Appendix 17.4-E

Jacko Lake and Downstream Pond Alternatives Assessment

NORWEST
CORPORATION

Suite 1830, 1066 W. Hastings Street
Vancouver, BC V6E 3X2
Tel: (604) 602-8992
www.norwestcorp.com

Memorandum

To	Daniel Lefebvre (KGHM)	**Project #**	809-3
CC	Clive Gillespie (KGHM)	**Date**	August 25, 2015
From	Chris Klassen (Norwest)	**Doc #**	C135-KA39-MEM-00-001
Subject	Jacko Lake and Downstream Pond Alternatives Assessment – Rev0		

1. INTRODUCTION

ORIGINAL SIGNED

Norwest Corporation (Norwest) was retained by KGHM Ajax Mining Inc. (KGHM) to develop and evaluate design options to manage water from Jacko Lake and Peterson Creek. As part of this work, Norwest completed a conceptual level trade-off study of viable water management options for these impacted areas. This document presents the results of the conceptual design alternatives study for Jacko Lake and Peterson Creek downstream pond to assist KGHM in selecting a preferred water management option for the next level of design and related cost studies. These options were presented to KGHM in a meeting on December 18, 2014. Subsequent review comments provided by KGHM (dated February 6, 2015) have been incorporated into this memorandum.

Engineered dams will be required within Jacko Lake to provide a reasonable offset from the proposed open pit to avoid flooding in this area and to preserve habitat and existing water license for downstream irrigation. It is understood that the water level in Jacko Lake will be managed to meet design requirements and any surplus water will be transferred to a new downstream pond located downstream of the open pit in Peterson Creek. Jacko Lake will be pumped down through a pump and pipework system ("Peterson Creek Diversion System") following the Main access road at a discharge location downstream. These structures will be required during the early phases of the project (Pre-Production) and during mine operations (Production). Closure considerations to return Jacko Lake to current (pre-mining) conditions are under development and will be addressed at a later date. A general site plan with major mine structures are shown on Figure 1.

2. AVAILABLE INFORMATION

The following information was used to develop the conceptual design options:

- Frontier Geosciences bathymetry survey (Klohn Crippen Berger (KCB), December 2014).
- Preliminary water management plan (Knight Piesold Ltd. (KPL), October 2014).
- Preliminary site infrastructure layouts (KPL, October 2014).
- Proposed and existing Kinder Morgan pipeline routes (KGHM, November 2014).

- Open pit, primary crusher, plant site, conveyor, truck shop footprints (KGHM, November 2014).
- Peterson Creek diversion pipeline (KGHM, November 2014).
- Tailings Storage Facility (TSF) and ancillary structures (KGHM, November 2014).
- TSF, East and South Mine Rock Storage Facility (MRSF) layouts and ancillary structures (KGHM, November 2014).
- Haul and access roads (KGHM, November 2014).
- Hydrology information (Norwest, 2015) .

3. DESIGN BASIS

The following design criteria were used to develop options for the Jacko Lake dams and the Peterson Creek downstream pond.

- Geotechnical:
  - 3H:1V upstream and downstream dam slopes assuming engineered fill structures.
  - 5m minimum dam crest width.
  - 1m deep foundation preparation beneath dam footprint area.
- Hydrotechnical:
  - Jacko Lake elevation is at El. 892m.
  - Jacko Lake current storage volume at El. 892m is approximately 4Mm^3 with a surface area of 44ha.
  - Design Flood (DF) is the Probable Maximum Flood (PMF).
  - 1.5m minimum freeboard.
- Environmental Constraints:
  - The Peterson Creek downstream ponds were sized to provide a minimum impoundment depth of 10m. It is understood that as the design progresses, the pond size may be reduced depending on compensation habitat and downstream water license requirements.
- Operational Constraints:
  - Maintain 100 m offset from the ultimate pit.
  - Maintain 90m offset from Kinder Morgan pipeline alignment.

Development of the PMF volumes and inflows are based on a separate hydrology study (Norwest, 2015). The PMF criteria are the highest design flood value under the design criteria outlined by the Canadian Dam Association Guidelines. This conservative design assumption was used to determine the highest dam heights and largest dam footprint for this conceptual study. It is understood that the dam class for Jacko Lake and the downstream pond would likely be a lower dam consequence category that would have lower DF requirements.

4. CONCEPTUAL DESIGN OPTIONS

Four (4) water management options were developed to manage water from Jacko Lake and Peterson Creek areas of the Ajax site.

A summary of these design options with respective layouts are presented in Table 1 and shown in Figures 2 to 10. Depth-area-capacity curves for each option are provided on Figures 12 and 13. The design basis criteria for each option are summarized in Table 2. Details for each design option are discussed in the following sections.

Table 1
Conceptual Design Options

Area	Option	Concept Description	Figure
Jacko Lake	1A	PMF or DF Event Containment	2
	1B	Contain a portion of the PMF or DF Event/ Spillway	3-8
Downstream Pond	2A	Within Ajax Mine Property Limits	10
	2B	Outside Ajax Mine Property Limits	11

Table 2

Jacko Lake and Downstream Pond Design Summary

Category		Jacko Lake		Peterson Creek Downstream Pond	
		1A	1B	2A	2B
Dam Configuration	# New Dams	3	3	1	1
	Dam Crest Elevation (masl)	894.5	894.5	877	840
	Max Dam Height (m)	5	5	15	20
	Dam Fill Volume (m^3)	25,000	25,000	75,000	139,000
Hydrotechnical	Max. NWL	892	892	874	837
	Immediate Catchment Area (Mm^2)	211 ha	211 ha	480 ha	300 ha
	Dead Storage (Mm^3)	4	4	N/A	N/A
	Live (Flood) Storage (Mm^3)	0.6	< 0.6[1]	N/A	N/A
	Total Storage Capacity (Mm^3)	4.5	4 to 4.6[2]	1.0	0.6
	Storage Efficiency[3]	25	< 25	14	4
	Spillway Invert Elevation (masl)	N/A	892 to 893[2]	874	837
	Spillway Outlet Location	N/A	Inks Lake, Alkali Creek, Peterson Creek	Peterson Creek	Peterson Creek
	Approx. Spillway Length (km)	N/A	1.6 to 3.3	0.2	0.3
	Max Spillway Channel Excavation (m)	N/A	5 to 41	< 5	< 5
Environmental	NWL Pond Area (ha)	44	44	17	7
	Inundated Area -Loss/+Gain (ha)	-5	-5	+17	+7
	Max. Pond Depth at NWL (m)	23	23	12	17

1. NWL = Normal water level.
2. Spillway invert level to be optimized to meet storage capacity and downstream requirements.
3. Storage Efficiency = Increase in Storage volume / Fill Volume.
4. This is the maximum Jacko Lake area at El. 892m.

4.1. Jacko Lake

Two primary design options were developed to manage water from Jacko Lake as follows:

- Option 1A will contain the DF within Jacko Lake using three engineered dams.
- Option 1B will contain a portion of the DF using three engineered dams, and any surplus flood water would be released via engineered spillway. The volume of water to be released would be defined by the permitting requirements outlined by others.

A detailed description of the Jacko Lake conceptual design options is provided in the following sections.

4.1.1. Option 1A (Full Containment of the DF)

Options 1A provides full containment of the DF using three dams located along the west, northeast and east sides of Jacko Lake (See Figure 2). The dam heights for each of the three dams vary but will not exceed a maximum dam height of 5m (Crest El. 894.5m). This ultimate dam height will require a total fill volume of approximately 25,000m^3 for all three dams, which will provide a total storage capacity of 4.5Mm^3. The increased storage capacity for these dams (excluding the current volume of Jacko Lake at El. 892m) to embankment fill volume or storage efficiency ratio amounts to 25:1. This means that a cubic metre of dam fill volume will provide approximately 25 cubic metres of storage capacity.

Assuming that Jacko Lake is fixed at El. 892m, Option 1A will include approximately 5ha reduction in inundated water surface area. There are opportunities to decrease the potential habitat losses by raising the level of Jacko Lake and the engineered dam heights. A sensitivity analyses on dam height versus inundated water surface area gain was completed to evaluate these optimization opportunities, which are discussed in Section 4.1.3.

A description of each Jacko Lake dam is described below:

- West Dam: This dam is approximately 2.5m high and prevents flood flows from reaching the Inks Lake catchment area. The crest length is 30m.
- Northeast Dam: This dam is approximately 4m high and is located west of the existing Kinder Morgan pipeline. Conceptual design completed by KCB shows that sheet piling upstream (west) of the existing pipeline is planned to assist with pipeline removal. The crest length is 175m.
- Southeast Dam: This dam is approximately 5m high and is located downstream of the existing dam location. The alignment of this dam is conceptual but may

be optimized for future studies to include upper catchment areas to expedite flooding of Jacko Lake to increase surface area for wetland habitat. The crest length is 95m.

A summary of advantages and disadvantages for Option 1A is as follows:

- Advantages:
  - The dam heights required to store the DF are relatively small and require low construction quantities.
  - Opportunity to raise dams and normal lake levels to offset losses of fish habitat. Inclusion of the upper catchment to the south may be used to expedite filling of Jacko Lake to the desired lake elevations.
  - Does not impact the proposed Kinder Morgan relocated pipeline route.
- Disadvantages:
  - There is no spillway provided in this option. It is understood that this additional design contingency to manage flood volumes may be more favorable for permitting. If a spillway is required, there is an opportunity to incorporate this engineered design feature along the dam on the northeastern arm of Jacko Lake to route design flood flows (exceeding PMF) into the open pit.

4.1.2. Option 1B (Partial Containment of DF and Spillway)

Option 1B includes the same three dams identified in Option 1A but one of these dams is sized smaller with an engineered spillway to safely discharge a portion of the DF. The volume of water discharged can be controlled based on environmental requirements and sensitivity of downstream areas. The dam heights, dam fill volumes and storage efficiency ratio for Option 1B are the same as those determined for Option 1A.

