UMC

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5/13/002

November 30, 2000

RECEIVED
OCT 29 2001
DIV. OF OIL, GAS & MINING

Ashley National Forest
355 North Vernal Avenue
Vernal, Utah 84078

Attn: Bert Kulesza, Forest Supervisor

Re: Clarifications to 1999 UMCC Plan of Operations
Response to Forest Service Supplemental Data Request Dated 10/30/00

Dear Mr. Kulesza:

In accordance with your request letter of 10/30/00 and the subsequent teleconference with your staff, Uintah Mountain Copper Company is providing the attached clarification information to its 1999 Plan of Operations for exploration and development of the Sunshine Quartz/Hematite Claims Project test pit work.

On November 13, 2000, I had the opportunity to discuss your request with Terry Clark, Garth Keaton and Chauncie Todd. In advance of this meeting I had sent by fax our concerns related to the ongoing EA and our perception that the EA scope was expanding far beyond the scope of our work. During our discussions, your personnel noted that significant volumes of previously submitted data had just been made available to the EA team, and that this information would probably provide answers to most of the questions posed in your earlier letter. Garth requested that I review the itemized request information and provide any supplemental data not yet in the hands of the Forest Service. I agreed to this option, but noted that I would also provide specific references to previously submitted information to simplify the work of the EA team. It was agreed that if changes were minor and did not significantly alter the scope of work already presented to the public, UMCC could either send an addendum to the POO or make these minor changes within the 1999 POO, and forward the revised pages.

The greatest confusion appears to be with the future intent of our work on the claims. It has always been UMCC's understanding that the current EA was focused on project exploration and development, and that potential future mine development would require additional environmental assessments or impact statements. As stated before, the proposed test pit is an extension of previous exploration phases and is not a prelude to mining. This proposed work is required to understand the potential for any possible future expansion – gaining a wealth of economic and technical data from a small, self-contained and environmentally sound test pit program. Once this point was discussed, your staff seemed to better understand why UMCC can see no need for new public scoping of the test pit project. I believe you will also see that the supplemental information needed to address your staff's questions are minor clarifications that do not change the scope presented to the public by your office's April 2000 scoping letter.

Please have your staff contact me if there are any questions or if additional information is needed.

Sincerely,

Peter Kandaris, President
Uintah Mountain Copper Company
(435-820-6460 – Price)
(602-236-8613 – Arizona)

cc: Pamela Kandaris-Cha
Joe Bistryski
Chauncie Todd

United States Department of Agriculture | Forest Service | Ashley National Forest | 355 North Vernal Ave Vernal, UT 84078

File Code: 2810

Date: October 30, 2000

Peter Kandaris, President
Uintah Mountain Copper Company
P.O. Box 578
Price, Utah 84501

Subject: Sunshine Quartz/Hematite Claims Project – Exploration and Development, Data/Information Needs for the Environmental Analysis and Evaluation Process

Dear Mr. Kandaris:

We are underway with the environmental analysis and evaluation of the subject project. Additional data and information are needed to meet the requirements of the National Environmental Policy Act (NEPA) and associated Forest Service direction, in regards to: public scooping, purpose and need, reasonable range of alternatives, reasonable foreseeable actions, connected actions, and cumulative affects. We also need clarification of existing data and information provided to us in recent months.

The data and information requests are included as Enclosure #1. We have also included the schedule for completing the environmental document (Enclosure #2). Responses to the items listed in Enclosure #1 should be addressed in a revised Plan of Operation. **We will need this revision by or before November 10 to stay on schedule with our analysis and evaluation work.**

Questions should be directed to Chauncie Todd, Lands and Minerals Staff Officer at (435) 789-1181.

Sincerely,

BERT KULESZA
Forest Supervisor

Enclosures (2)

Uintah Mountain Cooper Company
Sunshine Quartz/Hematite Claims Project – Exploration and Development

Data/Information Needs for the Environmental Analysis and Evaluation Process

The following data and information should be included in a revised Plan of Operations:

1. Additional information on the existing plans for expansion of operations within the claim area, following the completion of Phase 3 Test Pit work and ore/product testing and evaluation –

   Uintah Mountain Cooper Company has identified past and proposed test pit operations as part of potential larger operations. Therefore, the company should provide descriptions, illustrations, and maps of the plans of expansion. This new data and information should be part of a revised Plan of Operations and include general work descriptions, excavation and extraction methods, spur road construction, ore and overburden quantities, stockpiling of overburden and ore, hauling, equipment, camp facilities and use, and time frames.

This information is needed to meet NEPA requirements for connected actions, reasonable foreseeable actions, and cumulative affects. The information is also needed to address related public scoping questions and issues.

2. A brief narrative of the sample ore being removed and what products result from processing, including short- and long-term market value of the products –

3. Background data and information on Phase 1 and 2 test pit/reclamation work, over-and-above that provided in the "Supplemental Discussion to 1999 Plan of Operations" –

   Provide data and information on excavation quantities, cubic feet of ore and overburden removed, the results of testing and evaluation, and the reclamation work. We will address these phases of work, including reclamation in the environmental document being prepared.

   Explain what was done as part of reclamation work for Phase 1 and 2 test pits and associated spur road #1. We have no record of a request for review and approval of this work. Please inform us if Uintah Mountain Cooper Company has completed this reclamation work and is requesting review and approval. The review and approval will be necessary, since it will be part of the history and background information presented in the environmental document being prepared.

4. Material Hauling and Transport –
   The revised Plan of Operations will need to describe the system that will be used to transport ore from the mine site to the "turn-around area". The following items need clarification:

   - ✓ We understand that ore will be transported by 5-ton tucks to the turn-around area. Please confirm this in a revised Plan of Operations. The "Supplemental Discussion to 1999 Plan of Operations", and Uintah Mountain Cooper Company's letter to Utah Division of Oil, Gas and Mining have conflicting statements regarding this matter.

   - ✓ Verify the actual location of the turn-around area, i.e., 600 feet or 1800 feet from the mine site. If this location is mapped, please provide a copy of the map.

   - ✓ Describe how ore will be transferred from the 5-ton trucks to the 10-wheel trucks at the turn-around area, i.e., front-end loader or conveyor.

5. Camp Site Features –
   The revised Plan of Operations must include a description and map of the "camp area". Each temporary facility and piece of equipment should be briefly described. The map should show the location of proposed facilities and equipment to be used in the mining operation, i.e., temporary quarters, sanitation facility, fuel site, ore transfer site (bins, conveyors), etc.

The data and information discussed in items 2, 3, 4 and 5 will be part of the project description, and purpose and need section of the environmental document.

6. Disposal of woody vegetation, i.e., trees and brush, removed during excavation –
   If Uintah Mountain Cooper Company has disposal plans for woody vegetation, so indicate; otherwise, we will include a provision for vegetation disposal in the mitigation section of the environmental document.

7. Rights for water used in dust control –
   Describe the actual location of the water source to be used in dust abatement. Also describe the water rights that the company has or will need to obtain to use water for dust abatement. The unit of measure for this need will be gallons per day.

8. Stockpiling of topsoil –
   Section E of the "Supplemental Discussion to 1999 Plan of Operations" states that..."there will be an attempt to segregate and stockpile topsoil from the overburden. Reclamation measures will make it mandatory to segregate and stockpile topsoil; therefore, please make this change in the revised Plan of Operation.

9. Water Quality Issues –

The environmental document will include a section on the method and procedure to channel and control runoff from the access road, disturbed slopes, and spur roads within the mine site. Our field investigations indicate that runoff must be impeded, and then channeled to selected locations for downslope dispersal. If Uintah Mountain Copper Company has developed a method and procedure for this issue and management concern, please include them in a revised Plan of Operations. Otherwise, the Forest Interdisciplinary Team will develop it as part of the mitigation section of the environmental document.

The data and information discussed in items 6, 7, 8, and 9 are needed for the "Affected Environment and Environmental Consequences Sections of the environmental document.

10. Gabion or retaining wall design –

The "gabion rock wall" will be addressed as one of the protective measures being proposed by Uintah Mountain Cooper Company. Please provide us with an illustration of the latest gabion design (as modified in response to comments from our geotechnical engineer). The illustration can be sized to 8 x 11 or 11 x 14.

This design will become one of the illustrations included in the environmental document.

Uintah Mountain Cooper Company
Sunshine Quartz/Hematite Claims Project – Exploration and Development

Schedule for Completing the Environmental

1. Forest Service Planning Meeting and Field Review
   Done September 7

2. ID Team Office Meeting Field Review, including Reviews by Regional Geotechnical Engineering Staff
   Ongoing

3. Review of current plan of operations and determination of additional data/information needs, including requesting additional data and information and a revised Plan of Operations from the Uintah Mountain Cooper Company.
   Letter to be mailed to Uintah Mountain Cooper Company on October 20, with a requested response date of November 3.

4. Preparation and mailing of the Public Scoping Letter
   November 6 - 10

5. Content Analysis (identifying public issues and management concerns)
   December 11- 15

6. Development of Alternatives
   December 18 - 22

7. Preparation of Chapter One, Purpose and Need for the Action; and Chapter Two, Alternatives Including the Proposed Action
   December 25 - January 19, 2001

8. Review of Chapters One and Two by the ID team
   January 22 - 30, 2001

9. Preparation of Chapter Three, Affected Environment
   February 1 - 30, 2001

10. Review of Chapter Three by the ID team
    March 5 - March 12, 2001

11. Preparation of Chapter Four, Environmental Consequences
    March 1 - April 30, 2001

Enclosure #2 continued

12. Review of Chapters Three and Four by ID Team
    April 1- 30, 2001

13. Preparation of final draft EA, including Appendices
    May 7 - 18, 2001

14. Review of final draft EA
    May 21 - 31, 2001

15. Preparation and Submittal of Final EA
    June 4 - 15, 2001

The results of the EA and Decision Memo, including mitigation and special measures will be used to make necessary revisions to the Plan of Operation.

District and Forest Staff will review and comment on the revised Plan of Operations.

Supplemental Data Requested by Enclosure #1 of USFS Letter Dated 10/30/00

Item 1 – Revision to Plan of Operations to include future mining

No response needed. Refer to previous discussions in UMCC letter of 11/12/00, telephone conference meeting of 11/13/00 and the attached cover letter.

Item 2 – Ore market

A detailed iron oxide market assessment was submitted to the Forest Service September 30, 1999. A copy of the document is attached.

Item 3 – Background data on previous phases of test pit work

Per our telephone meeting, the following is a chronological history of the phased exploratory test pit project:

In late 1995, a new plan for claims exploration and development was developed by UMCC after completion of 1994-95 subsurface drilling work. Originally, a three-year phased exploratory test pit program with progressively expanding development areas for each phase of work was proposed by UMCC. This proposal is documented in the 1995 Plan of Operations, the 1996 Revisions to the Plan of Operations (dated 1/96) and Addendum No. 1 to the 1996 Revisions to the Plan of Operations (dated 5/21/96). Copies are not included, but can be sent to your staff upon request. In addition to the POO, drawing details were provided (Map 4, 1996 rev.) along with slope stability and sedimentation analyses. The 1996 POO was a result of revisions from both verbal and written comments provided by the Forest Service in 1995 and 1996 and was sent to the Forest Service for approval.

On April 29, 1996, a meeting was held between UMCC and the Forest Service to discuss the proposed work. The Forest Service decided to perform an Environmental Assessment on the full test pit scope, while allowing UMCC to begin the first phase of test pit work during 1996 (see cover letter to Addendum #1, dated 5/21/96 that documents the results of the meeting). Follow-up meetings with the Forest Service were held on June 3, 1996 and April 18, 1997 to review the work scope and progress (meeting confirmation letters attached).

The first phase of the test pit work was initiated in October 1996, but was halted by early snowfall. The Forest Service was notified and concurred on the need for delay (letter attached). The work resumed in September 1997 and activities were documented in a detailed engineering analysis report issued on September 26, 1997. The approved scope of work included excavation of a 20 to 25-foot wide by 20-foot long and 7-foot deep test pit, removal of an estimated 100 tons of sample ore and 120 tons of overburden, placement of a 30-foot long by 9-foot high gabion rock basket reclamation test section, replacement of overburden behind the gabion protection, and re-seeding of the disturbed area. A copy of the detailed report is attached. It should be noted that only 45 tons of sample ore were removed during this first year of work. The remainder was stored as backfill behind the gabion wall or stockpiled on site. UMCC bonds were returned upon completion of this work.

A review meeting with the Forest Service was held on November 10, 1997. Approval was given to UMCC to perform an extension of the first phase of test pit work which would allow excavation behind the reclaimed gabion structure, removal an additional 61 tons of sample ore, and reclamation and reseeding of the area. The EA had not yet been started by the Forest Service, so UMCC agreed to postpone planned Phase 2 and 3 test pit work until the summer of 1999 to allow time for Forest Service completion. This meeting and the subsequent agreement on future actions is documented in the meeting minutes, a follow-up UMCC scope letter dated December 4, 1997, and Forest Service correspondence dated December 23, 1997 (all are attached).

A field meeting was held on September 17, 1998 for the purpose of allowing the Forest Service geotechnical specialist an opportunity to perform a review of the completed and proposed work. Comments by the specialist were provided in January 1999 in the form of a letter (dated November 30, 1998) requesting detailed technical and engineering analysis for the future test pit phases.

The previously approved extension of the first phase of test pit work was performed in October 1998. A Cat 312 excavator was used to remove an estimated 60 to 70 tons of sample ore from behind the gabion structure while not disturbing any new areas. Poor weather prevented use of large haul trucks, so ore remained stockpiled at the site. A photographic record of all activities was taken. Fill soils were obtained from along disturbed areas of the road and from the adjacent natural slide zone for replacement backfill behind the gabion structure. The area was backfilled with this material and re-seeded to complete the reclamation efforts. Essentially, the extended Phase I work only allowed removal of additional sample ore, the evaluation of excavator equipment (the excavator was three times faster for ore removal than the loader tested earlier), and continued assessment of the success of the gabion reclamation work in place (no significant changes observed). No other test pit reclamation work was required or requested.

UMCC performed the detailed geotechnical engineering analysis requested by the Forest Service and on June 3, 1999, presented a reconfigured test pit plan that incorporate the remaining phases of work into a single final test pit program (at that time titled "Phase II"). Simultaneously, a paper documenting all Phase I and the extended Phase I test pit reclamation work was prepared for the 37th US Symposium on Rock Mechanics. Copies of both documents are enclosed.

A project status meeting was held at the Forest Service's offices in Roosevelt, Utah on July 21, 1999. From this meeting, UMCC again agreed to postpone activities during the summer of 1999 so that the Forest Service could complete EA field studies for the final test pit project (now titled "Phase III", which encompassed all of the original Phase 2 and 3 work). UMCC was authorized to remove the ore stockpiled during the previous season and agreed to meet with Forest Service personnel on-site in August 1999 to be directed on any additional specific reclamation maintenance work needed to be done. UMCC was also requested to prepare a new Plan of Operations that would consolidate all previous information from earlier phases of work and field studies. This would create a concise document for final public comment. The attached letter dated August 8, 1999 describes the meeting in detail.

A field meeting was held on August 26, 1999 with Chauncie Todd where UMCC was directed to (a) include reclamation of a drill spur road (#2) that crossed through the test pit site with the final phase test pit project scope of work, and (b) reclaim as soon as possible another smaller exploratory road (#1) constructed during the 1994 drilling program. Agreement was also reached on the best location for large truck turn-around – roughly 2000 feet from the ore body. This location was also determined as UMCC's limit of long-term reclamation responsibility. UMCC agreed to postpone ore stockpile removal until later in the summer to allow Forest Service specialist unrestricted access to the area. This was documented in a letter dated September 1, 1999 (attached).

At the same time (September 1999), UMCC presented the Forest Service with their requested revised 1999 POO. This document incorporated all previous test pit plans into a single, final Phase III program. All equipment and material handling information learned during the earlier phases of test pit work were incorporated into this new POO. Additionally, geotechnical comments and analysis from the earlier requests were also merged into this new document.

UMCC was never notified whether other Forest Service specialist had completed their work, and an attempt was made in late October 1999 to remove sample ore and reclaim spur road #1 per Forest Service requests. Because of poor weather conditions an excavator could not be safely mobilized to the site and spur road #1 could not be reclaimed at that time per the Forest Service request. UMCC's contractor was able to mobilize a 5-ton truck and small front end loader to the site and relocate the ore stockpile to the new proposed large truck turn-around area.

In March 2000, the Forest Service drafted a public scoping document based upon the new 1999 POO. UMCC provide comments on the draft letter the same month and it was sent out for public comment on April 18, 2000. UMCC, along with the general public, provided comments on the final document in May 2000 (UMCC response attached), with specific concerns that the inventoried roadless area boundary be identified to insure that the project (now or possibly in the future) would not impact the proposed roadless areas.

During the same time frame, UMCC received a letter from the permits supervisor of the State of Utah Division of Oil, Gas and Mining's Minerals Reclamation Program. The agency had reviewed the 1999 POO, was attempting to include reclamation of the main 6.5 mile access road as part of UMCC's long-term responsibilities, and requested a detailed inventory of all disturbed areas. After requesting the Forest Service contact the agency and provide explanations of road and reclamation responsibilities, UMCC called D. Wayne Hedberg at the division. The company was told that it must respond or face significant changes in state permitting. A response letter was sent on July 13, 2000 that provided access and camp site histories for long-term reclamation, then gave an itemized list of presently disturbed areas and disturbed areas from the proposed test pit development project. Included were maps excerpted from the POO and a new sketch (Map 4) documenting the scope of work previously approved by the Forest Service for sample ore removal and reclamation of spur road #1.

UMCC met with the Forest Service on June 20, 2000 to again discuss the status of the EA. The Forest Service agreed to complete the EA by November 2000 and UMCC would again attempt to reclaim spur road #1 during September and remove sample ore. Neither group was able to complete their desired actions by November 2000. On October 30,

2000, the Forest Service provided UMCC with another revised EA schedule, this time with a completion date of mid-June 2001. UMCC did not attempt to take heavy construction equipment into the forest during September 2000 because of the risk to the forest from extreme fire danger and time-of-day restrictions imposed by the Forest Service on these activities.

Item 4 – Materials Hauling and Transport

Turn-around area: A minor change is needed in the first paragraph of Section E of the "Supplemental Discussion" to reflect the changes mutually agreed to by UMCC and the Forest Service that occurred after issuing the 1999 POO in September 1999. Item 3 on page 2 of the letter to the Utah Division of Oil, Gas and Mining accurately describes the truck turn-around location. Ore will be transferred from 5 to 12 ton trucks via portable bin with conveyor or by backhoe – both methods are planned to be evaluated as part of the testing program.

A location map is also provided that shows the turn-around area in relation to the test pit site. A point of clarification: The turn-around area is 1800 feet from the test pit site. The road section that UMCC has long-term reclamation responsibility for includes this section of road plus about 100 feet north of the test pit and 100 feet south of the turn-around area, for a total of approximately 2000 linear feet of road.

Item 5 – Camp Site Features

A detailed description of the temporary camp facilities along with brief description of the equipment is given in Section IV (E) of the POO. A location map is attached. Please note that all test pit development work will be done within a 60-day period with 3 to 10 workers on site at any single time. There is no need to construct an extensive support system for this short-term operation. It is very likely that most of the workers will come from the surrounding communities, so the camp site will be used primarily as a daily staging area and for ore transfer, with only periodic housing of management personnel in one or two small trailers.

In specific reference to the ore transfer location, a 100 foot square site is noted on the location drawing. Sample ore would be stockpiled on tarps to prevent sample contamination from the ground. Depending upon ground softness at the time of the work, a four to six inch layer of pea gravel may be placed below the tarp to provide a firm base. The tarp would be removed after completion of the test pit activities and the pea gravel spread out to allow vegetation below to grow back through the coarse gravel.

Item 6 – Vegetation Disposal

The test pit location was selected because it is within an already disturbed area. Vegetation covers only about 100 square yards of the 250 square yard selected test pit location. It is estimated that less than one 5-ton truck load of small trees and bush will be generated from this test pit operation. In the past, the Forest Service has requested that this minor vegetation be incorporated within near-surface portions of fills to promote growth and inhibit erosion. Since salvaging of topsoil will be a high priority during excavation, it was planned that all removed vegetation would be combined with the topsoil and either mulched or blended (depending upon piece size) to enhance top soil

nutrients and inhibit erosion. No vegetation disposal was anticipated, rather, the minor vegetation would be incorporated within the topsoil during reclamation.

Item 7 – Dust Control Water

As noted in Section V (B) of the POO, minor water needed during the test pit work for road dust control would be obtained from off-site potable water sources or the nearby Moon Lake facility. 20 years of experience on the access road has shown that water for dust control is rarely needed. The POO discussion is a contingency on the occasion that dry conditions would warrant dust control. Application would occur only during the 16 days of ore hauling. Minor traffic during other times would not generate appreciable dust eve in dry conditions. More than 80 percent of the access road is vegetated or naturally plated with rock, requiring no dust control under any condition. Under the worst case scenario, a 5000 gallon water truck would need to fill up once ever other day for the 16 day haul period, or about 2500 gallons per day. The company will not obtain water rights for this work, but will require the contractor who performs the work to be responsible obtaining water and applying dust control measures.

Item – Stockpiling of Topsoil

It is not possible to segregate all topsoil from subsurface soil and rock overburden on the steep terrain with the proposed equipment and excavation technique. By working from the bottom upward, the excavator will attempt to scrape soil along with vegetation so that the loader can pick up the material and stockpile for use during reclamation. To carefully segregate these materials would require excavation from the top of the slope downward, thus causing far more disturbance to the surrounding forest than is needed for the pit work. This is the practice UMCC has used in the past to limit disturbance and has been previously allowed by the Forest Service. As was noted in the POO, UMCC will attempt to segregate topsoil from the surrounding materials, but cannot guarantee that all topsoil will be recovered or that the topsoil will contain no subsurface overburden. The following wording more accurately reflects the work: "There will be every effort made to segregate topsoil from overburden without causing disturbance outside the test pit area. All segregated topsoil will be stockpiled for use in the reclaimed slope."

Item 9 – Water Quality Issues

Please refer to Section H of the POO Supplemental Discussion for the detailed description on drainage and erosion control.

From the 11/13/00 conversation with EA team members, there appears to be two separate drainage issues that are being evaluated by the EA team – drainage along the existing access road and drainage within the test pit area. It was always UMCC's understanding from the Forest Service that road issues would be taken care of on an annual or "as needed" basis and were not part of the POO for the test pit project. It now appears that the EA team is attempting to change this agreement and combine all site work into a single POO, irrespective of the exploratory test pit impacts and previous agreements with the Forest Service.

UMCC strongly disagrees with this approach. For 20 years the company has been responsible for improving the road where its activities have caused drainage concerns.

At times the company has repaired road segments damaged by others for the good of the forest. UMCC has taken action as quickly as possible to improve drainage and control erosion when problems were identified by both the Forest Service and the company's personnel. It must be understood that since the Forest Service determined in 1997 that a special use road permit would not be issued to UMCC for its work, the Forest Service assumed maintenance road maintenance responsibilities. In September 1999 the Forest Service agreed that UMCC would be responsible for long-term reclamation (until the end of its claims development) only for the final 2000 feet of the access road and for the 400 feet of road that extends across the claims. Only the test pit area and spur road #2 would be included within the new POO. UMCC is concerned that combining all future maintenance within the POO could delay quick action for needed repairs since the POO would need to be altered every time maintenance was required.

In terms of the historic approach to road drainage/erosion control, the Forest Service has required construction of water bars and road edge bar ditches to periodically channel and remove drainage to the outside (downhill) edges of the road. This has been highly successful in controlling runoff and stormwater. The concept is discussed in detail in the Supplemental Discussion, Section H, first paragraph. A typical cross section is attached.

In recent conversations, it became apparent that the Forest Service water quality specialist has identified drainage problem areas along the road. Irrespective of the POO process, UMCC needs to know where these areas are located so that repairs can be made next season and, if needed, design site-specific erosion controls beyond what has traditionally worked.

In terms of the test pit disturbed slope, temporary drainage control during excavation and reclamation is discussed in the Supplemental Discussion, Section H, third paragraph. A typical detail is attached for further clarity. The test pit is adjacent to an existing natural erosive talus slope and slide zone. Storm water and runoff will be inhibited by placing the terraced gabion rock wall as the reclamation method. See the analysis in the Supplemental Discussion, Section H and the associated sedimentation calculations previously provided to the Forest Service.

Item 10 – Gabion Rock Wall Design

As requested, an illustration of the latest wall design is attached. This design incorporates comments from the Forest Service geotechnical engineer.

Other Items

It was noted that the spur road reclamation cross-section and detailed description, although requested by the Forest Service, was never officially submitted. The attached detail was provided to the Utah Department of Oil, Gas and Mining earlier this year and can be added to the 1999 POO.

ITEM 2 – ORE VALUATION

UMC

UINTAH MOUNTAIN COPPER COMPANY
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SUITE 401
SALT LAKE CITY, UTAH 84111
(801) 530-1045 WWW.UINTAHRED.COM

September 30, 1999

Ashley National Forest
Duchesne Ranger District
P.O. Box 981
Duchesne, Utah 84021

Attn: Joseph R. Bistryski, District Ranger

Dear Joe:

As we agreed to in July of this year, UMCC respectfully submits the attached assessment on the iron oxide pigment market for mineral deposit valuation of its Sunshine Quartz/Hematite Claims Project. This discussion incorporates both public information provided to the SEC within UMCC's recent form 10SB filing (full disclosure filing) and confidential information from our own studies. Although most UMCC data is on public record, information presented on the natural hematite market, market prices and our competitors were obtained at great expense and are not to be made available to the general public without written consent by UMCC. Full study and report texts are extensive and are summarized in this submittal. With appropriate advanced notice, all backup information may be viewed at our Salt Lake City office.

The information herein provides a reasonable standard for minerals valuation during exploration and development activities of our project. We believe that the level of information provided exceeds the Government threshold of the "prudent man rule," in that, where minerals have been found, a person of ordinary prudence would be justified in further expenditures of his labor and means with a reasonable prospect of success in developing a valuable mine, and the "marketability test," requiring a claimant shows a reasonable prospect that minerals can be mined, removed and marketed at a profit. Please refer to my correspondence of August 8th in which the parameters for this evaluation were fully defined.

Over the past 20 years, UMCC has spent over $1 million in development of the Sunshine Quartz/Hematite Claims Project. This investment was made by large investors, small investors and the Company's officers with an understanding of the value of these natural hematite ores.

Sincerely,

Peter M. Kandaris, M.S., P.E.
President, Uintah Mountain Copper Company

Cc: Pamela Kandaris-Cha (UMCC CFO)
Tom Abbay (USFS Minerals Specialist)

Attachment

Iron Oxide Market Assessment

Uintah Mountain Copper Company - Uintah Red™ Products

Uintah Mountain Copper Company's business objectives are to mine and mill high grade hematite (iron oxide) ore for use in the specialty natural pigment market. The Company's primary focus has been on the development of its mine site, taking initial mineral samples, designing its milling and mining operation, and introducing its products into the marketplace.

Ore Reserve Basis

Drilling, geologic and assay programs provide a detailed characterization of a portion of the Sunshine Quartz/Hematite Claims ore body and establish proven deposits. The small-scale test pit program provides an abundance of economic and environmental data to give a thorough evaluation of the mining and reclamation potential of the project. The exploration and development work along with preliminary marketing of products are used in concert to develop ore reserve estimates (that part of the mineral deposit which can be economically and legally extracted).

Ore Deposit and Reserve Estimates

The Company completed an extensive $200,000 exploratory drilling program in 1994 and 1995. This drilling program identified on the order of 54,000 tons of proven iron oxide ore deposit. A summary geologic report prepared from the drill data and all other sources of information also identifies 73,000 tons of probable iron oxide deposit and upwards of 750,000 tons of estimated ore deposits.

The most recent geologic evaluation identifies 54,363 tons of drill-proven ore deposit within 3 of the Company's 30 claims. Company analysis indicates the overburden to ore thickness ratio in these drilled areas varies from 0 for surface exposures up to 10 at deeper drill holes, with an average value of 2.65. To date, the on-going test pit work shows that (at a minimum) near-surface ore can be economically extracted and the surrounding area economically reclaimed. Near-surface ore is the iron oxide-bearing rock that can be extracted with small to intermediate track-mounted equipment to a depth of 30 to 50 feet below ground surface. The analyses identify just under one-half of these drill-proven deposits as proven reserve, or 20,436 tons of raw ore. This value will be upgraded as future planned phases of the test pit project are completed.

Probable reserve estimates show an additional 52,564 tons of raw ore. This value includes 33,927 tons of drill-proven ore deposits from non-near surface sources and deposits determined from widely-spaced deep drill holes, and 18,637 tons from geologic evaluations of surface exposures in adjacent areas of the claims yet to be drilled.

Raw ore quality in proven reserves has also been evaluated and ranges from 11% to 90% ferric iron oxide. Analysis of ore samples assayed by Kimball Laboratories shows the mean purity at 37.67% ± 27.78% for ungrouped samples and 56.2% ± 21.9% for grouped samples. Analysis of verification testing performed on additional samples by Bondar Clegg Laboratories and showed a mean purity of 44.38% ± 15.6% on grouped samples. Separate analysis performed by the

Company combine these laboratory analyses with a visually estimated hematite content index record used by consultant geologists during core logging. Through this analysis, average deposit purity was calculated at 26% ferric iron oxide.

Pilot plant metallurgical balance analysis notes a 62.8% total iron oxide mineral recovery through use of identified separation processes. Total marketable product recovery from raw ore is 85% and is distributed between three final products (product descriptions and specifications are attached). Based on these results and previous bench-scale ore processing work, the Company estimates a product recovery rate after benefaction of 80 to 85%. Using these values and an average deposit purity of 26% ferric iron oxide, the Company estimates that an average of one ton of final products results from every five tons of raw ore processed, or 2,500 tons of raw ore produces 500 tons of final products.

Present ore extraction, benefaction and reclamation methods used in pilot work and/or tested by the Company along with estimated company operating costs show the break-even price of products to be approximately $1.00 per pound.

Markets

The Company's products are iron oxide ore pigments. The pigments are used in cosmetics, artist paints, electronics, magnetic storage products and multiple other uses including steel coating materials. The Company hopes to establish itself in a target niche specialty market linked to growing consumer trends for natural color pigments, where higher than average values for products could be achieved and where competition is limited. To this end, the Company began to focus on markets that would desire its product for its natural characteristics and uniqueness of color. The Company is marketing its iron oxide pigments under the trademarked product name Uintah Red™. Laboratory and pilot plant studies indicate that Uintah Red™ will result in at least one pigment that will equal to or exceed current products in terms of purity and meet the standards of the paint and cosmetic industries.

The Company has determined that the quality of its Uintah Red™ will allow it to enter into the specialty niche market were there is currently enough demand, which is increasing, to cover the competing products. The competition in the natural pigment market is based on quality of the product and production methods. The Company is of the opinion that its Uintah Red™ products are of equal or superior quality to those of any other natural pigment on the marketplace; however, until the Company starts mining and refining its products, there will continue to be uncertainty around the quality of the products produced from the Company's claims.

Natural pigment products users in the target niche market are more willing to pay premium prices for raw materials since their customer base resists use of cheaper synthetic alternatives. Recent market research has shown that consumer demand for these types of natural products continues to be strong. Specifically in the cosmetics segment, natural products are increasing at an annual rate of 5%. The US Geological Survey reports that 1997 sales of finished iron oxide pigments by US processors increased by 9.4%, nearly doubling the average 10-year rate. Imports were also up by 7.6%.

The specialties sector of the natural red iron oxide pigments market is estimated to purchase about 16,600 tons (1996 data) of product annually. Upon successful completion of development work, the Company plans to produce up to 500 tons of finished pigment annually for both domestic and foreign sales. The Company has determined through market evaluations that

annual sales of up to 500 tons of final products is achievable. This value incorporates less than 3% of the domestic US consumer's market for natural red iron oxides (1996 figures).

To more precisely define plant size and initial production needs, the Company embarked on a 24-36 month preliminary marketing campaign in the late spring of 1999, introducing its products and soliciting interest from companies world-wide. Product brochures and samples developed from the pilot plant work have been distributed to specialty users who value the hues and characteristics of natural pigments. To date, a number of small to large pigment users in the target niche market have expressed interest in these products and are presently evaluating them for their applications (see the attached 9/99 UMCC Newsletter highlighting some of the market accomplishments).

An objective of the Company is to have customers identify Uintah Red™ as a premier socially conscious natural raw materials supplier that produces by natural means using environmentally friendly production methods. Market evaluations show that target niche market users desire not only a high-quality product, but demand that producers be sensitive to the environment during ore extraction and processing. The Company can meet this objective by holding the annual production volume low (relative to competitors), including continuous reclamation at the mine site, and instituting water recycling/zero waste management with processing plant operations.

The Company's use of continuous reclamation techniques, mining methods that produce no tailings and zero-waste refining methods are part of the marketing strategy. A number of potential customers in the natural pigments market (natural cosmetics manufacturers, in particular) place special value on companies that utilize these environmentally-sound production methods. Research shows few, if any natural iron oxide producers have capitalized on this market trend.

Pricing and Sales Strategies

Prices for natural pigments, particularly red iron oxides, vary significantly based upon quality, color characteristics, marketing and market desire. The specialty artist and craft paint market provides an example of the prices commanded by natural pigments. Retail prices from specialty market end suppliers throughout the United States show natural red iron oxides pigments range from $4.50 to $17.48 per pound, with a numerical average of $9.56 per pound (see the attached retail price comparison graph). In cosmetics markets, some retail pigment prices can be found for natural colorants (including red iron oxides), with values ranging from $17 to $45 per pound. A few environment-conscious companies are retailing organic and mineral-based natural pigments for $42 to $108 per pound. It must be noted that these very high-end retail prices are for small quantity sales, with products packaged to sell in small volume. Wholesale bulk prices to these suppliers by producers are expected to be substantially less, but within target prices ranges.

Natural iron oxide producers do not report sales prices within the target market niche specialty market. The Company is hopeful, based upon previously referenced prices, to obtain between $2.00 and $10.00 per pound for its various Uintah Red™ products. Product prices is distributed proportionally among its three products, with a weighted average price of about $5.00 per pound.

The Company's marketing efforts are focused on 150 to 200 end users in the target niche market that (whole or in part) include natural pigments in their products. The idea is to focus on

users who place special value on natural raw materials and are willing to pay premium prices to obtain such products. This strategy allows the Company to limit competition from major marketers who primarily sell synthetic pigments.

In addition to the specialty pigment market, the Company is investigating the use of other minerals and by products from the mine in other applications. Specular hematite (micaceous iron oxide) and silica are the primary materials after separation of Uintah Red™ pigment. Specular hematite has been used for over a century as a long-term corrosion protection coating for structural steel. This is an expanding market as new environmental laws limit the use of some synthetically based protection products. Uintah Red™ Specular Hematite is also of pigment grade and can be used as a cosmetic colorant and artist paint pigment.

Tests proceed with calcining UMCC pigments to achieve new colors. Typically heat-treated hematites will darken to brown umbers or ochres under high temperatures (1000°C or higher). Initial tests recently completed by the North Carolina State University Mineral Research show that the natural brown-red Uintah Red™ pigments change to darker and richer ranges of purple, from a maroon to a deep crimson. No similar natural iron oxide pigment colors can be found in the US.

Marketing of the three products that result from separation processes is on-going and is needed to verify economic viability of each product. Present ore extraction, benefaction and reclamation methods used in pilot work and/or tested by the Company along with estimated company operating costs show the break-even price of products to be approximately $1.00 per pound. A cursory review of the mining and processing costs of other natural iron oxide producers indicates that the Company's costs will be higher than those seen by a number of other natural iron oxide producers. The Company is, therefore, focusing on high priced specialties market to compensate for the planned additional expenses. For the most part, costs are higher because of the Company's commitment to forest environment preservation and the development of zero-waste refining methods that utilize all pigment and by-products. Funds derived from possible sales of by-products could reduce future operating costs, but are not included in these cost analyses.

The Company has also established an internet site to provide greater visibility to its products (www.uintahred.com).

Competition

Latest US Government data notes six primary domestic natural pigment producers and 13 finished product wholesale sources of natural red iron oxide. Company research has also identified about 20 additional product producers that are either listed as international companies or do not report data to the USGS. In addition, there are about 35 other companies worldwide that market finished natural pigments from various sources (1997 and 1998 data).

The six US sources produce about 90% of all natural iron oxide pigments sold in this country. Five of the six are in the Southeast US and one is in Arizona. They generally sell in bulk to the other finished product producers or to the 35 marketers. Only two will sell directly to specialty users, but will not vary their packaging to accommodate small purchasers (under 1 ton). Most of these sources perform some type of processing to upgrade their products and to meet FDA requirements for cosmetic grade pigments.

Each source provides different grades and qualities of natural pigments. The sources from the Southeast US tend to produce natural earth pigments, not true hematites. The natural earth are not as strongly pigmented (75% - 25% iron oxide contents). The other producers generally supply pigments from iron oxide deposits that are of a grade not adequate for steel production. These materials tend to be more metallic and are usually processed for their magnetic qualities (more magnetite than hematite). The Arizona source produces natural pigment that is most similar to the Company's hematite product. None of the US suppliers produce micaceous iron oxide. This product is primarily imported from Australia, Great Britain and Canada.

Most of the natural producers have multiple pigment lines, varying by the source material. For example, Arizona Oxides produces a micronized and coarse grind hematite pigment, along with four grades of synthetic red iron oxides. New Riverside Ochre in Georgia produces one red ochre pigment, two yellow iron oxides and an intermediate mix color. Alabama Pigments has two red iron oxides (fine and coarse grinds) and one black iron oxide. Pea Ridge Iron Ore produces four iron oxide powders, three of which are magnetites for the electronics industry and one high purity red-brown iron oxide. Hoover in Virginia has the most extensive production in the US with multiple colors and grades of red, yellow, brown and black iron oxides, varying colors naturally and by use of calcining (heat treatment).

