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