IUC

INTERNATIONAL URANIUM (USA) CORPORATION

Dave

File: IUC Cell 4A 1st Rnd Interrog. Response

June 9, 2006

VIA E-MAIL AND OVERNIGHT DELIVERY

Mr. Dane L. Finerfrock
Director
Division of Radiation Control
Department of Environmental Quality
168 North 1950 West
P.O Box 144850
Salt Lake City, UT 84114-4850

Received

Re: Cell 4A Lining System Design Report, **Dike Stability Analysis**

Dear Mr. Finerfrock:

Enclosed please find the Stability Analysis results for the 2h:1v section of the existing Cell4A dike. This analysis was requested in the 1st Round Interrogatories from URS.

If you have any additional requests please feel free to contact me at 303 389-4160.

Very truly yours,

Harold R. Roberts
Vice President – Corporate Development

cc: Ron F. Hochstein, w/ enclosure

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M F G

consulting scientists and engineers

TECHNICAL MEMORANDUM

TO: JoAnn Tischler, TetraTech EMI, Denver **MFG PROJECT: 181413X**

FROM: Tom Chapel

DATE: June 7, 2006

SUBJECT: White Mesa Stability Analysis

This memorandum presents details and results of slope stability analyses performed for an earthen embankment at the White Mesa Project near Blanding, Utah. The embankment was designed in approximately 1988 by Umetco Minerals Corporation, with details described in a report titled "*Cell 4 Design, Tailings Management System, White Mesa Project, Blanding, Utah*". The text of that report, excluding appendices was provided for our review, as were Sheet C4-1 and Sheet C4-2, plans prepared by Western Engineers, Inc. and dated January 17, 1989. Sheet C4-1 shows the location of Cell 4 and other facilities; and Sheet C4-2 shows cross sections at specified locations. The locations and configuration of the section used in our analyses are described later in this memorandum. In addition to the design report and plan sheets, we received a packet titled *Dike Construction, Soil Properties*, and one titled *Dike Construction, Compaction Test*. These documents are copies of laboratory and field tests characterizing the site soils from tests performed during design and construction of the embankment.

We understand the International Uranium (IUSA) Corporation is considering using Cell 4 to impound water and tailings. As part of the permitting process, IUSA has been requested to evaluate the stability of the 2h:1v embankment slope that was constructed on the Cell 4-A side of an embankment constructed between Cells 4-A and 4-B. Tetra Tech has evaluated the stability of the 2h:1v embankment slope. Our methodology, results, conclusions, and opinions are presented in the following paragraphs.

The design report indicates Cell 4-A and Cell 4-B are adjacent cells of a tailing impoundment, each approximately 1150 acre feet with final surface areas of 40 acres each. The tailings will be impounded on the upstream side of a homogenous earth dike. The embankment that is the subject of our investigation is a homogenous earthen embankment constructed between Cell 4-A and Cell 4-B. The general site layout and location are shown on Figure 1.

Several geotechnical investigations were conducted at the site between 1978 and 1981 and results are described in the design report. The embankment was constructed of on-site soils classified as CL and/or ML according to the Unified Soil Classification method (USCS). In the vicinity of Cell 4, bedrock is reported to be sandstone of the Dakota Formation that was encountered at depths of 3.5 to 13 feet. The bedrock is described as including discontinuous lenses of claystone and siltstone. Groundwater was found at depths of 70 and 110 feet below the ground surface in the vicinity of Cell 4.

According to the design report, the embankment base was prepared by removing topsoil, then compacting and proof-rolling the base to identify soft areas, which were removed and replaced with suitable soils.

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The embankment was constructed using 12 inch loose layers compacted and tested. Test results provided to us support the methods described in the design report.

The design report included a slope stability analysis performed on the Cell 4-B side of the separating embankment using a STABR computer model, the Ordinary Method of slices, and Bishops modified Method of analysis. That analysis indicated a minimum factor of safety of 1.5 for a 25 foot high embankment and a 3h:1v slope, assuming a saturated, steady state condition in which water was impounded to a level 2 feet below the crest of the embankment. The section was also analyzed using a 0.1g lateral load and a minimum factor of safety of 1.1 was calculated.