Three (3) spillway routes options were identified for this study:

- West Spillway. The spillway would be located on the west side of Jacko Lake with flood flows conveyed through a long channel towards an outlet at Inks Lake or Alkali Creek. The length of the spillway channel for Inks Lake and Alkali Creek outlets is approximately 1.6km and 2.2km, respectively. The water released from the spillway channel would potentially impact the main site access road, Lac Le Jeune public access road, and the proposed Kinder Morgan pipeline route. Preliminary estimates indicate that there may be capacity at Inks Lake to store a portion of the flood volume from Jacko Lake (in addition to the Inks Lake

flood volume). If this option is pursued further, then water volumes arising from the Inks Lake catchment flood flow plus the routed Jacko Lake spillway flow should be assessed in greater detail. An inundation study for flood flows into Alkali Creek was not included in this study. It is understood that there are potential impacts to the Coquihalla Highway and the New Afton tailings facility, which should be evaluated further if this option is considered for future studies. There are no significant excavations required (i.e. < 5m) for this option, with the exception of culvert installations where the spillway channel would cross under the access roads / highways. Figures 6 and 7 shows the profile of the proposed spillway routes.

- Southeast Spillway: This spillway would be located on the southeastern arm of Jacko Lake near the existing dam. Flood flows would be conveyed through a 3 km long engineered channel that runs between the open pit, MRSF, TSF, site infrastructure (proposed haul roads, collection ponds, overland conveyer primary crusher platform) and back into Peterson Creek. A large excavation (> 40m) would also be required to create a sufficient channel that would carry these flood flows, which make this arrangement challenging to construct in comparison to the other two spillway options. For this reason, Peterson Creek Diversion System was developed to manage water for the downstream water license holders. Figure 8 shows the profile of the proposed spillway route
- Northeast Spillway: This spillway would be located on the northeastern arm of Jacko Lake and would discharge into the open pit. KGHM has advised that this option may not be viable because there is an increased risk to personnel during a flood event and there is a potential to delay mining operations, but this could be mitigated.

A summary of advantages and disadvantages for Option 1B is as follows:

- Advantages:
  - The inclusion of a spillway to manage a portion of the DF may be preferred for permitting by regulators. This engineered design feature would allow for lower dam heights and volume requirements that could lower the dam classification and corresponding storage volume design requirements.
  - The dam height to store a portion of the DF is relatively small and requires low construction fill quantities.

- Disadvantages:
  - Flood discharges from along the west spillway would inundate a portion of the proposed Kinder Morgan pipeline route, and some public access roads but this could be engineered to minimize any significant impacts.
  - Flood discharges from the northeast spillway would flood the open pit and potentially delay mine operations, but most importantly potentially impact the safety of those working directly downstream in this area. However, it is possible to mitigate these risks to personnel. Containment of the DF within the open pit is an extremely low probability (in addition to the fact that the pit would be flooded by the PMF event anyways) and should be considered as a viable option.
  - Flood discharges from the southeast spillway would be challenging due to the close proximity of site infrastructure (proposed haul roads, collection ponds, overland conveyer, and primary crusher platform). This drainage channel would also require a large excavation (> 40m) to create a channel with adequate hydraulic capacity to divert flood flows.

4.1.3. Optimization Opportunities

There is an opportunity to significantly increase surface area for potential losses of habitat by raising the dam heights and water level in Jacko Lake. Table 3 and Figure 9 shows the current lake level at EL. 892m and the incremental increase in habitat areas for every one metre raise in Jacko Lake, assuming the same dam locations as shown for Option 1A/1B.

The duration and viability of raising the level of Jacko Lake was not covered in this study. It is unclear if raising the water levels within Jacko Lake will have significant impacts on the water license requirements downstream. Preliminary site wide water balance results completed by BGC Engineering (BGC) indicate that an elevation increase of one metre in Jacko Lake would take approximately one year. It is assumed that to increase the pond levels by two metres would take approximately two years.

Table 3
Jacko Lake Optimization

Category		Current Lake Configuration	Option 1A / Option 1B		
			Base Case[2]	Raise NWL to 893m	Raise NWL to 894m
Dam Configuration / Hydrotechnical	Max. NWL (masl)	892	892	893	894
	# New Dams	0	3	3	3
	Dam Crest Elevation (masl)	-	894.5	895.5	896.5
	Dam Fill Volume (m^3)	-	25,000	38,000	58,000
	Total Storage Capacity (Mm^3)	3.9	4.5	5	5.6
	Storage Efficiency[3]	-	25	29	29
Environmental	Max. NWL Lake Area (m^3)	50[4]	44	56	63
	Increase in Lake Area (ha)	0	-5	5	12

1. NWL = Normal water level.
2. Base case NWL = 892 masl.
3. Storage Efficiency = Increase in Storage volume / Fill Volume.
4. This is the maximum Jacko Lake area at El. 892m.

4.2. Peterson Creek Downstream Pond

Two (2) options for the Peterson Creek downstream pond were developed for this study based on pond depth requirements (minimum 10m depth for wintering of fish) and storage efficiency.

4.2.1. Option 2A

A single dam would be constructed on the downstream side of the Humphrey Creek / Peterson Creek confluence as shown on Figure 10. The dam would form a pond that would collect flows from Humphrey Creek, Anderson Creek Diversion, Edith Lake, Peterson Creek Diversion, and discharge from other collection ponds on site. The dam and pond would be located within Ajax Mine property limits. No residential or commercial dwellings are expected to be inundated.

The dam height is approximately 15m high (Crest El. 877m) that will require a total fill volume of approximately 75,000m^3. This ultimate dam height will provide a total storage volume of 1.0Mm^3 that will inundate approximately 16.8ha for potential habitat compensation from losses of Peterson Creek due to mine development. The storage efficiency ratio is 14:1.

A summary of advantages and disadvantages for Option 2A is as follows:

- Advantages:
  - Greater storage capacity and larger inundated footprint for potential habitat compensation compared to Option 2B.
  - The dam height is smaller than Option 2B.
  - No relocation of residential / commercial dwellings required.
- Disadvantages:
  - Potential dusting issues from MSRF in close proximity.

4.2.2. Option 2B

A dam would be constructed at a narrow valley near the juncture of Goose Lake Road and Long Lake Road as shown on Figure 11. The dam would form a pond that would collect Peterson Creek flows (including Humphrey Creek, Anderson Creek Diversion, Edith Lake, the Peterson Creek Diversion, and discharge from other collection ponds on site).

The dam height is approximately 20m high (Crest El. 840m) that will require a total fill volume of approximately 139,000m^3. This ultimate dam height will provide a total storage volume of 0.57Mm^3 that will inundate approximately 7.3ha for potential habitat compensation from losses of Peterson Creek due to mine development. The storage efficiency ratio is 4:1.

A summary of advantages and disadvantages for Option 2B is as follows:

- Advantages:
  - Option 2B is situated outside of the mine limits, which reduces potential health and safety issues related with the public to mining activity.
  - Minimal dusting impacts from the MRSF due to large distance to mining activity.
- Disadvantages:
  - Lower storage capacity and inundated surface for potential use of habitat compensation compared to Option 2A.
  - The dam height is higher than Option 2B with almost double the dam fill volumes.
  - Residential / commercial dwellings may need to be relocated.

5. CONCLUSIONS

Conclusions from the conceptual Jacko Lake and downstream pond engineering design study are as follows:

- Conservative engineering design assumptions (i.e. Design Flood assumes PMF volumes) were used to carry out the alternative options assessment to manage water from Jacko Lake and Peterson Creek. The conceptual designs provided in this document show layouts for these conservative scenarios.
- Two (2) conceptual design options were developed to manage water in Jacko Lake:
  - Option 1A is designed to provide full containment of the DF. The dam height can be designed to a suitable elevation to provide additional inundated surface area that has potential for habitat compensation. A filling curve was completed to show the ratio of increased dam height and water level in Jacko Lake to the amount of increased inundated area for potential habitat compensation (See Table 3, Figure 9 and 11). This option does not impact the proposed Kinder Morgan pipeline route.
  - Option 1B is designed to provide partial containment of the DF with any surplus flood volumes discharged safely through an engineered spillway. Three spillway options were considered and evaluated based on the hydraulic grade and impacts to infrastructure and catchment areas downstream. The inclusion of the spillway into the dam design would potentially lower the dam classification and the associated design flood storage requirements, which would lower the dam heights and dam fill volumes. In addition, this additional design contingency measure may be favorable to regulators for permitting. However, raising Jacko Lake above EL. 892m is beneficial to gain more habitat compensation due to the increased inundated and water surface area.
  - A hybrid of Option 1A/1B for consideration would include a dam spillway at a higher elevation, above the design criteria (assuming a HIGH or VERY HIGH dam classification), as a design contingency measure to manage any flood water that exceed these corresponding DF volume (i.e. EXTREME dam classification). This dam arrangement would capitalize on the increase in habitat compensation and would satisfy regulators with the inclusion of the spillway as a design contingency feature to safely manage flood requirements that may exceed design requirements.
  - Both Options 1A and 1B show low dam heights and require low construction quantities to manage the DF.

- Two (2) conceptual design options were developed to manage water within a downstream pond to compensate for any habitat losses from Peterson Creek:
    - Option 2A is designed within the current property limits of KGHM. There is higher flood storage and surface area to compensate for habitat losses is better in Option 1B than Option 2B. This is demonstrated by the higher storage efficiency (increased storage volume / fill volume = 14) for Option 1A than Option 2B.
    - Option 2B is designed downstream of Option 2A. This downstream pond location is further away from the mining areas, which has its benefits to minimize potential social and environmental impacts.

