November 23, 2012

FORMER POLARIS MINE SITE, NUNAVUT

Proposed Long-Term Geotechnical Monitoring Program

Submitted to:
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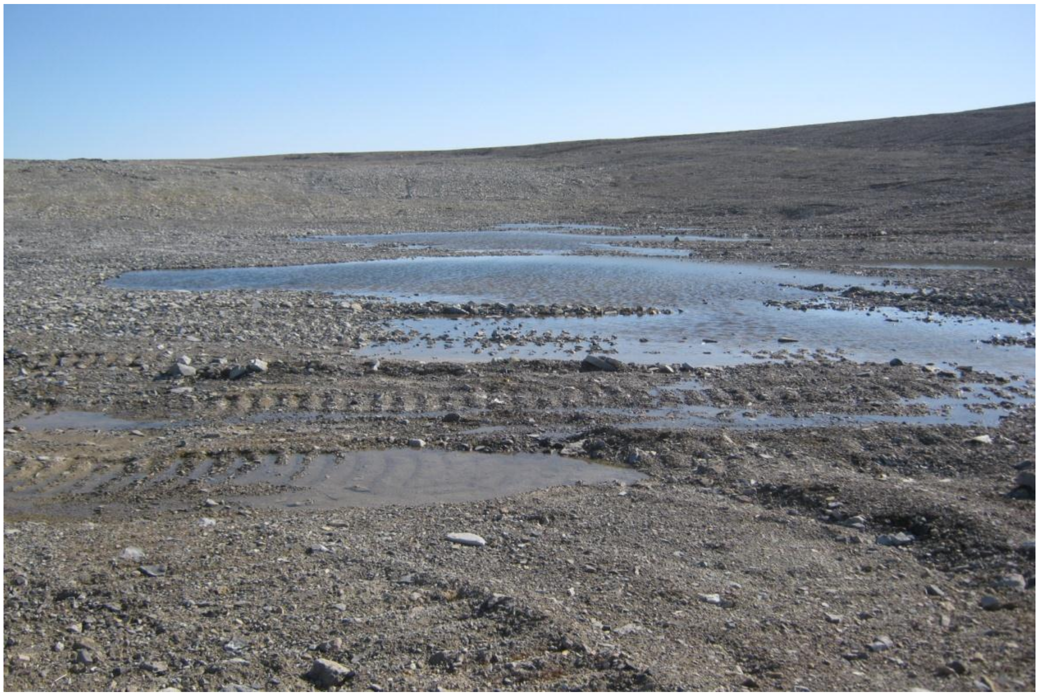

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REPORT

Golder Associates

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1.0 INTRODUCTION

Teck Metals Ltd. (Teck) retained Golder Associates Ltd. (Golder) to assess the potential for long-term subsidence and to recommend a long-term geotechnical monitoring program for the decommissioned Polaris Mine on Little Cornwallis Island, Nunavut.

The decommissioned Polaris mine site is located on Little Cornwallis Island approximately 120 km northwest of Resolute, Nunavut. Figure 1 presents the general arrangement of the decommissioned former Polaris mine site (the Site) and the area where subsidence has been previously observed.

1.1 Site History

The Polaris mine was operated by Teck between 1981 and 2002 and decommissioned in 2003 and 2004. Site facilities comprised an underground mine, concentrator plant, concentrate storage shed, dock, airstrip, tailings impoundment, freshwater intake on Frustration Lake, various site access roads, a limestone quarry, a shale quarry, and support infrastructure including fuel storage, camp, warehouse, etc. Decommissioning and reclamation of the site involved demolition of all structures and excavation of all soils contaminated by metals and hydrocarbons. All demolition waste and contaminated soil was either placed underground or in engineered landfills. Access roads between Garrow Lake, Frustration Lake and in the immediate vicinity of the previously active mining operations were decommissioned by rounding the shoulders of each road, removing culverts, and re-establishing natural drainage patterns. Facilities related to the airstrip were removed during decommissioning but the landing surface remains intact and has been used during the post-closure monitoring period. Little Cornwallis Island airstrip (referred to as LCI by local pilots) is also used occasionally by passing airplanes for emergency landings. Teck maintained a small temporary camp near Loon Lake during the post-closure monitoring period that was relocated near the ocean in 2010 and removed from the Site in September 2011. The temporary camp area was regraded after the camp and other remaining post-closure equipment and supplies were relocated to the shore of Polaris Bay in preparation for removal from the Site.

The marine foreshore area and slope in the vicinity of the former concentrate storage shed on the west side of the island were regraded to relatively gentle slopes during decommissioning. The graded slopes are interrupted by access roads and ramps. The shoreline area in the immediate vicinity of the former dock structure is almost flat. Four portals for mine access and exploration activities have been sealed, backfilled and graded to match the surrounding slopes.

Little Red Dog Quarry, located at the northwest end of the airstrip was backfilled partially with demolition debris and metals contaminated soils and subsequently capped with rockfill. The remnant quarry walls above the level of the capping layer are benched and serve to catch ravelling material as the slopes gradually weather. Safety berms extend around the quarry perimeter, and additional safety measures in the form of a ditch and a high berm exist at the end of the airstrip. Thermistors were installed through the rockfill capping layer into the underlying landfilled materials at Little Red Dog Quarry. The Operational Landfill, located at the south end of the former mine facility area, was regraded and capped with rockfill during decommissioning. Thermistors were installed in the Operational Landfill at four locations during operation of the mine. The existing thermistor installations were modified following closure of the landfill to monitor the new cap, however only two of the four installations were successfully modified in 2005. The following year all four thermistor installations were restored to full function along with improvements to the data collection system and insulation at ground surface. Thermistors and dataloggers have been continuously monitoring ground temperature in the Operational Landfill since 2006. Landfill thermistor data was downloaded and reported annually from 2007 through to 2011 by Teck. Ground temperature data measured by thermistors installed at the Little Red Dog Quarry Landfill and Operational Landfill indicates that the landfilled waste is frozen and that permafrost has extended up into the overlying rockfill cover effectively encapsulating waste materials in ice as designed.

The Subsidence Area is located over top of former underground mine workings and experienced significant settlement during mine operations. During decommissioning, the Subsidence Area was backfilled with non-hazardous solid waste, covered with rockfill, and regraded. Detailed topographic survey measurements of the Subsidence Area were carried out during annual post-closure inspections from 2005 through 2011 and no further ground deformations were detected during the annual post-closure topographic surveys.

The New Quarry area was a source of shale during mine construction, operations and decommissioning. It has been reclaimed by backfilling stripped materials against the quarry perimeter walls. Two erosion gullies at the south end of the New Quarry were repaired and lined with rip-rap to form an erosion resistant channel for drainage from Loon Lake. Access roads across the site were decommissioned and culverts were removed to restore natural drainage crossings that would not require ongoing maintenance. All-Terrain-Vehicles (ATVs) were driven on these access roads to facilitate post-closure inspection and monitoring. A rockfill jetty remains at Frustration Lake that was constructed for the freshwater supply intake during operation of the mine. Freshwater pumps and piping between the mine and Frustration Lake were removed during decommissioning.

At Garrow Lake, the former tailings disposal area, the impoundment dam and wave break structure were breached during decommissioning to return water levels to pre-development levels and to eliminate structures requiring long-term monitoring and maintenance. The central part of the main dam was breached and a rip-rap lined channel was constructed. Decommissioning of the impoundment dam lowered the water level in Garrow Lake by approximately two and one half metres to its pre-development level. The condition and stability of the reinstated Garrow Lake shoreline was monitored for several years after the dam was breached and was observed to be stable. Since the site was decommissioned and pre-development water levels were reinstated, natural wave and ice processes have resulted in the deposition of gravel along the south shore of Garrow Lake in front of the breached wave break structure. Topographic survey measurements of the natural gravel berm near the former wave break structure were carried out by Teck from 2007 through 2011.

1.2 Scope of Work

The scope of work included the following four tasks:

1. Compilation of available Polaris underground mine records (provided by Teck) and preparation of plan and cross-section drawings to illustrate the extent of underground mine workings.
2. Review available mine records and post-closure survey data to carry out an assessment of potential additional subsidence at ground surface over the long-term.
3. Identification of recommended mitigation measures should additional subsidence occur and estimation of potential long-term associated costs for financial assurance purposes.
4. Preparation of this report summarizing available underground mine records, post-closure survey data, area of potential additional subsidence, recommended subsidence mitigation measures (if required), long-term geotechnical monitoring program and cost estimates for financial assurance purposes.

2.0 ASSESSMENT OF LONG-TERM SUBSIDENCE POTENTIAL

2.1 Available Information

Available information that was reviewed included underground mine records and post-closure topographic survey data. Underground mine plans by level are included in Appendix A. Figures 2 and 3 are cross-sections illustrating underground mine levels and stopes. Appendix B presents results of post-closure topographic surveying that indicate no further subsidence has been detected since 2005.

2.2 Discussion on Mining Methods and Subsidence Mechanisms

Most of the mining at Polaris, and particularly the mining of the Keel Zone and the Keel Abutment Pillar, was undertaken by longhole open stoping with concurrent placement of backfill. The backfill was prepared from waste rock that was quarried on surface. This was fed underground in a series of vertical raises. In the Keel Zone itself, the mining involved the extraction of a series of primary stopes (each approximately 15 wide in the north-south direction) which were individually backfilled before the secondary stopes between them (each approximately 18m wide in the north-south direction) were in turn excavated and then backfilled. Almost all of the backfill was comprised of quarried rock which was mixed with either a small measured quantity of water so that it froze over a period of time (typically over a period of 2 years after being placed in the stope), or with a measured quantity of cement slurry that cured over a period of several weeks. In this way, the fill gained sufficient strength that it remained in a permanently stable condition, even during short periods of exposure as the rock beside it was excavated in small progressive increments, and these excavations were then in turn also backfilled.

All of the stopes mined at Polaris were excavated and backfilled in this same general manner. The backfilling was required to achieve a high percentage extraction of the ore and was not a discretionary activity. The only significant excavations in the mine that were not backfilled were the access excavations of typical approximate size 4.5m by 4.5m which even if they collapse in the future, are too small to result in any deformations on surface.

Not all of the backfill was placed tight to the back of the stopes. It was very important to backfill the primary stopes tight to the back so that the secondary stopes beside them could be excavated without experiencing significant dilution. This was achieved in places by levelling and pushing the fill with scoop trams and/or dozers to within about 1.0m to 1.5m of the back, then sealing of the top of the primary stope, and topping it up with a shale and water slurry. This slurry was placed under warm conditions and was termed “summer fill”. It subsequently froze so that it was reasonably tight to the back.

The secondary stopes were excavated between neighbouring primary stopes. Each secondary stope was excavated and backfilled in small increments from east to west, with each increment being backfilled from surface. The backfill placed using raises from surface filled most of the secondary stopes but formed cones at the top that either froze or gained strength once the cement cured. In this way, the immediate back of the secondary stopes was supported by a series of frozen or cemented cones. Beneath the cones, the stopes were completely filled with backfill. The result of this was that the secondary stopes were not completely filled over the entire back, although most of the secondary stopes, with the exception of the relatively small voids around and between the cones, were completely filled. In some localized areas, sections of the back of the secondary stopes failed upwards. This occurred mostly towards the far east of the Keel Zone, in the vicinity of 199 Stope which reportedly peaked up 35m, 202 Stope where a large block of unmined ore displaced into the stope, and

210 Stope (see Stope numbers noted on Figures 2 and 3). These back failures stabilized above the stopes and were backfilled to the maximum extent possible, and generally fairly completely, to facilitate ongoing mining.

There is no direct indication that the 18m wide secondary stopes that experienced back failures caved up to surface as individual unraveling failures. Rather a somewhat continuous subsidence trend aligned in the north-south direction developed on surface on the east side of the Keel Zone. This subsidence trend extended progressively to the north across the tightly filled primary stopes and less tightly filled secondary stopes. Between approximately 194 and 215 Stopes, the subsidence trend developed into a trough or graben-type depression that was approximately 200m long, 70m wide, and 10m deep. This graben-type trough referred to as a "sinkhole" was bounded on the west side by a very prominent single structure that was likely the 1500 Fault (identified on some of the mining plans) or a nearby parallel fault. The trough was defined or bounded on the east side by a slightly more diffuse series of north-south trending fractures. The block may have rotated slightly, particularly with the influence of the eastern abutment, but more generally, it moved downwards as a rigid-type block onto the tight fill of the primary stopes and the cones and underlying fill of the secondary stopes, and any other remaining voids which could not be effectively backfilled.

Subsidence also progressively occurred to the west of the graben–type trough. Initially this was controlled or restricted by the presence of the Keel Abutment Pillar which provided a stabilizing influence. In turn however this pillar was also mined and backfilled. This resulted in the merging of the Keel Zone and Panhandle extraction areas and the integration of the two associated subsidence zones to form a relatively uniform subsidence profile with vertical displacements of between 1.5m and 2.5m. In this way, the entire area above the Keel Zone and Panhandle subsided onto the backfill below, compressing it. The final subsidence profile at the conclusion of mining was a graben-type trough on the east side of the Keel Zone where the rock had displaced vertically down onto the fill approximately 10m, and the remaining area above the integrated Keel Zone and Panhandle that had also displaced down onto the fill approximately 2.0m. In both cases, the rock overlying the mined out areas displaced onto the fill in a relatively uniform manner.

In mid-2002, just prior to the completion of mining, the subsidence monuments that were being surveyed indicated that some areas were subsiding at a relatively fast rate as the overlying rock displaced down, compressing the backfill. The cracks that appeared on surface during the entire mining period were mapped on a regular basis until mining ceased in 2002. The pattern of cracks that were evident on surface conformed reasonably well with the outer limits of the integrated Panhandle and Keel mining, with the cracks associated with the graben-type trough being prominent on the east of the Keel Zone. Mining was completed in 2002, and the ground surface profile was re-contoured soon after this. Post-closure monitoring was established in 2005 in the area of previous subsidence. No additional significant surface deformations were surveyed during the post-closure monitoring of the Subsidence Area from 2005 to 2011. Figure 4 presents a plan view of surface cracks that were surveyed during mine operation prior to 2002 compared to cracks surveyed post-closure from 2005 through 2011.

The general subsidence profile that developed on surface above the mined area, and the pattern of surface cracking that was mapped on surface prior to re-contouring, conform well with the footprint of the mining and backfilling activities that were undertaken, and with the overall mechanism of the overlying rock moving down onto the backfill and compressing it. The Keel and Panhandle areas were almost completely extracted over an area of approximately 500m by 250m and the rock above the mined area has almost certainly completely subsided onto the fill by now without any bridging or arching.

There is no evidence in the past of any individual voids above individual secondary stopes or around the backfill cones unravelling and caving up to surface, and it is unlikely that this will occur in the future now that the overlying rock has displaced onto the fill in this uniform manner. However, there is no way of guaranteeing with absolute certainty that there is not a void somewhere that may start to unravel sometime in the future and progressively cave up to surface. Under these conditions, some local cracking and settlement may become evident on surface in the future. There is no rational way of predicting where this subsidence might occur, and there is no longer value in continuing with routine topographic surveying of the Subsidence Area. This combined with a low probability of any further subsidence occurring indicates that the best approach to ongoing monitoring is visual inspections with the main objective of identifying any surface cracks and significant depressions that may be indicators or pre-cursors of possible more significant subsidence movements. Visual inspections and topographic surveys of the Subsidence Area were carried out on an annual basis during the 7 year post-closure monitoring period with no observations of problematic surface cracks or significant depressions that may be indicators or pre-cursors of possible more significant subsidence movements.

2.3 Area of Potential Long-Term Subsidence

Because all mining ceased approximately 10 years ago and most of the voids underground are backfilled, the most lateral extent of any potential additional subsidence that may pose a safety concern, if it occurs, will likely be just slightly beyond the previously observed surface cracks. Figure 4 presents a plan view of previously observed and surveyed surface cracks and the potential area of subsidence that may pose a hazard to humans or wildlife. If cave mining methods had been undertaken as opposed to open stoping, then surface subsidence could have extended further out than the limit shown on Figure 4, but with the type of stoping and backfilling that was undertaken at the Polaris mine, the peripheral extent of effects on surface are less. Although it may be possible to detect minor settlement at surface beyond this limit using very accurate surveying systems, any subsidence beyond this limit should not pose a hazard to humans or wildlife.

2.4 Recommended Mitigation Measure

If future geotechnical inspections observe additional surface cracking and depressions, these will need to be investigated and a decision made on how to mitigate the hazards and safety concerns. The recommended mitigation measure, should additional subsidence be observed that poses a hazard to humans or wildlife be observed, is construction of a perimeter safety fence. Installation of perimeter safety fencing around mine hazards is a common mitigation measure in populated mining communities and is considered a suitable mitigation measure for the former Polaris mine site, if required. The location and extent of such a perimeter safety fence will need to be based on the actual extent of subsidence and observations made at the time. For planning and financial assurance cost estimation purposes, the maximum extent of potentially required perimeter safety fence could be as shown on Figure 5. The recommended safety fence would be 1.8m (6 ft) high, galvanized steel, industrial-quality fencing. The total length of fencing shown on Figure 5 is 1360m.

