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State of Utah
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF OIL, GAS AND MINING

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September 9, 1999

TO: File

THRU: Daron Haddock, Permit Supervisor

THRU: Dave Darby, Team Lead

FROM: James D. Smith, Reclamation Specialist JDS

RE: Technical Analysis for Lila Canyon Mine, Utah American Energy, Inc., Horse Canyon Mine, ACT/007/013-98-1, File 2, Emery County, Utah.

SUMMARY

TECHNICAL ANALYSIS

ENVIRONMENTAL RESOURCE INFORMATION

Regulatory Reference: Pub. L 95-87 Sections 507(b), 508(a), and 516(b); 30 CFR Sec. 783., et. al.

GENERAL CONTENTS

Regulatory Reference: R645-302.122.

Referenced materials not on file at the Division or readily available to the Division will be provided upon request of the Division by the applicant (Section 120.122).

Outside sources are referenced many times in Chapters 6 and 7 and their appendices but are not adequately described nor listed in a reference section. Many of the publications cited are probably available to the Division and the general public through libraries, but they will be difficult to locate unless explicit citations are provided. Complete, usable references are needed, either at the end of each chapter or in one comprehensive reference section for the entire PAP. A partial References list is found at the end of Appendix 7-3, but the following citations from Chapters 6 and 7 (including Appendices) are not in that list:

Abbott and Liscomb, 1956.
Balsley and Horne, 1979.
Balsley, 1981 (perhaps a typo and should be the same as Balsley, 1980?).
Clark, 1928.
Doelling, 1972.

Fisher, 1936.
Fisher, Erdmann, and Reeside, 1960.
Osterwald and Mayberry, 1974 (perhaps same as F. W. Osterwald and J. O. Maheny, 1974?).
F. W. Osterwald and J. O. Maheny, 1974.
Sieler and Baskins, 1986.
Young, 1955, 1957, and 1966.
Waddell and others, 1983 (perhaps a typo and should be the same as Waddell and others, 1986?).

GEOLOGIC RESOURCE INFORMATION

Regulatory Reference: 30 CFR Sec. 784.22; R645-301-623, -301-724.

Analysis:

Geologic information includes a description of the geology of the proposed permit and adjacent areas down to and including the stratum immediately below the lowest coal seam to be mined. The coal seams and adjacent strata comprise an aquifer that may be adversely impacted by mining. Geology may affect the occurrence, availability, movement, quantity, and quality of potentially impacted surface and ground water.

The application does not include geologic information in sufficient detail to assist in determining the probable hydrologic consequences of the operation upon the quality and quantity of surface and ground water in the permit and adjacent areas, including the extent to which surface- and ground-water monitoring is necessary, and whether the proposed operation has been designed to prevent material damage to the hydrologic balance outside the permit area. The information is not sufficient to assist in determining all potentially acid- or toxic-forming strata down to and including the stratum immediately below the coal seam to be mined and determining whether reclamation can be accomplished. Geologic information is not sufficient to assist in preparing the subsidence control plan.

Required resource maps and plans and detailed site specific information are based on published geologic information, permit applications of the adjacent Sunnyside and South Lease areas, and drilling records of U. S. Steel Corporation and the Los Angles Department of Power and Water. Some of these are included in the PAP, others are readily available, but some of the information is proprietary or otherwise not readily available to the Division and public.

Strata above the coal seam to be mined will not be removed, so samples have been collected and analyzed from test borings or drill cores. Bore holes S-1 through S-23 were drilled between 1948 and 1975. S-24 through S-31 were drilled in 1980 and 1981, and an unsuccessful attempt was made to convert S-26, S-28, and S-31 to ground-water observation wells.

S-26 and S-31, located south of the Williams Draw Fault, were offset with shallow piezometers A-26 and A-31 to observe ground water in the alluvium (Table 6-3). Table VI-3 does not indicate that these wells have been plugged and abandoned; however, the applicant has no data on A-26 and A-31 (Section 6.5.1, p. 21) and considers these sites unusable (Section 724.100).

S-32 was drilled in 1981 and completed as a piezometer in the Grassy Member of the Blackhawk Formation. The location of S-32 is not shown on any map: it can be determined from the log in Appendix 6-1 that it is in T. 17 S., R. 15 E. but the section cannot be identified. The applicant states that other than the log there are no other geologic or piezometric data from S-32 (Section 6.5.1, p. 21).

