Re: Earth Energy Resources, Inc.
Kathleen Paser to: Tim Dejulis, law.donald 01/07/2008 09:49 AM

1 attachment

Earth Energy NOI.pdf

Thanks Tim!

I got a call from Earth Energy (or their consultants) shortly after you sent the initial email to them. They were not very happy about your analysis in regards to possible NSPS applicabilities you mentioned. They wanted me to, on the spot, confirm or deny your analysis without any material to review. It was very interesting. I think they were actually more concerned that they looked bad in the eyes of the big bad EPA. If they only knew me. I also got an email from them requesting a meeting to discuss the project.

After we look over this material you gave us, we will plan to meet with them. We will let you know as soon as possible where we stand with this project. Stay tuned!

Kathy

Kathleen Paser
Environmental Engineer
Air Technical Assistance Unit
Air and Radiation Program
US EPA Region 8
303-312-6526
****
We've Moved!
The Air Program's new mailing address is:

US EPA Region 8
1595 Wynkoop Street
M/C 8P-AR
Denver, Colorado 80202
****

To   Kathleen Paser/P2/R8/USEPA/US@EPA
cc
bcc
Subject   Earth Energy Resources, Inc.

"Tim Dejulis" <tdejulis@utah.gov>

01/07/2008 09:03 AM

Hello,

Attached is the Notice of Intent information from Earth Energy. I have spoken with the consultant about my concerns with the emission calculations. They are aware that they must contact you about the project. As new information arrives I will pass it along to you.

Regards,

Timothy Degelis

- Earth Energy NOI.pdf

OCT 18 2007

jbr environmental consultants, inc.
www.jbrenv.com
8160 South Highland Drive • Sandy, Utah 84093 [P] 801.943.4144 [F] 801.942.1852

October 17, 2007

Mr. Cheryl Heying
Utah Division of Air Quality
150 North 1950 West
P.O. Box 144820
Salt Lake City, UT 84114-4820

Re: Notice of Intent – Earth Energy Resources, Inc., Mining and Processing Tar Sands – PR Spring Mine

Attn: Tim Blanchard, New Source Manager

On behalf Earth Energy Resources, Inc (Earth Energy), JBR Environmental Consultants is providing this application under the regulatory requirement UAC R307-401-1, Notice of Intent (NOI).

This NOI is being submitted for tar sand mining and processing at the PR Spring Mine in Grand and Uintah Counties Utah. The appropriate permitting forms and emission calculations can be found in the Appendices. Air dispersion modeling documentation is also provided in the Appendices.

To the best of my knowledge, the information supplied in this application is true, accurate, and complete. I believe the application packet contains all of the necessary information to assist in an efficient review by UDAQ; however, if further information is needed, please do not hesitate to contact myself or Erin Hallenberg at 801-943-4144.

Regards,

Denise Kohtala
Environmental Analyst II

Enclosure

cc: Barclay Cuthbert, Earth Energy

Utah Division of Air Quality
New Source Review Section

CK # 101
Paid 1900.00

Date: **October 12, 2007**

Form 1
General Information

N0149-0001

Application for: **X** Initial Approval Order ☐ Approval Order Modification

AN APPROVAL ORDER MUST BE ISSUED BEFORE ANY CONSTRUCTION OR INSTALLATION CAN BEGIN. This is not a stand alone document. Please refer to the Permit Application Instructions for specific details required to complete the application. Please print or type all information requested. All information requested must be completed and submitted before an engineering review can be initiated. If you have any questions, contact the Division of Air Quality at (801) 536-4000 and ask to speak with a New Source Review Engineer. Written inquiries may be addressed to: Division of Air Quality, New Source Review Section, P.O. Box 144820, Salt Lake City, Utah 84114-4820.

Applicable base fee for engineering review and filing fee must be submitted with the application.

General Owner and Facility Information

1. Company name and address:
Earth Energy Resources, Inc.
Suite 740, 404 – 6th Avenue SW
Calgary, Alberta T2P 0R9

Phone No.: **(403) 233-9366**
Fax No.: **(403) 668-5097**

2. Company contact for environmental matters:
Tim Wall
Suite 740, 404 – 6th Avenue SW
Calgary, Alberta T2P 0R9

Phone No.: **(403) 233-9366**
Fax No.: **(403) 668-5097**

3. Facility name and address (if different from above):
Uintah and Grand Counties, Utah
Sections: T. 15 S., R. 23 E., SLB&M, Uintah County, Sections 35 & 36.
T. 15.5 S., R. 24 E., SLB&M, Grand County, Sections 31& 32.

Phone no.: **NONE**
Fax no.: **NONE**

4. Owners name and address:

Same as 1 above

5. County where the facility is located in:
Uintah and Grand Counties

6. Latitude & longitude, and/or UTM coordinates of plant:
4369592 km Northing, 645187 km Easting Zone 12, NAD 27

7. Directions to plant or Installation (street address and/or directions to site) (include U.S. Coast and Geodetic Survey map if necessary): **30 Northwest of I70 and Highway 6 Junction.**

8. Identify any current Approval Order(s):
AO#_ _Date__ AO#_____Date_____
AO#_____Date_____ AO#_____Date_____

9. If request for modification, permit # to be modified: Date

10. Type of business at this facility: **Tar Sand Mining and Processing**

11. Total company employees greater than 100?
☐ Yes ☒ No

12. Standard Industrial Classification Code
1442 Sand and Gravel Construction

Approval Order Application
Form 1 (Continued)

13. Application for:
- **X** New construction
- ☐ Existing equipment operating without permit
- ☐ Change of permit condition
- ☐ Modification
- ☐ Permanent site for Portable Approval Order
- ☐ Change of location

14. For new construction or modification, enter estimated start date: **11/1/07** Estimated completion date: **11/30/07**

15. For change of permittee, location or condition, enter date of occurrence: **N/A**

16. For existing equipment in operation without prior permit, enter initial operation date: **N/A**

17. Has facility been modified or the capacity increased since November 29, 1969: Yes ☐ No **N/A**

Process Information

18. Site plan of facility **(See Section 3.0)**

19. Flow diagram of entire process to include flow rates and other applicable information **(See Section 3.0)**

20. Detailed written process and equipment description. **(See Section 3.0)**
Description must include:
Process/Equip specific form(s) identified in the instructions
Fuels and their use
Raw materials used
Production rates
Equipment used in process
Operation schedules
(including daily/seasonal variances)
Description of product(s)
Description of changes to process (if applicable)

21. Does this application contain justifiable confidential data? ☐ Yes ☒ No

Emissions Information

22. Complete and attach Form 1d, Emissions Information **(See Section 4.0)**
Include Material Safety Data Sheets for all chemicals or compounds that may be emitted to the atmosphere.

23. Identify on the site plan **(see Section 3.0)** all emissions points, building dimensions, stack parameters, etc.

Air Pollution Control Equipment Information

24. List all air pollution control equipment and include equipment specific forms identified in the instructions. **(See Section 5.0)**

25. List and describe all compliance monitoring devices and/or activities (such as CEM, pressure gages). **N/A**

26. Submit modeling for the project if required. **(See Section 6.0)**

27. Attach your proposal of what air pollution control devices, if any, or operating practices represents Best Available Control Technology. Discuss and evaluate all air pollution control technologies relevant to your situation or process. **(See Section 5.0)**

28. I hereby certify that the information and data submitted in and with this application is completely true, accurate and complete, based on reasonable inquiry made by me and to the best of my knowledge and belief.

Signature: Barclay Cuthbert Title: **Vice President**

29. **Barclay Cuthbert**	30. Telephone Number: **(403) 233-9366**	30. Date: **October 12, 2007**

Earth Energy Resources, Inc.

Notice of Intent to Process Tar Sand from Surface Mining
PR Spring Mine – Tar Sand Ore Mining/Conditioning, Stockpiling & Bitumen Extraction Facility
Grand & Uintah Counties, UT

Submitted on
October 12, 2007

to

Utah Division of Air Quality
150 North 1950 West
Salt Lake City, UT 84114

Prepared by:

jbr environmental consultants, inc.
8160 South Highland Drive
Sandy, UT
(801) 943-4144

TABLE OF CONTENTS

LIST OF APPENDICES

1.0 INTRODUCTION AND OVERVIEW

Earth Energy Resources, Inc. (Earth Energy) is filing this Notice of Intent (NOI) as an initial application for an Approval Order (AO) to operate a mining, sizing, stockpile, and processing facility for a surface tar sand mine at a location on the on the borders of Uintah and Grand Counties, Utah. The PR Spring Mine will be located approximately 35 miles north of Cisco Utah.

With respect to calculated emissions, Earth Energy has included spreadsheets based on processing activities rather than individual pieces of equipment. Process-based emission calculations present the most accurate assessment of overall emissions at the location. Since this is a unique process that involves both mining and conditioning (sizing) of the sandstone ore, emission factors for Western Surface Coal Mine AP-42 Emission Factors, State of Wyoming Approved Emission Factors, and Crushed Stone Processing Emission Factors were used to develop the potential to emit (PTE) estimates from the facility. Any ambient air quality impacts from emissions generated by the equipment at the processing plant are discussed in Section 6.0 – Ambient Air Quality Impact Analysis.

2.0 GENERAL FACILITY INFORMATION

Earth Energy's PR Spring Mine – Tar Sand Sizing & Stockpile Facility will be located on the border of Uintah and Grand counties, Utah. The corresponding Universal Transverse Mercator (UTM) Datum NAD27, Zone 12 coordinates are:

Northing: 4,369,500 meters
Easting: 646,000 meters

A location map of the site, as well as a proposed facility layout, is given in Appendix A.

2.1 UDAQ General Information

The required UDAQ General Information Form is given in Appendix B. The requested Appendix designations have been changed to Section or Subsection designations to be consistent with the format of this NOI.

3.0 PROCESS INFORMATION

The PR Spring Mine will be a tar sand surface mining operation also known as oil sand. The tar sands will be mined with a self-contained mobile surface mining machine which removes and mills the ore prior to conveying it into a haul truck. For the purposes of this NOI the surface miner is being considered the crushing circuit, therefore AP-42 emission factors from 11.19 for sand and gravel processing are being used to estimate the emissions associated with the surface miner. The tar sands will be hauled to the process plant where they will be stockpiled prior to being fed into the crushing circuit. The overburden and interburden material will be placed in disposal sites. A portion of the overburden may be used for reclamation of the surface mined area.

The primary operations at this site will be mining, tar sand crushing, and tar processing. Earth Energy also plans to crush some of the overburden for roadbase. A process flow diagram is included in Appendix C. A brief description of the processes at the processing plant is listed below.

Each process train is designed to accommodate 3000-3500 tons of ore per day, producing approximately 2,000 bbl/day of bitumen. The extraction process begins when the mined and conditioned tar sand ore is sent through a crusher/ delumper and reduced to a 2 inch-minus aggregate size. From there, the crushed ore is augered or conveyed to a heated slurry mixer where the cleaning emulsion is introduced and the ore slurried to the consistency of a thick gritty milkshake. The oil sand slurry is then moved by screw conveyor to the slurry tank where primary separation of the bitumen from the sand occurs. The produced sand with residual bitumen is then pumped through a series of separation towers where the last traces of bitumen are removed. All of the liberated bitumen is captured, polished with cyclones and/or centrifuges and then pumped to a storage tank. The cleaning chemical is then removed from the bitumen by distillation and recycled to the front of the process. Produced bitumen is pumped to a product (sales) tank for heated storage prior to transport.

The clean produced sand is de-watered on a shale shaker (or similar device) and the recovered water is pumped to a holding tank for recycle to the front of the process. Additional cleaning agent is added to the re-cycled water to bring it back to full strength. De-watered sand and clay fines are then conveyed to a stockpile for loading and backhaul to the mine pit. At this point, the discharged sand and clay fines contain between 10 and 20% water.

Earth Energy requests flexibility in hourly operation limitations to 24 hours per day and with that flexibility will not exceed the annual production limits given in Table 3.2-1. This approach is necessary as maximum hourly production is not always possible or sustainable.

The required UDAQ forms for rock crushing equipment, internal combustion engines, and crude oil storage tanks are given in Appendix D.

3.1 Sizing Operations

Sizing/Sorting Process – Sizing of the ore is accomplished by a self-propelled/ self-loading surface miner machine (Wirtgen 2200SM). The Wirtgen uses a rotating cutter drum to mine and mill the ore to the desired grain size. Very little fugitive dust is emitted in the milling operation as the rotating drum is water-cooled to maximize the life of the cutting tools. The ore will be loaded into haul trucks by the Wirtgen and delivered to a de-lumper (roller crusher) feed hopper at the processing plant. One or more conveyors transfer the broken up tar sand to the extraction process. Oversize ore chunks and material devoid of bitumen (reject materials) will be sorted with a grizzly and returned to the mine pit with the clean produced sand tailings.

Hauling – Ore material will be transported to the processing plant using conventional (20-50 ton) mine haul trucks.

Overburden and interburden material (ROM) will be removed by conventional mining methods and hauled to overburden dumps in low-lying areas adjacent to the mine pit(s).

3.2 Process Equipment and UDAQ Equipment Forms

With the submittal of this NOI, Earth Energy proposes to permanently operate the equipment shown in Table 3.2-1.

Table 3.2-1 – PR Spring Mine Processing Plant Equipment and Production

Equipment Type	Number at Location	Production	
		Hourly	Annual**
Surface Miner[1]	1	350 tph	1,150,000 tpy
De-lumper[2]	1	150 tph	1,150,000 tpy
250 kW Diesel Generator	1		
500 kW Natural Gas Generator	1		
Process Heaters	1	25 MMBtu/hr	
1,000 bbl Crude Oil Tanks	11		

* tph, tons per hour
** tpy, tons per year

The surface miner extracts, mills, and conveys the ore to haul trucks on a 12 hr/day basis (actual production approx. 10 hrs of 12 hr shift). The de-lumper (dual roller crusher) breaks up the lightly re-consolidated (milled) ore after being transported to the extraction process inlet hopper. The de-lumper will operate on a 24 hr/day basis. It will be fed during the night shift by a wheel loader from ore stockpiled during the day shift.

4.0 EMISSIONS RELATED INFORMATION

Emissions from the tar sand mining, sizing, stockpiling, and extraction operation are calculated on the basis of activities and throughput rather than the size or capacity of equipment. Emission factors for processing and loading/unloading are expressed in terms of pound of pollutant per ton of material processed. Emission factors for stockpile wind erosion are expressed in terms of pound of pollutant per acre (lb/acre). Emission factors for combustion devices are expressed in terms of pound of pollutant per horsepower capacity per hour (lb/hp-hr) of operation.

Short-term emission rates are expressed in terms of pound of pollutant per hour and long-term emission rates are expressed in terms of ton of pollutant per year. The short-term rates are based on maximum hourly production, while long-term rates are based on maximum annual production, as given in Table 3.2-1.

The point source emissions at the facility will be from the internal combustion engines, a process heater and storage tanks; all other particulate emissions are considered fugitive emissions.

The spreadsheets in Appendix E give calculated emissions for each of the following activities:

- Product sizing(milling by surface miner), including controlled de-lumping (crushing) and conveyor transfers or drop points,
- Material removal (topsoil, over/interburden and tar sand),
- Stockpile loading/unloading,
- Stockpile and disturbed area wind erosion,
- Combustion devices internal and external,
- Fugitive emissions from haul road traffic
- Emissions from tanks,
- Emissions from tank to truck load-out.

The subsequent uncontrolled and controlled Potential To Emit (PTE) emissions from all processes are given in Tables 4.0-1 and 4.0-2. The emissions shown are based on mining over a rolling 12-month period and on operating the combustion devices over a rolling 12-month period.

Table 4.0-1 – Total Controlled PTE Emissions

Pollutant	Hourly Emission Rate (lb/hr)	Annual Emission Rate (tpy)
PM	117.96	252.76
PM_{10}	31.03	67.93
$PM_{2.5}$	2.85	5.88
NO_x	9.4	26.08
SO_2	2.10	9.22
CO	5.29	14.99
VOC	21.52	33.27
HAPs	0.11	0.42

Both uncontrolled and controlled emissions were evaluated to determine the status of the source. The uncontrolled emissions from each criteria pollutant are less than 100 tons per year (tpy), and thus the controlled emissions from each criteria pollutant are less than 100 tpy, classifying the source as minor. Uncontrolled annual emissions are based mainly on a throughput limitations as opposed to an hours per year. The uncontrolled emissions from each hazardous air pollutant (HAP) are less than 10 tpy, and the combination of all HAPs is less than 25 tpy, classifying the source as minor for HAPs.

5.0 AIR POLLUTION CONTROL EQUIPMENT INFORMATION

This section contains the required information for pollution control measures used on the types of equipment proposed for permanent installation in this NOI. In most cases, the analysis of Best Available Control Technology (BACT) is a summary of previously completed top-down analyses and/or the result of applying common industrial process knowledge for the type of control technology normally used on a particular piece of equipment.

5.1 Best Available Control Technology (BACT) Analysis

BACT is typically identified by a "top-down" analysis in which engineering feasibility, economic impact(s), environmental impact(s), energy consumption, and cost considerations are applied to each potential technology category. BACT is the technology that emerges from the analysis as the best choice based on all considerations. For purposes of this NOI, a detailed and comprehensive "top-down" presentation is not necessary for the equipment proposed at the PR Spring Mine for two reasons:

1. The equipment is relatively simple and control technology options are limited.
2. Prior analyses and process knowledge have defined BACT categorically and reiteration of the analyses is not necessary.

Consequently, for each type of equipment covered in this NOI, BACT is identified, and the basis for the choice is discussed. These controls will be implemented at the facility for the existing equipment.

Sizing (Primary and Secondary)
Emissions from mining and ore conditioning(sizing) operations are normally controlled by inherent moisture content and/or added moisture from water sprays. Water sprays will be used in the milling(sizing) operation. This type of control constitutes BACT for sizing. The entrained bitumen and connate water (moisture inherent in the material) will adequately control fugitive emissions generated by the sizing of materials. Baghouse technology can be applied; however, typically when baghouses are used on crushers they control emissions from numerous additional emission points (additional crushers, drop points, conveyor transfers, or screens). The economic and cost considerations would demonstrate that the application of baghouse technology to a single crushing circuit is cost prohibitive.

Conveying Operations
Conveyor transfer points are locations at which processed material moves from one conveyor belt to another. Typically the transfer involves a relatively short vertical drop. Since the material on the conveyors is already moist from entrained bitumen and connate water, fugitive dust emissions are minimal and additional controls are not necessary.

For all sources of fugitive emissions in this category and covered in this NOI, entrained bitumen and connate water (inherent moisture) is considered BACT. For reasons already discussed, baghouse technology is not appropriate. Additionally, when the incremental cost is considered,

i.e., the differential cost per ton of pollutant removed between water application and baghouse technology, the cost is unreasonable.

Diesel-fired Generator

BACT for the combustion device is the use of low-sulfur diesel and proper operation and maintenance. This engine also meets EPA Tier II emission levels for diesel engines, which is considered BACT. The application of any add-on technology to control gaseous emissions is cost prohibitive.

Natural Gas-Fired Internal Combustion Engine

BACT for the stationary internal combustion device would be add on controls such as a non-selective catalytic converter as well as the use of natural gas. The unit is controlled to 1.0 g/hp-hr for NOx and CO through the use of add on controls to meet BACT.

6.0 AMBIENT AIR QUALITY IMPACT ANALYSIS

The NOI Guidance provided by UDAQ requires that NOIs for new facilities with emissions above pollutant-specific thresholds in NAAQS attainment areas be accompanied by air quality impact analyses.

6.1 Criteria Air Pollutants

This facility is located in an area of attainment for all criteria pollutants, so applicability of air dispersion modeling of primary pollutants is required for this installation. Table 6.1-1 identifies those primary pollutants, the PTE emissions for the facility, and the modeling thresholds. As indicated in the table, air dispersion modeling of PM_{10} and NOx is required. Since this new source is still in the initial phase, modeling was not completed at this time. As soon as site drawings, equipment configurations, and other site related procedures are finalized, modeling will occur. A modeling protocol will be developed and submitted to UDAQ.

Table 6.1-1– Modeling Thresholds

Pollutant	Facility Emissions PTE (TPY)	Modeling Threshold (TPY)
Point PM_{10}	67.91	15
Non-point PM_{10}	0.01	5

6.2 Hazardous Air Pollutants

The UAC R307-410-4 requires sources to compare proposed HAP emissions to the emissions threshold value (ETV). If the maximum hourly HAP emissions exceed the ETV, the HAP emissions must be modeled.

The hourly emission rates of all HAPs except for formaldehyde and acrolien are below the modeling threshold. These pollutants will be included in the modeling discussed above. Additional detail on this conclusion is given in the emission calculation spreadsheets in Appendix E.

7.0 REQUESTED APPROVAL ORDER CONDITIONS

This section contains proposed language for the Approval Order (AO). The format of the proposed AO is the standard format used by UDAQ for other AOs. Earth Energy anticipates that submitting draft AO language will assist UDAQ and allow for the expeditious issuance of the final AO.

General Conditions:

1. This AO applies to the following company:

   Site Office
   N/A at time of filing.

   Corporate Office
   Earth Energy Resources Inc.
   Suite 740, 404 – 6th Avenue SW
   Calgary, Alberta T2P 0R9
   Phone Number (403) 233-8994
   Fax Number (403) 668-5097

2. All definitions, terms, abbreviations, and references used in this AO conform to those used in the Utah Administrative Code (UAC) Rule 307 (R307), and Title 40 of the Code of Federal Regulations (40 CFR). Unless noted otherwise, references cited in these AO conditions refer to those rules.

3. The limits set forth in this AO shall not be exceeded without prior approval in accordance with R307-401.

4. Modifications to the equipment or processes approved by this AO that could affect the emission covered by this AO must be approved in accordance with R307-401-1.

5. All records referenced in this AO or in applicable NSPS, which are required to be kept by the owner/operator, shall be made available to the Executive Secretary or Executive Secretary's representative upon request, and the records shall include the two-year period prior to the date of the request. Records shall be kept for the following minimum periods:

   A. Emission inventories — Five years from the due date of each emission statement or until the next inventory is due, whichever is longer.
   B. All other records — Two years.

6. Earth Energy shall install and operate the tar sand ore processing equipment and shall conduct its operation of the PR Spring Mine in accordance with the terms and conditions of this AO, which as written pursuant to Earth Energy's Notice of Intent submitted to the Division of Air Quality (DAQ) on October 12, 2007.

7. The approved installations shall consist of the following equipment:

Mine & Extraction Equipment

A. One (1) 350 TPH Surface Miner
B. One (1) 150 TPH De-lumper
C. One (1) 250 kW diesel generator
D. One (1) 500 kW natural gas generator
E. Associated conveyors, stackers, etc.
F. Associated loaders, dozers, drills, etc.
G. One (1) 25.0 MMBtu/hr Process heater
H. Eleven (11) 1,000 bbl Crude Oil Tanks

8. Earth Energy shall notify the Executive Secretary in writing when the installation of the equipment listed in Condition #7 has been installed and is operational, as an initial compliance inspection is required. To insure proper credit when notifying the Executive Secretary, send your correspondence to the Executive Secretary, Attention: Compliance Section.

If installation has not been competed within eighteen months from the date of this AO, the Executive Secretary shall be notified in writing on the status of the installation. At that time, the Executive Secretary shall require documentation on the continuous installation of the operation and may revoke the AO in accordance with R307-401-11.

Limitations and Test Procedures

9. Visible emissions from the following emission points shall not exceed the following values:

A. All crushers – 15%
B. All screens – 10%
C. All conveyor transfer points – 10%
D. All diesel engines – 20%
E. Conveyor drop points – 20%
F. All other points – 20%

10. Visible fugitive dust emissions from haul-road traffic and mobile equipment in operational areas shall not exceed 20% opacity. Visible emissions determinations for traffic sources shall use procedures similar to Method 9. The normal requirement for observations to be made at 15-second intervals over a six-minute period, however, shall not apply. Six points, distributed along the length of the haul road or in the operational area, shall be chosen by the Executive Secretary or the Executive Secretary's representative. An opacity reading shall be made at each point when a vehicle passes the selected points. Opacity readings shall be made one-half the vehicle length or greater behind the vehicle and at approximately one-half the height

of the vehicle or greater. The accumulated six readings shall be averaged for the compliance value.

11. The following production limits shall not be exceeded:

A. 1,150,00,000 tons of processed tar sands material per rolling 12-month period.
B. 1,150,000 tons of overburden material per rolling 12-month period.
C. 250 operating hours for the 250 kW diesel generator, per rolling 12-month period. 8,760 operating hours for the 500 kW natural gas generator, per rolling 12-month period
D. 3,960 operating hours for the mine, per rolling 12-month period.
E. To determine compliance with a rolling 12-month total, the owner/operating shall calculate a new 12-month total by the twenty-fifth day of each month using data from the previous 12 months. Records of production shall be kept for all periods when the plant is in operation. The records of production shall be kept on a daily basis. Hour of operation and production shall be determined by supervisor monitoring and maintaining of an operations log.

12. All unpaved roads and other unpaved operational areas that are used by mobile equipment shall be water sprayed and / or chemically treated to control fugitive dust. The application of water or chemical treatment shall be used except when the ambient temperature is below freezing (32°). If chemical treatment is used, it shall take place two (2) times a year and watering shall be initiated daily dependant upon observed dust generation. The opacity shall not exceed 20% during all times the areas are in use or unless it is below freezing. Records of water treatment shall be kept for all periods when the plant is in operation. The records shall include the following items:

A. Date of application
B. Number of treatments made
C. Rainfall received, if any
D. Time of day treatments were made

Records of treatment shall be made available to the Executive Secretary or Executive Secretary's representative upon request and the records shall include the two-year period prior to the date of the request.

13. The haul roads shall not exceed 14,376 feet combined, and the mine haul truck speed along the haul roads shall not exceed 30 miles per hour. The vehicle speed on the haul roads shall be posted, at minimum, on site at the beginning of each haul road so that it is clearly visible from the haul road.

14. The open or disturbed area shall not exceed limits set forth by the Division of Oil, Gas, and Mining without written consent from the Executive Secretary.

15. Unpaved operational areas shall be watered to minimize generation of fugitive dusts as dry conditions warrant or as determined necessary by the Executive Secretary. The

total disturbed area shall not exceed limits set forth by the Division of Oil, Gas, and Mining without written consent from the Executive Secretary.

Fuels

16. The sulfur content of any diesel fuel burned shall not exceed 0.5 percent by weight. Sulfur content shall be decided by ASTM Method D-4294-89 or approved equivalent. The sulfur content shall be tested if directed by the Executive Secretary.

Federal Limitations and Requirements

17. At all times, including periods of startup, shutdown, and malfunction, owners and operators shall, to the extent practicable, maintain and operate any equipment approved under this AO including associated air pollution control equipment in a manner consistent with good air pollution control practice for minimizing emissions. Determination of whether acceptable operating and maintenance procedures are being used will be based on information available to the Executive Secretary which may include, but is not limited to, monitoring results, opacity observations, review of operating and maintenance procedures, and inspection of the source. All maintenance performed on equipment authorized by this AO shall be recorded.

18. The owner/operator shall comply with R307-150 Series. Inventories, Testing and Monitoring.

19. The owner/operator shall comply with R307-107. General Requirements: Unavoidable Breakdowns.

The Executive Secretary shall be notified in writing if the company is sold or changes its name. Under R307-150-1, the Executive Secretary may require a source to submit an emission inventory for any full or partial year on reasonable notice.

This AO in no way releases the owner or operator from any liability for compliance with all other applicable federal, state, and local regulations including R307.

A copy of the rules, regulations and/or attachments addressed in this AO may be obtained by contacting the Division of Air Quality (DAQ). The Utah Administrative Code R307 rules used by DAQ, the NOI guide, and other air quality documents and forms may also be obtained on the Internet at the following web site: http://www.airquality.utah.gov

The annual emissions estimations below include point source, fugitive emissions, fugitive dust, road dust, etc. and do not include tail pipe emissions, grandfathered emissions, etc. These emissions are for the purpose of determining the applicability of Prevention of Significant Deterioration, non-attainment area, maintenance area, and Title V source requirements of the R307. They are not to be used for determining compliance.

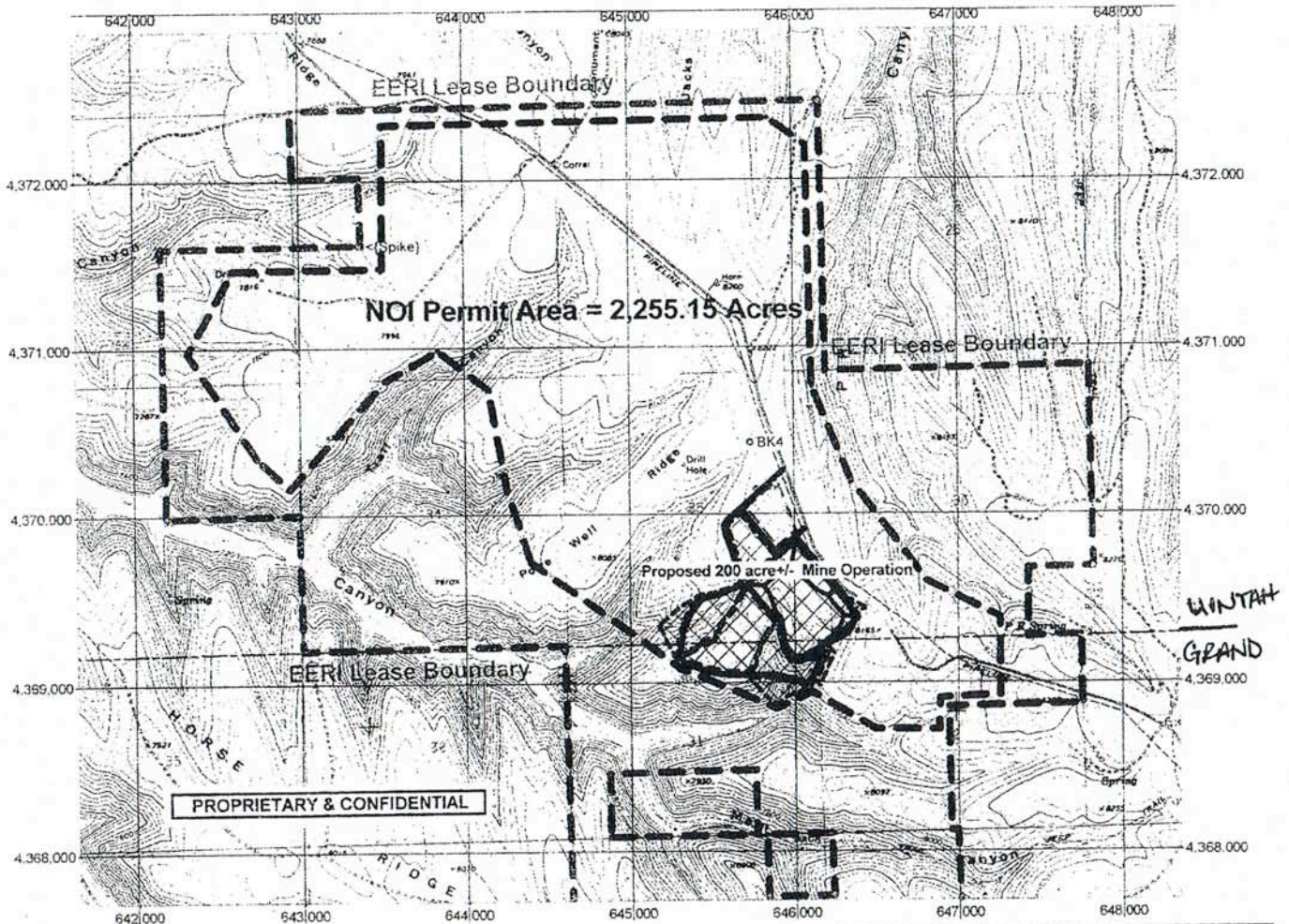
The controlled PTE emissions for this source, Earth Energy's PR Spring Mine, are currently calculated at the following values:

	Pollutant	Tons/yr
A.	PM_{10}	67.93
B.	SO_2	9.22
C.	NO_x	26.08
D.	CO	14.99
E.	VOC	33.27
F.	HAPs	0.42

APPENDIX A

Location Maps
Proposed Facility Layout

NOIPermitArea



0 ¼ ½ 1 Mile

0 1000 2000 3000 5000 Feet

0 0.5 1 Kilometer

1927 North American Datum: UTM grid zone 12
Generated by BigTopo7 (www.igage.com)
Map compiled from USGS Quads: P R Spring: UT

'NOIPermitArea.tif' Scale: 1" = 0.395Mi 635Mt 2,083Ft, 1 Mi = 2.534" , 1 cm = 250Mt

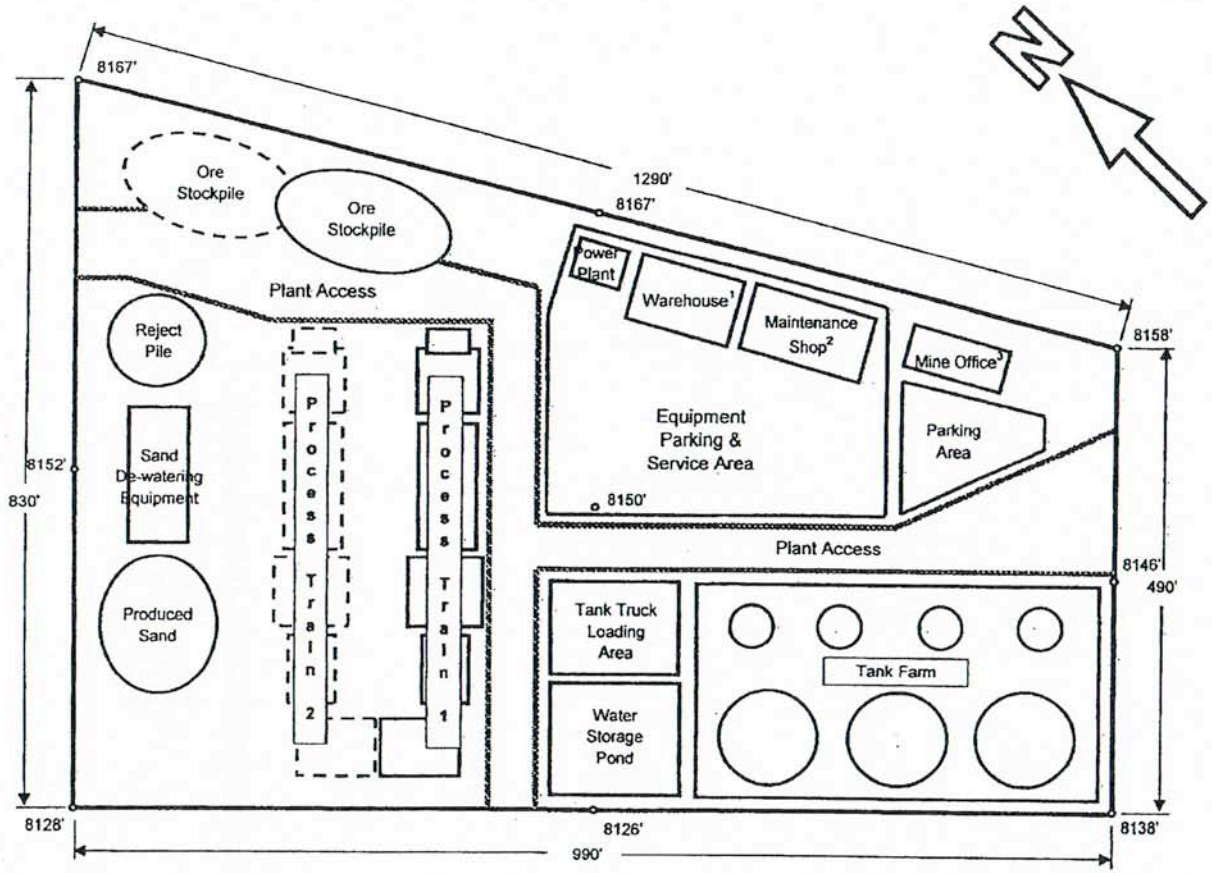
Earth Energy Resources Inc.