Tetra Tech modeled the slope using Cell 4 cross section D-D' shown on Sheet C4-2. We assumed a maximum crest elevation of 5608 feet, a crest width of 18 feet, a side slope of 2h:1v on the Cell 4-A side of the embankment, and a side slope of 3h:1v on the Cell 4-B side of the embankment. This resulted in a maximum embankment height of 46 feet, including 28 feet of man-placed, fine, silty sand fill over seven feet of natural silty sand, over sandstone bedrock. Where the excavation penetrated the bedrock we assumed a one foot thick layer was processed to a sand soil condition and recompacted in place. IUSA indicated a minimum 3 foot freeboard will be maintained. The soil parameters used in our analysis were taken from Figure 3.4-1 of the design report, and are shown in Table 1 below:

Table 1. Soil Properties

Unit	Description	Phi (degrees)	Cohesion, c (psf)	Total unit weight (pcf)
1	water	0	0	62.4
2	Compacted fine, silty sand	30	0	123
3	Natural silty sand	28	0	120
4	bedrock	-	-	-

We evaluated the embankment stability with Slope/W software by Geoslope International, using Spencers method, Bishops modified method, and the Ordinary method of slices. We evaluated a steady state condition under static conditions and using a 0.1g seismic loading. IUSA requested we model the slope in a submerged condition assuming a no-strength fluid (water) as one alternative; and in a submerged condition with an impermeable synthetic liner/barrier as a second alternative. We understand that rapid draw down conditions are not applicable for this application. Figures 2 and 3 show the slope conditions and minimum factors of safety for the static and seismic conditions and the steady state, saturated condition. Figures 4 and 5 show the slope conditions and minimum factors of safety for static and seismic conditions assuming an impenetrable barrier between the water and the soil. Minimum safety factors are summarized in Table 2, below:

Table 2. Minimum Factors of Safety

Figure	Condition	Calculated Minimum Factor of Safety
2	Unlined alternative, static, steady state	1.42
3	Unlined Alternative, 0.1g seismic	0.93
4	Lined Alternative, static	1.88
5	Lined Alternative, 0.1g seismic	1.37

The Slope/W software includes a feature called "safety mapping" which plots variable numbers of slip surfaces in addition to the critical failure surface. These radii can be seen in Figures 2 and 3 and show primary failure planes are generally more deep seated, but the slope has a much higher factor of safety against the larger failure planes. A similar plot is included in Figures 4 and 5, however the slip surfaces (including the critical radius) are very small and occur near the crest of the embankment.

The results of our analysis indicate the minimum factors of safety for the unlined alternative are lower than recommended standards. A factor of safety of 1.0 indicates an unstable condition. However, these scenarios assumed an unlined saturated, condition and are therefore not representative of the planned construction. We understand the planned construction is with double synthetic liners with a drain medium and solution recovery system between the liners. The unlined alternative is not a valid analysis if the Cell is completed according to the reported plans. The lined alternative had minimum safety factors greater than commonly accepted standards for both the static and seismic conditions. The impoundment should not be used in an unlined condition unless additional analyses are performed that indicate acceptable performance, but if the construction is completed as described then the dike between Cell 4-A and 4-B with the side slope of 2h:1v meets or exceeds recommended standards for stability and safety factors.

We assumed that as-constructed soil conditions are as indicated in the design report and according to data from tests performed during the actual construction, and significant changes have not occurred since the time of construction. These analyses and results should be considered valid only for the conditions described herein.

We understand the soil/liner stability issues will be addressed by others. If you have any questions regarding our analysis or this memorandum, please contact the undersigned.

Thomas A. Chapel, CPG, PE

Senior Geotechnical Engineer

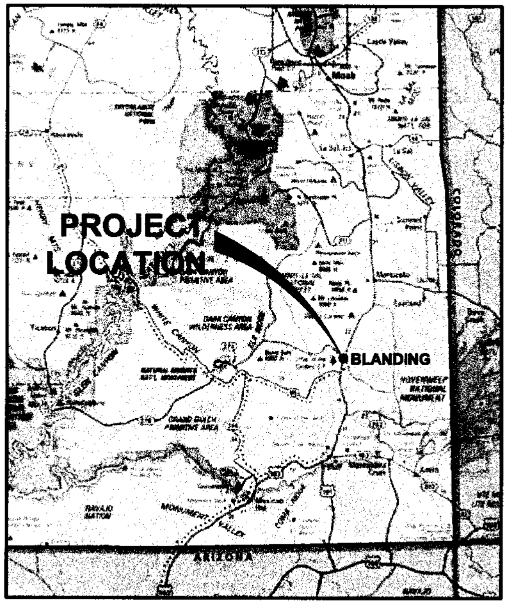
Reviewed by:

Daniel D. Overton, PE

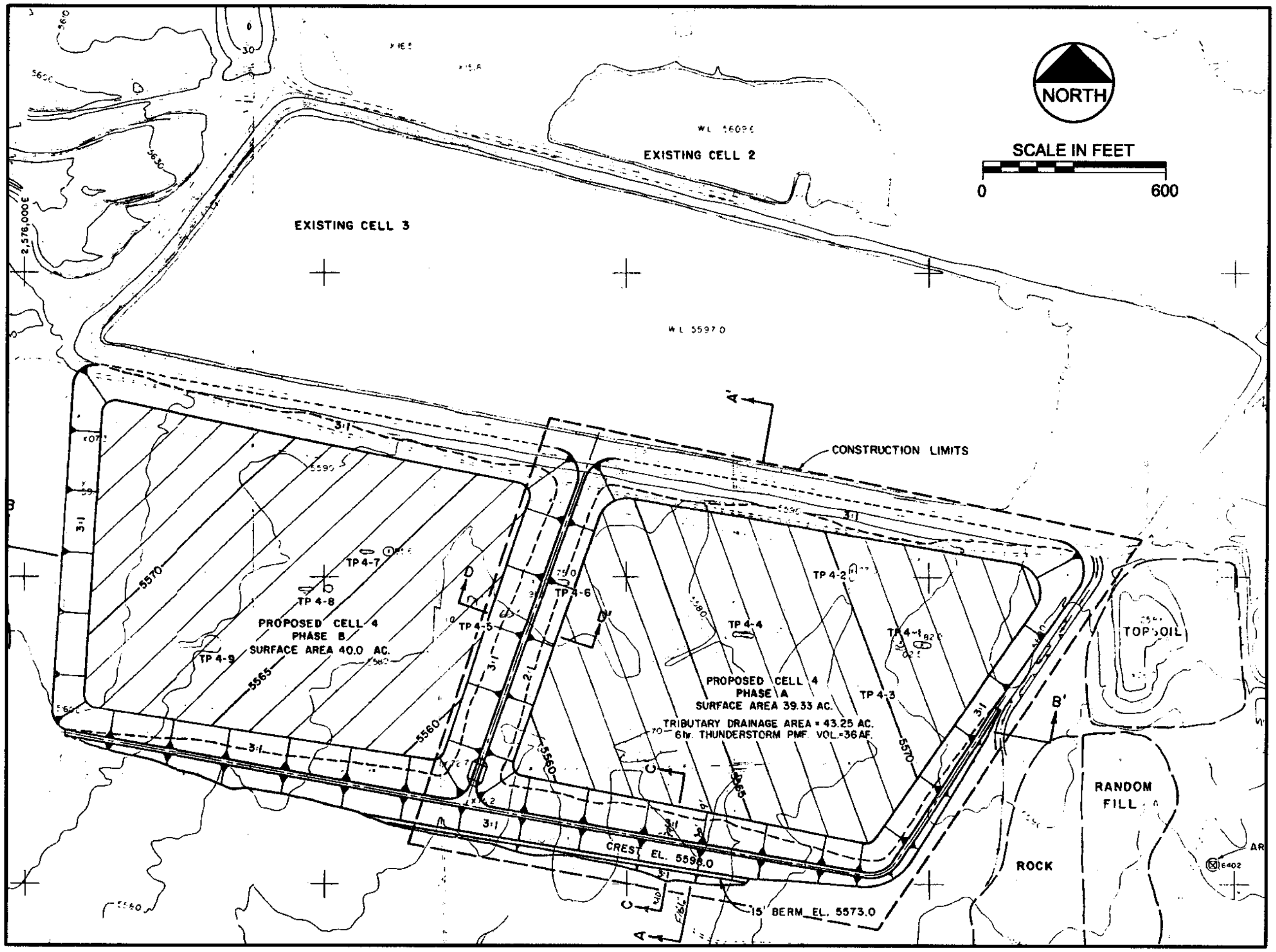
Senior Geotechnical Engineer

REGISTERED PROFESSIONAL ENGINEER No. 262513 DANIEL D. OVERTON STATE OF UTAH

12/3/06



VICINITY MAP



PROJECT AREA

TETRA TECH, INC.

