- In exceptional cases, boring may be used where trenching is not possible due to topographic constraints (e.g., steep slopes).

After trenching, individual sections (40- to 80-foot lengths) of pipe would be hauled to the construction site and laid adjacent to the trench along the right-of-way (pipe stringing). After trenching and pipe stringing, individual sections of pipe would be bent as necessary to fit the contours of the trench. Pipe ends then would be aligned and welded together and the completed pipe placed on temporary supports along the edge of the trench. All welds then would be visually and radiographically inspected and repaired if necessary. The welds would be field-coated to protect the pipeline against corrosion. Coating the welded joints would complete the external coating of the pipeline. The entire pipeline coating would be inspected by an electronic device to locate and allow for repair of defects in the external coating.

The pipe would be lowered into the trench by sideboom tractors and the trench backfilled with the previously excavated soil using a padding machine, bladed equipment, or backhoes. The right-of-way would be regraded to its approximate pre-construction contour, except for a slight crown of soil to compensate for the natural compaction of the backfill that would occur after placement.

After installation, the pipeline would be hydrostatically tested to verify the integrity of the completed steel pipeline system. In accordance with 49 CFR 192 regulations, the hydrostatic test pressure would range from 1.1 to 1.5 times the pipeline's maximum operating pressure. To accomplish this integrity testing, the pipeline would be hydrostatically tested in sections, at locations to be determined based upon elevation change. An estimated one million gallons of water would be used to fill about half of the completed pipeline for testing, and then transferred for subsequent testing. Water for hydrostatic testing would be obtained from the Project well field. After testing, the water would be returned to the proposed power plant site for disposal, or disposed of at each test site by discharging to a dewatering structure. Once the test sections are determined, appropriate discharge permits would be obtained.

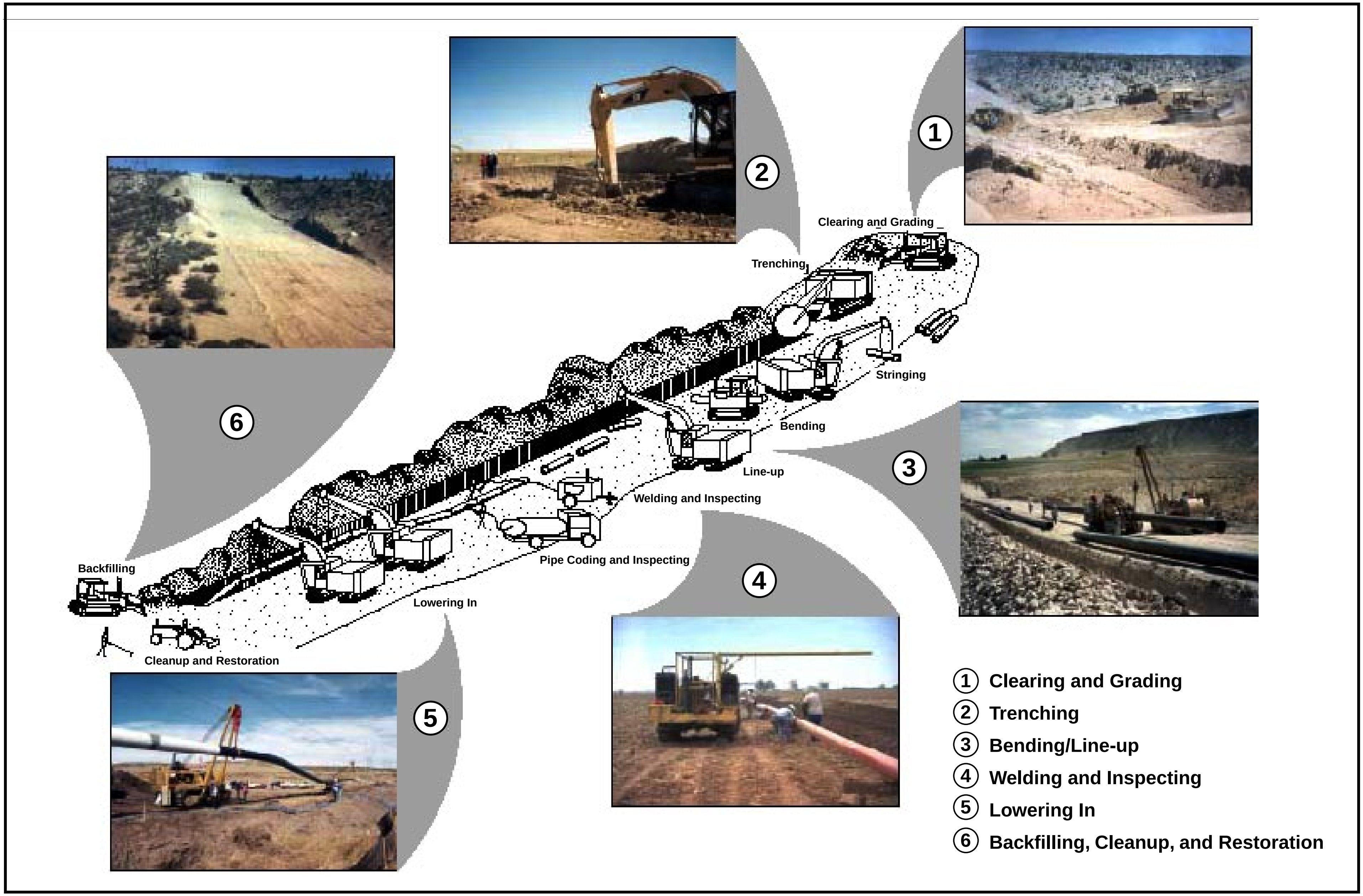
Concurrent with hydrostatic testing, the work areas would be final graded and restored. Reclamation would follow the appropriate plans (Appendix B). Topsoil would be returned to its original horizon and rock would be scattered randomly over the surface. Land contours would be restored as near to original as practical in all areas. In non-agricultural areas, permanent erosion control berms (waterbars or slope breakers) would be installed on slopes as appropriate. The ground surface would be prepared for seeding, and planted with a native seed mixture based upon consultation with land management agencies, local conservation authorities, and respective landowners. In agricultural lands, any existing terraces or swales would be restored and seeded. Annual croplands would not be seeded unless requested by the landowner. Surplus construction material and debris would be removed and disposed of in appropriate facilities, and private property, such as fences, gates, and driveways would be restored to a condition equal to or better than the preconstruction condition.

After hydrostatic testing, the pipeline would be dried, and block valves, taps, and meter interconnect facilities would be installed. The pipeline then would be purged and packed with natural gas for service.

Pipeline Construction at Wetland/River/ Stream Crossings

The proposed pipeline would need to cross the Big Sandy River and an associated wetland, and other ephemeral dry washes or drainages. The pipeline company would adopt FERC's "Wetland and Water Body Construction and Mitigation Procedures" (FERC procedures) for construction work in these locations.

Standard cross-country construction techniques (as described above) would be used to cross all dry ephemeral channels and non-wetland areas. For any drainage that contains water at the time



Pipeline Construction Sequence

Big Sandy Energy Project EIS

Figure 2-14

of crossing, open-cut crossings would be accomplished by using conventional bucket-type excavation equipment operating from the banks or from within the waterbody. Open-cut crossings typically would require temporary work space on both sides of the crossing. The excavation, pipeline installation, and backfilling across the water body and banks would be completed as quickly as possible. The pipeline construction company would obtain permits from the U.S. Army Corps of Engineers (COE) as required for crossing of dry washes and drainages subject to COE jurisdiction.

