Frontier Observatory for Research in Geothermal Energy – Milford Site, Utah

Task 2A.5 – Detailed Techno-economic Infrastructure Assessment; Analysis, Budget, Schedules, and Cost Summaries

February, 10, 2017

TASK 2A.5: TECHNO-ECONOMIC INFRASTRUCTURE ASSESSMENT AND ANALYSIS OF INFRASTRUCTURE REQUIREMENTS

INTRODUCTION

Analysis of the existing infrastructure and the Phase 2B-C and 3 activities indicates the FORGE Utah site can be upgraded without significant enhancements in order to build a state of the art EGS field laboratory. In this analysis, we have considered the existing network of roads, requirements for well pad construction and scientific investigations, day-to-day management activities, visitor (public and scientists) access, operational costs including availability of water and essential services (e.g. fuel, road maintenance, sanitation services), the needs for electric power, requirements for data collection and transmission, and the potential effects of Smithfield's planned hog farms north of Milford. Drilling of the deep test well in Phase 2B requires only minor upgrading of existing roads and construction of the drill pad. Subsequent infrastructure development can be accommodated in Phase 2C within the designated timeframe to meet all drilling and scientific activities required of the project. Significantly, no cultural or environmental constraints have been identified that interfere with development of new infrastructure or that delay construction of laboratory site facilities.

A. DESCRIPTION OF EXISTING INFRASTRUCTURE

The location of the Utah FORGE site is ideally suited for a subsurface research facility. It is located in a sparsely populated portion of the state that enthusiastically supports renewable energy projects (Figure 1). The site is located within the Milford Renewable Energy Corridor adjacent to PacifiCorp's 36 MW Blundell geothermal power plant (Roosevelt Hot Springs) and SunEdison's 306 MW windfarm and 240 MW solar PV field. Approximately 25 km southwest of Milford, Cyrq operates the 10 MW Thermo geothermal plant. A 15 MW biogas facility owned by Smithfield is located closer to Milford. In October 2016, Ormat leased BLM land surrounding the Blundell Power Plant for geothermal exploration and development. Their westernmost parcel lies adjacent to the FORGE site. In January 2017, Smithfield released plans for construction of 66 new hog farms immediately west and north of the FORGE site. Construction of the Smithfield facilities will have a major impact on infrastructure planning and development in the area, particularly with respect to the road system and new transmission lines. Potential effects of Smithfield's developments are discussed below. Smithfield has enthusiastically supported the FORGE project (see email and MOU included as part of the Phase 2A report).

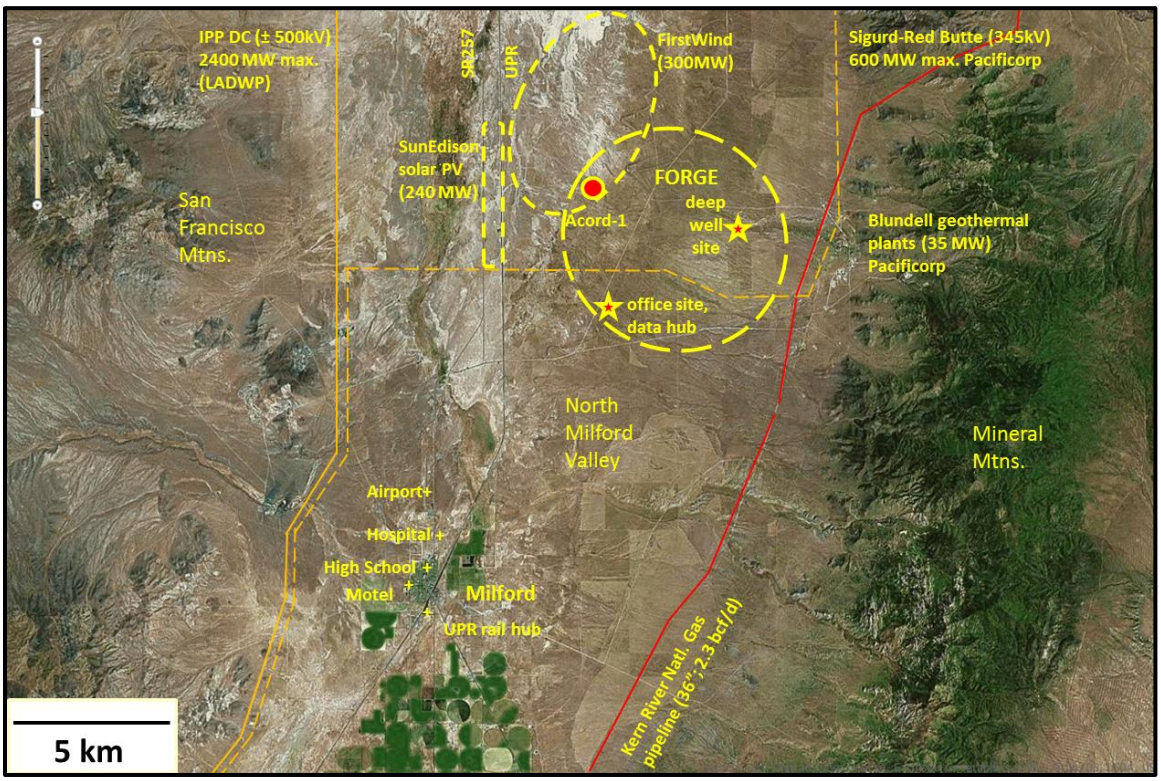

Figure 1. *Overview of major infrastructure around the FORGE site. The IPP DC transmission line and the Kern River Natural Gas pipeline supply a large part of Southern California's energy needs. In addition, the area around Milford is a center for renewable power generation.*

The existing roads provide excellent access to the FORGE and office site. To ensure access to the site during the winter months when snow might be present, we will contract for snow removal services. Portions of the existing roads will be graveled to reduce damage by heavy equipment required for drilling and stimulation operations.

A variety of support services can be locally obtained in Milford, in Beaver (31 miles to the west), or Cedar City (54 miles to the south). Milford, which is 10 miles from the FORGE site, has two gas stations, a hospital, a high school, water for purchase, waste-dump facilities, an airport, a railroad line, an Ace Hardware store, and an all-night eating establishment and motel (Penny's). Rollins Machine Company in Milford can provide earth moving, water hauling and construction equipment. Milford is serviced by Route 257 from the north (Delta) and Route 130 from the south (Minersville, Beaver). Both are two lane-paved roads. The Union Pacific rail (UPR) line parallels Route 257 and, if needed, can be used for transport of heavy equipment. The line runs north-south passing through Milford and close to the FORGE site. Milford is a hub for changing UPR crews.

The Milford Municipal Airport is 1.5 miles north of Milford. It has a 5000 ft paved runway that is suitable for small aircraft.

Beaver is located adjacent to Interstate 15, the main north-south highway in Utah, and approximately halfway between Salt Lake City and Las Vegas. The 200 mile drive from Salt Lake City takes about 3 hours. Beaver has numerous eating establishments, service stations and motels. Both Salt Lake City and Las Vegas have international airports to serve overseas visitors.

Cedar City has a population of 29,000 that is growing. It has a regional airport with service from Salt Lake City, and it is home to Southern Utah University and a regional Shakespeare festival. Numerous motels and eating establishments support the university and visitor activities. Both the UGS and the BLM have offices in Cedar City.

Diesel fuel and propane are available in Cedar City and can be provided by Jensen Oil & C Stores. Rollins Machine in Milford can provide a range of light to heavy equipment and qualified operators.

There are several sources of water available for the project. Water for drilling the 7000 ft well that will be drilled in 2B can be can be purchased from Milford and trucked to the site approximately 10 miles away. Smithfield's water wells are located approximately 6 miles north of the drill pad. These wells provide an alternative source of water under a lease agreement between Smithfield and the University of Utah. Because the water near the FORGE site in North Milford Valley is not potable, bottled water will be used for drinking and cooking. A small-diameter water well at the office site (water level at 150 ft depth) or water piped from the proposed groundwater wellfield to the office can be used for non-culinary purposes.

The FORGE project has acquired sufficient water for drilling, stimulation and heat-sweep testing. We have acquired rights to 300 acre-feet per year from the State and Smithfield has agreed to lease an additional 200 acre-feet to the project if required (see attached MOU). A portion of the water (50 acre-feet per year) is for consumptive use to allow for evaporative cooling of the produced hot water if needed.

A well that was drilled to 12,650 ft depth in 1979, Acord-1, was lightly plugged and is potentially available for testing tools and possibly also for experiments in the granite section at the bottom of the well. The well will be cleaned out during Phase 2C.

There are several existing groundwater wells near the FORGE site that will be available for monitoring water level and water quality. These are discussed under the section "Groundwater Supply Wells".

The Project plans to reduce infrastructure costs wherever possible by taking advantage of 3rd party upgrades. Smithfield's planned hog farm development adjacent to the FORGE site will require new transmission lines and roads, water wells, and road maintenance. Currently, the

nearest residential power line hookup is located approximately 3 miles southwest of the proposed FORGE office site. This line can provide up to about 200 kW to the FORGE project, which will be sufficient for groundwater pumping and the office facilities. Additional power will be required to run the injection and production pumps at the FORGE site, but these pumps will not be needed until 2020 or later. Smithfield has informed us they plan to begin construction of the hog farm this year. Utilizing infrastructure developed by Smithfield, rather than initiating new upgrades, will reduce FORGE expenditures and, in our opinion, represents the prudent approach to infrastructure development of the FORGE laboratory. Detailed analyses of the electrical needs and costs, including the use of diesel generators, are discussed below in sections on Phase 2C and 3.

B. DESCRIPTION OF PLANNED INFRASTRUCTURE UPGRADES AND NEW INFRASTRUCTURE

The project will showcase state of the art technologies for EGS reservoir testing and development. The supporting infrastructure that needs to be constructed and/or upgraded is shown in Figure 2 and includes:

1. An office building housing the visitor center, communications hub, parking and storage/workshop facilities
2. Expansion of the transmission line for electric power
3. Water wells and water pipeline
4. Fiber optic line to allow connection to the internet for remote data monitoring
5. Drill pads and facilities for heat-sweep testing
6. Monitoring networks (seismic, GPS, tiltmeter) for imaging reservoir formation and growth
7. Road upgrades

These are discussed separately below, and in each case the risks and uncertainties are identified.

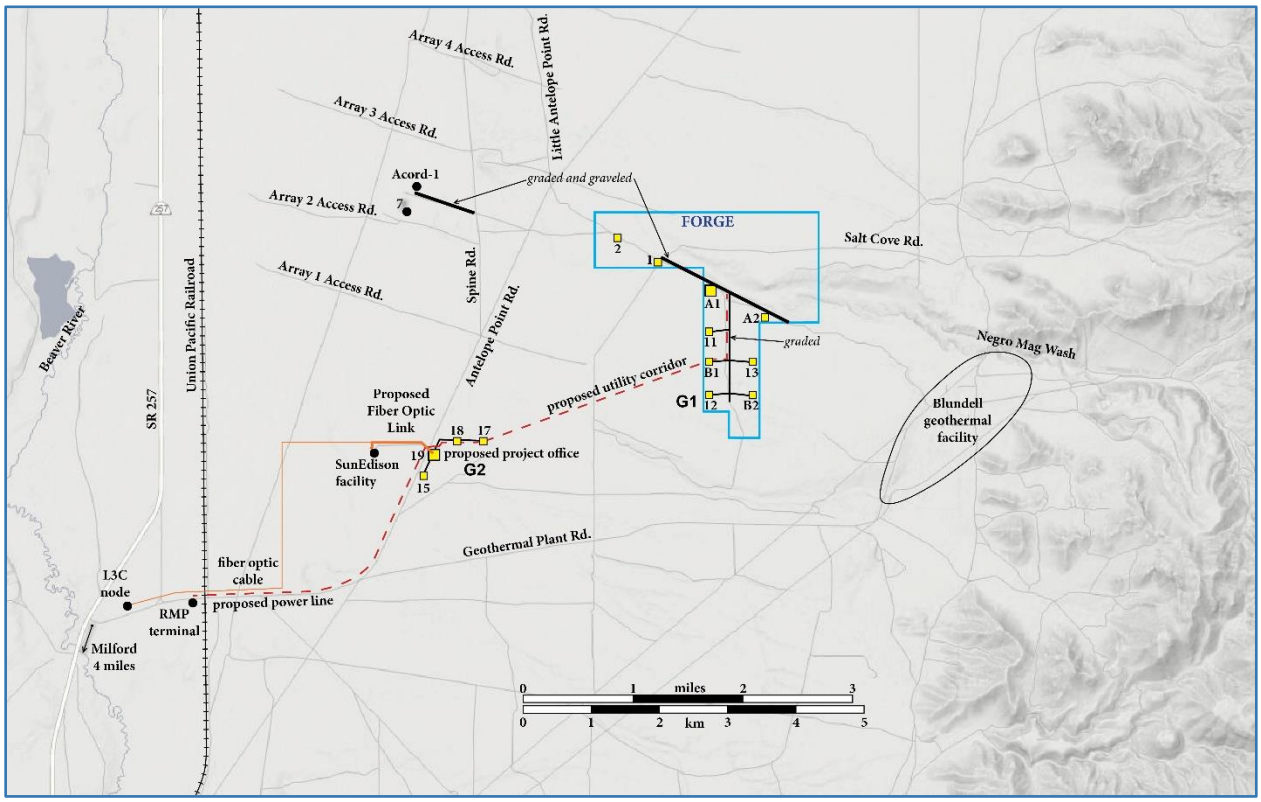

Figure 2. *Locations of new and existing facilities and roads. Labeled roads are maintained by Beaver County. SR257 is the main road linking Milford to Delta, and it is maintained by the State of Utah. Small numbered squares are potential water well sites. A1, A2, B1 and B2 are possible well pads. The deep 7000 ft well in Phase 2B will be drilled at A2; the strongly deviated production and injection wells required for Phase 3 will likely be drilled from A1. B1 and B2 are alternate sites for the deep wells if the A1-A2 area is found to be unsuitable during Phase 2B characterization work. The utility corridor is available for power, water and fiber optic lines. Light gray lines are existing roads shown on the state roads database; the bold black lines within the FORGE site, and linking to the existing Acord-1 well, show where existing roads will be graded and graveled to accommodate the drilling and stimulation equipment (discussed in more detail below). There are two scenarios, G1 and G2, for water wells which also have implications for the power line.*

LANDOWNERS

The FORGE site is about 2 square miles in area and comprises mostly Utah School and Institutional Trust Lands Administration (SITLA) and Smithfield land (Figure 3). All proposed deep drilling will be on land owned by SITLA. Smithfield owns the adjacent land (half-sections to the west and south) that could have groundwater wells drilled on them. Both SITLA and

Smithfield are supportive of the project. There are two owners of private land parcels, for which one is 40 acres (Patricia Rule, Q on Figure 3) and the other is 80 acres (Fort Churchill Corp., EE on Figure 3) in the northwest corner of Section 32; both owners have also expressed support for the project. They were recently informed that during the course of geophysical surveying during 2017 (Phase 2B) vehicles and survey crews on foot may cross their land, but their land will not be involved in the project after that surveying is complete.

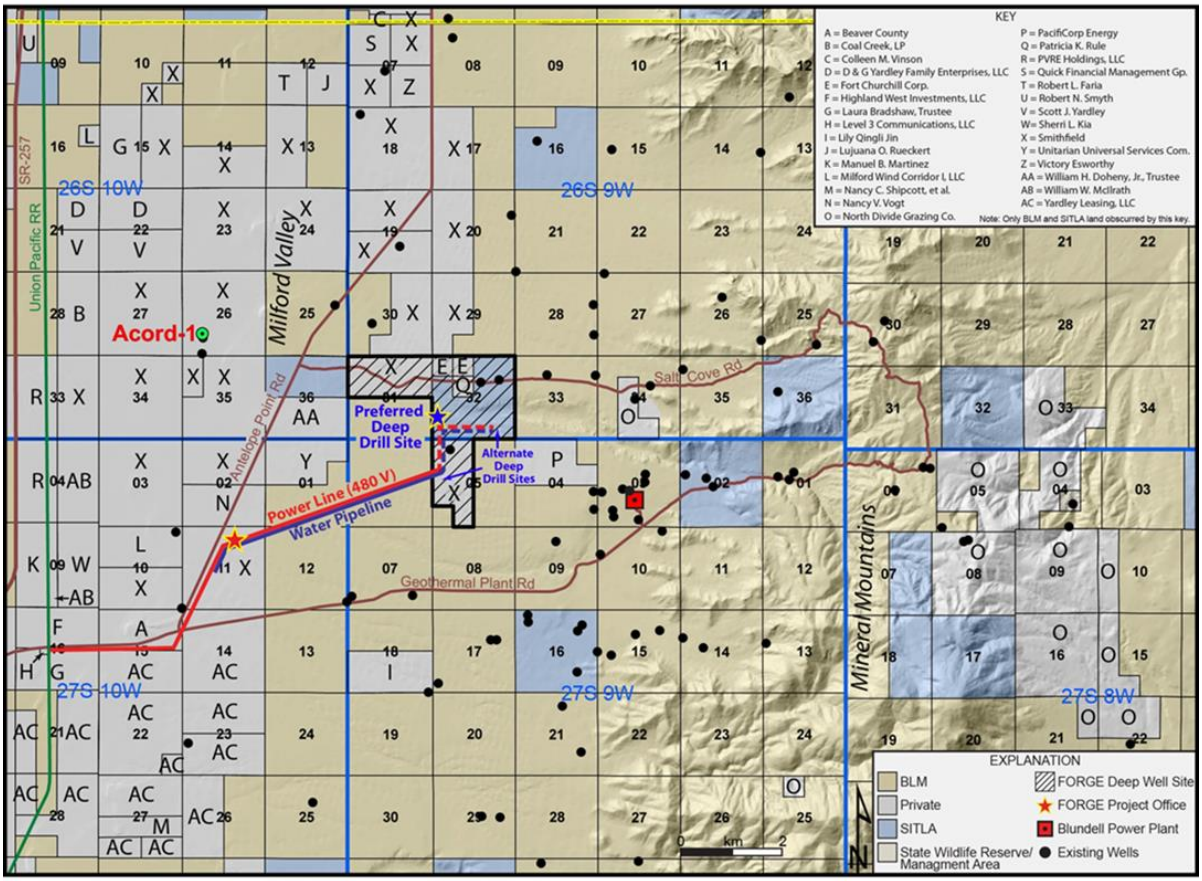

Figure 3. *Site ownership around the Milford FORGE site. The location of the site is shown by diagonal hachures. Ownership data are from the Beaver County Recorder's Office. Details of proposed site activities are shown in subsequent figures. Black dots are existing wells; most are thermal gradient wells drilled during intense geothermal exploration in the late 1970s and early 1980s and are now unusable due to degradation of the pipe left in the holes.*

The BLM land surrounding the FORGE site will be subject to minimal use. Apart from a 100 ft wide utility corridor crossing two BLM sections between the project office and the FORGE site, there will be no further impact on BLM land. PacifiCorp owns a half-section on the east side of the Forge site (Labeled P on Figure 3). They are also supportive of the project, and they will permit installation of a seismometer in that section. Ormat Nevada Inc. successfully bid for geothermal exploration leases on BLM sections around the Blundell facility (Figure 4). The

FORGE deep wells will be in Section 32 on the west side of one of the sale parcels picked up by Ormat. There has been limited discussion on access to data already acquired by FORGE.