3.0 LONG-TERM GEOTECHNICAL MONITORING PROGRAM

3.1 Areas to be Monitored

Areas of the decommissioned mine site that were monitored during the seven annual post-closure geotechnical inspections (conducted in 2005 through 2011) included the following:

- Garrow Lake Area (shoreline, wave break structure and breached dam);
- Frustration Lake Jetty and Access Road;
- New Quarry Area;
- Subsidence Area;
- Operational Landfill;
- Little Red Dog Quarry Landfill;
- Mine Portals;
- Marine Foreshore Adjacent to Former Dock; and
- Temporary Camp Area.

Monitoring of the Garrow Lake shoreline was discontinued in 2009 after several years of inspections and erosion monitoring indicated that the shoreline was stable. The former temporary camp area was inspected after camp removal in 2011 and further monitoring of this area is not required. The New Quarry area, Frustration Lake jetty and access roads were observed to be stable during the post-closure monitoring period (2005 through 2011) therefore ongoing monitoring of these areas is not required.

Long-term geotechnical monitoring of the following areas is recommended:

- Subsidence Area;
- Operational Landfill;
- Little Red Dog Quarry Landfill;
- Mine Portals;
- Garrow Lake wave break structure and breached dam; and
- Marine Foreshore Adjacent to Former Dock.

3.2 Geotechnical Monitoring Frequency

Operations at the Polaris Mine ceased in 2002. Mine closure and remediation activities were completed in 2004. Annual post-closure geotechnical inspections were carried out from 2005 through 2011, a period of seven years after closure of the mine site was completed.

The Department of Indian and Northern Affairs Canada Contaminated Sites Program prepared a guidance document entitled “Abandoned Military Site Remediation Protocol” (INAC, 2009) that describes a rationale and outlines a recommended schedule for long-term monitoring of Distant Early Warning (DEW) Line sites in northern Canada. This guidance document has been used to develop a reasonable long-term monitoring frequency for remediated, stable sites in the high Arctic. This same approach is considered reasonable to determine a post-closure frequency of monitoring for the decommissioned Polaris mine site given it’s high Arctic location and that it is a remediated, stable site. Post-closure monitoring of DEW line sites is separated into two phases; Phase 1 during years 1 through 5 and Phase 2 in years 7, 10, 15, and 25. Given that annual geotechnical inspections have already occurred for 7 straight years since remediation of the Polaris mine site was completed in 2004 (year 0), it is reasonable to assume that Phase 1 monitoring has been completed and that Phase 2 monitoring has commenced. If 2004 was Year 0 then the completed 2011 annual inspection was Year 7. Therefore the next geotechnical inspection event should occur in Year 10 (2014) with subsequent inspection events in Year 15 (2019) and Year 25 (2029). This approach is consistent with the monitoring frequency laid out in the INAC (2009) protocol used for decommissioned DEW Line sites. Subsequent to the 2029 inspection, the long-term monitoring program should be reviewed and the ongoing inspection frequency and scope should be re-evaluated at that time.

Table 1 summarizes the proposed frequency of geotechnical inspection events at the former Polaris mine site.

Table 1: Summary of Post-Closure Geotechnical Monitoring Program

<table>
<tr><th>Phase</th><th>Years Since Closure</th><th>Calendar Year</th><th>Areas Inspected (access)</th><th>Duration</th></tr>
<tr><td rowspan="5">1
(Annual)</td><td>1</td><td>2005</td><td rowspan="7">▪ Garrow Lake Area (ATV)
▪ Frustration Lake Jetty and Access Road (ATV)
▪ New Quarry Area (ATV)
▪ Subsidence Area (ATV)
▪ Operational Landfill (ATV)
▪ Little Red Dog Quarry Landfill (ATV)
▪ Mine Portals (ATV)
▪ Marine Foreshore (ATV)
▪ Temporary Camp Area (ATV)</td><td rowspan="7">2 to 3 days</td></tr>
<tr><td>2</td><td>2006</td></tr>
<tr><td>3</td><td>2007</td></tr>
<tr><td>4</td><td>2008</td></tr>
<tr><td>5</td><td>2009</td></tr>
<tr><td rowspan="6">2
(Reduced Frequency)</td><td>6</td><td>2010</td></tr>
<tr><td>7</td><td>2011</td></tr>
<tr><td>10</td><td>2014</td><td rowspan="4">▪ Subsidence Area (foot)
▪ Operational Landfill (air)
▪ Mine Portals (air)
▪ Little Red Dog Quarry Landfill (air)
▪ Garrow Lake Dam (air)
▪ Marine Foreshore (air)</td><td rowspan="4">2 to 3 hours</td></tr>
<tr><td>15</td><td>2019</td></tr>
<tr><td>25</td><td>2029</td></tr>
<tr><td>Long-term</td><td>Review frequency and scope in 2029</td></tr>
</table>

3.3 Geotechnical Monitoring Approach

The primary objective of the long-term geotechnical inspections will be to assess the physical condition of decommissioned mine areas for evidence of slope instability, erosion or other landform instabilities that could present a safety hazard to either humans or wildlife.

The Subsidence Area should be inspected on foot for surface cracks and/or settlement depressions that could pose a safety hazard to either humans or wildlife.

It should be possible to adequately observe the Operational Landfill, Mine Portals, Marine Foreshore Area, Little Red Dog Quarry Landfill and Garrow Lake Dam from the airplane before or after landing at the site. The following is a summary of problematic conditions for each area that should be identifiable from air:

- The Operational Landfill should be inspected for slope failures that may expose waste.
- The backfilled Mine Portal slopes should be inspected for slope failures that could allow access to the underground mine workings.
- The Marine Foreshore Area should be inspected for slope failures or major erosion causing discharge of sediment to the ocean.
- The Little Red Dog Quarry Landfill should be inspected for exposed waste protruding through the rockfill cover.
- The Garrow Lake Dam breach channel should be inspected for slope failures that may prevent or interfere with drainage of Garrow Lake to the ocean.

4.0 LONG-TERM FINANCIAL ASSURANCE

The following costs were estimated to calculate the financial assurance required to provide ongoing geotechnical inspections and to install and maintain perimeter safety fencing around the Subsidence area in perpetuity. For the purposes of the financial assurance calculation, a geotechnical inspection has been allowed every 10 years after 2029 although a monitoring review after the 2029 inspection may recommend less frequent ongoing inspections. All costs were estimated in 2012 Canadian dollars and include a 15% allowance for taxes and a 15% contingency. The event costs and frequencies assumed to calculate the financial assurance are as follows:

- Geotechnical inspection cost per event = $38,000 (2014, 2019, 2029 and every 10 years thereafter);
- Installation of 1360m of perimeter safety fencing = $1,050,000 (2015 and every 40 years thereafter); and
- Major fencing repair assuming replacement of 400m fencing = $330,000 (2035 and every 40 years thereafter).

Detailed cost estimates to conduct geotechnical inspections as outlined above, fencing installation and major fencing repair are summarized in Table C-1 of Appendix C. The Net Present Value (NPV) of inspections, fencing installation and repair as illustrated in Table C-2 of Appendix C are $1,190,008.43. It should be noted that the financial assurance conservatively assumes that the 2014 geotechnical inspection identifies significant additional subsidence that requires installation of safety fencing as shown on Figure 5 in 2015. As discussed in Section 2 (above), additional subsidence and the requirement to install fencing is considered unlikely. Therefore the calculated financial assurance amount is considered conservative.

5.0 CONCLUSION AND RECOMMENDATIONS

It is recommended that geotechnical inspections be carried out as outlined above in 2014, 2019, 2029 and then the ongoing long-term monitoring program should be reviewed. Should additional subsidence that poses a hazard to humans or wildlife be observed, then perimeter safety fencing should be installed around the area. The location and length of such a perimeter safety fence will need to be based on the actual extent of subsidence and observations made at the time. The maximum expected area of potential subsidence and perimeter fencing that may be required in the future to protect human and wildlife safety is shown on Figure 5. The calculated financial assurance associated with long-term geotechnical inspections and future installation/repair of this safety fencing is estimated to be approximately $1.2M (in 2012 dollars).

Report Signature Page

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DCJ/RH/dcj

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FIGURES

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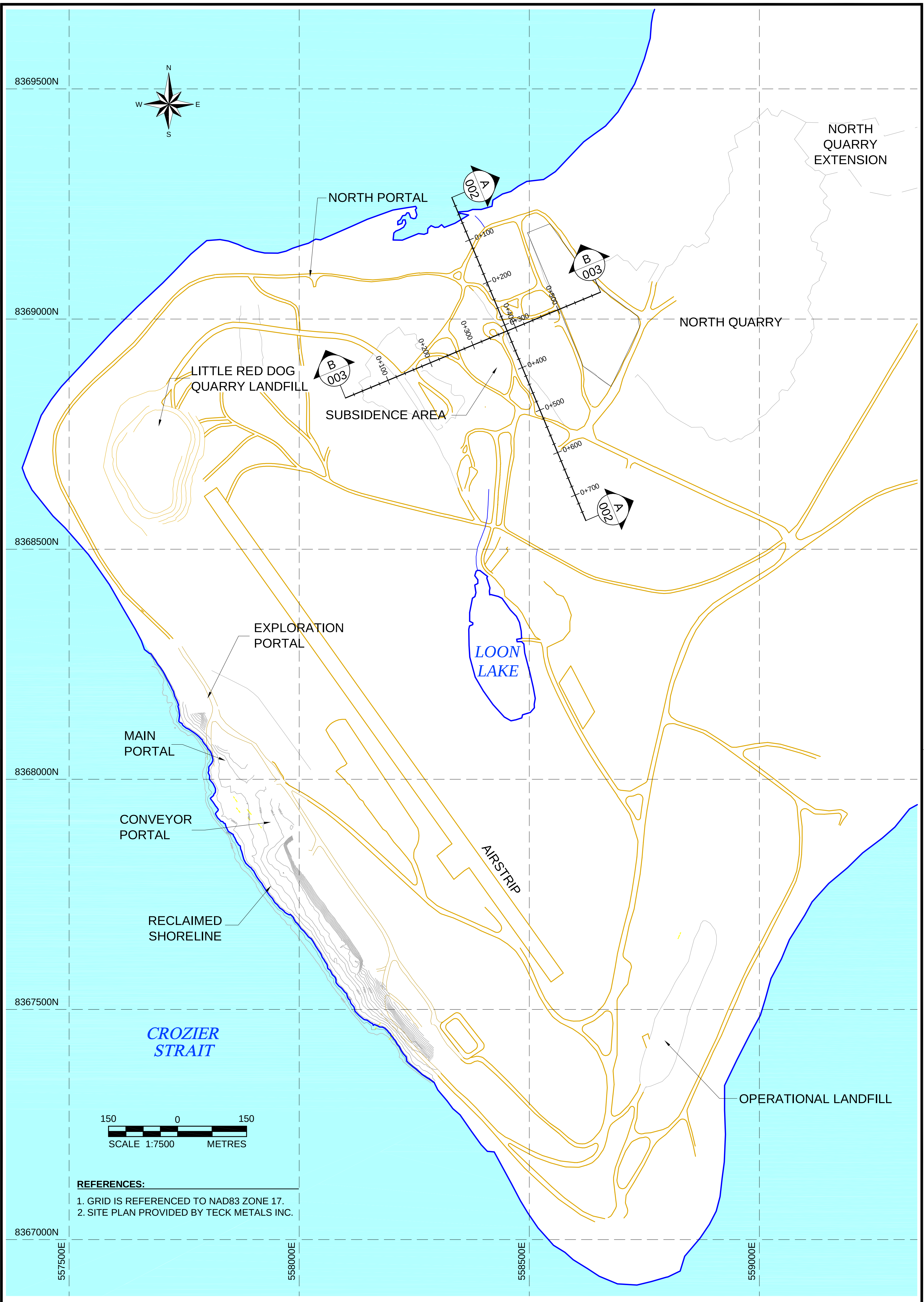

REFERENCES:

1. GRID IS REFERENCED TO NAD83 ZONE 17.
2. SITE PLAN PROVIDED BY TECK METALS INC.

Golder Associates Mississauga, Ontario, Canada	SCALE AS SHOWN DATE Nov. 19, 2012 DESIGN EPT CAD MY	TITLE	FORMER POLARIS MINE PLAN
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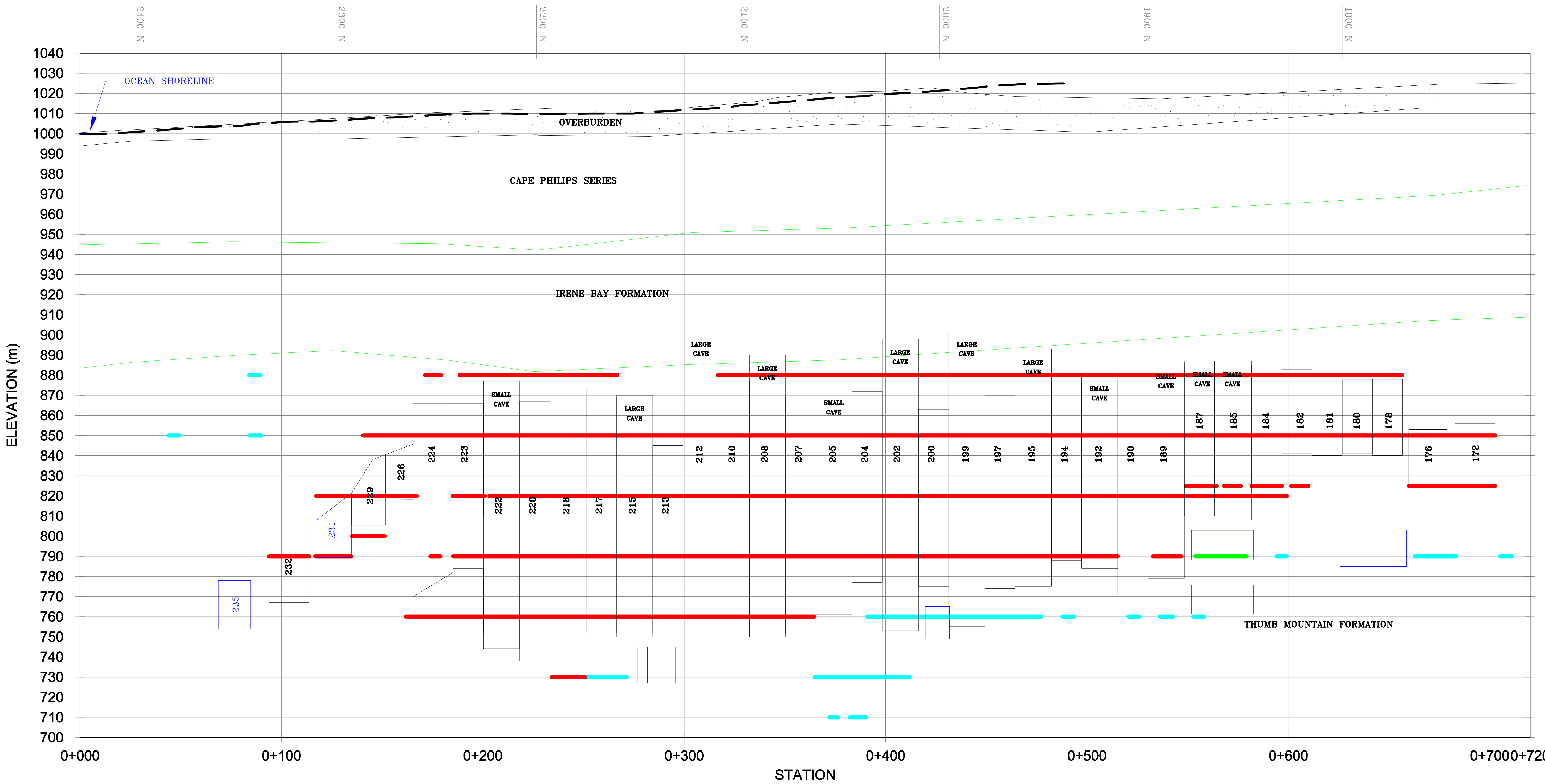

LEGEND:

GROUND SURFACE

MINE LEVEL (BACKFILLED)

MINE LEVEL (NON-BACKFILLED)

MINE LEVEL (ACCESS)

224 MINE STOPE NUMBER

Golder Associates
Mississauga, Ontario, Canada

SCALE	AS SHOWN	TITLE	CROSS-SECTION A-A' (1500 EAST)
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CHECK	DCJ		TECK METALS - SUBSIDENCE ASSESSMENT
REVIEW	RH	FIGURE	2