As one option for crossing the Big Sandy River, Caithness has proposed to directionally drill the pipeline under the river. If the option of directional drilling is used, the work areas would be configured as follows:

- two 150-foot by 200-foot pads for drilling equipment, mud tracks, and mud shakers, one on each side of the river, set back away from the Big Sandy River riparian area
- one 75-foot by 1,700-foot area for pipe string layout north of, and set back from, the Big Sandy River riparian area

The estimated depth of the directional drilling is 20 to 30 feet below the bed of the Big Sandy River, and the boring is expected to be about 1,300 feet long.

As a second option, installation of the pipeline across the Big Sandy River could be accomplished by open-cut methods, due to the very narrow width of the flowing waterway crossing and associated wetlands and riparian vegetation. The crossing installation would be completed during time of low flow and would be performed in accordance with the COE Section 404 permit and FERC Procedures. Pipeline construction staging, welding, and installation activities at the Big Sandy River crossing would require additional work areas, with an additional space of 100 feet (width) by 300 feet (length) required on each side of the crossing. Also, pipeline anchoring and construction methods to prevent flotation during flooding may be required.

Storage of hazardous materials, chemicals, fuels, and lubricating oils would be prohibited within 100 feet of wetland boundaries.

Limited and temporary access through the wetland would be required to complete the trenching. Construction equipment operating within wetlands would be limited to that needed to dig the trench, install the pipe, backfill the trench, and restore the right-of-way. All other construction equipment would use access roads on upland areas to the maximum extent practicable. No permanent access roads would be constructed in the wetland.

Sediment filter devices would be installed at the base of the slope leading to a wetland. If there is no slope, sediment filter devices would be installed as necessary to prevent spoil from flowing off the right-of-way into the wetland or to prevent sediment from flowing from the adjacent upland into the wetland.

During clearing, woody riparian/wetland vegetation would be cut at ground level and the cut material removed from the wetland, leaving the root systems intact. In most areas, removal of stumps and roots would be limited to the area directly over the trench. This would promote more rapid regeneration of woody wetland vegetation. To facilitate revegetation of wetlands, the top foot of soil would be stripped from over the trench, except in areas with standing water or saturated soils.The Project proponent would use several additional measures at the Big Sandy River crossing to minimize environmental impacts. These are addressed in Section 2.2.8. The dry-ditch technique would be used to limit disturbance in the stream channel and protect water quality of the flowing water.

The pipeline construction company would develop and implement a Hazardous Materials Management and Spill Prevention and Countermeasure Plan (HMMSPC Plan), including more detailed information on the use of hazardous materials and handling of hazardous materials encountered during construction activities.

Blasting

It is not expected that bedrock would be encountered during trenching operations; however, if bedrock is encountered and mechanical ripping is not feasible, blasting might be required. If blasting is required, applicable Federal, state, and local stipulations would be followed, and necessary permits and authorizations would be obtained. The pipeline company would take measures to prevent damage to property and livestock during blasting operations, including the use of blasting mats. Owners of nearby buildings would be notified.

The pipeline construction company would coordinate any blasting operations adjacent to public highways with ADOT, and would comply with ADOT guidelines regarding blasting operations. Federal blasting regulations are administered by the U.S. Bureau of Alcohol, Tobacco, and Firearms (27 CFR 55), and U.S. Department of Labor, Occupational Safety and Health Administration (29 CFR 1910.109-1926.914).

Road and Highway Crossing

Construction of the 16- to 20-inch pipeline to the Questar pipeline would require crossing of I-40. I-40 would be crossed by installing the pipeline within the Mohave County Hackberry Road right-of-way and through the ADOT I-40 underpass for Hackberry Road. Specific ADOT or Mohave County requirements would be followed for the pipeline installation at the highway underpass. Temporary extra work areas would be required at each end of the highway crossing location.

Existing smaller (county) roads and various private or public access roads would be crossed by trenching (open-cut crossing). Open-cut crossings typically would be completed within three to five days, and alternate vehicular routes would be provided for traffic during pipeline construction. After pipe installation and backfilling, the roadway would be restored to near original conditions.

Electric Power Transmission Line Crossing

The 16- to 20-inch pipeline would cross the existing electric transmission line corridor (Mead-Liberty 345-kV and Mead-Phoenix Project 500-kV overhead lines) north of Wikieup and at the entrance to the proposed power plant. Cathodic protection devices would be installed at these locations as required.

Extra Work Areas

Based upon preliminary site inspections, additional work areas would be required for construction of the pipeline. The exact locations of these are not known at this time, but they generally would be small areas (about 100 by 100 feet to 100 by 300 feet in size), totaling about 7 acres.

2.2.7.6 Optical Ground Wire Installation

Equipment, OPGW, and other construction material would be acquired from various vendors and stockpiled along the route at sites owned by Western or its contractor. During the construction phase, the contractor would obtain material from these sites.

The OPGW would be constructed in spreads consisting of equipment and crews handling various phases of construction for a given line segment. The equipment used in the construction would include a tensioner and cable puller. These vehicles are large, 10-wheel trucks designed for heavy loads. Tensioners also may be mounted on a trailer.

The process of replacing the existing overhead static wire with the OPGW would be accomplished by first mounting a traveler or pulley on each structure near the place where existing wire attaches to the structure. Next, the existing static wire would be released from its attachment to the structure and placed into the traveler and cut at one end. The OPGW then would be tied to the end of the old static line and pulled through the travelers, removing the static line and installing the OPGW in one motion. Linemen would remove the new OPGW from the travelers and attach them to the structures. For the 46-mile length, about 15 pulling and tensioning sites would be needed, resulting in about 5 acres of temporary disturbance.

Flagging and Staking of Right-of-way

All activities associated with the construction, operation, and maintenance of the right-of-way would be conducted within the authorized limits of the temporary and permanent disturbance. For the area west of the proposed substation, trenching would displace 18 inches of soil for the length of the trench. The length of the trench would be about 500 feet.

Sensitive areas as identified by the specialist (e.g., biologist, archaeologist) would be clearly marked for avoidance before any construction or surface-disturbing activities begin.

Temporary Construction Areas

Two to four temporary staging areas for equipment and materials storage, each about 100 by 100 feet in size, would be required. These marshaling yards would be located on previously disturbed land, avoiding wetlands and other environmentally sensitive areas.

Clearing and Grading of the Right-of-way

Portions of the existing access roads to the transmission line structures on the Mead-Liberty 345-kV transmission line may require improvement to accommodate cable trucks or construction vehicles. Improvements would be limited to blading the existing alignment in those areas necessary.

No construction or routine maintenance activities would be performed during periods when the soil is too wet to adequately support construction equipment. If equipment creates ruts in excess of 6 inches deep, the soil shall be deemed too wet to adequately support construction equipment.

The width of the disturbance zone along the route would be minimized to the extent practicable. Construction vehicles would be excluded from traveling or turning around in undisturbed areas outside the right-of-way, except for reasons of safety. Disturbance of vegetated areas would be avoided where possible. In those areas where the disturbance is necessary, sensitive and protected species, steep slopes, and floodplains would be avoided.

Access

New road construction is not anticipated. Construction-related traffic would be restricted to existing routes approved by the authorized specialist assigned by Western to monitor biological or cultural resources during construction.

Fences and Range Improvements and Existing Land Uses

All existing improvements would be protected. If damage occurs it would be repaired immediately to the satisfaction of the owner or land manager.

