Review of Inspection Report by M. Stepanek for Northern Affairs

dated July/87

SUMMARY OF REPORT

FRESH WATER RESERVOIR
-seepages - downstream toe - during construction and now
-crack across top
-high pore pressures measured above toe support berm.
Recommend: 1. evaluate stability
2. establish schedule of inspections and monitoring (seepage pressure)

DOWN VALLEY TAILINGS SCHEME
Maintenance activities promised in 1986 Water Report have not been initiated.

ORIGINAL TAILINGS POND
Seepage discharged into old diversion canal and along shore of new tailings pond..

ROSE CREEK DIVERSION
Concerns about stability of:
- canal dyke
- drop weir sections
- creek channel immediately downstream

Additional maintenance (additional to that promised in 1986 report)
-improve stability in borrow pit "I" area
-monthly visual monitoring of cracks and stability
-draining of ponded water at canal dyke
-stabilization measures in case of failure

INTERMEDIATE DAM
-clean up emergency spillway
-monitor and maintain spillways (decant and emergency), as they are critical to dam integrity.

CROSS VALLEY DAM
-instability of upstream face suspected.
-increased pore pressures, surface and groundwater seepages, recent cracks.
-erosion of spillways.
Recommend: evaluation of dam stability
monthly monitoring of piezometers and seepage flows
frequent visual inspections
grading and armouring of spillways

NORTH INTERCEPTOR DITCH
-maintenance and repair work required.

NORTH FORK CAUSEWAY
-monitoring program needed:
-flows and levels of impounded water

The main concerns are, and will continue to be, the location of the Vangorda waste dump in the valley and the proposal for ~~of~~ a permanent diversion of Vangorda Creek.

COMMENTS

1. I recommend we engage a consultant to:
   a. evaluate stability in the areas of concern
   b. advise on stabilization measures in case of structural failures
   c. assist in setting up a program for monitoring and inspection.

2. Mine personnel could prepare a schedule of maintenance and repair measures to be undertaken during this season. Top priority should be given to repairs promised in the 1986 Annual Report. We could submit to Northern Affairs a list of these measures along with reasons for not undertaking any that are being deferred or are considered to be unnecessary. Attachment 1 itemizes these recommended repairs and current status.

3. An inspection/monitoring/maintenance program should be set up, with the advice of a consultant. This would probably consist of a monthly inspection by mine personnel, piezometer and flow monitoring and follow-up maintenance where necessary.

4. Vangorda Plateau
   If there is any possible way of locating the Vangorda waste dump out of the valley and making the diversion temporary, the entire environmental and regulatory side of the Vangorda project will be greatly simplified. I would think the long term costs of constructing and maintaining a permanent diversion would out weigh the short term costs of handling the waste rock a bit further.

-upstream and downstream sediment loadings
-hydraulic capacity of the drain
-stability

WASTE DUMPS

-mainly stable. Possible long-term stability problems
-recommend: classify dumps according to stability.

VANGORDA - GRUM

Concerns: -Proximity of pit area and Doal Lake drainage channel to proposed Grum waste dump.
-Pit dewatering at both minesites: input to surface drainage system - quality and quantity.
-Foundation conditions for Grum dump
-Till overburden from Grum. Till waste at Grum lagoon is unstable, indicating problems may be encountered.
-Diversion of Vangorda Creek. Impossible to have a maintenance-free permanent diversion.
-Location of Vangorda waste dump in creek valley. Recommend instead it be located within a terrain depression to the south side of the pit (East of the proposed location)

SUMMARY OF RECOMMENDATIONS FOR ACTION BY CURRAGH

1. Evaluate stability and recommend repair/maintenance/stabilization measures for: Cross-valley dam (high priority)
   Freshwater reservoir
   Borrow pit "I" area
   Waste dumps (lower priority)

2. Develop plan of stabilization measures in case of failure of any of the dams or the diversion.

3. Set up a program for monitoring and inspection of:
   a. North Fork Causeway.
      Flows and sediment loadings. Periodic inspections of stability and hydraulic capacity.
   b. Dam stability:
      Including monthly inspection of:
      - cracks and seepages at dams and canal dyke
      - condition of spillways, especially at Intermediate Dam
      - piezometer and seepage flows of Cross Valley Dam