6. RECOMMENDATIONS

The options for Jacko Lake and Peterson Creek engineering were presented to KGHM during a meeting on December 18, 2014. During this meeting, it was agreed that Options 1A and 2A were preferred for preliminary design studies for the following reasons:

- Option 1A - Jacko Lake:
    - The required dam heights for Option 1A to store the design flood are relatively small and require low construction quantities. This design could be optimized to:
        - Include a spillway along the NE dam to safely convey any design flood flows (above PMF) into the open pit. This arrangement is a design contingency that transfers any flood risks to the project instead of the public which may be preferable to regulators.
        - Reduce compensation habitat requirements for the downstream pond by increasing the elevation of Jacko Lake and inundating more surface area for fish habitat.
    - Potential spillway routes for Option 1B to the West, Northeast and Southeast are significant engineered structures, when compared to a modest increase in dam height to contain the design flood within Jacko Lake (Option 1A). There are also risks associated with spilling design flood water towards public access roads (western spillway route), open pit (northeast route) or through high risk site infrastructure (southeastern route).
    - It is also noted that the Peterson Creek Diversion System remains as the preferred option to provide water for the downstream water license holders, as

a spillway along the existing Peterson Creek area would be a significant and challenging structure to engineer.

- Option 2A – Peterson Creek Downstream Pond:
  - Greater storage capacity and larger inundated footprint for potential habitat compensation compared to Option 2B.
  - The dam height is smaller than for Option 2B.

Norwest recommends the following action items be completed in preparation for the next level of preliminary design:

- Include design criteria from other project stakeholders and assess the associated impacts for the preferred options going forward. Norwest proposes that a meeting be held to discuss the findings of this study with the project stakeholders as chosen by KGHM. Considerations should include (but not limited to):
  - Determine minimum flow requirements for downstream users.
  - Assess impacts to the Peterson Creek aquifer.
  - Evaluate any environmental impacts and confirm viability/ suitability for fish habitat / food source of the Peterson Creek downstream pond, including minimum pond storage capacity requirements for fish compensation.
  - Verify the flow contributions from Edith Lake to supplement the raising of the Peterson Creek downstream pond and downstream users.
- Finalize a design elevation for Jacko Lake to meet habitat compensation requirements. The Jacko Lake elevation will dictate the dam heights for the preliminary design.
- Evaluate the viability of raising the water levels in Jacko Lake. The filling duration requirements and impacts to the water license requirements downstream should be evaluated further to determine if raising the water level of Jacko Lake is feasible.
- Finalize the ultimate pit outline and evaluate the failure modes and associated hydrological impacts to Jacko Lake and pit slope design. This study should include seismic impacts from expected blasting from mine development.
- Incorporate closure requirements into the preliminary design of the preferred options.

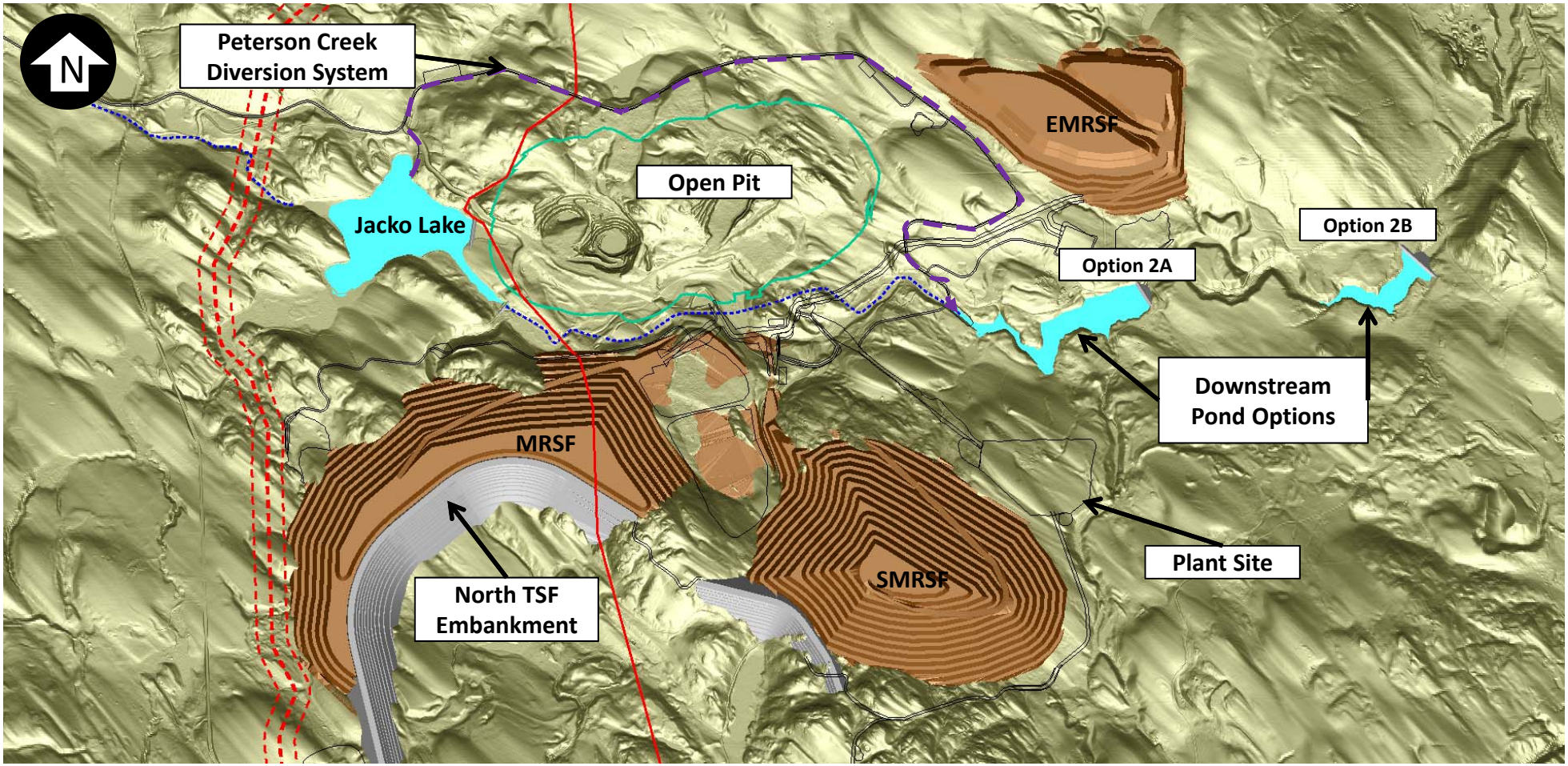
7. References

Norwest Corporation. (2015). Jacko Lake and Peterson Creek Downstream Pond Engineering – Preliminary Design Report. Reference C135-KA39-RPT-00-003. Draft report prepared for KGHM Ajax Mining Inc. (April 22, 2015).

Attachments:

Figure 1	General Site Plan
Figure 2	Jacko Lake – Option 1A
Figure 3	Jacko Lake – Option 1B – West Spillway
Figure 4	Jacko Lake – Option 1B – Southeast Spillway
Figure 5	Jacko Lake – Option 1B – Spillway Alignments
Figure 6	Jacko Lake – West Spillway Profile – Inks Lake Outlet
Figure 7	Jacko Lake – West Spillway Profile – Alkali Creek Outlet
Figure 8	Jacko Lake – Southeast Spillway Profile
Figure 9	Jacko Lake – Pond Elevation vs. Habitat Compensation
Figure 10	Peterson Creek Downstream Pond – Option 2A
Figure 11	Peterson Creek Downstream Pond – Option 2B
Figure 12	Jacko Lake Depth-Area-Capacity Relationship
Figure 13	Downstream Pond Depth-Area-Capacity Relationships

I:\PROJECTDATA\KGHM Ajax_809\809-3_Jacko Lake\Reports\Draft\809 3_Jacko Lake Conceptual Design Alternatives Study FIG_RevA.ppt



Existing KM Pipeline

Proposed KM Pipeline & 90m Offset

Ultimate Pit

KGHM INTERNATIONAL

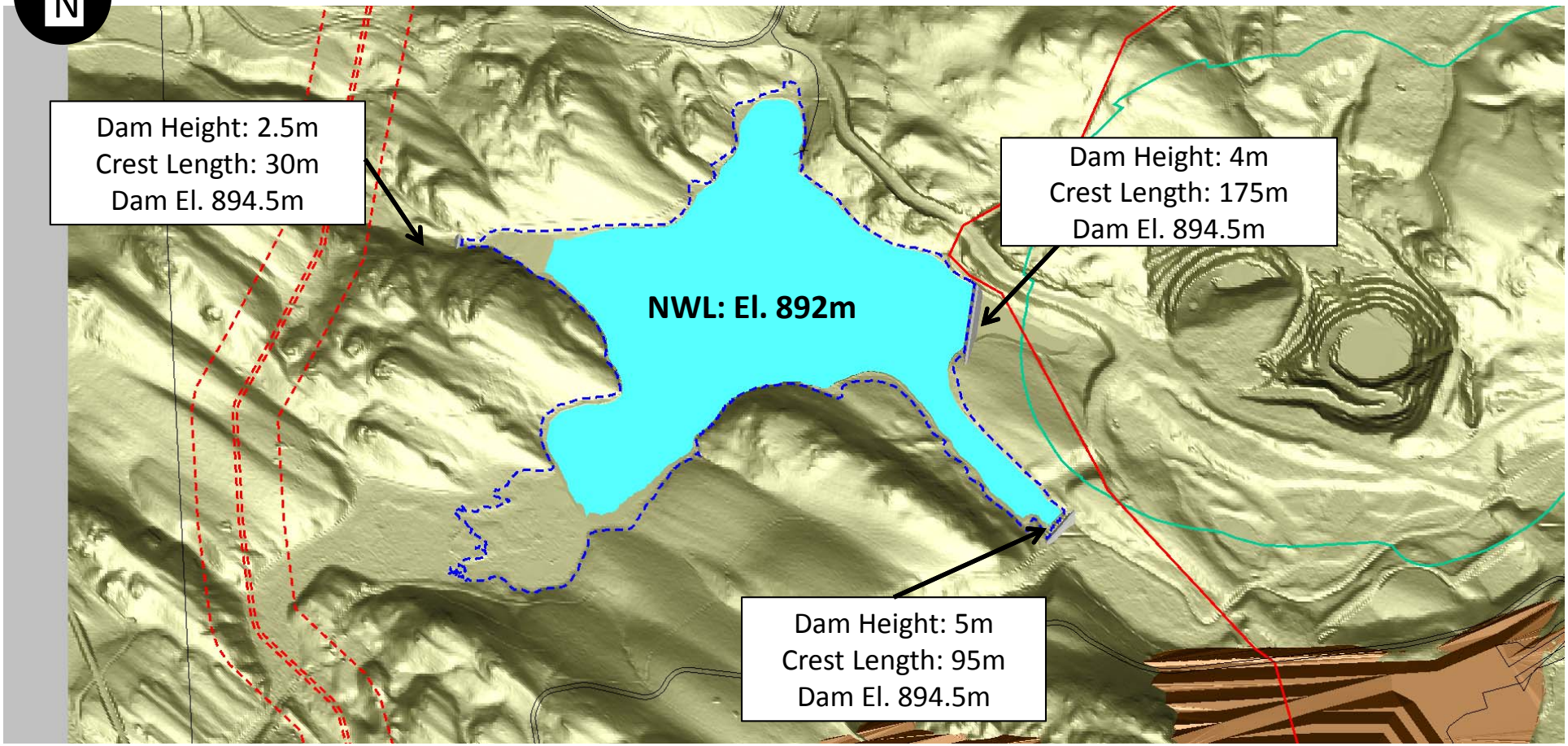
KGHM AJAX MINING INC.

