National Park Service
U.S. Department of the Interior

Grand Teton National Park
Wyoming

Replace Moose Wastewater System and Address Critical Water System Deficiencies

Environmental Assessment

Environmental Assessment
Replace Moose Wastewater System and
Address Critical Water System Deficiencies
GRAND TETON NATIONAL PARK

Teton County, Wyoming
March 2012

SUMMARY

The water system that serves the Moose and Beaver Creek areas in Grand Teton National Park was constructed in 1956, with some upgrades in 1983-1984. The Moose wastewater treatment plant dates from 1963 with a major upgrade in 1973. Many original components of both systems are still in service. The systems are inefficient to operate, and they are increasingly prone to failures from wear and corrosion. Their conditions pose health risks to staff and visitors and have the potential to impact the wild and scenic Snake River adjacent to the Moose plant. The water system is the source of firefighting water for structures in the area and cannot provide flows of sufficient rates, durations, or pressures.

The three alternatives include alternative 1 – no action / continue current management, alternative 2 – replace the water system and Moose wastewater treatment plant (NPS preferred alternative), and alternative 3 – replace water system and convey wastewater to the town of Jackson. The preferred alternative would replace most water system pumping, storage, and transmission components. It would provide gravity flow of water for firefighting and potable use from a new, 300,000-gallon tank near Taggart Creek. A new wastewater treatment plant would be constructed in Moose near the post office. Alternative 3 would replace most water system components and use gravity flow, with water storage in two new tanks at the Taggart site and at Windy Point. A 12-mile-long, pressurized sewer line would convey wastewater from Moose and the Jackson Hole Airport to the town of Jackson sewer system for treatment in the Jackson publicly owned treatment works.

Impact topics that were evaluated include cultural resources; soil and vegetation; water resources; wildlife, including candidate, threatened, and endangered species; health and safety; operations of the National Park Service and partners; and visitor use and experience. The intensity of all impacts was determined to be moderate or lower.

PUBLIC COMMENT

If you wish to comment on the environmental assessment, you may mail comments to the name and address below or post comments online at http://parkplanning.nps.gov/grte. This environmental assessment will be on public review for 30 days. Before including your address, phone number, email address, or other personal identifying information in your comment, you should be aware that your entire comment – including your personal identifying information – may be made publicly available at any time. Although you can ask us in your comment to withhold your personal identifying information from public review, we cannot guarantee that we will be able to do so.

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Chapter 1: Purpose and Need

BRIEF DESCRIPTION OF GRAND TETON NATIONAL PARK AND THE MOOSE AREA

Grand Teton National Park was established in 1929 and was united with Jackson Hole National Monument to create the present park in 1950. The 310,000-acre park contains spectacular scenery that includes majestic mountains, lakes, rivers, forests, sagebrush flats, and wildlife. Its visitation consistently ranks among the top 10% in the national park system. In 2010, the park hosted about 4 million visitors, 2.7 million of which were recreational visits (NPS 2010c). About 80% of annual visitation is between May and October.

The setting for the Moose wastewater and water project is shown in figure 1. Both systems serve the visitor center, headquarters, and housing area at Moose; and the water system also supplies the associated housing and administrative facilities at Beaver Creek. Throughout this environmental assessment, references to "Moose" from a water supply perspective generally also include the Beaver Creek administrative area.

Administrative facilities at Moose and Beaver Creek include offices for about 200 park employees; maintenance facilities; an interagency dispatch center; a post office; emergency response vehicles; and the largest government housing complex in the park, which provides housing for approximately 200 permanent and seasonal employees.

About 3,800 people visit Moose on a busy summer day. Much of that use is at the Craig Thomas Discovery and Visitor Center, which is the only year-round visitor center in the park. Visitors also frequent historic sites, including the Chapel of the Transfiguration, Menor's Ferry, and the Murie Ranch (a national historic landmark), all of which are listed in the National Register of Historic Places. The boat landing area, which is used both by concessioner and private vessels for float and fishing trips, is on the Snake River less than 200 feet from the existing wastewater treatment plant. Most of the recreational visitors use facilities in Moose or rely on park operations based in the Moose complex, which are supported by the subject water and or wastewater management facilities.

The 4 Lazy F Ranch, which is near the Snake River about a mile north of Moose, was a guest ranch that is listed in the National Register of Historic Places. The ranch transitioned from a life estate to NPS administration in 2006. The ranch includes 20 structures. Use of this area is being considered in a historic properties management plan and environmental assessment that is in preparation.

The project area for addressing Moose critical water system deficiencies and replacing the wastewater system extends from the area of Taggart Creek on the north to the town of Jackson near Flat Creek on the south. The width of the project area generally includes everything within a mile of existing or proposed project features.

PURPOSE OF THE ACTION

The purpose of this action is to address critical water system deficiencies and replace the Moose wastewater treatment system. The project would ensure water and wastewater services, maintain public health and safety, and meet firefighting requirements for structural fires at Moose and Beaver Creek. The project will be considered successful if it meets the following objectives:

- The systems reliably meet the water and wastewater needs for the area for at least the next 50 years.

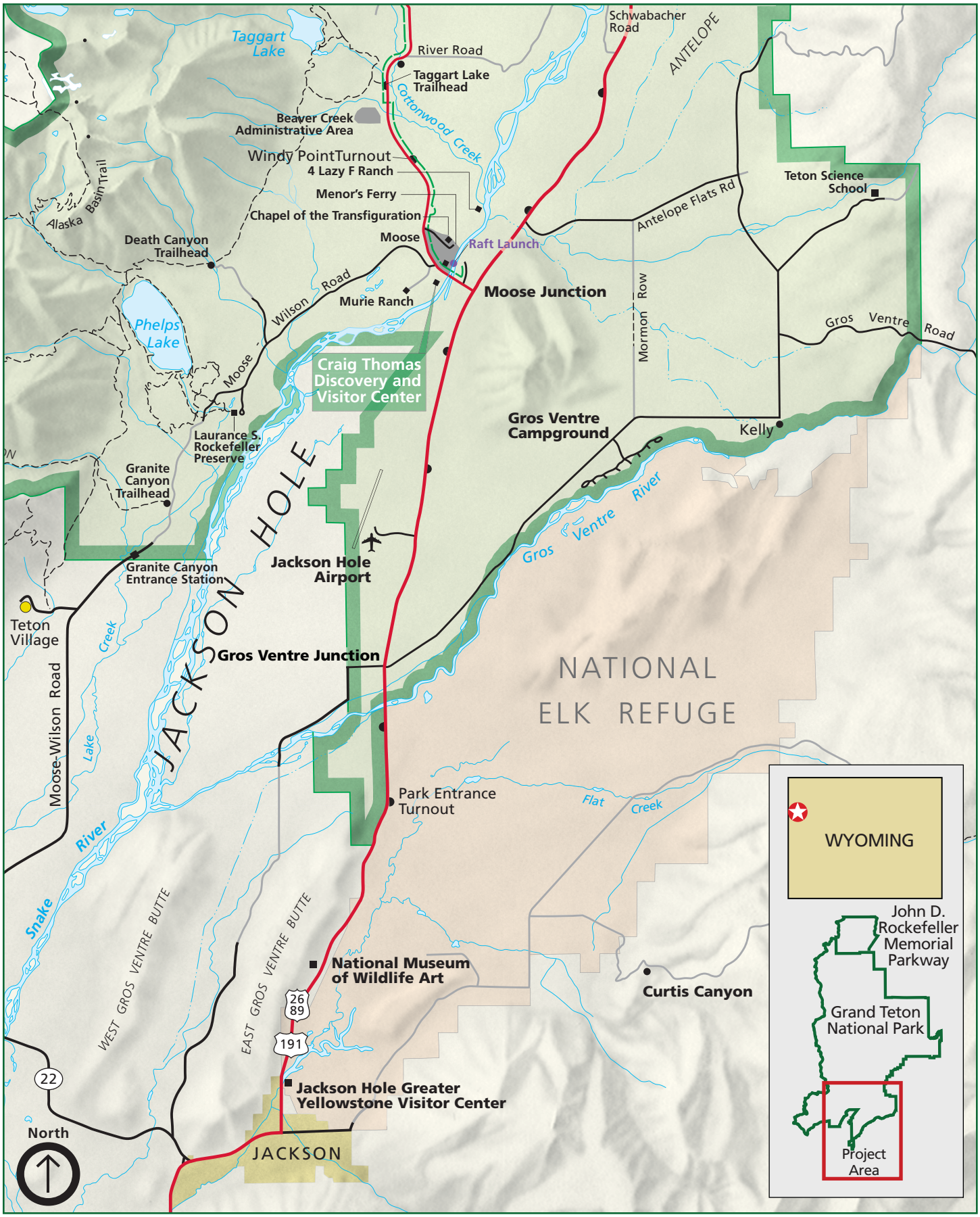

Figure 1: Region

Grand Teton National Park

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- Risks to health and safety and to natural and cultural resources are minimized.
- The water flow meets NPS requirements and state of Wyoming standards for fighting structural fires.
- The systems will meet regulatory requirements from the state of Wyoming for the project life.

NEED FOR THE ACTION

This project is needed because many components of the existing water and wastewater systems that serve Moose and the Beaver Creek administrative area have been in service for more than 50 years. These components have a high failure potential and have exceeded their design life. Both systems are too small to meet projected domestic demand, and the water system provides inadequate flow volumes, durations, and pressures to meet NPS and state requirements for firefighting. The project is needed to:

- Address potential threats to public health, park structures, and natural and cultural resources;
- Limit service interruptions;
- Reduce leaks in the water delivery system, thereby conserving water; and
- Improve the effectiveness of the wastewater treatment system.

MOOSE WATER SYSTEM

The water supply system for the Grand Teton National Park visitor center, park headquarters, and housing complexes at Moose and Beaver Creek was constructed in 1956, with upgrades in 1983-1984. It consists of two wells and pumps, a 50,000-gallon and a 100,000-gallon storage tank, and conveyance pipelines. This system provides potable water and is the firefighting water source for structures in Moose and Beaver Creek. Upgrades are needed to address the following critical water system deficiencies:

- The aging system has serious leakage problems. In 2011, leaks totaling about 40,000 gallons per day out of a total average-day delivery of 74,500 gallons per day were found and additional leaks are suspected. There is now an ongoing program of leak detection and repair in the project area.
- For fighting structural fires, the water supply system does not meet NPS requirements for flow or volume or the water pressure requirements of the state of Wyoming.
- The system is too small to meet the demand that will result from the new staff housing for critical employees at Moose and Beaver Creek. Supply concerns will be greatest during the summer months when demands from the highest visitor numbers are combined with demand from park administrative and housing functions.

Major Components

Components of the existing water system extend from Taggart Creek on the north to Moose on the south in the project area shown in figures 2, 3, and 4. They include:

- Two wells (designated Taggart well 1 and Taggart well 2) near Taggart Creek, with pumps and a well house that contains the chlorine disinfection system, standby generator, and computerized management system;
- The 50,000-gallon, aboveground Taggart tank up the hill west of the Taggart wells;

- The 100,000-gallon, buried Windy Point tank near the Windy Point turnout; and
- About 3.6 miles of water pipeline that conveys water from the wells to the Beaver Creek administrative area and Moose distribution systems.

Much of the water supply system dates from 1956, although some components were replaced or refurbished. Details regarding the components are provided in reports from the NPS' engineering consultant (Nelson Engineering 2010b, 2011b) and an NPS description of current conditions (NPS 2009b).

Facility Conditions Concerns

As part of a water loss study, Nelson Engineering determined that in 2010, the Moose water supply system was delivering about 75,000 gallons of water per day, but estimated that less than half that amount was being used at Moose and Beaver Creek. Based on this finding, leaks totaling about 30,000 gallons per day were found and fixed at the Windy Point tank. Leaks at several locations along the conveyance pipeline that totaled almost 10,000 gallons per day were identified. The NPS is continuing to identify the locations where additional, large losses of water are occurring so they can be repaired.

Other facility condition concerns include the following.

- Taggart well 2 produces 75 gallons per minute, a third less than its design production rate of 115 gallons per minute. The well may not have been properly constructed and sand in the water probably damaged the pump. (Taggart well 1 appears to be in good condition and it operates close to its design efficiency of 115 gallons per minute.)
- At the Taggart tank, the hard, protective coating is damaged and the underlying insulation has holes from animals such as rodents and woodpeckers. Parts of the tank interior have surface corrosion. The tank lacks a number of safety and security devices that are required by regulatory agencies or recommended by trade organizations such as the American Water Works Association.
- At Windy Point, the buried tank that was built in 1956 is still in service. Some mechanical components were upgraded in 1983-1984 and substantial leaks were fixed in 2011. However, one of the leak repairs is a temporary fix.
- The pipe and valves of the 3.6-mile-long water conveyance system mostly date to 1956. The condition of all components of this underground system is not known, but several substantial leaks were found and fixed in 2011. For visible components, such as valves, conditions range from minor rusting to major corrosion.

Aging system components cause interruptions in service and chronic system failures (NPS 2009b), but park personnel to date have been able to implement repairs fairly quickly. System failure could disrupt park operations and visitor services and would reduce firefighting capability. Leaks in the system also could introduce pathogens into the water supply.

Requirements for Potable Water Supply

The water system in 2010 had an estimated average daily water demand of about 34,500 gallons per day. Because flowing water is used in the winter to keep the pipes in some park housing from freezing, winter demand nearly matches summer demand, which includes the highest visitor use. Maximum-day use is about 127,000 gallons per day.

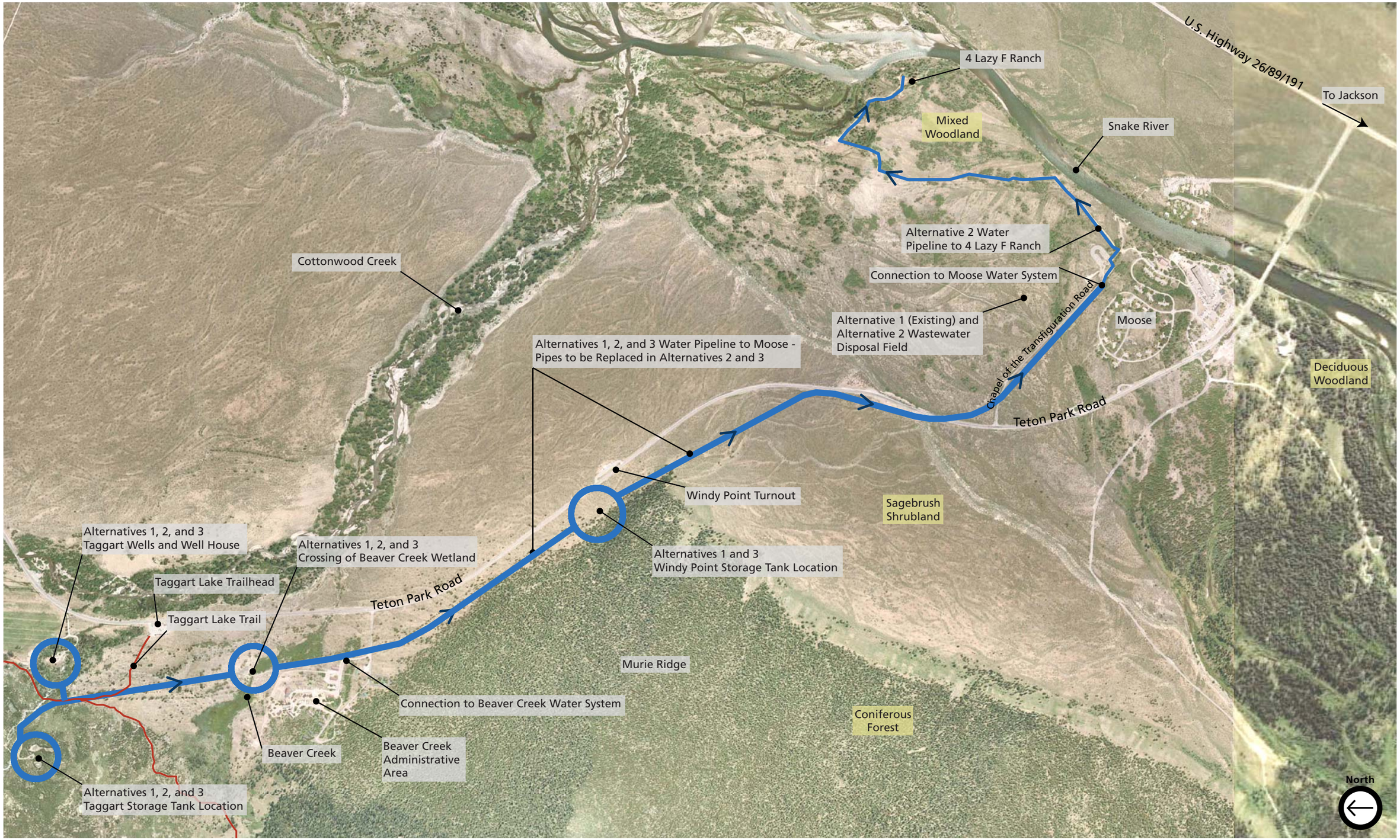

Figure 2: Project Area North of Moose

Grand Teton National Park

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Figure 3: Project Area at Moose
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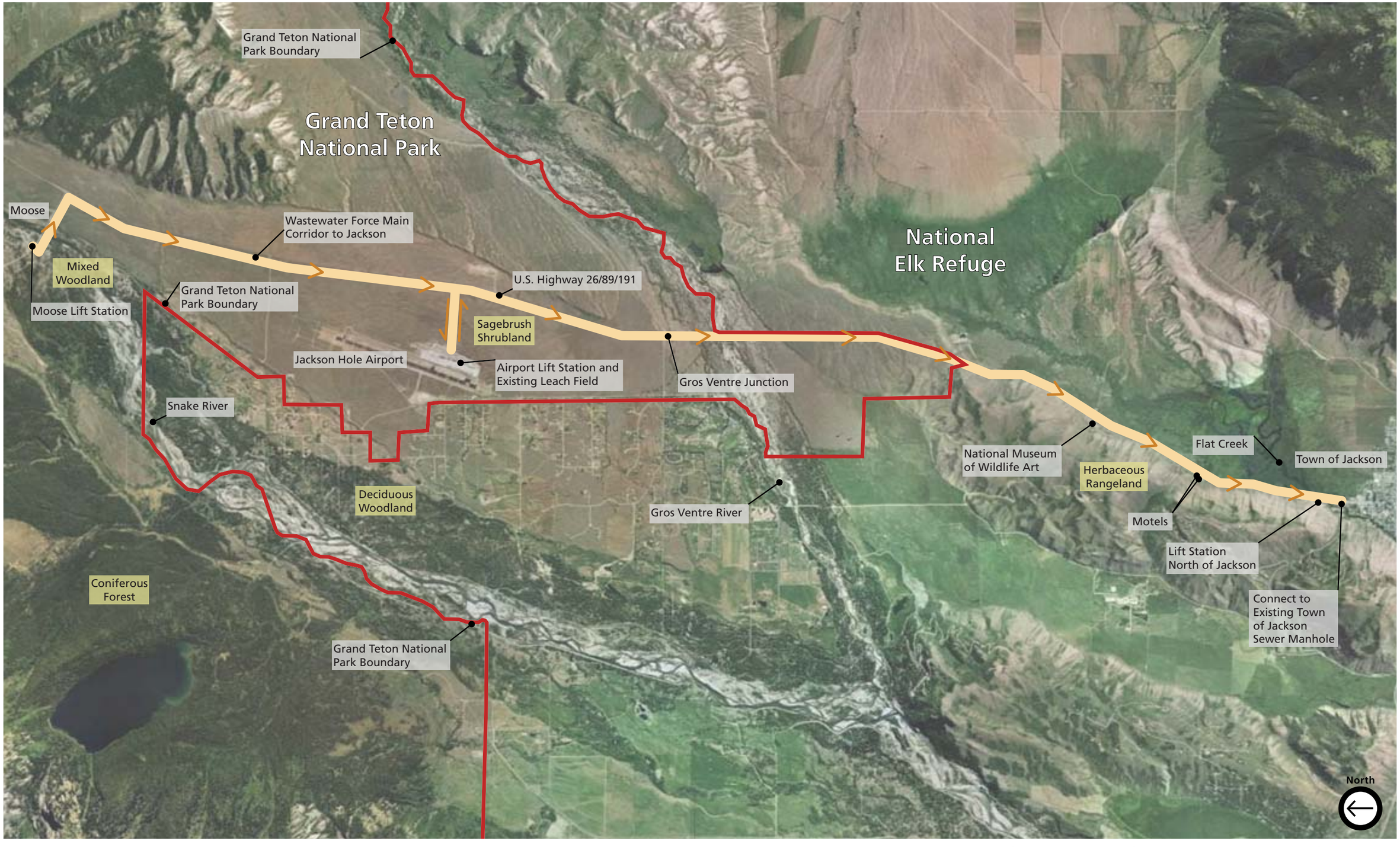

Figure 4: Project Area South of Moose

Grand Teton National Park

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Anticipated potable water demands in 2040 were calculated by Nelson Engineering (2011b). The estimate was based on the addition of 131 bedrooms of additional park housing at Moose and Beaver Creek that were authorized in the 1990 amendment to the park's 1976 master plan (NPS 1976, 1990), plus an increase in park visitation of 1% per year. It also assumed that most of the leaks that were occurring in 2010 were fixed. It was found that fixing the leaks would compensate for the new demand and that the estimated average daily water demand in 2040 would remain at about 75,000 gallons per day. The calculated design maximum day would be about 190,000 gallons per day, or 133 gallons per minute.

Requirements for Firefighting Flows

Firefighting flow requirements to protect structures in Moose and Beaver Creek define the needed size of the Moose water supply system. Those requirements are for:

- Flows of 1,250 gallons per minute, continuously for two hours, for hydrants near the maintenance building and near the Craig Thomas Discovery and Visitor Center in Moose. This flow was used as the criterion for the entire Moose complex.
- Simultaneous flows of 750 gallons per minute, continuously for two hours, for fire demands in the Beaver Creek administrative area.

The existing tanks and pumps cannot provide these flows durations. Moreover, the existing pipelines are hydraulically inadequate to deliver the pressure required for firefighting in either the Beaver Creek or Moose complexes (Nelson Engineering 2011b).

MOOSE WASTEWATER SYSTEM

The project area for wastewater management extends from the Moose area on the north to the town of Jackson on the south. This project area is shown on figures 2, 3, and 4. It does not include the Beaver Creek administrative area, where wastewater management occurs in several septic tank and leach field systems.

The wastewater plant that treats domestic sewage produced in the visitor, administrative, and housing structures at Moose was constructed in 1963 and expanded 10 years later. The wastewater treatment plant needs to be replaced because it poses numerous problems:

- It is nearing its daily capacity and is unable to handle projected future wastewater flows.
- It is less than 200 feet from the Snake River and is in the 500-year floodplain. The exiting treatment plant has experienced system failures and near failures. These failures have not resulted in sewage being discharged to the river but demonstrate that it is a possibility. Flooding or mechanical problems that released raw or partly treated sewage could contaminate the river, which is designated as a wild and scenic river and is classified by the Wyoming Department of Environmental Quality (2007) as Class 1, Outstanding Waters.
- Repairs to the obsolete facility are becoming more difficult and expensive.
- The outdated design and technology of the plant make it difficult to maintain and operate. As a result, treated effluent does not consistently meet the requirements of the state-issued permit for discharge from the plant to ground water.
- Carryover of solids could permanently clog the treated effluent disposal field.

Detailed characterizations of the wastewater management facilities are included in reports from the NPS' engineering consultant (Nelson Engineering 2010a, 2011a) and the descrip-

tion of current conditions from the NPS Project Management Information System (NPS 2009b). Initially, a septic tank and leach field system was used to treat Moose wastewater. That system was replaced in 1963 by an extended aeration wastewater treatment plant with surface discharge to the Snake River. The treatment plant was upgraded to its current configuration and 35,000-gallon-per-day capacity in 1973. This upgrade included changing from surface discharge in the Snake River to subsurface discharge using a percolation bed system at an upland site about a half-mile north of Moose. Since 1973, only small improvements have been made to the wastewater treatment system.

Wastewater Flows

Wastewater from the Moose area flows by gravity to a central collection point near the southeast edge of Moose by the post office. From there, the main lift station pumps the sewage to the wastewater treatment plant (see figure 3). A lift station near the visitor center pumps wastewater from that facility directly to the wastewater treatment plant. Annual average-day inflow to the Moose wastewater treatment plant in 2010 was about 14,400 gallons and the maximum day inflow was 26,288 gallons (75% of plant capacity).

Estimated influent in 2040 includes build-out of all approved and currently planned housing at Moose (NPS 1990) plus visitor growth of 1% per year. This would result in an approximate average daily inflow of 21,000 gallons, maximum day inflow of 44,000 gallons, and average inflow during the maximum winter month of 33,000 gallons per day. Many days annually would exceed the existing 35,000-gallon-per-day capacity of the plant.

In the next 50 years, the state of Wyoming may stipulate more stringent wastewater treatment standards. If this occurs, the NPS might choose to connect other areas in the south part of the park to the Moose plant. Together with wastewater from Moose, this would produce maximum inflows of about 86,000 gallons per day (Nelson Engineering 2011a).

Treatment and Maintenance Concerns

Annual reports from the U.S. Public Health Service characterize the Moose wastewater treatment plant, which provides activated sludge secondary treatment, as "antiquated." As a result, "constant monitoring and innovative repairs [are needed] to maintain operations of this obsolete facility. Despite these efforts, park staff cannot maintain the effluent quality required by the State of Wyoming Underground Injection Well permit" (NPS 2009b). Documented problems include inadequate treatment of ammonia and nitrates and poor solids removal.

Park personnel respond to an average of two or three failure emergencies at the plant each year, and repairs are becoming more difficult because of the age of system components. The plant may, as a result, experience extended service outages. To date, park personnel have been able to get the plant online fairly quickly. If a failure lasted for more than a few hours, it could interfere with park operations in the area.

Treated wastewater is pumped up to a percolation bed system about a half-mile north of Moose (see figure 2). The disposal system design is much like a traditional septic tank leach field, but it has higher hydraulic loadings. The system consists of four beds with a total capacity of 114,000 gallons per day. Discharge of treated effluent is periodically rotated among the beds, all of which operate effectively and do not display any problems. However, the poor solids removal of the existing wastewater treatment plant is of concern because solids could cause permanent clogging and failure of disposal field beds.

Regulatory Compliance

If the system fails, raw sewage could flow onto nearby land and possibly into the Snake River. This would cause safety and environmental concerns relating to sewage exposure for aquatic life, NPS employees providing cleanup, and visitors recreating in the river. Because the existing treatment plant is in the 500-year floodplain of the Snake River, extremely high flooding could result in the release of raw sewage to the Snake River.

The Snake River is an outstanding natural water resource under the Clean Water Act and is classified as Class 1, Outstanding Waters by the Wyoming Department of Environmental Quality (2007). These classifications mean that no further water quality degradation is allowed. This segment is classified as scenic under the Wild and Scenic Rivers Act. An overflow failure of the Moose plant could result in releases of untreated or partly treated sewage to the Snake River that would violate the water quality provisions of federal and state laws.

The wastewater treatment plant operates under a permit from the Wyoming Department of Environmental Quality. In 13 of 19 recent tests (68%), the treated effluent sent to the disposal field exceeded the permit limit for ammonia and/or nitrates, with some ammonia concentrations exceeding the regulatory limit by 10-fold. While additional treatment occurs in the disposal field soil, nitrogen levels in the effluent could eventually overload the disposal field beyond the treatment capabilities of the soil, which could contaminate the underlying ground water.

RELATIONSHIP TO PREVIOUS PLANNING EFFORTS AND THE CUMULATIVE IMPACT SCENARIO

The NPS has developed plans and implemented actions that could affect or be affected by water supply or wastewater management at Moose. These plans and actions are identified below with a brief description of their potential relevance to the proposed action. These plans and actions are considered in chapter 3 as the cumulative impact scenario.

The *Master Plan, Grand Teton National Park* (NPS 1976) is the basis for all planning and management actions in the park. The *Teton Corridor, Moose to North Jenny Lake: Development Concept Plan / Environmental Assessment: Grand Teton National Park, Wyoming* (NPS 1990) amended the master plan to rehabilitate and expand housing (with related increases in water and wastewater demand) by 131 bedrooms in Moose and Beaver Creek. Part of the housing expansion authorized by the amendment, consisting of 28 units in seven buildings, is under construction. The current water supply and wastewater treatment systems are too small to reliably service the full build-out. Because the proposed water and wastewater actions are needed to implement the development prescribed by the park master plan and its amendment, they are consistent with its intent.

The park master plan and amendment also authorized upgraded visitor and administrative facilities at Moose. These were addressed in the *Moose Visitor Center and Area Plan and Environmental Assessment* (NPS 2002b) and the *Moose Headquarters Rehabilitation – Site Work Environmental Assessment* (NPS 2010b). The resulting Craig Thomas Discovery and Visitor Center opened in August 2007. The upgraded visitor and administrative facilities contribute to the ongoing demand for potable water, firefighting water, and wastewater treatment at Moose. Meeting this demand by implementing the proposed actions would support the intent of the master plan to improve visitor and administrative facilities.

Traffic congestion and the desire to provide additional options for travel in the park were addressed in the *Transportation Plan Final Environmental Impact Statement, Grand Teton National Park* (NPS 2006b). The preferred alternative included constructing a multi-use

pathway outside the road corridor of U.S. Highway 26/89/191 from the south park boundary to Antelope Flats Road, and on the Teton Park Road from Moose to north Jenny Lake. At the south park boundary, the multi-use pathway connects with a similar pathway constructed by others (Jackson Hole Community Pathways 2009). The multi-use pathways generally parallel the routes of existing and proposed water or wastewater features from the Taggart Lake trailhead south to Jackson and contribute to cumulative effects.

In *Fire Management Plan and Environmental Assessment, Grand Teton National Park (2004)*, the NPS defines how it will meet the goals of managing fire on an ecosystem scale, restoring the natural role of fire to the landscape, using fire as a natural resource management tool, and providing structural protection. It includes pretreatment and suppression-oriented actions to protect the park's developed areas and infrastructure. The improved water supply that is the subject of this environmental assessment is consistent with fire management planning.

IMPACT TOPICS (INCLUDING TOPICS CONSIDERED AND DISMISSED)

This section identifies the resources and other values (impact topics) that could be affected by the alternatives. Candidate impact topics for this project were identified from internal and public scoping; based on federal laws, regulations, and orders; from NPS guidance such as *Management Policies 2006* (NPS 2006a); and from NPS knowledge of park resources.

Justifications are provided regarding why there was no need to examine some impact topics in detail. Other impact topics were carried forward for further analysis in chapter 3 of this environmental assessment. Effects on these impact topics were evaluated based on the issues that were identified during scoping, which also are presented in chapter 3.

RETAINED IMPACT TOPICS

The six impact topics that were retained for detailed analysis in chapter 3 include:

- Cultural resources (archeological resources and historic structures);
- Soil and vegetation;
- Water resources;
- Wildlife, including candidate, threatened, and endangered species;
- Health and safety;
- NPS and partner operations; and
- Visitor use and experience.

IMPACT TOPICS DISMISSED FROM DETAILED CONSIDERATION

This section explains why some impact topics were not evaluated in more detail. Impact topics were dismissed from further evaluation either because the resource does not occur in the area or because implementing the alternatives would have only a negligible or minor effect on the resource or value. Negligible or minor effects would include the following:

- An effect would be negligible if the resource would not be affected or if the effect would be so small that it would not be detectable or measurable.
- A minor effect would be detectable or measurable, but would be of little importance. For example, a measurable, long-term, beneficial effect on the soundscape would result from replacing the existing backup generators for the water and wastewater system

pumps in Moose with quiet-technology generators. The intensity would be minor because mitigation such as sound walls now reduces generator noise, generators usually run only for a short time each week, and generator sound usually cannot be discerned from other sounds in this often-busy area.

Because there would be negligible or minor effects on the dismissed impact topics, the contribution from an alternative to cumulative effects for dismissed topics would be low or none.

Air Quality

Best management practices during construction would minimize air pollution. However, construction activities would temporarily increase vehicle emissions and dust. Emissions would be rapidly dissipated because prevailing winds provide good air circulation. Construction dust would be controlled with the application of water or other approved dust reduction measures. There could be local, short-term, negligible, adverse impacts on air quality during construction, but no measurable effects outside the construction vicinity would occur. No measurable change in emissions would occur after construction was completed. Therefore, air quality was dismissed from further evaluation.

Climate Change

Climate change is a global phenomenon that will manifest differently based on regional and local factors. Changes in Grand Teton National Park are expected to include reduced snowpack, loss of glaciers, reduced snow-related winter recreation, earlier snow melt, greater dryness, fewer opportunities for boating and rafting, increased mortality among all tree species but particularly the loss of aspen groves, loss of habitat for grizzly bears and mountain sheep, reduced trout habitat, and increased fish kills (Saunders *et al*. 2009).

It is not possible to link the greenhouse gas emissions from individual projects to effects on regional or global climatic patterns. While construction of Moose water supply and wastewater management projects would emit greenhouse gases, emissions would be negligible and would not be discernible at a regional scale. Sewage treatment produces greenhouse gases, but the volume would not differ among the alternatives.

Concerns raised during scoping were related to changes in floodplain capacity and flooding frequency of water and wastewater infrastructure that result from climate change. While individual storms may become more intense, the mean reduced snowpack would tend to reduce flooding frequency and intensity compared to current conditions. Because all of the Moose water and wastewater infrastructure under any of the alternatives would be outside the 100-year floodplain, flooding reductions that resulted from climate change would have a negligible impact on the infrastructure.

Moose water supply and wastewater management alternatives would not measurably alter greenhouse gas emissions, affect regional or global climatic patterns, or change the frequency at which Moose water and wastewater infrastructure was flooded. Therefore, this impact topic was dismissed from detailed evaluation.

Geology

All project sites are underlain by poorly consolidated glacial or alluvial deposits. Bedrock blasting should not be needed to install project components. This near-surface project would not alter any geologic features, and site geology would not affect the installation or operation of the project. Therefore, geology was dismissed from further consideration.

Night Skies

Because construction would occur during the day, it would not affect the visibility of night skies. Little or no lighting would be required for the completed project, and any lighting that was necessary would include shielding to minimize light emissions. Therefore, all of the alternatives would have a negligible effect on the visibility of night skies and this impact topic was dismissed from further analysis.

Prime and Unique Agricultural Lands

Prime farmland has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops. Unique land is land other than prime farmland that is used for production of specific high-value food and fiber crops. Both categories require that the land is available for farming uses (Council on Environmental Quality 1980). The map of prime and unique agricultural lands prepared by the American Farmland Trust (2002) indicates that these high-value resources do not occur in Teton County, Wyoming. Therefore, this impact topic was not evaluated.

Soundscapes

An important part of the NPS mission is to preserve natural soundscapes. During construction, sounds from equipment, vehicular traffic, and construction crews would increase. Best management practices would be employed during construction to minimize noise. Sounds generated from construction would be temporary, lasting only as long as the construction activity was occurring.

In the long-term, backup generators would continue to be exercised for only 20 minutes per week (0.2% of the time) and the NPS would continue to specify that new generators include quiet technology. Therefore, noticeable increases in noise would not occur, and sound levels could decrease as existing generators were replaced by newer, quieter models.

Adverse construction-related effects on soundscapes would be minor or less in intensity, and impacts from operations would be negligible or beneficial. Therefore, this topic was dismissed from further analysis.

Visual Quality

As currently designed, the water storage tanks associated with the action alternatives would be mostly buried. Only about 18 inches would be above the ground surface, and the only tank feature that would extend above the surrounding vegetation would be a ventilation standpipe. This vent, which would be bear-proof and tall enough to be above the snow, would be painted to blend with the landscape. It might be possible to obtain approval from the Wyoming Department of Environmental Quality to bury the tanks completely, so that the vent and a small, locked access hatch would be the only aboveground features. Either configuration would be an improvement compared to the existing aboveground Taggart tank and a negligible effect at Windy Point, where the existing tank is buried. If security fences were required around the tanks, they also would be painted to match the surrounding vegetation, and would have a negligible or minor, highly localized, adverse effect on visual quality.

Other permanent project facilities would be out of sight from most visitors or would be indistinguishable in existing building clusters. These would include the underground pipelines and, depending on the alternative, the new wastewater treatment building near the Moose post office or sewage pump stations in Moose, at the airport, and near Flat Creek north of Jackson. The visual impacts of these features would be negligible.

Construction of the Taggart and Windy Point water tanks and installation of the water line would cause short-term, minor impacts in foreground and midground views. While mitigation such as fences could be installed in some areas, such as around the tanks, construction would still be apparent. Minor impacts would decrease when construction equipment was removed, natural contours were reestablished, and native vegetation was restored. Impacts would decrease to negligible after the restored, native vegetation started to become evident in about two or three years.

Pipeline construction to the Jackson sewer system would have negligible effects on visual quality. Installation would involve a fast-moving, plowed-in system with a short presence (minutes) in any specific location between Moose and Jackson. The narrow (8-foot-wide) area of crushed vegetation with a narrower trench of disturbed soil would be in the foreground close to the road and would not affect midground or distant views. The disturbed area would be revegetated within a couple of growing seasons. The horizontal directional drilling rig also would be a foreground feature near existing roads and would be present only for a short time in any specific location.

Because all of these visual impacts would be negligible or minor, this impact topic was dismissed from detailed analysis.

Wilderness

In 1978, the NPS recommended that Congress include approximately 146,355 acres of the backcountry (about 47% of Grand Teton National Park) in the National Wilderness Preservation System. The recommended wilderness area includes most of the Teton Range in the park and several of the lakes at its base. The NPS manages this area to maintain its eligibility for future wilderness designation.