4. Repairs:- those promised in the 1986 Annual Report
   - repair emergency spillway at Intermediate Dam
   - install drainage for ponded water at canal dyke.
   - grade and armour spillways of Cross-Valley Dam
   - repair North Interceptor ditch

5. Concerns with the Vangorda development

ATTACHMENT 1

STATUS OF REPAIR AND MAINTENANCE MEASURES RECOMMENDED BY STEPANEK

Maintenance measures promised in 1986 Annual Report:

1. Repair a portion of the disturbed thermal liner to assess the effectiveness of such work doing - late Aug - Sept
2. Repair the channel and dyke disturbed by access to the quarry same time.
3. Install a sedimentation benchmark for the canal and initiate a sediment survey not done - change room. Have flow point.
4. Place rip-rap in the drop weir canal section - Some done - late Aug.
5. Repair all dams, weirs and spillways as necessary - cleaned + removed debris from spillways.
6. Contruct a tower to allow spiggotting of the tailings upstream from the Intermediate Dam All data here from Kilborn - just put decant over Intermediate Dam by end of month.
7. Repair No. 6 weir and install a weir at X23. not done - planning to repair one in at X12 no. 6 have material for 23 technical problems, still planning.

Specific Measures Recommended in the Report

1. Install drainage for ponded water at canal dyke. - not been looked at
2. Repair emergency spillway at Intermediate Dam. - was cleaned out, regular flow.
3. Grade and armour spillways of Cross-Valley Dam. - regular - fair shape. emergency problem - 2 siphons, if water is too high it will wash out. Will take a look at it.
4. Repair North Interceptor ditch.
   - 2 areas
   - close to tailings - do both these work in late Aug - Sept.
   - another section - quite a ways from tailings - no major repairs required - hard to get at.

Every Thurs he checks - visual observations - going to set up routine monthly inspection - are designing.

Review of Inspection Report by M. Stepanek for Northern Affairs
NOTES
dated July/87

FRESH WATER RESERVOIR
-seepages - downstream toe - during construction and now
-crack across top
~~-standpipe BH 85-2: 1.8 m pressure head - above toe support berm.~~
~~-high pore pressures - loose or soft soil is an indication.~~
Recommend: 1. evaluate stability
2. establish schedule of inspections and monitoring (seepage pressure)

DOWN VALLEY TAILINGS SCHEME
~~-constructed 1981~~
~~-tailings deposited since June 1986~~
-maintenance activities promised in 1986 Water Report have not been initiated. These are: p. 8.

-ORIGINAL TAILINGS POND seepage discharged into old diversion canal, and along shore of new tailings pond.

-ROSE CREEK DIVERSION ~~stability of~~ - canal dyke
concerns about stability of: - drop weir sections
- creek channel immediately downstream
additional maintenance (additional to that promised) p 12
-improve stability in borrow pit "I" area
-monthly visual monitoring of cracks and stability
-draining of ponded water at canal dyke
-stabilization measures in case of failure

-INTERMEDIATE DAM
-clean-up emergency spillway
-monitor and maintain spillways (decant and emergency) as they are critical to dam ~~stability~~ integrity.
-CROSS VALLEY DAM
-instability of upstream face suspected.
-increased pore pressures, surface and groundwater seepage, recent cracks
-erosion of spillways.
recommend: evaluation of dam stability
monthly monitoring of piezometers and seepage flows
frequent visual inspections
grading and armouring of spillways

NORTH INTERCEPTOR DITCH
-maintenance and repair work required.

NORTH FORK CAUSEWAY
-monitoring program needed:
flows and levels of impounded water
upstream and downstream sediment loadings
hydraulic capacity of the drain
stability

WASTE DUMPS

-mainly stable. Possible long-term stability problems
-recommend: classify dumps according to stability.

