5.0 SUMMARY

As outlined in the as-built report, a number of design and construction modifications were made during the course of the shaft capping demonstration project as a result of material problems and site conditions. The most significant design change and construction modification related to the pre-cast panels and closure method selected for No. 2 Raise:

- Two of the five concrete pre-cast panels were cracked when received on site and as a result could not be used. The material problems resulted from the technique used to secure the panels to the flatbed trailer for transport and not providing enough time for the panels to reach their 28-day compressive strength prior to shipment.

- Uneven bedrock conditions along a portion of one side of No. 2 Raise opening required the use of a concrete or rock fill levelling course for placement of new pre-cast panels, or the use of an alternative closure method. Following discussions with NSDNR personnel, it was agreed to use a concrete cast-in-place cap over the uneven bedrock portion of the raise rather than cast new pre-cast panels. The cast-in-place cap was constructed to meet the design specifications for the pre-cast panels.

- Once delivered to site, it was determined that the pre-cast concrete panels did not meet design specifications for thickness or rebar reinforcement. However, because the closure cap over the raise opening was not to be backfilled following construction, the three undamaged pre-cast panels were used.

To correct the design specification problem, the existing pre-cast panels located over the raise opening will be replaced with new panels in the spring of 1996, which meet design specifications for thickness and rebar reinforcement. The existing panels will be removed and the new panels positioned in their place.

As a result of the problems encountered at No. 2 Raise, two recommendations are made with regard to future shaft capping projects:

1. Ensure pre-cast panels have adequate 28 day curing time to reach maximum strength and are carefully loaded if transport to the construction site is required.

2. In areas of hard, durable rock, where uneven bedrock conditions can be expected, a breaker attachment for an excavator, or a chipper/jack hammer should be available on site to level uneven bedrock as required for the selected closure method.