PR Spring Oil Sand Mine

Plan of NOI Permit Area

Map Scale: 1:25,000

Rev.1 - Date: March 9/07 **Drawn by: TJW**



NOTES:

1) "Sprung type" structure on concrete pad
2) "Sprung type" structure on gravel pad
3) "Atco type" modular office (2-3 unit) on gravel pad
4) All process equipment skid-mounted c/w sill plates
5) Spot Elevations: ft. ASL (from BigTopo)
6) Area of Plant Site: ~15 acres

Earth Energy Resources

PR Spring Plant Site - Plot Plan

Preliminary Equipment Layout - Rev.3

Drawing Not to Scale

Drawn by: TJW

Date: Mar 7, 2007

APPENDIX B

UDAQ Form 1 – General Information

Utah Division of Air Quality
New Source Review Section

Date: October 12, 2007

Form 1
General Information

Application for: X Initial Approval Order ☐ Approval Order Modification

AN APPROVAL ORDER MUST BE ISSUED BEFORE ANY CONSTRUCTION OR INSTALLATION CAN BEGIN. This is not a stand alone document. Please refer to the Permit Application Instructions for specific details required to complete the application. Please print or type all information requested. All information requested must be completed and submitted before an engineering review can be initiated. If you have any questions, contact the Division of Air Quality at (801) 536-4000 and ask to speak with a New Source Review Engineer. Written inquiries may be addressed to: Division of Air Quality, New Source Review Section, P.O. Box 144820, Salt Lake City, Utah 84114-4820.

Applicable base fee for engineering review and filing fee must be submitted with the application.

General Owner and Facility Information

1. Company name and address:
Earth Energy Resources, Inc.
Suite 740, 404 – 6th Avenue SW
Calgary, Alberta T2P 0R9

Phone No.: **(403) 233-9366**
Fax No.: **(403) 668-5097**

2. Company contact for environmental matters:
Tim Wall
Suite 740, 404 – 6th Avenue SW
Calgary, Alberta T2P 0R9

Phone No.: **(403) 233-9366**
Fax No.: **(403) 668-5097**

3. Facility name and address (if different from above):
Uintah and Grand Counties, Utah
Sections: T. 15 S., R. 23 E., SLB&M, Uintah County, Sections 35 & 36.
T. 15.5 S., R. 24 E., SLB&M, Grand County, Sections 31& 32.

Phone no.: **NONE**
Fax no.: **NONE**

4. Owners name and address:

Same as 1 above

5. County where the facility is located in:
Uintah and Grand Counties

6. Latitude & longitude, and/or UTM coordinates of plant:
4369592 km Northing, 645187 km Easting Zone 12, NAD 27

7. Directions to plant or Installation (street address and/or directions to site) (include U.S. Coast and Geodetic Survey map if necessary): **30 Northwest of I70 and Highway 6 Junction.**

8. Identify any current Approval Order(s):
AO#_ _Date__ AO#_____Date_____
AO#_____Date_____ AO#_____Date_____

9. If request for modification, permit # to be modified: Date

10. Type of business at this facility: **Tar Sand Mining and Processing**

11. Total company employees greater than 100?
☐ Yes Ξ No

12. Standard Industrial Classification Code
1442 Sand and Gravel Construction

Approval Order Application
Form 1 (Continued)

13. Application for:
X New construction
☐ Existing equipment operating without permit
☐ Change of permit condition
☐ Modification
☐ Permanent site for Portable Approval Order
☐ Change of location

14. For new construction or modification, enter estimated start date: **11/1/07** Estimated completion date: **11/30/07**

15. For change of permittee, location or condition, enter date of occurrence: **N/A**

16. For existing equipment in operation without prior permit, enter initial operation date: **N/A**

17. Has facility been modified or the capacity increased since November 29, 1969: Yes ☐ No **N/A**

Process Information

18. Site plan of facility **(See Section 3.0)**

19. Flow diagram of entire process to include flow rates and other applicable information **(See Section 3.0)**

20. Detailed written process and equipment description. **(See Section 3.0)**
Description must include:
Process/Equip specific form(s) identified in the instructions
Fuels and their use
Raw materials used
Production rates
Equipment used in process
Operation schedules
(including daily/seasonal variances)
Description of product(s)
Description of changes to process (if applicable)

21. Does this application contain justifiable confidential data? ☐ Yes Ξ No

Emissions Information

22. Complete and attach Form 1d, Emissions Information **(See Section 4.0)**
Include Material Safety Data Sheets for all chemicals or compounds that may be emitted to the atmosphere.

23. Identify on the site plan **(see Section 3.0)** all emissions points, building dimensions, stack parameters, etc.

Air Pollution Control Equipment Information

24. List all air pollution control equipment and include equipment specific forms identified in the instructions. **(See Section 5.0)**

25. List and describe all compliance monitoring devices and/or activities (such as CEM, pressure gages).
N/A

26. Submit modeling for the project if required. **(See Section 6.0)**

27. Attach your proposal of what air pollution control devices, if any, or operating practices represents Best Available Control Technology. Discuss and evaluate all air pollution control technologies relevant to your situation or process. **(See Section 5.0)**

28. I hereby certify that the information and data submitted in and with this application is completely true, accurate and complete, based on reasonable inquiry made by me and to the best of my knowledge and belief.

Signature: Barclay Cuthbert Title: **Vice President**

29. **Barclay Cuthbert**	30. Telephone Number: **(403) 233-9366**	30. Date: **October 12, 2007**

APPENDIX C

UDAQ Permitting Forms

Utah Division of Air Quality
New Source Review Section

Date: October 12, 2007
Company: Earth Energy Resources, Inc.
Site: PR Spring Mine

Form 15
Rock Crushing and Screening

Equipment Information

1. Check the appropriate crushing operations used in your process:

Type of Unit **Surface Miner / De-lumper**
Manufacturer **Wertgin / TBD**
Model **Surface Miner / Screen**
Date Manufactured **TBD/ TBD**
✗ Primary Crushing type □ Cone ✗ Jaw □ Ball
□ Secondary Crushing type □ Cone □ Jaw □ Ball
□ Tertiary Crushing type □ Cone □ Jaw □ Ball
Screen Manufacturer **TBD**
Model and Date Manufactured **TBD**
Screen type and size (triple, double, or single deck)
TBD

2. Dust sources will be controlled as follows:

	No Control	Pre Soaked	Water Spray	Bag house	Other (explain)
□ Feed hopper	□	□	□	□	✗
□ All belt transfer points	□	□	□	□	✗
□ Inlet to all crushers	□	□	□	□	✗
□ Exit of all crushers	□	□	□	□	✗
□ All shaker screens	□	□	□	□	✗

OTHER – Inherent moisture with added moisture by water sprays as needed.

3. Water Sprays

Total Water Rate to nozzles (gal/min):	Nozzle pressure (psi):	Quantity of nozzles at each spray bar location:
NA	**NA**	**NA**

4. Maximum Plant Production Rate and Operating Hours:

1,155,000 tons/yr **350** tons/hr
3960 hrs/yr **16** hrs/day

5. Water sprays used on stockpiles?
✗ Yes □ No

Stockpile size: **5.0 acres**

6. Number of conveyor belt transfer and drop points:
Approximately 5 or less

Utah Division of Air Quality
New Source Review Section

Date: October 12, 2007
Company: Earth Energy Resources, Inc.
Site/Source: PR Spring Mine

Form 11
Internal Combustion Engines

Equipment Information

1. Manufacturer: TBD
   Model no.: 250 kW

2. Operating time of Emission Source:

average	maximum
10 Hours/day	12 Hours/day
6 Days/week	6 Days/week
45 Weeks/year	52 Weeks/year

3. Manufacturer's rated output at baseload, ISO ___ hp or 250 Kw
   Proposed site operating range ___ hp or 250 Kw

Gas Firing – Not Applicable

4. Are you operating site equipment on pipeline quality natural gas: ☐ Yes ☐ No

5. Are you on an interruptible gas supply:
   ☐ Yes ☐ No
   If "yes", specify alternate fuel:
   _____

6. Annual consumption of fuel:
   _____ MMSCF/Year

7. Maximum firing rate:
   _____ BTU/hr

8. Average firing rate:
   _____ BTU/hr

Oil Firing

9. Type of oil:
   Grade number ☐ 1 ✗ 2 ☐ 4 ☐ 5 ☐ 6 Other specify _____

10. Annual consumption: 4775 gallons

11. Heat content: 19590 BTU/lb

12. Sulfur content: <0.5% by weight

13. Ash content: Trace % by weight

14. Average firing rate: 19.1 gal/hr

15. Maximum firing rate: 20.0 gal/hr

16. Direction of firing: ✗ horizontal ☐ tangential ☐ other: (specify)

Operation

17. Application:
- ✗ Electric generation
- _____ Base load _____ Peaking
- □ Emergency Generator
- □ Driving pump/compressor
- □ Exhaust heat recovery
- □ Other (specify) _____

18. Cycle
- ✗ Simple cycle
- □ Regenerative cycle
- □ Cogeneration
- □ Combined cycle

Emissions Data

19. Manufacturer's Emissions in grams per hour (grams/hp-hr): **4.8** NO_X **2.6** CO **Unavailable** VOC **Unavailable** Formaldehyde. **Note: (NOx & CO Tier II factors)**

20. Attach manufacturer's information showing emissions of NO_x, CO, VOC, SO_x, CH_2O and PM_{10} for each proposed fuel at engine loads and site ambient temperatures representative of the range of proposed operation. The information must be sufficient to determine maximum hourly and annual emission rates. Annual emissions may be based on a conservatively low approximation of site annual average temperature. Provide emissions in pounds per hour and except for PM_{10}, parts per million by volume (ppmv) at actual conditions and corrected to dry, 15% oxygen conditions.

Method of Emission Control: NO ADDITIONAL CONTROL

□ Lean premix combustors □ Oxidation catalyst □ Water injection □ Other (specify)_____

□ Other low-NO_x combustor □ SCR catalyst □ Steam injection

Additional Information

21. On separate sheets provide the following:

A. Details regarding principle of operation of emission controls. If add-on equipment is used, provide make and model and manufacturer's information. Example details include: controller input variables and operational algorithms for water or ammonia injection systems, combustion mode versus engine load for variable mode combustors, etc. **NOT APPLICABLE**

B. Exhaust parameter information on attached form. **ATTACHED**

C. All calculations used for the annual emission estimates must be submitted with this form to be deemed complete. **SECTION 4.0**

D. All formaldehyde emissions must be modeled as per Utah Administrative Code R307-410-4 using SCREEN 3. **SECTION 6.0**

E. If this form is filled out for a new source, forms 1 and 2 must be submitted also.

INTERNAL COMBUSTION ENGINE
FORM 11 (continued)
EMISSION SOURCES

Review of applications and issuance of permits will be expedited by supplying all necessary information requested on this form.

AIR CONTAMINANT DATA							EMISSION POINT DISCHARGE PARAMETERS							
EMISSION POINT (1)		CHEMICAL COMPOSITION OF TOTAL STREAM			AIR CONTAMINANT EMISSION RATE		UTM COORDINATES OF EMISSION PT. (6)			STACK SOURCES (7)				
										HEIGHT ABOVE GROUND (FT)	HEIGHT ABOVE STRUCT. (FT)	EXIT DATA		
NUMBER	NAME	COMPONENT OR AIR CONTAMINANT NAME (2)		CONC. (%V) (3)	LB/HR (4)	TONS/YR (5)	ZONE	EAST (METERS)	NORTH (METERS)			DIA. (FT)	VELO. (FPS)	TEMP. (^{O}F)
1	GENSET1	PM_{10}			0.11	0.014	12	646000	4369500	13		0.5	184	995°F
		NO_X			3.55	0.443	12	646000	4369500	13		0.5	184	995°F
		SO_2			0.0001	0.017	12	646000	4369500	13		0.5	184	995°F
		CO			1.922	0.24	12	646000	4369500	13		0.5	184	995°F
		VOC			0.001	0.0015	12	646000	4369500	13		0.5	184	995°F
		CH_20			0.003	0.0001	12	646000	4369500	13		0.5	184	995°F

GROUND ELEVATION OF FACILITY ABOVE MEAN SEA LEVEL is approximately 5,000 feet.
UTAH AIR CONSERVATION BOARD STANDARD CONDITIONS ARE 68^{O} F AND 14.7 PSIA.

General Instructions for this form.

1. Identify each emission; point with a unique number for this plant site on plot plan, previous permits and emission inventory questionnaire. Limit emission point number to 8 character spaces. For each emission point use as many lines as necessary to list air contaminant data. Typical emission point names are: heater, vent, boiler, tank, reactor, separator, baghouse, fgitive, etc. Abbreviations are OK.
2. Typical component names are: air, H_2O nitrogen, oxygen, CO_2, CO, NO_x, SO_x, hexane, particulate matter (PM_{10}), etc. Abbreviations are OK.
3. Concentration data is required for all gaseous components. Showconcentration in volume percent oftotal gas stream.
4. Pounds per hour. (#/hr) is maximum emission rate expected by applicant.
5. Tons per year (T/Y) is annual maximum emission rate expected by applicant, which takes into account process operating schedule.
6. As a minimum applicant must furnish a facility plot plan drawn to scale showing a plant benchmark, latitude and longitude correct to the nearest second for the benchmark, and all emission points dimensioned with respect to the benchmark. Please showemission point UTM coordinates if known.
7. Supply additional information as follows if appropriate:
   (a) Stack exit configuration other than a round vertical stack. Showlength and width for a rectangular stack. Indicate ifhorizontal discharge with a note.
   (b) Stack's height above supporting or adjacent structures ifstructure is within three "stack heights above ground" of stack.

Utah Division of Air Quality
New Source Review Section

Date: October 12, 2007
Company: Earth Energy Resources, Inc.
Site/Source: PR Spring Mine

Form 11
Internal Combustion Engines

Equipment Information

1. Manufacturer: TBD
   Model no.: 500 kW

2. Operating time of Emission Source:

average	maximum
10 Hours/day	12 Hours/day
6 Days/week	6 Days/week
45 Weeks/year	52 Weeks/year

3. Manufacturer's rated output at baseload, ISO ___ hp or 500 Kw
   Proposed site operating range ____ hp or 500 Kw

Gas Firing – Not Applicable

4. Are you operating site equipment on pipeline quality natural gas: □ Yes □ No

5. Are you on an interruptible gas supply:
   □ Yes □ No
   If "yes", specify alternate fuel:
   _____

6. Annual consumption of fuel:
   _____ MMSCF/Year

7. Maximum firing rate:
   _____ BTU/hr

8. Average firing rate:
   _____ BTU/hr

Oil Firing

9. Type of oil:
   Grade number □ 1 ✗ 2 □ 4 □ 5 □ 6 Other specify _____

10. Annual consumption: 44.3 MMSCF

11. Heat content: 1000 BTU/SCF

12. Sulfur content: ≤0.0% by weight

13. Ash content: 0% by weight

14. Average firing rate: 7520 BTU/hp-hr

15. Maximum firing rate: 7526 BTU/hp-hr

16. Direction of firing: ✗ horizontal □ tangential □ other: (specify)

Operation

17. Application:
- ✗ Electric generation
- _____ Base load _____ Peaking
- ☐ Emergency Generator
- ☐ Driving pump/compressor
- ☐ Exhaust heat recovery
- ☐ Other (specify) _____

18. Cycle
- ✗ Simple cycle
- ☐ Regenerative cycle
- ☐ Cogeneration
- ☐ Combined cycle

Emissions Data

19. Manufacturer's Emissions in grams per hour (grams/hp-hr): 1.0 NO_X 1.0 CO 0.03 VOC 0.0205 Formaldehyde.

20. Attach manufacturer's information showing emissions of NO_x, CO, VOC, SO_x, CH_2O and PM_{10} for each proposed fuel at engine loads and site ambient temperatures representative of the range of proposed operation. The information must be sufficient to determine maximum hourly and annual emission rates. Annual emissions may be based on a conservatively low approximation of site annual average temperature. Provide emissions in pounds per hour and except for PM_{10}, parts per million by volume (ppmv) at actual conditions and corrected to dry, 15% oxygen conditions.

Method of Emission Control: NO ADDITIONAL CONTROL

☐ Lean premix combustors ☐ Oxidation catalyst ☐ Water injection ☐ Other (specify)_____

☐ Other low-NO_x combustor ☐ SCR catalyst ☐ Steam injection

Additional Information

21. On separate sheets provide the following:

A. Details regarding principle of operation of emission controls. If add-on equipment is used, provide make and model and manufacturer's information. Example details include: controller input variables and operational algorithms for water or ammonia injection systems, combustion mode versus engine load for variable mode combustors, etc. **NOT APPLICABLE**

B. Exhaust parameter information on attached form. **ATTACHED**

C. All calculations used for the annual emission estimates must be submitted with this form to be deemed complete. **SECTION 4.0**

D. All formaldehyde emissions must be modeled as per Utah Administrative Code R307-410-4 using SCREEN 3. **SECTION 6.0**

E. If this form is filled out for a new source, forms 1 and 2 must be submitted also.

INTERNAL COMBUSTION ENGINE
FORM 11 (continued)
EMISSION SOURCES

Review of applications and issuance of permits will be expedited by supplying all necessary information requested on this form.

AIR CONTAMINANT DATA						EMISSION POINT DISCHARGE PARAMETERS							
EMISSION POINT (1)		CHEMICAL COMPOSITION OF TOTAL STREAM		AIR CONTAMINANT EMISSION RATE		UTM COORDINATES OF EMISSION PT. (6)			STACK SOURCES (7)				
									HEIGHT ABOVE GROUND (FT)	HEIGHT ABOVE STRUCT. (FT)	EXIT DATA		
NUMBER	NAME	COMPONENT OR AIR CONTAMINANT NAME (2)	CONC. (%V) (3)	LB/HR (4)	TONS/YR (5)	ZONE	EAST (METERS)	NORTH (METERS)			DIA. (FT)	VELO. (FPS)	TEMP. (^{O}F)
1	GENSET1	PM_{10}		0.003	0.001	12	646000	4369500	13		0.5	295	826°F
		NO_X		3.53	14.68	12	646000	4369500	13		0.5	295	826°F
		SO_2		0.002	0.009	12	646000	4369500	13		0.5	295	826°F
		CO		3.53	14.68	12	646000	4369500	13		0.5	295	826°F
		VOC		0.099	0.435	12	646000	4369500	13		0.5	295	826°F
		CH_20		0.069	0.301	12	646000	4369500	13		0.5	295	826°F

GROUND ELEVATION OF FACILITY ABOVE MEAN SEA LEVEL is approximately 5,000 feet.
UTAH AIR CONSERVATION BOARD STANDARD CONDITIONS ARE 68^{O} F AND 14.7 PSIA.

General Instructions for this form.

1. Identify each emission; point with a unique number for this plant site on plot plan, previous permits and emission inventory questionnaire. Limit emission point number to 8 character spaces. For each emission point use as many lines as necessary to list air contaminant data. Typical emission point names are: heater, vent, boiler, tank, reactor, separator, baghouse, fugitive, etc. Abbreviations are OK.
2. Typical component names are: air, H_2O, nitrogen, oxygen, CO_2, CO, NO_x, SO_x, hexane, particulate matter (PM_{10}), etc. Abbreviations are OK.
3. Concentration data is required for all gaseous components. Show concentration in volume percent of total gas stream.
4. Pounds per hour. (#/hr) is maximum emission rate expected by applicant.
5. Tons per year (T/Y) is annual maximum emission rate expected by applicant, which takes into account process operating schedule.
6. As a minimum applicant must furnish a facility plot plan drawn to scale showing a plant benchmark, latitude and longitude correct to the nearest second for the benchmark, and all emission points dimensioned with respect to the benchmark. Please show emission point UTM coordinates if known.
7. Supply additional information as follows if appropriate:
   (a) Stack exit configuration other than a round vertical stack. Show length and width for a rectangular stack. Indicate if horizontal discharge with a note.
   (b) Stack's height above supporting or adjacent structures if structure is within three "stack heights above ground" of stack.

APPENDIX D

Emission Calculation Spreadsheets

EMISSIONS SUMMARY

Source		PM		PM_{10}		$PM_{2.5}$		NO_x		SO_2		CO		VOC		Total HAPs	
		lb/hr	TPY	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY
Secondary Crushing - Controlled	Fugitive	0.63	1.76	0.26	0.71	0.01	0.04										
Screening - Controlled	Fugitive	0.54	2.08	0.33	1.27												
Conveyors	Fugitive	0.17	0.26	0.06	0.09												
Material Removal (Overburden)	Fugitive	1.01	1.99	0.30	0.60												
Stockpile Load-Unload (Overburden)	Fugitive	0.91	1.82	0.43	0.86	0.07	0.13										
Stockpile Load-Unload (Ore)	Fugitive	0.23	3.51	0.11	1.66	0.02	0.25										
Exposed Area Wind Erosion	Fugitive	6.20	27.17	1.86	8.15												
Diesel Generators	Non-Fugitive	0.11	0.01	0.11	0.01			3.55	0.44	0.00	0.02	1.92	0.24	0.00	0.00	0.01	0.00
Natural Gas Generator	Non-Fugitive	0.00	0.00	0.00	0.00			3.35	14.68	0.00	0.01	3.35	14.68	0.10	0.43	0.09	0.41
Haul Roads	Fugitive	105.32	208.54	26.84	53.15	2.68	5.31										
Tar Sand Loader Haul Roads	Fugitive	2.84	5.61	0.72	1.43	0.07	0.14										
External Combustion Emissions	Non-Fugitive							2.50	10.95	2.10	9.20	0.02	0.07	0.19	0.83		
Tank Emissions	Non-Fugitive													0.94	4.11		
Tank to Truck Loading Emissions	Non-Fugitive													20.29	27.90		
Totals	**Fugitive**	**117.84**	**252.75**	**30.91**	**67.91**	**2.85**	**5.88**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
	Non-Fugitive	**0.11**	**0.01**	**0.11**	**0.01**	**0.00**	**0.00**	**9.40**	**26.08**	**2.10**	**9.22**	**5.29**	**14.99**	**21.52**	**33.27**	**0.11**	**0.42**
Total		**117.96**	**252.76**	**31.03**	**67.93**	**2.85**	**5.88**	**9.40**	**26.08**	**2.10**	**9.22**	**5.29**	**14.99**	**21.52**	**33.27**	**0.11**	**0.42**

PROCESS EMISSIONS

Ore

Process[4]	Throughput		PM_{10} Emission Factor	PM Emission Factor	$PM_{2.5}$ Emission Factor	PM Emissions		PM_{10} Emissions		$PM_{2.5}$ Emissions	
	tph	tpy				lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
Fines Crushing - Controlled[1]	150	1,155,000	0.0012 lb/ton	0.003 lb/ton	0.00007 lb/ton	0.45	1.73	0.18	0.69	0.01	0.04
Fines Screening - Contolled	150	1,155,000	0.0022 lb/ton	0.0036 lb/ton		0.54	2.08	0.33	1.27	0.00	0.00
Conveyor Transfers[1,2]	150	1,155,000	0.00014 lb/ton/point	0.000046 lb/ton/point		0.06	0.24	0.02	0.08		

[1] Moisture content assumed to be 4%; above the moisture content for controlled crushing in the Emission Factor Reference provided.

[2] Assumption is that a total of 5 drop points are in use at the plant.

[3] AP-42 footnotes indicate no data available for primary/secondary crushing, but emission factors for PM_{10} for tertiary crushers can be used as an upper limit for primary/secondary crushing.

Overburden for Road base (One Time Event)

Process	Throughput		PM_{10} Emission Factor	PM Emission Factor	PM Emissions		PM_{10} Emissions		E-Factor Reference
	tph	tpy			lb/hr	tpy	lb/hr	tpy	
Secondary Crushing - Controlled[1]	150	49,345	0.00054 lb/ton	0.0012 lb/ton	0.18	0.03	0.08	0.01	AP-42, 5th Edition, Table 11.19.2-2[3]
Conveyor Transfers[1,2]	150	49,345	0.00014 lb/ton/point	0.000046 lb/ton/point	0.11	0.02	0.03	0.01	AP-42, 5th Edition, Table 11.19.2-2

[1] Moisture content assumed to be 4%; above the moisture content for controlled crushing in the Emission Factor Reference provided.

[2] Assumption is that a total of 5 drop points are in use at the plant.

[3] AP-42 footnotes indicate no data available for primary/secondary crushing, but emission factors for PM_{10} for tertiary crushers can be used as an upper limit for primary/secondary crushing.

[4] Crushing conveying unit is a Werkin Miner that removes and mills ore and conveys the milled material into a truck for hauling, the screen is a delumper to loosen the milled material after it has been hauled to the hopper for processing. As per conversations with Tim Blanchard and Tim DeJulius with the UDAQ it was suggested that fines crushing and screening emission factors could be used for this process.

E-Factor Reference
AP-42, 5th Edition, Table 11.19.2-2[3]
AP-42, 5th Edition, Table 11.19.2-2
AP-42, 5th Edition, Table 11.19.2-2

Earth Energy Resources **PR Springs Mine NOI**

Top Soil Removal

	Controlled Emissions			Uncontrolled Emissions		
Pollutant	Gram/sec	Lbs/hr	Tons/yr	Gram/sec	Lbs/hr	Tons/yr
Total Particulate	0.15	1.23	0.23	0.31	2.45	0.46
PM10	0.05	0.37	0.07	0.09	0.74	0.14

Throughput Rates		
Hourly	184.94	tons
Annual	68,796	tons

NOTE: 50% control

State of Wyoming Approved Emission factors
for fugitive dust emission sources from surface mining

TSP=((0.02 lb/ton*Tons/yr((365-P)/365))*0.75)/2000 WYO
PM10= TSP *0.3 WYO

Where

M=	Material moisture content	10	Natural moisture percent
S=	Material silt content	4.8	Silt Content (AP-42 Table 13.2.2-2)
P=	number of days in a year with at least 0.01 inches of precip	42	Days
A=	annual hours of operations	372	hours based on topsoil being removed 12 hours a day for 31 days.

Topsoil removal will take place during the first month of operation and will be a one-time occurrence as such the emission from the topsoil removal are only being accounted for in the first year of operation.

Earth Energy Resources **PR Spings Mine NOI**

Overburden Removal

	Controlled Emissions			Uncontrolled Emissions		
Pollutant	Gram/sec	Lbs/hr	Tons/yr	Gram/sec	Lbs/hr	Tons/yr
Total Particulate	0.13	1.01	1.99	0.25	2.01	3.98
PM10	0.04	0.30	0.60	0.08	0.60	1.19

Throughput Rates		
Hourly	150.00	tons
Annual	600,000	tons

NOTE: 50% control

State of Wyoming Approved Emission factors
for fugitive dust emission sources from surface mining

TSP=((0.02 lb/ton*Tons/yr((365-P)/365))*0.75)/2000 WYO
PM10= TSP *0.3 WYO

Where

M=	Material moisture content	4 Natural moisture percent
S=	Material silt content	4.8 Silt Content (AP-42 Table 13.2.2-2)
P=	number of days in a year with at least 0.01 inches of precip	42 Days
A=	annual hours of operations	3960 hours
		0.5 Control Efficiency

OVERBURDEN FRONT END LOADING/STOCKPILE DISTURBANCE EMISSIONS

Drop Point Emissions	Emissions		
Pollutant	Gram/sec	Lbs/hr	Tons/yr
Total Particulate	0.11	0.91	1.82
PM10	0.05	0.43	0.86
PM2.5	0.01	0.07	0.13

Throughput Rates		
Hourly	150	tons
Annual	600,000	tons

PM=(k)*(0.0032)*((U/5)^1.3)/((M/2)^1.4) 13.2.4-4 Equation (1)
PM10=(k')*(0.0032)*((U/5)^1.3)/((M/2)^1.4) 13.2.4-4 Equation (1)
PM2.5=(k)*(0.0032)*((U/5)^1.3)/((M/2)^1.4) 13.2.4-4 Equation (1)

Where

k=	Particle size multiplier for TSP	0.74	Page 13.2.4-4
k'=	Particle size multiplier for PM10	0.35	Page 13.2.4-4
k=	Particle size multiplier for PM2.5	0.053	Page 13.2.4-4
U=	Mean wind speed	7.5	DAQ Default (Average of Uintah & Grand Counties)
M=	Material moisture content	4	Natural moisture
n=	Number of drop points	4	Two dozers, two loaders

PM= 0.00152 lbs/ton
PM10= 0.000719 lbs/ton
PM2.5= 0.000109 lbs/ton

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13.2 Fugitive Dust Sources, 11/2006 Revision
13.2.4 Aggregate Handling and Storage Piles, 11/2006 Revision

ORE FRONT END LOADING/STOCKPILE DISTURBANCE EMISSIONS

Drop Point Emissions	Emissions		
Pollutant	Gram/sec	Lbs/hr	Tons/yr
Total Particulate	0.03	0.23	3.51
PM10	0.01	0.11	1.66
PM2.5	0.00	0.02	0.25

Throughput Rates		
Hourly	150	tons
Annual	1,155,000	tons

PM=(k)*(0.0032)*((U/5)^1.3)/((M/2)^1.4) 13.2.4-4 Equation (1)
PM10=(k')*(0.0032)*((U/5)^1.3)/((M/2)^1.4) 13.2.4-4 Equation (1)
PM2.5=(k)*(0.0032)*((U/5)^1.3)/((M/2)^1.4) 13.2.4-4 Equation (1)

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Section 13 Miscellaneous Sources
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13.2.4 Aggregate Handling and Storage Piles, 11/2006 Revision

EXPOSED AREA WIND EROSION

Area: 143 acres

Control Efficiency 50%
TSP= 0.38 Ton/acre/yr Table 11-9-4
PM10= TSP x 0.3 0.114
Usage 365 Days/yr

Pollutant	Controlled emissions		
	Grams/sec	Lbs/hr	Tons/yr
Total Particulate	0.782	6.203	27.17
PM10	0.234	1.861	8.15

Pollutant	Uncontrolled emissions		
	Grams/sec	Lbs/hr	Tons/yr
Total Particulate	1.563	12.406	54.34
PM10	0.469	3.722	16.30

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Section 11 Mineral Products Industry
Chapter 11.9 - Western Surface Coal Mining

UNPAVED HAUL ROADS

Unpaved Haul Roads	50% Controlled			Uncontrolled		
Pollutant	Gram/sec	Lbs/hr	Tons/yr	Gram/sec	Lbs/hr	Tons/yr
Total Particulate	0.36	2.84	5.61	0.72	5.67	11.23
PM_{10}	0.09	0.72	1.43	0.18	1.45	2.86
$PM_{2.5}$	0.01	0.07	0.14	0.02	0.14	0.29

PM= (k((s/12)^0.7)((W/3)^0.45)*((365-P)/365) Pounds per VMT

PM_{10}= (k'((s/12)^0.9)((W/3)^0.45)*((365-P)/365) Pounds per VMT

$PM_{2.5}$= (k2((s/12)^0.9)((W/3)^0.45)*((365-P)/365) Pounds per VMT

WHERE

k=	particle size factor 30 um from Table 13.2.2-2	4.9
k'=	particle size factor <10 um from Table 13.2.2-2	1.5
k2=	particle size factor <2.5 um from Table 13.2.2-2	0.15
s=	silt content default mean value page 13.2.2-2	4.8
W=	Mean vehicle weight (tons)	25
P=	number of days in a year with at least 0.01 inches of precip	42 Average of two WRCC Stations (1 in Grand ;1 in Uinta County)

PM=	5.9281089	Lbs/VMT	(lbs per vehicle mile traveled)
PM_{10}=	1.510857	Lbs/VMT	(lbs per vehicle mile traveled)
$PM_{2.5}$=	0.1510857	Lbs/VMT	(lbs per vehicle mile traveled)

VMT/YEAR= 3788

Length of road (ft)	1000	
Miles/Trip	0.2	Miles
Trips/year	20000	
Control Efficiency for roads	0.5	

HOURS OF OPERATION

Hours per day	12	
Days per week	Varied	
Weeks per year	Varied	
Hours per year	3960	

Materials and Trucks

	Ore[1] TPY
Material (tons/year)	600,000
Empty Weight (tons)	10
Loaded Weight (tons)	40
Mean Vehicle Weight	25
Trips/year	20000
% of Total Trucks	100%

Materials and Trucks

	Ore[1] TPH
Trips/hr	5
Road Length (ft)	1000
Miles/Trip	0.2
VMT/HOUR	0.96

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Section 13 Miscellaneous Sources, 11/2006 Revision
13.2 Fugitive Dust Sources
13.2.2 Unpaved Roads

Earth Energy Resources **PR Springs Mine NOI**

UNPAVED HAUL ROADS

Unpaved Haul Roads	50% Controlled			Uncontrolled		
Pollutant	Gram/sec	Lbs/hr	Tons/yr	Gram/sec	Lbs/hr	Tons/yr
Total Particulate	13.28	105.32	208.54	26.56	210.64	417.07
PM_{10}	3.39	26.84	53.15	6.77	53.69	106.30
$PM_{2.5}$	0.34	2.68	5.31	0.68	5.37	10.63

PM=	(k((s/12)^0.7)((W/3)^0.45)*((365-P)/365)	Pounds per VMT
PM_{10}=	(k'((s/12)^0.9)((W/3)^0.45)*((365-P)/365)	Pounds per VMT
$PM_{2.5}$=	(k2((s/12)^0.9)((W/3)^0.45)*((365-P)/365)	Pounds per VMT

WHERE

k=	particle size factor 30 um from Table 13.2.2-2	4.9
k'=	particle size factor <10 um from Table 13.2.2-2	1.5
k2=	particle size factor <2.5 um from Table 13.2.2-2	0.15
s=	silt content default mean value page 13.2.2-2	4.8
W=	Mean vehicle weight (tons)	25
P=	number of days in a year with at least 0.01 inches of precip	42 Average of two WRCC Stations (1 in Grand ; 1 in Uinta County)

PM=	5.928108873 Lbs/VMT	(lbs per vehicle mile traveled)
PM_{10}=	1.510856956 Lbs/VMT	(lbs per vehicle mile traveled)
$PM_{2.5}$=	0.151085696 Lbs/VMT	(lbs per vehicle mile traveled)

VMT/YEAR=	140710	
Length of road roundtrip(ft)	12700	
Miles/Trip	2.4	Miles
Trips/year	58500	
Control Efficiency for roads	0.5	