Western would protect all public survey monuments found within or adjacent to the right-of-way. Survey monuments include but are not limited to General Land Office and BLM Cadastral Survey Corners; reference corners; witness points; U.S. Coastal and Geodetic benchmarks and triangulation stations; military control monuments; and recognizable civil (both public and private) survey monuments. If any of the above are obliterated or disturbed, Western would report the incident, in writing, to the BLM Field Office Manager and the respective installing authority, if known. Where BLM or General Land Office right-of-way monuments or references are obliterated during operations, Western would secure the service of a registered land surveyor or a staff cadastral surveyor to restore the disturbed monument according to procedures found in the latest edition of the manual of surveying instructions for the survey of the public lands of the United States. Western would record such survey in the appropriate county and send a copy to the authorized specialist.

Work Force

Each construction spread would require 15 to 20 workers including foremen, equipment operators, general laborers, and environmental monitors and construction inspectors. Each spread would require three to five pieces of equipment and support vehicles.

Construction workers would not be permitted to camp on public lands while participating in construction activities. Construction camps would not be necessary. The 15 to 20 workers would move along the route as the OPGW is installed and find local lodging in Wikieup or Kingman.

Safety

The following measures would be undertaken to ensure the health and safety of agency personnel, contractors, and the general public:

- The existing transmission lines would be de-energized.
- Applicable Western construction and safety standards would be followed.
- Traffic control procedures at road crossings, as approved by ADOT, would be implemented.

Hazardous/Toxic Materials

No hazardous material would be generated by the actions required for the operation and maintenance of the OPGW. To minimize the impact of hazardous materials used during construction activities (fuels and lubricating oils), all equipment would be inspected regularly for leaks. Any leaks detected would be promptly corrected. Fueling operation would be conducted at commercial filling stations or fuel farms.

Maintenance and Operation

Supervisors and field personnel would monitor and control the system by driving throughout the Project area inspecting facilities and checking equipment. Periodic reconnaissance of the right-of-way would not change with the addition of the OPGW and would continue to be conducted twice a year by driving the entire route on the existing roads or by helicopter. Improvements and repairs would be conducted as necessary. Maintenance procedures for the right-of-way would remain unchanged with the addition of the OPGW. Once the proposed facilities are in place and functioning, they would remain in continuous operation.

2.2.8 Actions to Reduce or Prevent Environmental Impact

The Proposed Action includes actions or plans that would be implemented to reduce or prevent environmental impacts. Each of these actions or plans is summarized below, and has been committed to by Caithness, MCEDA, and Western, as applicable.

2.2.8.1 Dust Control Measures

Fugitive dust sources that would be anticipated during construction of the Proposed Action include ground-disturbing site work such as clearing, excavation, bulk material storage and handling, grading, and labor and material transport. During construction of the Project pipeline, dust would be generated by ground-disturbing activities as well as equipment travel on paved and unpaved roads.

Construction and Excavation Activities

For the duration of construction activities, actively disturbed areas would be stabilized through the use of wet suppression as required to meet offsite visible dust limits. Surfactants may be used to aid in wet suppression, thereby reducing the volume of water required to effectively treat the site. Disturbed areas of the site, including storage piles, not being actively used for a period of seven calendar days or longer, would be stabilized as appropriate to minimize dust emissions. Active stabilization may not be required if soil moisture or natural crusting is sufficient to limit visible dust emissions.

Control of Dust from Handling and Storage of Bulk Materials

Bulk materials stored on site would be actively wetted during unloading as needed to minimize visible dust emissions off site. It is anticipated that the majority of the material would be used on site upon arrival. Should bulk materials require onsite storage for an extended period of time, the application of active wet suppression or the installation of a porous wind fence (a.k.a., windscreens) would be used as necessary to minimize fugitive dust generation.

Paved and Unpaved Travel Surfaces

Traffic passing from unpaved surfaces to paved roadways would create both mud and dirt deposits on the road and blowing dust from passing vehicles. Onsite equipment tire washing would be implemented as necessary to mitigate this potential source of fugitive dust.

Particulate emissions occur whenever a vehicle travels across an unpaved surface. Many of the heavily traveled unpaved surfaces such as onsite access roads, parking lots, and laydown areas would be covered with gravel and watered as necessary to minimize dust generation.

Onsite fugitive dust emissions would be limited by reducing vehicle speeds, and a combination of active and passive dust suppression measures. Mitigation practices would include the following:

- Where practicable, onsite employee parking, construction offices, and equipment and material laydown areas would be located near the main entrance to minimize onsite vehicle traffic.
- Onsite access roads, parking lots, and laydown areas would be maintained with a gravel cover to the maximum extent practical.
- Traffic off of maintained onsite access roads would be restricted and a posted speed limit of 15 miles per hour would be enforced to minimize emissions from unpaved road segments.
- Unpaved road segments would be watered at least once daily when precipitation has not occurred. Additional watering of unpaved surfaces may be undertaken whenever it is necessary to prevent visible dust emissions off site.

2.2.8.2 Erosion and Sedimentation Control Measures

Caithness would prepare and implement a final Erosion and Sedimentation Control Plan. The measures described below would be included in this plan.

Big Sandy River Crossing

The following measures would be taken at the Big Sandy River crossing before and during construction of the pipeline if the Big Sandy River is crossed by trenching:

- Limit width of disturbance to the minimum necessary during construction.
- In disturbed areas outside of the trench, cut vegetation at ground surface rather than removal of root systems, where possible.
- Install water diversion flume (dry-ditch technique) or diversion pump across the portion of the channel to be trenched. Use sandbags to direct surface flow into flume or pump and protect sides of flume or pump exit.
- Segregate topsoil (i.e., soil removed from river channel and adjacent upland area) so that trench is filled with original material in its proper location. This material would be stored adjacent to the channel area while the pipe is being installed.

- Install water pump to relocate sub-surface water in the trench to water filtration structure in upland area.

- Install sediment barriers (sandbags, silt fence, or hay bales) immediately down gradient of the trenching along banks, riparian zones, and stockpile areas.

- Allow no construction traffic across riparian area.

- Use equipment mats to minimize impacts on soils and vegetation along right-of-way.

- Implement appropriate preventative and mitigative measures in accordance with the SPCC plan.

The following measures would be taken at the Big Sandy River crossing after construction of the pipeline if the Big Sandy River is crossed by trenching:

- Restore river channel and channel banks to preconstruction contours.

- Install trench breakers at the base of slopes near river channel.

- Apply seed to banks and riparian zone and cover with erosion control matting. Seeding should take place within a week from completion of construction.

- Application of a minimal amount of fertilizer on the banks may be implemented once seedlings have appeared.

- Leave sediment barriers and erosion control matting in place on banks and adjacent riparian zone until revegetation is successful.

- Check Big Sandy River crossing after substantial storm events within the first year after completion of installation across the river to ensure that unusual erosion has not occurred in the construction area. Maintain erosion control measures as necessary.

General Erosion and Sedimentation Control Methods

The following measures would be taken at all locations as applicable :

Standard measures and best management practices as discussed in the Stormwater Pollution Prevention Plan (Appendix A) and reclamation plans (Appendix B), including use of erosion control fabric, diversion ditches, ditch stabilization, sediment barriers such as silt fences and hay bales, sediment filtering devices in areas leading to wetlands, erosion control berms (water bars) on slopes, riprap, and revegetation.

2.2.8.3 Groundwater Monitoring Plan

The principal objective of groundwater monitoring would be to assess the extent to which observed water level drawdowns correlate with model-predicted drawdowns, and to use this information to determine the amount of water to be added, and the timing of this water augmentation.

