

4.5. MINING

DST Engineering Consultants Inc. (DST) was contracted by Bennett to conduct a mining impact assessment related to the development of the proposed facility. The Terms of Reference identified an issue for evaluation with regards to existing mining conditions. The entire report entitled, "Mining Impact Assessment" can be found in separate Appendix 9. A summary of issues concerning potential impacts is discussed in Section 6.5.

The assessment was conducted and prepared in compliance with the Approved Terms of Reference for the Environmental Assessment. The current section describes:

- Mining activity beneath the proposed site.

4.5.1. Background

The site for the proposed Bennett facility was chosen by the Citizen's Advisory Committee. Shortly after the site announcement it came to Bennett's attention that the joint venture of Queenston Mining Inc. (Queenston) and Franco-Nevada Mining Corporation (Franco-Nevada), holds a Mining Lease on the mineral rights of the AK Gold zone, part of which is located beneath the surface option held by Bennett.

Queenston expressed concern that the proposed facility would be located partly on top of the AK Gold zone, and could disrupt mining activity should the site ever be mined. As a result, Bennett agreed to relocate the facility to the southwest of the proposed site so not to be directly on top of the AK Gold zone. This was considered a first step in mitigating any impacts of the facility on future mining activity. The second step was the completion of the Mining Impact Assessment.

4.5.2. Location of the Proposed Bennett Facility in relation to the Amalgamated Kirkland (AK) Gold Zone

In order to identify potential mining zones a survey was made of diamond drill intersections (Report by Cyprus Canada titled, "Amalgamated Kirkland Project, August 1995" and available diamond drill logs). DST has classified "Higher-grade" drill intersections as drill intersections containing gold values of at least 5 grams of gold over a width of at least 1 metre. Mining narrow zones at this grade is uneconomic at current gold prices, as the derived revenue would not cover the substantial development costs. To become economic either the mineable tonnage per vertical unit or the potential gold revenues would have to be substantially increased. Diamond drilling on the AK zone has located higher-grade gold intersections in two zones that are northeast of the location of the proposed plant:

The first higher grade zone was cut by four diamond drill holes (AK-8, AK-9, AK-25 and AK-24), it appears to be approximately 100 metres long and is centred on UTM co-ordinates 570318 East and 5331030 North. The zone has been located at a depth of 40 to 50 metres and may extend to surface. The surface projection of this zone is located 77 metres (253 ft) north of the eastern corner of the Bennett plant building. This zone is the closest to the location of the proposed Bennett plant. The collar location of

diamond drill hole AK-8 (centre of the zone) was surveyed by Northland Technical Survey personnel. The AK Grid lines, 100 North and 80 East, were plotted on the drawing using this survey information. The possibility that this zone will ever be economical to mine is remote in that it is narrow and only just meets the definition of a higher-grade zone.

Two diamond drill holes out of ten that were drilled into the tuffs where they surface east of the proposed plant, appear to have cut a second higher-grade zone. This zone is located approximately 273 metres (897 ft) from the plant. Due to the erratic nature of gold values it is difficult to determine if the zone has a mining potential beyond that offered by a narrow low-grade gold zone.

The thickest portions of the main gold zone begin at a depth of 300 metres and extend to 500 metres below surface. The dip of the deposit is near vertical or steeply south. The deposit plunges to the west at approximately 40 degrees.

Original plans had the site at the north end of the property. As a result of concerns by Queenston, Bennett moved the plant site approximately 100 metres to the south and west. In the original location the stacker conveyor and open storage area were located directly over the location where the main zone plots on the 300-metre level.

In the new location the plant building is situated 71 metres (232 ft) to the south of the western half of the main zone 300 metre surface projection.

4.5.3. Future Mining of the Amalgamated Kirkland (AK) Gold Deposit

A study was made of available diamond drill hole logs in order to determine expected mining widths. Drill intersections in the gold zone are typically high gold values over narrow widths. This is essentially the rule in the drilling above the 300-metre level. High-grade gold values are found within the zone in quartz veins within a very competent volcanic trachytic lapilli tuff. The quartz veins within the volcanic tuff appear to be generally steeply dipping.

Mining in steeply dipping narrow veins within competent ore zones is generally done by the shrinkage mining method. In this method miners work within a narrow stope, using percussion air leg rock drills to mine successive vertical cuts within the ore zone. Minimum mining widths in shrinkage mining are generally 1.5 metres although in the Kirkland Lake mines shrinkage mining was performed in mining widths as narrow as 1.0 metre. The main advantages of the shrinkage method are that it is a low cost method of mining, the veins can be followed vertically allowing each vertical cut to be evaluated before being mined and the stope walls can be supported to prevent dilution of the ore.

Steeply dipping narrow veins can be mined using blast hole mining methods providing the strike of the zone is fairly regular and the stope walls are competent. This mining method employs larger diameter blast holes that are drilled vertically from sublevels or horizontally from raises within the zone. This mining method requires a great deal of engineering and geological control to avoid high dilution values.

Values and widths encountered in the two identified higher-grade zones do not support the development of an open pit but they may, with additional drilling, prove to support development of the zones from surface by using a narrow open cut mining method or from underground using a narrow shrinkage mining method.

Wider widths in the AK deposit begin at a depth of 300 metres below surface. Access to this zone can be accomplished by either a shaft or ramp from surface, or by further development from established underground workings.

Access from surface by shaft and/or ramp:

Any mine development would likely be located on or in close proximity to a rock outcrop in order to reduce development costs. Mine ramps are typically driven at a grade of minus 15 percent with rubber tired mobile equipment. Development of a surface ramp would likely be established at a surface outcrop located on the lot to the east of the Bennett option where the ramp could be started close to the upper part of the AK zone. An alternate location for the ramp would be in the lot immediately north of the Bennett option. In this location mine development would be started approximately 200m north of the plant building. Ramp development from this location would have to leave a stable pillar beneath Archer Drive. From either location ramp development would likely spiral down in the volcanic tuffs and sediments, relatively close to the zone, to allow further exploration of the zone as the ramp development proceeds. In either case the main ramp development will likely not be closer than 100 metres from the plant.

If a mineshaft were planned, shaft development would likely be located on the lot immediately west of the Bennett site. Mine shafts are typically located in the footwall of an ore body. Since the AK zone is almost vertical dipping it would allow shaft development in the hanging wall. The ideal location for shaft development appears to be in the bedrock at the current location of the Bennett plant.

Access from existing mine workings:

Mine development utilizing established mine workings is unlikely. The closest mine workings are the Hunton 500 level (152 metres deep), which is, located approximately 650 metres to the north-northeast of the AK zone. The Canadian Kirkland 400 level (122 metres deep) is located approximately 750 metres to the west and the Macassa 900 metre level is located approximately 900 metres to the northwest. Both the Hunton and the Canadian Kirkland are too shallow in depth to justify additional development towards the AK zone whereas the Macassa 900 metre level is too deep to justify additional development towards the AK zone.

The above section has described the existing situation with respect to mining and future mining activity on the proposed facility site pursuant to the approved Terms of Reference. The potential impact of the mining activity on the proposed facility is discussed in Section 7.4.