

## 4.0 Environmental Consequences

The Proposed Action to expand the existing EOR for Phases III/IV conforms with the plans and policies of the BLM's Casper Field Office Platte River Resource Management Plan (RMP). Specifically, the Proposed Action is in accordance with the planning decisions outlined in the Salt Creek Resource Management Unit (RMU) (BLM 1985). The Salt Creek RMU comprises approximately 347,000 acres of both BLM-administered surface lands (91,000 acres) and federal mineral estate (206,000 acres). Pertaining to the project area and Proposed Action elements, the Salt Creek RMU states that the management focus would encompass mineral development, special management emphasis for the Salt Creek ACEC based on soil conditions, protection of cultural resources in connection with historic significance of oil field development, and realty support associated with energy and non-energy linear ROWs.

### 4.1 Air Quality

#### 4.1.1 Proposed Action

Additional surface disturbance and activity levels associated with the Proposed Action may temporarily result in an increase in the wind-blown dust generated from increased traffic on the existing and newly constructed access roads, well sites, pipelines, facility and storage sites, and electric line ROWs in the project area. Increased activities associated with vehicles and equipment engaged in construction, drilling, workover, and other installation activities associated with the Phases III/IV project may result in a temporary increase in combustion emissions. As flow lines, wellhead equipment, and production facilities are upgraded, however, the potential for degrading air quality resulting from line or equipment failure would decrease. Gas plant operations would remain unchanged.

The Proposed Action would use to the greatest extent possible existing wells, facilities, access roads, and power lines to minimize areas of disturbance. Fugitive dust control measures and prompt reclamation of disturbed areas also would minimize air quality impacts. The potential localized impacts from short-term increase in dust and combustion emissions from additional drilling and well workover activities and drilling/workover rigs, construction equipment, and worker vehicles would, therefore, be expected to be negligible.

The subsurface pressure "water curtain" discussed in Chapter 2 and illustrated in Figure 2-3 is designed to eliminate the potential for CO<sub>2</sub> seeps in and around the populated areas within Salt Creek Oil Field and specifically for implementation of Phases III/IV. The monitoring "fence" also discussed in Chapter 2 provides further assurance that no CO<sub>2</sub> would enter the isolated subsurface area of high pressure. In the unlikely event that the monitoring wells indicated migration of CO<sub>2</sub> into the isolated subsurface area, Howell's proposed "CO<sub>2</sub> Seep Containment Plan" summarized in Chapter 2 would be implemented to eliminate the potential for a surface seep event. Potential air quality impacts from Phases III/IV due to CO<sub>2</sub> seeps would, therefore, be expected to range from no impacts, particularly in populated areas, to negligible or minimal impacts in remote areas.

The Phase I EA discussed potential ambient impacts of a CO<sub>2</sub> pipeline rupture for the proposed Phase I operations at Salt Creek (BLM 2003a). The initial modeling study (BLM 2003a) was

limited to vertical “jet” plume releases of CO<sub>2</sub> from hypothetical pipeline rupture scenarios. Howell subsequently retained Cameron-Cole to perform further air dispersion modeling studies to estimate downwind CO<sub>2</sub> and H<sub>2</sub>S concentrations resulting from various well blowout and pipeline rupture scenarios, including vertical and horizontal plume releases (Cameron-Cole 2005b). The modeling results were reported relative to the 10-minute time-weighted averages (TWA) and the immediately dangerous to life or health (IDLH) thresholds for H<sub>2</sub>S and CO<sub>2</sub>. It should be noted that the potential occurrence of a catastrophic pipeline rupture or well blowout event is extremely unlikely. Pipeline systems, drilling and completion equipment and work practices are conservatively designed to maximize reliability and avoid such events. In the unlikely event of a short-duration catastrophic well blowout event, CO<sub>2</sub> and H<sub>2</sub>S concentrations in the breathing zone (approximately 5 feet in elevation) would not be expected to exceed the 10-minute TWA thresholds (Cameron-Cole 2005b). Depending on ambient temperatures, wind, and plume rise conditions, modeling predicted that a pipeline leak could potentially result in short-term H<sub>2</sub>S concentrations that would exceed the TWA and IDLH levels once the plume settled to the ground. No CO<sub>2</sub> impacts, based on TWA thresholds, were predicted for a pipeline rupture (vertical or horizontal). No long-term ambient air quality impacts would be expected.

#### **4.1.2 No Action**

Under the No Action Alternative, activities associated with the existing waterflood operations within the Phases III/IV area would continue. Under the No Action Alternative scenario, the ambient air quality in and around the project area would be expected to remain unchanged. Currently, there are no ambient air quality exceedances or other issues with respect to Wyoming Air Quality Standards and Regulations (WAQS&R).

#### **4.1.3 Mitigation and Monitoring**

No additional mitigation or monitoring measures applicable to air quality have been developed for the Proposed Action.

### **4.2 Geology**

#### **4.2.1 Proposed Action**

The project region has been under similar development for over a century, most of the proposed operations would be located at existing facility sites, and overall the proposed Phases III/IV development activity would avoid steep or unstable slopes. Hence, no impact associated with reduced slope stability would be anticipated. Some minor changes in topography from cut and fill operations would be anticipated during construction of new roads and drill pads. However, the impacts from this activity would be minimal.

No impacts to surface geological structure would be anticipated from continued removal of petroleum hydrocarbons under the Proposed Action. There is no record of detectable earthquakes induced by water injection in the project region, and no record of subsidence as a result of oil production.

## **4.2.2 No Action**

No impacts to topography and geology would be expected under the No Action Alternative. A certain amount of underground geological resources (i.e., oil and gas) would not be recovered, as the No Action Alternative would continue with the waterflood operations and EOR in the Phases I/II areas.

## **4.2.3 Mitigation and Monitoring**

No additional mitigation or monitoring measures applicable to geology have been developed for the Proposed Action.

## **4.3 Water Resources**

### **4.3.1 Surface Water**

#### **4.3.1.1 Proposed Action**

Changes in surface water resources, as a result of the Proposed Action, have been collectively evaluated on the basis of the anticipated whole-field buildout of the enhanced oil recovery program. The partial contributions from each phase have not been disaggregated, as all discharges would be routed through the existing discharge points. The Phase I EA concluded that the primary anticipated effect would be a temporary increase in the total volume of produced water discharged to Salt Creek (and affected tributaries). However, recent (2005) operating data gathered during Phases I and II implementation indicate that CO<sub>2</sub> injection also may affect the composition of produced water discharges from the field.

As is detailed in the Phase I EA, prior to CO<sub>2</sub> EOR, approximately 168,000 barrels of water per day (BWPD) were discharged from Salt Creek Oil Field via the permitted outfalls to Salt Creek and its tributaries. The maximum average discharge rate into Salt Creek as a result of the EOR program was projected to reach a high of 196,250 BWPD in 2004 and 2005 after Phase II startup, which equates to an increase of about 17% over the waterflood only baseline discharge. In 2006, volumes are anticipated to drop to approximately 122,000 BWPD. By the time final phase expansion would be completed (when the additional contribution from the EOR program ceases) volumes are projected to be 132,000 BWPD, a 32% decline over current baseline waterflood discharges (Phase I EA, Table 37).

The effects of the Proposed Action on Salt Creek hydrology would be considered small in the context of historical flows and in the context of the total increase in flow anticipated when the final phases of the EOR program would be completed. Additional water volumes released for downstream use may result in an overall positive effect on water budgets.

No adverse impacts (e.g., sedimentation, siltation) to Salt Creek water quality from Phases III/IV construction activities would be anticipated, based on Howell's committed soil erosion control and reclamation measures. The Phase I EA details these committed protection measures that also would apply to the Phases III/IV Project.

The existing WYPDES permit and monitoring program establishes concentration limits on water discharges to protect Salt Creek (and the Powder River) beneficial uses. The primary constituents of concern found in produced waters include salinity-related parameters (e.g., TDS, conductivity and chlorides) and oil and grease, which are indicators of petroleum product spills. All of these constituents of concern are regulated. Chloride and TDS are currently the regulated constituents of greatest concern – chloride due to its presence in excess of the current water quality criterion, and TDS because recent data indicate several discharges exceed the permit effluent limit. The chloride concern is being addressed by WDEQ implementation of a site-specific WQC for chloride, based on the UAA completed in 2004. The specific manner in which the TDS issue will be resolved has not yet been determined, although several options have been identified (see Section 3.3.1.2). Howell is actively working with WDEQ to assure compliance with established discharge limits to protect beneficial water uses including aquatic life.

If a WYPDES noncompliance event occurs during future EOR operations Howell would be required to submit to WDEQ a written explanation for the noncompliance and steps taken or planned to reduce or eliminate the noncompliance event, and prevent a recurrence. Further, the WYPDES permits would require Howell to take reasonable steps to minimize or prevent any discharge in violation of their permits that has a reasonable likelihood to adversely affect human health or the environment. Howell must comply with all permit conditions, as permit noncompliance represents possible grounds for an enforcement action or permit modification, revocation, reissuance, or termination. Through the WYPDES program, WDEQ's continued monitoring and enforcement of the existing discharge permits would protect water quality in Salt Creek as Howell's EOR program expands.

#### **4.3.1.2 No Action**

Under the No Action Alternative, Phases III/IV of the EOR would not be implemented and the Phases III/IV area program would continue under waterflooding only. No additional water quantity issues or changed water quality would be anticipated for Phases III/IV of the EOR program. The additional water provided for the Powder River basin water budgets would not occur, reducing downstream beneficial water use. No changes in water quality would occur, positive or negative, in relation to the waterflood baseline.

#### **4.3.1.3 Mitigation and Monitoring**

No additional mitigation or monitoring measures applicable to surface water resources have been developed for the Proposed Action beyond those described in Phase I EA (BLM 2003a). Howell would continue monitoring water volumes and water quality of produced water discharged from LACTs to Salt Creek, as part of the established WYPDES monitoring program.

### **4.3.2 Groundwater**

#### **4.3.2.1 Proposed Action**

The maximum reservoir pressure under current waterflood operations is approximately 1,200 psi. An estimated maximum reservoir pressure during CO<sub>2</sub> injection operations would be around

1,500 psi. Howell conducted petrophysical analysis and matched the results of this analysis with the results from step-rate injection tests in the WC2 horizon. It was determined that the maximum injection pressure for the reservoir would be 1,550 psi, which is higher than the maximum reservoir pressure anticipated during the CO<sub>2</sub> injection operations. Maintaining the pressure difference between maximum injection pressure and maximum reservoir pressure would allow the project operators to maintain reservoir integrity during WAG injection operations.

Three pathways for CO<sub>2</sub> migration that could potentially impact groundwater include leakage through faulty cement grout along used and abandoned well casings, at points of failure in the cap rock aquitard, and across geologic units through naturally occurring fractures and faults. Potential impacts to groundwater could arise from the water solubility of CO<sub>2</sub> leaking into the upper aquifer system. CO<sub>2</sub> dissolves in groundwater to form the weak acid, H<sub>2</sub>CO<sub>3</sub>. The acid can dissolve aquifer minerals such as calcium carbonate (calcite) and mobilize associated trace metals under higher CO<sub>2</sub> pressures. However, Howell's efforts to eliminate or minimize leakage of CO<sub>2</sub> from the WC2 through improved well integrity work (e.g., re-plugging of abandoned wells, re-cementing of existing wells) would be expected to eliminate or minimize the potential for groundwater impacts from the project. Furthermore, the public water supplies for the towns of Midwest, Edgerton, and Gas Plant Camp are obtained from the Casper Regional Water System, which would not be impacted by the Proposed Action.