VANGORDA - GRUM

Concerns: proximity of ~~Grum~~ Doal Lake ~~pit~~ channel drainage to Grum waste dump
pit dewatering - input to surface drainage system - quantity - quality
foundation conditions for Grum dump
till overburden from Grum. Till waste at Grum lagoon is unstable.
diversion of Vangorda Creek. Impossible to have a maintenance-free permanent diversion.
location of Vangorda waste dump in creek valley. Recommend instead it be located within a terrain depression to the south side of the pit (East of the proposed location)

SUMMARY OF RECOMMENDATIONS

~~One-shot Measures~~

1. Evaluate ? stability and recommend repair/maintenance/stabilization measures for:
   - freshwater reservoir
   - borrow pit "I" area
   - Cross-valley dam - high priority
   - Waste dumps - low priority

2. Develop plan of stabilization measures in case of failure of any of the dams

3. Set up a program for monitoring
   a. North Fork Causeway.
      Flows and sediment loadings. Periodic inspections of stability and hydraulic capacity.
   b. Dam stability:
      includes: monthly inspection of:
      - cracks and seepages at dams and canal dyke
      - condition of spillways, especially at Intermediate Dam
      - piezometer and seepage flows of Cross Valley Dam

4. Repairs: those promised in the 1986 Annual Report
   repair emergency spillway at Intermediate Dam
   install drainage for ponded water at canal dyke.
   grade and armour spillways of Cross-Valley Dam
   repair North Interceptor ditch

5. Concerns with the Vangorda development

The main concerns are, and will continue to be, the location of the Vangorda waste dump in the valley and the proposal of a permanent diversion of Vangorda Creek. If there is any possible way of locating the waste dump out of the valley and making the diversion temporary, the entire environmental and regulatory side of the Vangorda project will be greatly simplified.

Aug 3/87

Review of Inspection report by M. Stepanek. for Dir Northern Affairs dated July/87. Geo-engineering

- Fresh Water Reservoir - unstable.
  - seepages - downstream toe - during construction + now
  - crack across top
  - standpipe B/H 85-2 : 1.8m pressure head - above toe support berm.
  - high ~~pore~~ pore pressure - loose or soft soil is an indication.

Recommend: 1. evaluate stability
2. establish schedule of inspecting and monitoring (seepage pressure).

- Down Valley Tailings Scheme.
  - constructed 1981
  - tailings deposited since June 1986.
  - maintenance activities promised in 1986 Water Report - have not been initiated.
  - Original Tailings Pond. Seepage discharged into old diversion canal.
  - Rose Cr Diversion. stability of - canal dyke
    drop weir section
    creek channel immediately downstream.

additional maintenance (additional to that promised) p. 12.
- improve stability in borrow pit "I" area
- monthly visual monitoring of cracks + stability
- draining of ponded water at canal dyke.
- stabilization measures in case of failure.

  - Intermediate Dam
    - clean-up emergency spillway
    - monitor + maintain spillways. (decant + emergency)
  - Cross Valley Dam - instability of u/s face
    increased pore pressures, seepages - surface + ground.
    erosion of spillways.

- recommend - evaluation of dam stability.
  - monthly monitoring of piezometers & seepage flows
  - frequent visual inspections. p.19.
  - grading & armouring of spillways.

- North Interceptor Ditch.
  - maintenance & repair work required.

- North Fork Conservancy -
  - monitoring program - flows & levels of impounded water
    - u/s & d/s sediment loadings
    - hydraulic capacity of the drain
    - stability

- Waste Dumps - angle of repose 35°, mainly stable. Possible long-term stability problems.
  recommend - classify dumps according to stability.

Grum Vanguarden.

concerns: - proximity of Grum pit drainage to Grum waste dump
- pit dewatering - input to surface drainage system.
- foundation conditions for Grum dump
- till overburden from Grum. Till waste at Grum lagoon is unstable.
- diversion of Vanguarden Cr. Impossible to have a maintenance-free permanent diversion.
- location of Vanguarden waste dump in creek valley. recommend instead - within a terrain depression to south side of pit. (East of proposed location)