HOURS OF OPERATION

Hours per day	12
Days per week	Varied
Weeks per year	Varied
Hours per year	3960

Materials and Trucks

Ore & Overburnden[1]

TPY	
Material (tons/year)	1,755,000
Empty Weight (tons)	10
Loaded Weight (tons)	40
Mean Vehicle Weight	25
Trips/year	58500
% of Total Trucks	100%

Materials and Trucks

Ore & Overburnden[1]

TPH	
Trips/hr	15
Road Length (ft)	12700
Miles/Trip	2.4
VMT/HOUR	35.53

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13.2 Fugitive Dust Sources
13.2.2 Unpaved Roads

DIESEL GENERATOR EMISSIONS

Generator Set	kW	hp	Hours of Operation	Emission Factors (g/hp-hr)(lb/hr)				
				PM_{10}[1]	NO_x[1]	SO_2[1,2]	CO[1]	VOC[1,2]
Generator Set	250	335	250	0.150	4.800	0.000	2.600	0.001
TOTAL	**250**	**335**						

Notes: 1 EPA Tier 2 Emission factors for nonroad diesel engines
2 EPA AP-42 Table 3.3-1 diesel industrial engine emission factors for engines less than 600 hp

Emissions

	PM_{10}		NO_x		SO_2		CO		VOC		Total HAPs	
	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY
Generator Set	0.111	0.014	3.548	0.443	0.000	0.017	1.922	0.240	0.001	0.055	0.015	0.002
Total	**0.111**	**0.014**	**3.548**	**0.443**	**0.000**	**0.017**	**1.922**	**0.240**	**0.001**	**0.001**	**0.015**	**0.002**

HAPS

Generator Set	kW	hp	Hours of Operation	Emission Factors lb/MMBtu[1]							Emissions (lb/hr)						
				HCHO	Benzene	Toluene	Xylenes	Propylene	Acetald.	Acrolein	HCHO	Benzene	Toluene	Xylenes	Propylene	Acetald.	Acrolein
Generator Set	250	335	250	1.18E-03	9.33E-04	4.09E-04	2.85E-04	2.58E-03	7.67E-04	9.25E-05	0.003	0.002	0.001	0.001	0.006	0.002	0.000
TOTAL	**250**	**335**									**0.003**	**0.002**	**0.001**	**0.001**	**0.006**	**0.002**	**0.000**

Notes: 1 AP-42, 5th Edition, Table 3.3-1,2

Generator Set	kW	hp	Hours of Operation	Annual Emissions (tpy)						
				HCHO	Benzene	Toluene	Xylenes	Propylene	Acetald.	Acrolein
Generator Set	250	335	250	0.000	0.000	0.000	0.000	0.001	0.000	0.000
TOTAL	**250**	**335**		**0.000**	**0.000**	**0.000**	**0.000**	**0.001**	**0.000**	**0.000**

NATURAL GAS GENERATOR EMISSIONS

Generator Set	kW	hp	Hours of Operation	Emission Factors lb/MMBtu				
				PM_{10}[1]	NO_x[3]	SO_2[1,2]	CO[3]	VOC[1,2]
Generator Set	500	671	8,760	0.001	1.000	0.001	1.000	0.030
TOTAL	500	671						

Notes:
1 EPA AP-42 Table 3.2-3 Emission Factors
2 Assumed brake specific fuel consumption of 5000 Btu/hp-hr
3 Controlled with an NSCR t

Emissions

	PM_{10}		NO_x		SO_2		CO		VOC		Total HAPs	
	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY
Generator Set	0.003	0.001	3.353	14.684	0.002	0.009	3.353	14.684	0.099	0.435	0.095	0.415
Total	0.003	0.001	3.353	14.684	0.002	0.009	3.353	14.684	0.099	0.435	0.095	0.415

HAPS

Generator Set	kW	hp	Hours of Operation	Emission Factors lb/MMBtu[1]							Emissions (lb/hr)						
				HCHO	Benzene	Toluene	Xylenes	Propylene	Acetald.	Acrolein	HCHO	Benzene	Toluene	Xylenes	Propylene	Acetald.	Acrolein
Generator Set	500	671	8,760	2.05E-02	1.58E-03	5.58E-04	1.95E-04	0.00E+00	2.79E-03	2.63E-03	0.069	0.005	0.002	0.001	0.000	0.009	0.009
TOTAL	500	671									0.069	0.005	0.002	0.001	0.000	0.009	0.009

Notes: 1 AP-42, 5th Edition, Tables 3.3-1.2 & 3.4-1,2,3

Generator Set	kW	hp	Hours of Operation	Annual Emissions (tpy)						
				HCHO	Benzene	Toluene	Xylenes	Propylene	Acetald.	Acrolein
Generator Set	TPY	671	TPY	0.301	0.023	0.008	0.003	0.000	0.041	0.039
TOTAL	0	671		0.301	0.023	0.008	0.003	0.000	0.041	0.039

Source	Burner Rating (MMBtu/Hr)	Annual Op Time (hours)	Fuel Type	Fuel Htg Value (Btu/scf)
Process Heater	25.000	8760	Field	1000

Emission Factors

Source	Burner Rating (MMBtu/Hr)	Emission Factors				
		NOx (Lb/MMFt^3)	CO (Lb/MMFt^3)	SO_2 (Lb/MMFt^3)	PM (Lb/MMFt^3)	VOC [3] (Lb/MMFt^3)
Process Heater	25.000	100.0	84.0	0.6	7.6	8.0
EF Source		AP-42	AP-42	AP-42	AP-42	AP-42

[1]AP-42, 5th Ed., Table 1.4-1,2

Emissions (Lb/Hr) = E.F. (Lb/MMft ^{3}) * FHV/1000 * Burner Rating (MMbtu/Hr) * 1/FHV (btu/scf) * 1 MMft ^{3}/1x10^6 ft^3 * 1x10^6 Btu/MMbtu

Emissions (TPY) = Emissions (Lb/Hr) * Annual Operating Time (Hr/Yr) * 1 ton/2,000 Lb

Emissions

Source	Source Emissions									
	NOx		CO		SO_2		PM		VOC	
	(Lb/Hr)	(TPY)	(Lb/Hr)	(TPY)	(Lb/Hr)	(TPY)	(Lb/Hr)	(TPY)	(Lb/Hr)	(TPY)
Process Heater	2.50	10.95	2.10	9.20	0.02	0.07	0.19	0.83	0.20	0.88
Total	**2.50**	**10.95**	**2.10**	**9.20**	**0.02**	**0.07**	**0.19**	**0.83**	**0.20**	**0.88**

TANK VOC EMISSIONS

4-500 bbl. Crude Storage Tanks

Composition	Average Throughput (BCPD)	Working Losses (Lb/Yr)	Breathing Losses (Lb/Yr)	Working Losses (TPY)	Breathing Losses (TPY)	Total Losses (Lb/Hr)	Total Losses (TPY)
Crude	2000	7387.66	828.16	3.69	0.41	0.94	4.11

TANKS 4.0.9d
Emissions Report - Summary Format
Tank Indentification and Physical Characteristics

Identification

User Identification:	Earth Energy Tar Sands Mine
City:	Vernal
State:	Utah
Company:	Earth Energy
Type of Tank:	Vertical Fixed Roof Tank
Description:	4-500 bbl tanks operating in parallel

Tank Dimensions

Shell Height (ft):	25.00
Diameter (ft):	12.00
Liquid Height (ft) :	24.00
Avg. Liquid Height (ft):	12.50
Volume (gallons):	20,304.71
Turnovers:	679.50
Net Throughput(gal/yr):	13,797,000.00
Is Tank Heated (y/n):	N

Paint Characteristics

Shell Color/Shade:	Gray/Light
Shell Condition	Good
Roof Color/Shade:	Gray/Light
Roof Condition:	Good

Roof Characteristics

Type:	Cone
Height (ft)	1.00
Slope (ft/ft) (Cone Roof)	0.17

Breather Vent Settings

Vacuum Settings (psig):	-0.03
Pressure Settings (psig)	0.03

Meterological Data used in Emissions Calculations: Salt Lake City, Utah (Avg Atmospheric Pressure = 12.64 psia)

TANKS 4.0.9d
Emissions Report - Summary Format
Liquid Contents of Storage Tank

Earth Energy Tar Sands Mine - Vertical Fixed Roof Tank
Vernal, Utah

Mixture/Component	Month	Daily Liquid Surf. Temperature (deg F) Avg.	Min.	Max.	Liquid Bulk Temp (deg F)	Vapor Pressure (psia) Avg.	Min.	Max.	Vapor Mol. Weight	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
Crude oil (RVP 5)	All	59.41	49.72	69.11	54.20	2.8447	2.3420	3.4307	50.0000			207.00	Option 4: RVP=5

TANKS 4.0.9d
Emissions Report - Summary Format
Individual Tank Emission Totals

Emissions Report for: Annual

Earth Energy Tar Sands Mine - Vertical Fixed Roof Tank
Vernal, Utah

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
Crude oil (RVP 5)	7,387.66	828.16	8,215.81

Earth Energy Resources PR Springs Mine NOI

TANK TO TRUCK LOADING EMISSIONS

$$LL = 12.46 * S\ P\ M\ /T$$

- LL = Loading loss (Lb/1,000 gal.), of liquid loaded
- S = Saturation factor (from AP-42 Table 5.2-1)
- P = True vapor pressure of liquid loaded (psia), (from AP-42 Table 7.1-2)
- M = Molecular weight of vapors (Lb/Lb-mole)
- T = Temperature of liquid loaded (0R = 460 + 0F)

S = 0.6 (For dedicated Hydrocarbon service)
P = 2.8 True Vapor Pressure (psia) @ T = 60 for a RVP = 10 fluid
M = 50 Lb/Lb-mole (from composition of vapor phase as per Tanks 4.09)
T = 60 0F or 520 0R

LL = 2.0128 Lb/1,000 gal. Loaded

-For a production facility making: 660,000 bbl/yr

LL (TPY) = LL (Lb/1,000 gal) * annual production (bbl/yr) * 42 gal/bbl * 1ton/2000Lbs

Truck Load out Emissions = 27.90 TPY of VOC

LL (lb/hr) = LL (Lb/1,000 gal) * 240 bbl tank truck * 42 gal/bbl * 1 hr load out duration

Truck Load out Emissions = 20.29 lb/hr of VOC

APPENDIX E

Air Dispersion Modeling Protocol

Air Dispersion Modeling Documentation

AIR QUALITY MODELING REPORT

1. PURPOSE

This air quality modeling report documents analyses prepared to support an NOI application to the Utah Department of Environmental Quality Air Quality Bureau (UDAQ) for the Earth Energy resources PR Spring Oil Sand mine on their EERI lease area in northeast Utah north of Vernal. The analyses documented were prepared consistent with a modeling protocol provided to Tom Orth of UDAQ in the form of modeling input and output files, a facility emission inventory, maps, and background information, and the limited conditions on approval by Mr. Orth. These analysis show that the proposed actions at the facility would not cause or significantly contribute to exceedances of ambient air quality standards or any other applicable air quality impact limit.

2. MODEL DESCRIPTION / JUSTIFICATION

The model chosen is ISCST3, the US EPA approved Industrial Source Complex model. This model is approved by UDAQ for minor source impact analyses, and was recommended for this application. Building downwash was not included because the proposed actions involve primarily fugitive emissions, the few stack emissions do not have nearby structures which would lead to downwash and/or are far from property boundaries as compared to the potential downwash area(s). ISCST3 was applied consistent with recommendations by UDAQ and in EPA's *Guideline on Air Quality Models* (2003), consistent with guidance in UDAQ's *Modeling Guidelines*, utilizing the recommended regulatory default options and simple and complex terrain calculation options. Other model parameters and settings were shared with UDAQ graphically and/or via model input and output files. The details of the analyses described here were reviewed and approved by Mr. Orth, with the limited issues where refinements from the proposed protocol were recommended (combining the Bonanza meteorological data into one four year file and comparing fifth highest 24 hour impacts over the period against applicable impact limits. Modeling analyses were performed for each pollutant emitted above UDAQ modeling thresholds to estimate maximum impacts during each averaging period for which an applicable ambient air quality impact limit exists. Chemical transformation of emissions was not considered.

3. EMISSION AND SOURCE DATA

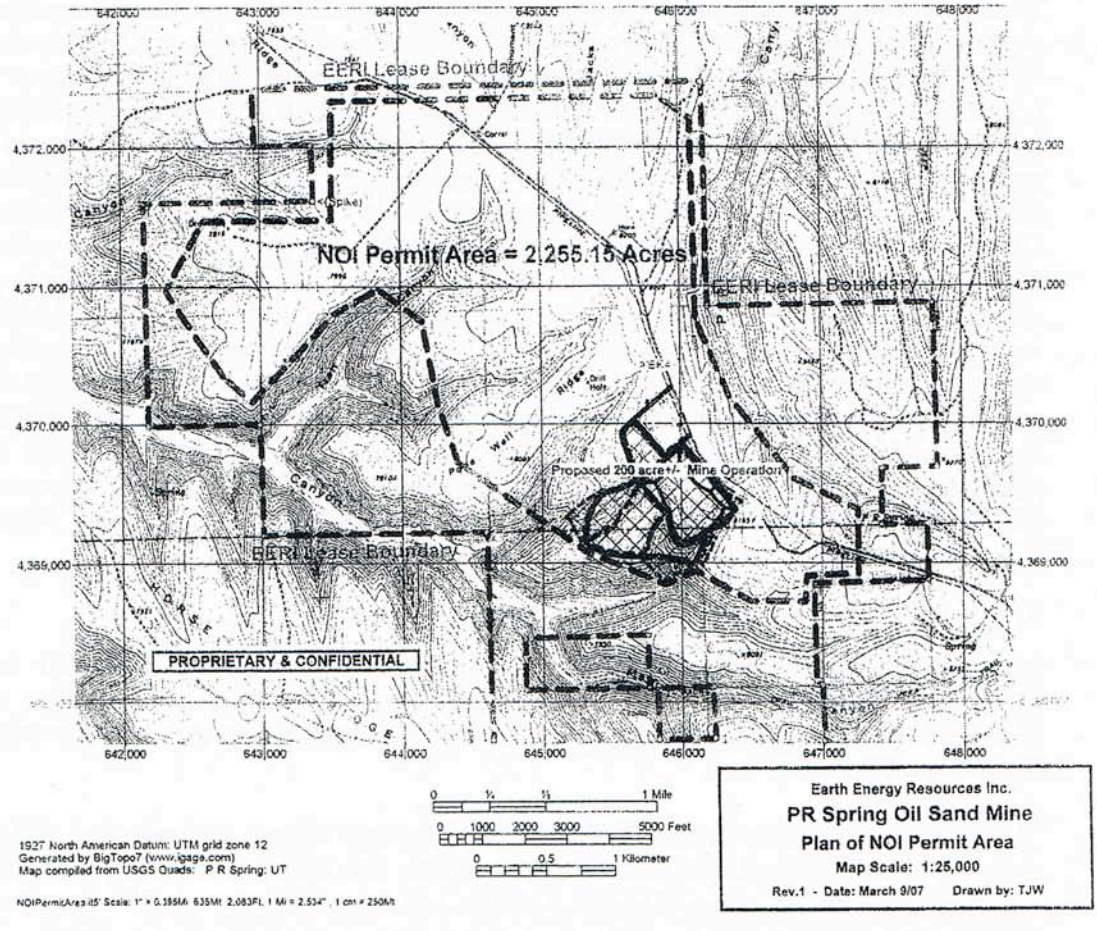
Modeled emissions include all sources in the emission inventory submitted with this application, including onsite vehicular traffic emissions. Those sources were spatially distributed consistent with typical plant operations, interpreted in worst-case scenarios under the proposed permit.

The facility's emission inventory shows that only one criteria air pollutant, PM_{10}, has a potential to emit above UDAQ modeling thresholds. The emission inventory also shows that two hazardous air pollutants (HAPs), Acrolein and formaldehyde, would be emitted above UDAQ modeling thresholds. Therefore, those three pollutants were modeled, and their predicted impacts compared against applicable impact limits to demonstrate compliance with those impact limits.

Emission rates modeled represent the maximum anticipated operating rates for each averaging period modeled. For that reason, emissions of PM-10, which has a 24-hour and an annual average impact standard, were calculated separately to determine separate potential emission rates for short term averaging period (as pollutant PMTEN) and long-term averaging period (as pollutant PMTENAN). In this analysis, though, PMTEN results alone are reported. That use of short term maximum emission rates is overly conservative for the annual average period, but sufficient to show compliance with all applicable impact limits.

The proposed operations at the Earth Energy PR Spring Oil Sand Mine cover up to 200 acres of activity in a parcel of over 2000 acres. Up to 140 acres of that ground will be disturbed. Figure 1 shows the location and boundaries of the facility on a USGS topographic map. The location is further documented by UTM coordinates in figures below.

Figure 1
Facility Location and Boundary



The 200 acres of activity within the lease boundary is shown above in the labeled area in the center of the figure. Project proponents will control access to the lease area, so would have significant setback to ambient air at the lease boundary. For added conservatism, all modeled mine, ore transport, and pit activity emissions were modeled from the possible west pit expansion, which will only be cindered if the north pit, further from property boundaries, is

played out after initial years of operation and the project is profitable to consider expansion to the west pit. Also, no credit was taken for any it retention, though such retention is expected. The modeled scenario uses the HROFDAY emission factor in the model to account for the up to 12 hours of operation per day between the hours of 6AM and 10PM proposed. Consistent with the modeling protocol, analyses were prepared to assess the impact of operations from 6AM to 6PM, and also from 10AM to 10PM. All wind erosion emissions, and emissions from plant crushing, screening operations and their feed supplies are modeled assuming continuous operations. The crushing and screening operation will be capable of operating overnight via an automated feed from stockpiles after the crew leaves for the night. The highest predicted impacts for either operating period scenario are reported in the results section below. Table 2 below shows the model source parameters for the onsite emission sources modeled.

Figure 1 shows the facility layout in the model. Red Highlights identify model sources. The surrounding solid line shows the facility boundary.

Figure 2
Facility Layout in the Model

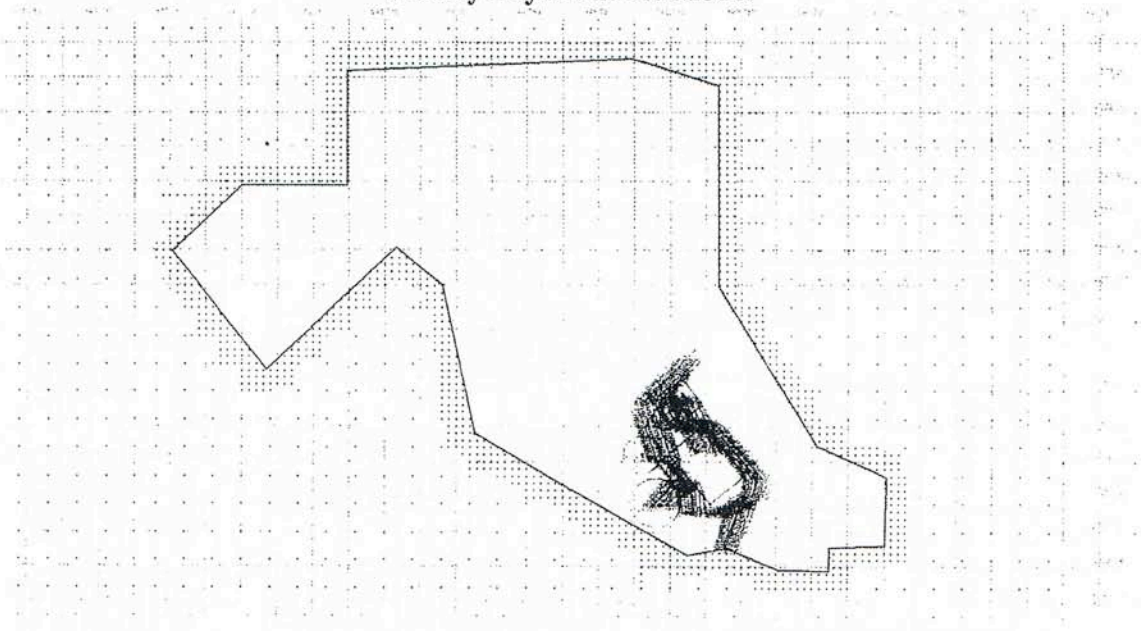


Table 2
Model Source Data

POINT SOURCES		Source Description	Easting (X)	Northing (Y)	Base Elevation	Stack Height	Temperature	Exit Velocity	Stack Diameter	PMTEN	ACROLEIN	FORMALD
Source ID	Stack Release Type		(m)	(m)	(m)	(ft)	(°F)	(fps)	(ft)	(lb/hr)	(lb/hr)	(lb/hr)
DGEN	DEFAULT	diesel generator	645830	4369950	2478	12	995.0	184.4	0.5	0.111		0.003
NGGEN	DEFAULT	natural gas generator	645825	4369955	2477.5	14	826.0	224.9	0.5	0.003	0.009	0.069

AREA SOURCES		Easting (X)	Northing (Y)	Base Elevation	Release Height	Easterly Length	Northerly Length	Angle from North	Vertical Dimension	PMTEN	ACROLEIN	FORMALD
Source ID	Source Description	(m)	(m)	(m)	(ft)	(ft)	(ft)		(ft)	(lb/hr)	(lb/hr)	(lb/hr)
DISTNP	Distrubed ground North pit area	646030	4369200	2457	0	1050	1500	-40	2.00	0.784		
DISTPLNT	Plant disturbed area	645865	4369818	2476.6	0	425	750	-35	2.00	0.191		
CONVY1	conveyor	645845	4369970	2479.7	16.4	6.6	6.6		13.12	0.030		
CONVY2	conveyor	645855	4369954	2480.1	16.4	6.6	6.6		13.12	0.030		
CONVYIN	conv for init rd gravel	645830	4369972	2478.1	16.4	6.6	6.6		13.12	0.030		
LUOVERBT	load / unload topsoil	645785	4369830	2473	6.6	16.4	16.4		14.76	0.200		
LUOVBDNW	load /unload waste ovb	645675	4369565	2437.5	6.6	16.4	16.4		14.76	0.230		
LUORE	load / unload ore	645834	4369982	2478.9	6.6	16.4	16.4		14.76	0.110		
LUOREREM	load overburden in pit	645646	4369209.5	2457.9	6.6	49.2	49.2		6.56	0.430		

CIRCULAR AREA SOURCES		Easting (X)	Northing (Y)	Base Elevation	Release Height	Radius of Circle	Number of Vertices	Vertical Dimension	PMTEN	ACROLEIN	FORMALD
Source ID	Source Description	(m)	(m)	(m)	(ft)	(ft)		(ft)	(lb/hr)	(lb/hr)	(lb/hr)
STORPTPS	Wind Er Topsoil storage pile	645711	4369810	2463.9	2.99	285.01		10.99	0.05161		
STORWR	Wind Er Waste material storage pile	645550	4369550	2439.3	4.00	425.00		12.99	0.33493		
DWEXTPIT	Dist area Poss W pit ext	645644.31	4369209.5	2457.9	0.00	575.00		12.99	0.38788		

Source ID	Source Description	Easting (X)	Northing (Y)	Base Elevation	Release Height	Horizontal Dimension	Vertical Dimension	PMTEN	ACROLEIN	FORMALD

		(m)	(m)	(m)	(ft)	(ft)	(ft)	(lb/hr)	(lb/hr)	(lb/hr)
ROAD1	main road segment	646135.2	4368900.7	2434.7	2.001	27.887	3.248	0.15606		
ROAD2	main road segment	646141.6	4368918.0	2440.5	2.001	27.887	3.248	0.15606		
ROAD3	main road segment	646148.1	4368935.3	2444.7	2.001	27.887	3.248	0.15606		
ROAD4	main road segment	646154.5	4368952.7	2448.4	2.001	27.887	3.248	0.15606		
ROAD5	main road segment	646160.9	4368970.0	2451.3	2.001	27.887	3.248	0.15606		
ROAD6	main road segment	646167.4	4368987.3	2452.4	2.001	27.887	3.248	0.15606		
ROAD7	main road segment	646173.8	4369004.7	2453.2	2.001	27.887	3.248	0.15606		
ROAD8	main road segment	646180.2	4369022.0	2453.3	2.001	27.887	3.248	0.15606		
ROAD9	main road segment	646186.6	4369039.3	2453.1	2.001	27.887	3.248	0.15606		
ROAD10	main road segment	646193.1	4369056.7	2452.6	2.001	27.887	3.248	0.15606		
ROAD11	main road segment	646199.5	4369074.0	2451.6	2.001	27.887	3.248	0.15606		
ROAD12	main road segment	646205.9	4369091.3	2450	2.001	27.887	3.248	0.15606		
ROAD13	main road segment	646212.4	4369108.7	2448.9	2.001	27.887	3.248	0.15606		
ROAD14	main road segment	646218.8	4369126.0	2448.4	2.001	27.887	3.248	0.15606		
ROAD15	main road segment	646225.2	4369143.3	2447.9	2.001	27.887	3.248	0.15606		
ROAD16	main road segment	646231.6	4369160.7	2447.8	2.001	27.887	3.248	0.15606		
ROAD17	main road segment	646238.1	4369178.0	2447.6	2.001	27.887	3.248	0.15606		
ROAD18	main road segment	646244.5	4369195.3	2447.7	2.001	27.887	3.248	0.15606		
ROAD19	main road segment	646250.9	4369212.7	2447.6	2.001	27.887	3.248	0.15606		
ROAD20	main road segment	646257.4	4369230.0	2448	2.001	27.887	3.248	0.15606		
ROAD21	main road segment	646263.8	4369247.3	2448.8	2.001	27.887	3.248	0.15606		
ROAD22	main road segment	646276.9	4369261.8	2449.5	2.001	27.887	3.248	0.15606		
ROAD23	main road segment	646296.6	4369273.3	2452.8	2.001	27.887	3.248	0.15606		
ROAD24	main road segment	646316.4	4369284.8	2457.8	2.001	27.887	3.248	0.15606		
ROAD25	main road segment	646336.1	4369296.3	2462.3	2.001	27.887	3.248	0.15606		
ROAD26	main road segment	646348.1	4369311.0	2464.9	2.001	27.887	3.248	0.15606		
ROAD27	main road segment	646352.3	4369329.0	2464.9	2.001	27.887	3.248	0.15606		
ROAD28	main road segment	646356.4	4369347.0	2465.3	2.001	27.887	3.248	0.15606		
ROAD29	main road segment	646360.6	4369365.0	2466.8	2.001	27.887	3.248	0.15606		
ROAD30	main road segment	646364.8	4369383.0	2469.3	2.001	27.887	3.248	0.15606		
ROAD31	main road segment	646368.9	4369401.0	2472.5	2.001	27.887	3.248	0.15606		
ROAD32	main road segment	646365.0	4369417.0	2474.4	2.001	27.887	3.248	0.15606		
ROAD33	main road segment	646353.0	4369431.0	2474	2.001	27.887	3.248	0.15606		

ROAD34	main road segment	646340.9	4369444.9	2475	2.001	27.887	3.248	0.15606		
ROAD35	main road segment	646328.9	4369458.9	2476.7	2.001	27.887	3.248	0.15606		
ROAD36	main road segment	646316.9	4369472.9	2478.1	2.001	27.887	3.248	0.15606		
ROAD37	main road segment	646304.8	4369486.8	2479.2	2.001	27.887	3.248	0.15606		
ROAD38	main road segment	646292.8	4369500.8	2479.7	2.001	27.887	3.248	0.15606		
ROAD39	main road segment	646280.8	4369514.8	2479.9	2.001	27.887	3.248	0.15606		
ROAD40	main road segment	646268.7	4369528.7	2480.1	2.001	27.887	3.248	0.15606		
ROAD41	main road segment	646256.7	4369542.7	2480.5	2.001	27.887	3.248	0.15606		
ROAD42	main road segment	646244.7	4369556.7	2481.1	2.001	27.887	3.248	0.15606		
ROAD43	main road segment	646232.6	4369570.6	2481.6	2.001	27.887	3.248	0.15606		
ROAD44	main road segment	646220.6	4369584.6	2482	2.001	27.887	3.248	0.15606		
ROAD45	main road segment	646208.6	4369598.6	2482.6	2.001	27.887	3.248	0.15606		
ROAD46	main road segment	646196.5	4369612.5	2483.3	2.001	27.887	3.248	0.15606		
ROAD47	main road segment	646184.5	4369626.5	2484.3	2.001	27.887	3.248	0.15606		
ROAD48	main road segment	646172.5	4369640.5	2485.4	2.001	27.887	3.248	0.15606		
ROAD49	main road segment	646160.4	4369654.4	2486.4	2.001	27.887	3.248	0.15606		
ROAD50	main road segment	646148.4	4369668.4	2487.2	2.001	27.887	3.248	0.15606		
ROAD51	main road segment	646136.4	4369682.4	2487.4	2.001	27.887	3.248	0.15606		
ROAD52	main road segment	646124.3	4369696.3	2487.6	2.001	27.887	3.248	0.15606		
ROAD53	main road segment	646112.3	4369710.3	2487.5	2.001	27.887	3.248	0.15606		
ROAD54	main road segment	646100.3	4369724.3	2487.3	2.001	27.887	3.248	0.15606		
ROAD55	main road segment	646088.2	4369738.2	2486.9	2.001	27.887	3.248	0.15606		
ROAD56	main road segment	646076.2	4369752.2	2486.3	2.001	27.887	3.248	0.15606		
ROAD57	main road segment	646064.2	4369766.2	2485.6	2.001	27.887	3.248	0.15606		
ROAD58	main road segment	646052.1	4369780.1	2484.8	2.001	27.887	3.248	0.15606		
ROAD59	main road segment	646040.1	4369794.1	2484.2	2.001	27.887	3.248	0.15606		
ROAD60	main road segment	646028.1	4369808.1	2483.5	2.001	27.887	3.248	0.15606		
ROAD61	main road segment	646016.0	4369822.0	2483.1	2.001	27.887	3.248	0.15606		
ROAD62	main road segment	646001.6	4369824.3	2482.9	2.001	27.887	3.248	0.15606		
ROAD63	main road segment	645984.7	4369814.8	2482.4	2.001	27.887	3.248	0.15606		
ROAD64	main road segment	645967.8	4369805.3	2481	2.001	27.887	3.248	0.15606		
ROAD65	main road segment	645950.9	4369795.8	2479.5	2.001	27.887	3.248	0.15606		
ROAD66	main road segment	645934.1	4369786.3	2477.9	2.001	27.887	3.248	0.15606		
ROAD67	main road segment	645917.2	4369776.8	2476.5	2.001	27.887	3.248	0.15606		

ROAD68	main road segment	645900.3	4369767.3	2475.2	2.001	27.887	3.248	0.15606		
ROAD69	main road segment	645883.4	4369757.8	2474	2.001	27.887	3.248	0.15606		
ROAD70	main road segment	645869.4	4369760.6	2473.4	2.001	27.887	3.248	0.15606		
ROAD71	main road segment	645858.1	4369775.7	2473.9	2.001	27.887	3.248	0.15606		
ROAD72	main road segment	645846.8	4369790.8	2474.9	2.001	27.887	3.248	0.15606		
ROAD73	main road segment	645835.5	4369805.9	2475.2	2.001	27.887	3.248	0.15606		
ROAD74	main road segment	645824.3	4369821.0	2475.6	2.001	27.887	3.248	0.15606		
ROAD75	main road segment	645813.0	4369836.1	2475.6	2.001	27.887	3.248	0.15606		
ROAD76	main road segment	645801.7	4369851.2	2475.1	2.001	27.887	3.248	0.15606		
ROAD77	main road segment	645790.4	4369866.3	2474.7	2.001	27.887	3.248	0.15606		
ROAD78	main road segment	645779.1	4369881.4	2474	2.001	27.887	3.248	0.15606		
ROAD79	main road segment	645767.9	4369896.6	2473.6	2.001	27.887	3.248	0.15606		
ROAD80	main road segment	645756.6	4369911.7	2473.4	2.001	27.887	3.248	0.15606		
ROAD81	main road segment	645745.3	4369926.8	2473.8	2.001	27.887	3.248	0.15606		
ROAD82	main road segment	645734.0	4369941.9	2474.3	2.001	27.887	3.248	0.15606		
ROAD83	main road segment	645722.8	4369957.0	2474.7	2.001	27.887	3.248	0.15606		
ROAD84	main road segment	645711.5	4369972.1	2474.7	2.001	27.887	3.248	0.15606		
ROAD85	main road segment	645700.2	4369987.2	2474.4	2.001	27.887	3.248	0.15606		
ROAD86	main road segment	645688.9	4370002.3	2474.1	2.001	27.887	3.248	0.15606		
ROAD87	main road segment	645677.6	4370017.4	2473.3	2.001	27.887	3.248	0.15606		
ROAD88	main road segment	645919.7	4370300.2	2483.2	2.001	27.887	3.248	0.15606		
ROAD89	main road segment	645907.0	4370286.7	2483.8	2.001	27.887	3.248	0.15606		
ROAD90	main road segment	645894.4	4370273.2	2484.4	2.001	27.887	3.248	0.15606		
ROAD91	main road segment	645881.8	4370259.6	2485.1	2.001	27.887	3.248	0.15606		
ROAD92	main road segment	645869.1	4370246.1	2485.9	2.001	27.887	3.248	0.15606		
ROAD93	main road segment	645856.5	4370232.6	2486.6	2.001	27.887	3.248	0.15606		
ROAD94	main road segment	645843.8	4370219.0	2487.3	2.001	27.887	3.248	0.15606		
ROAD95	main road segment	645831.2	4370205.5	2487.5	2.001	27.887	3.248	0.15606		
ROAD96	main road segment	645818.5	4370192.0	2486.7	2.001	27.887	3.248	0.15606		
ROAD97	main road segment	645805.9	4370178.4	2485.2	2.001	27.887	3.248	0.15606		
ROAD98	main road segment	645793.3	4370164.9	2483.6	2.001	27.887	3.248	0.15606		
ROAD99	main road segment	645780.6	4370151.3	2481.8	2.001	27.887	3.248	0.15606		
ROAD100	main road segment	645768.0	4370137.8	2480.3	2.001	27.887	3.248	0.15606		
ROAD101	main road segment	645755.3	4370124.3	2479.2	2.001	27.887	3.248	0.15606		