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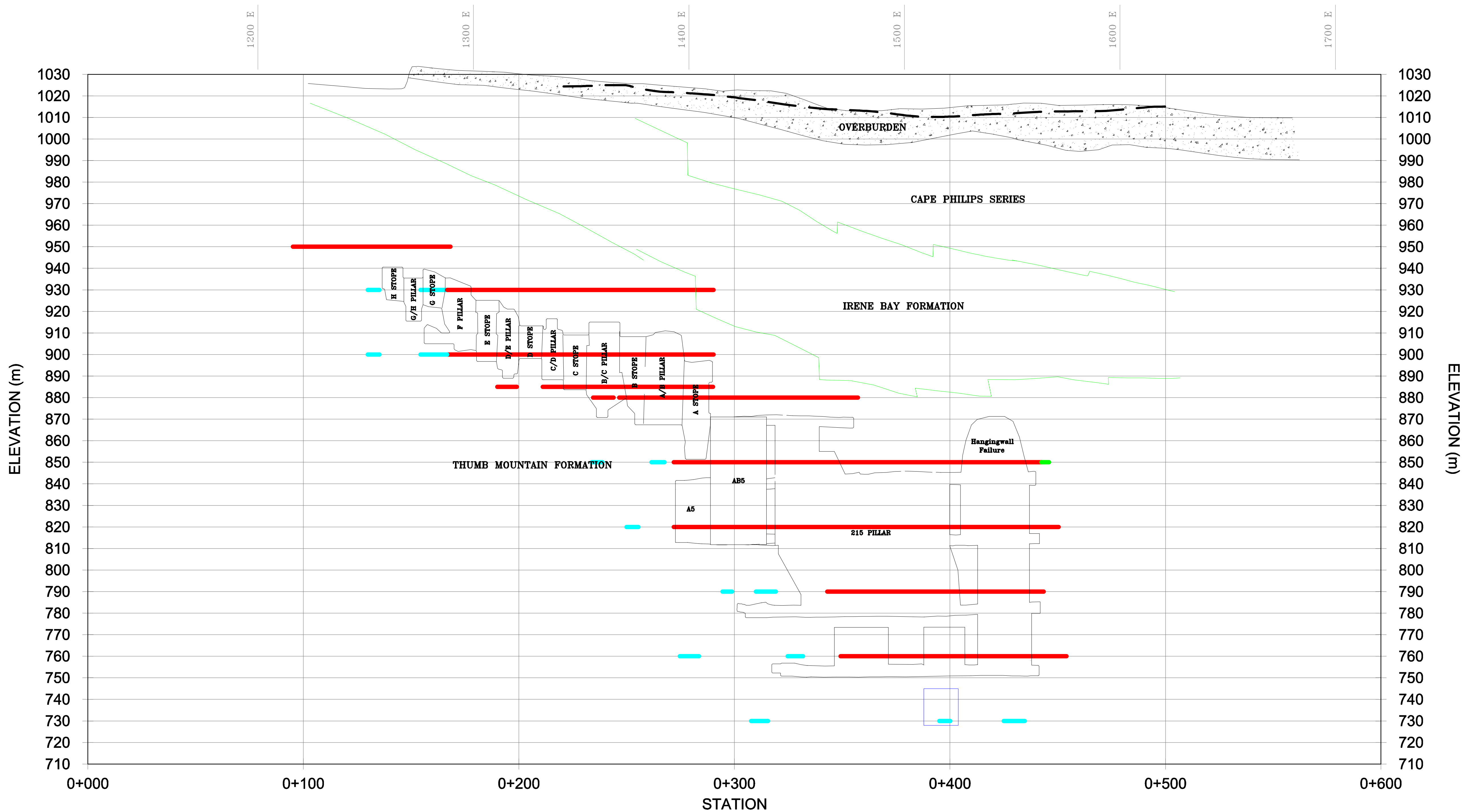

LEGEND:

GROUND SURFACE

MINE LEVEL (BACKFILLED

MINE LEVEL (ACCESS)

224 MINE STOPE NUMBER

40 0 40

SCALE 1:2000 METRES

Golder Associates
Mississauga, Ontario, Canada

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DATE	Nov. 19, 2012
DESIGN	EPT
CAD	MY
CHECK	DCJ
REVIEW	RH

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PROJECT No. 12-1118-0022 REV.

TITLE

CROSS-SECTION B-B' (2150 NORTH)

TECK METALS -
SUBSIDENCE ASSESSMENT

FIGURE 3

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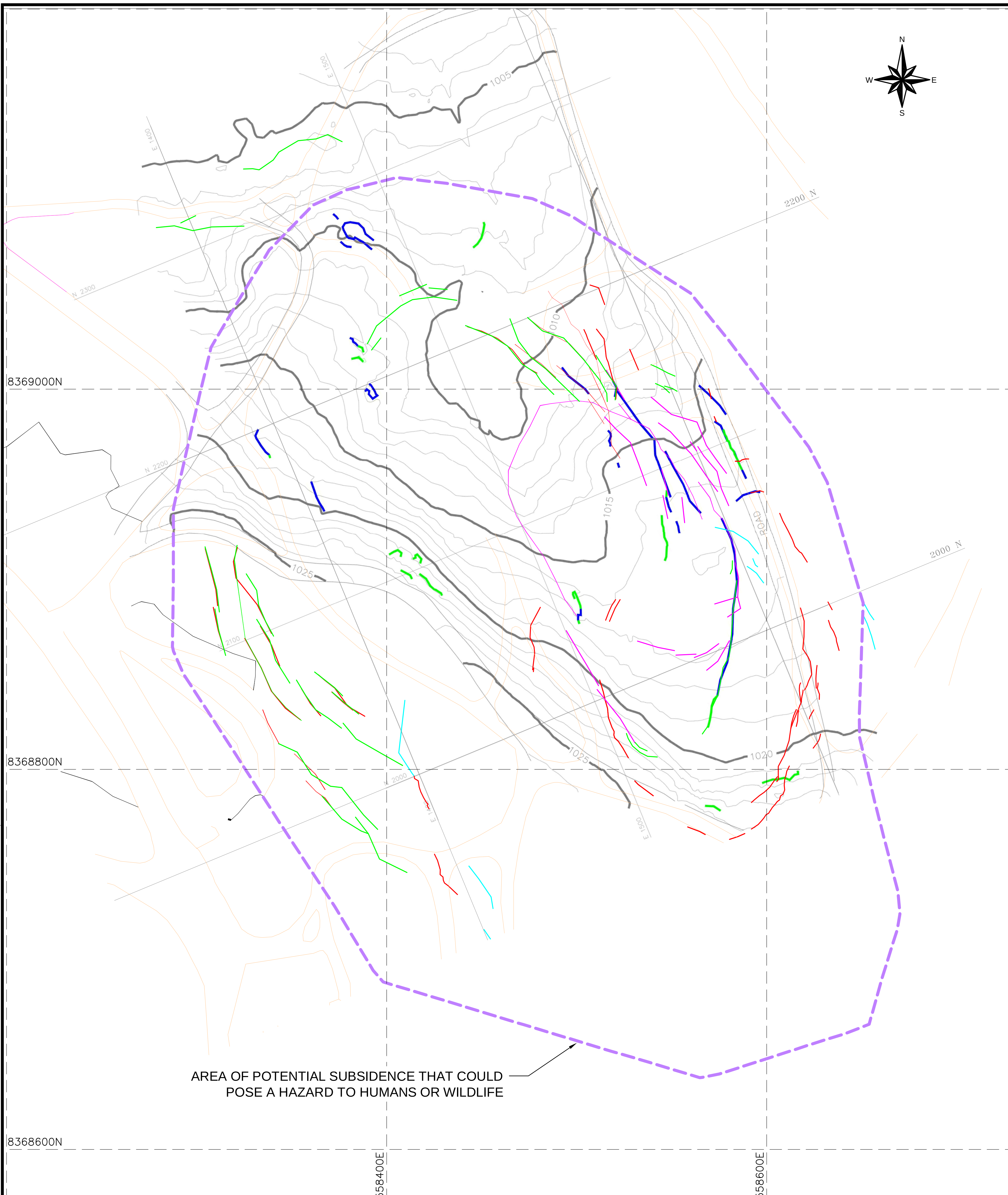

OBSERVED SURFACE CRACKS (DATE SURVEYED)

- 2011
- 2005-2010
- 2002
- 2001
- 2000
- 1999
- 1998
- 1997
- 1996
- 1995

NOTES:

1. GRID IS REFERENCED TO NAD83 ZONE 17.
2. CRACK INFORMATION BASED ON FILE: PM-2011-AREA-8-SHEET-2.PDF AND SUBSIDENCE MASTER.DWG PROVIDED BY TECK METALS

40 0 40 80

SCALE 1:2000 METRES

Golder Associates
Mississauga, Ontario, Canada

SCALE	AS SHOWN	TITLE	
DATE	Nov. 19, 2012	**PREVIOUSLY OBSERVED SURFACE CRACKS RELATED TO SUBSIDENCE**	
DESIGN	EPT		
CAD	MY		
CHECK	DCJ	TECK METALS - SUBSIDENCE ASSESSMENT	FIGURE 4
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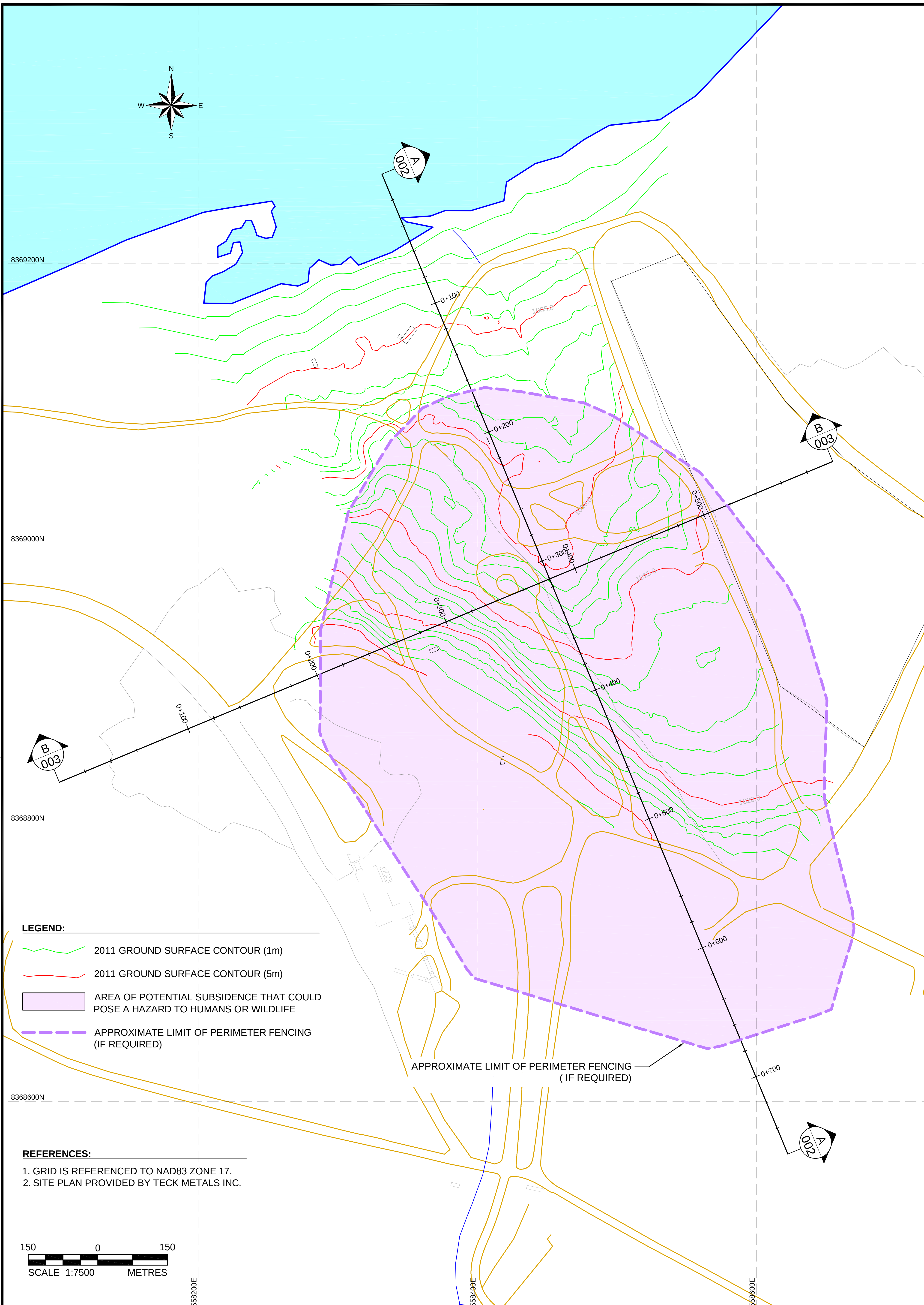

Golder Associates, Mississauga, Ontario, Canada	SCALE: AS SHOWN	TITLE	
	DATE: Nov. 19, 2012	**AREA OF POTENTIAL SUBSIDENCE THAT COULD REQUIRE FUTURE PERIMETER FENCING**	
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	CAD: MY		
FILE No. 1211180022AC005.dwg	CHECK: DCJ	TECK METALS - SUBSIDENCE ASSESSMENT	FIGURE 5
PROJECT No. 12-1118-0022 REV.	REVIEW: RH		

APPENDIX A

Mine Level Plans

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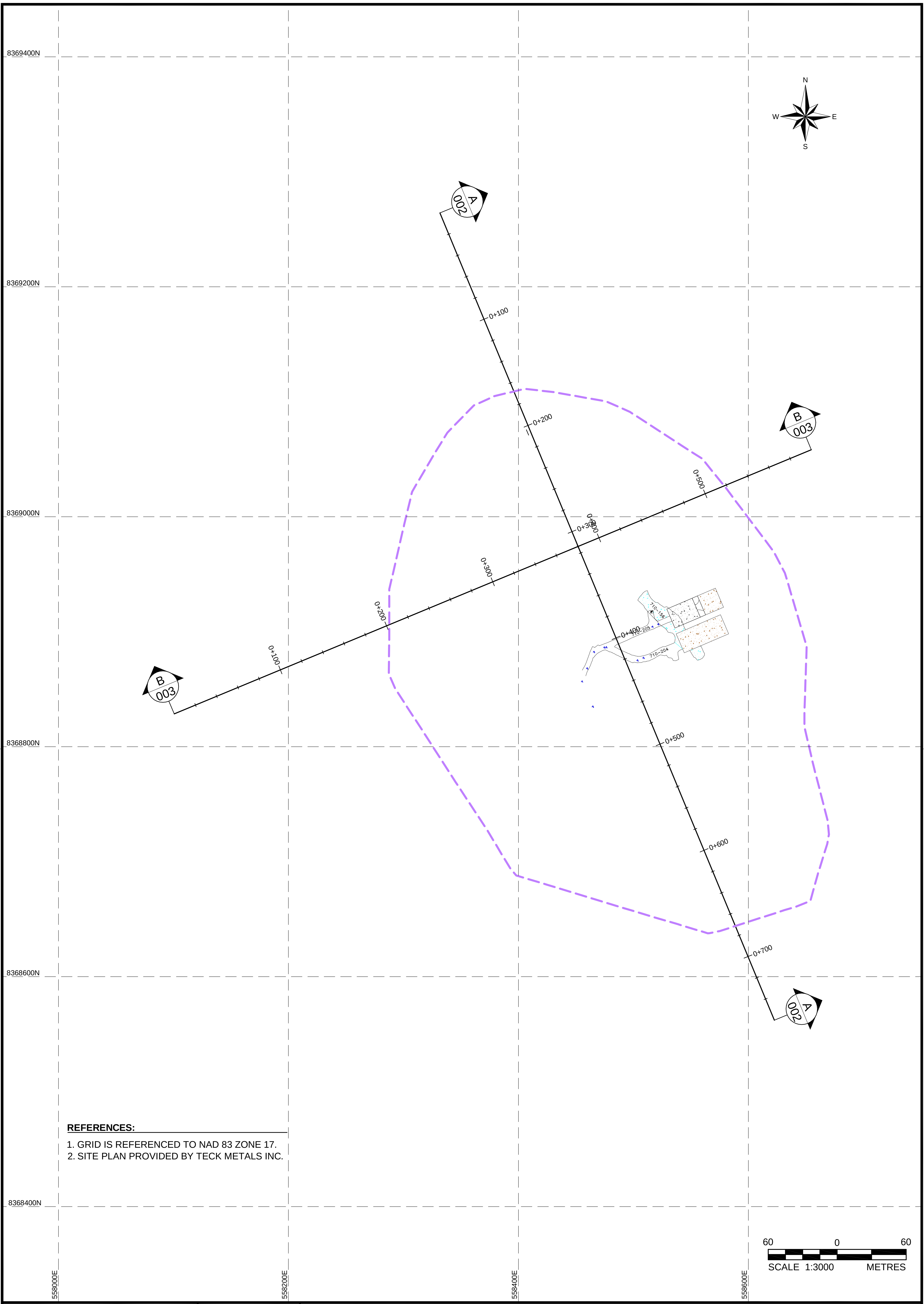
FILENAME: T:\Projects\2012\12-1118-0022 (TECH RESOURCES, Resolute)\-AC-\1211180022AC00A1-15.dwg



REFERENCES:

1. GRID IS REFERENCED TO NAD 83 ZONE 17.
2. SITE PLAN PROVIDED BY TECK METALS INC.

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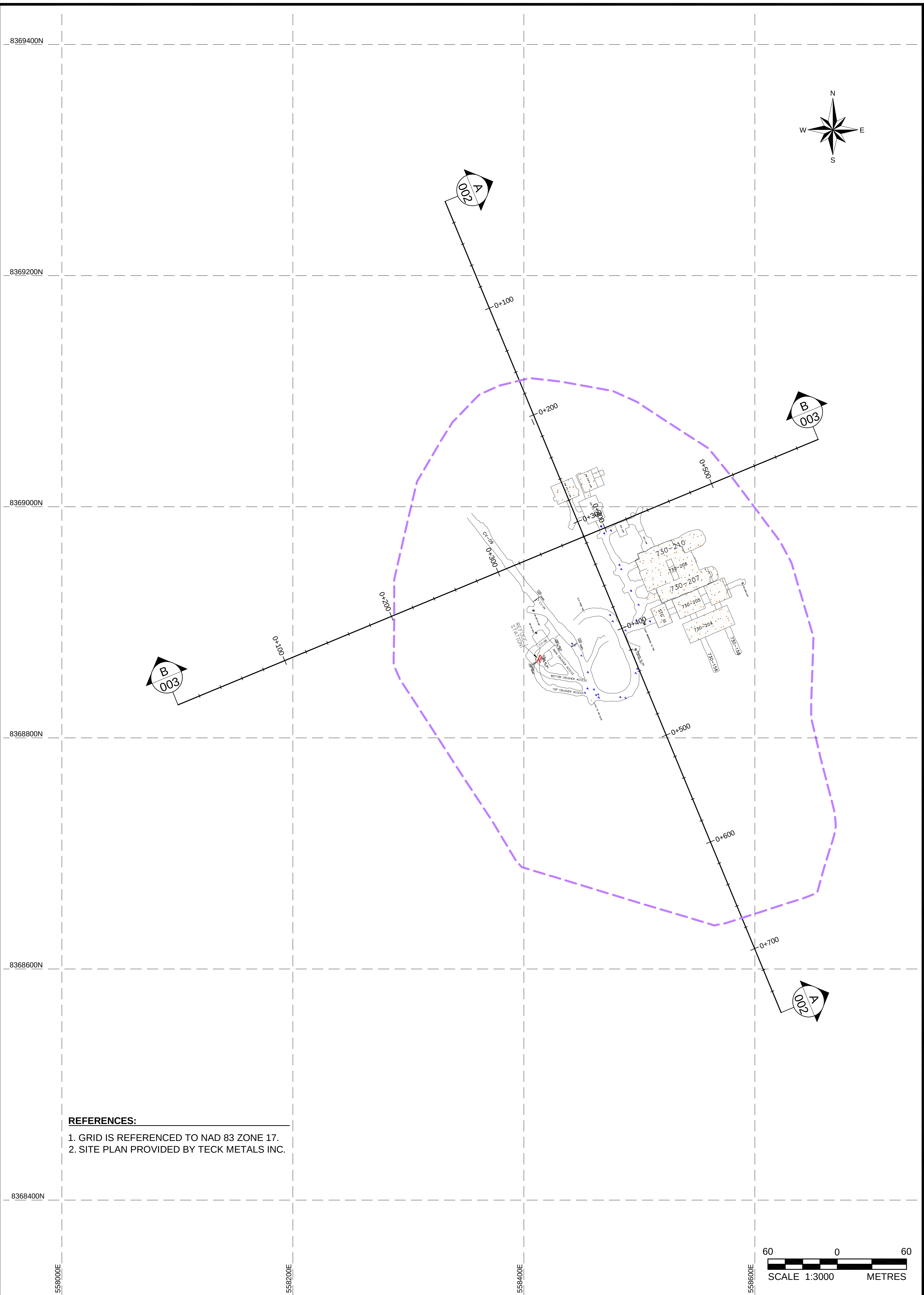
Mississauga, Ontario, Canada

SCALE	AS SHOWN	TITLE	
DATE	Nov. 19, 2012	**LEVEL 710 PLAN VIEW**	
DESIGN	EPT		
CAD	MY		
FILE No. 1211180022AC00A1-15.dwg	CHECK DCJ	TECK METALS - SUBSIDENCE ASSESSMENT	FIGURE
PROJECT No. 12-1118-0022 REV.	REVIEW RH		**A-1**

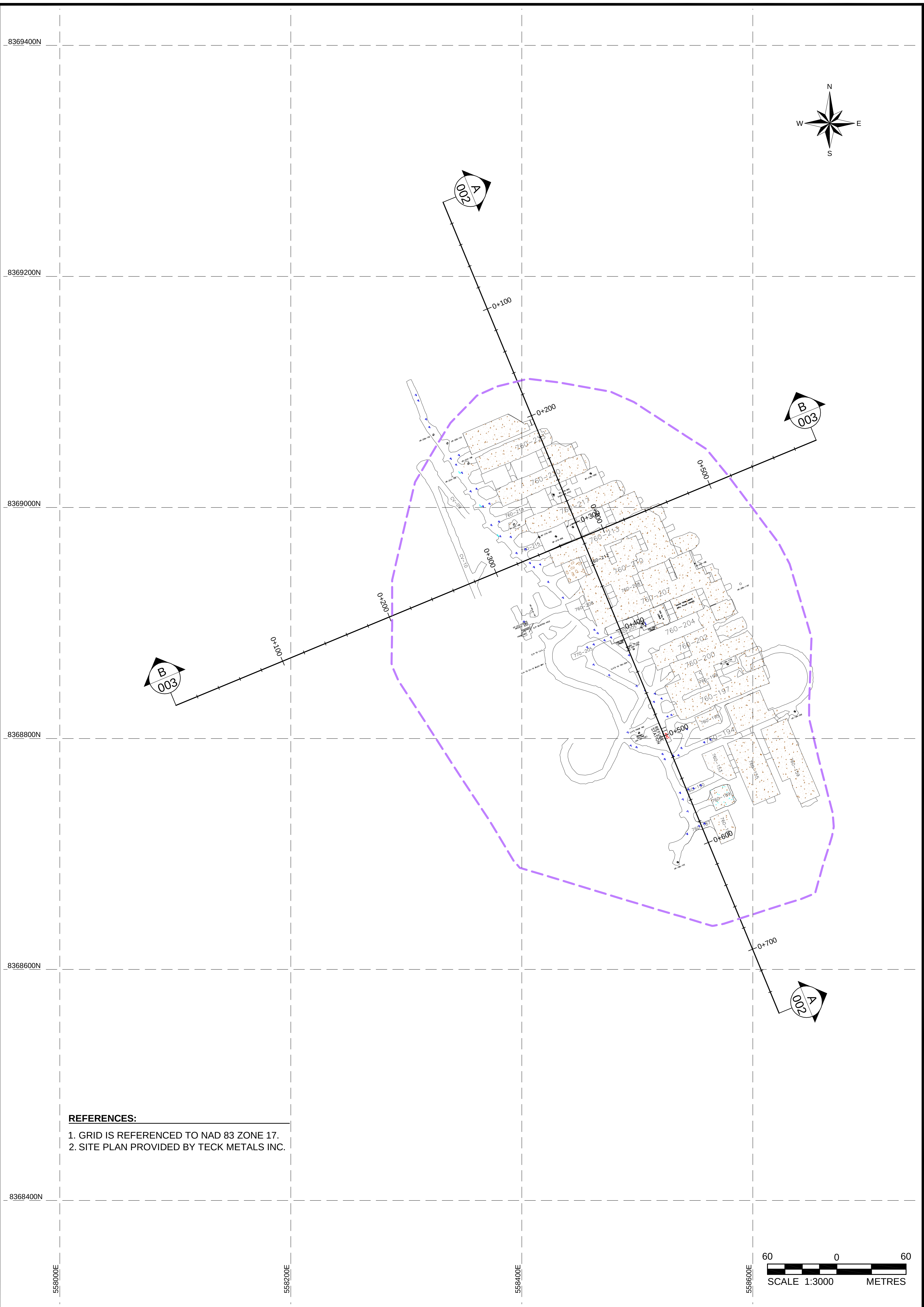


REFERENCES:

1. GRID IS REFERENCED TO NAD 83 ZONE 17.
2. SITE PLAN PROVIDED BY TECK METALS INC.

Golder Associates, Mississauga, Ontario, Canada	SCALE: AS SHOWN	TITLE	
	DATE: Nov. 19, 2012	**LEVEL 730 PLAN VIEW**	
	DESIGN: EPT		
	CAD: MY		
FILE No. 1211180022AC00A1-15.dwg	CHECK: DCJ	TECK METALS - SUBSIDENCE ASSESSMENT	FIGURE
PROJECT No. 12-1118-0022 REV.	REVIEW: RH		**A-2**

PLOT DATE: November 19, 2012
FILENAME: T:\Projects\2012\12-1118-0022 (TECH RESOURCES, Resolute)\-AC-\1211180022AC00A1-15.dwg



REFERENCES:

1. GRID IS REFERENCED TO NAD 83 ZONE 17.
2. SITE PLAN PROVIDED BY TECK METALS INC.

Golder Associates, Mississauga, Ontario, Canada	SCALE: AS SHOWN	TITLE	
	DATE: Nov. 19, 2012	**LEVEL 760 PLAN VIEW**	
	DESIGN: EPT		
	CAD: MY		
FILE No. 1211180022AC00A1-15.dwg	CHECK: DCJ	TECK METALS - SUBSIDENCE ASSESSMENT	FIGURE
PROJECT No. 12-1118-0022 REV.	REVIEW: RH		**A-3**

PLOT DATE: November 19, 2012
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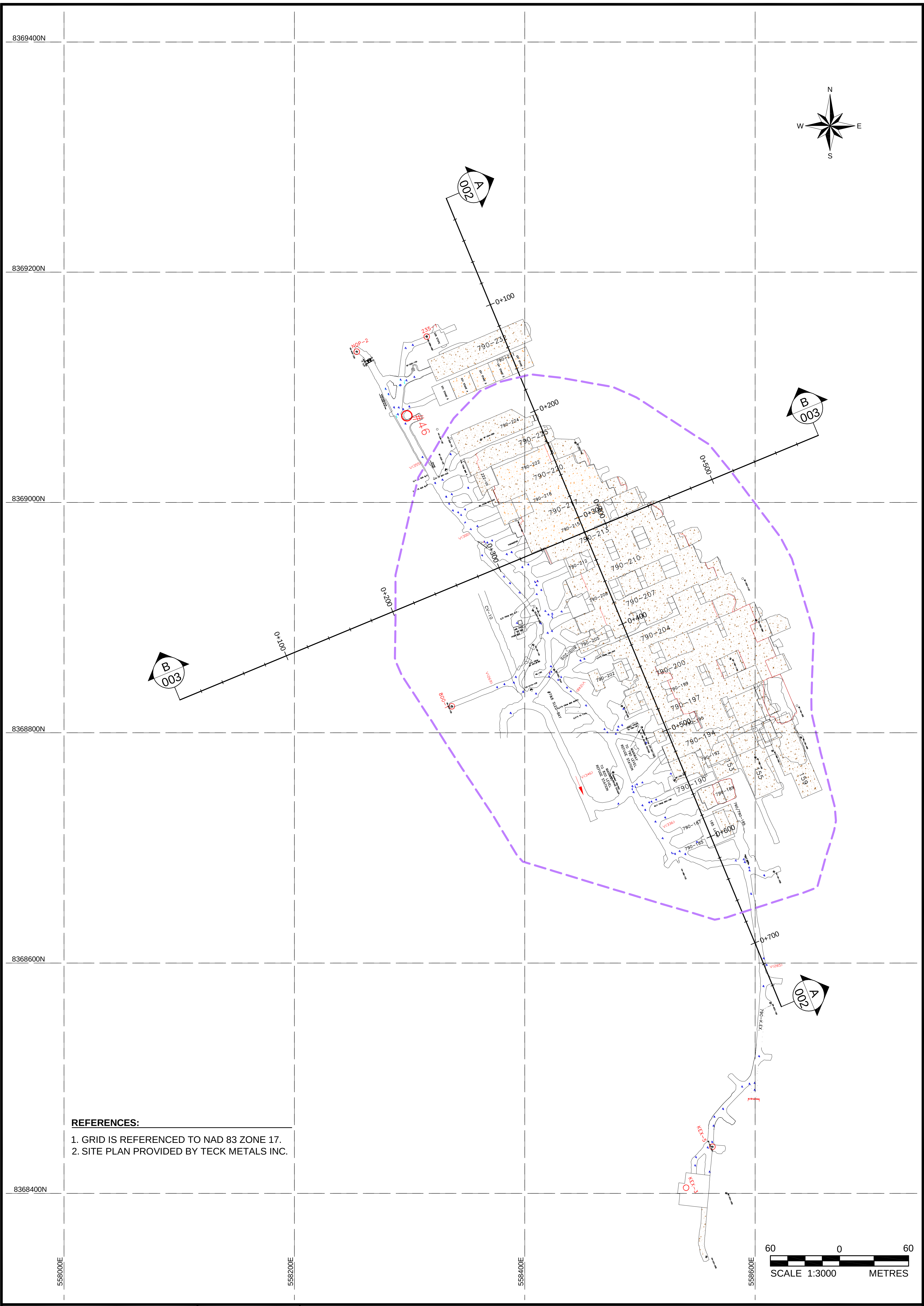

REFERENCES:

1. GRID IS REFERENCED TO NAD 83 ZONE 17.
2. SITE PLAN PROVIDED BY TECK METALS INC.

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SCALE	AS SHOWN
DATE	Nov. 19, 2012
DESIGN	EPT
CAD	MY
CHECK	DCJ
REVIEW	RH

FILE No. 1211180022AC00A1-15.dwg

PROJECT No. 12-1118-0022 REV.

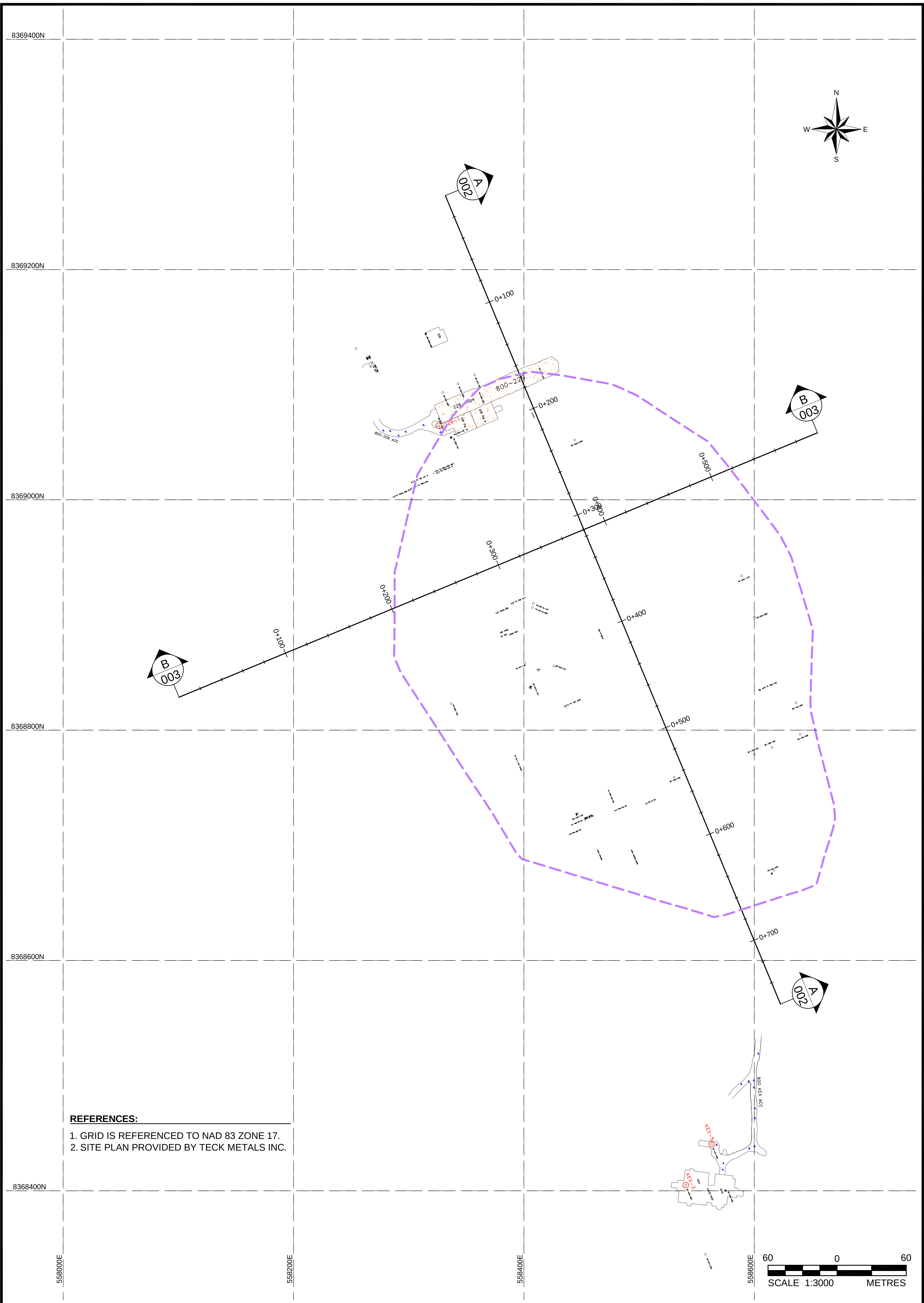
TITLE

LEVEL 790 PLAN VIEW

TECK METALS - SUBSIDENCE ASSESSMENT

FIGURE A-4

PLOT DATE: November 19, 2012
FILENAME: T:\Projects\2012\12-1118-0022 (TECH RESOURCES, Resolute)\-AC-\1211180022AC00A1-15.dwg



REFERENCES:

1. GRID IS REFERENCED TO NAD 83 ZONE 17.
2. SITE PLAN PROVIDED BY TECK METALS INC.

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SCALE	AS SHOWN
DATE	Nov. 19, 2012
DESIGN	EPT
CAD	MY
CHECK	DCJ
REVIEW	RH

FILE No. 1211180022AC00A1-15.dwg

PROJECT No. 12-1118-0022 REV.