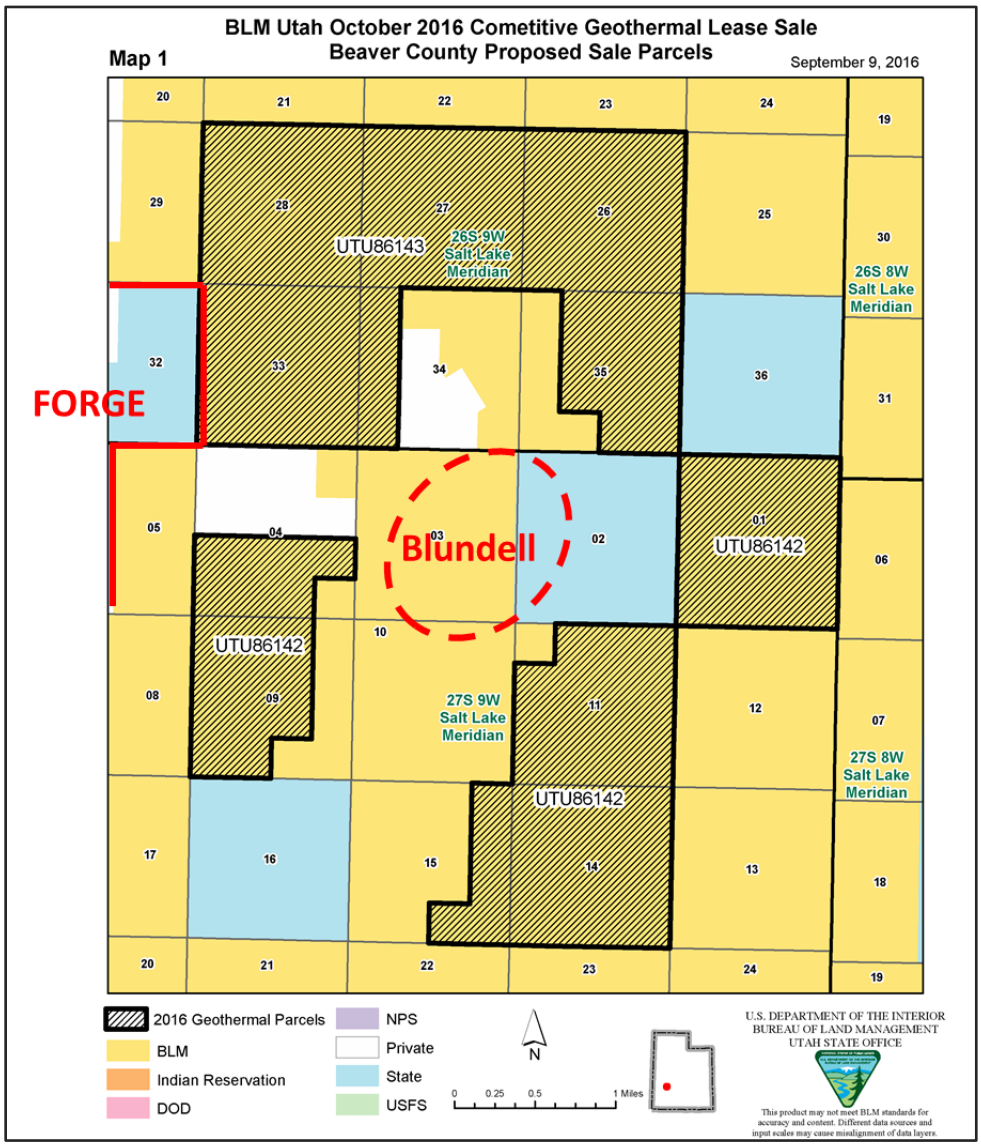

Figure 4. *Geothermal exploration leases acquired by Ormat in September 2016. Solid red lines show the eastern edge of the FORGE site; dashed red oval shows the outline of the Blundell steam field.*

Uncertainties and Risks

With all the landowners around the FORGE site being supportive of the project, there are no risks to land access and use. All landowners have been informed about the project, and there have been presentations at two meetings of the Beaver County Commission, and one meeting

of the Milford City Council. A stake-holder fieldtrip was run during Phase 1, and the Beaver County Journal (newspaper) wrote an article about the project in October 2016, immediately after the Milford City Council presentation. There has been no opposition to the project. We are strongly committed to effective communication in keeping the public and all stakeholders informed about activities and developments as the project progresses.

OFFICE SITE

The Utah FORGE project will require an office to:

1. Serve as a visitor's center where the public can obtain information on FORGE
2. Provide a secure facility for researchers to meet and store equipment, receive safety training, and receive and send packages and equipment
3. Serve as a data hub for the collection and transmission of field and test data
4. Store auxiliary equipment for project needs
5. Serve as a gathering site in the case of emergencies
6. Provide emergency sleeping quarters

The proposed site will be located adjacent to Antelope Point Road approximately 0.5 miles east of the SunEdison Maintenance Office. The FORGE office will be located on a gated and fenced 1.5-acre lot. Figure 5 illustrates the layout for the office site and supporting facilities.

The site has several important advantages. It is adjacent to a county maintained road with easy access to Route 257, the main road to Milford. It is close to the rail line and airport. SunEdison, the current owner of the windfarm, provides 24-hour security for its facilities and office. The proximity of the SunEdison office to the FORGE office will provide extra security during periods when no one is at the FORGE site. The FORGE office compound is adjacent to an existing fiber optic cable and the proposed electric power line that will be constructed for the FORGE project. The land proposed for the office compound is flat, easily graded, contains no identified cultural resources and is on private land owned by Smithfield. The water table at this location is at a depth of <150 ft depth. Tests of the well at the SunEdison facility indicate an adequate supply of water could be obtained from a shallow well for nonpotable use, including washing, non-culinary applications and fire-fighting. Scenario G2 for the groundwater supply has the wellfield close to the office site. Alternatively, water could be piped from the groundwater well field located to the east if scenario G1 is adopted.

The compound will have an office/visitor center, two storage containers for equipment owned by the University of Utah and the researchers, and an additional container unit which will be fitted out as a lab and workshop facility. These facilities will provide security for equipment required by the management and research teams working at the site. The compound will have

adequate space for parking vehicles and trucks making deliveries and pickups, and for storing large items such as casing and water pipes. For security, the compound will be fenced with a locking gate, and lit at night. Cameras will be placed around the compound for additional security. We have included the cost of solar panels to provide electricity for the office.

The office is not intended for use as permanent living space. It will contain a dining and kitchen area, offices for the Site Manager and data hub, a room for conferences, a small visitor's reception area, a bathroom, and a small sleeping area. Adequate motel and dining facilities for team members and researchers are available in Milford and in Beaver.

Both the University of Utah and the State have expressed support for a visitor's center and educational signage. At the moment, there are display panels near the southern end of Antelope Point Road, but these only describe wind energy and the wind turbines. A new panel display next to the FORGE office compound will expand awareness of the geothermal potential and the technology development planned at for the site.

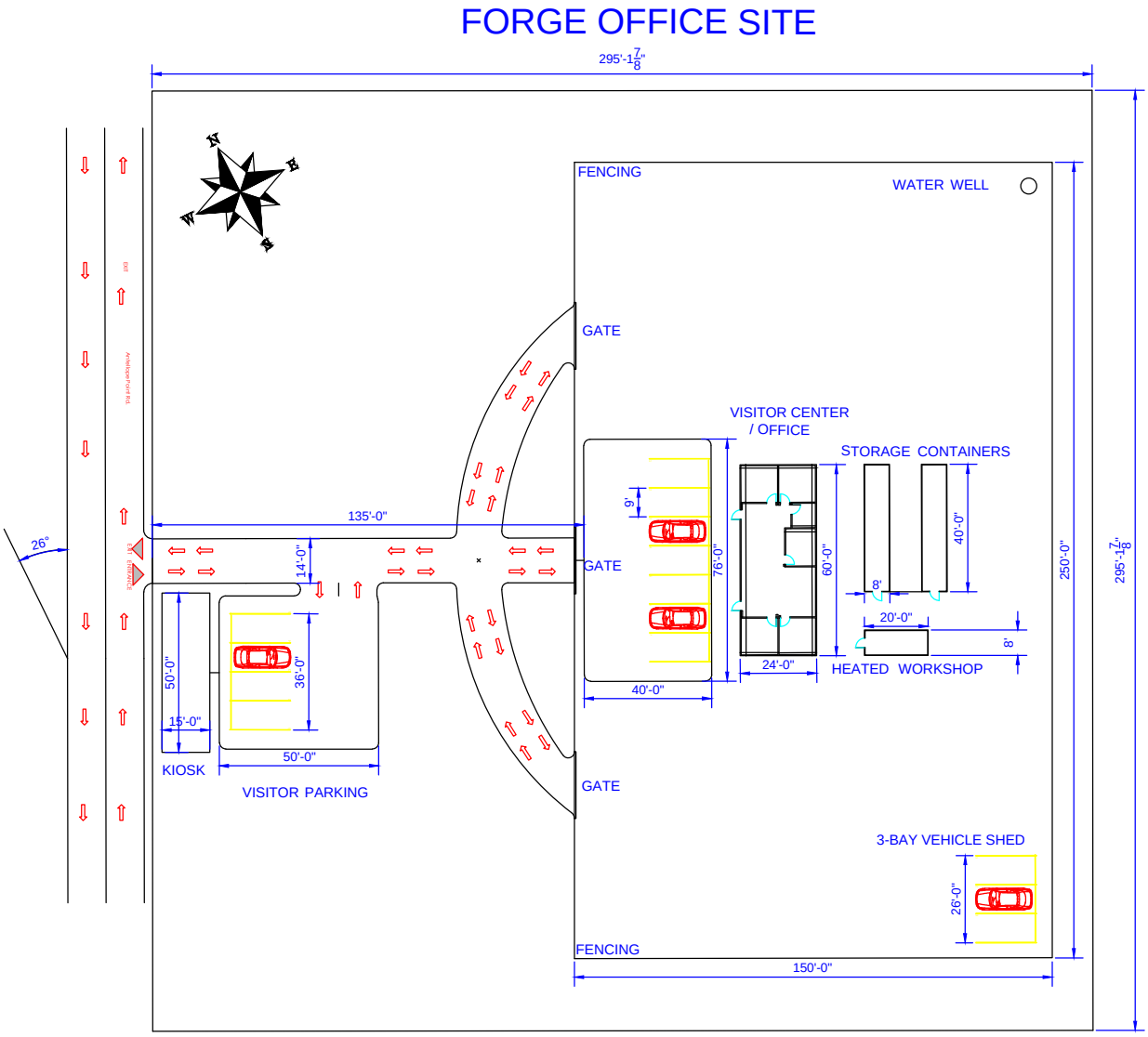

***Figure 5**. Layout of office site, and possible design of the office.*

Alternative site options

Several alternatives were considered for the office site. These include a site ~3 miles north of the proposed site on Antelope Point Road, renting space within the SunEdison office, and renting space in Milford. Secure storage facilities are also available in Milford.

The primary objection to the northern site is its remote location. Activity at the office compound will be limited during non-daylight hours and when no drilling or stimulation activities are occurring. The site's security is important, and this northern location offers no advantages in this regard or cost savings in respect to construction.

We have discussed the possibility of renting office space in the SunEdison facility with their manager. Utilizing their existing space has some cost advantages to the FORGE project but a secure storage yard would still be required and this could greatly increase foot and vehicle traffic at the SunEdison facility. SunEdison expressed that non-company visitors to a FORGE office in their facility will not be allowed in order to adhere to NERC security policies. Sun Edison are undergoing chapter 11 bankruptcy restructuring, and their wind farm has been offered for sale. A new buyer is expected to be announced early in 2017.

We evaluated the availability of suitable rentable office space in Milford but there is none. Even so, Milford is too far from the FORGE site to store equipment and to serve as a hub for scientific studies and day-to-day operations.

Uncertainties and Risks

There are no risks or uncertainties in locating and constructing the office site. At this point, our preferred office site (Figure 2) is mostly influenced by practical issues such as proximity to the FORGE site. The large hog farm development Smithfield is planning throughout the area of the windfarm (discussed below) is expected to have a positive effect on FORGE infrastructure development. Their development will require upgrades in power and communication lines, road construction and maintenance and groundwater wellfield development. Thus there may be synergies in our preferred office site and preferred groundwater wellfield (option G2) with their operations and a possible truck-washing facility on the opposite side of Antelope Point Road.

VERTICAL WELL DRILL PAD

In Phase 2B, a 7000 ft vertical well will be drilled on pad A2. Figure 6 shows the general layout for the pad. The well will be located above the toes of the deep production/injection wells. In Phase 2B, the well will provide direct information on temperature, rock type and stresses within the granite reservoir. In Phase 3, geophones will be installed in the well to monitor crack formation and growth as the reservoir develops between the deep production and injection wells. This should allow very accurate detection of microseismicity associated with reservoir enhancement. At other times, the well can be used by researchers for testing tools and new techniques for monitoring the reservoir.

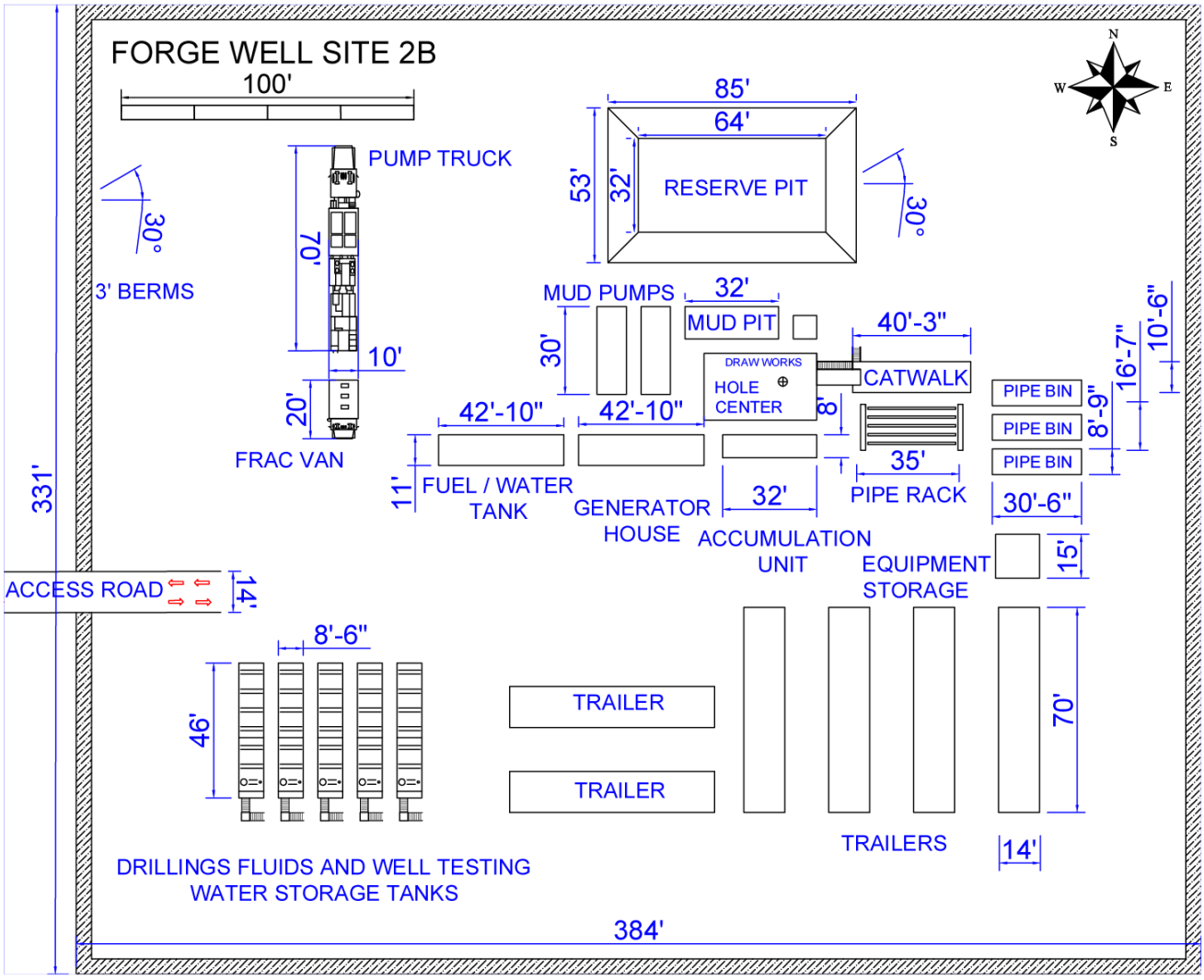

Figure 6. *Layout of the A2 pad for the 7000 ft vertical test well during drilling.*

Once the drilling and testing of the well are complete, the trailers, storage tanks and drilling equipment will be removed. A large water storage tank will be installed after the site is cleared to provide water for drilling and stimulating the deep production/injection wells. The pad will be surrounded by a berm in case there are any spills. The site will be reclaimed at the end of the project.

Uncertainties and Risks

The primary purpose of this 7000 ft well is to establish the thermal regime and characteristics of the granite beneath the FORGE site. There are always risks during drilling that result from equipment failures and unexpected drilling conditions (e.g. major loss zones), particularly at sites that have not been previously drilled. Uncertainties in drilling costs are always greatest for the first well, but decrease as site-specific experience is gained. A team with strong experience in drilling hot granitic rocks designed the drilling plan and will supervise the drilling. The design of the well and the testing once the hole reaches total depth is described in the Environmental Impact Volume (p. 16). The plan includes direct measurements of temperature, permeability, rock type and stress.

During drilling operations, a minimum of 50,000 gallons of cool water will be stored on site. The well will be drilled through a Blow-out Preventer (BOP), although the likelihood of its necessity is low.

During Phase 2B, in addition to the drilling and testing of this deep vertical well, a variety of geoscientific surveys will be conducted to develop an improved three-dimensional image of the site. Possibly the most important is the 3-D seismic reflection surveying using state-of-the-art data acquisition and interpretation techniques. At the end of Phase 2B, all the technical information will be integrated. Although considered unlikely, if for some reason the reservoir site beneath pads A1 and A2 does not meet FORGE requirements, the deep drilling site can be shifted south by 0.75 miles to pads B1 and B2. The B pads are also covered by seismic reflection and other geophysical surveys.

WATER SUPPLY WELLS

Water will be required for drilling the deep wells, the stimulation activities, and subsequent circulation testing. Water rights for 250 acre-ft per year (81 million gallons/year) of non-consumptive use and 50 acre-ft per year (16 million gallons/year) for consumptive use have been acquired by the project. An additional 200 acre-ft of water has been offered by Smithfield under a lease arrangement. The pump requirements for supply wells and getting water to the main storage tank on drill pad A2 are expected to be the main source of power demand for the first few years of Phase 3. Pad A2 is about 100 feet higher than pad A1, so water can flow to smaller tanks on A1 during the drilling, stimulation and circulation testing in Phase 3. The drilling activities during Phase 2B will use water trucked in from either Milford City or from Smithfield groundwater wells about 7 miles north of the FORGE site.

Two to three water supply wells may be required to supply the required water for Phase 3 based on the productivity of a supply well drilled for the First Wind/SunEdison maintenance facility (Figure 2). A transfer pump will be required to pipe water to a tank on pad A2. Two

scenarios have been considered for the water supply system (called G1 and G2; Figure 2). Scenario G1, in the west half of Section 5, is the option closest to the deep wells, with the groundwater wells between 0.5 and 0.8 miles south of pad A2. This option requires power to be extended to at least a distance of over 6 miles from the Rocky Mountain Power terminal (assuming the pumps receive power from the electric line). The alternate groundwater wellfield at G2, near the office compound, requires a power line of half that distance and half the cost. Comparisons of G1 and G2 wellfield scenarios are shown in Figures 7 and 8, and an economic analysis is included in the discussion of Phase 2C. A discussion of the power requirements is also contained in the next section of this report. The option of having the groundwater supply wells in the western half-section of the FORGE site (i.e. near wells 1 and 2 in Figure 2) was not seriously considered because of the remote possibility of drawing down the groundwater table close to the wind turbine lines. The western half-section of the FORGE site is about half a mile from the eastern end of wind turbine array 3, and simple numerical modeling has suggested the extent of drawdown from sustained production could extend up to a mile.

Although the water table is deeper at G1 than near the office compound, the head (elevation) is the same because of the 400 ft difference in ground surface elevation. Therefore, the required lift to get water to Pad A2 should be similar for the G1 and the G2 wellfields. Although the power line to G1 is longer, the length of surface piping will be much shorter for the G1 wellfield. A groundwater well at the SunEdison facility near G2 has proven permeability, a temperature of 88^{o}F (31°C), and total dissolved solids (TDS) content of 4000 mg/kg, so there is confidence that wells at G2 will have the required productivity. The temperature of the groundwater beneath G1 is expected to be about 140°F (60°C) and the TDS content of about 6000 mg/kg, but the permeability of the alluvium between the inferred water level at about 500 ft depth and the assumed maximum depth of groundwater wells about 1000 ft is unknown. It is possible the alluvium is cemented because of hydrothermal alteration. Inspection of shallow drill cuttings from the 7000 ft deep well from Phase 2B will help determine if this is the case. Comparative cost analysis shows that the increase in cost of building the pipeline in G2 is considerably less than the cost of running the power line to G1, making G2 a much more cost effective option. Furthermore, the most likely location for Smithfield's new power line will follow Antelope Point Road (Figure 3) to the north, passing the office and coming close to the deep well site. A detailed analysis is given in Tables 3, 4, and 5. Thus it is prudent to wait until Smithfield's plans for new transmission lines are developed before we embark on costly engineering designs and power line construction.

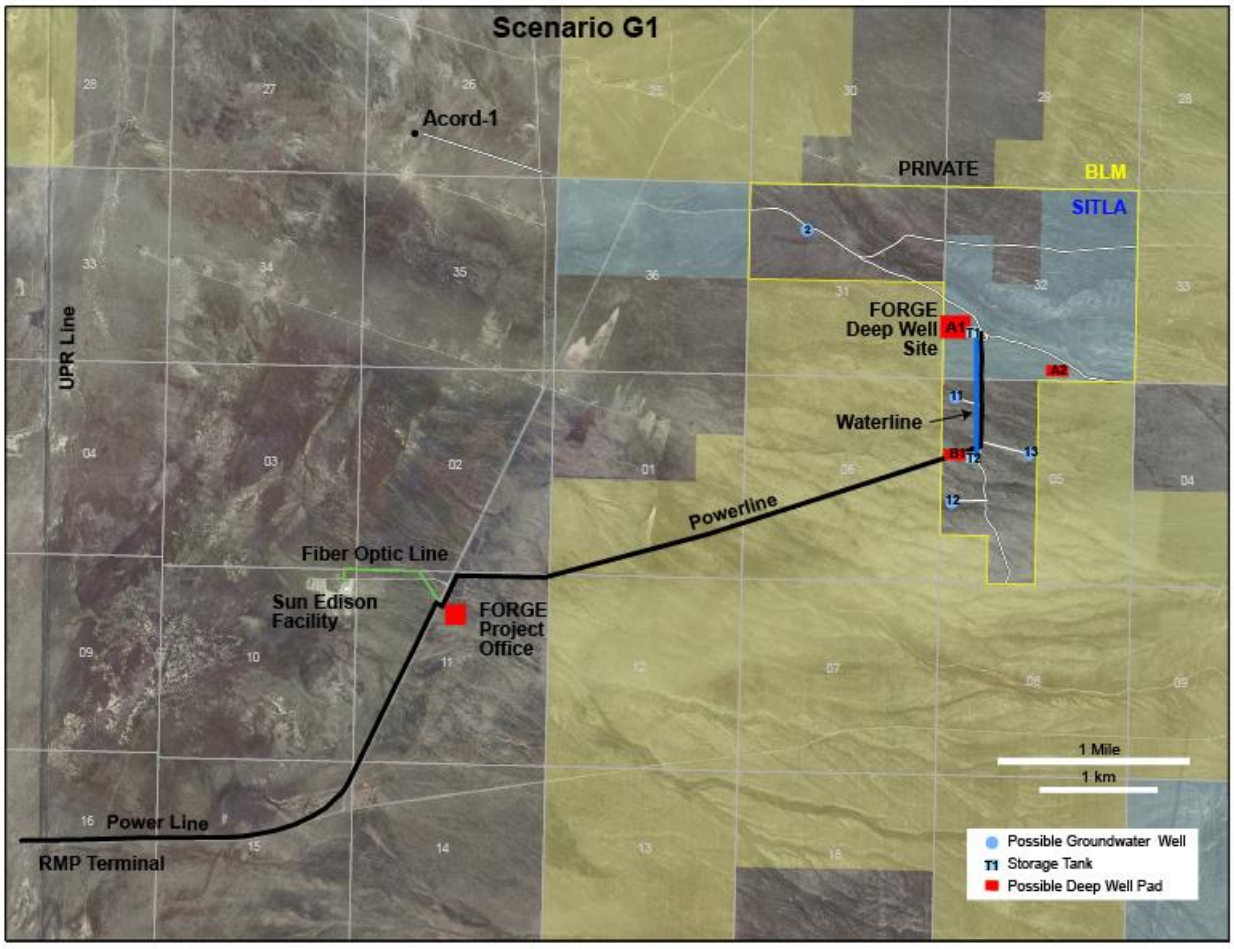

Figure 7. *Details of the power line, pipeline and water tanks required for wellfield G1.*

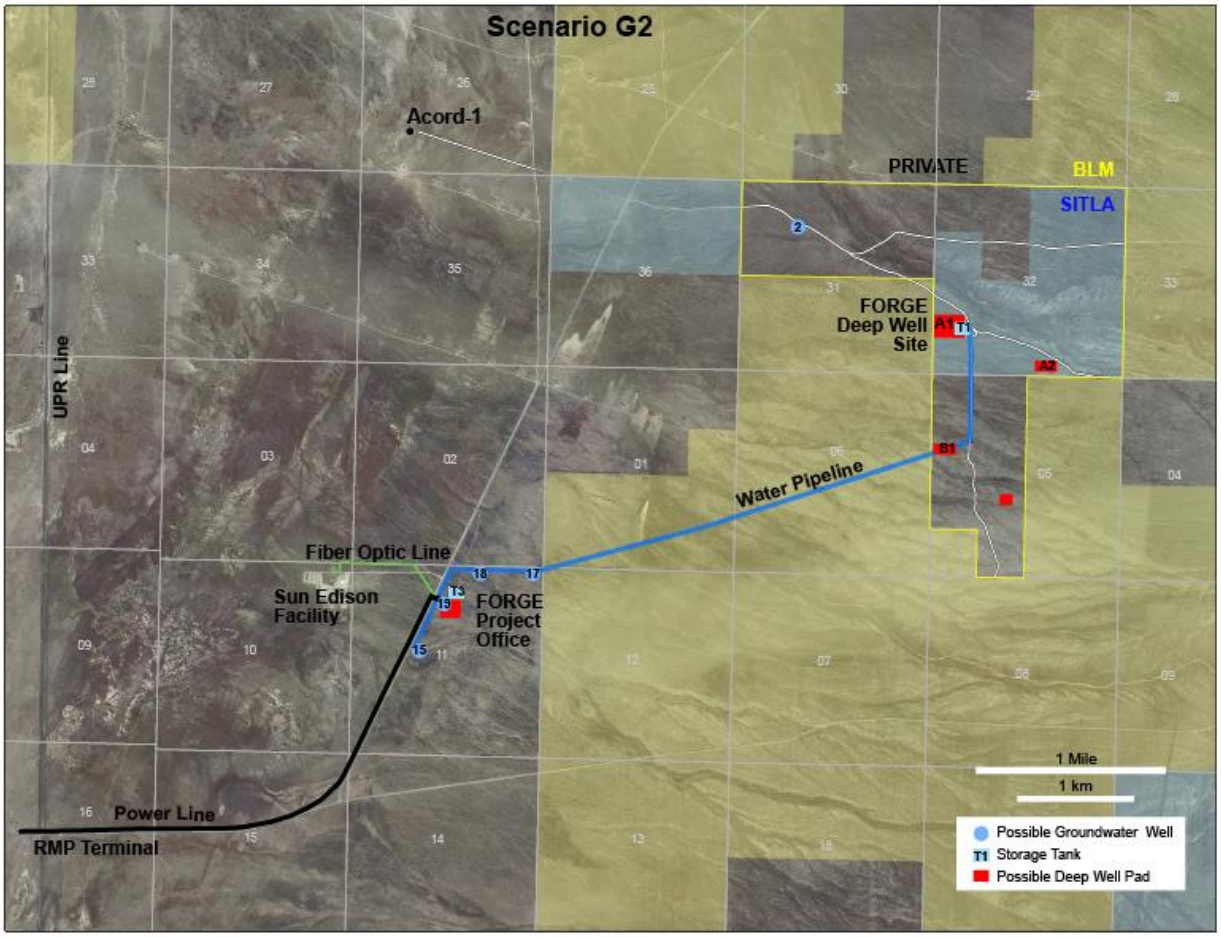

Figure 8. *Details of the powerline, pipeline and water tanks required for wellfield G2.*

At the end of drilling, stimulation and circulation testing in Phase 3, any surplus water stored in the main tank at A2, or smaller tanks at A1, can be disposed of in a groundwater disposal well. An appropriate well could be sited near wells 1 or 2 west of pad A1 (Figure 2). This is an additional 100 feet downhill from pad A1. Although the water rights include both water production and disposal, a disposal well will need an approved plan of operation by the State Engineer (Utah Division of Water Rights) and by the Utah Department of Environmental Quality (DEQ).

Continued monitoring of water quality and water levels in water wells near the FORGE site will be an important part of all stages of the project. In addition to the supply wells at G1 or G2 wellfields, and a disposal well likely near the west side of the FORGE site, existing wells can provide important baseline data and opportunities for long term monitoring. Four groundwater wells are located within 5 km to the west and down-gradient of the FORGE site (Figure 9).

Recent geochemistry and isotopic data has been collected for wells FWW and SSW. These data along with older geochemical data collected from the WOW2 and WOW3 wells represent baseline geochemical conditions for groundwater down-gradient of the FORGE site (Simmons et al., 2016). Annual water levels have been measured in wells WOW2 and WOW3 by the U.S. Geological Survey. Wells SSW and FWW have sporadic long term water level data, with recent measurements from 2015. All four wells could be used for continuous water level monitoring and periodic geochemical sampling during the FORGE project. Numerous wells other than those shown in Figure 9 exist at distances greater than 5 km from the FORGE site. Water levels and geochemistry from several of these wells could be monitored to establish far field groundwater conditions during the FORGE project.

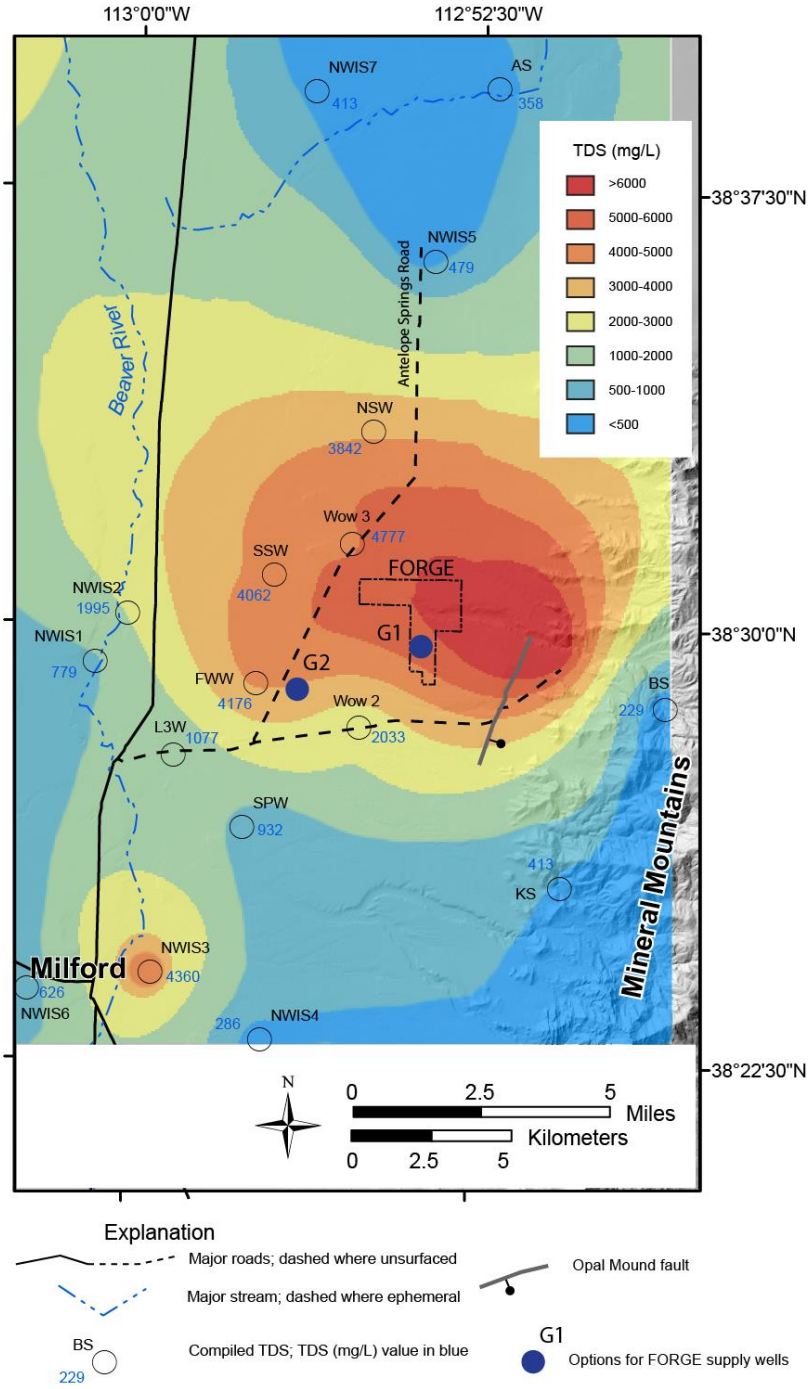

***Figure 9**. Groundwater wells available for monitoring. Colors on the base map represent the TDS contents of the groundwater. G1 and G2 are the two groundwater wellfield options under consideration for the FORGE site. Economic analyses indicate G2 is significantly cheaper than G1.*

Uncertainties and Risks

The project has secured ample water rights for all phases of the FORGE project. Although wells at G2 should have the required permeability based on the nearby First Wind/Sun Edison well), it is unclear whether up to three wells will be required to supply the required for a sustained 500 gpm flow rate. Even if the first well has excellent permeability and can supply the total flow, we recommend a second well so pump maintenance can occur without affecting the water supply to the FORGE project.

POWER REQUIREMENTS

The FORGE site is located within a power corridor (Figure 10) and is surrounded by wind, solar and geothermal power plants (Figure 1). However, there is no residential power supply within North Milford Valley, and the nearest terminal is near the railway crossing on Geothermal Plant Road (Figure 2). This is 3 miles from the proposed FORGE project office. Discussions with Rocky Mountain Power (RMP), the sole residential power provider in Utah, have allowed them to provide an estimate of the cost to run power the 6 miles to pad A1 on the FORGE site, with the route passing the site office, and using the utility corridor that is being permitted as part of the NEPA process (refer to EIV). A copy of the estimate from RMP is attached as Appendix 3 to this Infrastructure report.

The estimate from RMP assumes 200 HP (150 kW) of pump power and 50 kW of single phase 120/240V 200 amp power for the project office. This is sufficient to meet pump power needs of the groundwater supply system, and power for the project office. RMP have indicated that this is the maximum power available from the terminal on Geothermal Plant Road. Once there are a pair of deep deviated wells at the site (likely after 2020), additional pump power could be required for long-term circulation and heat sweep testing. By then Smithfield will have built their hog farm facility, and additional power will be available, if required, from a new powerline along Antelope Point Road. Pad A1 is 1.5 miles from Antelope Point Road. Details on the Smithfield hog farm plans are given below. Their power requirements exceed 1.5 MW.

The estimate from RMP is $1.2 million for the 6 mile line to pad A1. This is an above-ground line except for a 300 ft length underground where the line crosses beneath the Sigurd-Red Butte 345 kV transmission line. The line crosses the UPR tracks above the ground. The groundwater wellfield options G1 and G2 (Figures 7 and 8) require the line length to be close to 1.25 miles and 4.35 miles, respectively. As discussed below, option G2 is preferred because it costs less to develop.

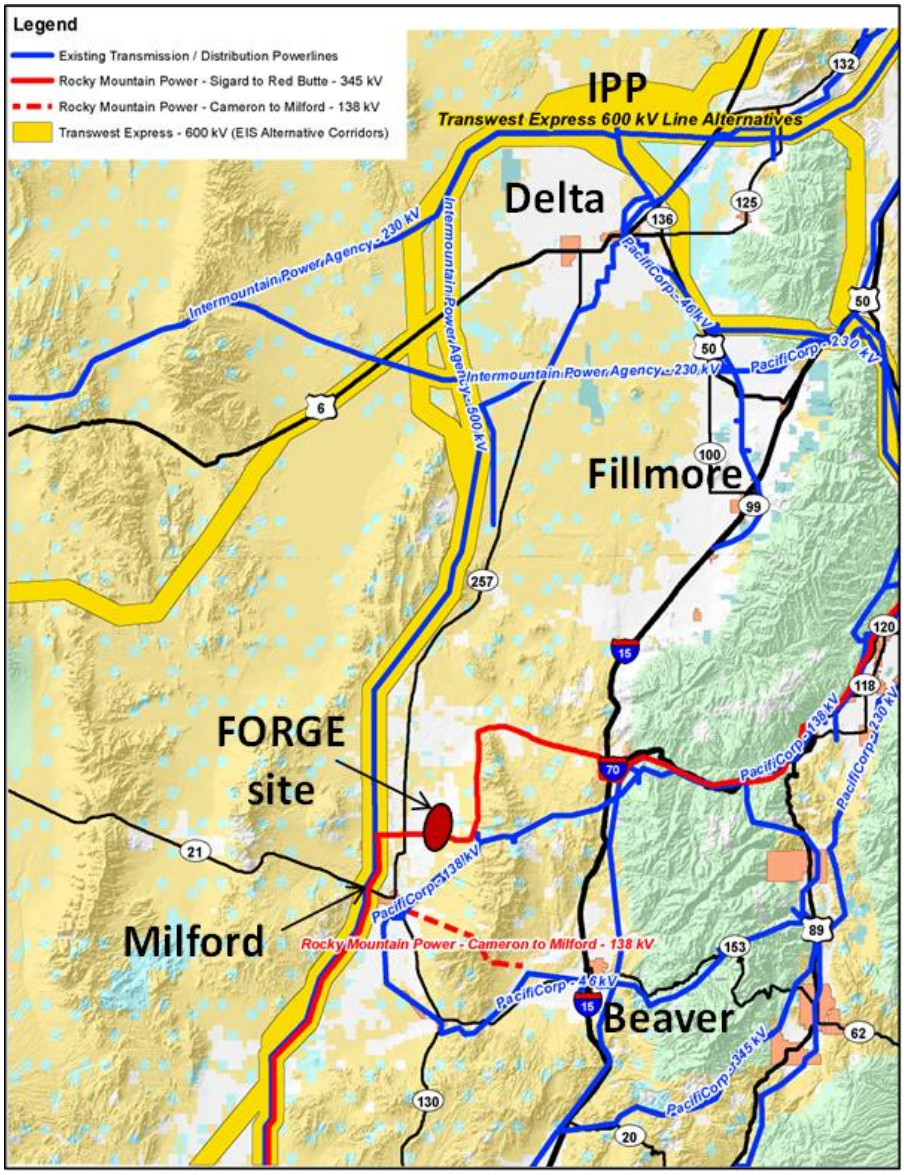

Figure 10. *The FORGE project is close to several major transmission lines. On the west side of North Milford Valley is the IPP 500 kV DC line (2000 MW capacity) and the recently permitted Transwest 600 kV DC line (planned for 3000 MW capacity; yellow band). The Sigurd – Red Butte 345 kV line, just completed by PacifiCorp, runs about 1 mile south of the FORGE site (red line). PacifiCorp also has a 138 kV line that extends from east of the Mineral Mountains to near the Blundell power plant and runs southwest to Milford (blue line). This line passes about 3 miles south of the FORGE site.*

Beaver County is currently clarifying legal certainty that utilities (power or water) can run in the road corridor adjacent to Antelope Point Road (a county road). They believe this will be a straightforward process.

Uncertainties and Risks

The 200 kW power requirements for the FORGE site may require a lead time of a year in order to be constructed. No contract commitment to RMP can be made until final approval to proceed as the winning site occurs in mid-2018 based on the information we have now. Phase 2C is only 8 – 12 months in duration, and this may not be sufficient time for getting power to the groundwater wellfield by the start of Phase 3. However, generators can be used to power the pumps, if needed. Thus we see no risk in pumping water to the wellfield.

The other major uncertainty is the timing of the power infrastructure for the Smithfield hog farm project. If their permits proceed as planned, their timeframe may be faster than that for FORGE. In that case, FORGE may tap directly into the new power line that will run northwards on Antelope Point Road.

SMITHFIELD HOG FARM PLANS

Smithfield has announced plans for a major hog farm development on their land largely northwest of the FORGE site (Figure 11). The 66 buildings will be paired and located on 33 sites. Permits have been applied for, and the company intends to be pouring concrete by March-April this year. Most of the project will be completed within a year of gaining the required permits, although completion of their project may take several years. Jim Webb, Environmental Manager for Smithfield, has informed the FORGE team that hog farm sites very close to planned FORGE activities (e.g. the half section in Section 5 representing the southern part of the FORGE site), can be moved around to accommodate FORGE requirements. On the opposite side of Antelope Point Road from the FORGE project office, Smithfield is planning a truck-washing facility. Email correspondence regarding the possibility of FORGE having a groundwater wellfield next to the project office, and potential synergies regarding water wells, have been positive. A shared water supply “may work” although Jim Webb notes that their truck-washing facility could be several years away.

The scale of the proposed Smithfield hog farm development is large compared to FORGE. Their power demand will be in excess of 1.5 MW, whereas FORGE requires 200 kW and perhaps an additional 200 kW once long-term flow tests between deep wells occurs. Similarly, Smithfield has over 2000 acre-ft/year of water rights compared to 300 acre-ft/y for FORGE. Smithfield has three large wells on the north side of the wind farm about 7 miles north of FORGE (NWIS 5 on Figure 9 is one of their wells). The water quality here is high, in contrast to the geothermal content of the groundwater beneath the FORGE site.

It is premature to discuss whether there are direct-heat needs for the Smithfield project that geothermal wells could help with, but we are aware that such possibility deserves further investigation.

Uncertainties and Risks

The development of a major agricultural facility adjacent to the FORGE site is considered to be a benefit to the project. Increased infrastructure such as power and water should provide additional options depending on the timing of the Smithfield development. Smithfield are very supportive of FORGE, providing 1 square mile of the FORGE site at no cost, and the land where the project office will be sited. Preliminary discussions show they are open to possible synergies between their project and the requirements and goals of FORGE.

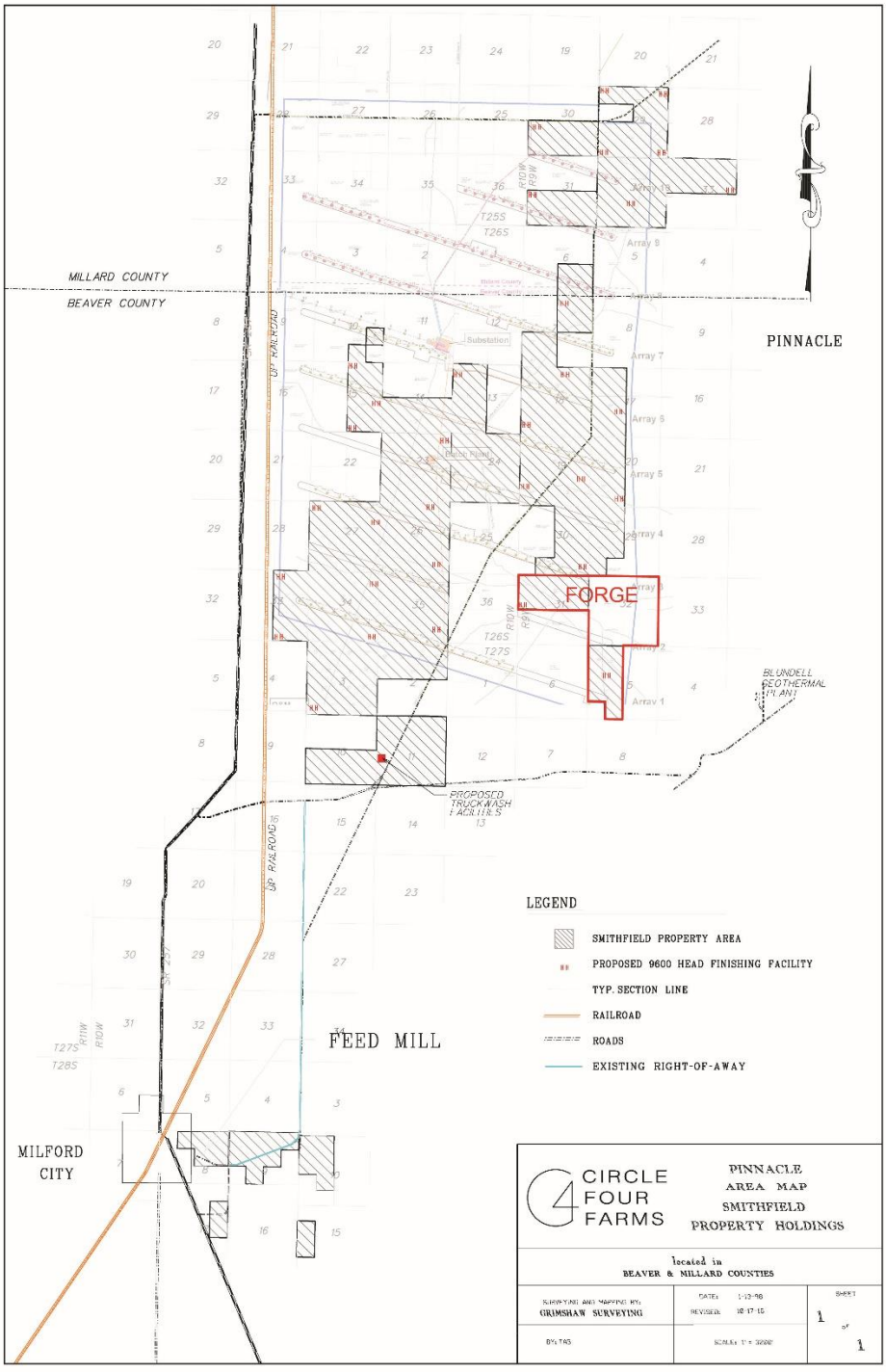

Figure 11. *Smithfield plans for a hog farm operation. FORGE site outline has been superimposed.*

Information from seismometers and data loggers around the FORGE sites will be telemetered to the FORGE office. A communications hub in the office will then transfer the information to the internet allowing remote monitoring.

South Central Communications (SCC) is the fiber optic service provider in much of southwest Utah. A fiber optic line currently connects to the SunEdison windfarm maintenance office (Figure 2) from a hub near the UPR crossing on Geothermal Plant Road operated by L3 Communications, a regional fiber optic communications company (Figure 2). Negotiations have begun to see whether this line can be extended to the office site, a distance of 0.7 miles. With typical costs of $4-6 per foot for underground cable, the cost to connect the project office should be about $15k (verbal communications on 12/7/2016, SCC Office, Cedar City). Although SCC owns the cable into Sun Edison, the connection to this line needs to occur at the node (end point) of this cable. Since this is on Sun Edison land, their permission will be required to run the cable 350 ft north to a Smithfield section. Discussion with the present maintenance manager of Sun Edison indicates no problem, but final approval will need to come from the new owners of this facility. Sun Edison has been in Chapter 11 bankruptcy proceedings and a new owner is expected to be announced in January 2017.

An alternative for the fiber optic line is to string it from the power poles of the new power line that RMP will install along Antelope Point Road. SCC have said in this case, the cost of a fiber optic cable will be $1.75 per lineal feet of aerial span, $200 per pole that SCC attaches to, and $10 per ft for any buried cable installation at either end of the line. An initial assessment based on the RMP ballpark plans indicates the total cost could be around $100,000. If the cable were to run underground from the SCC node on Geothermal Plant Road, the cost would be also be about $100,000. A more accurate estimate will be sought if discussions with the new SunEdison owners are unsuccessful.

Uncertainties and Risks

The primary uncertainty is whether a fiber optic connection can be made to the SCC node at the SunEdison maintenance facility. Alternative connections are available, but the cost is greater. Once a new owner of the windfarm facility is known, it should be possible to start discussions on the nearby connection. If the fiber optic cable has to be run from the SCC hub on Geothermal Plant Road, the timing of the connection could be dependent on RMP constructing the power line if their poles are used. A more rapid connection is likely if only SCC is involved.

ROAD UPGRADES

The existing network of roads provides access to all of the sites within the FORGE project area. Relatively minor roadwork is needed to improve Salt Creek Road (refer to Figure 2) from its termination at Antelope Point Road. The center of the road will be leveled and the road will be

topped with approximately 4 inches of gravel to mitigate damage by the heavy equipment needed for the drilling, stimulation, and research activities (e.g. vibroseis and logging trucks). A similar improvement will also be made on the access road to Acord 1 (Figure 2). The cost of these improvements is estimated to be $120,000 as discussed below in the cost analysis.

Uncertainties and Risks

None. Use of the County roads will be covered under the Conditional Use Permit. The project will be liable for negligent road damage. Beaver County is supportive of this project and has indicated the permit should be obtainable.

SEISMIC MONITORING DRILLHOLES

Up to ten 500-ft-deep bore holes will be drilled around the FORGE site for high-precision seismic monitoring and up to six additional seismometers may be placed on the surface on the west and east sides of North Milford Valley. The bore holes will be drilled using a truck-mounted drilling rig. No drill pads or reserve pits are required. The area of disturbance for each seismic monitoring hole is approximately 50 × 50 feet. Cuttings will be tested and if nonhazardous, used for local construction. The drillholes will be cased with 6-inch-diameter casing, and each will contain a single three-component geophone. Electricity will be provided by a solar panel, and the seismic data will be telemetered to the communications hub at the office. Figure 12 shows an example of the surface equipment that could be situated adjacent to the drillhole. Equipment may be fenced to protect it from livestock.

Figure 12. *Surface equipment at a seismic monitoring site at the Raft River geothermal field. The geophone is located at the bottom of the capped 300-fthole in the lower right. Data are telemetered to a hub more than 1 mile away. The yellow poles keep cows and horses away from the cement pad and the wire attached to the geophone.*

GPS SURVEY MONUMENTS, TILTMETERS, AND SEISMOMETER SITES

A network of 31 GPS survey monument stations and two survey base monument stations (total of 33 stations) will be installed to detect and measure any significant ground surface deformation. The network is intended to monitor elevation changes in and around the FORGE site as a result of stimulation or circulation activities. All stations will be sited close to existing roads.

A truck-mounted auger is required to drill each hole. No drilling pads are required. The area of disturbance for each station is approximately 20 × 20 feet. Cuttings will be spread on-site. For each station, a rod is driven into the soil with a grease-filled sleeve surrounded by sand to effectively decouple the rod from near-surface movements. A marked bronze survey cap will be installed on the top of each rod. Each monument station will be measured several times during Phase 2C to determine the elevation at the sites prior to major drilling and testing in Phase 3. Accuracy within several millimeters is expected. To conduct measurements at each site, a hand-held antenna needs to be balanced on the top of the survey cap, so that a GPS receiver can record the precise location.

Additionally, up to nine tiltmeters may be installed within 2 miles of the FORGE site. These instruments are sensitive to tilt of the ground surface and supplement the measurement data from the monuments. The tiltmeter consists of an aluminum tube that is held in place with clean, dry sand at the bottom of a 12-meter-deep hole cased with cemented 10-centimeter-diameter PVC pipe (Figure 13). The surface disturbance for each station is approximately 20 × 20 feet. The hole is dug with a geotechnical or rat-hole driller using a simple flight auger. Cuttings will be spread on-site. Electricity will be provided by a solar panel, and data will be telemetered.

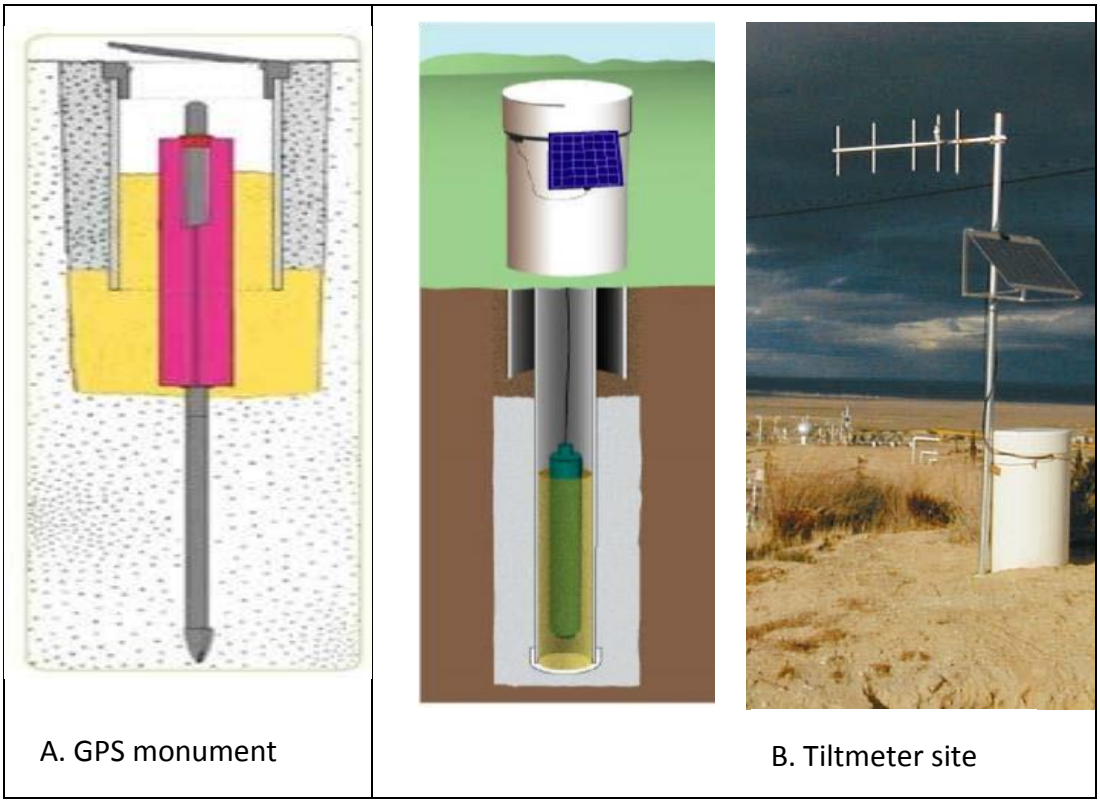

Figure 13. *Schematic cross sections of a National Geodetic Survey-style monument (A) and surface tiltmeter (B). The right hand picture in B is an example of a typical surface tiltmeter instrumented site.*

Four surface seismometers were installed during Phase 2A, and the network now comprises six seismometers which telemeter data to the University of Utah Seismograph Station office in Salt Lake City. The locations of the seismometers are shown in Figure 14, and up to six additional surface seismometers will be installed in Phase 2C. Also in Phase 2C, we will install up to 10 seismometers below the surface in 500 ft strong bore holes. Their locations will be decided after the results of Phase 2B drilling and geoscientific surveying are available.

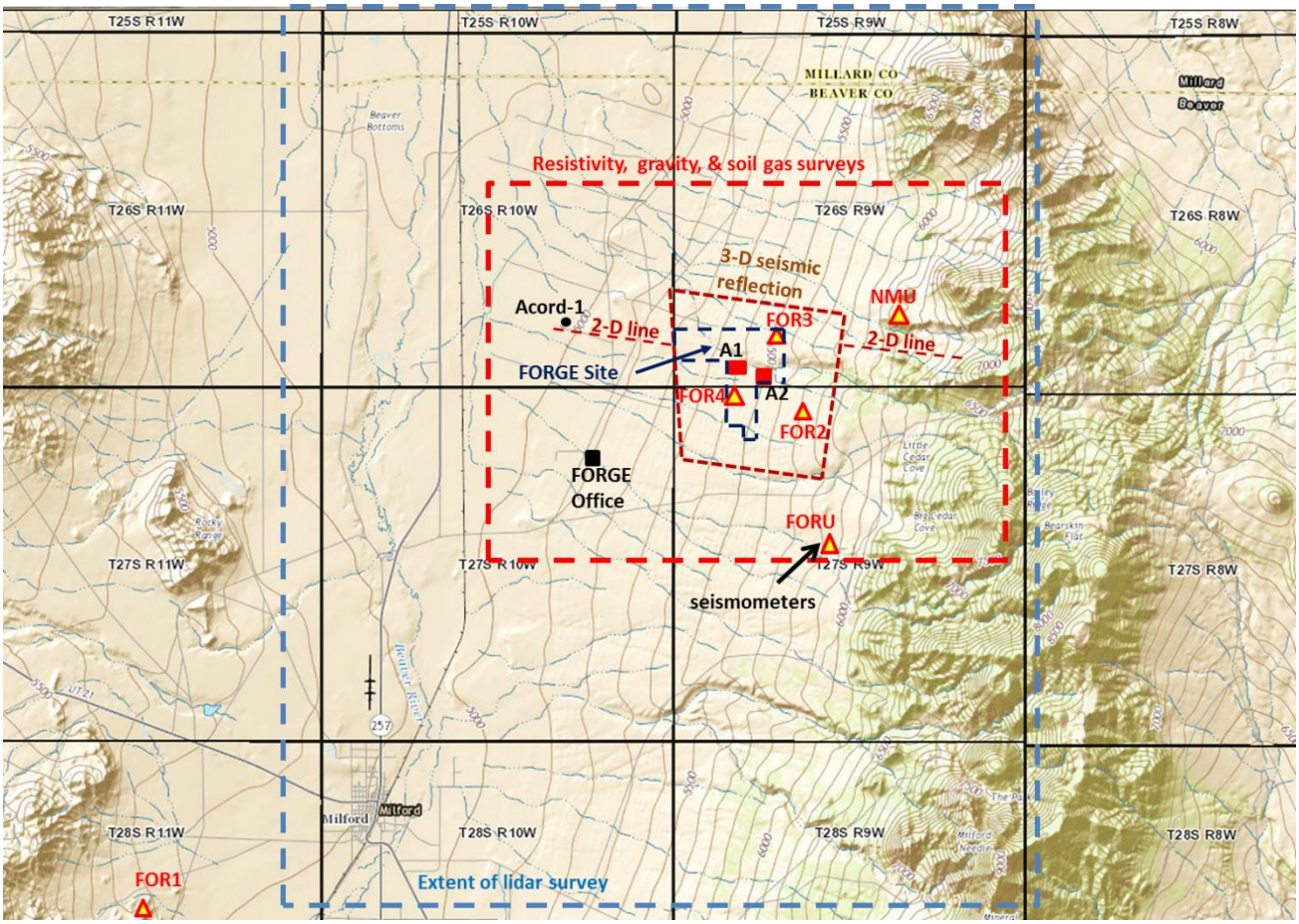

Figure 14. *Extent of geoscientific surveys for Phase 2B. LiDAR, blue dash. Resistivity (MT and TDEM), gravity and soil gas surveys, red dash. 2-D and 3-D seismic reflection, dark orange dash, and seismometer sites, red-yellow triangles. Topography at 100 feet intervals in background (office site is at 5100 ft; pad A2 at 5500 feet, and pad A1 at 5400 feet above sea level). Seismometer NMU has been operating for over 25 years; FORU was installed during Phase 1, and the other four seismometers were installed during Phase 2A. FOR1 is in the lower left of the figure; the remaining five are located within the outer dashed red box.*

Uncertainties and Risks

There are no known risks associated with this monitoring.

ACORD-1 WELL

During Phase 2C, the Acord-1 well (a pre-existing well) will be cleaned out for testing tools (see Figures 15a and b). The well was lightly plugged when it was abandoned in 1980. Access to the

well is by an existing two-track road. A drill rig would remove the two cement plugs (50 feet thick and 200 feet thick) and all mud in the hole. Total depth of the well is 12,650 feet. The mud and any cement cuttings would be removed to a landfill (if required) after chemical testing. The cleanout operation requires water, either from an existing well 1,000 feet from Acord-1 that the project has a water right for (well #7, Figure 2), or from Milford City. The cost of the clean-out is estimated to be $1 million.

Figure 15a: *Wellhead of Acord-1*

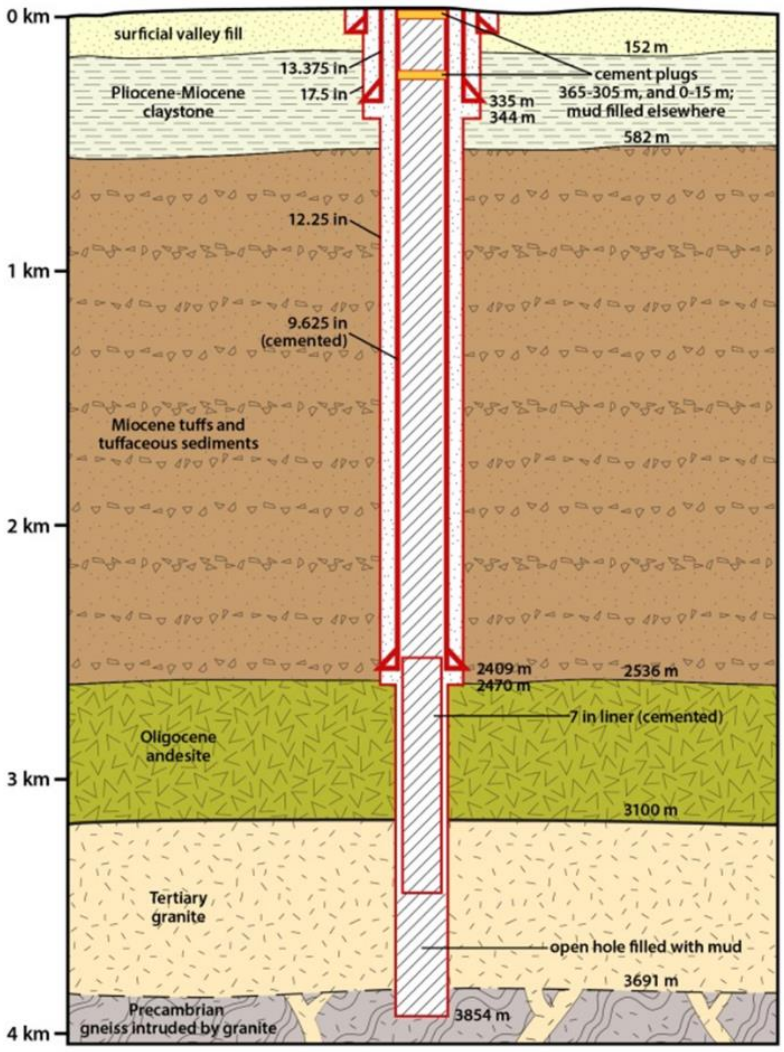

Figure 15b: Stratigraphy, casing pattern, and plugs in Acord-1. There is 1640 ft (500 m) of granite and gneiss in the lowermost portion of the well below the cemented liner. The temperature at the bottom of the well is 446°F (230°C).

Uncertainties and Risks

Acord-1 was drilled in 1980 but was unproductive. The casing is 38 years old, so there is a risk that degradation has occurred at depth. The well has great value to the project because of the open section in the granite and the possibility that tools can be tested in this well before being lowered into the much more expensive deep wells on the FORGE site. There is also the possibility that injection and hydrofracture testing could be carried out in the open hole section.

DEEP PRODUCTION-INJECTION WELLS

The FORGE injection/production wells will make up the focal point of activities during Phase 3. Activities will include well drilling, downhole and geophysical surveys, well stimulations, heat sweep testing and monitoring. Circulation tests will require measurement of downhole and wellhead flow rates, pressure and temperature, water storage, a heat exchanger for cooling the produced water, piping to connect the injection and production wells, wellhead pumps and appropriate data gathering system. Forklifts and cranes for moving heavy equipment will be required at times.

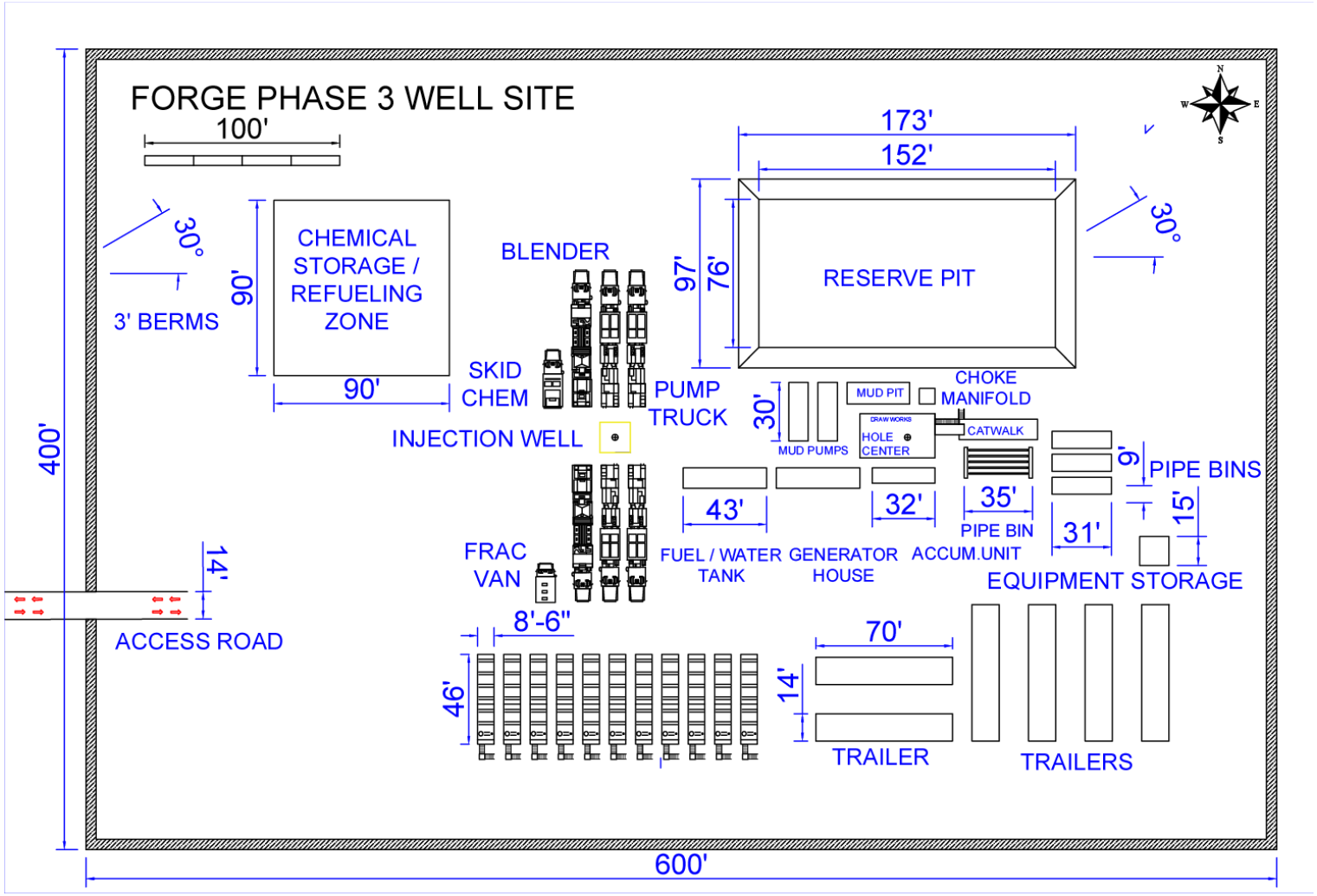

Figure 16. Schematic figure of the infrastructure on the FORGE deep well site (Phase 3).

The drill pad will be constructed in Phase 2C so that the first deep well can be drilled early in Phase 3. Figure 16 is a schematic illustration of the pad after the drilling of the two deep wells. The Utah team has proposed a drilling plan for consideration by the STAT and has recommended stimulating the lowest three stages of the first well immediately after drilling. However, the drilling, stimulation and research activities will be defined by the STAT as described in the FOA.

The level of funding provided by the DOE will define the drilling and stimulation program. These activities could be accomplished within a year; however, it is likely more than two years will be required to drill and stimulate the wells and create the reservoir.

CIRCULATION TESTING

Once two deep wells are drilled and stimulated, the project will enter a phase of circulation testing. Details of the circulation tests will be defined by the STAT. We expect that multiple circulation tests will be conducted. Variables that need consideration include the period and duration of the circulation test, the temperature of the injected water, addition of additives (e.g. acids) to improve permeability, and the injection pressure.

Circulation testing will be conducted after both wells are drilled and stimulated and the injected fluid is successfully circulating between wells. The produced water could be cooled by a variety of methods. We expect the water will approach the temperature of the reservoir rocks, which will range from about 175 to 200^{o}C. Air-cooling is the preferred method of cooling as it will reduce water losses caused by evaporation. Cooling could be augmented by mixing with cold water stored in a large tank on pad A2. Some tests could last several months or more. Make-up water, which will be provided by the water wells, could be required if there are subsurface losses from the stimulated reservoir. The amount of make-up water that will be required cannot be estimated a priori. Consumptive loses from a cooling tower will depend on climatic conditions. These loses can be mitigated by dry cooling. Assuming evaporative cooling, AltaRock predicted a consumptive loss of 16.3-37.6% for circulation tests ranging from 30 - 60 days respectively at for their Newberry EGS Demonstration Project. Additionally, it was assumed that 2% of the injected volume is lost due to leak off in the reservoir.

Environmentally benign tracers will be added to the injected fluid to trace fluid movement and map out the permeable pathways. Each test will consist of flowing the produced water to the injection well while monitoring geothermal fluid temperatures, pressures, flow rates, chemistry, and tracer contents. Depending on the tests and the scientific questions being addressed, the produced water may be temporarily stored in steel tanks and cooled to varying degrees, or reinjected directly into the injection well with little cooling. Injectivity tests may be conducted on each well without production of the water from the second well to evaluate the effects of thermal or other stimulation techniques.

C. SCHEDULE AND BUDGET FOR INFRASTRUCTURE

This analysis is based on bids and estimates (Appendices below) we have received for the full range of infrastructure requirements over the life of the project (i.e. Phase 2B, 2C, and 3). The most accurate data are available for Phase 2B activities. Due to project needs, circumstances, and economic factors that could change by the time of Phase 2C and Phase 3 activities, the uncertainties are greater.

PHASE 2B

In Phase 2B a research well to 7000 ft total depth will be drilled. It requires a graded well pad, 2.25 miles of road improvements and fencing. It will cost $42,500 to rehabilitate the site. A summary of costs are summarized in Table 1. The details of the costs are included in Appendix 1.

Table 1. Phase 2B infrastructure needs and costs

7000' research well	$5,400,000
A2 well pad 400x175 ft2 (1.6 acre)_Roads 1.25 graded and graveled; 1 mile graded	$98,012
Fencing 6' tall x 1150 ft with 2 gates	$22,970
Rehabilitate well site	$42,5000

PHASE 2C

In Phase 2C, we will install the utility corridor from the RMP to the FORGE site, construct the office and associated facilities including the workshop/lab, drill a water well field (3-4 wells), cleanout the Acord-1 well, and install GPS and seismic monitoring network. Itemized costs are summarized in Table 2.

Table 2. *Phase 2C infrastructure needs and costs*

Utility Corridor	
Road grading (~3.5 miles)	$14,000
Power line	
option 1- 6 mile line from RMP terminal to G1 water wells and A1 pad	$1,200,000
option 2- 3 mile line from RMP terminal to G2 water wells and office site	$600,000
option 3- 1.5 mile line from New Smithfield line on Antelope Point Road to A1 pad	$300,000
Office site	
Two 40' storage containers	$7,200
20' storage container with workshop/lab space	$17,500
Office building including furnishings	$109,200
Concrete slab foundation	$7,200
Solar Panels	$20,000
Septic tank	$7,500
Office water well (800')	$5,000
Permits for power/septic	$5,000
Site grading/preparation (1 acre)	$29,000
Fencing 6' tall x 853 ft with 2 gates	$17,000
Fiber optic cable install	
option 1 = 0.7 miles from SunEdison office	$15,000

option 2 = from SCC node on Power Plant Road	$100,000
Reclamation of office site (if done at time of A1 reclamation)	$10,000
FORGE Deep Well site	
40' container storage	$3,600
40' storage container with workshop/labspace	$22,500
A1 well pad (5.5 acre)	$164,000
Fencing (6' tall x 2000 ft with 2 gates	$38,600
Water tank (1.7 million gallons)	$314,000
Fuel tank500 gal	$3,000
Reclamation of A1 drill pad	$75,000
Water well field	
3 groundwater production wells 600 to 1000' deep	$600,000
1 water disposal/injection well 1000' deep	$200,000
3 wellhead pumps	$105,000
Transfer pump	$25,000
Transfer tank	
Polypropylene 22,000 gallons	$45,600
Steel Frack tank 21,000 gallon	$39,000

Water pipeline	
G1 6,562 ft of 6" steel pipe	$103,000
G2 22,952 ft of 6" steel pipe	$359,000
Acord-1	
Clean out	$1,000,000
~3/4 of a mile graded and graveled road	$29,700
GPS-tilt meters	
33 GPS monuments	$6,600
9 tilt meters	$156,000
Seismic monitoring	
6 surface seismometers	$13,600
10 boreholes @ 500 ft each	$500,000
10 borehole seismometers	$192,000
Telecommunications Hub	$10,000

A significant portion of the budget will be directed toward construction of the utility corridor and the construction of the water pipelines. Accordingly, two options (G1 and G2) are considered in terms of finding the most cost-effective design (Tables 3 and 4). These are

described earlier in the report, and they are shown as map views in Figures 7 and 8. Table 5 summarizes the assumptions that are common to both options.

Option G1. The power line distance is 6 miles and the pipeline distance is 1.25 miles. The elevation gain is 150 ft and the friction head loss at 500 gallons/minute is calculated for two pipeline designs. A single 6 inch diameter line at 64.4 psi gives a friction head loss of 149 ft; two 4 inch diameter lines at 135 psi give a friction head loss of 311 ft. An extra 100 ft of head loss is estimated to result from welds and elbows required for laying and connecting the pipeline. A pump lift of 600 ft (450 ft static plus 150 ft drawdown) is expected. The pump power required to supply 200 gallons/minute/well is 37.9 kW (50.6 hp/well), which adds up to a total pumping power requirement of 113.7 kW.

Table 3. *G1 options for pipelines, pumps, and power requirements for water supply.*

Pipeline option	1 x 6 in diameter line	2 x 4 in diameter lines
Construction cost,	103,000	91,000
Pipeline rise, ft	150	150
Pipeline friction, ft	149	311
Pipeline miscellaneous, ft	100	100
Total pipeline head required, ft	399	561
Pipeline power required, kW / hp	63.0 / 84	88.6 / 118
Well pump power, kW / hp	113.8 / 151.8	113.8 / 151.8
Total water system power, kW	176.8	202.4
Energy to deliver 1,000,000 gal, kWh	5,893	6,747
Fuel cost to deliver 1,000,000 gal, $	825	945
Generator rental cost for 1,000,000 gal, $	1,096	1,096
Delivered cost of water, $/kgal	1.92	2.04

Option G2. The power line distance is 3 miles and the pipeline distance is 4.35 miles. The elevation gain is 650 ft and the friction head loss at 500 gallons/minute is calculated for two pipeline designs. A single 6 inch diameter line at 225.5 psi gives a friction head loss of 520 ft; two 4 inch diameter lines at 471.3 psi give a friction head loss of 1088 ft. An extra 100 ft of head loss is estimated to result from welds and elbows required for laying and connecting the

pipeline. A pump lift of 300 ft (150 ft static plus 150 ft drawdown) is expected. The pump power required to supply 200 gallons/minute/well is 19.0 kW (25.3 hp/well) which adds up to a total pumping power requirement of 56.9 kW.

Table 4. *G2 options for pipelines, pumps, and power requirements for water supply.*

Pipeline option	1 x 6 in diameter line	2 x 4 in diameter lines
Construction cost, $	359,000	319,000
Pipeline rise, ft	650	650
Pipeline friction, ft	520	1,088
Pipeline miscellaneous, ft	100	100
Total pipeline head required, ft	1,270	1,838
Pipeline power required, kW / hp	200.7 / 268	290.4 / 387
Well pump power, kW / hp	19.0 / 25	19.0 / 25
Total water system power, kW	219.7	309.4
Energy to deliver 1,000,000 gal, kWh	7,323	10,313
Fuel cost to deliver 1,000,000 gal, $	1,025	1,444
Generator rental cost for 1,000,000 gal, $	1,096	1,096
Delivered cost of water, $/kgal (diesel)	2.12	2.54
Cost of purchased power for 1,000,000 gal, $	769	1,083
Delivered cost of water, $/kgal (utility)	0.77	1.08

From Tables 3 and 4, the cost estimate for G1 is $91,000-103,000 and for G2 it is $319,000-359,000. However, the cost of constructing a 6 mile power line is $1,200,000 versus $600,000 for a 3 mile power line. Thus the G1 option costs $1,291,000-1,303,000, and the G2 option costs $919,000-959,000. G2 is the cheaper option. We suggest the use of 6-inch mild steel line pipe, which provides close to an optimal combination of cost and construction flexibility for the water distribution system. A rented generator is the preferred source of power for well and transfer pumps in option G1. In G2, power from a generator or power from a utility electric line are possible, and the cost analysis indicates utility electric power supply is cheaper.

Table 5. *Assumptions for analyzing options G1 and G2.*

Project office elevation	5040 ft
Well site elevation	5540 ft
Water delivery elevation from storage tank above site A2	5640 ft
Generator 300 kW SFC 0.717 gal/kWh, rental	$5700/mo
Generator mobilization and demobilization (total)	$2000
Off highway cost of diesel fuel	$1.95/gal
Cost of electricity from Rocky Mountain Power utility	$0.105 kW/hr
4 inch water pipeline installed (used pipe)	$36,630/mi
6 inch water pipeline installed (new pipe)	$82,500/mi
Water table depth at the Project Office site	150
Water table depth at sites A1 and B1	450

Additional budget items for the utility corridor and well field include road grading $14,000, 3 groundwater wells ($600,000), an injection well ($200,000), water well pumps ($105,000), a transfer pump ($25,000), and a transfer tank ($39,000-45,625 depending on material and purchase vs rental). Note that the groundwater wells for G2 will be shallower and cheaper, which is an additional factor favoring scenario G2 over G1.

The office site covers an area of 2 acres (Figure 5) and to grade and prepare the site is $29,000. The fenced area costs $17,000. For the office structure, it is cheaper to rent this unit for 60 months ($109,000) than to purchase ($142,000), and the rental agreement includes furnishings. However, it is cheaper to purchase the storage containers at $3,600/each ($7,200 total) than to rent. For the 20 ft lab/workshop facility, the rental cost is equivalent to the purchase cost of $17,500. Foundations for buildings cost $10,800. Solar panels will be used to power the office, and the cost is $20,000. The vehicle equipment shed costs $14,200. The septic tank, water well supply and pump (including tanks), plus permits add up to $25,000. A fuel tank costs $3000. The cost of installing the fiber optic cable depends on distance, and it ranges from $15,000 to $100,000. Other office site costs include webcams for security, first aid kits, wind sock, fire extinguishers, outdoor lighting, radios, tools, safety equipment, road signs, computer, data projector, screen, chemical spill kit, backup emergency generator, and bedding (for emergency), which will total about $10,000.

The A1 FORGE Deep Well site requires grading and road access ($164,000), a storage container ($3,600) and a 40 ft lab/workshop facility ($22,500). Fencing costs $38,600 and a 1.7 million gallon water tank costs $314,000.

The Acord-1 well cleanout will cost ~$1 million. Road improvements to the wellhead will cost $20,700.

Thirty-three GPS monuments will be installed at a total cost of $6,600. Nine tilt meters will be rented from Schlumberger and installed at a total cost of $156,000.

Seismic monitoring involves installation of a surface and a borehole network. The surface network requires up to six new units at a total cost of $13,560. The borehole network requires up to ten 500 ft deep wells, which in total cost $500,000, and the total cost of the borehole seismometers is $192,000.

A telecommunications hub costs $10,000.

PHASE 3

In Phase 3, drilling and completion of two deep wells with doglegs is estimated to cost $20,000,000. A pump for the production well will cost $450,000 and a pump for the injection well will cost $100,000. Pipework and a cooling tower will cost no more than $200,000. The dry cooling tower from the RMOTC site is being stored at Brady's, and it is of the right design scale in terms of cooling requirements for use at the FORGE Deep Well site. It is powered by two cells with 25 hp motors and a 7 kW circulating pump, for a total tower consumption of 42 kW.

Two DTS tools ($790,200), a PTS tool ($81,000), plus a wireline with a mast trailer ($176,000) will cost in total $1,047,200. A telehandler will cost $148,000.

Phase 3 costs are summarized in Table 6.

Table 6. *Phase 3 infrastructure needs and costs*

Two deep deviated wells	$20,000,000
Production well pump	$450,000
Injection well pump	$100,000

Pipework, cooling tower and/or separator	$200,000
Two DTS tools for production and injection wells	$790,200
Wireline and mast trailer	$176,000
Telehandler	$148,000

Table 7. *Infrastructure schedule for Phases 2B, 2C and 3.*

	Apr-Jun 2017	Jul-Sep 2017	Oct-Dec 2017	Jan-Mar 2018	Apr-Jun 2018	Jul-Sep 2018	Oct-Dec 2018	Jan-Mar 2019	Apr-Jun 2019	Jul-Sep 2019	Oct-Dec 2019	Jan-Jun 2020	Jul-Dec 2020	Jan-Jun 2021	Jul-Dec 2021	Jan-Jun 2022	Jul-Dec 2022	2023	2024
Phase 2B																			
Improve roads																			
Construct/grade well pad A2																			
Drill and test 7000' research well at pad A2																			
Phase 2C																			
Build Office Site																			
Contract Southwest Communications for fiber-optic connection																			
Fiber-Optic line installed to project office																			
Install telecommunications hub in project office																			
Contract Rocky Mountain Power for Power Line																			
Construct 200 kW power line to project office																			
Construct/grade FORGE deep well site																			
Drill water well field (2 - 3 wells) and install pumps and tank																			
Install water line along utility corridor to storage tank at pad A2, line to pad A1																			
Acord-1 cleanout																			
Install GPS benchmarks and tiltmeters																			
Upgrade Seismic Network (surface and bore hole seismometers)																			
Phase 3																			
Drill and stimulate bottom of Well 1																			
Stimulate remainder of well and test (R&D)																			
Drill and stimulate bottom of Well 2																			
Stimulate remainder of well and test																			
Construct cooling tower, pipeline and pad infrastructure																			
Decommision site																			

ROUTINE OPERATIONAL REQUIREMENTS

Road grading, dust suppression, and snow clearing will cost $50/hour, and a welder will cost $145/hour. Garbage collection is $397 per haul for a 30-yard long roll off trailer. Electricity is $0.105/kWh and diesel fuel costs $1.95 gallon. A portable toilet costs $800/10 weeks. A security system, including monitoring, costs $30-60/month. Telemetering data for 5 years will cost $2340 ($39/month). A list of local (Milford) equipment and service costs is given in Appendix 2.

DECOMMISSIONING

The FOA states that the site will need to be decommissioned after five years of operation. Based on current timing we expect that to be around 2024. Decommissioning costs will be assessed once a detailed Phase 3 budget is required. The State Engineer requires that a bond of $10,000 be paid for each deep well up to a maximum of $50,000. This is paid prior to the drilling of each well. If the FORGE site is chosen to be Milford, Utah, then there will be a minimum of $30,000 that is set aside as bonds with the State Engineer (i.e. the research well in Phase 2B and the two deviated wells in Phase 3). Depending on the abandonment conditions, which could vary from no cost if a geothermal developer takes over the project, to full plug and abandonment, the bond sum may cover most of the decommissioning costs. Similarly, the extent of required reclamation of the office site and the main FORGE site is uncertain because the project is on private and SITLA land.

APPENDICES

APPENDIX 1. DETAILS OF RESEARCH WELL COST – PHASE 2B.

GEOTHERMAL RESOURCE GROUP

AFE NO: 5 (no cost share)
DATE: 28-Dec-16

DRILLING COST ESTIMATE - SUPPORTING DATA

Well Name & Number: MU-ESW1 Field: Milford
Exploratory Yes Proposed Depth: 6,970'
Estimated by OB

LINE ITEM	NATURE OF EXPENDITURE	ESTIMATED COST TANGIBLE	INTANGIBLE	SUBTOTAL
	1.0 SUPERVISION			
01-001	Wellsite Supervision		$ 336,840.00	$ 336,840.00
01-002	Wellsite Geologist		$ -	$ -
01-003	Engineering		$ 160,945.00	$ 160,945.00
01-004	Management & Logistics		$ 277,776.69	$ 277,776.69
01-005	Permits		$ -	$ -
01-006	Office (On site)		$ -	$ -
01-007	Office Supplies		$ -	$ -
	Cost Share (for information)		$ 201,396.82	$ 201,396.82
	TOTAL SUPERVISION	$ -	$ 775,561.69	$ 775,561.69
	2.0 LOCATION COSTS			
02-001	Road work		$ 19,500.00	$ 19,500.00
02-002	Pad Construction		$ 157,500.00	$ 157,500.00
02-003	Conductor and Cellar		$ 15,000.00	$ 15,000.00
02-004	Surveying		$ -	$ -
02-005	Site Remediation		$ 42,500.00	$ 42,500.00
02-006	Conductor Pipe		$ -	$ -
02-007	Other		$ -	$ -
	TOTAL LOCATION COSTS	$ -	$ 234,500.00	$ 234,500.00
	3.0 RIG MOB / DEMOB			
03-001	Rig Mob / Demob		$ 455,000.00	$ 455,000.00
03-002	Truck & Crane Service		$ 31,200.00	$ 31,200.00
03-003	Misc Move Costs		$ -	$ -
	TOTAL RIG MOB/DEMOB COSTS	$ -	$ 486,200.00	$ 486,200.00
	04.0 RIG COST			
04-001	Rig Up/Rig Down		$ -	$ -
04-002	Daywork Rate		$ 1,203,450.00	$ 1,203,450.00
04-003	Turnkey Cost		$ -	$ -
04-004	Footage Rate		$ -	$ -
04-005	Torque Limiter and Autodriller		$ 17,750.00	$ 17,750.00
04-006	Top Drive		$ -	$ -
04-007	Drilling Water		$ 32,170.00	$ 32,170.00
04-008	Third party labor		$ 32,400.00	$ 32,400.00
04-009	Crew Subsistence		$ -	$ -
04-010	Crew Camp		$ -	$ -
04-011	Boiler		$ -	$ -
04-012	Other		$ -	$ -
	TOTAL RIG COSTS	$ -	$ 1,285,770.00	$ 1,285,770.00

	NATURE OF EXPENDITURE	ESTIMATED COST TANGIBLE	INTANGIBLE	SUBTOTAL
	05.0 DRILLING BITS & TOOLS			
05-001	Bits		$ 198,245.00	$ 198,245.00
05-002	Drill Pipe & Collar Rental		$ 2,620.00	$ 2,620.00
05-003	Shock Subs & Drilling Jars		$ 135,160.00	$ 135,160.00
05-006	Hole Openers		$ -	$ -
05-007	Underreaming		$ -	$ -
05-008	Stabilizers / Reamers		$ 85,308.00	$ 85,308.00

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05-009	Inspection and Repair		$ -	$ -
05-010	Retrievable Tools (for DFIT)		$ 74,992.06	$ 74,992.06
	TOTAL DRILLING BITS & TOOLS	$ -	$ 496,325.06	$ 496,325.06
	06.0 FUEL			
06-001	Fuel - Rig and Assoc. Equip		$ 106,500.00	$ 106,500.00
06-002	Fuel - Other		$ 12,450.00	$ 12,450.00
06-003	Lubricants		$ -	$ -
06-004	Fuel Tank Rental		$ -	$ -
	TOTAL FUEL	$ -	$ 118,950.00	$ 118,950.00
	07.0 EQUIPMENT RENTALS			
07-001	Blowout Preventers		$ 15,000.00	$ 15,000.00
07-002	Forklift		$ -	$ -
07-003	Seperator		$ -	$ -
07-004	Rotating Head		$ -	$ -
07-005	Light plants / Generator		$ 17,000.00	$ 17,000.00
07-006	Desander, Desilter, Degasser, Centrifuge		$ -	$ -
07-007	Survey Instrument (Incl. Heat Shield)		$ 16,200.00	$ 16,200.00
07-008	Mud Cooler		$ 44,950.00	$ 44,950.00
07-009	Other		$ -	$ -
	TOTAL EQUIPMENT RENTALS	$ -	$ 93,150.00	$ 93,150.00
	08.0 TOOL AND EQUIPMENT MAINT.			
08-001	Rotating Rubbers		$ -	$ -
08-002	BOPE Repair / Preventive Maintenance		$ -	$ -
08-003	Shaker Screens		$ 4,000.00	$ 4,000.00
08-004	Tubular Inspection and Repair		$ 32,500.00	$ 32,500.00
08-005	Other		$ -	$ -
	TOTAL TOOL AND EQPT. MAINT.	$ -	$ 36,500.00	$ 36,500.00
	09.0 OUTSIDE SERVICES			
09-001	Casing Crew and Equipment		$ 36,667.00	$ 36,667.00
09-002	Electric Logging and Perforation		$ 292,300.00	$ 292,300.00
09-003	Mud Logging		$ 230,420.00	$ 230,420.00
09-004	PVT & Data Acquisition		$ -	$ -
09-005	H2S Services		$ -	$ -
09-006	Welding		$ 10,000.00	$ 10,000.00
09-007	BOP & LOT Testing Service		$ 18,000.00	$ 18,000.00
09-008	Coring		$ 25,200.00	$ 25,200.00
09-009	Field Office Trailer and Supplies		$ 35,500.00	$ 35,500.00
09-010	Well Insurance		$ 18,000.00	$ 18,000.00
	TOTAL OUTSIDE SERVICES	$ -	$ 666,087.00	$ 666,087.00

	NATURE OF EXPENDITURE	ESTIMATED COST TANGIBLE	ESTIMATED COST INTANGIBLE	SUBTOTAL
	10.0 MUD AND CHEMICALS			
10-001	Drilling Fluids		$ 127,200.00	$ 127,200.00
10-002	Engineering		$ 53,580.00	$ 53,580.00
10-003	Mud Trucking		$ 12,000.00	$ 12,000.00
10-004	Misc. Drilling Fluids		$ -	$ -
	TOTAL MUD AND CHEMICALS	$ -	$ 192,780.00	$ 192,780.00
	11.0 CEMENT AND SERVICES			
11-001	Primary Cementing		$ 289,350.60	$ 289,350.60
11-002	Secondary Cementing		$ -	$ -
11-003	Cement Company Service		$ -	$ -
11-004	Lost Circulation Plugs		$ 80,944.60	$ 80,944.60
11-005	Safety/Whipstock Plugs		$ -	$ -
11-006	Cement Retainers		$ -	$ -
11-007	Cement Company Standby Charges		$ -	$ -
11-008	DFIT Pumping Unit		$ 88,000.00	$ 88,000.00
	TOTAL CEMENT AND SERVICES	$ -	$ 458,295.20	$ 458,295.20
	12.0 AIR / Sumpless drillling			

12-001	Air Package		$ -	$ -
12-002	Dewatering		$ -	$ -
12-003	Misc Air/Sumpless Costs		$ -	$ -
	TOTAL AIR / Sumpless drilling	$ -	$ -	$ -
	13.0DIRECTIONAL SERVICES			
13-001	Directional Tools		$ 4,180.00	$ 4,180.00
13-002	Directional Engineer		$ -	$ -
13-003	MWD Engineer		$ -	$ -
13-004	Other		$ -	$ -
13-005	Gyro		$ -	$ -
13-006	Whipstock		$ -	$ -
	TOTAL DIRECTIONAL SERVICES	$ -	$ 4,180.00	$ 4,180.00
	14.0 FISHING TOOLS AND SERVICES			
14-001	Fishing Tools and Services		$ 112,500.00	$ 112,500.00
14-002	Standby / Rentals		$ -	$ -
14-003	Total Lost in Hole "Fish"		$ -	$ -
	TOTAL FISHING COSTS	$ -	$ 112,500.00	$ 112,500.00
	15.0 OTHER EQUIPMENT			
15-001	Floats		$ -	$ -
15-002	Small Parts & Supplies		$ 11,000.00	$ 11,000.00
15-003	Stud, Nuts, Rings		$ -	$ -
15-004	Pump Expendables		$ -	$ -
	TOTAL OTHER EQUIPMENT	$ -	$ 11,000.00	$ 11,000.00
	16.0 TRANSPORTATION			
16-001	Freight Charges		$ 8,800.00	$ 8,800.00
16-002	Trucking & Hotshot		$ 11,000.00	$ 11,000.00
16-003	Water Trucks		$ -	$ -
16-004	Misc. Transportation		$ -	$ -
	TOTAL TRANSPORTATION	$ -	$ 19,800.00	$ 19,800.00

	NATURE OF EXPENDITURE	ESTIMATED COST TANGIBLE	INTANGIBLE	SUBTOTAL
	17.0 WASTE WATER DISPOSAL			
17-001	Vacuum Truck Services		$ -	$ -
17-002	Disposal Fees		$ -	$ -
17-003	Miscellaneous (Other)		$ -	$ -
	TOTAL WASTE WATER DISPOSAL	$ -	$ -	$ -
	18.0 OTHER SERVICES			
18-001	Garbage Bins		$ 14,205.00	$ 14,205.00
18-002	Portable Toilets		$ 2,200.00	$ 2,200.00
18-003	Water Lines and Pumps		$ -	$ -
18-004	Dust Control		$ -	$ -
	TOTAL OTHER SERVICES	$ -	$ 16,405.00	$ 16,405.00
	19.0 CASING COST			
	CASING AND ACCESSORIES			$ -
19-001	Casing	$ 209,617.00		$ 209,617.00
19-002	Liner Hangers & Adapters	$ -		$ -
19-003	Centralizers	$ 4,856.00		$ 4,856.00
19-004	ECP/Stage Collars/Tiebacks	$ 29,126.00		$ 29,126.00
19-005	Liner Hanger Serviceman		$ -	$ -
19-006	Thread Serviceman		$ -	$ -
19-007	Float Equipment	$ 9,198.60		$ 9,198.60
19-008	Shipping, Rentals, and Consumables		$ 8,695.50	$ 8,695.50
	TOTAL CASING COSTS	$ 252,797.60	$ 8,695.50	$ 261,493.10
	20.0 PRODUCTION EQUIPMENT			
20-001	Wellhead	$ 16,914.00		$ 16,914.00
20-002	Spools, T's & Flanges		$ -	$ -
20-003	Master Valve	$ -		$ -
20-004	Wing Valves	$ -		$ -

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20-005	Misc Production Equipment - Tangible	$ 53,748.00		$ 53,748.00
20-009	Misc Production Equipment - Intangible		$ -	$ -
	TOTAL PRODUCTION	$ 70,662.00	$ -	$ 70,662.00
	21.0 WELL TESTING			
21-001	Geochemistry		$ -	$ -
21-002	Test Instruments		$ -	$ -
21-003	Test Supervisor		$ -	$ -
21-004	PTS Logging		$ 95,220.00	$ 95,220.00
21-005	CT and Stimulation		$ -	$ -
21-006	Blooie Line & Seperator		$ -	$ -
21-007	Post Drilling Evaluation		$ -	$ -
21-008	Separator Lines		$ -	$ -
21-009	Well Stimulation		$ -	$ -
21-010	Other		$ -	$ -
	TOTAL WELL TESTING	$ -	$ 95,220.00	$ 95,220.00
	TOTAL AFE DEVELOPMENT	**$ 323,459.60**	**$ 5,111,919.45**	**$ 5,435,379.05**

SUMMARY OF

NATURE OF EXPENDITURE	ESTIMATED COST TANGIBLE	ESTIMATED COST INTANGIBLE	SUBTOTAL
Supervision and Management	$ -	$ 775,561.69	$ 775,561.69
Location Costs	$ -	$ 234,500.00	$ 234,500.00
Rig Mob / Demob	$ -	$ 486,200.00	$ 486,200.00
Rig Cost	$ -	$ 1,285,770.00	$ 1,285,770.00
Drilling Bits & Tools	$ -	$ 496,325.06	$ 496,325.06
Fuel	$ -	$ 118,950.00	$ 118,950.00
Equipment Rentals	$ -	$ 93,150.00	$ 93,150.00
Total Tool & Eqpt Maintenance	$ -	$ 36,500.00	$ 36,500.00
Outside Services	$ -	$ 666,087.00	$ 666,087.00
Mud and Chemicals	$ -	$ 192,780.00	$ 192,780.00
Cement and Services	$ -	$ 458,295.20	$ 458,295.20
Sumpless Drilling / Air Compressor	$ -	$ -	$ -
Directional Services (NMDC rental)	$ -	$ 4,180.00	$ 4,180.00
Fishing	$ -	$ 112,500.00	$ 112,500.00
Other Equipment	$ -	$ 11,000.00	$ 11,000.00
Transportation	$ -	$ 19,800.00	$ 19,800.00
Waste Water Disposal	$ -	$ -	$ -
Other Services	$ -	$ 16,405.00	$ 16,405.00
Casing Costs (no tax)	$ 252,797.60	$ 8,695.50	$ 261,493.10
Production Equipment (no tax)	$ 70,662.00	$ -	$ 70,662.00
Well Testing (PT surveys)	$ -	$ 95,220.00	$ 95,220.00
TOTAL	**$ 323,459.60**	**$ 5,111,919.45**	**$ 5,435,379.05**

Estimated by: OB

Reviewed by: WMR

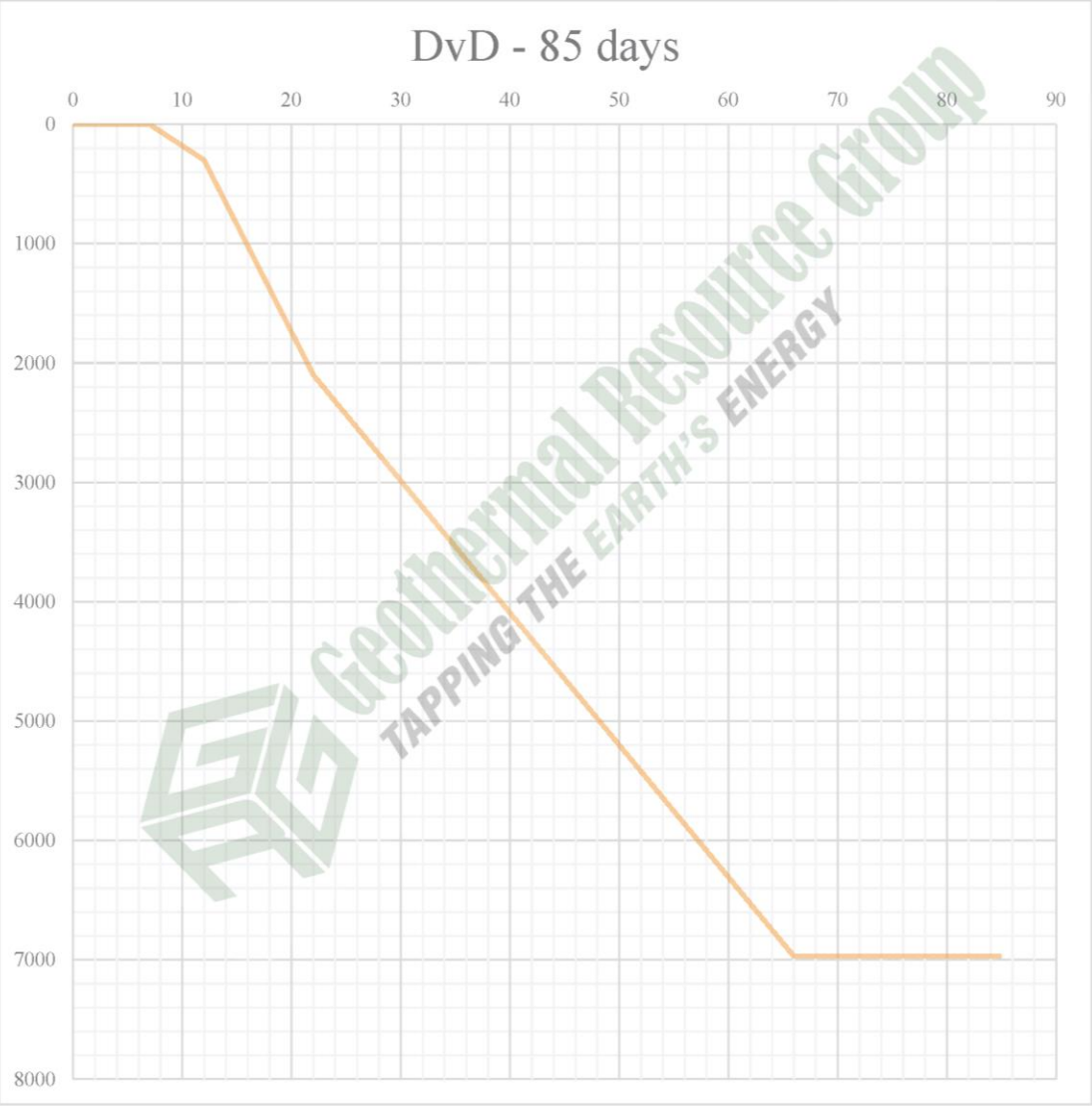
Approved by:

Costs of Vendor Services for Phase 2B well, split by sub-contracts through EGI (> $100,000) or Geothermal Resource Group (GRG).

Code	Vendor	AFE Est. Cost (w/ inf. cont.)	% of AFE			
DC	Rig Contractor (drilling rig) Daywork and equipment	$ 1,207,450.00	22.2%			
DC	Rig Contractor (drilling rig) Mob/demob	$ 455,000.00	8.4%			
RSRC	Resource Cementing (cement, test)	$ 458,295.20	8.4%			
GRG	Geothermal Resource Group-Supervision	$ 336,840.00	6.2%			
LSRV	Hot Rock Services (earthwork / local services / water)	$ 327,475.00	6.0%			
BKR	Baker (e-logs, perforation)	$ 292,300.00	5.4%			
GRG	Geothermal Resource Group-Management	$ 277,776.69	5.1%			
KNR	KnR (d/hole tools)	$ 243,468.00	4.5%			
WGL	West Coast Geologic (logging and H_2S)	$ 230,420.00	4.2%			
BPS	Bakersfield Pipe Supply (casing)	$ 209,617.00	3.9%			
BKR	Baker (bits)	$ 198,245.00	3.6%			
SINC	Sinclair DF Services (drilling fluid)	$ 192,780.00	3.5%			
GRG	Geothermal Resource Group-Engineering	$ 160,945.00	3.0%			
FUEL	rig + other use	$ 118,950.00	2.2%			
FISH	fishing (2 days burn rate + est. service cost)	$ 112,500.00	2.1%			
BKR	Baker (completions- packer, ECP, bridge plug)	$ 104,118.06	1.9%	EGI Contracted	$ 4,926,180	90.6%
EPI	EPI Valves (wellhead sales)	$ 85,662.00	1.6%			
DDRL	DiDrill (PT Surveys)	$ 95,220.00	1.8%			
H&S	hotshots and trucking	$ 51,000.00	0.9%			
DRLC	DrillCo (mud cooler)	$ 44,950.00	0.8%			
BNL	BnL Casing (casing running)	$ 36,667.00	0.7%			
BNL	BnL Casing (supervisor's trailer)	$ 35,500.00	0.7%			
INSP	Rig tubular inspection	$ 32,500.00	0.6%			
NOV	NOV (coring)	$ 25,200.00	0.5%			
PE	Project Engineering (casing acc. and float equip)	$ 22,750.10	0.4%			
BNL	BnL (BOPE test)	$ 18,000.00	0.3%			
INSU	well insurance	$ 18,000.00	0.3%			
AD-TL	autodriller and torque limiter	$ 17,750.00	0.3%			
GRMS	Grimshaw Drilling (conductor drilling)	$ 15,000.00	0.3%			
HRDW	hardware store	$ 11,000.00	0.2%			
OFFSP	office supplies store (included in trailer budget)	$ 7,500.00	0.1%	GRG Contracted	$ 509,199	9.5%
	total	**$ 5,435,379.05**	**100.0%**			
	vendor not identified					
xxx	looking for a new vendor					

Drilling Schedule Assumed for Phase 2B well

Days	Cum. Days	Depth	Activity
2	2	-	conductor
5	7	-	move in
5	12	300	surface
10	22	2,100	intermediate
44	66	6,970	production
12	78	6,970	test
5	83	6,970	additional test
2	85	6,970	move off



APPENDIX 2. ESTIMATES OF SUPPORT EQUIPMENT AND SERVICES

TABLE OF CONTENTS

Office building
Description: Modular Office space with room for meetings, office space, emergency sleeping quarter, kitchen, restroom with shower and furnishings.
Specifications: See below
Vendors and Quotations: ModSpace Rental price (60 months) includes furnishings = $109,186.94 Purchase price (furniture not included) = $141,600
Comments: Bid obtained by Clay Jones. Significantly cheaper to rent for 60 months than to purchase. **Rental option:**

ModSpace

This Offer Created For:
UNIVERSITY OF UTAH
505291

Date: 01/18/2017
Offer #: 246406
Offer Expires: 3/19/2017

800-523-7918

Customer Billing Address

UNIVERSITY OF UTAH
145 Park Building
Salt Lake City, UT 84112
Contact : Clay Jones
Phone : (801)585-7971
Email : cjones@egi.utah.edu
PO No :
Project No :
Project Name:

ModSpace Service Center

UT-Salt Lake City
2885 W. Directors Row
Salt Lake City, UT 84104
Contact : Scott Ravarino
Phone : (801)974-5628
Fax : (801)972
Email : Scott.Ravarino@modspace.com

Delivery Address

TBD Milford City Proper
Milford, UT 84751

Quantity	Description	Each	Total Amount
	Install 14' divider wall utilizing demountable wall system.		
1	Install Washroom	$6100.00	$6100.00
	Install ADA Shower. Includes making restroom larger, ADA Shower, 40 gallon water heater and new plumbing lines to all fixtures from new water heater.		
		Setup and Delivery Charges:	$23,408.00
	Remove		
1	Building Dismantle	$*	$*
1	Remove Anchors	$*	$*
1	Remove Skirting	$*	$*
	Return Delivery		
1	Fuel Charge	$*	$*
1	Transportation of Building	$*	$*
		Dismantle and Return Charges:	$*
		Total Monthly Rental:	$1,333.00
		Total Monthly Tax:	$76.28
		Total Monthly Amount:	$1,409.28
		Total One-Time Amount:	$23,408.00
		Total Tax on One-Time Items:	$1,222.14
		Total Amount Including 60 Month(s) Rent, Taxes, Delivery, Installation & Removal*:	$109,186.94

*** If Building Return and Removal amounts are not specified , such items will be billed at current rates at time of termination. ***

Tax rates vary and are determined by the state, local, federal and/ or provincial tax jurisdictions, they are subject to change at any time without notice. Taxes are estimated and will be finalized based upon either the actual delivery address or in accordance with the laws of the various jurisdictions.
If sales tax exempt, proof of exempt status is required and must be validated by ModSpace prior to contract finalization.

Prevailing/ Davis-Bacon Wage Applicable: No Badging or Access Requirements Applicable: No Union Labor: No

ModSpace

This Offer Created For:
UNIVERSITY OF UTAH
505291

Date: 01/18/2017
Offer #: 246406
Offer Expires: 3/19/2017

800-523-7918

Customer Billing Address

UNIVERSITY OF UTAH
145 Park Building
Salt Lake City, UT 84112
Contact : Clay Jones
Phone : (801)585-7971
Email : cjones@egi.utah.edu
PO No :
Project No :
Project Name:

ModSpace Service Center

UT-Salt Lake City
2885 W. Directors Row
Salt Lake City, UT 84104
Contact : Scott Ravarino
Phone : (801)974-5628
Fax : (801)972
Email : Scott.Ravarino@modspace.com

Delivery Address

TBD Milford City Proper
Milford, UT 84751

Tax Exempt: Yes__ or No__

Offer Type: Operating Lease

Only Modspace Offers You The Ultimate Confidence Pledge

Building Rental: DBL1260

Asset #:

Quantity	Term	Frequency	Rental Each	Monthly Rental
1	60	Monthly	$850.00	$850.00
			Total Monthly Rental:	$850.00

Additional Items

Quantity	Description	Rental Each	Rental Total
1	Personal Property Expense	$51.00	$51.00
2	Step Rental	$15.00	$30.00
4	2 Drawer Lateral File Rental	$19.50	$78.00
8	Chair Rental	$14.00	$112.00
	Conference Table Chairs		
4	Desk with Return Rental	$34.00	$136.00
1	Microwave Rental	$13.00	$13.00
1	Refrigerator Rental	$63.00	$63.00
		Total Additional Monthly Items :	$483.00

Delivery, Installation & Removal (One-Time Items)

Quantity	Description	Each	Total Amount
	Delivery		
1	Fuel Charge	$18.00	$18.00
1	Transportation of Building	$1350.00	$1350.00
1	Transportation of Furniture	$1500.00	$1500.00
	Installation		
14	Anchor Installation	$60.00	$840.00
1	Building Installation	$5565.00	$5565.00
1	Wood Skirting Installation	$1950.00	$1950.00
	Modification		
1	Install Modifications	$5500.00	$5500.00
	Install 6' base and 6' upper cabinets with sink. Includes 5 gallon hot water heater and 2 dedicated circuits above counter top for coffee and microwave. The room, 10x12 will be constructed with demountable wall system.		
1	Install Wall Partition	$585.00	$585.00

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Purchase option:

Clay Jones

From: Ravarino, Scott <Scott.Ravarino@modspace.com>
Sent: Thursday, January 19, 2017 3:48 PM
To: Clay Jones
Subject: EGI U of U Milford, Utah Project/Budgetary Sale Pricing

Clay,

Here are some budgetary numbers to consider the purchase option.

Building 24x60	$116,000.00
Furniture Package	$15,600.00
Delivery/Installation	$10,000.00
Total	$141,600.00

If you would like a formal proposal, let me know and I can put one together for you. Based on my quick calculations, leasing all over 60 months will be considerably less than purchasing all.

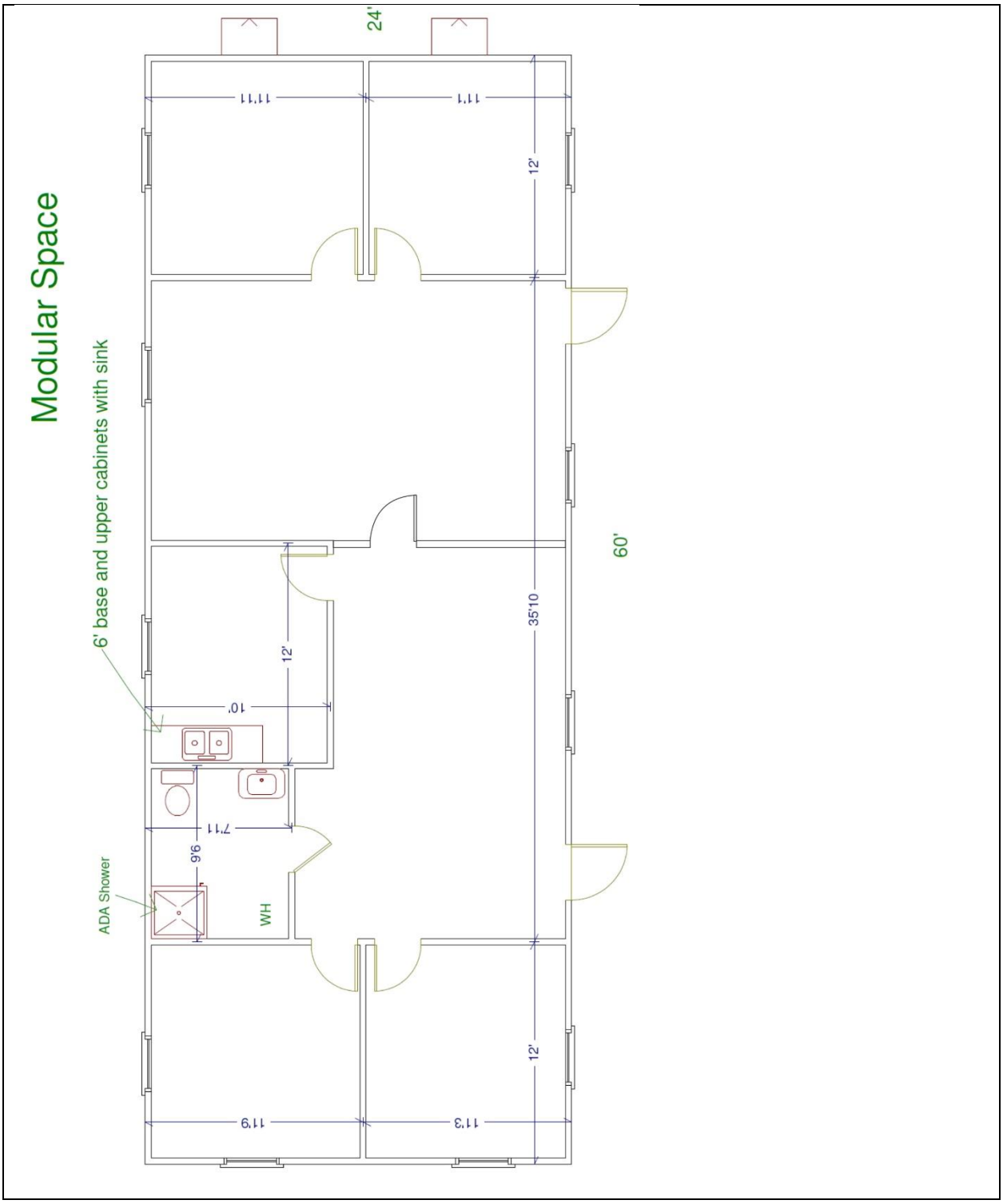
Call me to discuss further if needed.

Thanks,

Scott Ravarino
Territory Sales Manager
Office: 801-974-5628 Ext 87606
Mobile: 801-301-2056
2885 W.Directors Row | Salt Lake City, UT 84104
website | blog | online showroom

Photographs and Supplementary Information:

Floor plan with extra wall added


Modular Space
24'
60'
12'
35'10
12'
12'
6' base and upper cabinets with sink
ADA Shower
WH

STORAGE CONTAINERS AND COMBO STORAGE WITH OFFICE/WORKSHOP/LAB SPACE

Specifications:

Mobile storage containers

8’ W x 40’ L x 8’6” H

8’ W x 20’ L x 8’6” H

Vendors and Quotations: Quote obtained by Clay Jones via email.

Jeremy O'Connor
Inside Sales Representative
o: 801.936.0301 Ext. 7608
f: 480.894.6433
joconnor@mobilemini.com
www.mobilemini.com

RENTAL

$250 every 28 days 20' Combo
$340 every 28 days 40' Combo
$85 every 28 days 20' Container
$120 every 28 days 40' Container

SALES

$15,000-$20,000 20' Combo
$20,000-$25,000 40' Combo
$2800 20' Container
$3600 40' Container

DELIVERY FEE

$145

Comments:

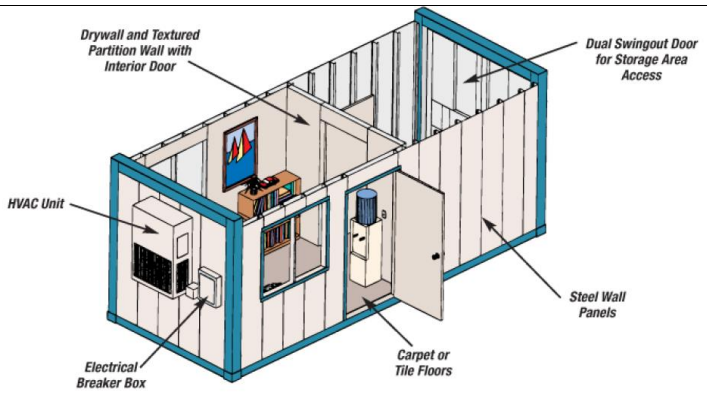
- Rental and purchase rates are similar for the combo units over the 5+ year project life span.

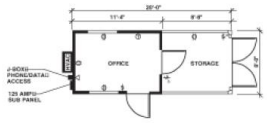
- It is much cheaper to purchase the storage containers over the five+ year project life span.
- Office space provides heating and cooling at drill site in inclement weather.
- Workshop/lab space for testing, modification, assembly/disassembly of equipment at office site.
- Secure storage of equipment. Weather and rodent prof.
- Emergency phone could be hard wired to office.
- Bid obtained by Clay Jones.

Photographs and Supplementary Information:

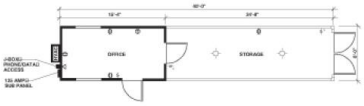
Example image of a 40’ storage container

Example image of a 20’ office/storage combo container





20' Office/Storage Combo



40' Office/Storage Combo

20' Office/Storage Combo

Size:
- 20' or 40' long
- 20' or 40' box size
- 8' wide
- 8' ceiling height
- Ground mounted

Interior Finish:
- Drywall textured
- Vinyl tile floors
- Drywall textured flat ceiling

Electric:
- Fluorescent ceiling lights
- 125 amp breaker panel
- 120/240 volt single phase
- Exterior phone/data access

Windows / Doors:
- Vertical slider windows w/screens
- Exterior security bars
- Mini blinds
- MMI high security door system w/ 3 pt interior locking system
- High security dual swing out door
- Hydraulic door closures

Exterior Finish / Frame:
- 16 gauge steel siding
- 10-16 gauge steel floor joist 12" on center
- Standard drip rail gutters
- 1 1/8" plywood sub floor
- All steel structural components

EARTHWORK

Description: 2 bids have been obtained for Well pad and road construction from Staker Parsons and Rollins Construction. Staker Parsons came in considerably cheaper.

Specifications of Staker Parson bid: Graded and graveled well pad area of 400’ x 175’ ft, or 1.6 acre

1.25 miles of graded and graveled road

1 mile graded dirt road

Comments:

Bid obtained by Garth Larson

Vendors and Quotations: Staker-Parsons

Earth Work- Vendor: Staker Parson

A2 Pad construction	$	22,000.00
6 " road base 1700 tons @ $12.00/ton	$	20,400.00
Sump included above		
A2 access road with gravel 1 .25 mi.@ $ 27550/mile	$	34,437.00

B1 Access road 1 mi. @ $ 4000/mile	$	4,000.00
Mobilization	$	16,800.00
Per Diem @ $ 25/day 5 days 3 men	$	375.00
Total Earth work with no cost-share offered-Staker Parsons	$	98,012.00

Specifications of Rollins Construction bid: Graded and graveled well pad area of 400’ x 175’ ft, or 1.6 acre, with sump,

6600’ of graded and graveled road and

5280’ graded dirt road

Comments:

Bid obtained by Garth Larson

Vendors and Quotations: Rollins Construction

1	**Earth Work- Vendor: Rollins Construction**			
1a	A2 Pad construction	400' X 175' cut and fill 195,000 yd3 @ $3.50/yd3	$ 68,250.00	
		6" road base 1450 tons @ $10.00/ton	$ 14,500.00	
1b	Sump construction	325' X 32' X 6' cut and grade 4366 yd3 @ $3.50/yd3	$ 16,100.00	*
1c	Access road A2	6600' w/gravel and compaction @ $ 8.00/ft.	$ 52,800.00	
1d	Access road B1	5280' with compaction @ $3.00/ft.	$ 15,840.00	
1e	Mobilization		$ 15,000.00	*
		Total Earth work (no cost share)		$182,490.00
1f	Cost-share (sump const. can be cost shared if done the same time as the pad)		$(31,100.00)	
		Total Earth work with cost-share-Rollins Construction		$151,390.00

FENCING
Description: Three bids for chain link fencing and gates for the drill pads and office site.
Specifications: 6’ tall fence with 16’ wide gates
Vendors and Quotations: Allied Fence Co. 6 ft fencing = $18.33/ft 16’ gates = $625

Clay,

Quoting this job by the linear foot is difficult since it is located about 3 hours from our yard. Here are some rough numbers for you but they are very rough numbers.

$18.33 per foot for 6' tall, add $1.25 per foot for barbed

$22.03 per foot for 8' tall, add $1.25 per foot for barbed

End and corner posts are not included in above pricing. They will vary from $60-103 depending on size and height.

6' tall X 16' double gate $628 + gate posts

8' tall X 16' double gate $815 + gate posts

I hope this helps. If you have a drawing or sketch of the layout I might be able to get you some more accurate numbers.

Ask about our sprinkler insurance.
Thank You,
Brad Fowlks
Allied Fence Co.
8580 Chromalloy Cir (4100 W)
West Jordan, Utah 84088
Mailing address:
P.O.Box 380
Heber, Ut 84032
801-262-3612 Office
801-550-8341 Mobile
801-261-1139 Fax

Vendors and Quotations: Robinson Fencing

Bid from Kevin Robinson 435-586-3846

Cedar City UT

$14/ft for 6 ft fencing

$16 to 17/ft for 8 ft fencing

$1/ft for barbed wire

16’ gates (2) included in cost per foot.

Vendors and Quotations: Stonehenge Fence

6’ fence = $16.50/ft

16’ gate = 945

Stonehenge FENCE
Our Fences & Decks Last the Test of Time!

Stonehenge Fence LLC
PO Box 1270
Orem, UT 84059-1270
(801) 607-5733
sales@stonehengefence.com

Estimate

ADDRESS
Clay Jones Outside of Milford Milford, Utah

SHIP TO
Clay Jones Outside of Milford Milford, Utah

ESTIMATE #	DATE	
19318A	12/15/2016	

SALES PERSON
Justin

JOB NAME
6’ Tall Chain Link Fence

ACTIVITY	QTY	RATE	AMOUNT
6’ Tall Chain Link Fence for 1200’ Labor and Materials	1	19,800.00	19,800.00
16’ wide x 6’ tall Double Chain Link Gate	1	945.00	945.00
3 Strand Barbed Wire Top, 1’ Tall making the over all height of the fence 7’. Labor and materials	1	3,600.00	3,600.00

$30 fee for returned checks. 3% fee for credit card charges. 20% restocking fee to cancel. Customer (BUYER) agrees to the following

TOTAL $24,345.00

Comments: Bids obtained by Clay Jones.

FUEL TANK

Description: 500 gallon diesel fuel tank for rent, or purchase of 2 285 gallon fuel tanks.

Vendors and Quotations: Jenkins Oil

Fuel		2 ea. 500 gal. fuel tank rental @ $50 per month		$	300.00
Vendor: Jenkins Oil		Current delivered price for off -road diesel/gal.	$ 2.10		

Vendors and Quotations: Northern Tool

285 gallon gravity feed fuel transfer tank	$	1,099.00
hose and nozzle	$	159.00
Shipping to Milford (1 tanks and 1 hose + nozzle)	$	1,730.00
Shipping to Milford (2 tanks and 2 nozzles)	$	3,169.70
Total for 2 of each and delivery	$	5,685.70

http://www.northerntool.com/shop/tools/product_47580_47580
http://www.northerntool.com/shop/tools/product_200627891_200627891

Comments:

Renting one 500 gallon tank for 60 months = $3,000. To purchase 2 285 gallon tanks would cost $5685.70.

Jenkins Oil bid obtained by Garth Larsen. Northern too bid by Clay Jones.

Photographs and Supplementary Information:

Fuel Storage Tank and Stand — 285 Gallon, Model# 300G

Item# 109583 (Not Yet Rated - New)

Key Specs

Tank Type	Storage
Tank Size (gal.)	285
Inlet Size (in.)	2
Outlet Port (in.)	2
Lockable	Yes
Material Type	Steel

See Complete Details

Factory Shipped —
Estimated Delivery: 9 - 11 Business Days

Only $1099.99

Only $159.99

Item in Cart

- Gravity-activated kit — no pumps, electricity or air supply is necessary
- Includes a 3/4in.dia. x 12ft.L DEF hose fitted with a 2in. NPTF fitting at one end that connects to the bottom of most DEF IBC totes
- Bottom end of the hose features a 3/4in. polypropylene manual nozzle with trigger lock
- Durable EPDM hose construction

Factory Shipped —
Estimated Delivery: 9 - 11 Business Days

View Shipping + Delivery Estimates

Not Available in Stores

CAT TH514C TELEHANDLER

Specifications:

Cat®
TH514C
TELEHANDLER

Specifications

Engine

Model	Cat® C3.4B*	
Gross Power (ISO 14396)	75 kW	101 hp
Maximum Torque	420 N-m/1,400 rpm	
Bore	99 mm	3.90 in
Stroke	110 mm	4.3 in
Displacement	3.4 L	207.5 in³

* meets U.S. EPA Tier 4 Interim Emission Standards

Weights

Operating Weight with Carriage & Forks	11 290 kg	24,890 lb

Operating Specifications

Rated Load Capacity	4999 kg	11,021 lb
Maximum Lift Height		
Stabilizers Up	13 300 mm	43 ft 6 in
Stabilizers Down	13 700 mm	45 ft
Maximum Forward Reach	9225 mm	30 ft 3 in
Top Travel Speed	32 km/h	20 mph
Load at Max Height		
Stabilizers Up	1814 kg	4,000 lb
Stabilizers Down	3175 kg	7,000 lb
Load at Max Reach		
Stabilizers Up	454 kg	1,000 lb
Stabilizers Down	1361 kg	3,000 lb
Outside Turning Radius Over Tires	3920 mm	12 ft 10 in
Drawbar Pull 74.5 kW	98 kN	22,037 lb

Service Refill Capacities

Fuel Tank	150 L	39.63 gal
Hydraulic Tank	90 L	23.78 gal

Tires

Standard 14.00-24 16PR TG-02

Brakes

Service Brakes	Servo assisted on front axle
Parking Brakes	Mechanical on front axle

Hydraulic System

Maximum System Pressure	250 bar	3,626 psi
Maximum Pump Flow	150 L/min	39.63 gal/min
Pump Type	Variable displacement load sensing axial piston pump	
Auxiliary Hydraulic Supply		
Intermittent	80 L/min	21.13 gal/min
Continuous	60 L/min	15.85 gal/min

Transmission Speeds

Forward		
1	5.8 km/h	3.6 mph
2	10.8 km/h	6.7 mph
3	24.5 km/h	15.2 mph
4	32 km/h	20 mph
Reverse		
1	5.5 km/h	3.4 mph
2	10.8 km/h	6.7 mph
3	24 km/h	14.9 mph

Boom Performance

Boom Up	13.7 Seconds	
Boom Down	14.6 Seconds	
Tele In	19.1 Seconds	
Tele Out	16.6 Seconds	
Crowd Forward (dump)	4.8 Seconds	
Crowd Backward	4.7 Seconds	
Combined		
Up and Out	28.0 Seconds	
Down and In	19.0 Seconds	
Bucket Breakout Force to ISO 8313	95 kN	21,356 lb
Boom Breakout Force	63 kN	14,162 lb

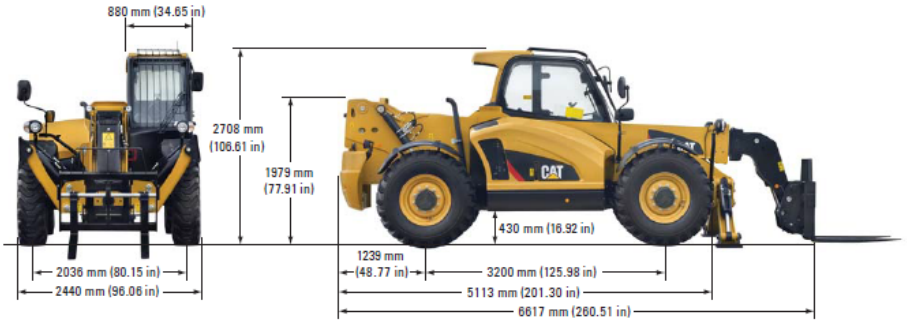
Sound

Exterior Sound (74.5 kW Engine)	106 dB(A)

TH514C Telehandler

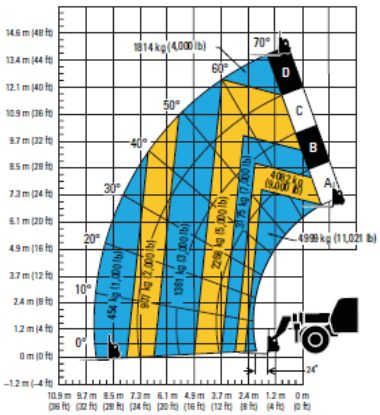
Dimensions

All dimensions are approximate.