FIGURE 1
SITE LOCATION MAP

Date:	JUNE 2006
Project:	181413X
File:	LOCATION.DWG

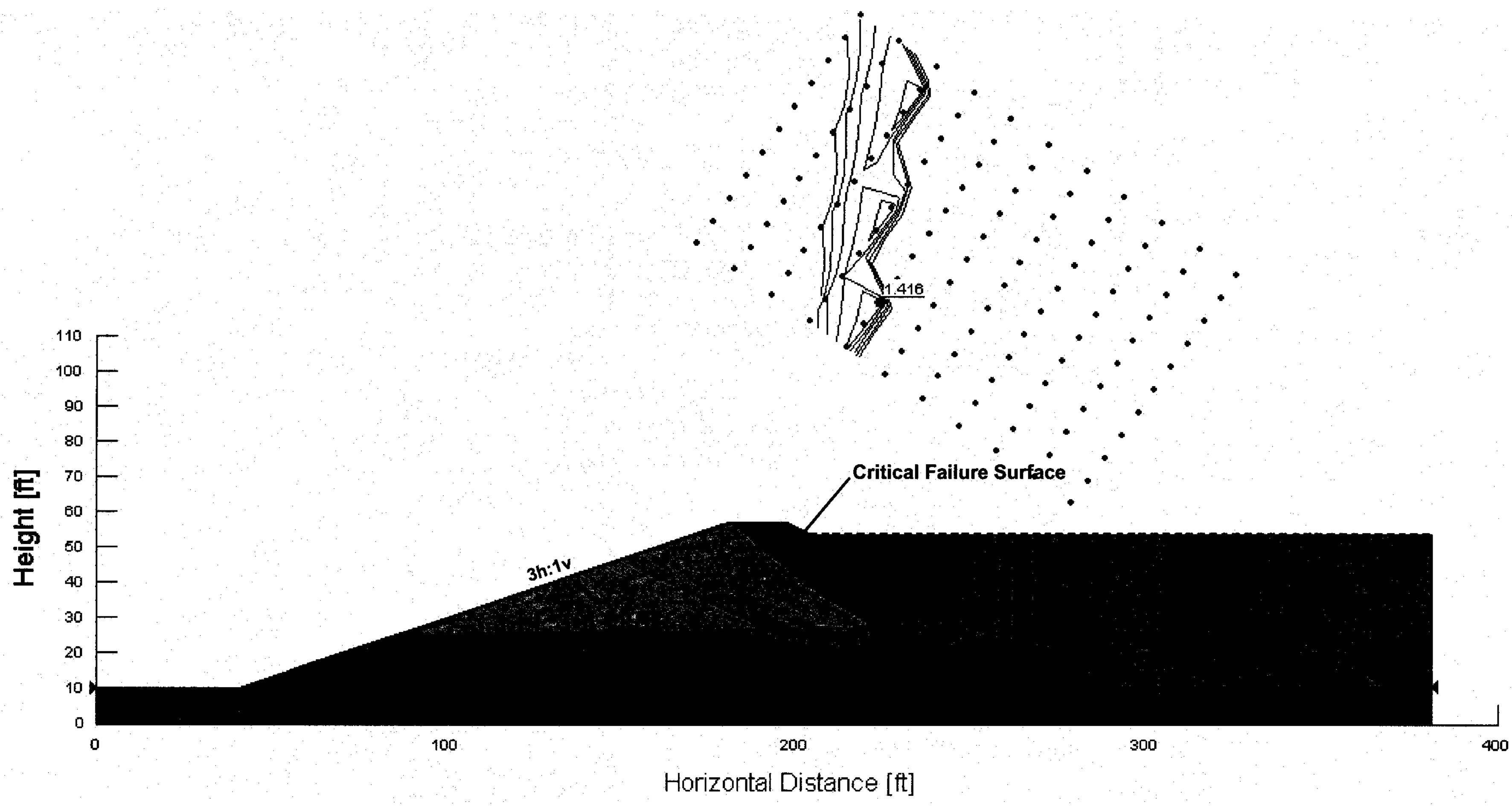


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FIGURE 2
Unlined Alternative
Static Condition