In summary, the Proposed Action is not expected to impact the groundwater resources. No changes in the hydraulic head in the upper and lower hydraulic units of the Powder River sedimentary basin and/or no leakage from the Wall Creek horizons into the upper and lower hydraulic units would be expected as a result of proposed operations in the WC2.

#### **4.3.2.2 No Action**

No additional development activities and/or operations that would affect groundwater resources in the project area would occur under the No Action Alternative. The current waterflood and EOR in the Phases I/II areas would continue.

#### **4.3.2.3 Mitigation and Monitoring**

No additional mitigation measures applicable to groundwater have been developed for the Proposed Action. Currently, there are no regulatory groundwater monitoring requirements for the project operations; however, Howell personnel conduct groundwater monitoring from selected wells for operational purposes under the Routine Oilfield Water Analysis (ROWA) and annual groundwater monitoring program for Salt Creek Oil Field Sewage Lagoon, as required by Permit Number 94-372 issued by WDEQ. Howell would continue the sewage lagoon and the ROWA groundwater monitoring programs, but no additional monitoring measures were identified for the proposed Phases III/IV EOR project.

## **4.4 Human Health & Safety and Ecological Risks**

### **4.4.1 Proposed Action**

The potential for localized occurrence of CO<sub>2</sub> seeps in the project area would be considered a potential risk to human health and the environment. Sections 2.1.1.1 and 2.1.3 of this EA summarize the measures, approach, and actions Howell has implemented to understand, predict, and minimize or prevent the occurrence of CO<sub>2</sub> seeps for future EOR phases.

The evaluation of adverse impacts to human health, safety, and the environment from the occurrence of CO<sub>2</sub> seeps depends on three factors: 1) the probability of significant surface seeps occurring during Phases III/IV implementation, 2) the probability of such an event occurring in a location where significant exposure is likely, and 3) the magnitude of exposure to CO<sub>2</sub> or other components in excess of toxic or adverse levels.

As discussed in Chapter 2.0, in-depth resources and technologies have been used to identify, assess, and control the source and pathways of surface seeps noted during the Phase I development. These data will aid in establishing measures to predict, prevent, and contain current CO<sub>2</sub> seeps and minimize future seeps from occurring. Containment measures have been proposed to eliminate potential seeps, as well as to minimize the effects of these seeps. Assuming the measures discussed above are sufficient in preventing surface seeps, there would be no adverse impacts to human health and ecological communities beyond the baseline risks associated with industrial activities in an active oil field. The following analysis provides information to better understand these relative risks and focuses on evaluating the effect of a rare event or scenario where CO<sub>2</sub> seeps would nonetheless occur in spite of containment and prevention measures.

#### **4.4.1.1 CO<sub>2</sub> Toxicity**

The primary constituent of the seeps occurring from the Phase I operations is CO<sub>2</sub>. Cameron-Cole (2005) measured CO<sub>2</sub> concentrations ranging from 18% to 90% in the seeps found in the NE ¼ of Section 14 (see Figure 2-6). H<sub>2</sub>S also was present at concentrations ranging from 18 to 196 ppmv. Cameron-Cole (2005) reported that H<sub>2</sub>S content when CO<sub>2</sub> concentrations are equal to 5,000 ppmv (the regulatory standard for CO<sub>2</sub>) are expected to be less than 10 ppmv (measured H<sub>2</sub>S ranged from 17 to 188 ppmv). The regulatory standards for H<sub>2</sub>S are 20 ppmv (maximum exposure ceiling), 50 ppmv (10 minute maximum peak exposure), and 100 ppmv (IDLH). In relation to the CO<sub>2</sub> content of the seeps, the potential contribution to human health risk from H<sub>2</sub>S would be minor, given the potential CO<sub>2</sub> levels would be the dominant factor.

Appendix C of this EA presents a review of CO<sub>2</sub> toxicity. Briefly summarized, CO<sub>2</sub> may be considered harmless (from a toxicological viewpoint) below 5,000 ppmv (0.5% by volume in air). Compare to the normal atmospheric concentration of 0.035% by volume. Above 5,000 ppmv toxic effects may occur, as seen in Table 4-1. CO<sub>2</sub> is primarily an asphyxiant, that is it exerts its toxic action by displacing oxygen in breathed air. At higher concentrations it also acts as a systemic central nervous system toxicant.

**Table 4-1 CO<sub>2</sub> Symptoms and Regulatory Standards**

% CO <sub>2</sub>	Symptoms / Effects	Regulatory Limits
0.5		Occupational threshold (8-hour): - OSHA PEL - ACGIH TLV - NIOSH Workday TWA
2 to 3	Shortness of breath, deep breathing.	
3		- OSHA STEL - ACGIH 10-minute Ceiling Exposure Limit - NIOSH 15-minute STEL
4		- OSHA IDLH level
5	Heavy breathing, sweating, quickened pulse	
7.5	Headaches, dizziness, restlessness, increased heart rate and blood pressure, visual distortion	
10	Impaired hearing, nausea, vomiting, loss of consciousness	
30	Coma, convulsions, death	

Sources: Table 1 in Appendix C and sources cited therein.

The Occupational Safety and Health Administration (OSHA) has an occupational Permissible Exposure Limit (PEL) for an 8-hour day of 0.5% CO<sub>2</sub>. ACGIH (American Conference of Industrial Hygienists) has the same value as an 8-hour Threshold Limit Value (TLV) as does NIOSH (National Institute for Occupational Health and Safety). Little specific information is available on ecological exposures, except to note that data underlying the human health values often is based on animal studies. Although 24-hour exposure is not contemplated in these limits, it is reasonable to use 0.5% as the key indicator of adverse impacts over long-term exposure, and 3% as the indicator of adverse impacts over a short exposure (10 minutes).

The effects of sublethal CO<sub>2</sub> exposure is rapidly reversible once the affected person or animal is removed from the elevated CO<sub>2</sub> atmosphere. If a person reacts to incipient symptoms by leaving the area no long-term health effects are likely to occur.

#### 4.4.1.2 Potential Magnitude of Exposure

Cameron–Cole (2005) evaluated the CO<sub>2</sub> seeps observed to date with the Phase I development. Seeps were present in open areas as well as in drainages. While the seeps themselves ranged from 18% to 90% CO<sub>2</sub>, concentrations measured at the perimeter of a major seep (diameter 4.5 feet) measured at 6 inches from the ground and 10 feet away from the edge of the seep varied from background values to over 2.4% CO<sub>2</sub>, depending on wind and temperature conditions. Modeling was conducted to define the dispersion of CO<sub>2</sub> under varying seepage and weather conditions. Concentrations at ground level exceeding 0.5% would generally be limited by the normal variance in weather conditions to less than 21 feet distance from the seep. At human breathing altitude, approximately 5 feet (1.5 meters), the concentration would not exceed 0.5%.

Under a worst-case scenario, with no wind or other dispersion, CO<sub>2</sub> concentrations exceeding the 10-minute criterion of 3% may be present at ground level (but not at breathing height) up to 45 feet from the seep. The highest measured CO<sub>2</sub> concentrations exceeded 2.4% (the maximum for the gauge) at 10 feet. Therefore, a potentially toxic condition (i.e., a CO<sub>2</sub> concentration exceeding 0.5%) may exist in the seep itself and extend near the ground but would not be present at the human breathing altitude of 5 feet. Toxic levels could extend at ground level for up to 45 feet from the seep perimeter, but more typically would occur 10 feet or less from the seep. A walking human, therefore, would not be expected to be exposed to a risk from CO<sub>2</sub> in open areas.

In drainages, depressions, and other protected areas concentrations may be higher. Measured concentrations (near ground level) in a gully with active seeps were typically well below the 0.5% long-term exposure criterion during the day, but would exceed 2.4% (gauge maximum) during night-time periods of no wind. It is possible that concentrations of CO<sub>2</sub> in sheltered depressions and gullies could rapidly reach potentially hazardous conditions in still conditions. However, as CO<sub>2</sub> is heavy, concentrations in the breathing zone would be expected to be much lower.

In summary, it is recognized that when CO<sub>2</sub> is allowed to accumulate in enclosed spaces it poses a threat to human health (Holloway 1997). If exposed, potential risks to human health and the environment could occur in enclosed spaces, sheltered drainages, and low spots during wind-free conditions and near ground level in the immediate vicinity of a seep during low-wind conditions, if a CO<sub>2</sub> seep were to occur. Evaluation of whether this constitutes a significant adverse impact depends on the probability of such an exposure occurring, which is defined and discussed in the following section.

#### **4.4.1.3 Probability of Exposure**

##### **Human Health and Safety**

The CO<sub>2</sub> seeps recorded following Phases I and II implementation occur in a small portion of the Phase I area. Seeps were noted in open land as well as in drainages, and all seeps presently occur in remote areas relative to habitation or travel routes (see Figure 2-6). Oil field workers would be the only anticipated sensitive receptors at these seep locations.

The Phases III/IV Project area is located closer to the towns of Midwest and Edgerton (see Figure 2-1). Public roads and highways also are present in the project area. Therefore, the potential for human exposure if a seep were to occur is greater for the Phases III/IV area than in the Phases I/II area.

Because of the potential risk if CO<sub>2</sub> were to accumulate in enclosed spaces or low spots, Howell's CO<sub>2</sub> Seep Containment Plan was structured to prevent CO<sub>2</sub> seepage from occurring both in rural areas and in or near the towns of Midwest or Edgerton. As detailed in Section 2.1.1.1, a series of water injection wells would be located to provide a barrier to lateral subsurface CO<sub>2</sub> migration in the vicinity of the towns and would be intended to promote movement of subsurface fluids (i.e., hydrocarbons, CO<sub>2</sub>, and water) toward production wells and away from the town perimeters. Based on the CO<sub>2</sub> Seep Containment Plan (Section 2.1.3), the probability of CO<sub>2</sub> seeps occurring in the towns of Midwest or Edgerton would be very low.

Seeps in open country present a much lower potential for health hazards. The Cameron-Cole (2005) report documented rapid dispersion of CO<sub>2</sub> in open country. In drainages and ravines Cameron Cole (2005) showed CO<sub>2</sub> concentrations may increase during periods of little or no wind. However, such times tend not to be of long duration, and the presence of people over extended periods in drainages located in the Phases III/IV Project area is not likely.

