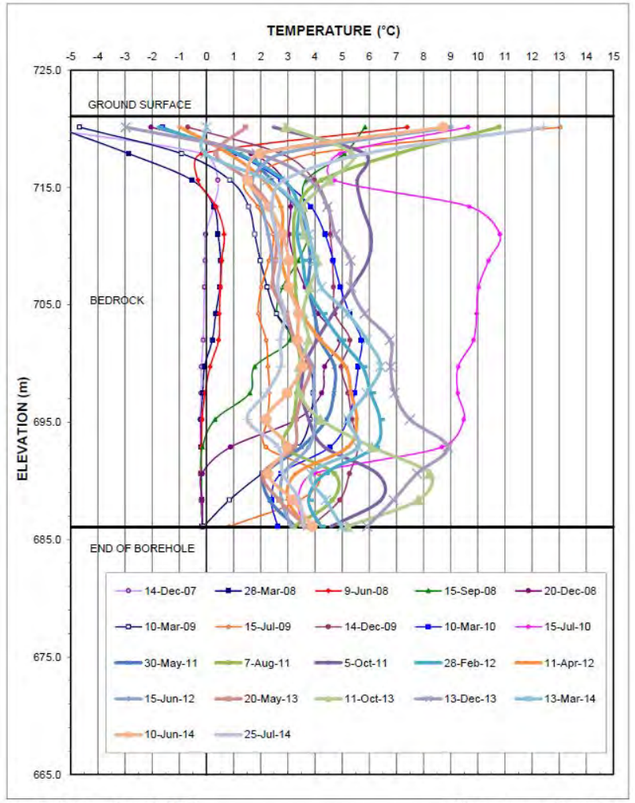
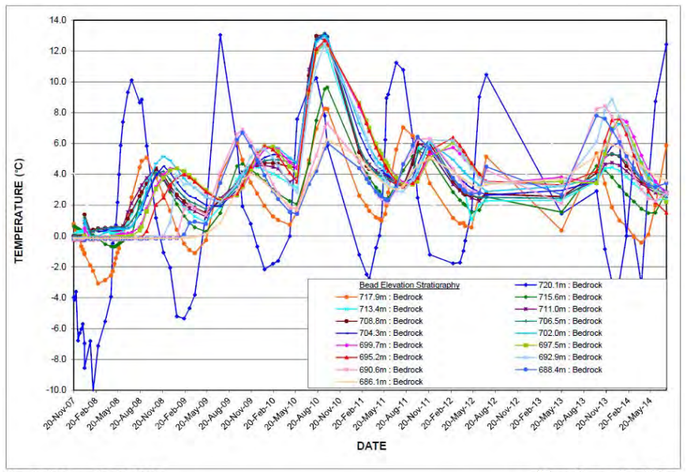
Filename: Minto 2014 Fall Inspection.ppt		Approved: PHM
		Figure: **20**