International Uranium Corp.
Project: White Mesa (181413x)
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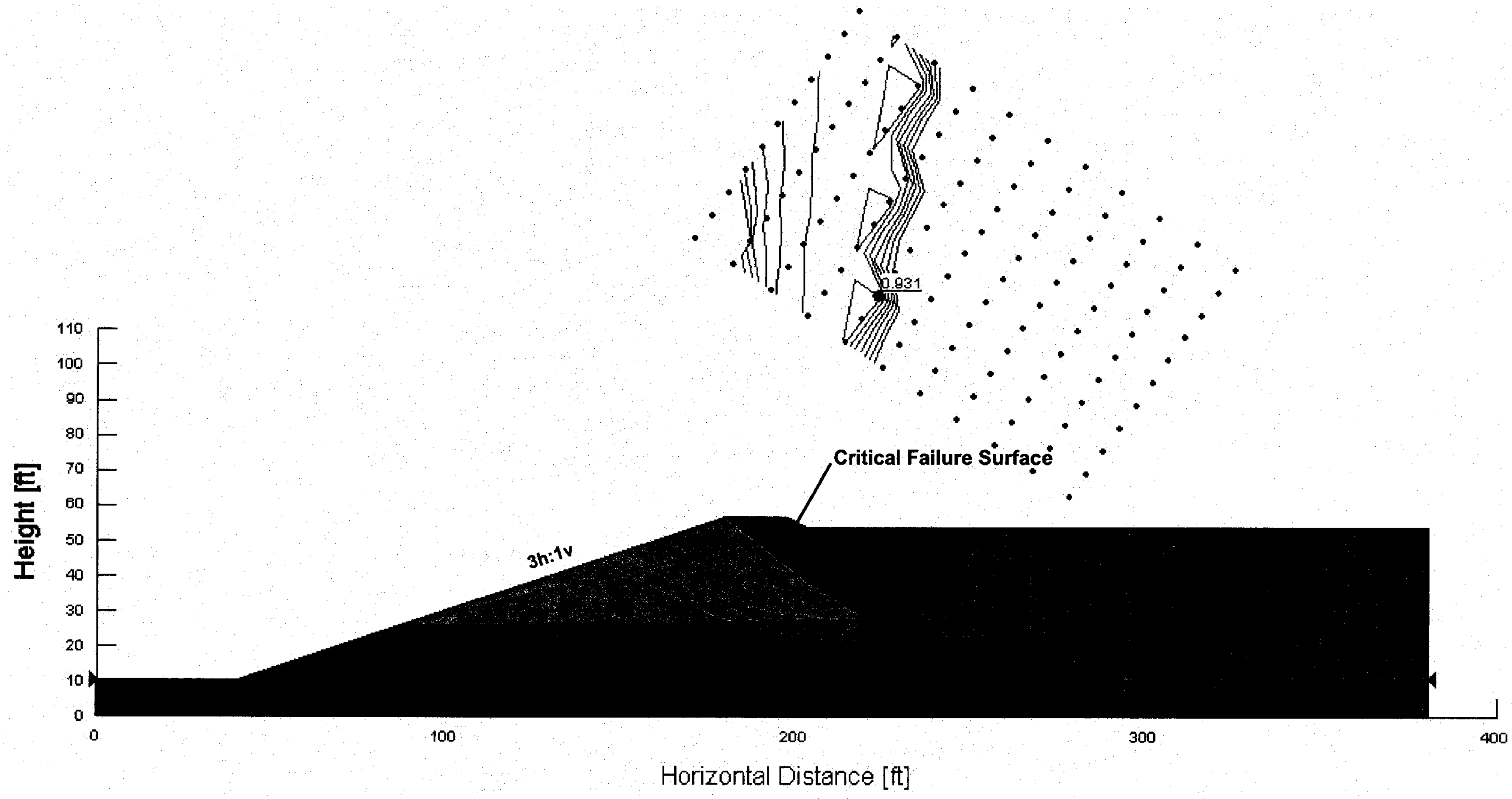