All project features would be outside the candidate wilderness. Although the site of the Taggart tank is within about a half mile of the proposed wilderness boundary, it would not affect future wilderness designation or wilderness character in Grand Teton National Park. Therefore, this impact topic was dismissed from further analysis.

Cultural Landscapes

The NPS' (1998) *Cultural Resource Management Guideline* defines a cultural landscape as

> *... a reflection of human adaptation and use of natural resources and is often expressed in the way land is organized and divided, patterns of settlement, land use, systems of circulation, and the types of structures that are built. The character of a cultural landscape is defined both by physical materials, such as roads, buildings, walls, and vegetation, and by use reflecting cultural values and traditions.*

For listing in the National Register of Historic Places, cultural landscapes must meet one or more of the following criteria of significance (NPS 1997):

- Associated with events that have made a significant contribution to the broad patterns of our history;
- Associated with the lives of persons significant in our past;
- Embody the distinctive characteristics of a type, period, or method of construction, or represent the work of a master, or possess high artistic value, or represent a significant and distinguishable entity whose components may lack individual distinction; or
- Have yielded, or may be likely to yield, information important in prehistory or history.

The landscape must also have integrity of those patterns and features necessary to convey its significance. These include spatial organization and land forms; topography; vegetation; circulation networks; water features; and structures/buildings, site furnishings, or objects (The Secretary of the Interior 1995b).

According to the NPS cultural landscapes inventory database, the 4 Lazy F Ranch, Menor's Ferry Historic District, Murie Ranch, and Beaver Creek Administrative Area Historic District have been identified as cultural landscapes. Project-related construction may occur nearby, but would not intrude into any of the landscapes. As a result, cultural landscapes would experience negligible impacts and were dismissed from further analysis.

Museum Collections

Museum collections are defined as artifacts, natural specimens, and archival and manuscript material. Because none of the alternatives would change the location or conservancy of museum collections, alter conservancy demands or requirements, or alter the risk of damage (such as by flooding), this topic was dismissed from further consideration.

Sacred Sites and Ethnographic Resources

Executive Order No. 13007, "Indian Sacred Sites," requires federal land managers to accommodate access to and ceremonial use of sacred sites by Native Americans, and to avoid adversely affecting the physical integrity of such sites. Procedures for national park lands are defined in Part 512, Chapter 3 of the *Department of the Interior Departmental Manual*.

NPS-28: Cultural Resource Management Guideline (NPS 1998) identifies ethnographic resources as "variations of natural resources and standard cultural resource types. They are subsistence and ceremonial locales and sites, structures, objects, and rural and urban landscapes assigned cultural significance by traditional users."

A number of tribes traditionally, and currently, value Jackson Hole for hunting, gathering, ceremonial, and other practices. Traditionally associated tribes include the Apache, Northern Arapaho, Blackfoot, Northern Cheyenne, Coeur d'Alene, Comanche, Crow, Gros Ventre, Kiowa, Nez Perce, Northern Paiute, Salish-Kootenai Group, Eastern Shoshone, Shoshone-Bannock, Assiniboine Sioux, Teton Sioux, Umatilla Group, and Yakama Group. Other traditionally associated tribes may be identified in the future. Grand Teton National Park holds many resources important to these tribes, including minerals; water; wildlife such as bison, elk, and pronghorn; and plants such as sagebrush and native grasses. These resources do not always have defined boundaries and may occur in and adjacent to the project area.

As part of scoping, the NPS sent letters to the tribes regarding the proposed action, but did not receive any comments. The environmental assessment will be submitted to each tribe for review and comment.

The NPS would continue to consult with the tribes about potential concerns associated with ethnographic resources. If tribes subsequently identified the presence of ethnographic resources, appropriate mitigation measures would be undertaken in consultation with the tribes. The locations of ethnographic sites would not be made public. In the unlikely event that human remains, funerary objects, sacred objects, or objects of cultural patrimony were discovered, provisions outlined in the Native American Graves Protection and Repatriation Act would be followed. For these reasons, this topic was dismissed from further consideration.

Energy Requirements and Conservation Potential

The NPS strives to incorporate the principles of sustainable design and development into all facilities and park operations. Sustainability is the result achieved by doing things in ways that do not compromise the environment or its capacity to provide for present and future generations. Sustainable practices minimize the short- and long-term environmental impacts of developments and other activities through resource conservation, recycling, waste minimization, and the use of energy-efficient and ecologically responsible materials and techniques. Value analysis and value engineering, including life-cycle cost analyses, were performed to minimize energy, environmental, and economic costs of proposed water and wastewater management alternatives. The NPS also will encourage suppliers, permittees, and contractors to follow sustainable practices. Consequently, any adverse impacts relating to energy use, availability, or conservation would be negligible. Therefore, energy requirements and conservation potential were dismissed from further consideration.

Environmental Justice (Socially or Economically Disadvantaged Populations)

All federal agencies must incorporate environmental justice into their missions by identifying and addressing the disproportionately high and/or adverse human health or environmental effects of their programs and policies on minorities and low-income populations and communities. Because the Moose water system and wastewater systems would continue to be available for use by all park staff and visitors regardless of race or income, and the construction workforces would not be hired based on their race or income, the proposed action would not have disproportionate health or environmental effects on minorities or low-income populations or communities. The proposed actions are consistent with section 1.4.7.1 of the *Management Policies 2006* (NPS 2006a). There would be no measurable effects on environmental justice issues. Therefore, this topic is dismissed from further analysis.

Indian Trust Resources

Any anticipated impacts on Indian trust resources from a proposed project or action by Department of Interior agencies must be explicitly addressed in environmental documents. The Federal Indian Trust Responsibility is a legally enforceable fiduciary obligation on the part of the United States to protect tribal lands, assets, resources, and treaty rights, and it represents a duty to carry out the mandates of federal law with respect to American Indian and Alaska Native tribes. Because there are no American Indian trust resources identified or located in Grand Teton National Park, this topic was dismissed from further consideration.

Natural or Depletable Resource Requirements and Conservation Potential

This impact topic addresses quality, recycling, or conservation of petroleum products and other natural resources. The use and conservation of fuels and other energy sources, including petroleum products, was discussed above under energy requirements and conservation potential. The amounts of other materials, such as metals and concrete, that would be required for the construction and operation of the water and wastewater management alternatives would be small and would not be detectable compared to the annual, regional use of these materials. Therefore, detailed analysis of this impact topic is not provided.

Potential Conflicts between the Proposal and Land Use Plans, Policies, or Controls

Land use plans, policies, or controls for the area outside the park are contained in the *Jackson/Teton County Comprehensive Plan* (Town of Jackson and Teton County 2002). All proposed actions for water supply would occur entirely within Grand Teton National Park.

Therefore, they would not conflict with land use plans, policies, or controls for jurisdictions outside the park.

In discussions with the NPS, the town of Jackson found the alternative to convey wastewater to the Jackson system to be consistent with its land use planning policies and future plans for wastewater management. Providing a sewer would not encourage strip development on private parcels along its length because:

- Most land is federally owned and cannot be privately developed.
- The NPS and Jackson Hole Airport would own the pressurized sewer line, and other entities could not connect to the line without NPS approval. If the NPS allowed other facilities to connect, they could not increase their flows without NPS approval.

For these reasons, the alternatives would not conflict with land use plans, policies, or controls, and this impact topic was dismissed from further analysis.

Socioeconomics

Jobs and purchases associated with construction and long-term operation and maintenance of the water and wastewater facilities would not be detectable from normal variations in the labor or retail markets of Jackson and Teton County. The project would not produce indirect socioeconomic impacts, such as increased park visitation that could result in more demand for food and lodging outside the park. Payments of approximately $12,000 per year to the Jackson Public Works Department by the NPS and airport for sewage treatment under alternative 3 would be modest and would not substantially affect the budgets of any of these agencies. There would not be any changes in the need for services such as schools, fire protection, or street maintenance.

Scoping identified concerns about promoting development near the park by providing a sewer connection to the Jackson system. As described above under "Potential Conflicts between the Proposal and Land Use Plans, Policies, or Controls," the NPS and airport would own the pressurized sewer line and would only consider additional connections of limited capacity to existing facilities. As a result, development potential would be unchanged.

Because the project would have a negligible effect on social and economic conditions, a more detailed analysis is not included.

Transportation

The water supply alternatives and the alternative of onsite wastewater treatment would not affect roads in or outside the park. During construction, additional truck traffic would sometimes be detectable in Moose, but it would not reduce access to visitor use areas. On U.S. Highway 26/89/191, construction-related traffic would not be detectable compared to normal traffic variations. Closure of part of the Taggart Lake Trail might be required during water supply system construction, but visitors could continue to access the lake from other trails. Therefore, all impacts on transportation would be negligible.

The alignment of the sewer force main to Jackson typically would be 25 feet from the edge of the asphalt shoulder of U.S. Highway 26/89/191. This would allow for construction without traffic conflicts. Horizontal directional drilling would be used to cross local roads, so road closures would not be required. Negligible impacts would occur during operation of any alternative. Because all impacts on transportation during construction and operation would be negligible, a more detailed impact analysis is not needed.

Chapter 2: Alternatives Considered

This chapter describes three alternatives for addressing critical water system deficiencies and replacing the Moose wastewater system. Alternative 1 is no action / continue current management, where the NPS would continue to use, maintain, and repair the existing water and wastewater systems, both of which are beyond their design lives. Details primarily are from the NPS' Project Management Information System (NPS 2009b).

The NPS also developed two action alternatives. Details primarily are from engineering feasibility studies from Nelson Engineering (2011a, 2011b). Each alternative includes a water and a wastewater component, but the pairings presented in this environmental assessment might not be the pairings approved in the finding of no significant impact and implemented by the NPS. This is acceptable under the National Environmental Policy Act, as long as the effects of each of the approaches that is a component of the final alternative was considered in detail in the environmental assessment.

ELEMENTS COMMON TO ALL ALTERNATIVES

The action alternatives would substantially change the Moose water and wastewater systems. However, some components of the existing systems would remain in service, and the types of management actions that would be required would be similar for all alternatives. Facilities that would be common to all of the alternatives include the following.

- Water would continue to be obtained from the two existing wells at Taggart Creek, about 3 miles north of Moose.
- The points of connection from the water supply pipeline to the distribution systems for the Beaver Creek administrative area and for Moose would not change.
- The existing water distribution systems for Moose and the Beaver Creek administrative area would stay in service.
- The existing Moose sewage collection system would stay in service. This system collects domestic wastewater from throughout Moose and conveys it via gravity and pressurized flow to the main pump station near the post office.
- There would not be any changes to the components of the water and wastewater systems for the Craig Thomas Discovery and Visitor Center that are south of Teton Park Road. The water supply pipeline, sewage pump station, and pressurized sewer line were installed when the structure was constructed in 2006-2007 and are in good condition.

Similar types of management activities would be needed for all of the water and wastewater management alternatives. For example, all would require regular operation and maintenance, testing, monitoring, and reporting. However, factors such as the frequency and locations of these activities would vary by alternative.

ALTERNATIVE 1: NO ACTION / CONTINUE CURRENT MANAGEMENT

Routine maintenance of the water and wastewater systems would continue, with repairs as needed, but neither system would be replaced. The systems would continue to be undersized to meet future demands for potable water, water for fighting structural fires, and sewage treatment. Important features of the Moose water and wastewater management systems are described below and summarized in a table at the end of this chapter.

WATER SYSTEM

Alternative 1 would use the existing water system that consists of two wells, a well house, two storage tanks, and a conveyance system. The locations of project features are shown in figures 2 and 3. The system would continue to serve the administrative, visitor center, and housing areas at Moose, plus the housing and administrative facilities at Beaver Creek. The 4 Lazy F Ranch would continue to get water from onsite wells.

Ground water would be obtained from two wells in the Taggart Creek area about 3 miles north of Moose at maximum rates of approximately 115 gallons per minute for Taggart well 1 and 75 gallons per minute for Taggart well 2. The problem of sand in water from one of the wells would not change and pump damage would be a recurring problem.

The configuration of the single-room well house would not change. Because the electrical and control instrumentation would stay in the same room as the chemical treatment system, accelerated corrosion of the instrumentation by chlorine vapors would continue.

Treated water would continue to be pumped from the well site to the existing, aboveground Taggart tank, about a quarter-mile to the west and 150 feet higher in elevation. Water would be stored in the 50,000-gallon, aboveground Taggart tank, with no correction of its corrosion, safety, and security concerns. From the Taggart tank, water would flow by gravity through the Beaver Creek administrative area, where some is diverted into the distribution system, and down to the existing, underground Windy Point tank. The collective storage in the two tanks would continue to be inadequate to meet firefighting requirements.

The existing water system transmission pipelines would remain in service, including about 3.6 miles of pipeline. The leak detection and repair program that currently is underway might need to be expanded in the future as the transmission system continued to deteriorate. The existing pipelines would continue to be hydraulically inadequate to deliver the required pressures for firefighting in the Beaver Creek and Moose complexes. The risk would continue that a corroded pipeline component could fail when subjected to firefighting flows and pressures, with a resulting total loss of flow at the fire site.

Automated operation of the system and condition recording would continue to be provided by a supervisory control and data acquisition system in Moose. The current system was installed in 2001 and, under alternative 1, it could continue to be periodically updated as technology improved.

WASTEWATER MANAGEMENT

The existing wastewater plant, which was installed in 1973, would continue to treat wastewater from Moose. This plant is in a 40-foot by 50-foot building about 180 feet west of the Snake River within the 500-year floodplain. Alternative 1 would also continue to use all of the other components of the existing system, which are shown in figures 2 and 3.

The original plant was placed near the Snake River so treated effluent could be discharged directly to this waterway. Upgrades and expansion in 1973 included constructing a subsurface land disposal field north of Moose and installing a pump station at the plant to lift the treated effluent to this upland site. All of these facilities would remain in service.

The wastewater treatment plant would continue to provide secondary treatment with a capacity of 35,000 gallon per day. Alternative 1 would continue to present problems relating to wastewater management, including:

- Inability to treat the projected future wastewater production from Moose;
- Inability to meet current treatment requirements for removal of ammonia and nitrates;

- Inability to meet anticipated future state treatment requirements;
- Poor solids removal, which could permanently clog the land disposal field;
- Outdated design and antiquated technology that make plant operations challenging;
- Absence of automated controls so that the plant operator must perform regular system checks and set all controls manually;
- A high failure rate (currently two or three failures each year), with the potential for more frequent or severe failures as components continued to wear and corrode;
- Lack of wastewater storage capacity in the plant, which could result in the pumping of partly treated sewage discharge to the disposal field; and
- Potential for violations of Clean Water Act and Wild and Scenic Rivers Act provisions that protect the water quality of the Snake River.

Alternative 1 would continue use of the existing pump stations and force mains, which are shown on figure 3. The main pump station moves sewage from the central collection point of the gravity sewers into a force main to the wastewater treatment plant. The pump station was constructed at its present site near the post office in 1956 and was most recently upgraded in 2002. The pump station near the visitor center was constructed in 2006 and would remain in service for all alternatives. This pump station moves wastewater into a force main that goes directly to the wastewater treatment plant.

Unless the Jackson Hole Airport develops an alternative to wastewater treatment, they would continue to use four onsite septic tank and leach field systems to treat wastewater. The rate is expected to increase from the current maximum-month flow of about 12,200 gallons per day to about 19,000 gallons per day in 2028.

ALTERNATIVE 2: NPS PREFERRED, ONE WATER STORAGE TANK AND ONSITE WASTEWATER SYSTEM

Alternative 2 would replace or upgrade most components of the existing water supply system. One 300,000-gallon, partly buried, water storage tank would be constructed at the Taggart site and the existing tanks would be demolished. Other replacements would include the well pumps and the water main from the new Taggart tank to Moose. In addition, a new water main would be constructed from Moose to the 4 Lazy F Ranch.

The wastewater treatment function would remain in Moose, but a new wastewater treatment plant would be constructed near the post office and the existing plant would be demolished. The new plant would meet current and anticipated future state of Wyoming requirements. The plant would treat projected year 2040 flows for Moose, with the future potential to treat wastewater from Beaver Creek and several other sites in the south part of the park.

Important features of the water supply and wastewater management systems are described below and are summarized in the table at the end of this chapter. This alternative also would include best management practices and mitigation measures identified later in this chapter.

WATER SYSTEM

Alternative 2 would rehabilitate or replace water storage and main lines providing water to Moose and Beaver Creek and would provide a new connection to the 4 Lazy F Ranch.

A new well would be drilled at the Taggart well site. Taggart well 2, which has always had problems with sediment production, would be plugged in accordance with state water protection requirements. New, 145-gallon-per-minute pumps would be installed on the new

well and Taggart well 1. Each new well pump would meet maximum-day potable water demands of 140 gallons per minute in 2040 with the other well out of service.

The existing, 115-square-foot well house would be removed and replaced with a new, 425-square-foot structure. The new well house would separate chemical treatment and disinfection equipment from the control instruments, which would reduce chlorine-caused corrosion.

A new, 300,000-gallon tank would be installed near the existing Taggart tank. The new tank would provide sufficient storage to satisfy future firefighting and potable water needs at Beaver Creek, Moose, and the 4 Lazy F Ranch at least through 2040. Initial plans included a mostly buried tank, with the top 18 inches exposed. However, it is more likely that a variance from the Wyoming Department of Environmental Quality would allow the tank to be buried completely, with security provided by a locked hatch and no fence. Any configuration would include corrosion, safety, and security features that met state requirements and industry recommendations. Impact analyses were based on a buried tank.

Tank construction would remove about 3 acres of vegetation. Site preparation and tank construction would be completed in two construction seasons (May to November). When the new tank was operational, the old, aboveground Taggart tank would be dismantled and removed and the underground Windy Point tank would be collapsed and filled. The areas around the new tank and both old tanks would be restored with native vegetation.

The existing transmission line from the Taggart tank to Moose would be abandoned and replaced with 16,600 linear feet (3.1 miles) of new pipeline laid adjacent to the existing line. This line would be hydraulically adequate to provide firefighting water at state- and NPS-specified flows, durations, and pressures throughout Moose and Beaver Creek. Installation would involve a disturbance area up to 40 feet wide along the entire pipeline length, for a maximum disturbance of approximately 15 acres. All pipeline installation procedures would be confined to this disturbance area, including staging and stockpiling.

A new water pipeline (approximately 6,400 linear feet) would be installed along the gravel road from the Moose distribution system valves to the main lodge at the 4 Lazy F Ranch. Trenching to install the line would occur primarily in the existing, 24-foot-wide gravel road, but the disturbance area could extend up to 25 feet beyond the road center line (13 feet from the road edge) for a maximum new disturbance area of 1.9 acres. Measures such as avoidance or directional drilling would be taken to ensure that wetlands would not be affected.

After installation was completed, areas of new disturbance would be graded to match local contours, top-dressed with stockpiled native soil, and revegetated in accordance with an NPS-approved restoration and revegetation plan using native seed and vegetation. The 4 Lazy F Ranch road would be restored to its original width with a gravel surface.

WASTEWATER MANAGEMENT

Wastewater would continue to be treated in Moose. A new treatment plant (approximately 3,360 square feet) would be constructed near the post office at the site of the existing pump station where the gravity sewer lines converge. Parking would be available in existing, nearby lots, so additional impermeable surfaces would not be needed. Construction would require the removal of approximately 0.5 acre of vegetation. Except for the building and driveway footprints, this area would be revegetated with native species selected for root systems with a low tendency to invade and block pipelines.

The site of the new plant is about 950 feet from the Snake River and outside the 500-year floodplain. The plant would be sized for year 2040 flows from Moose. An equalization basin would improve treatment effectiveness and provide storage if the plant had to be taken out of

service. A supervisory control and data acquisition system would manage all plant processes. This system would increase plant reliability, extend the life of components, and reduce energy use and operating costs. The plant would address all of the concerns that were described in chapter 1 and summarized in the alternative 1 description.

All of the gravity collection pipelines from buildings at Moose would remain in service. The visitor center pump station and part of the force main from the visitor center also would remain in use, but about 635 feet of new force main would be constructed north of Teton Park Road to route wastewater from the visitor center to the new treatment plant. Additionally, approximately 3,015 linear feet of force main would be constructed from the new wastewater treatment plant to the existing percolation bed, which would continue to be used for wastewater disposal. The construction corridors for the new force mains would be up to 40 feet wide, for a maximum disturbance of approximately 3.3 acres.

The existing wastewater treatment plant (2,000 square feet) and adjacent water laboratory (225 square feet) would be demolished and the area would be revegetated. Seeding or plantings might be used to advance the restoration process and reduce opportunities for exotic invasive plant species. The existing main pump station adjacent to the new treatment plant also would be demolished. The existing force main pipelines to the demolished plant and from the plant to the upland disposal field would be plugged and abandoned in place.

Wastewater management at the airport would not change from alternative 1.

ALTERNATIVE 3: TWO WATER STORAGE TANKS AND SEWER LINE SYSTEM

Alternative 3 would replace or upgrade many of the same components of the water system that would be addressed by alternative 2. However, it would maintain the current configuration by replacing the water storage tanks at both the Taggart and Windy Point sites. It would not provide water to the 4 Lazy F Ranch, which would continue to use well water.

Alternative 3 would move wastewater treatment out of Grand Teton National Park. A new pump station (also called a lift station) would be constructed near the Moose post office. It and two other new lift stations would pump the wastewater in a new force main (approximately 12 miles long) to the town of Jackson sewer system south of Flat Creek. Along the route, the force main would receive sewage from the Jackson Hole Airport. In the Jackson system, the sewage would flow by gravity to the Jackson treatment plant where it would receive advanced secondary treatment and be discharged to the Snake River.

Important features of the water supply and wastewater systems are described below and summarized in the table at the end of this chapter. In addition, this alternative would include best management practices and mitigation measures identified later in this chapter.

WATER SYSTEM

Under alternative 3, the existing supply facilities would be rehabilitated and upgraded, the Taggart and Windy Point water storage tanks would be replaced, and all of the transmission lines from the Taggart tank to Moose would be replaced. Components that would be the same as described for alternative 2 would include drilling a new well and plugging Taggart well 2, upgrading the well pumps, replacing the well house, and demolishing the old Taggart and Windy Point water tanks.

A new, 132,000-gallon, concrete tank would be constructed near the existing Taggart tank. At Windy Point, a new, 174,000-gallon, concrete tank would be constructed near the existing tank. The Taggart tank alone would meet firefighting and potable water needs at Beaver Creek and the coordinated operation of the two tanks would meet firefighting and potable

water needs at Moose. As described for alternative 2, the tanks currently are designed to extend about 18 inches above the ground, but they could be completely buried. Either design would have modern corrosion, safety, and security features. Each site would require clearing about 3 acres, with restoration of most of the area using native vegetation after construction. The Taggart tank would continue to be accessed using the existing road. The Windy Point site would require a new access road from Teton Park Road that would be 10 feet wide and up to 400 feet long.

A new transmission line would be installed along the same alignment as the existing pipeline to minimize new disturbance of soil and vegetation. Pipeline diameters would differ from those in alternative 2 but other features, including a maximum disturbance of about 15 acres along a 40-foot-wide construction corridor, would be the same as described for alternative 2.

WASTEWATER MANAGEMENT

The NPS would no longer treat wastewater at or near Moose. Instead, a new sewer force main, approximately 12 miles in length, would transport wastewater from the Moose area to the town of Jackson sewer collection system and, ultimately, its treatment plant. Figure 4 shows the pipeline alignment and components.

To minimize resource disturbance, the sewer line would be installed using a plowed-in technique, with horizontal directional drilling for all crossings of waterways and paved roads. Gravel roads would be crossed using the plowed-in trench and would be repaired. After wastewater flows were switched to the new system, the existing wastewater treatment plant and water laboratory near the river would be demolished and the area would be revegetated.

The sewer force main would handle flows from Moose, the Jackson Hole Airport and, possibly, the National Museum of Wildlife Art and two motels north of Jackson. Although the force main would be sized to also handle wastewater from other facilities in the south part of the park, connection of other park areas is not part of the current project.

The sewer line would end south of Flat Creek where the sewage would be discharged to the Jackson sewer system. From there, it would flow by gravity to the existing Jackson treatment plant on South Ricks Road near the Snake River. In the plant, treatment occurs to an advanced secondary level, and the effluent is discharged to the Snake River in conformance with the conditions of a National Pollutant Discharge Elimination System permit.

The Jackson plant, which has a capacity of 5 million gallons per day, currently treats an annual average flow of 1.7 million gallons per day with a maximum-day flow of 3.4 million gallons. The maximum-day flow from Moose, the airport, museum, and two motels would be about 0.13 million gallons, which is about 8% of the maximum-day available capacity of the Jackson plant. Sewage from other sources is not expected to increase substantially because of growth constraints in the service area. As a result, there is adequate capacity at the Jackson plant now and in the future to accept the wastewater from this alternative.

All of the gravity collection pipelines from buildings at Moose would remain in service. The visitor center lift station and the force main from this lift station to near Teton Park Road would continue to operate as in the other two alternatives. About 635 feet of new force main would be laid in a construction corridor up to 40 feet wide starting near Teton Park Road to move wastewater from the visitor center to the new lift station by the post office.

Starting at the new lift station, the pipeline would run north of Teton Park Road to the intersection with U.S. Highway 26/89/191. Horizontal directional drilling would be used to bore under the Snake River north of the bridge and under Teton Park Road west of the main highway without disturbing the river bed, road pavement, or road bed.

The pipeline would remain on the west side of U.S. Highway 26/89/191 from Moose Junction to Jackson. It would turn west at the airport, run along the north side of the airport road, and connect with the airport wastewater system near the terminal. The new airport lift station would then pump the combined Moose and airport sewage east to the highway using the same trench as the west-bound line. As the pipeline headed south, it would be bored under paved roads and waterways, including the Gros Ventre River.

Throughout its length, the pipeline would be about 25 feet from the edge of the asphalt shoulder. However, deviations could be made to accommodate topography or avoid features such as archeological sites, wetlands, or other utilities. South of the park boundary, the pipeline would be on land owned by the Wyoming Department of Transportation, U.S. Fish and Wildlife Service, and private owners. The connection to the Jackson sewer system would be on private land at an existing manhole about 400 feet south of Flat Creek.

Three pumping stations would move wastewater from Moose to Jackson (figure 4). The Moose lift station would be approximately 550 square feet and would contain drive-up access of approximately 2,400 square feet. The airport lift station would be approximately 520 square feet. The lift station north of Jackson on private land would be approximately 375 square feet and would contain drive-up access of approximately 2,400 square feet. The construction disturbance for each pump station would be approximately 0.25 acre, and vegetation would be restored beyond the permanent features. No vegetation disturbance was considered for the airport pump station because it would be in an already-developed area.

A supervisory control and data acquisition system would manage all conveyance system functions and would monitor features such as flows and pump operations. This system would increase system reliability and reduce operating costs. Backup generators in each pump station would ensure continued operation in the event of an electrical power failure.

MITIGATION MEASURES

Mitigation is designed to prevent or minimize adverse impacts during and after project implementation. The following measures would be implemented during the action alternatives, as needed. The NPS may need to obtain federal and state environmental permits and, as part of that process, additional mitigation measures could be required by other agencies.

The NPS commits to the mitigation measures identified in this section as a part of implementing the project. The impacts for the action alternatives in chapter 3 were determined with these mitigation measures in place, with tailoring to meet site-specific conditions.

SOIL

Install the pipeline using a plowed-in technology. Require a system that uses rubber tires to minimize soil and vegetation disturbance, limits disturbance to the width of the machine (about 8 feet), and cuts a trench that is not much wider than the pipe being installed. Perform restoration quickly and, where possible, roll the sod that contains the topsoil and vegetation back on top of the filled trench where the plants can reestablish and limit the opportunity for exotic invasive species.

Minimize areas of disturbance by marking and strictly enforcing construction site and staging area boundaries, travel paths, and work limits with highly visible means such as fences.

Whenever possible, schedule construction during dry periods and when surface and ground water levels are low to minimize soil compaction.

Use erosion control best management practices to minimize soil erosion. Examples include silt fences, sediment traps, erosion check screens and filters, and hydro mulch. Use materials such as straw bales, fabric barriers, and sandbags to prevent soil from entering waterways.

Within the limits of construction, salvage topsoil whenever possible in surface disturbance areas. Depths of soil to be salvaged typically range from 6 to 21 inches.

Stockpile topsoil away from excavations and future work and protect it from mixing with subsoil. Grade and shape stockpiles to allow unimpeded drainage of surface water. If topsoil will be stored for more than a short time, use seeding with a fast-growing native species to provide a protective cover and prevent the introduction of exotic invasive plants. Maximize the use of previously disturbed areas for staging and stockpile areas to minimize ground disturbance.

Require dust control during construction using methods such as watering, covering haul loads, and controlling vehicle speeds.

Where backfilling is required, such as in the water main trench and site of the Windy Point tan, ensure that the backfill does not extend above the original ground surface contour level after settling.

Obtain any fill materials from a source approved by the park ecologist. Maximize the use of excess excavated soil at other project sites.

For construction not finished by winter, protect disturbed areas and soil stockpiles using best management practices. This could include covering soil piles with impermeable materials.

Replace the topsoil as part of site restoration after construction is completed. Distribute topsoil evenly to provide an effective rooting medium over the entire area of disturbance.

VEGETATION

Prior to construction, develop a project revegetation plan. The plan should include, but not be limited to, the use of native species (preferably from the same gene pool), native seed/plant mixes, mulch, salvaged plant materials, management of exotic invasive species, monitoring to ensure successful recovery, and actions to be taken if monitoring indicates problems. Include natural spacing, abundance, and diversity of native plant species. Ensure that there would be no irrigation needs beyond plant establishment.

In establishing construction boundaries, minimize impacts on vegetation by avoiding shrubs and trees (including their root systems) where possible. Prohibit the damage or removal of vegetation without prior approval in the project documents or from NPS vegetation staff.

Require contractors to pressure-wash construction equipment before it enters the park to ensure that it is free of mud or seed-bearing material.

For soil stabilization and erosion control, use only certified weed-free materials to avoid introduction of exotic plant species. Review all proposed materials on a case-by-case basis.

Follow construction best management practices for revegetation preparation and revegetation. After site work is completed, scarify compacted soil and reestablish original contours. Spread topsoil in as near to its original location as possible to help preserve microorganisms and seeds of native plants. Whenever possible, salvage and preserve disturbed vegetation for reuse.

Use mulching, seeding, and/or planting with species native to the immediate area to improve revegetation success.

The project revegetation plan also would address control of exotic invasive species. This would include pretreatment of exotic invasive species in the project area, control measures required during construction, and post-construction treatment and follow-up.

The revegetation plan would include maintenance to monitor and mitigate impacts for at least three years after construction. It would stipulate additional measures if recovery of a weed-free cover of native species could not be documented at the end of this period.

WATER RESOURCES

Prepare a storm water pollution prevention plan (SWPPP). Specify site-specific measures to reduce and control erosion, sedimentation, and compaction that can degrade water quality.

Plan and maintain vegetated buffers between areas of soil disturbance and waterways.

Use soil erosion best management practices such as sediment traps, erosion check screen filters, and hydro mulch to prevent the entry of sediment into waterways.

Promptly remove and properly dispose of any hazardous waste that is generated in the project area.

Inspect equipment for leaks of oil, fuels, or hydraulic fluids before and during use to prevent soil and water contamination. Require contractors to implement a plan to promptly clean up any leaks or spills from equipment, such as hydraulic fluid, oil, fuel, or antifreeze.

Minimize onsite fueling and maintenance. If these activities cannot be avoided, store fuels and other fluids, and perform fueling and maintenance, in designated areas that are bermed and lined to contain spills. Require provisions for the containment of spills and the removal and safe disposal of contaminated materials, including soil.

Implement the following best management practices to avoid or minimize potential adverse impacts on wetlands, stream channel, and water quality at the pipeline crossing of Beaver Creek and its wetlands. Additional best management practices may be appropriate, depending on local conditions or special circumstances. These also serve as conditions that must be met for the proposed actions to qualify as an "excepted" action for NPS wetland statement of finding and wetland compensation requirements (NPS 2011a).

Take action that has only negligible to minor, new adverse effects on site hydrology and fluvial processes, including flow, circulation, velocities, hydroperiods, water level fluctuations, sediment transport, channel morphology, and so on. Take care to avoid any rutting caused by vehicles or equipment.

Conduct the action so it has only negligible to minor, new adverse effects on normal movement, migration, reproduction, or health of aquatic or terrestrial fauna, including at low flow conditions.

Conduct the action to avoid degrading water quality to the maximum extent practicable. Employ measures to prevent or control spills of fuels, lubricants, or other contaminants from entering the waterway or wetland. Ensure the action is consistent with state water quality standards and Clean Water Act Section 401 certification requirements.

Maintain appropriate erosion and siltation controls during construction, and permanently stabilize all exposed soil or fill material at the earliest practicable date.

Properly maintain structures or fill material to avoid adverse impacts on aquatic environments or public safety.

Avoid heavy equipment use in wetlands if at all possible. Place heavy equipment used in wetlands on mats, or take other measures to minimize soil and plant root disturbance and to preserve preconstruction ground and water surface elevations.

Whenever possible, place excavated material on an upland site. However, when this is not feasible, place temporary stockpiling of excavated material in wetlands on filter cloth, mats, or some other semipermeable surface, or take comparable measures to ensure that underlying wetland habitat is protected. Stabilize the material with straw bales, filter cloth, or other appropriate means to prevent reentry of excavated material into the waterway or wetland.

Remove temporary stockpiles or other temporary disturbances in wetlands in their entirety as soon as practicable. Return wetland areas temporarily disturbed by stockpiling or other activities during construction to their pre-existing elevations, and restore soil, hydrology, and native vegetation communities as soon as practicable.

Facilitate revegetation of disturbed soil areas by salvaging and storing existing topsoil and reuse it in restoration efforts in accordance with NPS policies and guidance. Store topsoil for as short a time as possible to prevent loss of seed and root viability, loss of organic matter, and degradation of the soil microbial community.

Where plantings or seeding are required, obtain native plant material from a local NPS source and use in accordance with NPS policies and guidance. Implement management techniques to foster rapid development of target native plant communities and to prevent or minimize invasion by exotic invasive or other undesirable species.

WILDLIFE

Areas of vegetation removal would be surveyed for nesting birds by park biologists if construction is between May 10 and August 1. These surveys would be conducted within a week of construction. If nests are found, park staff would work with construction contractors to modify the location or alter the timing of the construction plan to prevent nesting disturbance. Ideally, conduct work after August 1 to avoid any conflicts. Inform construction workers and supervisors that under the Migratory Bird Treaty Act, no migratory bird, nest, or egg can be disturbed, removed, or destroyed. Provide instructions for notification of NPS staff if the potential for disturbance is discovered.

Protect bald eagle nests from human disturbance between February 15 and August 15. Plan work to ensure that it does not occur within a half-mile of any active bald eagle nest from February 1 to August 15 (NPS 2011b, USFWS 2007).

Plan work in the park so that it does not occur within 100 yards of any osprey, trumpeter swan, peregrine falcon, or great blue heron nests from April 1 to September 1 (NPS 2011b).

Avoid working at the Snake River bridge at Moose and along the Gros Ventre River if trumpeter swans are in the area. Typically, swans do not nest at either location but they are known to use both areas for loafing and foraging the winter months. No construction should take place before September 1 near the swan territory located at Flat Creek if swans are actively nesting.

Construction activities must not take place before 8 a.m. or after 6 p.m.to protect animals whose movements and activities correspond with crepuscular hours.

Train all contractors and their employees regarding the NPS' bear management plan, safety protocols, and food storage regulations. Require storage and handling of food, fuel, and other attractants to minimize potential conflicts. Ensure that all project crews meet standards for sanitation, attractant storage, and access.

Notify NPS staff if bats are located in any project facilities. To minimize adverse effects to any bats present, survey buildings before they are removed. If bats are found using the site as a roost, delay removal activities until after an NPS survey determines that individuals and/or young have left the buildings.

SAGE-GROUSE AND OTHER SAGE-DEPENDENT SPECIES

Prohibit all habitat removal between March 15 and June 30 to protect breeding, nesting, and brood rearing grouse, as stipulated in the Wyoming Governor's Executive Order (2011). Do not remove any habitat within 1 mile of any sage grouse leks between April 1 and June 30.

Require survey of sagebrush habitat for nests by park personnel if vegetation removal takes place prior to August 1.

Revegetate disturbed sagebrush areas using appropriate soil and grade preparation, weed control, and native plant revegetation techniques. Use native seed mix containing perennial grasses and forbs as well as sagebrush seed. Monitor revegetation of native sage-grouse habitats for a period of five years after initial restoration attempts. Require additional revegetation work if initial revegetation attempts fail to meet revegetation standards.

Minimize the footprint of support areas such as travel zones and staging sites by locating them as much as possible in the work corridor or in existing disturbed areas.

OTHER CANDIDATE, THREATENED, AND ENDANGERED SPECIES

Complete section 7 consultation with the U.S. Fish and Wildlife Service before starting the project.

Inform construction workers and supervisors about the potential for special status species in the work area. Include contract provisions that require a stop in construction activities if a special status species is discovered until NPS staff members evaluate the situation. Modify protection measures as appropriate to protect the discovery.

Implement measures to reduce adverse effects caused by nonnative plants and wildlife on candidate, threatened, and endangered species.

CULTURAL RESOURCES

Detailed archeological inventories have been conducted for most areas in the park that could be affected by the alternatives and along parts of the sewer line route from the park boundary to Jackson. Before project designs are finalized, conduct detailed cultural resource inventories for all uninventoried areas. If archeological resources that are eligible for listing in the National Register of Historic Places are discovered, alter the project design to avoid them.