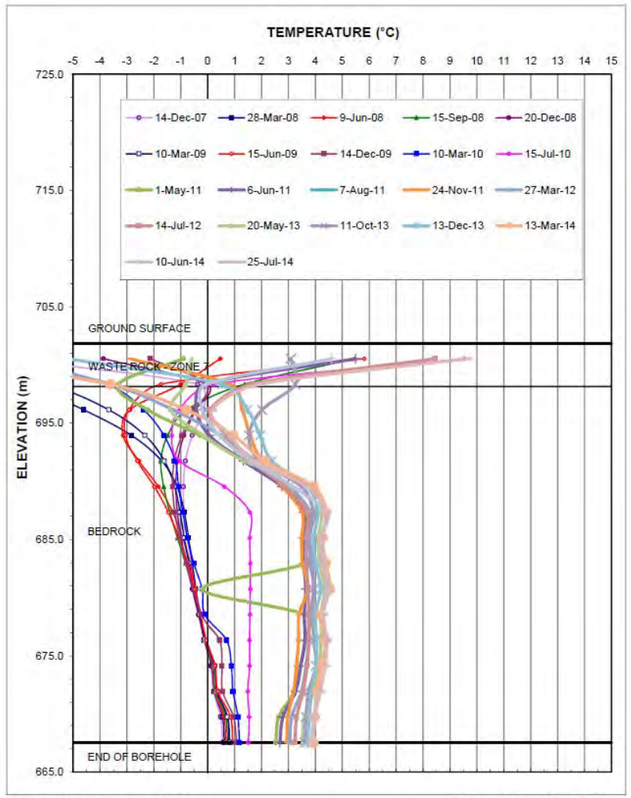
Installed: November 13, 2007

Water Storage Pond Dam
Ground Temperature Profile - WDT-7



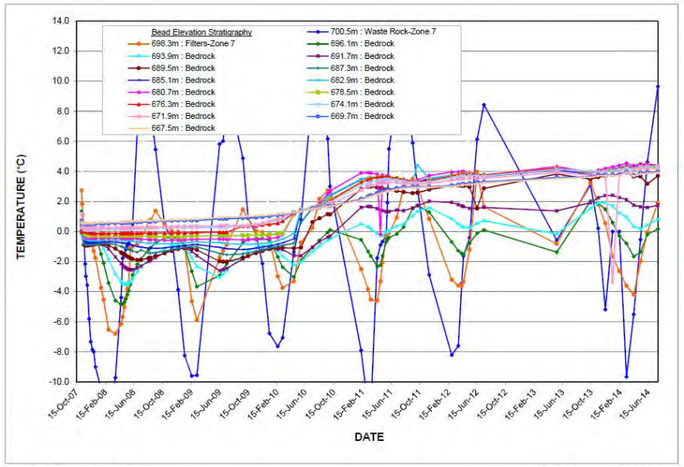
Installed: November 13, 2007

Water Storage Pond Dam
Ground Temperature Profile - WDT-7



Installed: November 5, 2007

Water Storage Pond Dam
Ground Temperature Profile - WDT-8



Installed: November 5, 2007

Water Storage Pond Dam
Ground Temperature Profile - WDT-8

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Water Storage Pond Ground Temperature Sensors (3 of 3)