Potential impacts to the upper aquifer are of primary concern. Because groundwater levels in the upper aquifer tend to fluctuate in response to groundwater pumping and flow in the Big Sandy River, it is not feasible to discern impacts on groundwater levels in the upper aquifer through direct measurement. Groundwater levels would be measured in upper aquifer wells as part of the monitoring program to record the daily and seasonal fluctuations in the upper aquifer in response to groundwater pumping in the upper aquifer, flows in the Big Sandy River, and climatic cycles. However, the groundwater level data obtained from the upper aquifer would not be used to assess whether upper aquifer groundwater levels are being impacted by groundwater pumping in the lower aquifer.

As an alternative to direct monitoring of groundwater levels in the upper aquifer to assess impacts, groundwater levels would be monitored in the lower and middle aquifers to assess the extent to which observed groundwater levels in those two aquifers correlate with groundwater levels predicted by the groundwater flow model. In this way, the groundwater monitoring data from the lower and middle aquifers would be used as an early warning of potential impacts on groundwater levels in the upper aquifer.

The results of the groundwater flow model define a range of predicted reduction in flow from the middle aquifer to the upper aquifer as a result of the Proposed Action. If the observed groundwater level drawdowns in the lower and middle aquifers are within the model-predicted range of drawdowns, then the observed data would be used to determine the amount of water to be added, and the timing of water augmentation. If the observed groundwater level drawdowns in the lower and middle aquifers are outside of the model-predicted range of drawdowns, then the observed water level data would be used to re-calibrate the model prior to determining the amount of water to be added and the timing of this augmentation.

Groundwater level measurements would be collected from five existing wells in the vicinity of the proposed power plant. One well (OW-2) would be used to monitor the lower aquifer, one well (OWMA-2) would be used to monitor the middle aquifer, and three wells (OW-1, OW-8, and Banegas) would be used to monitor the upper aquifer. In addition, there is a recognized need for a second middle aquifer monitor well between the production wellfield and the marsh. This second middle aquifer monitor well would be installed and equipped for water level monitoring prior to initiating groundwater pumping for the Proposed Action. The location of the new middle aquifer monitor well would be selected based on consensus between Caithness and BLM.

Groundwater level measurements would be collected from the lower and middle aquifer monitor wells (OW2, OWMA2, and the new middle aquifer monitor well) at a frequency of once per day. Based on the rates of drawdown observed during the long-term aquifer test, it is anticipated that more frequent measurements would not be necessary. Groundwater level measurements would be collected from the upper aquifer monitor wells (OW-1, OW-8, and Banegas) four times per day to monitor anticipated diurnal fluctuations in groundwater levels.

Groundwater level measurements would be collected from the middle and upper aquifer monitor wells using either an electric sounder or an electronic pressure transducer. Because the lower aquifer monitor well is under artesian pressure, groundwater level measurements in that well (OW-2) would be collected using a pressure transducer. Groundwater levels obtained using an electric sounder would be measured to an accuracy of 0.01 foot. Groundwater levels obtained using a pressure transducer would be measured to 0.01 psi, or about 0.01 foot.

2.2.8.4 Stormwater Pollution Prevention Plan/Surface Water Diversion Structures

A Stormwater Pollution Prevention Plan (Appendix A) would be followed to minimize impacts from surface water runoff and erosion. Under this plan, surface water diversion structures would be installed at the proposed power plant and substation site to drain surface water runoff from on-site graveled and impermeable surface areas, including areas that would be used for future phases of facility construction. Runoff (clean water) from the areas above the proposed power plant site would be diverted around the plant site.

The average annual precipitation measured at the Wikieup National Climatic Data Center Station is 10.0 inches. According to Western U.S. Precipitation Frequency Maps, published by the National Oceanic and Atmospheric Administration (1973), the 10-year, 24-hour storm event at the proposed plant site is 2.6 inches, and the 100-year, 24-hour storm event is 4.2 inches. The Best Available Demonstrated Control Technology Guidance Document for the Surface Impoundment Category at Industrial Facilities (ADEQ 1996) requires that surface water diversions have a design capacity capable of withstanding a 100-year, 24-hour storm event to protect impoundment structures from runoff.

Four ditches (designated A1, A2, A3, and A4) would receive flows from the proposed substation, power plant site, and Phase 2 areas. Ditch A3 also would receive overland flow from a small portion of the watershed to the east and north of the Phase 2 area. Flows from these sites would peak at about 84.08 cubic feet per second (cfs), and would be diverted to Evaporation Pond B. Flows from these sites would contribute a run-off volume of 7.44 acre-feet to Pond B from a 100-year, 24-hour storm event (Figure 2 - 15).

An offsite stormwater ditch (Ditch B1) would be located at the northern boundary of the proposed substation and the area containing facilities constructed under Phase 2 of the Proposed Action, and would receive overland flow from a slope on the north side of the ditch. Ditch B2, on the western boundary of the substation, would receive water from Ditch B1 and a small area west of the ditch. A culvert about 300 feet long would carry water from Ditches B1 and B2 under the access road and empty into the existing drainage south of the road. The culvert would need to be at least 96 inches in diameter to carry peak flows of 45.63 cfs. A retention basin would be constructed at this location to provide capacity for excess water during storm events. An erosion control structure would be installed at the outlet to dissipate energy. Table 2-6 summarizes the ditch designs required for offsite surface runoff and onsite stormwater runoff from a 100-year, 24-hour storm event.

Ditches C1, C2, and C3 would divert water from a temporary construction laydown area to the east of the proposed power plant site and Phase 2 areas to an unnamed drainage southeast of the proposed power plant site. A peak run-off of 6.16 cfs would drain from this area. Best management practices such as the use of energy dissipaters and silt fence/straw bale structures would be used to control sedimentation from this area.

The plan also would address erosion control and site stabilization. The main power plant area would be covered with asphalt, concrete, or rock. Portions of the proposed power plant's perimeter and interior would be reclaimed or landscaped with native vegetation to provide some erosion control and soil stability in localized areas.

2.2.8.5 Flow Augmentation and Monitoring

Groundwater monitoring data would be compiled and evaluated quarterly, and reported to BLM annually. Emphasis would be placed on evaluation of the monitoring data from the middle aquifer wells (OWMA-2 and the new middle aquifer monitor well), because groundwater levels in the middle aquifer are more directly connected to groundwater levels in the upper aquifer.

At the end of each quarter, the groundwater level measurements from each well would be appended to the groundwater level database for that well and an updated water level hydrograph prepared. For the lower and middle aquifer hydrographs, the model-predicted groundwater level data would be superimposed on the observed data to allow model-predicted and observed drawdowns to be compared.

If the observed groundwater level drawdowns in the lower and middle aquifers are within the model-predicted range of drawdowns for the two aquifers, then the observed data would be used to determine the amount of water to be added, and the timing of water augmentation , based on the model-predicted range of flow reductions. If the observed groundwater level drawdowns in the lower and middle aquifers are outside of the model-predicted range of drawdowns for the two aquifers, then the observed water level data would be used by Caithness, in cooperation with BLM, to re-calibrate the groundwater flow model. The re-calibrated model would then be used to determine the amount of water to be added.

