Appendix E

Site Photographs

Photographs 1 to 18

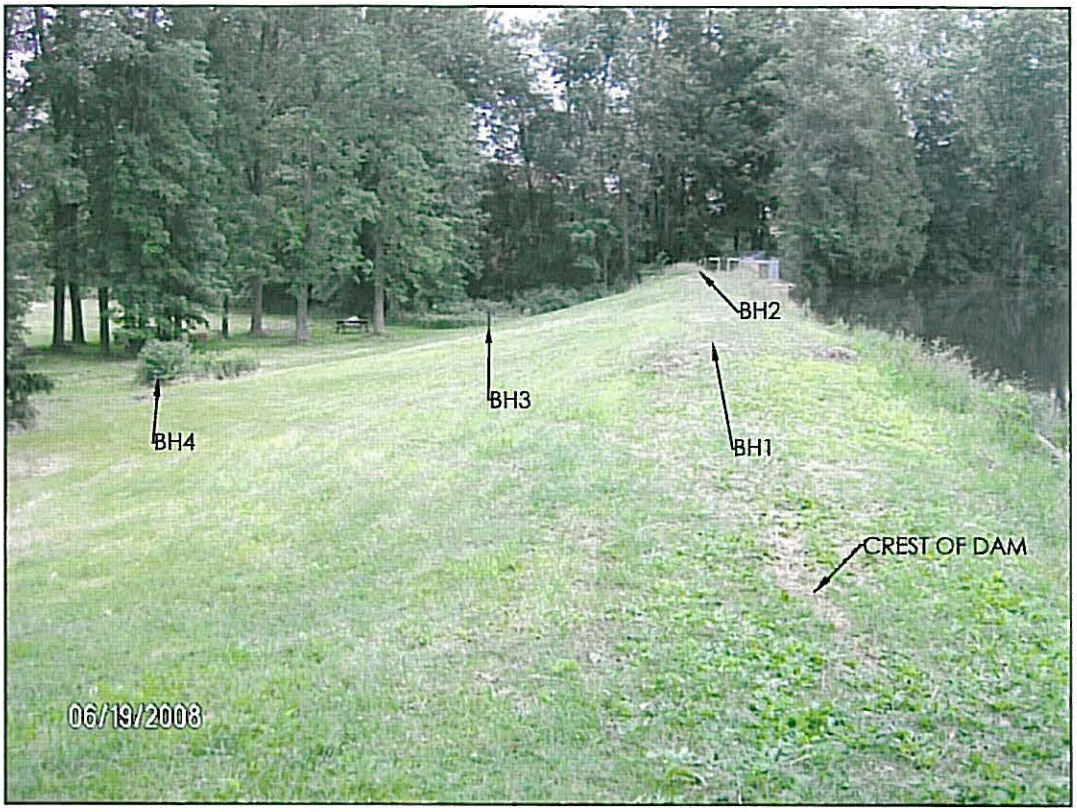

Photo 1: Looking east along the west embankment.

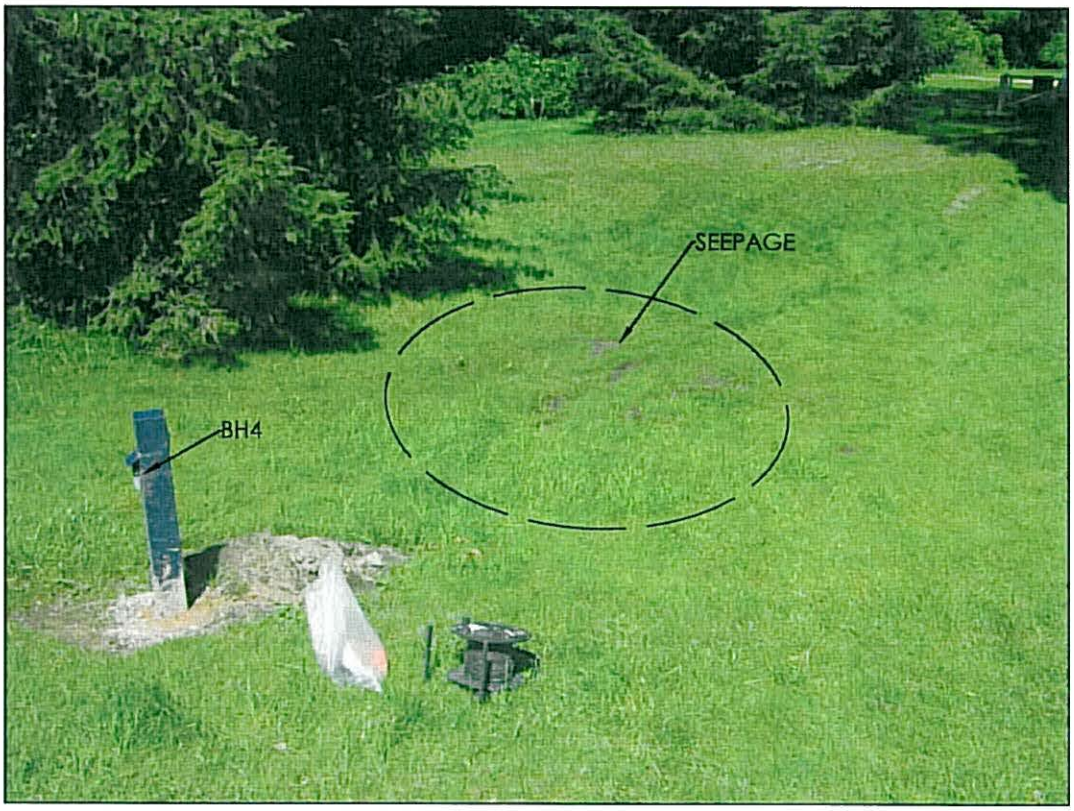

Photo 2: Looking northwest at Borehole 4.

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July 29, 2008 (ap)

Photo 3: Looking south over the dam reservoir.

Photo 4: Showing the rip rap located on the south (pond) side of the embankment.