Two areas located outside of the towns of Midwest and Edgerton may support more extensive human use than the surrounding unoccupied areas. These two areas include the Edgerton Rodeo Grounds and the Midwest Golf Club. The Edgerton Rodeo Grounds are located northeast of Edgerton and consists of a fenced area without bleachers or inhabited buildings except for a small ticket booth. The grounds are used a few times a year for local outdoor events (Farrell 2005.). The probability of occurrence of CO<sub>2</sub> seeps and health hazards are very low for these rodeo grounds, as occupancy would be short-term and no confined spaces are present. The Midwest Golf Course is located between Edgerton and Midwest and is within the Phases III/IV project area. It is a nine-hole golf course used a few days a week during the summer season (May through September) primarily by the local population. A small clubhouse, lacking running water, is located on the premises (in addition to a storage shed) and is used exclusively for golfers. The clubhouse lacks a basement or confined spaces, and is typically used after games with doors and windows open (Chapman 2005). Therefore, the potential for health hazards would be very low, as well, if a CO<sub>2</sub> seep were to occur in the area, and comparable to open country conditions.

Health hazards could occur only if individuals seek out, enter, and remain indefinitely in the immediate vicinity under the worst-case scenario outlined by Cameron-Cole (2005) (i.e., 1% of the time up to 31.9 feet downwind at ground level for a large seep and 6.7 feet for a medium-sized seep). This scenario applies only close to ground level. At breathing height for a person (5 feet), no health hazard would be anticipated (Cameron-Cole 2005a). Further, such an individual would have to deliberately ignore the early symptoms of exposure to elevated CO<sub>2</sub> and remain in the seep area. Finally, Howell has initiated measures to eliminate such contact (e.g., seep fencing), as outlined in Section 2.1.3.

## **Ecological Exposure**

Potential ecological exposure of animals to a CO<sub>2</sub> seep also could occur; however, the areas affected by elevated CO<sub>2</sub> concentrations around an open-land seep are typically small (Cameron-Cole 2005a) and significant exposure is unlikely. Small animals such as rodents, rabbits, snakes, and ground-dwelling birds occupying drainages could be affected by increased CO<sub>2</sub> concentrations, although the number of animals present in specific ravines or drainages is likely to be small. CO<sub>2</sub> exposure in burrows is a potential pathway for burrowing animals in the immediate vicinity of a seep; however, because CO<sub>2</sub> seeps are typically accompanied by surface water, any burrow in the path of a seep would likely be rendered uninhabitable.

A final ecological exposure pathway examined included individual animals accessing available surface water at a seep location for drinking or bathing, particularly in the seeps located in the more arid, upland habitats. High concentrations of CO<sub>2</sub> (70% to 80%) could be present in these depressions caused by the seeps (Cameron-Cole 2005). Animals may become overwhelmed from CO<sub>2</sub> inhalation near seeps. While most animals are expected to avoid the seeps due to the

noise and vibration, access for purposes of drinking is possible. Therefore, Howell developed the ongoing seep containment fencing and netting to prevent animal and bird access, minimizing potential impacts to area wildlife species, as discussed in Section 4.8.

#### **4.4.1.4 Summary of Impacts**

Potential impacts to human health from exposure to CO<sub>2</sub> would primarily apply to confined or protected spaces, if a CO<sub>2</sub> seep were to occur in that specific area. However, the probability of a seep surfacing in a confined space is low to none, based on a series of ongoing well improvements, future drilling scenarios, and project monitoring in the towns under the Proposed Action to prevent any CO<sub>2</sub> buildup and provide early detection, if warranted (see Sections 2.1.1.1 and 2.1.3). CO<sub>2</sub> seeps occurring outside of town would be expected to be rare occurrences. If present, the likelihood of unacceptable human exposure in such locations is low due to the small footprint of toxic conditions, infrequent occurrence of windless conditions, low intensity of use of land in most of the project area, and application of containment and monitoring measures currently implemented for Phase I and proposed by Howell for Phases III/IV.

The potential for ecological risks also is low. This assessment is based on the low probability of seeps occurring; the small footprint of the seeps, if present; likely avoidance of active seeps by some wildlife; and containment measures implemented by Howell to minimize access to seep areas.

#### **4.4.2 No Action**

Under the No Action Alternative, the Phases III/IV EOR would not occur, and continued oil production using waterflooding would continue in the Phases III/IV areas while economically practicable. No adverse impacts to human health and ecological communities would be anticipated beyond the risks inherent in an active oil field, and Howell would continue to monitor and minimize existing CO<sub>2</sub> seeps associated with Phase I, anticipating full control (as discussed in Chapter 2.0).

#### **4.4.3 Mitigation and Monitoring**

Howell has developed a detailed approach to prevent CO<sub>2</sub> seeps and to contain them if they were to occur as part of the Proposed Action for Phases III/IV. This CO<sub>2</sub> Seep Containment Plan is summarized in Section 2.1.3 of this EA. The containment measures are designed to prevent the surface expression of CO<sub>2</sub> seeps, thus eliminating or minimizing potential adverse impacts. Application of these containment measures reduces the probability of occurrence of a seep and minimizes exposure pathways, if it were to occur, thereby, reducing the risk to human health, safety, and the environment.

### **4.5 Soils and Reclamation**

#### **4.5.1 Proposed Action**

Based on the inherent nature of the soil resources in the project region (i.e., steep topography and erodible soil material), loss from erosion is likely. Soil loss is expected on disturbed surface areas during dry and windy conditions from increased road travel. During wet conditions, soil

loss due to wheel rutting, compaction, and associated water erosion also would be expected from increased vehicle traffic. The potential for soil loss would be greatest during the short-term construction phase of the Proposed Action. Soil erosion, whether from wind or water, would likely continue to occur on disturbed areas until they were successfully reclaimed.

Direct impacts to soils would include vegetation removal resulting in soil exposure to wind and water erosion; mixing of soil horizons; loss of topsoil productivity by removal of organic matter; as well as modification of texture, particle size distribution, chemical properties, and biological content due to erosion, deposition, compaction, and stockpiling. Soils would be compacted by vehicles during construction activities reducing infiltration and water storage capacity, increasing runoff, thereby increasing soil loss due to water erosion. Equipment handling during stockpiling would break down the soil structure and dilute soil organic matter resulting in a reduction of soil viability over time. No impacts to the Salt Creek drainage ACEC, based in part on erosion severity in portions of the watershed, would occur since no areas or soil map units coincide with the Phases III/IV project area. Therefore, no potential effects to soils would violate the Salt Creek RMU's planning directives.

Soil contamination could result if spills or leaks of petroleum products, drilling muds, or other contaminants occur. Previously, soil contamination from reserve pit leakage has been a concern in the project region. Other possible contamination sources include leakage or spills from production and storage facilities. If soil contamination occurs, constituents could then be transported and potentially affect water and soil quality downgradient of the source.

Topsoil quality in the project area varies considerably but is generally fair, with clay content and increased salinity and sodicity being the primary limitations to reclamation success in specific areas. In addition to these limitations, relatively low effective annual precipitation and wind and water erosion make successful reclamation more difficult to attain. Past experience in this area, however, has shown that successful reclamation can be attained with aggressive reclamation measures and follow-up monitoring and remediation.

The ACEPMs described in Section 2.1.6.4 of the Phase I EA (BLM 2003a) would aid in reducing potential impacts to soils from the Proposed Action. A Storm Water Pollution Prevention Plan (SWPPP) and Spill Prevention, Control, and Countermeasure Plan (SPCCP) are currently in place and would continue to be implemented for the proposed Phases III/IV expansion project to minimize impacts to soils, in addition to associated resources, such as vegetation, wildlife, and surface water resources. Post-construction monitoring on a regular basis would be undertaken to ensure: 1) surface reclamation is undertaken in a timely manner and 2) applicable erosion control measures are effective, including revegetation. Point 10 of the Master Surface Use Plan (MSUP) (Appendix D) outlines surface reclamation practices designed to reduce the environmental impact of project activities on the soil and vegetation resources within the project area. Table 4-2 summarizes the reclamation seed mixture agreed upon between Howell and the BLM. This seed mix is part of the MSUP and would be applied as part of the Proposed Action reclamation plan to enhance revegetation and minimize noxious weeds.

**Table 4-2 Reclamation Seed Mix**

Species	Pounds per Acre (PLS) <sup>1</sup>
Gardner saltbush	2.31
Slender wheatgrass revenue	3.24
Western wheatgrass	4.68
Sandberg bluegrass	0.70
Bottlebrush squirreltail	2.68
Alkalai sacaton	0.15
<b>TOTAL</b>	<b>13.76</b>

<sup>1</sup>PLS = pure live seed

In summary, approximately 167 acres of surface soils, representing approximately 8% of the Phases III/IV Project area (2,182 acres), would be newly disturbed from implementation of the Proposed Action, of which 145 acres would be short-term disturbance (i.e., reclaimed after construction) and 22 acres would be long-term disturbance (i.e., reclaimed at the end of the project). Redisturbance of existing disturbed area within the Phases III/IV project area would be approximately 356 acres.

#### 4.5.2 No Action

Under the No Action Alternative, no additional surface-disturbing activities associated with CO<sub>2</sub> injection from Phases III/IV would occur, with the exception of those associated with the existing waterflood operations. Therefore, the potential for additional soil loss due to wind and water erosion, and the potential for soil and water contamination, attributable to Phases III/IV Project area activities, would not occur. Without the implementation of the Phases III/IV EOR Project, the additional potential disturbances to soil resources from these project phases would not occur, and, the economic life of Salt Creek Oil Field would likely be shortened. The indirect effect of this alternative on the soil resource would be that reclamation of the entire project area would begin sooner.

#### 4.5.3 Mitigation and Monitoring

No additional mitigation measures applicable to soils or reclamation have been developed for the Proposed Action.

### 4.6 Wetlands

#### 4.6.1 Proposed Action

Based on the development scenarios presented for the Proposed Action, the avoidance of wetland areas (e.g., bridging Salt Creek for the proposed CO<sub>2</sub> trunk line), and the ACEMPs described in Section 2.1.6.5 of the Phase I EA for vegetation and wetland resources, no adverse impacts to wetlands would be anticipated.

## **4.6.2 No Action**

The No Action Alternative would result in the same type and level of impacts that have occurred over the past several years in Salt Creek Oil Field, although a lower level of well drilling, workover activity, and field maintenance would occur if the Proposed Action is not implemented. Activity in the well field would continue at a decreasing level until the field becomes uneconomical. Field abandonment and project closure would be followed with the appropriate decommissioning, reclamation, and revegetation activities, as described in Howell's existing Reclamation Plan (see Item #10 in Appendix D).

Wetlands that have developed along the WYPDES discharge channel into Salt Creek would likely be reduced or eliminated as discharge flows decline and are eventually terminated. Continuing the existing waterflood operations would not produce any adverse impacts compared to current conditions, unless regulatory pressure results in more reinjection and/or reduction in Salt Creek flow, which could reduce wetland/riparian values. If the amount of water in Salt Creek is reduced as a result of decreased or eliminated WYPDES discharge, it is possible that wetland changes could occur as the floodplain and riparian areas become drier. In this situation, wetland communities along the creek would likely return to conditions similar to those present prior to oil field development.

## **4.6.3 Mitigation and Monitoring**

No additional mitigation measures applicable to wetlands have been developed for the Proposed Action.