Two other wells were bored in Horse Canyon to monitor water in the alluvium. These two wells have since been sealed according to Section 724.100 (page 11) of the PAP; however, in Section 722.400 it states that one well will be used during mining and reclamation operations and sealed after reclamation is complete and that, to the applicant's best knowledge, the second well has already been sealed. There are no logs or other geologic or hydrologic data from these wells in the PAP.

In 1993 and 1994 IPA-1, IPA-2, and IPA-3 were drilled. Results of proximate and ash analyses of "floor" and "roof" from IPA-1, IPA-2 (roof only), and IPA-3 are in Appendix 6-2; however, the analyses reports show these are coal samples, not samples from strata overlying and underlying the coal seam. There are also proximate, ultimate, sulfur (total and pyritic), ash, and several other analyses for "middle" coal samples from the three bore holes.

Logs of bore holes IPA-1, IPA-2, IPA-3, S-14, S-27, and S-32 are in Appendix 6-1. Ground water was noted on the logs for IPA -1 and IPA-2: fluid levels were reported for S-27 and S-32 but the fluid may have been static drilling fluid in the bore hole rather than ground water. These logs show lithologic characteristics, including physical properties and thickness of each stratum that may be impacted. In addition to the bore holes, coal seams and adjacent strata were measured at seventeen out-crop locations in 1974 and 1975. Lithology and thickness of the coal seams and adjacent strata, based on the bore holes and measured out-crop sections, are shown on Plate 6-5.

Engineering properties of the strata immediately above and below the coal seam to be mined are listed in Table 6-6. Data are based on core samples from bore holes S-18 and S-22.

Access to the underground workings of the Lila Canyon Mine will be provided by two rock slopes driven up-dip from the top of the Mancos Shale to the coal seam. Rock that will be removed from the tunnels will be called "slope rock", and it fits most closely into the classification of underground development waste. The slope-rock underground development waste will contain mostly shale, sandstone, and mudstone. Traces of coal may be found, but the applicant feels the amount will be insignificant. Slope-rock will be used to fill in areas to be used as pads in the coal pile storage areas, with any additional being placed in the refuse pile, or it may be crushed and used for gravel (Section 528.320), although the use for the gravel is not described.

Coal processing waste from the crusher will be placed in disposal areas within the permit area. The refuse pile has been designed as a location for the storage of underground development waste that is brought to the surface, including any excess slope-rock not used as fill; it is not anticipated that any underground waste other than the slope-rock will be brought to the surface. The capacity of the pile is designed for 150,000 tons, which is in excess of projected needs. Material not transported to the surface, such as overcast material, rock falls, and slope material may be disposed of underground according to the appropriate MSHA regulations. Because this will be an underground mine there will be no spoil.

The slope-rock underground development waste will be left in place for final reclamation if tests indicate the material is satisfactory. If the material is not satisfactory, it will be handled as refuse; otherwise, the area will be covered and re-seeded as per Chapters 2 and 7 and PAP Section 540 . In 537.210 the applicant commits to test the slope-rock underground development waste to assure that the

material is composed of nonacid- or nontoxic-forming waste.

The PAP contains no reports of analyses for acid- or toxic-forming or alkalinity-producing materials and their content in the strata immediately above and below the coal seam to be mined, including the rock through which the tunnels will be built, and it is not established that this material can be properly disposed of at the waste rock disposal area and that reclamation of the waste rock disposal site can be accomplished. The applicant contends that over 100-years of mining experience at the adjacent Sunnyside Mines indicates that none of the horizons contain acid- or toxic-forming materials in quantities sufficient to be considered a problem, but no data are presented to substantiate this claim.

The coal seam crops out at approximately 6,500 feet in the vicinity of the rock-slope tunnels. The PAP indicates the tunnels will intercept the coal seam at approximately 6,300 feet.

Underground mining always has a potential for impacting surface-water, ground-water, and other surface resources. The applicant states in Section 721 (page 6) that subsidence effects are expected to be minimal due to the amount of cover and massive rock strata between the mining and the surface. Coal-seam elevations determined from bore holes are on Plate 6-4 - Cover and Structure Map.

The applicant has made no request to the Division to waive in whole or in part the requirements of the borehole information or analysis required of this section.