As noted above, the results of the groundwater model indicate that the potential reduction in

TABLE 2-6 BIG SANDY PROPOSED POWER PLANT SITE DITCH DESIGNS FOR 100-YEAR, 24-HOUR STORM EVENT						
Ditch	Discharge	Shape	Slope	Depth*	Width*	Type
On-site						
A1	43.48	Triangular	1.3	2.31	11.55	Riprap
A2	35.08	Triangular	0.4	2.61	13.06	Riprap
A3	44.78	Triangular	0.4	2.83	14.17	Riprap
A4	84.08	Triangular	7.8	6.60	8.01	Concrete
Off-site						
B1	38.20	Triangular	4.4	1.10	5.50	Riprap
B2	45.63	Triangular	0.4	2.85	14.26	Riprap
C1	3.61	Triangular	1.9	1.04	5.18	Riprap
C2	5.81	Triangular	2.9	0.70	3.49	Riprap
C3	6.16	Triangular	3.3	0.70	3.52	Riprap

* - with freeboard of 0.3 feet.

flow from the middle aquifer to the upper aquifer as a result of the proposed action may range from 0.5 percent (159 gpm or 256 ac-ft/yr) to 1 percent (350 gpm or 564 ac-ft/yr). The model results also indicate that the area of greatest potential flow reduction is at the marsh, located near the southern boundary of the basin above Granite Gorge, and that addition of water at the marsh would avoid these flow reductions. Water could effectively be conveyed to the marsh via the Big Sandy River. Accordingly, Caithness has proposed that any augmentation water be directed into the Big Sandy River between the US 93 bridge crossing of the Big Sandy River and the marsh. Required augmentation would be provided at least one year in advance of the projected flow reduction (as determined by monitoring and the groundwater model).

The two sources of augmentation water are (1) a portion of the 4,850 ac-ft/yr maximum withdrawal of groundwater from the lower aquifer, and (2) conversion of existing surface water irrigation rights to stream flow rights in the Big Sandy River.

Groundwater from the lower aquifer would be supplied by constructing a pipeline from the groundwater production wellfield or the power plant and diverting a portion of the groundwater from the production wellfield or water from the proposed power plant water treatment system to the river.

Surface water also could be supplied by converting surface irrigation rights at Banegas Ranch and/or others to instream flow rights.

2.2.8.6 Actions to Compensate for Predicted Impacts on Cofer Hot Spring

Cofer Hot Spring is privately owned, and is used by the owner for grazing and other uses. Hydrologic analysis of the Big Sandy Energy Project has indicated that a reduction of flow from Cofer Hot Spring is projected due to the drawdown of the lower aquifer from pumping the water supply for the proposed project. The lower aquifer has been determined to be the source for Cofer Hot Spring. The landowner will use existing shallow wells near the spring to replace water in the spring used for grazing. One of the wells would be pumped to a stock tank or water trough to provide water for the Hot Spring Grazing Allotment.

The Project proponent has agreed in concept with the landowner to provide a well to access water from the lower aquifer to replace any water lost from reduction in spring flow.

2.2.8.7 Actions to Minimize Impacts on Grazing

Range improvements that are removed or disturbed during construction of the proposed project would be repaired or replaced immediately following construction. A survey would be completed prior to construction of the natural gas pipeline and other facilities where range improvements are present to identify existing range improvements that would be impacted during construction. The pre-construction survey would be coordinated with BLM personnel to ensure all range improvements are taken into consideration. An action plan that identifies the duration, timing, and methods to reduce temporary impacts on range improvements would be developed so the function of range improvements is ensured during construction. In areas where permanent access is required to maintain or inspect the natural gas pipeline, cattle guards or gates would be installed to ensure the integrity of fencing systems.

2.2.8.8 Actions to Reduce Visual Impacts

The following actions would be taken to minimize visual impacts associated with the Proposed Action:

- All structures, exhaust stacks, buildings, tanks, and other features associated with the proposed power plant site and aboveground portions of the pipeline would be surface-treated (dulled or painted with desert tones) to reduce visible glare and visual contrast with the surrounding landscape.

- Areas of surface disturbance (e.g., proposed power plant site, pipeline, roads, well sites, and other areas) would be revegetated to be consistent with the surrounding landscape to reduce visual contrast. This primarily would occur along the perimeter of the proposed power plant site and not the interior, as well as along the pipeline and access road edges.

- Areas of surface disturbance (e.g., proposed power plant site, pipeline, roads, well sites, and other areas) would be contoured to closely match the surrounding landscape to reduce visual contrast and allow for revegetation. This primarily would occur along the perimeter of the proposed power plant site and not the interior, as well as along the pipeline and access road edges.

- Lighting for the proposed power plant and substation would be limited to areas required by regulation, operation, and safety. Wherever practical, provisional lighting control devices (i.e., motion detectors and emergency switches) would be installed to reduce the amount of lighting visible at the proposed power plant site during times of normal operation, and lights would be located at the lowest points on the power plant which still would provide for the intended use and reduce overall visibility of lights.

- Lighting devices would be an amber (high-pressure sodium) or red color where needed to avoid the intensity associated with white lights. Lights would have directive or shielding devices to reduce uplighting and offsite glare.

2.2.8.9 Reclamation Plans

The proponent has developed two different reclamation plans for the proposed Project: the Reclamation Operation Maintenance Plan (ROMP) for BLM-Managed Public Lands, which would be followed on public lands managed by BLM and the Reclamation Plan for State and Private Lands, which would be used on private and state-owned lands. Complete copies of these plans are included as Appendix B.

Primary provisions in the ROMP include the following:

- pre-construction surveys to identify native plants and areas of environmental concern (refer to Section 2.2.8.10)

- salvage of native plants listed on the Arizona Department of Agriculture List of Protected Native Plants (1999). The number of plants (per species) to be salvaged would be determined based on transplant spacing criteria as described in the plan.

- stockpiling and reuse of topsoil

- storage of salvaged plants in temporary nurseries located in work areas or other disturbed areas

- use of erosion control measures such as sediment barriers, water bars, mulching, riprap, and erosion control fabric

- reseeding of the recontoured right-of-way, using mainly broadcast seeding methods and

- a BLM-approved native seed mix, followed by transplanting of salvaged plants

- watering for about nine months after transplantation, with a follow-up inspection after one year

- use of two-track maintenance pathways along the pipeline right-of-way (no permanent access road construction)

The Reclamation Plan for State and Private Lands includes the same provisions as the ROMP, except that ADOT would identify which plants would be salvaged and use them in its highway reclamation projects, instead transplanting them on site. Disturbed areas would be similarly reseeded and a one year inspection conducted, but no watering schedule is specified.

For construction on any lands, a contractor would be selected to perform all reclamation activities for disturbed areas. This contractor would coordinate with appropriate Federal and state agencies, acquire all permits and approvals, prepare a detailed plan, and comply with the approved plan and all other applicable reclamation requirements.

2.2.8.10 Pre-construction Biological Surveys and Impact Reduction Measures

Pre-construction biological surveys would be conducted for special status plants and certain wildlife species or groups. Detailed field surveys would be conducted prior to construction to identify habitats of special status plants, including the endangered Arizona cliffrose. If special status plant habitat cannot be avoided, surveys would be conducted to identify any populations or individuals. Surveys for populations and/or individuals would be conducted during the species' flowering period, if appropriate. The Arizona cliffrose has a flowering period between April and June. Details on the proposed surveys are included in Appendix C.

Wildlife pre-construction surveys would be performed prior to ground-disturbing activities, with the precise timing of surveys dependent on the target species and the specific construction activity. Currently, pre-construction surveys are proposed for the Sonoran desert tortoise and breeding raptors. Details on the proposed surveys are included in Appendix C.

Caithness would restrict all ground-disturbing activities in the Big Sandy River riparian zone, including a 150-foot buffer on each side, to months outside the peak breeding season (mid-June through mid-August) for the southwestern willow flycatcher.