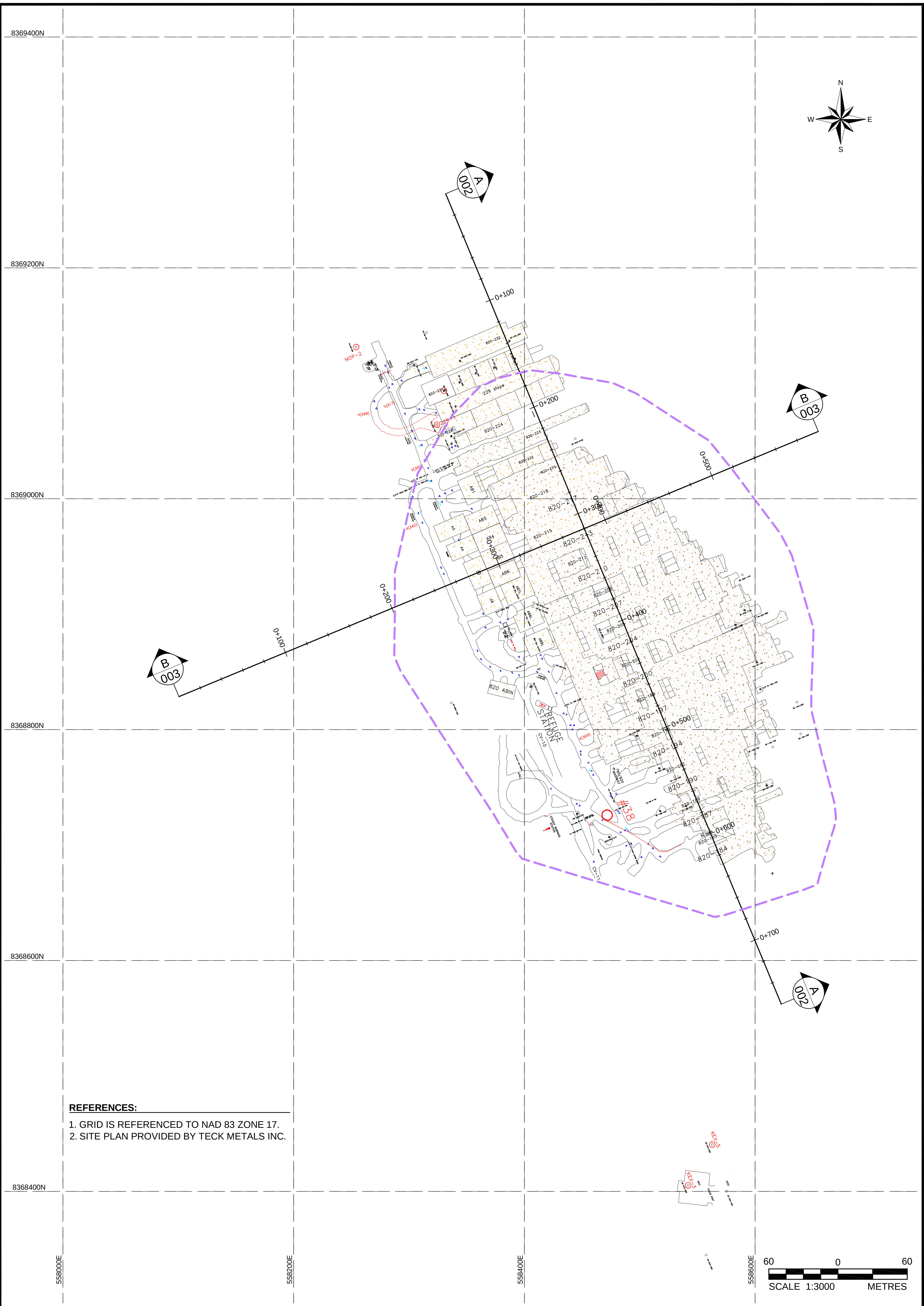
TITLE

LEVEL 800 PLAN VIEW

TECK METALS - SUBSIDENCE ASSESSMENT

FIGURE **A-5**

PLOT DATE: November 19, 2012
FILENAME: T:\Projects\2012\12-1118-0022 (TECH RESOURCES, Resolute)\-AC-\1211180022AC00A1-15.dwg



REFERENCES:

1. GRID IS REFERENCED TO NAD 83 ZONE 17.
2. SITE PLAN PROVIDED BY TECK METALS INC.

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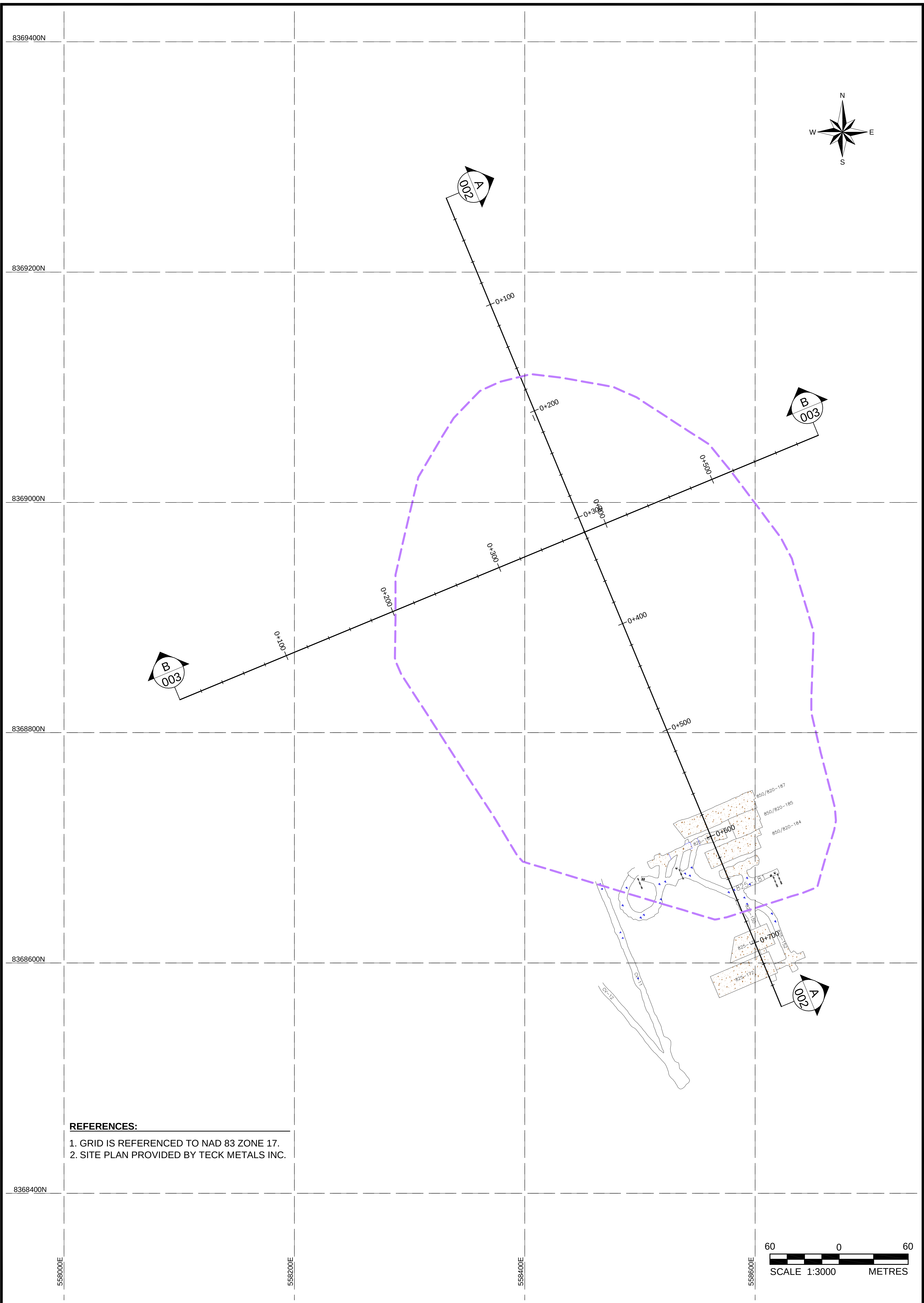
SCALE	AS SHOWN	TITLE	
DATE	Nov. 19, 2012	**LEVEL 820 PLAN VIEW**	
DESIGN	EPT		
CAD	MY		
FILE No. 1211180022AC00A1-15.dwg	CHECK DCJ	TECK METALS - SUBSIDENCE ASSESSMENT	FIGURE A-6
PROJECT No. 12-1118-0022 REV.	REVIEW RH		

PLOT DATE: November 19, 2012
FILENAME: T:\Projects\2012\12-1118-0022 (TECH RESOURCES, Resolute)\-AC-\1211180022AC00A1-15.dwg

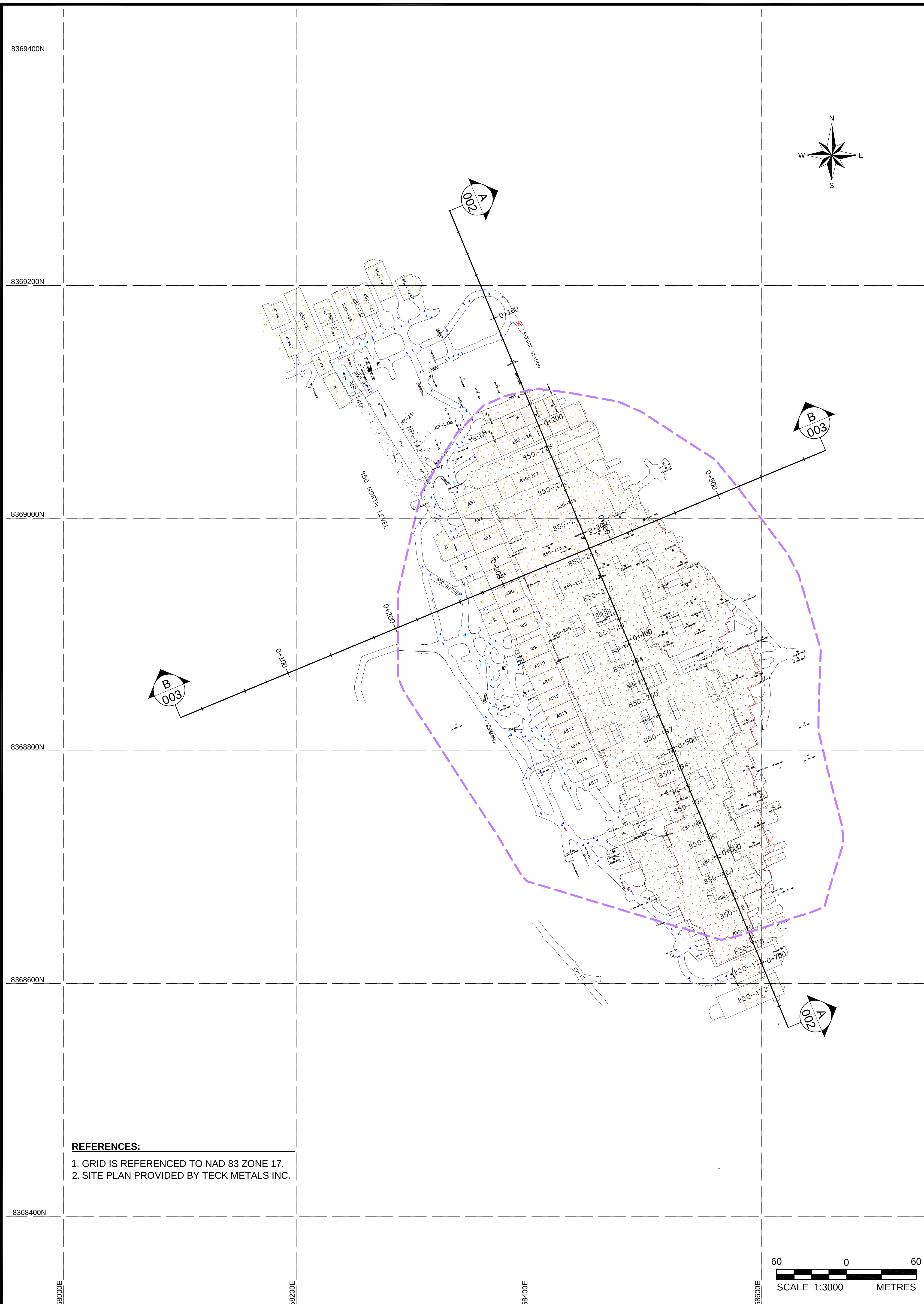


REFERENCES:

1. GRID IS REFERENCED TO NAD 83 ZONE 17.
2. SITE PLAN PROVIDED BY TECK METALS INC.

Golder Associates, Mississauga, Ontario, Canada	SCALE: AS SHOWN	TITLE
	DATE: Nov. 19, 2012	LEVEL 825 PLAN VIEW
	DESIGN: EPT	
	CAD: MY	
FILE No. 1211180022AC00A1-15.dwg	CHECK: DCJ	TECK METALS - SUBSIDENCE ASSESSMENT
PROJECT No. 12-1118-0022 REV.	REVIEW: RH	FIGURE A-7

PLOT DATE: November 19, 2012
FILENAME: T:\Projects\2012\12-1118-0022 (TECH RESOURCES, Resolute)\-AC-\1211180022AC00A1-15.dwg

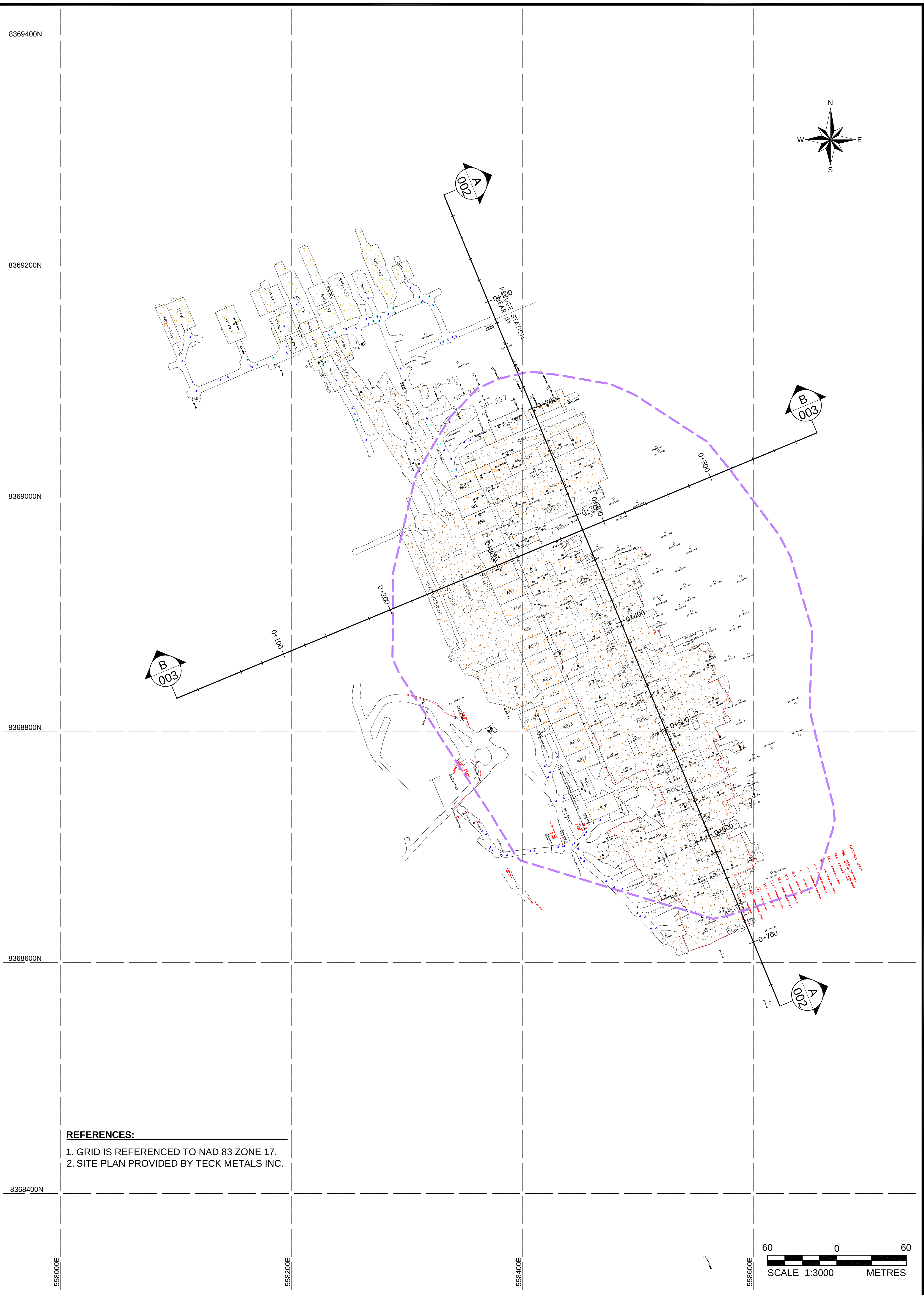


REFERENCES:

1. GRID IS REFERENCED TO NAD 83 ZONE 17.
2. SITE PLAN PROVIDED BY TECK METALS INC.

Golder Associates Mississauga, Ontario, Canada	SCALE AS SHOWN	TITLE	
	DATE Nov. 19, 2012	**LEVEL 850 PLAN VIEW**	
	DESIGN EPT		
	CAD MY		
FILE No. 1211180022AC00A1-15.dwg	CHECK DCJ	TECK METALS - SUBSIDENCE ASSESSMENT	FIGURE
PROJECT No. 12-1118-0022 REV.	REVIEW RH		**A-8**

PLOT DATE: November 19, 2012
FILENAME: T:\Projects\2012\12-1118-0022 (TECH RESOURCES, Resolute)\-AC-\1211180022AC00A1-15.dwg



REFERENCES:

1. GRID IS REFERENCED TO NAD 83 ZONE 17.
2. SITE PLAN PROVIDED BY TECK METALS INC.

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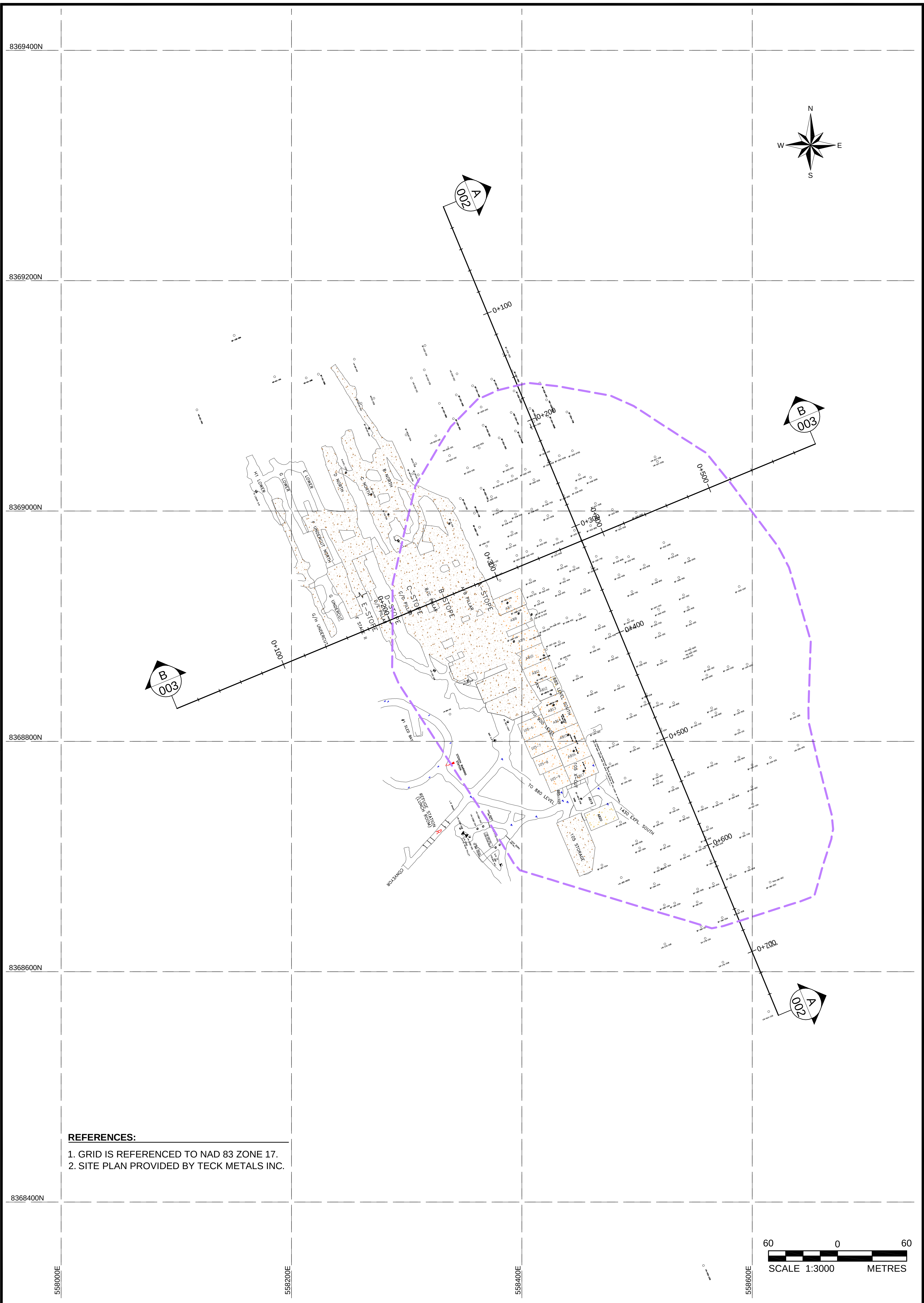
SCALE	AS SHOWN	TITLE	
DATE	Nov. 19, 2012	LEVEL 880 PLAN VIEW	
DESIGN	EPT		
CAD	MY		
FILE No. 1211180022AC00A1-15.dwg	CHECK DCJ	TECK METALS - SUBSIDENCE ASSESSMENT	FIGURE A-9
PROJECT No. 12-1118-0022 REV.	REVIEW RH		

PLOT DATE: November 19, 2012
FILENAME: T:\Projects\2012\12-1118-0022 (TECH RESOURCES, Resolute)\-AC-\1211180022AC00A1-15.dwg



REFERENCES:

1. GRID IS REFERENCED TO NAD 83 ZONE 17.
2. SITE PLAN PROVIDED BY TECK METALS INC.

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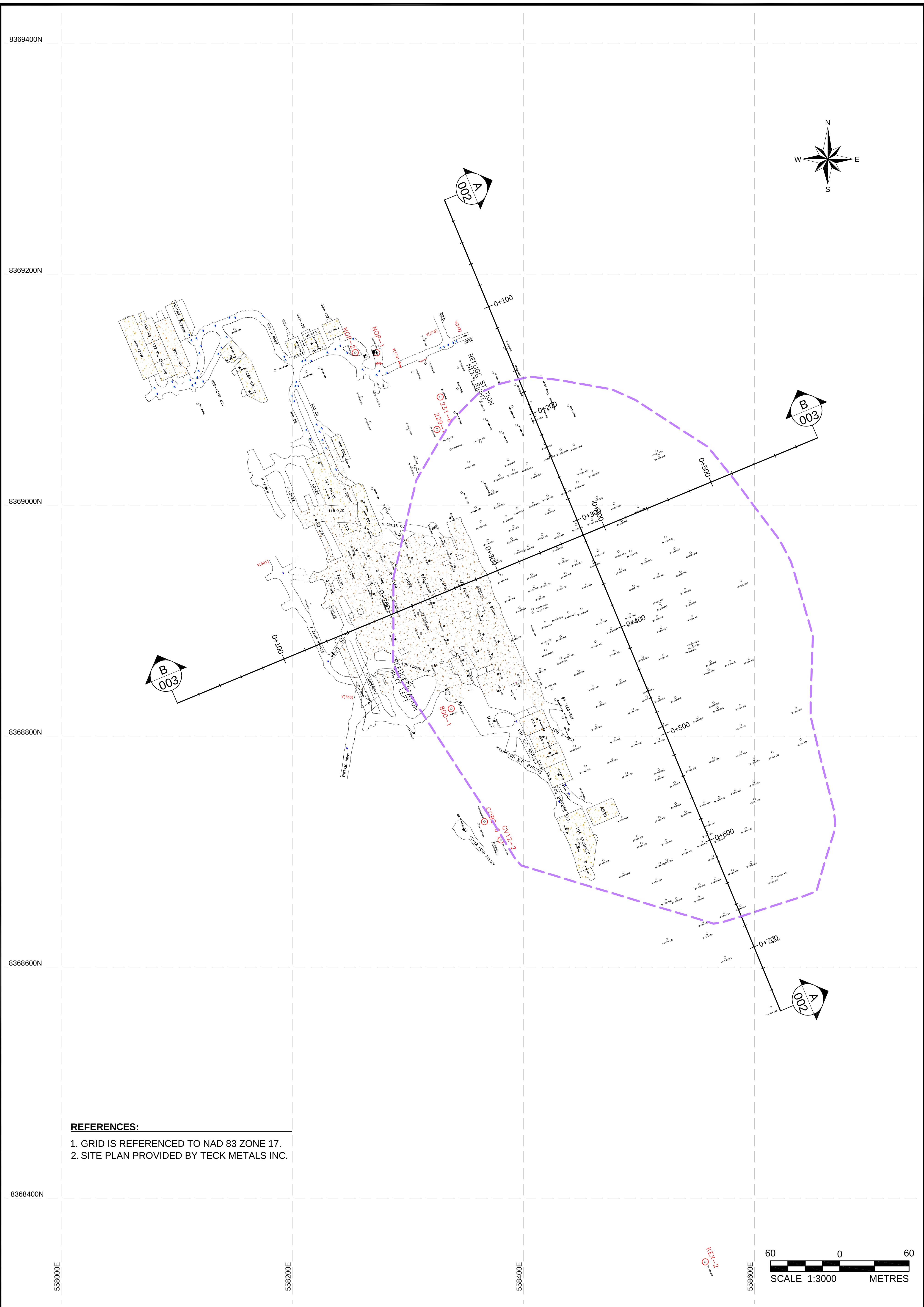
SCALE	AS SHOWN	TITLE	
DATE	Nov. 19, 2012		
DESIGN	EPT		
CAD	MY		
CHECK	DCJ		
REVIEW	RH		
FILE No.	1211180022AC00A1-15.dwg		
PROJECT No.	12-1118-0022	REV.	

LEVEL 885 PLAN VIEW

TECK METALS - SUBSIDENCE ASSESSMENT

FIGURE **A-10**

PLOT DATE: November 19, 2012
FILENAME: T:\Projects\2012\12-1118-0022 (TECH RESOURCES, Resolute)\-AC-\1211180022AC00A1-15.dwg

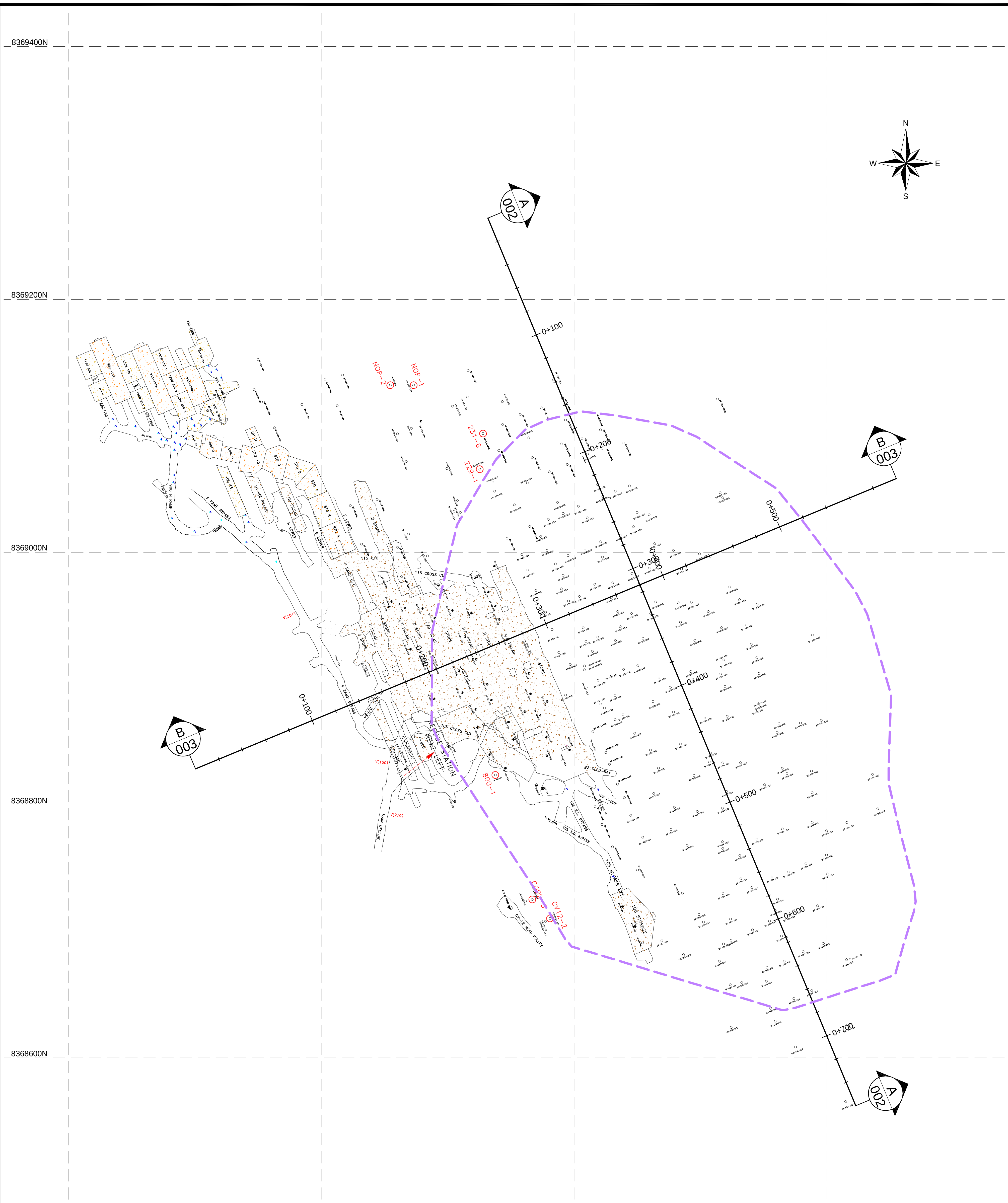


REFERENCES:

1. GRID IS REFERENCED TO NAD 83 ZONE 17.
2. SITE PLAN PROVIDED BY TECK METALS INC.

Golder Associates, Mississauga, Ontario, Canada	SCALE: AS SHOWN	TITLE	
	DATE: Nov. 19, 2012	**LEVEL 900 PLAN VIEW**	
	DESIGN: EPT		
	CAD: MY		
FILE No. 1211180022AC00A1-15.dwg	CHECK: DCJ	TECK METALS - SUBSIDENCE ASSESSMENT	FIGURE
PROJECT No. 12-1118-0022 REV.	REVIEW: RH		**A-11**

PLOT DATE: November 19, 2012
FILENAME: T:\Projects\2012\12-1118-0022 (TECH RESOURCES, Resolute)\-AC-\1211180022AC00A1-15.dwg



REFERENCES:

1. GRID IS REFERENCED TO NAD 83 ZONE 17.
2. SITE PLAN PROVIDED BY TECK METALS INC.

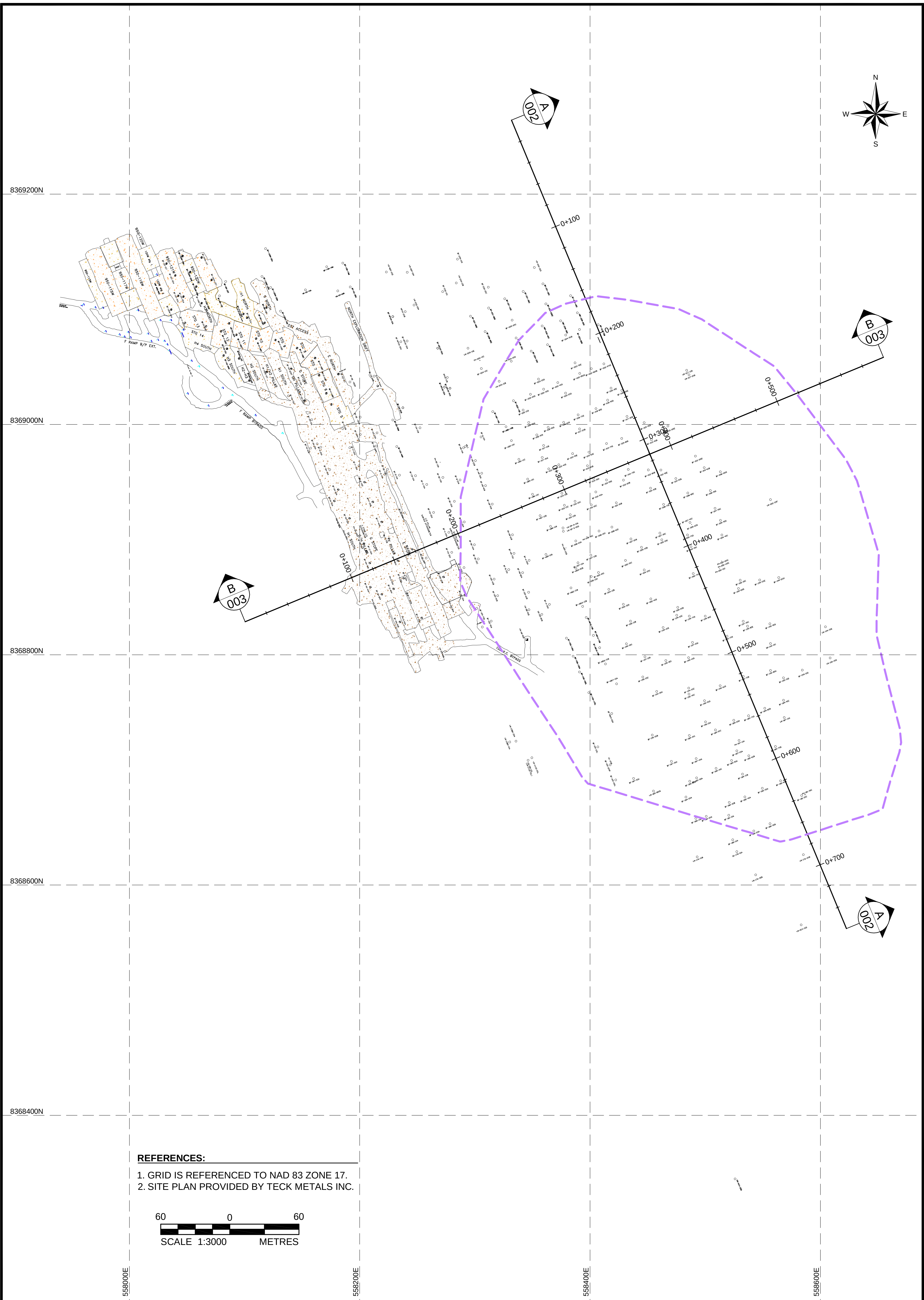
8368400N

558000E
558200E
558400E
558600E

60 0 60
SCALE 1:3000 METRES

Golder Associates Mississauga, Ontario, Canada	SCALE AS SHOWN DATE Nov. 19, 2012 DESIGN EPT CAD MY	TITLE **LEVEL 930 PLAN VIEW**
FILE No. 1211180022AC00A1-15.dwg PROJECT No. 12-1118-0022 REV.	CHECK DCJ REVIEW RH	TECK METALS - SUBSIDENCE ASSESSMENT — FIGURE **A-12**

PLOT DATE: November 19, 2012
FILENAME: T:\Projects\2012\12-1118-0022 (TECH RESOURCES, Resolute)\-AC-\1211180022AC00A1-15.dwg



REFERENCES:

1. GRID IS REFERENCED TO NAD 83 ZONE 17.
2. SITE PLAN PROVIDED BY TECK METALS INC.

60 0 60

SCALE 1:3000 METRES

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Mississauga, Ontario, Canada

SCALE	AS SHOWN
DATE	Nov. 19, 2012
DESIGN	EPT
CAD	MY
CHECK	DCJ
REVIEW	RH

FILE No. 1211180022AC00A1-15.dwg

PROJECT No. 12-1118-0022 REV.

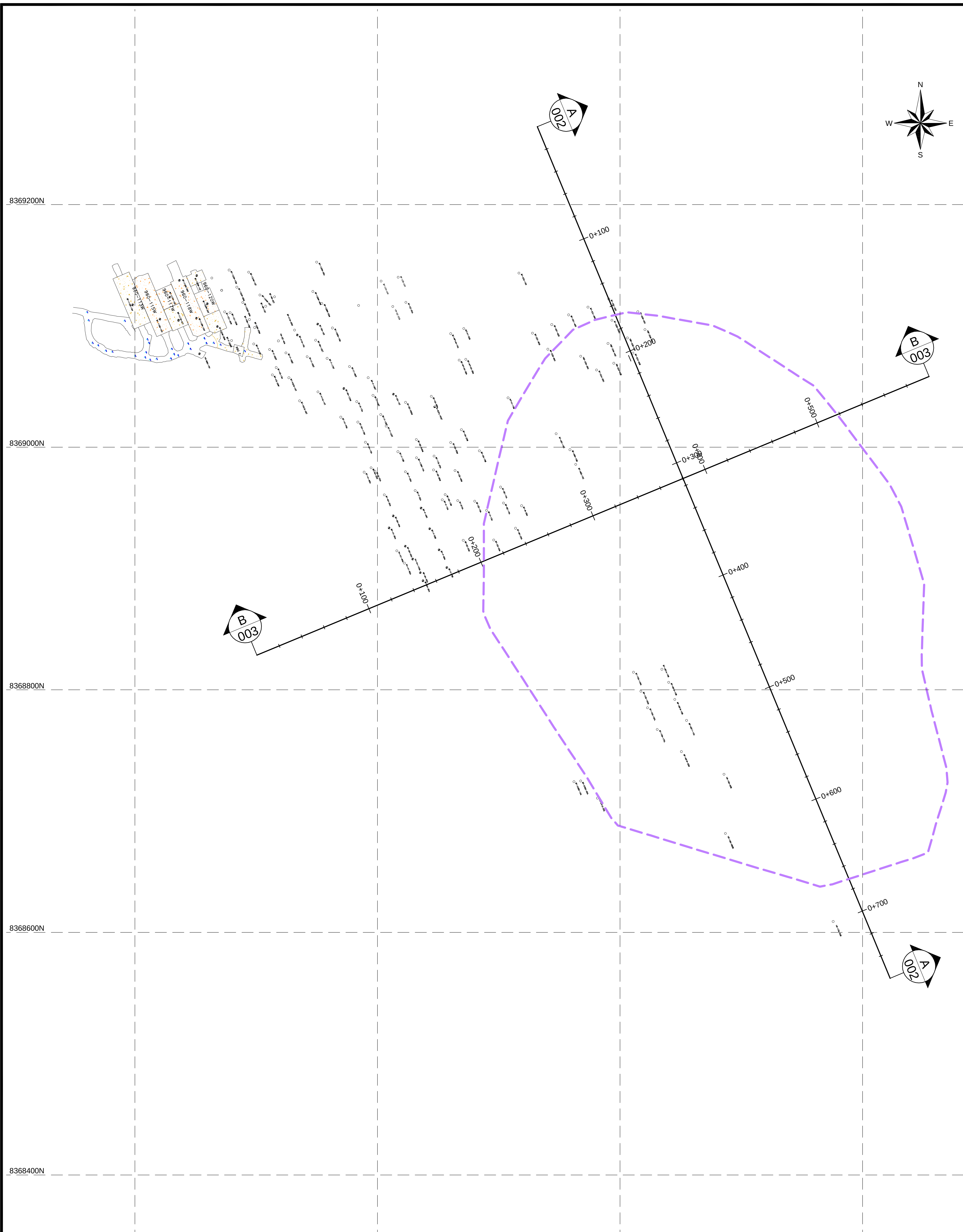
TITLE

LEVEL 950 PLAN VIEW

TECK METALS - SUBSIDENCE ASSESSMENT

FIGURE A-13

PLOT DATE: November 19, 2012
FILENAME: T:\Projects\2012\12-1118-0022 (TECH RESOURCES, Resolute)\-AC-\1211180022AC00A1-15.dwg



REFERENCES:

1. GRID IS REFERENCED TO NAD 83 ZONE 17.
2. SITE PLAN PROVIDED BY TECK METALS INC.

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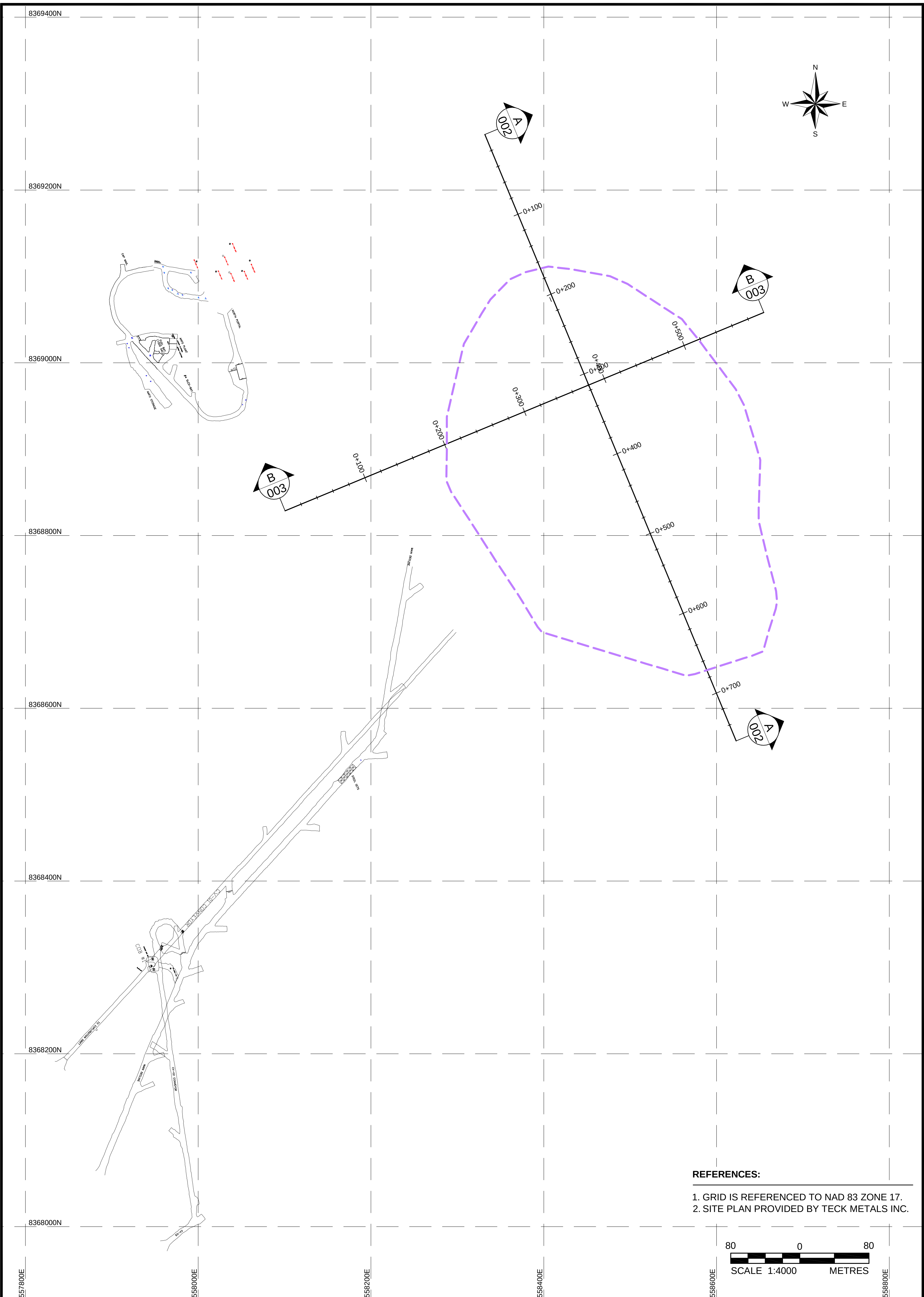
SCALE 1:3000 METRES

Golder Associates
Mississauga, Ontario, Canada

SCALE	AS SHOWN	TITLE	LEVEL 960 PLAN VIEW
DATE	Nov. 19, 2012		
DESIGN	EPT		
CAD	MY		
FILE No. 1211180022AC00A1-15.dwg	CHECK	DCJ	TECK METALS - SUBSIDENCE ASSESSMENT
PROJECT No. 12-1118-0022 REV.	REVIEW	RH	FIGURE A-14

PLOT DATE: November 19, 2012
FILENAME: T:\Projects\2012\12-1118-0022 (TECH RESOURCES, Resolute)\-AC-\1211180022AC00A1-15.dwg



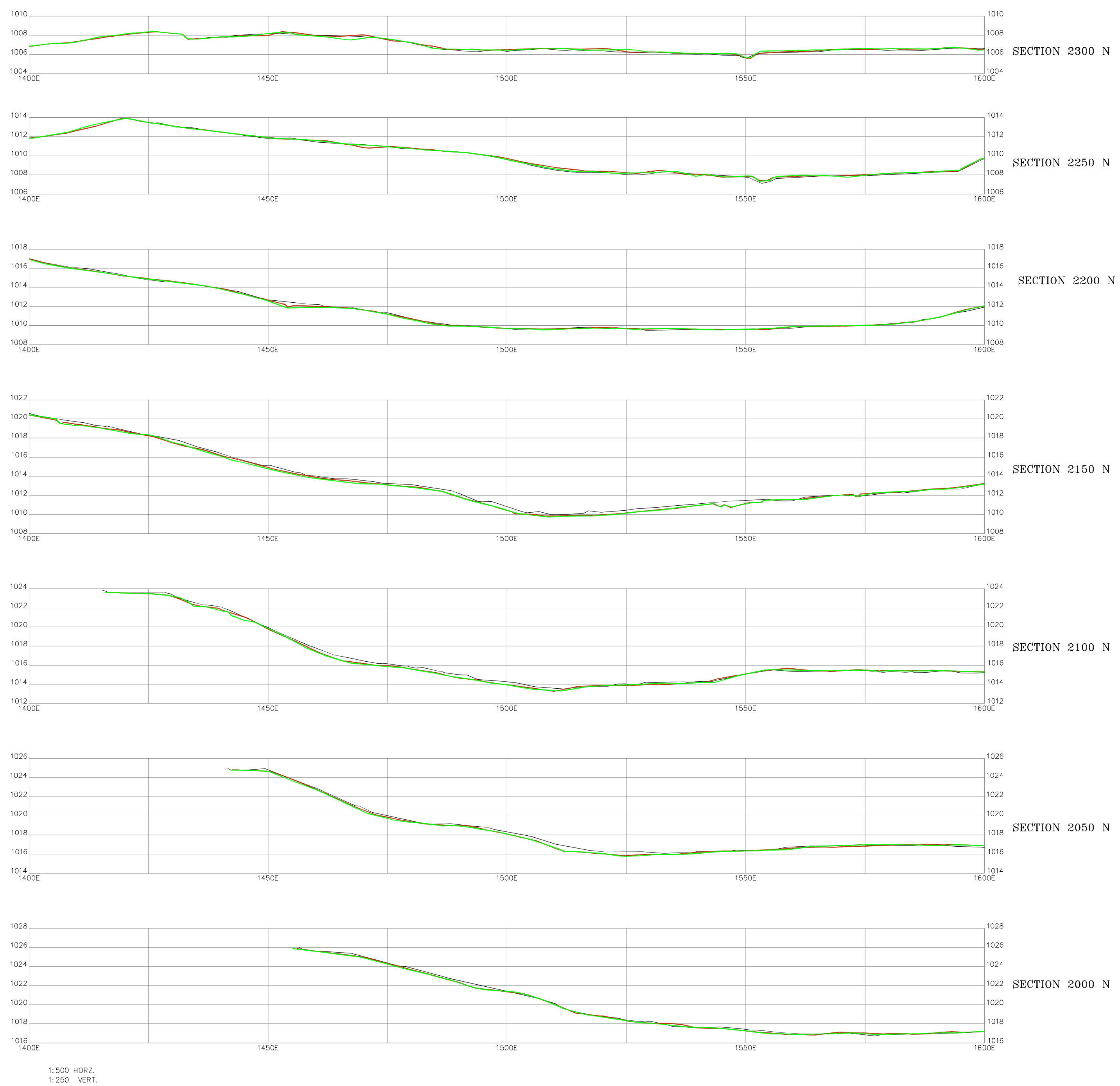
REFERENCES:

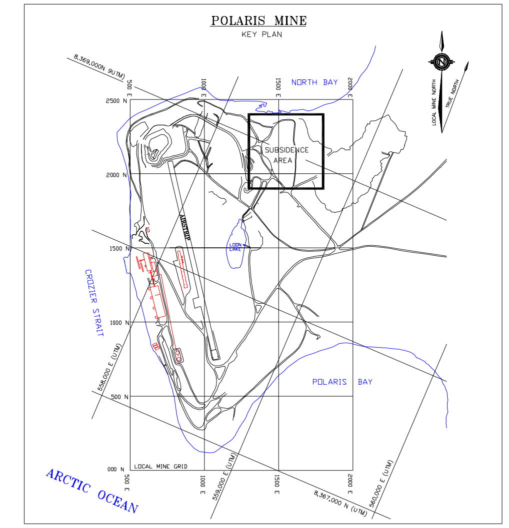
1. GRID IS REFERENCED TO NAD 83 ZONE 17.
2. SITE PLAN PROVIDED BY TECK METALS INC.