TetraTech, Inc.	FIGURE 3 Unlined Alternative Seismic Condition	International Uranium Corp. Project: White Mesa (181413x) 06/01/06

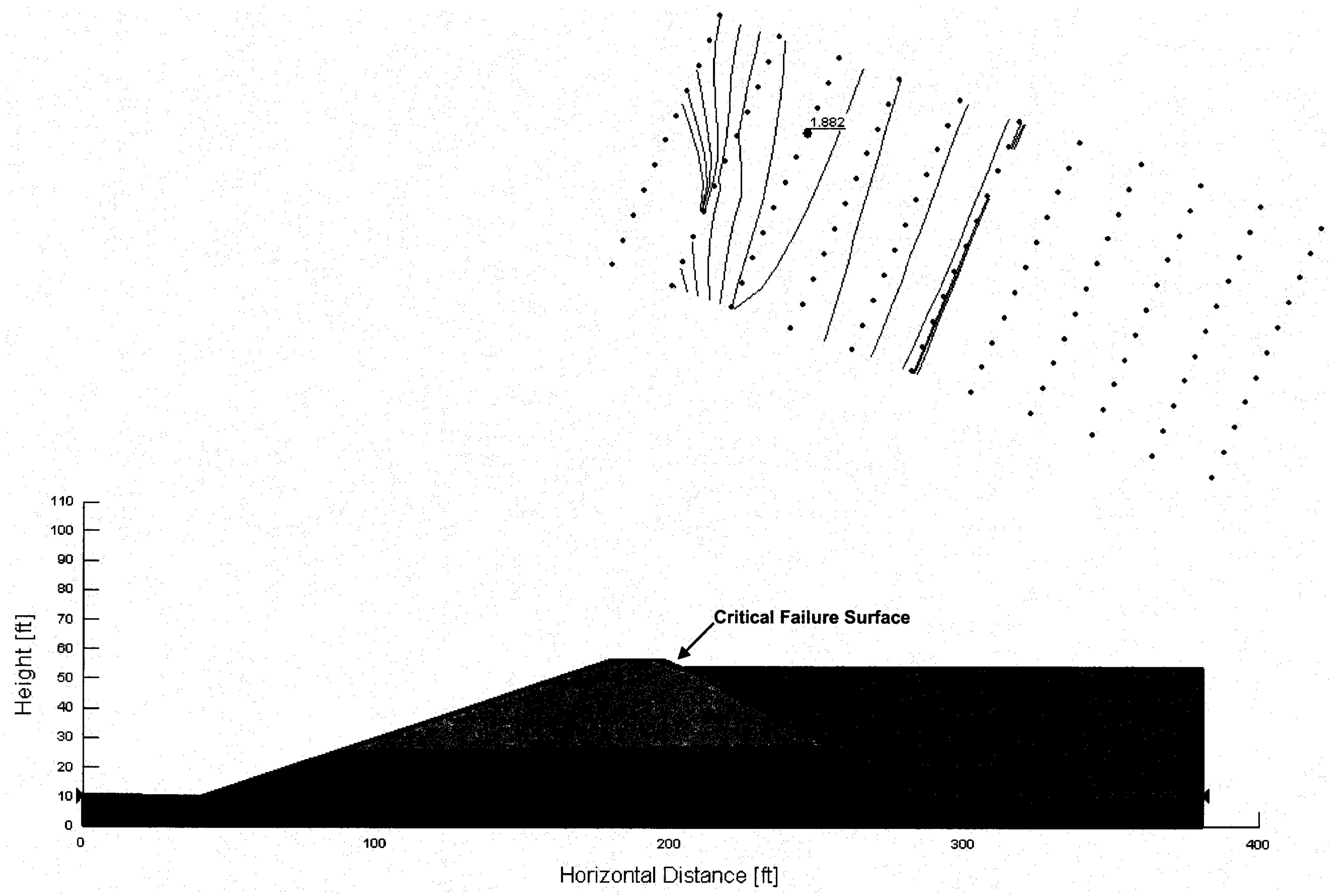

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FIGURE 4
Lined Alternative
Static Condition

