

From: Ingrid Campbell
To: Lclose@fs.fed.us; arowley@fs.fed.us
CC: OGMCOAL
Date: 11/10/2011 3:00 PM
Subject: South Fork Quitchupah 2R2S
Attachments: 0001.pdf; PLATE 5 - 10Av10.pdf; PLATE 5 - 10Cv2.pdf; PLATE 7 - 3v17.pdf

Please see the attached application from Canyon Fuel Company to allow mining under the South Fork of Quitchupah. We are in the process of reviewing it and we welcome any comments or concerns from the Forest Service. Please let me know if you have any questions.

Thank you,

Ingrid Campbell
Environmental Scientist II
Coal Regulatory Program
Division of Oil Gas & Mining
1594 W North Temple, Suite 1210
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Canyon Fuel
Company, LLC.
Sufco Mine

A Subsidiary of Arch Western Bituminous Group, LLC.

041/002 Incoming Cultural - Confidential

Ken May, General Manager
597 South SR 24
Salina, UT 84654
(435) 286-4400 - Office
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#3950

R

November 2, 2011

Permit Supervisor
Utah Coal Regulatory Program
Utah Division of Oil, Gas and Mining
1594 West North Temple, Suite 1210
P. O. Box 145801
Salt Lake City, Utah 84114-5801

Re: South Fork Quitchupah 2R2S Amendment, Canyon Fuel Company, LLC, SUFCO Mine C/041/0002

Dear Permit Supervisor:

The enclosed four redline copies of the South Fork Quitchupah 2R2S Amendment are being submitted for approval to modify the current Sufco monitoring and mitigation plan for undermining the South Fork of Quitchupah stream channel. Attached are DOGM forms C-1 and C-2.

Sufco would like approval of this amendment as soon as possible for mine planning by December 30, 2011. If you have any questions or need additional information, please contact Mike Davis at (435) 286-4421.

Sincerely,
CANYON FUEL COMPANY, LLC
Sufco Mine

Kenneth E. May
Kenneth E. May
General Manager

Encl.

KEM/MLD:kb

cc: DOGM Price Field Office
DOGM Correspondence File

sufpub\govt2011\dogm\mrp\South Fork Quit 2R2S ltr.doc

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DIV. OF OIL, GAS & MINING

File in:

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Date Folder 11/04/2011 C/041/0002

Incoming. See Confidential

APPLICATION FOR COAL PERMIT PROCESSING

Permit Change New Permit Renewal Exploration Bond Release Transfer

Permittee: CANYON FUEL COMPANY, LLC

Mine: SUFCO MINE

Permit Number:

C/041/0002

Title: South Fork Quitchupah 2R2S

Description, Include reason for application and timing required to implement:

Modification of the Monitoring & Mitigation plan for the South Fork Quitchupah 2R2S panel. Need approval by December 30, 2011.

Instructions: If you answer yes to any of the first eight questions, this application may require Public Notice publication.

- | | | |
|------------------------------|--|---|
| <input type="checkbox"/> Yes | <input checked="" type="checkbox"/> No | 1. Change in the size of the Permit Area? Acres: _____ Disturbed Area: _____ <input type="checkbox"/> increase <input type="checkbox"/> decrease. |
| <input type="checkbox"/> Yes | <input checked="" type="checkbox"/> No | 2. Is the application submitted as a result of a Division Order? DO# _____ |
| <input type="checkbox"/> Yes | <input checked="" type="checkbox"/> No | 3. Does the application include operations outside a previously identified Cumulative Hydrologic Impact Area? |
| <input type="checkbox"/> Yes | <input checked="" type="checkbox"/> No | 4. Does the application include operations in hydrologic basins other than as currently approved? |
| <input type="checkbox"/> Yes | <input checked="" type="checkbox"/> No | 5. Does the application result from cancellation, reduction or increase of insurance or reclamation bond? |
| <input type="checkbox"/> Yes | <input checked="" type="checkbox"/> No | 6. Does the application require or include public notice publication? |
| <input type="checkbox"/> Yes | <input checked="" type="checkbox"/> No | 7. Does the application require or include ownership, control, right-of-entry, or compliance information? |
| <input type="checkbox"/> Yes | <input checked="" type="checkbox"/> No | 8. Is proposed activity within 100 feet of a public road or cemetery or 300 feet of an occupied dwelling? |
| <input type="checkbox"/> Yes | <input checked="" type="checkbox"/> No | 9. Is the application submitted as a result of a Violation? NOV # _____ |
| <input type="checkbox"/> Yes | <input checked="" type="checkbox"/> No | 10. Is the application submitted as a result of other laws or regulations or policies? |

Explain: _____

- | | | |
|---|--|--|
| <input type="checkbox"/> Yes | <input checked="" type="checkbox"/> No | 11. Does the application affect the surface landowner or change the post mining land use? |
| <input checked="" type="checkbox"/> Yes | <input type="checkbox"/> No | 12. Does the application require or include underground design or mine sequence and timing? (Modification of R2P2) |
| <input type="checkbox"/> Yes | <input checked="" type="checkbox"/> No | 13. Does the application require or include collection and reporting of any baseline information? |
| <input type="checkbox"/> Yes | <input checked="" type="checkbox"/> No | 14. Could the application have any effect on wildlife or vegetation outside the current disturbed area? |
| <input type="checkbox"/> Yes | <input checked="" type="checkbox"/> No | 15. Does the application require or include soil removal, storage or placement? |
| <input type="checkbox"/> Yes | <input checked="" type="checkbox"/> No | 16. Does the application require or include vegetation monitoring, removal or revegetation activities? |
| <input type="checkbox"/> Yes | <input checked="" type="checkbox"/> No | 17. Does the application require or include construction, modification, or removal of surface facilities? |
| <input checked="" type="checkbox"/> Yes | <input type="checkbox"/> No | 18. Does the application require or include water monitoring, sediment or drainage control measures? |
| <input checked="" type="checkbox"/> Yes | <input type="checkbox"/> No | 19. Does the application require or include certified designs, maps or calculation? |
| <input checked="" type="checkbox"/> Yes | <input type="checkbox"/> No | 20. Does the application require or include subsidence control or monitoring? |
| <input type="checkbox"/> Yes | <input checked="" type="checkbox"/> No | 21. Have reclamation costs for bonding been provided? |
| <input checked="" type="checkbox"/> Yes | <input type="checkbox"/> No | 22. Does the application involve a perennial stream, a stream buffer zone or discharges to a stream? |
| <input type="checkbox"/> Yes | <input checked="" type="checkbox"/> No | 23. Does the application affect permits issued by other agencies or permits issued to other entities? |
| <input checked="" type="checkbox"/> Yes | <input type="checkbox"/> No | 24. Does the application include confidential information and is it clearly marked and separated in the plan? |

Please attach three (3) review copies of the application. If the mine is on or adjacent to Forest Service land please submit four (4) copies, thank you. (These numbers include a copy for the Price Field Office)

I hereby certify that I am a responsible official of the applicant and that the information contained in this application is true and correct to the best of my information and belief in all respects with the laws of Utah in reference to commitments, undertakings, and obligations, herein.