Findings:

Geologic Resource Information is not considered adequate to meet the requirements of this section. Prior to approval the applicant must provide the following information:

R645-302.122, -624.130 - Outside sources are referenced many times but the outside sources are not adequately described or listed in a "reference" section.

R645-301-302.122, -624.130, -624.320 - The applicant asserts that over 100-years of mining experience at the adjacent Sunnyside Mines indicates that none of the horizons contain acid- or toxic-forming materials in quantities sufficient to be considered a problem, but no data are presented to substantiate this assertion.

R645-301-624.320 - There are no reports of chemical analyses for acid- or toxic-forming or alkalinity-producing materials and their content in the strata immediately above and below the coal seam to be mined, including the rock through which the tunnels will be built.

R645-301-624, -624.210 - Two wells were located in the alluvium in lower Horse Canyon Creek. It is not clear whether the well that is nearer the Horse Canyon surface facilities has been sealed and abandoned (as indicated Section 724.100) or is operational and is to be used during mining and reclamation operations (as indicated in Section 722.400). There are no hydrologic data from either well in the PAP.

HYDROLOGIC RESOURCE INFORMATION

Regulatory Reference: 30 CFR Sec. 701.5, 784.14; R645-100-200, -301-724.

Analysis:

Sampling and analysis.

All water-quality analyses performed to meet the requirements of R645-301-723 through -724.300, -724.500, -725 through -731, and -731.210 through -731.223 will be conducted according to the methodology in the current edition of "Standard Methods for the Examination of Water and Wastewater" or the methodology in 40 CFR Parts 136 and 434. Water-quality sampling will be conducted according to either methodology listed above when feasible (Section 723).

Baseline information.

The U.S. Geological Survey conducted a water quality study in Horse Canyon from August 1978 until September 1979 during the time that U.S. Steel operated the mine. Samples were taken monthly from the Horse Canyon Creek and analyzed for most major ions and cations and field parameters. Metals, eight nitrogen species and other minor chemical constituents were taken on a quarterly basis or less. This is briefly mentioned in Appendix 7-3 but these data are not in the PAP and the results of the analyses are not discussed with the baseline information. There is no reference for the source of these data.

Between January 1981 and April 1983, baseline water quality data were collected for surface water and spring sites B-1, HC-1, RF-1 and RS-2 on the Horse Canyon permit area. Between 14 and 19 samples, depending on the site, were taken and analyzed during the monitoring period. The parameters that were analyzed were derived from Section 783.16 (apparently the number in the old Coal Mining Regulations). This is briefly mentioned in Appendix 7-3 but these data are not in the PAP and the results of the analyses are not discussed with the baseline information. There is no reference for the source of these data.

Two other sites, RS-1, and RS-2, were sampled once a year during 1978, 1979, and 1980 and analyzed for most major chemical constituents. In addition, springs H-6, H-18, and H-21 were sampled once and analyzed for the major constituents in 1985. Third quarter data for 1989 were collected for HC-1 and RF-1 and sampled for most of the parameters in UDOGM's guidelines. This monitoring is briefly mentioned in Appendix 7-3 but the data are not in the PAP and the results of the analyses are not discussed with the baseline information. There is no reference for the source of these data.

Ground-water information.

An unsuccessful attempt was made to convert bore-holes S-26, S-28, and S-31 to ground-water observation wells. S-26 and S-31, located south of the Williams Draw Fault, were offset with shallow piezometers A-26 and A-31 to observe ground water in the alluvium (Table 6-3); it is not clear from Table VI-3 whether or not these wells have been plugged and abandoned or if they are available for ground-water monitoring; however, the applicant has no data on A-26 and A-31 (Section 6.5.1, p. 21) and considers these wells unusable (Section 724.100).

Two other wells were bored in Horse Canyon to monitor water in the alluvium there. These two wells have since been sealed according to Section 724.100 (page 11); however, in Section 722.400 it states that one well will be used during mining and reclamation operations and sealed after reclamation is complete but that, to the applicant's best knowledge, the second well has been sealed. There are no logs

or other geologic or hydrologic data from these wells in the PAP.

S-32 was drilled in 1981 and completed as a piezometer in the Grassy Member of the Blackhawk Formation. Its location is not shown on PAP maps. The PAP contains no data on ground-water elevation or quality for S-32 and the applicant states that other than the logs in Appendix 6-2 there are no geologic or piezometric data from S-32 (Section 6.5.1, p. 21).