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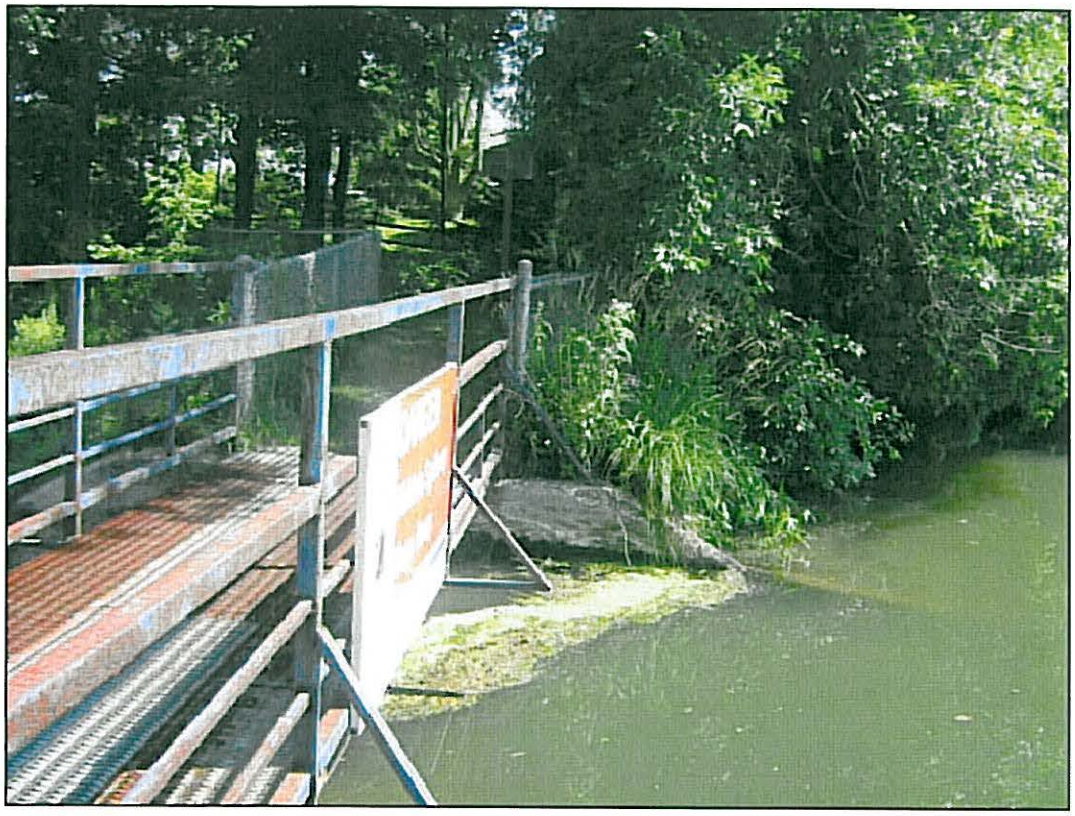

Photo 5: Looking east toward the south face of the dam spillway.

Photo 6: Rip rap lining the creek channel immediately downstream of the dam.

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July 29, 2008 (ap)

Photo 7: Looking north towards the stream downstream of the dam.

Photo 8: Looking southeast at the dam structure.

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July 29, 2008 (ap)

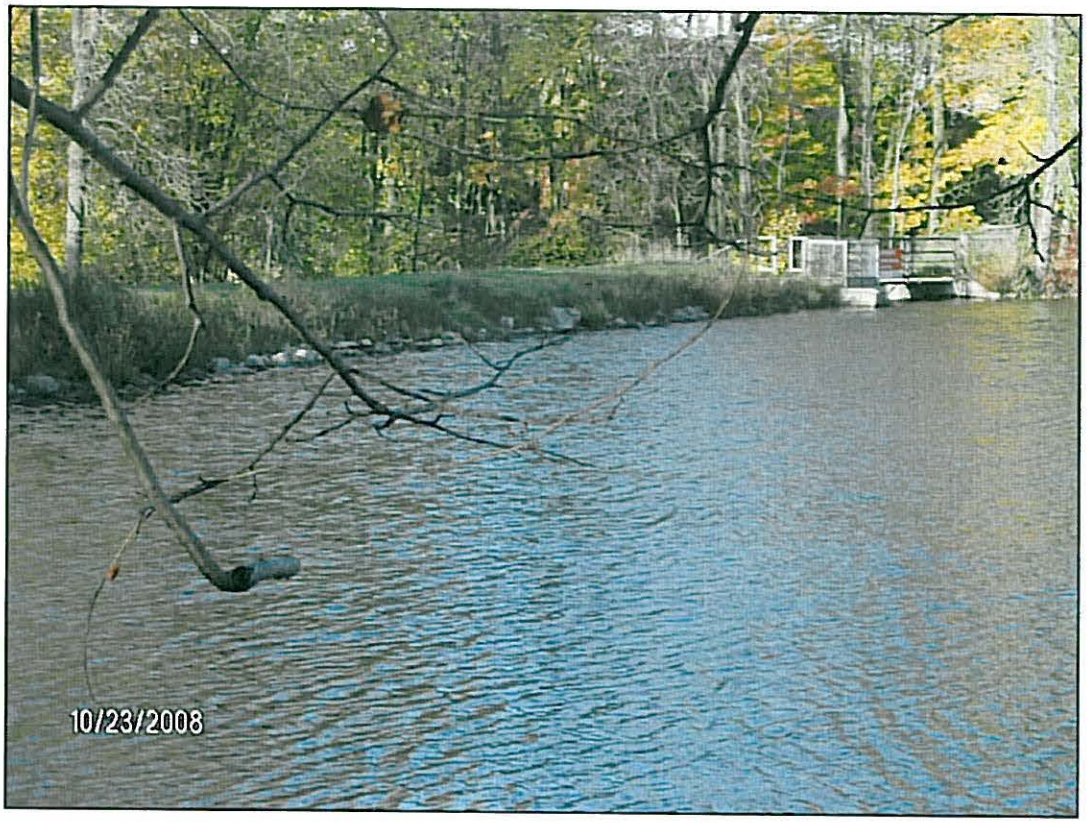

Photo 9: Looking northeast towards the dam.

Photo 10: Trees at east embankment.

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October 24, 2008 (sm)

Photo 11: Inlet of old mill race.

Photo 12: Looking north along mill race from dam.

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Photo 13: Concrete corehole at east wall.

