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# WARM-WATER INTERIM HATCHERY FACILITY

## **Environmental Assessment**

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Submitted to:

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Division of Wildlife Resources  
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# Reader's Guide

The Utah Reclamation Mitigation and Conservation Commission, in cooperation with the Utah Division of Wildlife Resources, proposes to construct and operate an Interim Fish Hatchery to raise June sucker, a fish native to Utah Lake and its watershed. The Preferred Alternative is to construct the Interim Fish Hatchery at the existing Fisheries Experiment Station in Logan, Utah.

This Environmental Assessment is intended fulfill two purposes: (1) to provide the Utah Reclamation Mitigation and Conservation Commission with sufficient information to make an informed, reasonable decision concerning the proposed Interim Fish Hatchery, and (2) to inform the public of this project so that they may express their opinions to the Utah Reclamation Mitigation and Conservation Commission . To achieve these purposes the following information has been included.

- **Chapter 1** provides background information, describes the underlying need for the project, and the needs that would be achieved with its implementation.
- **Chapter 2**, the heart of this document, describes the alternatives considered and identifies the Agency Preferred Alternative and an Environmentally Preferred Alternative. Chapter 2 also contains a summary of the environmental effects of each alternative.
- **Chapter 3** details the physical, biological, and social resources of the affected environment for each alternative.
- **Chapter 4** describes the anticipated environmental effects of each alternative and identifies measures to address these effects.
- **Chapter 5** describes the coordination and consultation that occurred as part of the Environmental Assessment.
- **Chapter 6** summarizes the public involvement process.

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# CHAPTER 1: PURPOSE AND NEED

## Introduction

The Utah Reclamation Mitigation and Conservation Commission (Commission) is administering the funding and planning for a Warm-water Interim Hatchery Facility (Interim Facility) for the production of stockable June sucker (*Chasmistes liorus*), a Federally endangered species. If approved for implementation, the Utah Division of Wildlife Resources (Division) would operate the Interim Facility. This Environmental Assessment (EA) considers two potential sites for the Interim Facility: the first site is on approximately 2.4 acres of Utah State land managed by the Division at Goshen Warm Springs in the City of Genola, Utah County, Utah (Goshen Warm Springs Alternative); and the second site is on approximately 0.1 acre of Utah State land operated as the Fisheries Experiment Station (FES) in Logan, Utah (FES Alternative).

The Commission, in cooperation with the Division, has prepared this EA to describe the potential environmental impacts of, and mitigation for, the Interim Facility. This EA has been prepared to comply with the National Environmental Policy Act (NEPA) of 1969 (Public Law 91-190, 1970), and the Council on Environmental Quality Regulations for Implementing NEPA (40 Code of Federal Regulations Part 1500 - 1508).

## Project Background

### Location of Goshen Warm Springs Alternative

Goshen Warm Springs is located approximately 2 miles east of Goshen, Utah, partly in the southern portion of the City of Genola, Utah County, and partly within unincorporated Utah County land (Figure 1-1). The springs and adjoining open water areas are located at the base of Warm Springs Mountain. Access to the site of the Goshen Warm Springs Alternative is from the south by an improved gravel-surface road that originates in the town of Goshen, or from the north via U.S. Highway 6 and a hard-surface road that turns into gravel.

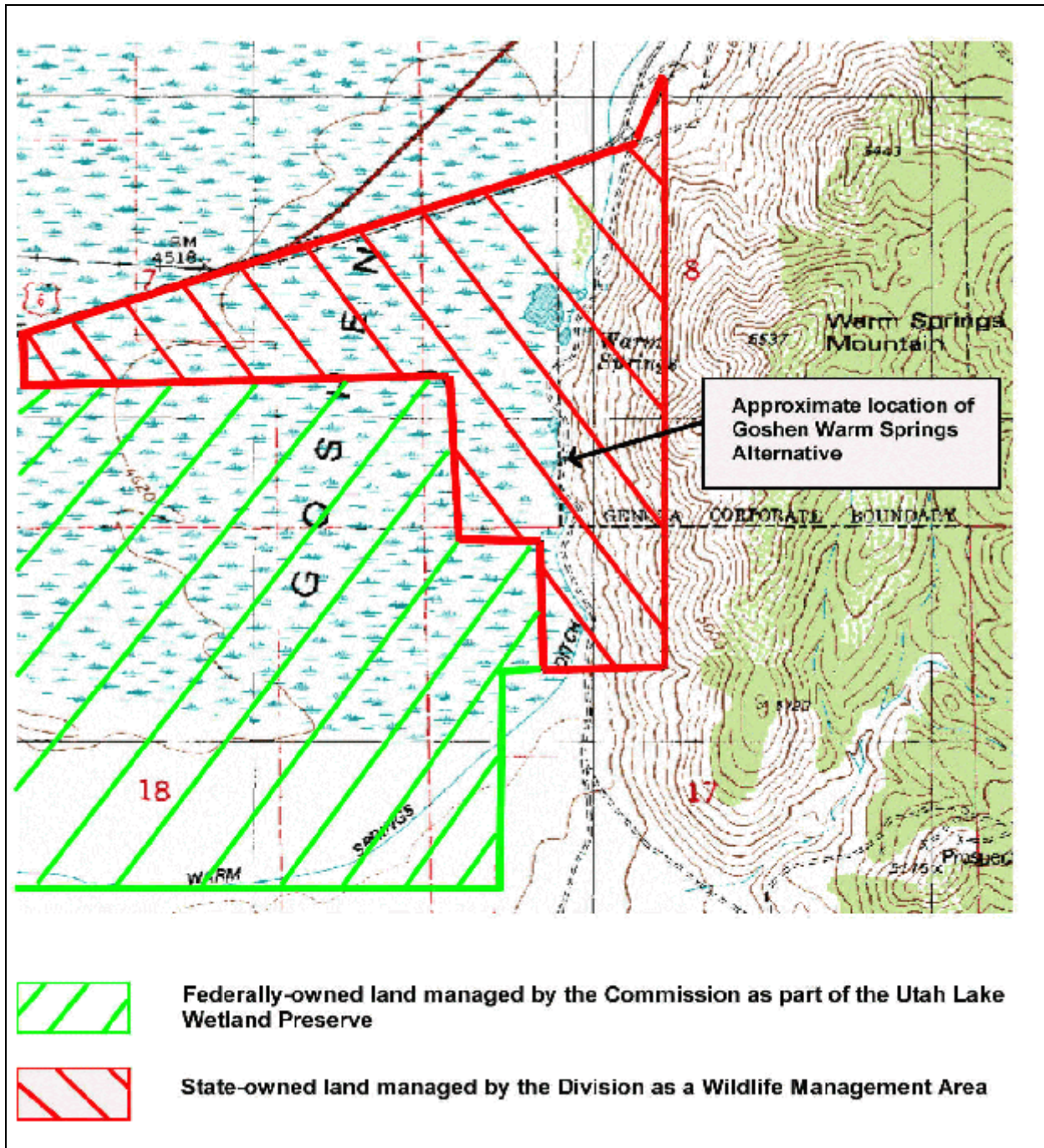
The property at Goshen Warm Springs is owned by the State of Utah and is managed by the Division as the Goshen Warm Springs Wildlife Management Area, an area that extends south of U.S. Highway 6 along the base of Warm Springs Mountain (Figure 1-2). Public access has been restricted to the Goshen Warm Springs Wildlife Management Area since 2000. Lands to the west and southwest of the State-owned land were purchased by the Commission under the Central Utah Project Completion Act (CUPCA) of 1992 and are managed for the protection and enhancement of wetland values as part of the Utah Lake Wetland Preserve (Figure 1-2).





**Figure 1-1. Map of Goshen Warm Springs Area.**





**Figure 1-2. Goshen Warm Springs Alternative Land Ownership Map.**

Goshen Warm Springs flow as two distinct groups of springs and surface waters at the base of Warm Springs Mountain: one group of springs flows north in a maintained canal, the other group flows south in a maintained canal (Figure 1-3). While a significant portion of Goshen Warm Springs water is utilized for agricultural irrigation, the adjacent CUPCA wetland area receives water as well. The north-flowing springs and their associated ponds are in close proximity to the abandoned Tintic Standard Reduction Mill (Tintic Mill) located on the hillslope to the east (Figure 1-3). While these north-flowing waters have abundant algae and aquatic plants, tests have shown elevated levels of heavy metals in the soil and water, possibly a result of stormwater runoff generated from ore reduction disposal. The south-flowing springs and canal are located in a drainage separate from the Tintic Mill site and appear to have fewer water quality issues. The site of the Goshen Warm Springs Alternative would be along this south-flowing canal system (Figure 1-3).

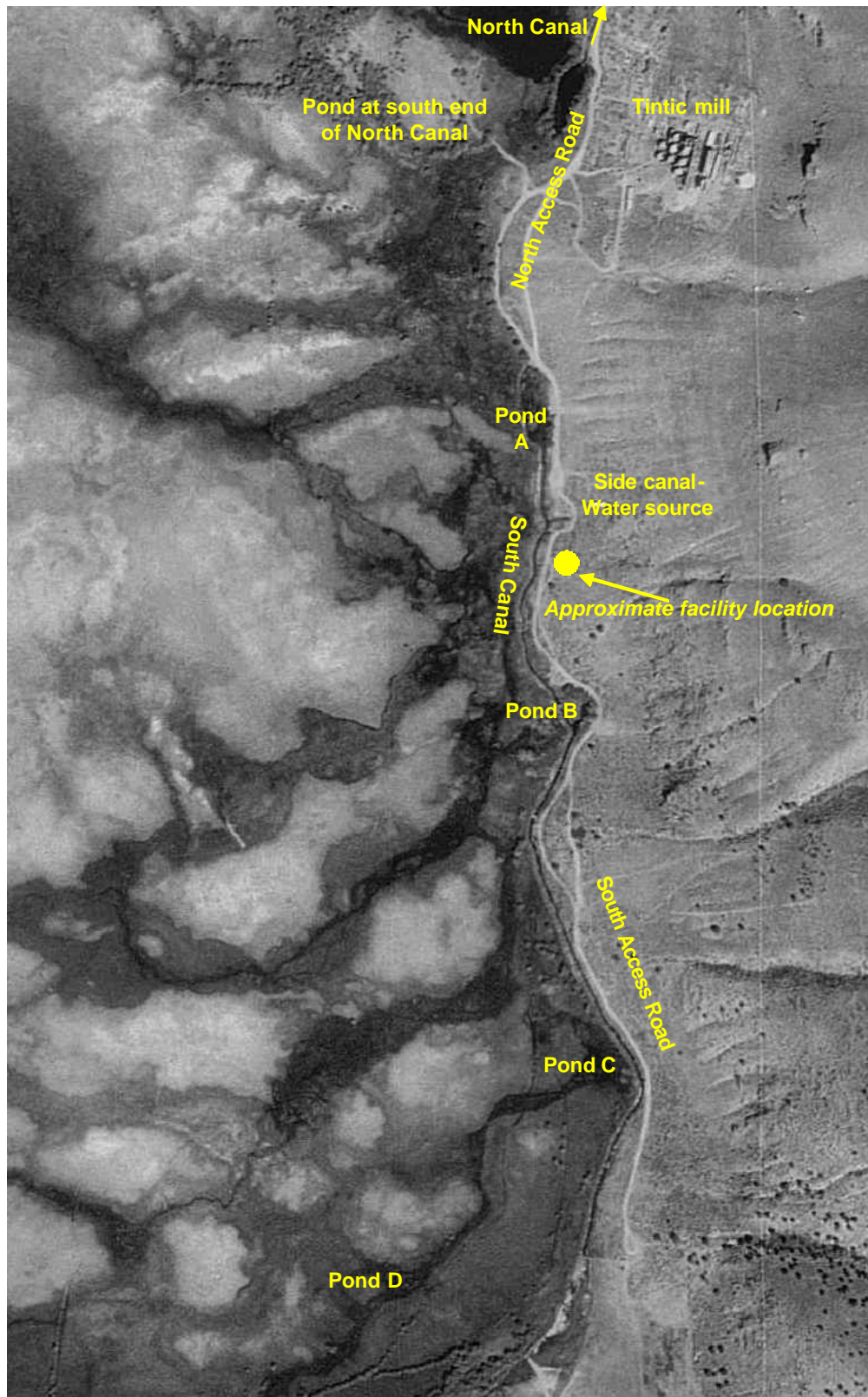
### **Location of FES Alternative**

The FES Alternative is at the Division's existing hatchery facility (existing facility) on the western edge of Logan, Utah, at approximately 1465 West 200 North (Figure 1-4). The existing facility is accessed directly from State Highway 30 (200 North), an east-west highway crossing Cache Valley, and has onsite parking. The Interim Facility would be an addition to an existing building, currently used for June sucker broodstock rearing, in the northeast portion of the property (Figure 1-5). Water would be supplied via the water system serving the existing facility, which is drawn from artesian wells.

The existing facility is on land owned by the State of Utah and managed by the Division. Land immediately bordering the existing facility to the east is commercially developed; to the south is the Logan landfill, and to the north and west are agricultural fields beyond the slough (locally called Swift Slough) that forms the northern and western boundaries of the existing facility (Figure 1-5).

### **Project History**

The U.S. Congress adopted the Colorado River Storage Project Act (CRSP) on April 11, 1956, to help meet the growing water needs of the arid west. The Central Utah Project was one of the major projects authorized under this act. In 1992 Congress adopted the CUPCA, establishing the Commission with a mandate to coordinate and implement mitigation and conservation measures for impacts associated with Federal water development in Utah. Section 313 (c) of CUPCA identified \$22.8 million for fish hatchery rehabilitation and construction to meet warm- and cold-water fish stocking needs in waters affected by the CRSP. Fish hatchery restoration and construction was to improve and increase the culture and production of species for recreational fisheries and for conservation and recovery needs of native aquatic species.



**Figure 1-3. Goshen Warm Springs Alternative Site Detail.**



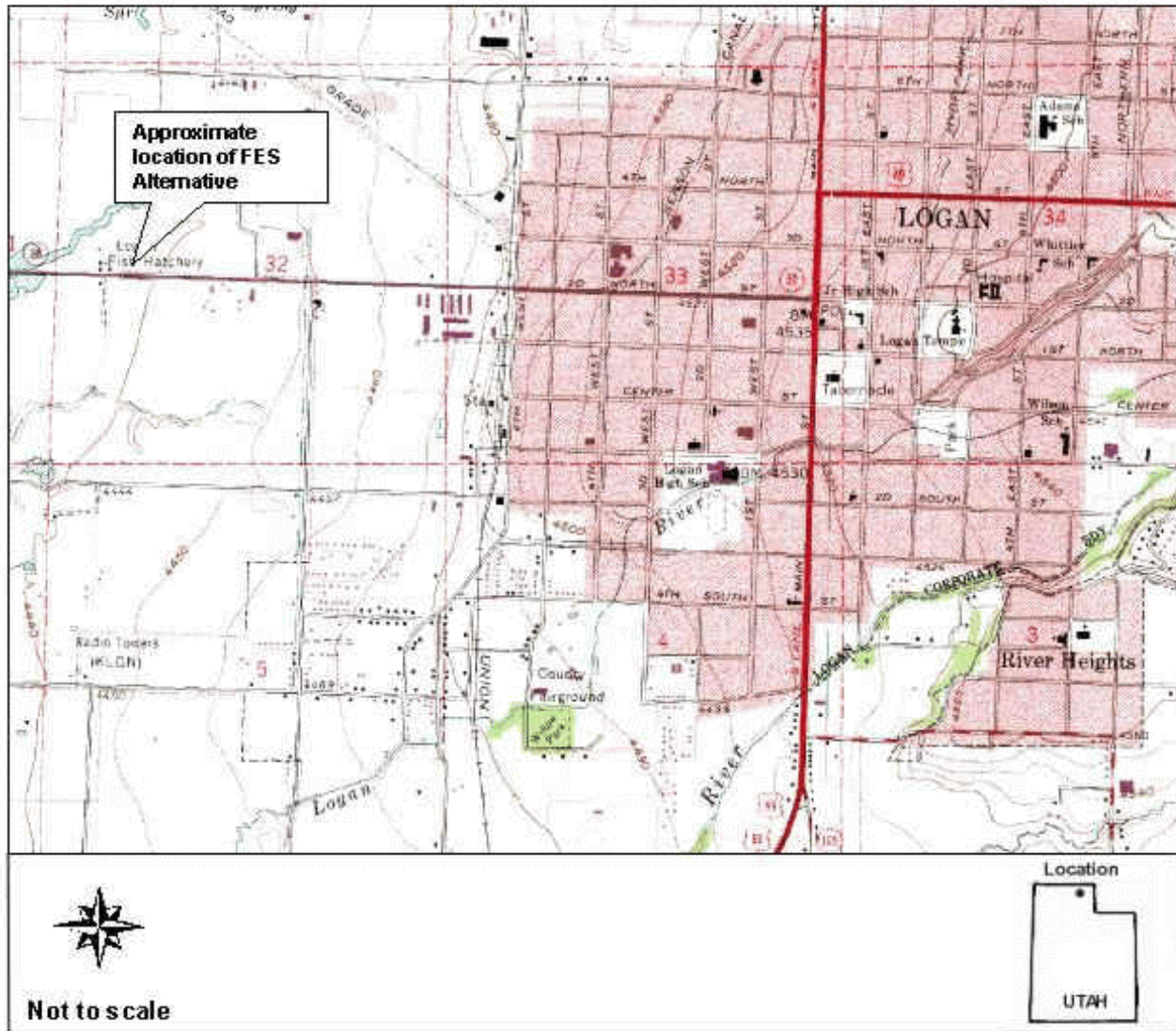
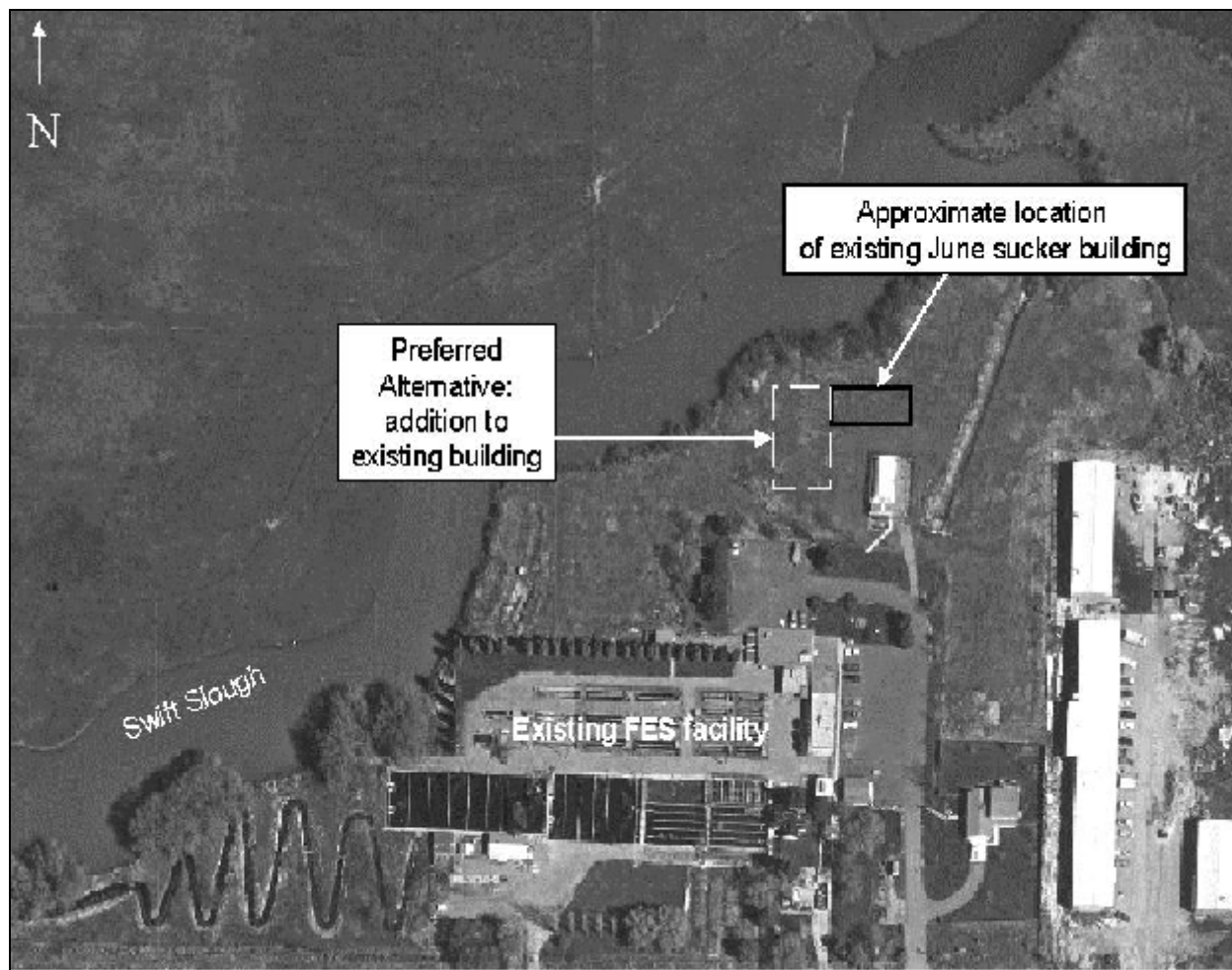


Figure 1-4. Location of the FES Alternative.

In 1995 the Commission, in conjunction with the U.S. Fish and Wildlife Service (USFWS), released a Draft Fish Hatchery Production Plan (Plan) and attendant EA as required under the CUPCA (USFWS and Commission 1998). After consultation with State and Federal agencies, the tribes, and angling organizations, the Plan and EA were revised and re-released in 1998, and the Commission subsequently accepted the revised Plan with a Decision and issued a Finding of No Significant Impact (FONSI). The Plan calls for the construction of two warm-water production facilities to meet the recovery and conservation goals for native aquatic species. One facility would be a warm-water hatchery (Production Facility) to culture June sucker, least chub (*Lotichthys phlegethontis*), leatherside chub (*Gila copei*), roundtail chub (*Gila robusta*), channel catfish (*Ictalurus punctatus*), and two sensitive amphibians: the spotted frog (*Rana luteiventris*) and boreal toad (*Bufo boreas*)



**Figure 1-5. FES Alternative Site.**

*boreas*). The second facility, the Interim Facility, would be a smaller hatchery specific to the culture of June sucker to help meet the recovery needs of this Federally endangered species until the Production Facility is operational, which is expected to take 5 to 8 years. The Interim Facility would have independent utility in the production of June sucker and would not be conditional to the construction of the Production Facility. As outlined by the Plan, both facilities would be managed by the Division.

The Decision and FONSI for the Plan state that the specific construction projects approved in the Decision require separate, site-specific analysis and documentation to further comply with NEPA. The Commission subsequently determined that the Interim Facility would be evaluated in an EA to determine if any significant impacts could occur.

A hatchery siting study completed in 2000 identified Goshen Warm Springs as a feasible location for the Interim Facility (FishPro 2000). Planning for the Interim Facility at Goshen Warm Springs continued through the next 3 years. In early 2003, as part of the scoping process for the Interim Facility, the FES in Logan was identified as an additional feasible location.

## **Purpose and Need for the Proposed Action**

The June sucker, a warm-water fish endemic to Utah Lake that spawns in the Provo River, is one of the native fish species that was targeted for recovery in the CUPCA. The USFWS Federally listed the species as endangered in 1986 with critical habitat. At that time there was an estimated wild population of less than 1,000 individuals, and the June sucker population has continued to decline (USFWS 1999). In 1999 the USFWS adopted a June Sucker Recovery Plan with a stated goal to prevent the extinction of the species and eventually remove the fish from the endangered species list through population and habitat enhancement.

June sucker is a lake sucker endemic and unique to Utah Lake and the lower reaches of the Provo River in Utah County. June sucker populations have been significantly impacted by historical dewatering, tributary stream channelization, general water quality degradation, and nonnative sportfishing species predation (USFWS 1999). The USFWS has given the species a recovery priority of 5C, which denotes a species with a high degree of threat towards extinction, a low recovery potential, and the presence of conflict(s) to such recovery.

According to the June Sucker Recovery Plan, natural recruitment of June sucker is currently insufficient to ensure the long-term survival of the species (USFWS 1999). Consequently, the June Sucker Recovery Plan included hatchery production of June Sucker to increase recruitment until restored Utah Lake June sucker habitat and population provide sufficient recruitment. The 1998 Fish Hatchery Production Plan included long-term (years 2000 to 2025) production levels for June sucker and included an ultimate annual goal of 84,582 pounds of June sucker from the combined Interim and Production Facilities (USFWS and Commission 1998). This goal was derived in part from the needs identified in the June Sucker Recovery Plan for population recovery and conservation (USFWS and Commission 1998 and USFWS 1999).

June sucker production was identified as an immediate need in the 1998 Fish Hatchery Production Plan (USFWS and Commission 1998). In order to offset a further decline in June sucker numbers until the permanent Production Facility could be planned and constructed, the Interim Facility is proposed for immediate construction and operation. It is estimated that the Interim Facility could be put into production approximately 1 year from start of construction, while the Production Facility could take 5 to 8 years to be operational (USFWS and Commission 1998). Consequently, the 1998 Fish Hatchery Production Plan identified the need to develop an Interim Facility to “jump-start” the rearing of June sucker.

June sucker broodstock production, egg incubation, and rearing of fish to a 2-inch size will continue to occur at existing facilities at the FES in Logan, Utah. These fish will then be transferred to the Interim Facility (either at FES or at Goshen Warm Springs) for growout. The capacity of the Interim Facility would be an annual production of approximately 36,000, 8.5-inch stockable June sucker (adequate size to reduce predation concerns), which is equivalent to approximately 10,000 pounds. The Interim Facility is anticipated to be rearing June sucker for approximately 10-15 years according to the 1998 Fish Hatchery Production Plan (USFWS and Commission 1998), although this time span could change along with changes to June sucker stocking needs (e.g., if research indicates a need for more stocking than is currently planned) or practices (e.g., research indicates that fingerling-sized fish may be successfully stocked). The facility may have a useful life beyond the period of time needed as an interim supply of June sucker. However, funding for facility operation and maintenance may not be provided from the Department of the Interior.

## Scoping and Issues

Public scoping for the Interim Facility at Goshen Warm Springs occurred in June 2002 with the distribution of a public newsletter to approximately 200 individuals and all pertinent Federal, State, and local agencies. This newsletter described the Goshen Warm Springs Alternative and requested relevant comments, concerns, and information by July 31, 2002. Four written responses were received, one from a Federal agency and three from the general public. Appendix A contains the newsletter and all comments received.

Numerous multi-agency meetings have occurred in conjunction with planning for the development of a permanent warm-water fish hatchery in the State. While most of these meetings were not specifically focused on the Interim Facility, many of the issues and concerns discussed were applicable to the Interim Facility and thus provided technical scoping information for the Interim Facility by framing and discussing agency concerns.

An additional meeting was held in March 2003 with the Goshen Warm Springs Irrigation Company to describe the Goshen Warm Springs Alternative and solicit any concerns. Specifically, the meeting focused on potential water withdrawals from the south-flowing canal system and potential impacts to downstream water withdrawals.

The scoping process for the Interim Facility led to the identification of the FES as a feasible alternative and inclusion in this EA. Scoping for the FES Alternative occurred in May 2003, with letters describing the FES Alternative sent to local interests and state and Federal agencies describing the project and soliciting comments and concerns. One response was received from a Federal agency (the US Fish and Wildlife Service—see letter dated July 23, 2003 in Appendix B).



## **Issues Raised during the Scoping Process**

As a result of the interagency meetings, the meeting with the Warm Springs Irrigation Company, and the responses to the scoping newsletter, the following relevant issues were raised regarding the Goshen Warm Springs Alternative:

- *water quality impacts*, particularly levels of selenium at Goshen Warm Springs and potential impacts to downstream water quality;
- *site-specific construction impacts* resulting from soil disturbance;
- *water rights protection* for downstream agricultural and other uses;
- *soil contamination* as a result of the proximity to the Tintic Mill site;
- *introduction of native and exotic fish species into the hatchery facility via intake water*; and
- *potential impacts to adjacent wetlands* from dewatering the canal.

Site-specific issues raised for the FES Alternative include the following:

- *potential impacts to Swift Slough and the onsite wetland area, and*
- *potential construction impacts.*

Some issues that were raised have been previously discussed and evaluated. The following issues are not discussed further in this document:

- *Definition of need* (what the Interim Facility is and why it should be built). The 1998 Fish Hatchery Production Plan and EA discussed these issues in detail, resulting in inclusion of the proposed Interim Facility (USFWS and Commission 1998) in order to help meet June sucker conservation and recovery needs. The Interim Facility would be constructed and operational five to eight years before the Production Facility would be on-line. Without the Interim Facility, June sucker production and subsequent stocking in Utah Lake would likely be delayed a period of years. The Record of Decision for the EA incorporated the Interim Facility as an element of the 1998 Fish Hatchery Production Plan.
- *Public use of spring pools at Goshen Warm Springs*. Goshen Warm Springs is currently closed to the public.

## CHAPTER 2: DESCRIPTION OF ALTERNATIVES

Based on the issues and the need for an Interim June Sucker Fish Hatchery Facility (Interim Facility), two Action Alternatives—construction of the Interim Facility at Goshen Warm Springs (Goshen Warm Springs Alternative) and construction of the Interim Facility at the Fisheries Experiment Station (FES) in Logan, Utah (FES Alternative)—and the No Action Alternative are considered in this Environmental Assessment (EA). In addition, five other alternatives were considered and dismissed from detailed study.

### No Action Alternative

The No Action Alternative is included in this environmental analysis to serve as a baseline from which to evaluate the impacts of the alternatives and to meet National Environmental Policy Act requirements. Under this alternative, the Interim Facility would not be constructed. This alternative would not meet the needs of June sucker (*Chasmistes liorus*) recovery as described in the June Sucker Recovery Plan (USFWS 1999) or the hatchery production goals of the 1998 Fish Hatchery Production Plan (USFWS and Commission 1998). Specifically, the No Action Alternative would not meet the immediate needs of establishing successful rearing of June sucker until a larger, multi-species warm-water hatchery (Production Facility) is constructed and operational. A short-term opportunity to enhance June sucker populations would not be available. Since June sucker populations are continuing to decline, the delay of 5 to 8 years or more until the Production Facility is operational would result in a greater chance of the wild June sucker population no longer being viable and enhanced difficulty in restoring the population.

### Goshen Warm Springs Alternative

The Goshen Warm Springs Alternative is to build an Interim Facility at the site of Goshen Warm Springs in the southern part of the City of Genola, Utah County (see Figure 1-1) along the south-flowing canal (Figure 1-3). The Interim Facility would be constructed on approximately 2.4 acres of land owned by the State of Utah and currently managed by the Utah Division of Wildlife Resources (Division) as part of the Goshen Springs Wildlife Management Area. The Interim Facility would consist of a small (approximately 40 foot x 70 foot) metal building on a concrete foundation and slab. The building would house tanks for rearing and holding June sucker. The capacity of the Interim Facility would be to produce an annual maximum of 36,000 stockable June sucker (8.5-inch length), or 10,000 pounds of fish. Electrical service would need to be provided along with an access road into the Interim Facility. Access would be via an improved, gravel-surface, one-lane road, approaching the Interim Facility from either the north or the south, whichever is deemed less impactful and most feasible; access from the south would require an easement across private property. Currently, access is available from both the north and the south via an unimproved

road (Figure 1-3). The Goshen Warm Springs Alternative would improve one of these roads and increase the road width by 10 feet at most. A small gravel parking lot at the building site would provide parking for up to six vehicles.

Water for Interim Facility operations would be pumped via a 4-inch poly-vinyl chloride (PVC) supply line from a small side spring discharge channel that is a tributary to the main south-flowing canal. It is anticipated that the entire 2.7-cubic-feet-per-second (cfs) flow within this tributary would be pumped for Interim Facility operations. Water temperature at Goshen Warm Springs has generally been measured at 70 degrees Fahrenheit (FishPro 2000). As this is a flow-through facility, water would be returned to the main canal approximately 400 feet downstream from the side channel via an 8-inch PVC gravity-feed return line. The facility would siphon solids from fish rearing tanks and allow the solids to decompose in a holding tank that would be pumped out periodically for disposal offsite. Liquid exiting this vault would be combined with the full flow from the Interim Facility. A portion of the diverted water would be allocated to domestic uses (i.e., toilet facilities) in the Interim Facility, which would be treated through the use of a septic system.

Fish would be fed a commercially available feed. Because of the ambient water temperatures in the Goshen Warm Springs system, two full rearing seasons (or about two calendar years) would likely be required to rear June sucker to stocking size (8.5 inches in length), although the design of the facility will be flexible to take advantage of any future changes in June sucker rearing protocol (i.e., to a different stocking size). Measured selenium levels in the water at Goshen Warm Springs have approached concentrations that cause impacts to fish growth. Consequently, bioaccumulation of selenium has been raised as a concern for the feasibility of successfully rearing June sucker at this location.

Two permanent staff would be hired to operate the Interim Facility and care for the fish. Security would also be provided at the Interim Facility, probably by a local security company.

According to the 1998 Fish Hatchery Production Plan (USFWS and Commission), the Interim Facility is anticipated to raise June sucker for approximately 10 to 15 years.

## **FES Alternative**

The FES Alternative is to construct the Interim Facility at the existing fish hatchery (existing facility) in Logan, Utah, on approximately 0.1 acre of State-owned land, a smaller area than the Goshen Warm Springs Alternative since the existing parking and driveway would be utilized. The FES is managed by the Division and is currently rearing June sucker for use as broodstock. The facility would be an approximately 4,200 square-foot addition to an existing building, allowing space for fish tanks as well as the equipment necessary for water recirculation and heating, and would have an annual production capacity of 36,000 stockable June sucker at 8.5 inches in length. Its design would be different from the Goshen Warm Springs

Alternative, however, because of lower water temperatures in the FES water supply; water would be recirculated and heated to approximately 75 degrees Fahrenheit to maximize June sucker growth. Water at this temperature could allow June sucker to be reared to the desired stocking size in one full rearing season (about one calendar year), although the design of the facility will be flexible to take advantage of any future changes in June sucker rearing protocol (i.e., to a different stocking size). The building addition would be located to avoid an area with wetland vegetation currently onsite.

Water for the Interim Facility would be supplied via a separate system from the rest of the existing facility. The existing facility draws water from artesian wells and discharges into Swift Slough immediately to the north (Figure 1-4). The FES Alternative would not include the withdrawal of any additional well water but would utilize a recirculating water system. This recirculation system and improvements in the efficiency of the trout raceways at the existing facility would enable additional fish to be reared without additional water withdrawals. Since the facility would be a recirculating system, discharging only 5 to 10 percent of water daily, discharge from the Interim Facility (from fish production and domestic facilities in the building) would be into a septic tank/leachfield system rather than into Swift Slough. Water quality at the FES has proven sufficient for rearing several fish species, including June sucker; there are no known constituents in the water supply that raise concern for bioaccumulation or pose potential fish-rearing feasibility issues.

Existing FES access and parking would be utilized for the Interim Facility with no improvements required. Consequently, the total area included in the FES Alternative is 0.1 acre, compared with the 2.4 acres, which includes road improvements and a new parking area, for the Goshen Warm Springs Alternative.

Two staff members would be hired to operate the Interim Facility and care for fish. Additional security would not have to be provided because of existing coverage at the FES. Because of the existing infrastructure (parking, utilities, etc.) at the FES, it is likely that the FES Alternative would be less expensive to construct than the Goshen Warm Springs Alternative.

According to the 1998 Fish Hatchery Production Plan (USFWS and Commission), the Interim Facility is anticipated to raise June sucker for approximately 10 to 15 years.

## **Alternatives Considered but Eliminated from Analysis**

### **Development of Alternative Location**

The specific requirements for the Interim Facility were outlined in the warm-water hatchery siting study (FishPro 2000). This study evaluated five other warm-water spring sites in Utah for their feasibility to successfully rear warm-water fish. The FishPro study identified Goshen Warm Springs in Utah County and Gandy Warm Springs in eastern Millard County as the two sites feasible for the Interim Facility. The other

sites were eliminated because of unacceptable water quality, unavailable water supply, and/or impracticable water pumping requirements. Thus, these other sites were eliminated from further analysis in this EA.

### **Gandy Warm Springs as the Interim Facility Location**

Gandy Warm Springs' remote location on the Utah-Nevada border, approximately 200 miles southwest of Utah Lake, presented severe logistical constraints, especially because the Interim Facility is not proposed to include employee housing. The closest services to Gandy Warm Springs are in Ely, Nevada (approximately 87 miles from Gandy Warm Springs) and Delta, Utah (approximately 124 miles from Gandy Warm Springs), and employees and suppliers would have considerable distances to travel. Based on these concerns, Gandy Warm Springs was not included for further study in this EA.

### **Use of Existing Hatcheries**

Existing hatcheries in Utah are either devoted to cold-water species and thus not suitable for June sucker production (e.g., the Kamas hatchery) and/or are already at capacity, as discussed in the EA for the 1998 Fish Hatchery Production Plan (USFWS and Commission 1998). The 1998 Fish Hatchery Production Plan and EA detailed the need for the construction of the new Interim Facility (USFWS and Commission 1998). Based on this previous analysis, the use of existing hatcheries for the Interim Facility was not included for further study in this EA.

### **Use of Utah Lake**

Culturing June sucker in cages in Utah Lake has been conducted on a very limited scale for research (rather than stocking) purposes. Research studies focused on rearing hundreds of fish at a time (far fewer fish than proposed for the Interim Facility) during summer months when water temperatures in Utah Lake are optimum for fish growth (M. Belk 2003, pers. comm.). Lower water temperatures in the winter would reduce fish growth, such that a minimum of two rearing seasons, or two summer seasons, would likely be necessary to achieve the desired stocking length (8.5 inches), compared with the FES facility's capability to grow fish to 8.5 inches in one calendar year. Although scheduled for study in 2004, the feasibility of stocking June sucker less than 8.5 inches in length is unknown and predation on smaller-sized fish in Utah Lake is a concern. During winter months, low water temperatures in Utah Lake likely would negatively impact June sucker growth and survival. Additionally, winter ice build-up on fish-rearing structures would be a difficult maintenance issue. Maintaining cages in Utah Lake also would also be negatively affected due to wave action impacts. The shallow depths of Utah Lake and the potential for rearing structures to pose a navigational hazard also present logistical problems.

For these reasons, there is no evidence that cage culturing to produce the number of desired fish on the scale anticipated for the Interim Facility would be successful in Utah Lake. Given the uncertainty of the success of this strategy, use of cage culture in Utah Lake was not included for further study in this EA.

## **Use of Delta Power Generation Facility**

The cooling water at the Intermountain Power Services Corporation generation facility (power facility) near Delta, Utah, was examined as a potential alternative to the Goshen Warm Springs site. However, water quality concerns resulting from the existing chlorination system used at the power facility and the potential for conflicts with the power facility operation rendered this alternative infeasible (J. Valentine 2003, pers. comm.), and it was not considered further.

## **Agency-Preferred Alternative**

*The Agency-Preferred Alternative is the FES Alternative.* Both the Goshen Warm Springs Alternative and the FES Alternative potentially would produce June sucker for stocking purposes. However, the FES Alternative does not pose the concern with selenium in the water supply and potential risks to reared June sucker that Goshen Warm Springs does. The higher water temperature associated with the FES Alternative would also optimize June sucker growth (potentially allowing grow-out to desired stocking size after one full rearing season—approximately one calendar year— compared to two rearing seasons or approximately 1.5 years for the Goshen Warm Springs Alternative) and increase rearing success. Because of the shorter rearing time associated with the FES Alternative, fish production could be as much as twice that of the Goshen Warm Springs Alternative. Additionally, the FES is an established facility with existing infrastructure, site security, and onsite expertise in raising fish.

## **Environmentally Preferred Alternative**

*The Environmentally Preferred Alternative is the FES Alternative.* As described in Chapter 4 and summarized below in Table 2-1, the FES Alternative has less overall associated environmental impacts than the Goshen Warm Springs Alternative. Primarily, the FES Alternative would be sited on Utah State lands currently developed for aquaculture operations. The FES Alternative would require less land conversion and development, would result in no surface water quality impacts, and would result in no direct wetland impacts.

## **Summary of Impact Comparison**

Table 2-1 provides a summary comparison of impacts for the No Action Alternative and each of the Action Alternatives under each resource topic: geology, soils, water resources, wetlands and vegetation, fisheries and aquatic resources, wildlife, cultural resources, land use, socioeconomics, visual resources, and hazardous materials.

**Table 2-1. Comparison of Impacts Related to the No Action and Action Alternatives.**

NO ACTION ALTERNATIVE	GOSHEN WARM SPRINGS ALTERNATIVE	FES ALTERNATIVE
<b>Geology</b>		
None – no change from existing conditions.	Negligible adverse effect caused by alteration of geomorphology from road cuts.	No impact anticipated.
<b>Soils</b>		
None – no change from existing conditions.	Disturbance of 2.4 acres of soils if road enters from the south (2.2 acres if from the north). Minimal adverse effect on soil resources. No impacts to prime or unique farmlands since there are none on site.	Disturbance of 0.1 acre of soils. Negligible adverse impact on soil resources. No impacts to prime or unique farmlands since there are none on site.
<b>Water Resources: Floodplains, Groundwater, Surface Water</b>		
None – no change from existing conditions.	Negligible adverse impact to groundwater if a septic tank is installed. Possible minimal adverse impacts to water quality from decreases in dissolved oxygen levels and nutrient concentration increases. Moderate adverse impact to an approximately 400-foot section of canal that will have reduced flows.	Negligible adverse impact to groundwater due to septic system. No impacts to Swift Slough are anticipated.
<b>Wetlands and Vegetation</b>		
None – no change from existing conditions.	Direct impact to up to 15 square yards of wetlands from pipe and pump installation. Potential, minor, mitigable impacts include introduction of sediment through erosion and habitat disturbance. Negligible adverse impact to vegetation community from introduction of noxious weeds.	No direct impact anticipated; Interim Facility would be sited to avoid existing wetland and riparian areas. Potential, negligible, mitigable impacts include introduction of sediment through erosion. Negligible adverse impact to vegetation community from introduction of noxious weeds.

**Table 2-1. Comparison of Impacts Related to the No Action and Action Alternatives**

NO ACTION ALTERNATIVE	GOSHEN WARM SPRINGS ALTERNATIVE	FES ALTERNATIVE
<b>Fisheries and Aquatic Resources</b>		
None – no change from existing conditions. No benefits would occur to June sucker population, since no hatchery would be constructed.	Significant positive benefit to June sucker population. Minimal negative effect on existing aquatic community from risk of spreading nonnative organisms and pathogens.	Significant positive benefit to June sucker population. Negligible negative impact on existing aquatic community from risk of spreading nonnative organisms and pathogens.
<b>Wildlife</b>		
None – no change from existing conditions.	Negligible adverse impact to raptors. Negligible adverse impacts to displaced wildlife.	Negligible adverse impact to raptors. Negligible adverse impacts to displaced wildlife.
<b>Cultural Resources</b>		
None – no change from existing conditions.	No impacts to cultural resources anticipated. Negligible adverse impacts to potential paleontological resources.	No impacts to cultural resources anticipated. Negligible adverse impacts to potential paleontological resources.
<b>Land Use</b>		
None – no change from existing conditions.	No impacts to land use anticipated.	No impacts to land use anticipated.
<b>Socioeconomics</b>		
None – no change from existing conditions.	Minimal beneficial impact to regional retailers. Negligible beneficial impact to regional employment. No recreation impacts since the Goshen Warm Springs Project Area is not currently nor will be managed for recreation in the foreseeable future.	Minimal beneficial impact to regional retailers. Negligible beneficial impact to regional employment. No recreation impacts since the FES Project Area is not currently nor will be managed for recreation in the foreseeable future.



NO ACTION ALTERNATIVE	GOSHEN WARM SPRINGS ALTERNATIVE	FES ALTERNATIVE
<b>Visual Resources</b>		
None – no change from existing conditions.	Minimal adverse impact resulting from Interim Facility. Negligible adverse impact during construction.	Negligible adverse impact resulting from Interim Facility. Negligible adverse impact during construction.
<b>Hazardous Materials</b>		
None – no change from existing conditions.	Negligible adverse impact from use of hazardous materials associated with Interim Facility.	Negligible adverse impact from use of hazardous materials associated with Interim Facility.

## CHAPTER 3: AFFECTED ENVIRONMENT

This chapter describes the existing environment that potentially would be affected by the construction and operation of the Interim Hatchery (Interim Facility) at Goshen Warm Springs in Utah County, Utah (Goshen Warm Springs Alternative) or at the Fisheries Experiment Station (FES Alternative) in Logan, Utah. The resource information presented here is of sufficient detail to support and clarify the impact analyses provided in Chapter 4. The resources discussed in this chapter were identified by the public and various agencies that have an interest in the Goshen Warm Springs and FES sites, as well as the interdisciplinary resource evaluation team assembled for this Interim Facility Project (Project). Resource conditions were determined by the following: onsite assessments; contacts and coordination with local, State, and Federal agencies and personnel; and available technical reports.

### Geology and Minerals

#### Geologic Resources

##### ***Goshen Warm Springs Alternative***

The Goshen Warm Springs Project Area is located along the western edge of Warm Springs Mountain, near the boundary of the Great Basin Province with the Southern Wasatch Mountains (Sirrinc 1953).

Goshen Valley is considered a graben from the Basin and Range type of block faulting. The Goshen Fault is a normal fault on the west side of Warm Springs Mountain that transects the Goshen Warm Springs Project Area. The abrupt change in mountain structure and topography, and the fault line scarp on the west side of Warm Springs Mountain, are evidence of the Goshen Fault. Goshen Warm Springs, located at the base of the mountain, are attributed to and suggest the presence of this fault (Sirrinc 1953). The Warm Springs Mountain structure indicates strong folding and faulting (Howes 2002). Warm Springs Mountain is a part of the east limb of the Long Ridge anticline that plunges south (Sirrinc 1953).

No soil or rock engineering problems occur within the Goshen Warm Springs Project Area (Mulvey 1992). Steep slopes east of the Goshen Warm Springs Project Area pose a slight risk for rock falls or debris flows. However, no evidence of either of these processes was observed during a site visit in September 2002.

##### ***FES Alternative***

The FES is located near the center of Cache Valley in the northeastern corner of the Basin and Range Province. The valley's eastern edge is bounded by the East Cache fault zone, and the western margin is bounded by the West Cache fault zone (McCalpin 1989); both faults are active (McCalpin 1989, Evans

and Oaks 1996). The FES Alternative Project Area (FES Project Area) is located approximately 4 miles from the East Cache fault zone and approximately 6 miles from the West Cache fault zone.

No soil or rock types that cause engineering problems occur within or near the FES Project Area (Mulvey 1992). The FES Project Area also has a low potential for liquefaction during an earthquake (Anderson et al. 1994).

## **Mineral Resources**

### ***Goshen Warm Springs Alternative***

Locatable mineral resources do not occur within the Goshen Warm Springs Project Area (Shubat et al. 1991). Serrine (1953) states that no mineralization of importance was noted in the vicinity of or within the Goshen Warm Springs Project Area.

The Energy Resources Map of Utah (Gurgel 1983) and the Oil-Impregnated Rock Deposits of Utah Maps (Ritzma 1979) indicate that geothermal resources exist within the Goshen Warm Springs Project Area, as evidenced by Goshen Warm Springs, while oil resources do not exist at this location.

The map of Non-Metallic Mineral Resources of Utah (Doelling 1983) shows that Warm Springs Mountain is a favorable area for limestone, dolomite, calcite, oolite, and cement rock resources.

Past production of saleable mineral resources has occurred in the Goshen Warm Springs Project Area vicinity. The Jensen-Chaffin Quarry, located on the north end of Warm Springs Mountain, operated from 1936 to 1946 (Serrine 1953) and quarried limestone and dolomite for the steel furnaces at Ironton and Geneva. A small prospect with limonite mineralization was observed on the hill east of the proposed Interim Facility site.

The Tintic Standard Reduction Mill (Tintic Mill) operated on the west face of Warm Springs Mountain from 1920 to 1925. The Tintic Mill did not produce ore, but it processed copper, gold, silver, and lead ore received from a mill near Eureka, Utah (Howes 2002).

### ***FES Alternative***

Locatable mineral resources do not occur within the FES Project Area (Shubat et al. 1991), and there is insufficient acreage for the development of saleable mineral resources.

The Energy Resources Map of Utah (Gurgel 1983) indicates that the FES Project Area is favorable for the discovery and development of low-temperature geothermal water but not for any other energy sources. The Oil-Impregnated Rock Deposits of Utah Maps (Ritzma 1979) indicates that oil resources do not exist within the FES Project Area.

The map of Non-Metallic Mineral Resources of Utah (Doelling 1983) shows that the FES Project Area does not contain non-metallic mineral resources.

## Soils

### Goshen Warm Springs Alternative

The Goshen Warm Springs Project Area is comprised of silt loam, cobbly loam, and consolidated rock (USDA 1984), with silt loam predominating in the valley bottom at the base of Warm Springs Mountain. The silt loam soils in the region are used mainly for range, wildlife habitat, and meadow hay. The cobbly loam and consolidated rock are also used as rangeland and wildlife habitat, although they are very poorly suited for rangeland seeding. This land is not suitable for use as pasture or cultivated crops because of the presence of steep slopes and active erosion. Soils in the Goshen Warm Springs Project Area are generally not susceptible to wind erosion. The cobbly loam soil is, however, prone to water erosion. Slope and vegetative cover determine the amount of erosion, rather than soil type. The names and characteristics of the various soil types found within the Goshen Warm Springs Project Area are summarized in Table 3-1.

**Table 3-1. Soil Types within the Goshen Warm Springs Project Area.**

SOIL SERIES (MAP SYMBOL)	SLOPE PERCENT	DEPTH TO BEDROCK IN INCHES	SHRINK-SWELL POTENTIAL	EROSION POTENTIAL (WATER)	LIMITATIONS	
					BUILDING SITE DEVELOPMENT <sup>a</sup>	SEPTIC <sup>b</sup>
Amtoft-Rock Outcrop Complex (AcF)	30-70	10-20	Low	High	Severe	Severe
Roshe Springs Silt Loam (Rr)	0-1	>60	Low	Low	Severe	Severe

Source: USDA (1984).

<sup>a</sup> Shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets.

<sup>b</sup> Septic tank absorption fields.

The Goshen Warm Springs Project Area soils are rated in Table 3-1 according to limitations affecting their suitability for building site and septic development. Building site development refers to the degree of soil limitations affecting shallow excavations, dwellings with and without basements, small commercial buildings, and local roads and streets. The degree of soil limitations that affect the construction of septic tank absorption fields is based on soil permeability, depth to seasonal high water table, depth to bedrock, and the area's susceptibility to flooding. The degree of soil limitations is expressed as slight, moderate, or severe. A slight rating means that the soil properties are generally favorable and that the limitations are

minor and easily overcome. A moderate rating means that the limitations can be overcome or alleviated by planning, design, or special maintenance. A severe rating means that soil properties are unfavorable and that the limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or a combination of these measures (USDA 1984).

Goshen Warm Springs Project Area soils are intermediate or occur between the two dominant soil types, downslope of the Amtoft-Rock outcrop complex in an area of eroded material from the hill above and above the Roshe-Springs silt loam that characterizes the wetland area. Consequently, the soils at the proposed Interim Facility location are likely more suitable for the proposed structure and a septic system than the soils map alone indicates.

### **FES Alternative**

The soil in the FES Project Area is comprised of silty clay (USDA 1974a). The silty clay soils in the Cache Valley region are used mainly for irrigated crops and native pasture, and are generally not susceptible to wind or water erosion. The name and characteristics of the silty clay soil type found within the FES Project Area are summarized in Table 3-2.

**Table 3-2. Soil Types within the FES Project Area.**

SOIL SERIES (MAP SYMBOL)	SLOPE PERCENT	DEPTH TO BEDROCK IN INCHES	SHRINK-SWELL POTENTIAL	EROSION POTENTIAL (WATER)	LIMITATIONS	
					BUILDING SITE DEVELOPMENT <sup>a</sup>	SEPTIC <sup>b</sup>
Cardon silty clay (Cd)	0-3	>60	High	Slight	Severe	Severe

Source: USDA (1974a).

<sup>a</sup> Shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets.

<sup>b</sup> Septic tank absorption fields.

The FES Project Area soil is rated in Table 3-2 according to limitations affecting its suitability for building site and septic development. Terms used in Table 3-2 are defined in the soils discussion for the Goshen Warm Springs Alternative above.

## **Groundwater**

### **Goshen Warm Springs Alternative**

The main groundwater system in Goshen Valley to the west of the Goshen Warm Springs Project Area is perched in unconsolidated basin-fill deposits that are thousands of feet thick and consist of inter-bedded

lenticular deposits of gravel, sand, silt, and clay. The lenses of alternating layers of clay, silt, sand, and gravel are divided into four separate aquifers. The aquifers, listed in descending order, are the Pleistocene age Lake Bonneville Group, a shallow artesian aquifer of Pleistocene age, a Pleistocene age deep artesian aquifer, and an artesian aquifer of Tertiary age (Brooks and Stolp 1995). Goshen Warm Springs are the result of the Goshen Fault intercepting the Lake Bonneville Group aquifer (Brooks and Stolp 1995), which allows water to surface through a gravel zone (Howes 2002). The Goshen Warm Springs probably result from circulation of meteoric water along the Goshen Fault. When water enters the fractured fault zone, it percolates to depth and is warmed by increasing temperatures. The thermal springs may also result from an intrusive body located beneath the area (Howes 2002).

The consolidated rock that surrounds the valley contains water, but few wells have been drilled. The permeability of the consolidated rock is unknown (Brooks and Stolp 1995).

Apparently no subsurface water rights exist within the Goshen Warm Springs Project Area (DWR 2002). However, there are several irrigation, stock-watering, and domestic use wells in the immediately surrounding areas.

According to Hecker et al. (1988), the valley bottom portion of the Goshen Warm Springs Project Area has a depth to groundwater of generally less than 10 feet below the surface.

### **FES Alternative**

The groundwater in Cache Valley is found in both confined and unconfined conditions. The shallow, unconfined aquifer is composed of Quaternary alluvium and has an average thickness of 50 feet (Robinson 1999). According to Hecker et al. (1988), the depth to groundwater in the shallow, unconfined aquifer in the FES Project Area is generally less than 10 feet below the surface.

An upper confined aquifer, averaging 30 feet thick and consisting of gravels to cobbles interbedded with sand and silt, is located between two confining layers that extend across Cache Valley. A second confined aquifer is found below this surficial aquifer layer at depths of approximately 100 feet. This aquifer is the most productive in Cache Valley (Robinson 1999) and is composed of unconsolidated to semi-consolidated thickly bedded gravels and sands with discontinuous lenses of silt, clay, and marl.

Sixteen water wells are present within the FES property and draw water at depths of 100 to 195 feet below grade (D. Routledge 2003a, pers. comm. and DWR 2003). There are also several irrigation, stock-watering, and domestic use wells in the areas surrounding the FES Project Area (DWR 2003). The FES has an existing domestic septic system.

## Surface Water

### Goshen Warm Springs Alternative

#### ***Water Quantity***

The Utah Reclamation Mitigation and Conservation Commission (Commission) owns 3.5 shares of Goshen Warm Springs Irrigation and Power Company water. The share is 6.9 acre-feet every 18 days and 8 hours from April through October for irrigation use. Other water users own irrigation water rights downstream from the existing diversion structure on the South Canal, which is downstream from the site of the Goshen Warm Springs Alternative (E. Larson 2002a, pers. comm.).

Few data are available to estimate the actual volume of water from Goshen Warm Springs. The following sources estimate potential flow in the South Canal (FishPro 2000):

- 2,800 to 5,300 gallons per minute (gpm) (6.24 to 11.8 cubic feet per second [cfs]) (Goode 1978);
- 5,307 to 6,686 gpm (11.8 to 15.37 cfs) (Division 1998); and
- 5,000 gpm (11.5 cfs) (FishPro 2000).

The FishPro (2000) study notes that 5,000 gpm (11.5 cfs) is a good approximation of flow in the south-flowing main canal based on the above estimates. While the spring at the canal's north end is a primary water source, other smaller seeps, side channels, and groundwater inputs add to the canal as it flows southward. In the side spring discharge channel proposed to supply water for the Interim Facility, the Utah Division of Wildlife Resources (Division) data indicated a flow of about 2.7 cfs; the flow measurement downstream of this point in the main canal was about 4.5 cfs (Division 2002a). The South Canal is a gaining reach as indicated by increasing flows measured progressively southward and downstream (Division 2002a) (see Table 3-3).

The flow of water in the diversion channel would be sufficient to rear the amount of fish proposed for the Interim Facility, since water would be treated with supplemental oxygen.

#### ***Water Quality***

The State of Utah has no beneficial use specifically designated for Goshen Warm Springs or its associated discharge canals. Therefore, the South and North Canals in the Goshen Warm Springs system (Figure 1-3) are given the beneficial use designation 2B, 3D. Most water bodies are also classified as 4 in addition to higher designations.

**Table 3-3. Surface Water Discharge at Specific Locations along the South Canal of Goshen Warm Springs<sup>a</sup>.**

LOCATION	DISCHARGE ESTIMATE	COMMENTS
Goshen Warm Springs Canal Immediately downstream of Pond A in South-flowing System	1.45 cfs <sup>b</sup>	Seems low when comparing difference between discharge in side canal and downstream points. Canal had thick growth of submerged macrophytes.
Side Canal downstream of Pond A	2.7 cfs	This is the next downstream observable spring flow source and proposed intake point.
Canal between Ponds A and B	4.5 cfs	Distance is 186 feet downstream of side canal measurement point. Difference between this discharge and the side canal is 1.8 cfs. Compare with measured value of 1.45 cfs immediately downstream of Pond A.
Pond B Inflow	None taken	Inflow point on pond 298 feet downstream from discharge measurement on canal between both ponds.
Pond B Outflow	None taken	Outflow point is 239 feet south of inflow point, measured along east bank.
Wooden Bridge Site Downstream of Pond B	8.4 cfs	This is the site used for previous discharge measurements by the Division and Commission. This site is 264 feet downstream of Pond B outflow.

Source: Division (2002a).

<sup>a</sup> See Figure 1-3 for Locations.

<sup>b</sup> Cubic feet per second.

The pertinent class designations are described below:

- Class 2B – Protected for secondary contact recreation such as boating, wading, or similar uses.
- Class 3D – Protected for waterfowl, shore birds, and other water-oriented wildlife not included [in other classifications], including the necessary aquatic organisms in their food chain.
- Class 4 – Agriculture.

There are no point sources discharging directly into either the South or North Canal. These water bodies are not identified as failing to meet water quality standards and are not listed on the Utah 303(d) list of water-quality impaired waters (UDEQ 2002).

Non-point sources in the area may be contributing nutrients and sediment to both the north and south ponds and canals. The area has been used for grazing and the ponds accessed for recreational use. Both of these activities may contribute nutrients and pathogens. Excess nutrients may cause eutrophic conditions in the canals and ponds. Algae and macrophytes were abundant during a September 2002 site investigation.



The unpaved road adjacent to the east side of the canals may be a source of sediment either from airborne dust particles or suspended sediment generated during stormwater runoff.

Water quality data from the Goshen Springs system are limited, as the springs are not monitored on a regular basis. However, sampling in the South Canal was performed as part of the preliminary analysis in the warm-water hatchery siting study (FishPro 2000). Sampled water quality parameters included nitrogen and phosphorus nutrients, temperature, and dissolved oxygen (DO). Nutrient levels in the samples did not exceed Utah State water quality standards. However, the South Canal is poorly shaded, shallow, and slow moving, which typically allows greater algal growth and nutrient uptake. This aspect of the existing canal, as well as its groundwater source, likely contribute to relatively low, natural DO levels in the South Canal system. FishPro (2000) noted that the lowest DO level obtained from the South Canal system was in Pond B, south of the site of the Goshen Warm Springs Alternative, at 3.1 milligrams per liter (mg/L). For a Class 3D waterbody, the State standard for DO is 3.0 mg/L for a one day average and 5.0 mg/L for a 30-day average (UDEQ 1999).

The Tintic Mill site on the western slope of Warm Spring Mountain may contribute metals to the Goshen Warm Springs system canals and ponds. Metal analyses were performed on surface water samples taken from Pond A (Figure 1-3), south of the Tintic Mill site, as well as from the spring discharge channel that would be the water source for the Goshen Warm Springs Alternative (Howes 2002). These samples showed that only aluminum and mercury were elevated to levels that could potentially exceed Utah State water quality standards for a Class 3D waterbody. More recently, the Division conducted metal analyses on two samples taken at the bridge near the south boundary of the Utah State property as well as one sample taken at the proposed intake point on the side channel. These analyses show that aluminum and silver may be possible issues because the levels were very close to or slightly exceeded Utah State standards for a Class 3D stream. Mercury results were inconclusive because of relatively high detection limits which were higher than the Utah Standard for a Class 3D stream.

Data from several other sources (see Table 3-4) also indicate that selenium levels are close to or exceed the State's selenium standard of 5 micrograms per liter ( $\mu\text{g/L}$ ) for class 3D and 4 waters (UDEQ 1999), as well as the maximum allowable rearing levels for fish (FishPro 2000).

## **FES Alternative**

### ***Water Quantity***

The FES acquires water from 16 artesian wells at a total flow of approximately 4.5 cfs (D. Routledge 2003a, pers. comm.) and a water temperature ranges from 54- 65 F. The FES holds non-consumptive water rights for 9.06 cfs flow from these wells (D. Routledge 2003a, pers. comm.).

Swift Slough to the north and west of the FES is not utilized as water supply for the FES, but the existing hatchery facilities discharge into this water body under the terms of an existing discharge permit.

**Table 3-4. Selenium Concentrations<sup>a</sup> at Goshen Warm Springs.**

DATE(S)	SELENIUM CONCENTRATION (MICROGRAMS PER LITER)	SAMPLE SITE	DATA SOURCE
07-18-96	3.9	Log Bridge Crossing downstream of Side Channels	FishPro (2000)
4-99 and 11-99	6.6 and 7.0	Spring	FishPro (2000)
4-99 and 11-99	7.2 and 19 <sup>b</sup>	Canal	FishPro (2000)
04-27-99	6	Log Bridge Crossing downstream of Side Channels	FishPro (2000)
5-2-00	4.5	Unknown	Division (2001)
8-1-00	4.7	Unknown	Division (2001)
1-31-01	3.7	Unknown	Division (2001)
12-02	4.1 and 4.4	Log Bridge Crossing downstream of Side Channels	Division (2002a)
12-02	4.9	Side Channel at Proposed Intake Point	Division (2002a)

<sup>a</sup> State selenium standard concentration is 5 µg/L (UDEQ 1999).

<sup>b</sup> Probable analysis anomaly.

### **Water Quality**

Swift Slough is the slough immediately to the north and west of the FES and receives effluent from existing facility operations. The slough is a spring- and groundwater-fed stream that also carries irrigation return flow and base flow. Swift Slough has a flat gradient and forks just to the west of the FES into a southern branch and a main stem or northern branch. The northern branch receives water from the Logan City effluent treatment lagoons west of the FES before joining the Logan River further west (W. Cardon 2003, pers. comm.). The southern branch also flows west, eventually joining the Logan River at a more southern confluence point, and receives no water from the effluent lagoons.

The slough is a slow-moving body of water. Flow has been measured between 9.5 cfs on November 2, 2000, to 1 cfs on July 25, 2001 (USEPA 2003a). Water levels are drawn down in the slough on occasions to help reduce fog (D. Routledge 2003b, pers. comm.).

Swift Slough and the Logan River are classified by the State of Utah as a 2B, 3A, 3D, 4 stream. The classifications are described below. Neither water body is listed on the Utah 303(d) list of impaired water bodies (UDEQ 2002).

Class 2B – Protected for secondary contact recreation such as boating, wading, or similar uses.

Class 3A – Protected for cold-water species of game fish and other cold-water aquatic life, including the necessary aquatic organisms in their food chain.

Class 3D – Protected for waterfowl, shore birds, and other water-oriented wildlife not included in Classes 3A, 3B, or 3C, including the necessary aquatic organisms in their food chain.

Class 4 – Agriculture.

Monitoring data from the northern branch of the slough, downstream of the FES prior to receiving water from the treatment lagoons, indicate that the slough meets state water quality standards, except for one temperature reading that exceeded the Class 3A temperature standard of 20°C (68°F). No data were available for phosphorus or nitrogen-nitrate (USEPA 2003a). Monitoring data from the slough upstream of the FES, only available for a single day, indicated that water quality standards (for metals, nitrogen, and ammonia) were met, except for phosphorus in one of two samples (USEPA 2003a).

Currently, effluent generated from the existing facility operations involved with trout rearing passes through a settling basin prior to discharge; effluent from the existing June sucker rearing facility is discharged directly into the slough without prior treatment. The FES has a discharge permit under the State of Utah Point Discharge Elimination System that requires total suspended solids (TSS) monitoring. Measured TSS levels have never exceeded the state standard of 4.0 mg/L (D. Routledge 2003b, pers. comm.).

The FES supplements water used for fish rearing with oxygen because of the naturally occurring, relatively low DO levels in the well water.

## **Wetlands and Vegetation**

### **Goshen Warm Springs Alternative**

A Goshen Warm Springs Project Area inspection was completed on September 18 and 19, 2002, to delineate wetland boundaries. Wetland boundaries were identified in accordance with the *U.S. Army Corps of Engineers Wetlands Delineation Manual* (Environmental Laboratory 1987). Jurisdictional status confirmation from the U.S. Army Corps of Engineers was made on October 28, 2002 (see Appendix B). The mapping and analysis of riparian-wetland plant communities were done concurrently with the mapping and analysis of the upland vegetation. Figure 3-1 depicts the two vegetation communities within the Goshen Warm Springs Project Area: a riparian-wetland community and a semi-desert upland community.

#### ***Riparian-Wetland Plant Community***

The riparian-wetland community is characterized by a well-established herbaceous wetland community transitioning from showy milkweed (*Asclepias speciosa*), witchgrass (*Panicum capillare*), rough false goldeneye (*Heliopsis hispidus*), goosefoot (*Kochia scoparia*), and saltgrass (*Distichlis spicata*) to

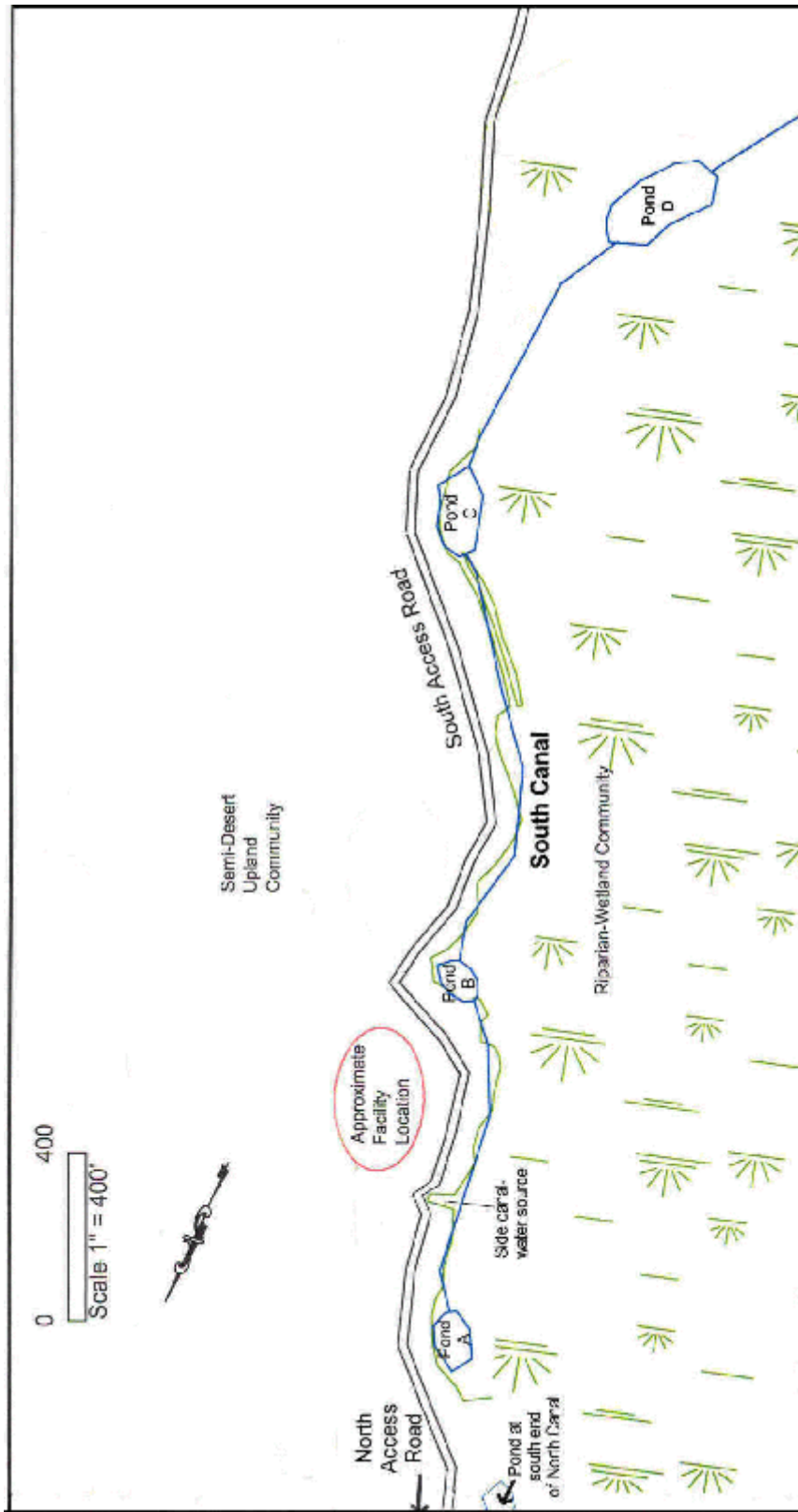


Figure 3-1. Vegetation Communities at the Goshen Warm Springs Alternative Project Area.

wetter areas dominated by cattail (*Typha latifolia*), bulrush (*Scirpus acutus*), sedges (*Carex* spp.), and wiregrass (*Juncus* spp.). Included in this zone are also areas of shallow water aquatic communities and their banks. Vegetation along the north- and south-flowing spring discharge channels consists of Russian olive (*Elaeagnus angustifolia*), western wheatgrass (*Agropyron smithii*), prickly lettuce (*Lactuca serriola*), and goosefoot.

Near the largest spring outlet, seeps and periodic shallow groundwater create an area dominated by scrub-shrub and emergent vegetation. Similar hydrological conditions produce a comparable vegetation community further downstream where another set of large springs occurs.

Uphill and adjacent to the canals, small wetland areas exist because of seeps surfacing in locations throughout the Goshen Warm Springs Project Area. Vegetation varies here as result of the amount and duration of groundwater flows, as well as depth to groundwater. Vegetation communities vary from areas dominated by goosefoot, aster (*Aster* spp.), wiregrass, or rough false goldenrod.

### ***Semi-Desert Upland Community***

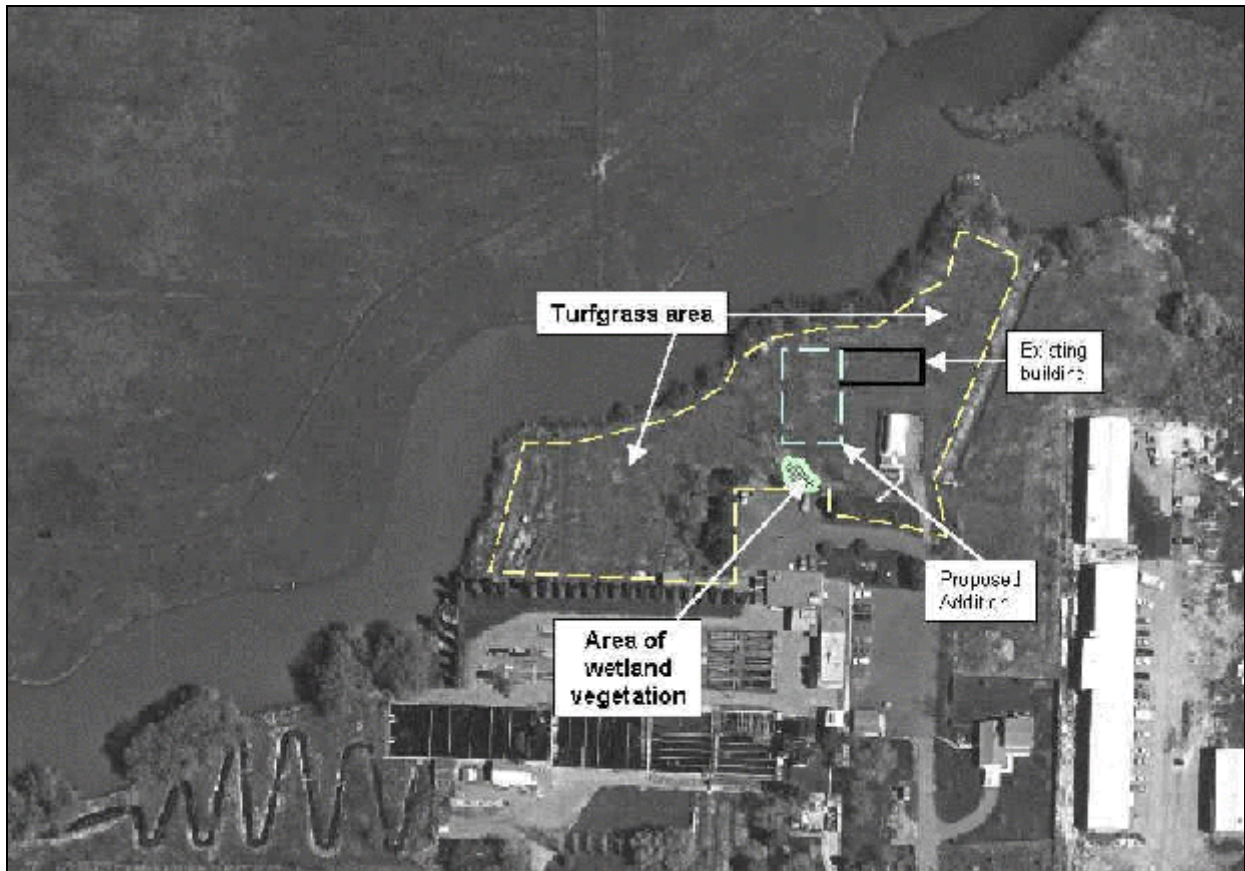
The semi-desert upland community is dominated by sagebrush (*Artemisia* spp.), other shrubs, and grasses such as cheatgrass (*Bromus tectorum*). In most places, the Goshen Warm Springs Project Area upland boundary is quite apparent because of an abrupt change in topography and plant community. However, in a few locations where the transition to upland is not as dramatic, some western wheatgrass, saltgrass, goosefoot, and cheatgrass are found inland from the riparian-wetland community. Although sagebrush appears to be the climax species in the upland areas, it may be representative of historic overgrazing (Rabkin and Rabkin 1981).

### ***Noxious Weeds***

Several noxious weed species on the Utah Noxious Weed List (UDAF 2003), including knapweed (*Centaurea* spp.) and thistle (*Cirsium* spp.), were observed in both vegetation plant communities in the Goshen Warm Springs Project Area. Russian olive, listed by several counties in Utah as a noxious weed (although not Utah County), was also observed. The weeds occur in scattered patches, with most occurring in highly disturbed areas.

### **FES Alternative**

An FES Project Area inspection was completed on April 8, 2003, to investigate potential wetlands. The intent of the inspection was to provide a preliminary determination of the presence of any wetland areas. The mapping and analysis of wetland plant communities were done concurrently with the mapping and analysis of the upland vegetation. Figure 3-2 depicts the two plant communities found within the FES Project Area: an area with wetland vegetation and an upland landscaped area.



**Figure 3-2. Vegetation Communities within the FES Project Area.**

### ***Wetland Vegetation Community***

The wetland vegetation community is a relatively small (less than 100-square foot) area characterized by disturbed soil running along a buried pipeline with cattail present in the immediate vicinity of the pipeline. The pipeline acts as a drain for onsite capped artesian wells and is periodically clogged by vegetation, causing water to back up and creating a wet area in the lawn (D. Routledge 2003c, pers. comm.). Consequently, cattail has grown within the immediate vicinity of the pipeline. Periodically the pipeline is excavated for repair; this work and landscaping practices (e.g., mowing) have highly disturbed this vegetation community.

Swift Slough forms the north boundary of the FES site. The proposed location of the Interim Facility would be approximately 100 feet from the slough.

### ***Upland Landscaped Community***

The upland landscaped community is dominated by typical turf grasses such as brome grass (*Bromus* sp.) and Kentucky bluegrass (*Poa pretensis*). The majority of the FES property that is not paved or occupied by a building is covered by turf grass (Figure 3-1). The boundary between the upland landscaped community and the wetland vegetation community is quite apparent as an abrupt change in plant community.

### ***Noxious Weeds***

No noxious weed species were observed in either of the vegetation communities.

## **Fisheries**

### **Goshen Warm Springs Alternative**

#### ***Fishes***

The Division conducted biological sampling of the Goshen Warm Springs Project Area using gill nets, hoop nets, and minnow traps in 2000 (K. Wilson 2002, pers. comm.). As a result of this sampling operation, it was determined that Goshen Warm Springs is occupied by predominately nonnative species, including largemouth bass (*Micropterus salmoides*), common carp (*Cyprinus carpio*), green sunfish (*Lepomis cyanellus*), western mosquitofish (*Gambusia affinis*), the aquarium species koi (*Cyprinus carpio*), convict cichlids (*Archocentrus nigrofasciatus*), and plecos (*Plecostomus* sp.).

Largemouth bass, green sunfish, common carp, and western mosquitofish are common nonnative fishes found in the Great Basin (Holden et al. 1997, Sigler and Sigler 1996) and could be present due to historical stocking of these fishes in the area or transfers from other nearby drainages stocked with these species. Koi, convict cichlids, and plecos are common pond/aquarium ornamental species and were likely released into Goshen Warm Springs by local aquarium enthusiasts.

The Utah chub (*Gila atraria*) is the only potentially native fish species that currently occurs in the Goshen Warm Springs canals and ponds. While Goshen Warm Springs is within the historic range of the Utah chub, it is unclear whether the fish was native to the spring system before it was altered for agricultural use.

Goshen Warm Springs is included in the historic range of the least chub (*Iotichthys phlegethontis*), which is classified as a conservation species by the State of Utah (Perkins et al. 1998). The U.S. Fish and Wildlife Service (USFWS) proposed to list the species as endangered in 1995, but this action was postponed pending the present Conservation Agreement (Perkins et al. 1998). Least chub have been collected at several locations along the Wasatch Front and in the West Desert, but the species has not been found near Goshen Warm Springs (Hogrefe 2001). Perkins et al. (1998) list competition with and predation by nonnative fishes as a major threat to least chub and, because of high numbers of nonnative predators in the Goshen Warm Springs system, the potential for least chub to persist in the Goshen Warm

Springs system is minimal (K. Wilson 2002, pers. comm.). Additionally, no least chub were found in sampling of the Goshen Warm Springs area in 2000 (K. Wilson 2002, pers. comm.).

### ***Macroinvertebrates***

Little information has been collected on the macroinvertebrate community at Goshen Warm Springs (E. Larson 2002b, pers. comm. and K. Wilson 2002, pers. comm.). However, the National Aquatic Monitoring Center collected samples in April and October 2002 that showed a relatively diverse group of invertebrates, comprised mainly of lentic (still water) taxa (M. Vinson 2002, pers. comm.). Twenty-nine insect taxa were present, but only five insect orders were represented. Many dragonfly, beetle, and true bug taxa were present, as was one caddisfly taxa. Fourteen noninsect taxa were present, including an exotic mollusk, the red-rimmed melania (*Melanoides tuberculatus*), which was the most abundant taxa collected. Another exotic mollusk, the Chinese mystery snail (*Viviparus malleatus*), was also collected.

### **FES Alternative**

#### ***Fishes***

Currently, the FES uses 16 artesian wells for its water supply and does not take surface water from nearby water bodies. The FES discharges into Swift Slough, the slough forming the north and west boundary of the FES Project Area. The fish community of the slough is dominated by nonnative fishes, including western mosquitofish, fathead minnow (*Pimephales promelas*), common carp, green sunfish, and channel catfish (*Ictalurus punctatus*) (C. Wilson 2003, pers. comm.). A 1981 fish survey in Swift Slough downstream of the FES revealed only common carp (P. Thompson 2003, pers. comm.).

#### ***Macroinvertebrates***

No information is available about the macroinvertebrate community of the slough (C. Wilson 2003, pers. comm.). However, both the macroinvertebrate and fish communities in the slough are probably ephemeral since the Logan Canal Company periodically draws down flows resulting in relatively poor habitat.

## **Wildlife**

### **Goshen Warm Springs Alternative**

#### ***General Wildlife and Habitats***

The Goshen Warm Springs Project Area is characterized primarily by upland grassland and shrub communities with a juniper/mountain shrub complex on the mountain slopes to the east of the Goshen Warm Springs Project Area riparian corridor along the pond-canal system, and a large wet meadow/emergent marsh complex west of the canals. These communities provide nesting areas and materials, protective cover, and a sufficient food base (e.g., fish, small mammals, macroinvertebrates, insects, and emergent vegetation) to potentially attract a wide variety of wildlife. Mammal species observed at or near the



Goshen Warm Springs Project Area include mule deer (*Odocoileus hemionus*), ground squirrels (*Spermophilus* spp.) and desert rabbit (*Sylvilagus audubonii*) (SWCA, Inc. 1999a). Bird species identified at the Goshen Warm Springs Project Area include ring-necked pheasant (*Phasianus colchicus*), mourning dove (*Zenaida macroura*), waterfowl (*Anas* spp.), raptors such as the red-tailed hawk (*Buteo jamaicensis*) and American kestrel (*Falco sparverius*), and songbirds such as the American robin (*Turdus migratorius*), yellow warbler (*Dendroica petechia*), lark sparrow (*Chondestes grammacus*), and house finch (*Carpodacus mexicanus*) (SWCA, Inc. 1999a). The Goshen Warm Springs Project Area also contains suitable habitat for herpetofauna such as the gopher snake (*Pituophis melanoleucus*) and garter snakes (*Thamnophis* spp.).

The mountainside east of the Goshen Warm Springs Project Area has been classified as high-priority winter range for mule deer (*Odocoileus hemionus*) (Division 2002b); some seasonal use of the riparian corridor by mule deer is also likely.

The red-tailed hawk and American kestrel have been observed throughout the Goshen Warm Springs Project Area and are commonly observed in Goshen Valley to the southwest (SWCA, Inc. 1999a). Nesting, foraging, and roosting of these species is likely to occur adjacent to the Goshen Warm Springs Project Area, where suitable habitat and prey sources exist. No known active or inactive raptor nests were observed during previous Goshen Warm Springs Project Area visits (SWCA, Inc. 1999a) or during a September 2002 investigation for this Environmental Assessment.

### **Sensitive Species**

The Division has developed the Utah Sensitive Species List (Division 1998) that identifies those species most vulnerable to population or habitat loss. This list and available Geographic Information Systems (GIS) data from the Division's Natural Heritage Office were reviewed to determine known and potential locations of sensitive species within the general Goshen Warm Springs Project Area. The actual potential for each of these species to occur within the Goshen Warm Springs Project Area was then assessed based on range distribution, current literature review, and habitat requirements.

The yellow-billed cuckoo (*Coccyzus americanus occidentalis*) is a candidate species for Federal listing and is a State threatened species in Utah. This neo-tropical migrant nests in localized riparian valleys statewide, including Utah County, and has declined significantly across its range. No yellow-billed cuckoo nesting is known to occur within the Goshen Warm Springs Project Area (Division 1998; SWCA, Inc. 1999a). Nesting habitat is available in the riparian corridor associated with the spring discharge canals.

The American peregrine falcon (*Falco peregrinus anatum*) was recently delisted as a Federally listed species, but it remains on the Utah Sensitive Species List (Division 1998, F. Howe 2003, pers. comm.). Peregrine falcons nest on cliffs associated with riparian-wetland habitats statewide, except in the western Basin and Range Province. The escarpments and cliffs associated with Warm Spring Mountain immediately east of the Goshen Warm Springs Project Area provide suitable nesting approximately 2,000

feet to the east. No known nesting sites have been found in or adjacent to the Goshen Warm Springs Project Area (Division 1998; SWCA, Inc. 1999a). Onsite investigations for this Project also did not identify any nest sites or “white-wash” indicative of cliff nesting.

Swainson’s hawk (*Buteo swainsoni*) is listed as a State species of special concern because of declining population numbers. This neo-tropical migrant raptor nests in trees near open desert grasslands, shrub-steppes, and agricultural lands. Potential nesting cover and available prey sources are present on and adjacent to the Goshen Warm Springs Project Area; however, this species has not been documented at this location (Division 1998; SWCA, Inc. 1999a).

The common yellowthroat (*Geothlypis trichas*) is listed as a State species of special concern because of declining population numbers. This neo-tropical migrant nests in riparian-wetland habitats statewide, typically in riparian shrub habitats such as the tamarisk (*Tamarix Ramosissima*), willow (*Salix* spp.)/cattail, and willow/cottonwood (*Populus* spp.)/tamarisk vegetation community types found on and adjacent to the Goshen Warm Springs Project Area. This species has not been documented at this location (Division 1998), although SWCA, Inc. (1999a) notes that it is likely to occur on the Goshen Warm Springs Project Area. Onsite investigations during September 2002 confirmed that suitable habitat exists within the riparian community associated with the Goshen Warm Springs discharge canals.

The short-eared owl (*Asio flammeus*) is listed as a State species of special concern because of declining population numbers and is a permanent resident of central and northern Utah wetlands and deserts (Division 1998). Although suitable habitat exists in the Goshen Warm Springs Project Area, this species has not been documented on or adjacent to this location (Division 1998; SWCA, Inc. 1999a).

The bobolink (*Dolichonyx oryzivorus*) is listed as a State species of special concern because of declining population numbers and limited distribution. This species typically inhabits riparian areas and adjacent agricultural lands and grasslands but has not been documented on the Goshen Warm Springs Project Area (Division 1998; SWCA, Inc. 1999a). Open grasslands do not exist on the Goshen Warm Springs Project Area, thus limiting the potential occurrence of this species.

The Townsend’s big-eared bat (*Plecotus townsendii*) is listed as a State species of special concern because of declining population numbers and limited distribution statewide, but suitable habitat for communal roosting in caves or mine shafts does not exist adjacent to the Goshen Warm Springs Project Area.

The Columbia spotted frog (*Rana luteiventris*) is a State-listed threatened species and is the subject of a Conservation Agreement between the State and USFWS. This species has a potential to occur on the Goshen Warm Springs Project Area in the wetlands and/or canal/pond system, although no occurrences have been documented on the Goshen Warm Springs Project Area or adjacent wetland preserve (Division 1998; SWCA, Inc. 1999a).

## **FES Alternative**

### ***General Wildlife and Habitats***

The proposed footprint of the FES Alternative is located adjacent to the existing facility buildings and main parking area. The FES Alternative building site is an area of maintained turf grass that is mowed regularly, as well as a small area (approximately 100 square feet) containing wetland vegetation (cattail). The building site's disturbed condition and human presence limit its habitat utility. Wildlife in the area is likely limited to small burrowing rodents and resident songbirds, both of which have ample habitat in the general vicinity.

A riparian corridor and slough, likely used by a variety of migratory waterfowl species, border the property to the north and west.

### ***Sensitive Species***

The Division has listed several species of concern that could occur within the FES Project Area (Division 1998). This list and available GIS data from the Division's Natural Heritage Office were reviewed to determine known and potential locations of sensitive species within the general Goshen Warm Springs Project Area. The actual potential for each of these species to occur within the FES Project Area was assessed based on range distribution, current literature review, and habitat requirements.

The common yellowthroat is listed as a species of special concern because of declining population numbers. This neo-tropical migrant nests in riparian and wetland habitats statewide.

The bobolink is listed as a species of special concern because of declining population numbers and limited distribution. This species typically inhabits riparian areas and adjacent agricultural lands and grasslands and may occur on or adjacent to the FES Project Area (D. Austin 2003, pers. comm.).

The yellow-billed cuckoo is a candidate species for Federal listing and is a State threatened species in Utah. This neo-tropical migrant nests in localized riparian valleys statewide, possibly including Cache County. The species has declined significantly across its range. No yellow-billed cuckoo nesting is known to occur within the immediate FES Project Area (D. Austin 2003, pers. comm.).

No Swainson's hawk nesting is known to occur within the FES Project Area. While the FES Project Area may provide limited hunting grounds for the Swainson's hawk and other raptors, ample hunting territory would remain in the land surrounding the FES Project Area.

No suitable peregrine falcon nesting sites are present on or in the vicinity of the FES Project Area.

Short-eared owls are known to nest north of the FES Project Area in scattered trees and hunt in open areas. No short-eared owl nests are known to nest on the FES Project Area.

# Threatened and Endangered Species

## Goshen Warm Springs Alternative

### **Wildlife**

The USFWS (2000) has identified two wildlife species listed as threatened under the Federal Endangered Species Act as potentially occurring in Utah County: the bald eagle (*Haliaeetus leucocephalus*) and Canada lynx (*Lynx canadensis*).

The distribution and range for the bald eagle falls within the Goshen Warm Springs Project Area. Migratory bald eagles winter throughout Utah between November and May, and are typically found in riparian areas, low elevation forests, and desert habitats. Bald eagle winter habitat consists of large trees with open branches allowing easy access to foraging areas, primarily river corridors, and lakes. Fish and carrion are the main prey of bald eagles (Paige et al. 1990). The wetland and riparian zones associated with Goshen Warm Springs provide available prey and scavenging opportunities for wintering bald eagles. Additionally, the tree structure could provide opportunities for roosting. However, no bald eagles were noted during a January 2003 Goshen Warm Springs Project Area investigation, nor have bald eagles been known to use this area historically for roosting (SWCA, Inc. 1999a). Only four known pairs of bald eagles nest in the State, and none occur in Utah County.

Canada lynx use young forest stands for hunting and mature stands for denning. A mixture of forest openings, or rather a mosaic of habitats with mature stands of cover or corridors, is considered best for supporting the species (Koehler and Britnell 1990). The Canada lynx is most typically associated with mature, isolated spruce/subalpine fir and lodgepole pine forests above 4,000 feet, which are used for denning. Areas containing limited human disturbance are also of primary importance for Canada lynx (Koehler and Britnell 1990). The lack of mature, coniferous stands and high amount of human-related disturbance within the Goshen Warm Springs Project Area preclude the use of the area by Canada lynx.

### **Plants**

The Ute ladies'-tresses (*Spiranthes diluvialis*) was suspected of occurring in the Goshen Warm Springs Project Area. The species is known in Utah County and the general area, and suitable habitat exists in relation to the riparian community along the canals. However, recent surveys for the plant species revealed no evidence of its occurrence (Intermountain Ecosystems LC 2002).

The USFWS (2000) lists the Federally endangered clay phacelia (*Phacelia argillacea*) as occurring in Utah County. However, this species is restricted to Spanish Fork Canyon where it grows on barren, precipitous hillsides in sparse pinyon-juniper and mountain brush communities (Callister and VanPelt 1992, Welsh et al. 1993). The species does not occur in the Goshen Warm Springs Project Area (L. England 2003, pers. comm.).

The USFWS (2000) also lists the Federally threatened desert milkvetch (*Astragalus desereticus*) as occurring in Utah County. However, this species is known from only a single site on a steep south- and west-facing slope in an open pinyon-juniper-sagebrush community on privately owned ground (Barneby 1989, Franklin 1990). This location is geographically distinct from the Goshen Warm Springs Project Area (L. England 2003, pers. comm.).

### ***Fish***

The June sucker (*Chasmistes liorus*) is listed as being present in Utah County by the USFWS (2000). However, the June sucker is endemic to Utah Lake and its major tributary, the Provo River. Presently, no evidence exists to suggest that June sucker were ever found anywhere else in Utah (Sigler and Sigler 1996). Additionally, no June sucker were found during sampling of the Goshen Warm Springs area in 2000 (K. Wilson 2002, pers. comm.).

### ***Invertebrates***

The USFWS (2000) lists the Federally endangered Utah valvata snail (*Valvata uatahensis*) as occurring in Utah County. This species occurred historically in Utah Lake, but it is currently restricted to the middle Snake River. The species has not been documented in Utah in the last 100 years and is likely extirpated (Division 1998).

## **FES Alternative**

### ***Wildlife***

The USFWS (2000) has identified two wildlife species listed as threatened under the Federal Endangered Species Act as potentially occurring in Cache County: the bald eagle (*Haliaeetus leucocephalus*) and Canada lynx (*Lynx canadensis*).

The distribution and range for the bald eagle falls within the FES Project Area. The riparian zones associated with FES Project Area provide potential prey and scavenging opportunities for wintering bald eagles. Additionally, the tree structure could provide opportunities for roosting. However, no bald eagles were noted during a April 2003 FES Project Area investigation, nor have bald eagles been known to use this area historically for roosting.

The lack of mature coniferous stands and high amount of human-related disturbance within the FES Project Area preclude the use of the area by Canada lynx.

### ***Plants***

The USFWS (2000) lists the Maguires primrose (*Primula maguirei*) as occurring in Cache County. This plant occurs in Logan Canyon in cliff, crevice, and ledge habitats (Division 2003a). Such suitable habitat does not exist anywhere within approximately 5 miles of the FES Alternative.

### ***Fish***

The USFWS (2000) does not list any threatened or endangered fish species as naturally occurring in Cache County. The FES is currently raising June sucker.

### ***Invertebrates***

The USFWS (2000) does not list any threatened or endangered invertebrate species as occurring in Cache County.

## **Cultural Resources**

### **Goshen Warm Springs Alternative**

#### ***Historic Properties***

Specific historical features of and adjacent to the Goshen Warm Springs Project Area include the Goshen Warm Springs Ditch, which according to archival information was constructed prior to 1893. This ditch functions as the canal for diverting water from Goshen Warm Springs to adjacent farmland (SWCA, Inc. 1999b). Immediately north and east of the Goshen Warm Springs Project Area are the historic remnants of the Tintic Mill, a lead-silver ore processing center that operated from 1921 to 1925. At its peak, the mill processed 200 tons of ore per year. Remains of the mill site include foundations of water tanks, crushers, roasters, iron boxes, leaching tanks, and drain boxes.

#### ***Archaeological Resources***

A field survey of the Goshen Warm Springs Project Area resulted in the finding of two quartzite percussion flake fragments (SWCA, Inc. 1999b). Both artifacts were found adjacent to an east-west running trench located in the northern portion of the Goshen Warm Springs Project Area. No other cultural materials were observed during the survey.

#### ***Paleontological Resources***

A field survey of the Goshen Warm Springs Project Area did not result in any fossil finds (SWCA, Inc. 1999b). However, the Goshen Warm Springs Project Area is in the general location of the Lake Bonneville shoreline, so there is potential for significant vertebrate fossils (Hayden 2003).

### **FES Alternative**

Consultation with the State Historic Preservation Office (SHPO) regarding potential cultural resources on the FES Project Area was initiated in spring 2003. Because of the already disturbed condition of the FES Project Area, and previous ground excavation that occurred at the FES, the potential for archeological or paleontological resources to occur appears low. Appropriate consultation with SHPO is expected to be completed before any groundbreaking at the FES for the Interim Facility would occur.

### ***Historic Properties***

No known historic properties fall within the FES Project Area. As part of the consultation process with SHPO, a site reconnaissance and file search will be completed by the Division archeologist to identify the presence of any historic properties.

### ***Archeological Resources***

No known archeological resources occur within the FES Project Area. As part of the consultation process with SHPO, a site reconnaissance and file search will be completed by the Division archeologist to identify the presence of any archeological resources.

### ***Paleontological Resources***

No known paleontological resources occur within the FES Project Area. As part of the consultation process with SHPO, a site reconnaissance and file search will be completed by the Division archeologist to identify the presence of any paleontological resources.

## **Land Use**

### **Goshen Warm Springs Alternative**

The land at Goshen Warm Springs is part of the Goshen Warm Springs Wildlife Management Area and owned by the State of Utah and managed by the Division. Additional lands to the west and southwest of these Division lands are owned by the Commission and managed as part of the Utah Lake Wetland Preserve to “mitigate for the historic loss of wetlands, due to Federal reclamation projects, which are important for wildlife (particularly migratory birds), outdoor recreation, wetlands education and research, and other conservation values” (Commission 1996). Land to the immediate south of the Goshen Warm Springs Project Area is privately owned.

The Goshen Warm Springs Project Area is within the City of Genola and zoned Agricultural. However, since the property is State-owned, local zoning designations do not apply.

The historic extent and intensity of grazing at Goshen Warm Springs is not known. Currently, grazing is not allowed on Goshen Warm Springs lands managed by the Division, but it does occur on the private property along the south boundary of the site (S. Conroy 2002, pers. comm.).

### **FES Alternative**

The land at the FES is owned by the State of Utah and managed by the Division as a hatchery facility. A slough borders the property on the north and west; across the slough land to the north and west is privately owned and primarily in grazing and agricultural uses. Grazing has not occurred on the FES Project Area

since its inception in 1964. Land to the east of the FES is privately owned and commercially developed. Land to the south of the FES, across 200 North, is part of the Logan landfill.

The FES Project Area is within the City of Logan and zoned Commercial General. Since the property is State-owned, local zoning designations do not apply.

## **Socioeconomics**

### **Goshen Warm Springs Alternative**

The town of Goshen, Utah, was incorporated in 1910 and is the smallest incorporated town in Utah County. The City of Genola was incorporated in 1935 and is a larger municipality occupying nearly 4 square miles. Like Utah County, these municipalities' economies initially centered around farming, but agriculture's role in the region's economic base has been decreasing and currently accounts for less than 10 percent of the county's total employment. The region's economy has more recently been replaced by production, transportation, construction, and professional jobs that comprise 80 percent of the local market. Livestock grazing, mineral extraction, and service occupations have also been increasing as important economic activities. Major employers in the area include the Utah County School District, local farms, gas stations, and a local food retailer.

### **FES Alternative**

The City of Logan, Utah, is the largest city in Cache County, with a population of approximately 42,000, and is home to Utah State University. Logan is an economic center of northern Utah and the county seat of Cache County. Cache County's economy historically centered on agriculture, and although agriculture has maintained an important role in the region's economic base, Cache County has diversified as a result of Utah State University's influence and the establishment of private companies. Major employers in the area include Utah State University, Icon Health and Fitness, the Cache County School District, Logan Regional Hospital, and several other private companies.

## **Visual Resources**

### **Goshen Warm Springs Alternative**

The Goshen Warm Springs Project Area rests at an elevation of about 4,600 feet in the heart of the Great Basin desert and agricultural landscape. Strong visual elements in the viewshed include foreground views of the Goshen Warm Springs Ponds, the desert, agriculturally modified lands, Goshen City's scattered



residences and small developments, the abandoned Tintic Mill, the natural-appearing mountain background surrounding the valley, and Utah Lake.

Human modifications consist of the canals, local farmed land, the town of Goshen, and mining sites. The canal that distributes Goshen Warm Springs water is a noticeable element on the Goshen Warm Springs Project Area. Farm land is dominant on the north, west, and south sides of the Goshen Warm Springs Project Area. The abandoned Tintic Mill and associated buildings are located on the mountain slopes above and northeast of the Goshen Warm Springs Project Area. Because of its size, form, and color, this abandoned operation is a dominant element in the landscape.

### **FES Alternative**

The FES Project Area rests at an elevation of about 4,450 feet in the heart of Cache Valley in northern Utah. Strong visual elements in the viewshed include foreground views of the existing facility, the adjacent commercial development to the east, agriculturally modified lands, scattered residences and small developments, the landfill to the south, and the natural-appearing mountain background surrounding the valley to the east and west.

In general, the context of the FES Project Area is urban in character and dominated by human modifications. The FES Project Area is already developed with the existing hatchery facility. In addition, the property immediately to the east of the FES Project Area is commercially developed with a two-story, multiple officer building with landscaped turf grass. Commercial development continues to occur within the area along either side of Highway 30.

## **Hazardous Materials**

### **Goshen Warm Springs Alternative**

#### ***Waste Water***

No waste water is currently generated in the Goshen Warm Springs Project Area.

#### ***Solid Waste***

No solid waste, other than minor litter, is generated in the Goshen Warm Springs Project Area.

#### ***Hazardous Materials***

Hazardous materials are not currently used or stored in the Goshen Warm Springs Project Area. During a Goshen Warm Springs Project Area inspection on September 13, 2002, no visible signs of stained soil, distressed vegetation, petroleum storage tanks, chemical containers, or mining or milling waste were found.

The Goshen Warm Springs Project Area is downslope and south of the Tintic Mill, which was built in 1920 and once processed ore using an acid-brine chloridizing and leaching process (Notarianni 1982). The Utah Division of Environmental Response and Remediation (DERR) (Howes 2002) lists the Tintic Mill in its Comprehensive Environmental Response, Compensation, and Liability Information System database as facility number UT0001910793.

The DERR completed a Site Inspection and Analytical Results Report (Howes 2002) and an environmental investigation of the Tintic Mill that included collecting of a number of soil samples, sediment samples, and water samples. Two sediment samples and two surface water samples were collected within the Goshen Warm Springs Project Area. In summary, Howes (2002) determined that the Tintic Mill site and certain adjacent areas did not contain detectable concentrations of volatile organic compounds but did contain elevated levels of a number of metals. Samples were classified as: source materials (tailings, waste rock, and ore piles), soils (some mixed with source materials), surface water, and sediment from ponds, ditches, or wetland areas.

Source area materials, soils, and sediments near both the Tintic Mill site and within the apparent footprint of the associated tailings disposal site located in the wetlands west of the Tintic Mill, but outside the potential footprint of the Interim Facility at the Goshen Warm Springs Project Area contained concentrations of heavy metals that were either elevated above background concentrations or exceeded the Superfund chemical data matrix (SCDM) benchmark for cancer or other risk values. The SCDM is a value that is used when evaluating potential Superfund national priority list sites (USEPA 1996a). These metals include antimony, arsenic, barium, cadmium, chromium, copper, iron, lead, mercury, nickel, selenium, silver, sodium, thallium, and zinc. Beryllium concentration did not exceed background concentrations, but some of the samples did exceed the SCDM value (Howes 2002). It appears that native soil and rocks at the Goshen Warm Springs Project Area are naturally high in beryllium. The tailings pile is likely the primary origin of the contaminant loading, although wind or flowing water may have contributed to migration of these metals away from the Tintic Mill site.

The two sediment samples were collected from the bottom of Pond A (Figure 1-3), and the bottom of the spring discharge channel that would be utilized as the water source for the Interim Facility (Howes 2002). Arsenic in both samples was estimated to be at levels exceeding the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) generic soil screening level for residential developments (USEPA 1996a, 1996b). Although the Interim Facility would not be a residential development, there are no screening levels specifically identified for commercial or other types of development; the CERCLA generic soil screening level was the most stringent criteria available as reference.

Two soil samples collected by the DERR from outside the Goshen Warm Springs Project Area indicate that the surface soil located approximately 250 feet away from the Tintic Mill contained elevated concentrations of arsenic, copper, lead, mercury, selenium, and silver (Howes 2002). In addition, recent

DERR screening analysis using a portable x-ray fluorescence unit showed that soils within the building footprint contained elevated levels of lead in surface soils (Howes forthcoming). Two samples from this screening analysis were submitted for further laboratory analysis. One of these soil samples was a composite sample collected near the proposed Interim Facility and submitted for inorganic element analysis. In this sample, lead (276 milligrams per kilogram [mg/kg]) was the only element that appeared to be substantially elevated above background conditions (T. Howes 2003, pers. comm.). The lead concentration was below the threshold of 400 mg/kg set by the U.S. Environmental Protection Agency (EPA) for CERCLA sites and Resource Conservation and Recovery Act Corrective Action Facilities (USEPA 1996b). The arsenic concentration (15.9 mg/kg) in the composite sample (collected near the proposed site of the Interim Facility) was slightly above that found in the other sample (7.0 mg/kg), which was collected south of the location of the proposed Production Facility (Howes forthcoming). Arsenic concentrations in both samples were below the SCDM value (USEPA 1996a). The DERR plans to conduct additional investigations in the area of the Interim Facility footprint during spring and summer 2003 with results available by late 2003 (T. Howes 2003, pers. comm.).

## **FES Alternative**

### ***Waste Water***

Domestic waste water from the FES is discharged to a septic absorption field. Bio-solid waste water effluent associated with fish production is discharged to Swift Slough north of the FES Alternative Project Area (D. Routledge 2003a, pers. comm.).

### ***Solid Waste***

Solid waste generated by the existing facility is collected and transported to the local landfill.

### ***Hazardous Materials***

Several potentially hazardous materials are used and stored in small quantities at the existing facility. The materials associated with the operation are disinfectants and treatments for disease or stress control. These materials include: hyamine, chlorine, hydrogen peroxide, formalin, benzochromium, and noniodized salt (D. Routledge 2003a, pers. comm.). No leaks or spills have occurred.

During an inspection of the FES Project Area on May 7, 2003, no visible signs of stained soil, distressed vegetation, hazardous waste, or petroleum storage tanks were found.

# CHAPTER 4: ENVIRONMENTAL CONSEQUENCES

## Introduction

This chapter describes the anticipated impacts of the Warm-water Interim Hatchery Facility (Interim Facility) on the physical, biological, and social components of the human environment. The current conditions of the potentially affected resources at the Goshen Warm Springs Project Area and the Fisheries Experiment Station (FES) Alternative Project Area (FES Project Area) described in Chapter 3 (Affected Environment) establish the baseline for the impact analyses. To the extent possible, the analyses provide quantitative impact estimates.

This chapter is divided into sections according to resource. Direct, indirect, and cumulative impacts are discussed for each resource. Under the individual resource component, potential impacts are assessed for the No Action Alternative, Goshen Warm Springs Alternative, and the FES Alternative (Agency-Preferred Alternative).

The cumulative impact analyses include consideration of past, current, and reasonably foreseeable future actions as required by the National Environmental Policy Act (NEPA) of 1969 (Public Law 91-190, 1970), and the Council on Environmental Quality Regulations for Implementing NEPA (40 Code of Federal Regulations Part 1500 - 1508).

Consideration of cumulative impacts under the FES Alternative includes the use of the site as a fish hatchery (existing facility) since the early 1930s. Reasonably foreseeable impacts include the continued presence of the existing facility.

For consideration of cumulative impacts regarding the Goshen Warm Springs Alternative, past actions include the Tintic Standard Reduction Mill (Tintic Mill) to the north of the potential site of the Interim Facility, which operated from 1921 to 1925 processing lead-silver ore (Howes 2002). The State of Utah, through the Division of Wildlife Resources (Division), has managed the Goshen Warm Springs Wildlife Management Area (see Figure 1-2) since 1986.

Reasonably foreseeable impacts addressed in the cumulative impact analyses for the Goshen Warm Springs Alternative include an approximately 50-acre hatchery (Production Facility) intended to rear several warm-water fish species and two amphibian species. The Production Facility is the subject of a separate NEPA review currently underway that includes construction of the Production Facility at Goshen Warm Springs as an alternative, in an upland area south of the proposed Interim Facility along the South Canal. To date, planning has identified Gandy Warm Springs in northwest Millard County as the preferred location for the

Production Facility (FishPro 2000). However, since the NEPA analysis is not complete, it is possible that the NEPA analysis will identify Goshen Warm Springs as the preferred location for the Production Facility.

If both the Interim Facility and the Production Facility were constructed and operated at Goshen Warm Springs, it is anticipated that fish rearing operations at the Interim Facility would be terminated upon completion of the Production Facility since the water supply would not be sufficient to allow operation of both facilities simultaneously (although the Interim Facility building would likely become a non-fish rearing part of the Production Facility [e.g., a storage shed]). As such, operational activities potentially would overlap for only a brief period, perhaps a couple of months at the most, during the time necessary to make the Production Facility fully operational prior to transferring fish from the Interim Facility. Consequently, there are potential short-term cumulative impacts when both the Interim and Production Facilities are operational, as well as long-term cumulative impacts when only the Production Facility is operational. These impacts are discussed below for each resource potentially impacted.

This chapter also contains proposed mitigation measures that address anticipated impacts, as appropriate. Following application of the mitigation measures, the resulting, unavoidable impacts to individual resources are described and categorized according to the categories in Table 4-1.

**Table 4-1. Anticipated Resource Impact Categories Following Application of Mitigation Measures.**

IMPACT CATEGORY	DEFINITION
Beneficial Effect	An action that would improve the resource compared with current conditions.
Negligible or No Effect	An action that would have an effect so small that it would be difficult to measure any adverse change to the resource. The risk of degradation to the resource would be very low.
Minor Effect	An action that would result in only a limited impairment of the resource; the effect would be small and localized. The action would not effect the functional quality of the resource.
Moderate Effect	An action that represents an intermediate risk to the resource. This action might result in impacts to a resource component that affects functionality in limited areas but does not occur over an extended area or impair overall functionality. Effects would conflict with Federal or State regulation.
Major Effect	An action that would have a high risk of resulting in long-term degradation of the resource or that could result in substantial diminished functionality of the resource component. The effect would substantially conflict with Federal and/or State regulation. The effect may be of such intensity and context that it may be considered significant.

## **Geology and Minerals**

### **No Action Alternative**

Under this alternative, there would be no changes to Goshen Warm Springs or the FES; therefore, there would be no impacts to the geologic or mineral resources at either site.

### **Goshen Warm Springs Alternative**

#### ***Impact Analysis***

Impacts relevant to the geologic aspects of the Goshen Warm Springs Project Area include modifying site topography by creating cut and fill areas during construction of the Interim Facility. The proposed location of the Interim Facility is within the Goshen Fault Zone, directly below a steep slope that poses a slight risk for rock falls or debris flows. No soil or rock engineering problems are known; however, the proposed facility location is near the Goshen Fault and could sustain damage from earth tremors. Construction best management practices (BMPs) will be employed to safeguard the Interim Facility from rockfalls. The Interim Facility will be sited and designed to minimize potential damage from rock falls and earth tremors and any associated interruption in power. A backup generator will be installed to ensure that any power interruption does not result in a cessation of water flow.

Since no locatable mineral resources (e.g., gold, silver) and saleable mineral resources (e.g., sand, gravel) occur on site, no effect to these resources would be anticipated. Geothermal resources exist within the Goshen Warm Springs Project Area and would be utilized by the Interim Facility in the form of the warm water from the springs. However, there would be no effect to this resource since the Interim Facility would be a flow-through hatchery.

Potential geological and mineral resource impacts would remain the same regardless of whether the Interim Facility is accessed from the north or the south.

#### ***Cumulative Impacts***

Cumulative impacts related to geologic and mineral resources are not anticipated.

#### ***Mitigation Measures***

No mitigation measures are proposed.

#### ***Impact Conclusion***

No impact to the Goshen Warm Springs Alternative geology or mineral resources is anticipated.

## **FES Alternative**

### ***Impact Analysis***

The proposed facility location is near the East and West Cache Valley Fault Zones and could sustain damage from earth tremors if not properly designed and constructed. The Interim Facility will be designed to minimize potential damage from earth tremors and any associated interruption in power. A backup generator will be employed to ensure that any power interruption does not result in a cessation of water flow.

Since no locatable mineral resources (e.g., gold, silver) and saleable mineral resources (e.g., sand, gravel) occur on the FES Project Area, no effect to these resources would be anticipated. Geothermal resources exist within the FES Project Area and would be indirectly utilized by the Interim Facility in the form of well water withdrawal. However, there would be no effect to this resource since the Interim Facility will not involve withdrawal of additional water.

### ***Cumulative Impacts***

Cumulative impacts related to geologic and mineral resources are not anticipated.

### ***Mitigation Measures***

No mitigation measures are proposed.

### ***Impact Conclusion***

No impact to the FES Alternative geology or mineral resources is anticipated.

## **Soils**

### **No Action Alternative**

Under this alternative, there would be no ground disturbance or surface changes to the terrain at the either Goshen Warm Springs or the FES; therefore, there would be no impact to either Project Area's soils.

### **Goshen Warm Springs Alternative**

#### ***Impact Analysis***

Construction and operation of the proposed Interim Facility at Goshen Warm Springs would include 0.2 acre of soil disturbance, based on the dimensions of the proposed Interim Facility building and the parking area. Approximately 1.2 acres of additional soil disturbance as a result of road widening would occur if the Interim Facility were accessed from the south or, if accessed from the north, approximately 1.0 additional acre of soil would be disturbed as a result of road widening. Soils at the Goshen Warm Springs

Project Area are believed to be suitable for development and operation of a septic system for use in treating domestic wastewater.

Improvements to the road and enlarged impervious areas could indirectly impact soils through the erosional effects of stormwater runoff.

### ***Cumulative Impacts***

The existing natural base road and the Tintic Mill have altered soil resources. An estimated 5 acres of soils have been covered by the Tintic Mill, while an additional 10 to 15 acres of road surfaces remain bare soil vulnerable to erosion. This total area is less than 0.1 percent of the available soil resources at the Goshen Warm Springs Project Area. The Goshen Warm Springs Alternative would incrementally add approximately 1 acre of cumulative soil alteration to this total, increasing the erosional base. This cumulative effect would be considered negligible.

Grazing likely occurred previous to 1986 when the Division began managing the site as a Wildlife Management Area. The extent of this grazing is not known. Grazing has not been allowed since 1986 and is not anticipated to be re-introduced, so that any impact to soils from previous grazing has been mitigated to some extent.

Cumulative impacts to soils and consequent erosion potential would be anticipated if the Production Facility was also to be constructed at Goshen Warm Springs. However, through the use of BMPs, such cumulative impacts to soils would be expected to remain negligible.

### ***Mitigation Measures***

Construction of the Interim Facility at Goshen Warm Springs would require a permit under the Utah Pollution and Discharge Elimination System (UPDES), since it will disturb more than 1 acre of ground. The development and implementation of an Erosion Control Plan will mitigate the erosion impacts related to soil disturbance caused by construction operations and stormwater runoff. The Erosion Control Plan will include several elements to mitigate erosion: the development of a Storm Water Pollution Prevention Plan (SWP3) as required by the UPDES permit, the use of published BMPs for controlling erosion and sedimentation from stormwater runoff (USEPA 2003b), and addressing runoff from all roads and parking areas (paved and unpaved).

The septic system will be installed according to Utah County Health Department protocols for septic tanks to ensure it functions properly.

### ***Impact Conclusion***

Through these mitigation measures, the anticipated negative impact to soils as a result of the Goshen Warm Springs Alternative would be negligible.



## **FES Alternative**

### ***Impact Analysis***

Construction and operation of the Interim Facility would disturb approximately 0.1 acre of soil within the FES Project Area. This area of soil disturbance is based on the dimensions of the proposed Interim Facility and the staging area used during construction. Soils on the Interim Facility could also be indirectly impacted by the erosional effects of stormwater runoff from the enlarged impervious surface.

Soils on the FES Project Area are believed to be suitable for the type of development proposed. While the soils survey noted limitations to site development because of shallow water tables and constraints in installing successful septic systems, these limitations will be offset by the Interim Facility design. The proposed Interim Facility would not include a basement and would be an addition to an existing building, so groundwater depth should not be an issue. The Bear River Health Department has protocols for addressing septic system issues in this type of soil, which is predominant in the valley bottom environs of Cache Valley. For example, septic systems may be over-excavated and backfilled with sand or other suitable porous material to ensure proper septic system function. The FES site already contains a domestic septic system.

### ***Cumulative Impacts***

Soils at the FES site have been previously impacted by construction and operation of the existing facility.

### ***Mitigation Measures***

The development and implementation of an Erosion Control Plan will mitigate the erosion impacts related to soil disturbance caused by construction operations and stormwater runoff. The Erosion Control Plan will include the development of a SWP3 and the use of published BMPs for controlling erosion and sedimentation from stormwater runoff (USEPA 2003b).

The septic system will be installed according to Bear River Health Department protocols for septic tanks in low-permeability soils to ensure it functions properly.

### ***Impact Conclusion***

Through these mitigation measures, the anticipated negative impact to soils as a result of the FES Alternative would be negligible.

## **Groundwater**

### **No Action Alternative**

Under this alternative there would be no changes to Goshen Warm Springs or the FES; therefore, there would be no impact to either site's groundwater.

### **Goshen Warm Springs Alternative**

#### ***Impact Analysis***

Construction of the proposed Interim Facility and access road (either from the north or south) would produce no direct impacts to the groundwater or hydrogeology of Goshen Warm Springs. The septic system would increase the groundwater concentration of constituents associated with waste water, such as nitrates and bacteria. However, any septic tank and drainfield would be installed according to the requirements of the Utah County Health Department and associated State regulations to ensure it functioned properly. Proper installation and periodic maintenance and cleanout would ensure that the septic system impacts to groundwater were minimized.

#### ***Cumulative Impacts***

No cumulative impacts to Goshen Warm Springs groundwater resources are anticipated.

#### ***Impact Conclusion***

The Goshen Warm Springs Alternative would have negligible impacts to Goshen Warm Springs groundwater.

### **FES Alternative**

#### ***Impact Analysis***

The septic system would increase the groundwater concentration of constituents associated with waste water, such as nitrates and bacteria. However, any septic tank and drainfield would be installed according to the requirements of the Bear River Health Department and associated State regulations to ensure it functioned properly. Proper installation and periodic maintenance and cleanout would ensure that the septic system impacts to groundwater were minimized. The drainfield poses little risk to the wells presently used at the FES because these wells are much deeper than the anticipated depth of the absorption field.

#### ***Cumulative Impacts***

Cumulative impacts to groundwater include additional septic discharge to the shallow, unconfined aquifer from the septic system in combination with the existing septic system.

### ***Mitigation Measures***

Coordination with the Bear River Health Department for design and permitting of the absorption field will minimize the impacts of the septic system on the shallow groundwater aquifer.

### ***Impact Conclusion***

The FES Alternative would have negligible impacts to groundwater in the FES Project Area.

## **Surface Water**

### **No Action Alternative**

Under this alternative, there would be no changes to Goshen Warm Springs or the FES; therefore, there would be no impact to surface water flow or water quality at either location.

### **Goshen Warm Springs Alternative**

#### ***Water Quantity***

##### **Impact Analysis**

The Interim Facility would require approximately 2.7 cubic feet per second (cfs) to be diverted from a side spring flow channel that feeds the South Canal (Figure 1-3). Pumping limitations would leave some water in the side channel, but this amount would most likely be minimal compared with the current flow. An estimated 20 feet of the side channel would be left with very limited flow. An estimated 400 feet of the South Canal would be subsequently affected by reduced flow of 2.7 cfs, since the proposed flow return point/effluent discharge point would be approximately 400 feet downstream from the side channel. Consumptive losses related to Interim Facility operations are expected to be minimal, with the diverted water re-entering the South Canal at the return point.

Because the South Canal is a gaining reach, the reduction in flow would be greatest at the upstream end of the flow-impacted reach and decrease as additional flow is gained downstream. Immediately below the confluence of the side channel and the main South Channel, flow would be reduced from an estimated 4.5 cfs to approximately 1.8 cfs; while nearer to the point of return flow from the proposed Interim Facility, South Canal flow would be reduced from an estimated 8.4 cfs to approximately 5.7 cfs. At the point of return from the Interim Facility, flows would not be expected to differ from current conditions. However, canal water depth would decrease in the section affected by flow reductions. Since the South Canal is uniform and rectangular, effects on wetted width are expected to be minimal. The trapezoidal/rectangular shape of the South Canal is the result of canal construction and dredging, not natural alluvial channel-forming processes. Therefore, the reduction in flow is anticipated to have few, if any, impacts on channel morphology.

Stormwater runoff may also increase with increased impervious area as, described previously. The increase in imperviousness would increase the runoff coefficient of the land area contributing to the North and South Canal systems, which could cause the hydrology of the canals to become “flashier” (i.e., the magnitude of flow peaks may increase and flows may respond to storm and runoff events more quickly). However, the overall effect of the Interim Facility on runoff characteristics is expected to be relatively minor. Under existing conditions, the runoff coefficient of the land surface is probably quite high, as is typical of desert areas with rocky, thin soils and sparse vegetation.

Construction of the proposed Interim Facility and the gravel roads would increase impervious surface area within the drainage area that contributes to additional surface runoff to the canal systems, an indirect impact to the surface water flow conditions at Goshen Warm Springs.

### **Cumulative Impacts**

The new, impervious surfaces would add to the existing impervious surfaces associated with the Tintic Mill complex and may cause a minor cumulative impact by contributing to excess stormwater runoff by increasing the runoff coefficient within the Goshen Warm Springs Project Area. Similarly, if a new permanent Production Facility were to be constructed at Goshen Warm Springs, the impervious surfaces associated with it could contribute to stormwater runoff. However, the elimination of grazing within the Wildlife Management Area has most likely improved vegetation condition and reduced soil compaction, thus lowering the runoff coefficient. These improvements may offset the impacts resulting from the increase in impervious area associated with the Interim Facility or the Production Facility.

Additionally, a new permanent Production Facility would result in an additional 0.5 mile of the South Canal being affected by decreased water levels. During the relatively short period of time that both facilities were operational, a greater level of water reduction would be likely along the 400-foot section of the South Canal affected by the Interim Facility, since both facilities would be withdrawing water. This impact would be temporary, however, assuming that the Interim Facility would cease fish-rearing operations when the Production Facility was fully functional, since the water supply at the South Canal is not sufficient to provide for both the Production Facility and the Interim Facility simultaneously.

### **Mitigation Measures**

An SWP3 that implements short- and long-term BMPs during and after construction will reduce the effects of increased imperviousness on the hydrology of the North and South Canals.

### **Impact Conclusion**

Returning water to the South Canal as close to the intake point as possible would reduce the length of canal affected by reduced flows, decreasing overall impacts to the system. Therefore, while moderate impacts to water flow in the main canal between the side canal and the return-flow point are expected, the overall effect on the larger existing pond-and-canal system at Goshen Warm Springs is anticipated to be negligible.

## **Water Quality**

### **Impact Analysis**

The primary water quality concern is that effluent from the proposed Interim Facility that is discharged into the South Canal potentially may carry elevated levels of total suspended solids (TSS), total dissolved solids, and nutrients (e.g., ammonia, nitrogen, and phosphorus). Increased nutrient levels may enhance eutrophication of the South Canal, a phenomenon that can create anoxic conditions leading to habitat loss and, in extreme cases, fish kills. However, water used in the Interim Facility will be oxygenated to raise dissolved oxygen (DO) to levels of at least 5 mg/L for successful fish rearing (J. Valentine 2003, pers. comm.), which would help address potential anoxia concerns. Hatchery effluent also may contain chemicals used in the fish-rearing process. These chemicals include nitrofurazone, uniodized salt, formalin, benzoalkonium chloride, chlorine, and hyamine. Other potential water quality concerns associated with hatchery effluent include aesthetic impacts such as odor or visible foam. Direct water quality impacts associated with effluent discharge would be limited to the portion of the South Canal downstream from the proposed return point.

The State of Utah has a General Permit authorizing the discharge of effluent for fish hatcheries under the Utah Pollutant Discharge Elimination System. The Interim Facility would likely be covered by this General Permit, which includes several water quality monitoring conditions: TSS, pH, flow, and the presence of foam and/or visible solids are all required to be reported to the Department of Environmental Quality, Division of Water Quality (UDEQ) on a monthly basis. Dissolved oxygen, chemicals used in the fish-rearing process, and other water quality constituents are not required to be monitored under this General Permit since these constituents have not proven to be a water quality issue for hatcheries (H. Campbell 2003, pers. comm.). Only one Utah hatchery, the Midway facility, monitors nutrients (phosphorus). The Midway monitoring requirement was instituted because it discharges into tributaries of Deer Creek Reservoir, which has concerns with algal blooms and provides culinary water for the Wasatch Front. Goshen Warm Springs is not managed as a culinary water supply, as described in Chapter 3.

A recent study of a Texas warm-water hatchery indicated that effluent had little impact on downstream water quality, in part because the effluent was discharged into a flowing stream that subsequently diluted the effluent and reduced the concentrations of pollutants (Fries and Bowles 2002). At Goshen Warm Springs, dilution would occur because the South Canal is a gaining reach and seeps contribute to flow downstream from the potential site of the Interim Facility. Thus, direct discharge of the effluent may not cause impairment of the receiving water body.

At Goshen Warm Springs, sampled phosphorus levels are below detection limits, suggesting that existing phosphorus concentrations are quite low. The Goshen Warm Springs Alternative could introduce increased amounts of phosphorus or other nutrients into the system (e.g., through effluent discharge), leading to enhanced aquatic vegetation growth downstream. However, the South Canal is a gaining reach and would naturally dilute effluent. This process, as well as the small size of the facility and its small amount of

discharge relative to the flow in the South Canal, minimize the potential for impacts to the South Canal system from phosphorus input.

A settling basin or tank would provide a primary treatment method for hatchery waste. The Interim Facility would drain fish waste to a 1,200-gallon concrete vault where it would decompose. Liquid exiting this vault would combine with the full flow from the facility. The discharge from the vault would be intermittent, occurring only when tanks are being cleaned and generating only minor flow of waste water (E. Larson 2002a, pers. comm.). Because solid wastes would settle out and decompose in the settling tank, effluent would only contain dissolved, not sediment-attached, nutrients.

Impacts from the chemicals used in the fish-rearing process are largely unknown and unregulated, except for chlorine; chlorine is regulated for 3D streams on a site-specific basis (UDEQ 1999). However, since these chemicals are used in the fish rearing process, their application by nature is at concentrations sufficiently low to avoid harming fish. While these materials may be found in the discharge water, expected concentrations would be low enough to meet water quality beneficial use criteria.

Facility construction and road improvements may indirectly affect water quality by contributing sediment to Goshen Warm Springs and South Canal, particularly during construction when the ground is disturbed. Road usage may generate additional sediment that could enter the South Canal either as airborne dust particles or in stormwater runoff.

Selenium levels measured from water samples from the Goshen Warm Springs system raise concern for the feasibility of rearing fish at Goshen Warm Springs. Other metals concentrations appear to be within the limits for successfully culturing fish. The Goshen Warm Springs Alternative would not be anticipated to measurably increase concentrations of selenium or other metals in the South Canal. Concerns with selenium uptake and potential fish impacts would be minimized through the use of artificial food.

### **Cumulative Impacts**

The effluent, combined with potentially increased stormwater runoff, may contribute to cumulative water quality impacts, particularly eutrophication when combined with nutrient and sediment inputs associated with runoff from the existing dirt road. The effluent discharge associated with the Interim Facility may exacerbate existing water quality issues caused by past disturbances from any grazing activity and surface runoff. Water quality sampling has also found elevated levels of aluminum and selenium within the south-flowing portion of the Goshen Warm Springs system. If improvements to the north access road occur and cause increased runoff through areas of contaminated sediments from the Tintic Mill area, the proposed Interim Facility may increase metal concentrations in the north-flowing canal system.

The Interim Facility could lead to additional cumulative impacts if a permanent Production Facility is eventually constructed at Goshen Warm Springs. During the relatively short period of time when both facilities were operational, both hatcheries could be discharging into the South Canal, potentially increasing nutrient and solids loading. However, both facilities would treat their effluent, so the impact would be

expected to remain minimal. The Interim Facility would not be expected to add incrementally to any water quality impacts from the Production Facility.

The elimination of any grazing that may have occurred prior to the Division assuming management of the site as a Wildlife Management Area has likely had a positive cumulative impact on water quality, as a result of decreased levels of fecal matter and sediment entering the canal system.

Utah Lake is the subject of a proposed Total Maximum Daily Load (TMDL) study to identify levels of potential pollutants that will be allowed to be discharged into waters draining into Utah Lake. One of the constituents of concern in Utah Lake is phosphorus (UDEQ 2002). Consequently, it is possible that the TMDL study will identify discharge levels for phosphorus (or other constituents) that will be permitted in the Utah Lake watershed. Since South Canal waters eventually flow into the marsh at the southern end of Utah Lake, the discharge permit for the Interim Facility could consequently be affected by the results of the TMDL study and additional monitoring or other required effluent treatment.

### **Mitigation Measures**

The Interim Facility will require a discharge permit since the proposed production in pounds of fish exceeds the State's permit threshold. The permit will include requirements to ensure that effluent meets water quality standards, including monthly monitoring for constituents such as pH, temperature, and TSS, and checks for visible solids and foam. Monitoring reports will be required to be submitted to the UDEQ.

Stormwater runoff controls are also recommended mitigation measures. An SWP3 that implements BMPs as described previously will help reduce the amount of onsite erosion as well as prevent sediment from reaching the water body (USEPA 2003b).

### **Impact Conclusion**

Overall, with the inclusion of these mitigation measures, the Interim Facility is expected to result in minimal negative impacts on water quality at Goshen Warm Springs.

## **FES Alternative**

### ***Water Quantity***

#### **Impact Analysis**

Because the FES Alternative would utilize the existing amount of water drawn from existing artesian wells, and because the Interim Facility would utilize a septic tank/leach field system to treat effluent, no impacts to the water supply in the Swift Slough are anticipated.

### **Cumulative Impacts**

The new, impervious surfaces would minimally add to the existing impervious surfaces associated with the existing facility. This may cause a negligible cumulative impact by contributing to excess stormwater runoff as a result of a slight increase in the runoff coefficient within the FES Project Area.

### **Mitigation Measures**

The use of short- and long-term stormwater BMPs during and after construction will reduce the effects of increased imperviousness on the hydrology of the Swift Slough.

### **Impact Conclusion**

With the application of mitigation measures, no impacts are anticipated to the Swift Slough water system.

### ***Water Quality***

#### **Impact Analysis**

Since the FES Alternative includes treatment of effluent through a septic tank/leachfield system, no additional direct discharge to Swift Slough would occur. A malfunctioning septic system could result in untreated effluent entering groundwater and flowing into the slough. However, as previously described the septic system would be installed according to Health Department regulations and would be periodically maintained and cleaned. The anticipated water quality impact to Swift Slough would be negligible.

Interim Facility construction could indirectly affect water quality by contributing sediment to Swift Slough, particularly during construction when the ground is disturbed. Sediment could enter the slough either as airborne dust particles or in stormwater runoff.

Because the FES Alternative includes a recirculating water system, water used in June sucker rearing tanks will be treated with an ultraviolet system and sand filters to control dissolved ammonia levels and other water constituents potentially detrimental to fish rearing. Additionally, approximately 5 to 10 percent of the water in the recirculating system will be replaced daily with fresh water to help maintain water quality levels (D. Routledge 2003b, pers. comm.).

### **Cumulative Impacts**

Potentially increased stormwater runoff may negligibly contribute to cumulative water quality impacts, particularly eutrophication when combined with nutrient and sediment inputs associated with runoff.

### **Mitigation Measures**

A stormwater pollution prevention program that implements BMPs as described previously will help reduce the amount of onsite erosion and prevent sediment from reaching the Swift Slough (USEPA 2003b).



## **Impact Conclusion**

With the inclusion of mitigation measures, the FES Alternative is expected to result in no impacts to water quality.

## **Water Rights**

Since the use of water for the Interim Facility is expected to be almost entirely nonconsumptive and because water would be returned to the system upstream of any diversion points, there would not be any direct, indirect, or cumulative impacts to water rights at either Goshen Warm Springs or the FES. No additional water withdrawals would be required for the FES Alternative. The Commission owns a water share at Goshen Warm Springs that is likely sufficient to provide for the minimal consumptive water uses expected as a result of the Interim Facility. If the Interim Facility were to be operated at Goshen Warm Springs, the proper authorization for consumptive and non-consumptive use of water would be required from the Utah Division of Water Rights.

## **Air Quality**

Construction and operation of the Interim Facility would have no effect on local or regional air quality at either the FES or Goshen Warm Springs sites. Ground disturbance at either location would be minimal (less than 2.5 acres at Goshen Warm Springs and approximately 0.1 acres at the FES). Although there would be some fugitive dust produced during construction, emissions during construction and operation would be negligible.

## **Wetlands and Vegetation**

### **No Action Alternative**

Under this alternative there would be no changes to Goshen Warm Springs or the FES, or additional ground-disturbing activities; therefore, there would be no change in either Project Area's vegetation.

## **Goshen Warm Springs Alternative**

### ***Impact Analysis***

#### **Riparian-wetland Plant Community**

Construction of the Interim Facility at Goshen Warm Springs could have minor direct impacts to wetlands adjacent to the South Canal through excavation and fill required for the pump housing and inlet and outlet piping. This impact would likely involve no more than 50 to 100 square feet of riparian disturbance.

There is a potential for impacts to wetlands adjacent to the site of the proposed Interim Facility from widening and grading of the access road from the north. However, if road improvements occur to the east of the current roadway, in places where the roadway borders wetlands, such impacts would be avoided. There is a lesser chance of wetland impacts by providing access from the south since the roadway would likely come through more upland areas.

Road construction, excavation, soil transport, and other land-disturbing activities can cause excess sediments to be transported in surface runoff that could enter the wetland system. This could affect wetlands by damaging vegetation and filling in depressions. Excess sediment can overwhelm a wetland's natural capacity for filtration, resulting in suspended sediment being transported into flowing aquatic systems and causing impacts to invertebrates and fishes. Consequently, the Goshen Warm Springs Alternative could have minor indirect impacts to existing wetlands.

#### **Semi-desert Upland Community**

The Interim Facility would impact the Goshen Warm Springs upland plant communities through the removal of existing vegetation as a result of road or building construction. Approximately 1.4 acres of upland vegetation would be permanently impacted by the construction of the Interim Facility with the access road from the north, 1.2 acres lost to road widening as described previously and 0.2 acre lost to the footprint of the facility and parking area. Approximately 1.2 acres of upland vegetation would be permanently impacted if the Interim Facility was accessed from the south, 1.0 acre lost to road widening and 0.2 acre lost to the footprint of the facility and parking area. The semi-desert upland community extends throughout the flanks of Warm Spring Mountain, and the permanent loss of less than 2 acres of this community would be a negligible adverse impact.

The Goshen Warm Springs Alternative could indirectly impact the existing Project Area vegetation through the increased use leading to vegetation disturbances in addition to vegetation directly disturbed by construction and operation of the Interim Facility. Again, this would have a negligible effect on the upland vegetation community.

### **Noxious Weeds**

Noxious weeds, including knapweed (*Centaurea* sp.) and thistle (*Cirsium* spp.), occur in scattered patches throughout the Goshen Warm Springs Project Area, with most dense occurrences in disturbed soil areas. Ground disturbance could facilitate further invasion of these species or the introduction of new noxious species.

### **Cumulative Impacts**

Grazing prior to 1986 and construction and maintenance of the existing road providing access to Goshen Warm Springs likely resulted in some impact to wetland areas, although the exact extent is not known. Additionally, construction, dredging, and maintenance of the existing canal system also resulted in some areas of wetland impact. The Goshen Warm Springs Alternative includes use of the existing roadways, with the proposed hatchery itself constructed in an upland portion of the Project Area. As a result, the Interim Facility would not result in cumulative impacts to wetlands.

The upland vegetation disturbed as a result of the construction of the Interim Facility would add to the areas previously disturbed through the use of the Tintic Mill and previous public access to Goshen Warm Springs, but the area of this upland disturbance would not be significant given the amount of upland that would remain undisturbed. This would remain the case even if a new, permanent Production Facility were to be located at Goshen Warm Springs. The Production Facility would result in cumulative effects to wetlands, due to wetlands impact from installing its intake pipe (likely from Pond A – see Figure 1-3). The area of wetland impacted due to the Production Facility intake pipe construction is anticipated to be no more than 200 square feet.

### **Mitigation Measures**

If the north access road is improved, excavation and improvements will be on the road side away from the riparian-wetland community associated with the canal to avoid wetland impacts. If siting cannot avoid wetland impacts, a Section 404 permit will be obtained for unavoidable placement of fill or dredged material in riparian-wetlands. Any unavoidable impact will be mitigated in accordance with the Section 404 permit and ensure no net loss of riparian-wetland areas.

Use of BMPs will alleviate potential sedimentation problems by preventing sediment from entering riparian wetlands and the South Canal (USEPA 2003b).

Disturbance to upland plant communities that are not within the footprint of the road or Interim Facility will be mitigated through revegetation with plant species that provide erosion control, water conservation, and wildlife habitat. Such revegetation will include native species to the extent practicable.

A program for controlling noxious and invasive weed species will be developed including specific techniques for controlling noxious weeds and pests during construction.

### ***Impact Conclusion***

With the use of these mitigation measures, the Interim Facility is anticipated to have a minimal impact on upland vegetation communities and a negligible effect on wetlands and riparian communities.

### **FES Alternative**

#### ***Impact Analysis***

##### **Upland Landscaped Vegetation Community**

The proposed addition to the existing June sucker building would impact approximately 0.1 acre of landscaped turf for the Interim Facility footprint and construction staging. This impact would be negligible.

The FES Alternative could indirectly impact existing vegetation through the increased use of the Project Area leading to vegetation disturbances, in addition to vegetation directly disturbed by construction. Again, this would be a negligible impact.

##### **Wetland Vegetation Community**

As described in Chapter 2, the Interim Facility would be sited and constructed to avoid the existing wetland area. As such, there would be no impact to wetlands. The U.S. Army Corps of Engineers (Corps) has concurred with this determination (see letter from the Corps, Appendix B).

Excavation, soil transport, and other land-disturbing activities could cause excess sediments to be transported in surface runoff that could impact wetlands associated with Swift Slough. Consequently, the FES Alternative could have negligible indirect impacts to existing wetlands and the slough to the north of the property.

##### **Noxious Weeds**

Although no noxious weeds were found in the FES Project Area, ground disturbance could facilitate invasion of such species.

##### ***Cumulative Impacts***

No cumulative impacts to wetlands as a result of the FES Alternative would be anticipated.

##### ***Mitigation Measures***

Use of BMPs should alleviate potential sedimentation problems by preventing sediment from entering wetlands and the slough to the north (USEPA 2003b).

Disturbance to upland plant communities that are not within the footprint of the Interim Facility will be mitigated through revegetation with native plant species that provide erosion control and water conservation.

A program for controlling noxious and invasive weed species will be developed including specific techniques for controlling noxious weeds and pests during construction.

### ***Impact Conclusion***

With the use of these mitigation measures, the Interim Facility is anticipated to have a negligible impact on upland vegetation communities and no effect on wetlands and riparian communities.

## **Floodplains**

No designated floodplains exist at either the Goshen Warm Springs (NFIP 2002) or FES Project Areas (NFIP 1984).

## **Fisheries**

### **No Action Alternative**

Under this alternative, there would be no changes to Goshen Warm Warm Springs or the FES; therefore, there would be no impacts on the existing fish populations at either Project Area.

### **Goshen Warm Springs Alternative**

#### ***Impact Analysis***

Construction of the Interim Facility would involve earth-moving activities that could introduce more sediment into aquatic communities and consequently lower primary productivity and invertebrate drift in the Southcanal. Additionally, once the sediment has become deposited it reduces the amount and diversity of invertebrate habitat. A reduction in invertebrate density or diversity can result in changes to the fish community. High levels of suspended and deposited sediment can directly affect fish communities by reducing spawning and rearing habitat, decreasing reproductive success, and in extreme cases, causing fish to abandon the area (Waters 1995). All of the species present, except Utah chub, are nonnatives, and the system itself is an artificially constructed pond and irrigation channel. Therefore, any impacts to the pond and channel are unlikely to impact a valuable aquatic resource.

An estimated 400 feet of the South Canal will be affected when the 2.7 cfs of water in the side channel is diverted to the Interim Facility. The South Canal will not be completely dewatered at any point because of flow from above the side channel and seeps, and groundwater discharge below the side channel. As noted in the Surface Water section, depth will decrease in the section affected by flow reductions but effects on wetted width and channel morphology are expected to be minimal. Therefore, little change is anticipated to the existing aquatic community within that 400 feet.

Water utilized in Interim Facility operations would be returned to the canal as effluent. The effluent has the potential to impact the water quality of the system as described previously, although major changes in the water quality of the canal below the effluent discharge are not expected. The most likely negative impact is increased phosphorus, which could cause increased primary productivity, or eutrophication. Most of the species present in the Goshen Warm Springs Project Area are fairly tolerant to such nutrient changes, and the only native fish in the system, the Utah chub, thrives under disturbed conditions (Sigler and Sigler 1996). Impacts of warm-water fish hatchery effluents on aquatic communities have not been well documented, but Fries and Bowles (2002) showed that the effluent entering the San Marcos River near San Marcos, Texas, from a warm-water sport fish hatchery had little impact on downstream water quality and the benthic community.

The nonnative fishes and invertebrates inhabiting Goshen Warm Springs also have the potential to be entrained into the proposed Interim Facility's intake water. Two concerns arise from this possibility: the potential for the nonnative species to be moved with the cultured fish to a new locale and the potential of disease, parasite transfer, and spread from the species inhabiting Goshen Warm Springs to the fish in the Interim Facility, which could then pass these on to organisms in receiving waters. Of particular concern is the nonnative red-rimmed melania snail (*Melanoides tuberculata*). The red-rimmed melania snail is a known host to several human and fish parasites, including the fish gill parasite *Centrocestus formosanus*, a trematode worm that burrows into the gill filaments of fish. *C. formosanus* has infected 39 species of fish in native waters and fish hatcheries of Mexico; in the United States, it has infected fish in Florida and Texas. Recently, *C. formosanus* was found infecting speckled dace (*Rhinichthys osculus*) at Gandy Warm Springs near Gandy, Utah (Division 2003b), and western mosquitofish at Goshen Warm Springs (Division 2003c). The parasitic trematode worm has infected 14 species of fish, including channel catfish (*Ictalurus punctatus*), largemouth bass (*Micropterus salmoides*), and the federally endangered fountain darter (*Etheostoma fonticola*) in the Comal River, Texas (Mitchell et al. 2000, Mitchell et al. 2002). At high infection levels gill damage can be severe and even life-threatening to fountain darters (Mitchell et al. 2000), but areas of the Comal River where fountain darters have high parasite loads maintain stable populations of fountain darter under favorable environmental conditions. Additional laboratory experiments have shown that the susceptibility of fish to infection and the damage inflicted by the parasite appear to vary among species (Mitchell et al. 2002).

The trematode worm damages gill filaments while residing in the fish, and heavy parasite loads can kill fish (USFWS 2002). The red-rimmed melania snails are parthenogenic livebearers, and newly born snails are around 0.06 inches long (T. Brandt 2002, pers. comm.). The parasitic flukes are even smaller (0.007 x 0.001 inch) (T. Brandt 2002, pers. comm.).

The preliminary Interim Facility plans include screening the intake area to prevent the entrainment and introduction of nonnative fishes, but *C. formosanus* and newly born red-rimmed melania snail are much smaller than all but the egg stages of the fishes present in Goshen Warm Springs. However, the San Marcos fish hatchery has never found a specimen of red-rimmed melania snail in the hatchery despite the

snail being present in the river from where they draw their water (L. Fries 2002, pers. comm.). They attribute this result to lining the hatchery ponds and performing regular inspections for snails. Regular fish health inspections have shown no sign of *C. formosansus* on hatchery-reared fish. A routinely used fish prophylactic treatment, the chemical praziquantel (trade name Droncit™), has been shown to be effective at killing trematodea, including species of *Centrocestus* (Plum and Rogers 1990; Woo 1995; C. Wilson 2002, pers. comm.).

June sucker would be the only species raised in the Interim Facility, and the susceptibility of June sucker to infection by *C. formosanus* is unknown. All June sucker reared at the Interim Facility would be stocked into Utah Lake. Therefore, Utah Lake would have to have an acceptable environment to support *M. tuberculata* in order for the snail and associated trematode parasite to become established in the lake and its tributaries, and spread the infection. Preliminary findings of a study evaluating temperature effects on *M. tuberculata* showed that the snail did not survive prolonged periods (12 days) at temperatures below 13 degrees C and that all snails died within 48 hours when facing temperatures less than 10 degrees C (T. Brandt 2003, pers. comm.). Temperature data collected at several areas in Utah Lake in 1990-1991, showed temperatures between 6 and 7 degrees C in November and temperatures near 0.5 degrees C in January (EPA 2003b). The low temperatures in Utah Lake should prevent the establishment of *M. tuberculata* and *C. formosanus*, but appropriate precautions should still be taken to prevent infection of fish in the hatchery and transportation of any infected fish from the hatchery.

### **Cumulative Impacts**

The natural community of the spring system has already been irrevocably altered by changing the system into an irrigation supply system and through the proliferation of a number of nonnative species.

### **Mitigation Measures**

Use of construction BMPs will alleviate potential sedimentation problems by preventing sediment from entering the canal.

Since prevention of the spread of nonnative organisms and pathogens is a major concern for the Interim Facility, the hatchery intake will be screened to prevent introduction of organisms from the spring into the hatchery and escapement of hatchery organisms into the spring system. The turbulent fountain design used at the Loa fish hatchery should be effective at preventing fish entrainment and escape. However, if practicable, the mesh size of the screens will be made small enough to prevent introduction of the smallest size classes of red-rimmed melania snail.

The Interim Facility will maintain a State of Utah fish health certification to help prevent disease spread. This certification will be obtained before any fish are stocked in Utah Lake.

To ensure that nonnative snails and their pathogens are not cultivated or dispersed by the Interim Facility, a consistent cleaning and snail monitoring protocol will be developed and implemented. If snails become

a problem within the Interim Facility, then hatchery water will be treated with copper sulfate, or some other molluscicide (Woo 1995), to prevent snails from becoming established in the hatchery and perpetuating parasite infections. Fish set to leave the Interim Facility will be inspected for parasites and treated for parasites with praziquantal and other prophylactic treatments to ensure that they are disease and pathogen free.

### ***Impact Conclusion***

Flow reduction from approximately 4.5 cfs to 1.8 cfs in approximately 400 feet of the South Channel will have a negligible impact on the existing aquatic populations because impacts to wetted width and channel morphology are expected to be minimal. As such, no change is anticipated to the existing aquatic community within that 400 feet of reduced surface flow. Effluent discharge is not anticipated to negatively affect existing fish or invertebrate populations. Implementing mitigation measures to control sedimentation, and intake of existing fish and parasite hosts will ensure negligible effects to Goshen Warm Springs system community and provide negligible opportunities to indirectly affect other aquatic communities. While there are concerns regarding the potential impacts of spreading nonnative species as a result of Interim Facility operations, the mitigation measures and experiences at other hatcheries have shown that these concerns can be addressed and such impacts are anticipated to be minor.

### **FES Alternative**

#### ***Impact Analysis***

Construction of the Interim Facility has a limited potential to lead to sediment transport to Swift Slough. The amount of sediment loading would not be expected to affect primary production, invertebrate drift, or fish habitat and health.

Water utilized in current hatchery operations is returned to the slough as effluent. The effluent has the potential to impact the water quality of the system. However, the proposed septic system and leach field should prevent any effluent from the proposed Interim Facility from influencing water quality and the biological community of the slough.

Escapement of June sucker into the Swift Slough could impact its current biological community. However, screening the rearing tank outflows and routing the effluent through a septic system should prevent escapement of fish from the facility (D. Routledge 2003a, pers. comm.).

Stocking June sucker is likely to have some impact on the current aquatic communities in those areas where they are released, but the impacts should hopefully return the system to a more natural state. However, stocked fish have the potential to transmit any contracted disease and parasites from the hatchery facility to a new locale, as described previously under the Goshen Warm Springs Alternative.



### ***Cumulative Impacts***

No cumulative impacts are anticipated.

### ***Mitigation Measures***

Use of BMPs will alleviate potential sedimentation problems by preventing sediment from entering Swift Slough (USEPA 2003b).

Stocked fish will be inspected for parasites and treated for parasites with praziquantal and other prophylactic treatments to ensure that they are disease and pathogen free. Additionally, the Interim Facility will maintain a State of Utah fish health certification to help prevent disease spread. This certification will be obtained before any fish are stocked in Utah Lake.

### ***Impact Conclusion***

With this mitigation, the Interim Facility is anticipated to have a negligible impact on the aquatic community of Swift Slough.

## **Wildlife**

### **No Action Alternative**

Under the No Action Alternative there would be no additional human-related activities or ground disturbance that would alter existing wildlife habitat components or disturb resident wildlife at either Goshen Warm Springs or the FES. As such, there would be no effect on existing wildlife resources at either location.

### **Goshen Warm Springs Alternative**

#### ***Impact Analysis***

Changes in the amount and quality of available habitat were assessed based on the type and extent of area that would be affected by the construction and placement of the Interim Facility, utilities installation, and road development and widening.

#### **General Wildlife and Habitats**

Approximately 1.4 acres of upland habitat would be disturbed and lost through construction and operation of the Interim Facility. Abundant upland habitat occurs on the flanks of Warm Springs Mountain, and the habitat loss would be negligible. Project implementation would increase human-related activity within the Goshen Warm Springs Project Area through increased vehicle traffic and operational activities. Such disturbance would be localized. The general wildlife community is not expected to be displaced through such disturbance, nor would disturbance affect critical life cycle functions (e.g., breeding, nesting). Mule

deer high-priority winter range is designated for the upper flanks of Warm Springs Mountain, within 1,000 feet of the proposed Interim Facility. Mule deer use of the adjacent range appears to be infrequent and limited. Construction activities may temporarily disturb locally browsing deer, but general operational activities are not expected to displace mule deer use.

No active or inactive raptor nests are known within the Goshen Warm Springs Project Area; thus, no impact on nesting raptors is anticipated. Overhead power lines could be installed to provide power to the Interim Facility, potentially resulting in raptor mortality through electrocution of perching birds. Such mortality would be a moderate impact.

### **Sensitive Species**

The bobolink (*Dolichonyx oryzivorus*) is not known to occur within the Goshen Warm Springs Project Area, and the Interim Facility would not affect this open grassland-nesting bird. Although not known to reside in the Goshen Warm Springs Project Area, suitable habitat does exist in the riparian corridor for nesting yellow-billed cuckoo (*Coccyzus americanus*) and common yellowthroat (*Geothlypis trichas*). Because there is no anticipated loss of forested or shrub riparian habitat, the Goshen Warm Springs Alternative would not affect these two species.

Suitable habitat for short-eared owl (*Asio flammeus*) exists throughout the Goshen Warm Springs Project Area, but no short-eared owls are not known to occur in the area. Loss of less than 2 acres of suitable habitat would not affect any resident short-eared owls, nor would operational activities be expected to displace nesting or hunting activities. Peregrine falcon (*Falco peregrinus anatum*) have not historically nested in the Goshen Warm Springs Project Area, and no known Swainson's hawk (*Buteo swainsoni*) nests occur within the Goshen Warm Springs. Therefore, the Goshen Warm Springs Alternative would not affect nesting of either species. Both species could hunt within the general area and could potentially be attracted to overhead power lines for perching. Such perches can result in electrocutions and, while such mortality would be rare, it is still considered a moderate adverse impact.

No suitable habitat for the Townsend's big-eared bat (*Plecotus townsendii*) occurs within the Goshen Warm Springs Project Area, so this species would not be affected.

The Columbia spotted frog (*Rana luteiventris*) potentially occurs in wetlands and the canal/pond system adjacent to the Goshen Warm Springs Project Area, although no occurrences have been documented. Since the Interim Facility is not anticipated to effect overall riparian-wetland habitat, it would not effect the species through loss of habitat or high mortality. The Interim Facility would increase vehicle traffic on the access road adjacent to the canal's riparian corridor. If the species was present, it is possible that passing vehicles could cause rare mortalities. Such mortality would be highly infrequent and would not affect any local population viability.

### ***Cumulative Impacts***

Previous habitat degradation as a function of past and present actions associated with the existing Tintic Mill, the existing access road through the Goshen Warm Springs Project Area, and grazing has historically occurred, although not since 1986. The Interim Facility would add incrementally to this existing disturbance but on such a small scale that any cumulative impact to general wildlife or sensitive species would be negligible.

Since 1986 the Division has managed the site as a Wildlife Management Area, a beneficial cumulative effect for wildlife.

If a permanent Production Facility were to be located at Goshen Warm Springs, the long-term loss of upland vegetation/wildlife habitat could increase to approximately 51 acres, which would be a minimal cumulative impact.

### ***Mitigation Measures***

Power lines will be designed to minimize the risk of any raptor electrocutions by including vertical phase separation of the lines or raptor perches on top of the power polls (APLIC 1996). Additionally, any widening as a part of road construction will occur into the hill slope to reduce the potential of impacts to riparian habitat.

### ***Impact Conclusion***

Through the use of these mitigation measures anticipated impacts to wildlife resources are expected to be negligible.

### **FES Alternative**

#### ***Impact Analysis***

Changes in the amount and quality of available habitat were assessed based on the type and extent of area that would be affected by the construction of the facility.

#### **General Wildlife and Habitats**

Approximately 0.1 acre of landscaped turfgrass habitat would be disturbed and lost through construction and operation of the Interim Facility, a negligible habitat loss. The riparian habitat along the slough to the north of the existing facility would not be directly impacted as a result of the FES Alternative. Construction activity within the FES Project Area could result in a temporary disruption to nesting or foraging in the area, but this impact would be expected to be localized and short term. Such impact would consequently be negligible.

No active or inactive raptor nests are known within the FES Project Area; thus, no impact to nesting raptors is anticipated. Power would be supplied to the Interim Facility through expansion of existing

underground conduits; consequently, there is no concern with the use of overhead utility lines and raptor mortality. While raptors may utilize undeveloped portions of the existing facility for hunting, ample hunting territory exists in the land surrounding the FES.

### **Sensitive Species**

Although unlikely, the bobolink could occur within the FES Project Area, and approximately 0.1 acre of currently open, turf-grassed land that could be used by the bobolink for foraging would be included in the footprint of the proposed Interim Facility. Ample nesting and foraging habitat would remain in the open lands surrounding the FES facility; consequently, this loss of potential bobolink habitat would be negligible.

Although not known to reside in the FES Project Area, suitable habitat possibly exists in the riparian corridor along Swift Slough for nesting yellow-billed cuckoo and common yellowthroat. Because there is no anticipated loss of riparian habitat, the FES Alternative would not affect these two species.

No short-eared owls or Swainson's hawks are known to nest within the FES Project Area. Both species could use the undeveloped portions of the FES for hunting, but ample hunting territory would remain in the lands surrounding the FES. The FES Alternative would not impact either species.

### **Cumulative Impacts**

The FES has been operated as a hatchery since the mid 1960s, so its habitat value has been limited. The FES Alternative would add incrementally to this existing disturbance but on such a small scale that any cumulative impact to general wildlife or sensitive species would be negligible.

### **Mitigation Measures**

No mitigation measures are proposed.

### **Impact Conclusion**

Anticipated impacts to wildlife resources are anticipated to be negligible.

## **Threatened and Endangered Species**

### **No Action Alternative**

Without construction of the Interim Facility, the desired short-term restocking of Utah Lake June sucker would not occur, and the June sucker production goals of the Revised Hatchery Production Plan (USFWS and Commission 1998) would not be approached. A short-term opportunity to enhance June sucker populations would not be available. This would be a moderate adverse impact.

## **Goshen Warm Springs Alternative**

### ***Impact Analysis***

#### **Wildlife Species**

Neither of the two Federally listed threatened species (Canada lynx and bald eagle [*Haliaeetus leucocephalus*]) are known to occur within the Goshen Warm Springs Project Area. The bald eagle may be a transient winter visitor, but it would not be displaced from any infrequent hunting activities by Interim Facility operations. Thus, the Goshen Warm Springs Alternative would not effect either of these species.

#### **Plants**

Neither the Federally endangered clay phacelia (*Phacelia argillacea*) nor the Federally threatened desert milkvetch (*Astragalus desereticus*) occurs within the Goshen Warm Springs Project Area; therefore, the Goshen Warm Springs Alternative would not affect these species.

The Federally threatened Ute ladies'-tresses (*Spiranthes diluvialis*) potentially exists within the riparian corridor associated with the South Canal, although a recent survey for the plant revealed no evidence of its occurrence (Intermountain Ecosystems LC 2002). Only extremely limited disturbance of any riparian habitat would occur as a result of the Goshen Warm Springs Alternative. Because of the extremely limited opportunity for suitable habitat disturbance and the unlikely occurrence of the species at the location of the Interim Facility, no effect to the Ute ladies'-tresses is anticipated from the Goshen Warm Springs Alternative.

#### **Fish**

The June sucker is a Federally endangered species, and enhancing the recovery opportunity of this species is the purpose of the Interim Facility. As such, its implementation is expected to have an overall beneficial effect to the species.

The elevated selenium concentrations measured in the spring system water supply raised concern that there may be an impact to June sucker reared at the Interim Facility in terms of harmful effects to the fish. A recent study of June sucker reared at Goshen Warm Springs indicated that selenium bioaccumulated to concentrations that were below chronic toxicity levels (USGS 2003). Fish in this study were given artificial feed but had access to naturally occurring zooplankton; June sucker at the Goshen Warm Springs Alternative would be on artificial food only.

#### **Invertebrates**

The only Federally listed invertebrate potentially occurring in Utah County is the Utah valvata snail (*Valvata uatahensis*). This snail historically occurred in Utah Lake, but it is now believed to be extirpated. As such, the Goshen Warm Springs Alternative would not effect this species.

### **Cumulative Impacts**

The Goshen Warm Springs Alternative is not anticipated to have any cumulative negative impacts to threatened or endangered wildlife, invertebrate, or plant species. The proposed Interim Facility would add to the ongoing efforts by the U.S. Fish and Wildlife Service (USFWS), the Commission, the Division, and the June Sucker Recovery Team in attempting to stabilize the June sucker population decline and recover the species to nonthreatened levels. The Interim Facility would contribute to the cumulative efforts to benefit the species.

### **Mitigation Measures**

The use of artificial food sources will help reduce the potential risk associated with bioaccumulation in hatchery-reared fish.

### **Impact Conclusion**

The Goshen Warm Springs Alternative would have no adverse effect on Federally listed threatened or endangered species. This effects determination has been concurred by the USFWS in informal consultation with the Commission. The Interim Facility would have a moderate to major beneficial effect on the June sucker population at Utah Lake through cumulatively adding to the recovery efforts for this species.

### **FES Alternative**

#### **Impact Analysis**

##### **Wildlife Species**

Neither of the two Federally listed threatened species (Canada lynx and bald eagle) are known to occur within the FES Project Area. The bald eagle may be a transient winter visitor, but it would not be displaced from any infrequent hunting activities by Interim Facility operations. Thus, the FES Alternative would not effect either of these species.

##### **Plants**

The Federally threatened Maguires primrose (*Primula maguirei*) does not occur within the FES Project Area; therefore, the FES Alternative would not affect these species.

##### **Fish**

The June sucker is a Federally endangered species, and enhancing the recovery opportunity of this species is the purpose of the Interim Facility. As such, its implementation is expected to have an overall beneficial effect to the species.

##### **Invertebrates**

No Federally listed invertebrate species are identified as potentially occurring on the FES Project Area.

### ***Cumulative Impacts***

The FES Alternative is not anticipated to have any cumulative negative impacts to threatened or endangered wildlife, invertebrate, or plant species. The proposed Interim Facility would add to the ongoing efforts by the USFWS, the Commission, the Division, and the June Sucker Recovery Team in attempting to stabilize the June sucker population decline and recover the species to nonthreatened levels. The Interim Facility would contribute to the cumulative efforts to benefit the species.

### ***Mitigation Measures***

No mitigation measures are proposed.

### ***Impact Conclusion***

The FES Alternative would have no adverse effect on Federally listed threatened or endangered species. This effects determination has been concurred with by the USFWS in informal consultation with the Commission. The Interim Facility would have a moderate to major beneficial effect on the June sucker population at Utah Lake through cumulatively adding to the recovery efforts for this species.

## **Cultural Resources**

### **Indian Trust Assets**

Indian Trust Assets (ITAs) are legal interests in property held in trust by the United States for Federally recognized Indian Tribes or individual Indians. Examples of ITAs include lands, minerals, hunting and fishing rights, and water rights. U.S. Department of the Interior Order 3175 requires that (1) agencies are to consult with Indian tribes when trust property may be affected, and (2) environmental and planning documents should “clearly state that the rationale for the recommended decision will be consistent with the Department’s trust responsibilities.” Implementation of either of the Action Alternatives would not adversely affect any known ITAs and would be consistent with U.S. Department of the Interior trust responsibilities.

### **Tribal Coordination**

There are no known tribal or ethnographic resources in the Goshen Warm Springs Project Area or its immediate vicinity, or in the FES Project Area or its immediate vicinity. Coordination with potentially interested Native American groups has occurred via letters requesting comments and input for the Goshen Warm Springs Alternative. These letters were sent on October 25, 2002, to the Te-Moak Western Shoshone, Duckwater Shoshone, Ute, Confederated Tribes of Goshute Reservation, Paiute Indian Tribe of Utah, Skull Valley Band of Goshute Indians, and Ely Colony Council. Letters requesting comments and input for the FES Alternative were sent on May 3, 2003, to the same organizations, as well as the Northwestern Band of Shoshone Nation, Shoshone Business Council, Shoshone-Bannock Tribes, and

Uintah and Ouray Tribes. The Te-Moak Western Shoshone indicated that the location was outside of their area of concern (J. Bell 2003, pers. comm.). The Paiute Tribe of Utah had no objections to the Project and requested that they receive notification of any updates or Project changes (see letter from Paiute Tribe of Utah in Appendix C). The Shoshone-Bannock Tribe indicated that they would like to review a cultural resources survey report and had questions regarding the amount of ground disturbance, types of vegetation in the FES Project Area, and any impacts to nearby water bodies (see letter from Shoshone-Bannock Tribe in Appendix C).

### **No Action Alternative**

Under this alternative, there would be no changes to Goshen Warm Springs system or the FES; therefore, there would be no effects to existing cultural resources at either Project Area.

### **Goshen Warm Springs Alternative**

#### ***Historic Properties***

The historic Warm Springs Ditch would be negligibly altered to install a pump system, intake pipe, and effluent pipe. About 400 feet of the canal would have reduced flows that would not affect the channel morphology. In terms of the cultural resource value of the canal, these effects would be negligible and would not alter the overall integrity of the historic canal.

The Interim Facility would be at least 1,000 feet downslope and south of the historic Tintic Mill. Any access road improvements would also be downslope and approximately 400 feet from the Tintic Mill. As such, the Goshen Warm Springs Alternative would have no effect on this historic site.

#### ***Archaeological Resources***

No significant archaeological site or site eligible for the National Historic Register is known in the Goshen Warm Springs Project Area. Two quartzite percussion flakes were located southwest of the Goshen Warm Springs Project Area. The proposed Interim Facility is not anticipated to affect archaeological sites.

#### ***Paleontological Resources***

No paleontological resources are known in the Goshen Warm Springs Project Area. However, some potential for buried vertebrate fossils is possible since the Goshen Warm Springs Project Area is in the general location of the Lake Bonneville shoreline. If construction activities unearthed and destroyed vertebrate fossils, the adverse impact would be moderate to major. The likelihood of such an occurrence is small.

#### ***Cumulative Impacts***

No cumulative impacts to cultural resources are anticipated.



### ***Mitigation Measures***

Excavation activities could unearth a previously unknown archaeological site or vertebrate fossils. All contractors involved in construction activities will be required to immediately halt any operations in the area and notify the Utah State Historic Preservation Office (SHPO) and the Utah Geologic Society (UGS), if a possible archaeological site or vertebrate fossil is unearthed. After such notification the site will be evaluated by the Division-appointed archaeologists in coordination with the SHPO, if the find is an archaeological site. If the site contains vertebrate fossils, the paleontologist from UGS will evaluate the find. In either case, appropriate protection measures will be determined after the evaluation.

### ***Impact Conclusion***

The Goshen Warm Springs Alternative will have no effect on eligible historic or archeological sites, or known paleontological sites. Mitigation measures will protect unearthed sites from adverse effects. This determination has been concurred by SHPO and UGS (see letter in Appendix B).

### **FES Alternative**

#### ***Historic Properties***

No historic properties are known for the FES Alternative site.

#### ***Archeological Resources***

No significant archaeological site or site eligible for the National Historic Register is known for the FES site.

#### ***Paleontological Resources***

No paleontological resources are known in the FES Project Area. If construction activities unearthed and destroyed vertebrate fossils, the adverse impact would be moderate to major. The likelihood of such an occurrence is small.

#### ***Cumulative Impacts***

No cumulative impacts are anticipated.

### ***Mitigation Measures***

Excavation activities could unearth a previously unknown archaeological site or vertebrate fossils. All contractors involved in construction activities will be required to immediately halt any operations in the area and notify SHPO and the Utah Geologic Society (UGS), if a possible archaeological site or vertebrate fossil is unearthed. After such notification the site will be evaluated by the Division-appointed archaeologists in coordination with the SHPO, if the find is an archaeological site. If the site contains vertebrate fossils, the paleontologist from UGS will evaluate the find. In either case, appropriate protection measures will be determined after the evaluation.

### ***Impact Conclusion***

The FES Alternative will have no effect on eligible historic or archeological sites, or known paleontological sites. Mitigation measures will protect unearthened sites from adverse effects.

## **Recreation**

The Division does not manage the Goshen Warm Springs Wildlife Management Area for public recreation. Access to the site of the proposed Interim Facility is restricted by locked gates and has been closed to the public since 2002 because of elevated levels of soil, sediment, and water contaminants in the North Canal area and in the vicinity of the Tintic Mill site. Site investigations underway will be completed and the results reviewed before the Division decides to allow public access. The FES is not managed for public recreation and access is also limited. Therefore, there would be no impact to recreational resources as a result of the No Action, Goshen Warm Springs, or FES Alternatives.

## **Land Use**

### **No Action Alternative**

Under this alternative there would be no change to existing land use at either the FES or Goshen Warm Springs Project Areas.

### **Goshen Warm Springs Alternative**

#### ***Impact Analysis***

The Interim Facility would not cause any direct impacts to existing rangeland or grazing since such activities do not occur currently on the Goshen Warm Springs Project Area. Beyond the proposed site itself, existing land uses would not be impacted by the Goshen Warm Springs Alternative. The need for an easement agreement with the private property owner to the south would become necessary if access is provided from that direction.

#### ***Cumulative Impacts***

No cumulative impacts to land use are anticipated.

#### ***Mitigation Measures***

No mitigation measures are proposed.

#### ***Impact Conclusion***

No impacts to land use are anticipated.

## **FES Alternative**

### ***Impact Analysis***

The Interim Facility would not cause any direct impacts to existing rangeland or grazing since such activities do not occur currently at the FES Project Area. Beyond the proposed site itself, existing land uses would not be impacted by the FES Alternative.

### ***Cumulative Impacts***

No cumulative impacts are anticipated.

### ***Mitigation Measures***

No mitigation measures are proposed.

### ***Impact Conclusion***

No impacts to land use are anticipated.

## **Prime and Unique Farmlands**

All of the Goshen Warm Springs Project Area is on State-owned land, managed by the Division for wildlife management. While access to the site of the Interim Facility at Goshen Warm Springs from the south would require an easement across private land, it would occur on an existing roadbed. The FES Alternative site is on State-owned land, also managed by the Division for use as the hatchery facilities. No farmlands occur at either site (see Appendix B letter from the Natural Resources Conservation Service concurring with the lack of farmlands at the FES site). Therefore, no farmlands would be affected by either the Goshen Warm Springs Alternative or the FES Alternative.

## **Socioeconomics**

### **No Action Alternative**

Under this alternative there would be no changes to Goshen Warm Springs or the FES; therefore, there would be no change in existing socioeconomic conditions at either location.

### **Goshen Warm Springs Alternative**

#### ***Impact Analysis***

Construction and operation of the proposed Interim Facility would be anticipated to have a slight beneficial impact in terms of purchases at local retail stores.

The Goshen and Genola communities would not be negatively impacted by the building of this Interim Facility. There would be no direct impact to the local economy, population, or housing markets by the proposed Interim Facility, although there is a possible positive impact because of the potential for employment.

### ***Cumulative Impacts***

No cumulative impacts are anticipated.

### ***Mitigation Measures***

No mitigation measures are proposed.

### ***Impact Conclusion***

There are no anticipated direct or cumulative negative impacts to socioeconomic characteristics of Goshen, Genola, or Utah County as a result of the Goshen Warm Springs Alternative. The Goshen Warm Springs Alternative would be expected to have a slight beneficial, local economic effect on retail sales.

## **FES Alternative**

### ***Impact Analysis***

Construction and operation of the Interim Facility at the FES would result in a slight positive impact to local retailers in terms of purchases. A slight beneficial impact would be expected in terms of employment opportunities. No negative impacts to the local Cache County economy, population, or housing would be anticipated.

### ***Cumulative Impacts***

No cumulative impacts are anticipated.

### ***Mitigation Measures***

No mitigation measures are proposed.

### ***Impact Conclusion***

There are no anticipated direct or cumulative negative impacts to socioeconomic characteristics of the City of Logan or Cache County as a result of the FES Alternative. The FES Alternative would be expected to have a slight beneficial, local economic effect on retail sales.

## **Environmental Justice**

Executive Order 12989, *Environmental Justice*, requires all Federal agencies to identify and address disproportionately high and adverse human health or environmental effects on minority and low-income

populations and communities. Because the Goshen Warm Springs Alternative would be located in a remote area at a minimum of 2 miles from any residences and would remain closed to public use, there would be no expected impact on the human environment. Similarly, because the FES Alternative would be located at the existing facility in Logan and would remain closed to the public, there would be no expected impact on the human environment. No indirect impacts from either the Goshen Warm Springs or FES Alternatives are anticipated either. Therefore, neither of the Action Alternatives would have health or environmental effects on minority or low-income populations or communities as defined in the EPA's Environmental Justice Guidance of 1988.

## **Visual Resources**

### **No Action Alternative**

Under this alternative, there would be no construction or ground disturbance at Goshen Warm Springs or at the FES; therefore, there would be no change in either Project Area's Scenic Quality Ratings or Visual Integrity Levels.

### **Goshen Warm Springs Alternative**

#### ***Impact Analysis***

Construction of a new building would add a new visual element in the landscape. The amount of bare ground would increase because of construction activities and staging, unless revegetation measures are taken. Surfacing the road with gravel would cause a small change in the color palette, but this would only be viewed in the foreground.

#### ***Cumulative Impacts***

The Tintic Mill is readily visible from U.S. Route 6 to the west of the Goshen Warm Springs Project Area. The Interim Facility would not be as visible, since it would be along the South Canal where vegetation would provide some visual buffer and would be lower in elevation than the Tintic Mill. Therefore, the cumulative visual impact from the Goshen Warm Springs Alternative is expected to be negligible.

If the Interim Facility remains standing for a time during and following construction of the Production Facility, there would be a cumulative impact to visual quality since both structures would be visible. Through the use of mitigation measures, this impact would be expected to remain minor.

#### ***Mitigation Measures***

The new facility should be constructed in neutral colors so it does not visually dominate the landscape. Where practicable, disturbed terrain should be revegetated with native plant species following construction.

### ***Impact Conclusion***

The use of mitigation measures renders the impacts to the visual aspect of Goshen Warm Springs negligible.

### **FES Alternative**

#### ***Impact Analysis***

Construction of the addition to the existing building will add a new, minor visual element in the landscape of the same color and character as existing FES buildings. The amount of bare ground would minimally increase as a result of construction activities and staging, unless revegetation measures are taken.

#### ***Cumulative Impacts***

Portions of the existing FES facility are visible from the road. Because of screening vegetation, the proposed addition to the building would not be visible from the road. The proposed addition would be visible from adjacent agricultural property and would be similar in character to the existing hatchery buildings. Therefore, the cumulative visual impact from the preferred alternative is expected to be negligible.

#### ***Mitigation Measures***

The addition should be constructed in neutral colors and a size similar to the colors and size of buildings existing at the site so it does not appear to be a dominant element of the landscape. Any ground disturbance during site construction that is not occupied by the building footprint should be revegetated with native plant species following construction.

### ***Impact Conclusion***

The use of mitigation measures renders the impacts to the visual aspect of the site negligible.

## **Hazardous Materials**

### **No Action Alternative**

Under this alternative, no new activities would occur at the Goshen Warm Springs or FES Project Areas; therefore, there would be no impact to the hazardous and/or waste material conditions at either location.

### **Goshen Warm Springs Alternative**

#### ***Impact Analysis***

The Utah Division of Environmental Response and Remediation's (DERR's) sampling indicates that Goshen Warm Springs Project Area soils may have elevated levels of lead. Analysis of the existing soil data suggests that while additional soil testing is necessary, the lead levels in the soils may not require extensive soil removal. If existing sample data are representative of the soil conditions in the Goshen Warm Springs

Project Area, it is unlikely that any excavated soil would exceed the toxic characteristic leaching procedure (TCLP) criteria. Additional sampling is scheduled for spring/summer 2003 with results reported in late 2003 (T. Howes 2003, pers. comm.).

Exposure to lead-contaminated soils could be a hazard to construction crews through ingestion and inhalation. This could be a moderate to major impact. Improper disposal of soils with elevated levels of lead would be a moderate impact. Onsite disposal of soils that exceed the TCLP criteria for lead could result in lead leaching into the groundwater. Because of the extensive distance to any wells or groundwater withdrawals, the effect would be considered a moderate adverse impact.

Bio-solid waste (fish excrement) from cleaning the raceways and tanks would be separated into a settling basin or tank and periodically disposed of offsite by a commercial contractor. No adverse effect from disposal of this solid waste is anticipated.

Several hazardous materials would be stored and used in small quantities at the proposed Interim Facility. The materials associated with the operation would be disinfectants and treatments for disease or stress control. These materials could include hyamine, chlorine, hydrogen peroxide, formalin, benzoalkonium chloride, and noniodized salt. These materials would be stored in containers that would typically contain 5 gallons or less (J. Valentine 2002, pers. comm.). While these materials may be found in the discharge water, expected concentrations would be low enough to meet water quality beneficial use criteria. Cylinders of compressed oxygen would also be stored at the facility as a backup source of DO. None of the noted materials are expected to create any adverse environmental impacts.

A 500-gallon fuel tank for a backup generator would be installed at the Interim Facility. A fuel leak from the tank could contaminate the South Canal and cause major adverse impacts to the surface water used for irrigation and by the local aquatic community.

### ***Cumulative Impacts***

Construction and operation of the Interim Facility are not anticipated to cause any cumulative impacts related to waste water or hazardous materials. Construction and operation would result in a slight increase in the amount of solid waste going to the local landfill.

### ***Mitigation Measures***

The 500-gallon fuel storage tank will be constructed with secondary containment to capture any inadvertent spills or tank rupture. The storage tank will be sited at the maximum distance practicable from any live surface water or drainage feature.

Used oil from the generator and other equipment will be taken to a recycling center for disposal. If a vault toilet is installed, cleaning services will be supplied by an appropriate contractor.

Additional sampling for total metals and chlorides is planned by the DERR. If this sampling results in elevated levels of metals and/or chlorides, then the Commission and Division will coordinate with the DERR to take proper actions if soils are to be disposed of offsite or reused onsite.

Contractors building the Interim Facility will develop a site-specific health and safety plan that addresses potential worker exposure to the physical and chemical hazards that may be encountered during construction. The plan should address dust control as well as inhalation of air-borne particles.

All construction equipment staging will be at a minimum of 100 feet from the South Canal. Any fuel tanks and other hazardous materials associated with operation of the facility will be stored in an appropriately bermed area that can contain worst-case scenario spills.

### ***Impact Conclusion***

Careful adherence to the mitigation measures will ensure construction worker safety, prevent accidental spills, ensure proper disposal of hazardous materials, and minimize the potential for contamination. As such, the Goshen Warm Springs Alternative is anticipated to have minimal adverse impacts related to hazardous waste or materials.

## **FES Alternative**

### ***Impact Analysis***

Bio-solid waste from cleaning fish tanks would settle in the septic tank system and the accumulated solid material would be periodically disposed of offsite by a commercial contractor. No adverse effect from disposal of this solid waste is anticipated.

Several hazardous materials, including disinfectants and treatments for disease or stress control already in use at the FES, would be used in the Interim Facility. These materials would include hyamine, chlorine, hydrogen peroxide, formalin, benzoalkonium chloride, and noniodized salt. Additional compressed oxygen cylinders would also be stored at the facility as a backup source of DO. These materials are already stored appropriately onsite. None of the noted materials are expected to create any adverse impacts to the environment.

### ***Cumulative Impacts***

Construction and operation of the Interim Facility are not anticipated to cause any cumulative impacts related to waste water or hazardous materials. Construction and operation would result in a slight increase in the amount of solid waste going to the local landfill.

### ***Mitigation Measures***

No mitigation measures are proposed.



### ***Impact Conclusion***

The FES Alternative is anticipated to have negligible adverse impacts related to hazardous waste or materials.

## **Mitigation Summary**

The following mitigation measures are proposed to address anticipated impacts to resources at the Goshen Warm Springs and the FES Alternative sites. The mitigation measures common to both Action Alternatives would be applied in either instance, in addition to the Alternative-specific mitigation measures.

### **Mitigation Measures Common to Both Action Alternatives**

- Develop and implement an Erosion Control Plan that includes (1) a Storm Water Pollution Prevention Plan; (2) the use of published BMPs for controlling erosion and sedimentation from stormwater runoff; and (3) addressing runoff from all roads and parking areas (paved and unpaved).
- Install a septic tank and drainfield according to the requirements of the County Health Department and associated State regulations.
- Properly install and periodically maintain and pump out the installed septic system.
- Inspect and treat fish for parasites with praziquantal and other prophylactic treatments to ensure that they are disease and pathogen free prior to leaving the Interim Facility.
- Maintain a State of Utah fish health certification to help prevent disease spread. Obtain certification before stocking fish in Utah Lake.
- Develop and implement a program for noxious and invading weeds control including specific techniques for controlling noxious weeds and pests.
- Require all contractors involved in construction activities to immediately halt any operations in the area and notify the SHPO and UGS if a possible archaeological site or vertebrate fossil is unearthed. After such notification, the Division will coordinate with SHPO and UGS to determine the appropriate procedures to protect any important find.
- Construct the new facility building in neutral colors so it does not visually dominate the landscape.

## Mitigation Measures for the FES Alternative

In addition to the mitigation measures listed above as common to both alternatives, the following mitigation measures would be implemented as part of the FES Alternative.

- Plant appropriate vegetation that provides for erosion control and water conservation following construction.
- Install the septic system according to Bear River Health Department protocols to ensure it functions properly according to the onsite soil and groundwater conditions.

## Mitigation Measures for the Goshen Warm Springs Alternative

In addition to the mitigation measures listed above as common to both alternatives, the following mitigation measure would be implemented as part of the Goshen Warm Springs Alternative.

- Obtain a discharge permit issued according to State regulations that includes requirements to ensure that effluent meets water quality standards (e.g., monthly monitoring for constituents such as pH, TSS, and any other constituent identified in the permit).
- Obtain the necessary Clean Water Act Section 404 permits for any actions that will result in unavoidable placement of fill or dredged material into riparian-wetlands. Any unavoidable impact will be mitigated such that there will be no net loss in the quantity of riparian-wetland areas.
- Effluent treatment, such as a rotating micro screen, will be an option to remove larger particles from the effluent.
- Return water to the canal as close to the intake point as possible to reduce the length of canal affected by reduced flows.
- Plant vegetation in disturbed areas that provides for erosion control, water conservation, and wildlife habitat, following construction. Such revegetation will include native species to the extent practicable.
- Screen the intake of the Interim Facility to prevent introduction of organisms from the Goshen Warm Spring system into the Interim Facility.
- Develop and implement consistent cleaning and snail-monitoring protocol. If snails become a problem within the Interim Facility, then treat hatchery water to prevent snails from establishing and perpetuating parasite infections.

- Construct above-ground power lines to minimize the risk of raptor electrocutions. Include vertical phase separation of the lines or raptor perches on top of the power poles.
- Construct the 500-gallon fuel storage tank with secondary containment to capture any inadvertent spills or tank rupture. The storage tank will be sited at the maximum distance practicable from any live surface water or drainage feature.
- Take used oil from the generator and other equipment to a recycling center for disposal. If a vault toilet is installed, cleaning services will be supplied by an appropriate contractor. Bio-solid waste (fish excrement) from cleaning the raceways and tanks will be hauled away for appropriate disposal at an approved location.
- Analyze additional soils testing data to coordinate with the DERR to determine the appropriate response if soil contaminant values exceed cleanup thresholds.
- Require contractors to develop a site-specific health and safety plan that addresses potential worker exposure to the physical and chemical hazards that may be encountered during construction. The plan should address dust control as well as inhalation of air-borne particles.
- Stage all construction equipment at a minimum of 100 feet from the South Canal. Any fuel tanks and other materials associated with operation of the facility will be stored in an appropriately bermed area that can contain worst-case scenario spills.

## **CHAPTER 5:           CONSULTATION AND COORDINATION**

Numerous entities provided consultation, coordination, and information during the preparation of this document. Representatives from local governments, State and Federal agencies, and private citizens provided input throughout the process.

A newsletter distributed in June 2002 notified recipients about the preparation of an Environmental Assessment (EA) and was sent to interested members of the public as well as Federal, State, and local agencies. As part of this newsletter, comments and concerns pertinent to the Goshen Warm Springs Alternative were solicited from those recipients. A copy of the scoping newsletter and all comments received are included in Appendix A. Another newsletter was sent in April 2003 notifying recipients of the inclusion of the Fisheries Experiment Station (FES) in Logan as a feasible alternative for inclusion in this EA.

In addition to the initial scoping process specifically regarding the Warm-water Interim Hatchery Facility at Goshen Warm Springs, further contacts, coordination, and consultation were made with the appropriate representatives of Federal, State, and local government agencies to complete a thorough analysis for this EA and to keep all parties informed of the Interim Hatchery Project and its status. Following identification of the FES Alternative, scoping letters were sent requesting Federal, State, and local agency input. Additionally, scoping letters were sent to potentially interested Native American groups requesting comments.

The following agencies and entities provided input and/or will receive copies of the EA.

### **Federal Agencies**

U.S. Army Corps of Engineers, San Francisco District  
U.S. Bureau of Reclamation, Upper Colorado Regional Office  
U.S. Department of the Interior, Fish and Wildlife Service, Salt Lake City Field Office  
U.S. Department of Agriculture, Natural Resources Conservation Service  
Utah Reclamation Mitigation and Conservation Commission

## **State Agencies**

Utah Department of Natural Resources, Division of Wildlife Resources  
Utah Department of Environmental Quality, Division of Environmental Remediation and Recovery  
Utah Department of Environmental Quality, Division of Water Quality  
Utah Department of Environmental Quality, Division of Air Quality  
Utah Department of Public Safety, Division of Comprehensive Emergency Management

## **Local Entities**

Cache County, Countywide Planning Office  
City of Logan, Department of Community Development

## **Native American Groups**

Te-Moak Western Shoshone Tribe  
Duckwater Shoshone Tribe  
Ute Indian Tribe  
Confederated Tribes of Goshute Reservation  
Paiute Indian Tribe of Utah  
Skull Valley Band of Goshute Indians  
Ely Colony Council  
Northwestern Band of Shoshone Nation  
Shoshone Business Council  
Shoshone-Bannock Tribes  
Uintah & Ouray Tribe

## **Other Organizations**

Central Utah Water Conservancy District, Technical Committee of the June Sucker Recovery Implementation Program  
Logan Canal Company

## List of Preparers

The environmental analyses were conducted and the subsequent EA was prepared by BIO-WEST, Inc. (BIO-WEST), the Utah Reclamation Mitigation and Conservation Commission (Commission), and the Utah Division of Wildlife Resources (Division). Investigations and assessments conducted by BIO-WEST were presented to the Commission and the Division for independent review and evaluation prior to acceptance. Impact evaluations were determined by BIO-WEST, and these impact evaluations were reviewed and independently evaluated by the Commission and the Division. The final determination of the likelihood and level of significance of impact was made by the Commission and the Division. Identification of practicable mitigation measures was initiated by BIO-WEST and reviewed by the Commission and the Division for effectiveness and incorporation.

Table 5-1 lists the primary persons responsible for the preparation of the EA.

**Table 5-1. Environmental Assessment (EA) Roles and Responsibilities.**

NAME, ORGANIZATION	YEARS OF EXPERIENCE	ROLE/RESPONSIBILITY
Maureen Wilson, Utah Reclamation Mitigation and Conservation Commission	22	Commission Project Manager, Quality Assurance, Impact Review, and Procedural Review
Eric Larson, Utah Division of Wildlife Resources	22	Utah Division of Wildlife Resources Project Manager, Quality Assurance, Impact Review, and Procedural Review
S. Blaise Chanson, BIO-WEST, Inc.	26	Quality Assurance, Regulatory Compliance, National Environmental Policy Compliance
Todd Black, BIO-WEST, Inc.	10	Wildlife, Biological Resources
Michael Cunningham, BIO-WEST, Inc.	6	Land Use
Michael Golden, BIO-WEST, Inc.	8	Fisheries, Aquatic Resources
Shannon Herstein, BIO-WEST, Inc.	6	Surface Water Quality, Flow
Andrea Moser, BIO-WEST, Inc.	6	Visual, Recreational Resources
Nate Norman, BIO-WEST, Inc.	13	Wetlands, Vegetation Resources
Wes Thompson, BIO-WEST, Inc.	15	Geology, Hydrology, Hazardous Materials
John Weber, BIO-WEST, Inc.	5	Document Preparation, Project Coordination

## CHAPTER 6: PUBLIC INVOLVEMENT

The Environmental Assessment (EA) underwent a 30-day review period, from September 24, 2003 through October 24, 2003. Notice of Availability was published on September 24 and 28, 2003, in *The Salt Lake Tribune*, the state newspaper of general circulation. The draft document was sent directly to 24 Federal, State and Tribal agencies, local governments, organizations, irrigation companies, and universities. In addition, a Notice of Availability was sent to all other pertinent and appropriate Federal, Tribal, State, and local agencies and governments, as well as those individuals that have previously expressed interest in the Interim Facility Project. The document was available for public review at the local Santaquin Public Library, Santaquin, Utah, at the offices of the Utah Division of Wildlife Resources (Division) in Salt Lake City, Utah, and at BIO-WEST, Inc. offices in Logan, Utah.

In response to the public review period, the Utah Reclamation Mitigation and Conservation Commission and Division received six letters commenting on the EA. All six letters came from current water users at Goshen Warm Springs (stock owners of the Warm Springs Irrigation and Power Company). These letters all expressed the same general comment, for unspecified reasons, that the Goshen Warm Springs Alternative would be detrimental to their water system, and that the FES Alternative was a better choice. No comment letters were received from any Federal, State, or local government agencies.

## REFERENCES

- Anderson L.R., Keaton J.R., Bay J.A. 1994. Liquefaction potential map for the Northern Wasatch Front, Utah, complete technical report. Salt Lake City: Utah Geological Survey. Scale 1:48,000.
- [APLIC] Avian Power Line Interaction Committee. 1996. Suggested Practices for raptor protection on power lines: the state of the art in 1996. Washington (D.C.): Edison Electric Institute/Raptor Research Foundation. 148 p.
- Austin D. 2003. Biologist, Utah Division of Wildlife Resources. Personal communication with Todd Black of BIO-WEST, Inc., Logan, Utah regarding presence of sensitive species at Fisheries Experiment Station, Logan, Utah. 04/29/03.
- Barneby R.C. 1989. Intermountain flora, vol. 3B: Fabales. Bronx: New York Botanical Garden. 279 p.
- Belk M. 2003. Professor of Integrative Biology, Brigham Young University. Personal communication with John Weber of BIO-WEST, Inc., Logan, Utah regarding rearing of June sucker in Utah Lake for experimental purposes. 04/16/03.
- Bell J. 2003. Representative, Te-Moak Western Shoshone Tribe. Personal communication with Maureen Wilson of the Utah Reclamation Mitigation and Conservation Commission regarding the FES site in Logan, Utah. 05/12/03.
- Brandenburg W.H., Gido K.B. 1999. Predation by nonnative fish on native fishes in the San Juan River, New Mexico and Utah. *The Southwestern Naturalist* 44:392-394.
- Brandt T. 2002. Hatchery manager, San Marcos National Fish Hatchery. Personal communication with Mike Golden of BIO-WEST Inc., Logan, Utah, regarding *Melanoides tubercualta* and fish parasites. 11/26/02.
- Brandt T. 2003. Hatchery manager, San Marcos National Fish Hatchery. Personal communication with Mike Golden of BIO-WEST Inc., Logan, Utah, regarding *Melanoides tubercualta*. 8/1/03.
- Brooks L.E., Stolp B.J. 1995. Hydrology and simulation of ground-water flow in Southern Utah and Goshen Valleys, Utah. Salt Lake City: United States Geological Survey. Technical Publication Number 111. 96 p.
- Callister D.C., Van Pelt N. 1992. Element stewardship abstract for *Phacelia argillacea* (clay phacelia). Salt Lake City: Prepared for The Nature Conservancy, Utah Field Office. 21 p.



- Campbell H. 2003. Environmental engineer, Utah DEQ Division of Water Quality. Personal communication with John Weber of BIO-WEST Inc., Logan, Utah, regarding fish hatchery discharge permit requirements. 04/23/03.
- Cardon W. 2003. Representative, Logan Canal Company. Personal communication with Shannon Herstein of BIO-WEST Inc., Logan, Utah regarding Swift Slough. 05/12/03.
- [Commission] Utah Reclamation Mitigation and Conservation Commission. 1996. Decision notice and finding of no significant impact for establishment of the Utah Lake Wetland Preserve. Salt Lake City: Commission. 50 p.
- Conroy S. 2002. Planner, Utah County. Personal communication with Michael Cunningham of BIO-WEST, Inc., Logan, Utah, regarding land use in Goshen, Utah. 12/02/02.
- [Division] Utah Division of Wildlife Resources. 1998. Utah sensitive species list. Salt Lake City: Utah Division of Wildlife Resources. Policy Number W2AQ-4.
- [Division] Utah Division of Wildlife Resources. 2001. Unpublished sampling data for Goshen Warm Springs, 2000-2001. Available at: Utah Division of Wildlife Resources, Salt Lake City, Utah.
- [Division] Utah Division of Wildlife Resources. 2002a. Unpublished sampling data for Goshen Warm Springs, July 2002. Available at: Utah Division of Wildlife Resources, Salt Lake City, Utah.
- [Division] Utah Division of Wildlife Resources. 1/21/02b. Utah Division of Wildlife Resources, mule deer habitat. Geospatial data presentation form. Location: <http://www.utahcdc.usu.edu/ucdc/downloadgis/disclaim.htm>.
- [Division] Utah Division of Wildlife Resources. 05/22/03a. Utah Division of Wildlife Resources, Utah Conservation Data Center. Location: <http://dwrcdc.nr.utah.gov/ucdc/>.
- [Division] Utah Division of Wildlife Resources. 2003b. Another new exotic fish pathogen comes to Utah. *Ichthyogram* 14(1): 5.
- [Division] Utah Division of Wildlife Resources. 2003c. *Centrocestus* parasite discovered at second location in Utah. *Ichthyogram* 14(2): 5.
- Doelling H.H. 1983. Non-metallic mineral resources of Utah. Salt Lake City: Utah Geological and Mineral Survey. Scale 1:750,000.

- [DWR] Utah Division of Water Rights. 1/4/02. Utah Division of Water Rights, on-line records search for existing water rights at Goshen Warm Springs. Location: <http://nrwrt1.nr.state.ut.us/>.
- [DWR] Utah Division of Water Rights. 5/5/03. Utah Division of Water Rights, on-line records search for existing water rights at the FES, Logan, Utah. Location: <http://nrwrt1.nr.state.ut.us/>.
- England L. 2003. Botanist, United States Fish and Wildlife Service, Utah Field Office. Personal communication with Blaise Chanson of BIO-WEST, Inc., Logan, Utah, regarding site location of desert milkvetch and clay phacelia. 01/28/03.
- Environmental Laboratory. 1987. U.S. Army Corps of Engineers wetlands delineation manual. Vicksburg (MS): U.S. Army Waterways Experiment Station. Technical Report Y-87-1. 92 p. plus appendices.
- Evans J.P., Oaks R.Q. Jr. 1996. Three-dimensional variations in extensional fault shape and basin form: the Cache Valley basin, eastern Basin and Range Province. United States: Geological Society of America Bulletin 108(12):1580-1593.
- FishPro. 2000. Utah warm water sportfish and native aquatic species siting study. Port Orchard (WA): Fishpro. 128 p.
- Franklin M.A. 1990. Report for 1990 challenge cost share project, Manti-La Sal National Forest. Target species: *Astragalus desereticus Barneby* (deseret milkvetch). Salt Lake City: Department of Natural Resources, Utah Natural Heritage Program. 6 p. plus appendices.
- Fries L. 2002. Biologist, Texas Parks and Wildlife Department. Personal communication with Mike Golden of BIO-WEST, Inc., Logan, Utah, regarding *Melanoides tuberculatus* access to San Marcos fish hatchery. 11/25/02.
- Fries L., Bowles D. 2002. Water quality and macroinvertebrate community structure associated with a sportfish hatchery outfall. North American Journal of Aquaculture. 64: 257-266.
- Goode H.D. 1978. Thermal waters of Utah. Salt Lake City: Utah Geological and Mineral Survey. 183 p.
- Gurgel K.D. 1983. Energy resources map of Utah. Salt Lake City: Utah Geological and Mineral Survey. Map 68. Scale 1:500,000.
- Hayden M. 2003. [Letter to Rick Larson, Utah Division of Wildlife Resources.] Located at: BIO-WEST, Inc., Corporate Office, Logan, Utah.

- Hecker S., Harty K.M., Christenson G.E. 1988. Shallow groundwater and related hazards in Utah. Salt Lake City: Utah Geological and Mineral Survey. Scale 1:750,000.
- Hogrefe T. 2001. Least chub (*Iotichthys phlegethonis*) conservation agreement and strategy annual progress report: 2000. Salt Lake City: Utah Division of Wildlife Resources. PN 01-08. 22 p.
- Holden P.B., Zucker S.J., Abate P.D., Valdez R.A. 1997. Assessment of the effects of fish stocking in the state of Utah: past, present, and future. Logan (UT): BIO-WEST, Inc. PR-565-1. 135 p. plus appendices.
- Howe F. 2003. Wildlife biologist, Utah Division of Wildlife Resources. Personal communication with Todd Black of BIO-WEST, Inc., Logan, Utah, regarding status of the American peregrine falcon. 1/12/03.
- Howes T. 2002. Site inspection analytical results report, Tintic Standard Reduction Mill, Utah County, Utah. Salt Lake City: Utah Department of Environmental Quality, Division of Environmental Response and Remediation. UT0001910793. 22 p.
- Howes T. 2003. Project Manager, Utah Department of Environmental Quality, Division of Environmental Remediation and Response. Personal communication with Wes Thompson of BIO-WEST, Inc., Logan, Utah, regarding soil sampling at Goshen Warm Springs. 4/28/03.
- Howes T. (Utah Department of Environmental Quality). Forthcoming. Detailed site investigation Report, Tintic Standard Reduction Mill, Utah County, Utah. Salt Lake City: Utah Department of Environmental Quality, Division of Environmental Response and Remediation. UT0001910793.
- Intermountain Ecosystems LC. 2002. [Letter to BIO-WEST, Inc.] Located at: BIO-WEST, Inc., Corporate Office, Logan, Utah.
- Koehler G.M., Brittell J.D. 1990. Managing spruce-fir habitat for lynx and snowshoe hares. Journal of Forestry 88(10):10-14.
- Larson E. 2002a. CUP Coordinator, Utah Division of Wildlife Resources. Personal communication with Shannon Herstein of BIO-WEST, Inc., Logan, Utah, regarding water rights and the design of the proposed facility. 10/31/02
- Larson E. 2002b. CUP Coordinator, Utah Division of Wildlife Resources. Personal communication with Michael Golden of BIO-WEST, Inc., Logan, Utah, regarding Goshen Springs macroinvertebrate sampling. 11/25/02.

- McCalpin J.P. 1989. Surface geologic map of the East Cache fault zone, Cache County, Utah. Salt Lake City: U.S. Geological Survey. Scale 1:50,000.
- Mitchell A.J., Salmon M.J., Huffman D.G., Goodwin A.E., Brandt T.M. 2000. Prevalence and pathogenicity of a Hetrophyid trematode infecting the gills of an endangered fish, the fountain darter, in two central Texas spring-fed rivers. *Journal of Aquatic Animal Health* 12: 283-289.
- Mitchell A.J., Goodwin A.E., Salmon M.J., Brandt T.M. 2002. Experimental infection of an exotic Hetrophyid trematode, *Centrocestus formosanus*, in four aquaculture fishes. *North American Journal of Aquaculture* 64: 55-59.
- Mulvey W.E. 1992. Soil and rock causing engineering geologic problems in Utah. Salt Lake City: Utah Geological Study. Scale 1:500,000.
- [NFIP] National Flood Insurance Program. 1984. Flood insurance map for the City of Logan, Utah. Community-Panel Number 4900190004-B. Effective September 28, 1984.
- [NFIP] National Flood Insurance Program. 2002. Flood insurance rate map for Utah County, Utah. Community-Panel Number 4955170465-A. Effective July 17, 2002.
- Notarianni P.F. 1982. Faith, hope and prosperity, the Tintic Mining District: Eureka, Utah. Tintic (UT): Tintic Historical Society, 190 p.
- Paige C., Madden B., Ruediger B. 1990. Bald eagles of the Upper Columbia Basin: timber management guidelines. Portland (OR): USDA-Forest Service. 38 p.
- Perkins M.J., Lentsch L.D., Mizzi J. 1998. Conservation agreement and strategy for least chub (*Iotichthys phlegethonis*) in the State of Utah. Salt Lake City: Utah Department of Natural Resources. PR 98-25. 35 p.
- Plum J.A., Rogers W.A. 1990. Effect of Droncit (Praziquantal) on yellow grubs (*Clinostomum marginatum*) and eye flukes (*Dilpostomum spathaceum*) in channel catfish. *Journal of Aquatic Animal Health* 2:204-206.
- Rabkin R., Rabkin J. 1981. Nature in the West. New York: Holt, Rinehart, and Winston. 248 p.
- Ritzma H.R. 1979. Oil-impregnated rock deposits of Utah. Salt Lake City: Utah Geological and Mineral Survey. Map 47. Scale 1:1,000,000.
- Robinson M. 1999. Chemical and hydrostratigraphic characterization of groundwater and surface water interaction in Cache Valley, Utah [MS thesis]. Logan, UT: Utah State University. 184 p.

- Routledge D. 2002. Hatchery Superintendent, Fisheries Experiment Station, Logan, Utah. Personal communication with employees of BIO-WEST, Inc., Logan, Utah, regarding fish hatchery operations. 10/17/02.
- Routledge D. 2003a. Hatchery Superintendent, Fisheries Experiment Station, Logan, Utah. Personal communication with Barry Myers of BIO-WEST, Inc., Logan, Utah, regarding number of water wells located at the FES and method of waste water disposal. 05/05/03.
- Routledge D. 2003b. Hatchery Superintendent, Fisheries Experiment Station, Logan, Utah. Personal communication with Shannon Herstein of BIO-WEST, Inc., Logan, Utah, regarding hatchery operations and water supply/quality. 05/01/03.
- Routledge D. 2003c. Hatchery Superintendent, Fisheries Experiment Station, Logan, Utah. Personal communication with Nate Norman of BIO-WEST, Inc., Logan, Utah, regarding the FES facility and grounds. 04/13/03.
- Routledge, D. 2003d. Hatchery Superintendent, Fisheries Experiment Station, Logan, Utah. Personal communication with Mike Golden of BIO-WEST, Inc., Logan, Utah regarding FES operations. 05/12/03.
- Sigler W.F, Sigler J.W. 1996. Fishes of Utah: a natural history. Salt Lake City: University of Utah Press. 375 p.
- Sirrine G.K. 1953. Geology of Warm Springs Mountain, Goshen, Utah [MS Thesis]. Provo (UT): Brigham Young University. 83 p.
- Shubat M.A., Tripp B.T., Bishop C.E., Blackett R.E. 1991. Mines and prospects containing gold in Utah. Salt Lake City: Utah Geological and Mineral Survey. Open-File Report 207. 28 p.
- Stokes W.L. 1988. Geology of Utah. Salt Lake City: Utah Museum of Natural History, University of Utah, and Utah Geological and Mineral Survey. 280 p.
- SWCA, Inc. 1999a. Utah State warm-water fish hatchery feasibility study: biological resources overview of the Gandy and Goshen sites. Salt Lake City: SWCA. 15 p.
- SWCA Inc. 1999b. Cultural resource file search and field reconnaissance of two proposed fish hatchery locations in Millard and Utah Counties, Utah. Salt Lake City: SWCA. Report 99-127. 31 p.
- Thompson P. 2003. Biologist, Utah Division of Wildlife Resources. Personal communication with Mike Golden of BIO-WEST, Inc., Logan, Utah, regarding fish populations in Swift Slough. 05/16/03.

- [UDAF] Utah Department of Agriculture and Food. 04/16/2003. State of Utah Department of Agriculture and Food: Utah Noxious Weed List. Location: [http://ag.utah.gov/plantind/nox\\_utah.html](http://ag.utah.gov/plantind/nox_utah.html).
- [UDEQ] Utah Department of Environmental Quality. 1999. Standards of the quality for waters of the state, R317-2, Utah Administrative Code. Salt Lake City: Utah Department of Environmental Quality, Division of Water Quality. 132 p.
- [UDEQ] Utah Department of Environmental Quality. 2002. Utah's 2002 303(d) List of Waters. Salt Lake City: Utah Department of Environmental Quality, Division of Water Quality. 94 p.
- [USDA] United States Department of Agriculture. 1974. Soil Survey of Cache Valley Area, Utah, Parts of Cache and Box Elder Counties. Washington (D.C.): United States Department of Agriculture. 192 p.
- [USDA] United States Department of Agriculture. 1984. Soil Survey of Fairfield-Nephi Area, Utah. Washington (D.C.): United States Department of Agriculture. 361 p.
- [USEPA] Environmental Protection Agency. 1996a. Superfund chemical data matrix. Washington (D.C.): Office of Solid Waste and Emergency Response. 1 p.
- [USEPA] Environmental Protection Agency. 1996b. Soil screening guidance: users guide. Washington (D.C.): EPA Office of Solid Waste and Emergency Response. EPA Document Number: EPA540/R-96/018. 651 p.
- [USEPA 2003a] Environmental Protection Agency. 05/01/03. STORET database, water quality data: Swift Slough monitoring points, Cache County, Utah. Location: <http://www.epa.gov/STORET>.
- [USEPA 2003b] Environmental Protection Agency. 04/16/2003. National Pollutant discharge elimination system: construction site storm water runoff control. Location: [http://cfpub.epa.gov/npdes/stormwater/menuofbmps/con\\_site.cfm](http://cfpub.epa.gov/npdes/stormwater/menuofbmps/con_site.cfm).
- [USEPA 2003c] Environmental Protection Agency. 09/10/03. STORET database, water quality data: Utah Lake monitoring points, Utah. Location: <http://www.epa.gov/STORET>
- [USFWS] U.S. Fish and Wildlife Service. 1999. June sucker (*Chasmistes liorus*) recovery plan. Denver: USFWS. 61 p.

- [USFWS] U.S. Fish and Wildlife Service. 2000. Federally listed and proposed (P) endangered (E) and threatened (T) species and habitat in Utah by county as of January 2000. Salt Lake City: USFWS. 9 p.
- [USFWS] U.S. Fish and Wildlife Service. 11/25/02. Exotic snail and associated exotic parasites affecting fishes and waterfowl in Texas: San Marcos National Fish Hatchery. Location: <http://ifw2irm2.irm1.r2.fws.gov/fishery/trematode.pdf>.
- [USFWS and Commission] U.S. Fish and Wildlife Service and Utah Reclamation Mitigation and Conservation Commission. 1998. Revised hatchery production plan and final environmental assessment. Salt Lake City: USFWS and Commission.
- [USGS] U.S. Geological Survey, Columbia Environmental Research Center. 2003. Assessment of Goshen Warm Springs as a Potential Hatchery Site for June suckers (*Chasmistes liorus*) focusing on selenium bioaccumulation and fish growth rates. Columbia, MO: USGS. 72 p.
- Valentine J. 2002. Fisheries Biologist, Utah Division of Wildlife Resources. Personal communication with Wes Thompson of BIO-WEST, Inc. Logan, Utah, regarding hazardous materials at the interim hatchery. 10/30/02.
- Valentine J. 2003. Fisheries Biologist, Utah Division of Wildlife Resources. Personal communication with John Weber of BIO-WEST, Inc. Logan, Utah, regarding water quality concerns at Delta power generation facility and hatchery water quality. 04/16/03.
- Vinson M. 2002. Aquatic Ecologist, National Aquatic Monitoring Center. Personal communication with Michael Golden of BIO-WEST, Inc., Logan, Utah, regarding Goshen Springs macroinvertebrate sampling. 11/25/02.
- Waters T.F. 1995. Sediment in streams: sources, biological effects and control. Bethesda (MD): American Fisheries Society Monograph 7. 251 p.
- Welsh S.L., Atwood N.D., Goodrich S., Higgins L.C. [eds.]. 1993. A Utah flora (2nd edition, revised). Provo (UT): Brigham Young University. 986 p.
- Wilson C. 2002. Station Head, Fisheries Experiment Station, Utah Division of Wildlife Resources. Personal communication with Mike Golden of BIO-WEST, Inc., Logan, Utah, regarding fish parasite control. 11/26/02.

- Wilson C. 2003. Station Head, Fisheries Experiment Station, Utah Division of Wildlife Resources. Personal communication with Mike Golden of BIO-WEST, Inc., Logan, Utah, regarding fish populations in Swift Slough. 05/12/03.
- Wilson K. 2002. Ecologist, Utah Division of Wildlife Resources. Personal communication with Mike Golden of BIO-WEST, Inc., Logan, Utah, regarding Goshen Springs fish and macroinvertebrate sampling. 9/30/02.
- Woo P.T.K. 1995. Fish diseases and disorders: Volume 1, protozoan and metazoan infections. New York: C.A.B. International.