In 1993 and 1994, IPA-1, IPA-2, and IPA-3 were drilled. There are seasonal water-level measurements in the PAP for IPA-1, IPA-2, and IPA-3 for 1994, 1995, and 1996 but not for 1997, 1998, or 1999.

Locations of all known seeps and springs, as well as watering ponds and tanks, are shown on Plate 7-1 (Section 722.200).

JBR Consultants Group conducted a seep and spring survey of the Horse Canyon area in 1985. Table 7-1 in the PAP contains flow, pH, conductivity, and temperature data collected in 1985 for nineteen seeps and springs: H-1 through H-11, H-13, H-14, H-18 through H-22, and H-92. Laboratory report sheets for H-2, H-4, H-11, H-13, H-14, and H-18 for 1994 and 1995 and for H-1, H-6, H-10, and H-21 for November 1985 are in Appendix 7-6. H-7, H-8, H-9, H-10, H-11, H-13, H-14, H-18, H-19, H-20, H-21, and H-22 could not be found on Plate 7-1.

Springs identified by JBR Consultants Group as H-21A, H-21B, H-18A, and H-18B were shown on a preliminary Plate 7-1 but were not listed or discussed in the PAP: the applicant states that no sample data or pertinent information are available for these sites, so they are no longer on Plate 7-1 (Section 724.100, page 14). The applicant states that HC-1A is not on Plate 7-1 for the same reason; however, HC-1A is still on Plate 7-1.

Appendix 7-1 contains seasonal information on ground-water quality and flow for seeps and springs 1, 9, 10, 14, 16(16Z), HC-2, HC-4, HC-9, HC-11, HC-13, HC-14, HC-18, HCSW-1. Data are from work done in 1993, 1994, and 1995 by EarthFax Engineering for the Los Angles Department of Water and Power. Water-quality descriptions include total dissolved solids or specific conductance corrected to 25°C, pH, total iron, and total manganese. Most other parameters listed in UDOGM directive Tech 004 were determined in these samples; however, total hardness, total alkalinity, and acidity were not reported (bicarbonate and carbonate were reported). Total rather than dissolved concentrations were determined for all metals. Springs and seeps HC-2, HC-4, HC-9, HC-11, HC-13, HC-14, HC-18, and HCSW-1 could not be found on Plate 7-1.

EarthFax also identified springs and seeps 1A,1B, 2, 3, 3A, 3B, 3C, 3D, 4, 5, 6, 7, 8, 8A, 8B, 9R, 10A, 11, 12, 12A, 12B, 12C, 12D, 12E, 13, 13A, 13B, 13Z, 14A, 15, 15A, 15B, 15C, 16A, 16B, 16C, 17, 17A, 17B, 18, 19A, 19B, 19C, 20, 22, HCSW-2, and HCSW-3. These were dry or had low flows at the time of the quarterly visits and no water-quality analyses were done. 8B, 15A, 17B, 18A, 19C, and HCSW-3 could not be found on Plate 7-1. Springs and seeps 8B, 15A,17B, 18A, 19C, and HCSW-3 could not be found on Plate 7-1.

Appendix 7-2 contains the 1997 Annual Hydrologic Monitoring Report for the Horse Canyon Mine with data for RS-2 (Redden Spring). The quarterly samples from this spring were analyzed for all Tech 004 parameters except total manganese and acidity.

Water rights are listed in Table 7-2. The list includes Redden Spring plus springs identified as Mont, Leslie, Cottonwood, Willows, Konna, and Pine. In addition there are eleven unnamed or otherwise unidentified springs listed, plus a well. Locations of water rights are on Plate 7-3, and some of the locations on Plate 7-3 correspond roughly with springs shown on Plate 7-1. A water right for a well is listed in Table 7-2, but information in other parts of the PAP indicate this was a water monitoring well.

Surface-water information.

Within the permit area the surface water resources consist of three main intermittent drainages; Horse Canyon Creek, Lila Canyon Creek, and Little Park Wash (Section 724.200). The location of all known seeps and springs, as well as watering ponds or tanks are shown on Plate 7-1 (Section 722.200); however, the applicant states that there are no streams, lakes or ponds, or irrigation ditches known to exist within the proposed permit or adjacent areas.