Each source produces unique pigments in terms of quality, color and crystalline structure, therefore market users evaluate products instead of producers. This is a major reason why most producers have business arrangements with finished product producers and marketers who have multiple contacts within the user groups. This relationship secures volume sales, but at reduced prices. Rarely do any of the producers market their products directly to the target niche market users, though their products are used in these areas. It is of interest to note that nearly 20 years ago, Mineral Pigments Corporation (now owned by Laporte) evaluated the quality of raw Uintah Red™ ore. In writing back to UMCC, they indicated that "this oxide has much potential" and could result in a "new type of natural red iron oxide for the market."

Direct competition to the Company will most likely come from the finished product producers that are more aggressive in marketing products and services. These companies tend to be large national and multinational firms (BASF, Bayer, Ciba-Geigy, Englehard, Elementis, Laporte, Merle, etc.) that have a broad product base and are involved with both natural and synthetic pigments. These companies have well established marketing groups.

Uintah Red™ Product Test Data

Uintah Red™ Natural Hematite - rich colored, micron-sized amorphous natural iron oxide pigment ideal for artist paints, cosmetics, plastics and other high-end uses.

Analytical Data

Fe_2O_3 Content	+85%
Total Silicates	< 10%
Loss on Ignition	1.2%
Carbonates	1.0%
Moisture	0.6%
pH	5 - 7

Physical Properties

Mean Particle Size	0.6 microns
Oil Absorption	31-34 g/100g
Specific Gravity	4.56

Uintah Red™ Specular Hematite - a dark natural pigment with a laminar crystalline structure ideal as a natural corrosion protector; also used for artist paints and as a general colorant.

Analytical Data

Fe_2O_3 Content	81%
Total Silicates	12%
Loss on Ignition	1.2%
Carbonates	<1.0%
Moisture	0.7%
pH	5 - 7

Physical Properties

Particle Size Distribution	90% under 5 microns
Oil Absorption	27-30 g/100g
Specific Gravity	4.32

Uintah Red™ Natural Earth Pigment - highly pigmented, micron-sized red earth that is an economical and unique pigment for artist paints and as a general colorant with multiple uses.

Analytical Data

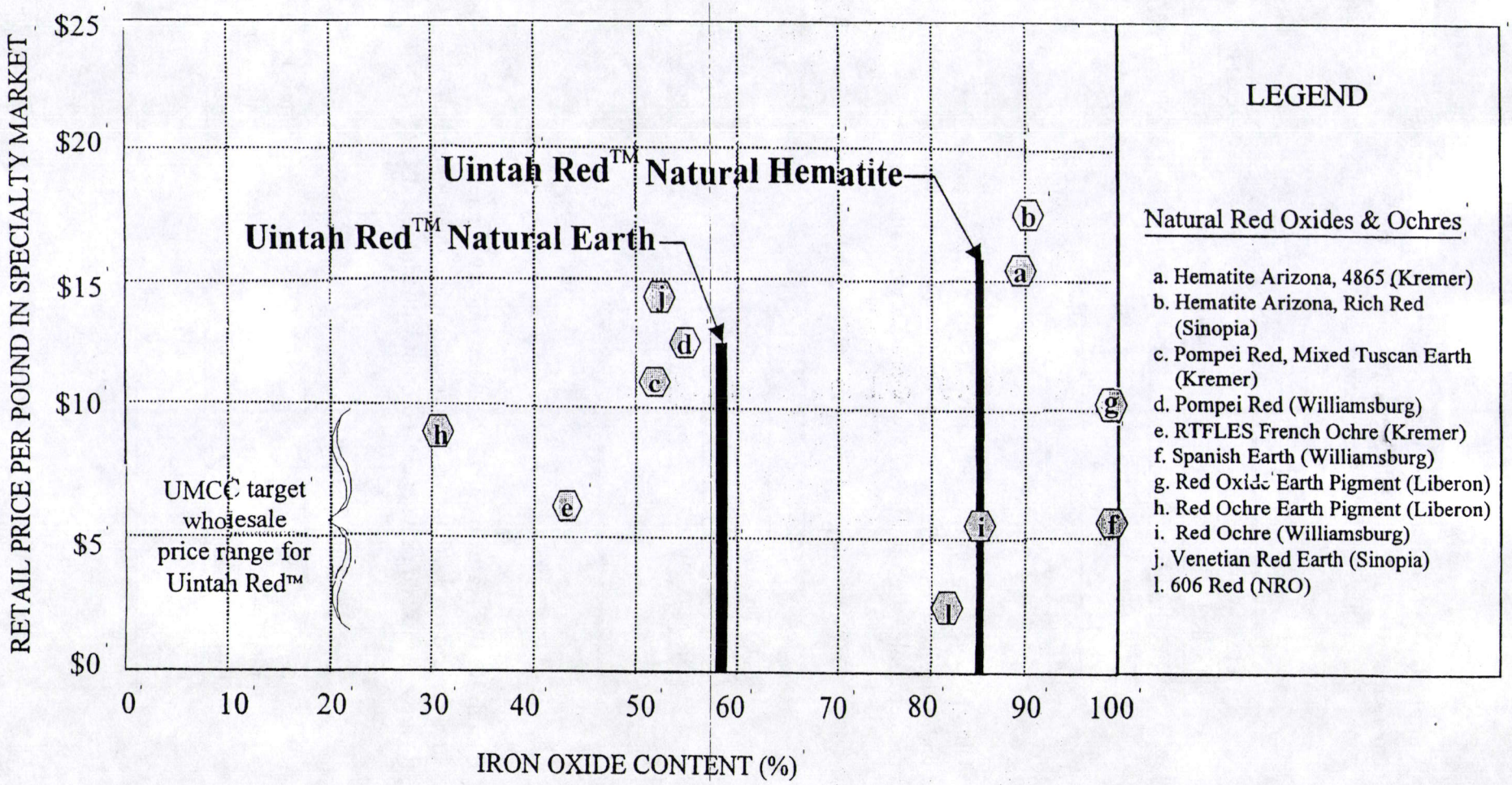
Fe_2O_3 Content	55-75%
Total Silicates	25%
Loss on Ignition	1.2%
Carbonates	1.0%
Moisture	0.6%
pH	5 - 7

Physical Properties

Mean Particle Size	<2 microns
Oil Absorption	32-37 g/100g
Specific Gravity	3.93

UMC
UINTAH MOUNTAIN COPPER COMPANY
SALT LAKE CITY, UTAH

COMMON NATURAL RED PIGMENTS IN US RETAIL SPECIALTY MARKET



ITEM 3 – POO HISTORY

UMC

UINTAH MOUNTAIN COPPER COMPANY
341 SOUTH MAIN STREET
SUITE 401
SALT LAKE CITY, UTAH 84111
(801) 530-1045

May 21, 1996

Ashley National Forest
Duchesne Ranger District
244 W. Highway 40 (333-6)
Roosevelt, Utah 84066

Attn: Wally Larsen & Joseph Bistryski

Ref: Sunshine/Hematite Claims Development Project
Addendum #1 to 1996 Revisions to Plan of Operations

In accordance with the meeting held on April 29, 1996 between representative of the US Forest Service and Uintah Mountain Copper Company (UMCC), we have attached an addendum to the 1996 Plan of Operation revisions that provides the following information:

- A detailed discussion of the exploration and development program
- Phasing of this program over a specific time frame

From our April meeting it is our understanding that, by phasing the work, UMCC will be allowed to perform exploration and development work during the Summer of 1996 while USFS performs detailed field analyses and the Environmental Assessment of the full scope of the remainder of the development project. As already discussed in previous telephone conversations with Wally Larsen during April, UMCC also plans to continue work already allowed under the existing and approved Plan of Operation, including road maintenance and repair necessary for our operations. We have also agreed to relocate the upper gate to a point on the service road just above the spring on Hematite Claim 25 where there is ample turnout space available.

This phased exploration and development plan is a small-scale project intended to provide an abundance of economic and environmental data while being environmentally independent of future mining and development activities because of proposed continuous reclamation. The information developed from this program (along with the previous drilling data) is necessary to perform a thorough evaluation of the full mining potential of the project. Forest Service representatives have requested and encouraged UMCC to proceed in a slow, step-by-step process that minimally impacts the environment. Even though this process has been time-consuming and expensive for our company, we have annually followed Forest Service requirements.

At this point in the project, there is not enough data to properly determine the full impacts of future potential of mining on all the UMCC claims. That is the purpose of this work. We are excited about the extensive reclamation built into the Plan of Operation and look forward to its results.

On a separate item, we must continue to express our concern over opening the service road to the general public. As you know, 16 years ago UMCC paid for and completed construction of the service road, with the intent that it was to be used as an access to our mining claims. Road access by all has always been on an exception basis, requiring permitting for use, thereby limiting damage to the surface. Up to this time, UMCC has been responsible for road maintenance and, along with the help of the US Forest Service, has created one of the finest, non-eroding and self-maintaining service roads in the National Forest system.

With access open to the public, UMCC cannot prevent others from abusing the road. Surface damage could seriously impact our future operations and may result in excessive erosion that could impact downstream water sources. As a public access road, we also cannot continue providing full road maintenance duties on sections that are not under our control. We will repair and reclaim any road section damaged by our actions, as described within the Plan of Operation. We respectfully request that the Forest Service closely monitor road use and evaluate this new policy annually to determine whether future modifications to this policy are justified.

We appreciate this opportunity to more fully explain our scope of work and would like to meet with you at your earliest convenience at the camp site to discuss our summer plans.

Sincerely,

Peter Kandaris
Uintah Mountain Copper Company

Attachments

PMK/

cc: Addressee (original + 2 copies)
Mike Kandaris

UMC

UINTAH MOUNTAIN COPPER COMPANY
341 SOUTH MAIN STREET
SUITE 401
SALT LAKE CITY, UTAH 84111
(801) 530-1045

June 28, 1996

Ashley National Forest
Duchesne Ranger District
P.O. Box 981
Duchesne, Utah 84021

Attn: Joseph R. Bistryski, District Ranger

Dear Joe,

We appreciate your notification letter of June 27, 1996, and understand the time constraints put on you and your staff with the extreme fire danger in the West this year. Thank you for taking the time at our meeting earlier this month to go into such great detail while discussing our project. We appreciate the expertise of the US Forest Service and the efforts put forth by yourself, Chauncie and Clarice.

As a follow-up to our meeting on June 3, 1996, we have prepared the attached outline that provides the general scope of reclamation work for all phases of the UMCC Sunshine/Hematite Claims Development Project as presented in the 1996 revisions to the Plan of Operations. It is understood that your personnel will use this outline as a starting point to determine required bonding for our work over the next few years. I also must apologize in sending this work scope late and hope we have enough time to meet our work schedule this Summer.

We propose that two bonds be established within the next few weeks: the first to cover the described 1996 pit activities (noted as Item 1 on the attached sheet) and the second to cover all final project closing work that would occur sometime after completion of all UMCC work at the site (noted as Item 4, post-1998 reclamation work). These bonds would protect the USFS interests for both short and long-term conditions.

We plan to mobilize to the site soon after bonding is in place to perform the approved Phase I pit activities. At that time we will also move the upper gate to its new location on the UMCC claims properties and excavate a simple earthen ore transfer dock within the edge of the existing gravel pit next to the camp site (after our meeting, we went up to the campsite and I scoped out a couple locations next to the road that appear ideal for a ramp in the gravel pit, with minimal excavation). These activities are tentatively scheduled for late July or early August. Prior to this time and upon evaluation of snow melt/run-off, we will perform our annual road maintenance activities. Understanding your present budget constraints, we are planning to perform maintenance on the entire road this year. The work should be minor, but will include moving of downed trees,

reconstruction of road mud bars and removal of any slides and road obstructions that occurred over the winter.

We will contact you soon in regards to the field work needed for the planned Environmental Assessment. Your offer for UMCC to enter into an agreement with and fund the USFS to perform this work is very interesting and we would like to discus the concept further. I personally would rather have Forest Service folks who are most knowledgeable in the area performing the field studies, rather than an outside consultant who may not understand as well the local conditions.

Please have your personnel who are reviewing the bonding contact me at the phone numbers shown below if they have any questions, need additional information or require clarification on the outline. Our best wishes to all at your office to stay safe during this summer's fire fighting activities, and again, thank you for all your help with our project.

Sincerely,

Peter Kandaris
Uintah Mountain Copper Company
602-236-8613 (office) 602-963-4986 (home)

cc: Mike Kandaris

United States Department of Agriculture
Forest Service
Ashley National Forest
Duchesne Ranger District
P.O. Box 981
Duchesne, Utah 84021

File Code: 2820

Date: October 25, 1996

Mike Kandaris
Uinta Mountain Copper company
341 South Main Street
Suite 401
Salt Lake City, Utah 84111

Dear Mike,

I appreciated your telecom of 10/25/96 updating me on activities relative to the Paint Mine. As a summary of that conversation you notified me that due to inclement weather conditions you were only able to remove 10-12 tons of material from the site. We agreed that to do anymore work this year would result in both safety and natural resource concerns. Consequently, no further work is planned until next spring. You stated that although the material you were able to remove was much less than anticipated, it was a sufficient amount to run through the pilot processing phase in order to determine purity and value. I would appreciate you contacting me as soon as you get the results of the pilot tests of the material. We can then schedule a time to meet and discuss the validity of the claim and agree upon our next logical step.

Mike, I will process a refund in the amount of the additional $5000 bond which posted recently as no further operations are planned this year. However, as we discussed in an earlier meeting this year, the Forest Service is still working on a figure for a reclamation bond for all operations. In addition, we will need to complete an Environmental Analysis for operations at the mine prior to approving any activity for the 1997 season. To that end I would request that you notify me as soon as the information on value is available. I will be glad to arrange a meeting with our specialists to discuss validity, 1997 and future operations, the reclamation bond and timing of the EA. In the meantime, I hope you will continue to feel free to call me with any questions or concerns.

Sincerely,

Mary Sanchez
for JOSEPH R. BISTRYSKI
District Ranger

cc: Forest Supervisor

UMC

UINTAH MOUNTAIN COPPER COMPANY
341 SOUTH MAIN STREET
SUITE 401
SALT LAKE CITY, UTAH 84111
(801) 530-1045

September 26, 1997

Ashley National Forest
Duchesne Ranger District
P.O. Box 981
Duchesne, Utah 84021

Attn: Joseph R. Bistryski, District Ranger

Re: **Phase 1 Test Pit: Transmittal of Engineering Analysis Report**
Sunshine Quartz/Hematite Claims Project - Addendum #2 to POO

Attached is the summary report detailing all work on the completed Phase 1 test pit for the above referenced project. Please incorporate this report as Addendum #2 to our current Plan of Operation for this project.

At this time, all ore to be tested this season has been excavated and hauled to laboratory facilities, the gabion basket wall test section has been constructed, and slope contouring is complete. Seeding on all areas disturbed by this year's activities will be performed on October 3rd and 4th when the contractor removes his equipment from the claims properties for the season. This final action will complete all required reclamation work for this phase of the project.

As we discussed on our April 18th meeting, upon successful completion of Phase 1 work, UMCC intends on proceeding with the next phases of project development on these claims in the summer of 1998. Please review the recommendations noted within the attached engineering report so that they may be made part of the POO. We understand that your staff and support personnel still may require an Environmental Assessment for some or all future phases of development. If this is the case, your field work needs to begin as soon as possible (prior to seasonal snowfall preventing safe access to the area).

We have expedited this report to aid in your efforts. Please contact Mike Kandaris by mail at the above noted address or by telephone (801-530-1045) by October 3, 1997 with your schedule of field activities. We are ready to provide any other information or details needed to support your work with assessing forest impacts of the proposed continuing development phases of our project. Please feel free to call me in Arizona if you have any questions (602-236-8613).

Sincerely,

Peter Kandaris, President
Uintah Mountain Copper Company

cc: Mike Kandaris, Pam Cha (UMCC)
Parsons, Davies, Kinghorn & Peters
Tony Gallegos (Utah Dept of Natl Resources)

UMC

UINTAH MOUNTAIN COPPER COMPANY
SUNSHINE QUARTZ/HEMATITE CLAIMS PROJECT

ENGINEERING ANALYSIS REPORT

PHASE 1 EXPLORATORY TEST PIT
EXCAVATION & RECLAMATION DEVELOPMENT PROGRAM

DUCHESNE COUNTY, UTAH

SEPTEMBER 26, 1997

Sunshine\Hematite Claims Project
Engineering Analysis Report

Phase I Exploratory Test Pit
Excavation & Reclamation Development Program

Uintah Mountain Copper Company

INTRODUCTION

The first phase of a multi-year, multi-phase exploratory test pit and reclamation development program was performed in 1996 and 1997 on the Uintah Mountain Copper Company's Sunshine Quartz and Hematite claims properties. These small-scale projects are intended to provide economic and environmental reclamation data for estimating the mining potential of the project.

The property is located about 25 miles northwest of Duchesne, Utah, in Township 2 North and Range 6 West, Section 15 and is directly west of Moon Lake in the Slate Creek Canyon region. An existing 6.5 mile unimproved graded access road extends directly to the ore body. The original mine diggings are at the 10,200 to 10,400 foot elevation, with surface outcrops of hematite ore observable intermittently along 600 feet of exposures adjacent to the access road, and over an additional 1500 feet of hillside. Five sample borings deep-drilled into the deposit in 1978 and thirty-six additional near-surface core holes added in 1994-95 defined proven deposits of 54,000 tons of iron oxide (hematite) ore within 3 of the 32 company's claims. Possible resource estimates encompassing all claims and performed by various geologists since 1978 range from 206,000 to 750,000 tons. The refined ore produces a unique, high-grade natural pigment that Uintah Mountain Copper Company intends to produce for use with cosmetics, plastics, artist paints and other specialty products.

PURPOSE OF ANALYSIS

The purpose of this analysis report is to:

a. Describe Phase 1 test pit and reclamation work.

b. Evaluate results of Phase 1 test pit development program.

c. Discuss the effectiveness of ore removal, hauling and reclamation techniques.

d. Provide recommendations for future development activities.

BACKGROUND

A three-year phased exploratory test pit program with progressively expanding development areas for each phase was proposed by the Uintah Mountain Copper Company (UMCC). The scope of proposed work is documented in the 1996 Revisions to the Plan of Operation dated January 1996 and Addendum No. 1 to the 1996 Revisions to the Plan of Operations dated May 21, 1996.

Phase 1 work was approved by United States Forest Service (USFS) representatives during meetings held on April 29, 1996, June 3, 1996 and April 18, 1997. The scope of Phase 1 was proposed as follows: Excavation of a small 20 to 25-foot wide by 20-foot long and 7-foot deep test pit in the existing disturbed area adjacent to the service access road and under the main claim spur road (Figure 1, Photo A). Overburden and ore at this location were estimated at 60 cubic yards (120 tons) and 44 cubic yards (95 tons), respectively. 1996 Phase I activities were subsequently modified (via internal UMCC memo dated October 3, 1996) to allow for excavation of only a portion of the area during 1996 because of rapidly deteriorating weather conditions. The remainder of the work was to be performed after seasonal snow melt and runoff in mid-1997.

UMCC proposed a multi-phased test pit program to (a) verify depth and location of geologic strata and faulting identified during the drilling programs, (b) assess the accuracy of drill hole data interpolations for calculating hematite ore deposits/reserve, (c) determine the probable depth of overburden for future mining and (d) provide for small scale reclamation projects to measure and document the viability of proposed reclamation methods and to extrapolate results to larger operations.

WORK PERFORMED

In October 1996, an approximate 10-foot by 10-foot by 5-foot deep pit was excavated near the northwest end of the Phase 1 area, with approximately 10-12 tons of hematite ore removed for testing. Snowfall halted this work and further activities were to be postponed until the next season for both safety and natural resource concerns. Ore was excavate by an Allis Chalmers HD6G 1-1/2 cubic yard track-mounted front-end loader and was hauled off the site via 12-ton capacity, 10-wheel truck. Overburden was stockpiled adjacent to the pit for future use in reclamation work.

Pit excavation activities resumed on September 5, 1997, with pit shape and area modified in the field to minimize overburden removal and expedite work (material volumes were kept close to those originally planned for Phase 1). The revised Phase 1 pit was excavated 12-15 feet wide, 45 feet long and varied from 0 to 12 feet in depth along the face of the hillside (Figure 2), with approximately 133 cubic yards of subsurface material disturbed. 43 tons (31 cy) of medium to high-grade sample ore were stockpiled on a wide accessible section of the access road about 600 feet from the test pit and approximately 55 tons (40 cy) of medium to low grade ore intermixed

with an approximately same quantity of overburden rock and soil remained stockpiled adjacent to the excavation. Ore was excavate by a 1-1/2 cy track-mounted front-end loader, with all work completed on September 6, 1997. Construction activities were performed by Kelly Bird Contracting of Bluebell, Utah.

Test reclamation section construction and sample ore haul activities were performed on September 12 and 13, 1997. 35.7 tons of sample ore were hauled via 10-wheel dump truck in three loads from stockpile to a laboratory facility in Lehi, Utah. The remaining estimated 7 tons of sample ore could not be removed because of time constraints and was placed within the inside edge of the road where it would be protected from erosion. A stair-stepped, three-tiered 26 cubic yard gabion wall (maximum 9 feet in height) was erected and backfilled with the intermixed medium to low grade ore and native overburden materials previously noted. Approximately 25 cubic yards of additional fill (50% hematite ore and 50% native rock and soil) needed for terrace backfill was obtained by lowering and re-contouring the spur road slope. The 3-foot high gabion baskets were inter-tied with adjacent baskets next to, above, and below each other to provide additional stability.

Rock fill for gabion baskets (Hilfiker ArtWeld Gabions - 3"x3" 11 gauge welded wire fabric) utilized a combination of hand-selected rock (4-inch to 12-inch in maximum dimension) from the excavation area (matching texture and color of the slope) and nearby talus slope residual limestone. Talus material ranged from a maximum dimension of 24-inches to fine soils, with predominately 4 to 8-inch diameter material. Gabions were filled with varying quantities of these different materials to observed the effect of their use. Filter fabric originally planned was not included in this gabion test section since backfill material was composed primarily of material that would not readily filter into the gabion mesh (large rock and clayey hematite ore).

Backfill behind the bottom two gabion tiers was placed with a 1-1/2 cubic yard track-mounted front end loader. No addition of moisture was needed for compaction since rainfall prior to and during these activities had pre-moistened soil and ore materials to a condition at or somewhat above optimum moisture. Backfilling behind the upper-most tier and contouring of the terrace above the wall was performed with a track-mounted D7 Caterpillar dozer. Each 3-foot lift was backfilled and compacted prior to construction of the next level. The equipment provided compactive effort, with passes continued until gabion movement at the level being placed was observable. Gabions were allowed to move about 2 to 6-inches outward from the hillside face to assure particle interlock and adequate compaction had occurred. No compaction testing was performed.

500 to 1000 linear feet of access and spur roads are to be seeded on October 3-4, 1997. Seed to be applied is a USFS approved *mix formula at the vendor's recommended rate of 3 pounds per 1000 square feet of area.

* 33% each of Nezpar Indian rice grass, Secar Blue Bunch wheat grass and Sheep fescue.

RESULTS SUMMARY

Details of the quantitative work measures of Phase 1 are provided in Table 1. Values estimated or planned quantities as referenced in the POO documents are provided for comparison with actuals quantities. Data and calculations are in Appendix A. All volumes noted are in-bank or compacted.

Table 1 - Results of Phase I Test Work

Work Item	Quantity		Rate		Equipment(5)	
	Planned	Actual	Est	Actual	Proposed	Actual
Overburden Excavation	70 cy	52 cy	10 cy/hr	5.6 cy/hr	2.5 FEL/D	1.5 FEL
Sample Ore Excavation	120 tons(1)	108 tons	2 t/hr	8.1 t/hr	2.5 FEL	1.5 FEL
Sample Ore Haul	95 tons	46 tons(2)	2 t/hr(4)	4.7 t/hr(4)	5 TD	12 TD
Gabion Wall Erection	25 cy	26 cy	0.25cy/mh	0.4cy/mh	2.5 FEL/D/5 TD	1.5 FEL
Backfill & Contour	70 cy	75 cy(3)	10 cy/hr	21 cy/hr	2.5 FEL/D/5 TD	1.5 FEL/D

(1) Includes area where boulder occupied est. 4.6 cy (10-ton) volume in ore strata. Revised from 95 tons in Addendum #1 to POO.

(2) Excludes 55 tons of low-grade hematite ore used as backfill and 7 tons of high grade ore not hauled.

(3) Includes 23 cy of low-grade hematite ore used as backfill.

(4) Round trip time to and from camp site.

(5) Equipment Abbreviations:
2.5 FEL = 2.5 cy rubber tired front end loader
1.5 FEL = 1.5 cy track mounted front end loader
D = D8 Cat Bulldozer
5 TD = 5 ton rear dump truck
12 TD = 12 ton, 10-wheel rear dump truck

There were 4 test cores drilled during the 1994-95 exploratory program within the Phase 1 test pit area. These borings, along with observations of surface ore outcrops, were used to predict the volume of ore present prior to pit excavation. 35 rankings of ore quality (logged by a geologist during coring) and 17 laboratory assays performed on samples from these borings were used to predict overall ore quality in the pit area. The following results were determined by the Phase 1 test pit program:

- Test pit excavation and Borings DDH 8 & 9 showed ore swelling to a maximum depth of 8-9 feet through the pit center, with a thick bed of rich, earthy hematite continuing into the claims property on the west side of the pit (Photo B).
- Borings DDH 12 & 13 predicted ore would pinch out, with only low-grade hematite filtering into thinly-bedded limestone joints at the south end of the pit. This was confirmed during pit excavation.
- The general shape of the ore body closely matched the predicted profile, with the exception of a single 5-foot diameter boulder embedded in the subsurface just north of borings DDH 8 & 9. This rock mass produced an occlusion that

inhibited hematite percolation into the thinly-bedded strata, reducing ore estimates in the area by 10 tons.

- Drill hole and geologic predictions estimated the Phase 1 area should contain 44% of medium-high grade iron oxide and 56% medium-low grade ore. Test pit quantities showed the ore distribution to be 40% and 60% medium-high and medium-low grade ore, respectively.

At the time of this report, one representative 948 pound composite sample of medium-high grade ore from the Phase 1 test pit area had been processed for analysis and pilot run work. This ore (crushed and blended) showed an average iron oxide content of 53 percent. Additional pilot runs are anticipated and will be compared to this value. Prediction made for this area based upon drill hole and assay results indicated a medium-high grade ore weighted average of 68% and a numerical average of 56%, with a predicted average of 60%. (Note: Assay and analysis performed on 9.76 tons of medium to low grade ore sample removed in 1996 showed an average ore quality of 37.1% iron oxide from 17 representative tests, compared to predictions of 20% average iron oxide from the drill logs and engineering analysis. This sample is still considered preliminary and may not be representative of all medium to low grade ore).

DISCUSSION AND CONCLUSIONS

Estimated quantities excavated ore and reclamation backfill were very close to actual amounts. Volumes and weights differed by about 10 percent (within accepted tolerance). Overburden was less than anticipated. The rate at which the work was performed was significantly faster than estimated and was performed with smaller than anticipated equipment. The following discussion will detail these conclusions.

Test Pit Development

Table 1 shows a drill-predicted estimates of 70 cubic yards of overburden and 120 tons (50 cubic yards) of hematite ore within the Phase 1 pit area. Actual measured and estimated quantities found 52 cubic yards of overburden and 108 tons (44 cy) of ore. Most of these differences can be accounted for from field alterations in pit dimensions and the major boulder occlusion within the ore body. More importantly, these numbers place actual to expected ore quantities about 10% of each other, with actual and expected overburden to ore ratios of 1.36 and 1.18 respectively. It is important to note that this unexpected low actual overburden-to-ore ratio made reclamation difficult since an inadequate volume of material was available for fill. Medium to low grade ore had to be placed back into the pit to make up the difference and complete reclamation work.

In terms of ore quality found within the test pit, high to low grade ore ratios were found to be within 10% of drill-inferred values (44% estimated versus 40% actual), and preliminary bulk tests of iron oxide content within medium to high grade composites are

about 7% lower than expected, or a 12% difference. Both sets of results are in the range of the estimated 10% tolerance of predicted values.

Stockpiling of ore prior to loading added another handling step, but improved overall operation efficiency by quadrupling the rate of ore removal and allowing a smaller, more economical and less intrusive loader to be used for pit operations. Hauling has always been considered the most time consuming part of the operation and the critical path item for estimating costs and schedules. Stockpiling ore de-coupled excavation and hauling activities and allowed each to be performed more rapidly without schedule impact on the other. Additionally, stockpiling allows hauling to be scheduled at more favorable times of the day where weather would not create safety concerns to drivers or road erosion (natural resource) concerns to the road surface.

Hauling and Access Road

Use of 10-wheel dump truck produced multiple advantages for the program; by doubling ore haul rates and reducing trip traffic on the access road. It was found that, with no additional road improvement, larger trucks could safely be brought within about 1000 feet of the main ore operations area. Cycle time between the ore stockpile (about 600 feet from the source) and the truck loading area ranged from 5 to 10 minutes, depending upon size of load and weather condition. With additional minor road improvements, these larger trucks can safely drive to the stockpile location.

10-wheel trucks travel slightly slower than anticipated 5-ton trucks (8.5 mph versus 6.5 mph), but do no additional road damage. Observation of road conditions after large truck travel showed the slower, heavier trucks compacting loose surfaces on the road and producing divots only where the road was saturated. This work and previous experience demonstrates that it is very important to maintain a well drained surface to prevent erosion and protect against damage. It was observed by those at the site who have been present during previous site development projects that more frequent trips by smaller pickup trucks have resulted in more road impacts since soft, saturated road sections are affected by all types of vehicles to about the same degree.

In well-drained areas (more than 90% of the access road), vegetation growth along with cobble rock plating cover the access road. Observations of road surface conditions were made prior to the start of haul and reclamation work and after completion of all described activities. Although grasses and tree seedlings in the wheel paths had been pressed onto the ground surface, nearly all vegetation was actively growing and appeared to be rebounding to original condition almost immediately after traffic ceased. Vegetation growth has been very aggressive over the past three years on the road surface and may require some trimming in the future to allow safer vehicle access. The road in many areas appears more like a forest field than an unimproved access road. Isolated poor drainage conditions appear on less than 10% of the road surface and are related to drainage features crossing the road path. There is less than 100 linear feet of rutting along the entire 6.5 mile access road.

Reclamation

Gabion construction took more labor man-hours than anticipated, but required far less and smaller equipment than included in the original estimate. Construction rate of gabion baskets walls was estimated at 0.25 man-hours per cubic yard of gabion erected. Actual work took 0.40 hours per gabion cubic yard (37% more time). This delay was primarily the result of slower than estimated gabion pad preparation and basket filling operations. The narrowing of the pit area produced a more confined space and prevented the loader from performing most of the preparation (requiring hand labor). Additionally, gabion rock was either hand-picked or sifted from the surrounding slopes with laborers hand-filling the first few baskets. It was determined that backfill rock should be stockpiled and prepared prior to labor arrival to expedite basket construction.

The small 1-1/2 cy track mounted loader was very capable of supporting most gabion fill and compaction activities. A larger loader would not have provided a significantly greater production rate and would possibly been more difficult to work with in the confined areas available. Track-mounted vehicles appear to provide the safest working conditions on these slopes and should be the primary type of construction equipment used on this site. The D7 Cat dozer rapidly contoured the slope and compacted the backfill.

The gabion baskets provided excellent hillside stability and were remarkably easy to install in the remote site conditions encountered. Even with over 12 feet of adjacent fill (3 feet higher that the top of the highest gabion), the wall supported all backfill and the weight of the D7 dozer working at the fill outside edge. Layering the backfill in compacted lifts helped maintain stability as the fill increased in height. The majority of the wall was constructed in a single shift with a relatively inexperienced labor crew who had not performed this kind of work before. In addition, the rock filled basket wall blended with the surrounding natural features providing a positive aesthetic appearance (see Photos C & D).

The gabion wall test section was placed within an active draw that runs with snow melt. Typically, gabion walls under water loads are installed with extra reinforcement or are toed into the slope to prevent side erosion and undercutting. At the time of construction, sufficient baskets were not available on site to do this additional work, so large boulders (12 to 48-inch in largest nominal dimension) were placed on the south end of the wall to act as lateral support. Seasonal snow melt will give a severe test of wall strength and stability in the most adverse of conditions. It is anticipated that some additional work will be needed next season to provide minor wall repair, and more gabion baskets can be added at that time to provide supplemental stability.

Rock fill variations used with the baskets appeared to have varying degrees of success and/or difficulty in placement and use. The most stable (and time consuming) baskets were those filled by hand with 4 to 12-inch diameter rock (Photos E & F). Those baskets moved least when backfilled and showed no appreciable settlement. Baskets backfilled

with random material placed by loader filled quickly, but required a great deal of hand work to level rocks and fill voids within baskets. Fine rock and soil filtered out during backfill operations and caused baskets to move and settle more than anticipated prior to locking in place. The use of a 4-inch grading screen (common in construction trench fill operations) would benefit the gabion basket construction by creating a stockpile of clean rock fill for later placement by loader into baskets.

The wall was contoured to allow access to the area above the test pit for planned future phases of development work. Once Phase 3 activities are complete, the wall will be extended to the north and the terrace on top will be made level with the slope terrain.

Seeding will be performed on 500 to 1000 linear feet of road surfaces to evaluate the effect of man-placed re-vegetation. Previous road seeding on an abandoned switchback access road performed by UMCC in the early 1980's provided temporary vegetation until the natural grasses and plants eventually became established. This new seeding will be monitored to measure effectiveness on active sites. Empirical evidence on the existing 6.5 mile access road suggests that natural seeding is aggressive and the most effective and long-lasting form of disturbed area re-vegetation.

RECOMMENDATIONS

1. Proceed directly to Phase 3 activities. It is important to note that the planned area for Phase 3 is only 4 to 5 times larger than that excavated pit for Phase 1 (250 sy versus 60 sy). Phase 1 proved that the geologic estimates extrapolated from the earlier drilling and geology programs are highly accurate and that ore is effectively identified for further development. Additionally, the scope difference between Phase 1 and 2 would provide little significant new development information in terms of ore removal, hauling and reclamation activities. Removal of more test ore and additional verification of geology would be the major potential assets of a Phase 2 program. A larger program would also justify use of a track-mounted backhoe to test the feasibility of larger equipment, would expedite final area reclamation and provide for better overburden-to-ore ratios for reclamation work, and could justify the use of temporary portable conveyors to move ore and overburden at the site. These items would have the potential of reducing natural resource impacts (see also Item 5 discussion).

2. Based upon previous discussions with the USFS, both Phases 2 and 3 may require completion of an Environmental Assessment (EA) by the USFS. If this is the case, it is recommended that a single comprehensive evaluation be performed for all proposed work. EA work should begin in September 1997 to allow Phase 3 to start in July 1998.

3. Modify the POO to include 10-wheel, 12-ton trucks in lieu of proposed 5-ton dumps for short haul from the mine to the camp site. These vehicles can be safely used on the access road, double the rate of production, and reduce road impacts.

4. Perform additional road stabilization work next season to stabilize isolated eroding road sections and provide for well-drained road surfaces. These sections tend to be in draws that frequently run water or low points that collect run off. Option include: (a) more frequent bar ditches, (b) geowebs to contain soils and allow runoff with minimal sedimentation, (c) open graded rock overlaid with stabilized earth section that allows drain water to pass under roads with no sedimentation, or (d) soil-cement sections.

5. Include the use of temporary portable conveyors on the claims site and at the camp to move ore more effectively and reduce natural resource impacts. Conveyors would help inhibit the need to build additional roads on the claims for site development and could be incorporated into future mining plans to reduce traffic and natural resource impacts. A simple bin and conveyor at the camp site could also be used in lieu of a loading dock to off-load 12-ton trucks into larger 20 to 30 ton trucks for long-haul of ore. All components would be portable and could be removed from the forest upon completion of annual activities.

6. Continue and expand use of gabion basket walls as hill side stabilization for development activities. Although the feasibility of such an installation was initially questioned, this test program has proven that this system works remarkably well at the site. Modify placement to include stockpiling of natural rock from overburden excavated during pit excavation. Use of an economical construction sieve would speed up gabion erection and provide a superior product.

7. Monitor gabion wall test section and road seeding to evaluate the best methods for their use in future work at the site.

8. Modify cost estimates for future operations and reclamation bonding. The total installed cost of the gabion wall was approximately $80 per cubic yard, or about 50% of the cost estimated for construction and 35% of the cost used to calculate previous reclamation bonds.

CLOSURE

A copy of this report will be forwarded to the USFS so that they may begin EA work immediately. It is recommended that this document be made part of the POO as an addenda document, with more detailed information on use of conveyors and road stabilization methods to follow as a separate letter report. These items will not delay USFS field work needed for the EA since there is ample description of their intent in this document so that any additional field work needed this fall may be obtained.

Completion of Phase 1 activities fulfills UMCC's responsibility in performing reclamation work per commitments to the USFS and to its shareholders. Being a public company, UMCC will include a summary of this report in the next stockholder's letter along with USFS response to future work plans.

Complete documentation of all factual information provided in this report is included in Appendix A of this report. Please contact me if there is any other information required on this work.

Registered Professional Engineer (Civil)
CERTIFICATE NO.
20326
PETER M.
KANDARIS
Date Signed 9-26-97
ARIZONA U.S.A.