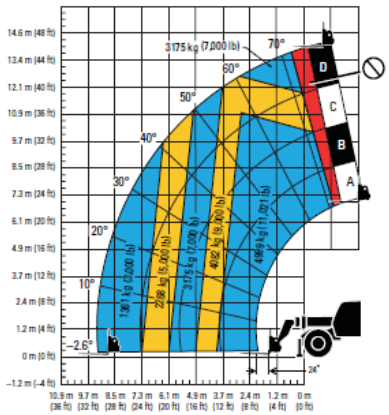


Load Chart and Dimensions

TH514C Stabilizers Up



TH514C Stabilizers Down



IMPORTANT

Rated lift capacities shown are with machine equipped with carriage and pallet forks. The machine must be level on a firm surface with undamaged, properly inflated tires as specified by the manufacturer. Machine specifications and stability are based on rated lift capacities at specific boom angles and boom lengths.

(If specifications are critical, the proposed application should be discussed with your dealer.)

DO NOT exceed rated lift capacity loads, as unstable and dangerous machine conditions will result.

DO NOT tip the machine forward to determine the allowable load.

Use only JLG approved attachments with proper material handler model/attachment load capacity charts displayed in the operator's cab. OSHA requires all rough terrain forklift operators be trained according to OSHA 29 CFR 1910.178 (l).

Due to continuous product improvements, machine specifications and/or equipment changes may be made without prior notification. This machine meets or exceeds ANSI/ITSDF B56.6-2005 as originally manufactured for intended applications.

Vendors and Quotations:

Trevor Shuman | Govt Sales Rep | Wheeler Machinery Co.
4901 West 2100 South, Salt Lake City, UT 84120
Office: 801.978.1614 | Mobile: 801.209.1882
tshuman@wheelercat.com

Purchase price $147,778.30. Deduct $8,000 if we don't want a cab with heating and A/C ($139,778.3).

Rental rates: Not including freight costs of $490 each way.

Yearly rental costs:
1 year 500 hours rental $28,500 per year

WARRANTY & COVERAGE
Standard Warranty: 12 Months / Unlimited Hours

F.O.B/TERMS:
Milford Utah

Rental rates:

Day	Week	Month
$280	**$1,120**	**$3,360**

Five year rental = $143,480

Comments:

Quote received by Clay Jones via email. PDF available.

LOCAL HEAVY MACHINERY RENTAL RATES

Vendors and Quotations: Rollin Construction

Rollins Construction and Trucking

Operated Equipment Rate Hourly

D-8 Dozer----------$255.00
D-6 Dozer----------$175.00
345 Excavator----------$210.00
330 Excavator----------$185.00
200 Excavator----------$130.00
Cat 140H Motor Grader----------$125.00
John Deer 770H Motor Grader----------$100.00
410 Backhoe----------$90.00
310 Backhoe----------$80.00
305 CR MiniEx----------$80.00
346 Cat Skidsteer----------$70.00
980 Wheel Loader 5 Yard----------$180.00
950 Wheel Loader 4 Yard----------$150.00
621 Case Loader 3 Yard----------$125.00
546 C Compactor----------$100.00
Ingersoll Rand Drum Roller----------$100.00
30 Ton Haul Pack----------$165.00
25 Ton Haul Pack----------$150.00
Crane ----------$150.00

Semi & Trailers

Semi & Single Side Dump----------$95.00
Semi & Double Side Dump (38 Ton)----------$135.00
Semi & Single Belly Dump----------$90.00
Semi & Double Belly Dump----------$120.00
50 Ton Lowboy----------$120.00
Forklift----------$ 90.00
Large Service Truck----------$90.00
Small Service Truck ----------$50.00

Labor Rates

Overtime rates will be applied after 8hrs on 5 day week, 10hrs on 4 day week

	Regular	Overtime
General Forman	$40.00	$60.00
Equip Operator	$35.00	$52.50
Laborer	$25.00	$37.50

WIRELINE AND TRAILER UNIT WITH MAST
Description: "Capabilities of this unit include setting and pulling of plugs, running Pressure/Temperature gauges including PTS tools of Kuster origin and most slickline operations. The Mast on this unit has a maximum working height of 46' is rated for a working load of 12,000 Lbs. so it has the capability to hang a top sheave and work as a rig less wireline mast for electric line operations such as perforating, logging, and long term real time bore hole and reservoir studies using downhole probes"
Vendors and Quotations: Tom Vail @ Western Wireline (805-320-8023) tvail@westernwireline.com Rental price for 60 months = $176,064

Photographs and Supplementary Information:

Clay Jones

From: Tom Vail <tvail@westernwireline.com>
Sent: Wednesday, January 25, 2017 3:35 PM
To: Clay Jones
Cc: tvailcal@sbcglobal.net
Subject: FW: wireline unit and mast
Attachments: wireline unit and mast; RE: Final Activity Report/Wallula Well De-Commissioning Activities

Clay,
As requested quote for lease of Wireline Unit and Mast.
The initial term would be 12 months At $3,472.00 per month total for lease period $41,664.00 After completion of the 12 month period, rental would be month to month at a rate of $ 2,800.00 per month.
Unit would come equipped with 316 stainless steel wireline, 20' of 2-7/8" lubricator and wellhead connection, wireline tool string and accessories. Capabilities of this unit include setting and pulling of plugs, running Pressure/Temperature gauges including PTS tools of Kuster origin and most slickline operations. The Mast on this unit has a maximum working height of 46' is rated for a working load of 12,000 Lbs. so it has the capability to hang a top sheave and work as a rig less wireline mast for electric line operations such as perforating, logging, and long term real time bore hole and reservoir studies using downhole probes

Three days wireline specialist @ 1,260.00 per day	$ 3,780.00
Tool rentals	$ 450.00
expenses at cost (travel out of Ventura Ca. or Seattle Wa. whichever is closer and subsistence)	
Service Estimate Total	$ 4230.00

PRESSURE TEMPERATURE SPINNER TOOL (PTS TOOL)

Specifications: Detailed bid available as a pdf

Vendors and Quotations: Kuster

Sale Amount:	80,865.00
Order Disc (0.00%):	0.00
Sales Tax:	0.00
Misc Charges:	0.00
Total Amount:	80,865.00

Comments:

Detailed bid available as a pdf. Bid obtained by Clay Jones.

DISTRIBUTED TEMPERATURE SENSOR (DTS TOOL)

Vendors and Quotations: Pinnacle/Haliburton

Option 2 : Equipment pricing for install on 2 7-8" Liner

Fiber Optics System (1 Well)		
Item	**Comments**	**Total**
Project Design and Setup		$10,000
DTS Surface Acquisition Interrogator (Purchase or Lease)	Additional $12k/well on same pad	$0
Monitoring System Well Hardware		$247,556
Surface Support Equipment		$13,700
Deployment and Mobilization		$55,290
Sub Total Equipment and Deployment		**$326,547**
Cement Monitoring and Report		$0
On-Demand Production Analysis		$30,425
StimWatch® Services (DTS+DAS)		$38,120
Estimated Project Total		**$395,092**

$395,092 per well or $790,778 for the production and injection pair.

Comments:

Bid obtained by Duane Winkler

Photographs and Supplementary Information:

Detailed bid available as a pdf

BOREHOLE SEISMIC ARRAY

Vendors and Quotations: Estimates from Kris Pankow

Geophones (each)	$	1,200
KMI data loggers (each)	$	10,000
Cables, clamps, lightning suppression, etc. (each)	$	6,000
VFL design (engineering firm)	$	20,000
Total for 10 units	$	192,000

SURFACE SEISMIC ARRAY

Vendors and Quotations: Estimates from Kris Pankow in phase 2A budget

5 cellular modems	$	2,250
5 cellular antennas	$	250
5 solar panels	$	750
5 charge controllers	$	750
10 AGM batteries	$	2,300
5 ancillary materials	$	3,000
shipping	$	2,000
Total	$	11,300
per seismic station	$	2,260

For 6 surface station = $13,560

Comments:

Does not include telemetering costs of $39/month for each station. Telemetering costs = $39/month x 60 months x 6 stations = $14,040

TILTMETERS

Vendors and Quotations: Pinnacle/Halliburton

Quote Date: 04/07/16

PINNACLE MICRODEFORMATION DIAGNOSTIC SERVICES

All pricing in USD$

SURFACE TILT MICRODEFORMATION MAPPING	List Price	Quantity	Total
Site Survey			
Remote site assessment, project design, and preliminary consultation/training	$ 3,000.00	1	$ 3,000.00
Instrumentation Mobilization, Installation, Activation, and Client Training			
Diagnostic Specialist, per day (estimated days)	$ 1,500.00	4	$ 6,000.00
Ancillary Array Activation Charges			
Additional Diagnostic Specialist, per day (if required)	$ 1,500.00	0	$ -
Subsistence, per man, per day (if not provided by Client)	$ 500.00	3	$ 1,500.00
Excess Array Construction Costs (i.e. environmentally sensitive areas)	(Per quotation)	0	$ -
Site Construction (drilling + PVC + cementing)			
Option 1: Pinnacle cost + 20% (estimated for location)	$ 1,800.00	9	$ 16,200.00
Option 2: Client provided	$ -	0	$ -
Array Deactivation, Demobilization, and Reclamation Supervision			
Per site	$ 250.00	0	$ -
Diagnostic Specialist, per day	$ 1,500.00	0	$ -
Subtotal Installation and Training Costs			***$ 26,700.00***
Reservoir Monitoring Charges	unit cost per mo.	no.	monthly cost
Instrumentation Rental	$ 120.00	9	$ 1,080.00
Monthly activity report	$ 750.00	1	$ 750.00
Monthly system operation report	$ 335.00	1	$ 335.00
Subtotal Monthly Costs			***$ 2,165.00***

Total cost = $156,600 and includes installation, monthly rental of tiltmeters and monthly reporting for 60 months

TANKAGE
Description: Bids obtained for 3 types of tanks: 1)1.7 million gallon lake tank; 2) 21,000 gallon steel frac tank; and 3) 22,000 gallon polypropylene tank
Vendors and Quotations: Baker Corp $383,944 for 1.7 million gallon tank.

BAKERCORP™

☑ QUOTE ☐ ORDER

2101 North Redwood Road
Salt Lake City, Utah 84116
Phone: (801) 363-5460 Fax: (801) 363-5462

ORDER # 01

Internal Use Only - Market Segment: 22
Sales Representative Number: 266

Date	May 16, 2016	Ship Date	TBD Time
Contact	Duane Winkler	Ship to	Milford Utah
Company	Department of Energy	Address	
Customer #		City, State ZIP	
Address	234 Handicap Ave	Site Contact	
City, State ZIP	Pagosa Springs, CO 81147	Site Phone	
Phone	970-769-4187	Purchase Order #	
Fax		Product	Horizontal Deep Test in Granite
Email	dcwinkler@centurytel.net	Internal Use Only	☐ Specialty Services ☐ Tax Exempt
Sales Rep	Mark Bond 801-631-2181		☐ #1 ☐ #2 ☑ #3

Job Details:

☐ Project Layout Attached ☐ Job Overview Attached ☐ Contract Rates Apply

RENTAL ITEMS:

Est. Qty	Equipment Description	Type of Billing 2.5 or 28	Daily Unit	Wkly Unit	Mthly Unit	Est Rental Term (Months)	Total Rental Cost Based on Rental Term
							$ -
							$ -
							$ -
Environmental Recovery Fee (1.5 %)							$ -
						Sub-Total Rental Items	$ -

SALE AND LABOR ITEMS:

Description	Qty.	Unit Cost	Total Cost
PT-42/42k BBL Mod Tank	1	$ 266,000.00	$ 266,000.00
12" Draw Line Set	1	$ 6,400.00	$ 6,400.00
Long - 4" Cane Line set	4	$ 660.00	$ 2,640.00
Medium - 4" Cane Line set	1	$ 530.00	$ 530.00
Short - 4" Cane Line set	1	$ 400.00	$ 400.00
Liner Clamps	78	$ 133.00	$ 10,374.00
Baker spec stair assembly	1	$ 7,600.00	$ 7,600.00
Liner	1	$ 15,000.00	$ 15,000.00
Modular Tank Set	1	$ 50,000.00	$ 50,000.00
			$ -
Contractor required for all heavy equipment work including offloading, staging pumps, pulling pipe, reloading, etc.			
		Sub-Total Sale Items	$ 358,944.00

ESTIMATED FREIGHT:

Description	Qty.	Rate	Total
Estimated Freight	1	$ 25,000.00	$ 25,000.00
			$ -
			$ -
			$ -
*** Above quote is for 1 complete Modular Tank			$ -
			$ -
			$ 25,000.00
		TOTAL PROJECT COST ESTIMATE BASED ON RENTAL TERM	$ 383,944.00

Comments: Quote does not include any applicable taxes. Quote based on one month (28 day) rental period. Transportation based on inventory availability out of Baker, Commerce City CO at time of order. All equipment is rented upon availability. "Customer is responsible for handling, storage, containment, and disposal of any chemical(s) as applicable. The applicability of all proposed or quoted systems should be verified by benchtesting conducted by BakerCorp. While a good-faith effort has been made to provide equipment that will meet project goals, no guarantee of performance is given with this quote, either express or implied. If a guarantee of performance is desired, please contact your Baker representative. Three hour minimum on deliveries/pick ups of equipment in Denver Metro Area.

Please contact Mark Bond @ 801-631-2181 with questions. Thank you for keeping BakerCorp in mind for your equipment needs!

Quotation Valid for 28 Days. Quoted in US Dollars. Quotation Does Not Include Sales Tax for Rental, Sale, or Freight Items. Refer to Terms Conditions Attached to this Quote.

Vendors and Quotations: Rain for rent Megan Cline 801-425-3215

1) 1.7 million gallon tank purchase = $314,000 (includes install and transport). Rental rate is $325/day ($325*5*365= $593,125)
2) 21,000 gallon steel frac tank purchase price range of $13,000 for used and $39,000 for new.
3) 22,000 gallon polypropylene tank. Still waiting on purchase price. Rental price of $25/day ($25*5*365 = $45,625).

Vendors and Quotations: 21,000 gallons Frac Tank Rental Staker Parson

Frac Tank rental	2 ea. Frac tank rental for 3 months @ 1100	$ 3,300.00	
Vendor: Staker Parson	Mobilization and de-mobilization @ 1950	$ 3,900.00	
	Total Frac Tank rental		$ 7,200.00

60 month frac tank rental = $69,900

Comments:

Purchase of 1.7 million tank from Rain for Rent is much cheaper than Baker. Steel frac tank purchase from Rain for Rent much cheaper than rental from Staker Parsons. Polypropylene tank although more expensive may be more resistant to corrosion than the steel frac tank.

Photographs and Supplementary Information:

Baker and Staker Parson bids obtained by Garth Larsen. Rain for Rent bid obtained by Clay Jones.

GARBAGE COLLECTION

Vendors and Quotations: Hughes and Sons

Garbage collection and haul	1 ea. 30 yd. roll-off delivery	$ 115.00	
Vendor: Hughes and Sons	1 ea. 30 yd. roll-off 10 pulls @ $ 385 ea.	$ 3,850.00	
	Total		$ 3,965.00

Comments:

Bid obtained by Garth Larsen

PORTABLE TOILET RENTAL

Vendors and Quotations: Hero Plumbing

Portable toilet rental	2 ea. trailer mounted toilets delivery	$ 50.00	
Vendor: Hero Plumbing	2 ea. trailer mounted toilets 10 week rental	$ 700.00	
	2 ea. trailer mounted toilets pickup	$ 50.00	
	Total		$ 800.00

Comments:

Bid obtained by Garth Larsen

WATER DELIVERY

Description: 2 cost equivalent options

Vendors and Quotations: Rollins Construction

Option 1:

Water pump and haul (Smithfield)	100000 gal. haul at 200 loads @ $ 95 ea.	$ 19,000.00	
Vendor : Rollins Construction	Setting pump and generator, fuel and rental	$ 42,000.00	
	Mobilization	$ 5,000.00	*
			$ 66,000.00

Option 2:

Water haul (Milford City)	100,000 gal. haul @$5.20 per 1000	$ 52,000.00	
Vendor : Rollins Construction	Tank rental	$ 2,500.00	
	Water fee @ $ 6.00 per 1000	$ 6,000.00	
	Pump-off pump rental	$ 6,000.00	
			$ 66,500.00

Comments:

Bid obtained by Garth Larsen

APPENDIX 3. "BALL-PARK" ESTIMATE FROM ROCKY MOUNTAIN POWER TO SUPPLY UP TO 200 KW OF POWER TO PAD A1.

PACIFICORP CUSTOMER COST ESTIMATE

Customer Name: UNIVERSITY OF UTAH Date: 1/18/2017

Title: GE THERMAL WELL Request # 6287299

The cost estimate provided below is valid as per conditions set forth.

Total Job Cost	$ 1,252,079 OAC
Less Customer Allowance	$
Less Contract Administration Credit	$
Total Customer Advance	$ 1,252,079 OAC

Ball Park Estimate	☑	A Ball Park Estimate is non-binding.
Firm Estimate	☐	A Firm Estimate is guaranteed for 90 days from the date this form is signed on condition that customer makes no changes to design and/or load.

Conditions/Comments

LINE EXTENSION WILL BE DONE UNDER CURRENT RULE 12

LINE COST ESTIMATE BASED ON A THREE PHASE 277/480 75 HP , 125 HP & A SINGLE PHASE 120/240 SERVICE FOR NEW OFFICE 200 AMP

CUSTOMER TO PROVIDE ALL TRENCHING, CONDUITS, TRANSFORMER PADS, RIGHT OF WAY PERMITS & ANY RECLAIMATION

Customer Signature

PacifiCorp Signature KENT SORENSON 1- 435 896 2232

Fault Duty: _____ Amps Motor Start Results: Reqmnts Below - 477 AAC Extension

Comments: 125 HP
Motor across-line start results in 3.3% VD on Distribution System (DS). Motor start be reduced to 361 A (335 kVA) with 460 V at motor terminals for 2.5% VD on DS. 13.5% VD projected at Service Transformer (ST), which may not be acceptable to customer. 5.2% VD projected at ST with 50% Reduced Voltage Start.

Engineer: Emily Stallman Date: 1/17/2017

Results (engineer to complete for requested values):

Fault Duty: _____ Amps Motor Start Results: Reqmnts Below - 477 AAC Extension

Comments: 75 HP
Motor across-line start results in 5.7% VD on Distribution System (DS). Motor start current must be reduced to 357 A (~310 kVA) with 460 V at motor terminals for 2.5% VD on DS. May not be acceptable to customer. 7.9% VD projected at Service Transformer.

Engineer: Emily Stallman Date: 1/17/2017

This form should be used for: • any 3Ø motor ≥ 35 HP; • 1Ø motor ≥ 3 HP; • Fault duty
The Engineer will provide, within three business days, the Motor Start Analysis report and/or the calculated Fault Duty at the customer's panel.

uCalc *version 12/02/16*