The main drainage through the permit area, Little Park Wash, is mentioned in Sections 724.100 and 724.200 and in Tables 7-2 and 7-3 but is not further described or discussed. Likewise, Range Creek drainage is mentioned in Section 724.100 in the description of the ground-water divide of the main aquifer but Range Creek is not further described or discussed.

Appendix 7-2 contains the 1997 Annual Hydrologic Monitoring Report for the Horse Canyon Mine with data on flow and water-quality for HC-1, HC-2 (B-1), and RF-1. The quarterly samples from these streams were analyzed for all Tech 004 parameters except total manganese and acidity. 1994 data for HC-2 are in Appendix 7-6. Additional flow and water-quality data for Horse Canyon Creek are available from other annual reports of the Horse Canyon Mine and these data should be included and evaluated in the PAP.

Data in Appendix 7-2 do not clearly support the statement in Section 724.200 (page 16) that "Flows in Horse Canyon, generally, are limited to the early spring period (Lines and Plantz, 1981). By late spring to early summer, usually no flow is evident in Horse Canyon Creek, below the minesite or Lila Canyon Creek." Although flows decrease, the data show there is still flow in late summer and early fall, which indicates possible perennial flow in Horse Canyon Creek above the Horse Canyon Mine; however, flow in the valley does appear to be intermittent.

Horse Canyon flows to the Price River by way of Icelander and Grassy Trail Creeks, while Lila Canyon Creek flows southwest then south to the Price River by way of Grassy and Marsh Flat Washes. Little Park Wash, which is a major drainage of the proposed permit area, flows south, where its waters pass through a short stretch of Trail Canyon before reaching the Price River.

There are no baseline data for the stream in Little Park Wash.

Water rights are listed in Table 7-2. Locations of water rights are on Plate 7-3.

Supplemental information.

Baseline cumulative impact area information.

Much of the hydrologic and geologic information that is necessary to assess the probable

cumulative hydrologic impacts of the proposed operation and all anticipated mining on surface- and ground-water systems for the cumulative impact area is probably available from federal and state agencies.

Any needed information that is not available from such agencies may be gathered and submitted by the applicant as part of the permit application. As discussed already, outside sources are referenced many times in Chapters 6 and 7, but the outside sources are not adequately described nor listed in a reference section.

The permit cannot be approved until the necessary hydrologic and geologic information is available.

Modeling.

Modeling has not been used in preparation of the PAP.

Alternative water source information.

Probable hydrologic consequences determination.

Appendix 7-3 contains a determination of the probable hydrologic consequences (PHC) of the proposed operation based upon the quality and quantity of surface and ground water under seasonal flow conditions for the proposed permit and adjacent areas. The PHC determination is based on baseline hydrologic, geologic, and other information collected for the permit application, but not on data statistically representative of the site. The applicant finds in the PHC determination that, based on available data and expected mining conditions, the proposed mining and reclamation activity is not expected to proximately result in contamination, diminution or interruption of an underground or surface source of water within the proposed permit or adjacent areas that is used for domestic, agricultural, industrial or other legitimate purpose.

The applicant has determined that within the permit area, the general seasonal streamflow is ephemeral. The streams generally dry up by late spring with only occasional runoff during the summer resulting from rainfall events.

The applicant finds (PHC - Appendix 7-3) that, due to the close proximity and similarities of mining and drainage conditions, water quality and impacts to the channels from pumping the Lila Canyon Mine would be very similar to those experienced in the adjacent Horse Canyon Mine. However, the water-quality and downstream impacts that resulted from pumping the Horse Canyon Mine are not described or discussed adequately enough in the PAP for this comparison to be meaningful.

Because of the disturbed areas and the potential for large runoff events, the control of erosion is a prime factor in maintaining the hydrologic balance within the mine permit area. Sediment controls and a sediment pond will be constructed at the new mine site to minimize impacts. Surface water will be protected by use of sediment controls and all sediment from the disturbed area is to be delivered to and be deposited in the sediment pond.

Although subsidence presents a potential to alter the groundwater flow regime in the area, several factors tend to limit the effects of subsidence on the groundwater regime. Most of the local

springs flow from perched systems in the North Horn Formation and are separated from the underlying regional aquifer. The North Horn contains swelling clays that tend to heal small fractures. Finally, the perched aquifers are lenticular and discontinuous so there is a great probability that fractures in one area will not drain all the different aquifers.