If previously unknown archeological resources are discovered during construction, halt all work in the immediate vicinity of the discovery until the resources can be identified and documented. If the project component cannot be rerouted and the resources preserved *in situ*, prepare an appropriate mitigation strategy in consultation with the Wyoming state historic preservation officer and American Indian tribes traditionally associated with park lands.

In the unlikely event that human remains, funerary objects, sacred objects, or objects of cultural patrimony are discovered during construction, follow the provisions outlined in the Native American Graves Protection and Repatriation Act (25 *United States Code* 3001-3013).

Inform all contractors and subcontractors of the penalties for illegally collecting artifacts or intentionally damaging archeological sites or historic properties. Instruct contractors and

subcontractors regarding procedures to follow in case previously unknown archeological resources are uncovered during construction.

HEALTH AND SAFETY

Implement measures to close and/or redirect trails in areas that would be affected by construction to ensure visitor health and safety. Provide information on alternatives that would help hikers achieve their goal while staying away from the work area.

Implement a traffic control plan during construction, as warranted. Include strategies to maintain safe and efficient traffic flow.

Implement measures to reduce adverse effects of construction on visitor health and safety.

OPERATIONS OF THE NATIONAL PARK SERVICE AND PARTNERS

Coordinate activities of contractors and park staff to minimize disruption of normal park activities. Inform construction workers and supervisors about the special sensitivity of park values, regulations, and appropriate housekeeping.

To minimize potential impacts on concessioners and visitors, consider stipulations on construction timing. For example, operate heavy construction equipment in noise-sensitive areas between 7 a.m. and 7 p.m. to minimize noise impacts.

Prior to construction, conduct a meeting with concessioners, project managers, and business resources staff to provide information on anticipated issues that may occur.

VISITOR USE AND EXPERIENCE

Share information regarding implementation of this project and its effects on the trail system and roads with the public. Distribute or post information at entrance stations, on the park's website, at trailheads, at other visitor sites, and through press releases.

Develop and enforce an NPS- approved traffic and pedestrian control plan for use during construction. The plan would minimize disruption to visitors and park operations and ensure safety of the public, park employees, and residents.

Require contractors to coordinate with park staff to minimize disruption of normal park activities. Inform construction workers and supervisors about the special sensitivity of park values, regulations, and appropriate housekeeping.

Include specific provisions and implementation measures in the NPS contract to prevent storm water pollution during construction activities, in accordance with the Clean Water Act’s National Pollutant Discharge Elimination System permit program and all other federal, state, and local regulations. Require the contractor to develop and implement a storm water pollution prevention plan and dust control plan prior to construction. The NPS would provide the contractor with information related to storm water protection and dust control.

GENERAL CONSTRUCTION BEST MANAGEMENT PRACTICES

Clearly state all protection measures in the construction specifications.

Minimize the amount of ground disturbance for activities not directly related to construction, such as staging and stockpiling areas. Return all staging and stockpiling areas to preconstruction conditions following construction. Limit parking of construction and employee vehicles to designated staging areas or existing roads and parking lots.

Identify and define construction zones with construction tape, snow fencing, or other material prior to any construction activity. Use the zone to confine activity to the minimum area required for construction. Stipulate that construction activities, including material staging and storage, cannot occur beyond the construction zone fencing.

Comply with federal and state regulations for the storage, handling, and disposal of all hazardous material and waste. If hazardous materials would be used on site, make provisions for storage, containment, and disposal.

In the contract, identify specific provisions to prevent storm water pollution during construction activities, in accordance with the National Pollutant Discharge Elimination System permit program of the Clean Water Act and all other federal regulations, and in accordance with the storm water pollution prevention plan to be prepared for this project.

Provide the contractor with a copy of U.S. Environmental Protection Agency document *EPA 832-F-99-003, Storm Water Management Fact Sheet-Dust Control*. Require the contractor to submit a dust control plan prior to construction.

If recycled concrete is used for backfill, ensure that it is free of waste metal products, debris, toxic material, or other deleterious substances and that it meets gradation and aggregate test requirements.

Backfill excavated areas that are not to be used for structural requirements with appropriate material and contour them so that, after settling, they will blend with the surrounding terrain.

In areas where structural fill is required, to ensure that backfill and compaction requirements are met to finished grade.

Ensure that construction equipment uses the best available technology for sound dampening muffler and exhaust systems.

To save fuel and reduce noise and emissions, require contractors to develop and implement a plan that prevents excessive idling of all vehicles used in construction.

Require good housekeeping practices such as placing debris in refuse containers daily, emptying containers regularly, and prohibiting the burning or burying of refuse in the park.

THE PREFERRED ALTERNATIVE AND ENVIRONMENTALLY PREFERABLE ALTERNATIVE

THE ALTERNATIVE PREFERRED BY THE NATIONAL PARK SERVICE

Alternative 2, consisting of one water storage tank and an onsite wastewater treatment system, is the NPS' preferred alternative. In the NPS' analysis of the alternatives using the Choosing by Advantages process, the wastewater and water approaches included in this alternative showed the greatest benefit.

THE ENVIRONMENTALLY PREFERABLE ALTERNATIVE

According to the U.S. Department of the Interior regulations in 43 *Code of Federal Regulations* section 46.30 that implement the National Environmental Policy Act, the environmentally preferable alternative "causes the least damage to the biological and physical environment and best protects, preserves, and enhances historical, cultural, and natural resources. The environmentally preferable alternative is identified upon consideration and weighing by the Responsible Official of long-term environmental impacts against short-term impacts in evaluating what is the best protection of these resources."

Alternative 2 is the environmentally preferable alternative for several reasons. It would provide reliable potable water, firefighting water, and wastewater services to the Moose area. As a result, visitors and staff could continue to use and enjoy the Moose area without concerns about water-borne disease transmission or the adequacy of firefighting flows. The better water supply for firefighting that it provides would be effective in protecting the historical, cultural, and natural resources of Moose and Beaver Creek. It would use water and energy efficiently and would maintain local hydrologic conditions.

Alternative 3, which includes two water storage tanks and a sewer pipeline to Jackson, is as effective as alternative 2 in providing reliable water supply and protecting the natural, historical, and cultural resources of the area. However, it would disturb substantially more soil, vegetation, and wildlife habitat.

Alternative 1, which would continue the use of the current water and wastewater systems, is not environmentally preferable. Favorable features include its lack of ground disturbing activities in previously undisturbed elements of the biological and physical environment. However, natural and cultural resources would continue to be jeopardized by inadequate firefighting flows; water quality would continue to be at risk because of inadequate sewage treatment; and the systems are not sustainable in the long term because they are too small and have poor energy efficiency relating to water losses and manual controls.

ALTERNATIVES AND ACTIONS DISMISSED FROM FURTHER CONSIDERATION

Some alternatives suggested during scoping were not incorporated into this environmental assessment. This section briefly identifies those approaches and why each was eliminated.

WATER SUPPLY

Continued use of the existing water main while expanding water storage was dismissed because of the poor condition of some pipeline components and because the pipeline is hydraulically unable to deliver firefighting water at the required flows and pressures at Moose or Beaver Creek.

Rehabilitation of the existing tanks to extend their life was dismissed because storage would continue to be inadequate to meet potable and firefighting water requirements.

Meeting fire-fighting needs at Beaver Creek by pumping water up from a single, large tank at Windy Point was not considered because it would be less reliable than a gravity-fed flow and because its winter maintenance would have to be performed under challenging conditions.

Obtaining firefighting water from large wells near the Snake River also would be less reliable than a gravity-flow system, plus the NPS would need to install and operate large pumps near two facilities that are listed in the National Register of Historic Places.

Providing separate Beaver Creek and Moose systems was dismissed because of the inefficiencies of creating separate systems.

WASTEWATER MANAGEMENT

Expanding the current plant in Moose was dismissed because the site is too small to accommodate expansion. There would be little opportunity to contain a spill in the short distance to the river (less than 200 feet) if a raw sewage release occurred. In addition, the plant would remain in the 500-year floodplain where it would be an obstacle to Snake River flood flows.

Alternative treatment techniques such as a lagoon system or oxidation ditch were dismissed because they would require the commitment of a large parcel of park land.

Several methods for crossing waterways were dismissed. Trenching in the riverbed would require rerouting the flow, and it may not be possible to bury the pipeline deeply enough to protect it from exposure during high spring flows. Similar exposure could result if the pipeline was installed with plow-in or pull-in pipe-laying equipment. The pipeline could not be hung from the bridges because of winter freeze-up and its potential to rupture the pipeline.

Trenching across paved roads was dismissed because it would add cost, disrupt surface travel, and result in patching that would make the road more susceptible to future damage.

Treating wastewater from the airport at a treatment plant in Moose was dismissed because of the high cost of pumping the airport sewage uphill.

Construction of a treatment plant at the airport was dismissed because no land is available in the airport's development subzone for this use.

Bypassing the airport with an NPS force main to Jackson was dismissed because it was not cost-competitive with other wastewater approaches that are available to the NPS.

SUMMARY COMPARISON OF THE ALTERNATIVE

Table 1 provides a summary of the important features of the alternatives and how each alternative meets the project objectives identified under "Purpose of the Action." Table 2 summarizes the environmental consequences that would result from each alternative. A more detailed explanation of the impacts is presented in Chapter 3: Affected Environment and Environmental Consequences.

The purpose of this project was identified at the beginning of chapter 1, with objectives that could be used to determine if an alternative would be successful in meeting the project purpose. Alternative 1 would not meet any of the objectives that would indicate success. Both action alternatives were designed to address the shortcomings of the existing systems and would meet all of the objectives for addressing critical water system deficiencies and replacing the Moose wastewater system. None of the alternatives would result in conflicts with any environmental laws or policies.

Table 1: Summary of the Alternatives and How Each Meets Project Objectives

Feature or Objective	Alternative 1: No Action / Continue Current Management	Alternative 2: NPS Preferred, One Water Storage Tank and Onsite Wastewater System	Alternative 3: Two Water Storage Tanks and Sewer Line System
		Water Supply	
Configuration	Storage would continue in a 50,000-gallon tank at the Taggart site and a 100,000-gallon tank at Windy Point.	Storage would be in a single, 300,000-gallon tank at the Taggart site.	Storage would be in a 132,000-gallon tank at the Taggart site and a 174,000-gallon tank at Windy Point.
Adequacy	Substantial shortfall in the volume of water prescribed for firefighting would remain.	Storage volume would satisfy firefighting water needs at Moose, Beaver Creek, and the 4 Lazy F Ranch.	The storage volume would satisfy firefighting needs at Moose and Beaver Creek.
Tank condition	Tanks would continue to have problems with integrity, corrosion, safety, and/or security.	Tank would meet current state requirements and industry recommendations and would provide reliable storage for at least 50 years.	Same as alternative 2, but using a two-tank system.
Pipelines	Existing transmission lines would stay in service. Leaks would continue, with ongoing efforts to find and fix them. Lines would remain hydraulically inadequate to deliver firefighting pressures.	New pipelines would provide firefighting water at adequate flows and pressures to Beaver Creek, Moose, and the 4 Lazy F Ranch.	New pipelines would provide firefighting water at adequate flows and pressures to Beaver Creek and Moose.
		Wastewater Management	
Adequacy	System could not meet 2040 flows and may not meet future state standards.	System would meet 2040 flows with future expansion capabilities and would treat wastewater to current and anticipated future state standards.	System would meet 2040 flows and would treat wastewater to current state standards.
Location	Wastewater treatment plant would remain at its current site about 180 feet from the Snake River and in the 500-year flood plain.	A new wastewater treatment plant would be about 950 feet from the Snake River and outside the 500-year flood plain.	Treatment would occur in Jackson. Components in Moose would be about 950 feet from the Snake River and outside the 500-year flood plain.
Jackson Hole Airport	Wastewater would continue to be treated using onsite septic tank systems.	Same as alternative 1.	The airport would partner with the NPS to construct, own, and operate the wastewater conveyance system. The septic tank and leach field systems at the airport would be closed.
		Meets Project Objectives	
Reliably meets water and wastewater needs for at least 50 years.	No. Firefighting storage and flows are inadequate. The wastewater treatment plant is nearing its capacity. Worn parts and antiquated design make maintenance challenging.	Yes. All facilities are designed to meet current and projected future demand. Modern facilities with new components will, with regular maintenance and upgrades, meet 50-year needs.	Yes, for the same reasons described for alternative 2.
Minimizes risks to health and safety and resources.	No. The greatest risks relate to limits on the ability to fight structural fires and inadequate wastewater treatment.	Yes. Risk would be reduced by providing adequate firefighting water storage and delivery and onsite wastewater treatment.	Yes. Risk would be reduced by providing adequate firefighting water storage and delivery and by pumping wastewater to Jackson for treatment.
System meet all NPS and Wyoming requirements.	No. Current firefighting water storage and flow capacities are inadequate. Wastewater discharge standards sometimes are not met.	Yes. All facilities are designed to meet current requirements with the ability to expand or upgrade the wastewater system.	Yes. All facilities are designed to meet current requirements.

Table 2: Impacts of the Alternatives

Feature	Alternative 1: No Action / Continue Current Management	Alternative 2: NPS Preferred, One Water Storage Tank and Onsite Wastewater System	Alternative 3: Two Water Storage Tanks and Sewer Line System
Cultural resources	The risk posed by the firefighting flows that were below standards would represent an adverse, moderate, long-term effect on listed sites and districts. Other impacts would be negligible or minor.	The better protection of cultural resources resulting from improved firefighting ability at Moose, Beaver Creek, and the 4 Lazy F Ranch would result in long-term, moderate, beneficial effects on cultural resources. Other impacts would be negligible or minor.	The risk posed by the firefighting flows at the 4 Lazy F Ranch would be the same as alternative 1. Otherwise, the types and intensities of impacts would be the same as alternative 2.
Soil and vegetation	All impacts would be negligible or minor.	Approximately 24 acres of soils and vegetation would be disturbed. All impacts would be negligible or minor.	Approximately 35 acres of soils and vegetation would be disturbed. Impacts on management of exotic invasive species would be moderate, adverse, and long-term. Other impacts would be negligible or minor.
Water resources	Adverse effects of moderate intensity on the ability to meet state water quality standards would continue. These impacts would be short-term for surface water quality standards and long-term for ground water quality standards. Other impacts would be negligible or minor.	Beneficial effects of moderate intensity on the ability to meet state water quality standards would occur. These impacts would be short-term for surface water quality standards and long-term for ground water quality standards. Other impacts would be negligible or minor.	The types and intensities of impacts would be the same as alternative 2.
Wildlife	All impacts would be negligible or minor.	Moderate impacts on the greater sage-grouse and other sagebrush-obligate species. Approximately 20 acres of sagebrush habitat would be impacted until the habitat approached maturity in approximately 15 years. There would be no permanent loss of sagebrush habitat. Other impacts would be negligible or minor.	The types and intensities of impacts would be the same as alternative 2 except that approximately 31 acres would be affected.
Health and safety	Moderate, long-term, adverse effects would occur on the adequacy of wastewater treatment, adequacy of firefighting flows, and reliability of providing potable water and wastewater management. Other impacts would be negligible or minor.	Moderate, long-term, beneficial effects would occur on the adequacy of wastewater treatment, adequacy of firefighting flows, and reliability of providing potable water and wastewater management. Other impacts would be negligible or minor.	The types and intensities of impacts would be the same as alternative 2.
NPS and partner operations	Moderate, long-term, adverse effects on NPS operations would occur because of workload disruptions and the need to implement alternative human waste management methods when extended water or wastewater outages occurred. Other impacts would be negligible or minor.	Moderate, long-term, beneficial effects on NPS operations would occur with regard to workload scheduling and avoidance of water or wastewater outages. Other impacts would be negligible or minor.	The types and intensities of impacts would be the same as alternative 2.
Visitor use and experience	Short-term, moderate, adverse impacts would occur in Moose during the failure and repair of the water or wastewater systems. Other impacts would be negligible or minor.	Construction would cause short-term, localized, moderate, adverse impacts in the area of the Taggart Lake Trail. Other impacts would be negligible or minor.	The types and intensities of impacts would be the same as alternative 2.

Chapter 3: Affected Environment and Environmental Consequences

This chapter analyzes the environmental impacts that would result from the alternatives for the proposed project. Topics analyzed in this chapter include cultural resources; soil and vegetation; water resources; wildlife, including candidate, threatened, and endangered species; health and safety; operations of the NPS and partners; and visitor use and experience.

METHODS

Effects were evaluated for each retained impact topic in terms of type, context, duration, and intensity. Type describes whether impacts are beneficial or adverse, and direct or indirect:

- *Beneficial*: A positive change in the condition or appearance of the resource or a change that moves the resource toward a desired condition.
- *Adverse*: A change that moves the resource away from a desired condition or detracts from its appearance or condition.
- *Direct*: An effect that is caused by an action and occurs in the same time and place.
- *Indirect*: An effect that is caused by an action but is later in time or farther removed in distance, but is still reasonably foreseeable.

Context describes the area or location in which the impact would occur, such as site-specific, local, regional, or even broader. The methods description for each impact topic identifies the geographic area that was considered. The term "disturbance area" is used for the area where activities such as clearing and grading occur in association with construction.

Duration describes the length of time an effect would occur, either short-term or long-term:

- *Short-term* impacts generally last only during construction, and the resources resume their pre-construction conditions following construction.
- *Long-term* impacts last beyond the construction period, and the resources may not resume their pre-construction conditions for a longer period of time.

Intensity describes the degree, level, or strength of an impact. For this analysis, intensity has been categorized into negligible, minor, moderate, and major. Intensity definitions are provided for each impact topic analyzed in this environmental assessment.

For each impact topic, the alternatives also were evaluated for their contribution to cumulative impacts, consistent with the Council on Environmental Quality (1978) regulations for implementing the National Environmental Policy Act. Cumulative effects are "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions."

The cumulative impact scenario identifies the other past, ongoing, or reasonably foreseeable future actions in the project area that, with this action, could contribute to cumulative impacts. Those actions were described earlier in this document under the heading, "Relationship to Other Plans and Policies." The timeframe extends from the master plan amendment (NPS 1990) through the final implementation of the actions several years from now. Geographically it covers the area from Jenny Lake to Jackson, with a focus around Moose.

REGULATIONS AND POLICIES

Laws, regulations, and policies indicate the desired conditions that should be achieved in Grand Teton National Park with regard to each impact topic. These also help clarify why a particular impact topic is important to discuss, or help support the reasoning for impact threshold definitions. Laws, regulations, executive orders, policies, and guidance that were considered with regard to replacing the Moose wastewater system and addressing critical water system deficiencies include, but are not limited to, the following.

- Archeological and Historic Preservation Act of 1974 (16 *United States Code* 469-469c-2)
- Archeological Resources Protection Act of 1979 (16 *United States Code* 470aa-470mm)
- Bald and Golden Eagle Protection Act of 1940 (16 *United States Code* 668-668c)
- Clean Water Act of 1977 (33 *United States Code* 1251-1387)
- Endangered Species Act of 1973 (16 *United States Code* 1531-1544)
- Migratory Bird Treaty Act of 1918 (16 *United States Code* 703-712)
- National Environmental Policy Act of 1969 (42 *United States Code* 4321-4370d)
- National Historic Preservation Act of 1966 (16 *United States Code* 470-470x-6)
- National Park Service Organic Act of 1916 (16. *United States Code* 1-4)
- Rivers and Harbors Appropriation Act of 1899 (33 *United States Code* 401 et seq.)
- Wild and Scenic Rivers Act of 1968 (16 *United States Code* 1271-1287)
- Executive Order 11593, Protection and Enhancement of the Cultural Environment (1971)
- Executive Order 11988, Floodplain Management (1977)
- Executive Order 11990, Protection of Wetlands (1977)
- Programmatic Memorandum of Agreement among the NPS, Advisory Council on Historic Preservation, and National Council of State Historic Preservation Officers (2008)
- Standards regarding archeology and historic preservation, treatment of historic properties, and cultural landscapes (Secretary of the Interior 1983, 1995a, and 1995b).
- National Park Service *Management Policies 2006* (NPS 2006a)
- *NPS-28: Cultural Resource Management Guideline* (NPS 1998)
- *Director's Order #77-1: Wetlands Protection* (NPS 2002a)
- *Director's Order #77-2: Floodplain Management* (NPS 2003)

CULTURAL RESOURCES

AFFECTED ENVIRONMENT

Archeological inventories in the Jackson Hole area suggest a seasonal settlement pattern by Native Americans. Prehistoric resources include seasonal camps and sites for plant, animal, and stone procurement and processing that represent more than 10,000 years of human use. In Teton County (which contains Grand Teton National Park), no archeological sites from the prehistoric period are listed in the National Register of Historic Places. However, several prehistoric sites have been recommended eligible for the National Register.

Settlement by people of European descent was slow, and the population of Jackson Hole in 1890 was 64 people. In the early 1900s, mountain-valley ranching was the chief occupation and, while a few prospered, most lived at a near-subsistence level. The Moose area, which was homesteaded by William Menor in 1892 and sold to Maude Noble in 1918, was acquired by the Snake River Land Company, owned by John D. Rockefeller, Jr., in 1929 (Uhler 2007). It was part of Rockefeller's gift to the nation that helped enlarge the park to its current size.

Cultural Resources Listed in the National Register of Historic Places

The Moose area contains seven sites and/or historic districts that are listed in the National Register of Historic Places. The Moose housing and headquarters area was determined ineligible for listing in the National Register in 2010.

The following information is from the nomination forms, which are available on the Internet at http://nrhp.focus.nps.gov/. Selected listing characteristics are shown in table 3.

Table 3: Summary of Project Area Cultural Resources Listed in the National Register of Historic Places

Resource	Site Number	Year Listed	State Listing	Historic District	Effect
4 Lazy F Dude Ranch	90000611	1990	X	X	No adverse effect
Administrative Area Historic District, Old (Also known as Beaver Creek Residential/Utility Area)	90000621	1990	X	X	No adverse effect
Chapel of the Transfiguration	80004055	1980	X		No adverse effect
Menor's Ferry	69000016	1969	X	X	No adverse effect
Moose Entrance Kiosk	90000619	1990	X		No adverse effect
Murie Ranch Historic District	98001039	1998	X	X	No adverse effect
Murie Residence	90000616	1990	X		No adverse effect
Register-eligible unknown archeological sites		Not applicable			No adverse effect

The 4 Lazy F Dude Ranch historic district north of Moose was listed in the National Register based on its significance as an example of a purpose-built guest ranch, compared to many valley guest ranches that evolved from working ranches. The NPS acquired the property in 2006. Future preservation and management alternatives are currently being prepared as part of the park's historic properties management plan.

Beaver Creek Residential/Utility Area, also known as the Old Administrative Area Historic District, consists of 10 contributing buildings, two noncontributing buildings, and two noncontributing sites of removed buildings. Most of the buildings were constructed between 1934 and 1939 by the Public Works Administration and the Civilian Conservation Corps. They are significant based on their clear statement of the NPS rustic style of the 1930s. Included in this area, is Beaver Creek #10, which was constructed circa 1908 and was the first park headquarters.

The Chapel of the Transfiguration was built in 1925 to serve the employees and guests of the outlying guest ranches that constituted much of the area's early tourist industry. The chapel is owned and operated by St. John's Episcopal Church in Jackson. It is listed in the National Register as three detached structures, including a bell canopy that serves as an entrance to the church grounds, the chapel, and a small storage shed. Its significance is based on its historical association with early guest ranching and tourism, and also on its representation as a locally important and highly visible example of an architectural style knows as Western Craftsman.

Menor's Ferry historic district includes the whitewashed log buildings of the Menor homestead and the site of a ferry that provided the only means of crossing the Snake River from the 1890s until a bridge was built at Moose in 1927. William Menor came to Jackson Hole in 1892 and homesteaded the land on the west bank of the Snake River at the current site of Moose. The ferry he constructed and operated was a vital crossing for the early settlers of the Jackson Hole valley. The buildings are original, but the existing ferry and cableworks are replicas. Maude Noble's Cabin is significant as the site of a meeting in 1923, where local ranchers and

businessmen developed the Jackson Hole Plan, which made way for the creation of Grand Teton National Park.

The Moose Entrance Kiosk is significant as an example of early NPS rustic architecture and for its role as one of the original entrance stations shortly after the 1929 creation of the park. It was built between 1934 and 1939 by the Public Works Administration or Civilian Conservation Corps at a site close to the Beaver Creek Residential/Utility Area, but was moved to its current location in Moose after the 1950 park expansion. Use of the kiosk ended when two modern entrance kiosks were built a few yards to its west in 1958. Treatment alternatives for this building are currently being analyzed in the park's historic properties plan.

The Murie Ranch Historic District and **Murie Residence** (listed separately) are about a half-mile southwest of the park headquarters area. Both were listed in the National Register based on their association with the American conservation movement, and/or for their association with conservationists Olaus and Margaret Murie and with scientist Adolph Murie. In 2005, they were designated a National Historic Landmark, the highest level of distinction for historic properties.

Archeological Resources

To support testing along the existing water main between Beaver Creek and Moose, St. Clair (2010) conducted a cultural resource inventory of the area of potential effect. This report noted, "both Beaver Creek and Moose developed areas have been inventoried for cultural resources." The background research for this project included a search through the files of the Wyoming State Historic Preservation Office, Cultural Records Office; and reviews of previous area archeological investigations, including block inventories, class III inventories, and linear inventories. A few of these investigations identified sites of previously unknown prehistoric occupation, but none were determined to be eligible for National Register listing. Nearly all of the prehistoric sites were along Cottonwood Creek, which is outside the area of disturbance for wastewater and water system upgrades. Most of the studies reported that no sites were recorded. Specifically:

- A block inventory of the Beaver Creek housing area did not record any sites.
- The class III inventory conducted for the multi-use pathway along U.S. Highway 26/89/191 from Moose north to Jenny Lake did not record any sites in Township 43 North, Range 116 West, sections 24 and 25 near Moose. One prehistoric site that was not eligible for listing was found in section 23.
- During an 1985 inventory, no cultural resources were recorded in sections 23 or 24 during a linear inventory for rebuilding Teton Park Road.
- A 1994, 12-acre block inventory for the Beaver Creek leach field did not record any cultural resources.
- Near the Moose entrance station, the only recorded sites included a prehistoric lithic scatter, an isolate obsidian flake, a historic trash scatter, and the Menor's Ferry Road.
- No sites were recorded in a 3-acre class III inventory at the 4 Lazy F Ranch.
- Three historic homestead sites that were determined to be not eligible for listing were recorded across the Snake River from Moose in the area of Dornans.
- Inventories in the Moose developed area recorded a small scatter that was not register-eligible.
- A class III inventory for the Craig Thomas Discovery and Visitor Center recorded one small prehistoric lithic scatter that was determined to be not eligible.

The 20-acre, class III cultural resource inventory conducted by St. Clair (2010) to support the water main testing did not record any sites. The report notes that the previously recorded sites suggest the possibility for additional, similar cultural materials to be encountered.

An inventory of the Moose post office area was summarized in the park transportation plan environmental impact statement (NPS 2006b). This inventory recorded one new site believed to be associated with an early homestead. The site consists of a foundation, three depressions, and some isolated historic debris, and is not eligible for the National Register.

Based on these investigations, currently unknown cultural sites may occur in the project vicinity. However, like the cultural resources described above, they probably would consist of lithic scatters, historic debris, or sites associated with historic homesteads.

IMPACT ANALYSIS METHODS

Impacts on cultural resources are described in terms of type, context, duration, and intensity, consistent with the regulations of the Council on Environmental Quality that implement the National Environmental Policy Act. In addition the impact analysis is intended to comply with the requirements of section 106 of the National Historic Preservation Act.

The section 106 regulations of the Advisory Council on Historic Preservation are published in 36 *Code of Federal Regulations*, Part 800, Protection of Historic Properties. In accordance with these regulations, impacts on cultural resources are identified and evaluated by

- Determining the area of potential effects;
- Identifying cultural resources present in the area of potential effects that are listed in or eligible to be listed in the National Register of Historic Places;
- Applying the criteria of adverse effect to affected cultural resources either listed in or eligible to be listed in the National Register; and
- Considering ways to avoid, minimize, or mitigate adverse effects.

Under the section 106 regulations, a determination of either adverse effect or no adverse effect was made for affected National Register-listed or -eligible cultural resources. An adverse effect occurs whenever an impact alters, directly or indirectly, any characteristic of a cultural resource that qualifies it for listing in the National Register, such as diminishing the integrity of its location, design, setting, materials, workmanship, feeling, or association. Adverse effects also include reasonably foreseeable effects caused by the alternative that would occur later in time, be farther removed in distance or be cumulative. A determination of no adverse effect means there is an effect, but the effect would not diminish in any way the characteristics of the cultural resource that qualify it for listing.

The Council on Environmental Quality (1978) regulations and NPS (2001) guidelines for implementing the National Environmental Policy Act call for a discussion of the appropriateness of mitigation and analysis of how effective the mitigation would be in reducing the intensity of a potential impact, such as reducing the intensity of an impact from major to moderate or minor. However, any resulting reduction in impact intensity applies only to the National Environmental Policy Act analysis. It does not suggest that the level of effect as defined by section 106 would be similarly reduced. Although adverse effects under section 106 may be mitigated, any effect that was not totally avoided would remain adverse.

A section 106 summary is included in the impact analysis for the preferred alternative. This summary is intended to meet the requirements of section 106 and is an assessment of the effect of the undertaking (implementation of the preferred alternative) on cultural resources, based on the criteria of effect and adverse effect found in the Advisory Council regulations.

For purposes of analyzing impacts on archeological sites and historic structures/buildings that are listed in or eligible to be listed in the National Register, the thresholds of change for intensity of an impact are defined below. Because of the nature of cultural resources, short-term effects would be limited to those that temporarily introduced non-historic visual, audible, or atmospheric elements lasting only as long as construction into the setting of the cultural resources. All other effects would be classified as long-term.

Threshold	Definition
Negligible	The impact would be at or below the lowest levels of detection, and would be immeasurable or barely measurable with no perceptible consequences, either adverse or beneficial, on cultural resources. For purposes of section 106, the determination would be no adverse effect.
Minor	Adverse: Disturbance of an archeological site would result in little, if any, loss of significance or integrity. Impacts on character-defining features of buildings or structures would be perceptible or measurable but would be slight and localized, resulting in little, if any, loss of integrity. For purposes of section 106, the determination would be no adverse effect. Beneficial: Would maintain or preserve an archeological site. Character-defining features of buildings or structures would be stabilized or preserved in accordance with the standards of the Secretary of the Interior (1995a) for the treatment of historic properties. For purposes of section 106, the determination would be no adverse effect.
Moderate	Adverse: Disturbance of an archeological site would result in some loss of significance or integrity. Impacts would alter character-defining features of buildings or structures but would not diminish the integrity of the building or structure to the extent that its National Register eligibility is jeopardized. For purposes of section 106, the determination would be no adverse effect. Beneficial: Would stabilize an archeological site. Buildings or structures would be rehabilitated in accordance with the standards of the Secretary of the Interior (1995a) for the treatment of historic properties. For purposes of section 106, the determination would be no adverse effect.
Major	Adverse: An archeological site is obliterated. Impacts would alter character-defining features of buildings or structures to the extent that they are no longer eligible for National Register listing. The section 106 determination would be adverse effect. Beneficial: Would provide active intervention to preserve an archeological site. Buildings or structures s would be rehabilitated in accordance with the standards of the Secretary of the Interior (1995a) for the treatment of historic properties. For purposes of section 106, the determination would be no adverse effect.

Impacts on cultural resources were considered for all parts of the project area that could be disturbed by construction activities, such as pipeline corridors; all cultural resources in and within a half-mile of Moose or the Beaver Creek administrative area; and support sites such as equipment layout areas. Impacts also were considered for cultural resources throughout Moose and Beaver Creek that rely on the water system for firefighting. For section 106 compliance, these areas constitute the area of effect.

ALTERNATIVE 1: NO ACTION / CONTINUE CURRENT MANAGEMENT

Impact Analysis

No new construction would occur under alternative 1. The increasing number of repairs that are expected for the water system components would require excavations to patch or replace failed components, but such activities would occur in ground that was disturbed when the features were installed. Similarly, the need to correct disposal field problems that were caused by poor solids removal at the plant would occur in an area that was excavated to install the disposal field. No impacts on archeological resources would be anticipated.

A sewage spill from the existing treatment plant would travel overland to the Snake River, about 200 feet to the east. Most of the route is a paved road or parking lot, and the entire route previously was disturbed. A sewage spill would result in no impacts to archeological resources.

Of the historic structures or districts listed in the National Register, only the Murie residence and ranch are lower in elevation or downstream from the wastewater treatment plant and could be affected by a sewage spill. In the half-mile river distance from the wastewater treatment plant to the ranch, even the highest possible sewage flow of about 86,000 gallons per day in 2040 (Nelson Engineering 2011a) would be diluted many-fold by the average Snake River flow of more than 1.8 billion gallons per day (U.S. Geological Survey 2010). Structures at the ranch would be unaffected, resulting in a negligible impact.

As described in chapter 1, flows of firefighting water in Moose and Beaver Creek do not meet state or NPS standards with regard to volume and pressure. This puts at risk all of the historic structures in the area. At any of these sites, a severe structural fire that could not be controlled because of inadequate water supplies would diminish the integrity of the resource, potentially to the extent that it was no longer eligible for listing. However, such a fire has never occurred during the NPS' management of the Moose and Beaver Creek areas, and the current water supply system has, to date, been adequate for actual firefighting. Therefore, the risk posed by the firefighting flows that are below standards represents a long-term, moderate, adverse effect on sites and districts listed in the National Register.

Construction activities associated with repair of the water storage tanks and pipelines could temporarily introduce non-historic visual, audible, and atmospheric elements into the setting of the historic resources in and near Moose. Such intrusions, however, would be short-term, lasting only as long as construction, and of negligible intensity.

Cumulative Impacts

For the most part, the actions in the cumulative impact scenario avoided or would avoid archeological resources. Some actions, such as the master plan amendment, were identified as affecting the integrity of archeological sites, but none of those sites are listed in the National Register. Therefore, the cumulative impact on archeological resources from other actions would be minor, permanent, and adverse.

As described in the impact analysis, implementation of alternative 1 would result in negligible impacts on archeological resources.

The negligible impacts of this alternative, in combination with the minor, permanent, adverse impacts on archeological resources from other past, present, and reasonably foreseeable future actions, would result in a minor, permanent, adverse, cumulative impact. The negligible effects of alternative 1 would contribute minimally to the adverse cumulative impact on archeological resources.

Other actions affecting historic structures and buildings resulted in adverse impacts ranging from disturbances of the setting during construction (minor) to building or structure demolition with mitigation by recording to the standards of the Historic American Building Survey / Historic American Engineering Record (major). Examples include demolition of selected buildings at the 4 Lazy F Ranch, Fabian Place, and Lupine Meadows with from implementation of the master plan amendment. Beneficial impacts were identified for actions that included preservation and rehabilitation (minor to moderate beneficial effects).

As described in the impact analysis, implementation of alternative 1 would result in impacts on historic buildings and structures ranging from negligible to moderate and adverse because of firefighting water storage capacity and delivery systems that do not meet standards.

The negligible to moderate, adverse impacts of this alternative, in combination with both the minor to major, adverse impacts and the minor to moderate, beneficial impacts of other past, present, and reasonably foreseeable future actions on historic buildings and structures,

would result in a moderate, adverse cumulative impact. The effects of alternative 1 would be a small component of the adverse cumulative impact on historic buildings and structures.

Conclusions

Impacts on archeological resources would be negligible. There would be a minor, permanent, adverse, cumulative impact on archeological resources, and alternative 1 would contribute minimally to this cumulative impact.

Impacts on historic buildings and structures could range from negligible to long-term moderate and adverse because of firefighting water storage capacity and delivery systems that do not meet standards. There would be a long-term, moderate, adverse cumulative impact on historic buildings and structures, and the adverse effects of alternative 1 would be a small component of the cumulative impact.

ALTERNATIVE 2: NPS PREFERRED, ONE WATER STORAGE TANK AND ONSITE WASTEWATER SYSTEM

Impact Analysis

Construction of the new water tank at the Taggart site and the wastewater treatment plant at Moose, as well as installation of water and wastewater lines, would occur predominantly on lands either previously disturbed by construction or inventoried for archeological resources. On uninventoried lands where installation of water or wastewater lines would occur, archeological inventories would precede construction activities. Based on the very low probability of encountering listing-eligible archeological resources in these linear corridors, and because the lines would be rerouted to avoid impacts if National Register-eligible archeological sites were discovered, there would be negligible impacts on archeological resources.

A new wastewater treatment plant would be constructed adjacent to the existing main pump station on a 1-acre undeveloped site near the Moose post office. Even though the Moose headquarters area has been determined not to be eligible for National Register listing, the treatment plant would be designed to minimally impact the landscape features in the Moose developed area. Any adverse impacts would be negligible to minor and long-term. After wastewater flows were switched to the new treatment plant, the former plant and water laboratory would be demolished and the site would be restored to support native vegetation, resulting in a minor, beneficial impact on the setting around the cultural resources in Moose.

No construction would occur near Menor's Ferry district, the Moose Entrance Kiosk, or Murie Ranch and residence. Near Beaver Creek and the Chapel of the Transfiguration, the new water pipeline would connect to the existing water distribution systems without disturbing any of the contributing features of the historic district or site. Permanent features in these areas would consist of manholes that would not generally be noticeable. There would be no direct effects to any of these historic structures and districts.

Alternative 2 would have a much lower potential for a sewage spill than alternative 1. In the unlikely event that a spill occurred, it most likely would be blocked in the 950-foot distance between the new treatment plant and the Snake River. Because most of this area has been inventoried for archeological resources, the potential for effects from a sewage spill on archeological resources or at the downstream Murie Ranch would be negligible.

Alternative 2 would reliably deliver firefighting flows that met all NPS and state of Wyoming requirements for volume, duration, and pressure. This would reduce (but not eliminate) the potential for severe structural fires that could diminish the integrity of cultural resources.

The improved firefighting ability would result in long-term, moderate, beneficial effects on cultural resources.

Construction activities associated with the proposed project would temporarily introduce non-historic visual, audible, and atmospheric elements into cultural resource settings. Such intrusions would be short-term, lasting only as long as construction occurred and would result in negligible or minor, adverse impacts.

Cumulative Impacts

Impacts on archeological resources from the actions in the cumulative impact scenario would be the same as those described for alternative 1. Collectively, they would result in minor, permanent, adverse, cumulative impacts on archeological resources.

As described in the impact analysis, alternative 2 would result in negligible impacts on archeological resources.

The negligible impacts of this alternative, in combination with the minor, permanent, adverse impacts on archeological resources from other past, present, and reasonably foreseeable future actions, would result in a minor, permanent, adverse, cumulative impact. The negligible effects of alternative 2 would contribute minimally to the adverse cumulative impact on archeological resources.

Impacts on historic structures and buildings from the actions in the cumulative impact scenario would be the same as those described for alternative 1. They would include both minor to major, adverse impacts and minor to moderate, beneficial impacts.

Alternative 2 would result in impacts on historic buildings and structures ranging from negligible to long-term, moderate, and beneficial because of the better fire protection associated with the alternative's upgraded firefighting water storage capacity and delivery systems.

The negligible to long-term, moderate, beneficial impacts of this alternative on historic buildings and structures, in combination with the minor to major, adverse impacts and the minor to moderate, beneficial impacts of other past, present, and reasonably foreseeable future actions, would result in a moderate, adverse cumulative impact. The effects of alternative 2 would be a modest component of the adverse cumulative impact on historic buildings and structures.

Conclusions

Impacts on archeological resources would be negligible. There would be a minor, permanent, adverse, cumulative impact on archeological resources, and alternative 2 would contribute minimally to this cumulative impact.

Short-term, negligible to minor, adverse effects on the settings of some historic buildings and structures would result from nearby construction activities. Long-term impacts on historic buildings and structures would be negligible with regard to construction-related changes to contributing features and effects from sewage spills. The improved firefighting ability would result in long-term, moderate, beneficial effects. There would be a long-term, moderate, adverse cumulative impact on historic buildings and structures, and the beneficial effects of alternative 2 would be a modest component of the cumulative impact.

Section 106 Summary

After applying the criteria of the Advisory Council on Historic Preservation of adverse effects (36 *Code of Federal Regulations* section 800.5, Assessment of Adverse Effects), the NPS con-

cludes that implementation of the preferred alternative would have no adverse effect on the cultural resources in and near Grand Teton National Park that are listed, or eligible for listing, in the National Register of Historic Places.

ALTERNATIVE 3: TWO WATER STORAGE TANKS AND SEWER LINE SYSTEM

Impact Analysis

Impacts in and north of Moose would be much the same as those described for alternative 2.

- Impacts on archeological resources would be negligible.
- For historic buildings and structures, there would be short-term, negligible to minor, adverse effects on the settings from nearby construction activities, and negligible, long-term impacts from construction-related changes to contributing features and effects from sewage spills.
- The improved ability to reliably deliver firefighting flows would have a long-term, moderate, beneficial impact on historic structures and buildings.

East and south of Moose, this alternative would include a 12-mile-long sewer force main and two pumping stations to convey wastewater to the Jackson sewer system. None of these features would affect historic structures and buildings.

For archeological resources, the mitigation measures in chapter 2 would be implemented before and during construction of the pipeline. These would include archeological inventories in areas that had not previously been investigated. If sites were discovered by the inventory or during construction, they would be avoided if practical, or mitigated.

The pipeline would be installed using a plowed-in pipe-laying technology. In contrast to a traditional trenching procedure, this equipment can easily work around features, including archeological sites that were found and marked for avoidance in advance, or sites that are discovered during construction. This ability would improve the potential to leave archeological resources in place. Based on the low incidence of archeological sites in the area, the absence of any archeological sites in Teton County that are listed in the National Register (although some sites are eligible), and the ability of the pipe-laying equipment to avoid sites, the impact of construction on unknown archeological sites would be adverse, long-term, and negligible or minor.

Cumulative Impacts

Cumulative impacts would be the same as those described for alternative 2.

Conclusions

Impacts on archeological resources would be negligible or minor, adverse. There would be a minor, permanent, adverse, cumulative impact on archeological resources, and alternative 3 would contribute minimally to this cumulative impact.

Short-term, negligible to minor, adverse effects on the settings of some historic buildings and structures would result from nearby construction activities. Long-term impacts on historic buildings and structures would be negligible with regard to construction-related changes to contributing features and effects from sewage spills. The improved firefighting ability would result in long-term, moderate, beneficial effects. There would be a long-term, moderate, adverse cumulative impact on historic buildings and structures, and the beneficial effects of alternative 3 would be a modest component of the cumulative impact.

SOIL AND VEGETATION

AFFECTED ENVIRONMENT

Soil

Soils in the park are described in the *Soil Survey of Teton County, Wyoming, Grand Teton National Park Area* (Young 1982). Soil names and descriptions are from this publication.

The project area includes six primary or dominant soil map units. These units collectively comprise about 75% to 80% of the disturbance area and define the prevailing soil conditions that would be encountered by one or more of the alternatives. Physical characteristics of the dominant soil map units are summarized in table 4. Twelve less extensively distributed soil mapping units collectively compose the remaining 20% to 25% of the disturbance area. Additional details of these map units are presented in the park transportation plan and environmental impact statement (NPS 2006b).

Table 4: Dominant Soil Map Units in the Project Area [a/]

Soil Map Unit (Number)	Characteristics	General Project Location
Taglake-Sebud Association (47)	Deep, well-drained soils are made up of approximately 75% Taglake very stony, sandy loam; 15% Sebud stony sandy loam; and 10% Walcott soils. These soils are on alluvial fans, till plains, moraines, hills, and mountains. Soil permeability is moderate and erosion hazard is high.	Taggart water storage tank and pipeline
Tetonia-Lantonia silt loam (50)	Very deep, well-drained soils are made up of about 45% Tetonia silt loam and 45% Lantonia silt loam. A combination of Crow Creek and Willow Creek soils make up the remaining 10% of this unit. These soils occur on gently undulating terrain of 3% to 6% slope, which is usually associated with loess-mantled terraces and hills. Soil permeability is moderate and the erosion hazard is moderate.	U.S. Highway 26/89/191 corridor along National Elk Refuge
Tetonville-Wilsonville fine sandy loam (58)	These nearly level soils occur in old, braided stream channels in floodplains along the Snake River. Composition is about 40% Tetonville fine sandy loam, 40% Wilsonville fine sandy loam, and 20% Tetonville very gravelly sandy loam. Seasonal high water table is 1 to 3 feet during May to July. Soil permeability is moderately rapid and erosion hazard is slight.	Snake River floodplains at Moose; crossings of the Snake River, Gros Ventre River, and major streams
Tineman gravelly loam (60)	Very deep, well-drained, gravelly loam soil is found along the Snake River; soils are on nearly level to steep alluvial fans, stream terraces, mountains, and moraines. Slopes are 0% to 40%. Soil permeability is moderate and erosion hazard is slight.	Large sagebrush flats around Jackson Hole Airport extending north to Moose
Tineman_Bearmouth gravelly loam (62)	Very deep, well-drained gravelly loam soils formed in alluvium that is 10 to 20 feet deep over extremely cobbly or extremely gravelly sand. These soils are on floodplains, stream terraces, and fans in mountain valleys. Soil permeability is moderate and erosion hazard is slight.	Large floodplain area in Moose and extending north to the 4 Lazy F Ranch area
Turnerville silt loam (65-69)	Very deep, well-drained soil occurs along the mountain front surrounding the south part of Jackson Hole. Most of the acreage is forest. Soil permeability is moderate and erosion hazard is slight to high, depending on local slope steepness.	Areas northwest of Moose that are crossed by the waterline from Taggart tank

a/ Sources: Young 1982 and NPS 2006b. The soil map units and unit numbers are from Young 1982.

The flat meadows of the valley floor at lower elevations in Grand Teton National Park generally have soil that developed from the porous quartzite sand and gravel deposited by glacial melt water. These glacial outwash soils are generally very deep and well-drained and have less water retention capability than moraine-derived soils. These soils are generally nutrient-poor and support a sagebrush/grassland community.

The Snake River floodplain consists of more recent alluvial soil, generally from the Tetonville series, which developed when modern streams reworked glacial material. Braided stream channels supporting riparian vegetation characterize these areas.

Vegetation

Dominant vegetation characteristics of the project area are described in the transportation plan environmental impact statement (NPS 2006b). Vegetation along the water and wastewater project area was surveyed by ERO Resources Corporation (2011). The project area consists of five dominant upland vegetation types, plus wetlands, which are discussed later under "Water Resources." Shrubland, composed predominantly of sagebrush and antelope bitterbrush, is the dominant vegetation type. General botanical characteristics of the dominant upland vegetation types are summarized in table 5.

As can be seen in figures 2 and 4, woodland corridors occur along the waterways in the area, including the Snake River, Gros Ventre River, and Cottonwood Creek. The riparian vegetation occurs in patches throughout Moose, but to the south, it expands to a width of about a half-mile.

The 1-acre lot that includes the main pump station is vegetated primarily with mature cottonwood trees. The wastewater system condition assessment noted that tree roots are, and in the past have been, a problem at and around the gravity sewers that drain into the wet well at the main lift station (Nelson Engineering 2010a).

Table 5: Dominant Upland Vegetation Types in the Project Area [a/]

Vegetation Type	Characteristics	General Project Location
Shrubland	Sagebrush and antelope bitterbrush or deciduous shrubs (for example, chokecherry or serviceberry) are the tallest vegetation layer. Shrub canopy cover can vary from 20% to 80%. Diverse forbs and grasses are often present. Designated as shrub and brush rangelands by ERO Resource Corporation (2011). This is the largest vegetation type in the project area.	Taggart pipeline corridor and pipeline corridor along U.S. Highway 26/89/191 in the park
Coniferous forest	Conifer species, including any combination of lodgepole pine, Douglas-fir, subalpine fir, blue spruce, Engelmann spruce, and whitebark pine, dominate the overstory with at least 20% cover. Several tree species may be present. The understory may be primarily grasses and forbs or may include cover with shrubs such as huckleberry and russet buffaloberry. Designated as evergreen forest by ERO Resource Corporation (2011).	Taggart water storage tank and portions of Moose area
Mixed woodland	Coniferous and deciduous trees co-dominate the sparse overstory, providing less than 20% canopy cover. The understory ranges from shrubs to grasses. Designated as forested wetland by ERO Resource Corporation (2011).	4 Lazy F Ranch area and portions of Moose area
Deciduous woodland	Cottonwood or aspen overstory is present. Understory usually consists primarily of sagebrush with a mixed forb and grass component. Designated as forested wetland by ERO Resource Corporation (2011).	Floodplain areas of the Snake and Gros Ventre Rivers
Herbaceous rangeland	These areas of short vegetation are dominated primarily by non-native pasture grasses. Occurs in the Moose-to-Jackson corridor south of the park.	Pipeline corridor along U.S. Highway 26/89/191 outside the park

a/ Sources: NPS 2006b and ERO Resources Corporation 2011.

Revegetation

Revegetation in the park occurs relatively slowly because of cold temperatures and the short growing season. However, with effective post-project mitigation and sufficient time, it typically is successful.

Recovery times differ for the various vegetation types to reach mature size once disturbance has ended. Recovery in the park after construction projects are completed routinely is aided by best management practices that include recontouring, spreading of stockpiled topsoil, and seeding with a native plant mix (see "Mitigation Measures" in chapter 2). Grass cover typically is established in 2 to 5 years, willow-alder complexes approach maturity in 5 to 10 years, riparian stands of cottonwood and balsam poplar require about 15 to 25 years to reach tree status, and lodgepole pine becomes mature in about 30 to 60 years.

Disturbed areas that have been reseeded in the sagebrush-dominated shrubland vegetation type, which is important to the sage-grouse population in the park (see "Wildlife" section in this chapter), typically have a stable herbaceous ground cover of grasses, forbs, and seedling sagebrush within two to three years. Small sagebrush plants are apparent five or six years after seeding an area, and medium- to full-sized sagebrush plants dominate the plant mix in about 15 years. Sagebrush maturity, followed by plant senescence (growing old), occurs over the next 25 years in the absence of any disturbance such as fire (Wambolt and Hoffman 2001).

Exotic Invasive Plant Species

Exotic invasive plant species represent a long-term management issue in the park. These species frequently occur along roadsides and trails and in other disturbed areas, including construction sites, gravel pits, and recently burned areas. Roadsides are uniquely vulnerable to exotic invasive species because of continual disturbance resulting from maintenance activities and the introduction of nonnative seed inadvertently transported on vehicles.

Exotic invasive plant species in the park are aggressive and difficult to control. These species include spotted knapweed, cheatgrass, Dalmatian and yellow toadflax, sulfur cinquefoil, perennial pepperweed, leafy spurge, musk thistle, bull thistle, Canada thistle, oxeye daisy, common tansy, St. Johnswort, houndstongue, and woolly mullein. All colonize disturbed, dry sites, often out-competing native vegetation and, in some cases, spreading into undisturbed areas.

A vegetation survey conducted in June 2011 found exotic invasive species throughout the project area. Stands ranged in size from individuals to "large patches." Spotted knapweed was the most prevalent species found, but other species also were widely distributed, including musk thistle, Canada thistle, and cheatgrass.

Throughout the project area, the highest populations of exotic invasive species are from Moose to the south park boundary. Species include, but are not limited to, spotted knapweed, musk thistle, cheatgrass, and Dalmatian toadflax.

The Taggart and Windy Point areas had smaller infestations of exotic invasive species than other parts of the project area, although a concentration of musk thistle was mapped near the Taggart wells and a large stand of Canada thistle was found on both sides of the access road from the Taggart Lake Trail parking area. Large patches of cheatgrass were particularly prevalent along U.S. Highway 26/89/191 from south of the park boundary to Jackson (ERO Resources Corporation 2011).

Sensitive and Special Status Plant Species

No sensitive or special status plant species were found during the plant surveys conducted throughout the project area (ERO Resource Corporation 2011).

IMPACT ANALYSIS METHODS

Impacts on soil and vegetation were evaluated using the process described in "Methods for Analyzing Impacts." Impact threshold definitions are as follows. For the action alternatives, the mitigation measures in chapter 2 would be implemented as part of the project.

Threshold	Definition
Negligible	Soil would not be affected, or effects would not be measurable. Any effects on soil productivity or fertility would be slight and would occur in a relatively small area. For vegetation, individual native plants may occasionally be affected, but measurable or perceptible changes in plant community size, integrity, or continuity would not occur.
Minor	Effects on soil characteristics such as erosion rate or ability to support vegetation would be detectable, but would affect a small area. Effects on native plants would be measurable, but would be localized in a small area. The viability of the plant community would not be affected and the community, if left alone, would recover.
Moderate	Effects on soil characteristics such as erosion rate or ability to support vegetation would be readily apparent, and would occur over a relatively large area. A change to vegetation would occur over a relatively large area in the native plant community and would be readily measurable in terms of abundance, distribution, quantity, or quality.
Major	Effects on soil characteristics such as erosion rate or ability to support vegetation would be readily apparent, and would be substantially altered over a large area. Effects on native plant communities would be readily apparent, and would substantially change vegetation community types over a large area.
Short-term	Effects would primarily exist during active implementation of a management action, such as construction. Within a year after construction, effects would be mitigated effectively by the measures described in chapter 2. This duration recognizes that some vegetation types could take 30 years or more to mature.
Long-term	Effects would extend more than a year beyond implementation of a management action.

Impacts on soil and vegetation were considered for all parts of the project that could be disturbed by construction activities. Areas near the disturbance area that could experience increased infestation by exotic invasive species also were evaluated.

ALTERNATIVE 1: NO ACTION / CONTINUE CURRENT MANAGEMENT

Impact Analysis

Soil and vegetation impacts are addressed together because water supply and wastewater management activities would affect both resources simultaneously. Under alternative 1, impacts would occur in association with repairing failed parts, such as pipeline segments or valves. These impacts would consist of travel off-road to the work site and localized excavation to expose and repair the failed part. Excavated areas would be backfilled and stabilized with standard erosion and sediment control measures and reseeded (see the mitigation measures in chapter 2). For both soil and vegetation, the short-term impacts would be localized, minor, and adverse and the long-term impacts would be negligible.

Cumulative Impacts

Long-term impacts from alternative 1 on soil would be negligible.

Most of the actions in the cumulative impact scenario were identified as having long-term, adverse and beneficial impacts of negligible or minor intensity on soil. Soil impacts from transportation plan implementation are long-term, moderate, and adverse.

The negligible impacts on soil from this alternative, combined with the negligible, minor beneficial and adverse, and moderate adverse impacts from other past, present, and reasonably foreseeable future actions, would result in a minor, adverse, cumulative impact. The effects of alternative 1 would contribute minimally to the cumulative impact on soil.

Long-term impacts from alternative 1 on vegetation would be negligible.

Most of the actions in the cumulative impact scenario would have negligible or minor adverse or beneficial impacts on vegetation. Moderate, adverse impacts were identified for the transportation plan. All of these impacts would occur within the framework of the fire management plan, which has a goal of maintaining a fire regime where fire has an active role in ecosystem function and would have moderate, beneficial impacts on vegetation.

The negligible impacts on vegetation from this alternative, combined with dominant influence of fire and the fire management plan, would result in a moderate, beneficial cumulative impact. The negligible effects of alternative 1 would contribute minimally to the moderate, beneficial, cumulative impact on vegetation.

Conclusions

Short-term impacts on soil would be localized, minor, and adverse and long-term impacts would be negligible. There would be minor, adverse, cumulative impact on soil, and alternative 1 would contribute minimally to this cumulative impact.

Short-term impacts on vegetation would be localized, minor, and adverse and long-term impacts would be negligible. There would be a moderate, beneficial, cumulative impact on vegetation, and alternative 1 would contribute minimally to this cumulative impact.

ALTERNATIVE 2: NPS PREFERRED, ONE WATER STORAGE TANK AND ONSITE WASTEWATER SYSTEM

Impact Analysis

Table 6 shows the areas of soil and vegetation that would be disturbed by each alternative. A total of approximately 24.1 acres of soil and vegetation would be temporarily disturbed by construction in alternative 2. Components responsible for most of the disturbances would include the buried water pipeline from the Taggart tank to Moose, Taggart tank construction, buried water pipeline from Moose to the 4 Lazy F Ranch area, and replacement of buried sewer force mains in and north of Moose. As can be seen in figures 2 and 3, most of the disturbance would occur in the shrubland vegetation type, with disturbance in small areas of coniferous forest near Taggart Creek and small areas of mixed woodland and deciduous woodland in and near Moose and the 4 Lazy F Ranch.

A construction corridor with a maximum width of 40 feet would be used except at the Beaver Creek stream and wetland crossing, where a narrower, 20- to 30-foot-wide corridor would be used. Impacts in this area are included in the "Water Resources" analysis.

Pipeline installation from the Taggart tank to Moose would occur next to the existing water line along the area that was disturbed by the original installation. After the new pipeline was brought online, the old pipeline would be destroyed in place using a pipe-bursting method to minimize surface disturbance.

Table 6: Soil and Vegetation Disturbance Area by Alternative

Project Feature	Alternative 1 No Action (acres) [a/]	Alternative 2 Preferred (acres) [a/]		Alternative 3 (acres) [a/]	
		Construction	Permanent	Construction	Permanent
Replace Taggart well house, plug existing well 2, and drill a new well	0.00	0.10	0.01	0.10	0.01
Construct new Taggart water storage tank	0.00	3.00	0.07	3.00	0.03
Restore site of existing Taggart water storage tank (demolition area included in previous item)	0.00	0.00	-0.02	0.00	-0.02
Construct new Windy Point water storage tank and permanent, 10-foot by 400-foot access road	0.00	0.00	0.00	3.00	0.13
Remove existing Windy Point water storage tank and restore site	0.00	0.04	0.00	Included above	0.00
Replace water main from storage tanks to Moose (maximum 40-foot-wide disturbance zone for 16,600 feet)	0.00	15.24	0.00	15.24	0.00
Construct new water main from Moose to the 4 Lazy F Ranch pipeline (maximum 13-foot-wide disturbance zone beyond existing road edge for 6,400 feet)	0.00	1.91	0.00	0.00	0.00
Construct new wastewater treatment plant in Moose	0.00	0.50	0.13	0.00	0.00
Construct three new pump stations for wastewater in Moose, at airport, and north of Jackson	0.00	0.00	0.00	0.75	0.14
Restore site of existing pump station for wastewater in Moose (demolition area included in previous two items)	0.00	0.00	-0.01	0.00	-0.01
Remove and restore site of existing wastewater treatment plant and adjacent water laboratory in Moose	0.00	0.00	-0.05	0.00	-0.05
Replace part of wastewater force main from visitor center (maximum 40-foot-wide disturbance zone for 635 feet)	0.00	0.58	0.00	0.58	0.00
Construct new force main from new wastewater treatment plant to disposal field (maximum 40-foot-wide disturbance zone for 3,015 feet)	0.00	2.77	0.00	0.00	0.00
Construct new wastewater force main from Moose to Jackson (maximum 8-foot-wide disturbance zone for 63,360 feet)	0.00	0.00	0.00	11.64	0.00
Use Moose to Jackson horizontal directional drilling sewer pipeline staging areas (24 locations at about 2,000 square feet each)	0.00	0.00	0.00	1.10	0.00
Total	0.00	24.14	0.13	35.41	0.23

a/ All areas are approximations. They typically were calculated based on the maximum length and width of construction zones or facility footprints that were provided in the project engineering feasibility studies (Nelson Engineering 2011a and 2011b).

The soil and vegetation mitigation measures in chapter 2 would be incorporated in an NPS-approved soil erosion control and vegetation management plan. These measures would minimize adverse soil erosion impacts and establish native vegetative cover. As a result, construction would have minor, short-term, adverse effects.

In the long-term, the project would convert 0.21 acre of soil and native vegetation to impervious surfaces. These changes would occur at the Taggart well pump station, new Taggart storage tank, and new wastewater treatment plant. Previously disturbed sites totaling 0.08 acre at the existing Taggart storage tank, wastewater pump station, and wastewater treatment plant would be restored to native vegetation, resulting in a net loss of 0.13 acre. This would represent a long-term, minor, adverse impact on soil and vegetation. In all other areas, implementation of the NPS-approved revegetation plan would result in restored native vegetation where impacts would end as the vegetation approached maturity in about 5 to 10 years for willow-alder complex, 15 years for sagebrush, and 30 years for lodgepole pine.

Control of exotic invasive plant species during construction would employ best management practices and other mitigation measures described in chapter 2 and would be followed by at least three years of monitoring and treatment of infestations. Monitoring and treatments of any remaining infestations would be conducted as part of the NPS' ongoing control of exotic invasive species, resulting in minor, long-term impacts on management of exotic invasive species.

Cumulative Impacts

Alternative 2 would result in long-term, minor, adverse impacts on soil.

Impacts on soil from the actions in the cumulative impact scenario would be the same as those described for alternative 1. They would include negligible, minor beneficial and adverse, and moderate adverse impacts.

The long-term, minor, adverse impacts on soil from this alternative, combined with the impacts from other actions, would result in a minor, adverse, cumulative impact. The effects of alternative 2 would contribute minimally to the cumulative impact on soil.

Alternative 2 would result in long-term, minor, adverse impacts on vegetation.

Impacts on vegetation from the actions in the cumulative impact scenario would be the same as those described for alternative 1. While they would include negligible to moderate, beneficial and adverse impacts, they would be dominated by fire and the moderate, beneficial effect of implementing the fire management plan.

The long-term, minor, adverse impacts on vegetation from this alternative, combined with the impacts from other actions, would result in a moderate, beneficial, cumulative impact. Alternative 2 would contribute minimally to the cumulative impact on vegetation.

The NPS is concerned about the cumulative disturbance of the sagebrush shrubland vegetation type because it is important to the sage-grouse population and other sage-dependent species. Alternative 2 would not result in the permanent loss of any sagebrush vegetation, but construction would remove sagebrush from about 20 acres, mostly along pipeline corridors that would be up to 40 feet wide. Two or three years after restoration and seeding, disturbed areas would likely have a stable herbaceous cover of grasses, forbs, and seedling sagebrush, with small sagebrush plants in about five or six years and medium- to full-sized sagebrush plants likely approaching maturity after about 15 years. Because sage-grouse use a variety of sagebrush age classes, their use of this area would be expected within about five years after seeding. In the short-term, the plant community would be converted from mature sagebrush dominated to grasses and forbs. In the long-term, sage dominated community would be ex-

pected to recover. Additional information on impacts to sage-grouse and their habitats is included in the wildlife section.

Conclusions

Construction-related impacts on soil would be short-term, adverse, and minor in intensity. The net loss of 0.13 acre would represent a long-term, minor, adverse impact on soil. There would be minor, adverse, cumulative impact on soil, and alternative 2 would contribute minimally to this cumulative impact.

Construction-related impacts on vegetation would be short-term, adverse, and of minor intensity. Long-term, minor, adverse impacts on vegetation would result from the net loss of 0.13 acre of vegetation and increased management requirements for exotic invasive plant species. There would be a moderate, beneficial, cumulative impact on vegetation, and alternative 2 would contribute minimally to this cumulative impact.

ALTERNATIVE 3: TWO WATER STORAGE TANKS AND SEWER LINE SYSTEM

Impact Analysis

Approximately 35.41 acres of soil and vegetation (table 6) would be affected in the alternative 3 disturbance area. Most of this disturbance would result from construction of the water main from the Taggart tank to the Windy Point tank and then to Moose, two water tanks, and a 12-mile-long sewer line from Moose to the airport and then to the Jackson sewer system connection. As can be seen in figures 2, 3, and 4, most of the disturbance would occur in the shrubland vegetation type, with small areas of disturbance in coniferous forest near Taggart Creek, mixed woodland and deciduous woodland in and near Moose, and herbaceous rangeland south of the park boundary. The types of impacts on soil and vegetation in and north of Moose, including at the Beaver Creek crossing, would be the same as described for alternative 2.

The sewer line to Jackson would follow the Teton Park Road, Airport Road, and U.S. Highway 26/89/191 alignments. The pipeline would be bored under the Snake River, Gros Ventre River, Flat Creek, several small drainages and irrigation channels, and paved roads using horizontal directional drilling to avoid altering the characteristics, including stability, of floodplain and streambed soil and vegetation.

Outside waterway and paved road crossings, the pipeline would be installed using plowed-in or continuous pipe-laying equipment to bury the pipeline approximately 6 to 7 feet deep, about 25 feet from the paved road shoulders. A disturbance area about 8 feet wide would be required to plow open a trench, lay the pipeline, backfill the trench with the displaced soil, and shape excess soil. Slopes are generally flat along the corridor and soil materials are moderately to highly permeable, so the soil erosion potential would be slight to moderate during rain events until a vegetative cover was reestablished. Adjacent, undisturbed vegetation would function as an effective buffer to prevent long-distance sediment transport.

The conventional, effective construction best management practices described in chapter 2 would be used to minimize soil erosion, stabilize disturbed soil, and establish a native vegetative cover. For parts of the corridor in the park, the NPS would ensure that a soil erosion control and sediment plan was approved prior to construction. Outside the park, similar plans could be required by the U.S. Fish and Wildlife Service and Wyoming Department of Transportation. With implementation of these plans, construction would have short-term, adverse, moderate impacts.

In the long-term, the project would convert 0.31 acre of soil and native vegetation to impervious surfaces. These changes would occur at the Taggart well pump station, new storage tanks at Taggart and Windy Point, and new wastewater pump stations in Moose and north of Jackson. Previously disturbed sites totaling 0.08 acre at the existing Taggart storage tank, wastewater pump station, and treatment plant would be restored to native vegetation, resulting in a net loss of 0.23 acre. This would represent a long-term, minor, adverse impact on soil and vegetation. In all other areas, implementation of agency-approved restoration would result in regrowth of native vegetation where impacts would end as plants approached maturity in about 5 to 10 years for willow-alder complexes, 15 years for sagebrush, and 30 years for lodgepole pine.

This alternative would create a linear disturbance feature into the park from the areas south of the park that have heavy infestations of exotic invasive species. Such corridors can act as pathways for the spread of exotic invasive species. It would also disturb the existing vegetative cover of a relatively large area, approximately 35 acres, making it more susceptible to exotic invasive species. As a result, alternative 3 would have moderate, adverse, long-term impacts on management of exotic invasive species. Control measures would be the same as those described in alternative 2.

Cumulative Impacts

Alternative 3 would result in long-term, minor, adverse impacts on soil.

Impacts on soil from the actions in the cumulative impact scenario would be the same as those described for alternative 1. They would include negligible, minor beneficial and adverse, and moderate adverse impacts.

The long-term, minor, adverse impacts on soil from this alternative, combined with the impacts from other actions, would result in a minor, adverse, cumulative impact. The effects of alternative 3 would contribute minimally to the cumulative impact on soil.

Alternative 3 would result in long-term, minor and moderate, adverse impacts on vegetation.

Impacts on vegetation from the actions in the cumulative impact scenario would be the same as those described for alternative 1. While they would include negligible to moderate, beneficial and adverse impacts, they would be dominated by fire and the moderate, beneficial effect of implementing the fire management plan.

The long-term, minor to moderate, adverse impacts on vegetation from this alternative, combined with the impacts from other actions, would result in a moderate, beneficial, cumulative impact. The effects of alternative 3 would contribute minimally to the cumulative impact on vegetation.

As described for alternative 2, the cumulative disturbance of the sagebrush shrubland vegetation type is important because it provides habitat for the sage-grouse population. Recovery of this habitat would be apparent within about five years after construction, with medium- to full-sized sagebrush plants likely approaching maturity after about 15 years. In the long-term, sage dominated community would be expected to recover. Additional information on impacts to sage-grouse and their habitats is included in the wildlife section.

Conclusions

Construction-related impacts on soil would be short-term, adverse, and moderate in intensity. The net loss of 0.23 acre would represent a long-term, minor, adverse impact on soil. There would be minor, adverse, cumulative impact on soil, and alternative 2 would contribute minimally to this cumulative impact.

Construction-related impacts on vegetation would be short-term, adverse, and of moderate intensity. Long-term, minor, adverse impacts on vegetation would result from the net loss of 0.23 acre of vegetation. Increased management requirements for exotic invasive species would result in moderate, adverse, long-term impacts. There would be a moderate, beneficial, cumulative impact on vegetation, and alternative 2 would contribute minimally to this cumulative impact.

WATER RESOURCES

AFFECTED ENVIRONMENT

Hydrology

The Snake River, which generally flows from north to south, is the principal waterway in Grand Teton National Park. Jackson Lake, in the north half of the park, is on the main stem of the Snake River. The natural Jackson Lake was enlarged into a reservoir when a dam was constructed by the Bureau of Reclamation in 1907 and again in 1916. This agency and the NPS cooperate to provide reservoir releases that provide water to meet the demands of downstream water-rights holders, provide flood control storage, support recreational activities, and, when possible, simulate the natural cycle of free-flowing rivers in the region to benefit native fish, plants, and wildlife habitat along the Snake River downstream from Jackson Lake (NPS 2010b). In 2009, the river through most of the park was designated for protection under the Wild and Scenic Rivers Act.

For most of its length in the park south of the lake, the Snake River has a classic, braided-stream morphology. However, near Moose, flow is naturally contained in a single channel. Farther south, the river returns to a braided form, but its western boundary is contained by a levee maintained by the U.S. Army Corps of Engineers (NPS 2010b).

Annual mean discharge in the Snake River at Moose for the past 15 years is 2,869 cubic feet per second. Recorded daily flows range from 600 to 24,500 cubic feet per second with a maximum recorded flow of 25,300 cubic feet per second on June 11, 1997 (U.S. Geological Survey 2010). This flow stayed almost entirely in the channel and did not flood the Moose area (Martin and Linn 2001).

Ground water recharge occurs primarily from infiltration of precipitation and stream flow. Ground water flows from high areas toward the Snake River and southwest through the valley in the general direction of the river. Much of the aquifer exhibits high permeability and interconnection with the streams and lakes, making it vulnerable to contamination from facilities, visitor uses, and transportation corridors in the recharge areas (NPS 2010b).

Surface and Ground Water Quality

State surface water quality standards classify all surface waters in the park as Class 1, Outstanding Waters (Wyoming Department of Environmental Quality 2001, 2007), and the Snake River near Moose is of high quality. However, there are some water quality concerns related to erosion of exposed soil, deterioration of riparian vegetation, and runoff from paved areas that transports pollutants such as oil and road salt into the water (NPS 2010b).

Ground water quality in the area is excellent and is protected by state standards that classify the alluvial aquifer at Moose as Class 1 (Domestic) (Wyoming Department of Environmental Quality 2005). The Moose wastewater plant discharges treated effluent to the ground water using a subsurface disposal field (see figure 2). The state permit for the disposal field authorizes a discharge of 57,000 gallons per day with quality limits for biological oxygen demand,

nitrate, and ammonia. Discharges from the Moose treatment plant are well below the specified volume, averaging 14,500 gallons per day with a maximum day volume of 26,300 gallons in 2010 (Nelson Engineering 2011a). However, the treated effluent entering the disposal bed sometimes exceeds the permit limits for nitrate and ammonia (NPS 2009b).

At the airport, wastewater is treated in four septic tank and leach field systems. The airport consistently meets all of its ground water discharge permit stipulations (NPS 2010a). South of the park on the west side of U.S. Highway 26/89/191, septic tank and leach field systems with discharge to ground water also are used by the National Museum of Wildlife Art and two motels.

Floodplains

NPS floodplain analyses found that the 100-year flood would be almost completely contained by the Snake River channel and that the 500-year flood would exceed the channel capacity by up to 3 vertical feet (Martin and Linn 2001). The existing wastewater treatment plant is in the 500-year floodplain boundary but the area around the existing wastewater pump station near the post office is about 400 feet outside the 500-year floodplain. A floodplains statement of findings for this project is included in appendix A, and figure A-1 shows mapped floodplain boundaries in the Moose area.

Wetlands

In support of this project, the NPS mapped plant communities, including wetlands. Some boundaries were approximated because of high water. Wetlands were classified using the method of Cowardin *et al.* (1979) and include lacustrine, palustrine scrub-shrub, and palustrine, deciduous broadleaf forest wetlands. From north to south, inventoried wetlands include the following (ERO Resources Corporation 2011):

- Sedge wetlands and red-osier dogwood-willow shrublands abut Taggart Creek where it flows steeply down the hillside. At the valley floor, wetlands vary from a fringe of herbaceous or willow shrub to a wider blue spruce and cottonwood zone.
- Two depressions that occasionally are wet are near the Taggart storage tank.
- Beaver Creek supports a willow-alder shrub wetland within a riparian corridor that ranges in width from less than 50 feet to more than 500 feet.
- Sedges and other wetland plants ring a former pond at the 4 Lazy F Ranch.
- Willow shrub wetlands occur on the banks and islands of the Snake River. In addition, the west bank has a narrow band of narrowleaf cottonwood.
- The Gros Ventre River west of the highway has narrowleaf cottonwood and willow shrub wetlands on islands and along the banks of the main stem. Sandbar and booth willow shrublands grow along a side channel.
- Farther south, willow shrub or narrowleaf cottonwood / willow wetlands developed along two irrigation ditches, two isolated ponds contain willow or herbaceous wetland vegetation, and an area of cattail and beaked sedge wetlands occurs at Flat Creek.

Snake River (Scenic Segment)

The Snake River below Jackson Dam to 1 mile south of Moose Junction is designated as a "Scenic River" under the Craig Thomas Snake Headwaters Legacy Act of 2008. "Scenic" rivers, as defined under the 1968 Wild and Scenic Rivers Act, are those rivers or sections of riv-

ers that are free of impoundments, with shorelines or watersheds still largely primitive and shorelines largely undeveloped, but accessible in places by roads.

The National Park Service is currently developing a Snake River Headwaters Comprehensive River Management Plan. This plan will incorporate specific management strategies for all designated wild and scenic river segments in Yellowstone National Park, John D. Rockefeller, Jr. Memorial Parkway, Grand Teton National Park, and the National Elk Refuge. This plan will provide river boundary delineation and strategies for broad-based management of the Snake River Headwaters, river-segment-specific management, and site-specific management (for example, at boat launches, landings, and overlooks).

The plan and its environmental assessment are currently being drafted (available for public comment during the fall of 2012). Possible impacts on the Snake River under each alternative will be evaluated based on the outstandingly remarkable values (scenic, recreational, geologic, fish and wildlife, history, cultural, free-flowing condition, water quality, or other similar values) as generally provided in the Wild and Scenic Rivers Act and the Snake Headwaters Legacy Act. Most of these outstandingly remarkable values are evaluated in this environmental assessment as separate impacts. As a result, these outstandingly remarkable values will be evaluated *collectively* within this section.

IMPACT ANALYSIS METHODS

Impacts on water resources were evaluated using the process described in the "Methods for Analyzing Impacts" section. Impact threshold definitions for water resources are as follows. For the action alternatives, the mitigation measures in chapter 2 would be implemented as part of the project.

Threshold	Definition
Negligible	Impacts would not be measurable. Features such as flows, floodplain extent, and the quality of surface and ground water would be within historical ranges that reflect normal variability. Wetlands would not be affected or the effects would be at or below levels of detection.
Minor	Measurable changes from historical norms would occur, but flows, floodplains, and surface and ground water quality would remain in the range of historical variability. Surface and ground water quality would be within water quality standards for the designated use. Effects on wetlands, including functions and values, would be detectable but small in area and type of change, affecting a limited number of individuals of wetland plant or wildlife species.
Moderate	Flows, floodplains, and/or surface and ground water quality would be outside the range of normal variability. However, while changes would be readily apparent, there would not be a change in the extent or frequency of stream dewatering or damaging floods, or the maximum area flooded. Water quality standards might be exceeded rarely, but the exceedence would not involve multiple parameters and would quickly be brought under control. Effects on wetlands, including functions and values, would be readily apparent, with a measurable effect on wetland plant or wildlife species, but key species would remain viable indefinitely.
Major	Changes to flows, floodplains, and/or surface or ground water quality would be readily apparent and, in the case of adverse effects, some water quality parameters for the designated use would be equaled or exceeded regularly or repeatedly. Flows would be outside the range of normal variability and could include complete dewatering or unusual flooding. The effects on wetlands, including functions and values, would be readily apparent over a relatively large area. The action would have measurable consequences for wetlands that could not be mitigated. Wetland species would be at risk of extirpation from the area.
Short-term	Effects would exist during active implementation of a management action, such as construction and would cease within a year following completion of the action.
Long-term	Effects would extend more than a year beyond implementation of a management action.

Impacts on water resources were considered for all parts of the project area that could be disturbed by construction activities or that support operation of the water or wastewater

system. It also considered downstream areas that could be affected by factors such as sewage spills, treated effluent discharges, or sedimentation.

ALTERNATIVE 1: NO ACTION / CONTINUE CURRENT MANAGEMENT

Impact Analysis

Hydrology. Alternative 1 would maintain current flows, removing about 75,000 gallons of water per day on an annual basis in 2040 from the Taggart wells and returning it to the water table via infiltration from limited surface irrigation around the headquarters area and infiltration from the treated effluent percolation bed. Impacts from this alternative would be negligible.

Discharge of Sediment. This alternative would not involve any new construction. Sediment production that occurred during the repair of existing facilities would be controlled by employing best management practices for protecting soil and reestablishing a permanent vegetative cover. Impacts would be negligible.

Wetlands. At most of the wetland sites close to project features, repairs probably could be conducted so that activities in wetlands were avoided, and impacts would be negligible. If water pipeline repairs were required at the crossing of Beaver Creek, they could be implemented during low-flow periods and could be designed to include the impact mitigation measures described in chapter 2. As a result, effects from repairs would be short-term, adverse, and minor. Long-term effects would be negligible.

Floodplains. The current wastewater treatment plant would remain in its existing location outside the 100-year floodplain but in the 500-year floodplain of the Snake River. At this location, it would continue to cause a very small reduction in the flood-carrying capacity of the Snake River floodplain and would represent a minor, long-term, adverse impact.

A 500-year flood would result in about 2 feet of water at the building (Martin and Linn 2001). While this probably would not permanently damage the structure, all wastewater management operations for Moose probably would cease during and after the flood until the flood water and mud were removed from the building and treatment basins; electrical equipment was dried out, repaired or replaced, and tested; and startup was implemented. Because of its relatively low probability (10%) of occurring within the 50-year life of this action, the intensity of the long-term, adverse impact on park assets would be minor.

Surface Water Quality. A wastewater treatment plant failure could result in the release of raw or partly treated sewage to the Snake River. However, because the NPS could quickly eliminate virtually all of the wastewater production in Moose by closing restrooms and instructing staff in housing to not use toilets or taps, the volume and duration of any spill would be small, less than the treatment plant daily capacity of 35,000 gallons. In the river, it would be diluted by a flow that averaged more than 1.8 billion gallons per day and never fell below 0.4 billion gallons per day (U.S. Geological Survey 2010). In addition, natural processes such as aeration and biological activity eventually would render the water safe. However, in the distance before that occurred, there would be a short-term exceedence of the state water quality standard for fecal coliform bacteria. Although such a sewage release has not been documented since the Moose plant came online in 1963, its potential would continue to

represent a moderate, short-term, adverse effect on surface water quality. Long-term impacts would be negligible.

Ground Water Quality. The existing plant does not always remove enough ammonia and nitrates, and the treated effluent sometimes exceeds the ground water disposal permit limit of the plant for these constituents. Although additional treatment occurs in the soil, similar to a leach field system, the potential for these contaminants to enter the Snake River aquifer would represent a moderate, long-term, adverse effect on ground water quality near Moose.

This alternative would not change wastewater management at the Jackson Hole Airport or at facilities outside the park along U.S. Highway 26/89/191. At the airport and other facilities where systems are operating effectively, impacts of alternative 1 on ground water quality would be negligible. At sites where inadequate treatment was occurring, impacts would be long-term and adverse, with minor intensity because of the relatively small volumes of wastewater involved and the numbers of nearby potable water wells.

Snake River Outstandingly Remarkable Values. The scenic, recreational, fish and wildlife, cultural, and water quality outstandingly remarkable values of the wild and scenic Snake River may be adversely affected under alternative 1, primarily because of the potential for a sewage release resulting from the failure of the existing wastewater treatment facility at Moose. Collectively, adverse effects on these outstandingly remarkable values would be short-term and minor. Long-term impacts would be negligible.

Cumulative Impacts

Impacts of alternative 1 on hydrology would be negligible.

The actions in the cumulative impact scenario were identified as having negligible, minor adverse and beneficial, and moderate adverse and beneficial impacts on hydrology. Collectively, they are having little effect on the volume or timing of surface or ground water flows in the project area.

The negligible impacts on hydrology from this alternative, combined with the impacts from other past, present, and reasonably foreseeable future actions, would result in a negligible cumulative impact on hydrology. The effects of alternative 1 would contribute minimally to the cumulative impact on hydrology.

Impacts of alternative 1 on discharge of sediment would be negligible.

The actions in the cumulative impact scenario were identified as having negligible, minor adverse and beneficial, and moderate adverse and beneficial impacts on discharge of sediment. Collectively, they represent a minor, adverse source of sediment discharge.

The negligible impacts on sediment discharge from this alternative, combined with the impacts from other past, present, and reasonably foreseeable future actions, would result in a cumulative, minor, adverse impact on discharge of sediment. The effects of alternative 1 would contribute minimally to the cumulative impact on discharge of sediment.

Long-term impacts of alternative 1 on wetlands would be negligible.

The actions in the cumulative impact scenario were identified as having negligible, minor adverse and beneficial, and moderate adverse and beneficial impacts on wetlands. Because the NPS protects and preserves wetlands, these actions collectively have resulted in negligible change in wetlands with regard to area, functions, or values.

The negligible impacts on wetlands from this alternative, combined with the impacts from other past, present, and reasonably foreseeable future actions, would result in a negligible cumulative impact on wetlands. The effects of alternative 1 would contribute minimally to the cumulative impact on wetlands.

Long-term impacts of alternative 1 on floodplains would continue to be minor and adverse.

Most of the actions in the cumulative impact scenario would not occur in a floodplain (such as new staff housing) or would not affect flood flows (such as the multi-use pathway). Beneficial effects have resulted from the NPS implementing actions that removed structures from floodplains, such as the removal of five temporary buildings as part of the Moose headquarters rehabilitation, but the results of these actions are too small to measurably change floodplain capacity and have a negligible impact.

The minor, adverse impacts on floodplains from this alternative, combined with the impacts from other past, present, and reasonably foreseeable future actions, would result in a negligible cumulative impact on floodplains. The effects of alternative 1 would contribute minimally to the cumulative impact on floodplains.

The long-term impact of alternative 1 on ability to meet surface water quality would be negligible.

The actions in the cumulative impact scenario were identified as having negligible, minor adverse and beneficial, and moderate adverse and beneficial impacts on surface water quality. Collectively, they represent a minor, adverse effect on ability to meet surface water quality standards.

The negligible impacts on ability to meet surface water quality standards from this alternative, combined with the impacts from other past, present, and reasonably foreseeable future actions, would result in a cumulative, minor, adverse impact on ability to meet surface water quality standards. The effects of alternative 1 would contribute minimally to the cumulative impact on ability to meet surface water quality standards.

Long-term impacts of alternative 1 on ability to meet ground water quality standards would be moderate and adverse.

Ground water quality was not identified as an impact topic of concern for any of the actions in the cumulative impact scenario. Their impact on this resource would be minor or less.

The moderate, adverse impacts on ability to meet ground water quality standards from this alternative would not contribute to a cumulative impact because impacts are not occurring from other actions.

Long-term impacts of alternative 1 on outstandingly remarkable values of the Snake River would be negligible.

This impact topic was not evaluated for the actions in the cumulative impact scenario because designation of the Snake River as wild and scenic is so recent. Because the designation occurred with all of these plans and many of their resulting actions in place, their implementation would have a negligible impact on the river's outstandingly remarkable values.

The negligible impacts on Snake River outstandingly remarkable values from this alternative, combined with the impacts from other past, present, and reasonably foreseeable future actions, would result in a cumulative, negligible impact on Snake River outstandingly remarkable values. The effects of alternative 1 would contribute minimally to the cumulative impact.

Conclusions

Impacts on hydrology would be negligible. There would be a negligible cumulative impact on hydrology, and alternative 1 would contribute minimally to this cumulative impact.

Impacts on discharge of sediment would be negligible. There would be a cumulative, minor, adverse impact on discharge of sediment, and alternative 1 would contribute minimally to this cumulative impact.

For wetlands, effects from repairs would be short-term, adverse, and minor. Long-term effects would be negligible. There would be a negligible cumulative impact on wetlands, and alternative 1 would contribute minimally to this cumulative impact.

For floodplains, the continued presence of the wastewater treatment plant in the 500-year floodplain would represent a continued, minor, long-term, adverse impact. There would be a negligible cumulative impact on floodplains, and alternative 1 would contribute minimally to this cumulative impact.

The potential for sewage spills would continue to represent a moderate, short-term, adverse effect on ability to meet surface water quality standards. The long-term impact on ability to meet surface water quality standards would be negligible. There would be cumulative, minor, adverse impact on surface water quality, and alternative 1 would contribute minimally to this cumulative impact.

For ability to meet ground water quality standards, the inability of the treatment plant effluent to consistently meet ground water disposal permit requirements represents a long-term, adverse effect of moderate intensity in the Moose area and possibly minor intensity at sites outside the park. Alternative 1 would not contribute to a cumulative impact because impacts are not occurring from other projects.

A sewage release would have a short-term, adverse, minor impacts on Snake River outstandingly remarkable values and negligible long-term impacts. There would be cumulative, negligible impacts on Snake River outstandingly remarkable values, and alternative 1 would contribute minimally to this cumulative impact.

ALTERNATIVE 2: NPS PREFERRED, ONE WATER STORAGE TANK AND ONSITE WASTEWATER SYSTEM

Impact Analysis

Hydrology. Alternative 2 would have the same cycle of potable water extraction from the Taggart wells and return to Snake River ground water system that was described for alternative 1. As a result, it would have a negligible impact on hydrology compared to alternative 1.

Discharge of Sediment. All construction would use best management practices to protect soil resources and prevent the transport of sediment into waterways. Section 7 of the Wyoming Water Quality Rules and Regulations, which address Class 1 waters, states that "temporary increases in turbidity . . . shall not exceed the actual construction period." To meet this requirement, revegetation of disturbed sites would be started as soon as practical after work in an area was completed. Because of the proven effectiveness of best management practices, discharge of sediment to waterways would be negligible compared to alternative 1.

Wetlands. The only location where project activities would affect stream or wetland resources is where the buried water main crosses the Beaver Creek wetland and channel.

Trenching would be used to install the pipeline to a depth of 6 or 7 feet below the channel bed at the pinch point where the creek channel is about 5 feet wide and the riparian corridor is about 60 feet wide. This crossing probably would require Clean Water Act permitting.

The crossing would be in an existing utility corridor that contains the existing water supply pipeline from the Taggart water storage tank, an electrical transmission line, and a dirt, two-track road that is occasionally used for corridor access and maintenance. Construction activity in the stream corridor would last no more than 2 days. The pipeline crossing of Beaver Creek would temporarily alter approximately 0.04 acre of palustrine scrub-shrub wetland, which is dominated by broadleaf deciduous shrubs of alder and willow. The location of this activity is shown in figure 5.

Figure 5: Location of Wetland (W11) at the Pipeline Crossing of Beaver Creek

Source: ERO Resources Corporation 2011

Construction would occur during low-flow periods. Best management practices would be taken to avoid and mitigate potential construction effects (see the mitigation measures in chapter 2). For example, steps would be taken to preserve wetland topsoil and to avoid surrounding wetland and riparian areas. Creek flows would be maintained during construction. After installation of the pipeline, the channel would be stabilized to protect the stream and pipeline from scouring, the restored channel would be configured to match the pre-disturbance size and grade, flow would be restored to the reconstructed channel, and the site would be restored with native topsoil and reseeded with native plant species. The width of the wetland and creek channel disturbance would be 30 feet or less.

Biotic and hydrologic functions and values are of primary importance at the Beaver Creek crossing site. Biotic functions include fish and wildlife habitat, floral and faunal productivity, and native species and habitat diversity. Hydrologic functions include streamflow maintenance, ground water recharge and discharge, water supply, erosion and sediment control, water quality purification, and detritus export to downstream systems. Primary cultural values include aesthetics and recreation interpretation.

Based on the limited size of the area to be affected (0.04 acre), the temporary nature of the disturbance (2 days of activity in the wetland and the stream channel), the best management practices to be implemented to minimize adverse effects, the actions to be implemented to restore the crossing to pre-disturbance conditions, and the very limited amount of visitation the site receives, there would be no loss of biotic, hydrologic, or aesthetic cultural wetland functions or values at this site. The same functions would continue to be provided by the wetland and the stream in the affected area after the crossing was completed as were provided before the disturbance occurred.

At the Beaver Creek crossing site, the effects on wetlands would be short-term, minor, and adverse. There would be no net loss of wetlands. Long-term impacts would be negligible.

In accordance with provisions of section 4.2 of the NPS' wetlands protection procedural manual (NPS 2011a), the proposed Beaver Creek crossing would qualify as an excepted action for a "minor stream crossings for underground utility lines" (section 4.2.1.e) and for "maintenance, repair, or renovation" (section 4.2.1.g). This conclusion is based on a wetland disturbance area of less than 0.1 acre and a commitment to the best management and impact avoidance practices previously described. As an excepted action, the requirements to provide a wetland statement of findings and wetland impact compensation are waived.

All other construction would be designed and implemented to avoid activities in wetlands and would have no impact on existing wetlands. Because the NPS would commit to wetland avoidance, there would be no adverse impacts on wetlands in other parts of the project area.

Floodplains. A detailed floodplains statement of findings for alternative 2 is provided in appendix A. The wastewater treatment plant for this alternative would be more than 400 feet outside the 500-year floodplain calculated by Martin and Linn (2011). Moving the structure to this site would slightly increase the flood-carrying capacity of the Snake River floodplain relative to alternative 1. The new wastewater treatment plant would not be damaged by a 500-year flood, and it also would be able to continue to provide wastewater treatment during and after the flood. Compared to alternative 1, the intensity of these long-term, beneficial impacts would be minor.

Surface Water Quality. Alternative 2 would have a much lower potential for a sewage spill. In addition to modern components that would be less likely to fail, the new wastewater treatment plant could store more than the average summer day flow in 2040 in its equalization and treatment basins. In the unlikely event that a spill occurred, the sewage could probably be blocked and retained in the 950-foot distance between the new treatment plant and the river. The greatly reduced potential for a sewage spill that would cause the NPS to violate the state water quality standard for fecal coliform bacteria would be a moderate, short-term, beneficial effect. The long-term impact on surface water quality would be negligible.

Ground Water Quality. The new wastewater treatment plant would improve the removal of nitrates and ammonia so that the treated effluent consistently met the limits in the ground water disposal permit for the plant. This would result in a moderate, long-term, beneficial effect on ground water quality at Moose. Impacts at the airport and locations outside the park would be negligible.

Snake River Outstandingly Remarkable Values. The scenic, recreational, fish and wildlife, cultural, and water quality outstandingly remarkable values of the Snake River would be improved under alternative 2, primarily because of the removal of the existing wastewater treatment facility about 180 feet from the Snake River and the transfer of this function to a

new treatment facility about 950 feet from the Snake River bank. Beneficial effects on these outstandingly remarkable values would be long-term and minor.

Cumulative Impacts

Impacts on hydrology, discharge of sediment, wetlands, floodplains, surface water quality, ground water quality, and the outstandingly remarkable values of the wild and scenic Snake River from the past, present, and reasonably foreseeable future actions in the cumulative impact scenario would be the same as those described for alternative 1.

Long-term impacts of alternative 2 on hydrology would be negligible.

The impacts from this alternative, combined with the negligible, minor adverse and beneficial, and moderate adverse and beneficial impacts on hydrology from other past, present, and reasonably foreseeable future actions, would result in a negligible cumulative impact on hydrology. The effects of alternative 2 would contribute minimally to the cumulative impact on hydrology.

Long-term impacts of alternative 2 on discharge of sediment would be negligible.

The impacts from this alternative, combined with the negligible, minor adverse and beneficial, and moderate adverse and beneficial impacts on discharge of sediment from the other actions, would result in a cumulative, minor, adverse impact on discharge of sediment. The effects of alternative 2 would contribute minimally to the cumulative impact on discharge of sediment.

Long-term impacts of alternative 2 on wetlands would be negligible.

The impacts from this alternative, combined with the negligible, minor adverse and beneficial, and moderate adverse and beneficial impacts on wetlands from other the actions, would result in a negligible cumulative impact on wetlands. The effects of alternative 2 would contribute minimally to the cumulative impact on wetlands.

Long-term impacts of alternative 2 on floodplains would be minor and beneficial.

The impacts from this alternative, combined with the negligible impacts from other the actions, would result in a negligible cumulative impact on floodplains. The effects of alternative 2 would contribute minimally to the cumulative impact on floodplains.

The long-term impact of alternative 2 on ability to meet surface water quality standards would be negligible.

The impacts from this alternative, combined with the negligible, minor adverse and beneficial, and moderate adverse and beneficial impacts from the other actions, would result in a cumulative, minor, adverse impact on ability to meet surface water quality standards. The effects of alternative 2 would contribute minimally to the cumulative impact on surface water quality.

Alternative 2 would have long-term, moderate, beneficial impacts on ability to meet ground water quality standards.

The impacts from this alternative would not contribute to a cumulative impact because impacts on ground water quality are not occurring from other actions.

Long-term, minor beneficial impacts on the outstandingly remarkable values of the Snake River would be associated with alternative 2.

The impacts from this alternative, combined with the negligible impacts from the other actions, would result in a cumulative, negligible impact on Snake River outstandingly remarkable values. The effects of alternative 2 would contribute minimally to the cumulative impact.

Conclusions

Impacts on hydrology would be negligible. There would be a negligible cumulative impact on hydrology, and alternative 2 would contribute minimally to this cumulative impact.

Impacts on the discharge of sediment would be negligible. There would be a cumulative, minor, adverse impact on discharge of sediment, and alternative 2 would contribute minimally to this cumulative impact.

For wetlands, effects from crossing Beaver Creek would be short-term, adverse, and minor. Long-term effects would be negligible. There would be a negligible cumulative impact on wetlands, and alternative 2 would contribute minimally to this cumulative impact.

For floodplains, moving the wastewater treatment plant to a location outside the 500-year floodplain would represent a minor, long-term, beneficial impact. There would be a negligible cumulative impact on floodplains, and alternative 2 would contribute minimally to this cumulative impact.

The reduced potential for sewage spills would represent a moderate, short-term, beneficial effect on ability to meet surface water quality standards. The long-term impact would be negligible. There would be a cumulative, minor, adverse impact on surface water quality, and alternative 2 would contribute minimally to this cumulative impact.

For ability to meet ground water quality standards, the ability to consistently meet the limits in the NPS' ground water disposal permit would be a long-term, moderate, beneficial impact in the Moose area. A negligible impact would occur with regard to permits for sites outside the park. Alternative 2 would not contribute to a cumulative impact because impacts are not occurring from other projects in the cumulative impact scenario.

Moving sewage treatment away from the riverbank would have a long-term, minor, beneficial impact on Snake River outstandingly remarkable values. There would be cumulative, negligible impacts on Snake River outstandingly remarkable values, and alternative 2 would contribute minimally to this cumulative impact.

ALTERNATIVE 3: TWO WATER STORAGE TANKS AND SEWER LINE SYSTEM

Impact Analysis

Hydrology. Alternative 3 would continue to obtain about 75,000 gallons of potable water per day from the Taggart wells and deliver it to Moose for beneficial use. Water that did not enter the Moose sewage collection system, including irrigation water and wastewater treated in the septic tanks at Beaver Creek (total of about 25,000 gallons per day) would be returned to the Snake River aquifer. All of the other water would be sent via a sewer force main to the Jackson municipal wastewater plant where, after treatment, it would be discharged from a permitted outfall to the Snake River. The effect of removing an average of 50,000 gallons of water per day from the Snake River aquifer and discharging it to the Snake River channel 15 miles south of Moose could not be detected in a river flow that averages more than 1.8 billion gallons per day and varies several-fold seasonally. Therefore, the effects of alternative 3 on Snake River hydrology would be negligible.

Discharge of Sediment. All of the construction would use best management practices during and after construction, and revegetation of disturbed sites would be started as soon as practical after work in an area was completed, even while construction was continuing at

other project sites. Because of the proven effectiveness of best management practices, discharge of sediment to waterways would be negligible compared to alternative 1.

Wetlands. Alternative 3 would have the same short-term, minor, adverse impacts from the water main installation across Beaver Creek that were described for alternative 2. All other impacts on wetlands between Taggart Creek and Moose would be negligible.

The sewer force main from Moose to the Jackson sewer system would cross six waterways, including the Snake River, Gros Ventre River, and Flat Creek. There also are several isolated ponds along the route that support wetland vegetation. Particularly at the river and creek crossings, there are zones of riparian vegetation that meet the definitions of wetlands by Cowardin et al. (1979). Because this alternative would use horizontal directional drilling or maneuverable pipe-laying equipment to avoid wetlands, sewer force main installation would have negligible impacts on wetlands. Long-term impacts also would be negligible.

Floodplains. The wastewater pump station would be more than 400 feet outside the 500-year floodplain. Placing the structure at this site and demolishing the wastewater treatment plant would slightly increase the flood-carrying capacity of the Snake River floodplain relative to alternative 1. The new pump station would not be damaged by a 500-year flood, and would continue to provide wastewater management during and after a flood. Compared to alternative 1, the intensity of these long-term, beneficial impacts would be minor.

Surface Water Quality. Alternative 3 would have a much lower potential for a sewage spill than alternative 1 because of its modern components. However, its raw sewage storage capacity would be limited to its two wet wells, which together could hold about 6,000 gallons. Therefore, while the probability of a spill would decrease, the potential for a release to the environment when such a spill occurred would increase. As a result, the change in impact compared to alternative 1 would be negligible, and the potential for a raw sewage release to the river would continue to represent a moderate, short-term, adverse effect on the NPS' ability to meet state of Wyoming surface water quality standards.

Alternative 3 would discharge treated effluent from the Jackson wastewater treatment plant to the Snake River, compared to the land disposal approach of alternative 1. The impact on Snake River quality would be negligible because the Jackson treatment plant routinely meets all of its quality requirements for treated effluent.

Ground Water Quality. Alternative 3 would not involve ground water discharges, so the potential for contamination that would violate state standards for ground water quality would be eliminated. This would result in a moderate, long-term, beneficial effect at Moose. If alternative 3 included sewer tie-ins at the airport and facilities south of the park along U.S. Highway 26/89/191, their use of septic tank and leach field systems would cease. Impacts on the ability to meet ground water discharge standards would be negligible at the airport, where the existing systems are operating effectively. At sites outside the park that were allowed to connect to the force main and that had inadequate septic tank and leach field systems, the potential for contamination that would violate state permits for ground water discharges would be eliminated. The intensity of this long-term, beneficial impact would be minor because of the relatively small volumes of wastewater involved and the low numbers of nearby, downgradient, potable water wells.

Snake River Outstandingly Remarkable Values. The scenic, recreational, fish and wildlife, cultural, and water quality outstandingly remarkable values of the Snake River would be im-

proved under alternative 3, primarily because of the removal of the existing wastewater treatment facility about 180 feet from the Snake River and the pumping of sewage for treatment in Jackson outside the designated Snake River scenic boundary. Because the sewer line would be installed beneath the riverbed of the Snake River, this may have a negligible adverse effect on the geologic value of the Snake River. Collectively, the beneficial effects on the outstandingly remarkable values would be long-term and minor.

Cumulative Impacts

Impacts on hydrology, discharge of sediment, wetlands, floodplains, surface water quality, ground water quality, and the outstandingly remarkable values of the wild and scenic Snake River from the past, present, and reasonably foreseeable future actions in the cumulative impact scenario would be the same as those described for alternative 1.

Cumulative impacts, and the contributions of alternative 3 to cumulative impacts, would be the same as those described for alternative 2 for hydrology, discharge of sediment, wetlands, floodplains, and the outstandingly remarkable values of the Snake River.

The long-term impact of alternative 3 on ability to meet surface water quality standards would be negligible.

The impacts from this alternative, combined with the negligible, minor adverse and beneficial, and moderate adverse and beneficial impacts from the other actions, would result in a cumulative, minor, adverse impact on ability to meet surface water quality standards. The effects of alternative 3 would contribute minimally to the cumulative impact on surface water quality.

The long-term impact of alternative 3 on ability to meet ground water quality standards would be moderate, long-term, and beneficial near Moose and minor, long-term, and beneficial at some sites outside the park.

The impacts from this alternative would not contribute to a cumulative impact because impacts on ground water quality are not occurring from the other actions in the cumulative impact scenario.

Conclusions

Impacts on hydrology would be negligible. There would be a negligible cumulative impact on hydrology, and alternative 3 would contribute minimally to this cumulative impact.

Impacts on the discharge of sediment would be negligible. There would be a cumulative, minor, adverse impact on discharge of sediment, and alternative 3 would contribute minimally to this cumulative impact.

For wetlands, effects from crossing Beaver Creek would be short-term, adverse, and minor. Long-term effects would be negligible. There would be a negligible cumulative impact on wetlands, and alternative 3 would contribute minimally to this cumulative impact.

For floodplains, constructing the wastewater pump station to a location outside the 500-year floodplain and removing the existing treatment plant near the river would represent a minor, long-term, beneficial impact. There would be a negligible cumulative impact on floodplains, and alternative 3 would contribute minimally to this cumulative impact.

The unchanged potential for sewage spills would result in a negligible impact on the ability to meet surface water quality standards. The long-term impact also would be negligible. There would be a cumulative, minor, adverse impact on ability to meet surface water quality standards, and alternative 3 would contribute minimally to this cumulative impact.

For ability to meet ground water quality standards, elimination of ground water discharges would result in long-term, beneficial impacts that would be moderate in the Moose area and minor at sites outside the park. Alternative 3 would not contribute to a cumulative impact because impacts are not occurring from other projects in the cumulative impact scenario.

Moving sewage management away from the riverbank in the park would have a long-term, minor, beneficial impact on Snake River outstandingly remarkable values. There would be cumulative, negligible impacts on Snake River outstandingly remarkable values, and alternative 3 would contribute minimally to this cumulative impact.

WILDLIFE, INCLUDING CANDIDATE, THREATENED, AND ENDANGERED SPECIES

AFFECTED ENVIRONMENT

Grand Teton National Park provides habitat for a variety of wildlife species, including 61 mammals, 4 reptiles, 6 amphibians, 19 fish, and 299 species of birds (NPS 2006a). Several of these species could occur in the project area. Potential residents include ungulates (elk, moose, bison, mule deer, and pronghorn), carnivores (coyotes, grizzly and black bears, gray wolves, wolverines, mountain lions, and lynx), rodents (beavers, muskrats, porcupines, marmots, ground squirrels, red squirrels, chipmunks, mice, and voles), and other small mammals such as bats, pine martens, river otters, badgers, and snowshoe hares. Numerous bird species, such as raptors, owls, neotropical migrants and sage grouse, might use the area as well. Many amphibian and reptile species may also inhabit the project area including toads, frogs, and snakes.

Mammals. Large mammals in the project area include elk, moose, mule deer, bison, pronghorn, grizzly bear, black bear, mountain lion, and wolf. Mid-sized and small mammals in the vicinity include bobcat, badger, beaver, coyote, red fox, pine marten, porcupine, river otter, long-tail weasel, red squirrel, deer mouse, pocket gopher, chipmunk, Uinta ground squirrel, and vole.

Elk use all of the habitat types in the project area. During their spring and fall migration between the park and the National Elk Refuge where they winter, much of the Jackson elk herd moves through the project area. Elk also calve in the early summer and rut in the fall in areas such as Murie Ridge, Windy Point, Cottonwood Creek, and 4 Lazy F Ranch.

Moose are common year-round in the project area's riparian and sagebrush habitats. The Snake River drainage and low-elevation parts of the Gros Ventre River drainage near Gros Ventre junction are identified either as "winter-yearlong" or "crucial moose winter range" by the Wyoming Game and Fish Department (NPS 2006b). The Snake River drainage and lower slopes of the surrounding mountains are critically important reproductive and maintenance habitat and the riparian areas of the Gros Ventre and Snake Rivers are important for calving (NPS 2006b).

Mule deer are common but in low numbers in the area during spring, summer, and fall. Their use of lower elevations along the Snake River and on the slopes of buttes and foothills south of Moose increases during spring and fall migration, although specific routes are not defined. Winter range includes east-, west-, and south-facing slopes and bottomlands, and crucial winter range occurs on East and West Gros Ventre Buttes between the southern park boundary and Jackson (NPS 2006b).

Bison primarily use the sagebrush areas and river bottoms in the project area and may calve throughout these areas. During the winter, many move to the National Elk Refuge to the

south. Although bison can occur anywhere, they are more common east of U.S. Highway 26/89/191 and east of Teton Park Road (NPS 2006b).

Pronghorn are seasonal residents primarily of the sagebrush habitat in the project area. The highest pronghorn concentrations in the park occur in the summer in the sagebrush communities along the Snake River floodplain; part of this area also is a key fawning area. Pronghorn sometimes winter on the National Elk Refuge and East Gros Ventre Butte, but most migrate south outside Jackson Hole (NPS 2006b).

Most carnivore and omnivore species are highly mobile and move throughout the habitat types in the project area. During the reproductive season, home ranges tend to focus around den sites but home ranges are expanded when the young are able to travel. The small mammals that provide much of the carnivores' food base usually have more limited ranges. Many of these species hibernate for the winter.

Amphibians and Reptiles. Several species of amphibians and reptiles may be present in the project area. Some of these include the tiger salamander, Columbia spotted frog, western boreal toad, western chorus frog, valley garter snake, rubber boa, and sagebrush lizard. Most inhabit wet areas such as the riparian zone of the Snake River and its tributaries but some species also use upland areas, including the Moose and 4 Lazy F Ranch areas, during the fall and winter. Rubber boas are the exception and typically are found in moist forested areas with heavy ground cover. Populations of all of these species appear healthy (NPS 2006b).

Three wetlands in or near the Moose water and wastewater project area were surveyed for amphibians in 2005 for the multi-use pathway project. These included sites north of the Beaver Creek housing area, where Taggart Creek crosses the Teton Park Road, and where the Teton Park Road crosses Cottonwood Creek. No amphibians were found at any of the survey areas, although suitable breeding habitat was found at the first two (NPS 2006b).

Birds, including Neotropical Migratory Species. Many bird species in the project area are protected by the Migratory Bird Treaty Act. This act protects migratory birds, their parts, and nests or eggs. The U.S. Fish and Wildlife Service, in its response to scoping for this project, recognized the presence of migratory birds in the project area (USFWS 2011b).

Neotropical migrants include raptors, songbirds, and shorebirds that breed in North America but migrate to Mexico, Central America, or South America for the winter. In Wyoming, 162 bird species are considered neotropical migrants (Cerovski *et al.* 2001). Peak migration periods occur in May and then from September through early October. Nesting typically occurs from mid- to late May through early August.

Migratory birds are of concern to resource managers because they have been experiencing severe population declines throughout North America (Askins *et al.* 1990). Habitat fragmentation and habitat loss are among the primary factors causing these declines (Robbins *et al.* 1989). Some birds also receive special attention because of their population status and need for conservation. These are discussed under "Species of Special Concern" and "Candidate, Threatened, and Endangered Species," below.

Sagebrush habitat loss, degradation, and fragmentation are major factors that have led to declines in populations of sagebrush-obligate species such as the sage thrasher and Brewer's sparrow, and numerous sagebrush-associated avian species (Connelly *et al.* 2004; Rich *et al.* 2005). These species include neotropical migrants such as the bobolink and raptors such as the short-eared owl, which nests and hunts in sagebrush.

Species of Special Concern

A Comprehensive Wildlife Conservation Strategy (Wyoming Game and Fish Department 2005) identifies the species of greatest conservation need in Wyoming. Many of these also are identified by the U.S. Fish and Wildlife Service as priority species for conservation or monitoring. Table 7 lists the special-concern species that use the habitats in the project area. (The greater sage-grouse is addressed later as a candidate for federal listing.) The species are discussed below, grouped by habitat type.

Table 7: Species of Special Concern with Potential Habitat in the Project Area

Common Name, *Scientific Name*	WYGFD Status [a/]	Habitat	Potential to Occur in Project Area
Reptiles and Amphibians			
Northern leopard frog, *Rana pipiens*	NSS4	Riparian	Unlikely
Boreal western toad, *Bufo boreas boreas*	NSS2	Riparian	Likely
Northern sagebrush lizard, *Sceloporus graciosus graciosus*	NSS4	Sagebrush	Likely
Birds			
Trumpeter swan, *Cygnus buccinator*	NSS2	Wetlands, streams	Unlikely
Northern goshawk, *Accipiter gentilis*	NSS4	Forests	Unlikely
Swainson's hawk, *Buteo swainsoni*	NSS4	Sagebrush	Likely
Bald eagle, *Haliaeetus leucocephalus*	NSS2	Riparian, rivers	Likely
Long-billed curlew, *Numenius americanus*	NSS3	Sagebrush	Unlikely
Short-eared owl, *Asio flammeus*	NSS4	Sagebrush	Likely
Great gray owl, *Strix nebulosa*	NSS4	Forests	Unlikely
Northern pygmy-owl, *Glaucidium californicum*	NSS4	Forests	Unlikely
Sage thrasher, *Oreoscoptes montanus*	NSS4	Sagebrush	Likely
Bobolink, *Dolichonyx oryzivorus*	NSS4	Sagebrush	Likely
Brewer's sparrow, *Spizella breweri*	NSS4	Sagebrush	Likely
Mammals			
Vagrant shrew, *Sorex vagrans*	NSS3	Forests, riparian, sagebrush	Unlikely
Water vole, *Arvicola terrestris*	NSS3	Riparian	Unlikely
Long-eared myotis, *Myotis evotis*	NSS2	Forests	Unlikely
Little brown myotis, *Myotis lucifugus*	NSS3	Forests	Unlikely
Long-legged myotis, *Myotis volans*	NSS2	Forests	Unlikely
Big brown bat, *Eptesicus fuscus*	NSS3	Forests	Unlikely
Townsend's big-eared bat, *Corynorhinus townsendii*	NSS2	Forests	Unlikely
Western small-footed myotis, *Myotis ciliolabrum*	NSS3	Forests	Unlikely

a/ Concern categories are from Cerovski 2003. Wyoming Game and Fish Department (WYGFD) native species status (NSS) categories are:
NSS2 = Populations restricted or declining in numbers and/or distribution; extirpation in Wyoming is not imminent AND ongoing significant loss of habitat.
NSS3 = Populations restricted or declining in numbers and/or distribution; extirpation in Wyoming is not imminent AND habitat is restricted or vulnerable but no recent or on-going loss; species is sensitive to human disturbance.
NSS4 = Species is widely distributed; population status and trends in Wyoming are assumed stable AND habitat is restricted or vulnerable but no recent or on-going significant loss; species is sensitive to human disturbance.

Sagebrush Habitat Species. Sagebrush in the park provides habitat for eight special-concern species, including one lizard, six birds, and one mammal (table 7). Two bird species, the Brewer's sparrow and sage thrasher, are sagebrush obligates, depending exclusively or primarily on sagebrush habitats for breeding and nesting. Population declines of the sagebrush-obligate and -associated species have occurred throughout their ranges because of habitat loss. Therefore, all of these are assigned a native species status of 3 or 4 because populations are declining and their habitat is vulnerable.

The project area contains suitable sagebrush habitat for all eight special concern species, particularly in areas of mature vegetation such as along Teton Park Road between Beaver Creek and Moose and along the west side of U.S. Highway 26/89/191. Sagebrush habitat also occurs along the highway between the south park boundary and Jackson.

Forest Species. Ten special-concern species, including three birds and seven mammals, primarily inhabit forest habitats. The birds all are classified as native species status 4, while the mammals have more vulnerable classifications of 2 or 3. All of these species are unlikely to occur in the project area. The vagrant shrew is of concern because populations are restricted in numbers and its habitat is vulnerable. The goshawk and owls are under stress because of habitat degradation and continued habitat vulnerability. For all three bird species, their population status and trends in Wyoming are poorly understood and habitat needs are not well defined (Wyoming Game and Fish Department 2005).

Factors currently contributing to the decline of the six bat species, all of which are unlikely in the project area, include habitat loss, habitat degradation, disturbances or conflicts with humans, and loss of prey (Wyoming Game and Fish Department 2005). An approaching threat is their susceptibility to white-nose syndrome, which is migrating toward the state. A strategic plan for their management with regard to this fungus has been prepared by the Wyoming Game and Fish Department (2011a).

Forest habitat is limited in the project area. As shown in figure 2, the existing water main and storage tanks skirt forested areas from the Taggart area to south of the Windy Point tank. Forested stands also occur along the rivers, including the Moose and 4 Lazy F Ranch areas.

Riparian, River, and Wetland Species. There are two amphibian species of concern in wet habitats. Boreal western toads are present in the park and have been documented in the project area. Northern leopard frogs were historically present but there have been no verified sightings in the park in nearly 40 years. It is assumed that this species is extremely rare or absent from the area (NPS 2010b).

Trumpeter swans use riparian areas such as lakes, ponds, rivers, and reservoirs for nesting and foraging. They initiate nesting when these areas thaw, typically in late April or early May. Eggs hatch in early June and the young usually fledge in September. Swans use open water along rivers and lakes for foraging in the late fall and winter. The nearest known swan nesting territory is along Flat Creek near the town entrance along Highway 26/89/191. Another swan nesting territory is located on the northern end of the National Elk Refuge. Throughout the year, swans use the Snake River near the Teton Park Road bridge at Moose, Gros Ventre River corridor, and open-water area at the Flat Creek wildlife viewing area east of U.S. Highway 26/89/191 for foraging and loafing.

The bald eagle was federally listed as an endangered species in 1967. After several decades of protection, recovery goals were met and bald eagles were de-listed in 2007. They are protected under the 1918 Migratory Bird Treaty Act and 1940 Bald and Golden Eagle Protection Act.

Eagles occur year-round in the park, particularly along the river corridors. The park contains 14 to 18 nesting bald eagle territories, but not all nests are active and fledge young each year. All territories are monitored for activity by the NPS. Two bald eagle nests are in the park near the project vicinity, including one near Cottonwood Creek north of the 4 Lazy F Ranch and one along the Snake River about a mile south of Moose (Wolff 2010). In the park, half-mile-radius protective closures around active bald eagle nests are established annually from February 15 to August 15 (NPS 2011b). Outside the park, an eagle nest is located less than a quarter mile west of U.S. Highway 26/89/191 near the National Museum of Wildlife Art.

The water vole inhabits moist, subalpine and alpine meadows within about 50 feet of narrow, low-gradient streams. Therefore, the only project area location where it might occur is the crossing site of Beaver Creek, but its presence is unlikely. The vole is designated native species status 3 because populations are restricted in distribution and its habitat is vulnerable (Wyoming Game and Fish Department 2005).

Threatened, Endangered, and Candidate, Species

Table 8 presents the species of concern under the Endangered Species Act that the U.S. Fish and Wildlife Service (2011b) identified as potentially present in the project vicinity. The Canada lynx and grizzly bear are federally listed as threatened. The status of wolves in Wyoming is changing. The greater sage-grouse and western yellow-billed cuckoo, which warrant listing under the Endangered Species Act but are not listed because of higher-priority actions, are included as candidate species.

Table 8: Threatened, Endangered, and Candidate Species with the Potential to Be Affected by the Project

Common Name	Scientific Name	Status	Habitat Affinity
Mammals			
Canada lynx	*Lynx canadensis*	Threatened	Montane forests
Gray wolf	*Canis lupus*	Experimental / non-essential	Greater Yellowstone Ecosystem
Grizzly bear	*Ursus arctos horribilis*	Threatened	Montane forests
Wolverine	*Gulo gulo*	Candidate	Subalpine to alpine
Birds			
Greater sage-grouse	*Centrocercus urophasianus*	Candidate	Sagebrush
Yellow-billed cuckoo (western)	*Coccyzus americanus*	Candidate	Riparian areas west of the Continental Divide

Canada Lynx (*Lynx canadensis*). This species was listed as a federally threatened species in 2000. The lynx is rare in Wyoming, but the highest concentrations of confirmed observations are in the northwest corner of the state, including Grand Teton National Park and the Teton and Gros Ventre Mountain Ranges (Reeve *et al.* 1986).

The lynx is a solitary carnivore generally occurring at low densities in boreal forests. It is strongly associated with the distribution and abundance of snowshoe hares, its primary prey (USFWS 2009). In Wyoming, lynx occur primarily in spruce/fir and lodgepole pine forests with slopes of 8 to 12 degrees and at elevations from about 8,000 to 9,600 feet (Ruediger *et al.* 2000). Sagebrush grasslands, dense willow thickets, and beaver pond complexes may also provide foraging opportunities for alternative prey. Denning usually occurs in mature spruce/fir forests on north-facing slopes. Dispersal corridors, principally continuous conifer forests several miles wide, are critical for lynx travel and dispersal (Tanimoto 1998).

Little information exists on lynx abundance and distribution in the park. Park records include 12 reports of lynx, but some may not be credible because lynx are easily confused with the bobcat. No evidence of lynx was found in a three year (2000-2002) survey in the best lynx habitat in the park (NPS 2006b). Suitable lynx habitat is present west of the Moose complex and in forested areas west of Teton Park Road near the existing Taggart water tank site. The sagebrush areas are not identified as suitable habitat for Canada lynx (NPS 2006b).

No critical lynx habitat occurs in the park. Lynx management areas, called lynx analysis units, have been identified in Grand Teton National Park (Ruediger *et al.* 2000). Mapping of lynx analysis units in the park was based primarily on vegetative characteristics. Five areas totaling about 150,000 acres provide 96,000 acres of potential lynx habitat. Habitat in the forested area along the west side of Teton Park Road from Beaver Creek to Moose is within a lynx analysis unit.

Grizzly Bear (*Ursus arctos horribilis*). This species historically roamed much of the western United States, but it was extirpated from most of its range by the mid-20th century. A small population persisted in Yellowstone National Park. The grizzly bear was listed as threatened under the Endangered Species Act in 1975, and a recovery plan was developed (USFWS 1982, 1993). In 2003, a conservation strategy for the Yellowstone grizzly bear specified management parameters for a primary conservation area (USFWS 2003). While the strategy was in effect from March 2007 to September 2009, the grizzly bears was delisted and state plans were used to manage the bear outside national parks in Wyoming, Idaho, and Montana. As a result of litigation, the grizzly bear was placed back on the endangered species list in September 2009.

Approximately 125,000 acres of Grand Teton National Park are within the Primary Conservation Area, as defined by the *Final Conservation Strategy for the Grizzly Bears in the Yellowstone Ecosystem* (USFWS 2003). Development within this zone is restricted and requires an equivalent area within the conservation area to be restored as useable grizzly bear habitat. The project area is not within the Primary Conservation Area.

Grizzly bears occupy a variety of coniferous forest and rangeland habitats. They have large home ranges (50 to 300 square miles for females and 200 to 500 square miles for males) that contain forests, moist meadows, and grasslands in or near mountains. In the spring, bears usually are at lower elevations but they can be found at a wide elevation range throughout the non-denning period. Bears require space and isolation from humans, suitable den sites, and an adequate food base that includes carrion and plant matter (USFWS 1993).

NPS management of the grizzly bear is guided by a human-bear management plan (NPS 1989) and the Interagency Grizzly Bear Committee (1986) guidelines. The NPS' objectives are to restore and maintain the natural integrity, distribution, and behavior of grizzly bears; provide for visitors to understand, observe, and appreciate grizzly bears; and provide for visitor safety by minimizing bear/human conflicts, reducing human-generated food sources, and regulating visitor distribution. Management of grizzly bears in the park has been effective in promoting grizzly bear recovery and reducing bear-human conflicts and human-caused bear mortalities.

Grizzly bear occurrence in the park and throughout the greater Yellowstone area has increased during the past 20 years. Sightings are now relatively common throughout the park, including the Moose, 4 Lazy F Ranch, Taggart, Beaver Creek, and Highway 26/89/191 areas.

Gray Wolf (*Canis lupus*). The gray wolf was reintroduced to the greater Yellowstone ecosystem in 1995 and 1996 through a release of 33 wolves from Canada to Yellowstone National Park. While wolves were designated as an experimental, nonessential species under section

10j of the Endangered Species Act at the time of reintroduction, in national parks and wildlife refuges they are managed as a threatened species. No critical habitat was designated for this species.

The USFWS has conditionally approved a Wyoming wolf management plan and has proposed to delist wolves once the state makes several statutory and regulatory changes to existing state laws and regulations. The delisting proposal is currently out for public and review and comment. Once delisted, wolves within the park will be managed by the NPS, while those adjacent to the park will be managed by the Wyoming Game and Fish Department as trophy game.

The gray wolf uses a variety of habitats and vegetation cover types. The most important habitat attributes for the wolf include an adequate ungulate prey base and tolerance by humans. In some areas, small mammals provide an important food source during non-winter months.

All of Grand Teton National Park serves as suitable habitat for the gray wolf and at least five wolf packs currently have territories that include parts of the park. Of these, the Huckleberry and Lower Gros Ventre packs have home ranges that include the project area. In addition, the Pinnacle and Buffalo pack use areas in and adjacent to the National Elk Refuge.

Wolverine(*Gulo gulo*). In December 2010, the North American wolverine was designated a candidate species under the Endangered Species Act in the contiguous 48 states. Their current range includes parts of Wyoming.

Wolverines are the second-largest member of the weasel family in North America. Breeding starts at four years of age or older, occurs only every two to three years, and produces litter sizes of just over one cub on average. Offspring accompany their mother for about a year before they disperse from the area. Female wolverines use natal (birthing) dens that are excavated in snow. Persistent, stable snow is strongly tied to wolverine habitat suitability and appears to be a requirement for natal denning because it provides security for offspring and buffers against cold temperatures.

Wolverines are highly territorial and occur at very low densities owing to their large space requirements. They are opportunistic feeders that consume a variety of foods, depending on availability. They primarily scavenge carrion, using an excellent sense of smell to find food beneath deep snow, but they also prey on small animals and birds and feed on fruits, berries, and insects.

In the Rocky Mountain states where they typically prefer high elevations and rugged, snowy terrain, the known breeding range of wolverines reaches its southernmost extent in Grand Teton National Park. In the Yellowstone region, where wolverines occur at a density of less than one per 100 square miles, long-term research has revealed that just two breeding female and two breeding male wolverines occupy the entire Teton Range. Because of the small wolverine population, the search for a mate and breeding territory requires covering long distances, sometimes hundreds of miles.

Wolverines often cross low-elevation valleys between mountain ranges in the process. Recently, a radio-marked wolverine was tracked as it moved from just east of Grand Teton National Park to Rocky Mountain National Park in Colorado.

In Grand Teton National Park, wolverine observations are common in the Teton canyons near the project area. Several observations are documented in low-elevation areas similar to the project area.

Greater Sage-Grouse (*Centrocercus urophasianus*). Populations of this species across its entire North American range have been in decline for nearly 20 years. These declines resulted in the petitioning for listing under the Endangered Species Act. The U.S. Fish and Wildlife Service (2010) determined that the greater sage-grouse warrants listing but is precluded because of higher-priority listing actions. As a candidate species, the greater sage-grouse does not have Endangered Species Act legal protection, but USFWS policy is to consider candidate species when making natural resource decisions. Therefore, the NPS manages this species as if it were listed. Critical habitat has not been designated for this species.

Greater sage-grouse populations throughout the West, including Wyoming, have declined by an average 33% since 1985 (Braun 1998). This species is listed as a level 1 priority species in the Wyoming bird conservation plan, suggesting that sage-grouse statewide require applied conservation action (Cerovski *et al.* 2001).

In response to these concerns, the Wyoming Game and Fish Department (2003) prepared the *Wyoming Greater Sage-Grouse Conservation Plan*. In addition, the governor issued Executive Order 2011-5, *Greater Sage-Grouse Core Area Protection* (Wyoming Office of the Governor 2011). These documents require that development of any type in the most important sage-grouse habitats (core areas and associated seasonal habitats) is to take place only when no decline to the species can be demonstrated. All sagebrush in the project area in the park boundary is considered to be in the core area.

To implement state requirements, the Upper Snake River Basin Sage-grouse Local Working Group (2008) prepared the *Upper Snake River Basin Sage-grouse Conservation Plan*. This was the first step in a program to benefit sage-grouse and other sagebrush-obligate species. The plan identifies six major conservation goals that address broad areas such as maintaining and improving habitat, reducing direct mortality, supporting research and monitoring, and educating landowners and the public. For each goal, the group prepared a set of objectives and management actions. All actions in the park are evaluated against these recommendations and may be modified to avoid conflicts or enhance protection of sage-grouse.

Sage-grouse in the Jackson Hole region, including the project area, belong to a resident, non-migratory population (Holloran and Anderson 2004). This population is remnant and at risk of extirpation (McDonald 2006). The local population, as measured by male and female attendance on leks, has declined by more than 70% in some years between 1990 and 2006 (Wolff 2006). Over the last few years, new leks have been located in the park and lek count numbers have been above the 13-year average (Wolff 2010). More than 400 sage-grouse (males and females) were counted during winter surveys (Craighead *et al.* 2008, Bedrosian *et al.* 2010). Some of these birds reside in the Gros Ventre hills and are not counted during springtime lek surveys.

The causes of sage-grouse declines in Jackson Hole are unknown, but suspected factors include low nest productivity and the loss, degradation, and fragmentation of key habitats. Any substantial changes to the existing suitable habitat or survival rates of sage-grouse may seriously imperil the continued existence of the Jackson Hole population (McDonald 2006).

Sage-grouse require large expanses of sagebrush habitat containing a diverse, substantial understory of native grasses and forbs that provide food and cover. They are known to occur in the project area year-round, including during reproductive, brood-rearing, and wintering phases of their life-cycle. Seasonal movements occur throughout the project area.

Reproduction includes use of the airport lek and its satellite lek, which respectively are about 0.5 and 0.2 miles from proposed project features. Over the past decade, about 18 males and 19 females have been recorded annually at the airport lek, compared to the regular observation of more than 60 males when recording began in 1948 (Wolff 2005). More recently, male attendance at the lek has declined to about 10 or 12 individuals (Wolff 2010). This lek is im-

portant to the local sage-grouse population, despite declining numbers of males at the lek over the last 10 years (Wolff 2006).

Breeding activity begins in mid-March when grouse gather on leks (Connelly *et al*. 1981). Lek attendance at the airport has been observed into late May during some years. Females then disperse to nesting areas characterized by relatively dense, tall, mature sagebrush stands (Connelly *et al*. 2000, Holloran and Anderson 2004). Sage-grouse nesting occurs throughout the sagebrush habitat in the project area. To protect nests in the park, the NPS requires surveys of sagebrush habitat for nests if vegetation removal takes place before August 1. The park also follows guidelines in the Governor's executive order, which prohibits removal of sage-grouse habitat between March 15 and June 30 within the core area.

Winter habitat is a critical and possibly a limiting habitat component for sage-grouse populations in the Jackson area (Upper Snake River Basin Sage-Grouse Local Working Group 2008). Winter habitat is well-documented in the project area (Holloran and Anderson 2004, Craighead *et al*. 2008, and Bedrosian *et al*. 2010). Sage-grouse select dense, tall stands of mature sagebrush during the winter where they find both food and cover. They also use low sagebrush stands on open, windswept knolls as feeding sites. If important winter habitats are present, project-related disturbance should not occur from November 15 through March 14.

Yellow-billed Cuckoo (*Coccyzus erythropthalmus*). This species warrants listing but remains a candidate because higher-priority actions continue to prevent the development of listing rules (USFWS 2011c). Critical habitat has not been designated for this species.

The western yellow-billed cuckoo breeds in large blocks of riparian habitats, particularly woodlands with cottonwoods and willows. Dense understory foliage appears to be an important factor in nest site selection. Clutch size is usually two or three eggs, and the young develop very quickly, with a breeding cycle of 17 days from egg-laying to fledging (USFWS 2011c).

Little is known about the status of the yellow-billed cuckoo in the park. Raynes and Raynes (1996) report this species as "rare" for the area during the spring, summer, and fall. The only sighting of this species reported to the NPS occurred in 2001 at the monitoring avian productivity station of the Teton Science School near the eastern park boundary (NPS 2009a)

The threats facing the western yellow-billed cuckoo primarily result from habitat loss from clearing and removal, or the alteration and fragmentation of riparian forest for agriculture, urban development, flood control, and as a result of invasion of habitat by exotic plant species, primarily salt cedar. Estimates of riparian habitat losses range from 90% to 99% in the primary states in its range (USFWS 2011c). Cuckoos are also sensitive to human presence and may abandon their nest if disturbed, especially during the nest building stage (NPS 2009a).

Suitable cuckoo habitat in the project area could include woodlands along Cottonwood Creek; the Snake River, including the Moose and 4 Lazy F Ranch areas; and the lower part of the Gros Ventre River.

IMPACT ANALYSIS METHODS

Impacts on wildlife, including their habitats, and on candidate, threatened, and endangered species were evaluated using the process described in the "Methods" section at the beginning of this chapter. In addition, the *Final Endangered Species Consultation Handbook* (U.S. Fish and Wildlife Service and National Marine Fisheries Service 1998) was used to assess impacts on threatened and endangered species. This handbook indicates that a "not likely to adversely affect" determination is appropriate when the effects on listed species are expected to be discountable, insignificant, or completely beneficial. It defines discountable effects as those

that cannot be meaningfully measured. The handbook states that a "no effect" determination is appropriate when the "action agency determines its proposed action will not affect a listed species or designated critical habitat." For this analysis, a "no effect" determination is equated with a "negligible" impact threshold.

Section 7(a)(1) of the Endangered Species Act requires federal agencies to consult with the U.S. Fish and Wildlife Service (USFWS) to ensure that they are not undertaking, funding, permitting, or authorizing actions likely to jeopardize the continued existence of listed or proposed species or destroy or adversely modify designated or proposed critical habitat. In May 2011, the NPS sent a scoping letter to the USFWS, Wyoming Ecological Services Office, notifying them of the Moose water and wastewater project.

The NPS will use this environmental assessment as the consultation document pursuant to section 7. This document provides an impact determination for each federally listed species under each alternative. The impact determinations as defined under section 7 include no effect; may affect, not likely to adversely affect; and may affect, is likely to adversely affect. This environmental assessment will be sent to the USFWS for its concurrence with these determinations of effect. Once concurrence has been received from the USFWS, consultation under section 7 will be complete.

Impact threshold definitions for wildlife and their habitats are as follows. For the action alternatives, the mitigation measures in chapter 2 would be implemented as part of the project.

Threshold	Definition
Negligible	General wildlife and species of concern - Wildlife would not be affected or the effects would be at or below the level of detection and so slight that they would not be of any measurable consequence to the population. Threatened and endangered species - No federally listed species would be affected, or the alternative would affect an individual of a listed species or its critical habitat, but the effects would be so small that it would not be of any measurable consequence to the protected individual or its population. Negligible effect would equate with a "no effect" determination in Endangered Species Act terms.
Minor	General wildlife and species of concern - Effects on individual animals and/or their respective habitats would be detectable, although the effects would be localized and would be small and of little consequence to the species' population. Threatened and endangered species - Individuals of a listed species or its critical habitat may be affected, but the effect would be relatively small. Minor would equate with a "may affect" determination in Endangered Species Act terms and would be accompanied by a statement of "may affect but not likely to adversely affect" the species.
Moderate	General wildlife and species of concern - Effects on individual animals and their habitat would be readily detectable, with consequences occurring at a local population level. Threatened and endangered species - An individual or population of a listed species or its critical habitat would be noticeably affected. The effect could have some long-term consequence to the individual, population, or habitat. Moderate would equate with a "may affect" determination in Endangered Species Act terms and would be accompanied by a statement of "likely" or "not likely to adversely affect" the species.
Major	General wildlife and species of concern - Effects on individual animals and their habitat would be obvious and would have substantive consequences on a population level. Threatened and endangered species - Individuals of a listed species or its critical habitat would be noticeably affected, with some long-term consequence to the individual, population, or habitat. Major would equate with a "may affect" determination in Endangered Species Act terms and would be accompanied by a statement of "likely to adversely affect" the species.
Short-term	Impact has a duration less than or equal to one year.
Long-term	Impact has a duration greater than one year.

Impacts on wildlife were considered for all parts of the project area that could be disturbed by construction or operation of the water or wastewater systems. These boundaries are approximate and recognize that many wildlife species are highly mobile and move beyond these areas.

ALTERNATIVE 1: NO ACTION / CONTINUE CURRENT MANAGEMENT

Impact Analysis

Alternative 1 would have negligible impacts on wildlife, their habitats, and threatened or endangered species because all water supply and wastewater components are currently installed and operating. Routine facility operation and maintenance activities, with repairs as needed, would occur at existing facilities but this would not be a change from existing conditions. For the same reasons there would be no effect on the Canada lynx, grizzly bear, gray wolf, wolverine, greater sage-grouse, and yellow-billed cuckoo.

Cumulative Impacts

The impacts of alternative 1 on wildlife would be negligible.

Most of the actions in the cumulative impact scenario would have negligible or minor adverse and beneficial impacts on wildlife. Moderate, adverse impacts were identified for the transportation plan, which would fragment habitats, erode habitat effectiveness, and alter species distributions and habitat use patterns. All of these impacts would occur within the framework of the fire management plan, which seeks to maintain fire's active role in ecosystem function and recognizes that the park's wildlife species evolved, coexisted, and adapted to periodic fire disturbances. The fire management plan would have negligible to moderate, adverse and beneficial impacts on wildlife.

The negligible impacts of alternative 1, in combination with the negligible to moderate, adverse and beneficial impacts from other past, present, and reasonably foreseeable future actions, would result in a cumulative, minor, adverse impact. The effects of alternative 1 would contribute minimally to the cumulative impact on wildlife.

The impacts of alternative 1 on endangered or threatened species would be negligible.

Most of the actions in the cumulative impact scenario, including the fire management plan, would not affect endangered or threatened species or had minor adverse or beneficial impacts that resulted in determinations of "*may affect, but is not likely to adversely affect*." The transportation plan identified long-term, moderate impacts on the grizzly bear and gray wolf, resulting in a determination of "*likely to adversely affect*" because of vehicle collisions that would adversely affect individuals.

The negligible impacts of alternative 1, in combination with the negligible, minor adverse and beneficial, and moderate adverse impacts from the other actions, would result in a cumulative, minor, adverse impact. The effects of alternative 1 would contribute minimally to the cumulative impact on endangered or threatened species.

Conclusions

The impacts of alternative 1 on wildlife would be negligible. There would be a cumulative, minor, adverse impact on wildlife, but alternative 1 would contribute minimally to this cumulative impact.

The impacts of alternative 1 on endangered or threatened would be negligible and would result in a "*no effects*" finding for listed species. There would be a cumulative, minor, adverse impact on endangered or threatened species, but alternative 1 would contribute minimally to this cumulative impact.

ALTERNATIVE 2: NPS PREFERRED, ONE WATER STORAGE TANK AND ONSITE WASTEWATER SYSTEM

Impact Analysis

Direct Mortality. Timing and mitigation measures, like surveys, would minimize conflicts with reproductive activities, such as the hatching and water-based stages of amphibians and the nesting of birds, when animals are least mobile and most vulnerable. As described in the mitigation measures in chapter 2, other actions such as surveys and avoidance would be used to ensure that nests or dens were not disturbed. Almost all animals would be able to move into undisturbed areas outside construction zones As a result, impacts from direct mortality would be negligible in both the construction and operation phases of water and wastewater improvements.

Habitat Effects on General Wildlife. Alternative 2 would result in a total construction disturbance of about 24 acres of sagebrush, coniferous forest, and riparian woodland habitats, with most of the disturbance occurring in sagebrush habitat. A net permanent loss of 0.13 acre of wildlife habitat would result from the project (see table 6).

About 15 acres of disturbance would result from installing the new water pipeline between the Taggart water storage tank and Moose. Most of this disturbance would occur in sagebrush habitat within an existing pipeline corridor that was created in 1956. Another 5 acres of disturbance would occur primarily in sagebrush habitat from constructing the new water line to the 4 Lazy F Ranch and from installing sewer force mains in and north of Moose. Habitat along the pipeline routes would eventually be restored after construction ended.

Water tank construction and demolition activities totaling about 3 acres would occur primarily in forest habitat at the sites of the existing storage tanks. The Taggart site would experience a small (net 0.05 acre), long-term habitat loss at the site of the new tank footprint.

The new wastewater treatment plant in Moose would result in the permanent loss of 0.13 acre. Removing and restoring the sites of the existing main pump station, treatment plant, and water laboratory would result in a gain of 0.06 acre. As a result of the small net habitat loss (0.07 acre), long-term impacts on wildlife in this area would be negligible. Short-term impacts would occur during construction and at the old treatment site until restoration was completed.

Alternative 2 would remove up to 0.04 acre of willow-alder wetland habitat at the water supply pipeline crossing of Beaver Creek. Impacts on species that inhabit these wetlands would be negligible because construction would take place late in the summer when these animals are mobile and only a small amount of habitat would be removed.

During construction, use of best management practices and other mitigation would minimize wildlife habitat losses. Because of the narrow width of the construction zone (40 feet or less in most areas), animals would be able to find suitable, undisturbed habitat nearby. The disturbance would represent only a small fraction of the habitat available along the more than 3 linear miles between the Taggart area and Moose. As a result, construction would result in short-term, adverse, minor habitat effects for general wildlife.

Actions to restore habitat outside the footprint of permanent, aboveground facilities would begin promptly after construction was completed. As demonstrated by the success at other disturbed sites in the project area, the implementation of an NPS-approved restoration plan that included revegetation with native species and control of exotic invasive plant species would result in the return of wildlife habitat that was approaching maturity in about 5 to 10 years for willow-alder areas, 15 years for sagebrush areas, and 30 years for forests. During this restoration period, the long-term, negligible to minor impacts could be adverse or beneficial, depending on whether each species had preferences for features such as edge effect or immature versus mature vegetation. The long-term impacts would end when mature habitat returned.

Habitat Effects on Species of Special Concern. Consistent with the requirements in the superintendent's compendium (NPS 2011b), project activities would not be allowed within a half-mile radius around each active bald eagle nest from February 15 to August 15. Because this closure would protect eagle nests from disturbance, effects on this species of concern would be negligible. Similar closures of 100-yard radius around trumpeter swan nests would protect nests of this species if any were discovered near or in the project area.

Sagebrush-obligate species, including the Brewer's sparrow and sage thrasher, would experience a decline in habitat availability and quality on up to about 20 acres. As a result, the project would have an adverse, moderate effect on these species until the restored sagebrush habitat approached maturity. Similar habitat reductions for the sagebrush-associated species (for example, the short-eared owl and bobolink) would have minor, adverse effects. Habitat changes would not be large enough to cause measurable population changes in any of these species.

Adverse effects on special concern species in forest habitat would be negligible or minor because project disturbances would occur only in small amounts of this habitat type in edge areas. Impacts would gradually decline as restored forest areas approached maturity.

Adverse impacts on the special concern species that depend on or use wetland areas and deciduous riparian stands would be minor because of the small size of the affected habitat (0.5 acre) and the presence of human activity in most of the affected habitat. This loss would be reduced by minor, beneficial effects from demolishing the former treatment plant and restoring its site with native species. Impacts would gradually decline as restored areas of wetland and riparian vegetation approached maturity.

Canada Lynx. Effects on Canada lynx would involve temporary interactions of individual animals that encountered pipeline or water storage tank construction in late summer or fall during their movements. Such encounters, which would be uncommon, would be most likely at the Taggart storage tank site. Based on the lynx's large home range and limited use of sagebrush habitat, the adverse effects would be negligible. After construction was completed, impacts on this threatened species would be negligible. Although project construction would affect a small portion of habitat within a lynx analysis unit between Taggart and Moose, the impacts would be negligible and short term.

The negligible, adverse effects on the lynx from about 3 acres of lodgepole pine and 20 acres of sagebrush alterations and human presence during the late summer and fall construction period would be long-term until restoration was completed in lodgepole habitats impacted from this project. A permanent habitat loss of 0.13 acres, mostly in Moose, would not affect the species. The determination of effect from the proposed action would be "*may affect, but is not likely to adversely affect*."

Grizzly Bear. Effects on the grizzly bear would involve temporary interactions of individual animals with pipeline or water storage tank construction during late summer or fall. The likelihood of such encounters would be limited by the mitigation measures to reduce interactions that were identified in chapter 2 and by this species' tendency to avoid humans. Based on the large home range and mobility of the grizzly bear, the adverse effects on this species from the disturbance of about 24 acres of habitat would be negligible. After vegetation was restored, effects would be negligible.

The negligible, adverse, short-term effects on grizzly bears would result from about 24 acres of vegetation alterations in the late summer and fall construction period. Restoration of this habitat would eventually result in a long-term, negligible effect on grizzly bears. A permanent habitat loss of 0.13 acre, mostly in Moose, would not affect the species. The determination of effect from the proposed action would be "*may affect, but is not likely to adversely affect*."

Gray Wolf. Effects on the gray wolf would result from temporary interactions when wolves encountered pipeline or water storage tank construction in late summer or fall. Such encounters would be uncommon because of the tendency of these animals to avoid areas of human activity. The adverse effects from such encounters would be negligible. Based on the large home range and mobility of the gray wolf, the adverse effects on this species from the disturbance of about 24 acres of habitat would be negligible. After vegetation was restored, effects would be negligible.

Negligible, adverse, short-term effects on the gray wolf would result from about 24 acres of vegetation disturbance during late summer and fall. Restoration of this habitat would - result in a long-term, negligible effect on gray wolves. A permanent habitat loss of 0.13 acre, mostly in Moose, would not affect the species. The determination of effect on the gray wolf would be "*may affect, but is not likely to adversely affect.*"

Wolverine (Candidate Species). Transient individual wolverines may move through the project area, although this would be uncommon. The behavior of a few individual animals could be altered because of the presence of people and construction activities, which could result in the animals' short-term displacement. Effects on the wolverine would involve temporary interactions of individual animals with pipeline or water storage tank construction during late summer or fall. The likelihood of such encounters would be limited by the mitigation measures to reduce interactions that were identified in chapter 2 and by this species' habitat preferences. Based on the large home range and mobility of the wolverine, short-term, negligible, adverse effects on this species would result from the disturbance of about 24 acres of habitat. After vegetation was restored, long-term effects would be negligible.

Negligible, adverse, short-term effects on wolverines would result from construction activities and about 24 acres of vegetation alterations in the late summer and fall construction period. Restoration of this habitat would result in a long-term, negligible effect on wolverines. A permanent habitat loss of 0.13 acre, mostly in Moose, would not affect the species.

Greater Sage-Grouse (Candidate Species). Alternative 2 would have short-term, moderate impacts on the greater sage-grouse and its habitat. A total of about 20 acres of disturbance would occur in sagebrush habitat, all of which would occur in core-area sagebrush habitat. There would be no permanent loss of sagebrush habitat, as vegetation eventually would be restored.

Project activities would not directly or indirectly affect any known greater sage-grouse leks but they would be in wintering, nesting, and brood-rearing habitat. Pipeline construction would be conducted in late summer and fall to reduce conflicts with sage-grouse nesting and

brood-rearing. To minimize new disturbance, the narrow (up to 40 feet wide), linear pipeline corridor would follow the existing pipeline alignment. Application of the mitigation measures for sage-grouse and other sage-dependent species in chapter 2 would help minimize adverse effects.

Revegetation of disturbed areas in accordance with an NPS-approved plan would begin promptly after site-disturbing activities ended. All disturbed sagebrush areas would be revegetated with native seed mixtures and eventually would be restored.

During the restoration period, some sage-grouse use of the revegetated area would be expected because of the availability of forbs and grasses. As the corridor progressed through successional stages, different types of sage-grouse use would occur. The small width of the corridor would allow sage-grouse foraging, with escape and hiding cover available nearby.

Confidence in restoring disturbed areas to sagebrush is high, based on the recovery of the area to sagebrush after the original pipeline was installed. Because there would be no permanent loss of sagebrush habitat, impacts of the project would be negligible after sagebrush habitats were restored.

Yellow-billed Cuckoo (Candidate Species). The mature cottonwood-balsam poplar stands around Moose and the 4 Lazy F Ranch are the only habitat that would be disturbed by the project that potentially is suitable for the yellow-billed cuckoo. However, no cuckoos have been documented in this area.

Project construction would remove up to 0.5 acre of mature cottonwood-balsam poplar habitat in Moose. Tree removal in the ranch area would be avoided by installing the water supply pipeline in or along the existing roadbed. These construction-related adverse impacts on the cuckoo would be negligible because the bird probably does not occur in the area and, if it does, more attractive habitat is abundant along the Snake River corridor. Because of site restoration in most of the construction zone and at the site of the old treatment plant, negligible adverse impacts would decline with the growth of restored trees and shrubs.

Cumulative Impacts

Alternative 2 would result in negligible to moderate, mostly adverse impacts on wildlife habitat that, depending on habitat type, would decline to negligible in 30 years or less.

Impacts on wildlife from the actions in the cumulative impact scenario would be the same as those described for alternative 1. These would include negligible to moderate, adverse and beneficial impacts. The long-term, negligible to moderate, mostly adverse impacts on wildlife from alternative 2, combined with the impacts from other actions, would result in a cumulative, minor, adverse impact. Alternative 2 would contribute minimally to the cumulative impact on wildlife.

Alternative 2 would result in long-term, negligible impacts on most listed or candidate endangered or threatened species. The moderate, adverse impacts on sage-dependent species would decline to negligible as sagebrush habitat likely approached maturity after approximately 15 years.

Impacts on listed or candidate endangered or threatened species from the actions in the cumulative impact scenario would be the same as those described for alternative 1. These would include negligible to moderate, adverse impacts. The long-term, negligible to moderate, adverse impacts on endangered or threatened species from alternative 2, combined with the impacts from other actions, would result in a cumulative, minor, adverse impact.

Alternative 2 would contribute minimally to the cumulative impact on endangered or threatened species.

Conclusions

Impacts on the direct mortality of wildlife would be negligible. Negligible or minor, adverse, long-term impacts would result from project construction and the early stages of restoration for wildlife in general; special-concern species; and the Canada lynx, grizzly bear, gray wolf, wolverine, and western yellow-billed cuckoo. The intensity of the short- and long-term adverse impacts on the greater sage-grouse, other sagebrush obligates, and their habitats would be moderate. All long-term adverse impacts would decrease to negligible as replacement habitats approached maturity after project restoration. There would be a cumulative, minor, adverse impact on wildlife, but alternative 2 would contribute minimally to this cumulative impact.

For the Canada lynx, grizzly bear, and gray wolf, the Endangered Species Act determination of effect would be "*may affect, but is not likely to adversely affect.*" There would be a cumulative, minor, adverse impact on listed and candidate endangered or threatened species, but alternative 2 would contribute minimally to this cumulative impact.

ALTERNATIVE 3: TWO WATER STORAGE TANKS AND SEWER LINE SYSTEM

Impact Analysis

Direct Mortality. Little or no direct mortality of wildlife would result from alternative 3 for the reasons that were described for alternative 2. Impacts from direct mortality would be negligible for the construction and operation phases of water and wastewater improvements.

Habitat Effects on General Wildlife. Alternative 3 would result in construction disturbances of about 35 acres, with about 31 acres occurring in sagebrush habitat. Of this, about 21 acres would occur in designated sage-grouse core habitat areas (Wyoming Game and Fish Department 2011b). A net permanent loss of 0.23 acre of wildlife habitat would result from alternative 3 (see table 6).

About 15 acres of the disturbance would result from installing the new water pipeline from the Taggart tank to the Windy Point tank and then to Moose. Most of this disturbance would occur in sagebrush habitat in existing pipeline corridors and road rights-of-way. All of the habitat along the pipeline route would be restored after construction ended.

Water tank construction and demolition activities would cause about 6 acres of the habitat disturbance. Half of this would be in forest habitat at the Taggart site and half would be in sagebrush habitat at the Windy Point site. The permanent footprints of the tanks together would result in a 0.16-acre, long-term habitat loss in forest and sagebrush.

The area of the Windy Point storage tank is used by elk to move between Murie Ridge and the Cottonwood Creek drainage. Other species, including mule deer and sage-grouse, also use this area. This area also receives heavy human use from travel along Teton Park Road, recreation at and near the Windy Point turnout, and use of the multi-use pathway. Prohibitions on construction during hours of highest wildlife activity (before 8 a.m. and after 6 p.m.) would result in adverse construction-related effects that would be short-term and minor.

Pipeline installation and horizontal directional drilling staging areas for the sewer force main from Moose to Jackson would result in about 13 acres of the habitat disturbance. About

three-quarters of this area would be in sagebrush habitat in the park and the rest would be in non-native grass and scattered sagebrush habitat along the west highway shoulder outside the park. Construction from pipeline installation in this area would be short-term (at a rate of a mile or more per day) and result in a narrow, 8-foot-wide area of habitat disturbance. Except for 0.1 acre for a pump station north of Jackson, all of the habitat along the pipeline route would be restored after construction ended.

In Moose, less than an acre of woodland habitat would be removed during construction. Restoring most of the construction area and removing the existing treatment plant and restoring its site to native vegetation would result in a net, long-term loss of woodland habitat in Moose of about 0.1 acre.

This alternative would disturb the same 0.04 acre of willow-alder wetland habitat at the water pipeline crossing of Beaver Creek that were described for alternative 2.

Construction would result in short-term, adverse, minor habitat effects for general wildlife. During the restoration period, the long-term, negligible to minor impacts could be adverse or beneficial. Reasons for these findings would be the same as those described for alternative 2. The long-term impacts would decline as mature habitat developed.

Habitat Effects on Species of Special Concern. As described for alternative 2, impacts on bald eagles and trumpeter swans would be negligible because of activity restrictions around their nests. Sagebrush obligates, including the Brewer's sparrow and sage thrasher, would experience a decline in habitat availability and quality on 31 acres. As a result, the project would have moderate, adverse effects on these species until restored sagebrush habitat approached maturity. Similar habitat reductions for the sagebrush-associated species would have minor, adverse effects because these species are not as dependent on sagebrush. Habitat changes would not be large enough to cause measurable population changes in any of these species. Adverse effects on special concern species in forest and wetland habitats would be negligible or minor for the same reasons described for alternative 2.

Canada Lynx, Grizzly Bear, Gray Wolf, and Wolverine. As described for alternative 2, effects on all four federally listed or candidate species would be limited to temporary interactions of individual animals with late summer or fall construction activities. In the project area between the Taggart tank and Moose, these species could experience the same negligible, adverse effects that were described for alternative 2. Negligible, adverse impacts also would occur along the sewer force main route from Moose to Jackson because the rapid rate of pipeline installation that would result in a short-duration of human presence at any location and because this area receives little use by the Canada lynx, grizzly bear, gray wolf, or wolverine. For all three listed species, the determination of effect would be "*may affect, but is not likely to adversely affect*."

Greater Sage-Grouse (Candidate Species). Alternative 3 would cause moderate, adverse effects on greater sage-grouse habitat, including 21 acres of core-area sagebrush habitat, until habitat was restored. In the project area between the Taggart tank and Moose, reasons for this finding would be the same as for alternative 2.

Between Moose and Jackson, about 13 acres of core-area sagebrush habitat would be disturbed during installation of the sewer force main along existing roads. The pipeline route would pass within about 0.5 mile of the airport lek and 0.2 miles of its satellite lek. There would be a permanent loss of about 0.1 acre of sagebrush habitat at the site of the new pump station north of Jackson. The mitigation measures in chapter 2 that include construction outside the breeding and nesting season, followed by restoration of all areas except the pump

station footprint, would help minimize adverse effects. As described for alternative 2, the adverse impacts outside the building footprint would end when the restored sagebrush areas approached maturity.

Yellow-billed Cuckoo (Candidate Species). Impacts on this species would be similar to those described for alternative 2; although slightly more cottonwood habitat would be affected near the Gros Ventre River, no habitat loss is expected. Construction-related adverse impacts would be minor or less, and the negligible, long-term impacts would decline as the restored riparian-area trees and understory matured.

Cumulative Impacts

Alternative 3 would result in negligible to moderate, mostly adverse impacts on wildlife habitat that, depending on habitat type, would decline to negligible in 30 years or less.

Impacts on wildlife from the actions in the cumulative impact scenario would be the same as those described for alternative 1. These would include negligible to moderate, adverse and beneficial impacts. The long-term, negligible to moderate, mostly adverse impacts on wildlife from alternative 3, combined with the impacts from other actions, would result in a cumulative, minor, adverse impact. Alternative 3 would contribute minimally to the cumulative impact on wildlife.

Alternative 3 would result in long-term, negligible impacts on most listed or candidate endangered or threatened species. The moderate, adverse impacts on sage-dependent species would decline to negligible as sagebrush habitat likely approached maturity after approximately 15 years.

Impacts on listed or candidate endangered or threatened species from the actions in the cumulative impact scenario would be the same as those described for alternative 1. These would include negligible to moderate, adverse impacts. The long-term, negligible to moderate, adverse impacts on endangered or threatened species from alternative 3, combined with the impacts from other actions, would result in a cumulative, minor, adverse impact. Alternative 3 would contribute minimally to the cumulative impact on endangered or threatened species.

Conclusions

Impacts on the direct mortality of wildlife would be negligible. Negligible or minor, adverse, long-term impacts would result from project construction and the early stages of restoration for wildlife in general; all special concern species except sagebrush obligates; and the Canada lynx, grizzly bear, gray wolf, wolverine, and western yellow-billed cuckoo. The intensity of the short- and long-term adverse impacts on the greater sage-grouse, other sagebrush obligates, and their habitats would be moderate. All adverse impacts would decrease to negligible as replacement habitats approached maturity after project restoration, depending on vegetation type. There would be a cumulative, minor, adverse impact on wildlife, but alternative 3 would contribute minimally to this cumulative impact.

For the Canada lynx, grizzly bear, and gray wolf, the Endangered Species Act determination of effect would be "*may affect, but is not likely to adversely affect.*" There would be a cumulative, minor, adverse impact on listed and candidate endangered or threatened species, but alternative 3 would contribute minimally to this cumulative impact.

HEALTH AND SAFETY

AFFECTED ENVIRONMENT

The information that supports the analysis of impacts on health and safety was included in the description of the need for the project in chapter 1. Consistent with instructions from the Council on Environmental Quality (1978) to avoid duplication, this section summarizes relevant information that previously was presented.

The water supply system consistently provides potable water that meets state and federal drinking water standards. However, concerns about health and safety relating to water storage and delivery are as follows:

- The storage tanks lack required or recommended safety and security devices.
- An inadequate volume of water is stored for firefighting at Moose and the Beaver Creek administrative area, as defined by rate and duration of delivery. In addition, pipeline hydraulics cannot provide required pressures for firefighting.
- Leaks in the system pose an opportunity to introduce pathogens into the water supply.

For the wastewater management system:

- Flows are nearing the physical capacity of the wastewater treatment plant. Hydraulically, the plant would be unable to handle the inflows that are predicted for the year 2040.
- Inadequate treatment already is occurring so that nitrates and ammonia sometimes exceed the levels stipulated in the ground water discharge permit from the state.
- Failure emergencies occur at the plant each year and the Public Health Service has expressed concern about the potential for an extended service outage.
- The plant cannot store much influent during a wastewater treatment plant failure. Releases would cause violations of state Class 1 water quality requirements.
- Sewage spills could expose NPS employees involved in the cleanup and river recreational users to water-borne pathogens.

IMPACT ANALYSIS METHODS

Impacts on health and safety were evaluated using the process described in the "Methods for Analyzing Impacts" section. Impact threshold definitions for health and safety are as follows.

Threshold	Definition
Negligible	Health and safety would not be affected, or the effects on health or safety would not be measurable. There would be no changes in factors such as water or wastewater system reliability or the ability to meet standards for potable water quality and volume; flows, durations, and pressures of firefighting water; and pollutants concentrations in treated effluent or sewage spills.
Minor	Effects would be detectable compared to recent conditions for factors such as water or wastewater system reliability; flows, durations, and pressures of firefighting water; and pollutants concentrations in treated effluent or sewage spills. However, measurable changes would not occur in the health and safety of park staff or visitors.
Moderate	Effects would include changes that were sufficiently large to be reflected as measurable changes in the health and safety of park staff or visitors, or in the ability to meet standards.
Major	Changes would be sufficiently large to be readily apparent in the health and safety of park staff or visitors. Changes in conditions such as loss of structures in fires or outbreaks of water-borne illness could be directly attributed to the alternative.
Short-term	Effects would occur only during and shortly after a specified action or treatment.

Long-term	Effects would persist well beyond the duration of a specified action or treatment, or would not be associated with a particular action such as construction or a defined sewage spill.

Impacts on health and safety were considered for all parts of the project area that could potentially be affected by accidental sewage spills.

Construction health and safety was not among the issues identified during scoping. Contractors would be required to prepare and implement an NPS-approved health and safety plan that would include standard best practices of the industry to protect workers and the public. Completion of all alternatives would be expected with zero reportable injuries.

ALTERNATIVE 1: NO ACTION / CONTINUE CURRENT MANAGEMENT

Impact Analysis

Adequacy. Water storage volumes and pipeline capacities would continue to be too small to deliver firefighting water at prescribed rates, durations, and pressures. In addition, current, ineffective removal of solids, nitrates, and ammonia in the wastewater treatment plant, which results in the inability to consistently meet permit standards from the state, would continue. Each of these represents a moderate, long-term, adverse effect on health and safety.

Reliability. Alternative 1 would continue to use the existing systems. As wear continued on already-stressed parts, potential system failures would continue at, or increase from, the current rate of two or three each year. In the water system, additional wear and corrosion would maintain or exacerbate a condition of "chronic system failures" (NPS 2009b). Both systems would continue to be kept online, at least most of the time, by NPS actions that involve "constant monitoring and innovative repairs" (NPS 2009b) and would result in long-term, adverse effects of moderate intensity on reliability.

Under firefighting pressures, a corroded valve or pipe segment along the 3-mile-long water main from the Taggart tank to Moose could fail, causing a loss of water at the fire site. This would be a long-term, adverse risk to people in the fire area, including firefighters. However, because weak spots are being found and fixed by the current leak detection program, the probability of this occurring is relatively low and the impact intensity is minor.

Safety Following a Sewage Release. If a sewage release occurred, the NPS employees who provided wastewater cleanup would be put at higher risk of exposure to contagious diseases (NPS 2009b). The NPS would only assign personnel to this task who were adequately trained, and they would use appropriate personal protective equipment. Therefore, cleanup would represent a minor, adverse risk to the health and safety of park staff.

As discussed previously under "Water Resources," sewage spills might not reach the Snake River. If they did, the NPS would promptly close the downstream segment to recreational uses such as float trips, fishing, and wading. Therefore, exposure for most visitors would be minimal. However, a few visitors might not receive the warning. The risk for these people would be attenuated by sewage dilution in the water volume of the Snake River, resulting in a negligible to minor, short-term, adverse impact on visitors health and safety.

The downstream communities of Teton Village, Wilson, and Jackson obtain potable water from ground water sources. Therefore, a release of sewage in the surface water would have a negligible impact on their health and safety.

Cumulative Impacts

Alternative 1 would have adverse impacts on health and safety with intensities that would range up to moderate. None of the actions in the cumulative impact scenario are affecting health and safety aspects that would be affected by continuing to operate the existing water and wastewater systems. As a result, there would be no cumulative effect from this alternative.

Conclusions

Alternative 1 would have moderate, long-term, adverse effects on the adequacy of wastewater treatment, adequacy of firefighting flows, and reliability of providing potable water and wastewater management. Impacts regarding reliability of delivering water for firefighting and the safety of park employees assigned to cleanup after a sewage release would be minor, long-term, and adverse. Downstream effects of a sewage spill would be negligible or minor. There would be no cumulative effect from this alternative.

ALTERNATIVE 2: NPS PREFERRED, ONE WATER STORAGE TANK AND ONSITE WASTEWATER SYSTEM

Impact Analysis

Adequacy. Alternative 2 was designed to address current system failings with regard to ensuring adequate present and future capacities for potable water and wastewater management. Facilities would be sized to meet demand in the year 2040 in conformance with all current standards plus any regulations that can foreseeably be promulgated, such as more stringent wastewater treatment. The siting and configuration of facilities would accommodate later expansion as it was justified by increasing demand beyond 2040. Compared to alternative 1, the result would be a long-term, moderate, beneficial impact on health and safety. The design of the new water system included modeling to ensure that water supplies could be delivered at the flow rates, durations, and pressures that would meet all regulatory requirements. This would produce a moderate, long-term, beneficial effect on safety.

Reliability. Alternative 2 would replace most existing system components with new, modern equipment that would greatly increase system reliability. Reliability would be maintained or improved not just by the newness, but also by the continued use of gravity to deliver firefighting flows; improved materials and design engineering over the past 50 years, including better ability to withstand seismic activity; use of a modern, computerized system that would provide real-time control of all components, save energy, and reduce equipment wear; and an equalization basin to stabilize flow rates and, with the larger storage capacity in the treatment train, facilitate shut-down for maintenance and emergency repairs. With regular maintenance, the new systems would reliably provide firefighting water, potable water, and wastewater management for at least the next 50 years. Compared to alternative 1, this would result in a moderate, beneficial, long-term impact. The newness and better materials of the components also would help ensure the ability of the water system to deliver water under firefighting pressures, which would have a minor, moderate, beneficial, long-term impact on the safety of firefighters and other Moose occupants.

Safety Following a Sewage Release. The potential for a sewage release would nearly be eliminated by features of this alternative that include new, modern equipment and greater storage of influent if the plant went out of service. The effect on the safety of park staff would

be minor, long-term, and beneficial. Spills would be less likely to enter the Snake River because they would be less probable and because of the increased distance to the river, resulting in a negligible to minor, beneficial impact on visitors health and safety. Impacts on the water supplies of downstream communities would be negligible.

Cumulative Impacts

Alternative 2 would have negligible, minor beneficial, and moderate beneficial impacts on health and safety. None of the actions in the cumulative impact scenario are affecting health and safety aspects that would be affected by alternative 2. As a result, there would be no cumulative effect from this alternative.

Conclusions

Alternative 2 would have moderate, long-term, beneficial effects on the adequacy of potable water supplies and wastewater treatment, adequacy of firefighting flow rates and, and reliability of providing potable water and wastewater management. Long-term, beneficial effects would be minor regarding the reliability of delivering firefighting water and the safety of park employees assigned to cleanup after a sewage release. Downstream effects of a sewage spill would be negligible or minor. There would be no cumulative effect from this alternative.

ALTERNATIVE 3: TWO WATER STORAGE TANKS AND SEWER LINE SYSTEM

Impact Analysis

Adequacy. Alternative 3 would have same benefits with regard to providing adequate potable water supplies and wastewater management that were described for alternative 2. It also would meet firefighting flow rate and pressure requirements. These would result in moderate, long-term, beneficial effect on safety.

Reliability. Alternative 3 would include most of the enhanced reliability features that were described for alternative 2, including new equipment, gravity delivery of water, better materials, and computer-controlled monitoring and operations optimization. Its lack of storage for raw or partly treated sewage makes it less advantageous than alternative 2. Still, with regular maintenance, alternative 3 would reliably provide firefighting water, potable water, and wastewater management for at least the next 50 years. Compared to alternative 1, this would result in a moderate, beneficial, long-term impact. Reliability for firefighting would increase as described for alternative 2, producing minor, beneficial, long-term impacts on safety.

Safety Following a Sewage Release. Alternative 3 would not change the potential for sewage spills compared to alternative 1. Therefore, it would have negligible impacts on the health of park staff involved in cleanup and recreational users in the Snake River.

Cumulative Impacts

Cumulative effects would be the same as those described for alternative 2.

Conclusions

Alternative 3 would have moderate, long-term, beneficial effects on the adequacy of potable water supplies and wastewater treatment, adequacy of firefighting flow rates and, and reliability of providing potable water and wastewater management. Long-term, beneficial effects would be minor regarding the reliability of delivering firefighting water. Effects on the safety of park employees assigned to cleanup after a sewage release and on downstream water users would be negligible. There would be no cumulative effect from this alternative.

NATIONAL PARK SERVICE AND PARTNER OPERATIONS

AFFECTED ENVIRONMENT

Park operations refer to the adequacy of staffing levels and the quality and effectiveness of the park infrastructure in protecting and preserving vital resources and providing for an enjoyable visitor experience. Infrastructure facilities include the roads that are used to provide access to and within the park (both administrative and visitor use), housing for staff required to work and live in the park, visitor orientation facilities (including visitor centers, developed and interpreted sites, visitor center bookstores, and other interpretative features), administrative buildings (office and workspace for park staff), management support facilities (garages, shops, storage buildings, and yards used to house and store maintenance equipment, tools, and materials), and utilities such as phones, sewer, water, and electricity.

Information on the adequacy and reliability of the systems providing potable water, firefighting water, and wastewater management was presented in the earlier section on health and safety and chapter 1. With regard to the NPS' planning and scheduling of resources, routine operation and maintenance activities for the water and wastewater facilities are performed in accordance with established schedules. Larger tasks such as equipment overhauls are scheduled at the intervals recommended by the manufacturer. Labor resources in the park are assigned to ensure that personnel with the proper experience, training, and certifications perform each task. Operations at the Moose facilities are integrated with operations at other sites throughout the park. While staffing levels are adequate to maintain operations, there is little or no surplus to meet needs beyond the normally planned and scheduled activities.

Partners in wastewater management could include the Jackson Hole Airport and Town of Jackson Public Works Department, Water and Sewer Division. At the airport where wastewater is managed in septic tank and leach field systems, operational requirements primarily consist of the pump-out of the septic tanks on a routine basis (NPS 2010a).

The Jackson treatment plant is in the south part of town on South Ricks Road near the Snake River. Raw sewage receives treatment to an advanced secondary level and is released to the Snake River in accordance with the conditions of the National Pollutant Discharge Elimination System permit issued for the plant. The capacity of the Jackson treatment plant is 5 million gallons per day. Currently, the annual average flow at the plant is about 1.7 million gallons per day, with a maximum-day flow of 3.4 million gallons. Sewage from other sources is not expected to increase substantially because of growth constraints in the service area.

IMPACT ANALYSIS METHODS

Impacts on the operations of the NPS and its partners were evaluated using the process described in the "Methods for Analyzing Impacts" section. Impact threshold definitions for park and partner operations are as follows.

Threshold	Definition
Negligible	Park and partner operations would not be affected, or effects would not be perceptible or measurable outside normal variability.
Minor	Effects would be measurable but would not appreciably change park or partner operations. They may be perceived by park staff and/or partner staff, but probably not by visitors.
Moderate	Effects would be readily apparent and would result in a substantial change in park or partner operations, or would result in a situation that would be noticed by many park visitors.
Major	Effects would be readily apparent, with a substantial change in park or partner operations in a manner that would be noticed by park visitors as markedly different from existing operations.
Short-term	Effects would occur only during and shortly after a specified action or treatment.
Long-term	Effects would persist well beyond the duration of a specified action or treatment, or would not be associated with a particular activity such as construction.

Impacts were considered for all parts of the project area, the Jackson Hole Airport, and the Jackson publicly owned treatment works on South Ricks Road.

ALTERNATIVE 1: NO ACTION / CONTINUE CURRENT MANAGEMENT

Impact Analysis

All of the existing operational problems with regard to the adequacy and reliability of the current water and wastewater systems would continue or get worse. Operation and maintenance activities for existing facilities would continue unchanged, except for those actions described earlier under "Elements Common to All Alternatives." Impacts would include a continuously increasing maintenance workload because of a lack of replacement of or substantial improvements to the aging existing infrastructure.

Maintenance staff would experience an increasing need to respond to emergency actions resulting from aging and deteriorating infrastructure. Failure of infrastructure systems, including sewer mains, water mains, water storage and wells, and the wastewater treatment plant, would increase the possibility of public exposure to unsanitary conditions and possible temporary or even long term closure of facilities.

Emergency responses to system failures would continue to disrupt the scheduling of park labor sources as response personnel were drawn from their planned activities. The response staff may work long hours or weekends, other staff may be pulled from their assignments to cover the normal duties of the response team, and less-critical jobs may not be done. In addition, the loss of either system for more than a few hours would require alternative strategies for managing human waste, such as closing restrooms to visitors and installing portable toilets for park staff. The long-term, adverse impacts on park operations would be moderate, particularly as the systems continued to deteriorate and the frequency and intensity of failures increased.

Alternative 1 would not change wastewater management by the airport and town of Jackson. It would have a negligible impact on the operations of these partners.

Cumulative Impacts

Alternative 1 would have moderate, adverse impacts on NPS operations and negligible impacts on partner operations. The actions in the cumulative impact scenario already were considered because they contribute to the park operations baseline that would be affected as described in the impact analysis, and they would not contribute further to a cumulative impact. As a result, there would be no cumulative effects from this alternative.

Conclusions

Alternative 1 would have moderate, long-term, adverse effects on NPS operations because of workload disruptions and the need to implement alternative human waste management methods when extended water or wastewater outages occurred. Impacts on the operations of partners would be negligible. There would be no cumulative effect from this alternative.

ALTERNATIVE 2: NPS PREFERRED, ONE WATER STORAGE TANK AND ONSITE WASTEWATER SYSTEM

Impact Analysis

This alternative was designed to address the failings of the current systems that are adversely affecting NPS operations. It would provide enhanced reliability as described in the health and safety analysis because of new equipment, better materials, computer controls, and storage capacity for raw or partly treated sewage. With regular maintenance, failures would be virtually eliminated along with secondary impacts such as the need to close restrooms to visitors and install portable toilets for staff use. Managers could schedule staff resources with confidence that personnel would not be pulled away to address water or wastewater emergencies. This would result in moderate, long-term, beneficial impacts on NPS operations.

Alternative 2 would not change wastewater management by the airport and town of Jackson. It would have a negligible impact on the operations of these partners.

Cumulative Impacts

Alternative 2 would have moderate, beneficial impacts on NPS operations and negligible impacts on partners. Other actions would not contribute to cumulative impact for the reasons described for alternative 1. There would be no cumulative effects from alternative 2.

Conclusions

Alternative 2 would have moderate, long-term, beneficial effects on NPS operations and negligible impacts on partner operations. There would be no cumulative effects.

ALTERNATIVE 3: TWO WATER STORAGE TANKS AND SEWER LINE SYSTEM

Impact Analysis

Alternative 3 would have the same moderate, long-term, beneficial impacts on NPS operations that were described for alternative 2.

At the Jackson Hole Airport, the need to maintain the septic tanks by contracting for pump-out services would be eliminated. At the Jackson treatment plant, alternative 3 would increase average daily flows by about 2%, which would slightly increase the efficiency of the plant but would not change operational labor requirements. The intensity of these long-term benefits on partner operations would be negligible or minor.

Cumulative Impacts

Alternative 3 would have moderate, beneficial impacts on NPS operations and negligible or minor benefits for partners. Other actions would not contribute to cumulative impact for the reasons described for alternative 1. There would be no cumulative effects from alternative 3.

Conclusions

Alternative 3 would have moderate, long-term, beneficial effects on NPS operations and negligible or impacts on partner operations. There would be no cumulative effects.

VISITOR USE AND EXPERIENCE

AFFECTED ENVIRONMENT

Providing for the safe enjoyment of national park resources is one of the foundations of the National Park Service Organic Act. The rehabilitation of the Moose area water and wastewater systems would address safety concerns imposed by failing infrastructure. Project construction may temporarily affect visitor use and experience because of construction equipment using parts of the Taggart Lake Trail system. Therefore, visitor use and experience was retained for analysis in this document.

Park management objectives focus on the protection of park resources while providing an enjoyable experience for all its visitors. Over the past decade, there have been 2.5 to 2.8 million recreational visits to Grand Teton National Park each year, with an additional 1.3 million nonrecreational visits annually. Approximately 80 percent of all visits to the park occur between June 1 and September 30, with July and August as the peak months for visitation. Visitation affected by this project would occur primarily from May through November, in the Moose and Taggart Lake areas of the park. During this time period, the Moose Entrance Station recorded close to 300,000 visitors in 2010 and 2011.

Moose

The Craig Thomas Discovery and Visitor Center in Moose had over 270,000 visitors from May through November of 2011. While in the area, they often visit Menor's Ferry Historic District, the Chapel of Transfiguration, and the Murie Ranch Historic District. In addition, approximately 85,000 park visitors are on the Snake River floating and fishing annually, with a large percentage of these users disembarking at the Moose landing. The Moose post office is adjacent to the administration building and shares the parking lot used by park personnel and visitors, including river and pathway users. The 4 Lazy F Ranch currently has little visitation, as the facilities are closed to the public. The area is primarily used to access fishing on the Snake River.

Taggart Lake Trail and Trailhead Parking Lot

Taggart Lake parking lot is open year-round, with extremely heavy use during the May through November anticipated construction season. Each spring before Teton Park Road is opened to motor vehicles on May 1, the road is plowed and is available for non-motorized uses, such as bicycling, walking, and rollerblading. From this time, continuing throughout the summer, the Taggart Lake parking lot has at times filled beyond capacity, with overflow parking occurring on the road toward Beaver Creek.

The Taggart Lake Trail is one of the most popular day-use areas in the park. The Valley Trail from the south connects to the Taggart Lake and Bradley Lake Trails, creating a system that provides access to many features in the south part of the park, including Avalanche Canyon, Garnet Canyon, and Surprise and Amphitheater Lakes. From the Taggart Trailhead, visitors can access all the areas listed above or can hike the approximately 4-mile-long loop to Taggart Lake. A trail counter on the Taggart Lake loop annually counts more than 30,000 people. July and August are the peak of visitation, with between 7,000 and 9,000 people on the trail per month.

In May 2009, Grand Teton National Park opened a multi-use pathway from Dornans to South Jenny Lake. Taggart Lake Trailhead is one of the four main parking lots that serve as pathway parking nodes. A pedestrian counter just north of Taggart Lake Trailhead recorded more than 25,000 pathway recreationists in both 2010 and 2011. Assuming most riders are on out-and-back outings, this equates to more than 12,500 users each summer season.

Between May and November, Grand Teton National Park's trail crew operates animal packing operations out of the Taggart Corrals. The Taggart Corral area, with the backdrop of rustic buildings and the Teton Range, is the subject of many photographers when the horses and mules are in the corrals.

There is no public water supply at Taggart Lake Trailhead and the restroom is a pit toilet that is not connected to the wastewater system. Therefore, these systems are not discussed as a component of visitor use and experience.

U.S. Highway 26/89/191, Moose to Jackson

U.S. Highway 26/89/191 serve as a gateway to the park for visitors coming from the south and east. It also is a major route for intrastate and interstate commerce in northwest Wyoming. The part of the highway within the project area is from Moose to the town of Jackson. In 2011, a multiuse pathway was constructed on the east side of the road from Jackson to Moose Junction. The pathway will be available for visitor use starting in summer 2012.

No public water or wastewater facilities are offered on U.S. Highway 26/89/191. Therefore, these systems are not discussed as a component of visitor use and experience.

IMPACT ANALYSIS METHODS

NPS *Management Policies 2006* (NPS 2006a) states that enjoyment of park resources and values by the people of the United States is part of the fundamental purpose of all parks and that the National Park Service is committed to providing appropriate, high-quality opportunities for visitors to enjoy parks. Past interpretive and administrative planning documents provided background on changes to visitor use and experience over time. Anticipated impacts on visitor use and experience were analyzed using information from previous studies and included park staff knowledge of the resources and site; visitor surveys; review of existing literature and park studies; information provided by NPS professionals; and professional judgment. For this analysis, visitor use and experience includes visitor understanding and satisfaction, site access and circulation, recreation access, and visual quality. Based on these findings, the following impact intensity levels were developed:

Threshold	Definition
Negligible	Visitor use and experience would not be affected, or the effects on visitor use and experience and recreation would not affect more than a few visitors.
Minor	Effects on visitor use and experience and recreation would be detectable.
Moderate	Changes in visitor use and experience and recreation would be readily apparent and measurable, and would affect many visitors.
Major	Changes in visitor use and experience and recreation would be sufficiently large to be readily apparent and would affect most visitors.
Short-term	Effects would occur only during and shortly after construction or treatment measure.
Long-term	Effects would persist well beyond the duration of the construction or treatment measure, or would not be associated with a particular action such as construction or an accidental failure of water or sewer.

Impacts on visitor use and experience were considered for all areas within and around Moose, the Taggart Lake Trail system and Taggart Lake Trailhead, and along the U.S. Highway 26/89/191 road corridor from Moose to Jackson.

ALTERNATIVE 1: NO ACTION / CONTINUE CURRENT MANAGEMENT

Impact Analysis

Under alternative 1, existing facilities and policies would remain in place. Without any modification or upgrades to the aged water or wastewater systems, visitor use and experience would potentially be affected by unpredictable disruptions in service or periodic failures. System failures may require that certain areas be evacuated or temporarily closed during repair, inconveniencing the public. Failure of wastewater infrastructure could result in visitor exposure to raw sewage, disease transmission, and other health and sanitary concerns.

Keeping the wastewater treatment operations in the 500-year flood zone would continue the risk for flooding and contamination of the Snake River. Flooding could result in releases of fecal coliforms and pathogens, potentially causing a public health risk to recreational users of the Snake River.

Most repairs to water or sewer lines would be completed within a short time after the system failure was recognized, and typically no longer than 24 hours. Depending on the location of the repairs, services may still be available to visitors at other locations.

The Moose and Taggart Lake parking lots would accommodate administrative and visitor parking at their current levels. Visitor access to historic properties and recreation opportunities in the two use areas would not change.

Should water or sewer services fail in the vicinity of Moose and be unavailable during repair periods, visitor experience in the Moose area may be affected. Impacts would be short-term, site-specific, moderate, and adverse.

Cumulative Impacts

Past, present, and reasonably foreseeable future actions that may impact visitor use and experience and recreation include recent upgrades to road surfaces, parking lots, and visitor facilities; and future upgrades to parking and boat facilities taking place during the Moose headquarters rehabilitation project. Each of these actions represents beneficial impacts on visitor user and experience. The relative contribution of alternative 1 on visitor use and experience would be short-term, adverse, and moderate. However, cumulative impacts would be beneficial, moderate, and long-term. The contribution of this alternative to the cumulative impact would be small.

Conclusions

Alternative 1 would result in short-term, localized, moderate adverse impacts on visitor use and experience and recreation. This would be attributed to relatively brief but readily apparent failures of the water supply or wastewater treatment system. The cumulative impacts on visitor use and experience and recreation would be long-term, moderate, and beneficial.

ALTERNATIVE 2: NPS PREFERRED, ONE WATER STORAGE TANK AND ONSITE WASTEWATER SYSTEM

Impact Analysis

Moose. The rehabilitation or replacement of water and wastewater system components in Moose would provide more uninterrupted and safer visitor services throughout the Moose area. The project would enhance the NPS' ability to provide more efficient and reliable delivery of potable water and treatment of wastewater and would reduce the likelihood of accidental discharges of untreated sewage, which would improve protection of park visitors and resources.

Short-term impacts on visitor use and experience would occur during two construction seasons.

There would be short-term, negligible to minor impacts in the parking lot near the Moose post office, as the south side of this parking area may be used for construction staging materials and/or equipment. Additional parking would be constructed during the site work of the Moose headquarters rehabilitation project, which would add additional parking spaces. Construction impacts at the site of the new wastewater treatment plant would be negligible or minor because this area receives very little visitor use. Moose boat landing users may have short-term, minor, adverse impacts during removal of the existing Moose wastewater treatment plant, although this activity may take place during the shoulder seasons when fewer visitors are in the area.

This alternative would replace part of the sewer force main from the Craig Thomas Discovery Visitor Center. No changes would be needed near the visitor center south of Teton Park Road, but new force main would be installed from north of the road to the new treatment plant near the post office. The new force main probably would be placed north of the sidewalk and south of the administrative building (see figure 3). During the short duration of the installation, the north side of the parking lot could be cordoned off. Visitors who wanted to walk to the post office could do so by way of the multi-use pathway.

Construction of the force main from the new wastewater treatment plant to the disposal field area north of the Chapel of the Transfiguration Road would have a limited impact on the visitor use and experience, as the line would be bored under the roadway, leaving one lane open at all times. Therefore, traffic flow would not be affected. There would be short-term, minor, adverse impacts on the visitor experience from the visual and audible elements of the construction.

Taggart Lake Trail and Trailhead Parking Lot. Management actions would be used to minimize conflicts. Throughout the construction period, the Taggart Lake Trailhead would remain open for trail and pathway users. All construction vehicles would use the utility corridor connecting Beaver Creek to the Taggart Lake Trail. Because large construction vehicles would be required to demolish the old water tanks, excavate fill, and install the new water storage tank at Taggart, part of the Taggart Lake Trail may be closed or rerouted for visitor and employee safety. Construction-related impacts on visitor use and experience in this area would be short-term, localized, moderate, and adverse. Impacts from other construction activities would be minor.

Construction activities associated with the proposed project would temporarily introduce visual, audible, and atmospheric elements into cultural resource settings. Such intrusions would be short-term, lasting only as long as construction.

Minor, beneficial, long-term impacts would occur in the area of the Taggart water tank, where the existing, tall tank would be replaced by a partly or completely buried tank. No visual changes would occur at the site of the buried Windy Point tank.

Cumulative Impacts

Recent, ongoing, and reasonably foreseeable projects in the park are expected to have beneficial, long-term cumulative impacts on visitor use and experience. These actions include upgrades to parking lots, road surfaces, boating facilities, and the headquarters area that currently are underway under the Moose headquarters site rehabilitation project. The relative contribution of alternative 2 on visitor use and experience would be short-term, localized, moderate, adverse impacts during construction and long-term, beneficial, minor impacts from making the water and wastewater systems safer and more reliable. Cumulative impacts on visitor use and experience would remain beneficial and moderate. The contribution of this alternative to the cumulative impact would be small.

Conclusions

Alternative 2 would have short-term, localized, moderate, adverse impacts during the construction period. Once completed, the project would have beneficial, minor, long-term impacts that would positively contribute to cumulative beneficial, moderate impacts.

ALTERNATIVE 3: TWO WATER STORAGE TANKS AND SEWER LINE SYSTEM

Impact Analysis

Moose. As in alternative 2, the likelihood of accidental discharges of untreated sewage would be reduced. The replacement of storage tanks and water lines would result in a more dependable supply of water and, thus, a lower threat of service disruption at visitor facilities and restrooms in Moose.

Effects from replacing part of the sewer force main from the Craig Thomas Discovery Visitor Center and from building a new wastewater pump station next to the existing pump station would be the same as the construction effects described for alternative 2. In addition, installing the sewer force main along the north side of Teton Park Road from the main pump station to Moose Junction would require short-term closures of construction zones to visitors. However, the rapidly moving plowed-in technology used for installing the pipeline and the use of horizontal directional drilling to cross the river and all roads would minimize impacts so that the short-term effects would be no greater than minor.

There would be long-term, minor, beneficial visual impacts to visitor use and experience with the removal of the existing wastewater treatment plant.

Taggart Lake Trail and Trailhead Parking Lot. Most impacts from alternative 3 would be the same as those described for alternative 2. The slightly smaller size of the Taggart water tank in alternative 3 would slightly reduce the number of construction vehicle trips to the project site throughout the construction period. As in alternative 2, for visitor and employee safety, trail segments would be closed and visitors rerouted.

Construction of the new Windy Point water tank would have short-term, minor, adverse visual impacts during construction and long-term, minor, adverse impacts on visual quality if

the installed tank was only partly buried. Visual impacts at the Taggart tank site would be the same as described for alternative 2.

Highway US 26/89/191, Moose to Jackson. The installation of the sewer force main to Jackson would have a short-term, minor, visual impact to visitor use and experience during construction. Long-term, minor, adverse impacts would occur at the pumping station sites.

Cumulative Impacts

Cumulative impacts on visitor use and experience for alternative 3 would be the same as those described for alternative 2 and would be moderate and beneficial. Combined with the effects from alternative 3, cumulative impacts would remain beneficial and moderate. The contribution of this alternative to the cumulative impact would be small.

Conclusions

Alternative 3 would have short-term, localized, moderate, adverse effects during the construction period. The completed project would have beneficial and adverse, negligible and minor, long-term impacts. The cumulative impacts on visitor use and experience and recreation would be long-term, moderate, and beneficial.

Chapter 4: Consultation and Coordination

SCOPING AND AGENCY CONSULTATION

Scoping is an early and open process to determine the breadth of environmental issues and alternatives to be addressed in an environmental assessment. Grand Teton National Park conducted both internal scoping with appropriate NPS staff and external scoping with the public and interested and affected groups and agencies.

INTERNAL SCOPING

A formal internal scoping meeting was held in Grand Teton National Park on April 21, 2011. Participants included the project interdisciplinary team and representatives from the NPS Denver Service Center and Parsons, the consultant preparing the environmental assessment. Products included the clarification of the project scope and features, definition of the action alternatives, determination of the relevant impact topics, and identification of issues for each.

During the preceding two days (April 19 and 20, 2011), project interdisciplinary team members participated in a Choosing by Advantages and value analysis workshop on this project. Other participants included park staff who would be involved in the planning, construction, or operation and maintenance of the water or wastewater system; representatives from the Town of Jackson Department of Public Works and Jackson Hole Airport; the facilitator consultant (Tetra Tech); the project engineering consultant (Nelson Engineering); and Parsons. Discussions in this workshop relating to project features, alternative approaches, advantages, and impacts directly supported the formal internal scoping meeting held the next day.

EXTERNAL SCOPING

The following actions were taken to inform the public about the intent to prepare a National Environmental Policy Act environmental assessment on this project. The scoping period was from May 1, 2011 through June 1, 2011.

- A press release was distributed to town of Jackson and Teton County media sources.
- Scoping letters or notices were sent to the approximately 500 people and organizations on the NPS' core mailing list. These included local, tribal, state, and federal agencies; organizations; and individuals.
- The scoping notice was made available electronically on the NPS Planning, Environment, and Public Comment website at <http://parkplanning.nps.gov/GRTE> and on the Grand Teton National Park official website.

Public scoping produced eight responses, as follows.

- One request for clarification was received from a representative in the state of Wyoming legislature. The park superintendent responded to the questions from the representative in a letter dated May 9, 2011 and there was no further communication.
- A letter from the deputy director of the Wyoming Game and Fish Department stated that the staff has no terrestrial wildlife or aquatic concerns pertaining to this project.
- Correspondence from the Wyoming Department of Transportation summarized permitting requirements for construction activities in the highway right-of-way.