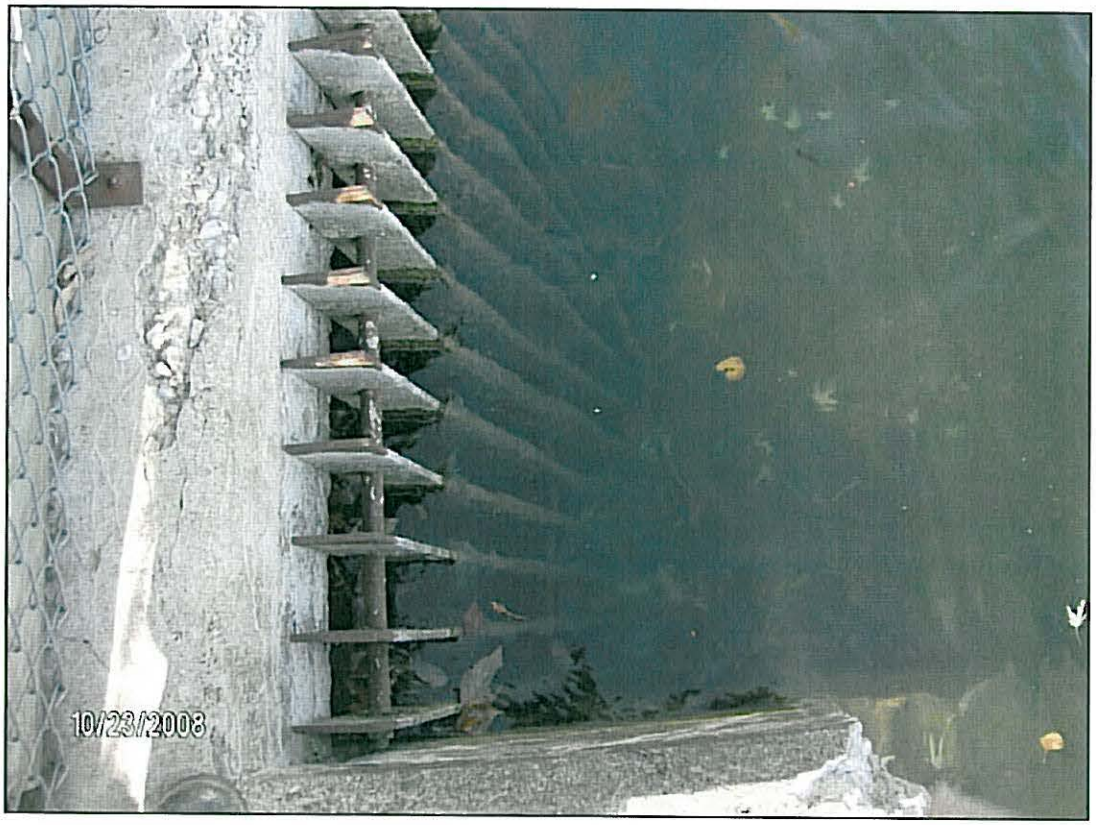

Photo 14: Culvert inlet at west wall.

Photo 15: Looking north from dam towards floodplain/park, artesian well and road.

Photo 16: Looking south from artesian well to dam.

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Photo 17: Twin box culvert at Road 28.

Photo 18: Artesian well outlet pipe located near twin box culvert.

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October 24, 2008 (sm)

Appendix F

Excerpts from Ontario Dam Safety Guidelines

Figure 1-7: Hazard Potential Classification for Dams
Figure 4-1: Minimum Inflow Design Floods for Dams
Figure 4-2: Minimum Freeboard for Low Hazard Potential Dams
Figure 6-1: Factors of Safety, Static Assessment
Figure 3-1: Minimum Suggested Frequency for Dam Safety Review, Inspection and Maintenance

Figure 1-7: Hazard Potential Classification for Dams

SELECTION CRITERIA

Hazard Potential	Loss of Life	Economic and Social Losses	Environmental Losses
Very Low	Potential for loss of life: None	Damage to dam only. Little damage to other property. Estimated losses do not exceed $100,000	Environmental Consequences: Short-term: Minimal Long-term: None
Low	Potential for loss of life: None. The inundation area (the area that could be flooded if the dam fails) is typically undeveloped.	Minimal damage to agriculture, other dams or structures not for human habitation. No damage to residential, commercial, industrial or land to be developed within 20 years. Estimated losses do not exceed $1 million.	No significant loss or deterioration of fish and/or wildlife habitat. Loss of marginal habitat only. Feasibility and/ or practicality of restoration or compensating in kind is high, and/or good capability of channel to maintain or restore itself.
Significant	Potential for loss of life: None expected Development within inundation area is predominantly rural or agricultural, or is managed so that the land usage is for transient activities such as with day use facilities. There must be a reliable element of warning if larger development exists.	Appreciable damage to agricultural operations, other dams or residential, commercial, industrial development, or land to be developed within 20 years. Estimated losses do not exceed $10 million.	Loss or significant deterioration of important fish and/or wildlife habitat. Feasibility and/or practicality of restoration and/or compensating in kind is high, and/or good capability of channel to maintain or restore itself.
High	Potential for loss of life: One or more. Development within inundation area typically includes communities, extensive commercial and industrial areas, main highways, public utilities and other infrastructure.	Extensive damage to communities, agricultural operations, other dams and infrastructure. Typically includes destruction of or extensive damage to large residential areas, concentrated commercial and industrial land uses, highways, railways, power lines, pipelines and other utilities. Estimated losses exceed $10 million.	Loss or significant deterioration of critical fish and/or wildlife habitat. Feasibility and/or practicality of restoration and/or compensating in kind is low, and/or poor capability of channel to maintain or restore itself.

* Supporting References: MNR Guidelines for Approval Under the Lakes and River Improvement Act, 1977
MNR Fisheries Section, 1999
US Army Corps of Engineers, Dam Safety Assurance Program, 1995
Dam Structure Assessment Program, Ontario Hydro, 1990

Notes:

1. Consideration should be given to the cascade effect of dam failures in situations where several dams are situated along the same watercourse. If failure of an upstream dam could contribute to failure of a downstream dam(s), the minimum hazard potential classification of the upstream dam should be the same as or greater than the highest downstream hazard potential classification of the downstream dam(s).
2. Economic losses refer to all direct and indirect losses to third parties; they do not include losses to owner, such as loss of the dam, associated facilities and appurtenances, loss of revenue, etc.
3. Estimated losses refer to incremental losses resulting from failure of the dam or misoperation of the dam and appurtenant facilities.
4. For Hazard Potential Classification and Safety Criteria for tailings dams, refer to "Guidelines for Proponents, Rehabilitation of Mines", issued by Ontario Ministry of Northern Development and Mines, 1995.