## **4.7 Vegetation and Weeds**

### **4.7.1 Proposed Action**

The Proposed Action would result in additional short-term and long-term losses of vegetation in the areas of new construction. However, much of the new disturbance would occur in areas that have already been disturbed by previous oil field activities. The Proposed Action would maximize the use of existing well pads and roads that have been previously disturbed. Riparian vegetation would likely not be impacted within the project area, since no construction activity would disturb riparian communities along Salt Creek. Eventually, as the amount of produced water discharge to Salt Creek declines, it is possible that some riparian habitat could be lost as inundated or saturated streamside zones are reduced. Since the economic life of Salt Creek Oil Field would be prolonged with implementation of the Proposed Action, riparian habitat supported by the produced water discharge in the project area would be maintained for a longer period of time under the Phases III/IV Project.

Development of new well sites, access roads, substation, electric power lines, and associated facilities would result in disturbance of approximately 167 acres of vegetation in the short-term, and following reclamation and revegetation 22 acres in the long-term. Although total disturbance of vegetation communities is estimated, the majority of new disturbance would be in the upland grassland and upland shrubland communities with relatively little disturbance in saltbush badlands for which revegetation efforts can be somewhat problematic. There would be no or very little impact in riparian communities. As discussed in Section 2.1.1.3, Gas System,

Howell would “bridge” Salt Creek with the CO<sub>2</sub> trunk line, avoiding surface disturbance to the stream or its associated riparian vegetation. Areas of short-term disturbance would be revegetated as soon as feasible after construction is complete. Long-term losses of vegetation would remain until field abandonment and the appropriate decommissioning, reclamation, and revegetation activities are completed (see Item #10 in Appendix D).

The ACEPMs described in Section 2.1.6.5 of the Phase I EA should be adequate to protect and minimize impacts to vegetation resources in the project area, including construction site management (e.g., using previously disturbed areas and existing easements, limiting equipment/materials storage yard and staging area sizes). New well locations and associated roads and pipelines would be located to avoid or minimize impacts in areas of high value, such as wetland/riparian areas. The reclamation seed mix listed in Table 4-2 in Section 4.5 would be used to enhance revegetation and minimize noxious weeds. Point 10 of the MSUP (Exhibit 5.3.2 of the Phase II EA [BLM 2004a]) outlines surface reclamation plans that should be effective in reducing the environmental impact to the soil and vegetation resources in the project area.

Construction involved with proposed project area activities has the potential to increase the spread of weeds across disturbed sites. The NWMP would be revised, as necessary, for these project phases to include the information and tools needed to mitigate the potential spread of noxious weeds associated with past and future development activities (see Appendix B). The objectives of the plan would be to reduce existing weed infestations and prevent the establishment of new infestations. An updated copy of the NWMP would be prepared as a part of the POD for these phases. If weeds were successfully controlled and the reclamation guidelines in the ACEPMs strictly followed, there should be no residual impact to the vegetation resource from proposed development activities with regard to noxious weed species.

Section 2.1.6.5 of the Phase I EA (BLM 2003a) states that Howell would monitor for noxious weeds and would apply BLM-approved weed control techniques, as necessary, on sites affected by oil field operations. The NWMP (see Appendix B) prepared for previous project phases in Salt Creek Oil Field provides a comprehensive plan to control the spread of noxious weeds and other invasive species that would be applied for the Proposed Action.

#### **4.7.2 No Action**

The No Action Alternative would result in the same degree of impacts to vegetation that has occurred over the past several years. Activity in the well field would continue at a declining level until field abandonment and project closure occurs. The applicable decommissioning, reclamation, and revegetation activities would be completed earlier than under the Proposed Action.

No new disturbances that could enhance the spread of weedy plant species would occur. The NWMP would be instituted with the existing weed population decreasing as weed control activities are applied and become effective.

### **4.7.3 Mitigation and Monitoring**

Considering that the NWMP (see Appendix B) would be updated to meet the conditions of the Phases III/IV Project, no additional mitigation or monitoring measures applicable to vegetation and weeds have been developed for the Proposed Action.

## **4.8 Terrestrial Wildlife**

### **4.8.1 Proposed Action**

Potential impacts to terrestrial wildlife species were assessed based on potential species' presence, overall habitat quality, and relative degree of historical and ongoing oil extraction activities in and near the Phases III/IV area and in Salt Creek Oil Field. The incremental surface disturbance and oil field activities over the last 116 years has modified the landscape, associated vegetation types, wildlife habitats, and relative carrying capacities in this immediate area. The specific project components of the Proposed Action were examined relative to the temporal and spatial patterns of both resident and migratory wildlife species and the current wildlife population trends apparent in the project area.

The incremental loss and disturbance of native habitats, habitat fragmentation, animal displacement, and direct loss of wildlife species from project construction and operation would be expected to be low. The reworking of existing wells, the use of existing roads and some power lines, and the use of existing ancillary facilities would minimize the degree of new surface disturbance. The Proposed Action would result in 167 acres of new disturbance, as compared to the use of 356 acres of previously disturbed areas. The vegetation types that would be impacted by new surface disturbance associated with the Phases III/IV Project primarily encompass upland grassland and upland shrubland communities, with little disturbance occurring in saltbush badlands, as detailed in Section 4.7.1. No impacts to riparian habitats would be anticipated from the Proposed Action, since no direct drilling or associated activities are proposed within the riparian community located along the Salt Creek drainage. Additionally, Howell's proposed CO<sub>2</sub> trunk line construction techniques for the Salt Creek crossing would entail bridging the channel with the pipe, similar to the existing Phase I CO<sub>2</sub> pipe crossing of Salt Creek (see Section 2.1.1.3, Gas System).

Of new disturbance, Howell's Reclamation Plan (see Section 4.5 and Appendix D), would reclaim an estimated 145 acres in the short term, following well drilling activities. The estimated 22 acres of habitat lost in the long term would be an incremental impact, given the degree of existing disturbance within Salt Creek Oil Field and the level of commitment to utilize existing infrastructure to the extent possible. Additionally, the ACEPMs presented in Section 2.1.6.6 of the Phase I EA (BLM 2003a) delineate committed protection measures to minimize impacts to terrestrial wildlife that also would apply to the Phases III/IV expansion. Specifically, logical site selection for wells, new access roads, flow lines, and ancillary facilities would aid in minimizing the potential effects to terrestrial wildlife habitats.

Parallel to the anticipated effects of habitat lost from the Proposed Action, the increased drill sites, access roads, substation, power line rights-of-way (ROWs), and ancillary facilities associated with Phases III/IV would incrementally increase habitat fragmentation and animals

displacement. It is assumed that surface disturbance and increased human-related activities (e.g., noise, human presence) would result in the loss or displacement of some terrestrial animals from the project area with a direct correlation to a reduced carrying capacity. Typically, animals will either avoid noise sources or become accustomed to the increased noise levels. The level of this impact depends on the type of noise source, individuals or species present, buffering capacity of the area (e.g., topography), and duration of the noise. As discussed, the degree of existing disturbance in Salt Creek Oil Field surrounding Phases III/IV, the minimal acreage with new surface disturbance, the relative existing habitat quality in these areas, and the observation that several species appear to habituate to these activities to a certain degree (e.g., pronghorn) helps to minimize direct and indirect effects to terrestrial wildlife species.

Potential impacts to the two big game species that occur in the area, pronghorn and mule deer, would reflect the discussion regarding potential short- and long-term effects to native habitats. Implementation of Phases III/IV would result in an incremental increase in habitat loss and fragmentation for pronghorn and deer use; however, the level of expected effects would be low, based on the degree of existing disturbance, the historic development of this oil field, and the focus on reworking existing wells and using existing infrastructure in and near the Phases III/IV area. No designated big game seasonal ranges or movement corridors would be affected by the Proposed Action.

These incremental habitat changes and increased human presence in the Phases III/IV area would likely reduce presence and use by certain more sensitive predators, such as bobcat, golden eagle, and ferruginous hawk; however, other predator species, including coyote, red fox, common raccoon, and red-tailed hawk, would more readily adapt to these changes in habitat configurations and human presence. It is assumed that the relative prey density and distribution (i.e., prey base of rodents and other small- or medium-sized mammals) would not change dramatically from the EOR expansion into the Phases III/IV area.

As discussed in Section 3.8, five active and eight inactive raptor nests were recorded in or within 0.5 mile of the Proposed Action. An increase in human-related activities (e.g., presence, noise, pedestrian or vehicle traffic) could directly impact nesting raptors, if they occur in close proximity to the nest site. Loss of eggs or young would be in violation of the Migratory Bird Treaty Act, and if the nest were occupied by a golden eagle, potential loss of eggs or individual birds in addition to disturbance to adult birds would be in violation of the Bald and Golden Eagle Protection Act.

Two raptor nest sites are of particular concern, given their location. The active red-tailed hawk nest (see Table 3-5, #8, 46) located approximately 0.25 mile east of the proposed pipeline corridor in Section 30 and the golden eagle nest that may have been originally “tended” by an eagle in February 2005 and ultimately occupied by a red-tailed hawk (see Table 3-5, #13). This nest was initially active in 2005 (i.e., containing one egg, but subsequently abandoned) and is located approximately 750 feet from the proposed Claim Jumper Switchyard and associated transmission and distribution power lines (Figure 3-2). Given that this golden eagle nest site exhibited signs of eagle use in early 2005, it is feasible that eagles could return in spring of 2006. The golden eagle nesting period extends from February 1 through July 31.

In accordance with the BLM's permitting stipulations outlined in the Platte River Resource Area Resource Management Plan (PRRA RMP) (BLM 1985), active raptor nests (i.e., containing eggs or young) are protected during the breeding season to minimize the potential for nest abandonment or loss of eggs or young. Therefore, project-related activities typically would be restricted within 0.5 mile of the nest for a specified period between February 1 and July 31 to protect breeding raptors and their nest sites. The applicable size of the buffer zone and extent of the seasonal restriction would be determined on a case-by-case basis by the BLM biologist. Since so many variables exist, the buffer and seasonal restriction can vary and would be determined, taking into account the species affected, topography, habitat suitability, degree of existing disturbance, associated prey base, breeding phenology, and degree or extent of proposed disturbance (BLM 1985). Therefore, based on the implementation of this BLM stipulation, no impacts to nesting raptors would be anticipated from construction of the Phases III/IV Project. However, there is a potential that the golden eagle nest located approximately 750 feet north of the substation in direct line-of-site would not be occupied in the future during project operation, resulting in a long-term loss of use by eagles. It is feasible, red-tailed hawks could re-occupy the nest site, since they are typically more tolerant of human-related influences.

This EA analysis also examined the potential for avian electrocution risk for birds that may perch on the proposed power lines associated with the Phases III/IV expansion project. As part of the Proposed Action, Howell has committed to construct and operate the 34.5-kV distribution lines in accordance with the standard raptor protection measures outlined in APLIC (1996) (see Section 2.1.1.4). Although larger birds (e.g., raptors) are generally of primary concern for electrocution hazards, applying the line design specifications outlined in APLIC (1996) and committed to by Howell for the Phases III/IV Project would aid in protecting birds of all sizes (including smaller birds perched on distribution equipment poles). Since these measures generally apply to lines below 69 kV voltage, these measures would specifically be implemented for the 34.5-kV distribution lines from the Claim Jumper Switchyard into Salt Creek Oil Field and to the Phases III/IV area. No impacts to birds from the operation of the two, 0.5-mile, 230-kV transmission lines from PP&L's existing main line to the Claim Jumper Switchyard would be anticipated. According to the National Electric Safety Code (NESC) specifications for electric conductor clearances, the larger 230-kV electrical line configuration increases the distance between phase-to-phase and phase-to-ground clearances, thereby preventing bird contacts or electrocutions on these larger structures.