Prepared by: _____ 9/26/97

Peter M. Kandaris, M.S., P.E.
Geotechnical Engineer
President, UMCC

Date

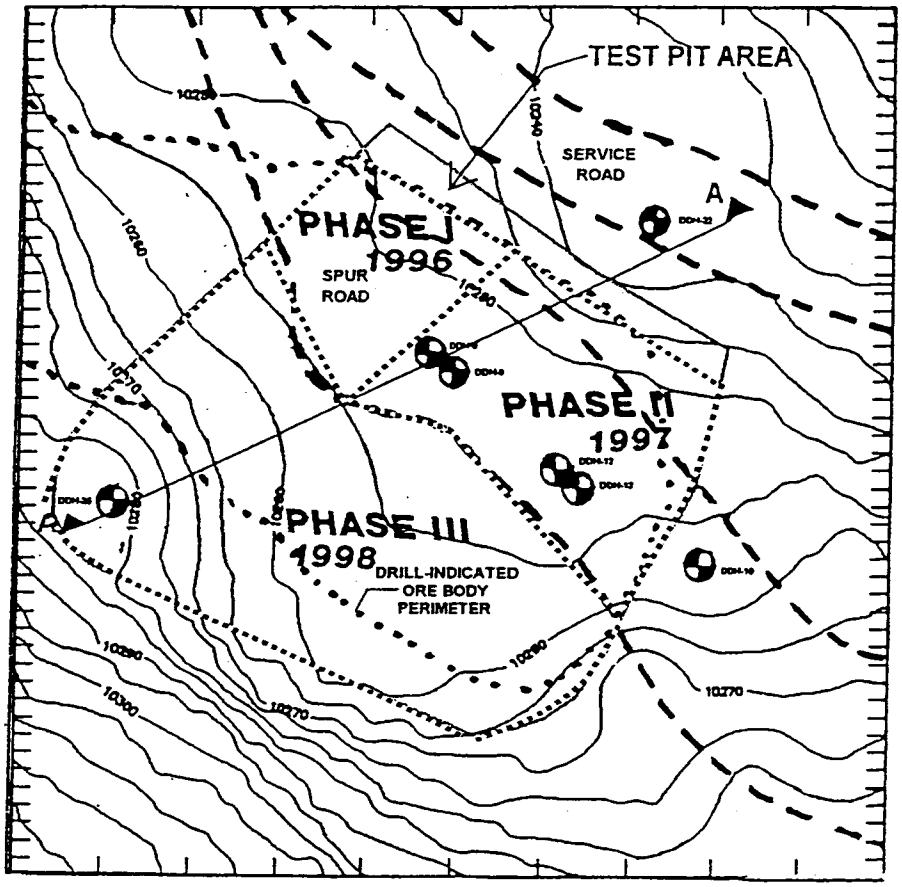


Figure 1

Proposed Test Pit Areas Per Phase

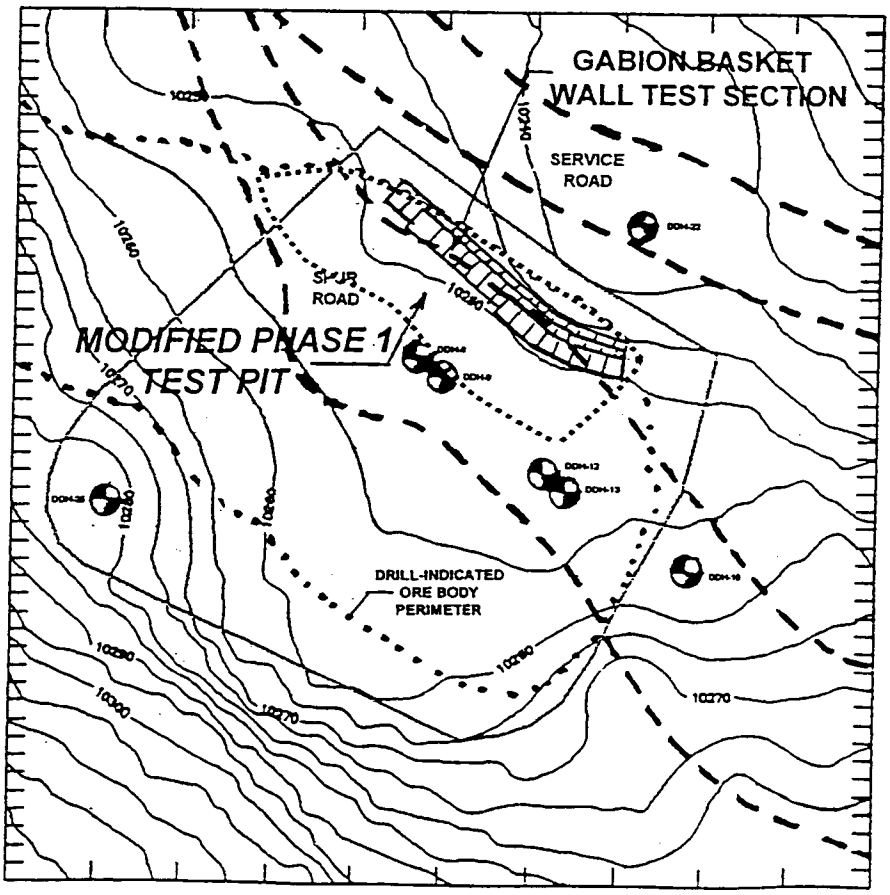


Figure 2

Modified Phase 1 Test Pit Area

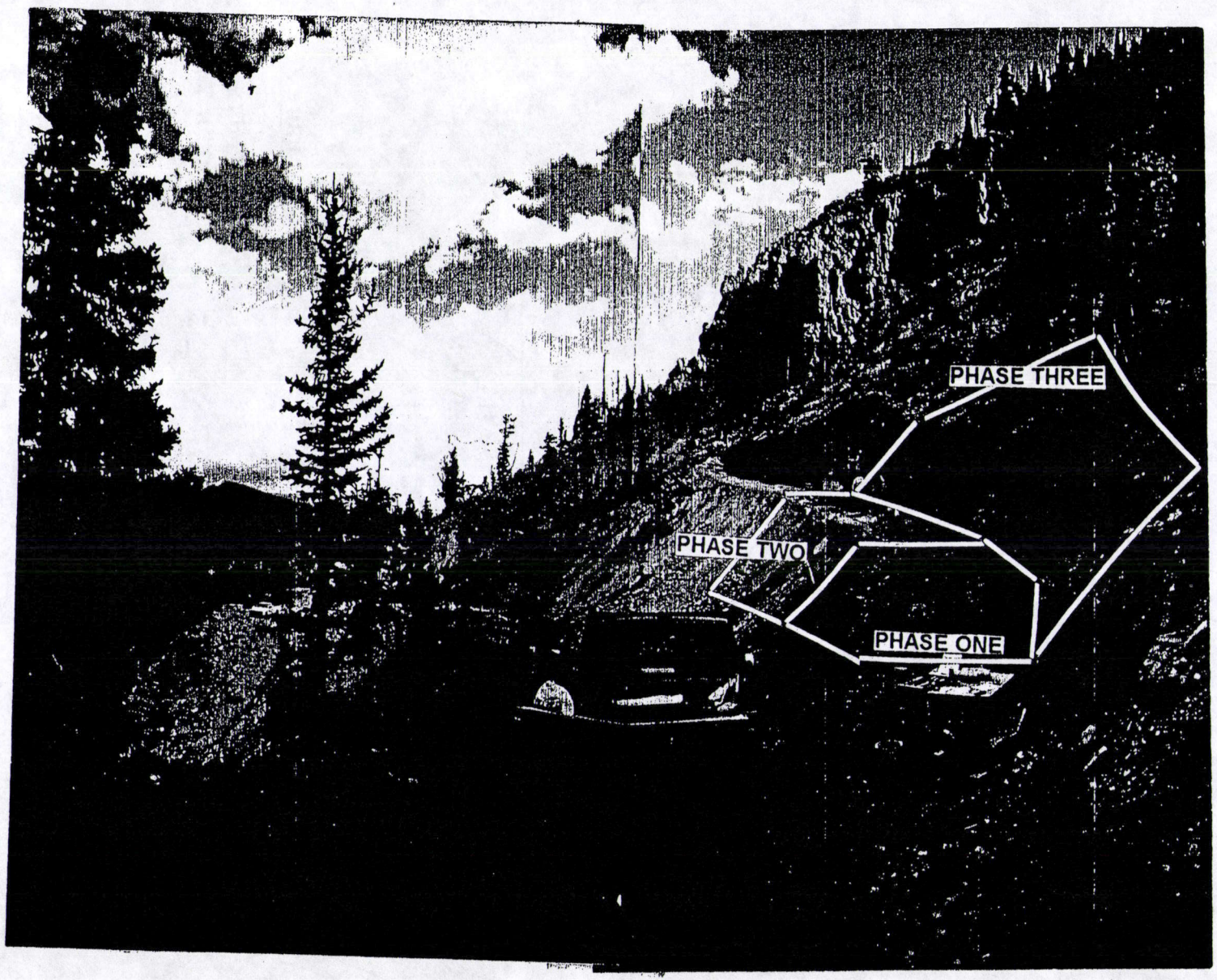


Photo A - Proposed Exploratory Test Pit Area per Phase

Photo B - Hematite Bed Uncovered in Phase 1 Test Pit (west side of pit)

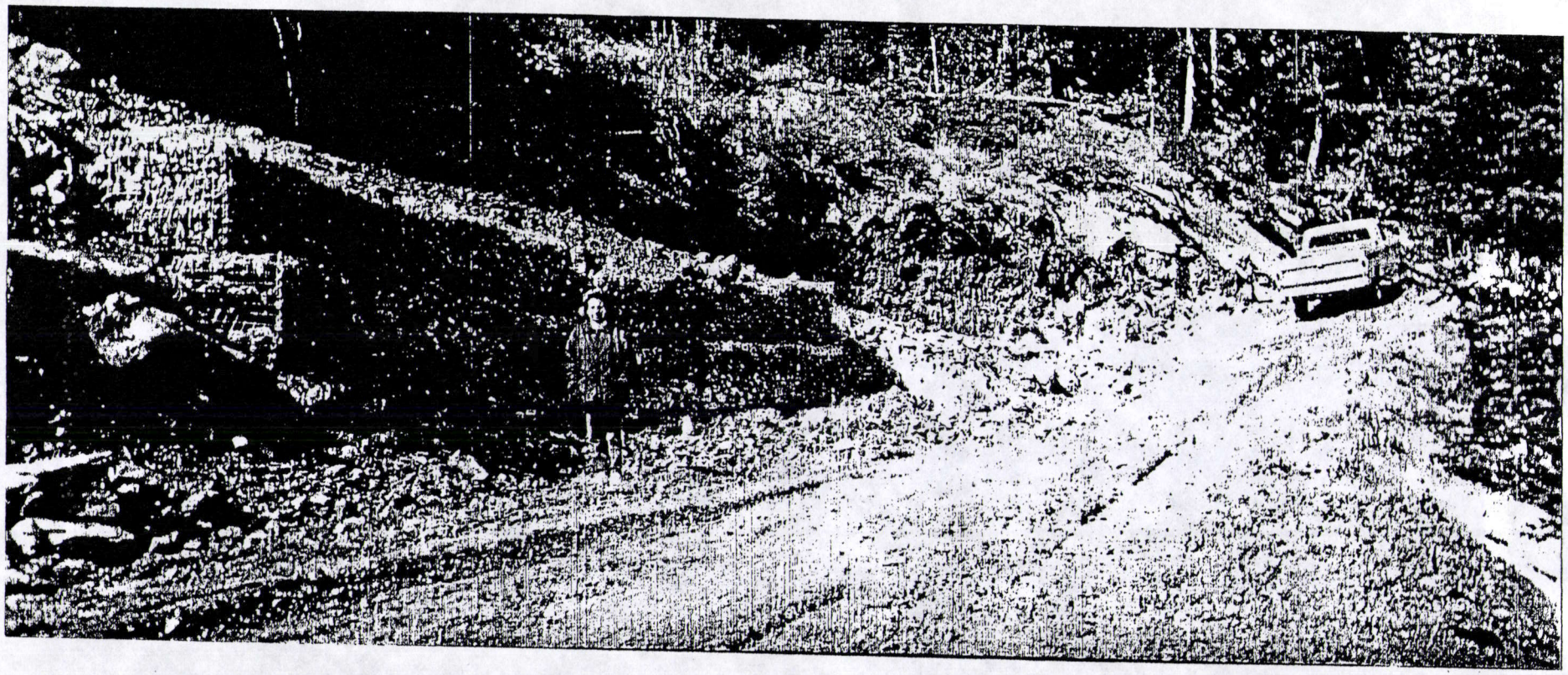


Photo C - Completed Gabion Basket Wall Test Section

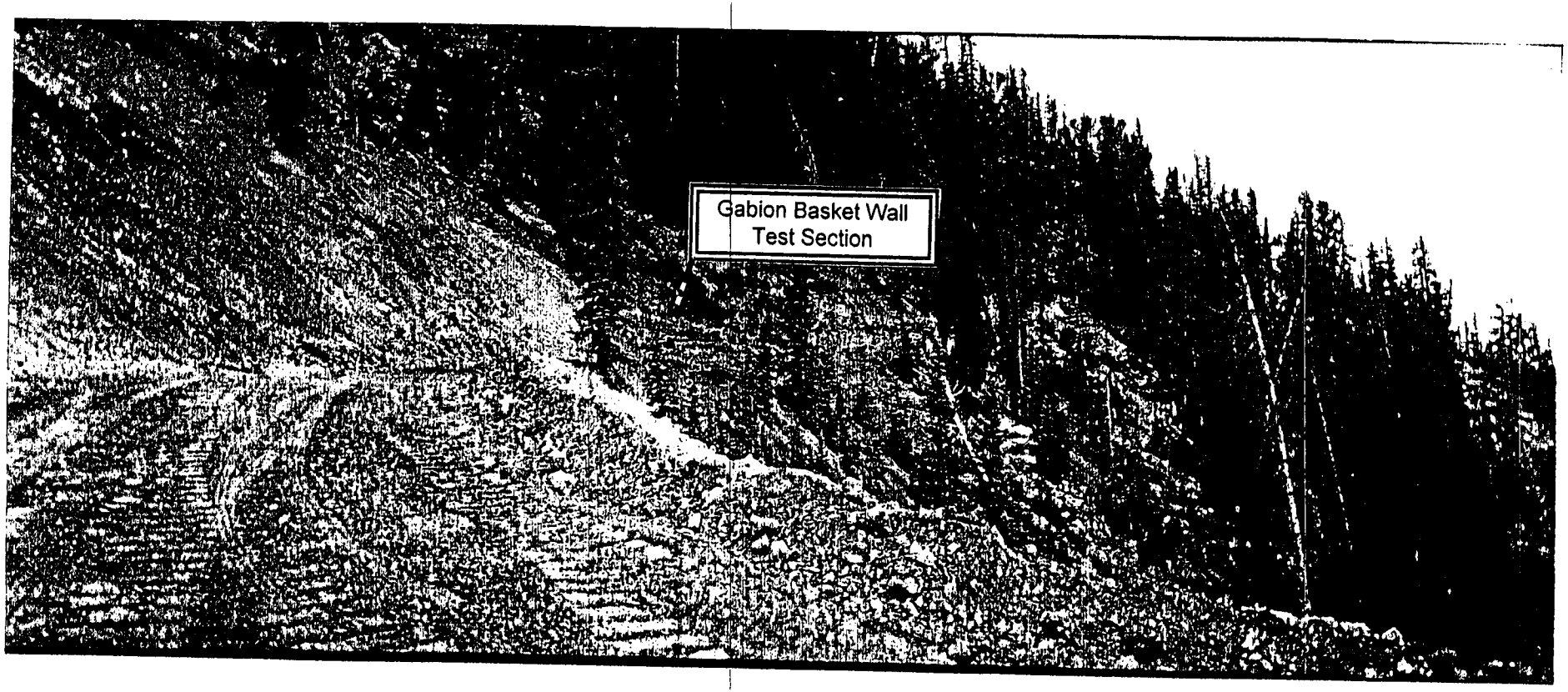


Photo D - Phase 1 Work Area with Gabion Basket Wall Test Section

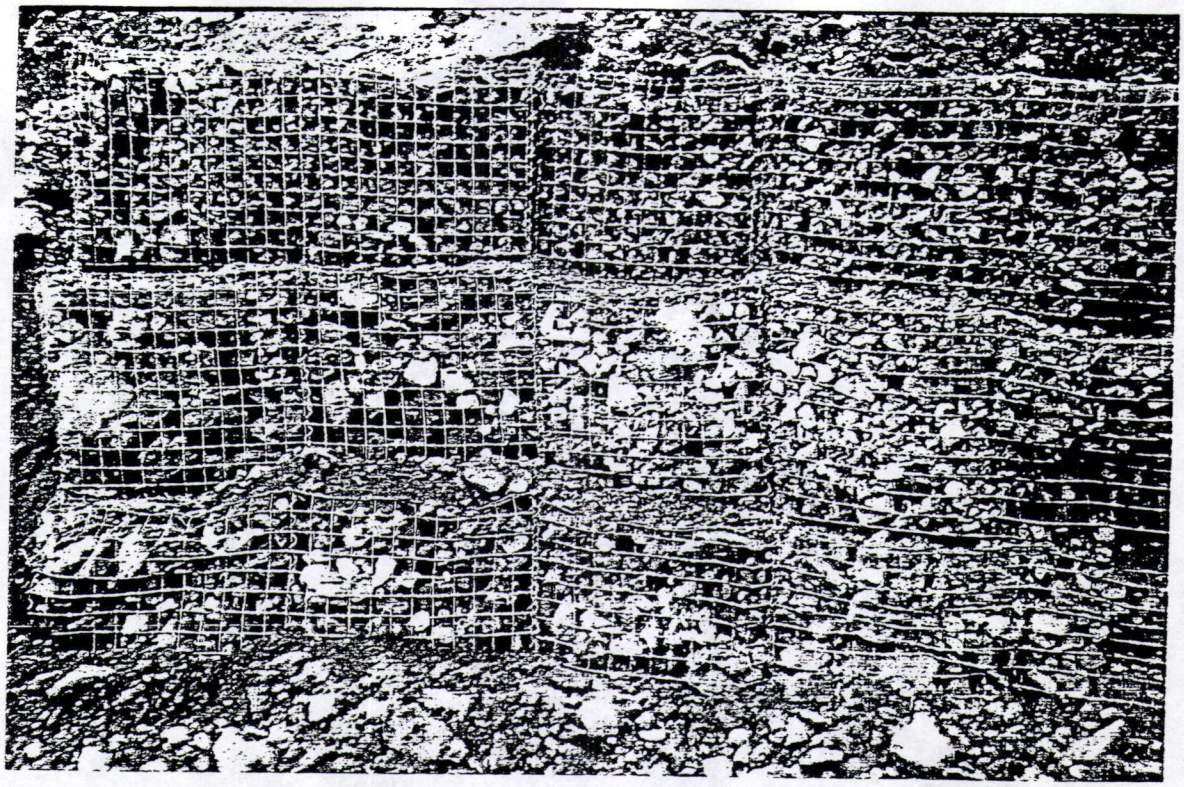


Photo E - Gabion Basket Wall Tiered Levels

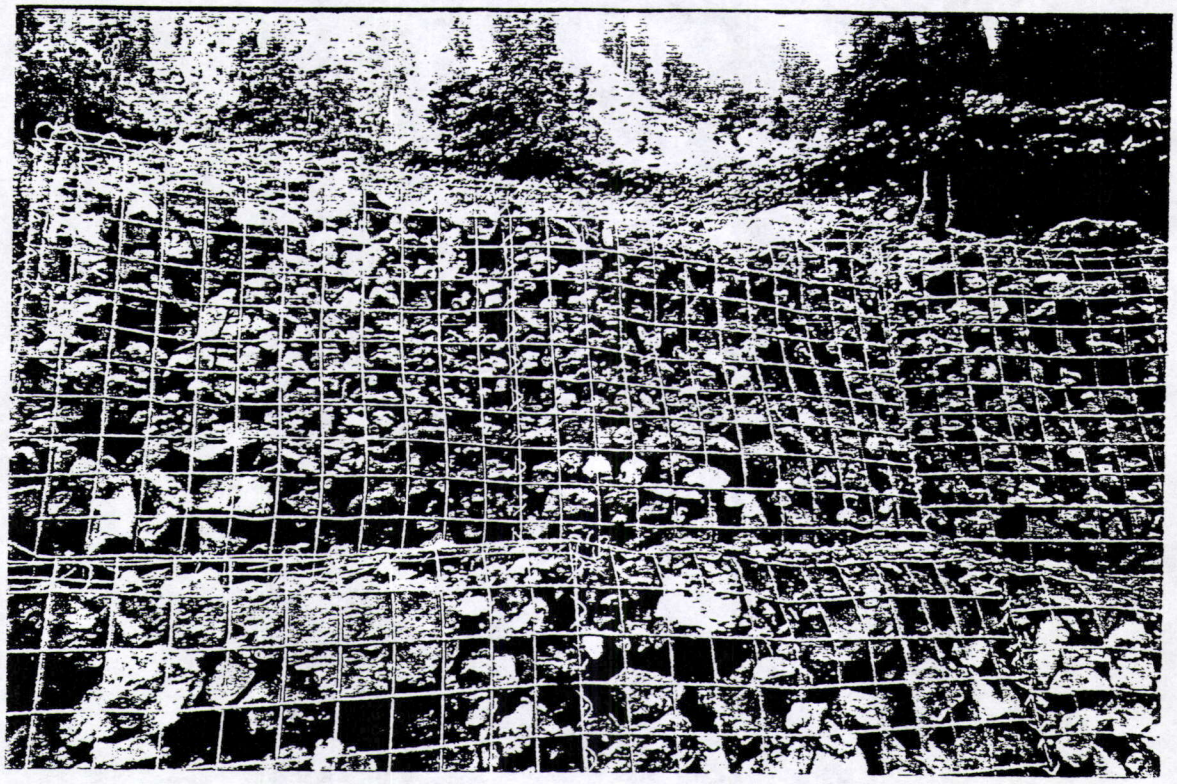


Photo F - Gabion Basket Wall Rock Fill

Phase 1 Test Pit Raw Data and Calculations
Sunshine Quartz/Hematite Claims Project

Measured Data:

			Basis
Ore Hauled 1996	9.76	tons	3/97 ore valuation analysis
Ore Hauled 1997	35.7	tons	scale weight slips
Oversized load (OSL) volume	2	cy	estimate by operator using 1.5 cy loader
Standard load (StdL) volume	1.33	cy	estimate by operator, 2/3 OSL
Oversized loader trips to fill 1997 haul	13	OSL	operator count
In-bank weight of hematite ore	180	lb/cf	1996 summary geology report
1997 high-medium grade ore stockpile	23.5	StdL	count by operator
1997 low-medium grade ore stockpile	30	StdL	count by operator
gabion wall volume	26	cy	11-2 cy baskets, 4-1 cy baskets
overburden stockpiled	30	StdL	estimate - equal to med-low grade ore pile
boulder occlusion in ore body	4.6	cy	measured, approx 5' block, all sides
volume of pit (see sketch)	108	cy	see sketch for dimensions
fill for contour of slope above gabion wall fill (see sketch)	25	cy	see sketch for dimensions

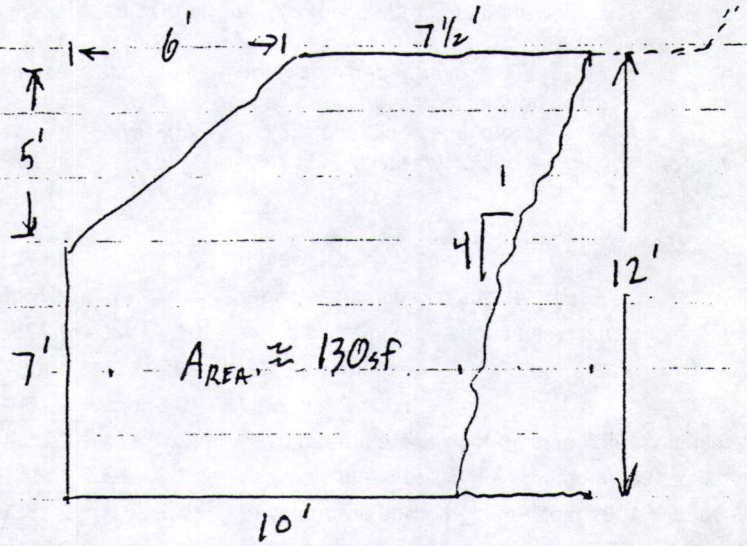
Analysis:

			Calculations
OSL weight	2.75	t/OSL	35.7t / 13StdL
Ore weight, loose in truck/loader	1.37	t/cy	2.75t/OSL / 2cy/OSL
Unit weight, loose ore in truck/loader	101.7	lb/cf	1.37t/cy x 2000#/t / 27cf/cy
expansion factor	1.77		180#/cf / 101/7 #/cf
Total Ore hauled	45.5	tons	9.76t + 35.7t
Weight of 1997 medium-high grade ore removed	42.9	tons	23.5StdL x 1.33cy/StdL x 1.37t/cy
Remaining 1997 medium-high grade ore in stockpile	7.2	tons	42.9t - 35.7t (visually verified as 2-3 OSL)
In-bank volume,1997 medium-high grade ore removed	17.7	cy	23.5StdL x 1.33cy/StdL x 1.77
In-bank volume,1996 medium-low grade ore removed	4.0	cy	9.76t x 2000#/t / 180#/cf / 27cf/cy
Weight of 1997 medium-low grade ore stockpiled	54.8	tons	30StdL x 1.33cy/StdL x 1.37t/cy
In-bank volume,1997 medium-low grade ore stockpiled	22.5	cy	54.8t x 2000#/t / 180#/cf / 27cf/cy
Total ore removed	107.5	tons	9.67t + 42.9t + 54.8t
% medium-high grade ore, by weight	40%		42.9t / 107.5t x 100
% medium-low grade ore, by weight	60%		(9.67t + 54.8t) / 107.5t x 100
overburden volume stockpiled	22.5	cy	22.5 cy (same as 1997 low-med ore)
Measured in-bank volume of excavated/fill material	97.4	cy	26cy + 4.6cy + 17.7cy + 4cy + 22.5cy + 22.5cy
Assumed non-accounted for material, 11%	10.7	cy	0.11 x 97.4cy
Total estimated & measured volume of excavated matl	108	cy	10.7cy + 97.4cy
Total volume of disturbed material	133	cy	25cy + 108cy
Total volume of backfilled material	74.7	cy	25cy + 4.6cy + 22.5cy + 22.5cy
Total volume of non-ore backfill material (overburden)	52.2	cy	25cy + 4.6cy + 22.5cy
overburden to ore ratio	1.18		52.2cy / (17.7cy + 4.0cy + 22.5cy)

Pit & Fill Cross-Section (Typical)

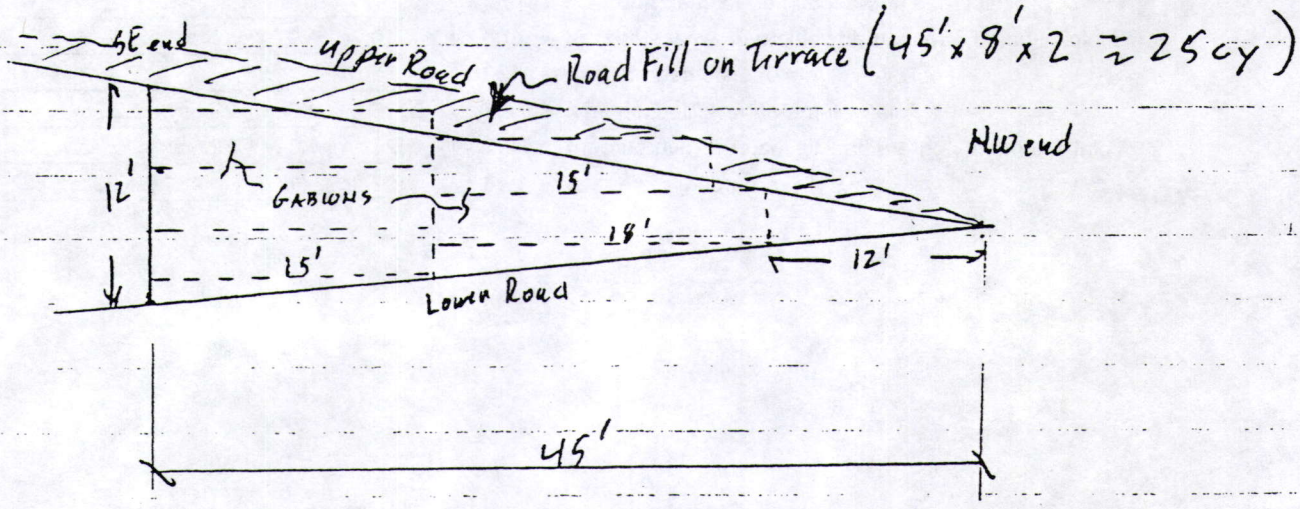
At SE End:
(idealized)

At NW End 45' away
Area = 0
(triangular area)
(wedge)



$$\text{In-Bank Volume} = (130\,sf \times 45\,ft\ \text{Length}) \times \frac{1}{2} \times \frac{cy}{27\,cf} = 180\,cy$$

Profile:



Item Description	Value	Unit	Value	Unit	Comments
Sample Ore Removal					
Quantity Hauled to Lehi, Utah	6.97	tons			Net weight from scales
Est. % remaining in Bluebell	40%				Conservative visual estimate
Total Sample Removed 10/96	9.76	tons	19516	lb	Conservative estimate
Sample Ore Testing					
Average Iron Oxide Content	37.12%				From assays on 13 representative samples of ore in Lehi
Total Iron Oxide in Sample			7244	lb	
Sample Ore Processing					
Percent iron oxide remaining after processing	80%				From 1995-96 bench test results
Total iron oxide from processing			5795	lb	
Sample Ore Valuation					
Low end gross value	$ 2.00	$/lb	$ 11,591		Specialty market evaluation of 2/1/97
High end gross value	$ 10.00	$/lb	$ 57,955		Specialty market evaluation of 2/1/97
Median gross value	$ 6.40	$/lb	$ 37,091		Specialty market evaluation of 8/23/96
Cost of removal/processing	0.95	$/lb	$ 5,506		Analysis of 9/96; increased by 50% to include marketing
Net Estimated Value of Sample Ore			**$ 31,585**		Based on median gross value

Note: This information is based on the best available data at the time of analysis. Actual results will depend on further sampling, processing and test marketing as proposed by UMCC in 1996 Plan of Operation and other correspondance.

1997 UMCC Equipment and Operations Data/Calcs

Activity	Equipment	Quantities		Time			Rate	
Overburden Removal	1.5 cy loader	22.5	cy	4	hrs		5.63	cy/hr
Ore Removal	1.5 cy loader	97.7	t	12	hrs		8.14	t/hr
Ore Haul	12 t trucks	35.7	t	7.67	hrs		4.66	t/hr
Gabion Wall Erection	laborers	26	cy	66	mh		0.39	t/hr
Backfill & Contour	1.5 cy loader	75	cy	3.5	hrs		21.4	cy/hr

Truck Loading	1.5 cy loader							
Truck 1		5	loads	50	min		10	min/ld
Truck 2		4	loads	30	min		7.5	min/ld
Truck 3a		2	loads	10	min		5	min/ld
Truck 3b*		2	loads	10	min		5	min/ld
		13	loads	100	min		7.69	min/ld

Travel time per truck: 1 hour each way to and from camp site to ore loading area

*Note: 20 minute delay for dead battery charge on loader not shown

Ore Quality Estimates from Drill Logs and Assays for Test Pit 1

Zone B Ore Type	Thickness (ft)	Iron Oxide Content (%)
High Grade	4.05	77.4
Medium Grade	1.05	34.9
Low Grade	6.48	12.5

all data from 1995 analysis of drill logs and assays

	Numerical Avg	Weighted Avg	Estimate	Use
Medium to High Grade	56.2	68.7	62.4	60.0
Medium to Low Grade	23.7	15.6	19.7	20.0

From 1995 Engineering Analysis of Core Drill Logs

Zone B

Boring	8			9			12			13		
	Thickness (ft)	Zone	% Fe2O3	Thickness (ft)	Zone	% Fe2O3	Thickness (ft)	Zone	% Fe2O3	Thickness (ft)	Zone	% Fe2O3
	0.3	1		1.2	1		3.6	1		7.0	1	
	0.9	6	23.5	0.4	4		0.5	2		0.5	2	
	1.0	8	57.7	0.8	8		0.5	3		0.2	8	
	1.1	6	26.2	0.7	4		1.7	3	6.6	0.4	10	
	3.3	10	86.5	0.9	1		1.0	6	32.1	0.1	10	
			76.2	1.2	2		0.6	8	86.6			
	1.3	9	70.8	4.9	8		2.1	10	88.7			
	0.3	8	74.6	3.2	1		0.6	7	84.8			
	1.7	1	6.0				0.4	1	22.3			
	0.7	6	31.9				0.5	6	65.2			
	0.6	8	70.5				1.6	1				
	0.5	1										
TOTALS												
7-10	6.5		72.7	5.7			3.3		86.7	0.7		
6	2.7		27.2	0			1.5		48.7	0		
1-5	2.5		6.0	7.6			8.3		14.5	7.5		

	Thickness (ft)	Avg(%)
7-10	4.05	77.4
6	1.05	34.9
1-5	6.48	12.5

CROSS SECTION F
(N 70 W)

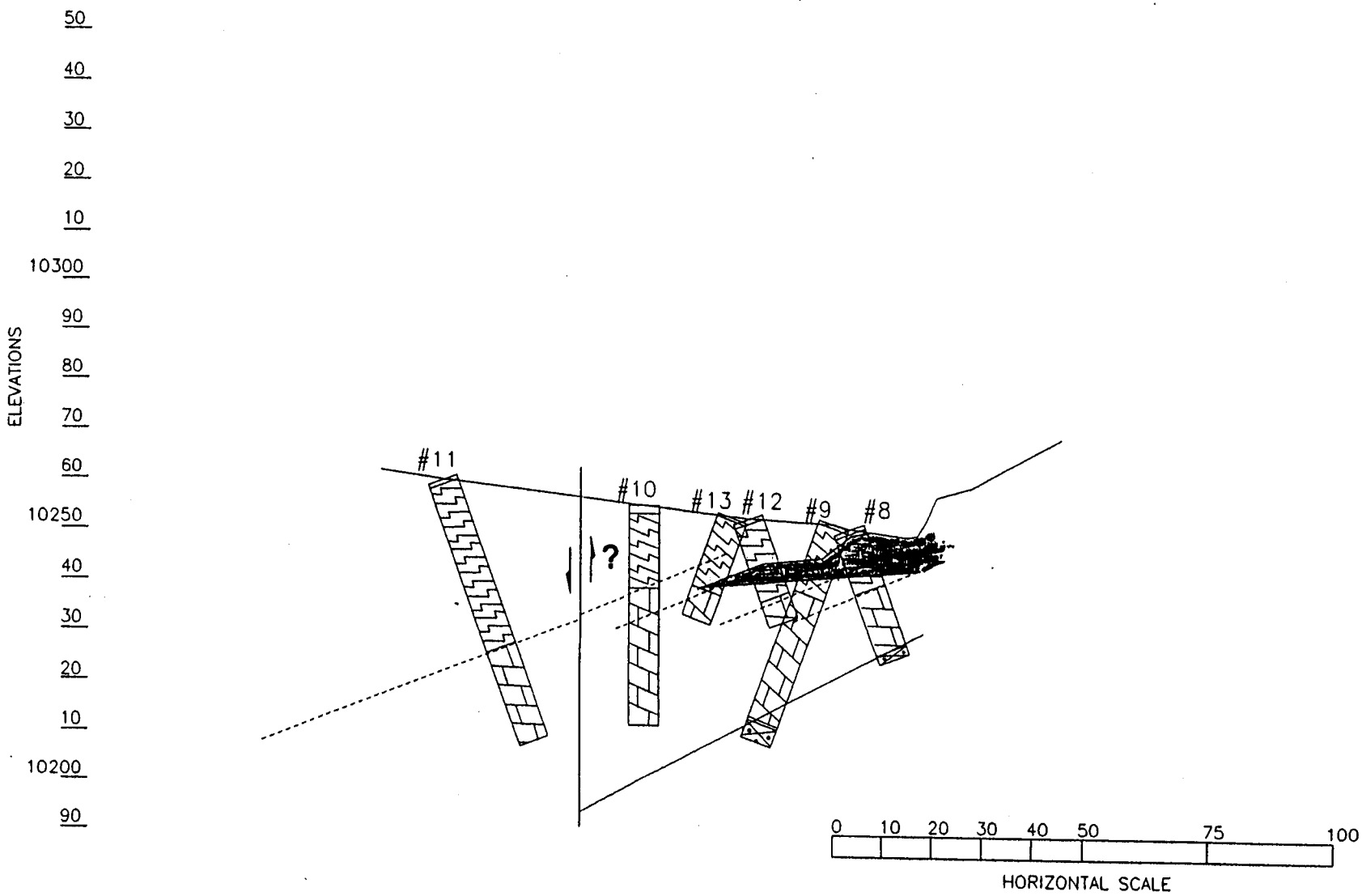


FIGURE 5

UMC

UINTAH MOUNTAIN COPPER COMPANY
341 SOUTH MAIN STREET
SUITE 401
SALT LAKE CITY, UTAH 84111
(801) 530-1045

MINUTES

UMCC - USFS MEETING OF 11/10/97

The meeting began at 10:30 a.m. on November 10, 1997 at the Uintah Mountain Copper Company Office at 341 South Main #401, Salt Lake City, Utah 84111. Those present at the meeting were Peter M. Kandaris, President of UMCC; Mike Kandaris, Vice President of UMCC; Pamela M. Cha, Consultant to UMCC; Joseph R. Bistryski, District Ranger of Ashley National Forest; Chauncie Todd, Ranger Ashley National Forest; and Clarice, Ranger Ashley National Forest. It was agreed by all that were present that a representative from Uintah Mountain Copper Company would take the minutes and that the minutes would serve as a written record of the meeting.

The first order of business was to review the 1997 development work. Peter explained what UMCC had done. He said that UMCC had excavated more than 100 tons of ore, but had only removed 45 tons. UMCC felt like it was imperative to both the USFS and UMCC that UMCC complete the reclamation work. To that end UMCC put in the gabions and used the balance of the ore as a source for backfill. The hauling of the ore was easier than expected and there was no significant erosion on the road. He went on to explain that the ore value quality was there. Joe stated that the gabions appeared just has he assumed they would. He had not been up since they had been seeded. Mike reported that he and Kelly Bird had spread approved USFS mixed seed on the gabions. Joe then asked if UMCC had built an additional spur road. Peter said no, that had been put in with Forest Service approval a few years ago during the drilling program. There had been no additions to the original road. Chauncie confirmed this. Everyone seemed satisfied with last year's progress.

The second order of business was to discuss the 1998 proposed development work. Before we discussed this specifically, the issue of both the road permit and the camp permit were handled. Although technically the permits had expired at an earlier date, UMCC had been billed by the US Forest Service and paid for the permits through December 31, 1998. Rather than reissue the permits, Joe recommended that the road and the camp site become part of UMCC's continuing plan of operation. Peter agreed that this was an acceptable solution and will send an amended plan of operation to Joe. In that plan he will include detailed descriptions of both the road and camp site.