Figure 4-1: Minimum Inflow Design Floods for Dams

(Source: MNR)

Hazard Potential	Size of Dam and Inflow Design Floods					
	Small		Medium		Large	
	Height < 7.5 m	Storage < 100 x 10^3 m^3	Height 7.5 to 15 m	Storage 100 x 10^3 to 1000 x 10^3 m^3	Height > 15 m	Storage > 1000 x 10^3 m^3
Very Low	25-year flood to 50-year flood		50-year flood to 100-year flood		100-year flood to RF	
Low	25-year flood to 100-year flood		100-year flood to RF		RF to PMF	
Significant	100-year flood to RF		RF to PMF		PMF	
					Policy for existing dams is under consideration	
High	RF to PMF		PMF		PMF	
	Policy for existing dams is under consideration					

Legend: RF – Regulatory Flood PMF – Probable Maximum Flood

Notes:

1. For Minimum Inflow Design Floods for Mine Tailings dams, refer to "Guidelines for Proponents, Rehabilitation of Mines", issued by Ontario Ministry of Northern Development and Mines, 1995.

2. Existing dams refer to those structures built prior to 1978.

The maximum extreme steady state level is normally at or below the top of the impervious core.

Additional freeboard or provision for overtopping may be required for dams on reservoirs subject to landslide-induced waves.

For Low Hazard Potential dams, freeboard can be based on an economic analysis of damages, but not less than that shown in Figure 4-2.

Figure 4-2: Minimum Freeboard for Low Hazard Potential Dams
(Source: MNR)

Reservoir Size (Length)	Freeboard
Under 200 m	300 mm
Up to 400 m	450 mm
Up to 800 m	600 mm
Over 800 m	Individual analysis required

4.6. Flow Capacity of Hydraulic Structures

Requirement: *The discharge facilities shall be capable of passing the Inflow Design Flood (IDF), taking into account the routing effect of the reservoir, without the reservoir level infringing on the freeboard established in Section 4.5 for this condition.*

New dams shall be designed such that:

- *The outflow structure handles ice and debris;*
- *Water conveyance structures resist the anticipated high velocities; and*

Any material stockpiled upstream of a tailings dam shall be maintained in a stable configuration, if it can affect the stability of the dam or its appurtenant structures either directly or by destabilising stored or stockpiled tailings.

See Section 5 for guidelines for reservoir rim stability.

Figure 6-1: Factors of Safety, Static Assessment [a]
(Source: CDA)

Loading Conditions	Minimum Factor of Safety	Slope
Steady state seepage with maximum storage pool	1.5	Downstream
Full or partial rapid drawdown	1.2 to 1.3 [b]	Upstream
End of construction before reservoir filling	1.25 to 1.3	Upstream and Downstream

(a) The factor of safety is that factor required to reduce the operational shear strength parameters in order to bring a potential sliding mass into a state of limiting equilibrium, using generally accepted methods of analysis.

(b) Higher factors of safety may be required if drawdown occurs relatively frequently during normal operation.

6.2.2 Freeboard

Requirement: *Sufficient freeboard shall be provided to accommodate expected settlement of the crest and cracks caused by frost action.*

See Section 4.5 for additional freeboard requirements and guidelines.

If the reservoir is required to operate up to the level of any cracks caused by frost action, the cracks must be repaired and additional material added to the top of the dam to protect the core. Frost cracks in a partially completed embankment must be repaired and protected from further frost action during construction.

Figure 3-1: Minimum Suggested Frequency for Dam Safety Review, Inspection and Maintenance

Item	High Hazard Potential [e]	Significant Hazard Potential [e]	Low Hazard Potential [e]
Dam Safety Review [a]	Every 10 years[f]	Every 10 years	Every 10 years[h] *(Review of Hazard Potential Classification only)*
Routine Maintenance [b]	As required	As required	As required
Routine Visual Inspection [c]	Monthly	Semi-annually	Annually
Scheduled Inspection [d]	Annually	Every 5 years	Every 5 years
Special Inspection [g]	As required	As required	As required
Instrumentation	As per OMS Manual	As per OMS Manual	As per OMS Manual
Test Operation of Outlet Gates and Mechanical Components	Annually	Annually	Annually

Note: ***All dams with High Hazard Potential require Dam Safety Review, Inspection, Maintenance and Monitoring schedules that are specific to each dam and may be more frequent than the minimum suggested schedule outlined above.***

(a) Dam Safety Review involves collection of all available dam records, field inspection, detailed investigations and possibly laboratory testing. It then proceeds with a check of structural stability and operational safety of the dam, beginning with a reappraisal of basic features and assumptions. The level of detail required in a Dam Safety Review should be commensurate with the importance and complexity of the dam, as well as the consequence of failure.

(b) Frequency of Routine Maintenance depends on the type of dam and associated works.

(c) Frequency of the Routine Visual Inspection may be selected to suit seasonal restraints, and dam and site conditions. *Note: Seepage readings (or any other conditions subject to change) should be measured at this time.*

(d) Scheduled Inspections are intended as more thorough inspections performed by the appropriate representatives of the owner, responsible for safety surveillance.

(e) See Figure 1-7 for Selection Criteria for Hazard Potential Classification for dams.

(f) Dam Safety Review should be conducted within 3 years after initial filling. This Review will also establish the frequency of subsequent Dam Safety Reviews.

(g) Special Inspections should be conducted after floods, earthquakes or other unusual events.

(h) Dams with Very Low and Low Hazard Potential should be subject to Dam Safety Review every 10 years, to determine whether the hazard potential has changed, and to ascertain whether a change in the Hazard Potential Classification is warranted. Formal inundation studies are normally not required for these dams.