No impacts to terrestrial species generally associated with open water or the riparian community (e.g., waterfowl, riparian obligate songbirds, amphibians) would be expected. As stated above, no direct impacts to the riparian corridor of the Salt Creek drainage or its inhabitants would be anticipated, based on Howell's commitment to avoid siting project facilities in this area. Potential impacts to reptiles would be expected to be minor and dispersed, based on the limited amount of new surface disturbance.

Potential impacts to terrestrial wildlife from potential CO<sub>2</sub> seeps in the future would likely be low overall. Individual animals that occupy the low-lying drainages could be lost if a CO<sub>2</sub> seep were to occur in this type of area. However, it would likely be limited to small- and medium-sized animals that use below-surface burrows. Two of the more important burrowing species include the burrowing owl and black-tailed prairie dog. Both of these species are addressed in Section 4.10.2.1. Potential impacts to other ground species would likely be

sporadic and dispersed. Howell's CO<sub>2</sub> Seep Containment Plan and existing seep containment fencing and netting reduces the potential exposure of animals to CO<sub>2</sub> effects.

#### **4.8.2 No Action**

Under the No Action Alternative, potential short- and long-term habitat loss and fragmentation would be the same as under the current EOR regime. No incremental increase in impacts to terrestrial wildlife species would occur beyond that already permitted within Salt Creek Oil Field. No potential increase in incidental mortalities of small- to medium-sized animals would occur from CO<sub>2</sub> seeps in low-lying draws or gullies beyond those anticipated for implementation of Phases I/II, albeit this number would be expected to be low.

#### **4.8.3 Mitigation and Monitoring**

Existing mitigation and monitoring measures have been developed for terrestrial wildlife species that are committed to by Howell and presented in Section 2.1.6 of the Phase I EA (BLM 2003a), Section 2.1.1.4 of this EA, and the BLM's stipulations contained in the PRRA RMP (BLM 1985). An additional mitigation measure has been developed to improve off-site avian protection and habitat enhancement in order to mitigate the potential long-term loss during project operation of golden eagle use of the existing eagle nest site located approximately 750 feet from the proposed Claim Jumper Switchyard and associated electric power lines. Three elements comprise this off-site protection program for area birds, specifically resident and migratory raptors. These elements include: 1) Howell would build new electric distribution lines to service Salt Creek Oil Field in accordance with the Avian Power Line Interaction Committee's *Suggested Practices for Raptor Protection on Power Lines: The State of the Art in 1996* (APLIC 1996) and forthcoming updates, 2) existing structures where future bird fatalities may be recorded would be retrofitted according to these same guidelines, and 3) existing de-energized electric distribution lines that are re-energized in the future would be made bird-friendly, as well. In accordance with APLIC's 1996 guidelines currently being updated and scheduled to be available for review in early 2006, these measures would either make the power poles safer for perching birds or implement perch management tools to control where birds perch on at-risk structures. This mitigation approach would not only aid in protecting raptor species that may occur in the project area, it also would improve habitat value for area birds.

### **4.9 Aquatic biology**

#### **4.9.1 Proposed Action**

The EOR program (including the Proposed Action for Phases III/IV) is projected to increase water volumes on a temporary basis (see Section 4.3.1). As Salt Creek has an established perennial aquatic life community adapted to the existing conditions, the effect of increased water flows in the Salt Creek system overall would be positive. In the arid conditions of the region, increased water availability has a positive effect on aquatic resources limited by water availability.

There are indications that changes in discharge water quality have occurred in LACT 4 and LACT 5, the LACTs associated with Phases I and II EOR. At this time it is not known if the water quality changes are associated with EOR. Produced water from the Proposed Action also

would be routed to the LACT 5 discharge. If the cause of the changes observed previously following Phases I and II implementation are related to EOR, it is possible that the Phases III/IV produced water may contribute further to changes in discharge water quality. However, as LACTs 4 and 5 together account for only 9.7% of Howell's total discharge volumes to Salt Creek (prior to EOR), these discharges, even considering the increase in discharge volumes, would not be expected to significantly alter the overall water quality in Salt Creek. The ongoing WYPDES monitoring program provides constraints to decreased water quality for the regulated constituents and procedures to address exceedances of the effluent limits and protect designated uses are in place per permit requirements. As proposed in the Salt Creek UAA (RETEC 2004), as long as cumulative discharges to Salt Creek do not increase over current (waterflood only) levels aquatic life should be protected and remain unimpaired.

#### **4.9.2 No Action Alternative**

Under the No Action Alternative, no additional water discharge would occur to Salt Creek. Any beneficial effects of the additional water supply to resident aquatic life would not occur. Water quality in Salt Creek would not change over the baseline water quality conditions in the creek based on waterflooding only and the Phases I and II EOR development.

#### **4.9.3 Mitigation and Monitoring**

The measures to minimize erosion described in Section 2.1.6 of the Phase I EA and the ongoing WYPDES monitoring would adequately reduce the chance of adverse impacts to aquatic life in Salt Creek. No additional mitigation or monitoring measures applicable to aquatic biological resources have been developed for the Proposed Action.

#### **4.10 Special Status Species**

##### **4.10.1 Plants**

##### **4.10.1.1 Proposed Action**

The Proposed Action occurs in an area that has been disturbed for over 100 years in the search for, and development of, petroleum resources. The threatened, endangered, and other special status plant species evaluated by this analysis are not known to occur in project area region, and no habitat for these species was observed within the project area boundaries, with one exception. Habitat for Nelson's milkvetch is present to a limited extent on site consisting of shale ridge outcrops associated with various project component elements. This species has not been observed in the project area. Based on the historical use of Salt Creek Oil Field, lack of plant species' observations, and the committed environmental protection measures to avoid steep slopes during construction, it can be assumed that no impacts to threatened, endangered, or other special status plant species would occur as a result of the proposed project.

##### **4.10.1.2 No Action**

Activity in the well field would continue at a decreasing level until the field becomes uneconomical. Field abandonment and project closure with the appropriate reclamation,

revegetation, and weed control activities would be completed. No impacts to special status plant species would be associated with the No Action Alternative.

#### **4.10.1.3 Mitigation and Monitoring**

No additional mitigation or monitoring measures applicable to special status plant species have been developed for the Proposed Action.

#### **4.10.2 Terrestrial Animals**

##### **4.10.2.1 Proposed Action**

The following impact analyses focus on the special status terrestrial wildlife species that may occur in or near the proposed Phases III/IV Project. As summarized in Table 3-7, of the 18 animal species examined for this project, 11 are analyzed in detail for potential direct, indirect, or cumulative impacts from construction and operation of the Proposed Action. A “no effect” impact determination has been made for the federally listed bald eagle and black-footed ferret, based on the lack of suitable habitat for bald eagle use and the USFWS block clearance for black-footed ferrets.

If present in the project area, potential impacts to the BLM-sensitive ferruginous hawk and western burrowing owl from project implementation would parallel those discussed for nesting raptors and predator species in Section 4.8.1. An increase in human-related activities (e.g., presence, noise, pedestrian, or vehicle traffic) could directly impact nesting raptors, if the activities were to occur in close proximity to the nest site. Species such as the ferruginous hawk are highly susceptible to nest abandonment, if disturbed during the breeding season. If abandoned, loss of eggs or young could occur, which would be in violation of the Migratory Bird Treaty Act. Since burrowing owls use underground burrows for nest sites, potential impacts to this raptor species could occur from ground-disturbing activities in proximity to nest burrows. However during the 2005 nest surveys, no active ferruginous hawk or burrowing owl nests were documented in or within 0.5 mile of the Phases III/IV boundaries, near the proposed substation site, along the proposed power line ROWs, or near other ancillary facilities (e.g., new compressor station) (ENSR 2005a, 2005b; Wildlife Consulting Services 2005a, 2005b). Therefore, it is assumed that no impacts to these two sensitive raptor species would occur from implementation of the Phases III/IV Project, if project construction began the winter of 2005/2006 prior to the 2006 breeding season. In the event that construction activities were delayed into the spring of 2006, the BLM’s permitting stipulations outlined in the PRRA RMP (BLM 1985) are structured to protect raptor nests to minimize the potential for nest abandonment or loss of eggs or young.

In the event that construction were delayed and breeding ferruginous hawks or burrowing owls were to be documented in 2006 within 0.5 mile of the Phases III/IV area, project-related activities would likely be restricted within 0.5 mile of an active nest site during a specified period between February 1 and July 31. As stated for other raptor species in Section 4.8.1, the extent of an applicable buffer area and seasonal restrictions can vary and would be determined by the BLM biologist, based on a number of factors (e.g., topography, existing disturbance, prey base, breeding phenology, proposed disturbance). In summary, no direct impacts to breeding

ferruginous hawks or western burrowing owls would be anticipated, based on survey data collected in 2005 and the implementation of the applicable BLM stipulations to protect active nest sites in the future, if they are warranted.

Other potential impacts to special status species, such as the ferruginous hawk and burrowing owl, from the incremental surface disturbance and oil field activities associated with the Proposed Action would parallel the discussion for general terrestrial wildlife species discussed in Section 4.8.1. Historic oil field development over the last 116 years has resulted in the incremental loss and disturbance of native habitats, increased habitat fragmentation, and animal displacement. The reworking of existing wells, the use of existing roads and some power lines, and the use of existing ancillary facilities would minimize the degree of new surface disturbance. Approximately 167 acres of new disturbance would occur under the Proposed Action, as compared to the use of 356 acres of previously disturbed areas, with an estimated 145 acres of new disturbance reclaimed in the short term, following well drilling activities, and an estimated 22 acres of habitat lost in the long term. Howell's commitment to build new electric distribution lines in accordance with APHLC (1996) to minimize the risk of bird electrocution for birds perching on these structures would aid in protecting ferruginous hawks attempting to perch on these new power lines (see Section 2.1.1.4), which is discussed in detail for general raptor species in Section 4.8.1. Additionally, the ACEPMs presented in Section 2.1.6.6 of the Phase I EA (BLM 2003a) delineate committed protection measures to minimize impacts to terrestrial wildlife applicable to the Phases III/IV expansion.

Potential impacts to the four sensitive songbirds identified as potentially occurring in the project area, i.e., sage thrasher, Brewer's sparrow, sage sparrow, and loggerhead shrike, would primarily include incremental habitat loss and fragmentation and potential displacement of adult breeding birds, if present. Displacement of breeding birds could result from project construction and increased human presence in native shrubland steppe habitats. Assuming an incremental reduction in habitat carrying capacities, some of these breeding birds could be displaced in the short term (i.e., during construction and site reclamation) and in the long term (e.g., until shrubs become re-established). Displacement or nest abandonment during the breeding season could result in the loss of productivity for that breeding season. Potential impacts to nesting birds would depend on the nest location relative to the proposed project components, the species' breeding phenology, the duration of the potential impacts, and the individual species' tolerance to disturbances.