ROAD102	main road segment	645742.7	4370110.7	2478.2	2.001	27.887	3.248	0.15606		
ROAD103	main road segment	645730.0	4370097.2	2477.4	2.001	27.887	3.248	0.15606		
ROAD104	main road segment	645717.4	4370083.7	2476.6	2.001	27.887	3.248	0.15606		
ROAD105	main road segment	645704.8	4370070.1	2475.9	2.001	27.887	3.248	0.15606		
ROAD106	main road segment	645692.1	4370056.6	2474.9	2.001	27.887	3.248	0.15606		
ROAD107	main road segment	645679.5	4370043.1	2473.7	2.001	27.887	3.248	0.15606		
ROAD108	main road segment	645666.8	4370029.5	2472.8	2.001	27.887	3.248	0.15606		
ROAD109	main road segment	645654.2	4370016.0	2471.5	2.001	27.887	3.248	0.15606		
ROAD110	main road segment	645641.5	4370002.5	2470.5	2.001	27.887	3.248	0.15606		
ROAD111	main road segment	645628.9	4369988.9	2469.1	2.001	27.887	3.248	0.15606		
ROAD112	main road segment	645616.3	4369975.4	2468.1	2.001	27.887	3.248	0.15606		
ROAD113	main road segment	645603.6	4369961.8	2467.3	2.001	27.887	3.248	0.15606		
ROAD114	main road segment	645591.0	4369948.3	2466.4	2.001	27.887	3.248	0.15606		
ROAD115	main road segment	645578.3	4369934.8	2465.5	2.001	27.887	3.248	0.15606		
ROAD116	main road segment	645575.3	4369919.1	2465.4	2.001	27.887	3.248	0.15606		
ROAD117	main road segment	645581.8	4369901.4	2465.7	2.001	27.887	3.248	0.15606		
ROAD118	main road segment	645588.3	4369883.7	2466	2.001	27.887	3.248	0.15606		
ROAD119	main road segment	645594.8	4369866.0	2466.4	2.001	27.887	3.248	0.15606		
ROAD120	main road segment	645601.3	4369848.2	2466.8	2.001	27.887	3.248	0.15606		
ROAD121	main road segment	645607.8	4369830.5	2467.2	2.001	27.887	3.248	0.15606		
ROAD122	main road segment	645614.3	4369812.8	2467.3	2.001	27.887	3.248	0.15606		
ROAD123	main road segment	645620.8	4369795.1	2467.4	2.001	27.887	3.248	0.15606		
ROAD124	main road segment	645627.3	4369777.3	2467.2	2.001	27.887	3.248	0.15606		
ROAD125	main road segment	645633.8	4369759.6	2466.6	2.001	27.887	3.248	0.15606		
ROAD126	main road segment	645640.3	4369741.9	2466.5	2.001	27.887	3.248	0.15606		
ROAD127	main road segment	645646.8	4369724.1	2465.4	2.001	27.887	3.248	0.15606		
ROAD128	main road segment	645653.3	4369706.4	2464.3	2.001	27.887	3.248	0.15606		
ROAD129	main road segment	645659.8	4369688.7	2461.8	2.001	27.887	3.248	0.15606		
ROAD130	main road segment	645666.3	4369671.0	2457.5	2.001	27.887	3.248	0.15606		
ROAD131	main road segment	645672.8	4369653.2	2453.4	2.001	27.887	3.248	0.15606		
ROAD132	main road segment	645679.3	4369635.5	2448.5	2.001	27.887	3.248	0.15606		
ROAD133	main road segment	645685.8	4369617.8	2441.7	2.001	27.887	3.248	0.15606		
ROAD134	main road segment	645692.3	4369600.1	2438.6	2.001	27.887	3.248	0.15606		
ROAD135	main road segment	645698.8	4369582.3	2441.3	2.001	27.887	3.248	0.15606		

ROAD136	main road segment	645705.3	4369564.6	2444.9	2.001	27.887	3.248	0.15606		
ROAD137	main road segment	645711.8	4369546.9	2448.3	2.001	27.887	3.248	0.15606		
ROAD138	main road segment	645721.3	4369530.9	2452.9	2.001	27.887	3.248	0.15606		
ROAD139	main road segment	645733.8	4369516.8	2459.2	2.001	27.887	3.248	0.15606		
ROAD140	main road segment	645746.3	4369502.6	2463.9	2.001	27.887	3.248	0.15606		
ROAD141	main road segment	645758.8	4369488.5	2466.4	2.001	27.887	3.248	0.15606		
ROAD142	main road segment	645771.3	4369474.4	2467.2	2.001	27.887	3.248	0.15606		
ROAD143	main road segment	645783.8	4369460.2	2467.1	2.001	27.887	3.248	0.15606		
ROAD144	main road segment	645796.3	4369446.1	2465.7	2.001	27.887	3.248	0.15606		
ROAD145	main road segment	645808.8	4369431.9	2463.1	2.001	27.887	3.248	0.15606		
ROAD146	main road segment	645821.3	4369417.8	2458.8	2.001	27.887	3.248	0.15606		
ROAD147	main road segment	645833.8	4369403.6	2453.5	2.001	27.887	3.248	0.15606		
ROAD148	main road segment	645846.3	4369389.5	2448.9	2.001	27.887	3.248	0.15606		
ROAD149	main road segment	645858.8	4369375.4	2444.7	2.001	27.887	3.248	0.15606		
ROAD150	main road segment	645871.3	4369361.2	2439.9	2.001	27.887	3.248	0.15606		
ROAD151	main road segment	645883.8	4369347.1	2437.5	2.001	27.887	3.248	0.15606		
INTRD1	interior road segment	645891.1	4369330.1	2438.1	2.001	27.887	3.248	0.07803		
INTRD2	interior road segment	645893.3	4369310.3	2438	2.001	27.887	3.248	0.07803		
INTRD3	interior road segment	645895.6	4369290.6	2437.7	2.001	27.887	3.248	0.07803		
INTRD4	interior road segment	645897.8	4369270.8	2437.5	2.001	27.887	3.248	0.07803		
INTRD5	interior road segment	645900.0	4369251.0	2436.4	2.001	27.887	3.248	0.07803		
INTRD6	interior road segment	645902.2	4369231.2	2435.2	2.001	27.887	3.248	0.07803		
INTRD7	interior road segment	645904.4	4369211.4	2433.9	2.001	27.887	3.248	0.07803		
INTRD8	interior road segment	645906.7	4369191.7	2432	2.001	27.887	3.248	0.07803		
INTRD9	interior road segment	645908.9	4369171.9	2430	2.001	27.887	3.248	0.07803		
INTRD10	interior road segment	645920.2	4369161.8	2433	2.001	27.887	3.248	0.07803		
INTRD11	interior road segment	645940.6	4369161.4	2439.9	2.001	27.887	3.248	0.07803		
INTRD12	interior road segment	645960.9	4369161.1	2444.9	2.001	27.887	3.248	0.07803		
INTRD13	interior road segment	645981.3	4369160.7	2448.7	2.001	27.887	3.248	0.07803		
INTRD14	interior road segment	646001.7	4369160.3	2450.9	2.001	27.887	3.248	0.07803		
INTRD15	interior road segment	646022.1	4369159.9	2450.5	2.001	27.887	3.248	0.07803		
INTRD16	interior road segment	646042.4	4369159.6	2448.7	2.001	27.887	3.248	0.07803		
INTRD17	interior road segment	646062.8	4369159.2	2446	2.001	27.887	3.248	0.07803		
INTRD18	interior road segment	646081.8	4369163.4	2444.1	2.001	27.887	3.248	0.07803		

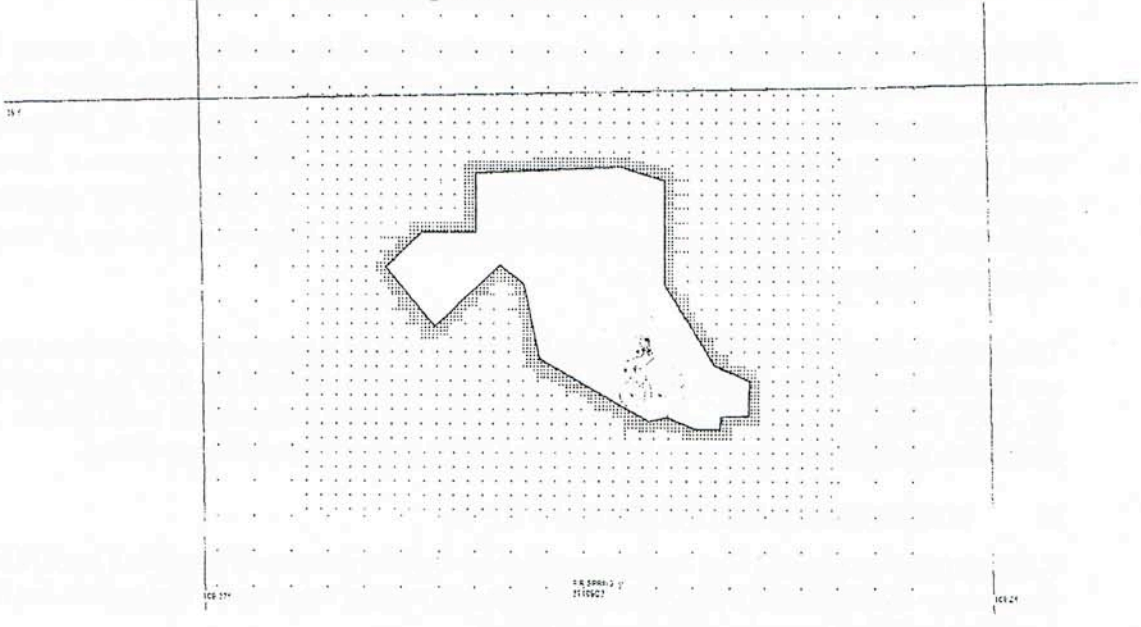
INTRD19	interior road segment	646099.5	4369172.2	2443.5	2.001	27.887	3.248	0.07803		
INTRD20	interior road segment	646117.1	4369181.1	2442.1	2.001	27.887	3.248	0.07803		
INTRD21	interior road segment	646134.7	4369189.9	2440.8	2.001	27.887	3.248	0.07803		
INTRD22	interior road segment	646152.4	4369198.7	2441.2	2.001	27.887	3.248	0.07803		
INTRD23	interior road segment	646170.0	4369207.5	2442.1	2.001	27.887	3.248	0.07803		
INTRD24	interior road segment	646187.6	4369216.3	2443.5	2.001	27.887	3.248	0.07803		
INTRD25	interior road segment	646205.3	4369225.1	2445.6	2.001	27.887	3.248	0.07803		
INTRD26	interior road segment	646222.9	4369234.0	2447.4	2.001	27.887	3.248	0.07803		
INTRD27	interior road segment	646240.6	4369242.8	2448.5	2.001	27.887	3.248	0.07803		
INTRD28	interior road segment	646258.2	4369251.6	2448.8	2.001	27.887	3.248	0.07803		
CRUSHER	process crusher	646000.0	4369600.0	2479.5	4.987	11.155	2.329	0.07803		
SCREEN	plant screen	645860.0	4369945.0	2480.3	4.003	13.025	2.789	0.07803		
INITCRSH	init crsh for rd gravel	645820.0	4369988.0	2477.9	4.987	11.155	2.329	0.07803		
WSHAUL1	Haul tar sand Wpit to proc	645650.8	4369216.9	2458.2	2.001	27.887	3.248	0.07803		
WSHAUL2	Haul tar sand Wpit to proc	645664.4	4369230.8	2458.6	2.001	27.887	3.248	0.07803		
WSHAUL3	Haul tar sand Wpit to proc	645677.9	4369244.6	2458.9	2.001	27.887	3.248	0.07803		
WSHAUL4	Haul tar sand Wpit to proc	645691.5	4369258.5	2459.1	2.001	27.887	3.248	0.07803		
WSHAUL5	Haul tar sand Wpit to proc	645705.1	4369272.4	2458.9	2.001	27.887	3.248	0.07803		
WSHAUL6	Haul tar sand Wpit to proc	645718.6	4369286.2	2459	2.001	27.887	3.248	0.07803		
WSHAUL7	Haul tar sand Wpit to proc	645732.2	4369300.1	2458.7	2.001	27.887	3.248	0.07803		
WSHAUL8	Haul tar sand Wpit to proc	645745.8	4369313.9	2458.7	2.001	27.887	3.248	0.07803		
WSHAUL9	Haul tar sand Wpit to proc	645759.4	4369327.8	2459.1	2.001	27.887	3.248	0.07803		
WSHAUL10	Haul tar sand Wpit to proc	645772.9	4369341.6	2459.2	2.001	27.887	3.248	0.07803		
WSHAUL11	Haul tar sand Wpit to proc	645786.5	4369355.5	2459	2.001	27.887	3.248	0.07803		
WSHAUL12	Haul tar sand Wpit to proc	645800.1	4369369.4	2458.1	2.001	27.887	3.248	0.07803		
WSHAUL13	Haul tar sand Wpit to proc	645813.6	4369383.2	2456.6	2.001	27.887	3.248	0.07803		
WSHAUL14	Haul tar sand Wpit to proc	645827.2	4369397.1	2454.7	2.001	27.887	3.248	0.07803		

4. RECEPTOR NETWORK

The facility is located in a rural area north of Vernal, in Uinta County near the county line. As shown in Figure 1, the terrain in the lease area is generally ridgetop, with lower drainages offsite to the east and the southwest. .

Consistent with the UDAQ approved Modeling Protocol, the ambient air boundary used in this analysis is the facility's lease and ambient air boundary. Model receptors were placed every 25 meters along the ambient air boundary. All model predicted maximum PM-10 impacts from facility operations occurred within this inner 25 meter receptor grid. Beyond the property boundary, the receptor network includes an inner set of receptors spaced 50 meters apart out to at least 150 meters, then 200 meter receptor spacing out to 1200 meters. Beyond 1200 meters, the receptor network was extended out to 2.5 kilometers with 500 meter receptor spacing. The inner receptor network can be seen outside the ambient air boundary in Figure 2. Figure 3 shows the rest of the receptor network, and the USGS topographic maps covering the model domain. It also includes, in red, the Harper model sources in the center, and the external cocontributing sources included in the modeling analysis.

Figure 3 Outer Receptor Network and Modeled Cocontributors



The HAP max impacts occurred approximately 0.45 km east of the lease boundary. Their impacts were at least two orders of magnitude below applicable impacts, and their values were within 10% of neighboring receptor values. Therefore, no refinement of the initial receptor network was necessary for finer resolution analyses because initial ISCST3 modeling runs all showed maximum predicted ambient PM-10 impacts on the property boundary in 25-meter grid spacing, and maximum HAP impacts were well bounded at values less than 2.5% of applicable impact standards.

5. ELEVATION DATA

All source base and receptor elevations were calculated from USGS 7.5-degree (30m or less horizontal resolution) NAD 27 DEM data using the Bee-Line BEEST preprocessing system.

6. METEOROLOGICAL DATA

Consistent with the UDAQ approved modeling protocol, four years of National Weather Service surface data from the Bonanza power station south of Vernal. The UDAQ provided data was actually from the years 1985 – 1987 and 1992. Upon the recommendation of Mr. Orth of UDAQ, the 1992 data was used as if it were from 1988, so that a four year meteorological data file from 1985 to 1988 could be created and used.

7. LAND USE CLASSIFICATION

ISCST3 includes rural and urban algorithm options. These options affect the wind speed profile, dispersion rates, and mixing-height formula used in calculating ground-level pollutant concentrations. A protocol was developed by USEPA to classify an area as either rural or urban for dispersion modeling purposes. The classification is based on average heat flux, land use, or population density within a three-km radius from the plant site. Of these techniques, the USEPA has specified that land use is the most definitive criterion (USEPA, 1987). The urban/rural classification scheme based on land use is as follows:

The land use within the total area, A_0, circumscribed by a 3-km circle about the source, is classified using the meteorological land use typing scheme proposed by Auer (1978). The classification scheme requires that more than 50% of the area, A_0, be from the following land use types in order to be considered urban for dispersion modeling purposes: heavy industrial (I1); light-moderate industrial (I2); commercial (C1); single-family compact residential (R2); and multi-family compact residential (R3). Otherwise, the use of rural dispersion coefficients is appropriate.

The Earth Energy PR Springs Oil Sand Mine is located in a rural area distant from much if any local human activity. Site and map reconnaissance showed that the area A_0 is well below the 50% urban land use criteria necessary for use of urban dispersion coefficients. Rural dispersion coefficients were therefore used in the air quality dispersion modeling.

8. BACKGROUND CONCENTRATIONS

Representative regional rural background concentrations previously provided by UDAQ for the vicinity and approved during modeling protocol review were used. The values for PM-10 provided by UDAQ are shown below in Table 3.

9. EVALUATION OF COMPLIANCE WITH STANDARDS

Model predicted maximum impacts reported in Table 3 are the highest first maximum predicted over the five years for annual average periods, and fifth maximum predicted over the four year period for shorter criteria pollutant averaging periods for either of the operating periods modeled. The first maximum predicted HAP impact for short term averaging periods are reported. All maximum predicted maximum impacts reported come from the 6AM to

6PM operating scenario. As noted, all modeling details and compliance determination methodologies were presented in detail to and approved by UDAQ, with conditions described and employed here, during modeling protocol discussions.

Predicted total concentrations presented are model predicted maximum ambient impacts during facility operation plus background concentrations for criteria pollutants. The impact limit standards applicable to this facility are the National Ambient Air Quality Standards (NAAQS) for criteria pollutants and UDAQ HAP pollutant emission limits.

Table 3
Background Concentrations, Ambient Impact Limits
And Method of Comparison with Ambient Air Quality Standards

Pollutant	Averaging Period	Background Concentration ($\mu g/m^3$)	Modeled Impact ($\mu g/m^3$)	Predicted Total Concentration ($\mu g/m^3$)	NAAQS ($\mu g/m^3$)	Location of Predicted Maximum Impact
PM_{10}	24-hour	76.7	67.1	143.8	150	W property boundary
	Annual	26.0	9.7	35.7	50	
Acrolein	1-hour	-	0.101	-	7.7	0.45 km E of property boundary
Formaldehyde	24-hour	-	0.814	-	37	

Maximum impacts for all pollutants and averaging impacts are shown by Table 3 to be well below the applicable impact limits. The 24 hour average maximum PM-10 impact came from the 10AM to 10PM run, while the annual average maximum impact came from the 6AM to 6PM run. Predicted facility impacts were a maximum of 44.7% of the applicable standards. Predicted total concentrations were well below the applicable standards, in large part because background was 51% of the NAAQS. These model analyses are quite conservative, since they're based upon maximum short term emissions scenarios, and include worst-case setback assumptions that will typically be exceeded in the field.

Figure 4 shows all model receptors for which impacts over 20 $\mu g/m^3$ are predicted for 24-hour average PM-10. Note that facility impacts drop off quite quickly away from the ambient air boundary. Figure 4 shows the maximum predicted impact occurs on the property's west boundary, east of the crushing and screening area.

Figure 4 Maximum 24-hour PM-10 Impacts

10. ELECTRONIC COPIES OF THE MODELING FILES

Electronic copies of all input, output, and support modeling files necessary to duplicate the model results will be provided to UDAQ. Those files include:

One meteorological file named DGT8592.ASC

Model files Earth Energy_hh_85_pp.ext , where
hh = 06 for the 6AM to 6PM analysis, and 10 for the 10AM to 10PM run, and
pp = PMTEN for PM-10, ACROLEIN or FORMALD for Acrolein or formaldehyde
ext = DTA for ISCST3 input files and LST for ISCST3 output files

The Modeling Protocol is not included in this submission. Documentation of agreements reached with UDAQ during extensive modeling protocol discussions can be provided if necessary.

APPENDIX F

Precipitation Data

CISCO, UTAH

ıl Climate Summary - Precipitation

Station:(421440) CISCO
From Year=1952 To Year=2006

	Precipitation										Total Snowfall		
	Mean	High	Year	Low	Year	1 Day Max.		>= 0.01 in.	>= 0.10 in.	>= 0.50 in.	>= 1.00 in.	Mean	High	Year
	in.	in.	-	in.	-	in.	dd/yyyy or yyyymmdd	# Days	# Days	# Days	# Days	in.	in.	-
January	0.48	1.75	1957	0	1961	0.61	16/1956	3	2	0	0	4.3	24	1957
February	0.5	1.63	1955	0	1961	0.5	19/1955	3	2	0	0	2.1	16.5	1955
March	0.52	1.81	1961	0	1966	0.66	May-61	3	2	0	0	1.1	5.3	1958
April	0.61	1.78	1965	0	1967	0.63	27/1965	3	2	0	0	0.3	2	1953
May	0.61	1.42	1967	0	1962	0.49	Jan-54	4	2	0	0	0	0	1953
June	0.26	1.47	1965	0	1955	0.77	30/1962	1	1	0	0	0	0	1953
July	0.37	1.72	1965	0	1955	0.92	24/1965	2	2	0	0	0	0	1953
August	1.03	2.61	1957	0	1962	0.9	25/1961	4	3	1	0	0	0	1953
September	0.8	2.84	1961	0	1953	1.1	Sep-61	3	3	0	0	0	0	1952
October	0.86	2.55	1957	0	1952	1.43	16/1965	3	2	1	0	0.2	2.5	1956
November	0.63	1.7	1965	0	1956	0.87	13/1954	3	2	0	0	0.9	5	1954
December	0.43	1.28	1966	0	1954	0.61	Jun-66	3	2	0	0	2.1	5.3	1953
Annual	7.11	13.99	1957	3.08	1956	1.43	19651016	35	24	3	0	11	30.1	1955
Winter	1.42	2.82	1957	0.08	1961	0.61	19560116	9	5	0	0	8.5	27.5	1955
Spring	1.74	3.86	1961	0.41	1956	0.66	19610305	10	6	0	0	1.4	7.3	1958
Summer	1.66	3.93	1965	0.27	1954	0.92	19650724	7	5	1	0	0	0	1953
Fall	2.29	4.78	1961	0.77	1956	1.43	19651016	9	7	1	0	1.1	5	1954

Table updated on Apr 23, 2007
For monthly and annual means, thresholds, and sums:
Months with 5 or more missing days are not considered
Years with 1 or more missing months are not considered
Seasons are climatological not calendar seasons

Winter = Dec., Jan., and Feb.
Spring = Mar., Apr., and May

Summer = Jun., Jul., and Aug.
Fall = Sep., Oct., and Nov.

BONANZA, UTAH

ıl Climate Summary - Precipitation

Station:(420802) BONANZA
From Year=1948 To Year=2006

	Precipitation											Total Snowfall		
	Mean	High	Year	Low	Year	1 Day Max.		>= 0.01 in.	>= 0.10 in.	>= 0.50 in.	>= 1.00 in.	Mean	High	Year
	in.	in.	-	in.	-	in.	dd/yyyy or yyyymmdd	# Days	# Days	# Days	# Days	in.	in.	-
January	0.58	1.86	1993	0	1972	0.92	16/1956	4	2	0	0	6.4	22.6	1993
February	0.43	1.15	1989	0	1972	0.8	20/1986	3	2	0	0	5.3	17.5	1955
March	0.7	2.62	1979	0	1951	1.03	28/1979	5	2	0	0	4.3	16.5	1952
April	0.79	1.84	1983	0.1	1949	1.02	Jan-75	4	3	0	0	1	15	1975
May	1.03	2.95	1975	0	1969	1.12	31/1985	5	3	1	0	0	0	1949
June	0.73	3.17	1970	0	1950	1.88	Nov-70	4	2	0	0	0	0	1949
July	0.83	3.9	1985	0	1968	1.45	21/1985	4	3	0	0	0	0	1948
August	0.91	3.6	1957	0	1950	1.02	Nov-82	4	3	1	0	0	0	1948
September	0.83	2.83	1954	0	1957	1.3	13/1958	4	2	0	0	0	0	1948
October	1.05	2.55	1981	0	1952	1.45	24/1956	4	3	1	0	0.5	11	1991
November	0.49	1.28	1987	0	1949	0.71	Dec-78	3	2	0	0	1.7	9	1953
December	0.52	1.84	1966	0	1989	1.23	Jun-66	3	2	0	0	5.3	18.5	1984
Annual	8.87	13.23	1957	4.14	1958	1.88	19700611	48	28	4	0	24.5	38.7	1951
Winter	1.53	2.51	1952	0.39	1972	1.23	19661206	10	5	0	0	17	30.6	1949
Spring	2.51	5.68	1983	0.44	1956	1.12	19850531	14	8	1	0	5.4	16.5	1952
Summer	2.46	4.76	1985	0.31	1974	1.88	19700611	12	7	1	0	0	0	1949
Fall	2.37	4.94	1954	0.59	1952	1.45	19561024	11	7	1	0	2.2	11	1991

Table updated on Apr 23, 2007
For monthly and annual means, thresholds, and sums:
Months with 5 or more missing days are not considered
Years with 1 or more missing months are not considered
Seasons are climatological not calendar seasons

Winter = Dec., Jan., and Feb.
Spring = Mar., Apr., and May
Summer = Jun., Jul., and Aug.
Fall = Sep., Oct., and Nov.

RE: Earth Energy

Kathleen Paser to: Denise Kohtala 01/04/2008 01:46 PM

Cc: Kathleen Paser, Donald Law, Alexis North, Claudia Smith

Denise,

Sounds good! I'll let you know when we get the package and have had a chance to look it over.

For the future meeting:

We would like for Earth Energy to present their proposed project to our team and then we can discuss the project and potential CAA requirements and the Federal Permitting Program.

Earth Energy should also prepare to answer questions from our water, RCRA, and NEPA programs. We have a Regional oil shale team with all the programs represented and they will probably want to have a seat at the table. They have for all the other meetings we've had with the oil shale companies so far. I wouldn't expect that to change for this meeting.

Hope you have great weekend.

Kathleen Paser
Environmental Engineer
Air Technical Assistance Unit
Air and Radiation Program
US EPA Region 8
303-312-6526

****

We've Moved!
The Air Program's new mailing address is:

US EPA Region 8
1595 Wynkoop Street
M/C 8P-AR
Denver, Colorado 80202

****

"Denise Kohtala" <DKohtala@jbrenv.com>

"Denise Kohtala"
<DKohtala@jbrenv.com>
01/04/2008 01:26 PM

To Kathleen Paser/P2/R8/USEPA/US@EPA
cc
Subject RE: Earth Energy

Kathleen,

Has Tim Dejulius sent you the Earth Energy application package yet. Once you have had a chance to review the application package Earth Energy would like to set up a meeting with the EPA!

Thanks and have a good weekend!
Denise

-----Original Message-----
From: Tim Dejulis [mailto:TDEJULIS@utah.gov]
Sent: Wednesday, January 02, 2008 3:42 PM
To: Denise Kohtala; Erin Hallenburg
Cc: Paser.Kathleen@epamail.epa.gov; uitaq@ubtanet.com; Christian Stephens; Reginald Olsen; Tim Blanchard
Subject: Earth Energy

Greetings,

I was able to review Earth Energy's application that you prepared and submitted to DAQ in October. I have several concerns and questions.

The Earth Energy property is in both Indian Country jurisdiction (therefore EPA by extension) and Utah DAQ jurisdiction, with the majority being in the former. Based on the site plan provided, all emitting units are in Indian Country jurisdiction and normally that would be the end of Utah DAQ's involvement in the matter. According to the demonstration of off-property impacts that was offered however, the largest impacts are in Utah DAQ jurisdiction. Due to this unique situation we are placing the process of issuing an AO on hold until consultation with USEPA results in a concrete course of action. Be advised that Earth Energy is obligated to coordinate this request with USEPA Region 8 in any event.

With this as the backdrop we can discuss other matters that form the basis of the PTE calculations. In the suggested permit conditions, condition 13 you reference a haul road length of 14,376 feet in combined length. In emission estimate calculations for these roads a value of 12,700 feet is listed. Which value is the correct value?

The BACT analysis is rather vague with regards to diesel fueled power generation. The criteria for decision making are, as you correctly point out, economics, feasibility, and energy. While the TIER standards for engines are in place, they do not constitute BACT by themselves. Given that Earth Energy has elected to install both diesel and NG fueled power generators, their comparative effectiveness in terms of $/ton of removed pollutant are to be considered. In other words, the relative effectiveness of each cannot be considered separately. The BACT is for the category of power generation, not by fuel type. If add on controls to the diesel engine cannot result in a suitable outcome from an operations perspective, then a NG engine must be considered.

Apparently you've missed several New Source Performance Standards. It appears as though 40 CFR 60 Subparts Dc, Kb, OOO, and XXXX apply to the project as proposed.

We here at Utah DAQ appreciate that our counterparts at Wyoming DAQ are involved with surface coal mining on a large scale and may have developed their own set of emission factors that represent a reasonable approximation of those activities being proposed by Earth Energy. We were unable to locate these on the Wyoming DEQ website. AP-42 emission factors for western surface coal mining were derived from this type of activity in Wyoming. Could you offer an explanation of why any Wyoming specific factors were used in preference to AP-42 factors? Utah DAQ personnel will be required to obtain this Wyoming information independently and compare the results from the Wyoming factors to the results from the use of AP-42 emission factors. Utah DAQ will consider the most conservative result. This will introduce delays in the engineering review, and may change inputs to the air dispersion modeling

already performed.

AP-42 emission factors were used to predict wind erosion. These factors do not make a distinction between uncontrolled and controlled emission rates. In other words, it appears as though credit for control is being taken when that is not an option.

We are concerned that this proposed operation creates off property impacts in Utah DAQ jurisdiction that are 96% of the 24 hour PM-10 NAAQS. Please submit electronic versions of the modeling information as soon as possible.

Please contact me at your earliest convenience so that we might discuss these issues over the phone or in person. Thank you.

Regards,

Timothy DeJulis
Engineer III
Utah Department of Environmental Quality Division of Air Quality New Source Review Section 150 North 1950 West Salt Lake City, Utah 84116
P: 801-536-4012
F: 801-536-4099
tdejulis@utah.gov

Fw: Earth Energy
Kathleen Paser to: Donald Law
Cc: Kathleen Paser

01/03/2008 08:20 AM

Hopefully this is only a first installment. Utah has received an NOI and air quality effects analysis. So, I'm pretty sure we'll be getting those as well.

Kathleen Paser
Environmental Engineer
Air Technical Assistance Unit
Air and Radiation Program
US EPA Region 8
303-312-6526
****
We've Moved!
The Air Program's new mailing address is:

US EPA Region 8
1595 Wynkoop Street
M/C 8P-AR
Denver, Colorado 80202
****
----- Forwarded by Kathleen Paser/P2/R8/USEPA/US on 01/03/2008 08:18 AM -----

"Tim Dejulis"
<tdejulis@utah.gov>
01/02/2008 03:42 PM

To <dkohtala@jbrenv.com>, "Erin Hallenburg" <ehallenburg@jbrenv.com>
cc Kathleen Paser/P2/R8/USEPA/US@EPA, <uitaq@ubtanet.com>, "Christian Stephens" <CSTEPHENS@utah.gov>, "Reginald Olsen" <RDOLSEN@utah.gov>, "Tim Blanchard" <TBLANCHARD@utah.gov>
Subject Earth Energy

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Regards,

Timothy DeJulis
Engineer III
Utah Department of Environmental Quality
Division of Air Quality
New Source Review Section
150 North 1950 West
Salt Lake City, Utah 84116
P: 801-536-4012
F: 801-536-4099
tdejulis@utah.gov

Earth Energy meeting tomorrow
Linda Matthews
to:
Donald Law
07/14/2008 03:26 PM
Show Details

Hello DJ:

The Earth Energy/JBR team will be at EPA to meet starting 9:30 am. Please provide any details on access to the building, how much time will be needed to go thru 'security' or sign in; and your location within the building at 1595 Wynkoop St.

Thanks,
Linda

--
Linda J. Matthews
jbr environmental consultants, inc.
8160 S. Highland Drive, Sandy, Utah 84093
Ph. 801.943.4144
Fax. 801.942.1852

Earth Energy NOI maps
Linda Matthews
to:
Donald Law
07/10/2008 01:27 PM
Cc:
"Bob Bayer", "Denise Kohtala", "Erin Hallenburg"
Show Details

2 Attachments

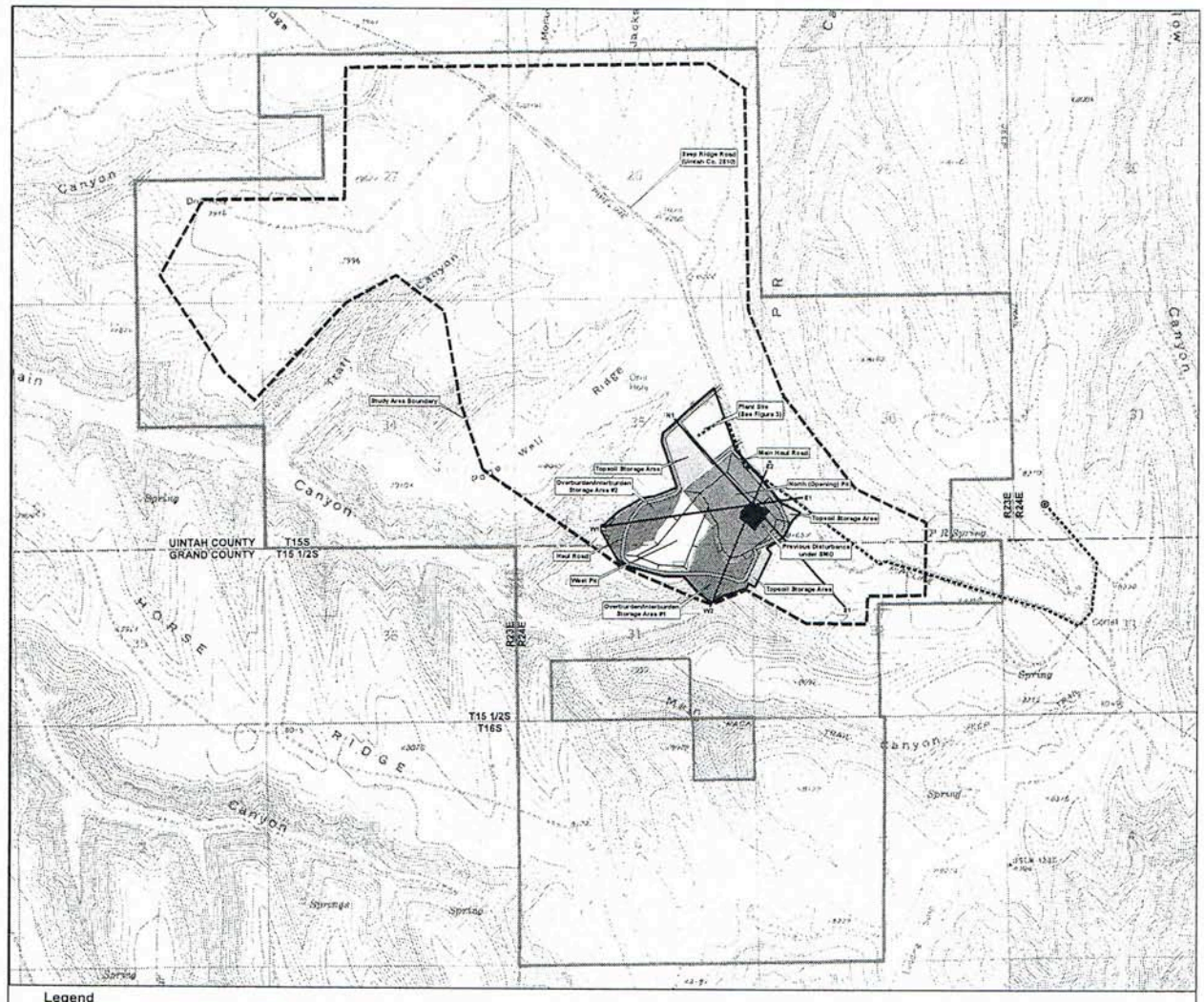
Fig2 Surface Facilities Map and Land Status Map 11x17.pdf Fig1 Location Map Layout1 (1).pdf

DJ:

Attached are Figures 1 and 2 from the Earth Energy Resources NOI.