Appendix G

Geo-Slope Modelling Results

Figure 1A to 1C: Current Downstream Results for Steady State Seepage with Maximum Storage Pool
Figure 2A to 2C: Current Upstream Results for Full Rapid Drawdown
Figure 3A to 3C: Current Results for Downstream Horizontal Seismic Load
Figure 4A to 4C: Current Results for Upstream Horizontal Seismic Load

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July 25, 2008

No.	Revisions	Date
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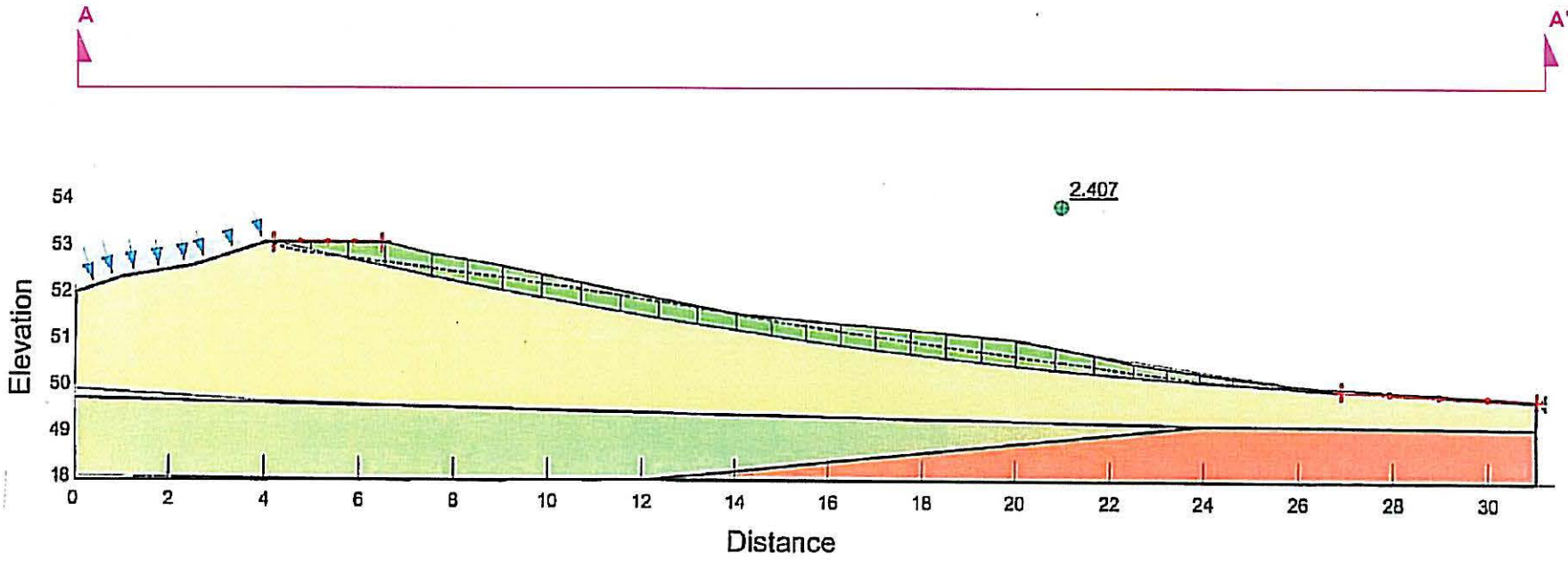

Legend

- Fill
- Silt Till
- Sand and Gravel

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Stability Assessment
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CURRENT UPSTREAM RESULTS FOR STATE SEEPAGE WITH MAXIMUM STORAGE POOL

Date	Scale	Job No.	Figure No.
Oct. 2008	NTS	7608G1	1A

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July 25, 2008

No.	Revisions	Date
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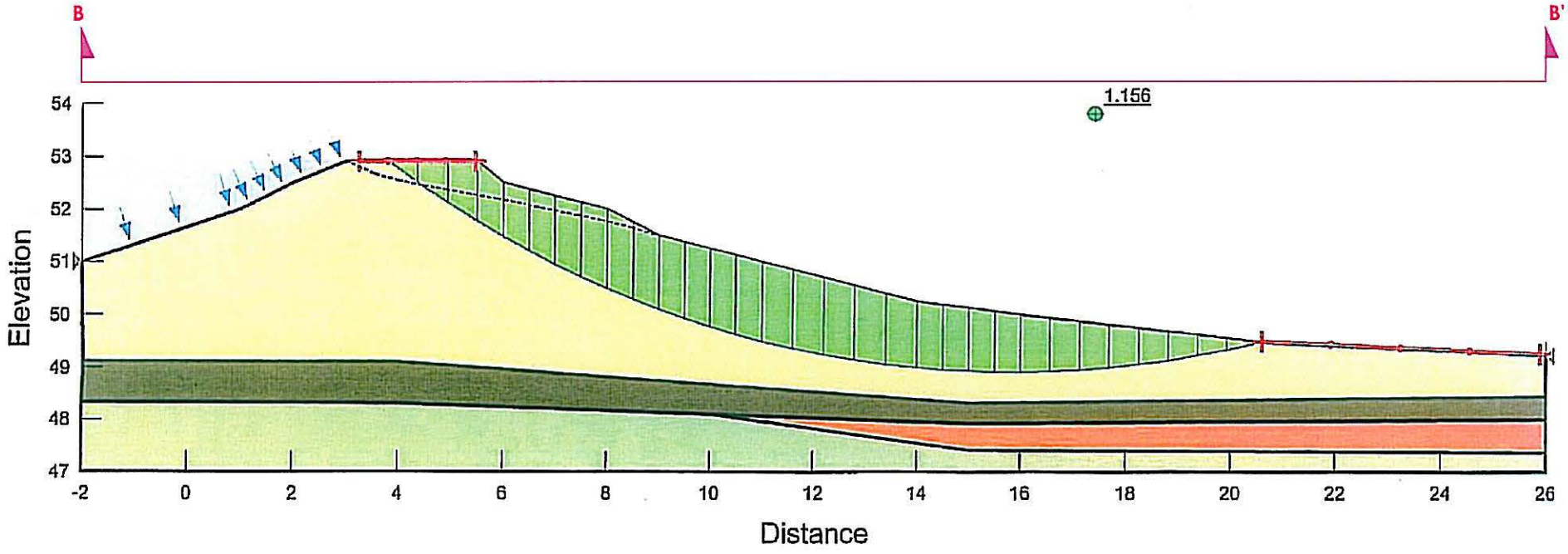

Legend

- Fill
- Peat
- Silt Till
- Sand and Gravel

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CURRENT UPSTREAM RESULTS FOR STATE SEEPAGE WITH MAXIMUM STORAGE POOL