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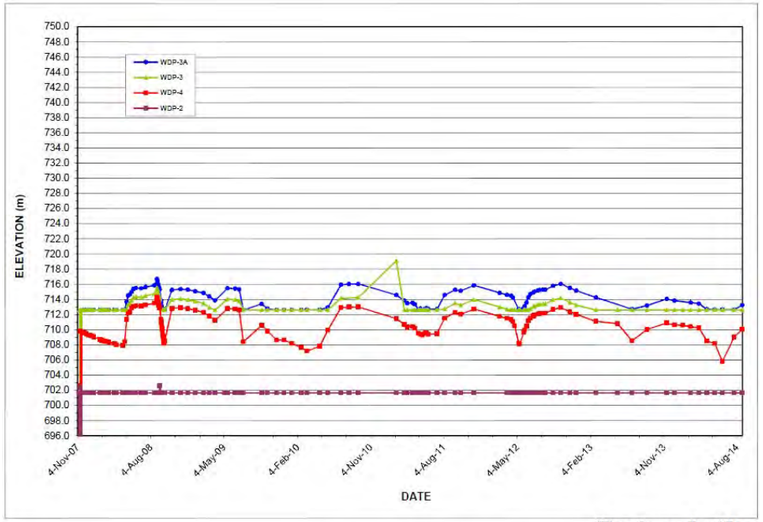
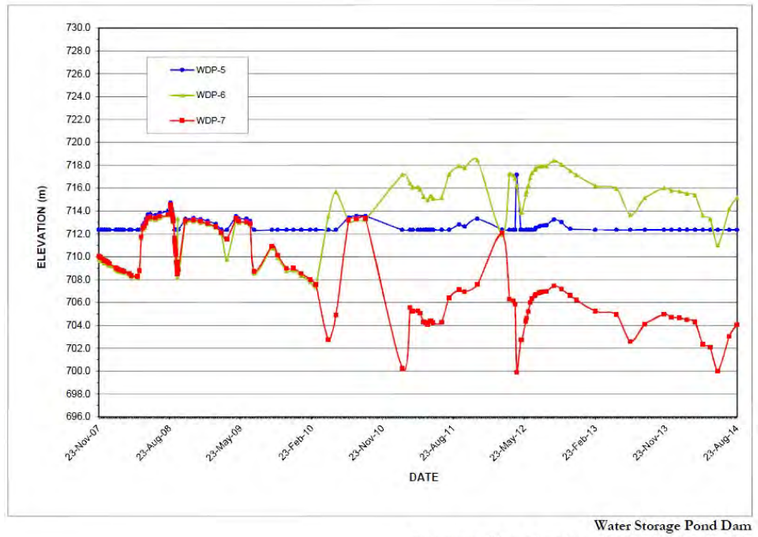
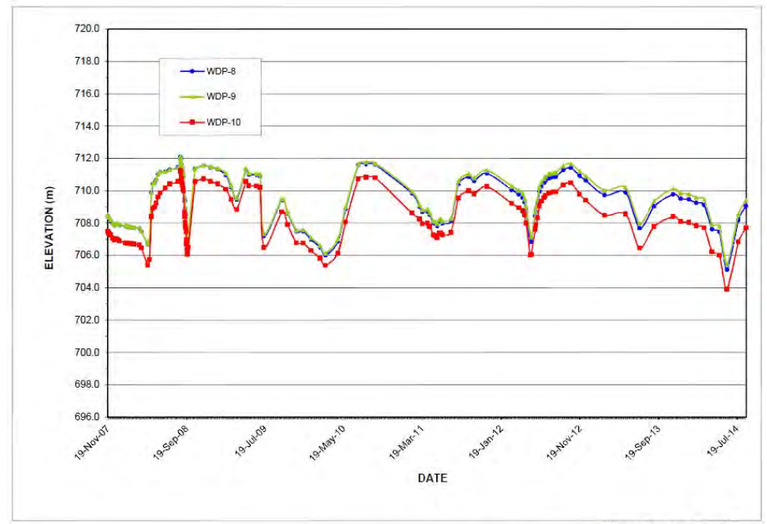
Figure: **21**



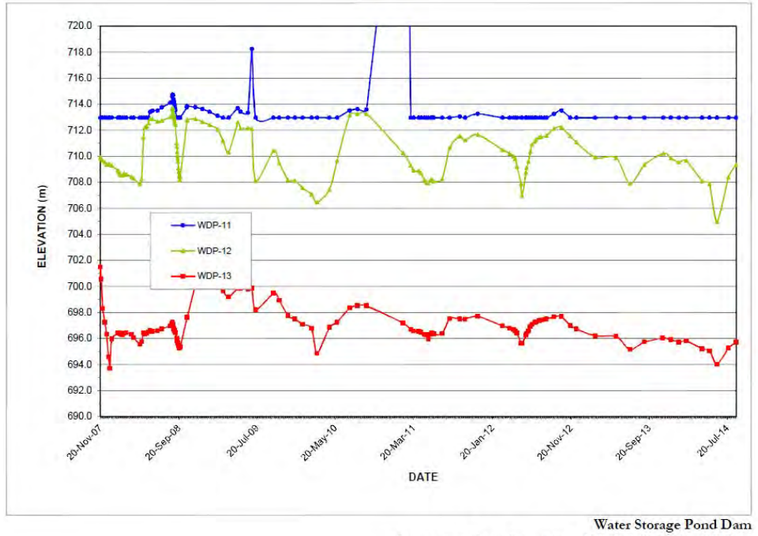
Water Storage Pond Dam
Instrument Water Elevation - WDP-3A, WDP-3, WDP-4, WDP-2



Water Storage Pond Dam
Instrument Water Elevation - WDP-5, WDP-6, WDP-7



Water Storage Pond Dam
Instrument Water Elevation - WDP-8, WDP-9, WDP-10



Water Storage Pond Dam
Instrument Water Elevation - WDP-11, WDP-12, WDP-13

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Water Storage Pond Piezometer Sensors

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Minto Mine

Date: November 2014
Approved: PHM
Figure: **22**