Linda

--
Linda J. Matthews
jbr environmental consultants, inc.
8160 S. Highland Drive, Sandy, Utah 84093
Ph. 801.943.4144
Fax. 801.942.1852

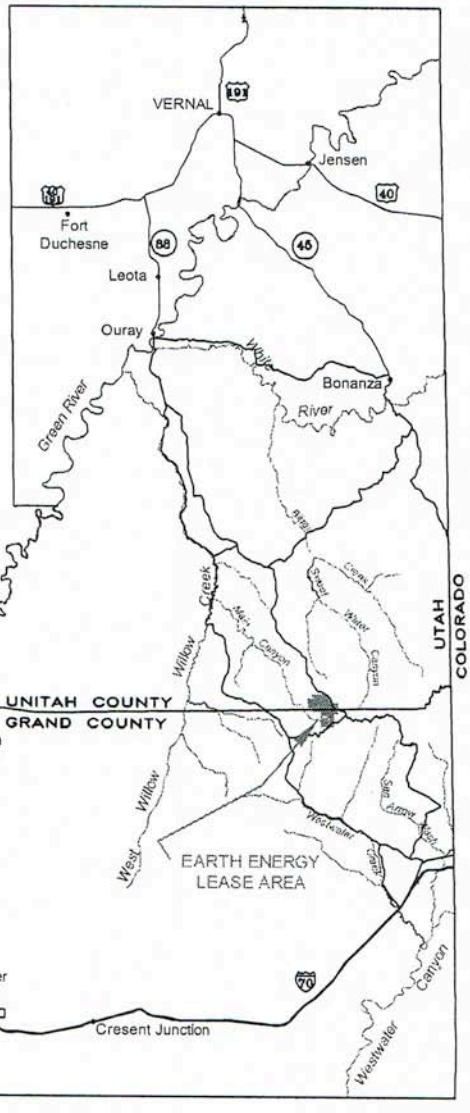


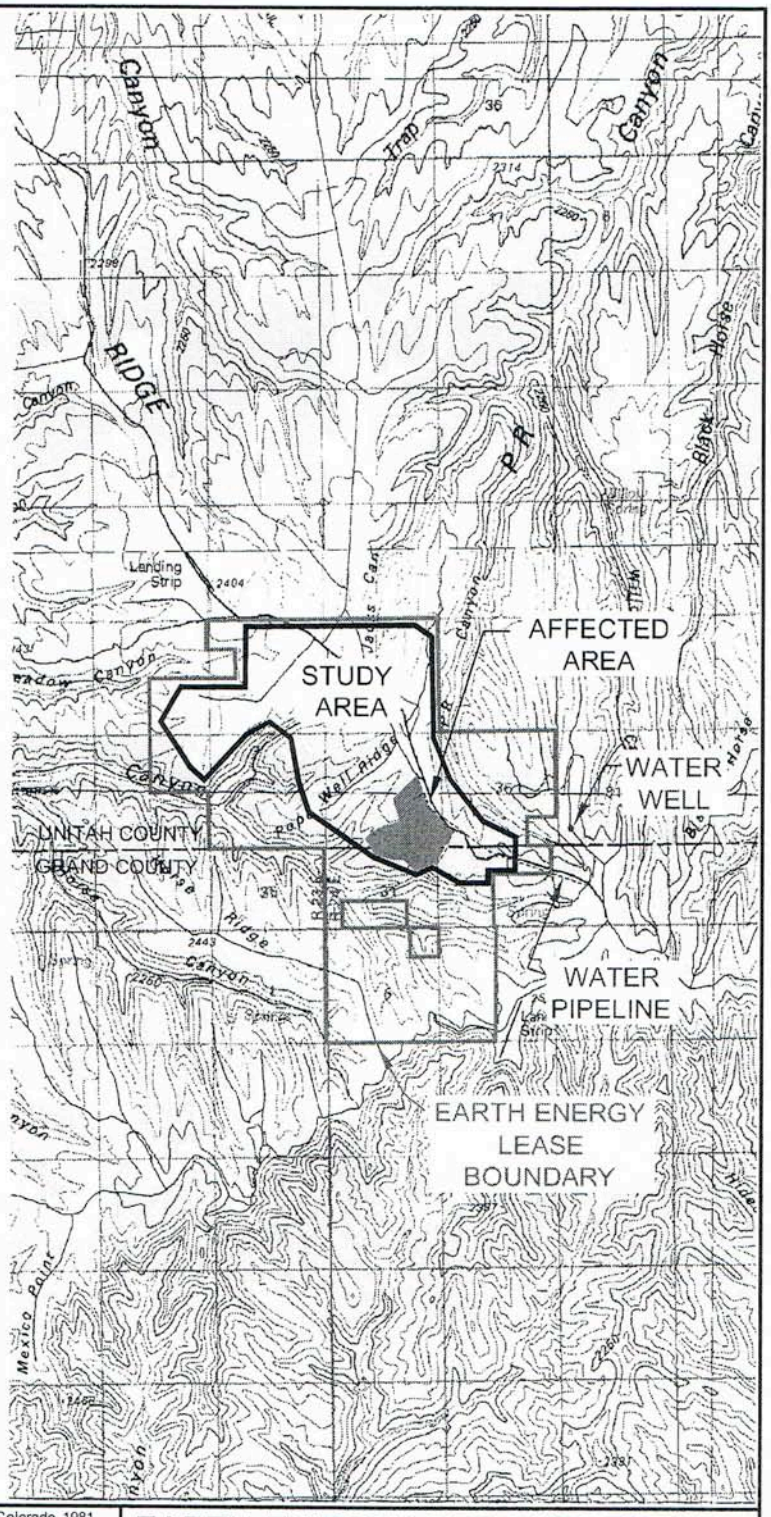
EARTH ENERGY RESOURCES, INC.
PR SPRING TAR SANDS DEVELOPMENT PROJECT

FIGURE 2
MINE SURFACE FACILITIES
AND LAND STATUS MAP

DRAWN BY	LM	CHECKED BY	CP	SCALE 1:12,000

REVISIONS	DATE
	9/11/07
	3/31/08
	5/08/08





Base from USGS 1:100,000-scale *metric* topographic map of: Seep Ridge, Utah-Colorado, 1981 and Westwater, Utah-Colorado, 1980.

N

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EARTH ENERGY RESOURCES, INC.

PR SPRING TAR SANDS DEVELOPMENT PROJECT

FIGURE 1
PROJECT LOCATION MAP

jbr environmental consultants, inc.

DESIGN BY	DRAWN BY	CH'D BY	SCALE	DATE DRAWN	REVISION
LM	CP		1:100,000	9/11/07 3/31/08	

drawings\EarthEnergy\Fig1 Location Map.dwg

Earth Energy meeting Tuesday July 15
Linda Matthews
to:
Donald Law
07/10/2008 01:05 PM
Show Details

History: This message has been replied to.

Hi DJ:

Please confirm list of attendees that you know of for the meeting Tuesday. JBR and Earth Energy folks will be there by 9:30 a.m. and will be leaving again for the airport around 4 pm. I will not be making the trip, as I ended up with a Dr. appmt. conflict. I will be sending a pdf of the draft Utah Division of Oil, Gas and Mining NOI and a couple site maps to you yet today.

Barclay Cuthbert, Vice President of Operations, Earth Energy Resources, Calgary, Alberta will attend the meeting.

A little background on those attending from JBR:

Robert Bayer
Managing Principal, Geologist-Geochemist
Master of Science, Geology, University of Tennessee, Knoxville, TN, 1974
Bachelor of Science, Geology, Marietta College, Marietta, OH, 1971

Years of Experience: 35

Mr. Bayer is a founder, shareholder, and Managing Principal of JBR Environmental Consultants, Inc. and is responsible for overall management of the company. His environmental industry experience includes the following: management of multimedia permitting projects for coal, ferrous and non-ferrous metallic and non-metallic mining operations, as well as for industrial facilities; managing and conducting environmental investigations, and management and technical review of environmental due diligence and audit projects. In addition, he is currently involved in permitting projects for both oil shale and tar sand projects on the Colorado Plateau. His due diligence experience includes: mine and mills; roasters, smelters, and refineries; oil and gas fields, gathering systems, and natural gas plants; and land disturbed and affected by abandoned mines and related facilities.

Erin Hallenburg, PE
Project Engineer IV (GCM)
Bachelor of Science, Civil Engineering, University of New Mexico, 1990
Bachelor of Science, Biology, Mount Union College, 1980

Years of Experience: 10

Mr. Hallenburg has extensive experience in air quality, with more than 27 years of experience in the field. Starting out as a stack emission for a power company, he furthered his air quality experience working as a regulatory in Florida. He conducted studies in an aerosol research laboratory and learned air dispersion modeling in New Mexico. Both in New Mexico and Utah Mr. Hallenburg gained valuable experience in permitting and regulatory strategies working for a variety of industrial clients. He is responsible for the first deem expectable Title V permit application and first Title V permit issued in the State of Utah. Mr. Hallenburg has an excellent understanding of the physical

and chemical processes, both in theory and in practical application that emits and disperses air pollutants. He also has designed groundwater remediation systems, have been involved in numerous NEPA effort and has a strong understanding of water quality, hazardous waste, and landfill regulations. He has been with JBR since 1998 and a manager since 2000.

Denise Kohtala
Environmental Analyst
Bachelor of Science, Geology, South Dakota School of Mines and Technology, Rapid City, SD, 2001

Years of Experience: 8

Ms. Kohtala has experience in regulatory compliance and permitting, storm water pollution prevention plans, and NEPA documentation. Her experience includes air quality permit application preparation, facility environmental audits, and preparation of spill prevention and storm water plans. Ms. Kohtala has worked closely with State and Federal agencies during permitting processes and maintains a working knowledge of State and Federal air quality rules and regulations.

-Linda J. Matthews
jbr environmental consultants, inc.
8160 S. Highland Drive, Sandy, Utah 84093
Ph. 801.943.4144
Fax. 801.942.1852

FW: Earth Energy Resources meeting
Linda Matthews
to:
Donald Law
07/02/2008 08:29 AM
Show Details

Hi DJ -

I don't think our agenda items have changed since I sent this. I still think we will need about an hour or less to present the project & answer questions, and then probably a couple hours to get thru emissions discussions. Based on flights, I think a start time of 9:30 a.m. would be earliest we could make it.

Thanks.
Linda

From: Linda Matthews
Sent: Tuesday, June 17, 2008 1:54 PM
To: 'Law.Donald@epamail.epa.gov'
Subject: Earth Energy Resources meeting

Hi DJ:

Below are proposed agenda items for the July 3rd meeting:

- **Introductions**
- **Overview of Earth Energy Resources & the PR Spring Project**
- **Discussion of emissions factors to be used in air quality modeling**
- **Timeline & responsibilities for application and approval**
- **Discussion and questions**

The following people are schedule to attend this meeting: Barlcay Cuthbert - Earth Energy Resources;
Robert Bayer
Erin Hallenburg
Denise Kohtala
Linda Matthews - all from JBR.

Do you think we can complete the meeting in around 5 hours? or do we need an entire day? We will plan travel accordingly.

Thanks.
Linda
--
Linda J. Matthews
jbr environmental consultants, inc.
8160 S. Highland Drive, Sandy, Utah 84093
Ph. 801.943.4144
Fax. 801.942.1852

Earth Energy meeting
Linda Matthews
to:
Donald Law
06/30/2008 07:44 AM
Show Details

Hello DJ:

How about July 15?

thanks.
Linda

--
Linda J. Matthews
jbr environmental consultants, inc.
8160 S. Highland Drive, Sandy, Utah 84093
Ph. 801.943.4144
Fax. 801.942.1852

RE: Earth Energy Resources meeting
Linda Matthews to: Donald Law 06/24/2008 10:09 AM

DJ -
This is perfectly understandable.
I will check regarding the 2nd.
I am presuming that you will be the decision-maker regarding the air quality permitting, thus it's imperative that we meet with you to discuss the project and modeling assumptions.
Linda

-----Original Message-----
From: Law.Donald@epamail.epa.gov [mailto:Law.Donald@epamail.epa.gov]
Sent: Tuesday, June 24, 2008 8:42 AM
To: Linda Matthews
Subject: Re: Earth Energy Resources meeting

Linda,

I absolutely -hate- to do this but my son has been able to be bumped up for some medical testing that we were on a 4 month wait list for that can now happen on the 3rd. Several other programs have stated that they will not be available on the 3rd as well. I know you previously had the 2nd as a possible date, is that still open? The third just isn't going to work for me. I know we have been dancing on this date forever and I wouldn't normally ask.

I'll be in an out from my desk all day if you want to call and discuss.

DJ Law, Environmental Engineer
Phone: (303) 312-7015

"Linda Matthews" <lmatthews@jbrenv.com>
06/17/2008 01:54 PM

To Donald Law/R8/USEPA/US@EPA
cc
Subject Earth Energy Resources meeting

Hi DJ:

Below are proposed agenda items for the July 3rd meeting:

*Introductions
Overview of Earth Energy Resources & the PR Spring Project
*Discussion of emissions factors to be used in air quality modeling
*Timeline & responsibilities for application and approval
*Discussion and questions

The following people are schedule to attend this meeting: Barlcay Cuthbert - Earth Energy Resources; Robert Bayer Erin Hallenburg Denise Kohtala Linda Matthews - all from JBR.

Do you think we can complete the meeting in around 5 hours? or do we need an entire day? We will plan travel accordingly.

Thanks.
Linda
--

Linda J. Matthews
jbr environmental consultants, inc.
8160 S. Highland Drive, Sandy, Utah 84093
Ph. 801.943.4144
Fax. 801.942.1852

Earth Energy Resources meeting
Linda Matthews
to:
Donald Law
06/17/2008 01:54 PM
Show Details

History: This message has been replied to.

Hi DJ:

Below are proposed agenda items for the July 3rd meeting:

- **Introductions**
- **Overview of Earth Energy Resources & the PR Spring Project**
- **Discussion of emissions factors to be used in air quality modeling**
- **Timeline & responsibilities for application and approval**
- **Discussion and questions**

The following people are schedule to attend this meeting: Barlcay Cuthbert - Earth Energy Resources;
Robert Bayer
Erin Hallenburg
Denise Kohtala
Linda Matthews - all from JBR.

Do you think we can complete the meeting in around 5 hours? or do we need an entire day? We will plan travel accordingly.

Thanks.
Linda
--
Linda J. Matthews
jbr environmental consultants, inc.
8160 S. Highland Drive, Sandy, Utah 84093
Ph. 801.943.4144
Fax. 801.942.1852

RE: Earth Energy PR Springs project meeting
Linda Matthews to: Donald Law 06/17/2008 09:07 AM
Cc: "Barclay Cuthbert"

OK, thanks DJ. I will get back to you today with names, and some proposed agenda items.

Regards,
Linda

-----Original Message-----
From: Law.Donald@epamail.epa.gov [mailto:Law.Donald@epamail.epa.gov]
Sent: Tuesday, June 17, 2008 9:00 AM
To: Linda Matthews
Subject: Re: Earth Energy PR Springs project meeting

I was going to send you an email later today for the 3rd. while I have been having problems with people getting back to me on confirmation for the 3rd, I agree that we need to have it then and they will have to make do. I will send out a tenative schedule later this afternoon after I have a bit more time to focus on it, but consider July 3rd the date.

When you get a chance, let me know the names or at least the numbers of people attending so I can get the appropriate paperwork into our security department so you dont' have as many hassles with that.

DJ Law, Environmental Engineer
Phone: (303) 312-7015

"Linda Matthews" <lmatthews@jbrenv.com>
06/17/2008 08:42 AM

To Donald Law/R8/USEPA/US@EPA
cc
Subject Earth Energy PR Springs project meeting

Hello DJ:

What's the latest from your group on setting up a meeting? If there are further schedule problems with getting folks together, it seems we should focus on the air quality group, and the other EPA groups would be invited if available? Let's get a date set. July 3 is looking like the next possible day, or we will get into the next week.

Thanks,
Linda

--
Linda J. Matthews
jbr environmental consultants, inc.
8160 S. Highland Drive, Sandy, Utah 84093 Ph. 801.943.4144 Fax. 801.942.1852

Earth Energy PR Springs project meeting
Linda Matthews
to:
Donald Law
06/17/2008 08:42 AM
Show Details

History: This message has been replied to.

Hello DJ:

What's the latest from your group on setting up a meeting? If there are further schedule problems with getting folks together, it seems we should focus on the air quality group, and the other EPA groups would be invited if available? Let's get a date set. July 3 is looking like the next possible day, or we will get into the next week.

Thanks,
Linda

--
Linda J. Matthews
jbr environmental consultants, inc.
8160 S. Highland Drive, Sandy, Utah 84093
Ph. 801.943.4144
Fax. 801.942.1852

RE: Earth Energy
Linda Matthews to: Donald Law 06/11/2008 12:26 PM

OK, thanks; guess we're looking at July.
Linda

-----Original Message-----
From: Law.Donald@epamail.epa.gov [mailto:Law.Donald@epamail.epa.gov]
Sent: Wednesday, June 11, 2008 12:09 PM
To: Linda Matthews
Subject: Re: Earth Energy

The 19th is actually worse than the 16th.

DJ Law, Environmental Engineer
Phone: (303) 312-7015

"Linda Matthews" <lmatthews@jbrenv.com>
06/11/2008 11:53 AM

To: Donald Law/R8/USEPA/US@EPA
cc:
Subject: Earth Energy

Hi again DJ:

Actually, the best time for us (prior to July) remains to be next week; if there's any way we can still get a meeting end of next week (19th?), maybe that would work?
thanks - just throwing out another option.
Linda

--

Linda J. Matthews
jbr environmental consultants, inc.
8160 S. Highland Drive, Sandy, Utah 84093 Ph. 801.943.4144 Fax.
801.942.1852

Earth Energy
Linda Matthews
to:
Donald Law
06/11/2008 11:50 AM
Show Details

History: This message has been replied to.

Hi again DJ:

Actually, the best time for us (prior to July) remains to be next week; if there's any way we can still get a meeting end of next week (19th?), maybe that would work?
thanks - just throwing out another option.
Linda

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Linda J. Matthews
jbr environmental consultants, inc.
8160 S. Highland Drive, Sandy, Utah 84093
Ph. 801.943.4144
Fax. 801.942.1852

Earth Energy Resources meeting
Linda Matthews
to:
Donald Law
06/11/2008 10:37 AM
Show Details

Hi DJ:

It's becoming more difficult to coordinate a meeting schedule. Please check regarding potential meeting dates of July 2 or July 3, as it's looking like the week of June 23rd won't work for us.
Thanks.
Linda
--
Linda J. Matthews
jbr environmental consultants, inc.
8160 S. Highland Drive, Sandy, Utah 84093
Ph. 801.943.4144
Fax. 801.942.1852

Earth Energy meeting
Linda Matthews
to:
Donald Law
06/06/2008 12:19 PM
Show Details

Hello DJ:

JBR will be coordinating next week to prepare for our meeting with you at EPA. If possible, please provide a list of people that will attend the meeting from EPA, and their area of interest or specialty. Regarding your voice mail question on agenda, Earth Energy and JBR will likely require an hour at most, to provide project description and overall air permit background info. If we are breaking into focus groups, Erin thought he/they would need at least a couple hours to get through the details related to air quality.

Thanks.
Linda

--
Linda J. Matthews
jbr environmental consultants, inc.
8160 S. Highland Drive, Sandy, Utah 84093
Ph. 801.943.4144
Fax. 801.942.1852

RE: Meeting dates for Earth Energy project
Linda Matthews to: Donald Law 06/05/2008 02:33 PM

DJ:

June 24, 25, 26 would work.
Thanks.
Linda

-----Original Message-----
From: Law.Donald@epamail.epa.gov [mailto:Law.Donald@epamail.epa.gov]
Sent: Tuesday, June 03, 2008 11:29 AM
To: Linda Matthews
Subject: RE: Meeting dates for Earth Energy project

That whole week looks rough with the conference center, so it would probably be safer starting the week after. 2 dates should be plenty that far out.

DJ Law, Environmental Engineer
Phone: (303) 312-7015

Protecting the environment is everyone's responsibility. Help EPA fight pollution by reporting possible harmful environmental activity. To do so, visit EPA's website at
http://www.epa.gov/compliance/complaints/index.html

"Linda Matthews" <lmatthews@jbrenv.com>
06/03/2008 11:25 AM

To: Donald Law/R8/USEPA/US@EPA
cc:
Subject: RE: Meeting dates for Earth Energy project

DJ -

How soon after the 16th will folks be available? I am checking again with people here regarding schedule restrictions. Would you like another 3 possible dates, starting the 17th, or as indicated below, is that entire week unavailable?

Also, I did get your voice message and will coordinate with Erin Hallenburg on agenda/timing, which is now not as urgent.

Thanks.
Linda

-----Original Message-----
From: Law.Donald@epamail.epa.gov [mailto:Law.Donald@epamail.epa.gov]
Sent: Tuesday, June 03, 2008 11:03 AM
To: Linda Matthews
Subject: RE: Meeting dates for Earth Energy project

Linda,

I've just been informed that the 16th is a large all hands meeting where all rooms of sufficient size are being used (it is the Regional Administrator's retirement, and I believe Administrator Johnson will be in attendance). As such, and I hate asking this, is it possible to move the meeting back a week or so?

DJ Law, Environmental Engineer
Phone: (303) 312-7015

"Linda Matthews" <lmatthews@jbrenv.com>
06/03/2008 09:01 AM

To: Donald Law/R8/USEPA/US@EPA
cc:
Subject: RE: Meeting dates for Earth Energy project

Thanks DJ.

Would you please provide a meeting agenda and list of attendees from EPA?

Thanks,

Linda
JBR

-----Original Message-----
From: Law.Donald@epamail.epa.gov [mailto:Law.Donald@epamail.epa.gov]
Sent: Monday, June 02, 2008 2:33 PM
To: Linda Matthews
Subject: RE: Meeting dates for Earth Energy project

That is probably reasonable provided traffic isn't too much of a headache.

DJ Law, Environmental Engineer
Phone: (303) 312-7015

"Linda Matthews" <lmatthews@jbrenv.com>
06/02/2008 02:18 PM

To: Donald Law/R8/USEPA/US@EPA
cc:
Subject: RE: Meeting dates for Earth Energy project

DJ:

We can start at 9:00 am. .. That's assuming that we fly over that morning (arriving at 8:15), and it takes 1/2 hr. to get to your office - is that reasonable, or should we allow more time?

Thanks.
Linda

-----Original Message-----
From: Law.Donald@epamail.epa.gov [mailto:Law.Donald@epamail.epa.gov]
Sent: Monday, June 02, 2008 2:06 PM
To: Linda Matthews
Subject: Re: Meeting dates for Earth Energy project

Linda,

Linda J. Matthews
jbr environmental consultants, inc.
8160 S. Highland Drive, Sandy, Utah 84093 Ph. 801.943.4144 Fax.
801.942.1852

It looks like the best day here will be the 16th. What time would you be available to begin that morning?

DJ Law, Environmental Engineer
Phone: (303) 312-7015

"Linda Matthews" <lmatthews@jbrenv.com>
05/28/2008 10:55 AM

To: Donald Law/R8/USEPA/US@EPA
cc: "Erin Hallenburg" <ehallenburg@jbrenv.com>
Subject: Meeting dates for Earth Energy project

Hello DJ:

Based upon input from JBR's air quality team and Earth Energy, the following are potential meeting dates: June 9, 12, 13 (as I recall Fridays are bad for you), 16.

Please let us know what works for you.
Thanks.
Linda--
Linda J. Matthews
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8160 S. Highland Drive, Sandy, Utah 84093 Ph. 801.943.4144 Fax. 801.942.1852

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DJ Law, Environmental Engineer
Phone: (303) 312-7015

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Linda
JBR

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Phone: (303) 312-7015

"Linda Matthews" <lmatthews@jbrenv.com>
05/28/2008 10:55 AM

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cc: "Erin Hallenburg" <ehallenburg@jbrenv.com>
Subject: Meeting dates for Earth Energy project

Hello DJ:

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Please let us know what works for you.
Thanks.
Linda--

Notice of Intention
To Commence Large Mining Operations

Earth Energy Resources, Inc.
PR Spring Mine

May 9, 2008

Submitted by:

Earth Energy Resources, Inc.
Suite #740 404 – 6th Avenue SW
Calgary, Alberta T2P 0R9

to:

Utah Division of Oil, Gas and Mining
1594 West North Temple, Suite 1210
Salt Lake City, Utah 84114-5801

Prepared in part by:

JBR Environmental Consultants, Inc.
8160 S. Highland Drive
Sandy, Utah 84093
(801) 943-4144

Table of Contents

List of Figures

Appendices

Introduction

Earth Energy Resources Inc. (Earth Energy) is a privately held Canadian firm engaged in the development of process technology for extraction of bitumen from naturally occurring tar sand deposits in the United States and Canada. Earth Energy holds State Institutional Trust Lands Administration (SITLA) oil sands leases on 5,930 acres in Utah's Uinta Basin, near PR Spring. The PR Spring deposits are the largest of the Uinta Basin special Tar Sand Areas defined by the U.S. Geological Survey. Within the SITLA lease areas, Earth Energy has defined a 2,255-acre Study Area for the PR Spring Mine. The initial mine development under this NOI will take place in the southeastern part of this Study Area on approximately 202 acres (referred to throughout this NOI as the Affected Area) (See **Figures 1** and **2**). The remaining 2,053 acres within the Study Area were the subject of environmental data collection efforts, but will not be subject to disturbance under this NOI. A Conditional Use Permit (CUP) for the mine has been approved by Uintah County (Appendix B), and requested from Grand County. When approved by Grand County, Earth Energy will provide a copy of that CUP to DOGM.

Earth Energy has patented a chemical method for extraction of hydrocarbons from oil sands. Known as the Ophus Process, this production method produces clean (inert), "damp-dry" sand tailings that can be backfilled into the quarry. The planned sequence of exploration and pilot processing and production tests underway are intended to refine and adapt the process to fit the unique characteristics of the Utah PR Spring deposits. Oil (tar) sands in Utah vary significantly from the oil sand deposits and extraction methods commonly used in the Athabasca oil sands of Alberta.

Earth Energy conducted exploration drilling in spring of 2005 under Exploration Permit (E/019/052), Earth Energy PR Spring 1 Project (less than ½-acre disturbance). Additional drilling was conducted under Exploration Permit (E/019/053) within a 100-acre area along Seep Ridge Road. These programs included twenty-five 4-inch diameter holes drilled to depth of 50 to150 feet on 30-foot by 30-foot drill pads located on drill roads or adjacent to the main Seep Ridge Road. The drilling programs were used to select the 5-acre mine site for the fall 2005 production test conducted under a Small Mine Permit, Leonard Murphy #1 (S/019/059).

Other geophysical activities have been ongoing in a small portion of Earth Energy's lease area. These existing rights and activities ongoing in the area are described below in Section 104.2.

Drilling and geophysical work planned for second half of 2008 will provide grade-thickness data of the tar sand beds necessary for detailed planning, permitting, site development and mining to go forward

R647-4. Large Mining Operations

R647-4-101. Filing Requirements and Review Procedures

101. As is required of the party that is planning to conduct large mining operations, this NOI is submitted by Earth Energy Resources, Inc. for review and Division approval.

2. The Division has 30 days from the last action on the NOI to approve/deny the NOI, and then to publish a Notice of tentative decision in accordance with R647-4-16.

3. As stated at R647-4-101.3, upon Division approval of the NOI and execution of the Reclamation Contract by Earth Energy, both the Division and Earth Energy will be bound by the NOI and implementing regulations, and Earth Energy will be able to begin mining. Earth Energy understands that execution of the Reclamation Contract is not complete until the contract and the surety receives Division approval; only then can mining commence. Further, Earth Energy explicitly commits to conform to all of the operation and reclamation practices that are described in this NOI and that are required by all applicable regulations at R647-4.

4. Earth Energy will provide notification to the Division within 30 days of starting mining operations.

5. Earth Energy's LMO is greater than 50 acres, for purposes of calculating permit fees. Fees are due annually by the last Friday in July unless the NOI is closed out under R647-4-101.5.13.

R647-4-102. Duration of the Notice of Intention

It is understood that, when approved, Earth Energy's NOI, including any subsequently approved amendments or revisions, remains in effect for the life of the mine.

R647-4-103. Notice of Intention to Commence Large Mining Operations

Earth Energy's NOI addresses the requirements of the rules listed in this section as follows:

104. Operator(s), Surface and Mineral Owner(s)
105. Maps, Drawing, and Photographs
106. Operation Plan
108. Hole Plugging Requirements
109. Impact Assessment
110. Reclamation Plan
112. Variance

Under this section, rules at 107 and 111 are not required to be addressed; however those subjects are covered within the NOI in other sections.

R647-4-104. Operator(s), Surface and Mineral Owner(s)

104.1. Operator Responsible for Mining Operations/Reclamation of the Site

MINE NAME: PR Spring

NAME OF PERMITTEE/ OPERATOR/ APPLICANT: Earth Energy Resources, Inc., a Corporation registered to do business in the State of Utah.

Business License #:	5834125-0142
Registered Agent:	Daniel A. Jensen
Address:	185 South State Street, Suite 1300 Salt Lake City, UT 84111
Phone:	801-532-7840 Fax: 801-532-7750
E-mail address:	daj@pwlaw.com

PERMANENT ADDRESS: Earth Energy Resources, Inc.
Suite #740, 404 – 6 Avenue SW
Calgary, Alberta T2P 0R9
Phone: 403-233-9366 Fax: 403-668-5097

COMPANY REPRESENTATIVE: Barclay Cuthbert, Vice President, Operations

Address:	Suite # 740, 404 – 6 Avenue SW Calgary, Alberta T2P 0R9
Phone:	403-233-9366 Fax: 403-668-5097
E-mail address:	barclay.cuthbert@earthenergyresources.com

LOCATION OF OPERATION: Uintah and Grand Counties, Utah (the Uintah County CUP is attached in Appendix B; the Grand County CUP will be provided to DOGM when it is approved subsequent to the approval of this large mine operation.)

Universal Transverse Mercator (UTM) Coordinate System: UTM Datum NAD27 4369592 km Northing, 645187 km Easting, Zone 12

Sections: T. 15 S., R. 23 E., SLB&M, Uintah County, Sections 35 & 36.
T. 15.5 S., R. 24 E., SLB&M, Grand County, Sections 31& 32.

The Uintah County portion of the operations will be on lands under Indian Jurisdiction (tribal land but not part of an Indian Reservation). As such, certain aspects of environmental permitting for the PR Spring Operation will be handled by the Environmental Protection Agency (EPA) rather than Utah's Department of Environmental Quality.

104.2. Surface and Mineral Owners of All Lands to be Affected

OWNERSHIP OF THE LAND SURFACE: Utah State Institutional Trust Lands Administration.

OWNERS OF RECORD OF THE MINERALS TO BE MINED: SITLA (Earth Energy has lease rights to mine up to a 500-foot depth below ground surface,)

BLM LEASE OR PROJECT FILE NUMBER(S): None for the mine operation. A BLM right-of-way (No. UTU-86004) is pending to allow construction of the appurtenant water well and pipeline. Correspondence with the BLM on this issue is included in Appendix B.

ADJACENT LAND OWNERS:

Canyon Gas Resources, LLC – Natural Gas Pipeline Right of Way
7400 East Orchard Rd., Suite 30025, Englewood, CO 80111

Uintah County - Road 2810 Right of Way
147 East Main St.
Vernal, UT 84078

Bureau of Land Management, Vernal Field Office
170 South 500 East
Vernal, UT 84078

Township 15 South, Range 23 East, SLB&M

Section 26:

Grazing Permit 20905:	Alameda Corporation PO Box 22608 Houston, TX 77227-2608
Mineral Lease 49944:	EOG Resources, Inc. PO Box 4362 Houston, TX 77210-4362

Section 27:

Grazing Permit 20905:	Alameda Corporation PO Box 22608 Houston, TX 77227-2608
Mineral Lease 49280:	Robert L. Bayless Producer LLC 621 17th Street Ste. 1640 Denver, CO 80293

Section 28:

Grazing Permit 20905:	Alameda Corporation PO Box 22608 Houston, TX 77227-2608
Mineral Lease 49280:	Robert L. Bayless Producer LLC 621 17th Street Ste. 1640 Denver, CO 80293

Section 33:

Grazing Permit 20905:	Alameda Corporation PO Box 22608 Houston, TX 77227-2608
Grazing Permit 21202:	Burt De Lambert PO Box 607 Vernal, UT 84078-0607
Mineral Lease 49281:	Robert L. Bayless Producer LLC 621 17th Street Ste. 1640 Denver, CO 80293

Section 34:

Grazing Permit 20905:	Alameda Corporation PO Box 22608 Houston, TX 77227-2608
Grazing Permit 21202:	Burt De Lambert PO Box 607 Vernal, UT 84078-0607
Mineral Lease 49281:	Robert L. Bayless Producer LLC 621 17th Street Ste. 1640 Denver, CO 80293

Section 35:

Grazing Permit 20905:	Alameda Corporation PO Box 22608 Houston, TX 77227-2608
Mineral Lease 49944:	EOG Resources, Inc. PO Box 4362 Houston, TX 77210-4362

Section 36:

Grazing Permit 20995:	Alameda Corporation PO Box 22608 Houston, TX 77227-2608
Mineral Lease 49944:	EOG Resources, Inc. PO Box 4362 Houston, TX 77210-4362

Township 15.5 South, Range 24 East, SLB&M

Section 31:	
Grazing Permit 20905:	Alameda Corporation PO Box 22608 Houston, TX 77227-2608
Grazing Permit 21202:	Burt De Lambert PO Box 607 Vernal, UT 84078-0607
Mineral Lease 49572:	Moose Mountain Land Company 935 E South Union Avenue Suite D-202 Midvale, UT 84047
Section 32:	
Grazing Permit 20905:	Alameda Corporation PO Box 22608 Houston, TX 77227-2608
Mineral Lease 49572:	Moose Mountain Land Company 935 E South Union Avenue Suite D-202 Midvale, UT 84047

HAVE THE LAND, MINERAL, AND ADJACENT LANDOWNERS BEEN NOTIFIED IN WRITING? The adjacent owners (BLM and SITLA) will be notified in writing once this NOI is tentatively approved (those agencies are both currently aware that the project is pending), and those agencies will notify other land users or right-of-way holders as they deem appropriate.

DOES THE PERMITTEE/ OPERATOR HAVE LEGAL RIGHT TO ENTER AND CONDUCT MINING OPERATIONS ON THE LAND COVERED BY THIS NOTICE? Yes.

104.3. Federal Mining Claims or Lease Numbers

There are no Federal mining claims or permits.

A summary of lands under lease to Earth Energy is provided in Appendix A.

R647-4-105. Maps, Drawings and Photographs

105.1. USGS topographic base maps, as well as other select figures in the NOI) provide the following information:

1.11 Property boundaries of surface ownership.
1.12 Water features (including streams and springs), infrastructure, and surface/subsurface facilities within 500 feet of mining operations.
1.13 Access routes.
1.14 Previous mining/exploration impact in the disturbance area is shown on Figure 2.