AJAX PROJECT

JACKO LAKE
GENERAL ARRANGEMENT PLAN

NORWEST | 809-3 | FIGURE 1 | REV. A

I:\PROJECTDATA\KGHM Ajax_809\809-3_Jacko Lake\Reports\Draft\809 3_Jacko Lake Conceptual Design Alternatives Study FIG_RevA.ppt



IDF Inundation level: El. 893m

Existing KM Pipeline

Proposed KM Pipeline & 90m Offset

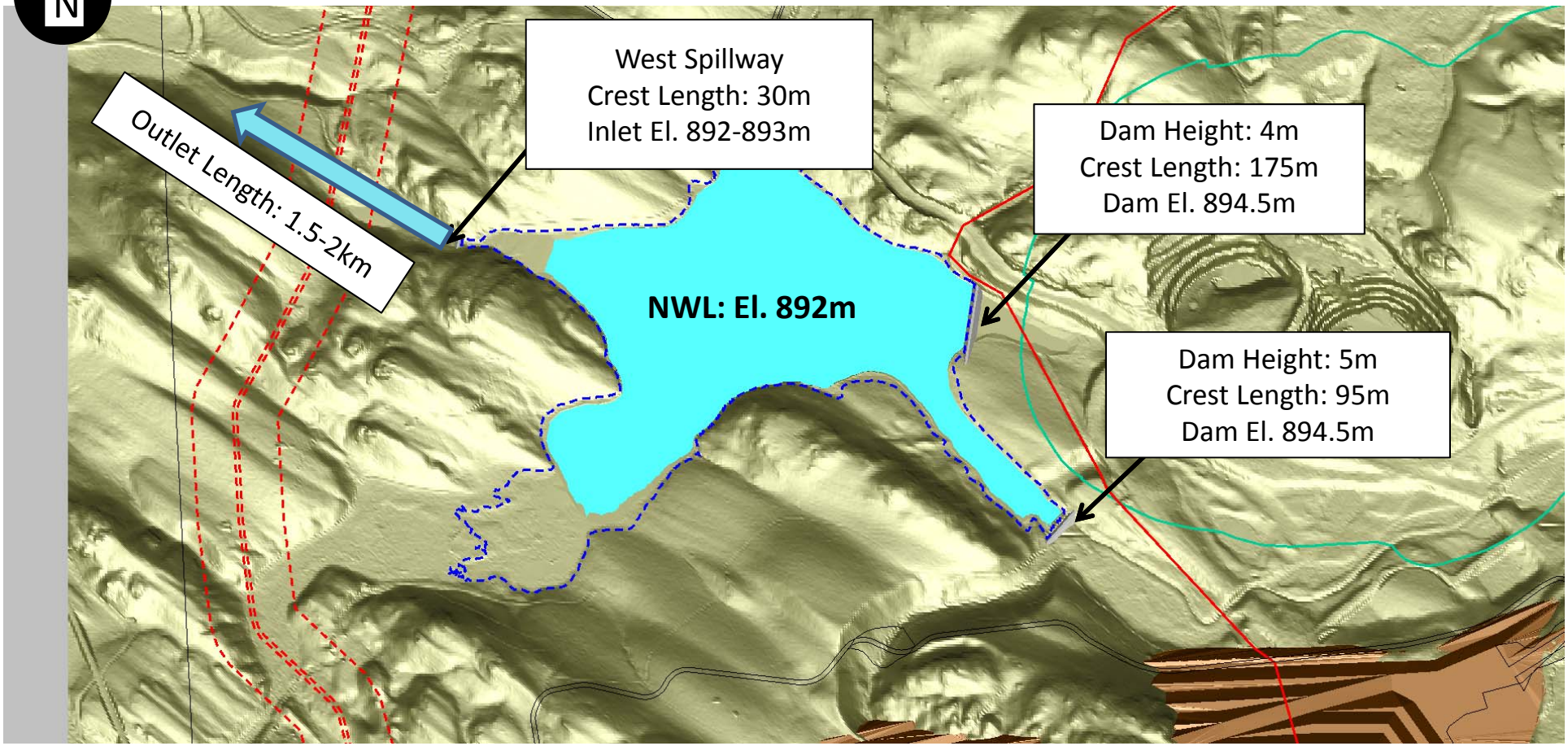
Ultimate Pit

Notes:

1. NWL = Normal water level.

KGHM INTERNATIONAL	KGHM AJAX MINING INC.		
	AJAX PROJECT		
JACKO LAKE OPTION 1A			
NORWEST	809-3	FIGURE 2	REV. A

I:\PROJECTDATA\KGHM Ajax_809\809-3_Jacko Lake\Reports\Draft\809 3_Jacko Lake Conceptual Design Alternatives Study FIG_RevA.ppt



IDF Inundation level: El. 893m

Existing KM Pipeline

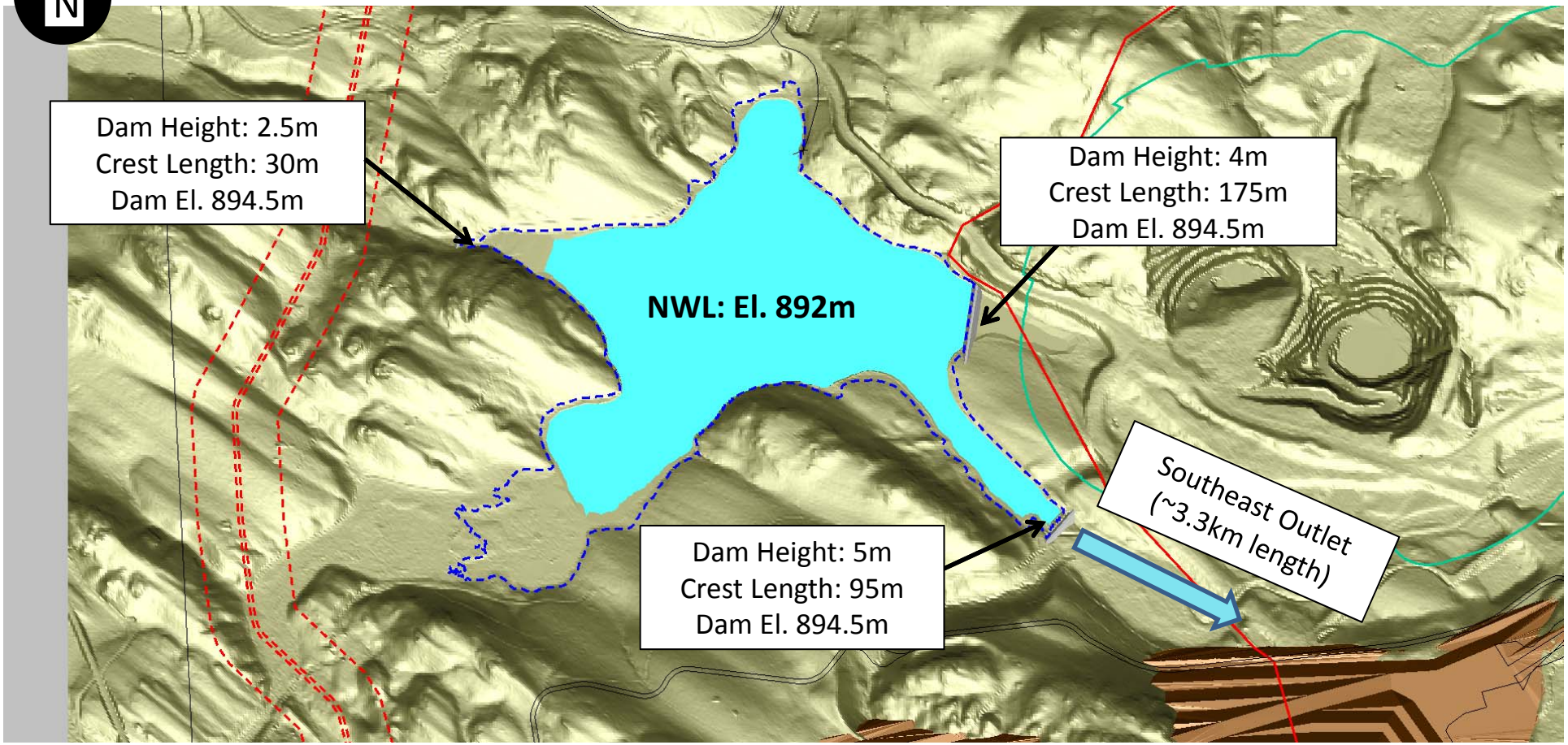
Proposed KM Pipeline & 90m Offset

Ultimate Pit

Notes:

1. NWL = Normal water level.

KGHM INTERNATIONAL	KGHM AJAX MINING INC.		
	AJAX PROJECT		
JACKO LAKE OPTION 1B WEST SPILLWAY			
NORWEST	809-3	FIGURE 3	REV. A



IDF Inundation level: El. 893m

Existing KM Pipeline

Proposed KM Pipeline & 90m Offset

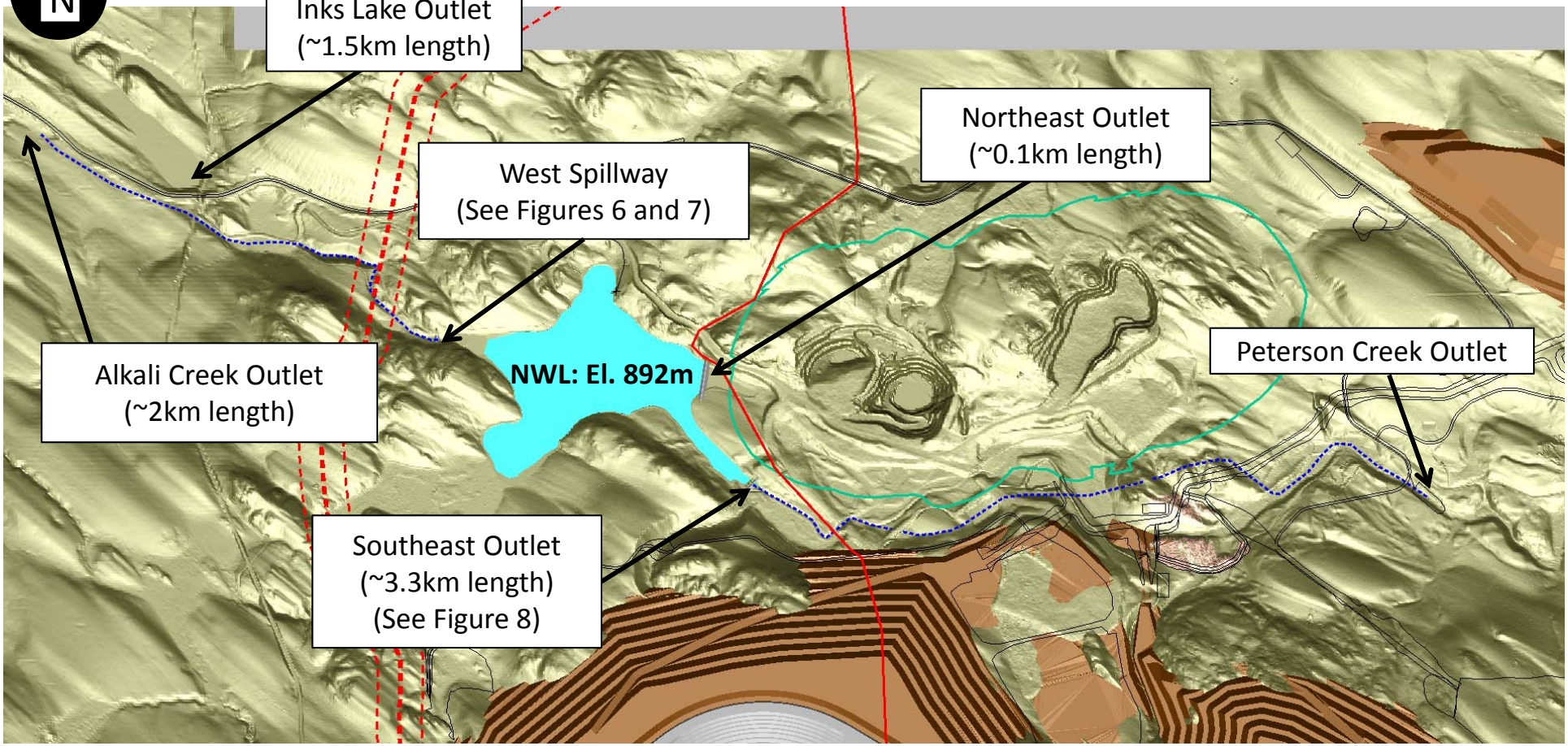
Ultimate Pit

Notes:

1. NWL = Normal water level.

KGHM INTERNATIONAL		KGHM AJAX MINING INC.	
		AJAX PROJECT	
JACKO LAKE OPTION 1B SOUTHEAST SPILLWAY			
NORWEST	809-3	FIGURE 4	REV. A

I:\PROJECTDATA\KGHM Ajax_809\809-3_Jacko Lake\Reports\Draft\809 3_Jacko Lake Conceptual Design Alternatives Study FIG_RevA.ppt



Spillway Alignment

Existing KM Pipeline

Proposed KM Pipeline & 90m Offset

Ultimate Pit

KGHM INTERNATIONAL

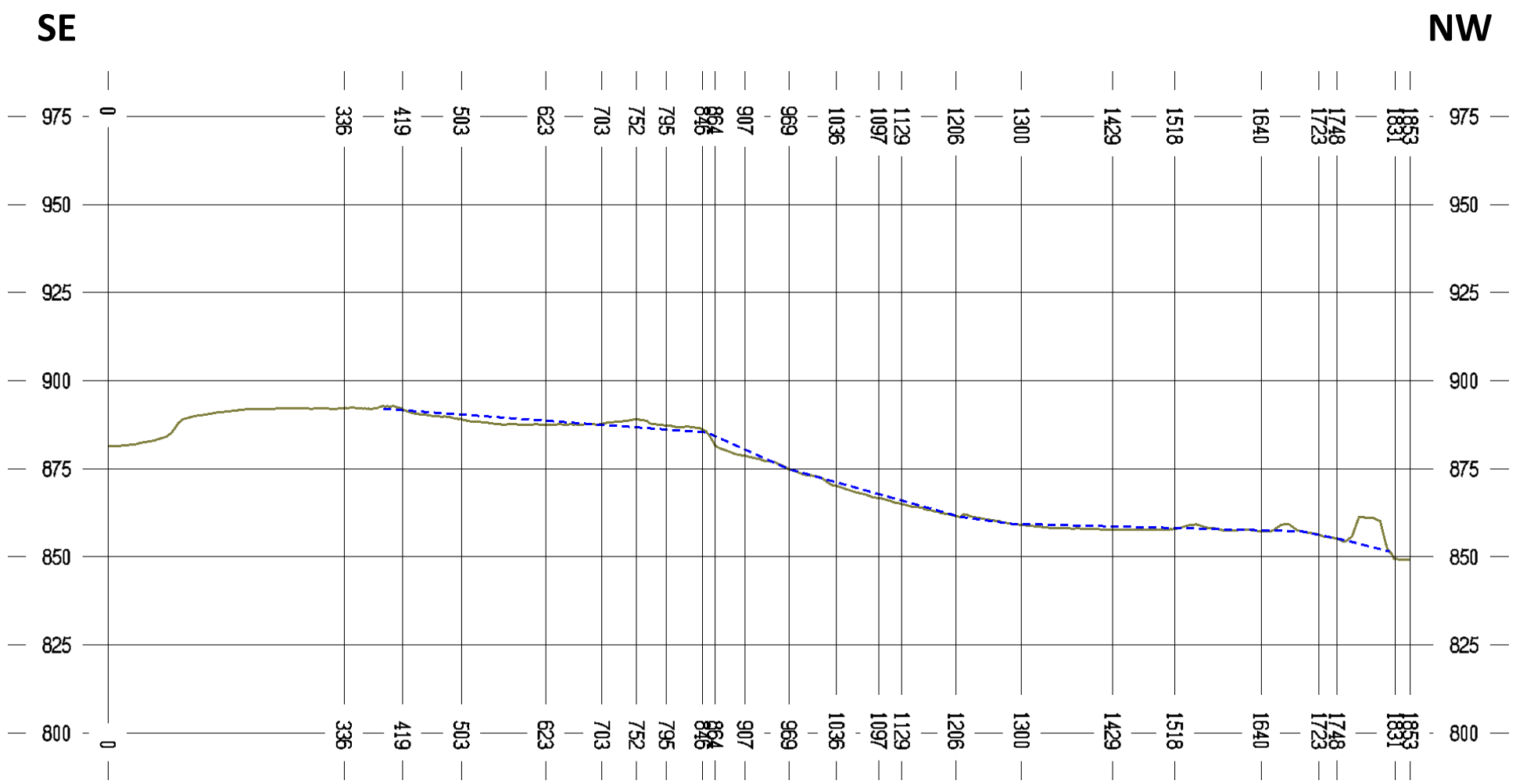
KGHM AJAX MINING INC.