Date	Scale	Job No.	Figure No.
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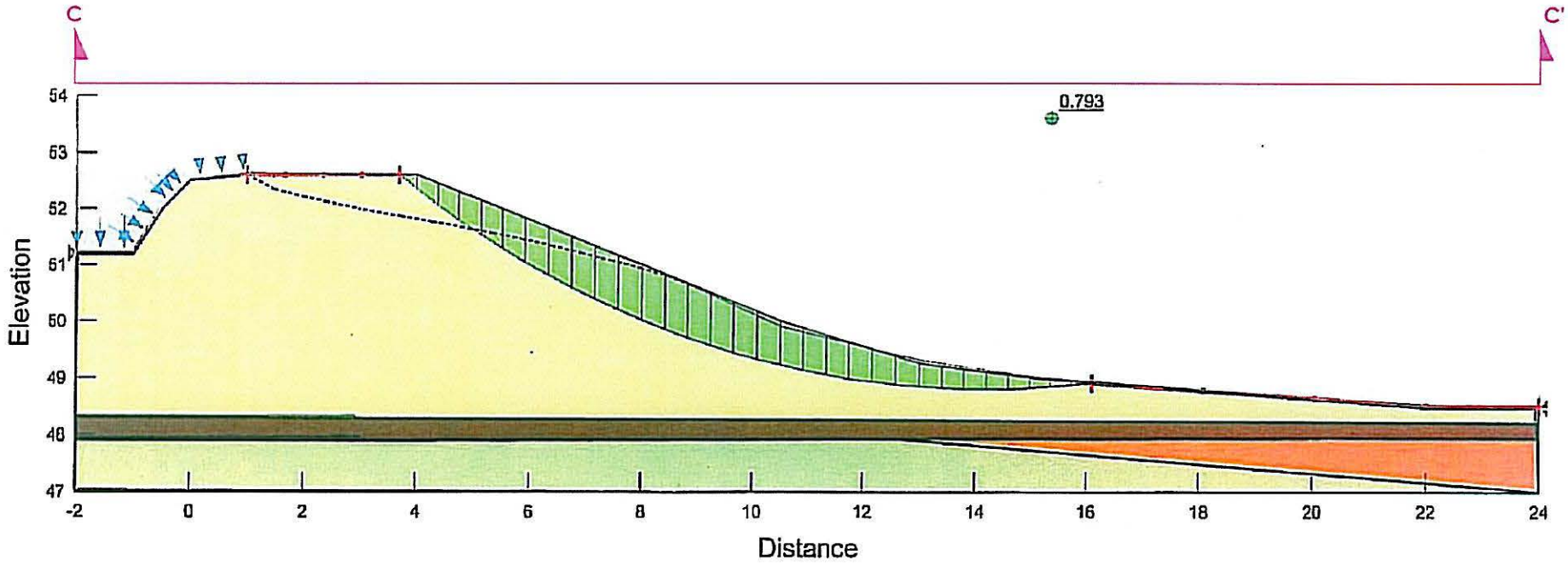

Legend
- Fill
- Peat
- Silt Till
- Sand and Gravel

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CURRENT UPSTREAM RESULTS FOR STATE SEEPAGE WITH MAXIMUM STORAGE POOL

Date	Scale	Job No.	Figure No.
Oct. 2008	NTS	7608G1	1C

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July 28, 2008

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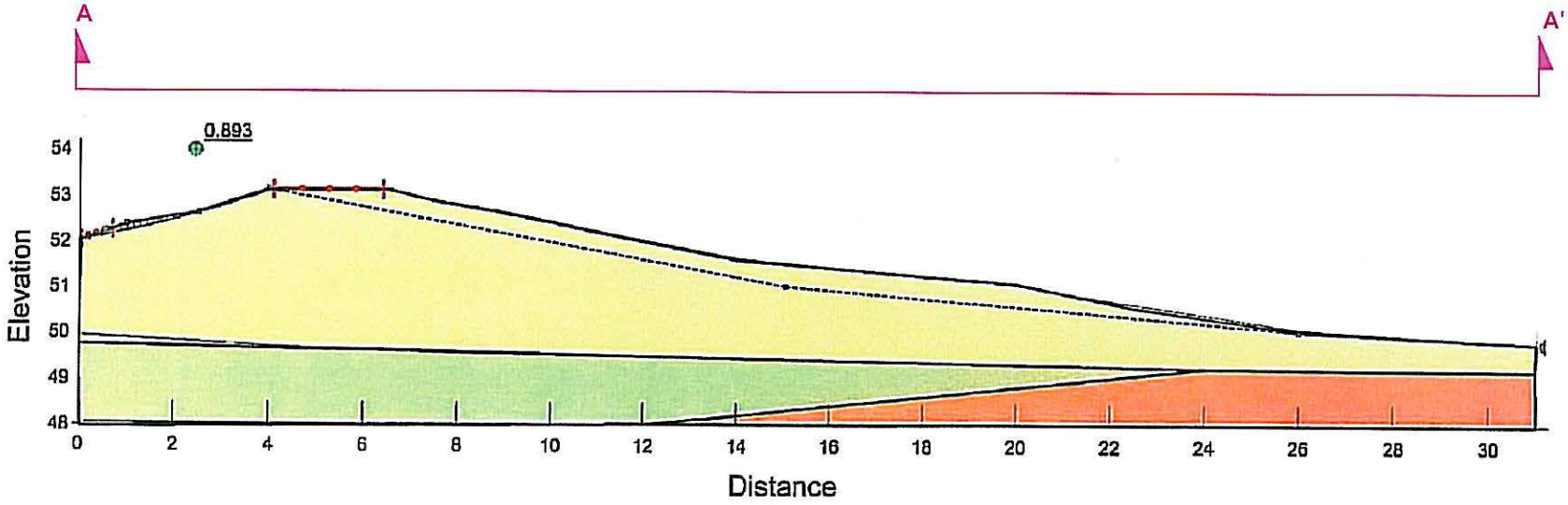