In September 2003, the USFWS determined federal listing of the mountain plover as federally threatened was not warranted; however, the species remains a BLM sensitive species. Plover nest sites are protected on BLM lands with applied seasonal restrictions for surface use and human-related activities from April 10 to July 10. As shown on Figure 3-2, potentially suitable habitat for the mountain plover occurs in and adjacent to the Phases III/IV Project area. If development activities were to occur during the breeding season, increased human presence and noise could result in displacing breeding adult plovers (if present) from their respective territories resulting in the potential loss of productivity for that season. It is assumed that breeding birds would likely return to these areas the following year, particularly since this species' habitat association encompasses open, disturbed areas. Therefore, surface disturbance for the Phases III/IV development would not likely degrade habitat quality or availability for this species.

If project development were to occur within suitable plover habitat delineated for the Phases III/IV area during the breeding season, the BLM would require specific mountain plover surveys, and if present, applicable restrictions would be required near active nest sites. These procedures are outlined in the BLM Instructional Memorandum No. WY-2004-035, dated April 16, 2004. Restrictions include mountain plover surveys conducted in potentially suitable habitat, if project-related activities were to occur between April 10 and July 10. Two surveys (14 days apart) would be required prior to the initiation of project actions to minimize impacting breeding or nesting birds. The BLM has developed additional protection measures, in the event a nest site were recorded in the vicinity of project activities.

No impacts to active prairie dog colonies would be anticipated from the development and expansion of Phases III/IV involving existing infrastructure. It is not likely that project-related activities with existing wells, roads, and ancillary facilities would impact prairie dogs or their burrows. Potential impacts to prairie dogs from the construction and development of new wells, access roads, power lines, and associated facilities could result in crushing of burrows and direct mortality of individual animals if present in these development areas (see Figure 3-3). As stated in Section 2.1.6.6 of the Phase I EA, Howell has committed to avoiding active prairie dog colonies whenever possible. Howell and the BLM maintain communications on this avoidance measure when siting would unavoidably impact prairie dog burrows.

No impacts to the three bat sensitive bat species identified for the proposed project, Townsend's big-eared bat, fringed myotis, and long-eared myotis, would likely occur. No communal bat roosts (e.g., hibernacula, maternity colonies, or bachelor roosts) are known to occur in the project area, and if present, bats would likely occupy individual day roosts only.

Potential impacts to special status species from potential future CO<sub>2</sub> seeps would parallel the impacts discussed for Terrestrial Wildlife (Section 4.8.1). Individual prairie dogs, ground-nesting birds, or burrowing owls that may occupy low-lying areas in the vicinity of a CO<sub>2</sub> seep could be lost. However, the anticipated incidence of these potential mortalities would be expected to be low, based on the low incidence of CO<sub>2</sub> seeps recorded for Phase I, the sporadic occurrences of these special status species, the CO<sub>2</sub> Seep Containment Plan developed by Howell for the Proposed Action (see Section 2.1.3), and Howell's existing seep containment fencing and netting to prevent or minimize wildlife access to these areas.

#### **4.10.2.2 No Action**

Under the No Action Alternative, current levels of EOR activities would continue until field closure and reclamation. Potential impacts to special status animal species examined for the Proposed Action would be the same as under the current EOR regime. If species are present, the anticipated incremental increase in surface disturbance, habitat fragmentation, or animal displacement would continue under the current levels already permitted within Salt Creek Oil Field. However, the ACEPMs outlined in the Phase I EA (BLM 2003a) would help in mitigating potential habitat effects and impacts to special status species. The potential increase in incidental mortalities of special status songbirds, black-tailed prairie dogs, or burrowing owls from CO<sub>2</sub> seeps in low-lying draws or gullies would be expected to be low, based on typical habitat associations, animal mobility, isolated occurrences of the CO<sub>2</sub> seeps from the Phase I EOR

activity, and the CO<sub>2</sub> Seep Containment Plan developed by Howell to minimize or prevent CO<sub>2</sub> seeps.

#### **4.10.2.3 Mitigation and Monitoring**

No additional mitigation or monitoring measures applicable to special status animal species have been developed for the Proposed Action beyond those already committed to by Howell in Section 2.1.6.6 of the Phase I EA (BLM 2003a), Section 2.1.1.4 of this EA, and as part of the Proposed Action.

#### **4.10.3 Aquatic Species**

##### **4.10.3.1 Proposed Action**

The Proposed Action would not affect any federally listed, state-listed, or BLM sensitive aquatic species, since no sensitive aquatic species have been documented in Salt Creek or its tributaries. Any changes in water discharge quality or quantity from the Proposed Action would not be of such magnitude that water quality or quantity conditions would change significantly in the receiving waters in the Powder River where sensitive fish species (e.g., sturgeon chub, shovelnose sturgeon) may occur. Additionally, Howell proposes to cross the Salt Creek drainage by bridging the new CO<sub>2</sub> pipe, thereby avoiding dried or indirect effects to this creek.

##### **4.10.3.2 No Action**

No effect on sensitive aquatic species would be expected under the No Action Alternative and current waterflood conditions continue in that area.

##### **4.10.3.3 Mitigation and Monitoring**

No additional mitigation or monitoring measures applicable to special status aquatic species have been developed for the Proposed Action.

#### **4.11 Cultural Resources**

Cultural resources are regarded as significant if they are enrolled in or meet the eligibility criteria of the NRHP. NRHP eligibility criteria are enumerated in 36 CFR 60 and are described as follows:

The quality of *significance* in American history, architecture, archaeology, and culture is present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, and association, *and*:

- (a) That are associated with events that have made a significant contribution to the broad patterns of our history.
- (b) That are associated with the lives of persons significant in our past.

- (c) That embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction.
- (d) That have yielded, or may be likely to yield, information important in prehistory or history.

To qualify for NRHP eligibility, a property must meet two separate types of requirement. It must exhibit integrity of location, design, materials, etc. and it must meet one or more of the four additional criteria. The National Historic Preservation Act (NHPA) of 1966, as amended, makes clear that a site need not be of national historic significance to be considered eligible; sites of local, state, and regional importance also may be listed, and thus are significant in the legal sense. The phrasing of NHPA is critical with respect to actual management of cultural resources. A site does not have to be included on the NRHP to receive protection under the law, but must simply meet the requirements of eligibility.

Impacts to cultural resources may be direct or indirect. Direct impacts are those that occur as a primary result of project designs and might be associated with actual gas field development (e.g., well pad construction activities, equipment staging areas, building of temporary access roads) and subsequent gas field maintenance operations. The greatest direct impacts can be expected to occur early in the course of any undertaking when surface disturbance takes place. Indirect impacts are those that occur as a secondary consequence of a project and are generally associated with increased human activity in previously inaccessible areas. Illicit surface collection of sites is a common form of indirect impact. Indirect impacts can occur at any time during or after construction; however, their effects must be anticipated at the outset.

#### **4.11.1 Proposed Action**

Applying these guidelines and NRHP eligibility criteria, a number of protection measures currently exist to protect known and undiscovered archaeological or cultural sites located outside of the existing cultural resources exclusion zone. ACEPMs for archaeological and cultural resources presented in Section 2.1.6.7 of the Phase I EA (BLM 2003a) remain applicable for the Phases III/IV Project, but do not include the Class III cultural resources exclusion zone (see Figure 3-4).

Based on these committed measures, existing sites (see Table 3-9) and new (unknown), significant prehistoric and historic sites would either be protected or a data recovery program would be implemented, as deemed appropriate by the BLM in consultation with the SHPO, the Advisory Council on Historic Preservation (ACHP), and Howell (BLM 2003a). Therefore, no significant impacts to archaeological or cultural sites would be anticipated from implementation of the Proposed Action, and the project would conform to the Salt Creek RMU planning decisions and direction for cultural resources.

#### **4.11.2 No Action**

Under the No Action Alternative, no additional impacts would occur to cultural resources.

### **4.11.3 Mitigation and Monitoring**

No additional mitigation or monitoring measures applicable to cultural resources have been developed for the Proposed Action beyond the ACEPMs detailed in Section 2.1.6.7 of the Phase I EA (BLM 2003a).

## **4.12 Range Management and Grazing Resources**

### **4.12.1 Proposed Action**

Under the Proposed Action, AUMs would be lost in the short term during the Phases III/IV construction until new road ROWs, new pipeline routes, and non-work areas around wells and facilities could be reclaimed. Within the Phases III/IV areas, approximately 167 acres of new disturbance would occur from project implementation, with 145 acres being short-term disturbance and 22 acres would be long-term disturbance. A precise estimate of the AUMs lost from this disturbance is difficult to obtain. However, a simple average productivity estimate for the Phases III/IV project, based on ESD and NRCS soils information (see Table 3-11), yields an estimate of 5.4 acres per AUM. Applying this estimate to the projected short- and long-term surface disturbance in the Phases III/IV Project area would yield an estimated short-term loss of 27 AUMs and a long-term loss of 4 AUMs during Phases III/IV. These numbers represent less than 0.9% of the public land AUMs and less than 0.6% of the total AUMs in the Davis Allotment from the short-term disturbance. Losses from long-term disturbance would be 0.1% of public AUMs and less than 0.1% of total Davis Allotment AUMs. They would, however, be in addition to the reduced AUM capacity in the allotment from previous disturbance.

The total surface disturbance would be projected to be 8% of the total Phases III/IV area (2,182 acres) and the long-term surface disturbance would be 1% of the total Phases III/IV area (see Table 2-2). Following full-field production, the field would be closed in an estimated 30 to 40 years and the Phases III/IV area would be reclaimed.

The ACEPMs described in Sections 2.1.6.4 and 2.1.6.5 of the Phase I EA (BLM 2003a) would reduce potential impacts to range resource in the Phases III/IV area. In accordance with Howell's Reclamation Plan (see Item #10 in Appendix D), new surface disturbance for pipelines, wells, power lines, and other ancillary facilities would be reclaimed as soon as practicable with the proper seed mixture (see Table 4-2).

Although the project-related reduction in grazing capacity in the project area would be small, the operations associated with construction of the Proposed Action also could potentially disrupt efficient management of the allotment for grazing. Construction and drilling related activities would be dangerous to cattle, and cattle could cause problems for oilfield workers, especially during the construction period, as discussed below.

Range improvements in the project area include pasture fences, stock reservoirs, and one stock water surface pipeline. However, few existing range improvement projects would be impacted by the Proposed Action. Leaving fences down or gates open when livestock are present could result in livestock moving into unauthorized areas or mixing in adjacent pastures. If this were to occur, livestock entering the production area could either be injured or cause damage to the facilities. If fenced, no impacts to livestock from the Proposed Action would be anticipated.

Increased heavy vehicle traffic could cause damage to existing cattle guards, especially during construction, depending on the size of the equipment.

After construction is completed, the short-term disturbed areas would be reclaimed and revegetated. The BLM typically requires a 2-year period without grazing on reclaimed areas to facilitate the success of the reclamation effort. The short-term loss of grazing capacity on the Davis Allotment would continue through this period. Howell also has committed to a protection measure to coordinate directly with the grazing lessee to review applicable options to minimize potential grazing impacts in the short term. Once reclamation is successfully completed, it is expected that the reclaimed areas would be more productive for grazing than the native pasture.