AJAX PROJECT

JACKO LAKE
OPTION 1B
SPILLWAY ALIGNMENTS

NORWEST | 809-3 | FIGURE 5 | REV. A

I:\PROJECTDATA\KGHM Ajax_809\809-3_Jacko Lake\Reports\Draft\809 3_Jacko Lake Conceptual Design Alternatives Study FIG_RevA.ppt



KGHM INTERNATIONAL

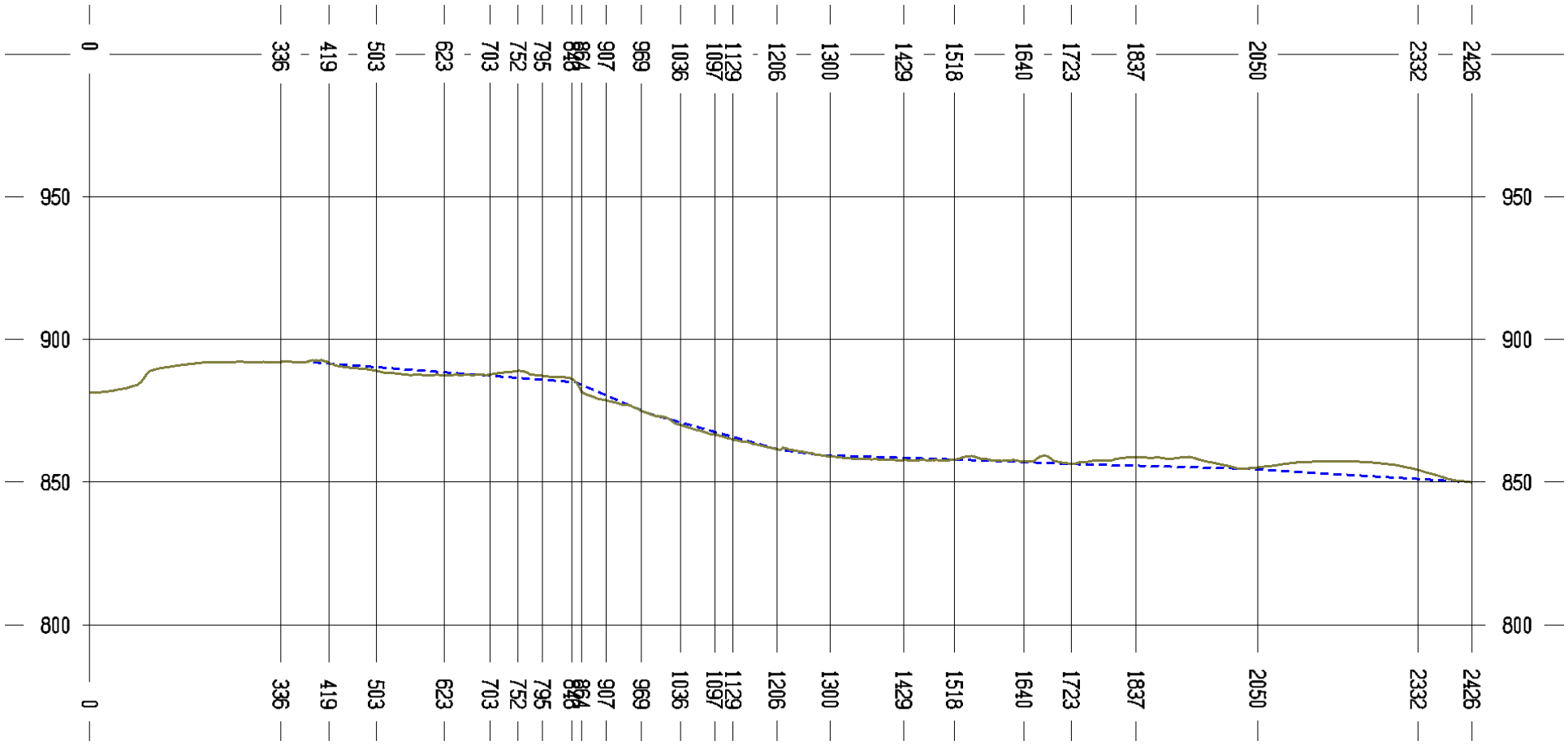
KGHM AJAX MINING INC.

AJAX PROJECT

JACKO LAKE
WEST SPILLWAY PROFILE
INKS LAKE OUTLET

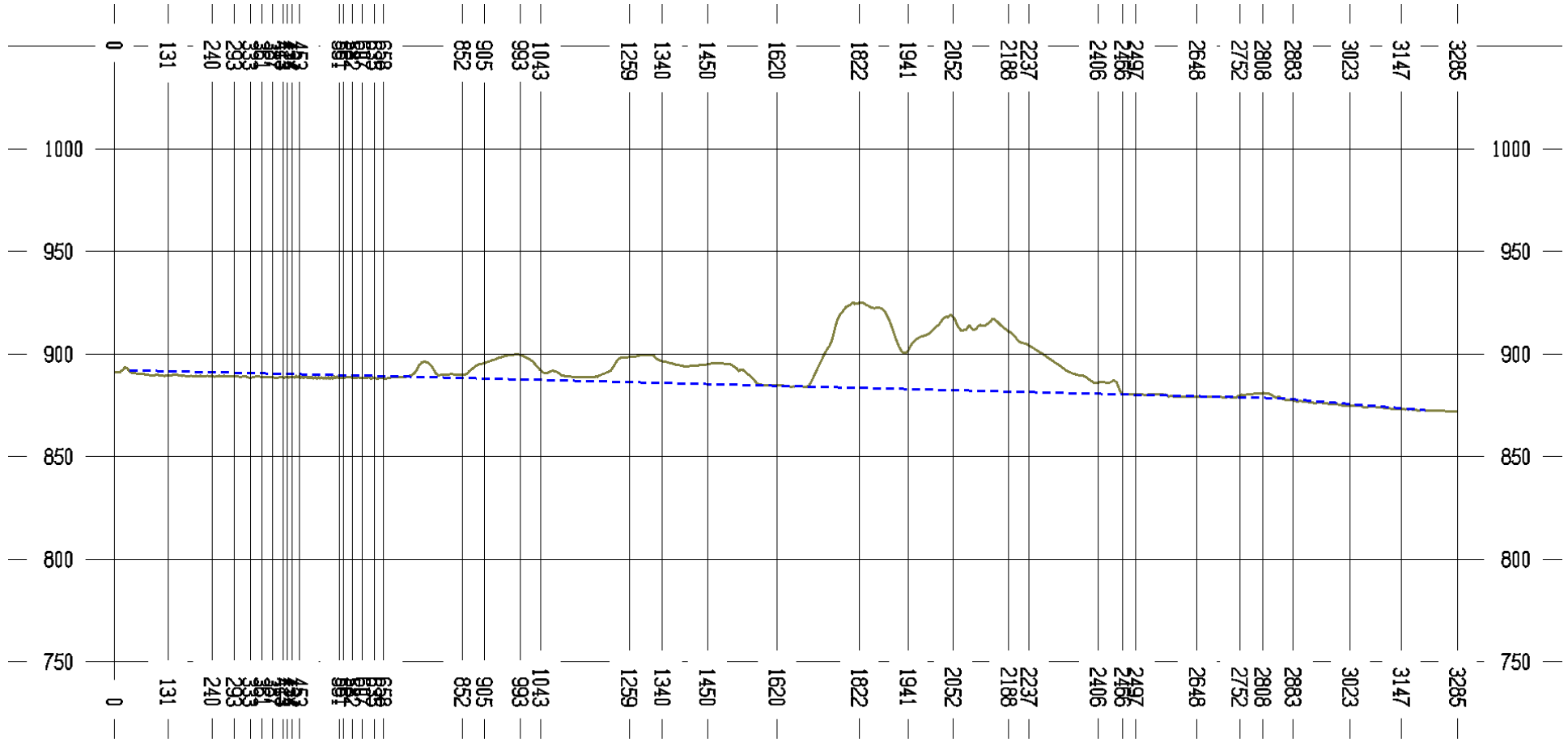
NORWEST | 809-3 | FIGURE 6 | REV. A

I:\PROJECTDATA\KGHM Ajax_809\809-3_Jacko Lake\Reports\Draft\809 3_Jacko Lake Conceptual Design Alternatives Study FIG_RevA.ppt



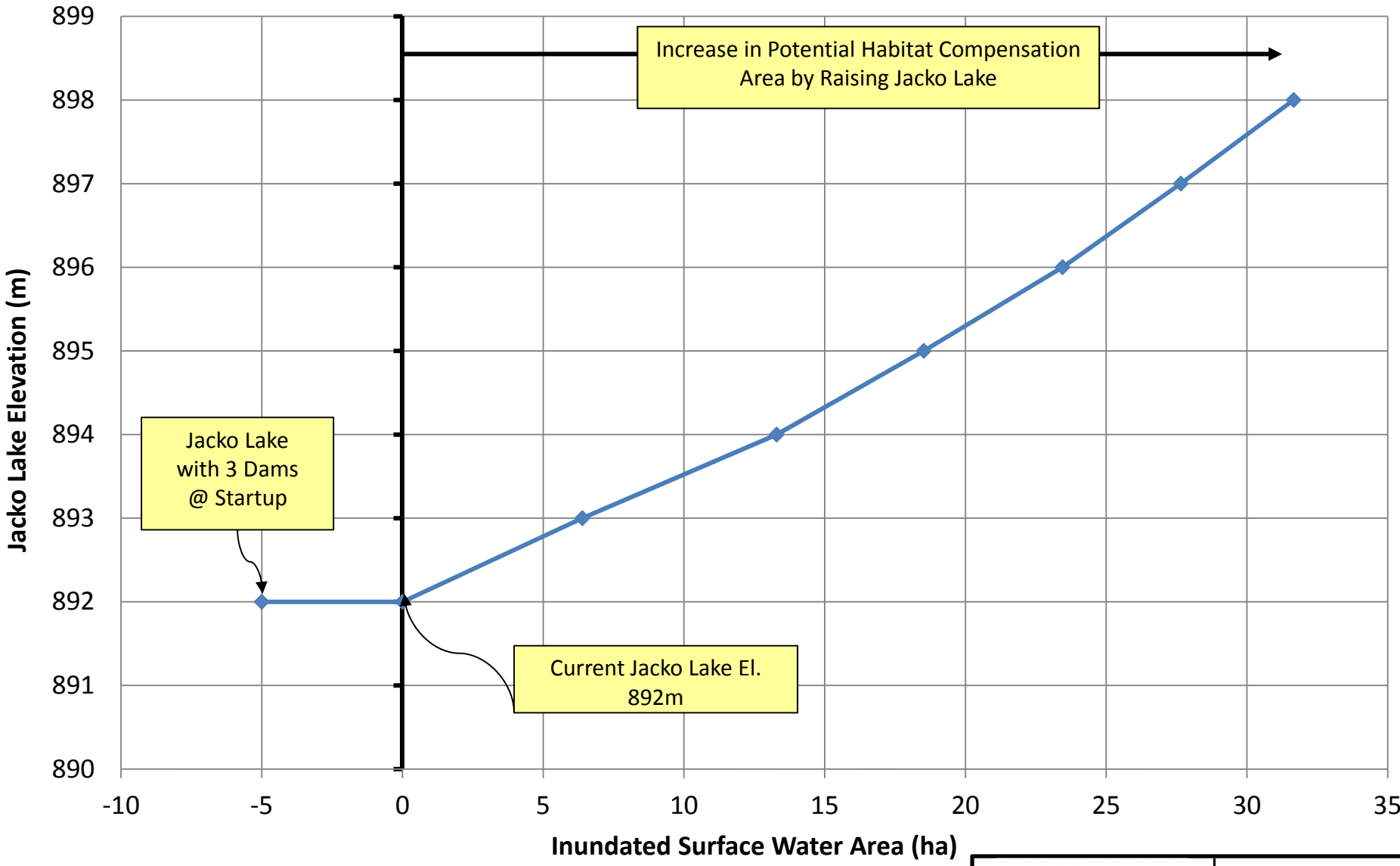
KGHM INTERNATIONAL	KGHM AJAX MINING INC.	
	AJAX PROJECT	
JACKO LAKE WEST SPILLWAY PROFILE ALKALI CREEK OUTLET		
NORWEST	809-3	FIGURE 7 REV. A