Legend

- Fill
- Peat
- Silt Till
- Sand and Gravel

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CURRENT UPSTREAM RESULTS FOR FULL RAPID DRAWDOWN

Date	Scale	Job No.	Figure No.
Oct. 2008	NTS	7608G1	2A

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July 28, 2008

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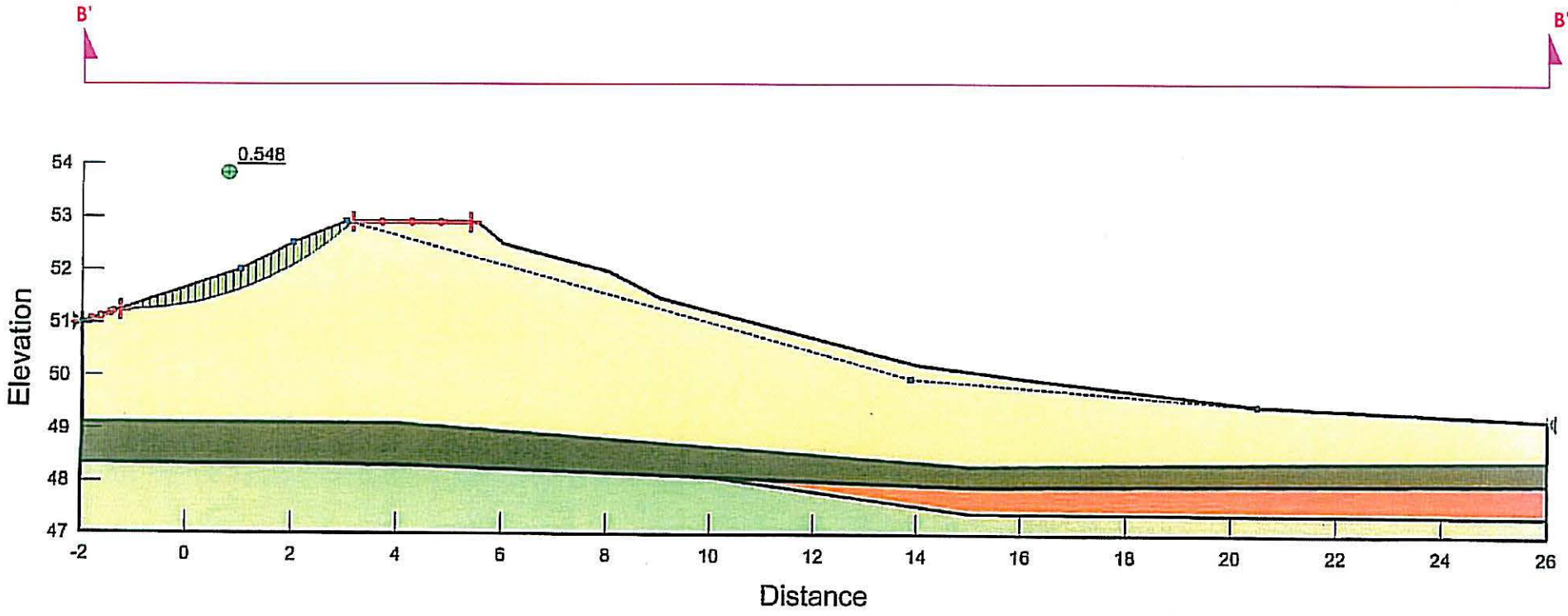

Legend

- Fill
- Peat
- Silt Till
- Sand and Gravel

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Stability Assessment
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CURRENT UPSTREAM RESULTS FOR FULL RAPID DRAWDOWN

Date	Scale	Job No.	Figure No.
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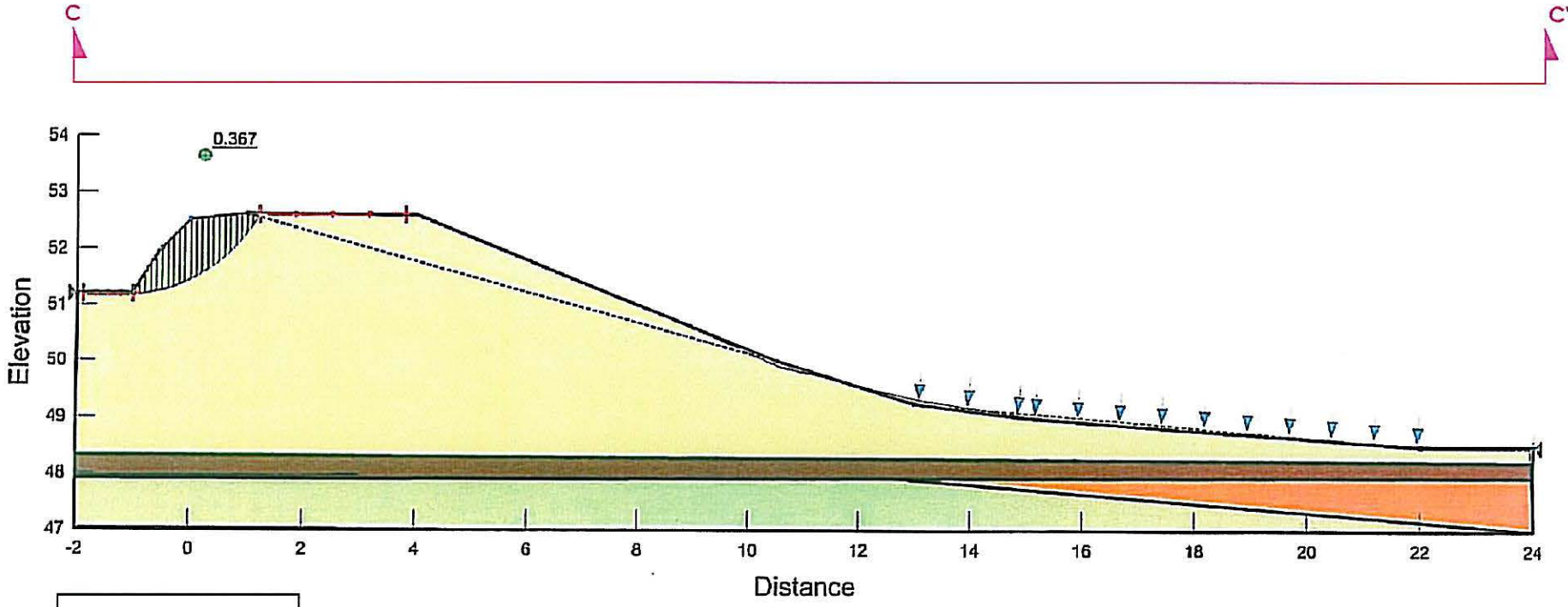

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CURRENT UPSTREAM RESULTS FOR FULL RAPID DRAWDOWN

Date	Scale	Job No.	Figure No.
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July 28, 2008