#### **4.12.2 No Action**

Under the No Action Alternative, development would continue under the existing EOR and waterflood operations. No additional AUMs would be lost from EOR activities beyond those already permitted within Salt Creek Oil Field.

#### **4.12.3 Mitigation and Monitoring**

ACEPMs developed to minimize potential impacts to range resources and livestock grazing are presented in Sections 2.1.6.4 and 2.1.6.5 of the Phase I EA, and an additional measure was developed for the Phases III/IV Project in Section 2.1.4.2 of this EA. The new measure for the Proposed Action would increase communication and coordination with the Davis Allotment operator to minimize adverse effects on grazing management. Although the number of AUMs expected to be lost from the Proposed Action would be small, this measure would aid in compensating the allotment operator for the anticipated loss by providing 1) temporary fencing of reclaimed areas, 2) alternative pastures, or 3) supplement livestock feed. Howell and the grazing lessee would develop a mutual agreement as to the specific option or options to be implemented. It is recommended that BLM serve as an arbitrator, if warranted.

Additionally, whenever possible, construction activities should be conducted when the construction area is not actively in use for grazing. Fencing should be erected to prevent conflict between grazing operations and oil field development activities, including reclamation activities. Fences should be constructed around production facility areas that present a risk to cattle to prevent injury to the animal or damage to the facility. No residual impact from the Proposed Action would be anticipated if the disturbed areas are properly reclaimed and returned to productive use for grazing purposes. Increased forage production from reclaimed areas also would help mitigate some AUM loss due to native area disturbance.

Finally, gates should be closed immediately after passing through them, whenever possible. Gates adjacent to roadways should be used as an alternative to crossing cattle guards, wherever possible.

## **4.13 Land Use**

### **4.13.1 Proposed Action**

The Proposed Action would have essentially no effect on surface ownership or existing land use outside the project area. Within the project area, the Proposed Action would result in short-term disturbance of an estimated 167 surface acres and a long-term disturbance of approximately 22 surface acres. The potential effects to livestock grazing, the primary land use, is discussed in Section 4.12.

### **4.13.2 No Action**

The No Action alternative would have essentially no effect on surface ownership or land use, except that reclamation would begin earlier on previously disturbed areas. Additionally, field closure, with its attendant reclamation requirements, would occur in 5 to 15 years rather than 30 to 40 years.

### **4.13.3 Mitigation and Monitoring**

Mitigation or monitoring measures applicable to land use for the Proposed Action are discussed in Section 4.12.3.

## **4.14 Socioeconomics**

### **4.14.1 Proposed Action**

#### **4.14.1.1 Population**

The Proposed Action would result in a 6- to 10-month increase in workforce at Salt Creek Oil Field of approximately 250 to 300 construction workers (see Section 4.14.1.2). It is expected that 80 to 90 percent of the workers would come from the existing labor pool in the local surrounding areas of Midwest, Edgerton, Casper, Mills, Evansville, and Kaycee. Most of these workers would be expected to commute from their current residences, which are all within 45 miles of the project area. Assuming a maximum of 20 percent of the new workers would be non-local, there would be 50 to 60 potential new families, or 120 to 144 additional people at an average of 2.4 people per household. Assuming acceptable housing were available, perhaps half of the new people would choose to live in the Midwest-Edgerton area, which would represent a 10 to 12 percent increase in the population for the area. While not insignificant, the increase would still leave the population well below the 1,148 individuals recorded as recently as the 1990 census. Consequently, the increased population and the economic activity they would bring would likely be viewed as a benefit in Midwest and Edgerton. The population increase would be an insignificant 0.2 percent, or less, of the current estimated Natrona County population.

It is likely that most of the remaining half of the population increase would choose to live in the Casper area because of the greater range of services and housing opportunities available there. An increase of 60 to 72 people in Casper would scarcely be noticed. One concern would be the current low vacancy rate in rental housing, but ample temporary housing would be available in motels and campgrounds to accommodate workers and families, if needed.

Unless the construction employment opportunities were to continue in subsequent phases of the project, the population gain would be temporary and would be absent in 6 to 10 months.

#### **4.14.1.2 Employment and Income.**

The Proposed Action would require a temporary increase in construction worker employment of 250 to 300 workers. As the region has a long history of oil and gas activities, it is anticipated that the necessary skills for construction and drilling work would be available locally; consequently, most of the workers would be hired from the local Natrona County area, as noted in Section 4.14.1.1. Approximately 85 percent would be skilled workers, including welders and fitters, heavy equipment operators, and a number of experienced supervisory personnel; the remainder would be unskilled workers. The skilled jobs, in particular, would pay above average wages ranging up to approximately \$20 per hour. The result would be an influx of money into the local economy, as workers would spend a portion of their earnings locally for housing, food, and other necessities. Construction activities are anticipated to begin in January-February 2006, pending regulatory approvals. Expenditures by workers would lead to additional business and employment opportunities for provision of various goods and services in local communities. Total new employment created by the project would increase employment opportunities in the Natural Resources and Mining sector of the Natrona County economy by 12 to 15 percent in the short term, which is considered a beneficial effect.

In addition to the construction workers, one or two operating employees would be added to the Howell staff at each phase. These would be long-term positions. The long-term employment increase would be negligible in the context of the county economy. Most of the required operations workforce would be expected to come from Casper, Midwest, Edgerton and surrounding local communities.

#### **4.14.1.3 Economy**

The Proposed Action would have mostly beneficial effects on the economy. Oil production is expected to increase by over 50 percent from current levels of 7,000 BOPD to approximately 10,700 BOPD. The total increase in oil production from the Phases III/IV area is estimated at 22 MMBO over the 30- to 40-year life of the project. Increasing the total recoverable oil from Salt Creek Oil Field and extending the life of the field would increase property and severance taxes to the county and the state. Royalty payments to the federal and state governments also would increase and a portion of the tax and royalty increases would accrue back to the local communities. For the Phases III/IV CO<sub>2</sub> flooding in 2007, Howell estimates that \$10 million in gross revenue would be generated. The company would pay about \$3.8 million in royalties and taxes (not including income taxes) annually for the Phases III/IV expansion. Estimated operating expenses, severance taxes and ad valorem taxes for the Proposed Action are summarized in Table 4-3.

**Table 4-3 Phases III/IV Estimated Expenses and Taxes Generated<sup>1</sup>**

Description	Operating Expenses	Severance Tax	Ad valorem Tax
First Full Year (2007)	\$2,000,000	\$424,000	\$712,000
Maximum Value	\$7,300,000	\$1,055,000	\$1,800,000
Annual Average (40 years)	\$3,091,000	\$655,000	\$1,109,000

<sup>1</sup>Estimates from Howell.

Increased employment and wages also would increase economic activity in the region and state and would result in an increase in personal income tax revenue.

Wage rates for the skilled and unskilled construction workers range from \$12 to \$19 per hour plus benefits. Assuming an average pay rate of \$15.50 per hour at 60 hours per week and 300 construction workers, the estimated construction payroll during Phases III/IV construction would be approximately \$600,000 per month for approximately 11 months. A portion of this income would be spent in the local area for goods and services, resulting in a beneficial effect on local businesses such as restaurants, service stations, and retail stores. Oil field workers also would be contributing to the local and regional economy through expenditures for goods, services, housing, insurance, entertainment, and food. Operating positions at Howell would average about \$65,000 per year with benefits and would be ongoing for the life of the project.

A summary of actual and estimated capital expenditures by year, from 2003 through 2006, is presented in Table 4-4. Estimated capital expenditures for the Proposed Action beyond 2006 would average about \$35 million per year over the next several years, plus approximately \$15 million per year for CO<sub>2</sub>.

**Table 4-4 Phases III/IV Estimated Capital Expenditures**

Year	Wells and Equipment	CO <sub>2</sub> Purchases
2003	\$74,300,000	\$280,000
2004	\$34,900,000	\$10,250,000
2005	\$17,300,000	\$19,300,000
2006	\$68,800,000	\$15,600,000

A portion of the capital expenditures would be spent in the local area for miscellaneous supplies and repairs. This would benefit the local economy.

The current livestock operation associated with the Phases III/IV area would experience a short-term economic loss from a reduction in AUMs available on the Davis Allotment. This is addressed in greater detail in Section 4.12.

#### **4.14.1.4 Infrastructure**

##### **Housing**

A short-term increase of 50 to 60 households would be a small increment, approximately 0.2 percent, in Natrona County as a whole. If an assumed 25 to 30 of those households would prefer to live in the Midwest-Edgerton area, they may encourage renovation of currently unused homes and they may put increased pressure on local rental rates. The local communities have accommodated a substantially larger population in the past, although the condition of currently vacant residences is uncertain. If as many as all of the new households located in the Casper area, they would increase pressure on an already tight rental housing market. The effect would be very small, however, and there are a substantial number of motels and camping facilities available to relieve the pressure in the short term until the market could accommodate the demand. Extending the life of Salt Creek Oil Field would tend to support additional investment in the supply of housing by increasing the confidence level of builders, developers, and bankers.

##### **Other Public Facilities and Services**

The potential population increase in the Midwest-Edgerton area would include an increase of as many as 35 to 45 school-age children. The Midwest schools have accommodated substantially larger numbers of students in the past, however, and the increase would not be expected to be problematic for the school district. All other public facilities and services are believed to have ample capacity to accommodate the modest, short-term population increase associated with project construction.

#### **4.14.1.5 Environmental Justice**

Economic and demographic data indicate that minority populations are a small increment of the population of Natrona County. Although average incomes in the Midwest-Edgerton area are lower than for Natrona County as a whole, the percentage of people living at or below the poverty level is not known. However, no adverse impacts to people living in the area from implementation of the Proposed Action have been identified, so there would be no disproportionate environmental impacts on low income or minority populations. Economic effects of the Proposed Project would be expected to be beneficial to the local population. The Native American population is smaller than for the state as a whole and there are no known Native American sacred sites on or near the Phases III/IV project area. Consequently, the Proposed Action would not adversely affect environmental justice considerations in the study area.

#### **4.14.2 No Action**

##### **4.14.2.1 Population**

The No Action Alternative would mean no additional construction workers would be required. Existing personnel would continue to operate the field at current levels as long as it remained economical to produce oil from the field.

#### **4.14.2.2 Employment and Income**

The No Action Alternative would not change the current status of employment in Salt Creek Oil Field.

#### **4.14.2.3 Economy**

The No Action Alternative would result in a continuation of current operations; the productive life of the oil field would end within approximately 5 to 15 years. Upon completion of reclamation of the oil field, much of the economic rationale for the communities of Midwest and Edgerton would be gone and it is expected that they would decline, as have other resource-based communities throughout the West.

#### **4.14.2.4 Infrastructure**

##### **Housing**

The No Action Alternative would have no effect on housing demand compared to the existing situation.

##### **Other Public Facilities and Services**

The No Action Alternative would cause no measurable effects on public facilities and services.

#### **4.14.2.5 Environmental Justice**

No impacts to environmental justice would occur under the No Action Alternative.

#### **4.14.3 Mitigation and Monitoring**

##### **4.14.3.1 Population**

Because the population growth would be modest and considered beneficial to the local area, no additional mitigation or monitoring measures applicable to area population have been developed for the Proposed Action.