105.2. Surface facilities maps (Figures 2 and 3) include the following information:

2.11 Surface facilities
2.12 Disturbance boundary

105.3. Other maps that may be required:

3.11 There would be no re-graded slopes to be left steeper than 2H:1V
3.12 Plan, profile, X-section of any earthen structures to be left as part of post-mining land use.
3.13 There would be no water impounding structures >20 feet high.
3.14 There are no areas that will be left un-reclaimed as part of the post-mining land use.
3.15 There will be no diversion channels constructed.
3.16 Geology, tar sands cross sections, water features and vegetation communities are shown on Figures 5, 6, 7, and 8, respectively.
3.17 Reclamation treatments are shown on Figure 9.
3.18 Mine plan cross sections are provided as Figures 4a, 4b, and 4c.

105.4. Site photographs are included in Appendix F.

105.5. No underground development is proposed. Surface mine development is shown on Figure 2.

R647-4-106. Operation Plan

106.1. Mineral to be Mined

The type of mineral to be mined is tar sand. The tar sands occur generally in lenticular beds, with interbedded sandstone, siltstone, shale, mudstone and calcareous marl. The tar sand beds have been defined as the 'D' or upper bed, and the 'C' or secondary bed. Tar sand beds below the C bed are not as well defined based upon drill logs, resistivity testing and modeling. Although current mine plans under this NOI are to a depth of approximately 145 feet, the maximum lease depth is 500 feet.

106.2. Operations to be Conducted

Throughout operations at the PR Spring location, Mine Safety and Health Administration (MSHA) safety requirements and guidelines will be followed, and the operating plan as described in this document will be followed. The acreages associated with the individual components of these operations are described in Section 106.3. The types of operations to be conducted include the following:

SURFACE PREPARATION/ STORAGE OF OVERBURDEN AND TOPSOIL

Surface preparation will include the clearing of vegetation and removal of topsoil for storage in designated topsoil storage areas, as described further in Section 106.5. Larger vegetation would be cleared by crushing, then pushing into slash piles. This material will be stockpiled within or on top of the salvaged topsoil, or used to form berms surrounding the topsoil piles (see Section 106.6); the estimated volumes of both topsoil and vegetative matter are also provided in Section 106.6 . All of this vegetative matter will be redistributed along with the topsoil during reclamation in order to provide organic matter and help with surface roughness and soil moisture retention.

Where overburden must be removed, it will be scraped and deposited in the overburden/interburden storage areas shown on Figure 2. As mining proceeds, overburden and interburden, along with produced sand from extraction operations, will be back-hauled and re-contoured in the mined pit. These operations are discussed in more detail under the overburden/interburden storage areas and pit backfill subheadings below.

ACCESS ROADS

The main access to the PR Spring Mine site is via Uintah County Road 2810 (Figure 1). Onsite access roads to the mine pit and facilities area (Figure 2) have

been designed to minimize grade. In general, they are located around the perimeter of the Affected Area, serving to confine disturbance and manage runoff. In part, these roads cross -- and are integral to -- the overburden/interburden storage areas. In those cases, those road segments will not be constructed until they are needed to access those features. Access roads will be surfaced with crushed overburden (rock) material and maintained with a grader and water truck.

MINING

Mining will be conducted using a self-contained mobile surface mining machine (e.g. Wirtgen 2200SM Surface Miner). Overburden and interburden will be removed by conventional drill/blast/muck or rip/muck methods. Initially, overburden will be removed on five acres of the initial mine site to expose the uppermost layer of oil sand. The surface miner will then mine through the first layer of oil sand by successively planing 8 to 10 inches of oil sand per pass. When the initial layer of oil sand has been mined, the interburden layer will be exposed and this will be removed to expose the next layer of oil sand.

As oil sand mining is taking place with the surface miner, the conventional mining equipment will be employed for concurrent overburden removal to expose new areas of the oil sand bed and allow oil sand mining to progress. As sufficient area comes available, the mining operation will transition to multiple benches of mining, where oil sand mining occurs on the top layer of newly exposed areas and previously mined areas are excavated to expose the next bed of oil sands. When all target oil sands beds have been mined and access to newly opened areas is established, backfilling of the depleted areas will commence.

Currently, it is not known if blasting will be required to fracture overburden/interburden to facilitate its removal. This material may be sufficiently friable to allow removal by ripping with dozers. If blasting is required, each program will be designed as a controlled blast to minimize fly-rock, vibration, and dust, and to generate aggregate size conducive for removal from the mine area. The drill size, spacing and depth of blast holes, and the frequency of blasting, will vary depending upon the situation, but in all cases will be in accordance with state and federal rules. Warning signs advising the public of blasting protocols will be posted at 150-foot intervals along the fence line, placed at all ready access points, and in any other locations required by MSHA. Blasting is not expected to result in fly rock landing on the adjacent county road. However, during blasting, the road will be closed for 1,000 feet on either site of the blast site. Flaggers will posted to accomplish this, and resultant wait time for any travelers would not be expected to be more than 10-15 minutes.

Regular and routine inspections will occur throughout the mine area to ensure that operating conditions remain safe, that MSHA safety guidelines are being followed, and that the mining plan stated herein is being followed. This will include

inspections to verify that the pit wall slopes are at the correct angles and that they remain stable.

Equipment

Mining equipment will consist of the Wirtgen Surface Miner noted above, trackhoes, dozers, graders, rock drill, loader, water truck, and service trucks. Mining is anticipated to be conducted during the day shift only. A complete list of mining equipment is included in Appendix D.

Mined tar sands will be hauled to the process plant (Figure 3) and either discharged directly to the inlet hopper of the crusher (which is integral to the process train structure) or alternately placed in a storage pile adjacent to the processing facility for feed to the inlet hopper during the night shift. Generally, a two-week reserve supply of ore will be maintained in stockpiles at the processing facility. The mined tar sands storage pile or piles (also known as the reserve ore pile) is not expected to exceed 40,000 yd cubic yards at any time and is typically expected to amount to 30,000 cubic yards of ore. The dimensions of this pile (or combined smaller piles) will not exceed 100 yards by 100 yards by 4 yards in height

It is expected that the mining process will intercept shales and sandstone in addition to the tar sand beds. Interburden material will be placed in the overburden/interburden storage areas defined on Figure 2 and used as pit backfill. These operations are described below.

Pit Design

The 62-acre initial mine pit is delineated on Figure 2, and is designated as the North (Opening) Pit. It is designed with a perimeter highwall, which in all locations (during operations) will be higher than the highest elevation of the pit floor. In this manner, all precipitation falling within the mine pit boundaries will collect within precipitation collection sumps located in the bottom of the pit and thereby prevent runoff from leaving the mine site. These collection sumps are simply low areas within the working mine pit where precipitation falling directly within the pit perimeter will drain and collect. The accumulated precipitation will be removed from the pit along with the solid materials and processed along with the bitumen bearing sands. As needed, it will also be pumped from the mine and used for dust suppression on mine and plant roads. The active mining area will be a pit at all times (concave to incident precipitation). No pit configurations are planned where storm water will be allowed to egress the active mine workings. Further, the highwall safety berms will prevent runoff from outside the pit perimeter from entering the pit (the pit's location atop the slope minimizes this potential even without the presence of the safety berms).

The pit will be mined at an operating pit slope of 2H:1V. The planned pit design configuration can be achieved using the above-noted mining methods. In addition, the planned pit design will be geotechnically stable and will not create

any safety or environmental concerns. Use of 2H:1V pit slopes represents Earth Energy's desire to facilitate pit reclamation, and to provide conservatively designed slopes to compensate for the lack of detailed knowledge regarding the extent of localized faulting or fracture planes that could cause instabilities. Site-specific information indicates that much steeper slopes could be justified: numerous existing road cuts and excavations in the area (including Earth Energy's 2005 production test pit) are stable with slopes steeper than 1H:1V. The use of 2H:1V pit wall slopes will also prevent rock falls. Back-break near the highwall will be controlled or eliminated by smooth transition grading. Any required blasting along the highwalls of the pit will be accomplished with small controlled blasts to eliminate over-break and weakening of the remaining material on the face of the slope.

The North (Opening) Pit has approximately 7.9 million cubic yards of material to be mined. Of this, approximately 10-12 percent (by weight of ore) is processed out as bitumen product, which leaves 3,944,228 cubic yards of processed sand that will be disposed of (along with 3,506,465 cubic yards of overburden and interburden as described below). Applying a bulkage factor of 1.3 to the over/interburden and processed sand, this will result in 9.7 million cubic yards of waste material to be disposed of. Filling overburden/interburden storage areas 1 and 2 to their maximum capacity of 4.9 million cubic yards will result in approximately 4.8 million cubic yards to be back-filled in the mine pit, including the processed sands.

After the North (Opening) Pit is mined, and assuming that conditions are favorable, Earth Energy would extend mining to the southwest, to a contiguous area designated at the West Pit. Details on the West Pit design are conceptual at this stage; once coring has been accomplished and analyzed, this pit design will be developed more fully. These details will be submitted to DOGM as a Plan Amendment prior to the initiation of mining. At this time, general estimates as needed to provide bonding calculations have been made; these will also be revised as needed and provided in a subsequent amendment.

Anticipated yearly mined tonnages include: 920,000 – 1,200,000 tons of oil sand ore mined per year and 1,000,000 -1,400,000 tons of overburden/interburden mined per year. The expected life of the mine is expected to be between 6 and 13 years for both the North (Opening Pit) and the West Pit, depending on the amount of time the processing equipment is on-stream and the number of process trains employed. Expansion into the West Pit may occur in the future depending upon numerous factors; at this time, the best estimate of when that might realistically occur is approximately 5 years after the North (Opening) Pit mining has begun.

Hauling

Mined ore will be hauled via the main haul road to the process area and either discharged directly to the inlet hopper of the process unit or placed in a

temporary storage pile (see above for pile size information) for off-shift processing. The distance from the approximate center of the North (Opening) Pit to the plant is approximately 2,000 feet. Figure 3 shows the location of the temporary storage pile; the inlet hopper feeds to the east end of the process train, which is also shown on Figure 3.

PROCESSING

General Facility Description

The processing facility will be located adjacent to Uintah County Road 2810 in the area shown on Figure 3. As shown on this plant site diagram, this would be an area of approximately 15 acres including a mine office and associated parking area; a maintenance shop, warehouse, power plant, equipment parking and service area; process equipment, sand de-watering equipment, a tank farm, tank truck loading area, and water retention/storage pond; and stockpiles for processed sand, reject materials (ore loads that contain too much interburden or overburden to be viable for processing), and ore.

The tank farm will be constructed with an impermeable barrier to prevent any liquid emissions from leaving those areas of the process site. It will be constructed with secondary containment sufficient to meet applicable Spill Prevention Control and Countermeasure Plan (SPCC) regulations for tank farm construction (total volume of the bermed area greater than 110% volume of the largest tank contained in the farm, for example). In order to provide a proper foundation for these tanks, it is assumed that the impermeable barrier/secondary containment will be comprised of concrete. The SPCC Plan will cover new and spent fuel, oil, and lubricants, as well as any other hydrocarbons including the processed shale oil. If any hydrocarbon spills occur during mining these will be dealt with as outlined in the SPCC Plan.

The remainder of the plant site will be constructed to be a self-contained area, through the use of perimeter berms or ditches where needed. All ditches will be designed to pass the 10-year, 6-hour precipitation event. They will be triangular in cross section with side slopes approximately 2H:1V; depth including freeboard will be less than 2 feet or equivalent in cross section. Berms will generally be 2 feet high, with a one-foot top width and 2H:1V side slopes. Final designs for these structures will be produced concurrent with final engineering designs, and will be submitted to DOGM. All precipitation incident on the site will be collected in the water retention/storage pond located at the low point of the plant site. As the PR Spring operation is located primarily along a fairly flat interfluve with little or no up-gradient, off-site runoff flowing onto the site, the pond will collect only runoff generated from precipitation falling upon the plant site itself. It will also be used to store fresh make-up water, however no process water will be routed to this pond. Any sediments collected in the pond will be removed as needed in order to maintain its design capacity. It will be

designed to contain the runoff from the 10-year, 24-hour precipitation event as well as sediment storage and make-up water. The pond would also be HDPE-lined to prevent loss to infiltration (it is not needed as a water quality protection measure). Once final designs are completed, this information will be submitted to DOGM.

The mine office will be a modular building placed on a gravel pad. The process equipment will be skid-mounted and also located on gravel pad, as would the parking areas. The warehouse and maintenance shop will be 'Sprung-type" semi-permanent structures on concrete pads. Concrete pads may be required for some tanks in the tank farm area. A list of equipment, buildings, and tanks planned for use in the facilities area is included in Appendix D.

The facility would operate 24-hours per day, approximately 350 days per year, not including unscheduled shutdowns/outages.

Process Flow Details

Each process train is designed to accommodate 3,000-3,500 tons of ore per day, producing approximately 2,000 bbl/day of bitumen. The extraction process begins when the mined and conditioned tar sand ore is sent through a crusher/ delumper and reduced to a 2 inch-minus aggregate size. From there, the crushed ore is augered or conveyed to a heated slurry mixer where the cleaning emulsion is introduced and the ore slurried to the consistency of a thick gritty milkshake. The oil sand slurry is then moved by screw conveyor to the slurry tank where primary separation of the bitumen from the sand occurs. The produced sand with residual bitumen is then pumped through a series of separation towers where the last traces of bitumen are removed. All of the liberated bitumen is captured, polished with cyclones and/or centrifuges and then pumped to a storage tank. The cleaning chemical is then removed from the bitumen by distillation and recycled to the front of the process. Produced bitumen is pumped to a product (sales) tank for heated storage prior to transport.

The clean produced sand is de-watered on a shale shaker (or similar device) and the recovered water is pumped to a holding tank for recycling to the front of the process. Additional cleaning agent is added to the recycled water to bring it back to full strength. De-watered sand and clay fines are then conveyed to a stockpile for loading and backhaul to the mine pit. At this point, the discharged sand and clay fines contain between 10 and 20 percent water.

Water is expected to be consumed at a rate of approximately 1.5-2 barrels for each barrel of produced bitumen. The 2,000 bbl/day operation would use approximately 4,000 barrels of water, or 116 gallons per minute (gpm) based upon 24-hour processing. The majority of the water "consumed" in the process is simply returned to the environment as un-recoverable entrained moisture in the pore spaces of the produced sand and clay fines. All of this residual water is

anticipated to evaporate from the loosely consolidated produced sand/fines mix with no free-water run-off. (This subject is described in greater detail in Appendix B, within correspondence requesting Permit-by-Rule coverage under the Utah Division of Water Quality's (DWQ) groundwater protection program.) The process flow diagram is included in Appendix D.

Process Chemical Storage & Handling

The process chemical, in its neat form (without additives), will be transferred from the distillation unit into storage tanks noted on Figure 3, and from the storage tanks to the blending area using appropriate pumps to mitigate the risk of fire or explosion. These factors will be considered fully during engineering of the commercial production unit. There are no other waste streams that might get into the solids or tailings and the chemical is not changed as a result of processing – it acts as a diluent and a cleaning agent, but is not itself altered by bitumen extraction operations.

The process chemical is stable, colorless, evaporates rapidly when exposed to air, and has negligible solubility in water. (This subject is described in greater detail in Appendix B, within correspondence requesting Permit-by-Rule coverage under the Utah Division of Water Quality's (DWQ) groundwater protection program.) When blended into the cleaning emulsion form required for use in the process stream, it has low flammability and presents low risk. The cleaning emulsion's biodegradability has not been determined, but related chemicals are known to be biodegradable. It will be stored and handled according to regulation.

Power Source

Generators located at the plant site (one natural gas, one diesel) will be used to supply all the electrical requirements for the process trains. A three conductor, heavy gauge, armored power supply cable will be buried in the water line trench (described below) to convey power to the nearby water well.

Water Source

Water for processing would be obtained from a well drilled nearby on BLM land, and piped to the site along existing roadways (Figure 2). Correspondence with BLM and the State Engineers Office regarding right-of-way and approval to drill the well are included in Appendix B.

The well is expected to be completed in aquifers that are approximately 1,000 – 2,600 feet below the surface; ground elevation at this location is approximately 8,260 feet. The well would have a bore diameter of 12 inches and would be cased with 12-inch diameter steel casing pipe that is perforated in the water bearing sandstone aquifers. It would be housed within an 8-foot by 8-foot frame building, located on a concrete pad, and surrounded by a chain link fence.

The supply pipeline will be 12,650 feet in length and constructed of 6-inch HDPE pipe. It will be buried to a depth of 5-6 feet for insulation and protection, except at crossings, where it will be buried to a depth of 8-10 feet. The line will be sized and rated to supply 223 gpm at less than 100 pounds per square inch. It will be fitted with valves, hydrants, and air intakes. The initial trench width will be 12-24 inches wherever possible, though in certain areas may need to be wider as required by ground conditions; BLM right-of-way covers a 15-foot corridor width. A three conductor, heavy gauge, armored power supply cable will also be buried in the trench to supply power to the well, as noted above.

At the terminal end (the plant site), water would be stored onsite in a lined pond adjacent to the tank farm, as shown on the Plant Site diagram (Figure 3); it may also be stored in tanks, which would be outfitted with manifolds and valves. The pond will be lined with a synthetic (HPDE) liner simply to retain water; this lining is not required for any water quality purpose and any infiltration of contained water due an inadvertent leak or tear would not impact surface or groundwater quality.

A 360 acre-foot portion of water right number 41-3523 has been allocated to Earth Energy from the Uintah County Water Conservancy District. A copy of the agreement is contained in Appendix B.

PIT BACKFILL

As mining progresses in the North (Opening) Pit, produced (clean) sand will be used to backfill it. It is estimated that 20 to 25 percent of the 62-acre pit would need to be open in order to begin backfilling. Dump points will vary as needed in order to fill the pit at the desired sequence.

The discharged sand will contain 10 to 20 percent water and less than 4,000 ppm residual hydrocarbons (principally near-inert asphaltenes). The blended solid tails (80-85% sand at 12-15% moisture content, 15-20% fines at 20% moisture content) will be a relatively plastic material that will readily compact to a load-bearing surface for operation of the haul trucks. The "sand" fraction of the tails can be characterized as primarily quartz material in the 80-1,000 µm range (d_{50} = 117 µm), and the "fines" fraction is the sub-80 µm (d_{50} = 18 µm) material comprised of quartz, shale and clays. The density of the damp sand is roughly 2,850 pounds per cubic yard. The nature of the pit backfill materials are described in greater detail in Appendix B, within correspondence requesting Permit-by-Rule coverage under the Utah Division of Water Quality's (DWQ) groundwater protection program.

When the logistics of the mine/truck haul are optimized in the early stages of operations, it is anticipated that over/inter-burden materials from adjacent removal operations will be alternately combined (blended) with the sand tails to result in a stable, compactable, bulk replacement material. Thus, rather than layering, the

replacement material will be a more homogenous mixture. Drainage from this fill will be comparable to in-situ materials.

The volume of the North (Opening) Pit is 7,900,000 cubic yards and approximately 4.8 million cubic yard of overburden, interburden, and tailings (sand and fines) will be replaced in this pit. A bulkage factor of 30 percent has been applied to the replaced material in replacement volume calculations. Upon completion of a pit backfill, that area of the pit will be reclaimed.

Overburden/Interburden Storage Areas

During initial mine development, where overburden and interburden must be removed, it will be scraped and deposited in one of two overburden/interburden storage areas shown on Figure 3. The material will primarily consist of broken sandstones and shales mixed with lesser amounts of fines. Grain sizes will vary from fine to coarse rock rubble (run-of-mine) materials potentially as large as one cubic yard. Once mining has opened a large enough excavation to allow equipment movement and backfilling, these storage areas will no longer be used; instead these materials will be re-deposited in the pit along with produced sands. The volume of overburden and interburden placed in these two overburden/interburden storage areas combined will be approximately 4.9 million cubic yards.

Both of the overburden/interburden storage areas will be constructed outside of the pit limits on the side-slopes of ephemeral draws above Main Canyon. The overall slopes of the land on which the overburden/interburden storage areas will be constructed ranges from 16.5 to 40 percent (10° to 22°). During mining, these overburden/interburden storage areas will be sloped at the angle of repose: 1.5-1.7H:1V (30° to 34°). Upon reclamation the slopes will be graded down to between 2.5H:1V to 3H:1V (18° to 22°). Overburden/interburden storage area No. 1 will be constructed on a 40 percent slope (2.5H:1V) that is concave, grading to a slope angle of about 10 percent (10H:1V) near its base. Overburden/interburden storage area No. 2 will be constructed on a 6H:1V slope. Both overburden/interburden storage areas will be designed and constructed to be stable within standard engineering parameters. Dump points will vary with time and will be chosen to facilitate the desired end configuration as described in this plan.

The top surfaces of these storage areas will be maintained with a very slight grade away from the outslope so as to minimize runoff running over the outslope, thus controlling erosion. Runoff generated from the outslopes of the overburden/interburden storage areas will be controlled by armoring placed within the contact between the pile and the native slope (essentially forming a triangular channel-type feature), and by installing a rip-rapped energy dissipator at the toe. As all of the topsoil will be salvaged for final reclamation, only minimal quantities of fine-grained particles will be placed in the dumps. Broken rock material has a very

low siltation potential and will effectively encapsulate the finer material initially placed in the waste dumps. The coarser materials will typically end up near the toe of the expanding fills as the dump sites are filled to their maximum capacity. The concentration of coarse materials at the toe of the fills provides a natural energy dissipater for storm runoff from the faces of the dumps. Typical design drawings are included in Figure 2a. These structures, as with all site best management practices (BMPs), will be maintained to ensure that they are functional.

When the dumps are filled to capacity, their exposed faces will be contoured (to an overall slope of 2.5-3H:1V) to blend in with adjacent canyon wall slopes as indicated on the Reclaimed Mine Contour Plan (Figure 9). Short segments within the overall slope will be steeper than the overall slope, however no portion of the reclaimed slopes will be steeper than 35°. Both the overall slope and any individual slope segments will be well below the allowable 45°, thus no slope variances are being requested for these operations.

106.3. Disturbance

The following acreages will be disturbed by mining:

Table 1: Disturbance Areas

Facility	Area
Plant Site including Office and Processing facilities	15 acres
Main haul road	24 acres
Plant perimeter road	
Overburden/interburden storage area haul road	
North (Opening) Pit	61.5 acres
West Pit	30.5 acres
Overburden/interburden storage area 1	25.3 acres
Overburden/interburden storage area 2	26.3 acres
Topsoil storage areas	15.3 acres
Well pad and water pipeline	4.4 acres
Total	202.3 acres

Table 2: Disturbance by Year (approximate)

Year	Planned Disturbance (acres)	Type of Disturbance	Cumulative Disturbance (acres)
Year 1	90	Plant site, roads, topsoil storage, pipeline & well, portion of North (Opening) Pit, portion of overburden/interburden storage areas	90
Year 2	25	Expansion of North (Opening) Pit, expansion of overburden/interburden storage area	115
Year 3	35	Expansion of North (Opening) Pit, expansion of overburden/interburden storage area	150
Year 4	15	Expansion of overburden/interburden storage area	165
Year 5	5	Expansion of overburden/interburden storage areas	170
Year 6	20	Begin West Pit	190
Year 7	12.3	Expansion of West Pit	202.3
Total	202.3	Disturbance includes all areas bonded under this NOI	202.3

Notes: (1) After year 7, mining and processing may continue, but no additional disturbance would occur. (2) While year-to-year disturbance given above may change as conditions warrant, in no case will total disturbance exceed the permitted 202.3 acres.

Deleterious materials and their management during operations are described above within the operating descriptions in Section 106.2.

106.4. Nature and Amount of Materials to be Mined

The materials to be mined are tar sands. In the Uinta Basin of Utah, the tar sands deposits are overlain by the Green River Formation containing lenticular beds of lacustrine sandstone saturated with bitumen separated by intervals of barren sandstone, siltstone, shale, mudstone and calcareous marl. The overburden materials are comprised of siltstone and sandstone with interbedded shale; interburden layers between the tar sand deposits are expected to have the same characteristics as the overburden materials. Figure 5 provides a geology map showing surface formations in the area, and Figure 6 provides a geologic cross section that focuses on the tar sands beds within the Douglas Creek member.

Areas to be mined within the overall pit layout are categorized by geology and presence of overburden/interburden, as shown in the following table. The mining areas have been characterized into layers including overburden, tar sand layers in the 'D' bed and 'C' bed, and interburden. Overburden varies from 0 to 50 foot depth and averages 20 foot depth. Interburden thickness averages 15 feet. The "D" bed averages 21 feet in thickness and the "C". bed averages 24 feet in thickness. This is a ratio of 1.25:1, ore:overburden.

Table 3 provides per-acre and total volumes of material to be mined. The overall material balance is as follows:

	1,996,082 cubic yards of overburden
+	1,510,383 cubic yards of interburden
=	3,506,465 cubic yards of overburden and interburden removed
+	4,382,476 cubic yards of tar sands mined
=	7,888,941cubic yards total volume extracted
-	10 percent (conservative, by weight of tar sands) bitumen
=	3,944,228 cubic yards of sand after processing
+	3,506,465 cubic yards of overburden and interburden
=	7,450,693 cubic yards of material to be disposed of
x	1.3 bulkage factor
=	9.7 million cubic yards of material to be disposed of
-	4.9 million cubic yards put in overburden/interburden storage areas
=	4.8 million cubic yards to be back-filled in the mine pit

Table 3: Material to be Mined from the North (Opening) Pit Exclusive of the West Pit (61.51 acres)

	Total Volume in yd^3	Overburden in yd^3	Tar Sands - D Bed in yd^3	Interburden in yd^3	Tar Sands C - Bed in yd^3
Per Acre Average	128,255	32,451	33,195	24,555	38,053
Total	7,888,941	1,996,082	2,041,807	1,510,383	2,340,669

The material volumes in Table 3 do not include the potential material mined from the West Pit. Anticipated yearly mined tonnages from the North (Opening) Pit include: 920,000 – 1,200,000 tons of oil sand ore mined per year and 1,000,000 - 1,400,000 tons of overburden/interburden mined per year. Once the mining process is underway, it will be determined whether or not to continue the mining of the North (Opening) Pit into the West Pit. The expected life of the mine is expected to be between 6 and 13 years, depending on the amount of time the processing equipment is on-stream and the number of process trains employed.

106.5. Existing Soil Types/Location and Extent of Topsoil

EXISTING SOIL TYPES

Soil types in the Study Area include the Seeprid-Utso complex, 4 to 25 percent slopes, on the upper flats, and Tosca gravelly sandy loam, 25 to 40 percent slopes below this, where the terrain starts to drop off into the drainages. The Gompers-Rock Outcrop complex, 50 to 80 percent slopes, lies on the steep, lower sideslopes of significant drainages and may be affected by overburden/interburden storage areas at the heads of drainages, or if mining continues significantly to the north. The Saddlehorse-Rock outcrop-Pathead association, 50-80 percent slopes, is found on south-facing slopes on the north end of the Study Area. It will not be affected in the next five-year development plan, thus it is not discussed further here.

The *Seeprid-Utso complex* is found from 8,100 to 9,200 feet elevation and occurs on the shoulders and summits of hills in the Mountain Stony Loam (browse) ecological site. It is derived from Aeolian deposits over residuum derived from sandstones and shales. Bedrock is generally 40-60 inches from the surface. The top 4 to 18 inches are loam to clay loam. Below 18 inches the soil becomes very channery. The soil is well drained and pH ranges from 6.6 to 7.8 in the top 18 inches. There is some calcium carbonate accumulation below 24 inches. Sodium levels and SAR are very low. The soil supports shrubs with a grass understory.

The *Tosca gravelly sandy loam*, 25 to 40 percent slopes occurs from 7,500 to 8,200 feet elevation on the backslopes of plateaus in the Mountain Stony Loam (browse) ecological site. It is derived from slope alluvium derived from sandstone and shale. Bedrock is generally 40-60 inches deep. Topsoil includes up to 2 inches of organic material underlain by a gravelly sandy loam to 11 inches. Below this the soil is very gravelly to cobbly. The pH ranges from 5.1 to 8.4 in the top 11 inches and from 7.9 to 9.0 below this. Calcium carbonate increases with depth, with the highest percentage between 11 and 39 inches. This soil has very little sodium.

The *Gompers-Rock outcrop complex*, 50 to 80 percent slopes is found from 6,500 to 7,400 feet elevation on cliffs, erosional remnants, escarpments and ledges in the Upland Very Steep Shallow Loam. It is derived from colluvium over shale residuum. Bedrock is within 4-8 inches of the surface. The top 8 inches is a very channery silt loam to loam. It is well-drained; the pH is 7.9 to 9.0. It has a calcium carbonate percent up to 30, and an SAR up to 10.

Table 4: Soil Types

Soil Series	Ecological site	Topsoil depth (inches)	pH	CaCO3 %	Gypsum %	SAR	Precipitation (inches)
Seeprid-Utso complex, 4- to 25% slopes	Mountain Stony Loam (browse)	4-18 *(avg. salvage depth 6 inches, assumed)*	6.6 to 7.8	To 75%	0	0	16-22
Tosca gravelly-sandy loam, 25-40% slopes		0-11 *(avg. salvage depth 4 inches, assumed, slope permitting)*	5.1 to 8.4	To 40%	0	5.0	16-22
Gompers-Rock outcrop complex, 50-80% slopes	Upland Very Steep Shallow Loam	0	7.9-9	To 30	0	5-10	12-16

LOCATION AND EXTENT OF TOPSOIL

Topsoil occurs to some extent on all of the mining area and is suitable for plant growth and reclamation. However, based upon site development to date under the small mine permit, the actual salvageable topsoil depths found on site are less than those reported above. Of the 202 acres that will be affected under this NOI, approximately 15 acres will be used for topsoil storage and topsoil will not be salvaged from this area. The 4.4 acres associated with the water line and well pad will also not required salvage; these areas are within previously disturbed corridors and the BLM is required revegetation but not topsoil salvage. On the remaining 183 acres of disturbance, topsoil will be salvaged prior to mining from all areas where it is practical to salvage topsoil (slopes flatter than or equal to than 2H:1V), and it will be stored for reclamation. For the purposes of the topsoil volume summary discussed below, it is assumed that topsoil will be salvaged from 165 acres (132 acres of Seeprid-Utso complex soils and 33 acres of Tosca soils from slopes flatter than 2H:1V). The remaining Tosca soils (18 acres) that occur on slopes steeper than 2H:1V will not be salvaged.

Based upon previous site development, topsoil depth varies from approximately 2 to 4 inches on the ridgetops and 0 to 3 inches on sideslopes. About two-thirds of the Affected Area would occur in the deeper, ridgetop, Seeprid-Utso complex soils. With an average topsoil salvage depth of 6 inches on 132 acres of this soil type, an estimated 106,500 cubic yards of topsoil will be salvaged and stored for future reclamation. For the remaining disturbances where Tosca soils occur on slopes flatter than 2H:V (33 acres), an average salvage depth of 4 inches is assumed feasible. An estimated 17,700 cubic yards of topsoil will be salvaged and stored for reclamation from these areas. Therefore, the total topsoil salvage for this operation is estimated to be 124,200 cubic yards.

However, it is important to note that this is an estimate only; actual soil salvage volume could be more or less than this amount. The actual amount salvaged would be dependant upon what is encountered in the field: all available topsoil would be salvaged (with the exceptions noted above for the topsoil storage piles and the waterline/well pad), which in some areas may reflect a lesser thickness than assumed and in other areas may be a greater thickness than assumed. The amount calculated above is the amount upon which reclamation is based and for which bonding will be in place.

106.6. Plan for Protecting and Re-depositing Existing Soils

Salvaged topsoils will be collected with a 631 scraper and a D8 dozer used in combination depending upon the gradient and the presence of rock. It will be stored in topsoil storage areas shown on Figure 3. These storage areas are located on flat to gently sloping ground along the margins of the mining and processing areas. This will minimize haul distance, facilitate isolation and protection of the soil resource, and reduce contact with storm water run-on from outside the storage footprint. Topsoils will be protected by seeding with a fast growing cover grass, such as slender wheatgrass and/or Sandberg bluegrass seeded at a total of 10 PLS (pure live seed) pounds per acre. Topsoil piles will be bermed at the outer edges for runoff control, using the salvaged and compacted woody vegetation that is removed prior to topsoil salvage activities. These berms will be trapezoidal in cross section: two feet high, with a two-foot wide top width and approximately 1.5H:1V sideslopes. A sign will be placed at each topsoil storage area, which will read "Topsoil Storage Area – Do Not Disturb". The estimated 93,170 cubic yards of salvaged vegetation will be placed adjacent to or on top of the salvaged soil.

Topsoil will be deposited on areas prepared for reclamation once mining and/or backfilling is complete in an area and the surface is at final grade. It is hoped that 6 inches of soil can be salvaged from the 132 acres of Seeprid-Utso complex soils, and that about 4 inches of soil can be salvaged from approximately 33 acres of the shallower Tosca soils. Soils on the steeper slopes (those greater than 2H:1V) of the Tosca soils covering approximately 18 acres of the total 51 acres of Tosca soils that will be disturbed will not be salvaged. An estimated 124,200 cubic yards of soil will be available for reclamation by the end of development of this mining area. This averages out to a re-spread depth of about 5 inches of topsoil over 183 acres of disturbance (This does not include the 15 acres of disturbance associated with topsoil stockpiles and the 4.4 acres associated with the well pad and waterline, where salvage would not occur and thus would not need topsoiling).

106.7. Existing Vegetative Communities

The Study Area elevations range from 8,222 feet on the ridgetop to 7,560 feet in the drainages. Existing vegetation in the Study Area includes mixed shrub and sagebrush/grassland communities on the ridgetops, with junipers on slopes upper slopes, trending to a Doug fir community as elevation decreases. There are some aspen patches in the drainages. The Affected Area is primarily within the mixed shrub and sagebrush/grassland communities.

Vegetation Cover Levels Sufficient to Establish Re-vegetation Success Standards

On August, 16, 2007 a quantitative vegetation survey utilizing 13 one-meter-square quadrats was conducted on plateaus and slopes located between 7,720 feet and 8,880 feet elevation within the Study area, including within and immediately adjacent to the Affected Area. (See Figure 8 for quadrat locations, and Appendix C for vegetation survey data). On May 16, 2007 a qualitative vegetation survey listing all species noted was conducted on plateaus, slopes, and upper canyon sites located between 7,440 feet and 8,840 feet elevation on hilltops and hillsides within the mine area. Results of the vegetation surveys are summarized in Tables 5 and 6 below.

Table 5: Results of 13 cover transects surveyed August 17, 2007 to determine revegetation success standards.

Life Form	Average Cover (percent)
Shrubs & Trees	*50.3*
Grasses	*14.7*
Forbs	*2.7*
Total vegetation cover	*67.7*
70% of cover value	***47.4***
Litter	*12.7*
Rock	*16.7*
Bare Ground	*21.0*
TOTAL	***100.0***

These results indicate that the post-reclamation vegetative cover for upland areas must be at least 47 percent to meet bond release standards.