International Uranium Corp.
Project: White Mesa (181413x)
06/01/06

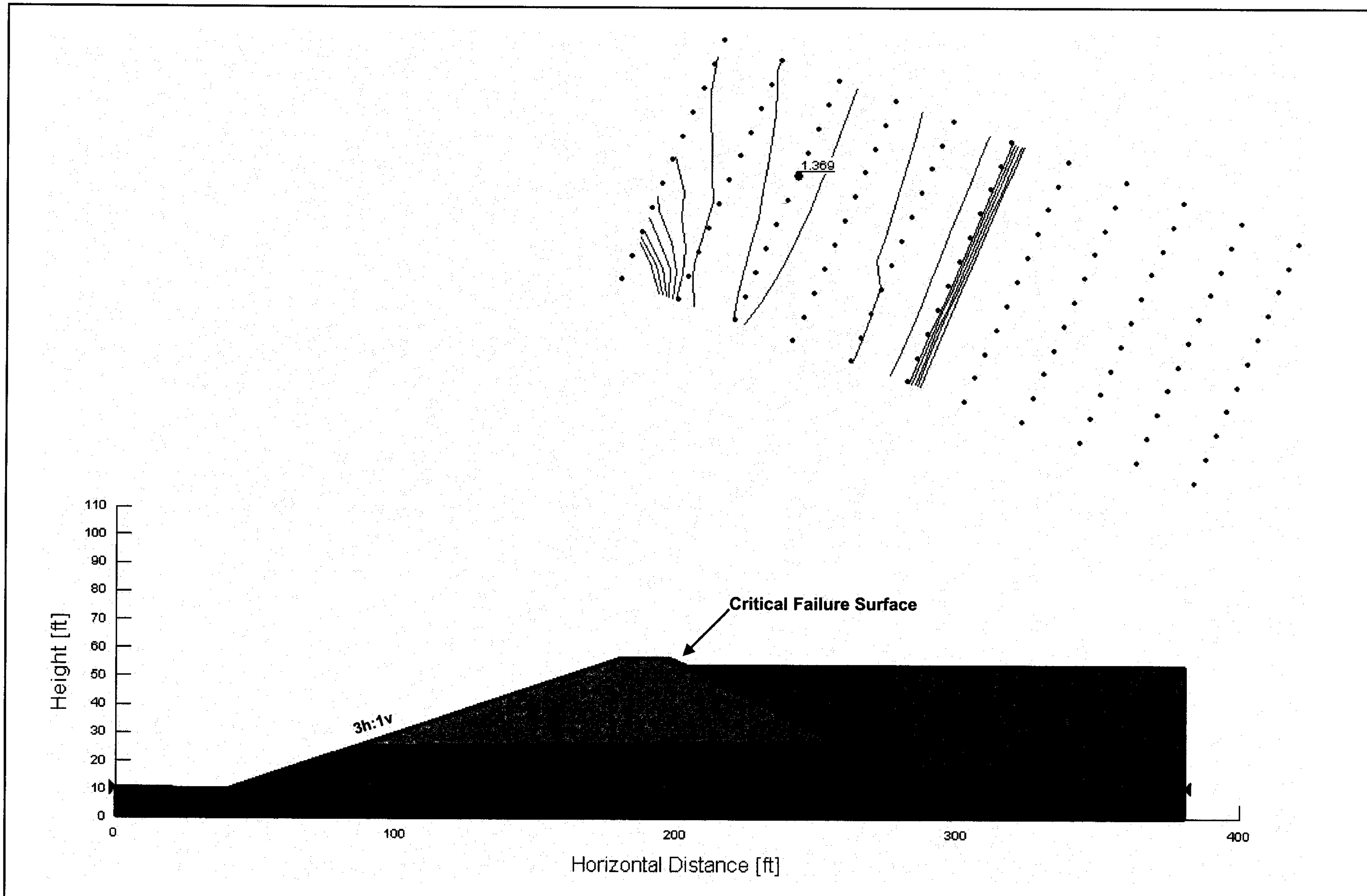

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FIGURE 5
Lined Alternative
Seismic Condition

International Uranium Corp.	
Project: White Mesa (181413x)	
06/01/06	