Golder Associates, Mississauga, Ontario, Canada	SCALE: AS SHOWN	TITLE: **LEVEL 980 PLAN VIEW**
	DATE: Nov. 19, 2012	
	DESIGN: EPT	
	CAD: MY	
FILE No. 1211180022AC00A1-15.dwg	CHECK: DCJ	TECK METALS - SUBSIDENCE ASSESSMENT
PROJECT No. 12-1118-0022 REV.	REVIEW: RH	FIGURE **A-15**

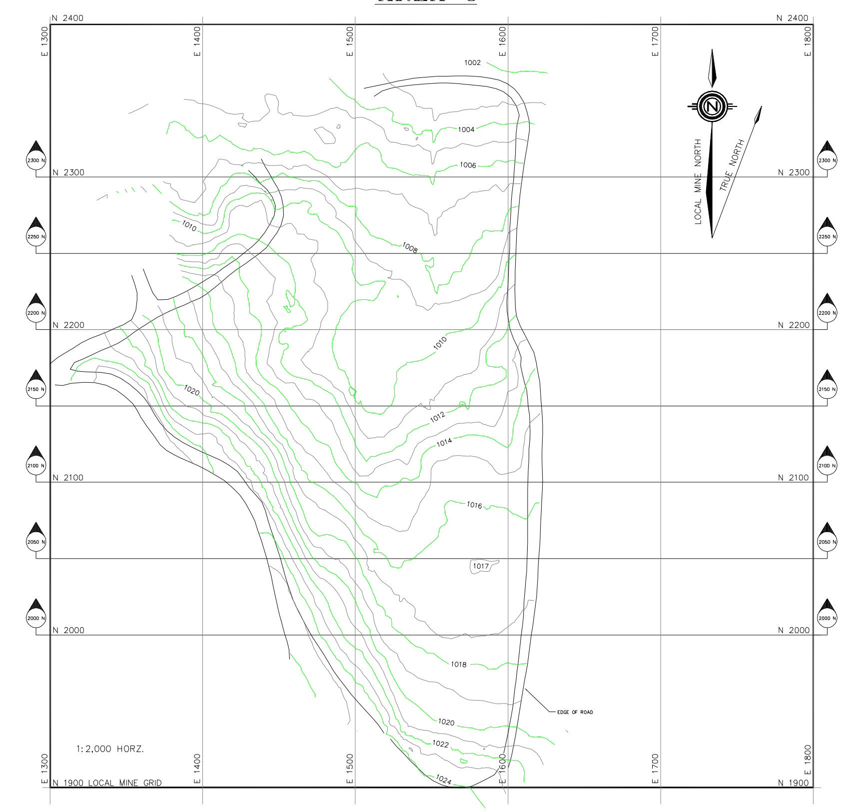
APPENDIX B

2011 Subsidence Area Survey Results





POLARIS MINE
AREA 8



NOTES:
1. DATA COLLECTED JULY, 2011 BY FOCUS ENGINEERING.
2. SECTION CO-ORDINATES AND ELEVATIONS REFER TO LOCAL MINE DATUM.
3. CONTOUR INTERVALS = 1meter
4. SECTIONS HAVE A 2:1 VERTICAL EXAGGERATION.

LEGEND:
DENOTES 2011 SURFACE.
DENOTES 2010 SURFACE.
DENOTES 2005 SURFACE.

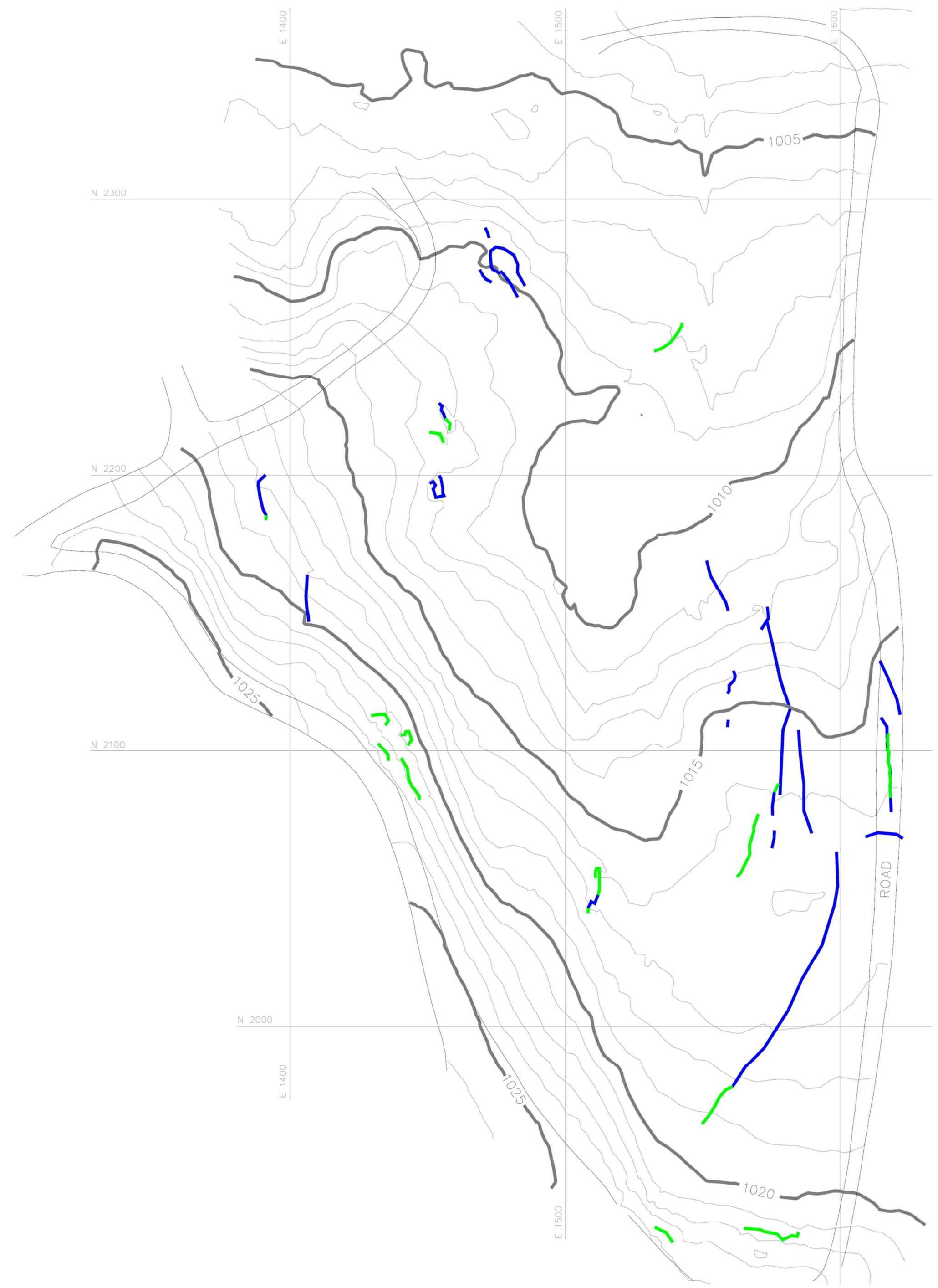
PROJECT:
POLARIS MINE POST CLOSURE
2011 ANNUAL SITE INSPECTION

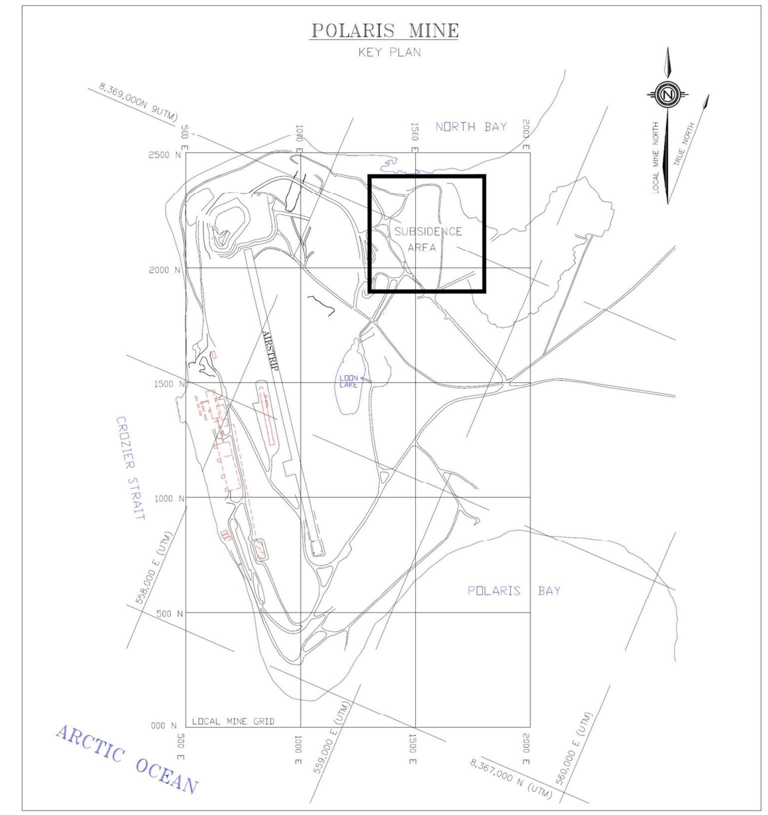
DRAWING:
PLAN & SECTION VIEWS
SUBSIDENCE – AREA 8

DRAWN BY: T. M. TECH SERVICES 10–542
CLIENT: Teck
DATE: AUGUST 3, 2011
SCALE: 1:1250 HORZ. 1:625 VERT.
FIGURE No.: PM 2011 AREA 8
SHEET: 1 of 2

Golder Associates

SCALE	AS SHOWN	TITLE	
DATE	Nov. 19, 2012	2011 SUBSIDENCE AREA SURVEY PLAN AND SECTION	
DESIGN	EPT		
CAD	MY		
FILE No. 1211180022AC00B1.dwg	CHECK DCJ	TECK METALS - SUBSIDENCE ASSESSMENT	FIGURE B-1
PROJECT No. 12-1118-0022 REV.	REVIEW RH		





POLARIS MINE
AREA 8

NOTES:

1. DATA COLLECTED JULY, 2011 BY FOCUS ENGINEERING.
2. ELVATIONS REFER TO LOCAL MINE DATUM.
3. CONTOUR INTERVAL 1 meter.

LEGEND:

- DENOTES CRACKS LOCATED IN 2011 NOT PREVIOUSLY IDENTIFIED
- DENOTES CRACKS IDENTIFIED IN PREVIOUS YEARS

CONTOURS FROM JULY 2011 SURVEY

PROJECT:
POLARIS MINE POST CLOSURE
2011 ANNUAL SITE INSPECTION

DRAWING:
ANNUAL SURVEY REVIEW
SUBSIDENCE CRACKS – AREA 8

DRAWN BY:
T. M. TECH SERVICES
11–578

CLIENT:
Teck

DATE:
AUGUST 4, 2011

SCALE:
1:2500

FIGURE No.: PM 2011 AREA 8

SHEET: 2 OF 2

Golder Associates
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SCALE	1:2500
DATE	Nov. 19, 2012
DESIGN	EPT
CAD	MY
CHECK	DCJ
REVIEW	RH

FILE No. 1211180022AC00B2.dwg

PROJECT No. 12-1118-0022 REV.

TITLE

2011 SUBSIDENCE AREA SURVEY OBSERVED SURFACE CRACKS

TECK METALS - SUBSIDENCE ASSESSMENT

FIGURE B-2

PLOT DATE: November 19, 2012
FILENAME: T:\Projects\2012\12-1118-0022 (TECH RESOURCES, Resolute)\-AC-\1211180022AC00B2.dwg

APPENDIX C

Financial Assurance Calculations

TABLE C-1
FENCING AND GEOTECHNICAL INSPECTION COST ESTIMATES
Polaris Subsidence Area
Long-Term Financial Assurance

Fence Installation/Replacement Cost (Initial and Every 40 Years Thereafter)

Description		Quantity	Unit	Unit Cost	Total
Fence Installation (1360 m)	Supply and Installation of Fencing (materials, labour and supervision)	1	lump sum	$280,000.00	$280,000.00
	Installation Equipment	1	lump sum	$250,000.00	$250,000.00
Transporting Supplies	Ship From Montreal to Site (40 tonnes)	1	lump sum	$100,000.00	$100,000.00
Travel	Flights (round trip Ottawa/Resolute)	7	round trip	$6,000.00	$42,000.00
	Flights (round trip Resolute/site)	10	round trip	$2,500.00	$25,000.00
	Temporary Camp (Room & Board)	20	days	$2,000.00	$40,000.00
Additional Labour	Inuit Wildlife Monitor	240	hours	$50.00	$12,000.00
	Local Contracted Labourer	240	hours	$50.00	$12,000.00
	Mechanic	240	hours	$100.00	$24,000.00
Miscellaneous	ATV	2	lump sum	$5,000.00	$10,000.00
	Fuel	1	lump sum	$10,000.00	$10,000.00
	30% total (15% tax and 15% contingency)				$241,500.00
				Total Cost	$1,046,500.00

Major Fence Repair Cost (20 Years after Installation or Replacement)

Description		Quantity	Unit	Unit Cost	Total
Repair (400 m)	Supply and Installation of Fencing (materials, labour and supervision)	1	lump sum	$100,000.00	$100,000.00
Transporting Supplies	Ship From Montreal to Resolute (6 tonnes)	1	lump sum	$10,000.00	$10,000.00
	Chartered Flights From Resolute to Site	30	round trip	$2,500.00	$75,000.00
Travel	Flights (round trip Ottawa/Resolute)	6	round trip	$6,000.00	$36,000.00
	Flights (round trip Resolute/site)	1	round trip	$2,500.00	$2,500.00
	Temporary Camp (Room & Board)	7	days	$2,000.00	$14,000.00
Additional Labour	Inuit Wildlife Monitor	84	hours	$50.00	$4,200.00
	Local Contracted Labourer	84	hours	$50.00	$4,200.00
	Mechanic	84	hours	$100.00	$8,400.00
Miscellaneous	30% total (15% tax and 15% contingency)				$76,290.00
				Total Cost	$330,590.00

Geotechnical Inspection Cost (Per Event)

Description		Quantity	Unit	Unit Cost	Total
Travel	Flight (round trip ottawa/resolute)	1	$	$5,625.00	$5,625.00
	Flight (round trip resolute/site)	1	$	$3,616.00	$3,616.00
	Room & Board	5	$/day	$170.00	$850.00
	Equipment	1	$/day	$500.00	$500.00
Labour	Supervisor	40	$/hr	$180.00	$7,200.00
	Inuit Wildlife Monitoring	12	$/hr	$25.00	$300.00
	Local contracted labour	12	$/hr	$90.00	$1,080.00
	Reporting	1	lump sum	$10,000.00	$10,000.00
Miscellaneous	30% total (15% tax and 15% contingency)				$8,751.30
				Total Cost	$37,922.30

Notes: Assumes 6 labourers required for fence installation and repair.
Assumes 20 days for fence installation or replacement (every 40 years).
Assumes 7 days for major fence repair (every 20 years).

TABLE C-2
NET PRESENT VALUE CALCULATION
Polaris Subsidence Area
Long-Term Financial Assurance

Year	Event	Annual Cost (2012 dollars)
2014	Geotechnical Inspection	$37,922.30
2015	Fence Installation	$1,046,500.00
2019	Geotechnical Inspection	$37,922.30
2029	Geotechnical Inspection	$37,922.30
2035	Major Fence Repair	$330,590.00
2039	Geotechnical Inspection	$37,922.30
2049	Geotechnical Inspection	$37,922.30
2055	Fence Installation	$1,046,500.00
2059	Geotechnical Inspection	$37,922.30
2069	Geotechnical Inspection	$37,922.30
2075	Major Fence Repair	$330,590.00
2079	Geotechnical Inspection	$37,922.30
2089	Geotechnical Inspection	$37,922.30
2095	Fence Installation	$1,046,500.00
2099	Geotechnical Inspection	$37,922.30
2109	Geotechnical Inspection	$37,922.30
2115	Major Fence Repair	$330,590.00
2119	Geotechnical Inspection	$37,922.30
2129	Geotechnical Inspection	$37,922.30
2135	Fence Installation	$1,046,500.00
2139	Geotechnical Inspection	$37,922.30
2149	Geotechnical Inspection	$37,922.30
2155	Major Fence Repair	$330,590.00
2159	Geotechnical Inspection	$37,922.30
2169	Geotechnical Inspection	$37,922.30
2175	Fence Installation	$1,046,500.00
2179	Geotechnical Inspection	$37,922.30
2189	Geotechnical Inspection	$37,922.30
2195	Major Fence Repair	$330,590.00
2199	Geotechnical Inspection	$37,922.30

Estimated Net Present Value:	$1,190,008.43

Notes: An annual discount rate of 5.22% was used to calculate the net present value

At Golder Associates we strive to be the most respected global company providing consulting, design, and construction services in earth, environment, and related areas of energy. Employee owned since our formation in 1960, our focus, unique culture and operating environment offer opportunities and the freedom to excel, which attracts the leading specialists in our fields. Golder professionals take the time to build an understanding of client needs and of the specific environments in which they operate. We continue to expand our technical capabilities and have experienced steady growth with employees who operate from offices located throughout Africa, Asia, Australasia, Europe, North America, and South America.

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Europe	+ 356 21 42 30 20
North America	+ 1 800 275 3281
South America	+ 55 21 3095 9500

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