Table 6: Species List of all species noted on May and August field trips to EERI Study Area

Scientific name	Common name	Relative abundance
Shrubs, Trees, and Sub Trees		
Quercus gambelii	Scrub oak	Common at mid-hi elev
Cercocarpus montanus	Birchleaf mountain mahogany	Common at mid-hi elev
Purshia tridentata	bitterbrush	Common at mid-hi elev
Amelanchier alnifolia	Utah serviceberry	Abundant at mid-hi elev
Symphoriocarpus albus	Snowberry	Abundant at mid-hi elev
Artemisia tridentata	Big sagebrush	Abundant at mid-hi elev
Artemisia filifolia	Fringed sage	Occasional at mid-hi elev
Artemisia ludoviciana	Herbaceous sage	Occasional at mid-hi elev
Chrysothamnus nauseosus	Rubber rabbitbrush	Occasional at mi-hi elev
Juniperus osteosperma	Utah juniper	Common at mid elev
Pinus edulis	Pinyon pine	Occasional at mid elev
Pseudotsuga menziesii	Douglas fir	Common at lower elev.
Populus tremuloides	Aspen	Common in drainages
Berberis repens	Oregon grape	Occasional at lower elev
Rosa woodsii	Woods rose	Occasional at lower elev
Ribes sp.	Currant	Occasional at lower elev
Pachistima myrsinites	Mountain boxwood	Occasional at lower elev
Forbs		
Opuntia sp.	Prickly pear	Occasional at mid-hi elev
Collinsia parviflora	Blue-eyed Mary	Occasional at mid-hi elev
Taraxicum officionale	Dandelion	Occasional at mid-hi elev
Astragalus beckwithii	Beckwith astragalus	Occasional at mid-hi elev
Phlox longifolia	Long-leafed phlox	Occasional at mid-hi elev
Erigeron pumulis	Shaggy daisy	Occasional at mid-hi elev
Senecio sp.	Senecio	Occasional at mid-hi elev
Delphinium bicolor	Larkspur	Occasional at mid-hi elev
Aquilegia sp.	Columbine	Occasional at lower elev
Frasera speciosa	Monument plant	Occasional at mid-hi elev
Lithospermum incisum	Puccoon or Fringed gromwell	Occasional at mid-hi elev
Stanleya pinnata	Wallflower	Occasional at mid-hi elev
Cryptantha glomerata	Popcorn flower	Occasional at mid-hi elev
Phacelia linearis	Narrow-leafed phacelia	Occasional at mid-hi elev
Antennaria sp.	Pussy toes	Occasional at mid-hi elev
Saxifraga sp	Brook saxifrage	Occasional at mid-elev
Osmorhiza beteroi	Mountain sweet cicely	Occasional at mid-elev
Erodium cicutarium	Red stem filaree	Common under aspen
Achillea millefolium	Yarrow	Occasional under aspen
Maianthemum stellatum	False Solomon's seal	Occasional under aspen
Urtica dioica	Stinging nettle	Occasional under aspen
Descurainia pinnata	Flixweed	Common under aspen
Circium arvense	Canada thistle	Occasional under aspen
Grasses & Grass-likes		
Poa sandbergii	Sandberg bluegrass	Common at mid-hi elev
Pseudoroegneria spicata	Bluebunch wheatgrass	Common at mid-hi elev

Scientific name	Common name	Relative abundance
Achnatherum hymenoides	Indian ricegrass	Occasional at mid-hi elev
Pascopyron smithii	Western wheatgrass	Common at mid-hi elev
Carex sp.	Dry-land or mountain sedge	Common under firs
Calamagrostis purpurascens	Purple Reedgrass	Occasional under firs
Bouteloua gracilis	Grama grass	Occasional at mid-elev
Poa pratensis	Kentucky bluegrass	Common under aspen
Leymus cinereus	Ryegrass	Occasional under aspen
Carex aquatilis	Water sedge	Seasonally
Scirpus sp.	Rush	Seasonally

106.8. Depth to Groundwater

The depth to the regional groundwater table in the vicinity of the Study Area is expected to be 1,500 feet or more (Price and Miller 1975). Nearby springs (shown on Figure 7) provide evidence of very localized, shallow groundwater, likely representing isolated perched aquifers. Previous geologic exploration drilling at the site, at maximum depths of approximately 150 feet below ground surface, did not encounter groundwater. This drilling consisted of 25 wells drilled under the previously mentioned DOGM exploration permits. Six of these wells were drilled under E/019/052, along Seep Ridge Road south of the County line within Earth Energy's lease area, but just east of main Affected Area. The remaining wells were drilled under E/019/053, also located along Seep Ridge Road, spanning the County line, and within the eastern part of the 202-acre Affected Area. Maps from DOGM exploration permits that show these locations are included in Appendix B. Depth to groundwater is also discussed in Appendix B, within correspondence requesting Permit-by-Rule coverage under the Utah Division of Water Quality's (DWQ) groundwater protection program.

Extent of Overburden Material

The tar sand beds crop out in PR Canyon to the northeast of the mine area, and in Main Canyon to the southwest of the mine area (Murphy, Leonard A., 2003 private report).

Twenty-five holes drilled by Earth Energy in 2005 penetrated to the highest, or "D" bed, of the tar sands. Average depth to mineable ore was 20 feet, with areas near the outcrop having virtually no overburden, and areas on the southwest side having up to 50 feet of overburden.

Between the two beds that will be mined (the higher D bed and lower C bed) there is a layer of interburden that averages 15 feet in thickness (total average thickness of waste rock = 35 feet) (Figure 6). The "D" bed averages 21 feet thickness and the "C" bed averages 24 feet in thickness (total average thickness of ore = 45 feet). This is a ratio of 1.25:1 (ore:waste rock). As noted in Table 3 above (see Section 106.4), it is estimated that there will be 1,996,082 cubic yards of

overburden and 1,510,383 cubic yards of interburden salvaged to mine the 61.51-acre North (Opening) Pit.

Geologic Setting

There are three Designated Tar Sand Areas (D.T.S.A) located in the south and southwestern part of the Uinta Basin - PR Spring, Hill Creek, and Sunnyside. The PR Spring D.T.S.A. comprises an area over 223 square miles, and includes Townships 11 to 18 South and Ranges 21 to 26 East, Salt Lake Base and Meridian. Earth Energy's PR Spring project encompasses approximately 6,000 acres of leases located in the southeast corner of the PR Spring D.T.S.A.

Geology

Rocks on Earth Energy lands include thick, buff-to-cream, rim-forming, cross bedded sandstone cropping out in the bottom of Main Canyon. These rocks were mapped by Gaultieri (1988) as the Renegade Member of the Wasatch Formation consisting of medium to thick, indistinctly banded sandstone with sparse shale. These beds are overlain by the Green River Formation containing lenticular beds of lacustrine sandstone saturated with bitumen separated by intervals of barren sandstone, siltstone, shale, mudstone and calcareous marl. Five distinct asphalt impregnated sands, labeled "A", "B", "C", "D" and "E" with "E" the highest strata, occur in the upper portion of the Douglas Creek Member of the Green River Formation (Byrd, William D. 1970) and (Clem, K. 1984). The "E" bed is regionally known, but is not present locally. The beds crop out in PR Canyon to the northeast and Main Canyon to the southwest of County Road 2810 (Seep Ridge Road). All four beds occur in an interval 240 to 290 feet thick (Murphy, Leonard A., 2003 private report). Figure 5 provides a geology map and Figure 6 provides a geologic cross section that focuses on the tar sands beds within the Douglas Creek member.

Twenty-five holes drilled by Earth Energy in 2005 penetrated only the highest or "D" bed. Moderate-to-well saturated tar sand was cut at depths ranging from 10 feet to 40 feet with an average depth of 19 feet, ranging in thickness from 10 feet to 30 feet. Information from these holes and work by authors previously mentioned confirm mineable tar sands may be expected in the area.

In the area of the opening pit, the strike of the beds is N 20° E, and the dip is 1.2-1.7° NW. The axis of the San Arroyo fault is known to trend in an East-West orientation, approximately one mile to the north of the mine area. The strike and dip of the ore beds vary slightly throughout the planned mine area as the host formations are part of a gentle anticlinal structure.

106.9. Ore and Waste Stockpiles

The mined tar sands will be stockpiled adjacent to the processing facilities in areas shown on Figure 3. Generally, the operator will maintain a two-week supply of ore at the processing facility. It is expected that no more than approximately 40,000 cubic yards of tar sands will be stockpiled at any one time, awaiting processing. This material would be piled within loader range of the inlet feed hopper (about 200 to 500 feet). It would have a maximum footprint of about 100 yards by 100 yards, and a maximum height of four yards, and may be placed within one or more piles in this area whose combined footprint does not exceed that noted above. In addition, up to 2,500 cubic yards of reject material (ore loads that have been mistakenly hauled to the plant site, but which contain too much interburden or overburden to be viable for processing) would be piled at any one time in a location near the ore stockpiles, prior to being returned to the pit as backfill or disposed of in the overburden/interburden storage areas.

Waste sand from the processing operation would be nearly dry and fairly neutral chemically. Earth Energy has received Permit by Rule coverage under DWQ's Groundwater Protection Program, due to the *de minimus* impact of the project, including the planned pit backfills with processed tar sands, on groundwater resources. Copies of related correspondence are included in Appendix B.

Initially, produced sand will be discharged in the overburden/interburden storage areas until there is sufficient room available in the opened mine pit to permit commencement of backfill to the pit. Once mining has opened a large enough excavation to allow equipment movement and backfilling, produced sands would be re-deposited in the pit.

Overburden/interburden storage area No. 2 will be designed to avoid impacting flow from a very small ephemeral spring located near the east edge of its fill footprint. Outflows would be routed down-slope along the eastern limit of the fill to a discharge point below the toe of the overburden/interburden storage area.

Runoff from the overburden/interburden storage areas will be controlled in armored (rip-rapped) areas at the margins and energy dissipation at the toes of their slopes. Typical design drawings for these BMPs are shown in Figure2a. These structures, as with all site BMPs, will be maintained to ensure that they are functional.

TAILINGS FACILITIES

There would be no liquid tailings ponds associated with this mining operation.

WATER STORAGE/TREATMENT PONDS

Water for processing would come from a deep water well (1,000 to 2,600 feet deep) drilled approximately 1 mile east of the production facility on the north side of the San Arroyo fault. A water right transfer with the Uintah Water Conservancy District allows Earth Energy to use up to 360 acre-feet per year of Green River basin water (currently allocated under Water Right No. 41-3523). Approval must be granted from the State Engineer to approve the well location. Well water would be pumped and piped via deep-buried and/or insulated 6-inch-diameter, steel pipeline, and stored in the retention pond described below. In addition, recycled process water will be stored in an insulated storage tank with an approximate capacity of 4,000 barrels.

There would be no treatment ponds located on the site. However, a retention/storage pond will be located at the low point of the plant site, and will collect all plant site runoff and runoff-transported sediments; it will also be used to store clean reserve make-up water (approximately 10,000 barrels, which equates to a 2.5-day supply. This pond will be lined in order to preserve the availability of make-up water. Lining is not needed to prevent water quality impacts. Any sediments that collect in this pond will be removed as needed to maintain design capacity. All precipitation collected within the working mine pits and process areas will be used in the process or for dust suppression on mine and plant roads.

106.10. Amount of Material to be Extracted, Moved

As illustrated in Table 3 (Section 106.4), over the next five years approximately 4,382,475 cubic yards of tar sand ore will be removed from the mine for processing into bitumen. To accomplish this, approximately 124,200 cubic yards of topsoil will be removed from lands to be disturbed and set aside for reclamation purposes. Approximately 3,506,465 cubic yards of overburden and interburden will be removed during the course of mining, to access the ore. Ore will be mined at a rate of approximately 3,000-3,500 tons of per day, producing approximately 2,000 bbl/day of bitumen from the initial process train.

The total volume of tar sand ore plus overburden and interburden to be extracted from the North (Opening) Pit is therefore approximately 7,900,000 cubic yards (4,382,476 plus 3,506,465). Approximately 4.8 million cubic yards of overburden, interburden, and tailings (sand and fines) will be replaced in this pit. A bulkage factor of 30 percent has been applied to the replaced material.

R647-4-108. Hole Plugging Requirements

All exploration holes drilled by Earth Energy have been plugged according to the requirements of R647-4-108. Future drill holes, should there be any, would be plugged according to the same requirements. Drill holes would not be left unplugged for more than 30 days unless approved by UDOGM.

Once Earth Energy has completed its operations in this area, it is likely that the water well would revert to SITLA (the water right itself would revert to them and it is likely that they would choose to maintain the well). However, in the event that SITLA chooses not to do so, the well would be properly closed and sealed.

R647-4-109. Impact Assessment

109.1 Surface and Ground Water Systems

SURFACE WATER

The Study Area is located on the Tavaputs Plateau along the southeastern rim of the Uinta Basin. Hydrologically, it is within the Green River watershed (in HUC 14060005), which is part of the Colorado River system. The 2,255-acre Study Area includes the relatively flat interfluve between PR Canyon and Main Canyon, as well as the headwaters of those canyons and adjacent tributaries. Figure 7 shows watershed boundaries in the Study Area, as well as other water features such as streams and springs.

The disturbances will be located on this drainage divide and extend southwestward into the Main Canyon watershed. Previous activities associated with an approved Small Mine Operation at this site have modified local natural surface drainage patterns over about five acres. Among those existing disturbances, is a small open pit in which collected runoff and precipitation is impounded.

Main Canyon and several of its tributaries (including Trail and Meadow Canyons) drain the majority of the Study Area. There are several small springs that issue in the headwater reaches of Main Canyon and support perennial flow for some distance along its main stem. Main Canyon flows generally west and northwest, entering Willow Creek several miles west of the Study Area. Willow Creek in turn flows into the Green River near Ouray. PR Canyon and a tributary named Jacks Canyon drain northward, conveying snowmelt and runoff from the northeast part of the Study Area. Although there is a small spring complex located in PR Canyon, flow in these channels is intermittent or ephemeral. PR Canyon is tributary to Sweet Water Canyon, Bitter Creek, and the White River, prior to the White River entering the Green River near Ouray.

Precipitation in this area is estimated at about 12 inches annually (Price and Miller 1975), which is generally not sufficient to sustain perennial flow in the smaller watersheds in this region. Instead, much of the Study Area is dissected by numerous ephemeral drainages that, although channels themselves are small, are located within larger canyons with steep slopes. Because the majority of mining and mining-related surface disturbance will be located on the relatively flat interfluve, there is negligible up-gradient watershed area that could contribute run-on. The small headwater drainages that will be filled with overburden/interburden storage areas flow ephemerally, contain very small active-channel cross sections, and typically show no evidence of live water or riparian vegetation.

Overburden/interburden storage area No. 2, the western-most overburden/interburden storage area, will be located on the area that contains a small seasonal spring near the east edge of its fill footprint on which a water right (49-1567) has been entered. However, a May 16, 2007 reconnaissance trip to pin-point this spring and determine a flow rate found no evidence of active flow at the site listed by the State Engineer. A very minor seep, with flow too small to be measured, was found approximately 100 vertical feet down from, and ¼ mile west of the spring identified with the water right. No other water was found during this survey. As noted above, overburden/interburden storage area No. 2 would be designed to avoid impacting discharge from the small ephemeral spring located in its footprint. Outflows would be re-directed along the edge of the overburden/interburden storage area fill to a point below the toe of its slope. This is the only spring or seep feature with the potential to be impacted; no other impacts to springs as a result of Earth Energy's PR Spring Operation are predicted.

The plant site will be constructed to be a self-contained area, though the use of perimeter berms or ditches where needed. Ditches will be designed to pass the 10-year, 24-hour precipitation event. They will either be triangular in cross section with side slopes approximately 1.5H:1V; depth including freeboard will be less than 2 feet; or will have an equivalent cross section. Berms will generally be 2 feet high, with a one-foot top width and 1.5H:1V sideslopes. In some areas, the roads form the perimeter berm or ditch. All precipitation incident on the site will be collected in the water retention/storage pond located at the low point of the plant site and used in the extraction process or for dust suppression on mine and plant roads. This pond will also be used to store clean reserve process water. If sediments accumulate in the pond, it will be cleaned as needed to maintain its design capacity. The lining used in this pond will prevent loss to infiltration so as to maximize Earth Energy's storage volume; this lining is not needed for any water quality protection purpose, and any inadvertent leak or tear that results in infiltration would not impact surface or groundwater quality.

The mine pit is constructed with a highwall around the workings, which in all locations (during operations) will be higher than the highest elevation of the pit floor. In this manner, all precipitation on the mine pit will collect in precipitation collection sumps located in the bottom of the pit. These collection sumps are simply low areas within the working mine pit where precipitation falling directly within the pit perimeter will drain and collect. Collected precipitation will be transported to the processing site with mined ore or pumped separately and added to the process stream as part of the make-up water. The active mining area will be a pit at all times (concave to incident precipitation and run-on). No pit configurations are planned where storm water will be allowed to egress the active mine workings.

Runoff and sediment from the outslopes of the overburden/interburden storage areas will be controlled by armoring placed within the "channel" formed by the contact between the pile and the native slope, and by installing a rip-rapped energy dissipater at the toe.. Due to the size of overburden/interburden/ storage area materials (broken sandstones and shales mixed with lesser amounts of fines, with particles varying from fine to coarse rock rubble (run-of-mine) materials potentially as large as one cubic yard), these outslopes would not be expected to produce significant amounts of sediment. Typical design drawings are included in Figure2a. Runoff and erosion will be minimal from the overburden/interburden storage area top surfaces, because these will be maintained with a gentle grade away from the outslope.

SPCC

All BMPs will be inspected regularly and maintained in operable conditions. These types of BMPs are also described in a Storm Water Pollution Prevention Plan (SWPPP) developed to comply with a State of Utah Multi-Sector General Storm Water Permit for Industrial Discharges (and/or the analogous EPA permit). That Permit also requires quarterly visual monitoring of storm water. All of these measures would reduce the likelihood of inadvertent discharges of process waters or erosion-produced sediments. This SWPPP will be added to the NOI as Appendix 9 when it is available.

GROUNDWATER

The tar sands deposit that would be mined during this project is located in the Green River Formation. The Parachute Member of the Green River Formation is the uppermost bedrock formation found throughout the Study Area. This Formation includes various water bearing zones (including the Birds Nest and Douglas Creek aquifers), though they are apparently of limited extent and yield. The State Water Plan (Utah Division of Water Resources 1999) doesn't include any Green River Formation aquifers as significant enough to be target for groundwater development, and information from wells and spring indicates generally low yields (Price and Miller 1975).

Most springs in the area, including PR Spring, are reported to discharge from the Parachute Creek Member of the Green River Formation (Price and Miller 1975). The BLM (1984) notes that known springs within the combined Hill Creek and PR Spring Special Tar Sands Area (STSA) typically discharge at less than 50 gpm, with most discharging at less than 10 gpm. They range from fresh to moderately saline, with total dissolved solids (TDS) ranging from about 300 mg/L to 6,100 mg/L (BLM 1984). Generally, the springs are freshest near the southern extent of the STSA, in the vicinity of the Study Area, with TDS concentrations of less than 500 mg/L (Price and Miller 1975). In 1964, PR Spring was discharging at 5.6 gpm and had a dissolved solids concentration of 380 mg/L (Price and Miller 1975). These springs are not expected to be impacted by Earth Energy's operation.

Underlying the Green River Formation at depth are the Wasatch Formation and the Mesa Verde Group, which are likely aquifer targets for Earth Energy's water supply well. Price and Miller (1975) indicate that the potentiometric surface in the general area is 1,500 feet or greater below ground surface, with a gradient to the north. Generally, these bedrock sources are thought to be of low permeability and relatively poor water quality (Price and Miller 1975) and thus insufficient for major groundwater development. At its maximum depth of 140 feet, the North (Opening) Pit would not be expected to encounter this regional groundwater table, nor would it be expected to approach it or affect its gradient or quality.

Based upon review of drill logs obtained for a nearby abandoned (watered out) exploratory gas well, a local aquifer believed to be associated with the San Arroyo fault structure is anticipated to yield a sufficient quantity of groundwater for project requirements. The abandoned well of interest is located approximately 1 mile east of the plant site (on BLM land) with the target aquifer at least 1,000 feet below ground (Earth Energy personal communication). An application to the BLM for drilling of a test well at the subject location is currently in progress. Pending results of this test well, additional permitting through DOGM, the State Engineer's Office, and BLM may be required. Use of this deep groundwater would not affect the nearby springs.

As noted above, Earth Energy has received Permit by Rule coverage under DWQ's Groundwater Protection Program, due to the *de minimus* impact of the project, including the planned pit backfills with processed tar sands, on groundwater resources. Copies of related correspondence are included in Appendix B.

WATER RIGHTS

According to online records of the State Engineer's Office, (Utah Division of Water Rights) there are a number of water rights in and near the Study Area, as shown in Table 7 and on Figure 7. The only one of these that would potentially be affected by Earth Energy's operations would be 49-1567. This right is in the application phase, and has not yet been granted by the State Engineer's Office. It was first filed on in 1995, by Alameda Corporation and their attorney Pruitt-Gushee. The applicant stated that the use of the water would be in conjunction with several other area sources for domestic and livestock uses; these other sources were filed on at the same time as the 49-1567 spring. The quantity of water filed on at this spring was approximately 4.5 gpm.

The water right application (and others similarly filed by Alameda) was protested by SITLA and Utah Division of Wildlife Resources (DWR), among others, in 1995. A hearing was held in 2004, at which time Alameda was apparently asked to provide additional information. The rights were neither granted nor rejected.

An additional water right of importance is that which will be used by Earth Energy to provide water for processing the ore. Through an agreement with the Uintah Water Conservancy District, Earth Energy's long-term plan is to use Green River Water (currently allocated under Water Right No. 41-3523) via a water rights transfer of about 360 acre-feet/year. Initially, approximately 200 acre-feet/year of groundwater will be pumped from a deep water well (1,000 to 2,600 feet deep) drilled within 1-2 miles of the production facility in the San Arroyo fault structure. This deep well has not yet been approved by the State Engineer.

109.2 Wildlife Habitat and Endangered Species

As noted in Section 106.7, the Study Area is on the top of a flat-lying plateau above Main Canyon and PR Spring Canyon. Ephemeral drainages drop steeply off the plateau into these canyons. Existing vegetation in the Study Area includes mixed shrub and sagebrush/grassland communities on the ridgetops, with juniper on upper slopes and sideslopes, trending to a Doug fir community as elevation decreases. There are some aspen patches in the drainages.

The Utah Natural Heritage Program (NHP) of the Division of DWR was contacted directly for information about known occurrences of any species of concern. Their response letter, attached in the correspondence section (Appendix B), listed occurrences of Mexican Spotted Owls (*Strix occidentalis lucida*) and greater sage grouse (*Centrocercus urophasianus*) in the vicinity of Study Area. The Mexican spotted owl was listed as a threatened species on 15 April 1993 (USFWS 2007). Sage grouse are not protected by Federal law, but as a "wildlife species of concern", it is expected that conservation actions may be needed to preclude the need to list sage grouse under the Endangered Species Act. Sage grouse are also currently listed as a sensitive species by the Utah DWR.

GIS Shape files of Mexican Spotted Owl nesting habitat, acquired from the Bureau of Land Management (BLM) Vernal Field Office indicate that there is no known such nesting habitat within 1.5 miles of the Study Area boundary, or within 3 miles of the Affected Area. It is possible, however, that owls may move up the canyons from known nesting habitat to forage in areas closer to the mine. There is concurrent gas well development in the area, which may have already acclimated the birds to industrial activities. Conversely, this existing and previous activity may have caused them to avoid the area already. If the former, once the mine is in operation, forage within the area affected by the mining operation would not be available for Mexican Spotted Owl to forage in. This loss would be temporary, as forage habitat would be reestablished after reclamation occurs.

Locations of greater sage grouse leks, on file with the UDWR, were reviewed on June 8, 2007 by Brian Maxfield, UDWR Sensitive Species Biologist. One lek, known as the Monument Lek, is located within the Study Area and approximately 3,000 feet due north of the initial mine development, but within 100 feet of the active Seep Ridge Road and a buried gas transmission line.. Mr. Maxfield stated

In early 2007, the State Engineer's Office requested that Alameda Corporation supply information on these applications and their intentions regarding them within 90 days. If this was not done, the state indicated that it would reject the applications. In early April of this year, Alameda's current attorney (Mabey and Wright) notified the State Engineer that they were pursuing some of water rights, including 49-1567, and dropping others. They further indicated that they have obtained SITLA's permission to develop the water sources on state land, including 49-1567. They have requested that the State Engineer grant these water rights ASAP.

As explained in the Surface Water section above, the May 16, 2007 reconnaissance trip to GPS the location of this spring and determine a flow rate found no evidence of active flow at the site listed by the State Engineer. Any seasonal flow at this site is expected to be nowhere near the above-noted 4.5 gpm.

Table 7: Water Rights

Water Right No.	Water Source	Quantity (cfs)	Use	Water Right Owner
49-55	Unnamed Spring	0.002	Stock watering	John S. Purdy
49-57	PR Springs	0.002	Stock watering	John S. Purdy
49-193	Unnamed Spring	0.025	Stock watering	Alameda Corp.
49-196	PR Springs	0.021	Stock watering	Alameda Corp.
49-262	PR Springs	0.011	Domestic & stock watering	BLM
49-378	East Fork Jacks Canyon Spring	0.015	Stock watering & wildlife	BLM
49-495	Meadow Spring	0.015	Stock watering & wildlife	SITLA
49-496	South PWR Meadow Spring	0.015	Stock watering & wildlife	SITLA
49-497	North PWR Meadow Spring	0.015	Stock watering & wildlife	SITLA
49-504	Jacks Canyon Spring	0.015	Stock watering & wildlife	BLM
49-1508	Unnamed Spring	0.05	Stock watering	SITLA
49-1566*	Unnamed Spring	0.027	Domestic & stock watering	Alameda Corp.
49-1567*	Unnamed Spring	0.01	Domestic & stock watering	Alameda Corp.
49-1572*	Unnamed Spring	0.004	Domestic & stock watering	Alameda Corp.
49-1581*	Unnamed Spring	0.004	Domestic & stock watering	Alameda Corp.

* Application phase – water right not yet approved

that sage grouse use the general area for nesting and brood rearing, while their winter range is located further to the west. The Seep Ridge Road is currently used as a thoroughfare for oil and gas development. During one visit in Summer, 2007 trucks passed the mine area approximately every 20 minutes.

While the mine has no control over vehicles associated with gas development, during mining, impacts to grouse strutting on the Monument Lek can be mitigated. Prior to Spring 2009, Earth Energy will consult with DWR to determine the status of this lek (it has apparently not been used for the last few or several years). If it was active in 2008, during Spring 2009, Earth Energy will commit to observe the Monument Lek three times during early morning hours between March 15 and April 15 to see if it is again active. During that time interval, they will cease mining between ½ hour before to 1 hour after sunrise, and 1 hour before to 1 hour after sunset. If no grouse are using the lek after three observations, mining can continue during those hours. If grouse are found to be using the lek, the twice-a-day mining cessation will continue until May 15th. This will be repeated on an annual basis, as long as the lek remains active.

Upon reclamation, any loss of potential brood-rearing habitat will be reestablished as pits will be backfilled and graded to a broad slope. The disturbed area will be reclaimed to a grass-shrubland. The reclamation seed mix includes several species palatable to sage grouse, and provides a broad mix of grasses and forbs, as well as three of the following four shrubs: sagebrush, bitterbrush, serviceberry, and snowberry.

The Utah DWR, Utah Conservation Database (UCD) at http://dwrcdc.nr.utah.gov/ucdc/ was also reviewed. It contains links to several maps showing that the Study Area is within summer habitat for elk and mule deer. Other ungulate habitat is not found near the Study Area. In order to discourage elk and mule deer from entering the mining area, a fence would be constructed along the County Road. As recommended by the Utah DWR (personal communication with Brian Williams, DWR Northeast Region), this fence will be between 38 and 48 inches high, comprised of three or four strands barbed wire, topped with a log rail. It will be anchored with T-posts.

The UCD website also includes a list of plant and animal species that are Federally listed as Threatened, Endangered, or are Candidates for T&E designation in Utah, or are listed as Sensitive Species by the DWR. Those that are listed as present in the southern portions of Uintah and/or the northern portions of Grand Counties are listed below in Table 7 (with the exception of listed fish species, since there is not adequate live water to support fish on or near the Study Area). The information was taken from the UCD website on May 11, 2007.

Table 7: Threatened, Endangered, and Candidate Species that may be present at Earth Energy Resources Tar Sands Mine

Common Name	Scientific Name	Status	Elevation in Feet / Habitat	Chance of Presence at Project Site
Shrubby Reed-mustard	*Glaucocarpum suffrutescens*	E	6000-7000	None due to elevation
Clay Reed-mustard	*Schoenocrambe argillacea*	T	4725-5750	None due to elevation
Uinta Basin Hookless Cactus	*Sclerocactus glaucus*	T	4500-6500	None due to elevation
White River Beardtongue	*Gila cypha*	C	5000-6680	None due to elevation
Black-footed Ferret	*Mustela nigripes*	T	Prairie dog towns	None due to lack of prairie dogs
Brown (Grizzly) Bear	*Ursus arctos*	T -Extirpated	Mountain timber	None
Southwestern Willow Flycatcher	*Empidomax traillii extimus*	E	Riparian areas with willows	None due to lack of riparian habitat

Shrubby Reed-mustard, *Glaucocarpum suffrutescens,* is a Federally listed endangered plant. This perennial, clump-forming mustard produces yellow flowers in May and June. It grows on shaley, fine textured soils of the whitish, semi-barren Green River Formation, Evacuation Creek Member. It is associated with mixed desert shrub and pinyon-juniper communities at elevations of 6000 ft to 7000 ft. The Study Area elevation is generally above, and the soils thicker and deeper than those noted above, making it highly unlikely that this species would be encountered within the Study Area.

Clay Reed-mustard, *Schoenocrambe argillacea,* is a Federally threatened plant. This mustard produces white, purple-veined flowers that bloom from mid-April to mid-May. The plant is hairless with a stout, woody base. It occurs on the Green River Formation, Evacuation Creek Member, where it prefers precipitous slopes consisting of bedrock or scree mixed with fine-textured soils in mixed desert shrub communities at elevations of 4725 ft. to 5750 ft. It is unlikely that this plant would be present within the Study Area due to elevation and site characteristics.

Uinta Basin Hookless Cactus, *Sclerocactus glaucus,* is a Federally listed threatened plant that is known to occur in central and southern Uintah counties just north of the Study Area. This cactus has a solitary, egg-shaped stem that is 3-12 inches long. Pink flowers are produced late April to late May. It is found on xeric, fine textured soils overlain by cobbles and pebbles on river benches, slopes, and rolling hills of the Green River and Mancos formations from 4500 ft. to 6500 ft. elevation. It is associated with salt desert shrub and pinyon-juniper communities. It is highly unlikely that this plant would occur on the Study Area due to the higher elevation and moister site characteristics of the mine site.

White River Beardtongue, *Penstemon scariosus,* is a candidate for Federal listing as threatened or endangered. It is found in Duchesne and Uintah counties

in Utah and Rio Blanco County in Colorado. This figwort has lavender to pale blue flowers that bloom in late May to June. It is found on semi-barren areas on white (infrequently red) soils that are xeric, shallow, fine-textured, and usually mixed with fragmented shale from 5000 ft. to 6680 ft elevation. It is highly unlikely that this plant would occur on the Study Area due to the higher elevation and moister site characteristics of the mine site.

The **Black-footed ferret**, *Mustela nigripes*, is Federally listed as endangered. Thought to be extinct, the species was re-discovered near Meteetse, Wyo. in the 1980's. Since then a captive breeding program has allowed introduction of populations classified as "non-essential-experimental" by the US Fish and Wildlife Service (USFWS) in the Coyote Basin area of Uintah County in 1999, as well as at other locations in the west. There are also unconfirmed sitings of naturally occurring black-footed ferrets in eastern Utah.

Black-footed ferrets are nocturnal and rely on prairie dogs for their primary food, thus they are closely associated with prairie dog towns. Loss of prairie dogs (by plague, poisoning or habitat loss) directly threatens the survival of the ferrets. Due to the lack of prairie dog colonies in the Study Area, no black-footed ferrets would be expected to occur in this area.

The **Grizzly or brown bear,** *Ursus arctos,* was extirpated (eliminated) from Utah in the 1920s. Because of the drastic decline in brown bear numbers and distribution, the U.S. Fish and Wildlife Service has listed it as threatened in the lower 48 states. The last known siting of a grizzly bear in the state of Utah was over 50 years ago, thus it is highly unlikely this animal would be seen on or near the Study Area and no evaluation is necessary.

The **Southwestern willow flycatcher**, *Empidonax traillii*, is Federally listed as endangered. It is a rare summer resident of southern Utah up to the northern border of Grand County. It prefers riparian habitats with willows. It eats insects, seeds, and berries. It breeds in late spring and early summer in the vertical fork of a willow or other riparian tree. The Study Area is at the northern edge of the range for this bird; the lack of developed riparian habitat in the Study Area makes it highly unlikely that this bird would occur in the Study Area.

As noted in Section 106.7, the Study Area is on the top of a flat-lying plateau above Main Canyon and PR Spring Canyon. Ephemeral drainages drop steeply off the plateau into these canyons. Existing vegetation in the Study Area includes mixed shrub and sagebrush/grassland communities on the ridgetops, with juniper on upper sideslopes, trending to a Doug fir community as elevation decreases. There are some aspen patches in the drainages.

109.3 Existing Soil and Plant Resources

SOILS

Existing soil types in the Study Area are described in Section 106-5 above and are shown on Appendix C. Associated disturbance related to mining and processing at PR Spring mine includes approximately 15 acres to be disturbed by the plant site and 24 acres to be disturbed by haul roads. These disturbances will remain un-reclaimed for the life-of-mine. Approximately 62 acres will be disturbed for mining the North (Opening) Pit, 31 acres will likely be disturbed by mining in the West Pit, and 51 acres will be disturbed with two overburden/interburden storage areas. The waterline and well pad, and the topsoil storage areas will take up approximately 4.4 and 15 acres of land, respectively. These latter acres will not be stripped. This is a total disturbance footprint of approximately 202 acres.

Of this acreage, 132 acres are within the Seeprid-Utso complex of soils, located on the tops and shoulders of the plateau, while 51 acres are within the shallower Tosca soils, located on the slopes below the plateau.

Reclamation will remain as concurrent as possible as mining advances and produced sand is replaced in the excavated pit. This will allow regrading, topsoiling, and seeding of some lands including portions of the mined-out pit. Thus, the total volume of topsoil stored at any one time will never reach the full 124,200 cubic yards. All salvaged soils will be used on-site in reclamation.

PLANTS

The Study Area intersects four plant communities: Sagebrush-grass, Mixed tall shrub, Pinyon-juniper-Douglas fir, and Aspen glade (Figure 8). All but the Aspen glade community were sampled, as no mining will occur in the aspens. Within the Study Area there are 1,638 acres of Sagebrush-grass community, 1482 acres of Mixed tall shrub community, 1203 acres of Pinyon-juniper-Douglas fir community, and 43 acres of Aspen glade community. Within the Affected Area included in this NOI, approximately 70 percent are within the Mountain tall shrub community, 20 percent are within the Sagebrush-grass community, and 10 percent are within the Pinyon-juniper-Douglas fir community. Further information about existing plant resources is included in Section 106.7, Table 3, and in Appendix C.