KENNETH E. MAY

GENERAL MANAGER

11/02/11

Kenneth E. May
Signature (Right-click above choose certify then have notary sign below)

Print Name

Position

Date

Subscribed and sworn to before me this 2 day of November, 2011

Notary Public: Jacquelyn Nebeker, state of Utah.

My commission Expires: _____

Commission Number: _____

Address: _____

City: _____

State: _____

Zip: _____

} ss:



JACQUELYN NEBEKER
Notary Public
State of Utah
My Commission Expires 3/24/2015
Commission # 005049

For Office Use Only:

Assigned Tracking
Number:

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DIV. OF OIL, GAS & MINING

CHAPTER 4
LAND USE AND AIR QUALITY

The Applicant agrees, however, to notify the regulatory authority and the Utah State Historical Preservation Office (SHPO) of previously unidentified cultural resources discovered in the course of mining operations. The Applicant also agrees to have any such cultural resources evaluated in terms of National Register of Historic Places eligibility criteria.

West Coal Lease Modification Areas

Cultural and Historic Information. Cultural resource information and maps identifying cultural and historical study areas are located in Appendix 4-2 in the Confidential folder of the M&RP. EarthTouch, Inc. conducted an intensive evaluation of the West Coal Lease Modification Areas.

The results of the cultural resource inventory for the project resulted in the identification of 15 cultural resource sites, which included three previously recorded sites (42SV1301, 42SV1386 and 42SV2688), and 12 new sites (42SV3207-3215 and 42SV3246-3248). Overall, the identified cultural resource sites consist of small- to moderate-sized lithic scatters and small rock shelters/overhangs, some with associated pictographs. Of the 15 sites identified within the West Coal Lease Modification Areas, six sites are recommended eligible for the National Register of Historic Places. These sites include 42SV3209, 42SV3211, 42SV3212, 42SV3213, 42SV3247 and 42SV3248 which consist of small rock shelters and rock shelters with pictographs. Site 42SV3209 will be the only site undermined under the present mine plan. This shelter is more of a terrace overhang that extends 6 meters long, with a 1.5 meter overhang or width.

South Fork of Quitcupah Area

Cultural and Historic Information. Cultural resource information and maps identifying cultural and historical study areas are located in Appendix 4-2 in the Confidential folder of the M&RP. Canyon Environmental conducted an intensive evaluation of the South Fork of Quitcupah Area.

The results of the cultural resource inventory for the project resulted in the identification of 4 cultural resource sites, which included one previously recorded site (42SV2690), and 3 new sites (42SV3462, 42SV3463 and 42S3464). Overall, the identified cultural resource sites consist of lithic scatters and a small rock shelter/overhang. Of the 4 sites identified within the South Fork of

Quitcupah Area, two sites are recommended eligible for the National Register of Historic Places. These sites include 42SV2690 which consists of a lithic scatter and 42SV3464 which consists of a lithic scatter associated with a small rock shelter. Both sites will be undermined under the present mine plan. This shelter is more of a terrace overhang that measures approximately 1.5 meters high and 4 meters wide at the opening and extends 1.5 meters beneath the rock to a tapered edge. The shelter shows signs of modern disturbance and it appears that some of the fill material has been disturbed by minor looting activities..

The Applicant agrees, however, to notify the regulatory authority and the Utah State Historical Preservation Office (SHPO) of previously unidentified cultural resources discovered in the course of mining operations. The Applicant also agrees to have any such cultural resources evaluated in terms of National Register of Historic Places eligibility criteria.

4.1.1.2 Previous Mining Activity

Portions of the mine plan area were mined prior to the filing of this permit application. SUFACO Mine began a small operation mining the Upper Hiawatha Coal seam in 1941. There was no previous mining activity prior to the 1941 SUFACO operation.

From 1941 through 1974, the coal was removed by conventional mining techniques. From 1974 through 1978, both conventional and continuous mining methods were used. From 1978 until October 1985, all mining used continuous mining methods. Since October 1985 both continuous mining and longwall mining methods have been used. The portion of the seam mined by conventional methods was only partially extracted leaving all pillars for support. The majority of the mining done has been full extraction. All longwall mining is full extraction.

The quantity of coal mined prior to this permit application was approximately 37,058,100 tons. The earlier workings are shown on Plate 5-1 as an integral part of the mining operation.

Use of the land preceding mining was primarily grazing. The area also supported limited timbering in the Ponderosa stands and hunting.

CHAPTER 5
ENGINEERING

stream channel or reduction in stream flows were noted as a result of undermining that portion of Burnout Canyon using the approved mining schedule.

A weekly report will be submitted via e-mail to the Division detailing the results of the inspections. The reports will include, but not necessarily be limited to: a map illustrating the current location of the longwall face; descriptions and dates of field activities; noted changes in stream and local geomorphology; location, width, frequency of cracks; and a description of repairs, if any, conducted. If the prescribed inspections cannot be conducted, the reason for the missed inspection and a record of the attempt to conduct the inspection will be submitted to the Division in the weekly report. The Division will be notified immediately after mining-induced cracks, if any, are found in the East Fork stream channel and the steps taken or planned to be taken as mitigation. Thereafter, the Division will be advised of continuing mitigation efforts, if needed, in the weekly report.

A copy of the October 2003 "Monitoring and Mitigation Plan for Mining Under the East Fork of Box Canyon" prepared by the Division and reviewed and accepted by the Forest with some modifications has been included in Appendix 3-10. The preceding paragraphs have been prepared based on this plan. Sufco will meet all of the monitoring and mitigation responsibilities described in the plan as it pertains to the undermining of the East Fork of Box Canyon.

South Fork of Quitchupah Subsidence Monitoring and Mitigation

Portions of the South Fork of Quitchupah where ~~alluvial and the Price River Formation cover over~~ lying the ~~Castlegate Sandstone exceeds a thickness of 10 feet~~ will be undermined and subsided as longwall panel 2R2S is extracted. A monitoring **and mitigation** plan that is more intensive than the general ~~permit~~ **Mining and Reclamation Plan** area has been proposed for monitoring ~~surface and~~ **ground-water flows, and** subsidence cracks and repair of the cracks in the portions of the South Fork of Quitchupah channel to be undermined. The subsidence portion of the monitoring **and mitigation** ~~plan~~ **program** is discussed in detail in the following text.

Prior to the initiation of undermining and subsidence, a pre-subsidence survey of the stream channel will be conducted in the portion of South Fork of Quitchupah to a location above the gate roads associated with that flows over the 2R2S panel and associated gate roads. The survey will consist of a gain/loss survey of the condition of flow within the stream channel paying particular attention to surface flows and ground water discharge, soil conditions, and the general channel geomorphology of the area. A similar study was performed in the past but all stream measurements were not conducted on the same date. The second gain/loss survey will be completed on a single day at or near base flow conditions late in the summer or early fall of 2011. The mine will attempt, as part of this second survey, to occupy the same monitoring sites in the panel area as those chosen in the initial survey. The monitoring of surface and ground water flows are discussed in greater detail in Section 7.3.1.2.

The subsidence monitoring plan for the South Fork of Quitchupah will include frequent inspection of the stream channel during and after active subsidence. While mining is occurring under the stream channel, and within the 15-degree angle-of-draw above the active longwall face, that area of the channel will be inspected every two weeks semi-weekly for subsidence cracks or other related features. As the longwall face advances and the 15-degree angle-of-draw area follows, the portions of the channel that now lie outside the 15-degree angle-of-draw will be monitored for subsidence features on a quarterly basis for two years following the cessation of subsidence related effects, if any, due to mining.

Mitigation of cracks that would appear to interrupt or divert flows from the stream channel will be sealed immediately with bentonite an appropriate impermeable grout or, in some cases, native materials. Sufco will use hand placement methods when sealing cracks with bentonite, with an adequate volume of bentonite, in powder, granular, and/or chip form, to seal small cracks. The bentonite may be placed by pouring it directly into the crack and hydrating with stream water or, if in an actively flowing portion of the stream, temporarily diverting the flow around successive portions of the crack using native soils and placing the bentonite in the exposed section of the crack until the crack is sealed. Sufco will attempt to seal cracks with the least intrusive methods (typically hand placement of grout or native materials) first. The sealing material may be placed by pouring it directly

into the crack or, if cracks occur in an actively flowing portion of the stream, the stream may be temporarily diverting using native materials (or a designed flume or pipe if necessary to maintain the flow) until the crack is sealed. If cracks are present in channel walls defined by soil, the soil cracks will be hand filled using a native soil/bentonite mix. The sealing of the channel floor and walls will be accomplished with hand tools such as shovel, picks, trowels, etc. In the unlikely event that cracks too large to be sealed through the efforts of one or two persons in one day do occur and it appears there is a danger of water being diverted from the channel for an extended period of time, arrangements will be made to get ~~additional help~~ a contractor selected after consultation with the Forest Service to the site as soon as possible.

There may be sections of the stream channel that may require more intensive mitigation efforts to restore surface flows in the creek. These efforts could include the drilling of closely spaced shallow boreholes in and adjacent to the stream channel and the injection of an acceptable impermeable grout into the alluvium or bedrock. The work will be accomplished either using hand tools or low impact equipment to minimize surface disturbance. Existing roads and turnouts will be used as staging areas to locate larger equipment and supplies. Any hoses or lines will be transported from the staging areas to the nearby worksites either by hand, the use of pack animals, or by helicopter. This work will be done with a contractor selected after consultation with the Forest Service.

If mitigation measures by Sufco personnel, and their consultants and contractors, are not successful in restoring flows after two spring runoff periods, Sufco will initiate additional analysis and planning with the Forest Service.

Additionally, it may be required to remove loose rock from the channel floor, either where the channel flows across thin-bedded bedrock or where large rock have fallen into the channel and is impeding flows. In the instance of the former, past experience has shown this can occur in the upper Blackhawk Formation and is easily repaired by removing enough of the broken channel surface to again expose the stream flow. In the instance of the later, removal of large rocks could be accomplished by drilling and then fracturing the rock into smaller fragments more easily moved to locations were they are not impeding flow. This work may be completed using available pneumatic

or hydraulic tools that do not require road or pad building disturbances. In the unlikely event that large boulders do need to be moved, pumps and tanks necessary to complete the work will be located in pre-disturbed areas, such as roads or turnouts, and hoses will be walked into the work area.

Sufco will conduct longwall mining operations in such a manner as to minimize surface disturbance while mining within the 15-degree angle-of-draw area that includes the South Fork stream channel. This will be accomplished by advancing the longwall on a schedule where mining will not be suspended for a period to exceed 48 hours.

A bi-weekly (once every two weeks) report on the impacts to stream flow and required mitigation, if any, will be submitted via e-mail to the Division and the forest detailing the results of the inspections while mining is occurring under the stream channel. The reports will include, but not necessarily be limited to: a map illustrating the current location of the longwall face; descriptions and dates of field activities; noted changes in stream and local geomorphology; location, width, frequency of cracks; and a description of repairs, if any, conducted. If the prescribed inspections cannot be conducted, the reason for the missed inspection and a record of the attempt to conduct the inspection will be submitted to the Division and the forest in the report. The Division and the forest will be notified immediately after mining-induced cracks, if any, are found in the South Fork stream channel and the steps taken or planned to be taken as mitigation. Thereafter, the Division and the forest will be advised of continuing mitigation efforts, if needed, in the report.

Though not anticipated, short segments of Cowboy Creek could be subsided in the SITLA Muddy Tract. If this is anticipated to occur, Sufco, will submit a plan for mitigation to address, if it occurs, adverse impacts to Cowboy Creek. With the approval of the Division and concurrence of the Forest, Sufco will instigate a flow monitoring plan similar to the plan implemented prior to the undermining of the East Fork of Box Canyon. If mitigation of surface cracks are required, methods similar to those proposed and implemented in the East Fork of Box Canyon as described above could be used.

Mining within the area of the East Fork of the Box Canyon, South Fork of Quitcupah and within the area of Cowboy Canyon in the SITLA Muddy Tract will be conducted in accordance with State and Federal rules and regulations and the requirements and stipulations presented in the BLM's Conditions of Approval of the Resource Recovery and Protection Plan (July 31, 2003) located in Appendix 1-2. A survey of the water quality and quantity of surface and groundwater, including State appropriated waters, within the SITLA Muddy Tract has been completed. The results of the area survey are included in the PHC for the SITLA Muddy Tract and included in Appendix 7-20. Ground and surface waters in the tract that have attached rights are listed in Appendix 7-1.

A discussion regarding the methods Sufco would employ to mitigate and replace an adversely affected State appropriated water supply is provided in Chapter 7, Section 7.3.1.8.

5.2.5.2 Subsidence Control

Adopted Control Measures. As indicated above, SUFACO Mine has adopted subsidence-control measures in areas where surface resources are to remain protected. These controls consist primarily of leaving support pillars in place in those areas designated on Plates 5-10A, 5-10B & 5-10C as not planned for subsidence. Based on experience and data collected from the lease area, the design of support pillars for those areas where subsidence is not planned has been based on the following equations:

$$SF = SD/OS \quad (5-1)$$

where SF = safety factor against pillar failure (fraction)

SD = support strength density (psi)
= $(Y_c)(1-ER)$

Y_c = average compressive yield strength of the coal (psi)
= 3090 psi for the Upper Hiawatha seam

ER = extraction ratio (fraction)
= $1-(A_p/A_t)$

A_p = pillar area (ft²)

A_t = area supported by pillar (ft²)

OS = overburden stress (psi)

$$= (d)(D_o)/144$$

d = overburden depth (ft)

D_o = overburden density (lb/ft³)
= 160 lb/ft³ for the lease area

Based on these equations and data, the support pillar designs summarized in Table 5-3 have been derived. This equation does not take into account either size effect or shape effects and is based on a one-dimensional stress field. Historically this equation has provided good results when used in areas where a number of uniform pillars are extracted. One area (5 North panels) of the mine experienced pillar failure when the area was flooded with water after mining of the panels had been completed. This particular area was mined using a double pass technique and the mining height was from 14 to 18 feet. The resulting pillars varied from 25 feet x 25 feet to 40 feet x 40 feet. The underlying floor was a weak mudstone that lost its cohesive strength when wet. When the 1R5N and 2R5N panels were flooded the underlying mudstone became saturated and lost its cohesive strength. This allowed the pillars in the area with SF < 2.5 to fail, because frictional confinement on the bottom of the pillar was lost. To prevent reoccurrence the Applicant will commit to not flood areas of the mine that have small pillars and a weak mudstone floor in areas where subsidence is to be prevented.

Compliance With Control Plan. SUFCA Mine will comply with all provisions of the approved subsidence control plan.

Correction of Material Damage. SUFCA Mine will try to plan mining operations so that no material damage occurs as a result of subsidence in the lease area. However, should material damage occur, SUFCA Mine will correct any material damage resulting from subsidence caused to surface lands to the extent technologically and economically feasible by restoring the land to a condition capable

CHAPTER 7
HYDROLOGY

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TABLE 7-2
Water Monitoring Program

<u>Monitoring Wells</u>	<u>Protocol</u>	<u>Comments</u>
US-80-2	A	Screened in Castlegate Sandstone
US-80-4	B	Screened in Castlegate Sandstone
89-20-2W	A	Screened in Castlegate Sandstone
US-79-13	B	Screened in Blackhawk Formation
US-81-3	A	Screened in Blackhawk Formation
US-81-4	A	Screened in Blackhawk Formation
01-8-1	A	Screened in Blackhawk Formation
 <u>Streams</u>		
SUFCO 006	C,2	Upper South Fork Quitchupah Creek
SUFCO 006A	F,1	Upper South Fork Quitchupah Creek
SUFCO 006B	F,1	Upper South Fork Quitchupah Creek
SUFCO 006C	F,1	Upper South Fork Quitchupah Creek
SUFCO 007	C,2	Upper North Fork Quitchupah Creek
SUFCO 041	C,2	Lower Quitchupah Creek
SUFCO 042	C,2	Lower North Fork Quitchupah Creek
SUFCO 046	C,2	Upper Quitchupah Creek
SUFCO 047A	C,2	Lower East Spring Canyon Creek
SUFCO 090	C,1	Upper Box Canyon Creek
Pines 106	C,2	Upper East Fork Box Canyon
Pines 302	C,1	Muddy Creek-Last Water Creek Confluence
Pines 403	C,2	Lower Box Canyon Creek
Pines 405	C,1	Muddy Creek - Box Creek Confluence
Pines 406b*	C,1	Lower Muddy Creek
Pines 407	C,1	Box Canyon Creek
Pines 408	C,1	East Fork Box Canyon Creek
USFS-109	C,1	Upper Main Fork of Box Canyon Creek
Link 001	C,2	Link Canyon Drainage
Link 002	C,2	Link Canyon Drainage
FP-1	G,6	East Fork of Main Fork of Box Canyon
FP-2	G,6	East Fork of East Fork of Box Canyon
M-STR4	C,1	Cowboy Creek

*Monitoring point Pines 406 was moved downstream to the USGS monitoring point in 1999 and renumbered as Pines 406b. The point is located in the NW1/4NE1/4, Sec. 21, T21S. R6E.

essentially no tritium. Modern surface waters contain abundant tritium. They visited this site again in June 1996 and located several springs in the drainage several hundred feet above where samples are collected and classified the site as a spring-monitoring site. Nevertheless, Mayo now agrees with SUFCO that this site should be considered a surface water site for monitoring purposes because, at times, this drainage has flow which is contributed by snow melt, precipitation, or sediment pond discharge.

Monitoring sites are sampled three times per year. Surface water monitoring data are submitted to UDOGM by the end of the quarter following sampling. Monitoring data are submitted in an annual summary by March 31 of the subsequent year. UPDES reporting requirements will be met for the three UPDES discharge sites at the mine (see Appendix 7-7).

To better understand the effects that mining will have, if any, on the stream flows within Box Canyon, surface water monitoring sites Pines-407 and Pines-408 will be monitored for stream flows in gallons per minute once every week during the months of June, July, August, September, and October in 1999. Starting in the year 2000, sites 407 and 408 will be monitored once a month in July, August, September, and October for a five year period. If analysis of the data shows no significant changes during this time period, monitoring at these points will be eliminated from the water monitoring program on Table 7-2. Flow measurements at these two sites will be obtained on the same day. Also, the operator will endeavor to obtain the required samples at least five days after the last precipitation event in the drainage area.

To better understand the effects that mining will have, if any, on the stream flows within the South Fork of Quitchupah, surface water monitoring sites SUFCO 006A and SUFCO 006B will be monitored quarterly starting in 2010 for stream flows in gallons per minute and once every two weeks when accessible while mining is occurring within the 15 degree angle-of-draw of the stream channel. An additional surface water monitoring site SUFCO 006C will be monitored quarterly starting in 2011. Once mining has been completed within the angle-of draw, the sites will be monitored on a quarterly basis for two years after mining has progressed past the 15 degree angle-of-draw. If analysis of the data shows no significant changes during this time period, monitoring at these points will be eliminated from the water monitoring program on Table 7-2. Flow measurements at these ~~two~~three sites will be obtained on the same day.

1. Determine if ground water discharge in the area of Pines 105 and Joes Mill Pond springs continue to discharge to the alluvium;
2. Monitor and evaluate the effects of mining on the surface and subsurface water in the Pines 310 and Pines 311 spring areas; and
3. Determine the potential for completing and operating ground water wells in the spring areas as part of the spring site mitigation activities.

The piezometers/wells completed as part of this project will be monitored on a bi-weekly basis through December 2006 or as accessible. Transducers with data loggers will be placed in several of the piezometers to record data on a more continuous basis. The monitoring frequency of the piezometers/wells after December 2006 will be dependant upon the results of the drilling investigation and the impacts to springs Pines 310, 311, 105, and the Joes Mill Pond of mining the 6LPE panel in the fall and winter of 2006.

A report detailing the results of the drilling and piezometer/ well installation and completion will be submitted to the Division by the end of October 2006. Water level data collected from the piezometers/wells will be reported to the Division electronically within two weeks at the end of each the month through December 2006. The Division will also be notified within three days via e-mail or telephone of significant changes to ground water elevations in Pines 310, 311, 105 spring areas as the 6LPE longwall panel is mined. A report compiling the water level data and interpretation of the data will be submitted to the Division by the end of January 2007.

Based on the findings of the investigation, Sufco will submit to the Division either additional plans (if water is not found in the Pines 105 and Joes Mill Pond area, additional bedrock drilling may be required to locate a suitable source of ground water) or a final plan for mitigation of the effected spring areas.

South Fork of Quitchupah Monitoring and Mitigation Plan

A monitoring and mitigation plan that is more intensive than the general Mining and Reclamation Plan area has been proposed for monitoring water flows, subsidence cracks, and repair of the cracks in the portions of the South Fork of Quitchupah channel to be undermined. This plan is outlined below.

Prior to the initiation of undermining and subsidence, a pre-subsidence survey of the stream channel will be conducted in the portion of South Fork of Quitchupah that flows over the 2R2S panel and associated gate roads. The survey will consist of a gain/loss survey of flow within the stream channel paying particular attention to surface flows and ground water discharge, soil conditions, and the general channel geomorphology. A similar study was performed in the past but all stream measurements were not conducted on the same date. The second gain/loss survey will be completed on a single day at or near base flow conditions late in the summer or early fall of 2011. The mine will attempt, as part of this second survey, to occupy the same monitoring sites in the panel area as those chosen in the initial survey.

Two weeks before and then once every two weeks after subsidence mining begins, the measuring locations occupied during the gain/loss survey will be reoccupied and flow measurements of the stream flow will be obtained. The approximate locations of these sites are illustrated on Figure 7-9. The once every other week flow measurements will be supplemented by visual observations of flow performed twice a week or once every three to four days. Flow/no flow conditions will be described on these days. If no flow or diminished flows are noted, the appropriate mine and Forest personnel will be contacted and the mitigation plan to restore flows will be implemented.

Semi-weekly flow observations and visual inspections will continue for at least 12 weeks, or as conditions allow, after the completion of mining under the stream channel. The bi-weekly stream flow monitoring will continue for at least four weeks, or as conditions and monitoring results indicate necessary, after the completion of subsidence mining under the stream channel. The monitoring plan will then change to quarterly flow and field parameter measurements for two years at three sites: one upstream of the panel, one within the panel, and one downstream of the panel. The location of these new temporary monitoring sites are listed in Table 7-2 and shown on Plate 7-3 and labeled as sites 006A, 006B, and 006C. Additional flow monitoring may be needed to determine specific locations where flow is being lost, and treatments are needed.

The subsidence monitoring plan for the South Fork of Quitchupah will include frequent inspection of the stream channel during and after active subsidence. While mining is occurring under the stream channel, and within the 15-degree angle-of-draw above the active longwall face, that area of the channel will be inspected semi-weekly for subsidence cracks or other related features. As the longwall face advances and the 15-degree angle-of-draw area follows, the portions of the

channel that now lie outside the 15-degree angle-of-draw will be monitored for subsidence features on a quarterly basis for two years following the cessation of subsidence related effects, if any, due to mining.

Mitigation of cracks that interrupt or divert flows from the stream channel will be sealed immediately with an appropriate impermeable grout or, in some cases, native materials. Sufco will attempt to seal cracks with the least intrusive methods (typically hand placement of grout or native materials) first. The sealing material may be placed by pouring it directly into the crack or, if cracks occur in an actively flowing portion of the stream, the stream may be temporarily diverting using native materials (or a designed flume or pipe if necessary to maintain the flow) until the crack is sealed. If cracks are present in channel walls defined by soil, the soil cracks may be hand filled using a native soil/bentonite mix. The sealing of the channel floor and walls will be accomplished with hand tools such as shovel, picks, trowels, etc. In the unlikely event that cracks too large to be sealed through the efforts of one or two persons in one day do occur and it appears there is a danger of water being diverted from the channel for an extended period of time, arrangements will be made to get a contractor selected after consultation with the Forest Service to the site as soon as possible.

There may be sections of the stream channel that may require more intensive mitigation efforts to restore surface flows in the creek. These efforts could include the drilling of closely spaced shallow boreholes in and adjacent to the stream channel and the injection of an acceptable impermeable grout into the alluvium or bedrock. The work will be accomplished either using hand tools or low impact equipment to minimize surface disturbance. Existing roads and turnouts will be used as staging areas to locate larger equipment and supplies. Any hoses or lines will be transported from the staging areas to the nearby worksites either by hand, the use of pack animals, or by helicopter. This work will be done with a contractor selected after consultation with the Forest Service.

If mitigation measures by Sufco personnel, and their consultants and contractors, are not successful in restoring flows after two spring runoff periods, Sufco will initiate additional analysis and planning with the Forest Service.

Additionally, it may be required to remove loose rock from the channel floor, either where the channel flows across thin-bedded bedrock or where large rock have fallen into the channel and

is impeding flows. In the instance of the former, past experience has shown this can occur in the upper Blackhawk Formation and is easily repaired by removing enough of the broken channel surface to again expose the stream flow. In the instance of the later, removal of large rocks could be accomplished by drilling and then fracturing the rock into smaller fragments more easily moved to locations where they are not impeding flow. This work may be completed using available pneumatic or hydraulic tools that do not require road or pad building disturbances. In the unlikely event that large boulders do need to be moved, pumps and tanks necessary to complete the work will be located in pre-disturbed areas, such as roads or turnouts, and hoses will be walked into the work area.

Sufco will conduct longwall mining operations in such a manner as to minimize surface disturbance while mining within the 15-degree angle-of-draw area that includes the South Fork stream channel. This will be accomplished by advancing the longwall on a schedule where mining will not be suspended for a period to exceed 48 hours.

A bi-weekly (once every two weeks) report on the impacts to stream flow and required mitigation, if any, will be submitted via e-mail to the Division and the Forest detailing the results of the inspections while mining is occurring under the stream channel. The reports will include, but not necessarily be limited to: a map illustrating the current location of the longwall face; descriptions and dates of field activities; noted changes in stream and local geomorphology; location, width, frequency of cracks; and a description of repairs, if any, conducted. If the prescribed inspections cannot be conducted, the reason for the missed inspection and a record of the attempt to conduct the inspection will be submitted to Division and the Forest in the report. Division and the Forest will be notified immediately after mining-induced cracks, if any, are found in the South Fork stream channel and the steps taken or planned to be taken as mitigation. Thereafter, Division and the Forest will be advised of continuing mitigation efforts, if needed, in the report.

~~Sufco anticipates undermining and subsidizing a portion of the South Fork of Quitcupah beginning in 2013 when the mine starts longwalling panel 2R2S. A surface and ground water monitoring and mitigation program more intensive than the general monitoring plan described previously in this Section will be initiated in this area prior to subsidence occurring within the 15-degree angle-of-draw of the stream channel. This monitoring program will include conducting a pre-mining subsidence survey of the portion of the South Fork of Quitcupah over the 2R2S panel that will be undermined and will incorporate a gain/loss survey of the stream channel from a location~~

~~above the gate road of the 2R2S panel. Besides the existing South Fork of Quitcupah monitoring site (SUFÇO 006), two additional temporary monitoring sites (SUFÇO 006A, and SUFÇO 006B) have been identified above and below the portion of the South Fork where the monitoring of surface and/or ground water flows, and general geomorphology will occur. These new temporary monitoring sites are listed in Table 7-2 and their locations are shown on Plate 7-3. Stream monitoring sites will be monitored specifically for stream flow.~~

~~The surface and/or ground water flows at these stations will be monitored on a bi-weekly basis while mining is occurring within the 15 degree angle-of-draw of the stream channel. Once mining has been completed within the angle-of-draw, the sites will be monitored on a quarterly basis for two years after mining has progressed past the 15-degree angle-of-draw. Table 7-2 presents the monitoring site numbers, monitoring parameters, and the frequency of monitoring. A report on the impacts, if any, to the stream or ground water flows, general geomorphology, location of the longwall, etc., will be provided via e-mail to the Division while mining is occurring under the stream channel.~~

~~Monitoring for subsidence cracks within the stream channel of the South Fork of Quitcupah Creek will also be part of this intensive monitoring and mitigation plan. The details of the mitigation plan are discussed in greater detail in Section 5.2.5.1 of this M&RP. The subsidence monitoring program will consist of inspecting the stream channel floor within the active 15-degree angle-of-draw on a bi-weekly basis. Mining induced subsidence effects, such as cracks, slumps, offsets, etc., will be identified, mapped, and a brief narrative of the effects will be recorded and forwarded to the Division. A report will be provided via e-mail to the Division on the results of the subsidence monitoring and mitigation activities while mining is occurring under the stream. A summary report to the Division documenting the pre- and post-mining conditions of the stream channel will be submitted 90 days after subsidence monitoring is complete for the 2R2S panel. This report will include a description of all activities and work conducted by Sufco for stream channel evaluation and mitigation. All identified impacts and mitigation efforts will be documented. The results of mitigation, if performed, will be discussed.~~

Prior to implementation of any mining-induced subsidence mitigation efforts in the stream channel as described in Chapter 5, a Stream Alteration Permit will be obtained from the Utah Division of Water Rights. Sufco will have the alteration permit(s) prior to undermining the South Fork of

Quitichupah stream channel since the mitigation efforts will occur as soon as possible after a need for mitigation is determined.

~~Every reasonable attempt will be made by Sufco to implement and follow the monitoring program schedule. If access is limited due to snow or inclement weather, the mine's effort to access the area will be documented in the report to the Division. The time of the access attempt, weather conditions, and reason(s) for failing to monitor the South Fork of Quitichupah sites will be provided in the report.~~

1927 North American Datum: UTM grid zone 12
 Generated by BigTopo7 (www.igage.com)
 Map compiled from USGS Quads: Acord Lakes, UT Heliotrope
 Mountain, UT

38° 56' 51.727" N
 111° 27' 33.570" W

38° 56' 52.803" N
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111° 27' 34.784" W
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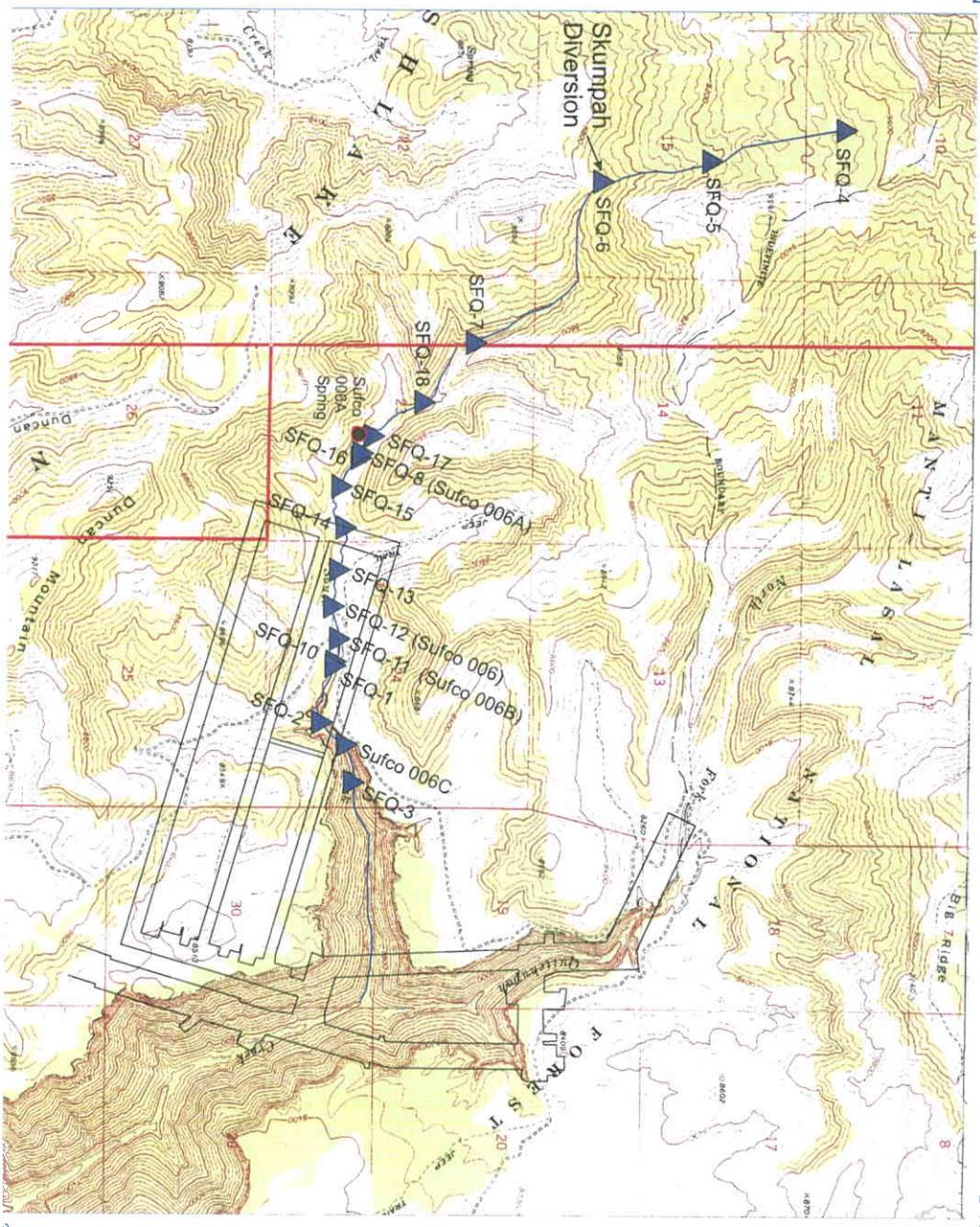
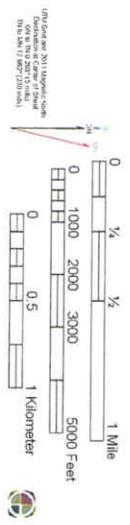
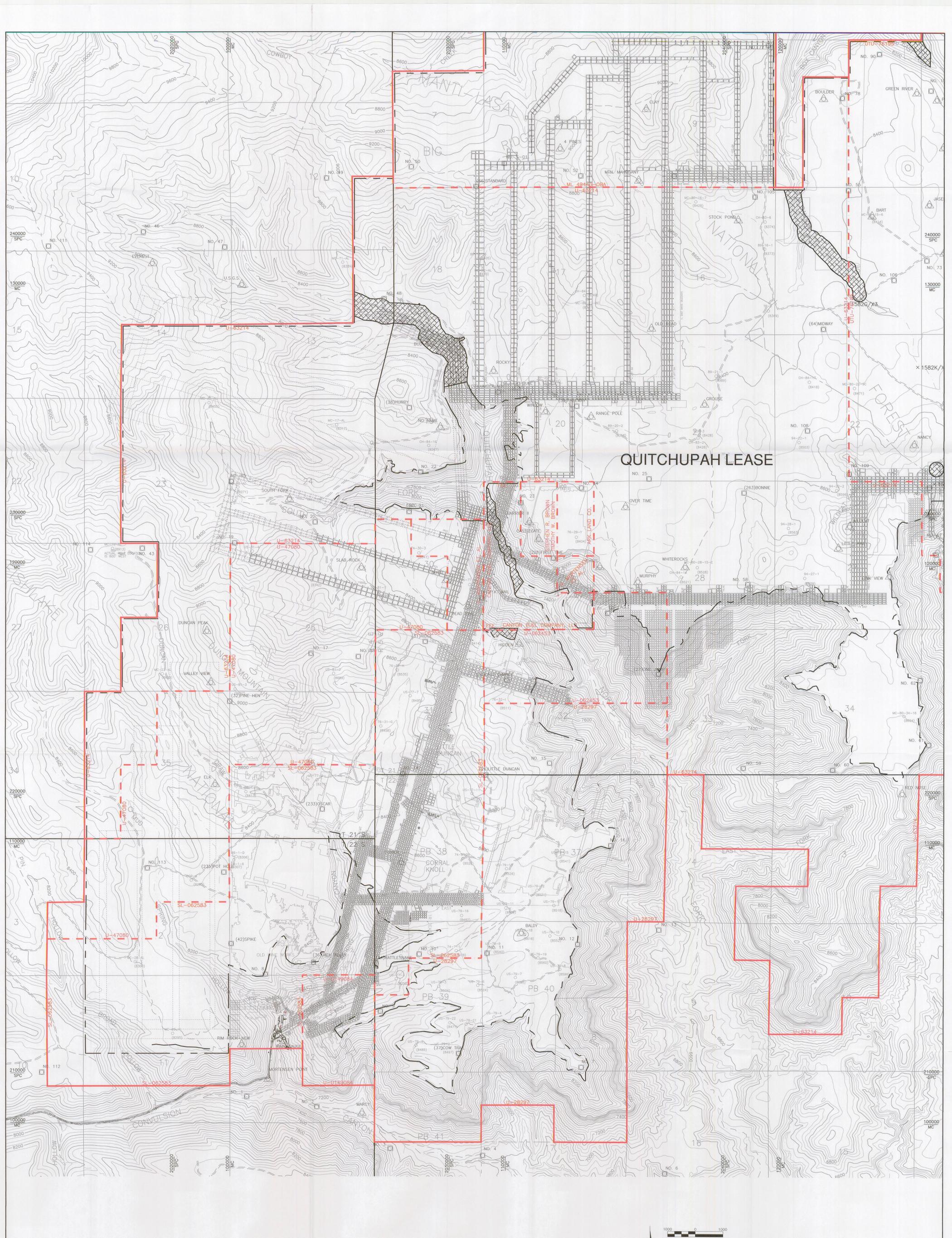


Figure 7-9
 South Fork Quitchupah Monitoring Locations



QUITCHUPAH LEASE

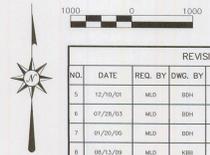
EXPLANATION

- SUFCO EXTERIOR LEASE BOUNDARY
- SUFCO INTERIOR LEASE BOUNDARY
- MINE COORDINATES
- STATE PLANE COORDINATES
- CONTROL POINT
- AERIAL TARGET
- LIMIT OF POTENTIAL SUBSIDENCE
- ▨ UNDERGROUND PERENNIAL STREAM AND PROTECTED CULTURAL SITE BUFFER CORRIDOR



FILE NO: 1104110041000
 SHEET NO: 1104110041000
 DATE: 11/02/11

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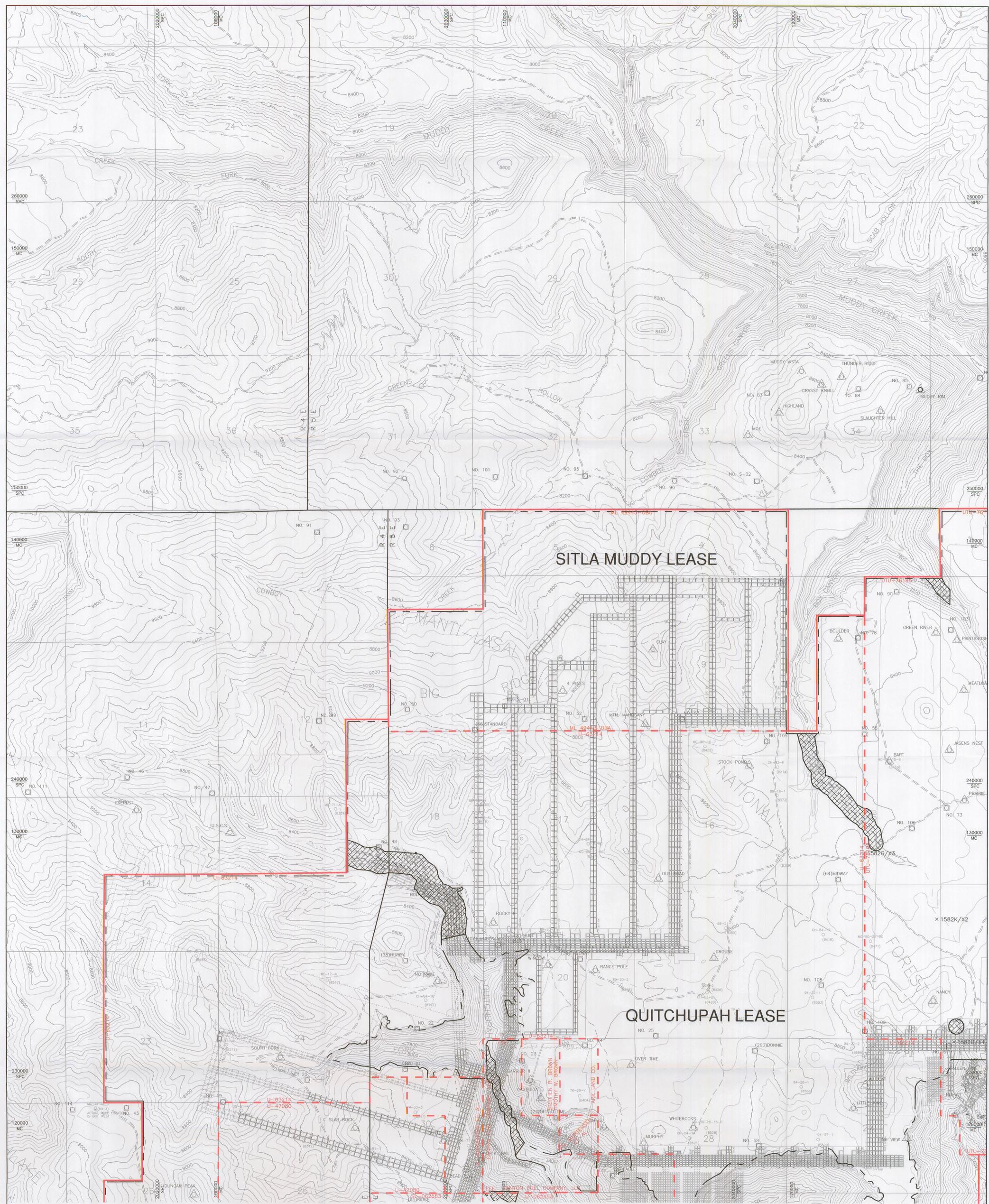
REVISIONS				
NO.	DATE	REQ. BY	OWG. BY	REMARKS
1	12/16/01	M.D.	B.H.	
2	07/26/03	M.D.	B.H.	
3	01/20/05	M.D.	B.H.	
4	08/13/09	M.D.	K.B.	
5	06/11/10	M.D.	H.B.	
6	11/02/11	M.D.	K.B.	

Canyon Fuel Company, LLC
SUFCO Mine
 597 South 28 1/2 - 50th, UT 84654
 (435) 286-4880 Phone
 (435) 286-4499 Fax

POTENTIAL SUBSIDENCE LIMITS
QUITCHUPAH TRACT

SCALE: 1" = 1000'
 DATE: 01/14/97
 DRAWN BY: JMB
 ENGINEER: [Signature]
 SHEET NO: PLATE 5-10A10

NOV 04 2011
 DIV. OF OIL, GAS & MINES



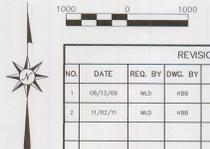
EXPLANATION

- SUFCO EXTERIOR LEASE BOUNDARY
- SUFCO INTERIOR LEASE BOUNDARY
- MINE COORDINATES
- STATE PLANE COORDINATES
- CONTROL POINT
- AERIAL TARGET
- LIMIT OF POTENTIAL SUBSIDENCE
- UNDERGROUND PERENNIAL STREAM AND PROTECTED CULTURAL SITE BUFFER CORRIDOR

File No: Confidential
 Date: 08/13/09
 Drawn by: JMB
 Checked by: JMB



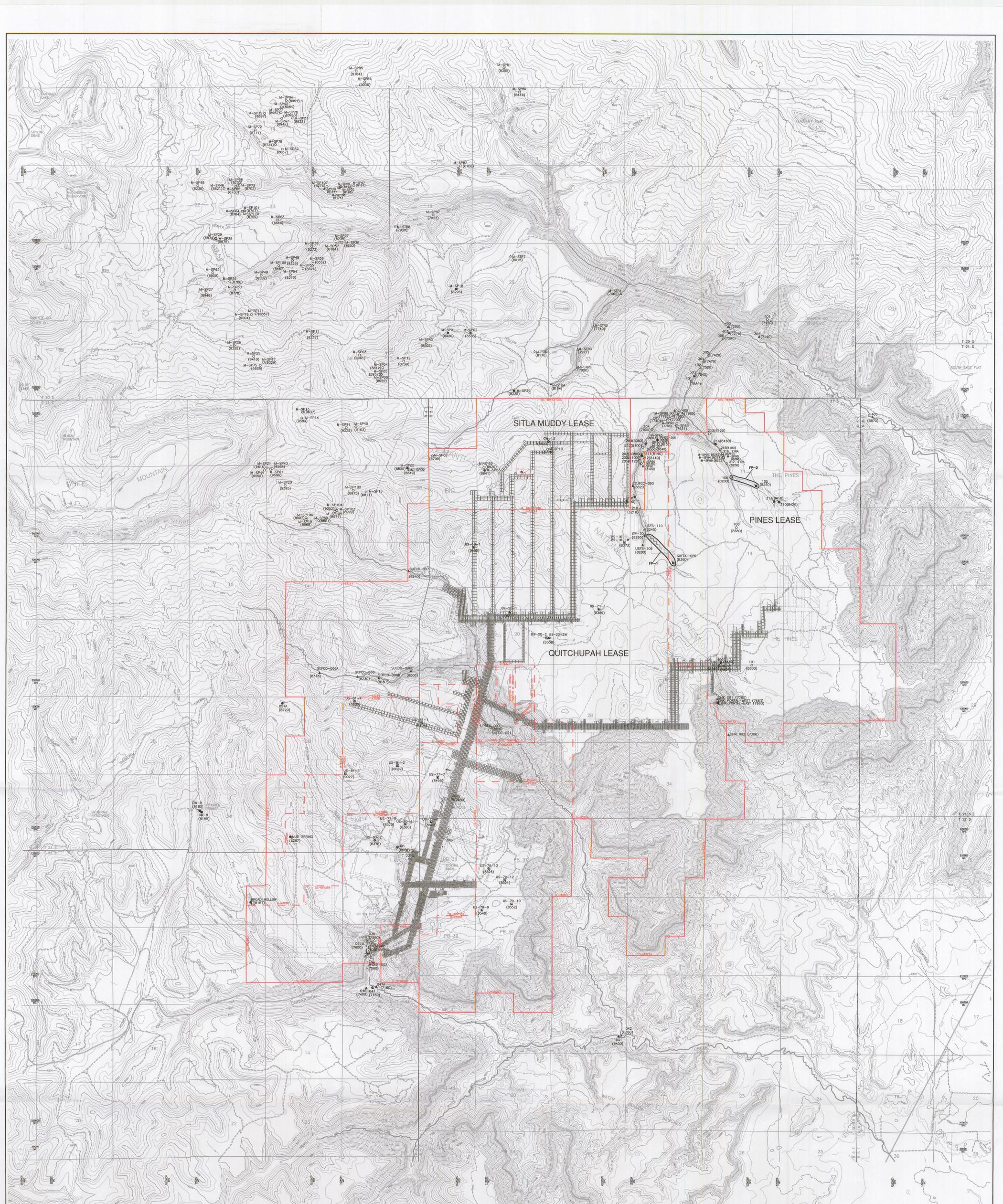
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REVISIONS				
NO.	DATE	REQ. BY	DWG. BY	REMARKS
1	08/13/09	JMB	HBB	
2	11/02/11	JMB	HBB	

Canyon Fuel Company, LLC
SUFCO Mine
 597 South 300 W. • Orderville, UT 84654
 (435) 286-4880 Phone
 (435) 286-4499 Fax

POTENTIAL SUBSIDENCE LIMITS
SITLA MUDDY & GREENS HOLLOW TRACT
 SCALE: 1" = 1000' DATE: 08/13/09 DRAWN BY: JMB ENGINEER: HBB SHEET NO: PLATE 5-10C-2
 CHECKED BY: WKS FILE NAME: H:\DRAWINGS\MPR\PLATES\PLATE 5-10C.dwg



NOTES:
 1. HISTORIC STREAM, SPRING AND WELL MONITORING SITES ARE OLD BASELINE MONITORING SITES OR SITES THAT HAVE BEEN DISCONTINUED OR MINED THROUGH THAT ARE NOT CURRENTLY BEING MONITORED.

EXPLANATION

- SUFCO MINE PROPERTY BOUNDARY
- - - SUFCO MINE LEASE BOUNDARY
- 100000 MINE COORDINATES
- 3000000 STATE PLANE COORDINATES
- △ HISTORIC STREAM
- ▲ STREAM
- HISTORIC MONITORING WELL
- ⊕ MONITORING WELL SITE
- HISTORIC SPRING MONITORING SITE
- SPRING
- UPDES MONITORING POINT
- IN MINE MONITORING SITE
- (7600) ELEVATION OF SITE
- PERENNIAL FLOW LOCATION MONITORING POINT
- PERENNIAL FLOWS

File No: *110416-041000*
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 Drawing



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REVISIONS				
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13	10/26/06	MD	BEH	
14	05/08/07	MD	KSB	
15	06/13/09	MD	KSB	
16	06/11/10	MD	KSB	
17	11/02/11	MD	KSB	

Canyon Fuel Company, LLC
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HYDROLOGIC MONITORING STATIONS

SCALE: 1" = 2000'	DATE: 01/14/09	DRAWN BY: JMB	ENGINEER: JMB	SHEET NO.: 7-317
CHECKED BY: WKS	FILE NAME: H:\DRAWINGS\MWP\PLATES\PLATE 7-317.dwg	PLATE 7-317		