Caithness would implement numerous measures in areas designated as Category III desert tortoise habitat to reduce or minimize impact. Surface-disturbing activities would be minimized along the proposed pipeline corridor. Access to roads not needed after construction would be restricted, and the roads would be scarified. Access roads scheduled for upgrading in desert tortoise habitat would not be widened, if possible, nor would berms be disturbed during grading. New permanent access roads would not be created in desert tortoise habitat except where the right-of-way is not adjacent to an existing right-of-way or road. Stockpile areas in desert tortoise habitat would be placed either in less valuable habitat, or minimized in size.

2.2.8.11 Cultural Resources Protection Measures

Cultural resources would be protected in accordance with the provisions of a Programmatic Agreement (PA) prepared in compliance with Section 106 of the National Historic Preservation Act (Western 2001). The PA defines procedures for additional pre-construction surveys to inventory cultural resources within areas of potential effect as they are identified. Any inventoried cultural resources would be evaluated and treated in consultation with the parties participating in the PA, which include Western, BLM, Hualapai Tribe, Arizona State Historic Preservation Office, Arizona State Museum, Arizona State Land Department, COE and Caithness.

2.2.8.12 Spill Prevention Control and Countermeasure Plan

An SPCC plan would be developed as design information is finalized. This plan would address specific methods and standards to ensure safe storage of chemicals and petroleum products at the proposed power plant site. An HMMSPC Plan would be developed by the pipeline company and implemented during construction. The plans would contain information on how to safely handle, store, and dispose of hazardous materials, as well as procedures to follow in case of a release.

2.2.8.13 Noise Reduction Measures

Noise reduction measures would be included in the design of the turbines and the turbine housing. The air intake system would include silencers to reduce noise from the combustion turbine compressor inlet. The turbines would be contained within an insulated shell to further reduce noise levels.

Construction other than water well drilling would be anticipated to occur in one 10-hour shift per day 5-days per week, thereby reducing the potential for noise on nights and weekends. Construction equipment would be required to have operable mufflers wherever possible.

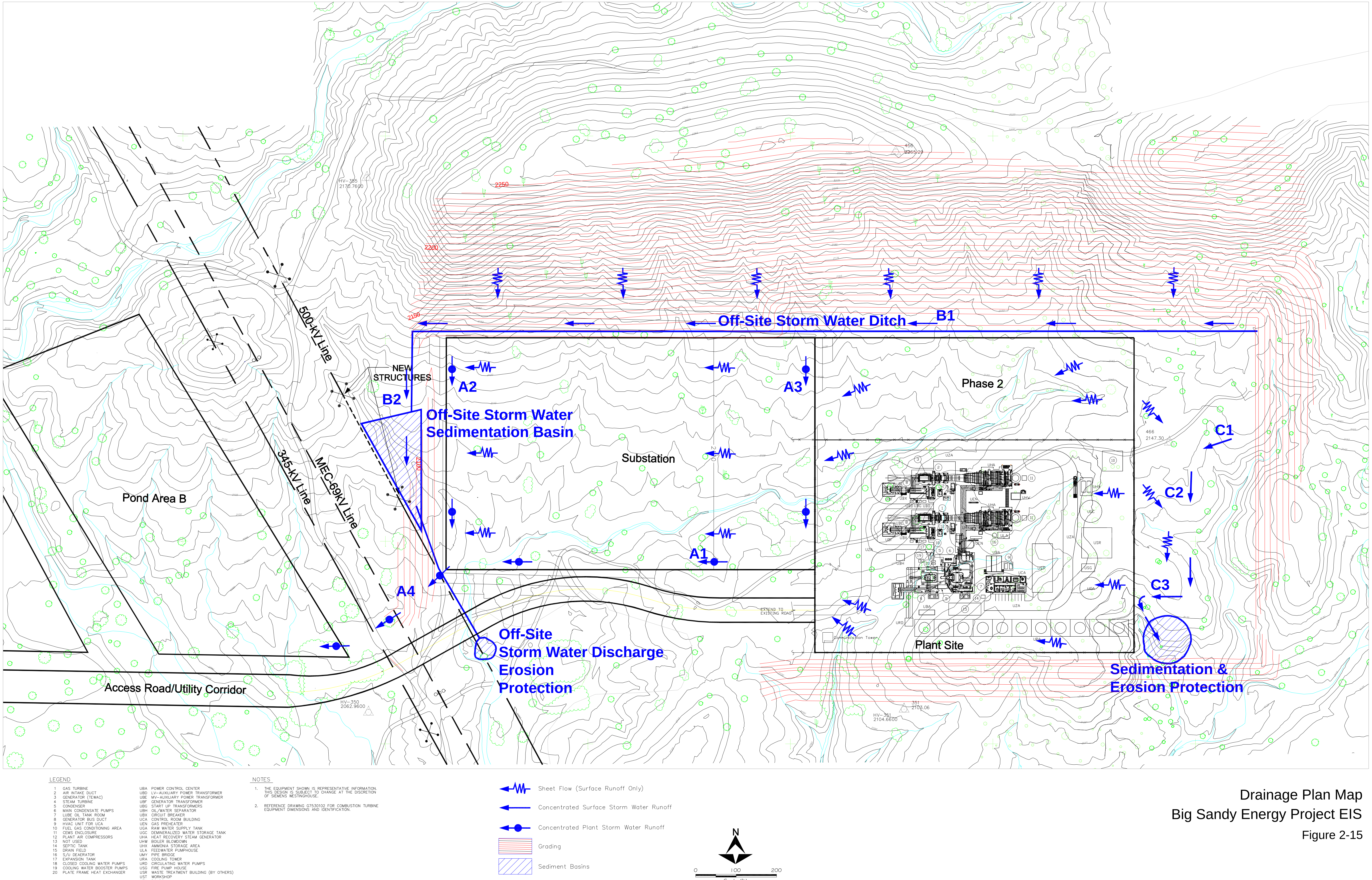
2.3 DESCRIPTION OF ALTERNATIVES

2.3.1 Alternative Pipeline Routes

Two alternatives were identified for routing the natural gas pipeline. The first would make use of the existing BLM utility corridor that overlays the Mead-Phoenix Project 500-kV and Mead-Liberty 345-kV transmission line corridors. Although Western's polices do not allow the parallel location of the pipeline within these transmission line rights-of-way, this recognized utility corridor provides a viable route from the supply pipeline connection to the proposed power plant, and the transmission lines can be closely paralleled. Also, a second alternative route that generally follows road rights-of-way was identified. This alternative would follow Hackberry Road, US 93, and the new Mohave County access road leading to the proposed power plant site.

As with the proposed pipeline, these alternative corridors consist of combined corridor segments. The five corridor segments following the transmission lines are designated T1 through T5, while the segments following roads are designated R1 through R5. Both alternatives make use of corridor segment C3 where the transmission line corridor overlaps the US 93 corridor. Figure 2-12 depicts the locations of the alternative pipeline routes and their respective corridor segments, and Table 2-2 provides a detailed description of each of the segments. Sections 2.3.1.1 and 2.3.1.2 below describe the location and features of each alternative pipeline route in more detail.