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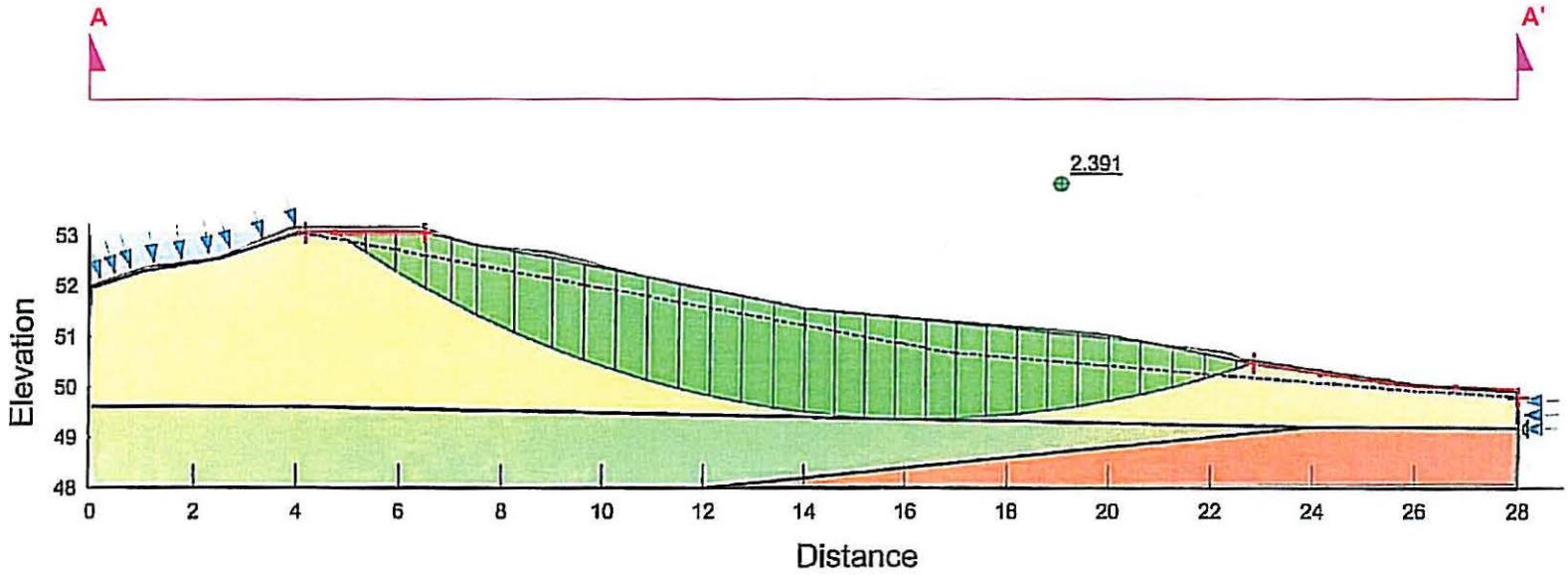

Legend

- Fill
- Peat
- Silt Till
- Sand and Gravel

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CURRENT RESULTS FOR DOWNSTREAM HORIZONTAL SEISMIC LOAD

Date	Scale	Job No.	Figure No.
Oct. 2008	NTS	7608G1	3A

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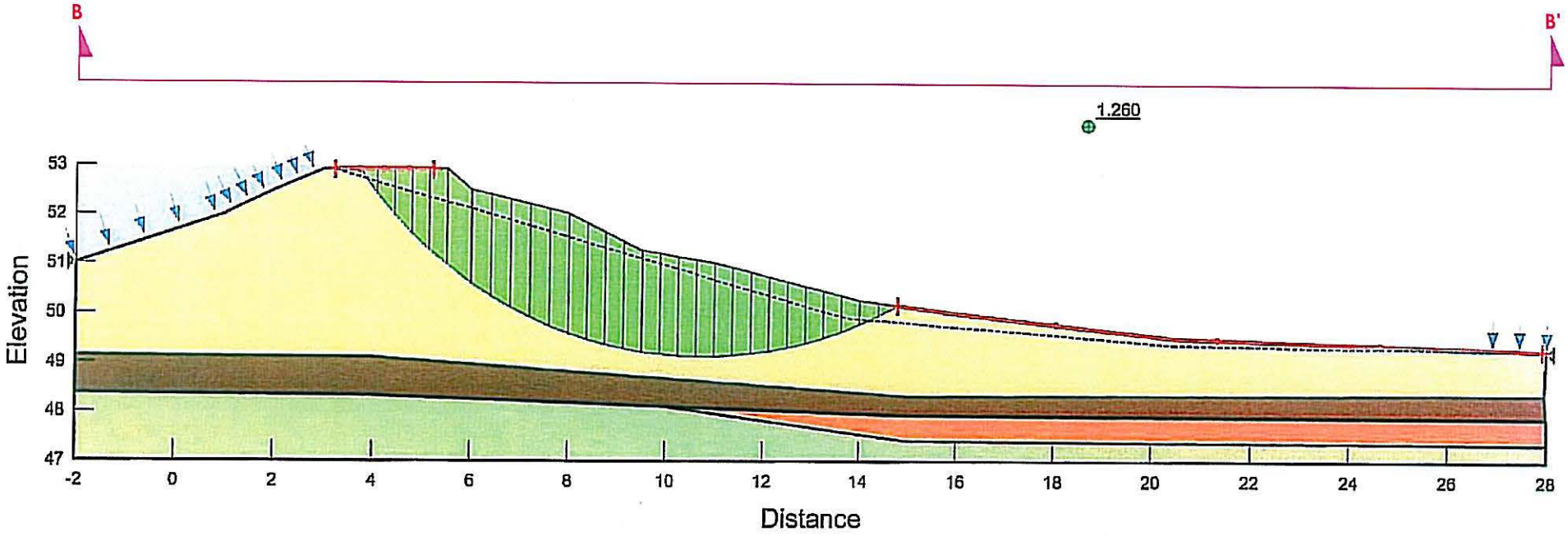

Legend

- Fill
- Peat
- Silt Till
- Sand and Gravel

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CURRENT RESULTS FOR DOWNSTREAM HORIZONTAL SEISMIC LOAD

Date	Scale	Job No.	Figure No.
Oct. 2008	NTS	7608G1	3B