Springs are used by wildlife and livestock. Current conditions of springs and seeps reflect the impacts (if any) of 50 years of mining as well as pre-mining conditions. No depletion of flow and quality of springs is expected in the Lila Canyon area. The applicant has determined that to date there is no known depletion of flow and quality of surveyed springs in the Horse Canyon permit area. The basis for this determination is not clear: in Section 724.100 (page 13) the applicant states that it is impossible to precisely describe the area's pre-mining hydrology.

The applicant has determined that it is unlikely there will be any additional measurable impacts from the mining and reclamation activities at the Lila Canyon Mine. Springs are mostly located upstream of the permit areas or are in areas where subsidence resulting from post-1977 mining has not been documented and is not expected. Springs above the mine should continue to flow, showing fluctuations that are related to variations in recharge.

The applicant finds that after reclamation it is unlikely that the groundwater level in the regional aquifer will ever rise to the level of any portal of either the Horse Canyon or Lila Canyon Mines, so there should be no natural discharge of groundwater through any sealed portals. Stand pipes are to be incorporated into the sealed portals of the Lila Canyon Mine so that water levels can be checked annually.

In the PHC the applicant finds that, based on available data and expected mining conditions, the proposed mining and reclamation activity is not expected to proximately result in contamination, diminution or interruption of any underground or surface source of water within the proposed permit or adjacent areas; however, some subjects, such as acid-forming or toxic-forming materials, flooding or streamflow alteration, and ground water and surface water availability, that are not clearly covered in the PHC could use further clarification. Numerous technical deficiencies have been identified in the PAP. Additional information that will be provided to meet those deficiencies may necessitate revision or at least expansion of the PHC determination.

Ground-water and Surface-water Monitoring Plans.

The applicant has based the ground-water and surface-water monitoring plans on the PHC determination and the analysis of baseline hydrologic, geologic, and other information in the permit application.

Water samples from seeps, springs, and streams will be analyzed for the parameters listed in Table 7-4. The parameters in Table 7-4 closely match those in Tech 004 except that dissolved iron and total alkalinity are not listed: dissolved iron and total alkalinity should be added to Table 7-4. Measuring total alkalinity is a necessary step in determining carbonate and bicarbonate so it is usually reported routinely by laboratories; it should be included by the applicant in Table 4. Total manganese is listed in the body of Table 7-4 with a note that analysis will be done for dissolved manganese; this has the potential for causing confusion in the future and the two parameters should be listed specifically and separately in Table 7-4.

Table 7-4 indicates that oil and grease is to be analyzed for in samples taken below the mine site only rather than at sites both above and below as recommended in Tech 004. A footnote indicates that this analysis will be done for designated samples only. Oil-and-grease needs to be determined both above and below the mine site to be an effective water-quality indicator, and the sites at which it will be measured need to be clarified.

Table 7-4 indicates that cation anion balance is to be determined only for surface-water samples taken below the mine site rather than at all locations: this is an important quality control measure and should be routine in all water-quality analyses.

Monitoring reports will be submitted to the Division at least every three months, within 30 days following the end of each quarter.

The applicant's water-monitoring plan is intended to provide data to show impacts to potentially affected springs, seeps, impoundments and drainages within and adjacent to the permit area by comparison with relevant baseline data and with applicable effluent limitations. The applicant has selected monitoring locations and frequencies, described in Table 7-3, so that significant springs, seeps, impoundments and drainages that could potentially be impacted by the mining and reclamation operations will be monitored on a regular basis. (Section 731.222.1).

Ground-water monitoring plan.

Ten sites are proposed for ground-water monitoring: L-5-G through L-11-G and IPA 1, 2, and 3. They are listed in Table 7-3 and locations are shown on Plate 7-4. Seeps and springs will be monitored quarterly for parameters listed in Table 7-4. Station L-5-G is the potential mine discharge point and will be monitored in accordance with UPDES Permit requirements. IPA 1, 2, and 3 will be monitored quarterly for depth.

Stations L-6-G through L-11-G are significant springs located over the area of proposed mining. The relationship of these springs to seeps and springs monitored previously by JBR Consultants, EarthFax Engineering, and others is described in Table 7-3; however, this relationship is not always clear, especially on the maps in the PAP.

Four of the springs proposed for operational monitoring are identified by the applicant as L-8-G (Cottonwood Spring), L-9-G, L-10-G (Pine Spring), and L-11-G and correspond with the springs monitored by EarthFax as 9, 10, 22, and 13A, respectively. Springs 9 and 10 have data from 1993, 1994, and 1995 but nothing more recent. The PAP contains some data on field parameters from 1995 and 1993 for Springs 22 and 13A but no analysis reports: these two springs were usually observed to be dry from 1993 to 1995. L-6-G (Mont Spring) and L-7-G (Leslie Spring) correspond roughly with a group of springs monitored by JBR Consultants in 1985; there are baseline data in the PAP for the JBR springs for 1994 and 1995, but the correlation to the springs proposed for operational monitoring is not clear.

A-26 and A-31 were bored as offsets to S-26 and S-31 to observe ground-water levels in the alluvium south of the Williams Draw Fault. Table VI-3 does not indicate that these wells have been plugged and abandoned; however, the applicant has no data on A-26 and A-31 (Section 6.5.1, p. 21). S-32 was drilled in 1981 and completed as a piezometer in the Grassy Member of the Blackhawk Formation. The applicant considers these sites unusable (Section 724.100).

Surface-water monitoring plan.

Intermittent drainages in the area flow in response to snowmelt and precipitation events. The proposed surface-water monitoring program will monitor Lila Canyon both above and below the disturbed mine site area at L-1-S, L-2-S, and L-3-S and the sediment pond discharge at L-4-S. No monitoring is proposed for Little Park Wash, which appears to be the major surface drainage in the permit area.

Streams will be monitored monthly. Sediment pond and mine discharges will be monitored monthly or as frequently as discharges occur.

Point-source discharge monitoring will be conducted in accordance with 40 CFR Parts 122 and 123, R645-301-751 and as required by the Utah Division of Environmental Health for Utah Pollutant Discharge Elimination System (UPDES) permits. A UPDES discharge permit application has been submitted to the Division of Environmental Health for the proposed sediment pond and mine water for the Lila Canyon operation. UPDES permit applications for the Lila Canyon Mine are provided in Appendix 7-5.

Findings:

Hydrologic Resource Information is not considered adequate to meet the requirements of this section. Prior to approval the applicant must provide the following information:

R645-301-624, -624.210 - Two wells were located in the alluvium in lower Horse Canyon Creek. It is not clear whether the well located nearer the Horse Canyon surface facilities has been sealed and abandoned (as indicated to Section 724.100, page 11) or is operational and is to be used during mining and reclamation operations (as indicated in Section 722.400). There are no data from either well in the PAP.

R645-301-724.100 - There are seasonal water-level measurements in the PAP for IPA-1, IPA-2, and IPA-3 for 1994, 1995, and 1996 but no measurements for 1997, 1998, or 1999.

R645-301-724.100, -724.200 - The 1997 quarterly samples from Redden Spring (RS-2), HC-1, HC-2 (B-1), and RF-1 were analyzed for all required parameters except total manganese.

R645-301-724.100, -724.200 - The following data are briefly mentioned in Appendix 7-3; however, the actual data are not in the PAP, the results of the analyses are not discussed with the baseline information, and there is no reference to the source of these data:

- RS-1 and RS-2 (Redden Spring) were sampled once a year during 1978, 1979, and 1980 and analyzed for most major chemical constituents.
- Springs H-6, H-18, and H-21 were sampled once and analyzed for the major constituents in 1985.
- Third quarter data for 1989 were collected for HC-1 and RF-1 and sampled for most of the parameters in UDOGM's guidelines.

- Between January 1981 and April 1983, baseline water quality data were collected for surface water and spring sites B-1 (HC-2), HC-1, RF-1 and RS-2 on the Horse Canyon permit area. Between 14 and 19 samples, depending on the site, were taken and analyzed during the monitoring period.

- The U.S. Geological Survey conducted a water quality study in Horse Canyon from August 1978 until September 1979. Samples were taken monthly from the Horse Canyon Creek and analyzed for most major ions and cations and field parameters. Metals, eight nitrogen species and other minor chemical constituents were taken on a quarterly basis or less.