We then moved on to revising the present plan of operation to meet UMCC's and the USFS's needs. The USFS explained that there are a lot of eyes on us. Further, they stated that it would be impossible to mine ore that wasn't already approved in our plan of operation. Peter explained that UMCC had no intention of mining ore that was not part of what was already approved. As he had explained earlier, UMCC had only been able to

remove 45 tons. UMCC was approved to removed 100 tons. He believed that the slower approach was better for all concerned. By only removing 45 tons, UMCC can study how the gabions hold up during the winter. Further, there is more ore behind the gabions. This ore could be removed without disturbing last year's gabion work and still remain within the scope of the already approved Plan of Operation. It was agreed by both parties that Peter would submit an explanation to Joe, but that there was no reason that UMCC could not take out the rest of the ore that had already been approved for removal. Further if there was a need for additional drilling, the USFS saw no barriers to doing it.

The Forest Service then discussed the bonding. Pam explained that the telephone numbers given to her by the USFS had been disconnected. She went on to say that she had received no information from Chauncie on the amount of the bond for 1997. He explained that he had some unexpected complications. She said that UMCC felt that the reclamation work was essential for the 1997 year, so they completed their obligation without a bond in place. She stated that she does not want this to happen again. She explained that she needs to know what the bond amount will be. Further, she requires a list of all USFS approved Bonding Companies. She was assured that she would receive all of the information by mid January.

The final order of business was a discussion regarding future development work - Phases 2 & 3. Peter expressed his concern that no work had been done on the E.A. Joe explained that some work had been initiated. He said that because of the Dry Fork Chasm, they did not have the manpower in 1997 to do all of the field work necessary. He said he could not make any guarantees for 1998. Peter responded that it was imperative to UMCC that the E.A. be completed in 1998. He suggested that the USFS put together a schedule for the E.A. He also asked that they give approximate completion dates and any recommendations/suggestions the USFS would have for UMCC, especially in the area of expediting the E.A. He stated that UMCC needed a workable schedule so that there would be no misunderstandings between UMCC and the USFS. During the discussion it was decided that much of the work that UMCC was doing for the Securities and Exchange Commission, specifically the 15C-2-11 would help with the E.A. in that it would verify the economical validity of the ore body. It was decided that the USFS would send the schedule of work and any other information on the E.A. to UMCC by mid January.

Both UMCC and the USFS were pleased with the progress made at this meeting and it was adjourned at 11:45 a.m.

Respectfully submitted

Pamela M. Cha

Pamela M. Cha

ACCEPTED BY:

Joseph R. Bistryski, USFS

Peter M. Kandaris, UMCC

Action Items:

1. Amend the Plan of Operations to include use of access road and campsite. Include modified Phase 1 work needed for 1998 development operations.
   Responsibility: UMCC
   Completion by: Early December 1997

2. Provide UMCC with bonding information; include reclamation bond amount for 1998 work (short-term), reclamation bond amount for long-term items (road, camp), and list of approved reclamation bonding companies (preferably companies in the Western US).
   Responsibility: US Forest Service
   Completion by: Mid January 1998

3. Provide UMCC a schedule for environmental assessment work (EA) for Phase 2 and 3 claims development; include approximate completion dates and suggestions on how UMCC could help expedite the process.
   Responsibility: US Forest Service
   Completion by: Mid January 1998

4. Prepare minutes for meeting; include signature block for concurrence by both UMCC and the US Forest Service.
   Responsibility: UMCC
   Completion by: As soon as possible.

UMC

UINTAH MOUNTAIN COPPER COMPANY
341 SOUTH MAIN STREET
SUITE 401
SALT LAKE CITY, UTAH 84111
(801) 530-1045

December 4, 1997

Ashley National Forest
Duchesne Ranger District
P.O. Box 981
Duchesne, Utah 84021

Attn: Joseph R. Bistryski, District Ranger

Re: **Proposal for Modification of POO: Addendum #3**
Sunshine Quartz/Hematite Claims Project
Revision of Phase 1 Test Pit Plans for 1998 Onsite Development Work

As discussed in our meeting of November 10, 1997, Uintah Mountain Copper Company requests your agency's concurrence with our proposal for completion of Phase 1 sample ore removal and other minor site improvements and support activities during 1998 for the above noted project. The details of this work are specified herein and should be made part of the active Plan of Operation for the project.

1998 activities will remain within Phase 1 areas that have previously been approved and will not require additional surface disturbance. This modification of the Phase 1 plan will also allow UMCC to postpone start of planned Phase 2 and 3 development activities until the summer of 1999, thus providing the USFS with ample time to initiate and complete Environmental Assessment work on these development phases.

Please review the attached addendum. If the Forest Service is in agreement with scope of work, please sign your concurrence at the bottom of the addendum (or under separte letter) and return one copy to myself or Mike Kandaris at the above noted address. If other changes are needed, please provide UMCC with a written response detailing these alterations so that they can be incorporated into our plans.

UMCC appreciates the willingness of the Forest Service to evaluate our project so that development work may proceed in a prudent and timely manner. Please contact me in Arizona if you have any questions.

Sincerely,

Peter Kandaris
President, Uintah Mountain Copper Company

cc: Mike Kandaris
Pam Cha
John Parsons

Proposal for Modification of POO: Addendum #3
Sunshine Quartz/Hematite Claims Project
Revision of Phase 1 Test Pit Plans for 1998 Onsite Development Work

Background

Approved Phase 1 test pit development activities were performed by Uintah Mountain Copper Company (UMCC) on the Sunshine Quartz/Hematite Claims during 1996 and 1997. The scope of this work included excavation of large volume hematite ore samples. During the work, an estimated 107 tons of ore were excavated from the Phase 1 test pit area, but only 46 tons were hauled off site to laboratory facilities. The bulk of the remaining ore was used as on-site backfill behind a gabion basket retaining wall since inadequate overburden was available for planned reclamation activities. It was UMCC's intent to remove this sample ore in the future when sufficient backfill was made available from overburden produced in other phases of development.

All information detailing this work has been forwarded to the Forest Service (USFS) via a UMCC engineering analysis report dated September 26, 1997, with the intent that the report should become part of the current UMCC Plan of Operation (and noted as Addendum #2).

Proposal

UMCC requests extension of approved Phase 1 activities to allow removal of test sample ore per the original intent of the planned work. The scope of work is detailed as follows:

- Excavate ore used as backfill behind gabion wall and left stockpiled on site (approximately 54 and 7 tons, respectively). Sample ore would be hauled from the claims property to UMCC laboratory facilities outside of the national forest. See Figure 1 for location of work.

- Excavate, haul and backfill compatible local rock and soil material from disturbed areas of the access road to fill and properly complete Phase 1 reclamation backfill per the original intent. UMCC and the USFS will jointly select backfill locations and materials once access to the site is possible after spring runoff.

Support Activities

Other development activities on the claims that need to be performed in 1998 include the following:

- Perform road clearing and maintenance activities for access to the claims properties. If acceptable, slide and slough material from the hillside may be utilized as replacement backfill behind the gabion wall.

- Repair and extend the gabion wall. Weather effects from off season snows and rains may result in some wall damage that must be repaired. Additionally, extending the wall along

disturbed road areas to the west and north will allow for creation of a more natural, long-term contour and help expand re-vegetation of the natural slide.

- Re-seed the contoured top of the gabion wall slope once new backfill is in place.

Other Activities

The 9/26/97 analysis report identified the following activities that UMCC should include in future phases of site development (including extended Phase 1 work for 1998). The work items are detailed in the report and are briefly summarized below (please review the background and justification for each item within the analysis report):

- Use 10-wheel, 12-ton trucks in lieu of proposed 5-ton dumps for short haul from the ore body to the camp site.
- Perform additional road stabilization work to prevent erosion of isolated road sections and provide for well-drained road surfaces.
- Include the possible use of temporary conveyors on the claims site and at the camp to move ore more effectively and reduce natural resource impacts.

Discussions subsequent to the issuance of the analysis report have identified that additional drilling (similar to that approved and performed in 1994 and 1995) would be of benefit to the ore body evaluation process. If additional drilling is performed in 1998, UMCC does not anticipate the need to build new roads for any 1998 drilling work, but would issue a written request for an addendum to the POO if such new access construction would be needed. Either horizontal drilling would be done from the existing access and spur roads, or portable drilling equipment would be back-packed or placed by helicopter. A spring on the claims has been used in the past for drilling fluid and would continue to be the source of water for this type of work.

Support Facilities

Facilities needed to support the claims development work include the 6.5 mile access road and camp site identified in the active POO. Beginning in 1978 and through the end of this year, UMCC has maintained and paid for continuous use of these facilities via annual special use permits. It is understood that the USFS has determined that, beginning in 1998, support facilities to be used by UMCC in the Ashely National Forest should be made part of the active POO (through this addendum) and no special use permits will be required for future continued use.

In 1978, UMCC exchanged grandfathered permits (originally established in the early 1950's) on a camp site near Moon Lake and a well-established access road (heavily used by recreationalists for entry to the High Uinta's Wilderness Area) for the present camp and road locations. These new support facility locations were selected by the USFS specifically for use by UMCC in their development of the Sunshine/Hematite Claims. A new road route was engineered by the USFS to the claims site and the road was paid for and constructed by UMCC in 1979-80. Since their inception, UMCC has provided and paid for all road and camp maintenance. Periodic reviews have been conducted by the USFS to determine the condition and maintenance of both

facilities, with UMCC performing any additional improvements as required by the USFS. The most recent reviews by the USFS indicate that both facilities are in compliance.

The road is approximately 6.5 miles in length and varies from 15 to 30 feet in nominal width within a 30-foot right-of-way. The unsurfaced access road extends west from FS Road 151 for about 3.3 miles then continues northwest to the claims for the remainder of the distance, climbing in elevation from 8070 feet to 10,400 feet with an average grade of 6½ percent. The road is within Sections 13, 14, 15 & 24 in T2N, R6W and Section 19 in T2N, R5W near the Slate Creek Canyon region of the Ashely National Forest (see active POO, Map 1).

Annual UMCC road maintenance activities include, clearing of fallen trees from drive paths, cleaning of water bars and drainage ditches, and clearing of slides. Disturbance of the road surface is avoided since the cover of natural grasses, rounded cobble rock and small vegetation provides excellent erosion and dust control. Access is controlled by the USFS, with locked gates at the entrance and along the roads at Mile 0.4 (just beyond the camp site) and Mile 5.8 (within the claims). Even though the road is part of the USFS system, maintenance continues to be paid for and performed by UMCC as long as an active permit or written authorization for use on claims development is in force. UMCC annual activities on the road occur from June through October, depending upon spring snowmelt/runoff and winter snowfall.

The 5 acre camp site adjacent to the access road and is ½ mile south of the Moon Lake dam and 0.3 miles west of FS Road 151 (southwest ¼ of Section 19 in T2N, R5W). Distribution telephone and electric lines cross through the site. The camp is occupied only during times of claims development activity, with portable tent and self-contained trailers used to house personnel. Domestic water is brought to the site as needed in small portable tanks or 5-gallon containers. Sewage is generally controlled in portable trailer tanks as needed (there is an infrequently-used outhouse onsite). Year-round structures include a portable tool trailer and a covered work/lunch table area. On the east edge of the site is an abandoned gravel pit not associated with the claims work. A temporary earthen dock was excavated in the pit for possible use with transfer of ore.

As documented in the active POO, the access road and camp site are needed to allow for development activities and safe work on the claims. The road is of adequate size and grade for travel by heavy equipment trailer trucks and 10-wheel dumps needed to support the proposed development activities. No substantial road improvements are anticipated for future activities by UMCC. The camp provides a location for proposed sample ore transfer from short-haul dumps to long-haul trailers, with clean and quiet power available for operation of future portable conveyor systems. Safety of the development operations is enhanced by the telephone line at the site (cellular phones are operable in only a few locations of the canyon). The camp also provides a safe place for daily operation and safety tailboard meetings, refuge from frequent storms, reliable temporary personnel housing facilities, and a safe temporary materials and equipment storage location.

Concurrence

The development work as noted in this addendum to the Plan of Operation (POO) defines the scope of activities planned by UMCC for 1998 at the Sunshine Quartz/Hematite Claims properties and incorporates use of the access road and camp site for all future work. By performing this work, UMCC will be able to postpone start of planned Phase 2 and 3 development activities until the summer of 1999 and provide the USFS ample time to initiate and complete Environmental Assessment work deemed necessary for these future development phases.

12/4/97

Peter Kandaris, President, date
Uintah Mountain Copper Company

The work defined herein for 1998 is acceptable and may proceed as described:

12/23/97

Joseph R. Bistryski, District Ranger date
Duchesne Ranger District

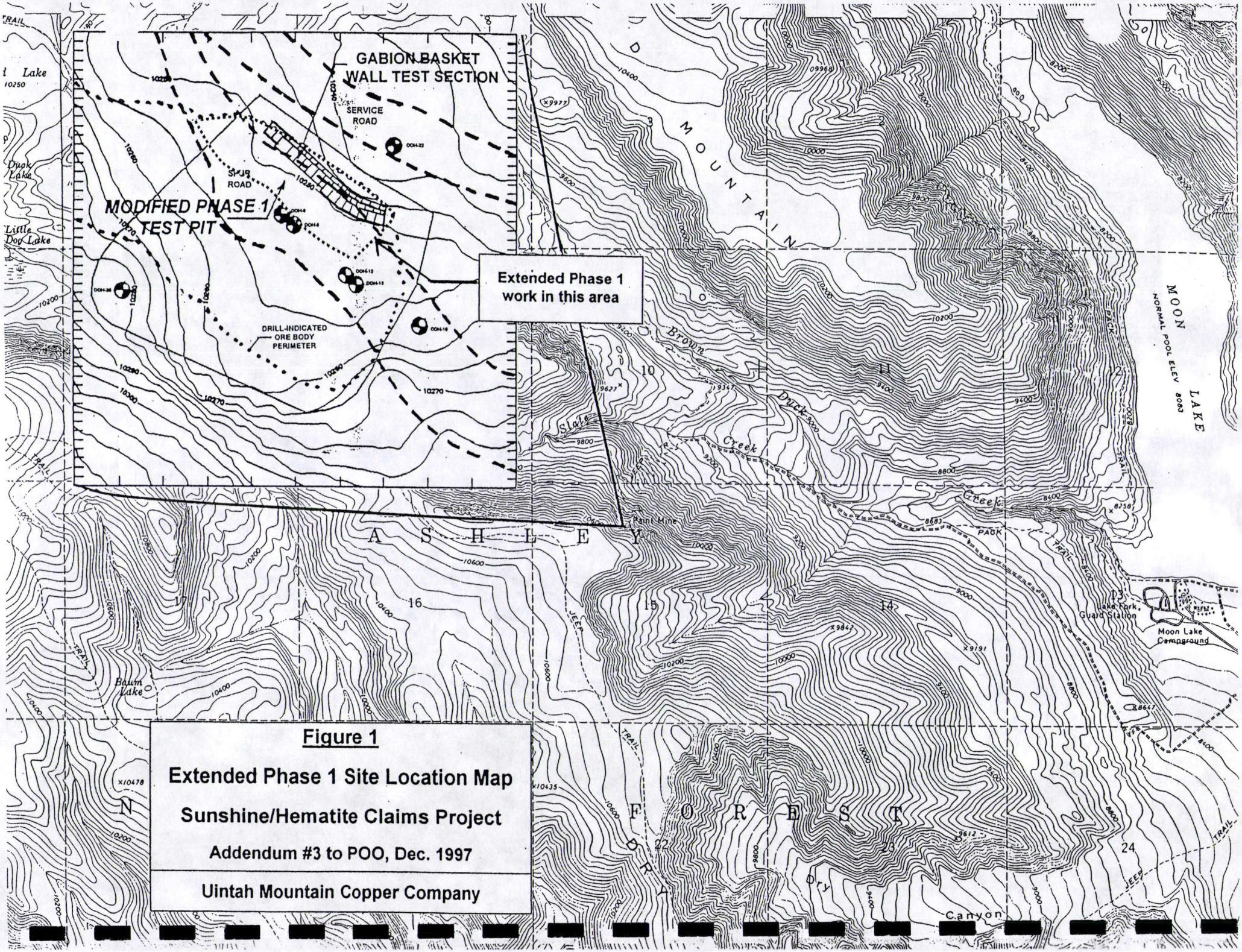


Figure 1

Extended Phase 1 Site Location Map

Sunshine/Hematite Claims Project

Addendum #3 to POO, Dec. 1997

Uintah Mountain Copper Company

United States
Department of
Agriculture

Forest
Service

Ashley National Forest
Duchesne Ranger District
P.O. Box 981
Duchesne, Utah 84021

File Code: 2810

Date: December 23, 1997

Uintah Mountain Copper Company
Peter Kandaris, President
341 South Main Street, Suite 401
Salt Lake City, UT 84111

Dear Peter:

As was discussed at our meeting on November 10th, we must complete an environmental analysis before further work beyond Phase I can take place on your Sunshine Claims. This analysis will lead to an Environmental Assessment (EA) or an Environmental Impact Statement (EIS). As we discussed, our resource specialists already have their work scheduled for the 1998 field season and we would not be able to complete the environmental analysis and subsequent document in the time frames that you desire.

Here are three alternatives to completing the analysis and documentation. Two of which may help shorten the time in completing this work.

1. The Forest Service can put the proposal in their fiscal year 1999 program of work and schedule FS resource specialists to field surveys in the summer of 1999. Depending on other work and any emergencies that might arise the analysis and documentation would take from 14 to 18 months.

2. Uintah Mountain Copper (UMC) could enter into a Memorandum of Understanding with the Forest Service (FS). UMC could then hire outside resource specialists, approved by the FS, to complete needed field surveys and submit reports to the FS for review. UMC could then enter into a Collection Agreement with the FS whereby UMC would fund the FS to acquire additional personnel to review reports and write the appropriate NEPA document.

Under this alternative the outside resource specialists would still need to wait until the field season to complete most of their field work. However, it would save time since the FS resource specialists would not be able to schedule the work until the 1999 field season. Resource reports needed would include; wildlife and TES, soils, visuals, hydrology, and cultural resources. This process would take from 12 to 14 months. The outside specialists would cost from $12,000 to $25,000 and the additional FS work would cost from $20,000 to $30,000.

3. UMC could enter into a MOU with the Forest Service whereby UMC could hire outside consultants, approved by the FS, to complete needed field surveys and write the appropriate NEPA document. The NEPA document would then have to be reviewed and approved by the FS. An estimate of the cost for an outside consultant to complete the analysis and documentation should be from $60,000 to $100,000.

All of the estimated dollar amounts are based on a standard NEPA analysis and Environmental Assessment documentation. The costs could be lower depending on the amount of work required by FS resource specialists or they could be much higher if highly sensitive resource issues surfaced during the analysis and an EIS was required.

This has been a short description of the options available. There are more detailed steps involved in each of the options. If you would like to discuss any or all of these options in more detail please let me know and I will get someone to help discuss them with you.

Sincerely,

Joe Bistryski

JOSEPH R. BISTRYSKI
District Ranger

cc: SO

UMC

UINTAH MOUNTAIN COPPER COMPANY
341 SOUTH MAIN STREET
SUITE 401
SALT LAKE CITY, UTAH 84111
(801) 530-1045 WWW.UINTAHRED.COM

June 3, 1999

Ashley National Forest
Duchesne Ranger District
P.O. Box 981
Duchesne, Utah 84021

Attn: Joseph R. Bistryski, District Ranger

Dear Joe:

Attached are the analyses and information requested in your letter of November 30, 1998. This should address the technical concerns of the Phase II test pit program brought up last fall during your visit to the Sunshine Quartz/Hematite Claims project. We did not receive this letter until late January of this year (even though it is dated last year). Because of the late delivery, we were not able until now to give this request the time it deserved for an extensive review. Other work scheduled for completion during spring had until now prevented us from spending the time needed in providing a quality response.

In summary, Richard Kennedy's questions caused us to perform more critical analyses of the Phase II test pit work. This has resulted in a somewhat smaller and reconfigured pit area that is significantly more stable and safe than originally designed. We thank Rich for his thoughtful question that prodded us to design a better reclamation project. The revised reclamation work is to be presented as part of a technical paper on gabion construction in difficult terrain at next week's 37th US Symposium on Rock Mechanics in Vail, Colorado. I will send you a pre-print of the paper as soon as the publisher provides extra copies.

We expect that your field work for the EA will begin as soon as the snowpack melts and the roadway can safely be used, hopefully sometime within the next 4 to 8 weeks. The passing of my father has required myself and the other officers of UMCC to take on additional responsibilities, but has not delayed us from continuing with the project. I will send you an update on the total project under a separate letter to assure you that we have made great progress and remain on schedule.

Please have you or your staff contact me if you have any questions. I will call you within the next few weeks to discuss the schedule of work to keep the project moving forward.

Sincerely,

Peter M. Kandaris, M.S., P.E.
Geotechnical Engineer
President, Uintah Mountain Copper Company

PMK/
Attachments (1 original + 2 copies)

Response to Forest Service Letter Dated 11/30/98
Slope Stability Analyses of Test Pit Phase II Work
UMCC Sunshine Quartz/Hematite Claims Project

Question No. 1: *"It the existing gabion retaining wall a safe platform from which to operate heavy equipment? The existing wall currently exhibits indications of overturning which may be due to the application of heavy equipment live loads during construction."*

Response:

The wall was originally designed as a three-tiered, stair-stepped vertical gabion structure. During placement of backfill, the top of the wall rotated from 0 to 2 feet off vertical alignment to the present observed state. As a test of live load stability, heavy equipment was placed above the wall and within 1 foot of the gabions immediately after backfill. No additional movement was observed. One year after installation, a CAT 312B excavator performed additional sample removal work within 3 feet of the wall. No movement was observed from this equipment activity.

Further analyses have been performed to verify that the wall is safety (results are attached). The wall was modeled in a worst-case configuration, assuming all tiers rested in a vertical alignment. Table 1.0 gives a summary of the analyses, including the original design case, the as-built (model) configuration and this same configuration with design equipment loads. Although stability is lower than originally anticipated, the wall still functions safely, meeting minimum standard industry safety factors for long-term and transient loadings.

Table 1.0 – Safety Factor Analyses Summary of Gabion Wall

Analysis Case	Factors of Safety			
	Sliding	Overturning	Slope Stability	Bearing
Design (no loads)	7.37	6.51	2.57	14.5
As –Built	5.20	3.12	2.72	7.40
As-Built w/loads	3.11	2.36	2.19	5.61

This construction and analysis information indicates that future gabion walls should be inclined into the hillside 10° to 15° from vertical to compensate for construction-related outward rotation from backfilling.

It should be understood that few pit activities will be performed from directly above this gabion wall structure since the ore body is near the bottom of the wall. The wall will only be used to support traffic passing beyond this point on the upper spur road to allow pit excavation at higher elevations (sequencing will be discussed later in this analyses) and for long-term slope stabilization (no equipment present).

Question No. 2: *"If the project is allowed to proceed as proposed, i.e. excavation by small hydraulic excavators from a work platform located on top of the existing gabion wall, is it feasible for equipment to safely reach and excavate the slope as planned? Equipment performance charts indicate a maximum reach for a small hydraulic excavator of around 30 feet. Will an operator be able to strip and slope unconsolidated material to the angle of repose or at least 10 feet from the top of the quarry wall for the proposed working platform."*

Because of Questions 2 and 3, a more critical engineering analysis was performed on the entire slope using variable soil and rock conditions. That analysis yielded a revised, smaller and more stable pit excavation configuration (this will be discuss in greater detail when responding to the next question). The embankment height was reduced and a 3-foot bench was included at the top of rock. Unconsolidated overburden was also laid back at a significantly flatter slope.

Figures A through D demonstrate the sequencing of excavation and backfill of the proposed sample pit (quarry is a bit of an overstatement of this operation). We agree that a typical small excavator (CAT 312 or 315) has a maximum reach of about 30 feet. Our plan is to limit the reach to 20 to 30 feet. By excavating only to the bottom of the drill-indicated ore body at this location, the maximum free-standing rock slope will be limited to 40 to 45 feet from top of slope to toe.

The existing upper spur road will be cleared of sloughed material to allow access to the top of the slope (Figure A). A small dozer will cut into the hillside at about Elev. 10260 to allow the excavator access to the top of the slope (maximum planned reach of 20-30 feet to the top of the cut at about Elev. 10290). Once the overburden at this elevation has been removed, work will begin near the intersection of the spur and service roads (Elev. 10245 to 10250) to remove any remaining overburden (Figure B). Underlying ore will then be removed by combined use of a small dozer, loader and excavator (not all at the same time).

The pit will be backfilled by following the process in reverse and using the adjacent spur road for access to the upper reaches of the cut (Figure C). Overburden will be placed behind the existing gabion to the base elevation of the next higher gabion system (Elev. 10252). Upon completion of the second wall system, overburden backfill will be placed from the spur road at Elev. 10262. The final upper gabion walls are significantly smaller and will require the use of the excavator to locate at Elev. 10262, lifting backfill and basket rock to higher levels (Figure D). Once all upper level work is complete, the existing lower gabion wall will be extended to the northwest, with final backfill placed from the service road by use of the excavator.

Question No. 3: *"How will the mine operator insure the safety of workers operating heavy equipment below a 50 foot high slope that is prone to raveling and rock spalling? What is the overall slope stability of this temporary construction slope, including the stability of the overburden and wet draw? Will the back slope be benched or scaled to assure stability and safe working conditions?."*

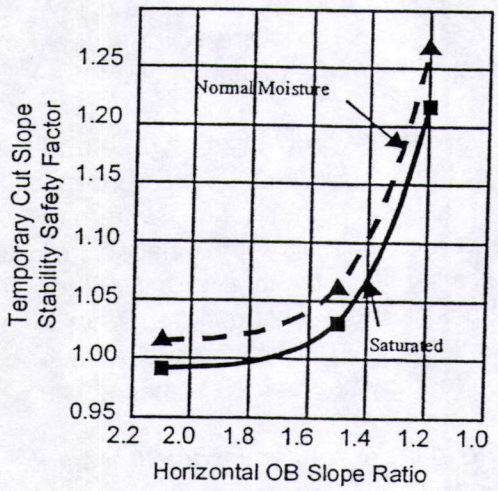
Per this analysis, the temporary embankment has been modified to provide a more stable and safe configuration. The pit depth has been decreased to allow for a bench at the top of the rock/soil interface. In addition, 12 to 15 feet of cut have been added to flatten the cut slope on the unconsolidated overburden at the top of the slope. Finally, by following the ore body and not overexcavating within the pit, the steep rock slope face will only be a maximum of 30 feet.

Drill logs show that the unconsolidated overburden ranges from 5 to 9 feet in thickness. Below this material is fractured rock that becomes significantly more competent with depth at 7 to 16 feet below the top of the cut. Rock below this depth is bedded into the hillside and does not daylight, allowing near vertical slopes (see previous correspondence on this issue from 1995). Minor rock raveling within the limestone strata are easily controlled by cutting the slope to the planned 5:1 slope (V:H). This is in agreement with most standard texts (Rodriguez, et al. note.

slopes cut in similar materials ranging from 4:1 to 8:1). Rock scaling with this new configuration is not anticipated.

The minimum acceptable temporary slope stability for a one to two week time frame is 1.1 (approximately the minimum existing natural slope stability value with the assumed soil and rock properties). The analysis shows cut embankment stabilities through the entire rock mass with 5:1 slopes are at least 1.28 (saturated) and 1.31 (normal moisture). When evaluating only the fracture rock zone, localized slope stabilities remains acceptable at 1.28 (saturated) and 1.33 (normal moisture.

Previous analysis and work at this site indicates that the overburden zone is stable at about a 1.5:1 to 1.2:1 slope (H:V) for temporary cuts. Figure 1.0 provides a summary of new slope stability computer runs for the steepest and highest slope within the Phase II test pit (assumes the maximum/worst case unconsolidated fill and highly fractured rock depths found at this site, 9 and 7 feet, respectively). Analysis summaries and assumed slope material properties are attached.



A slope stability of 1.10 to 1.20 for the unconsolidated upper overburden is adequate for short-term cuts (less than 2 weeks), especially in areas where only cab-enclosed heavy equipment will be allowed. Any loss of material will derived from the unconsolidated overburden at the top of the cut that may erode during rainstorms. The 3-foot bench cut at the top of the fracture rock zone will capture these loose material.

In addition to these questions, the following information was requested:

1. *A stability analysis and design of 'temporary' 50 ft. high construction slope, including the unconsolidated overburden and 'wet' area;*
2. *An analysis of the gabion retaining walls including heavy equipment live loading;*
3. *An analysis of the overall slope stability following construction of the proposed gabion wall slope;*
4. *An analysis of the proposed operation in relation to safety and feasibility of construction methods and phasing of operations.*

Response:

All items listed, except for No. 3, have been provided in the previous discussion and analyses are attached.

In terms of Item No. 3, overall slope stability analyses before and after pit excavation and reclamation are included in the attachments. In summary, the existing undisturbed slope has a stability safety factor of 2.33 for deep-seated failure and 1.11 for localized surface failure of saturated unconsolidated overburden. Upon completion of all gabion walls, the disturbed embankment overall and local safety factors are both on the order of 1.5. Because of this analysis, the gabion base design for the upper levels was modified to improve overall stability of the embankment from failure.

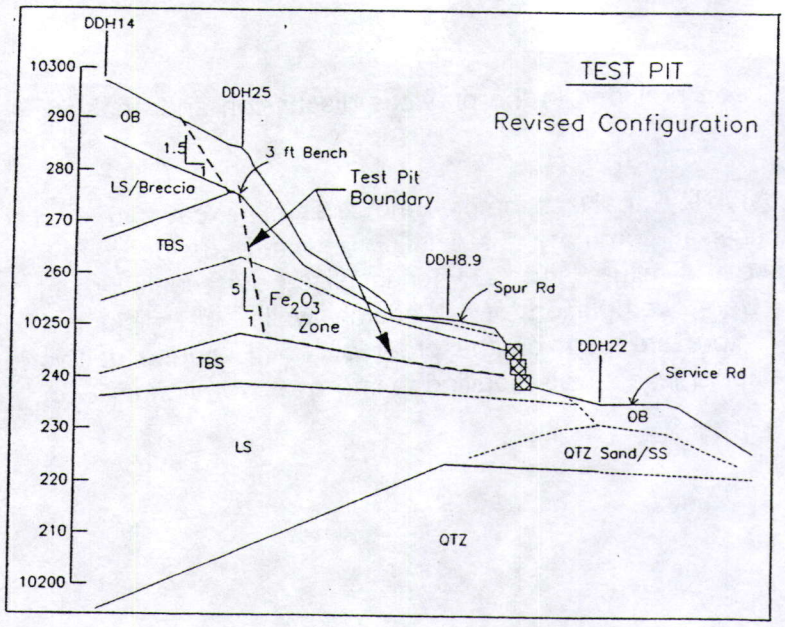
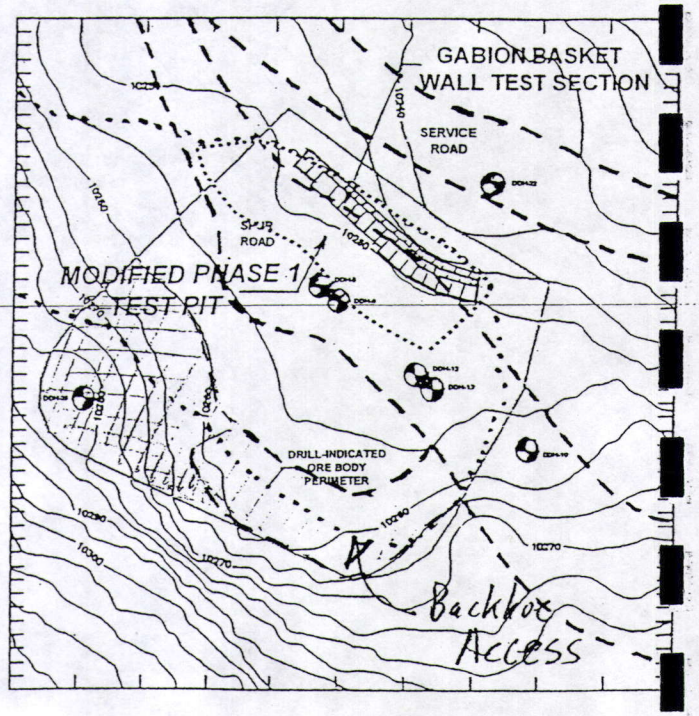
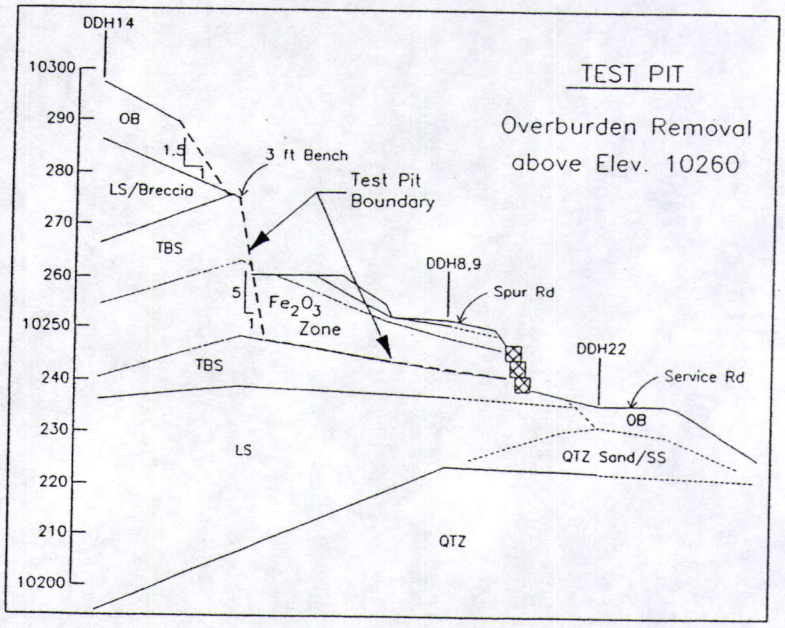


Figure A

Revised Test Pit Configuration
Staged Excavation
Overburden Removal





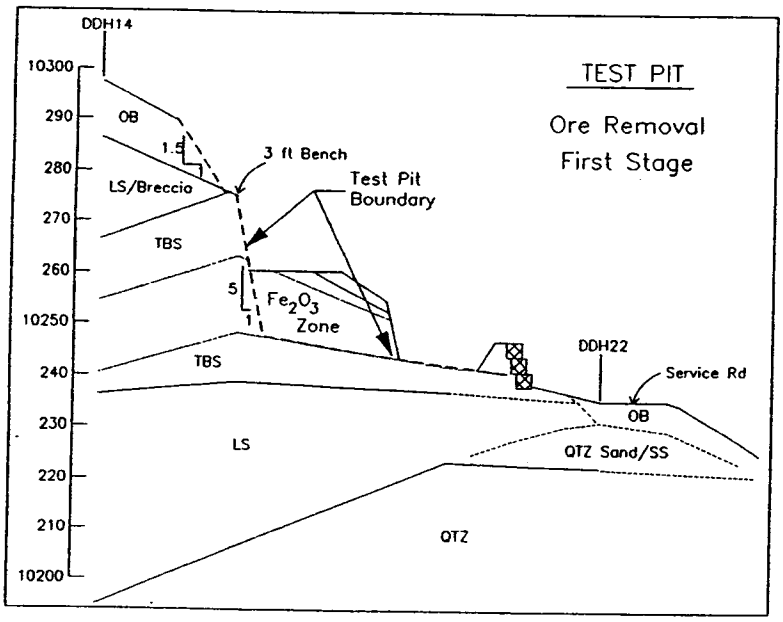
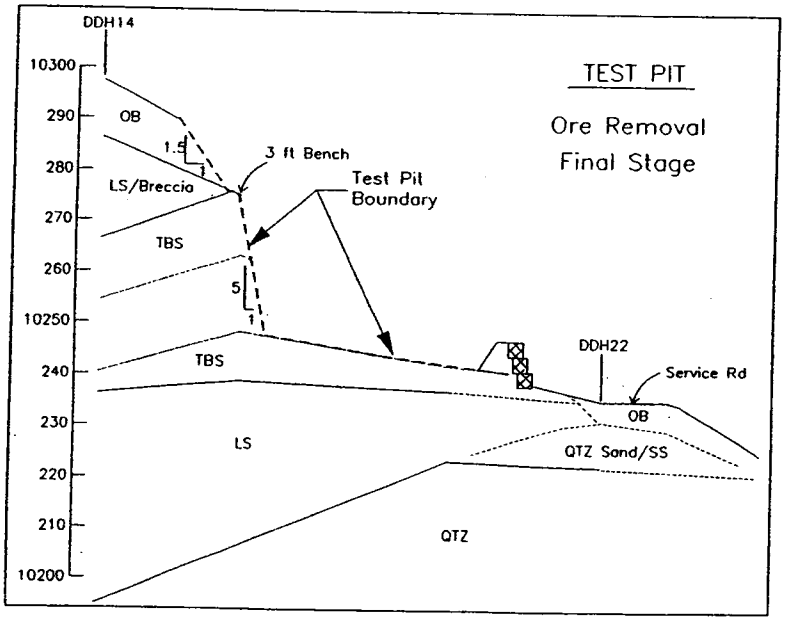