109.4 Slope Stability, Erosion Control, Air Quality, Public Health & Safety

SLOPE STABILITY

Slope stability is a concern at the rim and floor of pits, the ground surface on which overburden/interburden storage areas are constructed, and on the slopes of constructed overburden/interburden storage areas and topsoil stockpiles. The bulk of each mining pit would be constructed within the relatively flat-lying terrain of the plateau top, minimizing slope-related risks. Overburden/interburden storage areas 1 and 2 would be constructed on the steeper side slopes between the plateau top and the base of Main Canyon. These overburden/interburden storage areas have a higher risk of slope stability issues.

Regular and routine inspections will occur throughout the mine area to ensure that operating conditions remain safe; that MSHA safety guidelines are being followed, and that the mining plan stated herein is being followed. This will include inspecting to verify that the pit wall slopes are at the correct angles and that they remain stable.

PITS

The North (Opening) Pit will be incised into the terrain, with the highest walls of the pit being the highwall on the northwest and the sidewall on the northeast. The lowest walls of the pit (low walls) would be located on the southwest and southeast sides of the pit at the head of a natural, ephemeral drainage. All pit walls would be maintained at approximately 2H:1V for stability. Use of this slope represents Earth Energy's desire to facilitate pit reclamation, and to provide conservatively designed pit wall slopes to compensate for the lack of detailed knowledge regarding the extent of localized faulting or fracture planes that could cause instabilities. Numerous existing road cuts and excavations in the area (including Earth Energy's 2005 production test pit) are stable with slopes steeper than 1H:1V, providing evidence of the conservative nature of Earth Energy's design. Use of 2H:1V pit walls slope will prevent rock falls. Back-break near the top rim of the pits will be controlled or eliminated by smooth transition grading. Any required blasting along the walls of the pit will be accomplished with small controlled blasts to eliminate over-break and weakening of the remaining material on the face of the slope.

The maximum depth of the North (Opening) Pit would be approximately 140 feet. The minimum depth on the low wall side of the pit would be 20 feet. The thickness of the undisturbed bank of land between the low wall of the pit and the outer side of the native slope would be approximately 100 feet. Exploratory drill hole data did not encounter any groundwater, thus it is highly unlikely that water-bearing strata in the Parachute Member of the Green River Formation would be significant enough to create ponding behind the low-wall.

The West Pit would expand the highwall about 1500 feet to the southwest and the pit floor to approximately 7860 ft. elevation, starting from the northwest corner of the North (Opening) Pit. No water or stability problems are anticipated with the highwalls or low-walls in this pit extension.

As noted above, regular and routine inspections will occur to verify that the pit wall slopes are at the correct angles and that they remain stable.

OVERBURDEN/INTERBURDEN STORAGE AREAS

Overburden/interburden storage areas No. 1 and No. 2 will be constructed during the mining of the North (Opening) Pit and the west extension of this pit (designated as the West Pit). Both overburden/interburden storage areas will be constructed outside of the pit limits on the side-slopes of ephemeral draws above Main Canyon. The overall slopes of the land on which the overburden/interburden storage areas will be constructed ranges from 16.5 to 40 percent (10° to 22°) (see Table 8 below). During mining, the overburden/interburden storage areas will be sloped at 1.5-1.7H:1V. Upon reclamation the slopes will be graded down to between 2.5H:1V to 3H:1V.

Table 8: Slope Angles of Native Lands and Overburden/interburden storage areas

Overburden /interburden Storage Area **Number**	**Total Height in Feet of** Overburden/interburden storage areas **from toe of** Overburden/interburden storage area **to top of** Overburden/interburden storage area* ***(During Mining / Post-Reclamation)**	**Average Native Slope Angle (H:V)**	**During Mining Average Slope Angle of Outer** Overburden/interburden storage area **Slope (H:V)**	**Post-Mine: Reclaimed Average Slope Angle of Outer** Overburden/interburden storage areas **Slope (H:V)**
1	350 / 390	2.7:1	1.5:1	2.5-3:1
2	240 / 270	6:1	1.5:1	2.5-3:1

The native slopes on which the overburden/interburden storage areas will be constructed are made up of lacustrine sandstone, siltstone, shale, mudstone and calcareous marl overlain by sandstone and shale alluvium and colluvium,

with scattered small escarpments and ledges. The surface material is gravelly to cobbly toward the top of the overburden/interburden storage areas with intermittent rock outcrops along the slope, and the bedrock exposed at the base of the overburden/interburden storage areas. Overburden/interburden storage area No. 1 will be constructed on a 40 percent slope (steeper than 3H:1V) that is concave, grading to a slope angle of about 10 percent (10:1) near its base. Overburden/interburden storage area No. 2 will be constructed on a 6H:1V slope. Both overburden/interburden disposal areas will be designed and constructed to be stable within standard engineering parameters.

EROSION CONTROL

Erosion issues are possible in several areas of the mine:

- On the faces of overburden/interburden storage areas
- Off topsoil piles
- From the pit as it is first opened
- Off haul roads

Runoff from the outslope faces of the overburden/interburden storage areas will be controlled by armoring placed within the "channel" formed by the contact between the pile and the native slope, and by installing a rip-rapped energy dissipater at the toe. Typical design drawings are included in Figure 2. Controlling runoff will minimize sediment production, and the energy dissipators will also serve as sediment traps, causing at least some of the sediments to drop out. Further, as these materials will primarily consist of broken sandstones and shales mixed with lesser amounts of fines, their grain sizes will vary from fine to coarse rock rubble (run-of-mine) materials potentially as large as one cubic yard. The coarser materials will typically end up near the toe of the expanding fills as the dump sites are filled to their maximum capacity. The concentration of coarse materials at the toe of the fills provides a natural energy dissipater for storm runoff from the faces of the dumps. This broken rock material has a very low siltation potential and will effectively encapsulate the finer material initially placed in the waste dumps. Last, the top surfaces of these overburden interburden storage areas will generate very little runoff or sediment as the will be maintained with a gentle grade away from the outslope (toward the plant site and the pit).

All topsoil piles will be bermed to catch eroded material and prevent run-on and run-off of storm water.

The active mining area will be a pit at all times (concave to incident precipitation and run-on). No operational pit configurations are planned where storm water will be allowed to egress the active mine workings.

Most of the haul roads will be integral to the pit and overburden/interburden storages areas and will not require separate erosion control. As needed, however, certain haul roads will be ditched, and if the grade increases to above two percent, water turn-outs will be constructed to prevent erosion of the road base.

The facilities site will be constructed to be a self-contained area through the use of perimeter berms or ditches as needed to direct runoff. All precipitation incident on the site will be collected in the water retention/storage pond located at the low point of the plant site and used in the extraction process or for dust suppression on mine and plant roads. This pond will also be used to store clean reserve process water. Sediment production from the plant site is expected to be negligible, due to gradient and surfacing; any transported in runoff would eventually make its way to the water retention/storage pond. This pond will be cleaned of sediments as needed.

All BMPs will be regularly inspected, and maintained in operable condition. These above-noted types of BMPs are also described in a Storm Water Pollution Prevention Plan (SWPPP) developed to comply with a State of Utah Multi-Sector General Storm Water Permit for Industrial Discharges (and/or the analogous EPA permit). The Permit also requires quarterly visual monitoring of storm water discharges. These measures would reduce the likelihood of inadvertent discharges of process waters or erosion-produced sediments. This SWPPP will be added to the NOI as Appendix 9 when it is available.

Air Quality

Potential air quality issues include the following:

- Fugitive dust from stripped lands, the mine pit, overburden/interburden storage areas, and topsoil stockpiles.
- Fugitive dust from the plant site area and ore stockpiles
- Emissions from the equipment used to mine, haul and process the ore
- Fugitive dust from newly reclaimed lands

Fugitive dust will be minimal from ore piles. Overburden and interburden may or may not be moist, depending on current weather conditions. However, consistency of raw ore is massive to granular and thus does not readily become airborne.

Once the tar is removed from the ore, clean sands are left to be used as backfill. This sand material will hold approximately 10 to 20 percent moisture. Waste sands and over/interburden will be alternated in construction of the overburden/interburden storage areas, to increase stability and reduce wind-blown sand, should it become dry.

Haul roads will be sprayed regularly with water from a water truck.

Earth Energy is currently working with EPA on permitting, which will address the above air quality issues. (EPA has taken the lead on air permitting for this operation given its Tribal Land location.) Earth Energy intends to comply with the conditions set forth by EPA; documentation will be included in Appendix B once it has been obtained.

PUBLIC HEALTH AND SAFETY

The following measures are in place to protect public health and safety:

- MSHA safety guidelines will be followed in all aspects of this project.
- There are no shafts or tunnels within the Affected Area and therefore none that require closing or guarding.
- All trash, scrap metal, and wood, and extraneous debris will be temporarily stored at a designated location prior to being routinely hauled offsite to a licensed facility. Further, volumes of material such as product, waste oil, etc. will be periodically removed from the site as needed so that their allocated storage is not exceeded.
- Any exploratory or other drill holes will be plugged or capped as set forth in Rule R647-4-108.
- Warning signs will be posted in locations where public access to operations is readily available, including at the points of exit/entry from the main access road (Co. Road 2810) to the open pit and processing facilities.
- All blasting materials are kept in locked, ATF-approved magazines.
- Warning signs advising the public of blasting protocols will be posted at the access road to the pit area at the appropriate locations as required by MSHA from the time a blast begins to be set until the all-clear is given.
- Blasting is not expected to result in fly rock landing on the adjacent county road. However, during blasting, the road will be closed for 1,000 feet on either site of the blast site. Flaggers will posted to accomplish this, and resultant wait time for any travelers would not be expected to be more than 10-15 minutes.
- Although blasting will normally not result in material (other than acceptable amounts of fugitive dust) being transported outside the pits, should large loose material unforeseeably end up outside of the pit and outside of the 202-acre Affected Area, it will be removed immediately so as not to present a public safety concern. To this end, a loader will be kept ready to pick up any fly rock that inadvertently ends up on the road.
- The opening pit highwall will be bermed and fenced along the County Road. As recommended by the Utah DWR (personal communication with Brian Williams, DWR Northeast Region), this fence will be between 38 and 48 inches high, comprised of three or four strands barbed wire, topped with a log rail. It will be anchored with T-posts. Signs will be

placed along the fence line every 150 feet to warn the public of the mining activity, including the potential for blasting.

- During all Earth Energy mining work in the vicinity of the Canyon Gas natural gas pipeline, Earth Energy would operate safely and in cooperation with Canyon Gas to ensure safety of both operations and the public.
- Containers stored on-site will be labeled so that wastes are clearly identified. Salvageable materials and other wastes will be stored at the plant site within the fenced area. No hazardous materials or hazardous wastes will be generated or used during this operation, thus none will be stored.

R647-4-110. Reclamation Plan

110.1 Current Land Use and Post Mining Land Use

The current land use is mining, exploration, and wildlife habitat/open space. Due to the nature of exploration and ongoing activity in the Uinta Basin, the post mining land use is likely to include exploration, as well as wildlife habitat and open space. While recognizing that exploration may occur in the future, the stated objective of reclamation planning in this NOI is to reclaim the site in order to provide for future post mining land uses of wildlife habitat and open space. In order to ensure an environmentally safe and stable condition for the wildlife in the area that meets the objectives of the mined land reclamation act 40-8-12, Earth Energy has proposed to leave safe, stable topography; establish native vegetation suitable for habitat; remove man-made structures, including tanks, ponds, etc.; and cause no degradation or harm to water sources.

CULTURAL RESOURCES

Cultural resources were reviewed and inventoried onsite. No previously documented or new cultural resources were recorded (See Appendix B).

110.2 Reclamation of Road, Highwalls, Slopes, Etc.

If economics allow, mining may continue in other portions of the Study Area. In this case, facilities, and some roads may be maintained for access, and all new disturbances and operations would be subject to new permit approvals, either through amendments to this NOI or otherwise as required by the DOGM. At this time, however, the mine/reclamation plan and associated bond estimate are based upon initial North (Opening) Pit mining, the West Pit, and associated disturbance. Also for the purposed of the reclamation plan and bond estimate, it is assumed that all facilities and roads within the 202-acre Affected Area will be reclaimed as stated herein.

The overall objective of the reclamation plan described herein is to reclaim the entire Affected Area so as to allow postmining land uses of wildlife habitat and open space to resume. This objective will be met in part by removing facilities and structures that have been brought to the site, regrading, topsoiling, and reseeding, as described in more detail below. The intent is to meet the requirements of the Utah Rules at R647-4, as stated in Section 110.6 below, and to meet the objectives of 40-8-12 of the Utah Mined Land Reclamation Act including to provide for a safe, stable, environmentally functioning site.

Safety will be managed at reclamation by continuing to follow safe operating conditions while using equipment and continuing to follow the appropriate MSHA guidelines and regulations. Throughout the reclamation activities, visual inspections will be made at the site, under the terms of the Storm Water Permit(s) issued by either EPA or DWQ (depending upon Tribal Land jurisdictional decisions), which must remain active until bond release has been obtained. This will focus on erosion and sediment control, further ensuring that reclamation goals can be met.

ROADS

During operations, interim reclamation, and on-going reclamation and while on-site roads are still needed to access Affected Areas during final reclamation, Earth Energy will maintain roads as needed to minimize erosion and off-site sedimentation. Such road maintenance will continue until the roads are fully reclaimed.

There are approximately 24 acres attributed to roads. During final reclamation, on-site roads would be deep-ripped to relieve compaction, regraded to blend with site topography, and seeded. Except where bedrock is encountered, ripping will be 24 inches deep, with ripper shanks spaced no more than 24 inches apart. In shallow bedrock areas, ripping depth may be less than 24 inches, by necessity.

HIGHWALLS

No highwalls would remain at the end of mining as pits would be backfilled and/or graded off to blend with the existing surrounding topography.

SLOPES

All overburden/interburden storage areas (covering approximately 52 acres) and backfilled pits will be regraded to a 2.5-3H:1V or flatter slope to achieve a stable, natural-looking landscape. While short segments may exceed this overall slope, no areas will be so steep as to require a variance from DOGM (required for slopes greater than 45 degrees). The overburden/interburden storage areas will be re-contoured by dump-top rounding, toe extension and surface recontouring to create an undulating, roughened surface that will blend with the surrounding terrain, provide a site amenable to revegetation, and minimize runoff and erosion. This will be done with a trackhoe, backhoe, and/or dozer prior to topsoil placement, and safety and erosion control will be of primary focus during regarding activities. As described further in Section 110.5, available salvaged topsoil will be applied on the contour to all surfaces and the entire area will be seeded with native species to stabilize the soil, and provide for the post-mining land use.

As noted, drainage will not be an issue on these regraded areas as there is no run-on and infiltration capacity will be high on reclaimed slopes.

PITS

Pits (approximately 92 acres) would be backfilled to approximately 50-60% of their original volume, primarily with produced sand, inter-mixed with overburden/interburden. Since the pit floor will be backfilled as part of the cast-back mining process, it will not need to be ripped. The final cut during mining will create a 3:1 slope to blend with surroundings. This will create a near-level surface (see cross-sections), thus no backfilling will be required during reclamation of the mined-out pits.. The rough backfilled surface will be finish-graded and contoured with a road grader to assure the land blends with surroundings; it will then be ripped to two feet with a dozer to relieve compaction..
Remaining pit walls will be graded down to blend with the backfilled materials. The resulting contours would be graded to blend with surrounding topography, ripped and seeded. The pit will not be an impounding feature upon final reclamation.

DRILL HOLES

No drill holes would remain at the end of mining.

There would be no shafts or adits, or similar structures that would require reclamation. The operating pit that forms an impoundment will not be impounding after backfilling and reclamation. As described, the water retention pond will be reclaimed.

FACILITIES AND MATERIALS

Facilities on the 15-acre facility site would either be taken apart and hauled away for disposal, or buried onsite. The facilities proposed for onsite burial include the following: gravel from the parking area; foundations of Sprung structures; and reserve ore, sand, fines, and reject materials.

The maintenance building and warehouse are "Sprung" aluminum structures and are easily dismantled using hand power tools and crane. The mine office is a one-piece modular "Atco" office structure mounted on I-beams. Atco, which has been in business since 1947, includes removal of the structure in the purchase price, so no reclamation cost is included for this. The Power Plant is approximately 2,500 $ft^{2,}$ and 20 tons, and consists of 1 gas generator, 1 diesel back-up, and 1 boiler.

Each process train, including piping, hoses, etc. is skid-mounted and is approximately 480 ft. long by 75 ft. wide by 20 ft. high, with a void volume of 30% for an assembled volume of 8,000 CY of material. Cut up, the volume would be roughly 25% of this, or 2,000 CY. The train would be drained of all process materials, disconnected to individual skids, and hauled away. The sand dewatering unit weighs approximately 30 tons.

The re-bar reinforced concrete foundation under the warehouse and maintenance shop (each 10,000 ft^2) will be ripped up and broken into chunks using the D8 dozer.

The water/storage pond liner (60 mil) will be removed and hauled to the Uintah County Landfill on a flatbed as part of other loads. Gravel from the equipment parking and service area (approximately 2.6 acres in size, or 1,396 CY of gravel) will be pushed into water retention pond after removal of liner with dozer. Reserve, sand and fine tails, and reject ore stockpiles (approximately 60,000 CY, total) will be loaded into trucks and hauled back to pit where an opening will be made to place unused ore in the backfilled pit.

Trash removal will occur after all buildings and facilities are removed; it will involve collection of all refuse, litter, stray metal, pipe, wood, insulation, and other debris. The 202-acre area will be inspected to check for and collect trash.

110.3 Surface Facilities to Remain

The processing plant and all associated support facilities (except the water well as noted below) and mining equipment would be removed from the site, unless economic conditions allow for continued mining, in which case the site processing facilities would remain intact on the 15-acre processing site.

The surface infrastructure associated with the water well will revert to SITLA (as will the water right and the well), thus it will remain on the site. The water pipeline will be abandoned in place.

Approximately 4,000 feet of fence with a wooden top rail (as per DWR request) will be in place when reclamation commences, as well as two metal safety gates, and safety signs. The fence and signs located along the county road will be left in place until bond release, at which time they would be removed.

110.4 Treatment, Location and Disposition of Deleterious Materials

During operations, all new and spent fuel, oil, and lubricants will be stored within secondary containment as required by the SPCC Plan, as further described in the operations Section 106.2. These containers and their contents will be removed to a licensed disposal facility prior to reclamation of the process facility. If any hydrocarbon spills occur during mining these will be dealt with as outlined in the SPCC Plan, and thus will not pose a problem during reclamation. Any fuel spills that occur during the reclamation process would be similarly managed.

Any other chemicals, including the process chemical, present during operations, would be consumed during mining and processing. Any of the stored substances remaining onsite at the end of mining would be properly removed and disposed of, prior to final reclamation. Any remaining fuels would be used to fuel equipment used in reclamation work. Fuels and liquids remaining after reclamation will be removed for disposal or re-use by a company such as Tri-State Recycling. No acid forming or deleterious material would be left on-site.

110.5 Revegetation Planting Program and Topsoil Redistribution

Table 9, below, shows that all of the 202 acres of Affected Areas will be reclaimed. This includes redistributing topsoil on all areas except those associated with the topsoil storage areas and the well pad/waterline (soils will not have been salvaged on those areas, so original topsoil will remain).

Table 9 Reclamation Treatment Acres

Facility	Affected Area (acres)	Acres to be graded	Acres to be ripped	Acres to be topsoiled	Seeded Acres
Plant Site including Office and Processing facilities	15	15	15	15	15
Main haul road	24	24	24	24	24
Plant perimeter road					
Overburden/interburden storage area haul road					
North (Opening) Pit	61.5	61.5	0	61.5	61.5
West Pit	30.5	30.5		30.5	30.5
Overburden/interburden storage area 1	25.3	25.3	0	25.3	25.3
Overburden/interburden storage area 2	26.3	26.3	0	26.3	26.3
Topsoil storage areas	15.3	0	15.3	0 (topsoil already in place)	15.3
Water line	4.4	0	0	0 (topsoil already in place)	0 (seeded per BLM ROW reclamation)
Total	202.3	182.6	54.3	182.6	197.9

SOIL MATERIAL REPLACEMENT

Once final grading is complete, as described above, topsoil will be replaced using scrapers and dozers. Topsoil would be placed on the backfilled and regraded surfaces of the pit and overburden/interburden storage areas as the mining/processing/ backfilling sequence allows. Approximately 124,200 cubic yards of topsoil will be redistributed to about a 5-inch depth with a scraper and dozer assist, over approximately 183 acres of the mine. Topsoil storage areas and the outer slopes of waste dumps will not be topsoiled.

The graded/topsoiled surfaces would be ripped with a road grader on the contour to provide a greatly roughened surface to retain seed and to enable root penetration. Vegetative matter gathered during the topsoil salvage operations and stockpiled as a component of those piles would also be spread along with the topsoil, providing organic matter and helping with soil moisture retention. Any additional salvaged vegetation that was stored in slash piles will be placed and redistributed on reclaimed areas in order to provide organic matter and surface roughness.

Equipment used for this task is likely to be a dozer, scraper and farm tractor/ implements.

SEED BED PREPARATION

As described above, the topsoil will be spread and left in a very roughened surface that will be loose but not erodible. Ripper shanks on a road grader will be used to stabilize soil, depending on field conditions. The ripper will be used with shanks spaced approximately 36 inches apart and 18 inches deep. The salvaged topsoil is expected to provide a reasonable growth medium for the site. No mulch or fertilizer will be used in reclamation efforts. The final surface will be rough, creating small depressions for water retention sites and habitat niches.

Seed Mixture

A single seed mix (below) will be used for all reclaimed surfaces and is based on sampling results and NRCS ecological site data. It allows for some choice in the actual species to account for variations in seed availability that may occur when reclamation commences. Any alterations beyond what is included in the list would require agency approval. All 198 acres affected will be seeded with a D6 tractor-pulled broadcast seeder.

Table 10: Seed Mix

SPECIES	SEEDS/LB	PLS* LB/AC
Forbs- One of the following:		
Blue flax (*Linum lewisii*)	293,000	0.25
Rocky Mountain penstemon var. Bandera (*Penstemon strictus*)	592,000	0.25
Total in seed mix		0.25
Two of the following:		
Small burnet (*Sanguisorba minor*)	55,000	1.0
Foothills goldenbanner (*Thermopsis divaricarpa*)	15,000	1.0
Lupine (*Lupinus caudatus* or *L. alpestris*)	27,600 or 18,300	1.0
Total in seed mix		2.0
Grasses - Two of the following:		
Muttongrass (*Poa fendleriana*)	890,000	2.0
Sandberg bluegrass (*Poa sandbergii*)	2,000,000	1.0
Canby bluegrass (*P. canbyi*)	926,000	2.0
Total in seed mix		3.0-4.0
Four of the following:		
Indian ricegrass (*Achnaetherum hymenoides*)	150,000	2.0
Prairie junegrass (*Koelaria machrantha*)	2,315,400	0.5
Great basin wildrye var. Magnar (*Leymus cinereus*)	130,000	2.0
Bluebunch wheatgrass (*Pseudoroegneria spicata ssp. spicata*)	140,000	4.0
Western wheatgrass (*Pascopyrum smithii*)	110,000	4.0
Total in seed mix		9.5
Shrubs - Two of the following:		
Sagebrush – Wyoming or Mountain (*Artemisia tridentata wyomingensis or vaseyana*)	2,500,000	0.25
Bitterbrush var. Lassen (*Purshia tridentata*)	15,000	2.0
Serviceberry (*Amelanchier alnifolia*)	25,800	1.0
Snowberry (*Symphoricarpos oreophilus* or *S. albus*)	75,000	1.0
Total in seed mix		1.25 – 3.0

Range of pounds of seed applied per acre with this seed array: 15.0 – 17.75 PLS lb/ac

* PLS = Pure Live Seed

Seeding Method

The seed mix would be broadcast seeded on all areas that will be reclaimed, including regraded overburden/interburden storage area slopes and pit slopes. Revegetation work, including both seedbed preparation and seed application will take place in the late fall season and seed would be spread as soon as possible following seedbed preparation.

Other Revegetation Procedures

As noted throughout this document, all reclaimed slopes will be stabilized by regrading to 2.5H:1V or flatter and leaving them in a very roughened form to maximum infiltration and minimize runoff. It is important to note that there will be little to no run-on on these reclaimed surfaces. Further, in regard to the overburden/interburden storage area slopes, the coarser materials will typically end up near the toe of the expanding fills as the dump sites are filled to their maximum capacity. The concentration of coarse materials at the toe of the fills provides a natural energy dissipater for storm runoff from the faces of the dumps. The broken rock material has a very low siltation potential and will effectively encapsulate the finer material initially placed in the waste dumps.

Earth Energy would monitor for noxious weeds, and would provide weed control measures according to County directives should noxious weeds pose a potential problem. This would be done in the early summer months each year after reclamation until bond release has occurred. The monitoring would consist of a site visit by a biologist familiar with the potential noxious weeds, and a simple visual walk around the 202-acre area would be sufficient for this small area. If any noxious weeds are identified, the County would be informed of their extent, and actions taken as directed by them.

Further, Earth Energy would qualitatively and visually monitor revegetation success for the first two years after reclamation, during the growing season. During the third summer, quantitative surveys, following the appropriate Division guidelines, will be conducted to assess revegetation success. This will determine whether revegetation has achieved 70 percent of the pre-mining cover, and survived after three growing seasons, as required by R647-4-111.13.11.

110.6 Statement

Earth Energy would conduct reclamation as required under the Utah Rules R647-4.

R647-4-112. Variance

No variances are being requested for this mining operation.

R647-4-113. Surety

A reclamation surety estimate is being provided to the Division and is summarized below. See Appendix E for the spreadsheet and backup information.

References

BLM 1984. Utah Combined Hydrocarbon Leasing Regional Final Environmental Impact Statement. Volume I: Regional Analyses.

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Utah Division of Water Resources. December 1999. Utah State Water Plan: Uinta Basin.

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Byrd, W. D., II, 1970, PR Spring oil-impregnated sandstone deposit, Uintah and Grand Counties, Utah: Geological and Mineralogical Survey Special Studies 31,34p.

Clem, Keith, 1984, Economic potential of the PR Spring oil-impregnated deposit, Uinta Basin, Utah: Utah Geological and Mineral Survey Special Studies 65, 35 p.

Gualtieri, J.L.1988, Geologic Map of the Westwater 30' X 60' Quadrangle, Grand and Uintah Counties, Utah and Garfield and Mesa Counties, Colorado.

Murphy, Leonard A., 2003. Personal communication private report.

Figures

Appendix A
Site Exploration & Summary of Lands Under Lease

Appendix C
Soils Descriptions & Vegetation Data

Appendix D
Equipment List & Process Flow Sheet

Appendix E
Surety Calculation

Appendix F
Site Photos

RE: Meeting dates for Earth Energy project
Linda Matthews to: Donald Law 06/03/2008 09:02 AM

History: This message has been replied to.

Thanks DJ.

Would you please provide a meeting agenda and list of attendees from EPA?

Thanks,
Linda
JBR

-----Original Message-----
From: Law.Donald@epamail.epa.gov [mailto:Law.Donald@epamail.epa.gov]
Sent: Monday, June 02, 2008 2:33 PM
To: Linda Matthews
Subject: RE: Meeting dates for Earth Energy project

That is probably reasonable provided traffic isn't too much of a headache.

DJ Law, Environmental Engineer
Phone: (303) 312-7015

Protecting the environment is everyone's responsibility. Help EPA fight pollution by reporting possible harmful environmental activity. To do so, visit EPA's website at
http://www.epa.gov/compliance/complaints/index.html

"Linda Matthews" <lmatthews@jbrenv.com>
06/02/2008 02:18 PM

To: Donald Law/R8/USEPA/US@EPA
cc:
Subject: RE: Meeting dates for Earth Energy project

DJ:

We can start at 9:00 am. .. That's assuming that we fly over that morning (arriving at 8:15), and it takes 1/2 hr. to get to your office - is that reasonable, or should we allow more time?

Thanks.
Linda

-----Original Message-----
From: Law.Donald@epamail.epa.gov [mailto:Law.Donald@epamail.epa.gov]
Sent: Monday, June 02, 2008 2:06 PM
To: Linda Matthews
Subject: Re: Meeting dates for Earth Energy project

Linda,

It looks like the best day here will be the 16th. What time would you be available to begin that morning?

DJ Law, Environmental Engineer
Phone: (303) 312-7015

"Linda Matthews" <lmatthews@jbrenv.com>
05/28/2008 10:55 AM

To: Donald Law/R8/USEPA/US@EPA
cc: "Erin Hallenburg" <ehallenburg@jbrenv.com>
Subject: Meeting dates for Earth Energy project

Hello DJ:

Based upon input from JBR's air quality team and Earth Energy, the following are potential meeting dates: June 9, 12, 13 (as I recall Fridays are bad for you), 16.

Please let us know what works for you.
Thanks.
Linda--

Linda J. Matthews
jbr environmental consultants, inc.
8160 S. Highland Drive, Sandy, Utah 84093 Ph. 801.943.4144 Fax.
801.942.1852

RE: Meeting dates for Earth Energy project
Linda Matthews to: Donald Law 06/02/2008 02:15 PM

History: This message has been replied to.

DJ:

We can start at 9:00 am. .. That's assuming that we fly over that morning (arriving at 8:15), and it takes 1/2 hr. to get to your office - is that reasonable, or should we allow more time?

Thanks.
Linda

-----Original Message-----
From: Law.Donald@epamail.epa.gov [mailto:Law.Donald@epamail.epa.gov]
Sent: Monday, June 02, 2008 2:06 PM
To: Linda Matthews
Subject: Re: Meeting dates for Earth Energy project

Linda,

It looks like the best day here will be the 16th. What time would you be available to begin that morning?

DJ Law, Environmental Engineer
Phone: (303) 312-7015

"Linda Matthews" <lmatthews@jbrenv.com>
05/28/2008 10:55 AM

To: Donald Law/R8/USEPA/US@EPA
cc: "Erin Hallenburg" <ehallenburg@jbrenv.com>
Subject: Meeting dates for Earth Energy project

Hello DJ:

Based upon input from JBR's air quality team and Earth Energy, the following are potential meeting dates: June 9, 12, 13 (as I recall Fridays are bad for you), 16.

Please let us know what works for you.
Thanks.
Linda--
Linda J. Matthews
jbr environmental consultants, inc.
8160 S. Highland Drive, Sandy, Utah 84093 Ph. 801.943.4144 Fax. 801.942.1852

Meeting dates for Earth Energy project
Linda Matthews
to:
Donald Law
05/28/2008 10:53 AM
Cc:
"Erin Hallenburg"
Show Details

History: This message has been replied to.

Hello DJ:

Based upon input from JBR's air quality team and Earth Energy, the following are potential meeting dates: June 9, 12, 13 (as I recall Fridays are bad for you), 16.

Please let us know what works for you.
Thanks.
Linda--
Linda J. Matthews
jbr environmental consultants, inc.
8160 S. Highland Drive, Sandy, Utah 84093
Ph. 801.943.4144
Fax. 801.942.1852

Earth Energy PR Spring Project Emission Factors
Linda Matthews
to:
Donald Law
05/23/2008 02:58 PM
Cc:
"Erin Hallenburg", "Denise Kohtala", "Barclay Cuthbert"
Show Details

1 Attachment

EE_Emissionfactors_Memo_5-23-08_to EPA.pdf

Hello DJ:

Please see the attached memo. I will be sending you a list of potential meeting dates in another email.

Thank you.
Linda
--
Linda J. Matthews
jbr environmental consultants, inc.
8160 S. Highland Drive, Sandy, Utah 84093
Ph. 801.943.4144
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Memo

To: DJ Law/EPA Region 8

From: Erin Hallenburg; Denise Kohtala/JBR

CC: Linda Matthews/JBR; Barclay Cuthbert/Earth Energy

Date: May 23, 2008

Re: Earth Energy Tar Sand's Emission Factors

The following emission factors were used to submit the Notice of Intent (NOI) to Utah Division of Air Quality (UDAQ) for Earth Energy's Tar Sands Project. Subsequently, the permitting authority has switched to EPA Region 8. As requested, we are presenting emission factors used in our application. Several emission factors, developed mostly by the State of Wyoming, could be used when properly characterizing tar sand operations. Below, we have shown each source category and the reference to the emission factor used.

Process Emissions:

AP-42 emission factors from Chapter 11.19 for Crushed Stone Processing were used to calculate tar sands crushing and the overburden to be crushed for road base. These factors were chosen because the tar sands are sandstone and the overburden is limestone, sandstone, and shale. The overburden crushing factors are representative, but these tar sand crushing factors likely overestimate emissions.

Top Soil, Overburden, and Tar Sand Removal Emissions:

State of Wyoming approved emission factors were used to calculate emissions resulting from the removal of topsoil, overburden, and the tar sands. The State of Wyoming factors were used as it was thought that they would be more representative of the material in Utah than the AP-42 Chapter 11.9 for Western Surface Coal Mining factors.

50 percent (%) control efficiency was applied to the overburden removal to account for dust suppression methods such as watering. A 70% control factor was applied to the removal of the tar sands as they contain bitumen and are will not generate the amount of dust that the overburden will. While topsoil and overburden factors are representative, emissions from the removal of tar sands are likely greatly overestimated, especially if "no control" is considered.

Stockpile Loading and Unloading Emissions (Overburden and Tar Sands):

Stockpile disturbance emissions were calculated using AP-42 Chapter 13.2 Aggregate Handling and Storage piles. These are the nearest representative factors of the material being stored at the Earth Energy Tar Sand Mine, but likely overestimate fugitive particulate emissions.

Exposed Area Wind Erosion Emissions:

Emissions from exposed area wind erosion were calculated using AP-42 Chapter 11.9 for Western Surface Coal Mining. These factors were chosen as they are accepted emission factors for calculating disturbed area emissions by the Utah Department of Air Quality. These factors probably greatly overestimate particulate emissions for tar sands.

Unpaved Haul Roads and Loader Roads:

Emissions from haul roads were calculated using AP-42 Chapter 13.2.2 emission factors for unpaved roads.

Diesel Generators:

Emissions from the diesel generators were calculated using both EPA Tier 2 emission factors and AP-42 Chapter 3.3 for small diesel engines.

Natural Gas Engines:

The remaining emissions were calculated using controlled emission factors of 1.0 g/hp-hr for NOx and CO and AP-42 Chapter 3.2.

External Combustion Sources:

Emissions from the heaters and boilers were calculated using AP-42 Chapter 1.4 Natural Gas Combustion emission factors.

Tank to Truck Loading Emissions:

Tank to truck loading emissions from the crude oil storage tanks were calculated using AP-42 Chapter 5.2 Transportation and Marketing of Petroleum Liquids emission factors.

Tank Working/Breathing Emissions:

Crude oil tank working and breathing emissions were calculated using EPA Tanks 4.02 with the appropriate input values.