Similar to the proposed gas pipeline, an interconnection facility would be installed at each interconnection point at the northern end of the pipeline. This facility would consist of isolation valves, control valves, metering



LEGEND

1	GAS TURBINE	UBA	POWER CONTROL CENTER
2	AIR INTAKE DUCT	UBD	LV–AUXILIARY POWER TRANSFORMER
3	GENERATOR (TEWAC)	UBE	MV–AUXILIARY POWER TRANSFORMER
4	STEAM TURBINE	UBF	GENERATOR TRANSFORMER
5	CONDENSER	UBG	START UP TRANSFORMERS
6	MAIN CONDENSATE PUMPS	UBH	OIL/WATER SEPARATOR
7	LUBE OIL TANK ROOM	UBX	CIRCUIT BREAKER
8	GENERATOR BUS DUCT	UCA	CONTROL ROOM BUILDING
9	HVAC UNIT FOR UCA	UEN	GAS PREHEATER
10	FUEL GAS CONDITIONING AREA	UGA	RAW WATER SUPPLY TANK
11	CEMS ENCLOSURE	UGC	DEMINERALIZED WATER STORAGE TANK
12	PLANT AIR COMPRESSORS	UHA	HEAT RECOVERY STEAM GENERATOR
13	NOT USED	UHW	BOILER BLOWDOWN
14	SEPTIC TANK	UHX	AMMONIA STORAGE AREA
15	DRAIN FIELD	ULA	FEEDWATER PUMPHOUSE
16	S/U DEAERATOR	UMY	PIPE BRIDGE
17	EXPANSION TANK	URA	COOLING TOWER
18	CLOSED COOLING WATER PUMPS	URD	CIRCULATING WATER PUMPS
19	COOLING WATER BOOSTER PUMPS	USG	FIRE PUMP HOUSE
20	PLATE FRAME HEAT EXCHANGER	USR	WASTE TREATMENT BUILDING (BY OTHERS)
		UST	WORKSHOP
		UZA	ROADS

NOTES

1. THE EQUIPMENT SHOWN IS REPRESENTATIVE INFORMATION. THIS DESIGN IS SUBJECT TO CHANGE AT THE DISCRETION OF SIEMENS WESTINGHOUSE.
2. REFERENCE DRAWING G7530102 FOR COMBUSTION TURBINE EQUIPMENT DIMENSIONS AND IDENTIFICATION.

Drainage Plan Map
Big Sandy Energy Project EIS
Figure 2-15

equipment, and a filter separator. The equipment would be enclosed within small buildings. This equipment and buildings would be located within new approximately 100-foot by 100-foot fenced and graveled yard. In addition, a small communication tower (about 15 feet high) would be included within the fenced yard. Electric power service would be supplied from a nearby existing distribution line. Access to the interconnection facility would be from existing roads. Additional yards would be needed if connections were made to more than one of the interstate pipelines.

A gas metering facility would be installed at the southern end of the pipeline within the proposed power plant site. This facility would consist of isolation valves, metering equipment, a filter separator, and pressure reduction and control valves used to feed gas to the turbines. A fuel gas preheater also would be installed to increase the efficiency of the proposed power plant.

2.3.1.1 Alternative R Gas Pipeline Corridor

The Alternative R (Road) gas pipeline corridor, would consist of the following corridor segments:

R1 – R2 – R3 – C3 – R4 – R5

Corridor segment R1 begins at the northernmost potential supply pipeline and heads south after crossing under I-40. This segment and corridor segment R2 encompass the Hackberry Road right-of-way, which varies from 100 to 150 feet wide. Corridor segment R1 passes through both private and state-owned land, while corridor segment R2 crosses private land only. Corridor segment R1 is 3.9 miles long and segment R2 is 0.8 miles long.

Corridor segment R3 begins where Hackberry Road intersects with US 93 and continues south, following the US 93 alignment. The corridor width is 400 feet, immediately adjacent to the eastern edge of the US 93 right-of-way. This segment is about 9.3 miles long and crosses primarily private lands.

Corridor segment C3 is the same connecting segment included in the Alternative T gas pipeline corridor, and is described above.

Corridor segment R4 continues south along US 93 just east of the US 93 right-of-way to the intersection with the Alternative T gas pipeline corridor, a distance of about 13.7 miles. This segment crosses private, BLM-managed public, and state-owned lands and has a width of 400 feet except within the Carrow-Stephens Ranches ACEC, where it also includes the 200-foot wide US 93 right-of-way; and along US 93 south of Gunsight Canyon, where it increases to a width of 1,500 feet to accommodate the planned realignment of US 93.

From this point, the Alternative R gas pipeline corridor follows corridor segment R5, which follows along US 93 south to the proposed access road leading to the proposed power plant site. The access road right-of-way would cross Sections 1, 5, and 7, T15N, R12W, and enter the proposed power plant site over the section corners of Sections 5, 6, 7, and 8, T15N, R12W. This corridor segment is about 8.5 miles long and varies in width from 200 feet wide along the proposed access road to 1,800 feet wide along part of US 93.

2.3.1.2 Alternative T Gas Pipeline Corridor

The Alternative T (Transmission Line) Gas Pipeline Corridor, would consist of the following corridor segments:

T1 – T2 – T3 – C3 – T4 – T5

The northern end of this alternative route would begin with corridor segment T1. The exact starting location would depend on which interstate pipeline or pipelines are selected for the gas supply, but would begin about 1 mile northwest of the interchange of US 93 and I-40. All three potential source natural gas pipelines are located north of I-40 at this location; therefore, the pipeline would be installed by boring underneath I-40. Corridor segment T1 extends south about 3.7 miles to Old Highway 93 in Section 18, T20N, R13W (also the intersection with corridor segment C2). The corridor has a width of 2,235 feet and crosses private and state-owned lands.

This route continues along corridor segment T2, following the existing transmission lines for about 2.1 miles to the intersection with corridor segment C1 in Section 30, T20N, R13W. Corridor segment T2 is also 2,235 feet wide and crosses private and state-owned lands.

The route continues with corridor segment T3, heading south parallel to the transmission lines, for a distance of 8.5 miles. This corridor segment is also 2,325 feet wide, crossing both private and state-owned lands. It intersects with corridor segment C3, which is located where the transmission line and US 93 corridors overlap. This segment's eastern boundary is 400 feet east of the US 93 right-of-way and the western boundary is 1,000 feet west of the Mead-Liberty 345-kV transmission line right-of-way. The segment is about 1.9 miles long and crosses private and state-owned lands.

This alternative route continues with corridor segment T4, which follows the transmission line rights-of-way to their intersection with US 93. Corridor segment T4 is 2,325 feet wide except along the western border of the Carrow-Stephens Ranches ACEC, where it expands to 4,000 feet. This segment is 13.8 miles long and crosses private, BLM-managed public, and state-owned lands.

The final corridor segment for the Alternative T gas pipeline corridor is T5, which begins at the southern end of corridor segment T4 and extends southeast about 7.8 miles to the proposed power plant site. This segment is 2,325 feet wide except where it veers from the transmission line rights-of-way to cross the Big Sandy River perpendicularly; the corridor expands to 3,000 feet wide for this crossing. This segment crosses private and BLM-managed lands.

2.3.1.3 Crossover Segment C2

Although not a part of any alternative route, corridor segment C2 is included in environmental planning and analysis because it could be considered during final right-of-way acquisition as a connecting link between the Alternative T and R gas pipeline corridors. It encompasses the Mohave County 150-foot-wide right-of-way of Old Highway 93 and is about 2.3 miles long, crossing private and state-owned lands. Mohave County has agreed that the pipeline could be placed within the existing road right-of-way to minimize impacts.

2.3.1.4 Construction of the Alternative Pipelines

Construction and maintenance within either alternative corridor would use methods similar to those described for the Proposed Action (refer to Section 2.2.7.4). Any applicable actions to reduce or prevent environmental impact (Section 2.2.8) also would be implemented. Requirements for temporary workspace are expected to be similar to those of the Proposed Action. Wherever possible, existing roads would be upgraded as needed and used for pipeline construction and maintenance access. The new area of disturbance for construction of either route would be 90 feet wide within the pipeline right-of-way, with additional work areas totaling 7 acres. Tables 2-7 and 2-8 summarize the areas of disturbance associated with both alternative corridors, including a breakout of total, permanent, and temporary disturbance.