Figure B

Revised Test Pit Configuration
Staged Excavation
Ore Removal



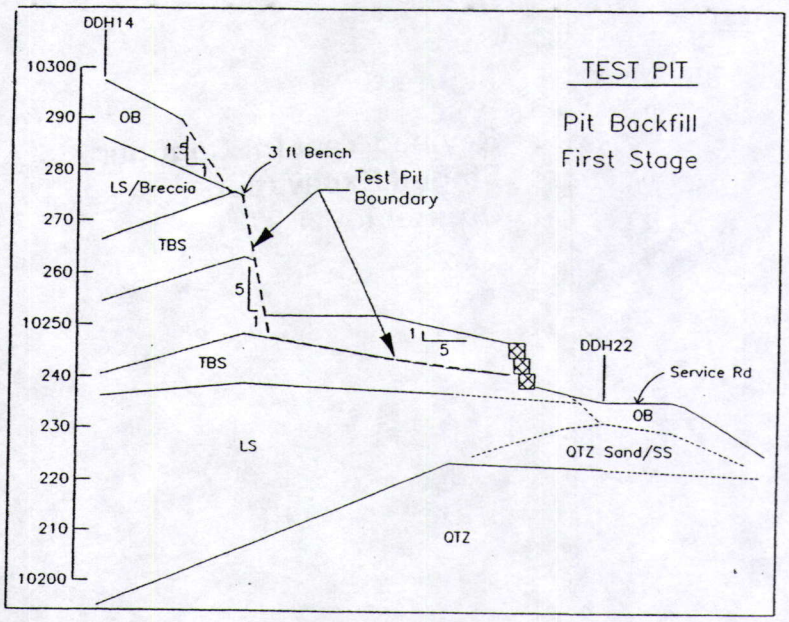
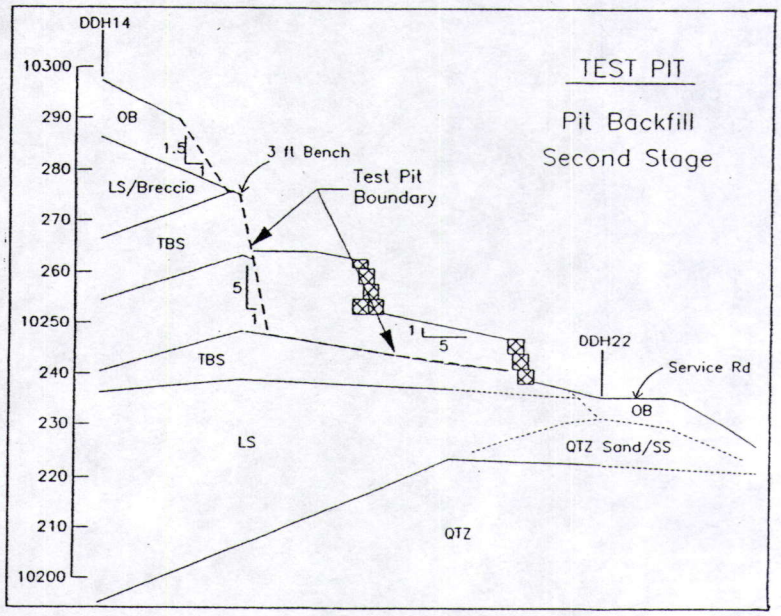
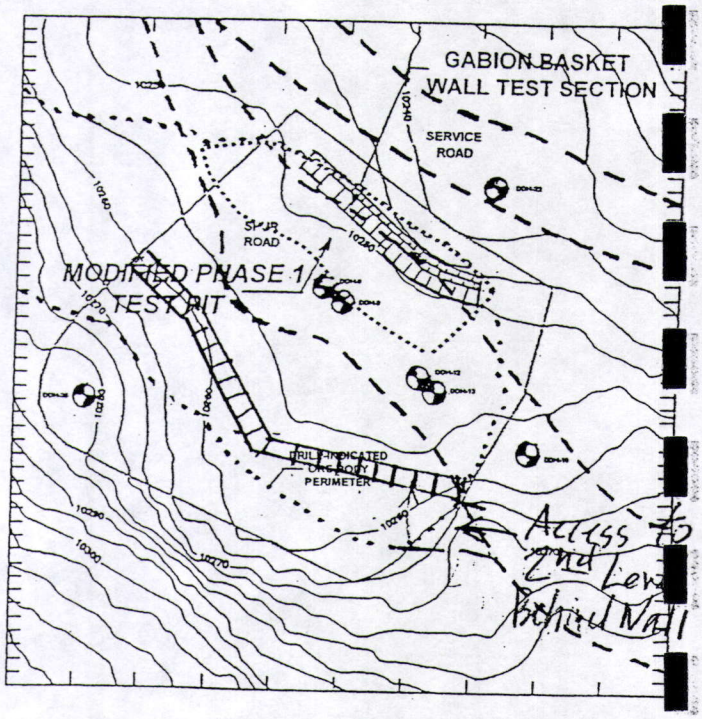


Figure C

Revised Test Pit Configuration
Staged Backfill Work
Lower Gabions





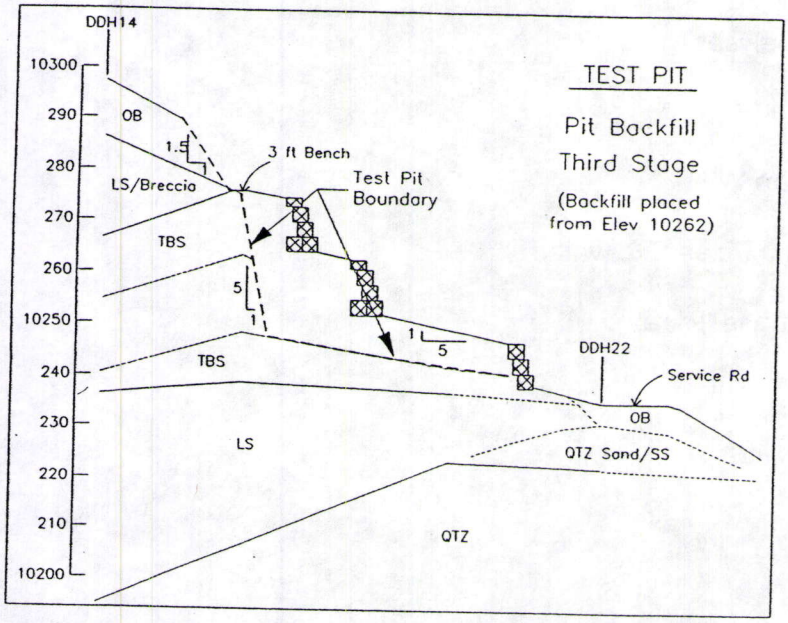
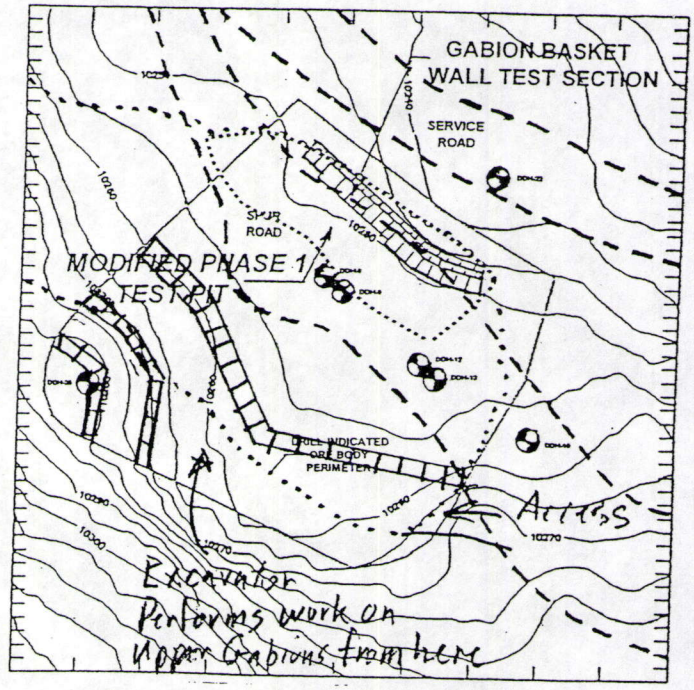
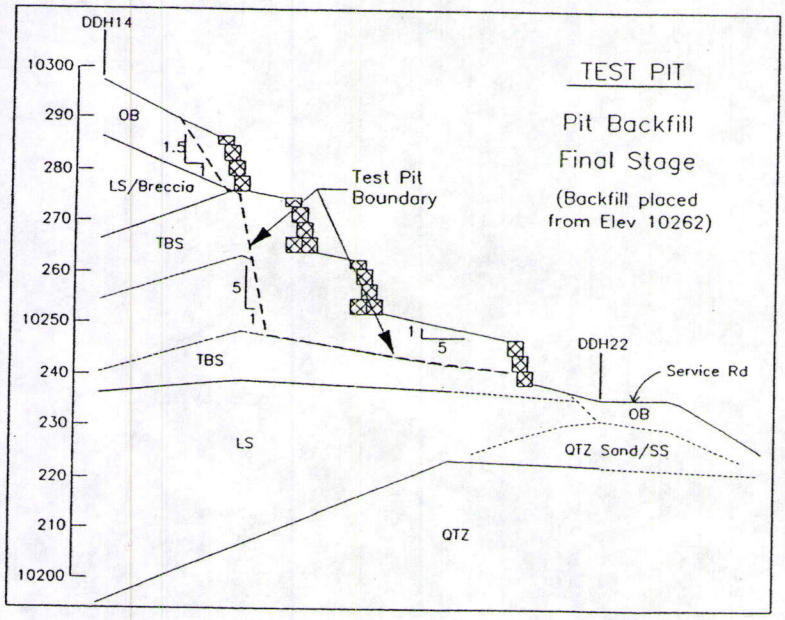


Figure D

Revised Test Pit Configuration
Staged Backfill Work
Upper Gabions





Calculation Summaries

A. Rock & Soil Properties Used in Analyses

B. Analysis Methods

C. Stability Analysis of Existing Gabion Wall

D. Slope Stability Analyses of Phase II Pit as Excavated

E. Stability Analyses of Reclaimed Phase II Area

A. Rock & Soil Properties Used in Analyses

Existing Slope

Layer	Normal Unit Wt (pcf)	Sat Unit Wt (pcf)	Effective Friction Angle (degree)	Effective Cohesion (psf)
1. Unconsolidated Overburden	125	135	35	100
2. Fractured Rock (recovery < 80%)	130	135	40	500
3. Competent Rock (recovery > 80%)	150	155	45	1000

Backfill (consisting of a mix of overburden soils and fractured rock), layer 4

Normal Unit Wt (pcf)	Sat Unit Wt (pcf)	Effective Friction Angle (degree)	Effective Cohesion (psf)
125	135	40	10

Gabion Rock Fill

Normal Unit Wt (pcf)	Sat Unit Wt (pcf)	Effective Friction Angle (degree)	Effective Cohesion (psf)	Porosity (%)
160	160	45	0	15

B. Analysis Methods

Gabion Analysis: Maccaferri Gabions Computer program, GAWAC BR02 for design of gabion wall structures.

Slope Stability Analysis: GEOSLOPE Computer program, Version 4.20, by GEOCOMP Corp. GEOSLOPE is based on the program, STABL3, developed at Purdue University under sponsorship of the Federal Highway Administration. Simplified Janbu method of slices with irregular failure surfaces.

Stability Analysis of Existing Gabion Wall

Gabion Walls calculation - GAWAC BR02
MACCAFERRI GABIONS INC. - SACRAMENTO (CA)

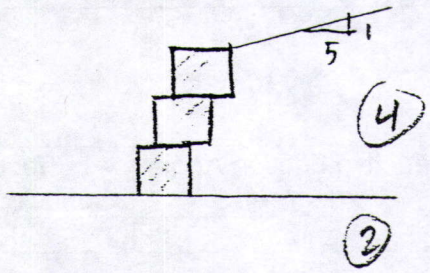
File: UMCC1 Project : Original Gabion Design

****
DATA INPUT PAGE 1
****

WALL DATA

Wall batter [deg].....: 0.00
Rockfill unit weight [lb/ft3].:160.00
Porosity of gabions.....: 0.15
Geotextile in backfill.....: No
Friction reduction [%].....:
Geotextile under the base.....: No
Friction reduction [%].....:

Layer	Length [ft]	Height [ft]	Init. [ft]
1	3.00	3.00	
2	3.00	3.00	1.00
3	3.00	3.00	2.00



GEOMETRICAL PARAMETERS OF BACKFILL
Inclination of the first stretch [deg].....: 11.30
Length of the stretch [ft].....: 20.00
Inclination of the second stretch [deg].....:

BACKFILL SOIL DATA
Unit weight of soil [lb/ft3].....:125.00
Friction angle [deg].....: 40.00
Cohesion [lb/ft2].....: 10.00

BACKFILL SOIL ADDITIONAL DATA

Layer	Initial Height [ft]	Inclin. angle [deg]	Unit weight [lb/ft3]	Cohesion [lb/ft2]	Frict. angle [deg]

Gabion Walls calculation - GAWAC BR02
MACCAFERRI GABIONS INC. - SACRAMENTO (CA)

File: UMCC1 . Project : Original Gabion Design

****
DATA INPUT PAGE 2
****

DATA ABOUT THE UPHILL WATER SURFACE
Initial height [ft].....:
Inclination of the first stretch [deg].....:
Length of the stretch [ft].....:
Inclination of the second stretch [deg].....:
Length of the stretch [ft].....:

GEOMETRICAL DATA ABOUT FOUNDATION SOIL
Elev. of placing from the base [ft].....: 0.00
Soil inclination ref.to base [deg].....: 0.00

DATAI ABOUT FOUNDATION SOIL
Unit weight of soil [lb/ft3].....:130.00
Friction angle [deg].....: 40.00
Cohesion [lb/ft2].....:500.00
Allowable stress on foundation [lb/ft2].....:
Water level [ft].....:

DATA ABOUT ADDITIONAL FOUNDATION SOILS

Layer	Depth [ft]	Unit weight [lb/ft3]	Cohesion [lb/ft2]	Frict.angle [deg]

DATA ABOUT DISTRIBUTED LOADS

Distributed loads on backfill
First stretch [lb/ft2]...: Second stretch [lb/ft2]..:
Distr. loads on the wall
Surcharge load [lb/ft2]..:

Point loads on the backfill
1.Load [lb/ft].....: Dist. from wall top [ft].:
2.Load [lb/ft].....: Dist. from wall top [ft].:
3.Load [lb/ft].....: Dist. from wall top [ft].:
Point loads on the wall
Surcharge load [lb/ft2]..: Dist. from wall top [ft].:

DATA ABOUT SEISMIC ACTIONS
Horizontal coefficient...: Vertical coefficient.....:

Gabion Walls calculation - GAWAC BR02
MACCAFERRI GABIONS INC. - SACRAMENTO (CA)

File: UMCC1 Project : Original Gabion Design

****
RESULTS PAGE 3
****

EXTERNAL STABILITY

Active thrust [lb/ft].....: 623.16
Point of application ref. to X axis [ft].....: 3.62
Point of application ref. to Y axis [ft].....: 2.78
Direction of thrust ref. to X axis [deg].....: 27.47

Passive thrust [lb/ft].....: 0.00
Point of application ref. to X axis [ft].....: 0.00
Point of application ref. to Y axis [ft].....: 0.00
Direction of thrust ref. to X axis [deg].....: 0.00

SLIDING

Normal force on the base [lb/ft].....: 3959.46
Point of application ref. to X axis [ft].....: 2.14
Point of application ref. to Y axis [ft].....: 0.00
Shear force on the base [lb/ft].....: 552.89
Resisting force on the base [lb/ft].....: 4072.39

Safety coefficient.....: 7.366 >2.0 OK

OVERTURNING

Overturning moment [lbft/ft].....: 1539.52
Restoring moment [lbft/ft].....:10016.27

Safety coefficient.....: 6.506 >2.0 OK

STRESSES ACTING ON FOUNDATION

Stress on outer foundation border [lb/ft2]....: 1232.97
Stress on inner foundation border [lb/ft2]....: 0.00
Max. allow. stress on the foundation [lb/ft2].:17920.26
Notice: the base is partialized!

FS = 14.5 ✓

Gabion Walls calculation - GAWAC BR02
MACCAFERRI GABIONS INC. - SACRAMENTO (CA)

File: UMCC1 Project : Original Gabion Design

****
RESULTS

****

OVERALL STABILITY

Initial distance at pivot leftside [ft].....:	
Initial distance at pivot rightside [ft].....:	
Initial depth referred to base [ft].....:	
Max. depth allowed in the calculation [ft]....:	
Center of the arc referred to X axis [ft].....:	0.75
Center of the arc referred to Y axis [ft].....:	19.10
Radius of the arc [ft].....:	19.23
Number of search surfaces .....:	51
Safety coefficient.....:	2.565 > 1,5 OK

INTERNAL STABILITY

Layer	H [ft]	N [lb/ft]	T [lb/ft]	M [lbft/ft]	tmax [lb/ft2]	tad [lb/ft2]	smax [lb/ft2]
1	6.00	2602.99	262.72	4864.62	87.57	1394.31	696.41
2	3.00	1292.95	82.17	1970.91	27.39	965.75	424.10

Allowable normal pressure [lb/ft2].....:16165.52

****

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****

Gabion Walls calculation - GAWAC BR02
MACCAFERRI GABIONS INC. - SACRAMENTO (CA)

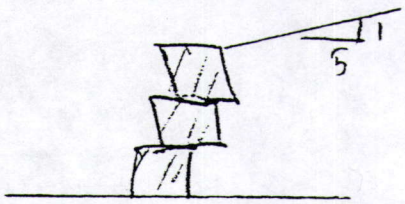
File: UMCC1A Project : Loads on existing gabions

****
DATA INPUT PAGE 1
****

WALL DATA

Wall batter [deg].....: 0.00
Rockfill unit weight [lb/ft3].:160.00
Porosity of gabions.....: 0.15
Geotextile in backfill.....: No
Friction reduction [%].....:
Geotextile under the base.....: No
Friction reduction [%].....:

Layer	Length [ft]	Height [ft]	Init. [ft]
1	3.00	3.00	
2	3.00	3.00	0.00
3	3.00	3.00	0.00



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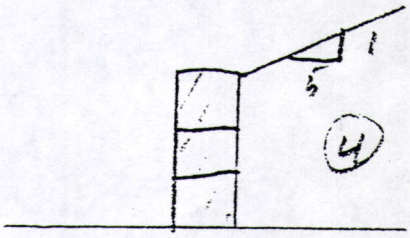

model 2

GEOMETRICAL PARAMETERS OF BACKFILL
Inclination of the first stretch [deg].....: 11.30
Length of the stretch [ft].....: 20.00
Inclination of the second stretch [deg].....:

BACKFILL SOIL DATA
Unit weight of soil [lb/ft3].....:125.00
Friction angle [deg].....: 40.00
Cohesion [lb/ft2].....: 10.00

BACKFILL SOIL ADDITIONAL DATA

Layer	Initial Height [ft]	Inclin. angle [deg]	Unit weight [lb/ft3]	Cohesion [lb/ft2]	Frict. angle [deg]

Gabion Walls calculation - GAWAC BR02
MACCAFERRI GABIONS INC. - SACRAMENTO (CA)

File: UMCC1A Project : Loads on existing gabions

****
DATA INPUT PAGE 2
****

DATA ABOUT THE UPHILL WATER SURFACE
Initial height [ft].....:
Inclination of the first stretch [deg].....:
Length of the stretch [ft].....:
Inclination of the second stretch [deg].....:
Length of the stretch [ft].....:

GEOMETRICAL DATA ABOUT FOUNDATION SOIL
Elev. of placing from the base [ft].....: 0.00
Soil inclination ref.to base [deg].....: 0.00

DATAI ABOUT FOUNDATION SOIL
Unit weight of soil [lb/ft3].....:130.00
Friction angle [deg].....: 40.00
Cohesion [lb/ft2].....:500.00
Allowable stress on foundation [lb/ft2].....:
Water level [ft].....:

DATA ABOUT ADDITIONAL FOUNDATION SOILS

Layer	Depth [ft]	Unit weight [lb/ft3]	Cohesion [lb/ft2]	Frict.angle [deg]

DATA ABOUT DISTRIBUTED LOADS

Distributed loads on backfill
First stretch [lb/ft2]...: Second stretch [lb/ft2]..:
Distr. loads on the wall
Surcharge load [lb/ft2]..:

Point loads on the backfill
1.Load [lb/ft].....: Dist. from wall top [ft].: 0.00
2.Load [lb/ft].....: Dist. from wall top [ft].:
3.Load [lb/ft].....: 0.00 Dist. from wall top [ft].:
Point loads on the wall
Surcharge load [lb/ft2]..: Dist. from wall top [ft].:

DATA ABOUT SEISMIC ACTIONS
Horizontal coefficient...: Vertical coefficient.....:

Gabion Walls calculation - GAWAC BR02
MACCAFERRI GABIONS INC. - SACRAMENTO (CA)

File: UMCC1A Project : Loads on existing gabions

****
RESULTS PAGE 3
****

EXTERNAL STABILITY

Active thrust [lb/ft].....: 1112.96
Point of application ref. to X axis [ft].....: 3.00
Point of application ref. to Y axis [ft].....: 2.88
Direction of thrust ref. to X axis [deg].....: 40.00

Passive thrust [lb/ft].....: 0.00
Point of application ref. to X axis [ft].....: 0.00
Point of application ref. to Y axis [ft].....: 0.00
Direction of thrust ref. to X axis [deg].....: 0.00

SLIDING

Normal force on the base [lb/ft].....: 4387.40
Point of application ref. to X axis [ft].....: 1.19
Point of application ref. to Y axis [ft].....: 0.00
Shear force on the base [lb/ft].....: 852.58
Resisting force on the base [lb/ft].....: 4431.46

Safety coefficient.....: 5.198 > 2.0 ok

OVERTURNING

Overturning moment [lbft/ft].....: 2451.18
Restoring moment [lbft/ft].....: 7654.20

Safety coefficient.....: 3.123 > 2.0 ok

STRESSES ACTING ON FOUNDATION

Stress on outer foundation border [lb/ft2]....: 2381.18 ✓
Stress on inner foundation border [lb/ft2]....: 543.75 ✓
Max. allow. stress on the foundation [lb/ft2].:17609.30 ✓

Gabion Walls calculation - GAWAC BR02
MACCAFERRI GABIONS INC. - SACRAMENTO (CA)

File: UMCC1A Project : Loads on existing gabions

****
RESULTS PAGE 4
****

OVERALL STABILITY

Initial distance at pivot leftside [ft].....	
Initial distance at pivot rightside [ft].....	
Initial depth referred to base [ft].....	
Max. depth allowed in the calculation [ft]....	
Center of the arc referred to X axis [ft].....	0.75
Center of the arc referred to Y axis [ft].....	16.24
Radius of the arc [ft].....	16.39
Number of search surfaces	63
Safety coefficient.....	2.720 >1.5 OK

INTERNAL STABILITY

Layer	H [ft]	N [lb/ft]	T [lb/ft]	M [lbft/ft]	tmax [lb/ft2]	tad [lb/ft2]	smax [lb/ft2]
1	6.00	2753.44	364.01	3906.79	121.34	1443.53	970.29
2	3.00	1292.95	82.17	1970.91	27.39	965.75	424.10

Allowable normal pressure [lb/ft2].....:16165.52

****

NOTICE

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Gabion Walls calculation - GAWAC BR02
MACCAFERRI GABIONS INC. - SACRAMENTO (CA)

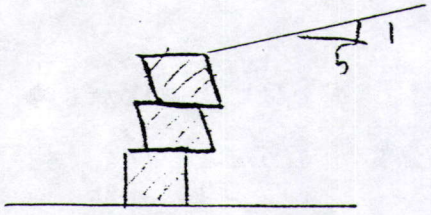
File: UMCC1A Project : Loads on existing gabions

****
DATA INPUT PAGE 1
****

WALL DATA

Wall batter [deg].....: 0.00
Rockfill unit weight [lb/ft3].:160.00
Porosity of gabions.....: 0.15
Geotextile in backfill.....: No
Friction reduction [%].....:
Geotextile under the base.....: No
Friction reduction [%].....:

Layer	Length [ft]	Height [ft]	Init. [ft]
1	3.00	3.00	
2	3.00	3.00	0.00
3	3.00	3.00	0.00



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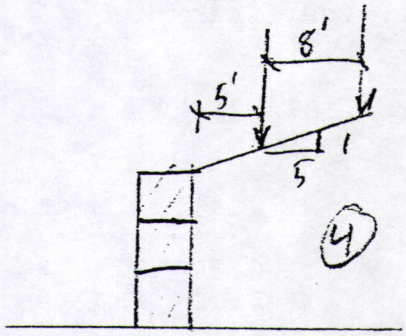

model 2

GEOMETRICAL PARAMETERS OF BACKFILL
Inclination of the first stretch [deg].....: 11.30
Length of the stretch [ft].....: 20.00
Inclination of the second stretch [deg].....:

BACKFILL SOIL DATA
Unit weight of soil [lb/ft3].....:125.00
Friction angle [deg].....: 40.00
Cohesion [lb/ft2].....: 10.00

BACKFILL SOIL ADDITIONAL DATA

Layer	Initial Height [ft]	Inclin. angle [deg]	Unit weight [lb/ft3]	Cohesion [lb/ft2]	Frict. angle [deg]

Gabion Walls calculation - GAWAC BR02
MACCAFERRI GABIONS INC. - SACRAMENTO (CA)

File: UMCC1A Project : Loads on existing gabions

****
DATA INPUT PAGE 2
****

DATA ABOUT THE UPHILL WATER SURFACE
Initial height [ft].....:
Inclination of the first stretch [deg].....:
Length of the stretch [ft].....:
Inclination of the second stretch [deg].....:
Length of the stretch [ft].....:

GEOMETRICAL DATA ABOUT FOUNDATION SOIL
Elev. of placing from the base [ft].....: 0.00
Soil inclination ref.to base [deg].....: 0.00

DATAI ABOUT FOUNDATION SOIL
Unit weight of soil [lb/ft3].....:130.00
Friction angle [deg].....: 40.00
Cohesion [lb/ft2].....:500.00
Allowable stress on foundation [lb/ft2].....:
Water level [ft].....:

DATA ABOUT ADDITIONAL FOUNDATION SOILS

Layer	Depth [ft]	Unit weight [lb/ft3]	Cohesion [lb/ft2]	Frict.angle [deg]

DATA ABOUT DISTRIBUTED LOADS

Distributed loads on backfill
First stretch [lb/ft2]...: Second stretch [lb/ft2]..:
Distr. loads on the wall
Surcharge load [lb/ft2]..:

Point loads on the backfill
1.Load [lb/ft].....:2500.00 Dist. from wall top [ft].: 5.00
2.Load [lb/ft].....:2500.00 Dist. from wall top [ft].: 13.00
3.Load [lb/ft].....: Dist. from wall top [ft].:
Point loads on the wall
Surcharge load [lb/ft2]..: Dist. from wall top [ft].:

DATA ABOUT SEISMIC ACTIONS
Horizontal coefficient...: Vertical coefficient.....:

Gabion Walls calculation - GAWAC BR02
MACCAFERRI GABIONS INC. - SACRAMENTO (CA)

File: UMCC1A Project : Loads on existing gabions

****
RESULTS PAGE 3
****

EXTERNAL STABILITY

Active thrust [lb/ft].....: 2077.83
Point of application ref. to X axis [ft].....: 3.00
Point of application ref. to Y axis [ft].....: 2.53
Direction of thrust ref. to X axis [deg].....: 40.00

Passive thrust [lb/ft].....: 0.00
Point of application ref. to X axis [ft].....: 0.00
Point of application ref. to Y axis [ft].....: 0.00
Direction of thrust ref. to X axis [deg].....: 0.00

SLIDING

Normal force on the base [lb/ft].....: 5007.60
Point of application ref. to X axis [ft].....: 1.10
Point of application ref. to Y axis [ft].....: 0.00
Shear force on the base [lb/ft].....: 1591.71
Resisting force on the base [lb/ft].....: 4951.88

Safety coefficient.....: 3.111 >2.0

OVERTURNING

Overturning moment [lbft/ft].....: 4031.29
Restoring moment [lbft/ft].....: 9514.81

Safety coefficient.....: 2.360 >2.0

STRESSES ACTING ON FOUNDATION

Stress on outer foundation border [lb/ft2]....: 3021.13 ✓
Stress on inner foundation border [lb/ft2]....: 317.28
Max. allow. stress on the foundation [lb/ft2].:16941.01 ✓

Gabion Walls calculation - GAWAC BR02
MACCAFERRI GABIONS INC. - SACRAMENTO (CA)

File: UMCC1A Project : Loads on existing gabions

****
RESULTS PAGE 4
****

OVERALL STABILITY

Initial distance at pivot leftside [ft].....:	
Initial distance at pivot rightside [ft].....:	
Initial depth referred to base [ft].....:	
Max. depth allowed in the calculation [ft]....:	
Center of the arc referred to X axis [ft].....:	0.69
Center of the arc referred to Y axis [ft].....:	16.33
Radius of the arc [ft].....:	16.52
Number of search surfaces .....:	96
Safety coefficient.....:	2.193

> 1.5 ok

INTERNAL STABILITY

Layer	H [ft]	N [lb/ft]	T [lb/ft]	M [lbft/ft]	tmax [lb/ft2]	tad [lb/ft2]	smax [lb/ft2]
1	6.00	3134.21	817.80	5061.70	272.60	1568.10	970.36
2	3.00	1292.95	82.17	1970.91	27.39	965.75	424.10

Allowable normal pressure [lb/ft2].....:16165.52

****

NOTICE

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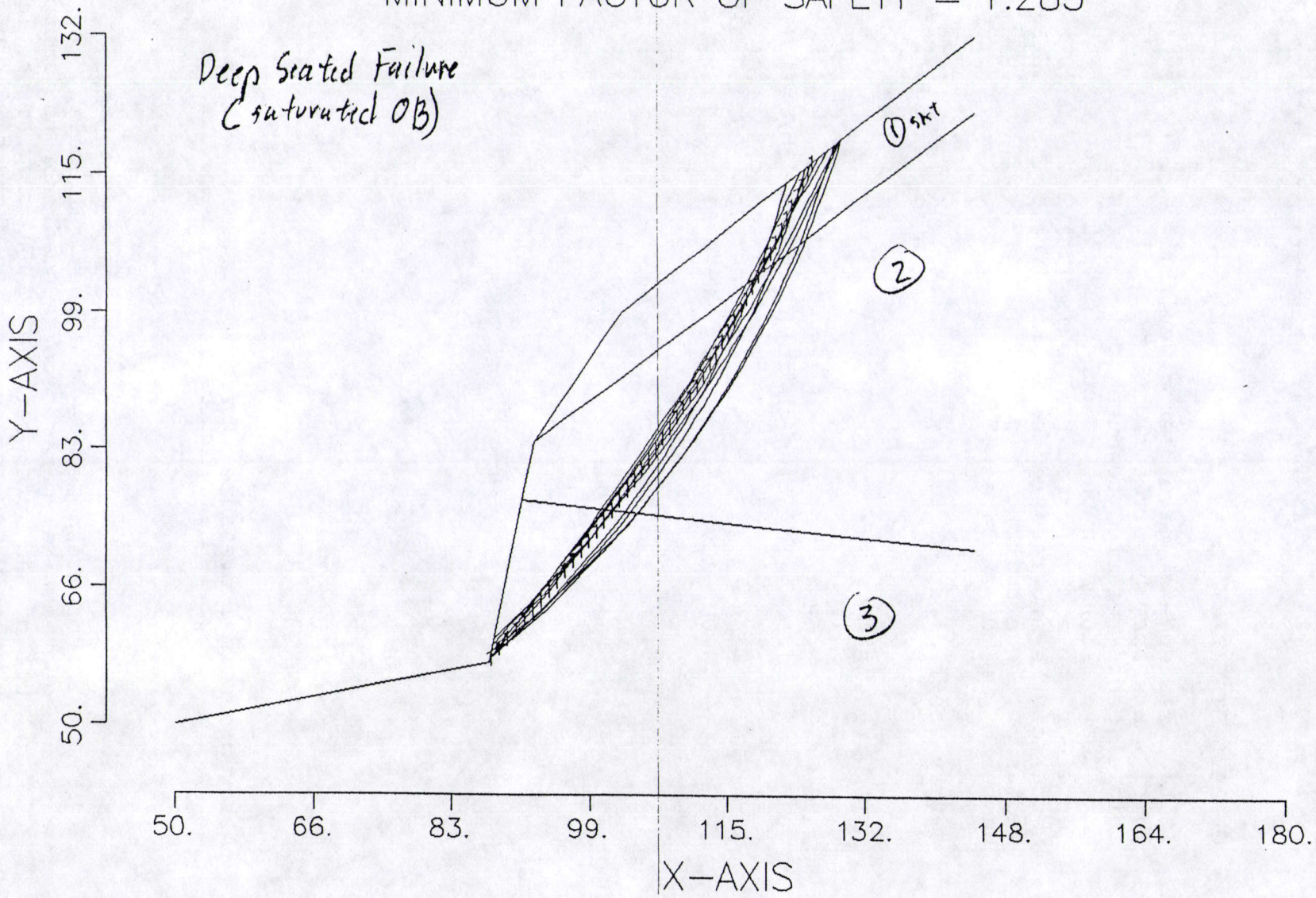
Sc. River Project
Tempe, Arizona 85281

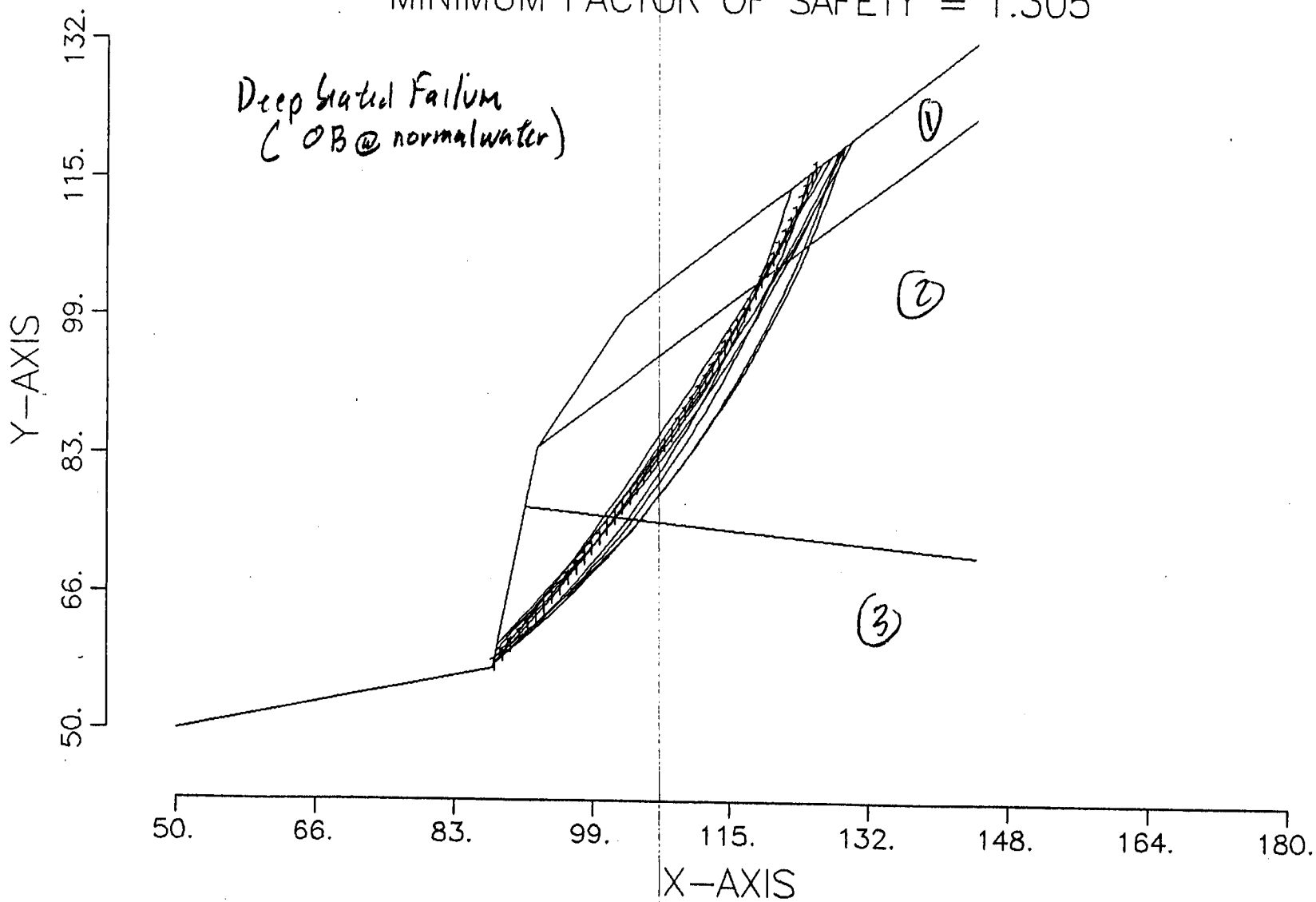
UMCC – HEMATITE/SUNSHINE CLAIMS – CUT SL
OPE FOR PIT
100 SURFACES HAVE BEEN GENERATED
10 MOST CRITICAL OF SURFACES GENERATED
MINIMUM FACTOR OF SAFETY = 1.283



D. Slope Stability Analyses of Phase II Pit - As Excavated

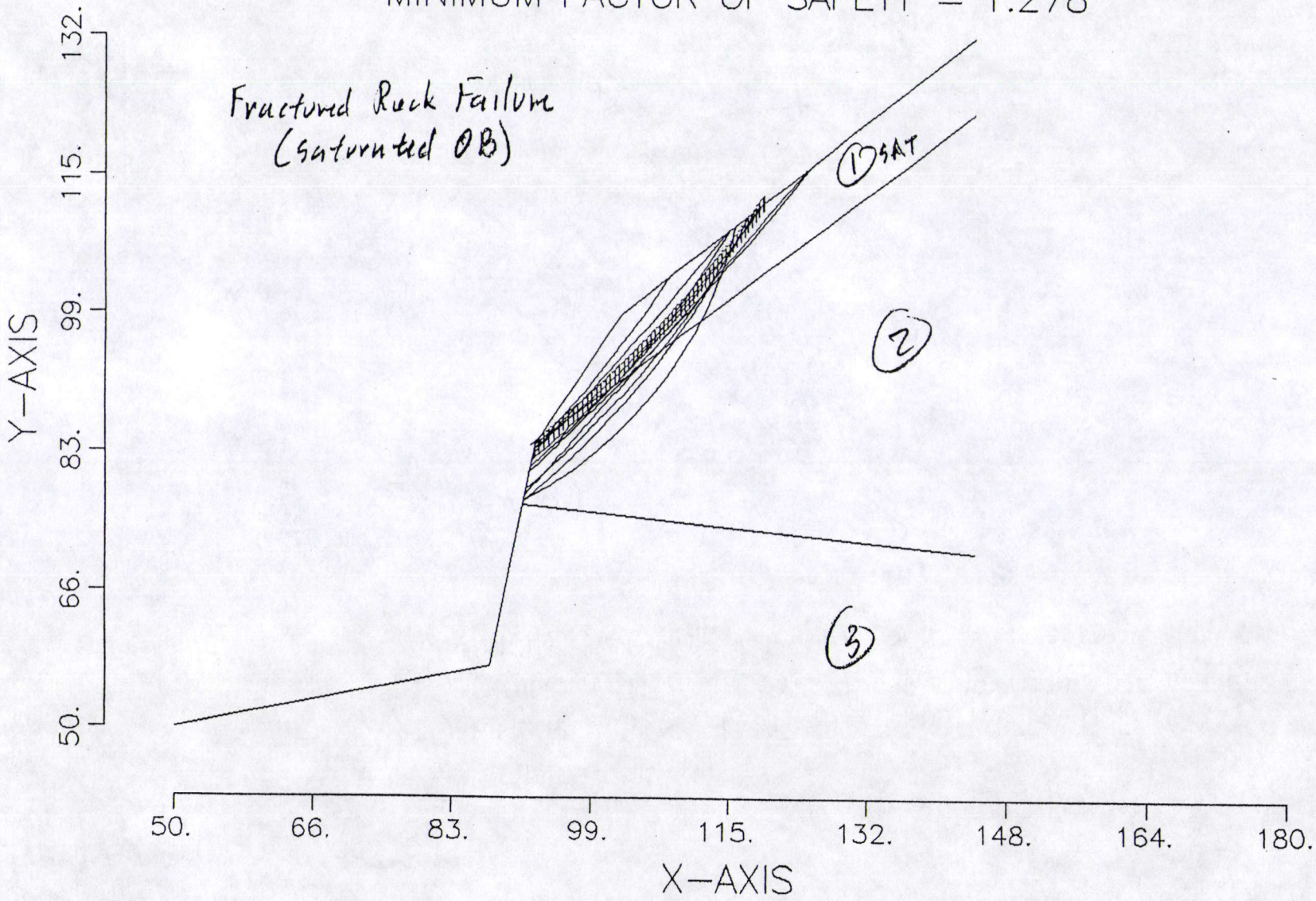
Sc River Project
Tempe, Arizona 85281

UMCC – HEMATITE/SUNSHINE CLAIMS – CUT SL
OPE FOR PIT
100 SURFACES HAVE BEEN GENERATED
10 MOST CRITICAL OF SURFACES GENERATED
MINIMUM FACTOR OF SAFETY = 1.305



Sc River Project
Tempe, Arizona 85281

UMCC – HEMATITE/SUNSHINE CLAIMS – CUT SL
OPE FOR PIT
100 SURFACES HAVE BEEN GENERATED
10 MOST CRITICAL OF SURFACES GENERATED
MINIMUM FACTOR OF SAFETY = 1.278



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Tempe, Arizona 85281

UMCC – HEMATITE/SUNSHINE CLAIMS – CUT SL
OPE FOR PIT
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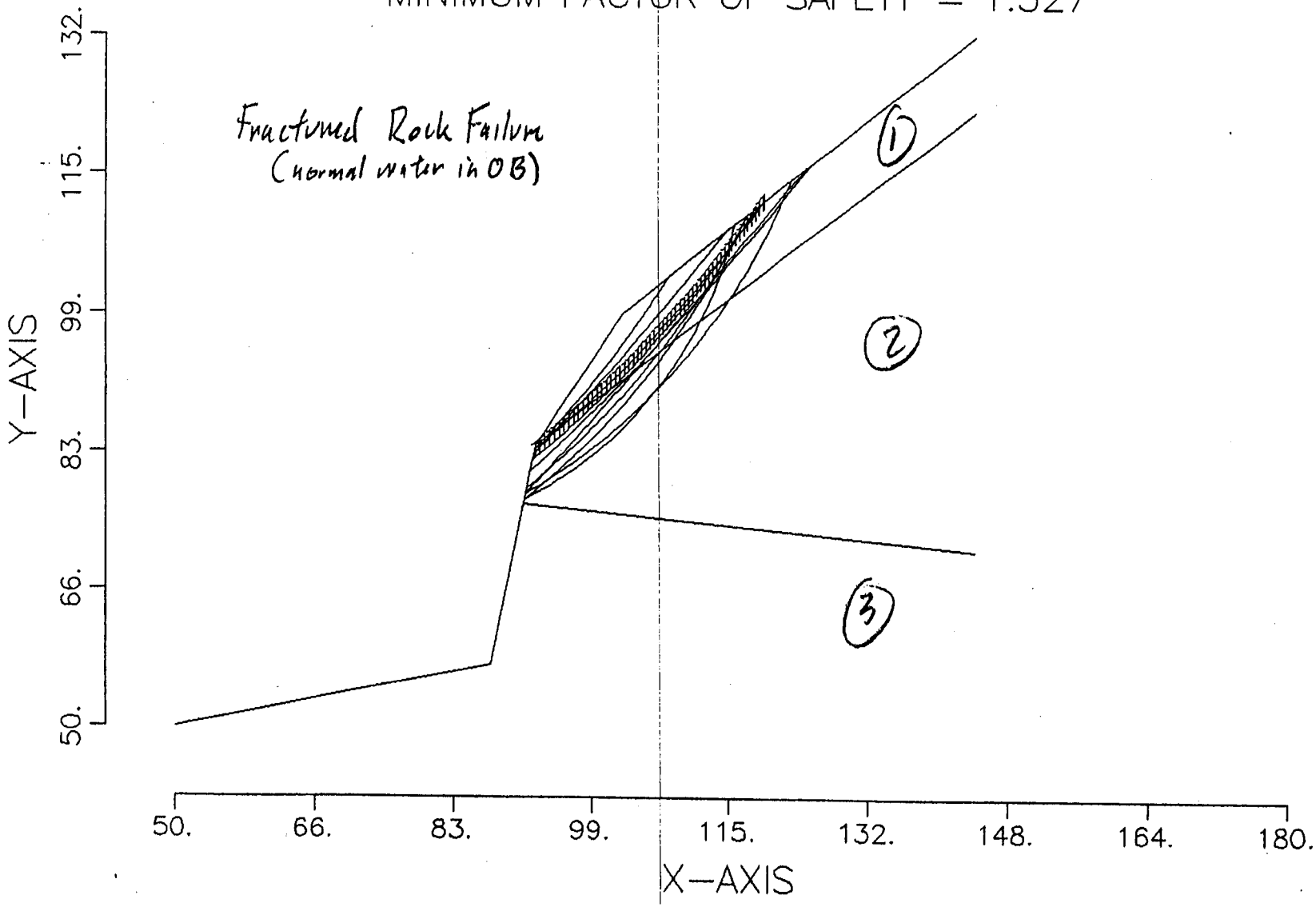
MINIMUM FACTOR OF SAFETY = 1.327



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UMCC – HEMATITE/SUNSHINE CLAIMS – CUT SL
OPE FOR PIT
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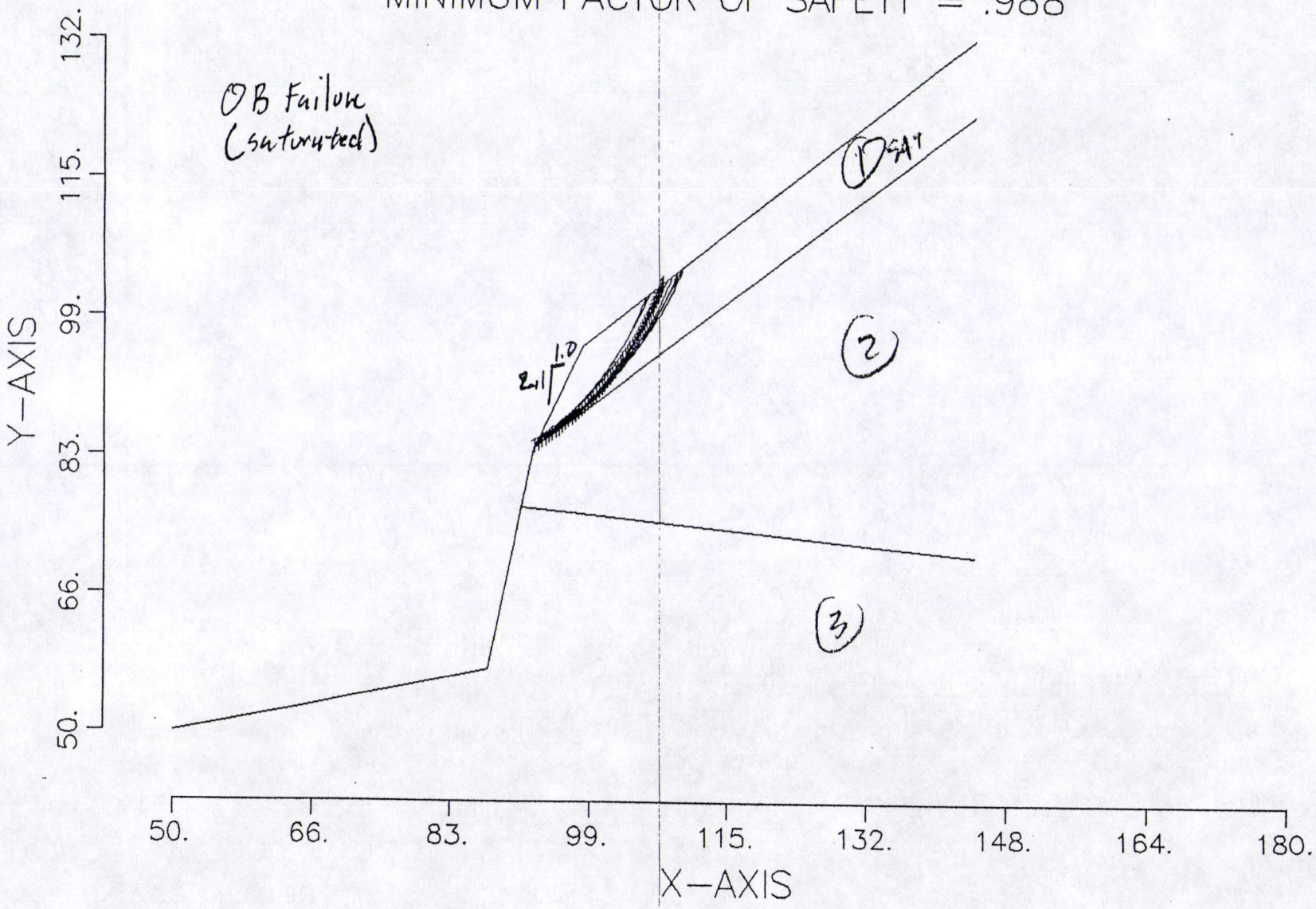

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UMCC – HEMATITE/SUNSHINE CLAIMS – CUT SL
OPE FOR PIT
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10 MOST CRITICAL OF SURFACES GENERATED
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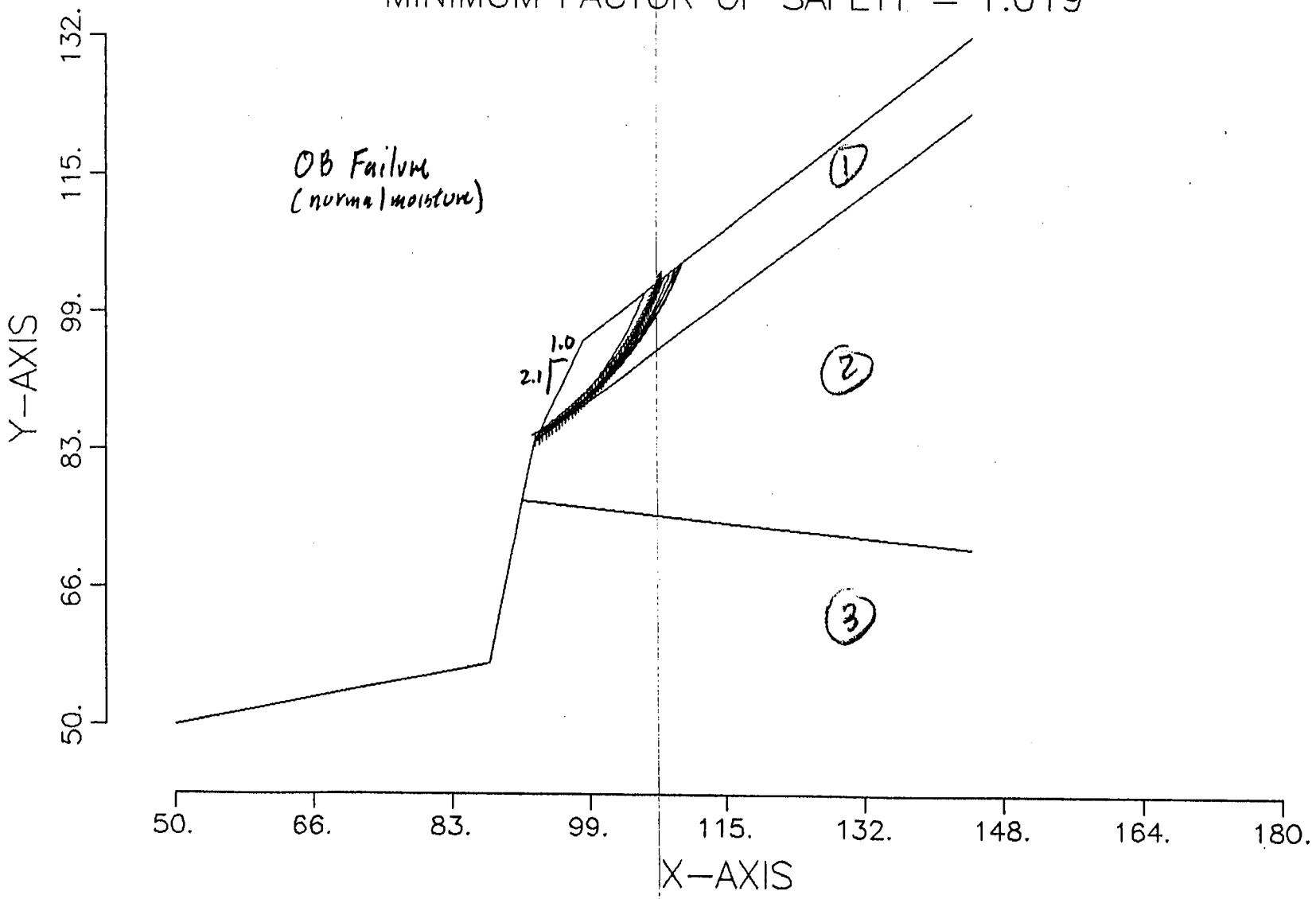

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UMCC – HEMATITE/SUNSHINE CLAIMS – CUT SL
OPE FOR PIT
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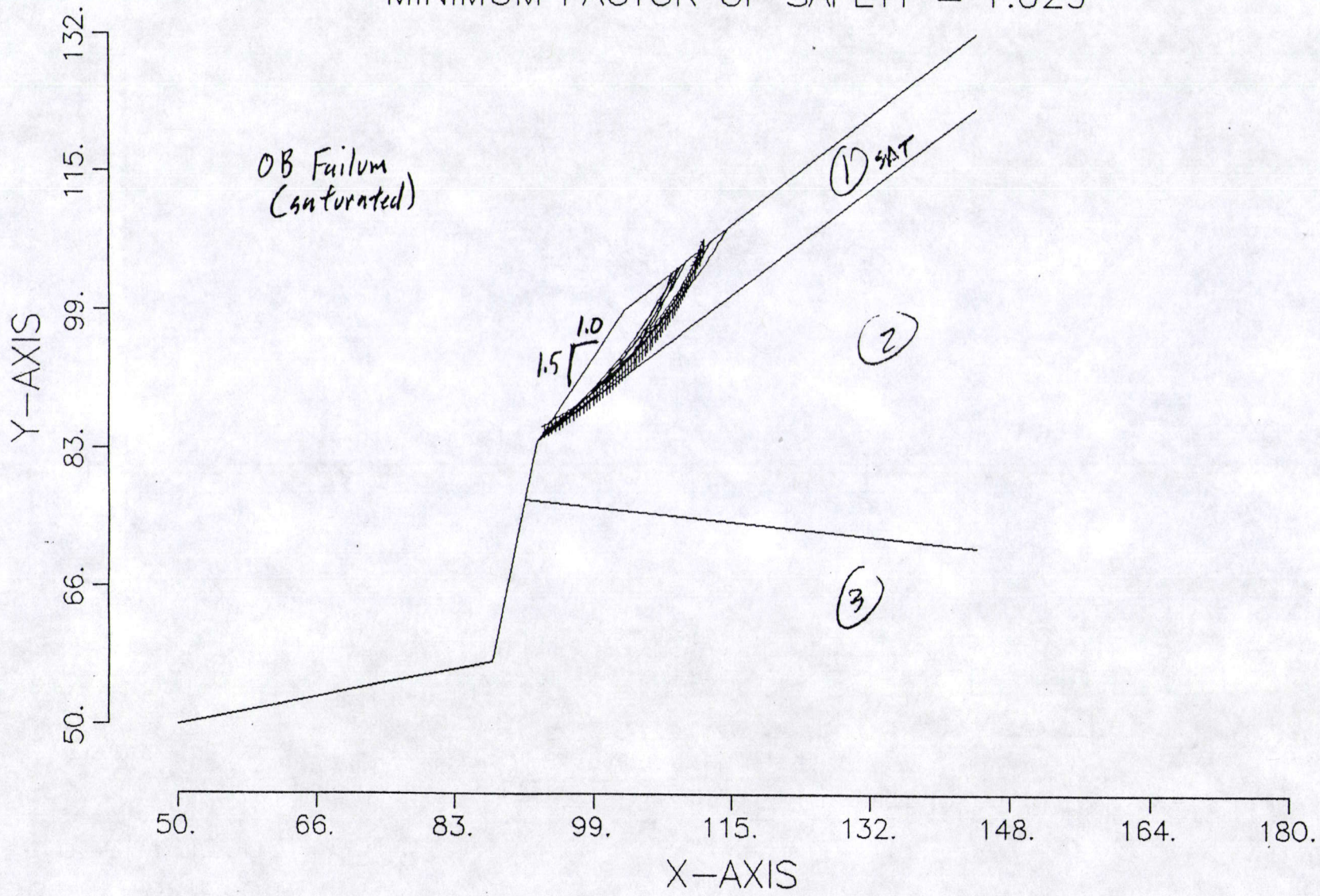
MINIMUM FACTOR OF SAFETY = 1.029



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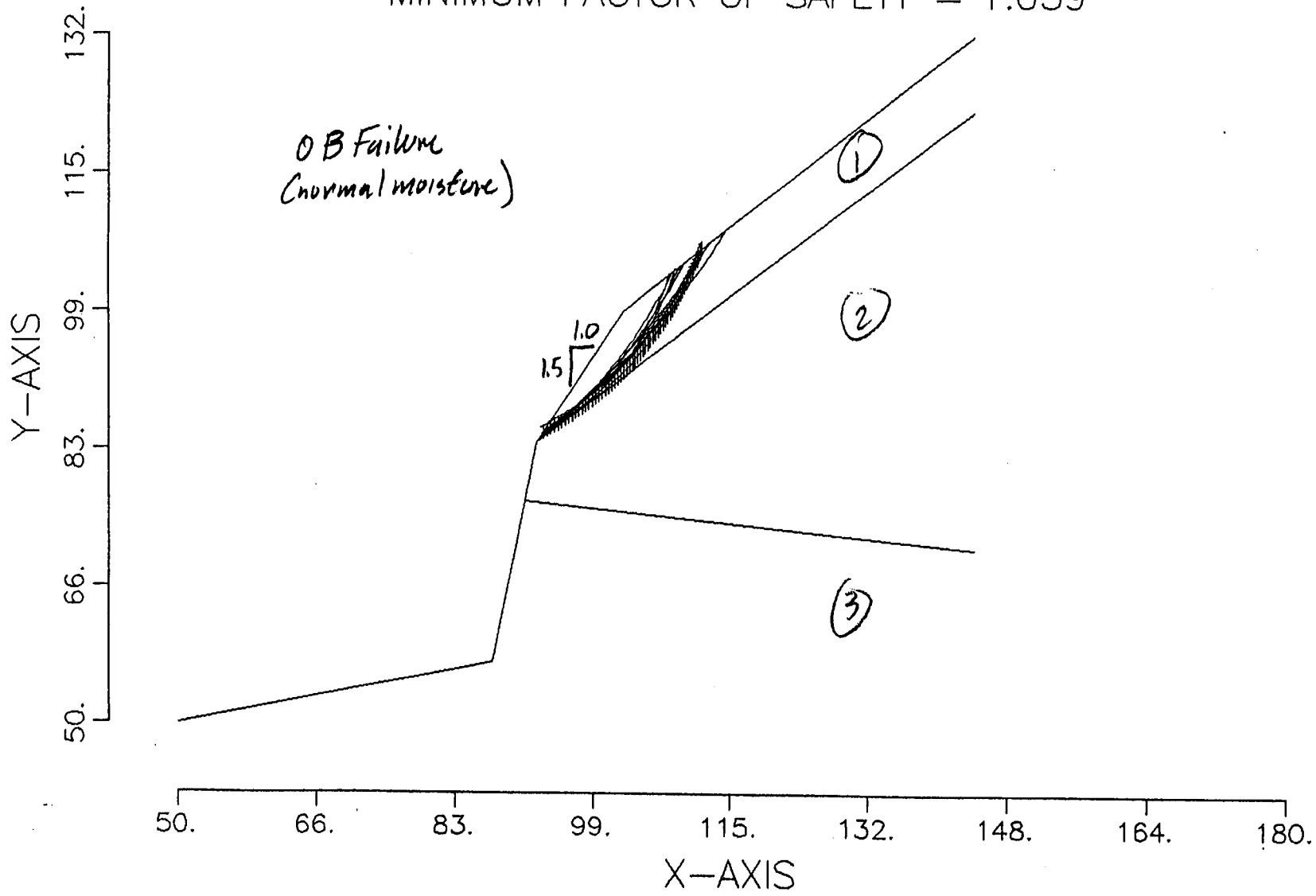
UMCC – HEMATITE/SUNSHINE CLAIMS – CUT SL
OPE FOR PIT
100 SURFACES HAVE BEEN GENERATED
10 MOST CRITICAL OF SURFACES GENERATED
MINIMUM FACTOR OF SAFETY = 1.059



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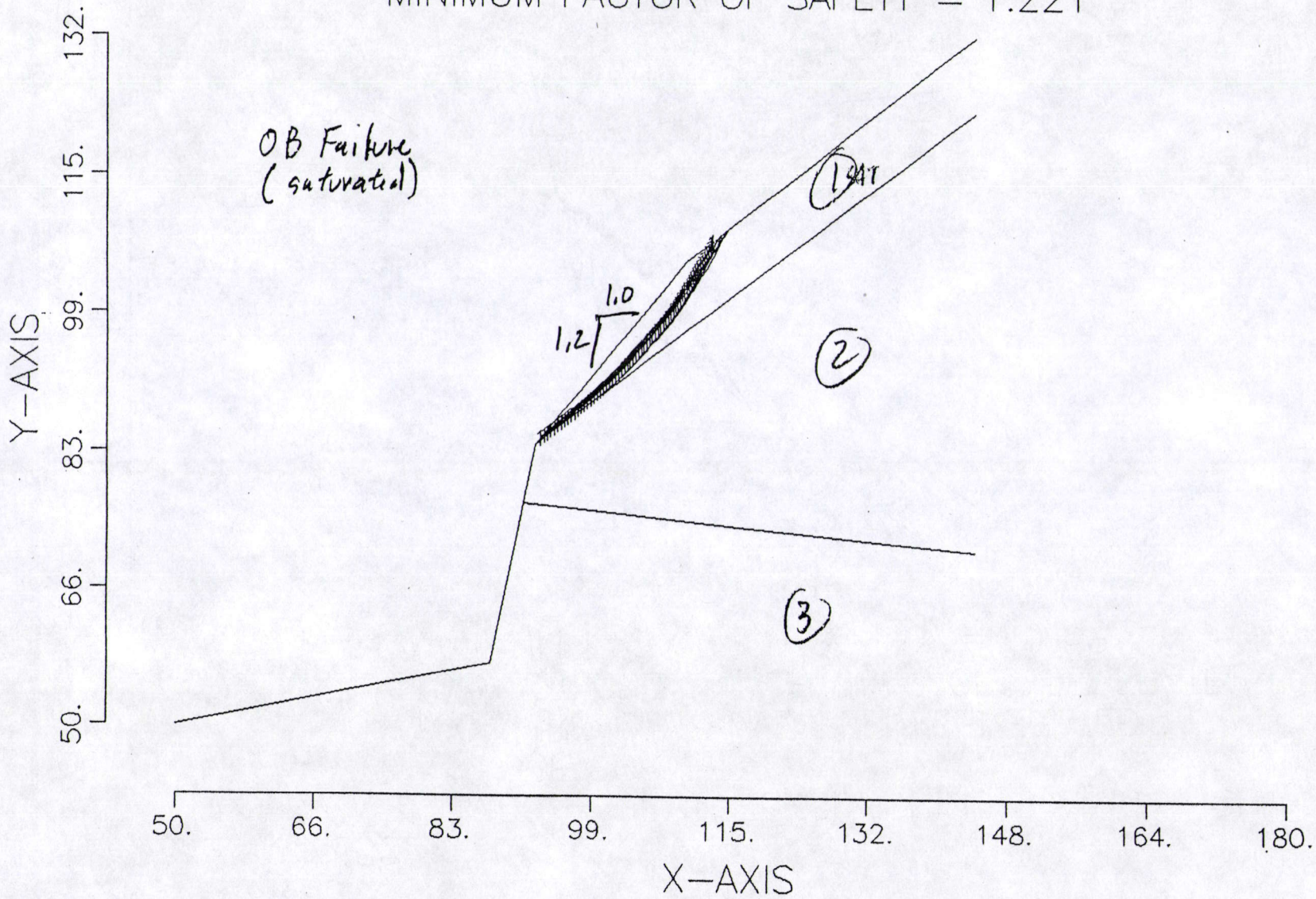
UMCC – HEMATITE/SUNSHINE CLAIMS – CUT SL
OPE FOR PIT
100 SURFACES HAVE BEEN GENERATED
10 MOST CRITICAL OF SURFACES GENERATED
MINIMUM FACTOR OF SAFETY = 1.221



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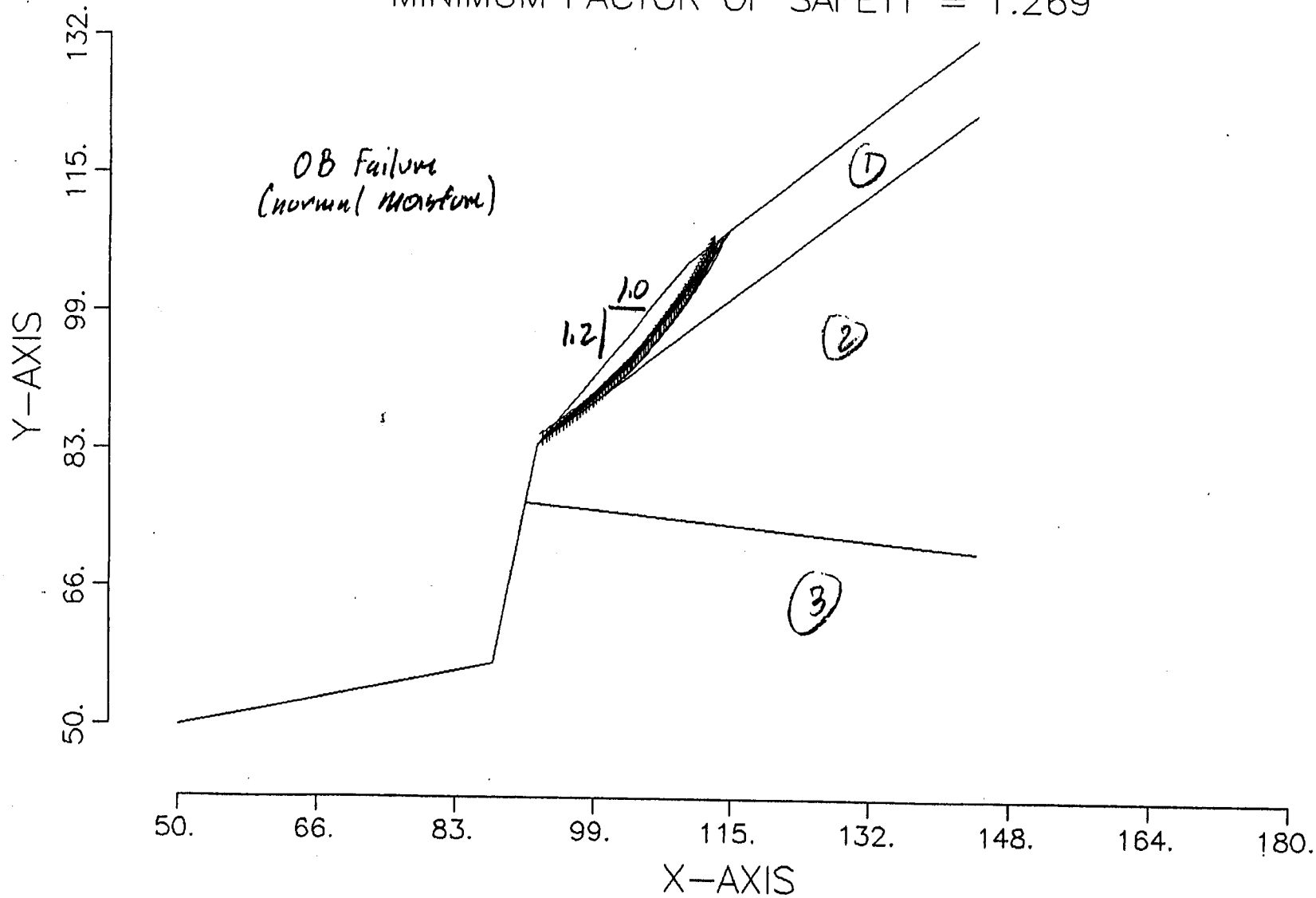
UMCC – HEMATITE/SUNSHINE CLAIMS – CUT SL
OPE FOR PIT
100 SURFACES HAVE BEEN GENERATED
10 MOST CRITICAL OF SURFACES GENERATED
MINIMUM FACTOR OF SAFETY = 1.269



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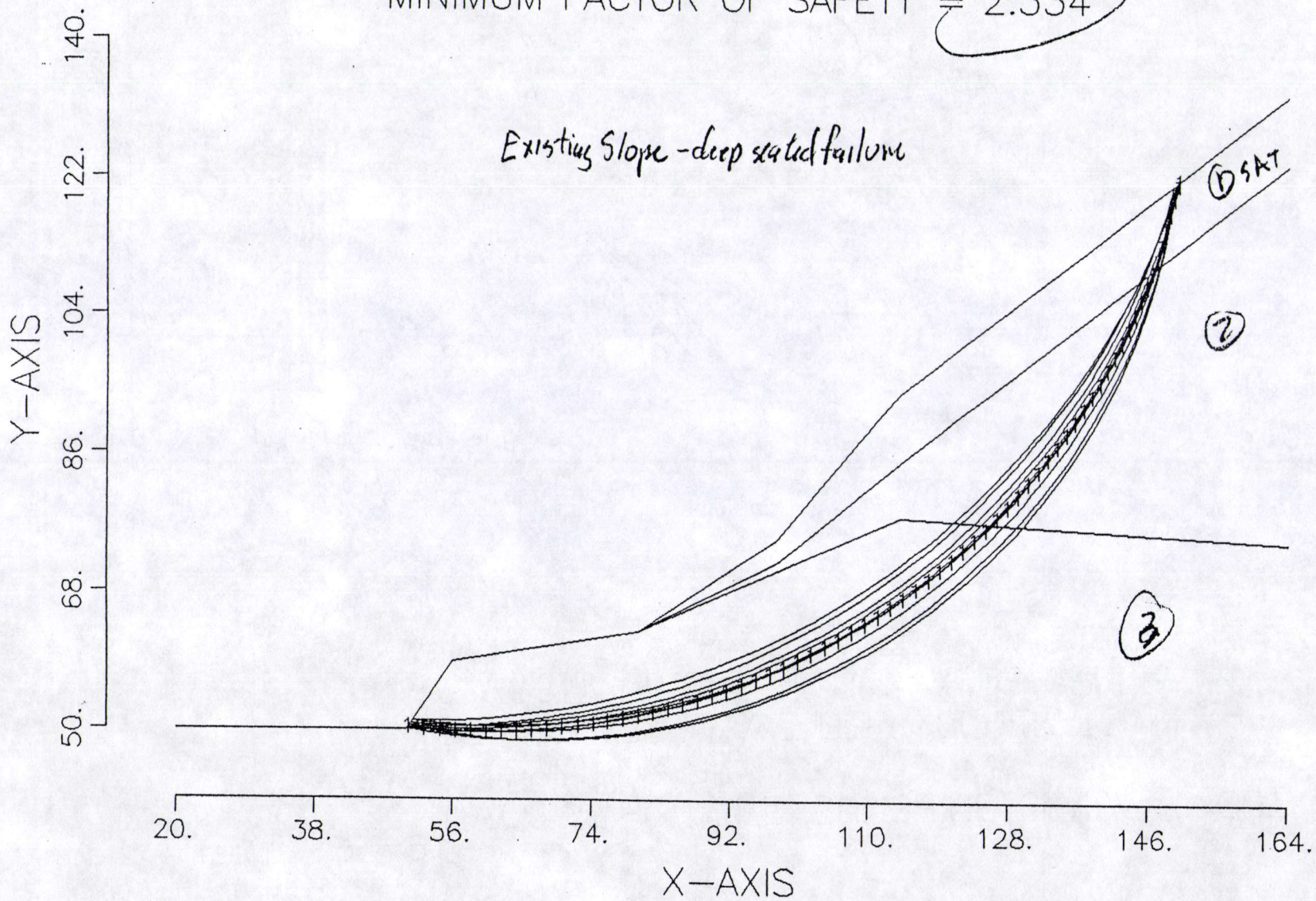
UMCC – HEMATITE/SUNSHINE CLAIMS – NATURAL SLOPE AT PIT
100 SURFACES HAVE BEEN GENERATED
10 MOST CRITICAL OF SURFACES GENERATED
MINIMUM FACTOR OF SAFETY = 2.334



E. Stability Analyses of Reclaimed Phase II Area

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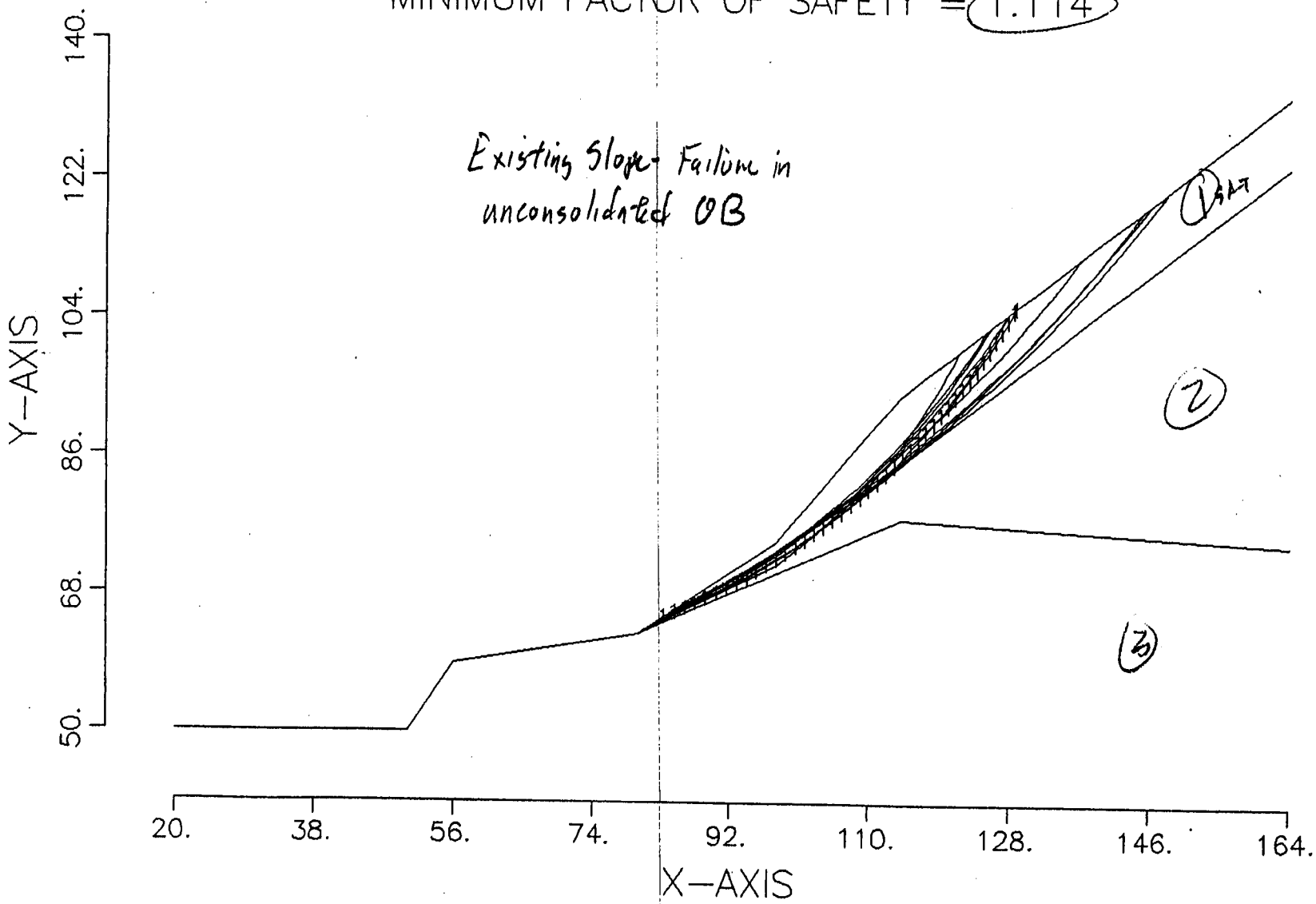
UMCC – HEMATITE/SUNSHINE CLAIMS – NATURA
L SLOPE AT PIT
100 SURFACES HAVE BEEN GENERATED
10 MOST CRITICAL OF SURFACES GENERATED
MINIMUM FACTOR OF SAFETY = 1.114



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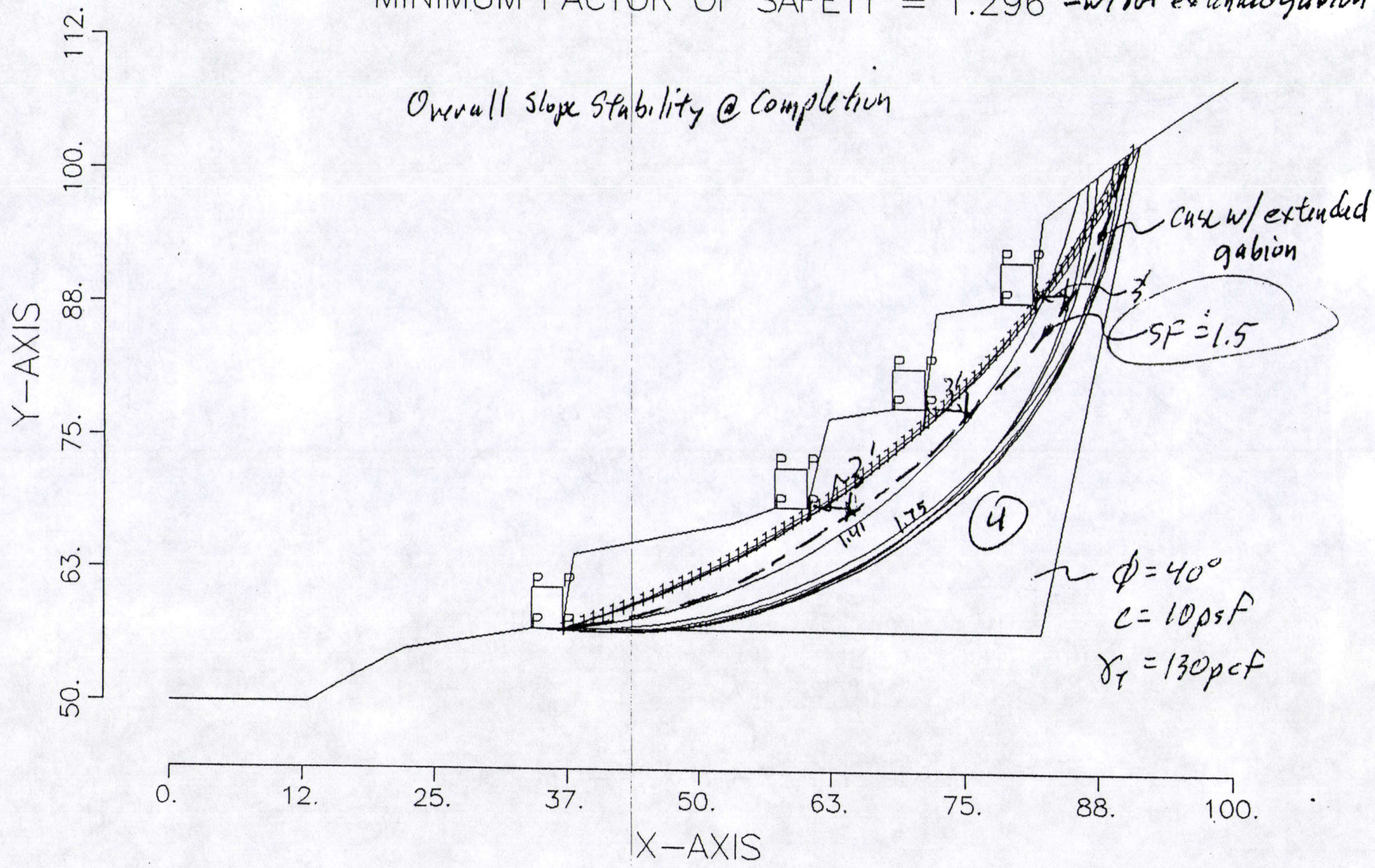
UMCC – HEMATITE/SUNSHINE CLAIMS – GABION
STABILIED SLOPES
100 SURFACES HAVE BEEN GENERATED
10 MOST CRITICAL OF SURFACES GENERATED
MINIMUM FACTOR OF SAFETY = 1.296 –w/out extended gabion



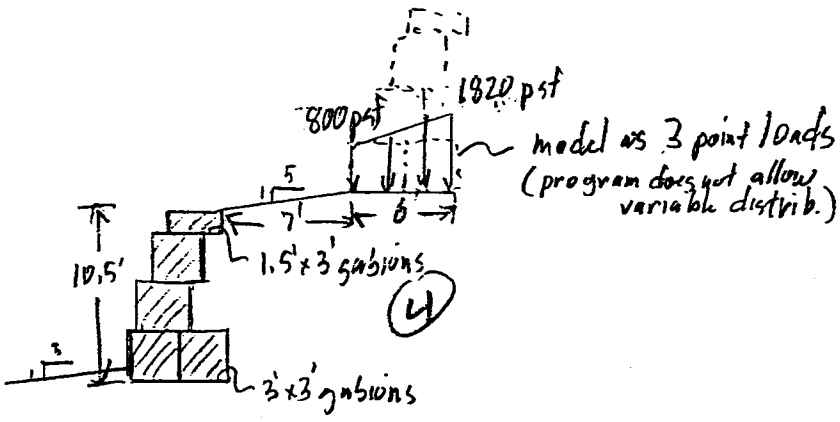
Gabion Walls calculation - GAWAC BR02
MACCAFERRI GABIONS INC. - SACRAMENTO (CA)

File: UMCC3 Project : umcc gabions - worst case - single elements

****
DATA INPUT PAGE 1
****

WALL DATA

		Layer	Length [ft]	Height [ft]	Init. [ft]
Wall batter [deg].....	0.00				
Rockfill unit weight [lb/ft3].:	160.00				
Porosity of gabions.....	0.15				
Geotextile in backfill.....	No	1	6.00	3.00	
Friction reduction [%].....		2	3.00	3.00	1.00
Geotextile under the base.....	Yes	3	3.00	2.50	2.00
Friction reduction [%].....	16.00	4	3.00	2.00	3.00



GEOMETRICAL PARAMETERS OF BACKFILL
Inclination of the first stretch [deg].....: 11.30
Length of the stretch [ft].....: 7.00
Inclination of the second stretch [deg].....: 0.00

BACKFILL SOIL DATA
Unit weight of soil [lb/ft3].....:130.00
Friction angle [deg].....: 40.00
Cohesion [lb/ft2].....: 10.00

BACKFILL SOIL ADDITIONAL DATA

Layer	Initial Height [ft]	Inclin. angle [deg]	Unit weight [lb/ft3]	Cohesion [lb/ft2]	Frict. angle [deg]

Gabion Walls calculation - GAWAC BR02
MACCAFERRI GABIONS INC. - SACRAMENTO (CA)

File: UMCC3 Project : umcc gabions

****
DATA INPUT PAGE 2
****

DATA ABOUT THE UPHILL WATER SURFACE
Initial height [ft].....:
Inclination of the first stretch [deg].....:
Length of the stretch [ft].....:
Inclination of the second stretch [deg].....:
Length of the stretch [ft].....:

GEOMETRICAL DATA ABOUT FOUNDATION SOIL
Elev. of placing from the base [ft].....: 0.75
Soil inclination ref.to base [deg].....: 11.30

DATAI ABOUT FOUNDATION SOIL
Unit weight of soil [lb/ft3].....:130.00
Friction angle [deg].....: 40.00
Cohesion [lb/ft2].....: 10.00
Allowable stress on foundation [lb/ft2].....:3000.00
Water level [ft].....:-10.00

DATA ABOUT ADDITIONAL FOUNDATION SOILS

Layer	Depth [ft]	Unit weight [lb/ft3]	Cohesion [lb/ft2]	Frict.angle [deg]

DATA ABOUT DISTRIBUTED LOADS

Distributed loads on backfill
First stretch [lb/ft2]...: Second stretch [lb/ft2]..:
Distr. loads on the wall
Surcharge load [lb/ft2]..:

Point loads on the backfill
1.Load [lb/ft].....:1943.00 Dist. from wall top [ft].: 8.00
2.Load [lb/ft].....:2625.00 Dist. from wall top [ft].: 10.00
3.Load [lb/ft].....:3308.00 Dist. from wall top [ft].: 12.00
Point loads on the wall
Surcharge load [lb/ft2]..: Dist. from wall top [ft].:

DATA ABOUT SEISMIC ACTIONS
Horizontal coefficient...: Vertical coefficient.....:

Gabion Walls calculation - GAWAC BR02
MACCAFERRI GABIONS INC. - SACRAMENTO (CA)

File: UMCC3 Project : umcc gabions

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RESULTS PAGE 3

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EXTERNAL STABILITY

Active thrust [lb/ft].....: 1947.50
Point of application ref. to X axis [ft].....: 6.00
Point of application ref. to Y axis [ft].....: 2.98
Direction of thrust ref. to X axis [deg].....: 40.00

Passive thrust [lb/ft].....: 186.80
Point of application ref. to X axis [ft].....: 0.00
Point of application ref. to Y axis [ft].....: 0.27
Direction of thrust ref. to X axis [deg].....: -11.30

SLIDING

Normal force on the base [lb/ft].....: 7879.22
Point of application ref. to X axis [ft].....: 3.39
Point of application ref. to Y axis [ft].....: 0.00
Shear force on the base [lb/ft].....: 1308.69
Resisting force on the base [lb/ft].....: 5766.80

Safety coefficient.....: 3.865 > 2.0

OVERTURNING

Overturning moment [lbft/ft].....: 4449.66
Restoring moment [lbft/ft].....:31156.62

Safety coefficient.....: 7.002 > 2.0

STRESSES ACTING ON FOUNDATION

Stress on outer foundation border [lb/ft2]....: 801.66
Stress on inner foundation border [lb/ft2]....: 1824.75
Max. allow. stress on the foundation [lb/ft2].: 3000.00

FS = 1.64 ✓

Gabion Walls calculation - GAWAC BR02
MACCAFERRI GABIONS INC. - SACRAMENTO (CA)

File: UMCC3 Project : umcc gabions

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RESULTS PAGE 4

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OVERALL STABILITY

Initial distance at pivot leftside [ft].....:
Initial distance at pivot rightside [ft].....:
Initial depth referred to base [ft].....:
Max. depth allowed in the calculation [ft]....:
Center of the arc referred to X axis [ft].....: -4.03
Center of the arc referred to Y axis [ft].....: 22.45
Radius of the arc [ft].....: 24.69
Number of search surfaces .....: 131

Safety coefficient.....: 1.467 ≥ 1.5 OK

INTERNAL STABILITY

Layer	H [ft]	N [lb/ft]	T [lb/ft]	M [lbft/ft]	tmax [lb/ft2]	tad [lb/ft2]	smax [lb/ft2]
1	7.50	3359.10	348.68	7415.96	116.23	1641.67	760.76
2	4.50	1935.98	126.91	3692.46	42.30	1176.11	507.52
3	2.00	845.16	34.75	1292.54	11.58	819.26	276.31

Allowable normal pressure [lb/ft2].....:16165.52

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NOTICE

MACCAFERRI GABIONS

is not responsible for the reliability of the geotechnical parameters assumed, nor the improper use of the software. The GAWAC program should be used only in conjunction with Maccaferri products

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Rock Mechanics for Industry, Amadei, Kranz, Scott & Smeallie (eds) © 1999 Balkema, Rotterdam, ISBN 90 5809 052 3

Use of gabions for localized slope stabilization in difficult terrain

P.M. Kandaris
Salt River Project, Phoenix, Ariz., USA

ABSTRACT: Two case studies are used to illustrate the application of gabion rock baskets for localized slope stabilization and erosion protection in difficult terrain. The gabion concept has been used for more than a century in numerous erosion control and bank protection projects. These flexible, environmentally sound and economical elements can also be used in small-scale rock slope stabilization projects where more invasive methods are either impractical or cost prohibitive.

1 INTRODUCTION

Gabions have been used throughout the world as wall elements for erosion control projects, soil reclamation work, retaining structures and stream channel linings. Though they vary in shape and size, gabion units are generally rectangular containers (baskets) made of hexagonal woven galvanized steel wire mesh and filled with cobble-size rock (Fig. 1). Units can be used individually or can be laced together and stacked atop one another to form a flexible gravity-type wall.

Employed in lieu of rigid structural materials such as concrete, wood and steel, gabion use is driven by benefits such as:

- simplicity and ease of installation
- adaptability to difficult sites
- use of local fill material
- construction by relatively unskilled labor
- flexible/forgiving elements
- ease of maintenance
- porosity
- economy
- natural appearance; can easily be vegetated

Gabions demonstrate adaptability as earth retaining structures in that they may be built in multiple tiers and set at nearly any inclination to accommodate a wide range of slope geometries. Many different stacking arrangements are possible including battered and stepped-back fronts. Higher tiered walls require greater basal widths and/or use of counterforts to brace against overturning moments induced by backfill (Gray & Sotir 1996). Various standard designs for different wall heights and backfill conditions are supplied by gabion manufacturers.

2 ANALYSIS METHODOLOGY

Although yielding by their nature, gabion retaining structures are designed in the same manner as rigid gravity walls. Gabions depend mainly on the shear strength of the rock fill for internal stability and their mass or weight to resist external lateral earth forces (Gray & Sotir 1996).

Traditional limit equilibrium methods are used to perform stability analyses. External loads on gabion walls are typically assumed to act as a Coulomb or Rankine active earth wedge. As with nearly al

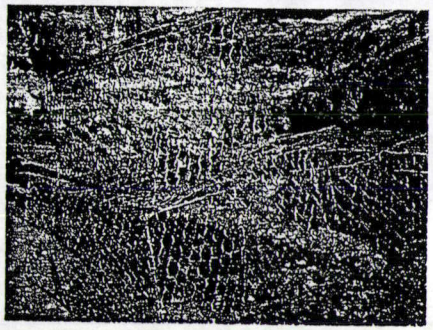


Figure 1. Gabions Containers (rock baskets)

retaining structures, gabion walls must be stable against overturning, basal sliding, bearing capacity failure and deep-seated rotational movement (slope failure). Internal stresses should also be evaluated to verify that stresses induced to the units do not exceed allowable values.

General gravity retaining wall analysis and design procedures found in most geotechnical engineering texts discuss lateral earth pressure and slope stability theories (e.g. Bowles 1996 and Spangler & Handy 1982). The assumptions, limitations and parameters for each analysis method should be understood prior to undertaking design, and should be related to the specific characteristics of the gabion retaining wall structure in question.

Vendors have also developed specialized gabion design manuals for use by practitioners. Maccaferri Gabions, Inc. (1995) provides both a detailed guide for the analysis and design of gabion retaining walls and computer design software. All of the previously described failure modes are analyzed with the software. Slope stability of the wall system can also be assessed by numerous computer software programs commercially available.

3 DAM ACCESS ROAD EDGE STABILIZATION

A 9.7 km unimproved dam access road in Central Arizona required the use of gabions to stabilize numerous road-edge wash outs from local storm water inflow. The Horse Mesa Dam road was constructed during the 1920's for access to the dam site. The dam is operated and the road is maintained by The Salt River Project. Road alignment follows a highly irregular hillside contour and makes several switchbacks and steep grade changes along its route, with numerous cuts and fills across a steep rock face hillside. At the bottom of the canyon, the road parallels the south bank of Canyon Lake. The local terrain consists of steep ½:1 to ¾:1 (horizontal to vertical) road cut sections. Above and below the road cuts, the natural slope ranges from 45-75 degrees inclination from horizontal.

The site is at an average elevation of 550 meters above mean sea level and is considered to be part of the Sonoran Desert. Summer temperatures range between of 40° to 47° C and the annual rainfall is on the order of 19 cm. The 50-year design rainstorm for a 1-hour period is 50 mm, with an infiltration of only 25%. Vegetation is sparse on the rocky slopes, primarily consisting of cactus, desert grasses and scrub brush. Erosion is extreme in this environment.

3.1 *Geology & Soil Conditions*

The turnoff to the access road from SR-188 is about 7.3 km east from Tortilla Flat, Arizona. The site is situated in rugged terrain within a small tributary canyon to Fish Creek Canyon that has down-cut into a sequence of massive Tertiary age volcanic and volcanoclastic rocks referred to as the Superstition Volcanic Field. The geologic unit exposed in cuts is a volcanic tuff breccia facies of the Geronimo Head Formation (Euge 1994). The tuff was formed during the mid-Tertiary as a result of a major caldera collapse within the Superstition Volcanic Field about 16M years ago (Sheridan 1978).

Native residual and cut materials were used as road fill that can be best described as a silty sand, gravel and cobble mix. Rock fragments are composed of basalt, rhyolite and pumice. Decomposed granite has been imported over many years as road surfacing to create a more even driving surface. The blend of native soil, import soil and rock creates a backfill with a maximum density of 2000 kg/m^3 at 12% moisture content.

3.2 *Historic Repairs*

Local runoff from storms stream down steep hillsides and flow along the road's inside bar ditch. Waters continue along the ditch to locations where road cross sections dip toward the downhill edge. Flows then stream across and down the road, breaking over the downhill face of the road embankment at intervals of every 15 to 300 meters and causing edge washouts ranging from a few feet in all dimensions to as much as 6m across and 3m deep.

In the 60-year history of the access road, numerous attempts have been made to control roadside erosion and washout. Most of these efforts were made by dam maintenance personnel and operations engineers whose primary duty was to the upstream dam and generation facility. Typical repair areas still intact incorporate the use of reinforcing bars and welded wire fabric. Bars ranging in diameter from 6 to 25mm were grouted into the rock face near the bottom of road fills and along any rock outcrops on the sides at about 0.6 to 1.0m spacings, then tied together across the breadth of the washout area. Welded wire fabric (100mm x 200 mm rectangle size) was then be placed on the inside face of the criss-crossed bars to retain fill rock and soil. A typical example is shown in Figure 2.

These short-lived repairs would survive only for a few season until fill washed out from under or around the mesh, or until vehicle tire loads would result in lateral failure of the system. On occasion, concrete would be mass-poured into these roadside voids in an attempt to fill the space. Eventually, fills would erode around the concrete, causing them to wash down the steep hillside.

Over time and many attempts at repairs, these minor problems became a constant drain on the facility operating budget and were unable to provide reliable site access during major storms.

Figure 2. Rebar-Mesh Washout Repair

3.3 *Gabion Repairs*

In the latter part of 1993, a series of major rain storms caused significant damage to the access road. During 1994, the Salt River Project contracted the repair of 38 localized washouts along a 3.2 km stretch of the access road. Because of the irregular nature of the repair sections and the urgency of repair work, small gabion retaining structures were selected as the method of repair. Three typical cross sections were designed for use under various subsurface conditions (Fig. 3).

Work incorporated placing on the order of 450 linear meters of 91mm x 91mm gabion baskets. Individual gabion units varied in length from 0.9 to 3.7 meters. 76mm to 200mm nominal diameter fill stones were imported in from the Metropolitan Phoenix area since little native material met the size and specific gravity requirements. Where feasible, gabions beared on level concrete pads anchored into near-surface rock (Fig. 4). In areas where cobble and boulders were present, the bottom row of gabions was placed from 15cm to 45cm below grade.

To prevent loss of fine soils into gabions, filter fabric was placed between gabions and the backfill. Gabions were installed so that runoff water principally flowed over the top of the baskets, preventing edge erosion from water draining off of the road. This was done by either setting a gabion section lower that the adjacent units and the roadway, or by dipping the top row to allow sheetflow and create a spillway effect. Examples of both types are shown in Figures 5-6.

Lateral earth stability was the only analysis required for these structures since they were founded on either bedrock or highly stable rock fill ($q_a > 0.24$ MPa) and were close to bedrock. When considering the largest repair structure (H = 4.6m) at the steepest configuration (23cm step-back for 91cm x 91cm gabions), factors of safety for sliding and overturning were 2.52 and 1.63, respectively for

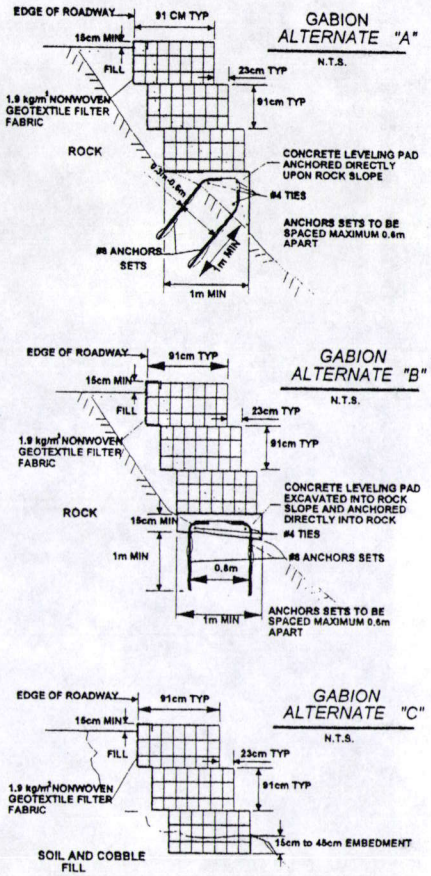


Figure 3. Gabion Repair Cross Sections

Figure 4. Gabion Repair on Concrete Pad

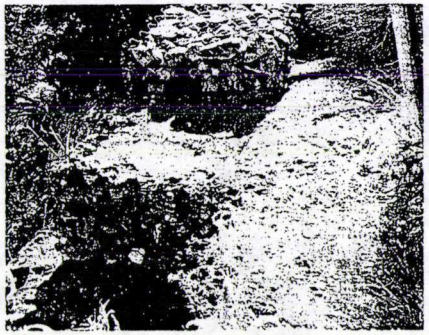


Figure 5. Single Gabion Lowered for Spillway

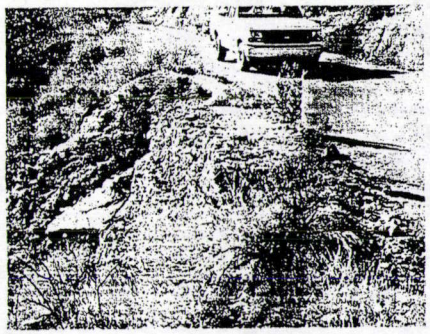


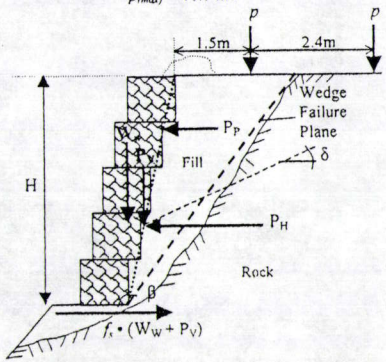
Figure 6. Gabion Structure Lowered for Spillway

standard load conditions (project required use of standard loads for design). For the maximum possible load case, factors of safety for sliding and overturning were 2.00 and 1.07, respectively. This was deemed acceptable for this site by the project designers. The analysis is shown in Figure 7.

Gabion repairs were performed over a 10 week period at a total installed cost of about $242 per cubic meter.

In the fall of 1994, the site encountered a rainstorm that resulted in 50mm of rain fall in a single hour. Gabions showed only minor erosion damage to the upper baskets edges and the road remained in service. Minor repairs were undertaken within one month of this storm, using earthen and concrete roadside berms to better direct future flows onto gabion structures. Since the 1994 repair, no other repair work has taken place on these gabion structures. A comparison of repair locations over this time period is shown in Figures 8-9.

Wall Properties: height of wall, H = 4.6m
91x91 cm baskets staggered @ 23cm
Unit weight of gabion stones = 2640 kg/m^3
Gabion basket porosity = 35%
Soil Properties: unit weight = 2000 kg/m^3
friction angle, φ = 40°
cohesion = 0 kPa
Wheel loads: $p_{(std)}$ = 3.6 kN
$p_{(max)}$ = 11.1 kN



Wall weight, W_w = 21.4 kN
Wall friction angle, $\delta = 2/3\varphi$ = 26.7°
Wall angle to active plane, β = 101.3°
Base friction coefficient, f_s = 0.84
Earth pressure coefficient, K_a = 0.132
Horizontal component of thrust at wall, P_H = 7.4 kN
Vertical component of thrust at wall, P_V = 3.7 kN
Horizontal thrust cause by point load, $P_{P(std)}$ = 1.0 kN
$P_{P(max)}$ = 3.2 kN

Figure 7. Gabion Wall Design Analysis for Road Edge Stabilization

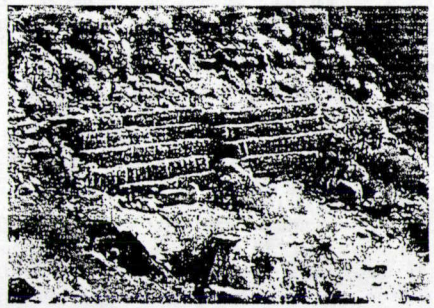


Figure 8. Road Edge Gabion Stabilization – 1994

4 RECLAMATION SLOPE STABILIZATION

Reclamation work for a mining development project in a remote high mountain region in northcentral

Figure 9. Road Edge Gabion Stabilization - 1998

Utah required the use of small gabion wall sections to stabilize slopes in rugged terrain. The Uintah Mountain Copper Company needed to install a gravity wall system as part of a pilot project for development of a natural iron oxide (hematite) pigment mine. Limited access required wall materials be both light-weight for ease in transportation and utilize on-site rock for aesthetics. Slope stabilization methods also needed to be inexpensive and compatible with the forest environment, leaving a natural appearance.

Gabion units were selected for placement in a test pit section on a high-energy talus slope/slide zone that undergoes extreme seasonal runoff conditions. This site is at an elevation of 3110 meters above mean seal level and on the edge of a small vegetated ravine. Estimated annual precipitation is on the order of 50cm, with the majority of the moisture from snow that is on the ground from October to June. Primary vegetation includes Douglas Fir trees along steep hillsides. Grassy meadows are intermingled in the Douglas Fir stands, which give way to treeless, barren slopes of the Alpine environment.

4.1 *Geology & Soil Conditions*

The site is approximately 40 km northeast of Duchesne, Utah and due west of Moon Lake in the Slate Creek Canyon Region's north face of Dry Ridge within the Ashely National Forest. The site is located on the down side of an almost vertical displaced normal fault of the Uintah South Flank Fault and elechlon fault system on the north and a series of elechlon faults and a brecciated zone on the south side of the property. This fault displaces Mississippian limestone formations and is underlain by Cambrian quartzite and shales (Wall 1990). The test pit area is within a zone of highly fractured and thinly bedded limestones that are highly weathered (clay-like) within the ore pockets.

4.2 *Test Pit Reclamation Program*

Once ore and overburden rock are removed from the test pit, the area is to be recontoured for reclamation purposes using overburden and native topsoils. Steep side slopes (30° to 40° from horizontal) preclude laying back of the hillside to a stable natural angle without a support system. Review of projects worldwide show that similar steep slopes in slide zones have been successfully stabilized by terracing with gabion structures (Maccaferri 1995). Figure 10 provides a cross section of the proposed terraced slope at the Uintah Mountain site.

Maximum overburden at the deepest section is on the order of 14m. The steep rock face is to be cut at a 5H:1V slope and rock pinned as needed to protect the pit from limestone rock mass wasting. A series of four gabion retaining wall structures ranging from 12 to 24 meters in length are to be placed up to 3 meters above adjacent terrace grades at step-back slopes up to 70°, making the reclamation feasible. Rock backfill is to include native limestone and fine soils near the top of the baskets to encourage vegetation growth on and above the retaining structures.

Backfill material was evaluated from road cuts to determine strength an unit weight properties. Native fractured and weathered limestone breaks down upon excavation and recompaction into predominately a clayey gravel and cobble mix. Water content of the clay component can range upwards of 20%, with a total mix unit weight (after compaction) of 2080 kg/m^3. Cohesion varies greatly and a nominal 0.5 kPa capacity was assigned to the mix. Large-size interlocking angular gravel and cobble rock were compared to similar backfills. An internal friction angle of 40° was assumed as a conservative value for the compacted mix.

Each terrace structure required a separate analysis including evaluation for both lateral and overall slope stability (deep-seated failure of slope). Coulomb earth pressure methods were utilized for

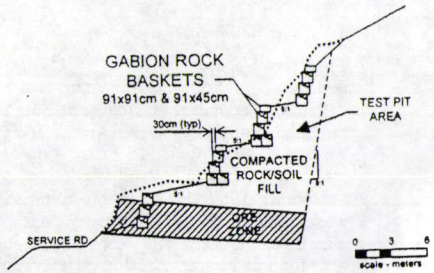
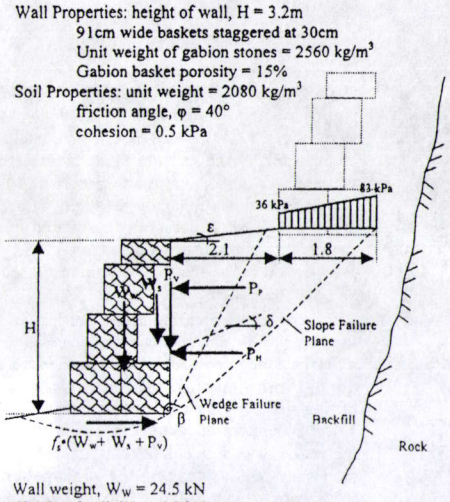


Figure 10. Reclaimed Test Pit Cross Section



Wall weight, W_W = 24.5 kN
Weight of soil, W_S = 5.2 kN
Wall friction angle, $\delta = 2/3\varphi = 26.7°$
Backfill slope, $\varepsilon = 11.3°$
Wall angle to active plane, $\beta = 90°$
Base friction coefficient, $f_s = 0.84$
Earth pressure coefficient, $K_a = 0.225$
Horizontal component of thrust at wall, P_H = 6.4 kN
Vertical component of thrust at wall, P_V = 3.2 kN
Horizontal thrust cause by point load, P_P = 4.8 kN

Figure 11. Gabion Wall Design Analysis For Reclamation Stabilization

determining lateral stability. Slope stability was calculated via a gabion design computer program that uses Bishop's method (Maccaferri Gabions GAWAC R2.0). Figure 11 presents the analysis for the most critical case.

The factors of safety for this section in terms of sliding, overturning and slope stability were 2.48, 2.00 and 1.50, respectively. This was deemed as adequate for the project.

4.3 *Construction of Test Section*

The first phase of this exploratory test pit reclamation development program was approved to determine the impact of such a retaining structure on the hillside and forest environment. Excavation of a 3.6 to 4.6 meter wide, 14 meter long and 0 to 3.6 meter deep phase 1 test pit was completed in early September 1997. Reclamation commenced a few weeks later once all survey and ore body measurements were complete. The gabion retaining wall for this section (the lowest elevation structure shown in Fig. 10) was built in 2 days at a total installed cost of $105 per cubic meter. The wall consisted of a simple 9m long, stair-stepped, three-tiered structure. Three feet of overburden fill was placed above the top of the upper row to improve access and allow observation of seeding tests. Rock fill for gabions utilized a combination of hand-selected 10cm to 30cm nominal diameter rock from the excavation area (matching the color and texture of the intact slope rock) and nearby talus slope residual limestone sands, gravels and cobbles (Fig. 12). A 1.1 m^3 loader and D7 Caterpillar bulldozer were used to place and compact backfill. The area above the wall was terraced and seeded upon completion of the structure.

Weather prevented site access after October 1997. This is typical for the region. Figure 13 shows the completed gabion wall at that time. A long snowmelt and runoff season did not allow return to the site until August 1998. At that time, a detailed evaluation was performed on the structure and other reclamation activities. A slide had deposited up to 3m of material on the terrace above the wall, but did not result in any significant movement. The wall had rotated outward, due partially to the fact that the rows were set steeper than the planned 30cm step-backs. Some fines had washed out of the baskets and deformations were observed. Adequate material was still present so that vegetation was actively growing on the terraced top and along the face of the gabion baskets. The wall appearance (color and texture) blended in well with the surrounding rock faces. Figure 14 shows the wall after one year in place.

5 CONCLUSIONS

1. Gabion retaining structures are simple and economical for use in small-scale slope stabilization projects.

Figure 12. Gabion Fill in Baskets at Reclamation Test Site

Figure 13. Reclamation Gabion Stabilization September 1997

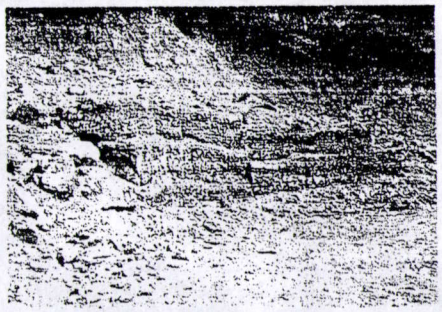


Figure 14. Reclamation Gabion Stabilization August 1998

2. Although highly deformable and flexible, gabion retaining walls are designed by the same traditional limit equilibrium methods used for rigid gravity structures. Both lateral and overall slope stability need to be considered in rockfill slopes. Bearing capacity in rock conditions is generally not significant.

3. Gabions were successfully used to stabilize numerous road-edge wash outs from local storm water inflow along the Horse Mesa Dam access road in Arizona. Since their installation in 1994, no significant maintenance has been required on these structures. The total installed cost for gabion walls at this site was about $242 per cubic meter.

4. Reclamation work for a mining development project in a remote high mountain region in northcentral Utah required the use of small gabion wall sections to stabilize slopes in rugged terrain. After one year in place, the wall has functioned well and has met project objectives. The total installed cost for gabion walls at this site was about $105 per cubic meter.

6 REFERENCES

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Wall, L. L. 1990. *Preliminary Geologic Report, Uintah Mountain Copper Company's Hematite Property* (internal company report).

UMC

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August 8, 1999

Ashley National Forest
Duchesne Ranger District
P.O. Box 981
Duchesne, Utah 84021

Attn: Joseph R. Bistryski, District Ranger

Dear Joe:

Thank you for meeting with us on July 21st to discuss the status and schedule of the Sunshine Quartz/Hematite Claims project. This letter confirms and clarifies items discussed during the meeting and subsequent telephone conversations with you and other Forest Service technical specialists. Per our conversation last week, I am also copying Tom Abbay on this correspondence to expedite the transfer of information.

UMCC work to date in 1999 includes the following activities:

- Completion of initial pilot plant work with the Colorado Minerals Research Institute. Prototype pigment products and a final process report have been forwarded to UMCC so that final plant engineering may begin. This work is schedule for later this year.
- Target marketing of pigment products to specialty users. Approximately 150 companies that use natural red iron oxides for their products have been introduced to UMCC's "Uintah Red™" brand pigments. These companies comprise about one-half of the major world-wide users that desire products such as ours for their natural hues and characteristics.
- Preparation of full disclosure form 10SB for submittal to the US Securities and Exchange Commission (SEC). This process makes UMCC a fully reporting company. Quarterly and annual reporting will commence upon approval of the filing by the SEC. Form 10SB includes detailed descriptions of UMCC's corporate structure, company history, business plans, audited financials and mineral deposit valuations.
- Road clearing at the site. Kelly Bird Construction has completed minor road work needed to provide safe access to the claims site for this summer's activities.

UMCC has agreed to limit site activity this summer allowing the Forest Service time to complete all field work needed for the Environmental Assessment (EA) on final Phase III development activities. UMCC will remove on-site ore that was stockpiled last season but could not be hauled because of the early onset of winter weather (approximately 100 tons). This work will not create any additional disturbance. UMCC and the Forest Service will meet at the site in August 1999 to review the condition of previously reclaimed areas. UMCC will perform any mutually agreed upon actions needed to maintain reclamation. Long-term reclamation bonding on the access road will also be finalized during this time period.

As requested by the Forest Service, UMCC will also prepare an updated Plan of Operations on the project that clearly defines the Phase III development work. This document is scheduled for submittal in August 1999.

As part of the updated POO, UMCC will provide a discussion on mineral deposit valuation. In conversations last year with the Forest Service, UMCC noted that a similar presentation would be provided to the SEC with the form 10SB filing. UMCC was given the impression from the Forest Service that approval by the SEC on this filing would be adequate evidence of valuable minerals deposits to justify Phase III development work. Subsequently, Forest Service representatives have stated that they now desire to perform an additional review of minerals valuation.

The SEC process for minerals valuation is one of the most restrictive in the industry. The reporting requirements focus on investor protection and thus prohibit disclosure of tonnage and grades not classified as probable reserve or proven reserve (only that part of a mineral deposit which can be economically and legally extracted or produced). Attached is a 4-page excerpt from the guideline used by the legal profession that delineates the process needed to present probable and proven reserve to the SEC. A recent article presented at the 1999 SME Annual Convention in Denver gives a thorough description of the SEC process and compares it to other industry valuation standards (copy is attached).

UMCC understands the importance of a minerals valuation process in evaluating UMCC's right to develop its claims. We are in agreement that prior to full mining operations and as part of a future Environmental Impact Statement, an expanded minerals property valuation should be performed that is less restrictive than the SEC requirements and includes all resources on the claims properties. We propose that the recently updated SME 1999 guide for reporting exploration information, mineral resources and mineral reserve be utilized for the EIS process (copy is attached).

UMCC proposes that valuation of the claims be more restrictive for Phase III test pit development work (and the associated EA), utilizing the SEC process. It must be remembered that Phase III work is developmental by nature and includes full reclamation of the test pit area. This phase of development work is also needed to provide the range of environmental and cost data necessary for a full economic evaluation of all proven resources (scope of the future EIS).

The US Bureau of Reclamation's Solid Minerals department provides a reasonable standard for minerals valuation during exploration and development activities. The USBR literature explains that federal statutes do not describe what constitutes a valuable minerals deposit, Rather, the Government has adopted an economic definition that make use of the concept of an economic ore body. Several judicial and administrative decisions have established the "prudent man rule." Where minerals have been found, a person of ordinary prudence would be justified in further expenditures of his labor and means, with a reasonable prospect of success in developing a valuable mine. The Supreme Court approved a parallel concept, the "marketability test," that adds to the prudent man rule and considers economics. It requires the claimant show a reasonable prospect that the mineral could be mined, removed and marketed at a profit. Therefore, the test for a lode claim incorporates (a) a physical exposure of the mineral deposit, (b) evidence that the deposit contains valuable minerals, and (c) engineering and economic data showing the possibility of a profit. This is precisely the type and scope of information requested by the SEC in its form 10SB filing.

Placing a burden of proof for minerals valuation on UMCC beyond those noted herein does not seem reasonable at this stage of claims development, nor is it consistent with Government practices. Additionally, we are unsure how to resolve a possible conflict between the SEC and

the Forest Service if the SEC validates the claim by approving the form 10SB filing, and the Forest Service denies economic viability from review of the same or less restrictive information.

Please contact me if you have any questions. Unless UMCC's hears otherwise, we will include the minerals valuation information presented to the SEC in our updated POO.

Sincerely,

Peter M. Kandaris, M.S., P.E.
President, Uintah Mountain Copper Company

Cc: Pamela Kandaris-Cha (UMCC CFO)
Tom Abbay (USFS Minerals Specialist)

Attachments: Guide 7 to the 1933 SEC Act, "Description of Property by Issuers Engaged or to be Engaged in Significant Mining Operations"

Preprint 99-29 to the 1999 SME Annual Meeting, "Trends in the Regulation of Mineral Deposit Valuation

SME 1999 Guide for Reporting Exploration Information, Mineral Resources, and Mineral Reserves

UMC

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September 1, 1999

Ashley National Forest
Duchesne Ranger District
P.O. Box 981
Duchesne, Utah 84021

Attn: Joseph R. Bistryski, District Ranger

Dear Joe:

On August 26, 1999, Chauncie Todd of your office met with Pamela Kandaris-Cha and myself at the Sunshine/Hematite Claims site to review the status of the project. This visit was the result of an action item from our July 21st meeting in Roosevelt. The following occurred:

- A draft of the updated Plan of Operations (POO) on the project to clearly define Phase III development work was submitted by UMCC per Forest Service request. This draft will be finalized once the Forest Service has provided informal comments (expected soon after field specialists have a chance to review the scope of the project).

- The scope of long-term and Phase III development reclamation bonding was evaluated. We agreed that:

  (a) The long-term road bond would include the road from the old adit works southeast to a point about 2000 feet away where easy turn-around can be accomplished (the area where equipment is typically off-loaded for final travel to the mine workings),

  (b) The spur road that crosses above the test pit area (about 200 feet in length) does not meet Forest Service expectations for final reclamation. Access to this area for additional grading cannot be provided until Phase III work begins. Reclamation of this area would be made part of Phase III development and be included in the new POO.

  (c) The long-term mine area bond would incorporate the road from the adit area west to its termination (about 400 feet in length). A small 150 foot long exploratory extension road south of the adit works will be reclaimed this year by UMCC as part of ore stock pile removal and will not be included in long-term bond requirements.

We are very concerned that the Forest Service has yet to initiate the remaining field studies for Phase III development Environmental Assessment (EA). It was our understanding at the July meeting that Forest Service specialists would be visiting the site within the following weeks to perform their work. During our field meeting, Chauncie informed us that these individuals had not yet been scheduled for this project. He confirmed that he would contact the Forest Service hydrologist, agronomist, wildlife expert and landscape architect to set firm dates for their visits. He stated that he would initially need to schedule a meeting with as many of these specialists as possible to go over the scope of Phase III development work and that we should plan to

attend. I requested that he contact me within seven to ten days so I could make travel arrangements (by September 6th). Chauncie said that he would also schedule two separate field visit dates to occur soon after this scoping meeting so that all the specialists would be able to perform their work as quickly as possible.

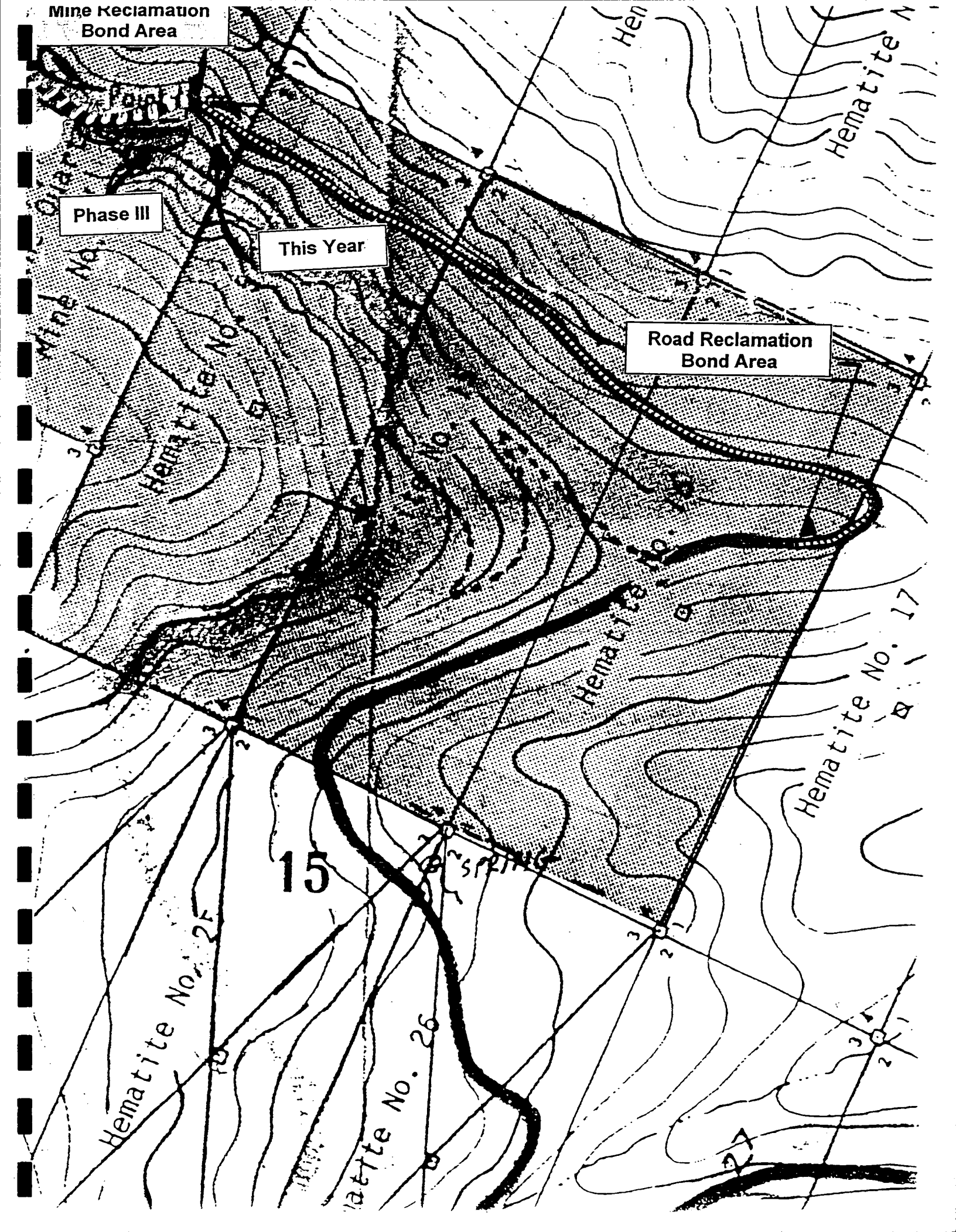
Because of this delay, we find it necessary to postpone our ore hauling activities to accommodate your specialists. Please be aware that all field work must be done by the end of September to ensure that inclement weather does not again make conditions unsafe for working at the site. Over the past two seasons, we have been very flexible and obliged the Forest Service schedule to delay EA field studies until the summer of 1999 so that your personnel could perform the work. As UMCC promised in July, the access road was promptly opened for your use and a new POO was prepared. The project cannot tolerate another delay on this very important item. We were assured by you in July that the field studies would be done this summer and have confidence that you will take care of this situation.

Please call me if you have any questions. I will make myself available to come to any of the Forest Service's Utah offices to assist with this work.

Sincerely,

Peter M. Kandaris, M.S., P.E.
President, Uintah Mountain Copper Company
SLC: 801-530-1045
Phx: 602-236-8613

Cc: Pamela Kandaris-Cha (UMCC CFO)


Mine Reclamation Bond Area
Phase III
This Year
Road Reclamation Bond Area
Hematite No. 17
Hematite No. 26
Hematite No. 25
15
SPRING

UMC

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May 16, 2000

Ashley National Forest
Duchesne Ranger District
P.O. Box 981
Duchesne, Utah 84021

Attn: Joseph R. Bistryski, District Ranger

Re: **Comments on UMCC 1999 Plan of Operations – Scoping Document**
Sunshine Quartz/Hematite Claims Project

Dear Joe:

Thank you for the opportunity to provide this supplemental project information. UMCC received facsimile copies of the Scoping Document on May 8 and May 15, 2000, and a copy via mail on May 16, 2000. We were disappointed to observe that none of our substantive comments from our review of March 28, 2000 were included in the final version. We still believe that these revisions would have provided a more clear picture of the project to the public. In particular, the scoping document references the work to be done in 2001, while the POO specifically notes that work is to begin in the Fall of 2000. This phase of the project has been delayed far too long and waiting for a 2001 start (unless as a result of weather) would not be acceptable to UMCC. A copy of our earlier review comments is attached.

Because of the recent Roadless Area Conservation Draft EIS release, we desire to determine whether our claims fall within the proposed roadless areas. A map showing UMCC's claims properties and our best estimate of the roadless initiative boundaries is attached. Please confirm whether the information shown is accurate. Although we understand that this initiative does not impact access to locatable minerals, it would be consistent with UMCC's corporate philosophy to voluntarily refrain from including any future minerals expansion into these proposed roadless areas. We need this information to make future planning decisions.

Finally, we request copies of all written comments received at your office by May 18th be sent to UMCC by May 24, 2000, along with the promised schedule for the remainder of the EA process. As we have discussed, Jacobs Engineering is preparing our Feasibility Study for final project funding and design (Phase One to be complete on 5/31/00). The timely forwarding of this information is essential for keeping our project on schedule and will make it possible for us to quickly aid your office in responses to the public.

I look forward to visiting with you soon and anticipate an early start to activities in 2000.

Sincerely,

Peter Kandaris, President
Uintah Mountain Copper Company

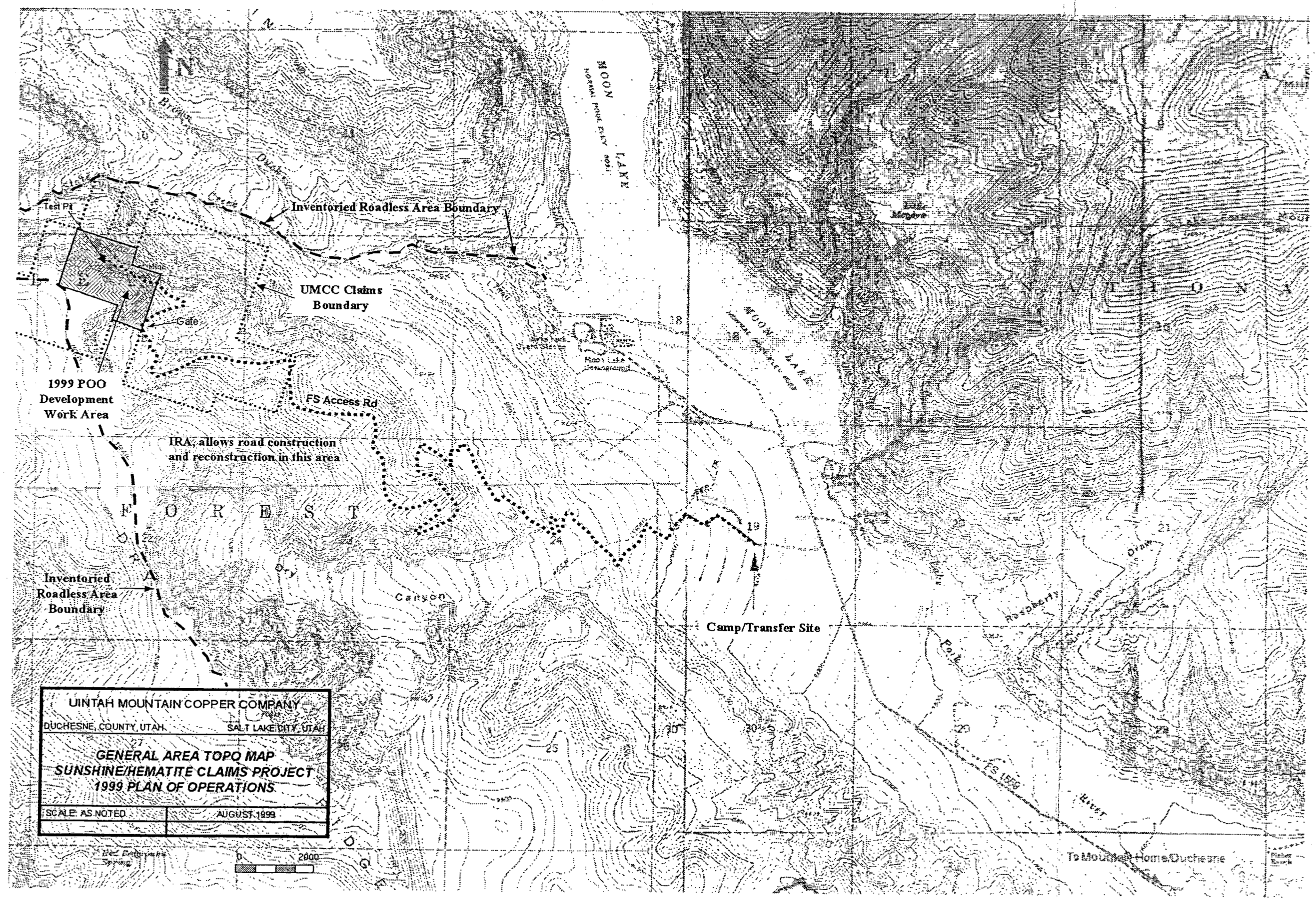
The Duchesne Ranger District of the Ashley National Forest has received a Plan of Operations from the Uintah Mountain Copper Company (UMCC) for a proposed final phase of exploration and development work on a portion of its claims on National Forest System lands. Proposed work incorporates sample hematite pigment ore extraction via test pit and reclamation of the site.

The proposed operation will begin either in the fall of 2000 or in the summer of 2001, depending upon weather conditions. It continues and replaces a previous approved plan of operations for phased test pit exploration and reclamation development activities. The area is located in Sections 10 and 15 T2N, R6W, USM (see map attached). Access would be by existing roads presently maintained by UMCC, with no new roads required for UMCC's planned operations. UMCC will continue to perform annual maintenance on the road, which includes hand clearing of rocks and fallen trees, and repair of minor washouts from winter snowmelt.

The proposal includes a test pit and terraced reclamation area less than 0.1 acre in size, located adjacent to an existing disturbed and naturally barren talus slope. Reclamation is an intrinsic part of the development program, with the slope reclaimed and revegetated after sampling work is complete. An estimated 650 cy of hematite ore (natural red pigment) within the test pit area will be removed and hauled from the forest. All overburden and non-ore materials resulting from the test pit (about 2000 cy of mostly limestone rock) will be incorporated into the reclamation project, with no tailings or waste resulting after completion of work.. The slope will be stabilized via natural gabion rock walls and revegetated.

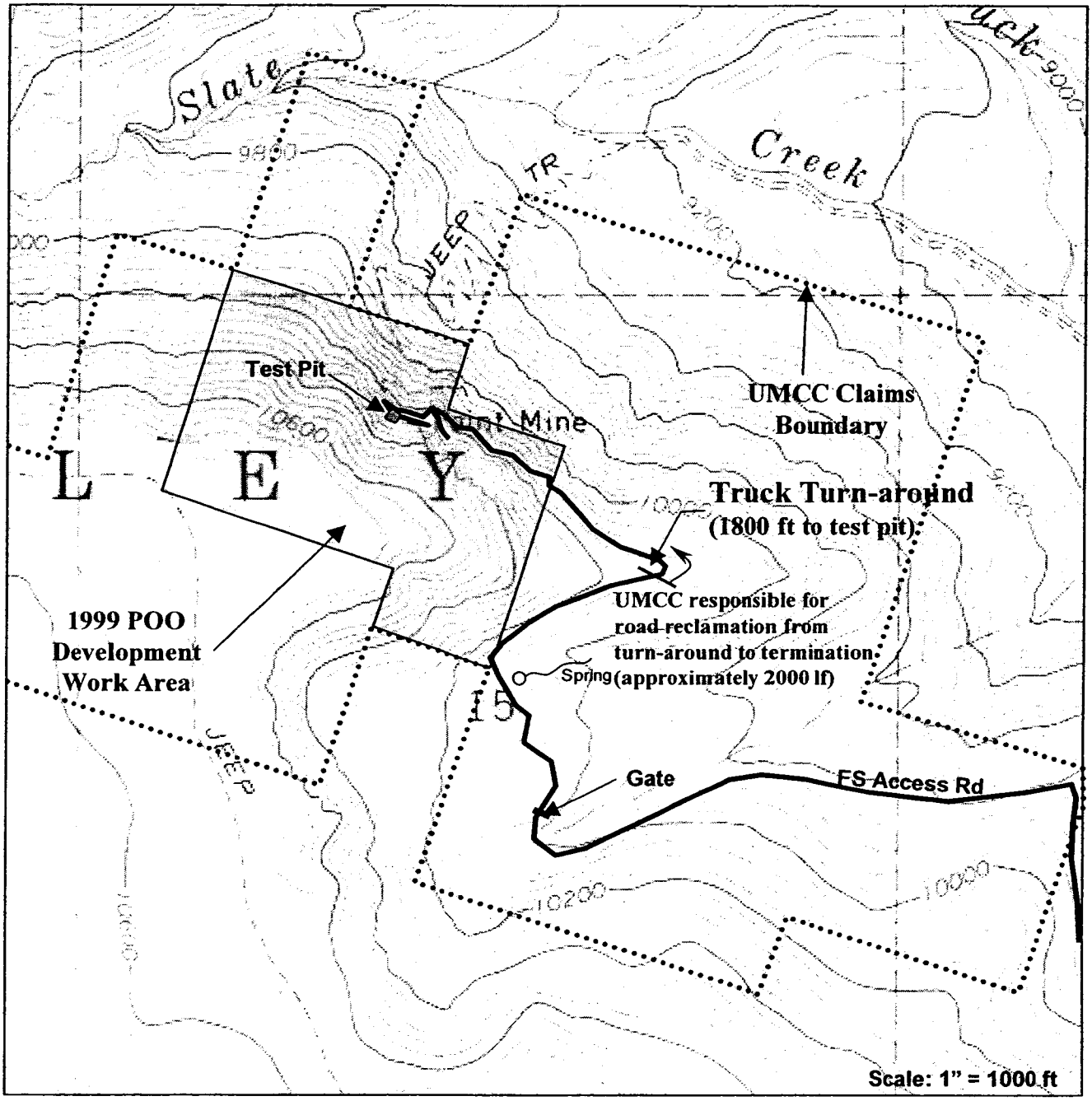
No permanent structures are needed or are planned. Any temporary facility needed will be located at a camp site area previously permitted under the exploration Plan of Operations. One or two trailers (maximum 25 feet) may be used to house personnel and for use as a field office (power and telephone connections are already installed at this site). Potable water will be brought to the site in 10-gallon containers. Sanitation facilities will be self-contained portable units, primarily within trailers.

Ore transfer at camp site will be done by use of temporary bins and conveyors. Power for transfer equipment will be either through use of existing distribution lines near the camp or by gas-operated engines. All sample ore will be removed from the forest. No milling facility or support facilities are needed or are planned within the National Forest (UMCC has recently obtained a mill site near Price, Utah). A copy of the Plan of Operations is available at District office.



Inventoried Roadless Area Boundary
UMCC Claims Boundary
Gate
1999 POO Development Work Area
FS Access Rd
IRA, allows road construction and reconstruction in this area
Inventoried Roadless Area Boundary
Camp/Transfer Site
MOON LAKE
NORMAL POOL ELEV 8051
Test Pit
Canyon
Dry
Park
Raspberry
Draw
FS 1869
River
To Mountain Home/Duchesne
0
2000
UINTAH MOUNTAIN COPPER COMPANY
DUCHESNE, COUNTY, UTAH
SALT LAKE CITY, UTAH
GENERAL AREA TOPO MAP
SUNSHINE/HEMATITE CLAIMS PROJECT
1999 PLAN OF OPERATIONS
SCALE: AS NOTED
AUGUST 1999

ITEM 4 – HAUL & TRANSPORT

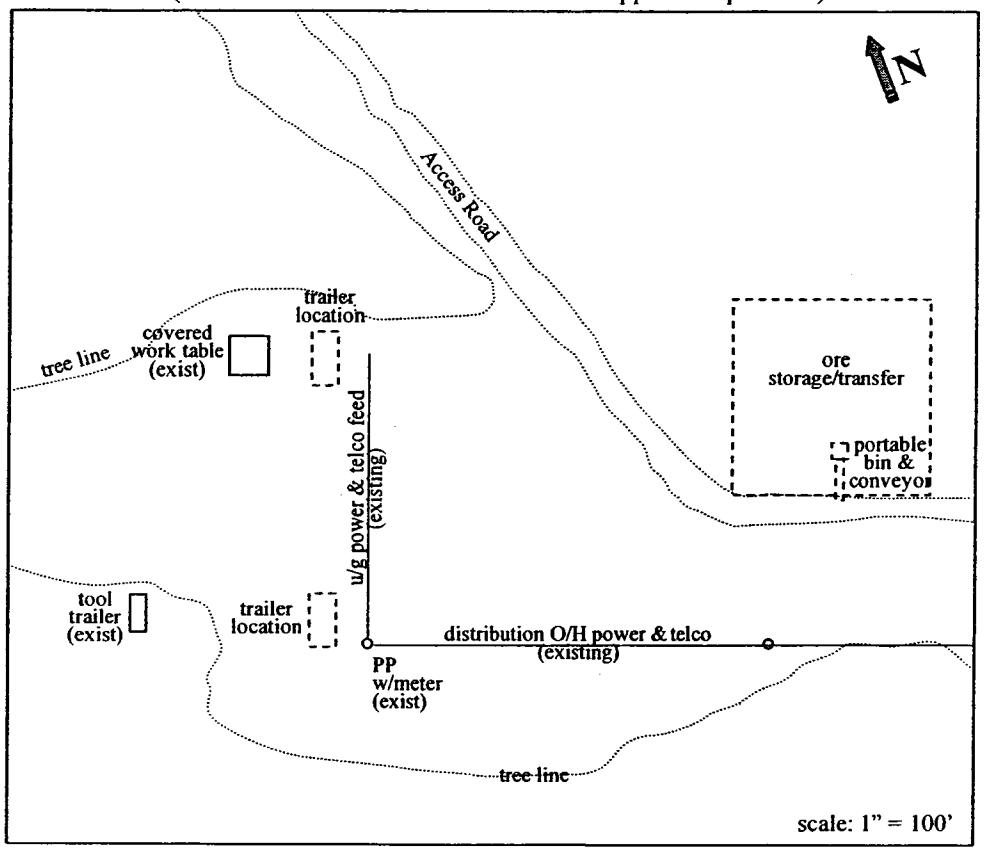


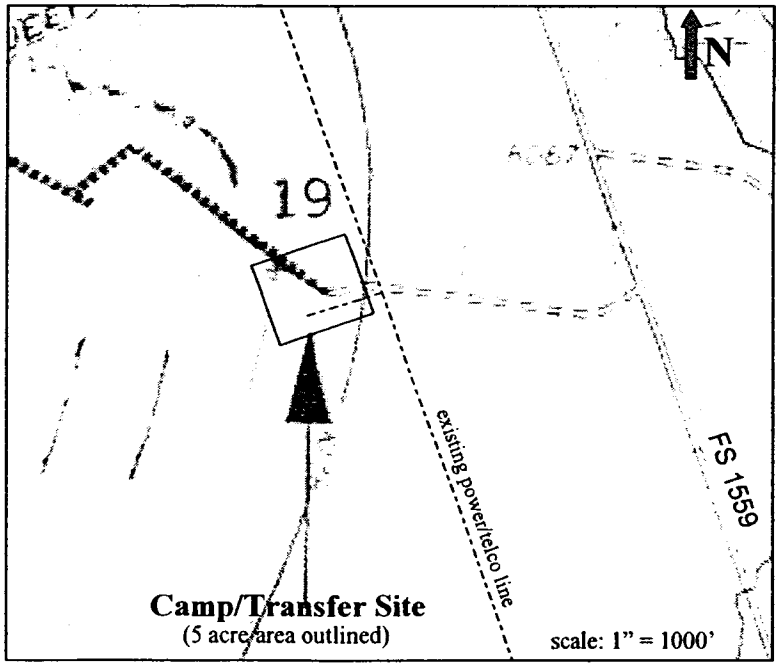
Sample Ore Transport Route Map

ITEM 5 – CAMP SITE FEATURES

Camp/Transfer Site

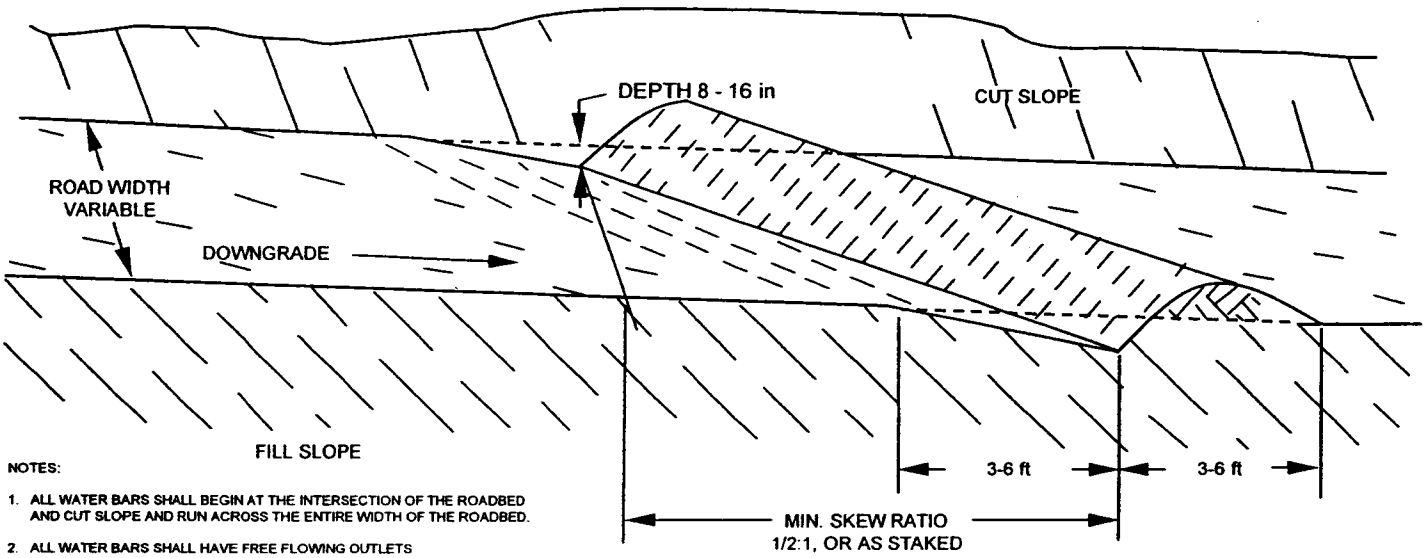
(note: structure locations have not been surveyed in and are shown as approximate
(dashed lines denote future facilities to support test pit work)





ITEM 9 – WATER QUALITY ISSUES

NO SCALE

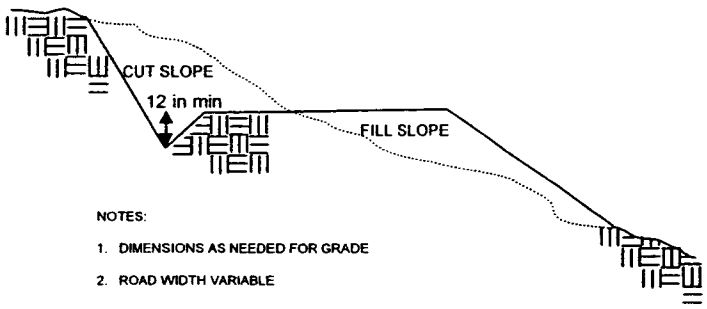


NOTES:

1. ALL WATER BARS SHALL BEGIN AT THE INTERSECTION OF THE ROADBED AND CUT SLOPE AND RUN ACROSS THE ENTIRE WIDTH OF THE ROADBED.
2. ALL WATER BARS SHALL HAVE FREE FLOWING OUTLETS
3. WHEN STAKES ARE USED, THEY DESIGNATE THE OUTLET LOCATION.

STANDARD DETAIL FOR WATER BAR

(adapted from USDA FS Wallowa-Whitman NF standards)



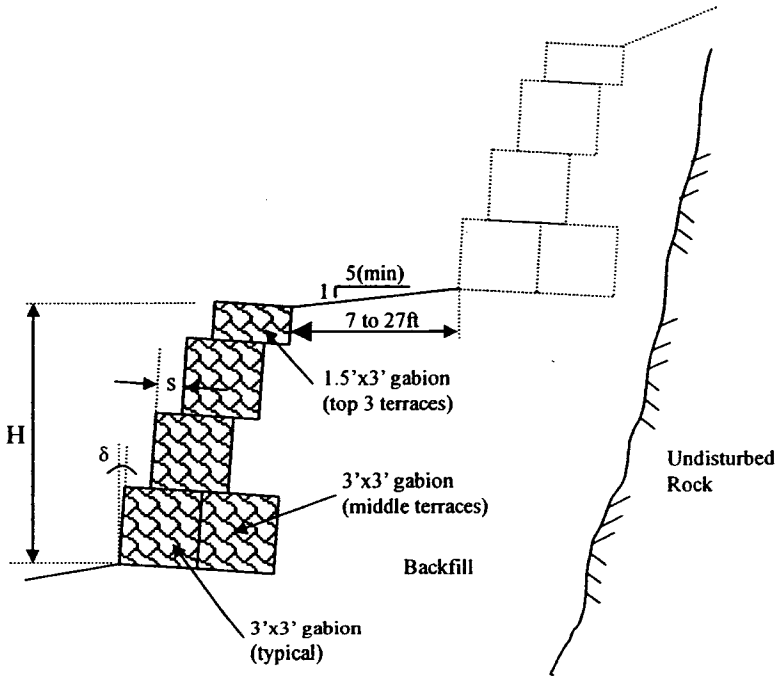
NOTES:

1. DIMENSIONS AS NEEDED FOR GRADE
2. ROAD WIDTH VARIABLE

STANDARD ROAD CROSS SECTION W/DITCH

(adapted from USDA FS Wallowa-Whitman NF standards)

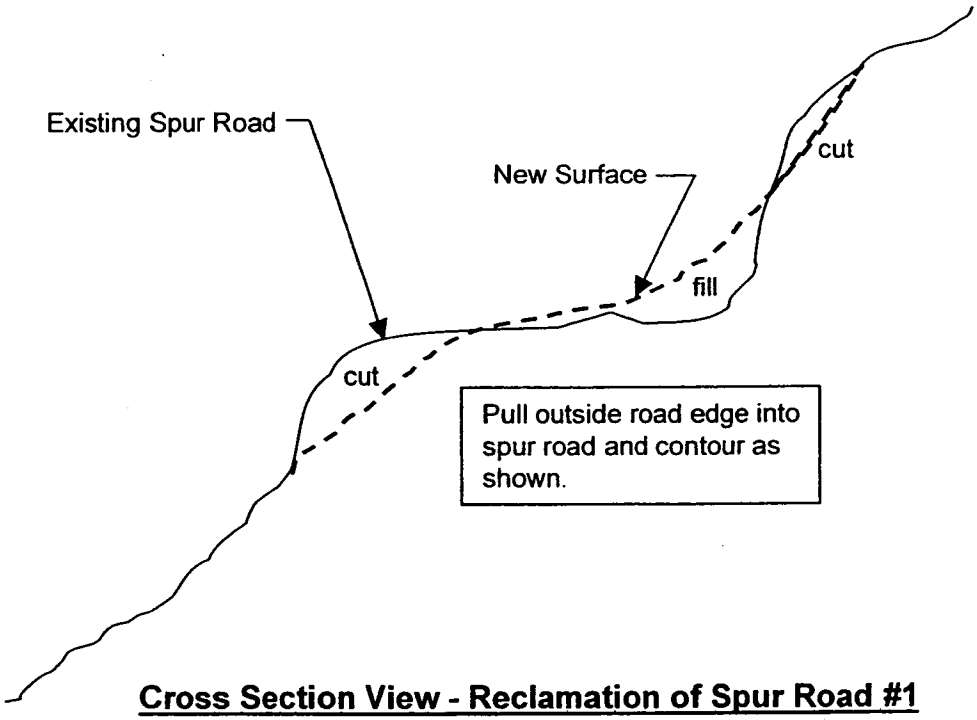
ITEM 10 – GABION WALL DESIGN



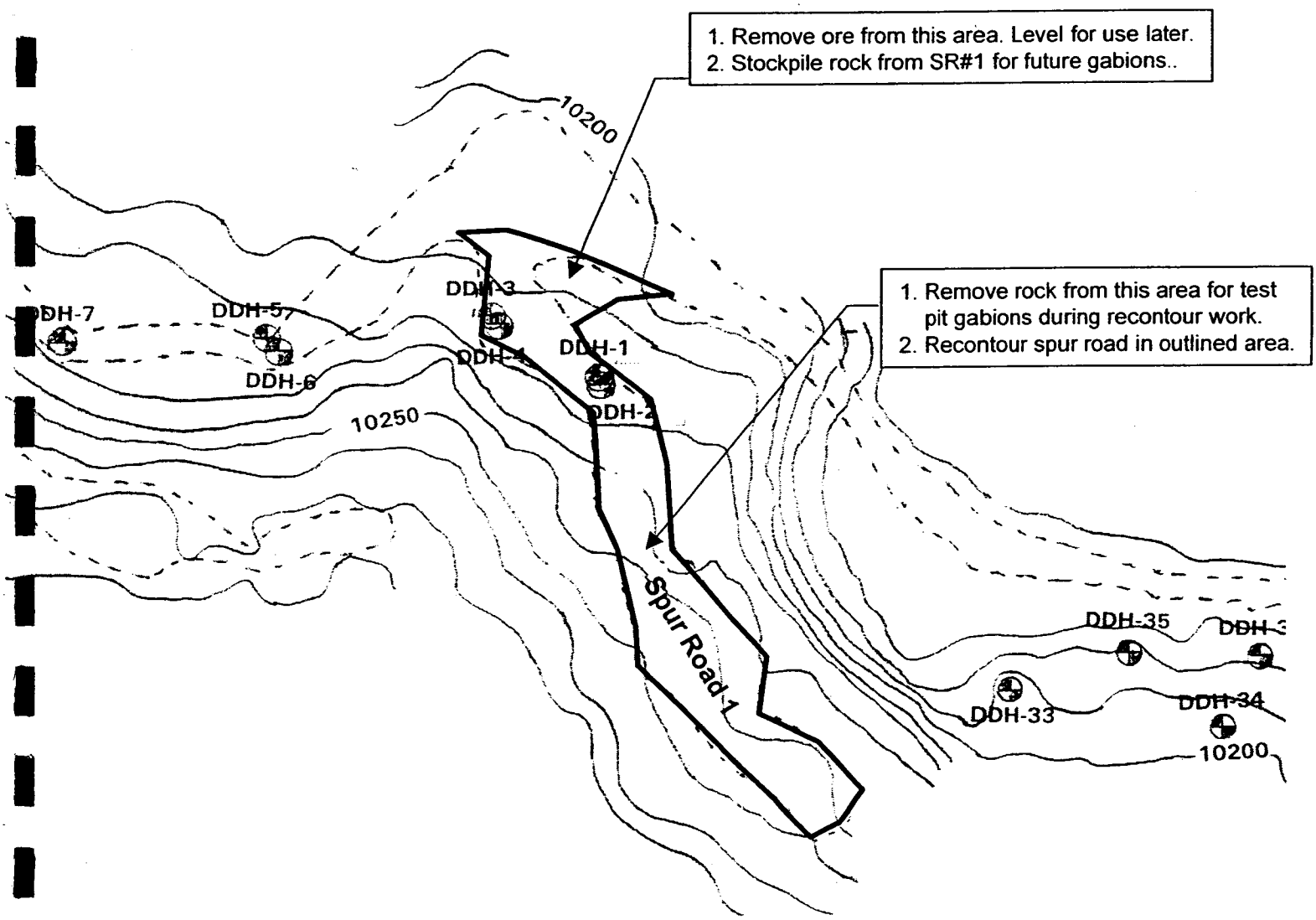
Wall height, H, varies from 8 to 10.5 ft
Gabion baskets stagger, s, 12±3 inches
Wall inclination at time of construction, $\delta = 10°$ to $15°$

Illustration of Typical Gabion Rock Wall Section

MAP 4



Cross Section View - Reclamation of Spur Road #1



This page is a reference page used to track documents internally for the Division of Oil, Gas and Mining

Mine Permit Number S0130002 Mine Name SunShine / Hematite
Operator Uintah Mountain Copper Date 10-29-2001
TO _____ FROM _____

__CONFIDENTIAL __BOND CLOSURE __LARGE MAPS X EXPANDABLE
__MULTIPUL DOCUMENT TRACKING SHEET __NEW APPROVED NOI
__AMENDMENT _OTHER _____

Description YEAR-Record Number

__NOI X Incoming __Outgoing __Internal __Superceded

Clarifications to 1999 UMCC Plan of Operations - Response to Forest Services Supplemental Data Request

___NOI __Incoming __Outgoing __Internal __Superceded

__NOI __Incoming __Outgoing __Internal __Superceded

__NOI __Incoming __Outgoing __Internal __Superceded

__TEXT/ 81/2 X 11 MAP PAGES __11 X 17 MAPS __LARGE MAP

COMMENTS: _____

CC: _____