- A memorandum from the U.S. Fish and Wildlife Service identified endangered, threatened, and candidate species that should be considered for impacts; summarized federal agency responsibilities relating to the conservation and management of fish and wildlife resources; recommended the contents of a biological assessment; described obligations for the protection of migratory birds; and outlined the information needed to assess project impacts on wetlands. The NPS will continue to work with the U.S. Fish and Wildlife Service to address any issues or concerns they identify after reviewing this environmental assessment.
- The forest supervisor of the Bridger-Teton National Forest wrote a letter in support of improved water quality protections for the Snake River Headwaters Wild and Scenic River.
- Three responses came from members of the public, including two individuals and one organization. They generally supported the project, but identified concerns regarding the optimal use of government resources, compatibility with NPS mandates and objectives, the potential for the sewer main to Jackson to encourage development along its length outside the park, loss of wildlife habitat, and scenic impacts caused by development at the Jackson Hole Airport.

The agency response letters are provided in appendix B. All of the concerns identified in public scoping were addressed in this environmental assessment.

AGENCY CONSULTATION

The agencies, organizations, and experts who were consulted in the process of preparing this environmental assessment are listed below. Where specific information from one of these people was cited, complete source information was provided in the "Bibliography" section.

- Ray Bishop, Jackson Hole Airport;
- Jacqueline Buchanan, Forest Supervisor, Bridger-Teton National Forest;
- John Emmerich, Deputy Director, Wyoming Game and Fish Department;
- Peter Hallsten, Wyoming Department of Transportation;
- Steve Kallin, National Elk Refuge Manager;
- Sean O'Malley, Town of Jackson Public Works Department, Water and Sewer Division;
- Mark Sattelberg, Field supervisor, U.S. Fish and Wildlife Service, Wyoming Field Office;
- Tory Thomas, Wyoming Department of Transportation; and
- Wyoming Department of Environmental Quality.

The undertakings described in this document are subject to section 106 of the National Historic Preservation Act. Consultations with the Wyoming state historic preservation office have been ongoing since inception of the project. This environmental assessment will be submitted to the Wyoming state historic preservation office for review and comment.

AMERICAN INDIAN CONSULTATION

A number of tribes traditionally, and currently, value Jackson Hole for hunting, gathering, ceremonial, and other practices. Traditionally associated tribes include the Apache, Northern Arapaho, Blackfoot, Northern Cheyenne, Coeur d'Alene, Comanche, Crow, Gros Ven-

tre, Kiowa, Nez Perce, Northern Paiute, Salish-Kootenai Group, Eastern Shoshone, Shoshone-Bannock, Assiniboine Sioux, Teton Sioux, Umatilla Group, and Yakama Group. In May 2011, the NPS sent copies of the scoping letter to the local tribes. One tribe provided a written response that there were no properties of religions and cultural significance to the tribe in the proposed construction area.

The environmental assessment will be sent to all of the associated tribes. Any issues or concerns that are identified by the tribes during their review will be addressed by the NPS.

LIST OF PREPARERS

The people identified in table 9 were primarily responsible for preparing this environmental assessment.

Table 9: Preparers

National Park Service, Grand Teton National Park	
Mary Gibson Scott	Superintendent
Jeff Allen	Civil engineer/project manager
Jason Brengle	Biologist/IPM coordinator
Carol Cunningham	Writer/editor
Chris Finlay	Chief of facility management
Patrick Larson	Utilities operator
Isabel Loe	Engineering technician
Mike Machupa	Chief of facility operations and maintenance
Kelly McCloskey	Ecologist
Gary Pollock	Management assistant
Robert Vogel	Former deputy superintendent
Margaret Wilson	Planner
Sue Wolff	Biological scientist
National Park Service, Denver Service Center	
Paula Aldrich	Project specialist
Connie Chitwood	Natural resource specialist
Greg Cody	Cultural resource technical specialist
Ron Shields	Project manager
Parsons	
Alexa Miles	Environmental scientist
Bruce Snyder	Environmental scientist and project manger
Janet Snyder	Environmental scientist

LIST OF RECIPIENTS

Elected Officials

U.S. Senator John Barrasso
U.S. Senator Mike Enzi
U.S. Representative Cynthia Lummis

Federal Agencies

Greater Yellowstone Ecosystem Interagency Visitor Center
U.S. Army Corps of Engineers
U.S. Department of Agriculture, Bridger-Teton National Forest and Grand Targhee National Forest
U.S. Department of the Interior, Bureau of Land Management, State Office
U.S. Department of the Interior, Fish and Wildlife Service, Cheyenne Office
U.S. Department of the Interior, National Park Service, Intermountain Region Office
U.S. Department of the Interior, National Park Service, Yellowstone National Park
U.S. Department of the Interior, Office of Environmental Policy and Compliance
U.S. Department of the Interior, U.S. Fish and Wildlife Service, National Elk Refuge
U.S. Department of Transportation, Federal Aviation Administration
U.S. Department of Transportation, Federal Highway Administration
U.S. Environmental Protection Agency, Region 8 Office
U.S. Postal Service, Moose Post Office

Traditionally Associated Indian Tribes

Apache
Northern Arapaho
Blackfoot
Northern Cheyenne
Coeur d'Alene
Comanche
Crow
Gros Ventre
Kiowa
Nez Perce
Northern Paiute
Salish-Kootenai Group
Eastern Shoshone
Shoshone-Bannock
Assiniboine Sioux
Teton Sioux
Umatilla Group
Yakama Group

State and Local Agencies

Jackson Hole Airport
Mayor Mark Barron, Town of Jackson
Teton County Board of Commissioners
Teton County Library
Teton County Planning Office
Town of Jackson Administrator
Wyoming Department of Environmental Quality
Wyoming Department of State Parks and Cultural Resources - State Historic Preservation Office
Wyoming Department of Transportation
Wyoming Game and Fish Department
Wyoming Office of Federal Land Policy

Other Agencies and Organizations

American Alpine Club/Climbers Ranch
Defenders of the Rockies
Dornans
Exum Mountain Guides
Grand Teton National Park Foundation
Grand Teton Association
Greater Yellowstone Coalition
Jackson Hole Conservation Alliance
Jackson Hole Historical Society
Jackson Hole Land Trust
Jackson Hole Mountain Guides
Jackson Hole Mountain Resort
Motels and other property owners on U.S. Highway 26/89/191 between Grand Teton National Park and Jackson
The Murie Ranch Center
National Parks Conservation Association
National Wildlife Foundation
Northern Rockies Conservation Cooperative
Permitted Boat launch Users – River Rafting Guides
St. John's Episcopal Church
Teton Group of the Sierra Club
Teton Science Schools
The Nature Conservancy
The Wilderness Society
Trout Unlimited
Wild Earth
Wildlife Conservation Society
Wyoming Wildlife Federation
Yellowstone Association

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Appendixes

Appendix A: Floodplain Statement of Findings

National Park Service
U.S. Department of the Interior
Grand Teton National Park, Wyoming

Statement of Findings for Floodplains

Replace Moose Wastewater System and Address Critical Water System Deficiencies

Recommended: Mary Gibson Scott		
	Superintendent	Date
Certification of Technical Adequacy: William Jackson		
	Chief, Water Resources Division	Date
Recommended: John Wessels		
	Regional Director, Intermountain Region	Date

Executive Order 11988, Floodplain Management, requires the National Park Service (NPS) to evaluate the likely impacts of actions in floodplains, avoid adverse impacts associated with the occupancy and modification of floodplains, and avoid support of floodplain development wherever there is a practicable alternative. *Director's Order 77-2: Floodplain Management* (NPS 2003) and its companion document, Procedural Manual 77-2 (NPS 2004), provide NPS policies and procedures for complying with Executive Order 11988. This statement of findings documents compliance with these NPS floodplain management procedures.

This floodplain statement of findings reviews the project to replace the Moose wastewater system and address critical water system deficiencies. It describes the flood hazard associated with selected alternative (without mitigation), analyzes risks at alternative sites, describes the effects on floodplain values, and describes and evaluates mitigation measures.

Brief Description of the Proposed Action

The NPS proposes to upgrade or replace the water and wastewater systems that serve the headquarters, housing, and largest visitor center area at Moose. Water supply to the Beaver Creek administrative area and 4 Lazy F Ranch complex also would be provided. The locations and relative spatial relationships of the systems and their components are shown in figures 2 and 3 of the environmental assessment.

About 16,600 linear feet of buried water line will connect the new Taggart storage tank to the Moose area. The pipeline will be buried in existing utility right-of-way next to the existing pipeline, which will be burst in place. About 6,400 linear feet of buried pipeline from Moose

will be laid along the existing road corridor and will provide water to the 4 Lazy F Ranch. About 24.1 acres will be temporarily disturbed by project installation. Floodplain avoidance was a key consideration of the NPS in selecting the action alternative for potable and fire-fighting water supplies. As a result, consistent with the guidance in Procedural Manual 77-2 (NPS 2004), there is no need to consider effects on these facilities.

The project would replace the existing, 35,000-gallon-per-day wastewater treatment facility with a modern, 86,000-gallon-per-day treatment facility. The existing, 2,000-square-foot treatment plant is on an upland site about 180 feet from the Snake River bank. The 3,300-square-foot replacement facility will occupy an upland site in the Moose headquarters area, about 950 feet from the Snake River. All other wastewater components are outside floodplains or would be underground where they would not affect, or be affected by, floodplains.

Brief Site Description

The Moose area includes park headquarters, visitor use areas, and administrative and maintenance facilities. Most of the development consists of Class I actions, which include constructed features such as administrative, housing, and warehouse buildings that entice or require humans to occupy the site and/or are prone to flood damage. These facilities within a 100-year floodplain are subject to the floodplain policies and procedures.

Class II actions include any activity for which even a slight chance of flooding is too great. These are subject to the floodplain policies and procedures if they lie in the 500-year floodplain. Examples listed in Procedural Manual 77-2 include sewage treatment plants. Therefore, the treatment plant in the preferred alternative would be a Class II action.

None of the facilities around Moose are Class III actions, which are subject to flash flooding.

Characterization of the Flooding and Associated Floodplain Processes

About 20 miles upstream from Moose, flows in the Snake River are regulated by Jackson Lake Dam. This 65.5-foot-high dam, which was completed in 1916 and is operated by the Bureau of Reclamation to provide irrigation water, has a storage capacity of 847,000 acre-feet. The outlet works capacity at full pool is 24,000 cubic feet per second. When added to the spillway capacity of 8,690 cubic feet per second, this results in a maximum flow below the dam of 32,690 cubic feet per second (Bureau of Reclamation 2009). Maximum flows at Moose would include this rate plus the flow from the relatively small tributaries that join the Snake River below the dam.

The maximum recorded flow at Moose during its period of record from 1995 to present is 25,300 cubic feet per second, recorded on June 11, 1997. That date also had the highest daily mean flow of 24,500 cubic feet per second (U.S. Geological Survey 2010). Information regarding the effects in Moose is provided later in this statement of findings under "Geomorphic Considerations."

The best available data were used to determine the extent of existing floodplain boundaries and water surface characteristics of the Snake River. Floodplain boundaries are shown on figure A-1, which includes 5-foot elevation contours (yellow lines).

- The 100-year floodplain mapped by the Federal Emergency Management Agency (FEMA 1989) includes the existing wastewater treatment plant. The site of the proposed new treatment plant is outside the FEMA 100-year floodplain but might be in the 500-year floodplain (not mapped by FEMA).

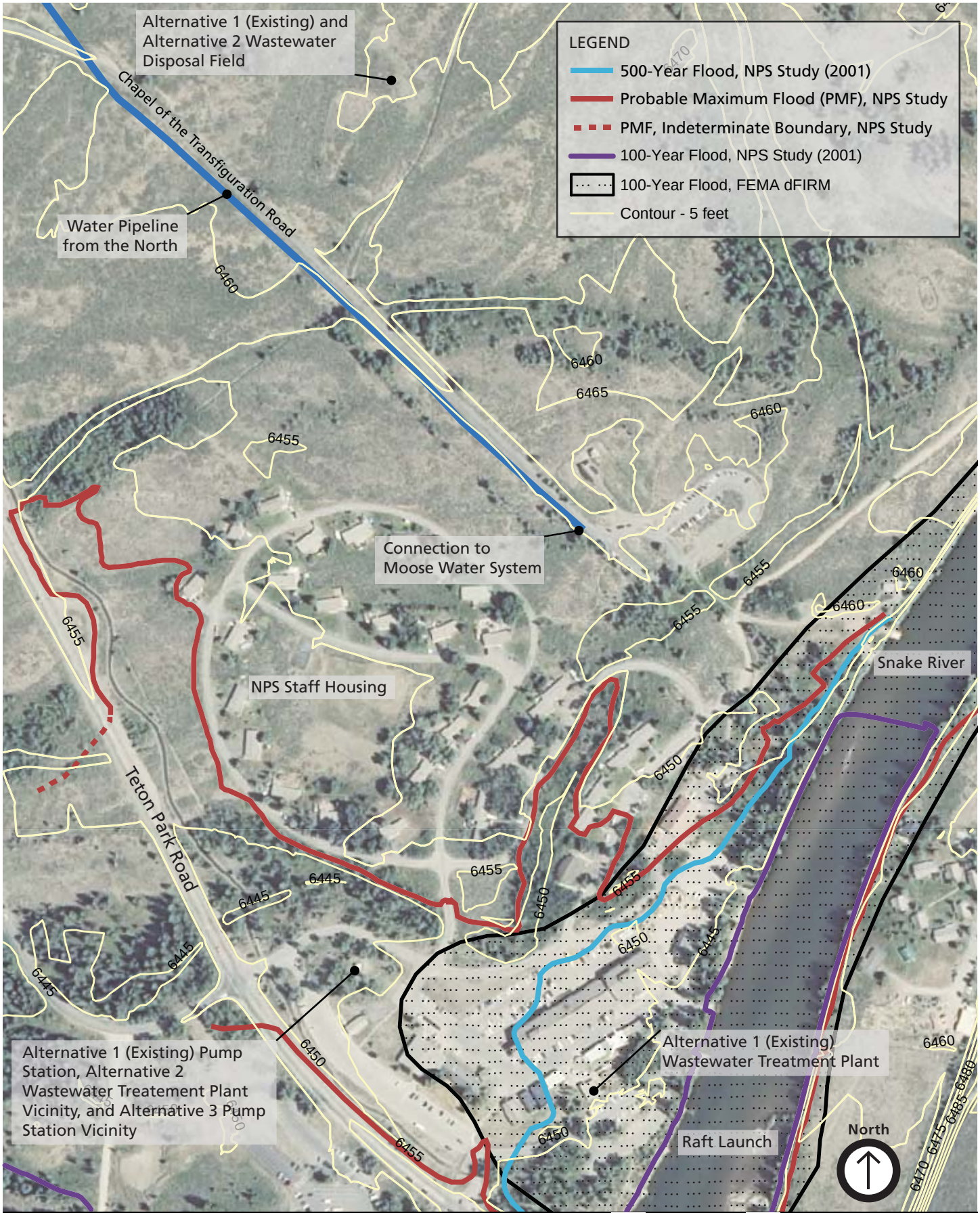

Figure A-1: Floodplain Boundaries near Moose in Grand Teton National Park

Grand Teton National Park

U.S. Department of the Interior / National Park Service

- A 2001 floodplain analysis for the Moose area was conducted by NPS' Water Resources Division (WRD) (Martin and Linn 2001) after they determined that the FEMA floodplain mapping was based on a non-detailed analysis and did not provide a sufficient level of confidence. They concluded that the 100-year floodplain is almost completely contained by the Snake River channel. The 500-year floodplain exceeds the channel capacity by 1 to 3 feet vertically and includes the area of the existing wastewater treatment plant. The new treatment plant would be more than 400 feet outside the 500-year floodplain.

Justification for Use of the Floodplain

Why the Proposed Action Must Be in a Floodplain. When the buildings at Moose were constructed in the 1960s, sanitary sewer pipelines were designed and installed to flow by gravity from the buildings to a central collection point at the southeast edge of Moose. From there, wastewater is pumped to the existing treatment plant. The preferred alternative's wastewater treatment plant would be built above this gravity-flow collection point at the southeast edge of Moose. It would be logistically impractical and prohibitively expensive to relocate all of the gravity sewers of the Moose collection system to drain to another site. Similarly, it would not be practical to install individual pumps and force mains to move wastewater from each source building to another site. Therefore, the Class II action structure must be located at this site.

Investigation of Alternative Sites. Most of the land in Moose has floodplain characteristics that are similar to, or worse than, those at the proposed site at the southeast edge of Moose. While a wastewater treatment plant could be built on higher ground outside Moose, the plant would continue to require a Class II action wastewater pumping station at the proposed site and would not provide any advantages with regard to flood vulnerability.

Description of Site-Specific Flood Risk

Recurrence Interval of Flooding. As shown in figure A-1, the existing wastewater treatment plant is in the 100-year floodplain based on the FEMA map and in the 500-year floodplain based on the NPS WRD map. The new wastewater management site for the preferred alternative is outside the NPS WRD 500-year floodplain but might be in the FEMA 500-year floodplain. To provide a worst-case analysis for this critical, Class II action, this analysis errs on the side of conservancy, considered the more restrictive FEMA floodplains in this statement of findings, and assumed that the new site is in the 500-year floodplain.

Hydraulics of Flooding at the Site. High-magnitude floods at Moose may occur because of tributary floods, large releases from the dam, and a combination of both, or, in the worst-case scenario, a sudden dam failure. The U.S. Army Corps of Engineers developed four models and concluded (Martin and Linn 2001):

- The 100-year flood would likely be in the range of 22,900 cubic feet per second. This flood would be mostly contained in the river channel.
- The 500-year flood was estimated to be 35,470 cubic feet per second. It would subject the area of the existing Moose wastewater treatment plant to flood depths of about a foot.
- The probable maximum flood, shown as the red line on figure A-1, would discharge at 39,500 cubic feet per second. It would flood the existing and proposed treatment plant sites, overtop the Teton Park Road, and threaten the Snake River bridge.

Time Required for Flooding to Occur (Amount of Warning Possible) and Opportunity for Evacuation. A dam break would result in a flow of 87,000 cubic feet per second and would take about five hours to reach Moose. The flood wave would inundate the entire Moose area with 3 to 6 feet of water, with velocities of 3 to 4 feet per second. It would overtop the bridge, isolating everything to the west (Martin and Linn 2001). The five-hour window between a dam break and flooding at Moose would provide a substantial opportunity to evacuate the site. It might be adequate to allow operators to take steps to lock down the treatment plant to minimize damage and facilitate restart after the flood passed.

Geomorphic Considerations. Peak discharges are usually produced by snowmelt in the spring, with possible summer pulses resulting from thunderstorms. Flash flooding is unlikely (Martin and Linn 2001). A springtime rain-on-snow event can produce a large, rapid rise in the river, as it did on June 11, 1997, causing moderate flood conditions in Moose. The Jackson Lake Dam was still storing most of the incoming runoff from the upper watershed. Flood conditions would have been worse if a release from the dam was necessary at the same time.

The 1997 peak flow (25,300 cubic feet per second) resulted in bank-full conditions in the upstream reach of the Moose area, and slight over-bank flooding in the boat landing area. There was substantial bank loss on the west bank upstream from the bridge. The river was almost all contained in the channel and did not result in any hazardous or costly flooding in the Moose area. The bank loss on the west side was the largest risk (Martin and Linn 2001). Since then, the NPS installed stone barbs north of the bridge to redirect flow from the bank. The barbs have been successful in trapping sediments during flow events and in stabilizing the bank (NPS 2010c).

Floodplain Mitigation

The proposed action would remove the existing wastewater treatment plant from the FEMA-mapped 100-year floodplain, and from the 500-year floodplain mapped by Martin and Linn (2001). This would slightly increase the capacity of the floodplain near the Snake River. More importantly, it would reduce the chance of flooding of this Class II action.

Based on FEMA mapping, the new wastewater treatment plant site might be in the 500-year floodplain where the probability of flooding would be 10% over the 50-year project life. (The WRD analysis classified this area as outside the 500-year floodplain.) Therefore, during design of the project, the NPS may consider actions such as those recommended in the WRD floodplain analysis for the existing plant, which included flood-proofing the treatment plant with a small levee or perhaps a waterproof seal around the building (Martin and Linn 2001). These actions could allow the new facility to continue to operate even during the probably maximum flood.

Summary

The proposed action would reduce the potential for flood effects on the critical, Class II action of wastewater management for the Moose area. This would result from moving the treatment plant to slightly higher ground about 950 feet from the riverbank. Based on FEMA mapping, the new location might be in the 500-year floodplain, but analyses from the NPS WRD place this site outside the 500-year floodplain in an area where the flood risk would be near zero.

The footprint of 3,300 square feet from the preferred alternative might slightly reduce the capacity of the 500-year floodplain. This would be mitigated by removing the existing, 2,000-square-foot treatment plant that is closer to the river, resulting in little or no net effect on the floodplain.

The water supply elements of the project would be outside, and would not affect, the Snake River floodplain. Floodplain avoidance was a key consideration of the NPS in selecting the action alternative for potable and firefighting water supplies.

The NPS concludes that the preferred alternative would reduce the impacts of potentially hazardous conditions associated with flooding in Moose. Mitigation and compliance with regulations and policies to prevent impacts on water quality, floodplain values, and loss of property or human life would be strictly adhered to during and after construction. Individual permits with other federal and cooperating state and local agencies would be obtained prior to construction. No long-term adverse impacts would occur from the alternatives analyzed.

Therefore, the NPS finds the preferred alternative to be acceptable under Executive Order 11988 for the protection of floodplains.

Appendix B: Agency Response Letters

U.S. Fish and Wildlife Service

U.S. Forest Service, Bridger-Teton National Forest

Northern Cheyenne Tribe

Wyoming Game and Fish Department

Wyoming Department of Transportation

cc: Sue Christina Miller

United States Department of the Interior

FISH AND WILDLIFE SERVICE

Ecological Services
5353 Yellowstone Road, Suite 308A
Cheyenne, Wyoming 82009

JUN 13 2011

In Reply Refer To:
ES-61411/WY11SL0301

RECEIVED
JUN 20 2011
GRTE
Superintendent's Office

Memorandum

To: Superintendent, National Park Service, Grand Teton National Park and John D. Rockefeller, Jr. Memorial Parkway, Wyoming

From: For Field Supervisor, U.S. Fish and Wildlife Service, Wyoming Field Office, Cheyenne, Wyoming

Subject: Species List for the Grand Teton National Park and John D. Rockefeller, Jr. Memorial Parkway

Attached is the U.S. Fish and Wildlife Service's (Service) current list of endangered, threatened, candidate, and proposed species, which may occur within the Grand Teton National Park's and John D. Rockefeller, Jr. Memorial Parkway's (Parks) area of management. This memorandum supersedes our 2010 list and is provided as a general reference for the Parks to use when evaluating actions under the Endangered Species Act of 1973, as amended (Act), 16 U.S.C. 1531 *et seq*. We have also included information that may be useful in the development of a project assessment for listed species as well as other areas of Service trust authorities, such as the Migratory Bird Treaty Act (MBTA), 16 U.S.C. 703, the Bald and Golden Eagle Protection Act (BGEPA), 16 U.S.C. 668, and wetlands protection.

Although we intend to update this species list annually or when additions or changes in species' status occur, the Parks should contact this office to verify the list before analyzing any Federal action. Additionally, a species list by county for Wyoming is currently available on-line at http://www.fws.gov/wyominges/Pages/Species/Species_Endangered.html. Information regarding non-listed, species of concern is now available at http://www.fws.gov/wyominges/Pages/Species/Species_Concern.html. If you have any questions regarding this letter or your responsibilities under the Act, please contact Pauline Schuette of my office at the letterhead address or phone (307) 684-1069.

Attachment (1)

cc: GTNP, Wildlife Biologist, Moose, WY (S. Dewey)
WGFD, Non-game Coordinator, Lander, WY (B. Oakleaf)
WGFD, Statewide Habitat Protection Coordinator, Cheyenne, WY (M. Flanderka)

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Ecological Services
5353 Yellowstone Road, Suite 308A
Cheyenne, WY 82009

Threatened and Endangered Species, Designated Critical Habitat and Candidate Species

National Park Service, Grand Teton National Park & John D. Rockefeller, Jr. Memorial Parkway

Updated June 2011

Species/Critical Habitat	Scientific Name	Status	Habitat
Canada Lynx	*Lynx canadensis*	Threatened	Montane forests
Canada Lynx Critical Habitat	Designated areas include boreal forest landscapes within Fremont, Lincoln, Park, Sublette, and Teton Counties of Wyoming (see 50 CFR 17.95(a))		
Gray Wolf	*Canis lupus*	*Experimental/ Non-essential	Greater Yellowstone Ecosystem
Grizzly Bear	*Ursus arctos horribilis*	Threatened	Montane forests
Wolverine	*Gulo gulo luscus*	Candidate	Subalpine to alpine
Greater Sage-grouse	*Centrocercus urophasianus*	Candidate	Sagebrush communities
Yellow-billed Cuckoo (Western)	*Coccyzus americanus*	Candidate	Riparian areas west of Continental Divide

*Treated as a threatened species within the National Park or National Wildlife Refuge Systems

Federal Agency Responsibilities

The U.S. Fish and Wildlife Service (Service) has responsibilities, under a number of Federal laws, treaties, executive orders, and memoranda of agreement for the conservation and management of fish and wildlife resources. Some of these same authorities also require other Federal agencies to consider, avoid, or prevent adverse impacts to fish, wildlife, and wetland resources. To ensure resources are afforded adequate consideration and protection, Federal agencies are often required to consult with the Service regarding potential impacts their actions may have on fish and wildlife resources.

When reviewing proposed actions of other agencies, this office normally focuses on three broad categories of trust resources: (1) threatened, endangered, and candidate species, (2) migratory birds, and (3) wetlands and riparian areas. The Service provides recommendations for protective

measures for threatened and endangered species in accordance with the Endangered Species Act of 1973, as amended (Act), 16 U.S.C. 1531 *et seq*. Protective measures for migratory birds are provided pursuant to the Migratory Bird Treaty Act (MBTA), 16 U.S.C. 703, and Bald and Golden Eagle Protection Act (BGEPA), 16 U.S.C. 668. Wetlands are protected pursuant to Section 404 of the Clean Water Act, Executive Order 11990 (wetland protection) and Executive Order 11988 (floodplain management) with the goal of "no net loss of wetlands." Other fish and wildlife resources are considered under the Fish and Wildlife Coordination Act, as amended, 16 U.S.C. 661 *et seq*., and the Fish and Wildlife Act of 1956, as amended, 16 U.S.C. 742a-742j.

Federal agency actions may range from small, site specific, short-duration projects to expansive, long-term programs. Because of the wide range of possible actions, the Service provides the following comments with the understanding that this list of comments may not be all inclusive or may not be applicable for each Federal project.

Regulations implementing the Act at 50 CFR §402.12 require the preparation of a biological assessment for any Federal action that is a major construction activity to determine the effects of the proposed action on listed and proposed species. If a biological assessment is not required (i.e., all other actions), the lead Federal agency is responsible for review of proposed activities to determine whether listed species will be affected. If it is determined that the proposed activities may affect a listed species, you should contact the Service to discuss consultation requirements. If it is determined that any Federal agency program or project "is likely to adversely affect" any listed species, formal consultation should be initiated with this office. Alternatively, informal consultation can be continued so the Service can assist you in determining how the project could be modified to reduce impacts to listed species to the "not likely to adversely affect" threshold. If it is concluded that the project "is not likely to adversely affect" listed species, you should request that the Service review the assessment and concur with the determination.

For those actions where a biological assessment is necessary, it should be completed within **180 days** of receipt of a species list. This deadline can be extended by mutual agreement between the lead agency and the Service. If the assessment is not initiated within 90 days of receipt of a species list, the list of threatened and endangered species should be verified with the Service prior to initiation of the assessment. The biological assessment may be undertaken as part of the agency's compliance with section 102 of the National Environmental Policy Act (NEPA) and incorporated into the NEPA documents. We recommend that biological assessments include:

1. A description of the project.
2. A description of all areas that may be directly or indirectly affected by the project.
3. The current status and habitat use of threatened and endangered species in the project area.
4. A discussion of the methods used to determine the information in item 3.
5. The direct and indirect impacts of the project to threatened and endangered species or their designated critical habitat.
6. An analysis of the effects of the proposed action on listed and proposed species and their habitats including cumulative impacts (pursuant to the Act) from State or private

projects in the area.

7. Measures that can potentially reduce or eliminate adverse impacts to threatened and endangered species.
8. The expected status of threatened and endangered species in the future (short and long term), during and after project completion.
9. A determination of "no effect," "likely to adversely affect," or "not likely to adversely affect" for listed species and any designated critical habitat.
10. A determination of "likely to jeopardize" or "not likely to jeopardize" for proposed species. A determination of "likely to adversely modify critical habitat" or "not likely to adversely modify critical habitat" for proposed critical habitat.
11. A description of alternatives to the proposed action if considered by the Federal Agency, a summary of how impacts of those alternatives on listed and proposed species would differ from the proposed action, and the reasons for not selecting those alternatives.
12. Citations of literature and personal contacts used in the assessment.

Candidate Species

Candidate species are those species for which the Service has sufficient information to propose for listing as threatened or endangered under the Act. Conservation measures for candidate species are voluntary, but recommended. Protection provided to these species now may preclude possible listing in the future. The Service's Wyoming Ecological Services office would appreciate receiving information as to the current status of these species within the proposed project area.

Migratory Birds

Under the MBTA and BGEPA, the Federal agency has a mandatory obligation to protect the many species of migratory birds, including eagles and other raptors which may occur on lands under its jurisdiction. Of particular focus are the species identified in the Service's *Birds of Conservation Concern 2008.* In accordance with the Fish and Wildlife Coordination Act, 16 USC 2912 (a)(3), this report identifies "species, subspecies, and populations of all migratory nongame birds that, without additional conservation actions, are likely to become candidates for listing" under the Act. This report is intended to stimulate coordinated and proactive conservation actions among Federal, State, and private partners and is available at http://www.fws.gov/migratorybirds/NewReportsPublications/SpecialTopics/BCC2008/BCC2008.pdf.

In order to promote the conservation of migratory bird populations and their habitats, the Service recommends that the Federal agency implement those strategies outlined within the Memorandum of Understanding directed by the President of the U.S. under Executive Order 13186, where possible.

During project planning analysis of the following information is recommended to determine project effects to migratory birds:

1. The current status and habitat use of migratory birds in the project area. This may include number of individuals, breeding pairs, population trends, and active nests within and adjacent to the project area.

2. An analysis of the effects of the proposed action on migratory birds and their habitats.

3. Measures that will reduce or eliminate adverse impacts to migratory birds, including protective buffers, seasonal restrictions, maintenance of habitat within the project area, raptor-proofing power lines, and netting of waste pits.

4. The projected short and long term impacts to migratory birds and their trends during and after project completion using monitoring, modeling, and current literature.

Potential adverse effects to migratory birds from power lines should be identified and every attempt to mitigate such effects should be implemented. Structures that are identified as affecting birds should be made safe to prevent subsequent mortalities. If you determine that power poles and/or stretches of power line are resulting in electrocution of migratory birds, especially raptors, the Service requests that specific information be documented regarding these mortalities. Based on regulations pursuant to the MBTA and BGEPA, migratory bird carcasses may only be collected, possessed, or moved by state game wardens, Service refuge officers, Service special agents, or persons holding a valid salvage permit issued by the Service and the applicable state. When a migratory bird mortality is observed, the Service recommends that as much of the following information as possible be documented: legal location, GPS location, all identifying numbers from the nearest power pole, date of observation, species, photographs of the power pole (top section) and the dead bird, and directions to the scene. Please contact our office with the information and call or email Roy Brown of the Service's Law Enforcement Office at 307-332-7607 /Roy_Brown@fws.gov to report your observation and obtain further guidance. The Service appreciates your efforts to protect migratory birds your efforts to protect migratory birds.

Wetlands

The functions and values of wetlands are well documented and are especially important in the arid west. Substantial degradation diminishes the effectiveness of wetlands to function as food, cover, and breeding sites for wetland dependent species; sediment transport systems; water retention/storage sites; contaminant sinks; and chemical exchange sites. To ensure the Service has sufficient information to assess project impacts on wetlands, assessments should include:

1. An enumeration of the acreage of wetlands, by type, impacted by the proposed action.
2. A discussion of why wetlands cannot be avoided.
3. A description of the functions and values of the wetlands, including sediment transport, water storage, habitat for aquatic and terrestrial organisms, and contaminant sinks, as well as the potential risks of water removal for these functions and values.
4. Measures that reduce or eliminate adverse impacts to wetlands such as a mitigation plan to offset unavoidable impacts, protective buffers, seasonal and physical restrictions,

maintenance of the natural hydrograph, and development and implementation of a monitoring program to track the effectiveness of mitigation measures.

5. Results of wetland monitoring or management activities in, or adjacent to, the proposed project site.
6. The anticipated short and long term effects to wetland and riparian areas during and after project completion.

We recommend the Federal agency address each of the above concerns where applicable to the project. Without this information it may be difficult for the Service to effectively review assessments.

USDA United States Department of Agriculture | Forest Service | Bridger-Teton National Forest | 340 N. Cache
PO Box 1888
Jackson, WY 83001-1888

File Code: 2350
Date: June 1, 2011

Mary Gibson Scott
Superintendent
Grand Teton National Park
P.O. Drawer 170
ATTN: Moose Wastewater and Water System EA
Comments
Moose, WY 83012

Dear Superintendent Scott:

Thank you for the opportunity to comment on the scoping for Moose Wastewater and Water System EA. As the Snake River in Moose is part of the Snake River Headwaters Wild and Scenic River designation we applaud the Park Service's effort to address the current aging system.

Sincerely,

JACQUELINE A. BUCHANAN
Forest Supervisor

Northern Cheyenne Tribe
Tribal Historic Preservation Office
P.O. Box 128
Lame Deer, Montana 59043
Phone: (406) 477-4838/4839 Fax: (406) 477-3839

Native American Consultation Response Form

Site Name/OBJECT Env. Assess. Moose Waste water Grand Teton National Park, WY
TCNS Notification ID Number L7617(GRTE)
Phone/Fax (307) 739-3390 Margaret Wilson fax: (307) 739-3438

Response:
REQUEST ADDITIONAL INFORMATION____(Initials of duly authorized Tribal Official)
I require the following additional information in order to provide a finding of effect for this purpose
undertaking:_____

___
NO ADVERSE EFFECT____(Initials of duly authorized Tribal Official) I believe the proposed project would have no adverse effect on these properties.
ADVERSE EFFECT____(Initials of duly authorized Tribal Official) Based on the information given, I believe the proposed project would cause an adverse effect on these properties.
NO INTEREST CF (Initials of duly authorized Tribal Official) I have identified that there are no properties of religious and cultural significance to the Northern Cheyenne in the proposed construction area.
NO EFFECT____(Initials of duly authorized Tribal Official) I have determined that there are no properties of religious and cultural significance to the Northern Cheyenne Tribe that are listed on the National Register within the area of potential effect or that the proposed project will have no effect on any such properties that may be present.
NO COMMENT____(Initial of duly authorized Tribal Official)
Other
(Specify)_____
Exceptions: If archaeological materials or human remains are encountered during construction, the State Historic Preservation Office and applicable Native American Tribes will be notified.

C. Fik
Signature

8/4/11
Date

Conrad Fisher
Printed Name (of Signing Official)

THPO
Title

406 477 4839
Telephone Number

WYOMING GAME AND FISH DEPARTMENT

5400 Bishop Blvd. Cheyenne, WY 82006

Phone: (307) 777-4600 Fax: (307) 777-4699

Web site: http://gf.state.wy.us

June 2, 2011

WER 12303
National Park Service
Grand Teton National Park
Environmental Assessment/Assessment of Effect
Moose Wastewater and Water System
Teton County

orginal to planning
cc: Mary ___
Bob ___
file Moose Water/Waste water

Mary Gibson Scott
Superintendent
ATTN: Moose Wastewater and
Water System EA Comments
Grand Teton National Park
PO Drawer 170
Moose, WY 83012

Dear Ms. Gibson Scott:

The staff of the Wyoming Game and Fish Department has reviewed the Environmental Assessment/Assessment of Effect for the Moose Wastewater and Water System in Teton County. We have no terrestrial wildlife or aquatic concerns pertaining to this project

Thank you for the opportunity to comment. If you have any questions or concerns, please contact Rick Huber, Staff Aquatic Biologist, at 307-777-4558.

Sincerely,

for John Emmerich
Deputy Director

JE/mf/gb

cc: USFWS
Rob Gipson, Jackson Region
Gary Fralick, Jackson Region
Tim Fuchs, Jackson Region

PEPC Project ID: 31570, DocumentID: 40703
Correspondence: 1

Author Information

Keep Private:	No
Name:	Tory L. Thomas
Organization:	Wyoming Department of Transportation
Organization Type:	I - Unaffiliated Individual
Address:	P.O. Box 1260 Rock Springs, WY 82901 USA
E-mail:	tory.thomas@dot.state.wy.us

Correspondence Information

Status: New	Park Correspondence Log:
Date Sent: 05/04/2011	Date Received: 05/04/2011
Number of Signatures: 1	Form Letter: No
Contains Request(s): No	Type: Web Form

Notes:

Correspondence Text

WYDOT will require permits for construction activities within the highway right-of-way, to include access, utilities, landscaping etc.

As the nation's principal conservation agency, the Department of the Interior has the responsibility for most of our nationally owned public lands and natural resources. This includes fostering sound use of our land and water resources; protecting our fish, wildlife, and biological diversity; preserving the environmental and cultural values of our national parks and historical places; and providing for the enjoyment of life through outdoor recreation. The department assesses our energy and mineral resources and works to ensure that their development is in the best interests of all our people by encouraging stewardship and citizen participation in their care. The department also has a major responsibility for American Indian reservation communities and for people who live in island territories under U.S. administration.

NPS 136/107944 / March 2012

National Park Service
U.S. Department of the Interior
Grand Teton National Park
Superintendent
Moose, Wyoming 83012