I:\PROJECTDATA\KGHM Ajax_809\809-3_Jacko Lake\Reports\Draft\809 3_Jacko Lake Conceptual Design Alternatives Study FIG_RevA.ppt



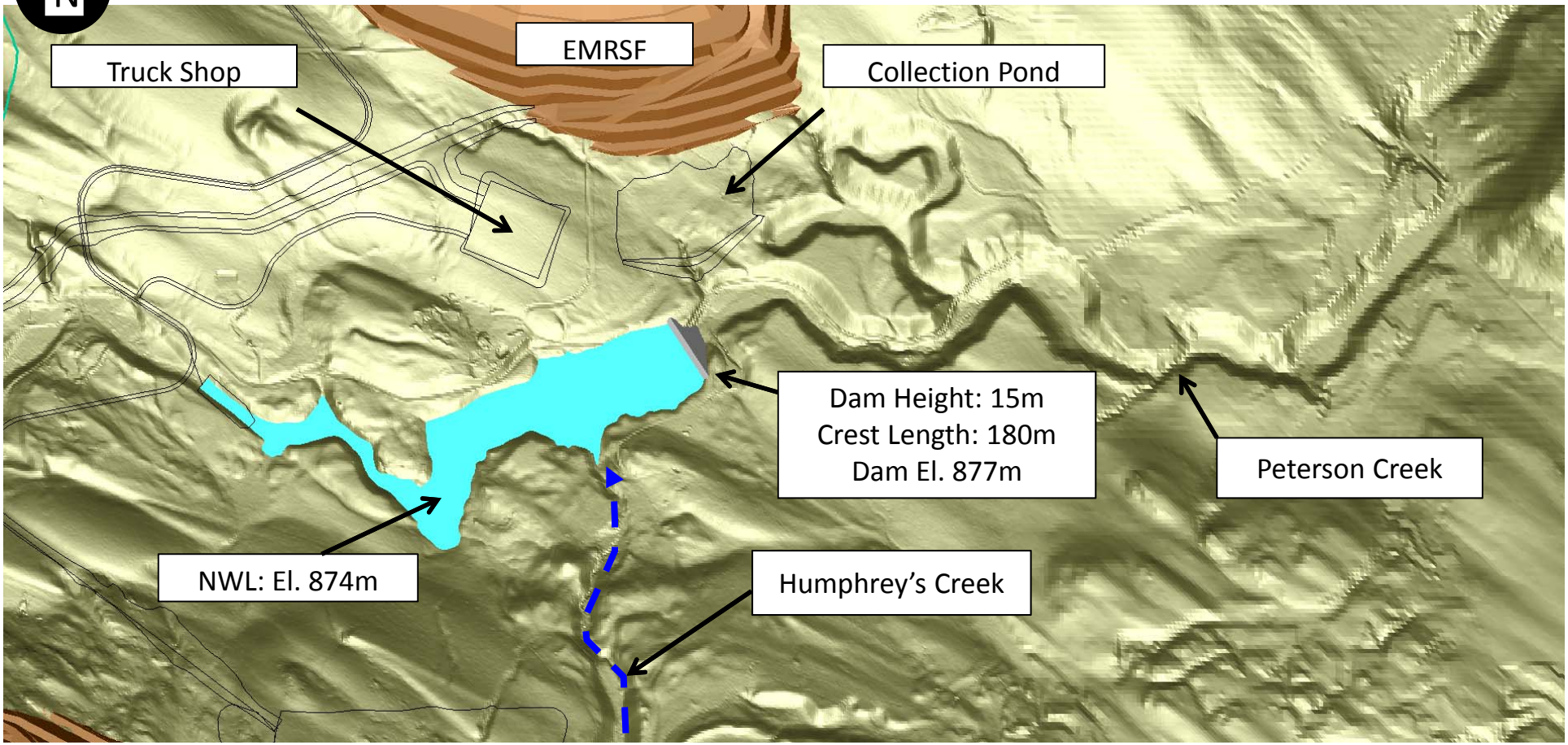
KGHM INTERNATIONAL	KGHM AJAX MINING INC.		
	AJAX PROJECT		
JACKO LAKE SOUTHEASTERN PROFILE PETERSON CREEK OUTLET			
NORWEST	809-3	FIGURE 8	REV. A

I:\PROJECTDATA\KGHM Ajax_809\809-3_Jacko Lake\Reports\Draft\809 3_Jacko Lake Conceptual Design Alternatives Study FIG_RevA.ppt



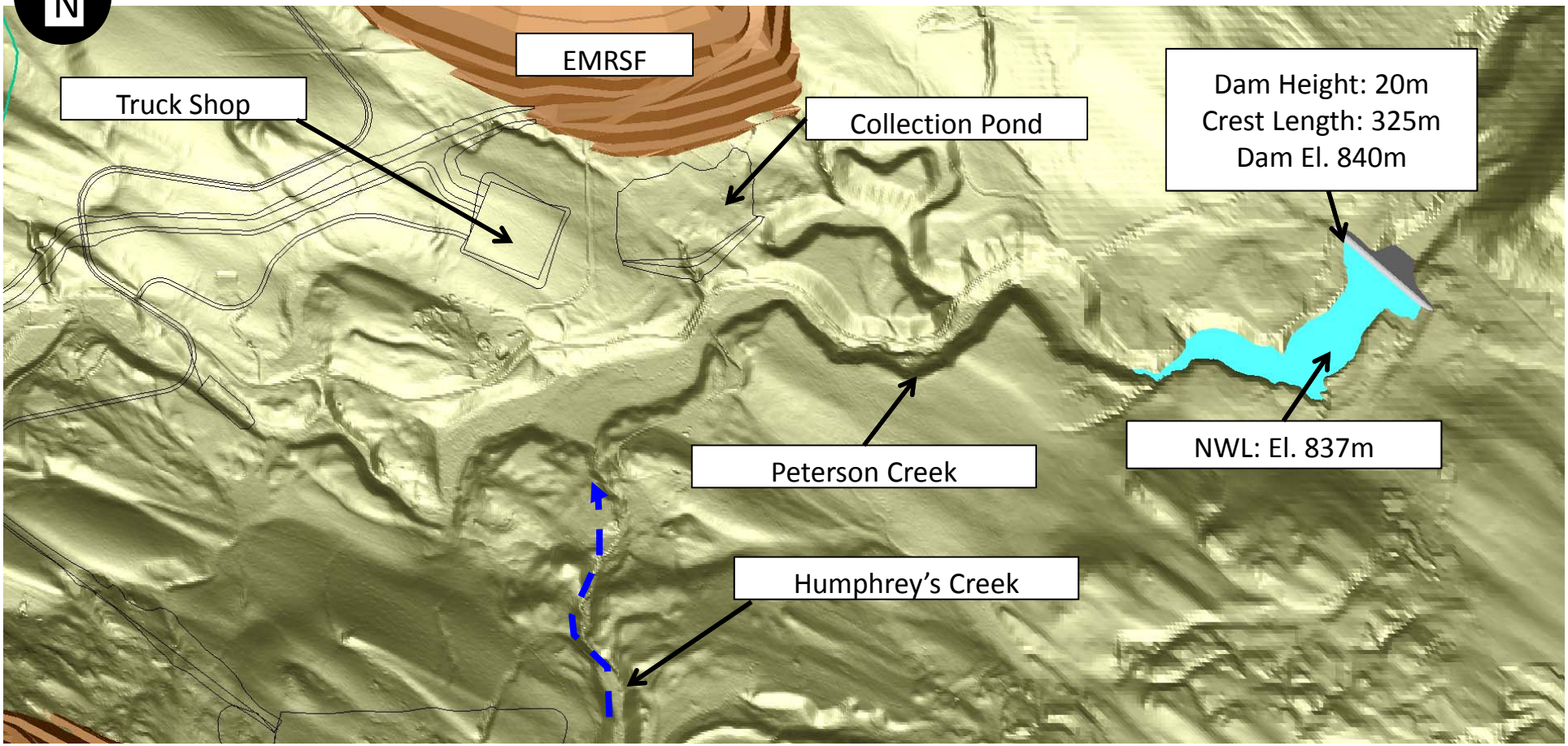
KGHM INTERNATIONAL	KGHM AJAX MINING INC.
	AJAX PROJECT
JACKO LAKE POND ELEVATION VS. INUNDATED SURFACE WATER AREA	
NORWEST	809-3 | FIGURE 9 | REV. A

I:\PROJECTDATA\KGHM Ajax_809\809-3_Jacko Lake\Reports\Draft\809 3_Jacko Lake Conceptual Design Alternatives Study FIG_RevA.ppt



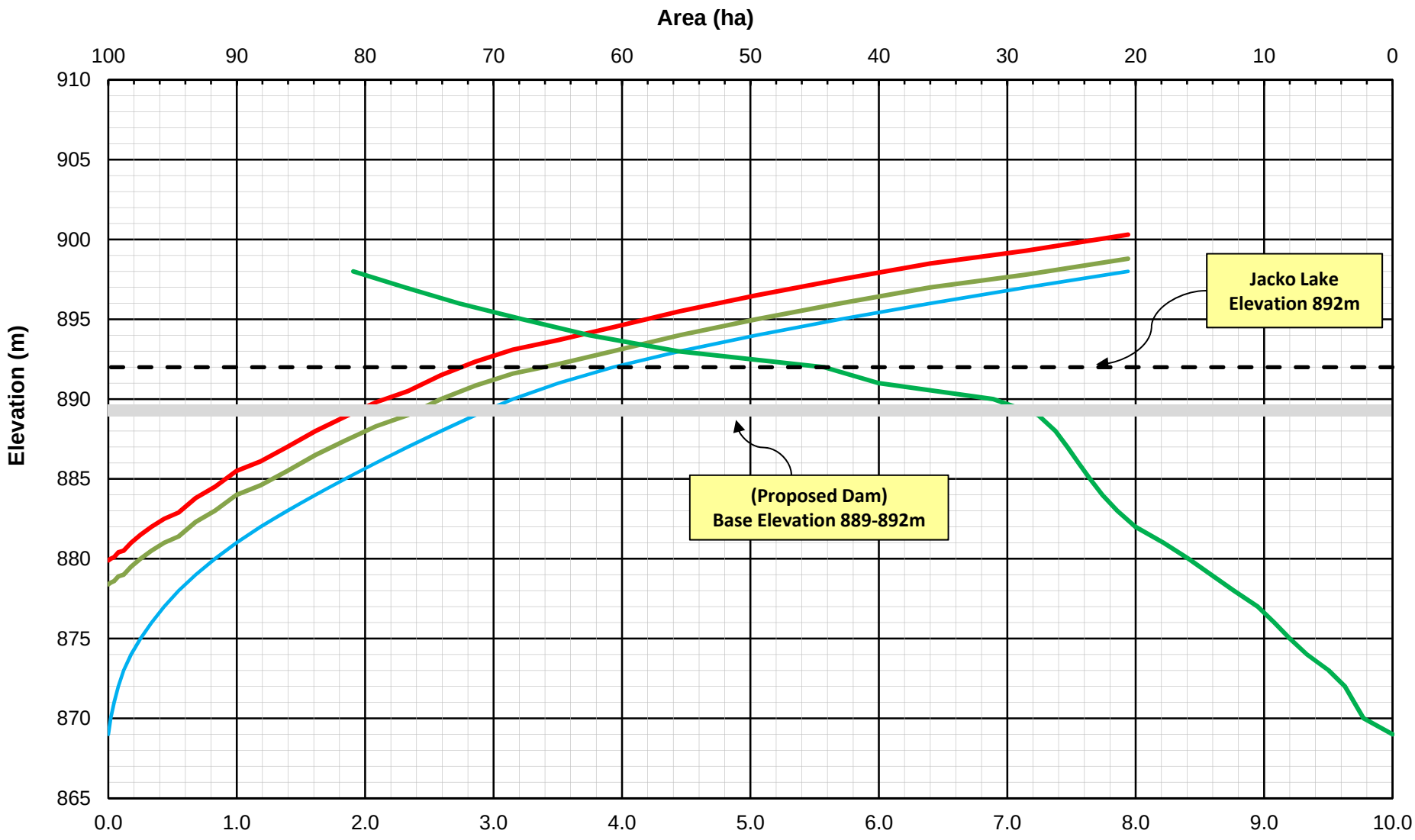
KGHM INTERNATIONAL	KGHM AJAX MINING INC.
	AJAX PROJECT
PETERSON CREEK DOWNSTREAM POND OPTION 2A	
NORWEST	809-3 | FIGURE 10 | REV. A

I:\PROJECTDATA\KGHM Ajax_809\809-3_Jacko Lake\Reports\Draft\809 3_Jacko Lake Conceptual Design Alternatives Study FIG_RevA.ppt

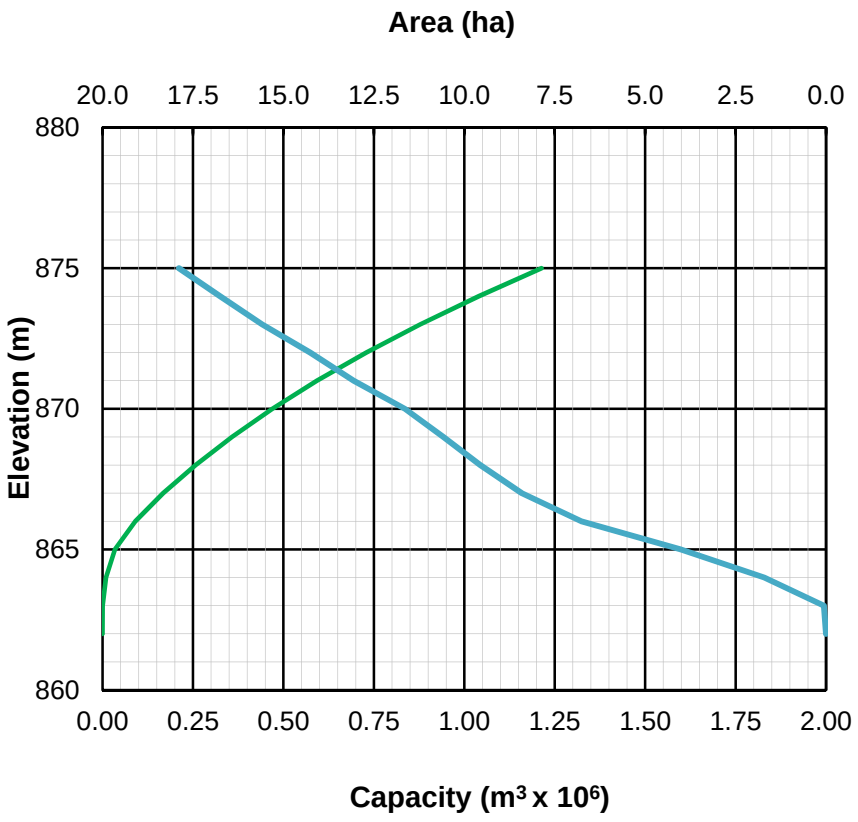


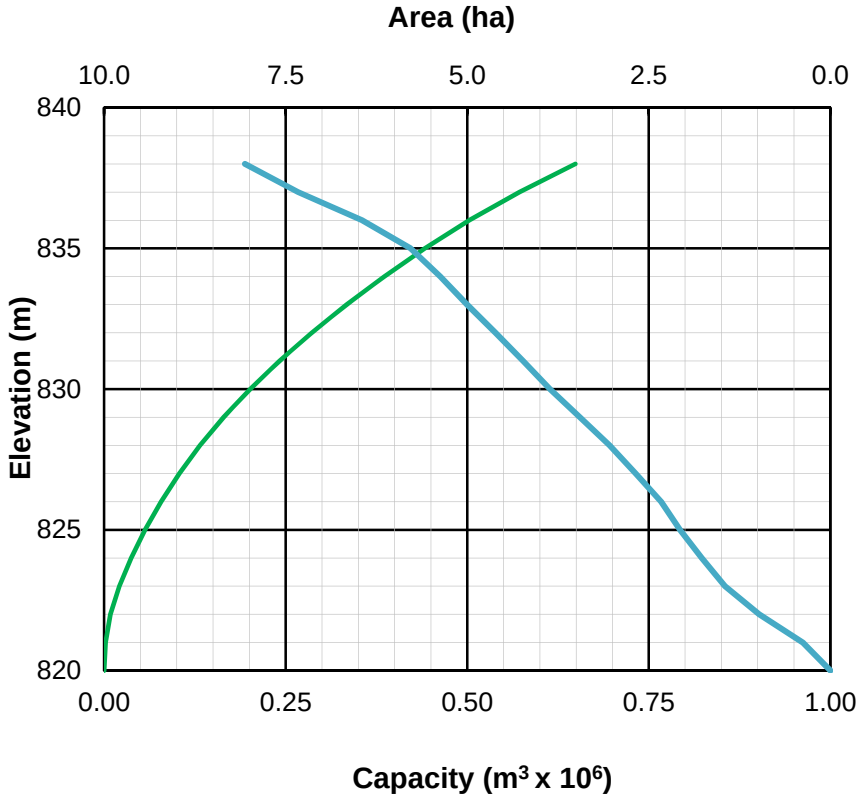
KGHM INTERNATIONAL	KGHM AJAX MINING INC.
	AJAX PROJECT
PETERSON CREEK DOWNSTREAM POND OPTION 2B	
NORWEST	809-3	FIGURE 11	REV. A

I:\PROJECTDATA\KGHM Ajax_809\809-3_Jacko Lake\Reports\Draft\809 3_Jacko Lake Conceptual Design Alternatives Study FIG_RevA.ppt



KGHM INTERNATIONAL	KGHM AJAX MINING INC.
	AJAX PROJECT
JACKO LAKE DEPTH-AREA-CAPACITY RELATIONSHIPS	
NORWEST	809-3 / FIGURE 12 / REV. A





KGHM INTERNATIONAL	KGHM AJAX MINING INC.
	AJAX PROJECT
PETERSON CREEK DOWNSTREAM POND DEPTH-AREA-CAPACITY RELATIONSHIPS	
NORWEST	809-3 / FIGURE 13 / REV. A