##### **4.14.3.2 Employment and Income**

No additional mitigation or monitoring measures applicable to employment and income, which would be considered beneficial, have been developed for the Proposed Action.

##### **4.14.3.3 Economy**

No additional mitigation or monitoring measures applicable to the overall economical effects have been developed, except to mitigate the effects for the grazing allotment, which are addressed in Section 4.12.3.

#### **4.14.3.4 Infrastructure**

##### **Housing**

No additional mitigation or monitoring measures applicable to the relatively small increase in housing demand have been developed. It may be necessary to informally monitor camping on public lands as construction activities have, in some past energy development scenarios, caused problems. The scale of the Proposed Action suggests any such problems would be minor, however.

##### **Other Public Facilities and Services**

In the absence of adverse effects, no additional mitigation or monitoring measures applicable to public facilities or services have been developed for the Proposed Action.

#### **4.14.3.5 Environmental Justice**

No additional mitigation or monitoring measures applicable to environmental justice review have been developed for the Proposed Action.

### **4.15 Recreation**

#### **4.15.1 Proposed Action**

The Proposed Action would have minimal, if any effect on recreation activities in the area. Access through the Phases III/IV area may be restricted at times, but there are ample alternative recreation opportunities nearby to accommodate local recreation needs, including potential increased demand from project-related population increases.

#### **4.15.2 No Action**

The No Action alternative would have no effect on recreation in the project area.

#### **4.15.3 Mitigation and Monitoring**

No additional mitigation or monitoring measures applicable to recreation have been developed for the Proposed Action.

### **4.16 Visual Resources**

#### **4.16.1 Proposed Action**

The Proposed Action would modestly improve the visual character of the project area in the short term by removing pump jacks that would be made obsolete by the EOR Program. Several proposed project facilities, in addition to the well field activities, would be located outside of the Phases III/IV boundaries and would introduce new visual features to the landscape. These features would include an electrical substation (T39N, R79W, NE $\frac{1}{4}$  SW $\frac{1}{4}$  S34), two short segments of a 230-kV transmission line, approximately 6.7 miles of a 34.5-kV distribution line, an electrically powered compression station (T40N, R78W, NE $\frac{1}{4}$  S31), and a bridged CO<sub>2</sub> trunk

line crossing Salt Creek approximately 0.5 mile north of the compression station (the pipeline itself would be buried underground).

The substation and the electric transmission lines would be approximately 3 miles from the major highways; at this viewing distance features of this type would not dominate the view. The distribution lines located outside the Phases III/IV boundaries would cross SR 259 and would parallel it within 0.25 to 0.5 mile; however, it would be a relatively small electrical line, similar to many others in the area and would not be visually dominant.

The proposed compression station and pipeline bridge also would be located within 0.25 mile of SR 259. As with all new buildings, the compression station would be painted in colors to minimize contrast with the natural environment, to be approved by the BLM. The pipeline bridge would be a low, horizontal structure. It would likely be visible from the highway, but would not dominate the views.

In the short term, these project facilities would be visible from public viewing areas and would add to the industrial character of the Salt Creek Field landscape. They would be offset in this time frame by the reduction in pump jacks and related facilities in the well field and by reclamation of obsolete disturbance areas.

In the longer term, most of the disturbance areas would be reclaimed and facilities would be removed, which would be in keeping with the visual resource objective of the ACEC management plan to improve the visual environment (BLM 1980).

Final rehabilitation of the landscape character of the project area would not be accomplished until after closure and reclamation of Salt Creek Oil Field because of the extensive previous disturbance and development.

#### **4.16.2 No Action**

The No Action Alternative would have no effect on the visual environment in the short term. It would result in closure and reclamation of the project area in the 5- to 15-year time frame rather than the 20-to 40-year time frame anticipated under the Proposed Action.

#### **4.16.3 Mitigation and Monitoring**

No additional mitigation or monitoring measures applicable to visual resources have been developed for the Proposed Action.

### **4.17 Noise**

#### **4.17.1 Proposed Action**

The Proposed Action would increase noise in the project area to some degree because of the construction and drilling activities planned in the short term. Operation of CO<sub>2</sub> compressors also would increase noise in the long term to an unknown degree. The compressors would be electrically driven, which would minimize, but not eliminate, the related noise emissions. It is

expected that the close relationship between the oil field and the nearby communities of Midwest and Edgerton would tend to reduce the sensitivity of residents to project-related noise.

#### **4.17.2 No Action**

The No Action Alternative would not change the existing noise environment in the project area.

#### **4.17.3 Mitigation and Monitoring**

High noise project activities in close proximity to schools should be conducted when schools are not in session. Compressor stations and other long-term noise sources should be constructed away from potential noise sensitive areas or in areas with natural topographic screening to minimize adverse effects of project noise. Howell should log and investigate any noise complaints related to the project to determine whether any unwelcome noise effects could be minimized.

### **4.18 Transportation**

#### **4.18.1 Proposed Action**

The Proposed Action would generate an increase in worker commuting traffic during the construction period and an increase in heavy truck traffic particularly during construction and to a lesser extent during operation of the project. An unlikely worst-case scenario of all construction workers driving separately to the project area would only generate an additional 300 vehicle trips in the peak hour, however, which would not cause the LOS to drop out of the “A” level. Truck traffic would have minimal effect on traffic flows, at worst causing some annoyance to drivers in areas where passing is difficult or prohibited. Effects on traffic safety would be minor with the probability of an accident increasing roughly in proportion to the increase in vehicle trips.

#### **4.18.2 No Action**

The No Action Alternative would have no perceptible effect on traffic.

#### **4.18.3 Mitigation and Monitoring**

No additional mitigation or monitoring measures applicable to transportation have been developed for the Proposed Action.

### **4.19 Unavoidable Adverse Impacts**

Anticipated impacts from implementation of the Phases III/IV project that cannot be fully mitigated have been identified for the Proposed Action. These unavoidable impacts would remain after application of the ACEPMs listed in Section 2.1.6 of the Phase I EA (BLM 2003a), the committed measures listed in Section 2.1.4 of this EA, and a number of construction and operation procedures that Howell has developed as part of the Proposed Action.

Unavoidable adverse impacts from the Proposed Action are summarized for the applicable resource disciplines:

- Fugitive dust: PM<sub>10</sub>/PM<sub>2.5</sub> from construction activities and initial temporary increase in vehicular traffic.
- Combustion emissions from mobile sources (gasoline and diesel vehicles) and non-road engines (e.g., drilling/workover rigs): PM<sub>10</sub>/PM<sub>2.5</sub>, NO<sub>x</sub>, SO<sub>2</sub>, CO and VOCs, but levels expected to be negligible.
- Potential negligible to minimal air quality impacts from CO<sub>2</sub> seeps in remote locations.
- Minor changes in topography from cut and fill activities for new pad, road, substation, and compressor station construction.
- Extremely low risk to humans and low risk to animals in rural locations only, if future CO<sub>2</sub> seeps surface.
- Some loss of topsoil productivity from vegetation removal, soil compaction, and removal of organic matter; soil exposure and soil loss from wind and water erosion from construction and operation activities until successful reclamation has been achieved and vegetation has re-established; and potential soil contamination from spills or leaks during project development and operation.
- Removal of 145 acres of vegetation in the short-term and 22 acres in the long-term for new disturbance.
- An increase in weed species until successful implementation of the NWMP and site monitoring, following which weed populations would decline through time.
- Removal of 145 acres of relatively low value wildlife habitat in the short-term and 22 acres in the long-term for new disturbance.
- Incremental long-term increase in minor habitat fragmentation and terrestrial wildlife displacement from surface disturbance and increased noise levels until final reclamation.
- Loss of some small- and medium-sized animals that use below-surface burrows along low-lying drainages, if a CO<sub>2</sub> seep were to occur in this area.
- Potential long-term loss during project operation of golden eagle use of existing eagle nest site located approximately 750 feet from the proposed Claim Jumper Switchyard and associated electric power lines.
- Incremental reduction in habitat carrying capacities, potential displacement during construction activities, and possible short-term loss of productivity for that breeding season for sage thrasher, Brewer's sparrow, sage sparrow, and loggerhead shrike.
- Potential impacts to prairie dogs from construction activities in previously undisturbed areas, if avoidance measures are not feasible.

- Some loss of archaeological or cultural resources from unidentified sites.
- A small amount of potential domestic cattle forage lost.
- A small increase in pressure on the already tight rental housing market to a very small degree.
- A localized, short-term increase in noise due to traffic and construction activities, and some long-term, localized increases in noise due to operation of compressors.
- Minor increase in traffic on area roads.

#### **4.20 Relationship Between Short-Term Use of the Environment and Long-Term Productivity**

For the Salt Creek Phases III/IV EA, short-term use of the environment is defined as occurring during project construction and development stages. Long-term productivity refers to the life of the project through final successful project reclamation. Use of the combined waterflood and tertiary EOR could ultimately extend operations for another 30 to 40 years and the economic life of the field. Upon final project completion, facility removal, and successful reclamation, the landscape character would return to the nature of the area prior to regional oil development in the long term.

Examples of short-term use of the environment include increased noise; dust; and surface disturbance from new drilling pad, access road and power line construction. These impacts are temporary in nature and mitigatable with current technology and industry practices. Ongoing actions, such as continual road closures, aid in returning the long-term productivity of the land. If reclamation and revegetation were successful within a few years, some of the surface disturbance associated with the Phases III/IV Project would be considered to be short-term. Disturbance to the surface areas that cannot be reclaimed in the short term would result in long-term impacts until final field closure and reclamation.

Some of the positive economic benefits identified for the Proposed Action would increase and extend the benefits of employment, energy production, and public fiscal enhancements in the long term, for up to 40 years.

#### **4.21 Irreversible and Irretrievable Commitment of Resources**

Construction and operation of the proposed Salt Creek Phases III/IV Project could result in either the irreversible or irretrievable commitment of specific resources. “Irreversible” loss of resources describes the loss of future options. It applies predominantly to the effects that result from the use of “nonrenewable resources,” such as minerals or cultural resources, or to resources that are only renewable over very long periods of time (e.g., soil productivity). “Irretrievable” is defined as a loss of production, harvest, or use of natural resources. Examples of irretrievable resources would be the loss of livestock forage or wildlife habitat during the life of the project for EOR facilities. The forage production lost for livestock or wildlife would be irretrievable,

but the action is not irreversible. As the Salt Creek Basin is reclaimed and facilities are removed, it is feasible that forage production would resume in the long term.

Specific to the proposed Phases III/IV Project, the oil removed from the Salt Creek Basin would be an irreversible and irretrievable commitment of a mineral resource that would no longer be available for future production. There would be an irreversible loss of some soil productivity from project construction, development, and operation. Construction of new drill pads and production facilities would result in an irretrievable loss of vegetation resources and wildlife habitat for the duration of the project and up to the successful completion of reclamation. Similarly, the potential loss of annual production in areas from displacement of breeding wildlife (e.g., birds) during the life of the project would be irretrievable, but not irreversible. Loss of unknown archaeological or cultural resources would be irreversible and irretrievable, if present. Loss of livestock forage production would be an irretrievable commitment of resources, but reversible over a period of a few years. Finally, the commitment of energy resources, materials, and manpower to the Proposed Action would be irretrievable.