R645-301-724.200 - There are no baseline data for the stream in Little Park Wash, the main drainage through the permit area. Little Park Wash is mentioned Sections 724.100 and 724.200 and in Tables 7-2 and 7-3 but is not further described or discussed.

R645-301-724.200 - Range Creek drainage is mentioned in Section 724.100 but Range Creek is not further described or discussed. There are no baseline data.

R645-301-724.200 - Flow and water-quality data for Horse Canyon Creek (HC-1, HC-2, and RF-1) from the Horse Canyon Mine 1997 Annual Report are in Appendix 7-2, and 1994 data for HC-2 are in Appendix 7-6. Additional data for Horse Canyon Creek are available from other annual reports of the Horse Canyon Mine and these data should be included and evaluated in the PAP.

R645-301-724.200, -728 - In the PHC the applicant finds that to date there is no known depletion of flow and quality of surveyed springs in the Horse Canyon permit area. The basis for this determination is not clear: in Section 724.100 (page 13) of the PAP the applicant states that it is impossible to precisely describe the area's pre-mining hydrology.

R645-301-724.200, -728 - In the PHC (Appendix 7-3) the applicant finds that, due to the close proximity and similarities of mining and drainage conditions, water quality and impacts to the channels from pumping the Lila Canyon Mine would be very similar to those experienced in the adjacent Horse Canyon Mine. However, the water-quality and downstream impacts that resulted from pumping the Horse Canyon Mine are not described or discussed adequately enough in the PAP for this comparison to be meaningful.

R645-301-724, -728 - In the PHC the applicant finds that, based on available data and expected mining conditions, the proposed mining and reclamation activity is not expected to proximately result in contamination, diminution or interruption of any underground or surface source of water within the proposed permit or adjacent areas; however, some subjects, such as acid-forming or toxic-forming materials, flooding or streamflow alteration, and ground water and surface water availability, that are not clearly covered in the PHC could use further clarification. Numerous technical deficiencies have been identified in the PAP. Additional information that will be provided to meet those deficiencies may necessitate revision or at least expansion of the PHC determination.

R645-301-731.210 - Two of the springs proposed for operational monitoring, L-6-G (Mont

Spring) and L-7-G (Leslie Spring), correspond roughly with a group of springs monitored by JBR Consultants in 1985:

- The correlation between the JBR springs and L-6-G and L-7-G is not clear.
- Baseline data in the PAP for the JBR springs is not adequate (1994 and 1995 but nothing more recent) .

R645-301-731.210 - Four of the springs proposed for operational monitoring are identified by the applicant as L-8-G (Cottonwood Spring), L-9-G, L-10-G (Pine Spring), and L-11-G and correspond with the springs monitored by EarthFax as 9, 10, 22, and 13A, respectively:

- Springs 9 and 10 have data from 1993, 1994, and 1995 but nothing more recent.
- The PAP contains some data on field parameters from 1995 and 1993 for Springs 22 and 13A but no analysis reports: these two springs were usually observed to be dry from 1993 to 1995.

R645-301-731.210, -731.220 - The parameters in Table 7-4 closely match those in Tech 004 except that dissolved iron and total alkalinity are not listed. Measuring total alkalinity is a necessary step in determining carbonate and bicarbonate so it is usually reported routinely by laboratories along with carbonate and bicarbonate, and it should be included by the applicant in Table 7-4.

R645-301-731.210, -731.220 - Dissolved iron should be added to Table 7-4.

R645-301-731.210, -731.220 - Total manganese is listed in the body of Table 7-4 with a footnote that analysis will be done for dissolved manganese; this has the potential for causing confusion in the future and the two parameters should be specifically and separately listed in Table 7-4.

R645-301-731.210, -731.220 - Table 7-4 indicates that oil and grease is to be analyzed for in samples taken below the mine site only rather than at sites both above and below as recommended in Tech 004. A footnote indicates that this analysis will be done for designated samples. Oil-and-grease needs to be determined both above and below the mine site to be an effective water-quality indicator, and the sites at which it will be determined need to be clarified.

R645-301-731.210, -731.220 - Table 7-4 indicates that cation anion balance is to be determined only for surface-water samples taken below the mine site rather than at all locations: this is an important quality control measure and should be routine in all water-quality analyses.

R645-301-731.220 - No monitoring is proposed for Little Park Wash, which appears to be the major surface drainage in the permit area. The reasoning for not monitoring is not discussed in the PAP.