Although the two alternatives differ in where they would cross the Big Sandy River, similar construction and environmental protection measures would be used. The Alternative T gas pipeline corridor would cross the river perpendicularly, where the river is typically dry, so that trenching would be used. Pipeline anchoring and construction methods to prevent flotation during flooding would be required across the entire 0.5-mile width of the crossing.

2.3.2 No-Action Alternative

No action would mean that BLM would not approve the requested right-of-way for the gas pipeline, the access road, the water pipeline and other related facilities for the proposed power

TABLE 2-7 SUMMARY OF GROUND DISTURBANCE ACTIVITIES ALTERNATIVE R GAS PIPELINE CORRIDOR			
Activity	Acres of Permanent Disturbance	Acres of Temporary Disturbance*	Total Acres Disturbed
Proposed Power Plant and Immediate Site Facilities			
Power Plant	15	0	15
Power Plant Lay Down Area	0	3	3
Substation	12	0	12
Substation Cut/Fill	0	7	7
Transmission Line Turning Structures	0	1	1
Evaporation Ponds	18	0	18
SUBTOTAL	**45**	**11**	**56**
Well Pad Sites	10	10	20
Well Pad Access Roads	6	0	6
Plant Access Road (2.3 miles)	13	8	21
Agricultural Activities	107	0	107
OPGW Installation (15 pulling and tensioning sites)	0	5	5
SUBTOTAL	**136**	**23**	**159**
Proposed Pipeline Route: R1-R2-R3-C3-R4-R5			
Construction Right-of-Way	47	339	386
Additional Work Spaces	0	7	7
SUBTOTAL	**47**	**346**	**393**
TOTAL	**228**	**380**	**608**

*These areas would be disturbed only during construction.

plant site, and Western would not approve the interconnection request. In effect, the Project would not be built as proposed.

For the No-Action Alternative, there would not be any power plant developed at the proposed site. This includes the principal associated facilities including the substation and modifications to the Mead-Phoenix Project 500-kV transmission line for the interconnection. The natural gas pipeline would not be built, and no opportunity would be created for natural gas supply in the Wikieup area. Those project features already constructed on private lands, such as groundwater well PW2, the groundwater monitoring wells, and the associated well pads and well access roads, would remain.

Table 2-9 at the end of this chapter summarizes the environmental consequences associated with each alternative by resource.

2.4 ALTERNATIVES CONSIDERED BUT ELIMINATED FROM FURTHER ANALYSIS

Possible alternatives were identified primarily through the scoping process. Following notification that an EIS would be prepared, the public and Federal, state, and local agencies were given the opportunity to provide comments on the proposed Project. An evaluation of these comments resulted in the identification of possible alternatives to the Proposed Action.

TABLE 2-8 SUMMARY OF GROUND DISTURBANCE ACTIVITIES ALTERNATIVE T GAS PIPELINE CORRIDOR			
Activity	Acres of Permanent Disturbance	Acres of Temporary Disturbance*	Total Acres Disturbed
Proposed Power Plant and Immediate Site Facilities			
Power Plant	15	0	15
Power Plant Lay Down Area	0	3	3
Substation	12	0	12
Substation Cut/Fill	0	7	7
Transmission Line Turning Structures	0	1	1
Evaporation Ponds	18	0	18
SUBTOTAL	**45**	**11**	**56**
Well Pad Sites	10	10	20
Well Pad Access Roads	6	0	6
Plant Access Road (2.3 miles)	13	8	21
Agricultural Activities	107	0	107
OPGW Installation (15 pulling and tensioning sites)	0	5	5
SUBTOTAL	**136**	**23**	**159**
Proposed Pipeline Route: T1-T2-T3-C3-T4-T5			
Construction Right-of-Way	45	366	411
Additional Work Spaces	0	7	7
SUBTOTAL	**45**	**373**	**418**
TOTAL	**226**	**407**	**633**

*These areas would be disturbed only during construction.

In addition to the scoping process, the lead agencies and environmental specialists reviewed the Proposed Action, and possible alternatives were identified in cases where a potentially significant impact was anticipated. Alternatives were identified for the following Project components:

- power plant and evaporation pond sites
- power generation technology
- water sources
- water for agricultural use
- power plant cooling
- Wikieup gas tap

2.4.1 Power Plant and Evaporation Pond Sites

During the scoping process, an alternative power plant site was suggested near the I-40 corridor.

This site does not directly satisfy the purpose and need to support MCEDA's objective for economic development in the Big Sandy Valley. Also, it was important that the plant be located outside a 100-kilometer (62-mile) buffer zone around Grand Canyon National Park, to minimize air quality and visual impacts on the Park. This site fell within that zone, which begins about 8 miles north of Wikieup. Water availability in the northern portion of the Big

Sandy groundwater basin was researched via standard literature reviews with the Arizona Geological Survey, ADWR, and U.S. Geological Survey. No information regarding the specifics of availability in this area was determined to exist.

Suggestions also were made to consider sites closer to Bullhead City or Lake Havasu City and use water from the Colorado River. However, sites in this area do not satisfy the purpose and need which includes efficient interconnection to the Mead-Phoenix Project 500-kV transmission line. In addition, water for industrial development is not practically available for allocation from the Colorado River.

The sites suggested as alternatives to the proposed power plant site were found to be lacking in available water resources, making them uneconomic to develop and inconsistent with the purpose and need for this Project.

Alternative sites for the evaporation ponds also were examined, primarily due to concern about the proximity of the proposed location of the ponds to the existing transmission lines, which could present a hazard to birds using the ponds during entry or takeoff. However, the ponds could not be relocated, due to the terrain and location of features such as drainages and roads. The land to the east of the proposed power plant site is at a higher elevation than the plant site itself and has very rugged terrain. This would make construction and containment more difficult and costly. It also would require that water be pumped uphill to the ponds. There also are land boundaries and facilities that must be accommodated or worked around. The proposed location of the west cell is bordered by a section line and a drainage. The east cell is bordered by a transmission line, a section line, an access road, and a drainage. All of these features limit the ability to make adjustments in the pond locations on the west side of the proposed power plant site.

2.4.2 Power Generation Technology

A key part of the purpose and need for this Project is the ability to consistently deliver competitively priced electrical energy. Energy sources that do not consistently deliver electrical energy do not meet the purpose and need of the Project.

2.4.2.1 Wind

Electrical power production using wind energy is dependent on the wind field encountered at the power plant site. Although wind generation is technically feasible, this location does not experience strong sustained winds, and is therefore not well-suited as a wind energy site. Even considering advances in energy storage technology, the proposed power plant site would not allow the Project to consistently deliver electrical power.

2.4.2.2 Solar

Electrical power production using solar energy is dependent on the solar energy received at the power plant site. This location receives strong solar energy during the daylight hours, especially during the summer. Although solar energy has been shown to be technically feasible, solar energy is not available during nighttime hours. Even considering advances in energy storage technology, this technology would not allow the Project to consistently deliver electrical power.

2.4.2.3 Other

Other energy sources capable of generating electrical energy (fuel cells, tidal power, geothermal) were not considered technically viable alternatives at this location.

2.4.3 Water Sources

Two alternative groundwater sources and one surface water source were considered for this Project, as follows: