RECLAMATION

Managing Water in the West

Draft Environmental Impact Statement
Minidoka Dam Spillway Replacement
Minidoka Project, Idaho

U.S. Department of the Interior
Bureau of Reclamation
Pacific Northwest Region
Snake River Area Office
Boise, Idaho

December 2009

U.S. Department of the Interior

The mission of the Department of the Interior is to protect and provide access to our Nation's natural and cultural heritage and honor our trust responsibilities to Indian tribes and our commitments to island communities.

Mission of the Bureau of Reclamation

The mission of the Bureau of Reclamation is to manage, develop, and protect water and related resources in an environmentally and economically sound manner in the interest of the American public.

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Lead Agency:

U.S. Department of the Interior
Bureau of Reclamation
Pacific Northwest Region

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U.S. Department of the Interior
U.S. Fish and Wildlife Service
Idaho Fish and Wildlife Office

Abstract:
This Draft Environmental Impact Statement (Draft EIS) examines alternatives to correcting structural problems at the Minidoka Dam Spillway and associated facilities on Lake Walcott, Idaho. Alternatives considered in the Draft EIS are the No Action, as required under the National Environmental Policy Act; total replacement of the spillway and headgate structures; and replacement of just the spillway. Total replacement of the spillway and headgate structures is the preferred alternative.

In addition, the Draft EIS identifies special use areas to be designated under each of the action alternatives that would open areas currently closed for public use. Certain public activities became restricted per 43 CFR Part 423 Public Conduct on Bureau of Reclamation Facilities, Lands, and Waterbodies which became effective on October 1, 2008. Designation of special use areas would again allow historic uses which are appropriate for this area, but are not currently allowed under the new rules and regulations.

This Draft EIS was prepared in compliance with the National Environmental Policy Act. It also provides the public review required under Executive Orders 11988 (Floodplain Management) and 11990 (Protection of Wetlands) and the National Historic Preservation Act. Results of compliance per Secretarial Order 3175 (Indian Trust Resources), Executive Order 13007 (Sacred Sites), the Fish and Wildlife Coordination Act and the Endangered Species Act of 1973 are included in the evaluations contained in this Draft EIS/

Comments are due to the Bureau of Reclamation at the address indicated above by February 5, 2010.

Filing Number: DES 09-56

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EXECUTIVE SUMMARY

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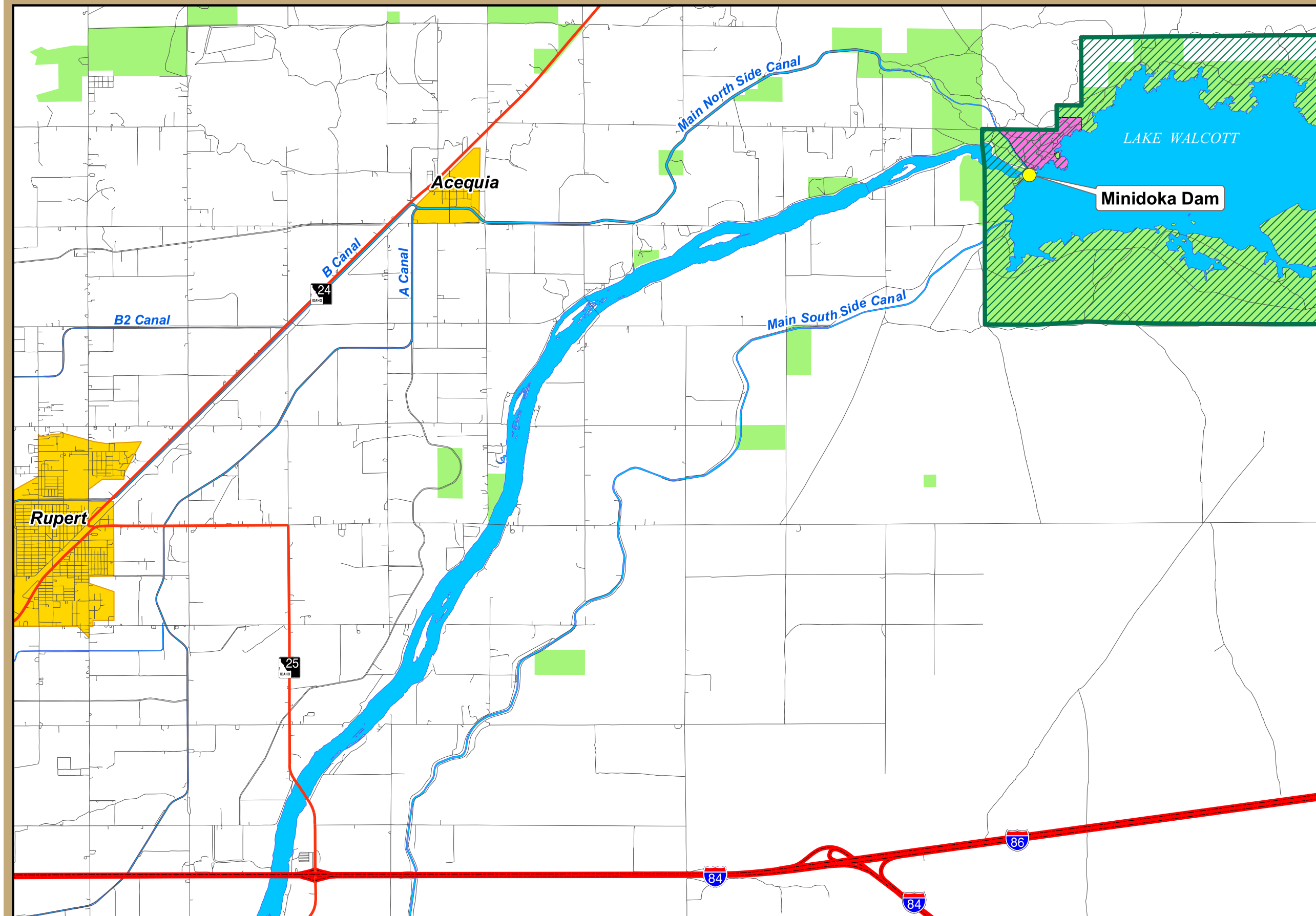
RECLAMATION *Managing Water in the West*

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION



Minidoka Dam Spillway Replacement Project Area

N
W E
S

- Reclamation Lands
- Lake Walcott State Park
- Minidoka National Wildlife Refuge
- Cities
- Interstate
- Highway
- Roads

0 0.25 0.5 1 1.5 2
Miles

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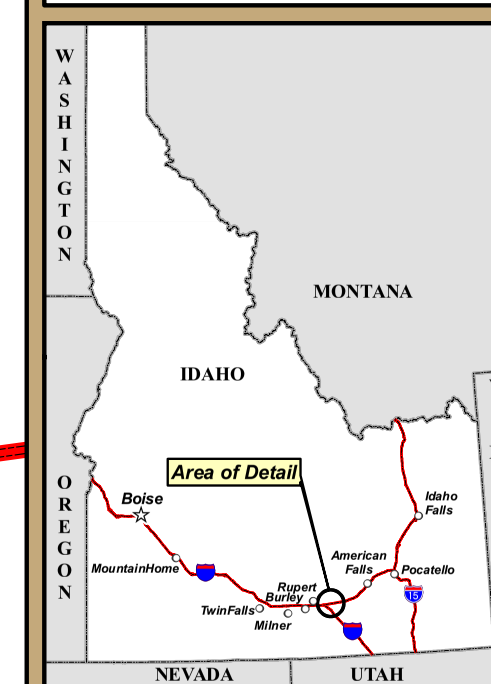

EXECUTIVE SUMMARY

The Proposed Action

The Bureau of Reclamation (Reclamation) is proposing to correct structural problems at the Minidoka Dam spillway and canal headworks on Lake Walcott, Idaho. The existing spillway and canal headworks are showing considerable signs of degradation.

In addition to correcting the structural problems of the existing spillway and canal headworks, Reclamation is also proposing to designate Special Use Areas at the project site in accordance with 43 CFR Part 423 Regulations, *Public Conduct on Bureau of Reclamation Facilities, Lands, and Waterbodies*. These Special Use Areas will define what public uses are allowed in close proximity to the dam, spillway, and other facilities.

Purpose and Need for Action

The purpose of the Proposed Action is to prevent structural failure of the Minidoka Dam spillway and canal headworks (proposed action area). After 103 years of continued use, the 2,237-foot-long concrete spillway has reached the end of its functional lifespan. The concrete that forms the spillway crest and stoplog structure piers have suffered extensive deterioration at numerous locations. Additionally, previous ice damage to the overflow section of the spillway requires that the reservoir water levels be dropped each winter. The headworks at the North Side Canal and South Side Canal also show serious concrete deterioration similar to the spillway conditions. The current conditions of the Minidoka Dam spillway and headworks present increasingly difficult reliability and maintenance problems. Reclamation must be able to continue to meet its contractual obligations for water delivery, power generation, and commitments to provide flow augmentation water under the Nez Perce Settlement Agreement and the Endangered Species Act (ESA). A partial or complete failure of the spillway or canal headworks could threaten Reclamation's ability to meet those obligations.

According to 43 CFR Part 423 Regulations, *Public Conduct Rules on Bureau of Reclamation Facilities, Lands, and Waterbodies*, certain public activities are restricted on Reclamation lands, facilities, and waterbodies. Specifically, Subpart C, Section 423.36 Swimming, states in part that, (a) You may swim, wade, snorkel, scuba dive, raft, or tube at your own risk in Reclamation waters, except:

(1) Within 300 yards of dams, powerplants, pumping plants, spillways, stilling basins, gates, intake structures, and outlet works.

In addition, Section 423.37 Winter Activities, states in part that, (b) You must not ice skate, ice fish, or ice sail within 300 yards of dams, powerplants, pumping plants, spillways, stilling basins, gates, intake structures, or outlet works.

Reclamation is proposing to designate Special Use Areas at the project site in accordance with 43 CFR Part 423 Regulations, *Public Conduct on Bureau of Reclamation Facilities, Lands, and Waterbodies*. The 43 CFR Part 423 rules and regulations restrict certain historic recreational uses on the Reclamation lands, facilities, and waterbodies associated with the proposed action area. In order to allow historic recreational uses to continue, Reclamation has determined that it would be in the best public interest to provide modifications to the rules. Reclamation will restrict uses which affect public safety.

Alternatives

To address the deterioration and potential structural failure of the spillway and associated structures, Reclamation began an alternative formulation process in March of 2000 with the preparation of an appraisal-level design that analyzed two different options for buttressing the existing spillway crest and providing new gated spillway sections.

Since 2000, Reclamation has evaluated several technical conceptual designs and options to address spillway replacement. Much of the early effort was devoted to identifying specific engineering elements and combinations that would meet this objective. A Value Planning Study was completed in January 2002 that considered 15 options for spillway replacement. Three options were eliminated due to feasibility or cost; twelve options were considered feasible and carried forward for further study.

In 2003, an Appraisal Study was completed that investigated the two most favorable options from the 2002 Value Planning Study. The two options studied were: (1) complete replacement of the spillway with a new concrete overflow section and a set of 12 new radial gates; and (2) complete replacement of the spillway with a combination of overflow sections and rubber dam sections. Both options were considered feasible with Option 1 being considered as the most cost-effective solution.

A Realignment Study was completed in 2006 that considered three different alignments for the spillway. The goal of this study was to shorten the overall length of the spillway; thereby, reducing costs.

A Value Engineering Study, completed in June 2008, resulted in 16 different options or combination of options being considered. The study team included staff and experts from Reclamation as well as representatives from the irrigation districts. Fourteen options were determined to have merit and were carried forward for further analysis.

In 2009, a Feasibility Study, including alternative selection was completed. The study investigated five different alternatives and three different alignments incorporating feasibility-level cost estimates (Attachment A - Figure ES-1). This study determined that Alternative B – Spillway and Headworks Replacement would provide the highest level of constructability, technical merit, cost effectiveness, and therefore, should be carried forward to final design. As an additional option, Alternative C – Spillway Replacement was formulated based on potential costs. As a key funding source of the project, the two irrigation districts are very concerned about project costs and their ability to pay. As a potential cost savings measure, Reclamation decided to analyze an alternative that does not include replacing the canal headworks.

Alternative A – No Action

Construction

The No Action alternative represents continuation of the current conditions which would leave the existing spillway and headworks in their present configuration and state of extensive deterioration (Photograph 1; Attachment A - Figure ES-2). Under the No Action alternative, it will be necessary to continue the seasonal 5-foot drawdown. As the concrete in the existing spillway and headworks continue to deteriorate, maintenance requirements will increase, subsequently increasing annual maintenance costs. As the existing spillway concrete deteriorates further, a program for pier replacement will become necessary. The pier replacement program will involve ongoing replacement of piers to maintain the existing spillway in a usable condition. As material and labor costs increase and as the location of piers to be replaced becomes more difficult to access, ongoing pier replacement costs will increase considerably.

Maintenance requirements and costs will also continue to escalate for the existing headworks. Eventually, annual concrete repairs on the headworks will also become necessary. These repairs will continue until the existing headworks reach the end of their service life at which time full replacement becomes necessary.

Photograph 1. Photograph showing the current state of deterioration of the Minidoka Dam spillway.

Public Use

Reclamation would allow the existing public use restrictions under 43 CFR Part 423 to remain in effect. The applicable sections which affect the historic recreational uses in the near vicinity of Minidoka Dam and the existing spillway are Subpart Sections 423.36 Swimming and 423.37 Winter Activities. See Figure ES-3 (Attachment A) for the 300-yard zone where these use restrictions would be in effect under this alternative.

Operations

Minidoka Dam is operated as a run-of-the-river project with a few seasonal variations. Water is routed through turbines in the two powerplants, through existing radial gates, and over the existing spillway. The minimum flow released over the existing spillway is 1,300 cubic feet per second (cfs) from April 15 to June 30 and from September 1 to September 15. From July 1 through August 31, the minimum flow is increased to 1,900 cfs. Water operations from April 1

to April 14 and again from September 16 until October 31, deliver the first 5,035 cfs of flow through the powerplant. The next available 1,300 cfs is discharged over the existing spillway. Flows in excess of 6,335 cfs are routed through the powerplant until it reaches its hydraulic capacity before additional flows are released over the existing spillway. There are no controlled spillway releases during the winter months.

Existing spillway releases travel through an extensive wetland area which consists of natural wetlands as well as a constructed wetland built as mitigation for the Inman Powerplant. Subsurface seepage locally enhanced by the reservoir as well as seepage through the existing spillway structure provides a portion of the water supplying the wetlands, while the constructed wetlands are supplied by a pipeline from the Inman Powerplant headworks.

During the irrigation season (April through October), the reservoir is maintained at full pool (elevation 4245 feet). After irrigation season and during the winter months, the reservoir is held between elevation 4239.5 and 4240.0 (5.5 feet to 5.0 feet below full) to prevent further deterioration of the existing spillway.

Alternative B – Spillway and Headworks Replacement (Preferred Alternative)

This alternative consists of the following new structures and improvements:

- Spillway
  - Overflow (Sections 1 and 2)
  - Radial Gate Sections
  - Dike (Sections 1 and 2)
- South Side Canal Headworks
- North Side Canal Headworks
- Public Use Improvements
- Special Use Areas

Spillway

Overflow

The new overflow sections would be constructed entirely downstream of the existing spillway (Attachment A - Figure ES-4). By constructing downstream, the existing spillway can be used as a cofferdam during construction and until completion of the new spillway. The new overflow sections will have a total length of up to 1,326 feet with a uniform crest

elevation of 4245.0 feet and be constructed of roller-compacted concrete (Photograph 2 and Photograph 3).

Following completion of the new spillway, partial demolition of the existing spillway would be completed. The demolition would include removal of the metal walkway and handrails, and removal of the concrete piers above the ogee section. Portions of the pier removal may occur in wet conditions, depending on the reservoir elevation and the elevation of the surrounding ground surface (Attachment A - Figure ES-5). Total removal of the existing spillway would be necessary in certain areas such as upstream of the new radial gate sections and would likely require in-water blasting. Best management practices (BMPs), such as the use of silt curtains or other appropriate sediment control actions, would be employed to control sediment releases during removal in order to protect water quality and endangered snail habitat.

It is anticipated that construction of the new spillway may reduce the current rate of structural leakage to the wetland. Therefore, as part of the new design to satisfy post-construction wetland flow needs, a total of five steel pipe release point features with slide gates would be constructed (referenced on Figure ES-6 in Attachment A as numbers 1, 2, and 3).

Photograph 2. "Before" photograph of a section of the existing Minidoka spillway (Reclamation photograph taken by D. Walsh, June 30, 2005).

Photograph 3. "After" photograph simulation of the same section of the Minidoka spillway showing the new overflow spillway situated 10 feet downstream of the existing spillway. The concrete service road runs through the foreground.

Radial Gate Sections

The new radial gate sections would be constructed entirely downstream of the existing spillway, which would serve as a cofferdam during construction. The new radial gate sections have been modeled after the radial gates in the existing at Minidoka Dam and consist of twelve 20-foot 8-inches-wide by 17-foot high gated sections separated by 5-foot-wide piers and 4-foot-wide end walls. It is anticipated that blasting would be required to remove rock for the foundation of the new radial gate sections and to improve the channel upstream and downstream.

Dike

New dike sections would be constructed downstream of the existing spillway, serving as the cofferdam during construction. The new dike sections would be constructed of roller-compacted concrete faced with structural concrete.

Section 1 of the new dike section would extend up to 201 feet from the southern end of the new radial gate sections and would connect to a new South Side Canal headworks structure.

Section 2 of the new dike section would extend up to 334 feet southeast from the new South Side Canal headworks structure toward the existing south dike.

South Side Canal Headworks

The new South Side Canal headworks would be reconstructed in the existing canal about 300 feet downstream of the existing headworks. The majority of the work would be performed during the non-irrigation season (October to March). The existing South Side Canal headworks gates would be closed during construction, serving as the upstream cofferdam while providing operational flexibility during the subsequent irrigation seasons. Following completion of the new headworks, the majority of the existing structure, including metalwork, would be removed. The southern-most bay would remain as support for the embankment endwall.

North Side Canal Headworks

The new North Side Canal headworks would be reconstructed in the existing canal about 115 feet downstream of the existing headworks. Work would be performed during the non-irrigation season (October to March). The existing North Side Canal headworks gates would be closed during construction, serving as the upstream cofferdam while providing operational flexibility during the subsequent irrigation seasons. Following completion of the new headworks, all metalwork would be removed from the existing headworks and the existing concrete structure would be permanently abandoned in place.

The new canal lining for the new North Side Canal headworks consists of three sections: (1) transition section, (2) flume section, and (3) shotcrete section. The transition section would consist of 2-foot walls and a 2-foot base, would be 30-feet long, and would provide a transition from the geometry of the existing headworks to the geometry of the flume section and new headgate structure. The flume section would also consist of 2-foot walls and a 2-foot base, would be 69-feet long, and would provide a water-tight channel from the transition section to the new headworks. The shotcrete section would consist of a 3-inch shotcrete lining for 100-feet downstream of the new headworks. This section would provide a smooth transition from the new headworks to the existing canal lining.

The construction of the new North Side Canal headworks structure would require the removal of the existing bridge which spans the North Side Canal.

Public Use Improvements

Currently, substantial fishing and birding opportunities exist in association with the existing spillway. Under Alternative B, some fishing and birding opportunities would be eliminated as a result of structural limitations and the closure of the new spillway and canal headgates to public access. Reclamation proposes to alter the existing spillway access bridge to meet

current accessibility standards. This bridge crosses the pool below where the new radial gate sections would be located and is currently open to non-vehicular public use such as fishing and birding.

Additionally, a parking area that is accessible to people with disabilities would be provided near the south end of the bridge (Attachment A - Figure ES-7).

Special Use Areas

Reclamation is proposing to designate Special Use Areas as provided for in 43 CFR Part 423 in order to allow historic recreational uses to continue that would otherwise be prohibited. Reclamation will restrict uses which affect public safety. The Special Use Areas would allow for wading and float tubing associated with fishing and birding, and ice fishing within specific portions of the 300-yard zone as shown in Figure ES-6 (Attachment A). Existing restrictions as described in 43 CFR Part 423, Subpart C, would remain in effect.

Construction

Construction is expected to take up to 31 months. Due to the large size of the construction zone, the contractor would most likely require multiple staging and waste areas. Five staging and/or waste areas have been identified, three on the north end of the construction zone and two on the south end (Attachment A - Figure ES-7).

Included with the new spillway would be a new service road. The new service road would be located just downstream of the new overflow section and would be constructed in two sections (Attachment A - Figure ES-6). The first section would run from the existing Inman Powerplant headworks south to the existing radial gates. The second section would run from the existing spillway access bridge north to the existing radial gates. The service road would be constructed using roller-compacted concrete and would be used by the contractor as the test section. In addition, the contractor would be required to remove the existing asphalt surface from the present access bridge. The service road would be open to the public for pedestrian traffic only.

Operations

After construction of the new spillway, Lake Walcott's water surface would no longer be constrained to elevation 4240.0 feet, or below, during the non-irrigation months. This reservoir operation will allow for increased power generation, complies with the requirements of the current BiOp, and maintains recreational opportunities. However, it may be necessary to utilize Lake Walcott Storage as the end of irrigation season approaches, as described in Section 2.2 Alternative A – No Action. Water rights, provisions of spaceholder contracts, commitments to implement Biological Opinions, and Total Maximum Daily Loads (TMDL) would not change under this alternative. Once irrigation demand is less than the

natural supply and water is available for storage, and absent any needs, Lake Walcott would be raised to its normal full capacity. Among water rights for irrigation storage, Lake Walcott has the earliest priority date below Jackson Lake allowing for the early refill of Lake Walcott once the storage season commences.

To replace the leakage which currently occurs across the existing spillway during the non-irrigation season, up to 100 cfs would be discharged through the new spillway at release point 3 as shown on Figure ES-6 (Attachment A). The non-irrigation season flows of 100 cfs would consist of a combination of structural leakage, subsurface seepage, and controlled releases. However, the winter release flow through the conduits would not exceed 100 cfs. During the irrigation season, approximately April 1 through October 15, minimum spillway release flows would be 500 cfs. Releases after construction of the new spillway would be accomplished as follows: approximately 50 cfs through each of the four northern-most new release points and approximately 300 cfs through the new southern-most release point (Attachment A - Figure ES-6). Spillway flows would be increased above 500 cfs when sufficient water is available after powerplant hydraulic capacity is met. This flow regime was selected because it will allow for increased power generation, complies with the requirements of the current BiOp, maintains recreational opportunities, and should be adequate to maintain the existing wetland community within the spillway area.

With construction of the new spillway, the minimum flow through the project would increase to 525 cfs during dry water type years and to 600 cfs for average to high water type years. These minimum flows are typically experienced during the winter months and are comprised of both powerplant and spillway releases measured at the downstream USGS gage (USGS 13081500 Snake River near Minidoka Idaho, at Howells Ferry).

Alternative C – Spillway Replacement

This alternative consists of the following new structures and improvements:

- Overflow (Sections 1 and 2)
- Radial Gate Section
- Dike
- Public Use Improvements
- Special Use Areas

The construction of the new spillway would be the same as described for Alternative B, except for a slightly different alignment in the southern section where it would follow the existing spillway alignment to the existing South Side Canal headworks (Attachment A - Figure ES-9). Construction of the new spillway is identical to that described for Alternative B.

Under Alternative C, the new dike section would be constructed of roller-compacted concrete material to effectively widen the crest to allow for loading and crane equipment to access the new spillway. The new dike would extend up to 150 feet from the southern end of the new spillway continuing south to the existing South Side Canal, then extend east, paralleling the canal, until it ties into the existing South Side Canal headworks.

Reclamation proposes to make the same public use access improvements as described in Alternative B.

Reclamation is also proposing to designate Special Use Areas as provided for in 43 CFR Part 423 as discussed in Alternative B.

Construction would be the same as described in Alternative B, except that the staging area and the rock and soil waste area near the existing North Side Canal headworks would not be needed. A new service road would also be constructed as described in Alternative B.

Operations for Alternative C are the same as those described for Alternative B.

Alternatives Considered But Not Carried Forward

Over the past 10 years, Reclamation has studied over 50 alternatives, including a combination of alternatives, options, and alignments for repair or replacement of the existing spillway and modification or replacement of both North and South Side Canal headworks. Alternatives were eliminated for a number of reasons including cost, technical considerations, potential length of service following the replacement, future operation and maintenance issues, and constructability. Consideration was also given to some type of staged construction but was eliminated due to steadily increasing construction costs over a lengthy period of time.

Public Involvement

Along with the technical analyses prepared for this Draft EIS, a public involvement process was also initiated. This process included publication of a “Notice of Intent to Prepare an Environmental Impact Statement” in the *Federal Register* on November 13, 2008 (FR 73 67206). On November 10, 2008, Reclamation mailed a scoping letter to 106 individuals, organizations, agencies, and congressional delegates. The letter discussed the proposed action and served as notification of the public scoping meetings. A similar letter was sent to 28 tribal governments. Reclamation held two public scoping meetings on December 3 and 4, 2008. The meetings were held in an informal setting in which Reclamation presented the proposed action alternatives, provided an overview of the NEPA process, and provided an opportunity for the public to identify issues and concerns associated with the proposed

action. In addition to comments received at the scoping meetings, written comments were accepted through December 19, 2008.

Five letters of comment were received. Comments ranged from brief comments and questions to detailed statement. Expressed issues and concerns that are within the scope of this EIS centered on the following issues:

- Elimination of winter drawdown
- Analysis of alternatives
- Economic impact to the Minidoka Irrigation District
- Fish entrainment in canal diversions, hydroelectric generators, and the spillway
- Spillway fishery below Minidoka Dam
- Wetland habitat below Minidoka Dam spillway
- Potential mitigation for affected spillway flows
- Lake Walcott water levels
- Threatened and endangered species present in the action area
- Species of greatest conservation need
- Previous mitigation commitments
- Water resources impacts
- Habitat, vegetation, and wildlife
- Wetlands and riparian areas
- Air quality
- Climate change
- Cumulative impacts
- Environmental justice
- Historic and cultural resources
- Monitoring

At the request of the Shoshone-Bannock Tribe, a public meeting was held on April 7, 2009, on the Shoshone-Bannock Reservation. One member of the public attended the meeting.

Consultation and Coordination

Concurrent with preparation of this document, agency coordination and consultation have been conducted in accordance with the Fish and Wildlife Coordination Act, Endangered Species Act of 1973, as amended, and the National Historic Preservation Act of 1966.

Reclamation requested that the IDFG, USFWS, IDEQ, EPA, and the Corps participate as cooperating agencies in the spillway replacement project. IDFG and IDEQ declined to participate as cooperating agencies. The EPA and the Corps also declined to participate as cooperating agencies; however, each stated their involvement would be in conjunction with the Section 404 permitting process. Reclamation received formal confirmation from the USFWS regarding their participation as a cooperating agency and an Inter-Agency agreement was completed.

Environmental Consequences

Impact Summary

The environmental impacts of each alternative are summarized below. Impacts of Alternatives B and C are compared to the impacts of the No Action alternative. These impacts are further summarized and compared in Table ES-1 . The terms “environmental consequences” and “environmental impacts” are synonymous in this document.

Hydrology and Reservoir Operations

Lake Walcott

Both Alternatives B and C would result in Lake Walcott elevation remaining at or close to full pool (elevation 4245 feet) during the winter months.

Both Alternatives B and C would result in reduced flows over the new spillway during the irrigation season to a minimum of 500 cfs.

Both Alternatives B and C would result in a winter spillway release flows of up to 100 cfs, whereas the No Action alternative releases 0 cfs through the existing spillway during the winter.

Snake River below Minidoka Dam

Alternatives B and C propose an increase in the minimum flow measured at the USGS gage near Minidoka, Idaho at Howells Ferry. With construction of the new spillway, the minimum flow through the project would increase to 525 cfs during dry water type years and to 600 cfs for average to high water type years. These minimum flows are typically experienced during the winter months and are comprised of both powerplant and spillway releases measured at the downstream USGS gage (USGS 13081500 Snake River near Minidoka Idaho, at Howells Ferry).

Groundwater

Under Alternative A – No Action, there will be a continuation of current groundwater conditions, groundwater levels, and seepage flows.

Alternatives B and C would result in a total measured seepage volume increase by about 4 percent downstream of the north abutment (maximum measured seepage at the site is 860 gpm). Water levels in the sand interbed would increase by about 1.5 feet and basalt water levels would increase by about 1 foot. The basalt water levels would remain below the elevation of the Snake River so there would be no increase or change of flow between the river and the aquifer. Seepage would also increase slightly under the new spillway and south abutment area.

Water Quality

The No Action alternative will result in no change in reservoir and downstream water quality. Reservoir bank erosion and upstream reach (in-channel) suspension of sediment during drawdown would continue.

During construction, Alternatives B and C could affect the Snake River below the new spillway as a result of temporary increases in turbidity and total suspended solids. No construction-related impacts are anticipated in Lake Walcott or in the Snake River above the reservoir.

Operation changes to the timing and duration of reservoir drawdown could decrease reservoir bank erosion and in-channel suspension in the Snake River above Lake Walcott to Lake Walcott Reservoir.

Water quality impacts of Alternatives B and C would be less than No Action alternative.

Minidoka Hydropower Generation

Both Alternatives B and C would result in an average increase in gross annual generation of Minidoka hydropower production of up to 11,400 megawatt hours (MWh) per year averaged over a 72-year hydrologic period of record.

The approximate annual economic value gained under Alternatives B and C would be $666,000 averaged over a 72-year hydrologic period of record based on forecasted energy prices through 2020.

Aquatic Biota

Reservoir Fish Community

Under the No Action alternative, the present species diversity and fish population levels are expected to remain unchanged. Winter drawdown will continue to expose the lava rock and boulder habitat that is particularly important to smallmouth bass juveniles as cover, increasing predation rates.

Alternatives B and C would reduce the length of time the reservoir is drawn down, benefitting smallmouth bass, as well as other species. Rainbow trout would continue to rely on stocking to maintain population levels. Spawning and rearing habitats in the shallow littoral zone would not be adversely affected by the reduced drawdown schedule. Additionally, approximately 5.2 acres of permanently watered reservoir habitat would be created as a result of Alternatives B and C.

Spillway Fish Community

Under the No Action alternative, habitat conditions and entrainment rates will continue unchanged from the present conditions. Rainbow trout will periodically be entrained through the new radial gates allowing a sport fishery to continue in this area. Spillway operations and leakage through the flashboards will continue to provide good habitat conditions for smallmouth bass as well as other species such as sculpins, suckers, chubs, dace shiners carp, and yellow perch. Entrainment of fishes into the canals will continue under the No Action alternative.

Alternatives B and C would allow for the continued entrainment of trout to the spillway area through a pipe that would convey 300 cfs of water. The opening of the pipe is at a similar depth as the new radial gates. Flow reductions, to a minimum of 500 cfs, are not anticipated to substantially reduce the fish habitat in the spillway area. Water temperatures would continue to remain the same as the temperature in the reservoir. In addition, entrainment of fishes into the canals via the headworks would continue under each action alternative.

Terrestrial Biota

Upland and Riparian Vegetation

Under the No Action alternative, reservoir operations will stay the same, with water levels continuing to fluctuate, with winter drawdowns.

The deteriorating piers of the existing dam will need to be replaced periodically under the No Action alternative; however, this will have no impact to vegetation communities or wildlife

due to the timing (post-irrigation season), duration (short term), location, and nature of the activities.

Upland vegetation surrounding the reservoir and within the spillway area will not be affected by the No Action alternative. The present distribution of riparian vegetation in the narrow zone around the reservoir will remain unchanged.

Alternatives B and C would enhance the ability to control trespass grazing that occurs from adjacent Bureau of Land Management grazing land onto the Minidoka National Wildlife Refuge (Minidoka Refuge) by reducing the need for winter drawdowns. The current drawdown schedule allows cattle to get around the fence on the reservoir bottom and trespass onto the Minidoka Refuge.

There would be no effects to noxious weed control efforts. The risk of Eurasian milfoil invasion of Lake Walcott may be increased by reducing drawdowns in Alternatives B and C. Drawdowns allow the shallow shoreline zone to freeze which kills the rhizomes, effectively controlling this invasive species.

Wetlands

Wetlands that occur in the reservoir shoreline (littoral) zone, as well as wetlands in the spillway area would continue unchanged in the No Action alternative. Sago pondweed responds positively to the drawdowns and its tubers provide a preferred waterfowl forage plant. This plant will continue to thrive under the No Action alternative. Alternatives B and C, however, may reduce the amount of drawdown periods, thus adversely affecting this highly-valued plant species

Approximately 5.2 acres of current spillway area would be converted to permanently watered reservoir habitat. A small amount of vegetation in the spillway area would be eliminated with the construction of the new concrete structure and service road. This is the vegetation that currently grows out of the cracks in the basalt below the existing spillway and is estimated to be less than one tenth of an acre. Changes in spillway operations would reduce spillway releases to a minimum of 500 cfs during the irrigation season, distributed through 4 water releases points of 50 cfs each and 1 with 300 cfs. These flows, however, are anticipated to be adequate to support wetland vegetation. Flows would improve during the non-irrigation season with a total release and seepage of up to 100 cfs.

Avian Communities

Under the No Action alternative, avian communities will remain the same as presently occurs.

There would be no adverse impacts to bird species using the reservoir or spillway area for Alternatives B or C. The few American white pelicans that forage in the spillway area as well as peregrine falcons, great blue herons, black-crowned night-herons, snowy egrets, and cattle egrets may be displaced during construction, but alternate feeding areas are available resulting in little impacts.

Mammalian Communities

Under the No Action alternative, the mammalian communities will remain the same as presently occurs.

Muskrat and beaver populations may benefit under Alternatives B and C by reducing or eliminating winter drawdowns which currently allow predator access to winter dens. Increasing beaver populations, however, could increase predation on the few cottonwood trees on the refuge which are important for bald eagle and great blue heron nesting. Increasing muskrat populations could result in increased foraging on emergent vegetation which in turn could adversely affect nesting waterfowl. Some mammals in the spillway area may be displaced during the construction periods for Alternatives B and C resulting in short-term adverse impacts.

Amphibian and Reptile Communities

Under the No Action alternative, the amphibian and reptile communities will remain the same as presently occurs. Little adverse impacts would occur from reservoir operations and spillway operations for Alternatives B and C. However, short-term construction activities may displace individuals in the immediate vicinity of construction activities.

Prime and Unique Farmlands

While there are no prime and unique agricultural lands within the boundaries of the proposed action area, under the No Action alternative reservoir operations “loafing areas” are available to migrating waterfowl during the winter months. This may prevent displacement of waterfowl during this time period and keep them on the refuge and off of any adjacent farmlands. Under the No Action alternative, the existing spillway will not change; therefore, existing wildlife distribution and habits are expected to remain the same.

Alternatives B or C may displace wintering waterfowl that may loaf on adjacent farm fields during the winter when the reservoir remains at full capacity. However, the numbers of waterfowl are small in winter; therefore, adverse impacts would be minimal.

Threatened and Endangered Species

Utah Valvata

Under the No Action alternative, the reservoir will continue under its current mode of operations. It is not anticipated that Utah valvata distribution, abundance, or colony viability would change under the No Action alternative.

The No Action alternative represents continuation of the current conditions which would leave the existing spillway and headworks in their present configuration, thereby resulting in the continuation the seasonal 5-foot drawdown. As concrete in the existing spillway and respective headworks continues to deteriorate, maintenance requirements would increase. Therefore, a program of pier replacement would likely become necessary. The pier replacement program will involve ongoing replacement of piers to maintain the existing spillway in a usable condition.

It is likely that construction activities will occur periodically for maintenance, repair, or replacement of the deteriorating piers. Replacement work will be conducted outside of irrigation season. Pier replacement and spillway maintenance activities will be conducted above the water line and will likely be consistent with past spillway maintenance activities. Depending on the location of the piers requiring replacement, some minor filling of depression in the basalt bench or construction of temporary bridges to cross channels may be required to facilitate equipment access to the respective piers. This activity would be conducted below the existing spillway, outside of irrigation season, on the dry basalt bench located immediately below the existing spillway. It is not anticipated this activity would have any impacts on Utah valvata, Snake River physa, bald eagles, or the yellow-billed cuckoos. Further, consistent with current Reclamation requirements, construction BMPs would be implemented so as to ensure resource protection.

It is anticipated that a future pier replacement program would be consistent with past pier replacement activities. Further, the program would have no impacts to ESA-listed snail, fish, wildlife or vegetative communities due to the timing (post-irrigation season), duration (short term), location and nature of the actual replacement activities. A pier replacement program under the No Action alternative would require NEPA compliance as well as the appropriate State of Idaho and Federal permits. Therefore, actions associated with the program would be subject to the appropriate level of review required by the respective compliance requirements.

Within the assessment area, Utah valvata primarily occur within Lake Walcott, although snails have been documented within the existing spillway area of Minidoka Dam. Known Utah valvata habitat and respective suitable habitat, are not known to exist immediately adjacent to the proposed project site. Due to the location of Utah valvata in relation to the proposed construction activities, construction requirements, structural design, and respective operations, no impacts to Utah valvata are anticipated under either Alternative B or C.

Snake River Physa

Snake River physa exist within the existing spillway area of Minidoka Dam. Snake River physa have been encountered in one pool on the south side of the existing spillway. Snake River physa and Utah valvata are found within the same pool in the existing spillway area. Current operations, structural leakage, and subsurface flows through fractured basalt prevent this pool from drying. Under the No Action alternative, this pool will continue to be watered year round and no adverse impacts or changes to this pool are anticipated.

It is likely that construction activities will occur periodically for maintenance, repair, or replacement of the deteriorating piers. See section above under Utah valvata for a detailed description of potential construction impacts associated with ongoing spillway maintenance requirements.

Snake River physa are not known to occur above Minidoka Dam, however, Snake River physa have been consistently documented below Minidoka Dam, including the existing spillway area of Minidoka Dam. Snake River physa are known to occur within one pool in the existing spillway area. Due to the location of this pool, construction requirements, structural design, and respective operations, no impacts to Snake River physa are anticipated under either Alternative B or C.

Bald Eagle

The bald eagle (*Haliaeetus leucocephalus*) was removed from the Federal list of threatened and endangered species in June 2007. Although bald eagles occur in the greater Lake Walcott area, including the assessment area, eagle use in the existing spillway area of Minidoka Dam is very low. Eagles typically utilize Lake Walcott for forage opportunities. During winter, when Lake Walcott is ice covered, eagles will forage in open water habitat below Minidoka Dam. The existing spillway area of Minidoka Dam has no perching or nesting habitat. Further, during over-winter months when eagles forage below Minidoka Dam, the existing spillway area is ice-covered, thereby providing no foraging opportunities for bald eagles.

Under the No Action alternative, bald eagle activity on Lake Walcott will continue consistent with current bald eagle activity. No impacts to bald eagles are anticipated under the No Action alternative.

It is likely that construction activities will occur periodically for maintenance, repair, or replacement of the deteriorating piers. See section above under Utah valvata for a detailed description of potential construction impacts associated with ongoing spillway maintenance requirements.

No impacts to bald eagles are anticipated as a result of Alternative B or C.

Yellow-billed Cuckoo

Yellow-billed cuckoos have never been observed in riparian habitat along Lake Walcott. Although small isolated pockets of habitat exist along Lake Walcott, it is not anticipated that yellow-billed cuckoos will occupy the habitat due to its isolated locations and lack of connectivity. Current reservoir operations support the existing habitat and will continue to do so under the No Action alternative.

It is likely that construction activities will occur periodically for maintenance, repair, or replacement of the deteriorating piers. See section above under Utah valvata for a detailed description of potential construction impacts associated with ongoing spillway maintenance requirements.

The yellow-billed cuckoo is currently a candidate species for the assessment area. However, to date, no yellow-billed cuckoos have been documented within 160 miles of the assessment area. Further, very limited yellow-billed cuckoo habitat exists in the assessment area, making the presence of this species highly unlikely. It is anticipated there would be no impacts to yellow-billed cuckoos associated with either Alternatives B or C.

Geology, Soils, and Flood Plain

Geology

The No Action alternative will result in the continuance of normal operations and maintenance that will have no impact on the basalt rock in the project area.

Alternatives B and C require excavation into the basalt rock to provide a foundation for the new spillway. Short-term impacts would occur from the excavation and stockpiling of the rock and the transport and wasting of the construction spoil material.

Soils

The No Action Alternative will result in the continuance of normal operations and maintenance that will have no impacts on soils in the project area.

Alternatives B and C would result in an impact on soils primarily related to the staging and waste areas. Construction activities in and around the staging and waste areas would create short-term impacts from the disturbance of vegetation and soil compaction. Impacts would be mitigated.

High winds could produce dust that would call for dust abatement procedures through the construction period. Piles of unconsolidated material may need to be covered or kept damp to keep the dust down.

Flood Plain

The narrow flood plain bordering the entrenched river would not be impacted by the alternatives. During flood control releases under Alternatives B and C, the increased discharges may redistribute bedload sediments in the river but would not adversely impact the flood plain areas.

Cultural Resources

There would be no immediate adverse impacts to the historic spillway and headworks under the No Action alternative. However, delaying spillway replacement will prolong the deteriorating condition of the existing spillway, causing repairs that could eventually render the historic site no longer eligible for the National Register.

None of the alternatives would adversely affect significant archaeological properties.

Alternatives B and C have greater potential for adverse impacts than the No Action alternative.

Alternatives B and C would adversely impact the historic integrity of Minidoka Dam, which is listed on the National Register of Historic Places. Primary impacts from both alternatives would be due to removal of the existing spillway and replacement with a new spillway. Alternative B includes additional impacts, primarily from construction of new North Side and new South Side canal headworks, and removal of a historic bridge at the North Side Canal.

Indian Trust Assets

The No Action alternative would result in the continuance of current conditions at the existing spillway. Indian Trust Assets (ITAs) that exist on these Federal lands are the right to hunt and the right to fish. Because the United States would retain title, and no operations would change, there would be no effect on ITAs.

Alternative B would temporarily affect fishing and hunting rights in the direct vicinity of the new spillway and canal headworks during construction. These fishing and hunting rights would be restored at the completion of the project.

Under Alternative C, expected impacts from construction and dewatering of the new spillway would be identical to the impacts described for Alternative B.

Sacred Sites

Under the No Action alternative, the existing spillway will continue operations and maintenance without change. Within the guidelines established by Executive Order 13007, Reclamation would continue to ensure that its actions do not adversely affect Indian sacred sites. If sacred sites are present or become known, access and ceremonial use of those sites will be accommodated to the most practicable extent.

There are no known Indian sacred sites in the area of the existing spillway or the adjacent area surrounding the project. There is potential of uncovering a sacred location if the water is dropped below normal management levels for the existing spillway replacement under both Alternatives B and C. No impacts are expected from the construction work when replacing the headworks under Alternative C.

Recreation

Under the No Action alternative, use restrictions in 43 CFR Part 423 will be in place indefinitely, precluding swimming, tubing, and wading in the area below the spillway as well as ice fishing on Lake Walcott within 300 yards of the existing spillway, dam, switchyard, and related facilities. Ice fishermen will be displaced either to the northeast where they will have to pay State Park entrance fees or to other areas to ice fish.

Alternatives B and C would have mostly positive impacts on fishing access, birding access, and access to people with disabilities. The new parking area and resurfaced bridge would provide new recreational opportunities to people with disabilities and others, including birders, who would have avoided the area below the existing spillway because of difficult pedestrian access over uneven terrain. The bridge would allow continued public access to the area north of the discharge channel below the new radial gates, despite the loss of existing spillway catwalk access. Therefore, fishermen would have the unique opportunity to fish both the old and new sets of new radial gates from immediately below their outflow points. Enhanced fish habitat created during excavation for the installation of the new radial gates, in concert with the new piped spillway flows, may improve the quality of fishing in the spillway area. Improved access coupled with improved fishing opportunities would likely increase visitation to the area below the new spillway in the long run.

Alternatives B and C would have adverse impacts on all recreational access currently dependent upon the existing spillway catwalk. However, visitor numbers using the existing spillway catwalk are small relative to visitor numbers in the Lake Walcott area; therefore, adverse impacts would be minimal. The new spillway would be permanently closed to public access. Ice fishermen would no longer be able to go over the new spillway or new South Side Canal headworks to get to the ice. These alterations in access would shift winter recreation use to the northeast, away from the new spillway and dike. Ice fishermen would

have to walk further to disperse themselves, bank fishermen would not be able to access the new or old dikes, and pedestrian access to the south side of the river would be much more difficult without the use of the existing spillway catwalk.

Under Alternative C, expected impacts from construction and dewatering of the new spillway would be identical to the impacts described for Alternative B.

Aesthetics

Alternative A will result in no new impacts to aesthetic values except for occasional construction activities that will be expected due to intermittent pier replacement.

Due to the overall reduction in visual contrast as a result of the simplicity of the new spillway design in the Proposed Action, Alternative B would have less visual impact on aesthetic values than the No Action alternative.

Impacts for Alternative C would be as described in Alternative B, except the existing headworks would not be replaced.

Noise

Temporary noise and groundborne vibration generated by equipment and machinery associated with pier replacement and headworks maintenance under the No Action alternative will attenuate to acceptable levels at the park and private residences. The potential temporary noise and groundborne vibration impacts generated by equipment, machinery, and blasting associated with Alternatives B and C will attenuate to acceptable levels at the park and private residences. Noise impacts associated with implementation of any of the alternatives would be temporary and less than significant.

Following maintenance or construction, noise levels would be the same as the current condition; therefore, there would be no operational noise impacts.

Noise impacts are localized in nature and decrease substantially with distance. No other construction projects are currently located or expected in the immediate vicinity of Minidoka Dam. Therefore, the No Action alternative and Alternatives B and C would not contribute to cumulative construction noise impacts.

Air Quality

Potential air quality impacts would be associated with pier replacement and headworks maintenance under the No Action alternative and construction of the new spillway with or without headworks replacement under Alternatives B and C, respectively. The primary types of air pollution would be combustible pollutants from equipment exhaust and fugitive dust

particles from disturbed soils becoming airborne. To avoid violation of air quality standards the contractor would be required to implement and follow all prescribed BMPs to control equipment exhaust and fugitive dust. Compliance with all applicable the Department of Environmental Quality emission standards and BMPs including those for operation of portable rock crushers, and concrete and/or asphalt batch plants would reduce potential impacts to less than significant levels. Therefore, air quality impacts associated with implementation of any of the alternatives would be temporary and less than significant.

Air quality following maintenance or construction would be the same as the current condition; therefore, there would be no operational air quality impact.

Air quality impacts associated with the No Action alternative or Alternatives B and C are localized in nature and decrease substantially with distance. No other construction projects are currently located or expected in the immediate vicinity of Minidoka Dam. Therefore, the No Action alternative or Alternatives B and C would not contribute to cumulative construction air quality impacts.

Socioeconomics

No construction-related expenditures outside of annual operation and maintenance (O&M) are expected for the No Action alternative.

Under Alternatives B and C, construction-related expenditures, mainly due to wages spent inside the study area result in increased employment, output, and labor income. These impacts would be spread over the construction period and would vary year-by-year proportionate to actual expenditures. Construction-related expenditures for Alternative B would result in 291 jobs, $28.5 million in output, and $10.0 million in labor income. Construction-related expenditures for Alternative C would result in 204 jobs, $20 million in output, and $7.0 million in labor income.

Expenditures related to annual O&M made inside the study area will result in an increase in jobs, output, and labor income. Annual O&M expenditures are expected to increase under the No Action alternative as the existing spillway and headworks continue to deteriorate. Under the No Action alternative, annual O&M related expenditures will increase resulting in 3 jobs, $292,300 of output, and $111,700 of labor income.

Annual O&M expenditures for Alternatives B and C would also result in an increase in employment, output, and labor income; however they are less than those anticipated with the No Action alternative. Alternative B’s annual O&M expenditures result in 1 job, $74,600 output, and $28,500 labor income. Annual O&M expenditures result in 1 job, $86,000 output, $32,900 labor income for Alternative C.

Environmental Justice

No disproportionate adverse human health or environmental impacts on minority and/or low-income populations have been identified for the No Action alternative.

Construction associated with the replacement of the existing spillway with or without canal headworks replacement would most directly impact those recreating or pursuing other activities in the immediate dam and reservoir area. The two county study area potentially affected by implementation of Alternatives B or C has a greater percentage of minority and low-income populations than the State of Idaho. However, there would be no disproportionate adverse impact to those populations; everyone in the area, especially those nearest the construction areas would be equally affected.

Other than minor construction impacts that are temporary, no adverse impacts to aquatic-related resources have been identified. No subsistence level of use of renewable natural resources by any population has been identified in the project area. No adverse human health impacts for any human population have been identified. Therefore, construction of a replacement spillway with or without headworks replacement would not have an adverse environmental justice impact for Alternatives B and C.

Summary Table Comparison of Alternatives

Table ES-1. Summary comparison of alternatives.

Resource	Alternative A – No Action	Alternative B – Spillway and Headworks Replacement	Alternative C – Spillway Replacement
Hydrology and Reservoir Operations			
o Lake Walcott Target Elevations	4245 feet (April through October)	Dry water type years: 4245 feet (November through August). Average/wet water type years: 4245 feet (November through September)	Same as Alternative B.
	4240 feet (November through March)	Dry water type years: 4240 feet (September through October). Average/wet water type years: 4240 feet (October)	Same as Alternative B.
o Target Flows below Minidoka Dam (includes both powerplant and spillway flows measured at the USGS gage)	500 cfs	Dry water type years: 525 cfs. Average/wet water type years: 600 cfs	Same as Alternative B.

Resource	Alternative A – No Action	Alternative B – Spillway and Headworks Replacement	Alternative C – Spillway Replacement
o Spillway Flow Targets	1,300 cfs (April 15 through June 30) 1,900 cfs (July 1 through August 31) 1,300 cfs (September 1 through September 15) First 5,035 cfs through the powerplant (April 1 through April 14 and September 16 through October 31). Next 1,300 cfs over the existing spillway additional flows above a total of 6,335 cfs through powerplant until hydraulic capacity reached, then excess flow is discharged over the existing spillway 0 cfs (October to March)	Minimum 500 cfs (April through October) Up to 100-cfs (November through March)	Same as Alternative B. Same as Alternative B.
Groundwater	Continuation of current groundwater conditions, groundwater levels, and seepage flows.	Total measured seepage volume would increase by about 4 percent downstream of the north abutment (maximum measured seepage is 860 gpm). Water levels in the sand interbed will increase by about 1.5 feet and basalt water levels will increase by about a foot. Water levels in the regional basalt aquifer would remain below the elevation of the Snake River so there would be no change of flow between the river and aquifer.	Same as Alternative B.
Water Quality	Reservoir bank erosion and upstream reach (in-channel) suspension of sediment during drawdown would continue. No change in downstream reach	Brief periods of elevated turbidity in the spillway area due to construction activities; no change in downstream reaches. Slight sediment delivery reduction from upstream reaches.	Same as Alternative B.
Minidoka Hydropower Generation	No change.	Increase in gross generation and economic value.	Same as Alternative B.
Aquatic Biota Reservoir Fish Community	Extensive areas of aquatic macrophytes along the littoral zone of Lake Walcott provide good spawning and rearing habitat and protection from predation. However the lengthy drawdown period during winter can force juveniles from the cover of	The change in reservoir operations will not adversely affect aquatic macrophytes which provide spawning and rearing habitat and cover from predation. Juvenile fish that rely on the cover of aquatic macrophytes or lava rock and boulder habitat for predator escape will benefit through the reduced period of reservoir drawdown.	Same as Alternative B.

Resource	Alternative A – No Action	Alternative B – Spillway and Headworks Replacement	Alternative C – Spillway Replacement
	aquatic macrophytes, as well as lava rock and boulders, increasing their exposure to predation. While this can increase prey availability for large predators, it can reduce overall juvenile survival of species such as smallmouth bass.	Overall there will be a benefit to the fish community in general and smallmouth bass in particular because of the reduction in drawdowns and improved juvenile survival. Approximately 5.2 acres of reservoir habitat would be created.	
Spillway Fish Community	No effect to the fish species present in the spillway area will occur.	With proper implementation of BMPs there would be no adverse construction impacts. Replacing the flows that occur as a result of leakage with pipes that will deliver a minimum of 500 cfs in summer and 100 cfs in winter will allow a similar fish population to continue in the spillway area. Fish entrainment rates would be similar to the present condition.	Same as Alternative B.
Terrestrial Biota			
Vegetation	Existing upland and riparian vegetation will not change and will not be disturbed by construction except for maintenance and the gradual replacement of piers.	Little or no change to existing upland and riparian vegetation. More stable water levels would allow better control of trespass grazing on the Minidoka Refuge by reducing the opportunity for cattle to go around fences during reservoir drawdown. No effects to noxious weed control efforts with the exception of Eurasian milfoil which may increase because of the elimination of winter drawdown and subsequent freezing. Spring full pool may allow better survival of riparian plantings. Temporary drawdowns are generally beneficial for emergent vegetation which exists in the drawdown zone of the reservoir. Overall extent of emergent vegetation should not be affected. Reduction of approximately 5.2 acres of spillway habitat. Reservoir wetlands – Elimination of winter drawdown and the implementation of late summer, early fall short-term drawdowns during the irrigation season would not adversely affect emergent vegetation in the reservoir littoral	Same as Alternative B.

Resource	Alternative A – No Action	Alternative B – Spillway and Headworks Replacement	Alternative C – Spillway Replacement
		zone. Creation of approximately 5.2 acres of reservoir habitat.	
Spillway Wetlands	There will be no changes in wetland function or extent.	Replacing the flows that occur as a result of leakage with 5 pipes that will deliver a minimum of 500 cfs in summer and 100 cfs in winter will allow the wetland to continue to function. The overall extent of the wetland should remain unchanged. The construction of the new headgates would primarily be completed outside the wetland area so would have little impact A small amount (less than 1/10 of an acre) of vegetation in the spillway area would be eliminated with the construction of the new spillway and service road	Same as Alternative B.
Avian, Mammalian, Amphibian, and Reptile Communities	No changes in the wildlife community would occur.	Little or no effect to avian communities, except temporary disturbance of birds in the construction area. No effect to large mobile wildlife such as deer and antelope. Muskrat and beaver populations would likely increase. Increasing beaver populations may put the few cottonwoods at risk. Elimination of winter drawdown would likely benefit amphibians. Wildlife species would be temporarily disturbed during the approximate 31 months of construction and may experience some increased mortality due to collisions with heavy equipment on the haul road, or as a result of displacement to already occupied habitats. The presence of humans may also cause some wildlife species to avoid the area while construction is taking place. Avoidance of the area by some species should change when construction is completed and the construction noise stops. Blasting to remove rock in the spillway area is likely to result in temporary adverse impacts to reptiles and amphibians including mortality of any individuals in the immediate area of the blasting activities.	Under Alternative C the new headworks would not be built only the existing spillway sections would be constructed. These would primarily be completed outside the wetland area and should have no impact.

Resource	Alternative A – No Action	Alternative B – Spillway and Headworks Replacement	Alternative C – Spillway Replacement
Threatened and Endangered Species			
Spillway Flow	Operations – No winter release; 1,300 to 1,900 cfs irrigation season No change in habitat for, ESA snails, wetland acres, bald eagle, or Yellow-billed cuckoo habitat No construction	Operations – Up to 100 cfs in winter; 500 cfs minimum in summer 2005 BiOp operations – Summer reduction; winter increase 5.2 acres converted from spillway habitat to permanently watered reservoir habitat. ESA snail - Winter Improvement, no summer change Eagle Habitat – Winter Improvement; no summer change Yellow-billed cuckoo – Winter improvement; summer improvement Construction – Reduce flows maintained	Same as Alternative B.
Reservoir	Operations – 5-foot winter draft; April refill No change in habitat for, ESA snails, wetland acres, bald eagle, or Yellow-billed cuckoo habitat No construction	Operations – 5-foot winter draft; December refill 2005 BiOp operations – Earlier pre-irrigation season fill 5.2 acres converted from spillway habitat to permanently watered reservoir habitat. ESA snail – No change Eagle Habitat –No change Yellow-billed cuckoo – No change Construction – Annual operations maintained	Same as Alternative B.
Geology	Weathering and erosion of the exposed rock would continue at a very slow rate. Over time some foundation areas below the existing spillway will be affected by erosion from spillway discharges and require treatment such as	Rock excavation and soil concrete fill would be required along the new spillway alignment and in the foundation of the new headworks. Staging and waste areas are required for using and disposal of construction materials.	Rock excavation and soil concrete fill would be required along the new spillway alignment. Staging and waste areas are required for using and disposal of construction materials.

Resource	Alternative A – No Action	Alternative B – Spillway and Headworks Replacement	Alternative C – Spillway Replacement
	concrete aprons over the rock.		
Soils	Normal operations and maintenance would have no impacts on soils in the project area.	Construction activities would cause disturbance of vegetation and compaction of soil from traffic, stockpiled material, and construction supplies. Dust abatement at stockpiles is necessary.	Construction activities would cause disturbance of vegetation and compaction of soil from traffic, stockpiled material, and construction supplies. Dust abatement at stockpiles is necessary. Potential staging and waste areas may not be used or perhaps reduced in size.
Flood Plain	Under continuance of existing spillway and powerplant operating conditions at the site no new impacts on the existing flood plain are anticipated.	During flood control releases that result in higher spillway flows the increased discharge may redistribute bedload sediments in the river but would not adversely impact the flood plain areas.	Similar impacts as Alternative B.
Cultural Resources	Spillway replacement will not be implemented; no immediate effect on the historic dam. However, no action could result in major changes later from repairs that will affect the dam's National Register status. There will be no effect on archaeological sites.	Impacts from removal of original components of the historic dam would include: the existing spillway, the historic bridge at the North Side Canal, the South Side Canal headworks, and the historic lining material on the North Side Canal. Additional impacts would result from introducing new elements: new overflow sections downstream of the existing spillway; new North Side Canal and South Side Canal headworks structures; new North Side Canal lining; a new radial gate section with 12 radial gate bays; accessible parking area and security fences; new service roads; and new concrete dikes. These new elements adversely affect the integrity and historic environment of the dam. Of the three alternatives, Alternative B would have the greatest impact to the dam's historic integrity. There would be no effect on archaeological sites.	Impacts to dam integrity would be at a reduced scale relative to Alternative B. Impacts from removal of original components of the historic dam would include removal of the existing spillway. Impacts from introducing new elements would include: new overflow sections; a new radial gate section; accessible parking area and security fences; new service roads; and new concrete dikes. These new elements would adversely affect the integrity and historic environment of the dam. There would be no effect on archaeological sites.
Indian Trust Assets (ITAs)	No change, assets will not be affected	Alternative B would temporarily affect fishing and hunting rights in the direct vicinity of the new spillway and canal headworks during construction. These fishing	Expected impacts from construction and dewatering would be identical to the impacts described for

Resource	Alternative A – No Action	Alternative B – Spillway and Headworks Replacement	Alternative C – Spillway Replacement
		and hunting rights would be restored at project completion	Alternative B.
Sacred Sites	No known sites in the area, sacred sites will not be affected	There are no known Indian sacred sites in the area of the existing spillway or the adjacent area surrounding the project. There is potential of uncovering a sacred location if the water is dropped below normal management levels for the spillway replacement. No impacts are expected from the construction work when replacing the headworks.	There are no known Indian sacred sites in the area of existing spillway or the adjacent area surrounding the project. There is potential of uncovering a sacred location if the water is dropped below normal management levels for the spillway replacement.
Recreation	Use restrictions in 43 CFR Part 423 would be in place indefinitely	Ice fishing use would shift northeastward; bank fishing from the existing dike would cease if private landowner denied public access; no access would be provided to the new dike; all recreation using existing spillway would cease; fishing would be available immediately below outflow points of both the existing radial gates and the new radial gates; more difficult to access south side of river; public access to the south half of area below the new spillway including existing radial gates improved; accessible parking constructed and fishing access improved for people with disabilities, which could result in increased visitation below the new spillway.	Same as Alternative B.
Aesthetics	No change; occasional construction activities would be expected due to intermittent pier replacement.	Short-term impacts associated with activities during construction of the new spillway and headworks. New spillway would have less visual impact than existing spillway.	Short-term impacts associated with activities during construction of the new spillway. New spillway would have less visual impact than existing spillway.
Noise	Temporary noise and groundborne vibration generated by equipment and machinery associated with pier replacement and headworks maintenance will attenuate to acceptable levels at the park and private residences. Noise impacts associated with implementation will be temporary and less than significant.	Potential temporary noise and groundborne vibration impacts generated by equipment and machinery used during construction of the new spillway and headworks replacement would attenuate to acceptable levels at the park and private residences. Noise impacts associated with implementation would be temporary and less than significant. Following construction noise levels	Same as Alternative B.

Resource	Alternative A – No Action	Alternative B – Spillway and Headworks Replacement	Alternative C – Spillway Replacement
	Following maintenance noise levels will be the same as the current condition; therefore, there would be no operational noise impact. Noise impacts are localized in nature and decrease substantially with distance. No other construction projects are currently located or expected in the immediate vicinity of Minidoka Dam. Therefore, pier replacement and headworks maintenance will not contribute to cumulative construction noise impacts.	would be the same as the current condition; therefore, there would be no operational noise impact. Noise impacts are localized in nature and decrease substantially with distance. No other construction projects are currently located or expected in the immediate vicinity of Minidoka Dam. Therefore, replacement of the existing spillway and headworks would not contribute to cumulative construction noise impacts.	
Air Quality	Compliance with all applicable DEQ emission standards and BMPs would reduce potential impacts to less than significant levels. Air quality impacts associated with pier replacement and existing headworks maintenance are localized in nature and decrease substantially with distance. No other construction projects are currently located or expected in the immediate vicinity of Minidoka Dam. Air quality following maintenance would be the same as the current condition; therefore, there would be no operational air quality impact.	Compliance with all applicable DEQ emission standards and BMPs including those for operation of portable rock crushers, and concrete and/or asphalt batch plants would reduce potential impacts to less than significant levels. Thus air quality impacts associated with Alternative B would be temporary and less than significant. Air quality following construction would be the same as the current condition; therefore, there would be no operational air quality impact. Air quality impacts associated with the construction of the new spillway and headworks are localized in nature and decrease substantially with distance. No other construction projects are currently located or expected in the immediate vicinity of Minidoka Dam.	Same as Alternative B.
Socioeconomics	No construction related impacts. Annual O&M related expenditures will increase resulting in 3 jobs, $292,300 of output, and $111,700 of labor income.	Construction-related expenditures, mainly due to wage earner's spending, result in 291 jobs, $28.5 million in output, and $10.0 million in labor income. These impacts are spread over the construction period. Annual O&M expenditures result in 1 job, $74,600 output, and $28,500	Construction-related expenditures, mainly due to wage earner's spending, result in 204 jobs, $20 million in output, and $7.0 million in labor income. These impacts are spread over the construction period. Annual O&M expenditures

Resource	Alternative A – No Action	Alternative B – Spillway and Headworks Replacement	Alternative C – Spillway Replacement
		labor income; all categories of impacts are less than No Action.	result in 1 job, $86,000 output, $32,900 and labor income, all categories of impacts are less than No Action.
Environmental Justice	No disproportionate adverse human health or environmental impacts on minority and/or low-income populations have been identified.	No disproportionate adverse human health or environmental impacts on minority and/or low-income populations have been identified.	Same as Alternative B.

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ATTACHMENT A – FIGURES

List of Figures

Figure ES-1. Minidoka Dam EIS proposed alternatives.

Figure ES-2. Alternative A – No Action.

Figure ES-3. Alternative A – Minidoka Dam spillway replacement recreation/public use areas.

Figure ES-4. Alternative B – Spillway and headworks replacement.

Figure ES-5. Alternative B excavation areas.

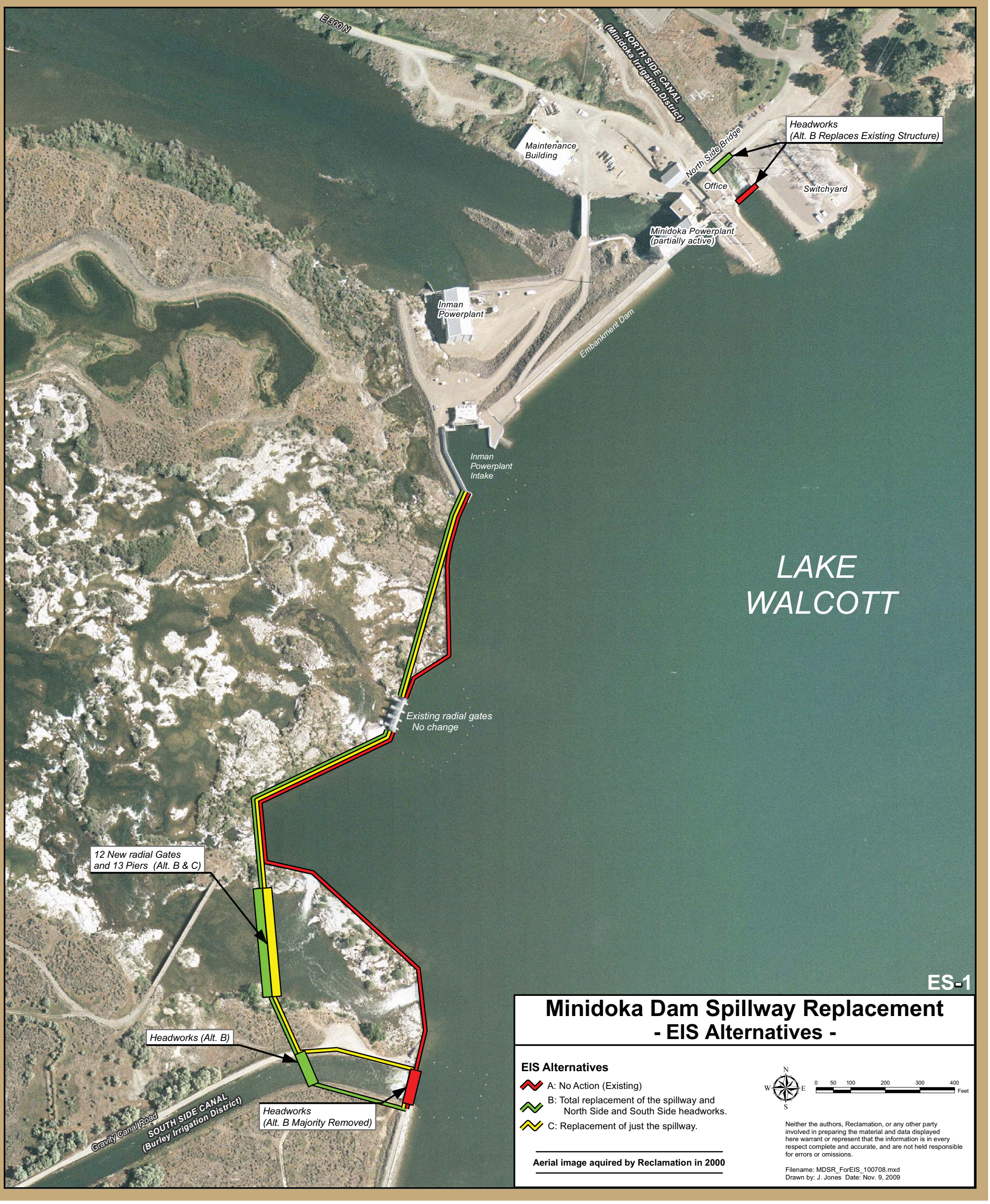
Figure ES-6. Minidoka Dam spillway replacement proposed biological flows.

Figure ES-7. Alternative B – Minidoka Dam spillway replacement recreation/public use areas.

Figure ES-8. Minidoka Dam spillway replacement staging, waste areas, and construction closure points.

Figure ES-9. Alternative C – Spillway Replacement.

RECLAMATION *Managing Water in the West*



Minidoka Dam Spillway Replacement
- EIS Alternatives -

EIS Alternatives

- A: No Action (Existing)
- B: Total replacement of the spillway and North Side and South Side headworks.
- C: Replacement of just the spillway.

Aerial image aquired by Reclamation in 2000

N W E S

0 50 100 200 300 400 Feet

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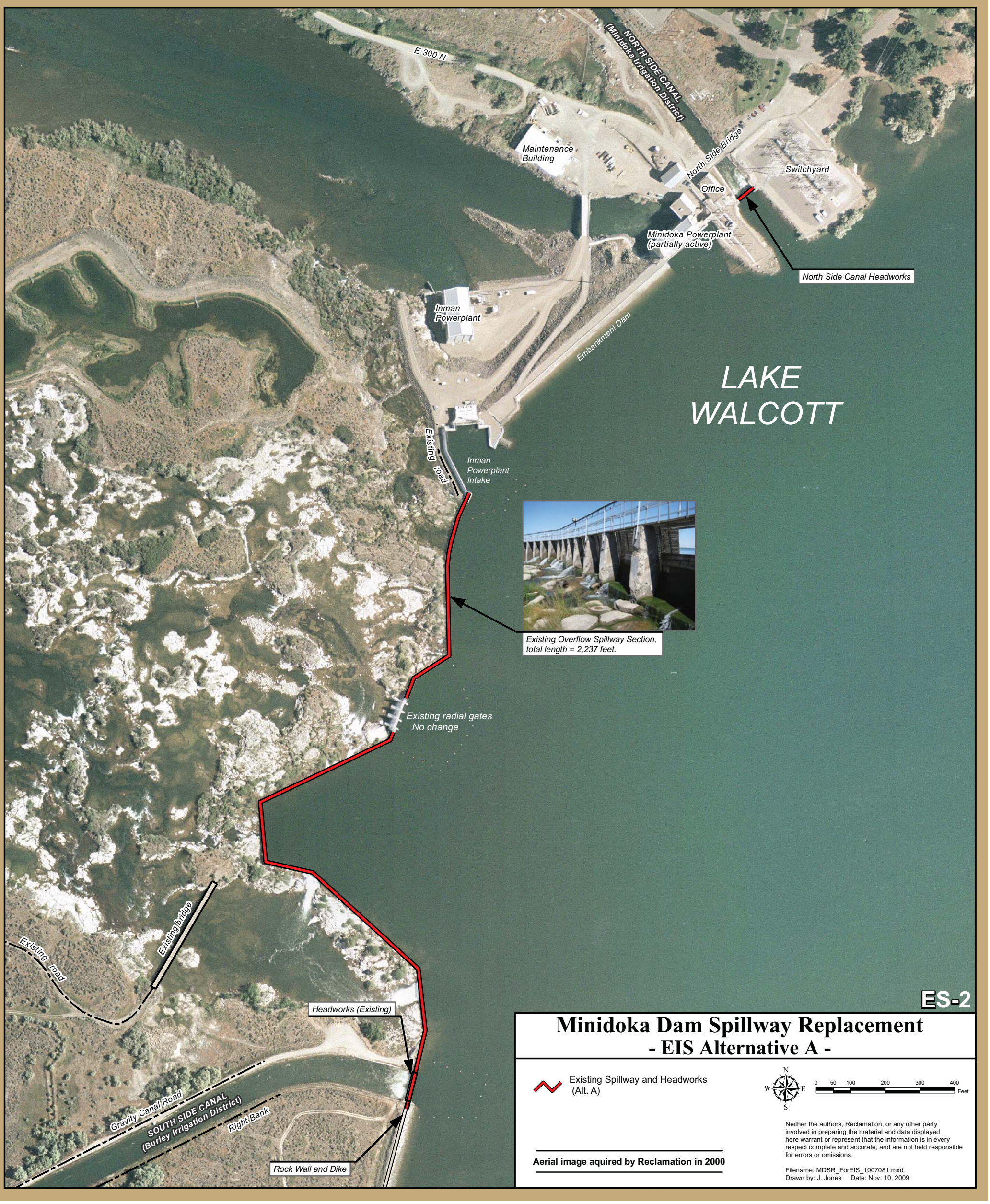

Minidoka Dam Spillway Replacement
- EIS Alternative A -

Existing Spillway and Headworks (Alt. A)

N W E S

0 50 100 200 300 400 Feet

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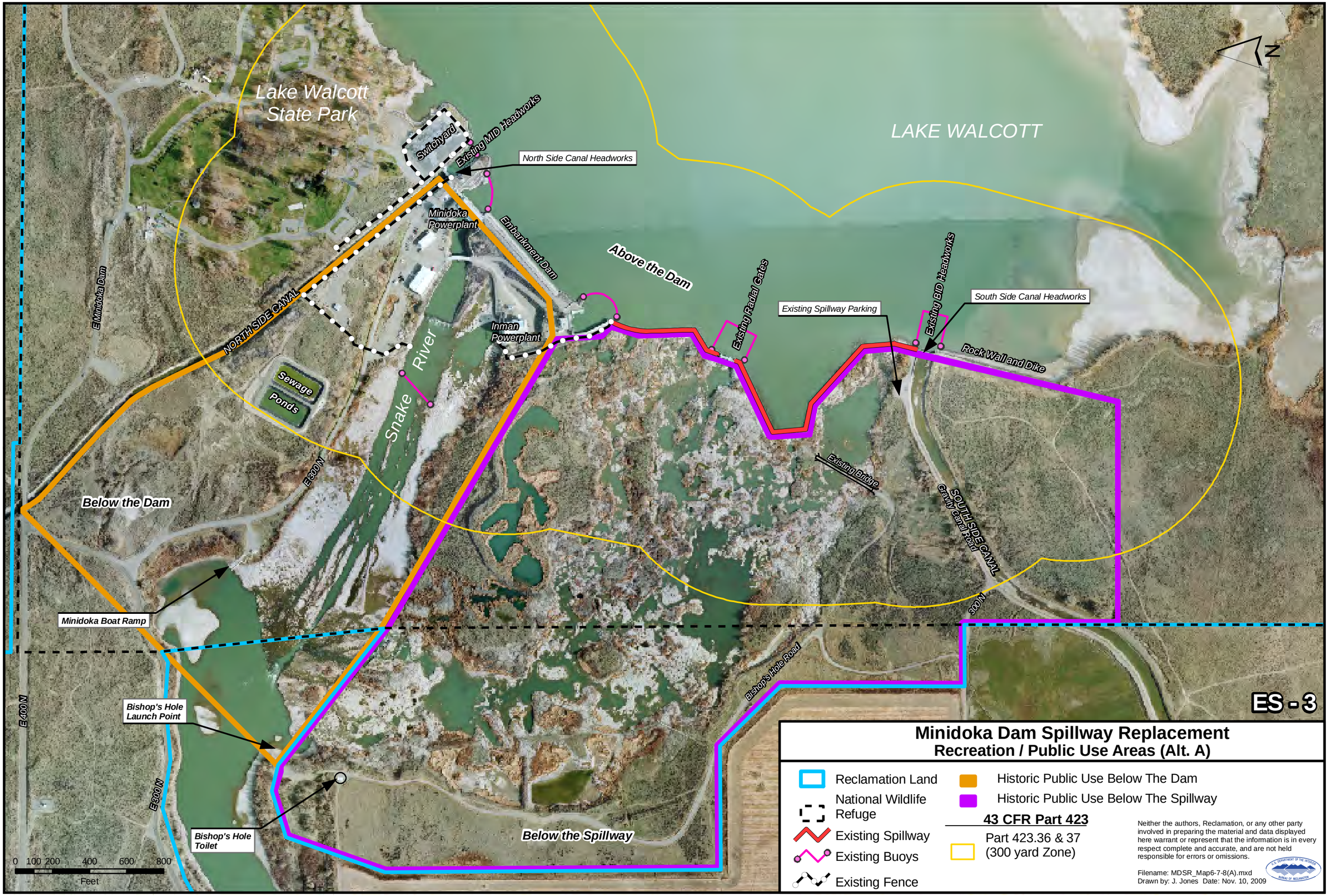
Lake Walcott State Park
LAKE WALCOTT
Switchyard
Existing MID Headworks
North Side Canal Headworks
Minidoka Powerplant
Embankment Dam
Above the Dam
Existing Radial Gates
Existing Spillway Parking
Existing BID Headworks
South Side Canal Headworks
Rock Wall and Dike
E Minidoka Dam
NORTH SIDE CANAL
Inman Powerplant
Snake River
Sewage Ponds
E300 N
Existing Bridge
SOUTH SIDE CANAL
Gravity Canal Road
300 N
Below the Dam
Minidoka Boat Ramp
Bishop's Hole Road
E400 N
Bishop's Hole Launch Point
E300 N
Bishop's Hole Toilet
Below the Spillway
0 100 200 400 600 800
Feet
ES - 3
Minidoka Dam Spillway Replacement
Recreation / Public Use Areas (Alt. A)
Reclamation Land
National Wildlife Refuge
Existing Spillway
Existing Buoys
Existing Fence
Historic Public Use Below The Dam
Historic Public Use Below The Spillway
43 CFR Part 423
Part 423.36 & 37 (300 yard Zone)
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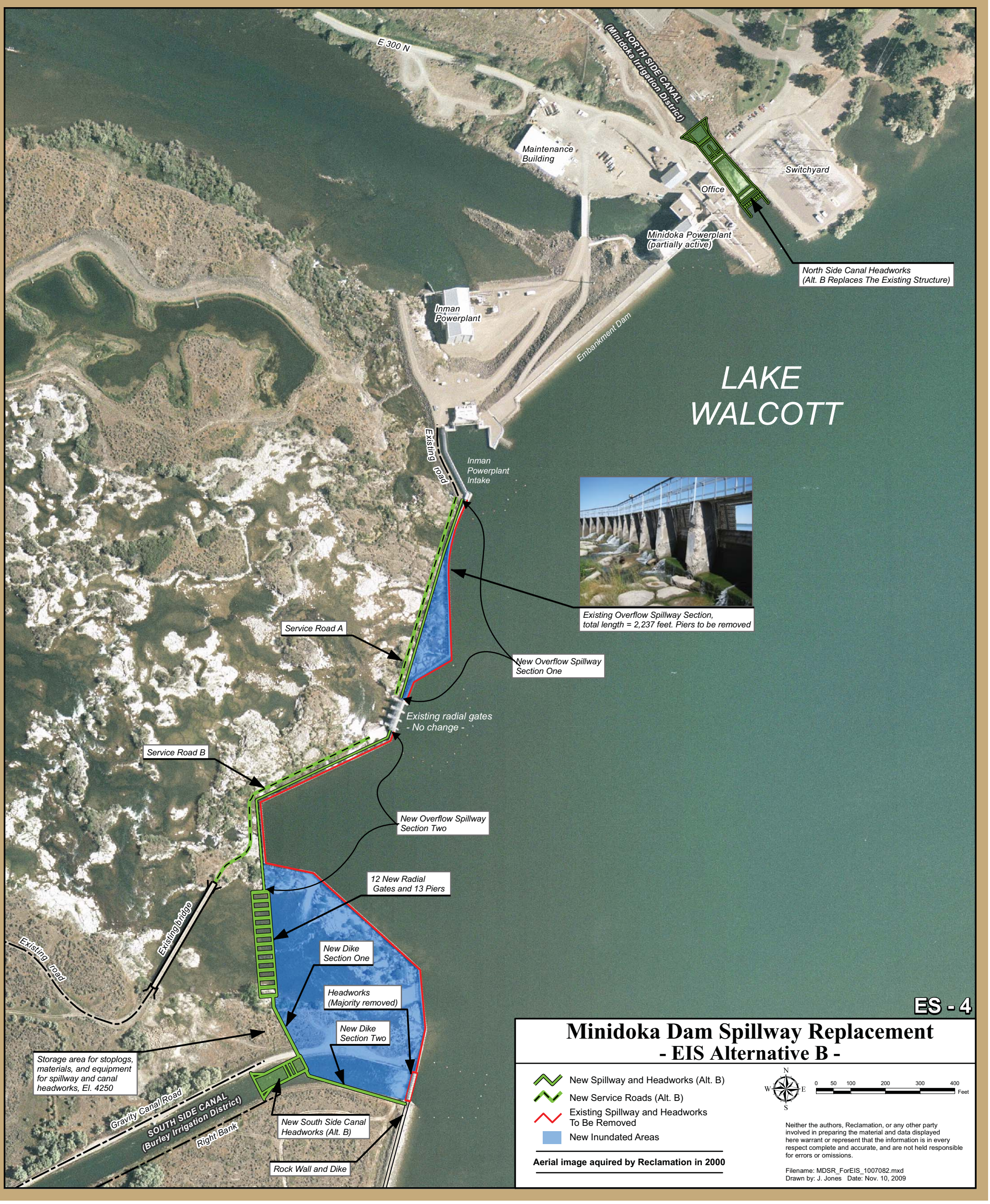

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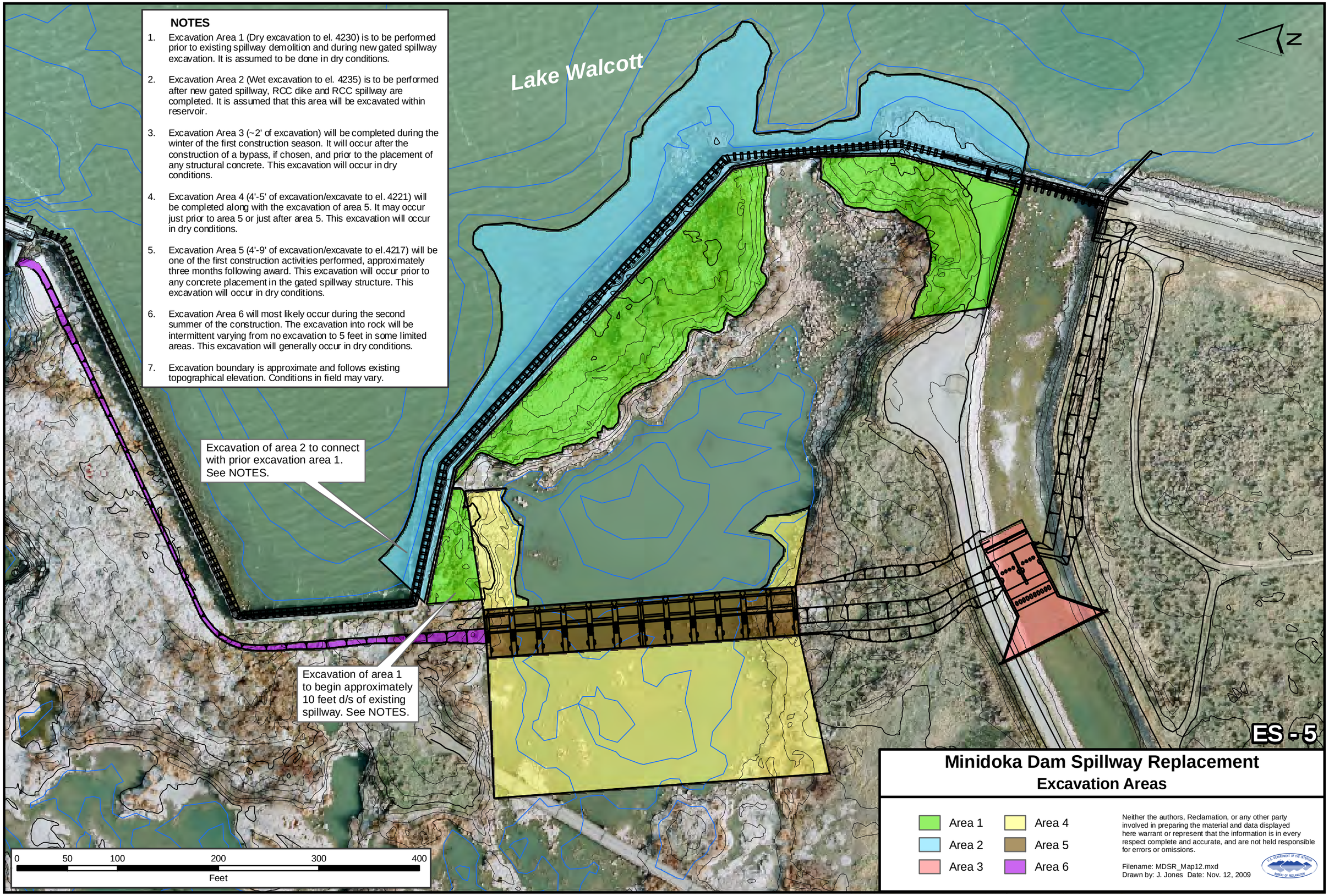

NOTES

1. Excavation Area 1 (Dry excavation to el. 4230) is to be performed prior to existing spillway demolition and during new gated spillway excavation. It is assumed to be done in dry conditions.
2. Excavation Area 2 (Wet excavation to el. 4235) is to be performed after new gated spillway, RCC dike and RCC spillway are completed. It is assumed that this area will be excavated within reservoir.
3. Excavation Area 3 (~2' of excavation) will be completed during the winter of the first construction season. It will occur after the construction of a bypass, if chosen, and prior to the placement of any structural concrete. This excavation will occur in dry conditions.
4. Excavation Area 4 (4'-5' of excavation/excavate to el. 4221) will be completed along with the excavation of area 5. It may occur just prior to area 5 or just after area 5. This excavation will occur in dry conditions.
5. Excavation Area 5 (4'-9' of excavation/excavate to el.4217) will be one of the first construction activities performed, approximately three months following award. This excavation will occur prior to any concrete placement in the gated spillway structure. This excavation will occur in dry conditions.
6. Excavation Area 6 will most likely occur during the second summer of the construction. The excavation into rock will be intermittent varying from no excavation to 5 feet in some limited areas. This excavation will generally occur in dry conditions.
7. Excavation boundary is approximate and follows existing topographical elevation. Conditions in field may vary.

Minidoka Dam Spillway Replacement

Excavation Areas

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(IS) Water released during Irrigation Season
(NIS) Water released during Non Irrigation Season.

- 50 cfs (IS) and 0 cfs (NIS)
- 300 cfs (IS) and 0 cfs (NIS)
- 50 cfs (IS) and 100 cfs minus seepage (NIS)
  Releases through point 3 will be added to any natural seepage to result in 100 cfs minimum flow all year.
  Example: If seepage is 20 cfs then 80 cfs will be released.
- When necessary to satisfy minimum flow requirements, additional releases will be made through the powerhouses. Minimum flows, comprised of both powerhouse and spillway flows, will be 525 cfs during dry water type years and 600 cfs for average and high water type years. (Measurements are taken at USGS gauge located at Howells Ferry)

Minidoka Dam Spillway Replacement
Proposed Biological Flows

New Spillway and Headworks
Existing Spillway
National Wildlife Refuge
Reclamation Land
Winter Release Flows
Water Release Gate

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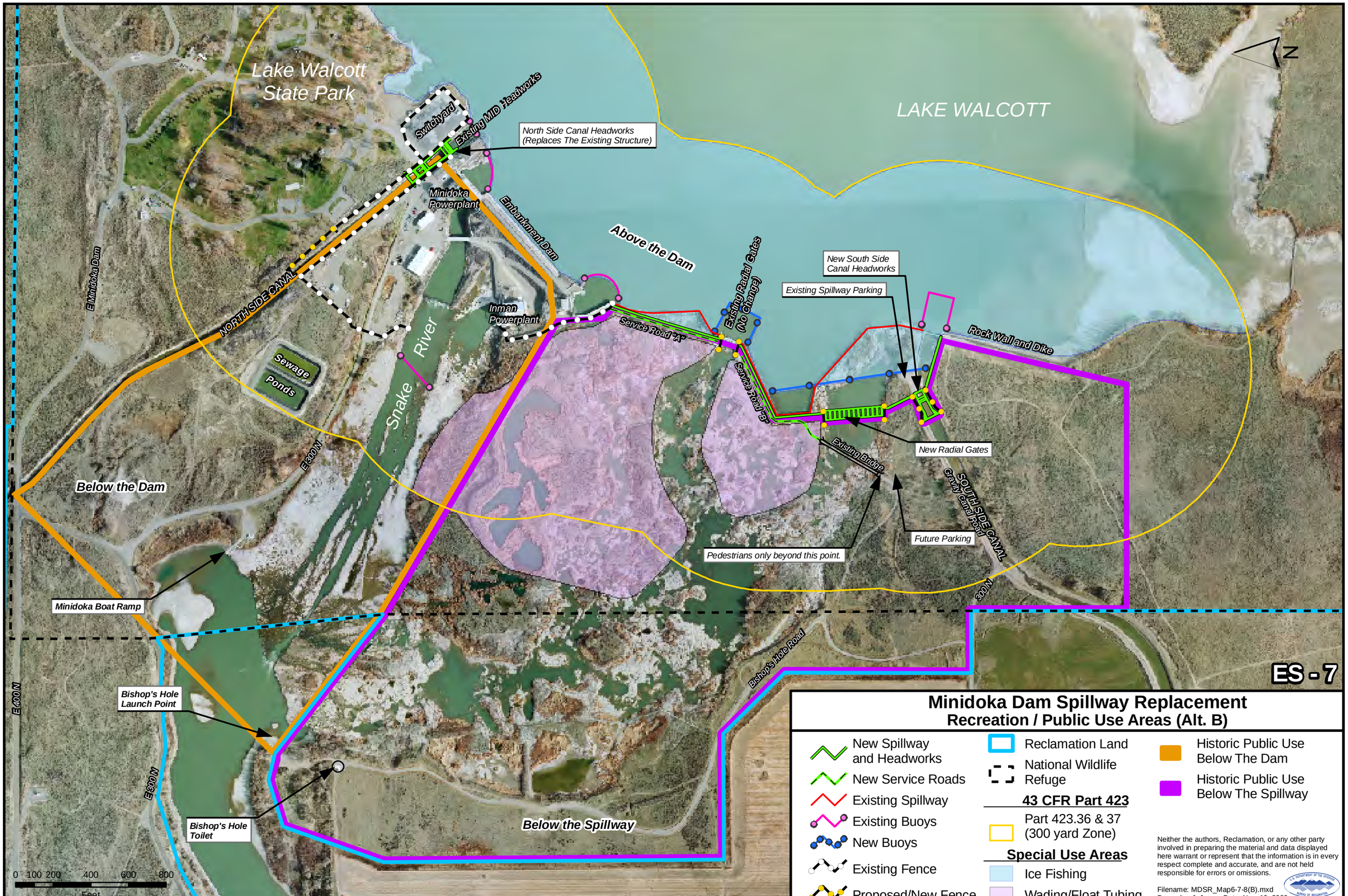
Lake Walcott State Park
LAKE WALCOTT
N
Switchyard
Existing MID Headworks
North Side Canal Headworks (Replaces The Existing Structure)
Minidoka Powerplant
Embankment Dam
Above the Dam
Existing Radial Gates (No Change)
New South Side Canal Headworks
Existing Spillway Parking
Rock Wall and Dike
Service Road "A"
Service Road "B"
Inman Powerplant
NORTH SIDE CANAL
E Minidoka Dam
Sewage Ponds
Snake River
E 300 N
Existing Bridge
New Radial Gates
SOUTH SIDE CANAL
Gravity Canal Road
Future Parking
Pedestrians only beyond this point.
300 N
Below the Dam
Minidoka Boat Ramp
Bishop's Hole Road
E 400 N
Bishop's Hole Launch Point
E 500 N
Bishop's Hole Toilet
Below the Spillway
ES - 7
0 100 200 400 600 800
Feet
Minidoka Dam Spillway Replacement
Recreation / Public Use Areas (Alt. B)
New Spillway and Headworks
New Service Roads
Existing Spillway
Existing Buoys
New Buoys
Existing Fence
Proposed/New Fence
Reclamation Land
National Wildlife Refuge
43 CFR Part 423
Part 423.36 & 37 (300 yard Zone)
Special Use Areas
Ice Fishing
Wading/Float Tubing
Historic Public Use Below The Dam
Historic Public Use Below The Spillway
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LAKE WALCOTT
Lake Walcott State Park
Staging Area
Rock & Soil Waste Area
Switchyard
Existing MID Headworks
North Side Canal Headworks (Replaces The Existing Structure)
NORTH SIDE CANAL
Minidoka Powerplant
Embankment Dam
Inman Powerplant
E Minidoka Dam
Sewage Ponds
Staging and Waste Area
E300N
Snake River
Existing Radial Gates (No Change)
South Side Canal Headworks (Majority Removed)
New South Side Canal Headworks
Existing BID Headworks
Rock Wall and Dike
Existing Bridge
New Radial Gates
SOUTH SIDE CANAL
Gravity Canal Road
Staging and Waste Area
Staging Area
Bishop's Hole Road
E300N
0 100 200 400 600 800
Feet
ES - 8
Minidoka Dam Spillway Replacement
Staging, Waste Area & Construction Closure Points
Staging and Waste Areas
National Wildlife Refuge
Reclamation Land
Proposed/New Fence
Existing Fence
Existing Spillway
New Spillway and Headworks
New Buoys
Existing Buoys
Limits of Construction Zone (No Public Access)
Approx. Closing Points During Construction
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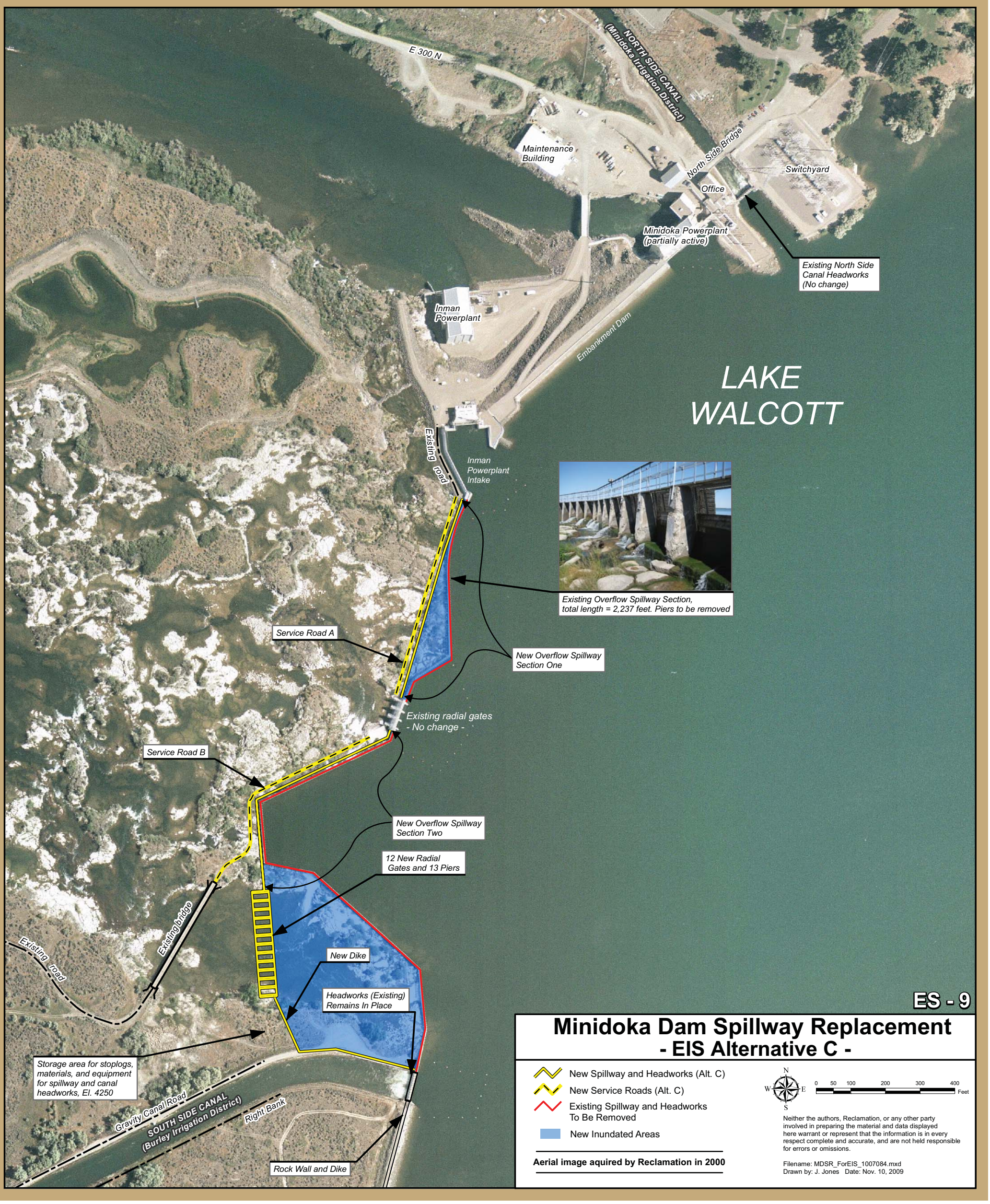
E 300 N
NORTH SIDE CANAL (Minidoka Irrigation District)
Maintenance Building
North Side Bridge
Switchyard
Office
Minidoka Powerplant (partially active)
Existing North Side Canal Headworks (No change)
Inman Powerplant
Embankment Dam
LAKE WALCOTT
Existing road
Inman Powerplant Intake
Existing Overflow Spillway Section, total length = 2,237 feet. Piers to be removed
Service Road A
New Overflow Spillway Section One
Existing radial gates - No change -
Service Road B
New Overflow Spillway Section Two
12 New Radial Gates and 13 Piers
Existing bridge
Existing road
New Dike
Headworks (Existing) Remains In Place
Storage area for stoplogs, materials, and equipment for spillway and canal headworks, El. 4250
Gravity Canal Road
SOUTH SIDE CANAL (Burley Irrigation District)
Right Bank
Rock Wall and Dike
ES - 9
Minidoka Dam Spillway Replacement
- EIS Alternative C -
New Spillway and Headworks (Alt. C)
New Service Roads (Alt. C)
Existing Spillway and Headworks To Be Removed
New Inundated Areas
Aerial image aquired by Reclamation in 2000
N
W
E
S
0 50 100 200 300 400 Feet
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ACRONYMS AND ABBREVIATIONS

Acronyms and Abbreviations

ACHP	Advisory Council on Historic Preservation
ADA	American with Disabilities Act
ANSI	American National Standards Institute
dB	decibel
dBA	A-weighted sound level
BID	Burley Irrigation District
BiOp	Biological Opinion
BLM	Bureau of Land Management
BMP	Best management practice
BP	Before present
BPA	Bonneville Power Administration
CAA	Clean Air Act
CCC	Civilian Conservation Corps
CEQ	Council on Environmental Quality
cfs	Cubic feet per second
cm	centimeter
CNEL	Community Noise Equivalent Level
CO	Carbon monoxide
Corps	U.S. Army Corps of Engineers
CWA	Clean Water Act
DEQ	Department of Environmental Quality

EA	Environmental Assessment
EIS	Environmental Impact Statement
EO	Executive Order
ESA	Endangered Species Act
ESPAM1	Enhanced Eastern Snake Plain Model
FONSI	Finding of No Significant Impact
ft^2/day	square feet per day
FR	Federal Register
FTA	Federal Transit Administration
FWCA	Fish and Wildlife Coordination Act
gpm	gallons per minute
HAER	Historic American Engineering Record
IBA	Important Bird Area
IDAPA	Idaho Administrative Procedures Act
IDFG	Idaho Department of Fish and Game
IDPR	Idaho Department of Parks and Recreation
IMPLAN	IMpact Analysis for PLANning
ITAs	Indian Trust Assets
kW	kilowatt
kWh	kilowatt per hour
m	meters
M^2	square miles
MBT	Migratory Bird Treaties
mg/m^3	millgrams per cubic meter

$\mu g/m^3$	millgrams per cubic meter of air
MID	Minidoka Irrigation District
Minidoka Refuge	Minidoka National Wildlife Refuge
MOA	Memorandum of Agreement
MOU	Memorandum of Understanding
MW	megawatts
MWh	megawatt hours
NAAQS	National Ambient Air Quality Standards
NAGPRA	Native American Graves Protection and Repatriation Act
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NOAA Fisheries Service	NOAA's National Marine Fisheries Service
NO_2	Nitrogen Dioxide
NPDES	National Pollution Discharge Elimination System
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NTU	Nephelometric Turbidity Units
O_3	Ozone
O&M	operations and maintenance
ORV	off-road vehicle
OSHA	Occupational Safety and Health Administration
PM10 and PM2.5	Particulate Matter
ppm	parts per million
PSD	Prevent Significant Deterioration

Reclamation	U.S. Bureau of Reclamation
RM	river mile
RMP	Resource Management Plan
SHPO	State Historic Preservation Office
SO_2	Sulfur Dioxide
SRAO	Snake River Area Office
State Park	Lake Walcott State Park
TCPs	Traditional cultural properties
TERO	Tribal Employment Rights Office
TMDL	Total Maximum Daily Load
TP	Total Phosphorus
TSC	Technical Service Center
TSS	Total Suspended Solids
UILT	Upper Incipient Lethal Temperature
USDA	U.S. Department of Agriculture
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
VdB	Vibration Decibels
VE	Value Engineering
Water Year	WY

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CHAPTER 1
PURPOSE AND NEED FOR ACTION

Chapter 1 PURPOSE AND NEED FOR ACTION

This chapter states the Proposed Action, and the purpose and need for that action. Background information is provided on the Minidoka Project (Project) and the current problems associated with the Minidoka Dam spillway and canal headworks (proposed action area). Additionally, scoping activities, other actions and activities related to spillway replacement, legal authorities and constraints, and the organization of this Environmental Impact Statement (EIS) are summarized.

1.1 The Proposed Action

The Bureau of Reclamation (Reclamation) is proposing to correct structural problems at the Minidoka Dam spillway and canal headworks facilities on Lake Walcott, Idaho. The existing spillway and canal headworks are showing considerable signs of degradation.

In addition to correcting the structural problems of the dam spillway and canal headworks, Reclamation is also proposing to designate Special Use Areas in the proposed action area in accordance with 43 CFR Part 423 *Regulations, Public Conduct on Bureau of Reclamation Facilities, Lands, and Waterbodies*. These Special Use Areas will define what public uses are allowed in close proximity to the dam, spillway, and other facilities.

1.2 Purpose and Need

The purpose of the Proposed Action is to prevent structural failure of the Minidoka Dam spillway and canal headworks. After 103 years of continued use, the 2,237-foot-long concrete spillway has reached the end of its functional lifespan. The concrete that forms the spillway crest and stoplog structure piers have suffered extensive deterioration at numerous locations. Additionally, previous ice damage to the stoplog piers requires that the reservoir water levels be dropped each winter. The headworks at the North Side Canal and South Side Canal also show serious concrete deterioration similar to the spillway conditions. The current conditions of the Minidoka Dam spillway and headworks present increasingly difficult reliability and maintenance problems. The need is for Reclamation to be able to continue meeting its contractual obligations for water delivery, power generation, and commitments to provide flow augmentation water under the Nez Perce Settlement

Agreement and the Endangered Species Act (ESA). A partial or complete failure of the spillway or canal headworks could threaten Reclamation's ability to meet those obligations.

According to 43 CFR Part 423 Regulations, *Public Conduct on Bureau of Reclamation Facilities, Lands, and Waterbodies,* certain public activities are restricted on Reclamation lands, facilities, and waterbodies. Specifically, Subpart C, Section 423.36 Swimming, states in part that, (a) You may swim, wade, snorkel, scuba dive, raft, or tube at your own risk in Reclamation waters, except:

(1) Within 300 yards of dams, powerplants, pumping plants, spillways, stilling basins, gates, intake structures, and outlet works;

In addition, Section 423.37 Winter Activities states in part that, (b) You must not ice skate, ice fish, or ice sail within 300 yards of the dams, powerplants, pumping plants, spillways, stilling basins, gates, intake structures, or outlet works.

Reclamation is proposing to designate Special Use Areas at the project site in accordance with 43 CFR Part 423 Regulations, *Public Conduct on Bureau of Reclamation Facilities, Lands, and Waterbodies*. The 43 CFR Part 423 rules and regulations restrict certain historic recreational uses on the Reclamation lands, facilities, and waterbodies associated with the proposed action area. In order to allow historic uses which are more appropriate but are not currently allowed, Reclamation has determined that it would be in the best public interest to provide modifications to the new rules. Reclamation will restrict uses which affect public safety.

1.3 Location and Setting

Minidoka Dam is a combined diversion, storage and power structure located on the Snake River in south-central Idaho about 6 miles south of Minidoka, Idaho (see Frontispiece – Location Map). Minidoka Dam and Powerplant, originally completed in 1906, are east of Rupert on County Road 400 North. The reservoir, Lake Walcott, extends 26 miles up the Snake River and has an active storage capacity of 95,200 acre-feet, with 80 miles of shoreline.

All of the proposed action area is within the Minidoka National Wildlife Refuge (Minidoka Refuge). However, Reclamation has retained exclusive management of an area immediately upstream and downstream of Minidoka Dam (the Reclamation Zone) for operations, maintenance, and security purposes wherein the proposed action area lies. The Minidoka Refuge is managed by the U.S. Fish and Wildlife Service (USFWS) subject to a Memorandum of Understanding (MOU) signed between the two agencies on April 23, 1964.

Lake Walcott State Park (State Park), a Reclamation-developed public recreation site with boating, day use, and camping facilities, is also located within the proposed action area. Reclamation has a lease agreement with Idaho Department of Parks and Recreation (IDPR) to manage the 140-acre State Park for public recreation. The State Park is located within the Minidoka Refuge, but is excluded from management by the USFWS.

The general area of the proposed action area provides a variety of recreational opportunities. The State Park provides picnicking, boating, camping facilities, and other recreational activities. Fishing occurs along the Snake River, below the spillway, in portions of the canals, and in Lake Walcott. Boat access to the Snake River exists below Minidoka Dam on both sides of the river; however, swimming is not allowed. Local anglers frequently fish both the north and south banks of the river.

Vegetation in the proposed action area consists of a variety of trees, grasses, and shrubs in the State Park, to sagebrush, native grasses, and riparian areas along the reservoir and river, and below Minidoka Dam and spillway area. The 2,237-foot spillway creates a large wetland area below the structure, which provides fish and wildlife habitat for a variety of species.

1.4 Background and Existing Facilities

The Minidoka Project, one of the earliest Federal reclamation projects in Idaho, includes Minidoka Dam and Powerplant and Lake Walcott; Jackson Lake Dam and Jackson Lake; American Falls Dam and Reservoir; Island Park Dam and Reservoir; Grassy Lake Dam and Reservoir; two diversion dams; canals, laterals, drains, and approximately 177 water supply wells. The Project serves lands north and south of the Snake River. The original Project included Minidoka Dam and spillway, the related reservoir (Lake Walcott), a hydroelectric powerplant, and two irrigation delivery units, one primarily served by gravity flow and the other aided by three lift stations (Hess et al. 2002).

Minidoka Dam was the first structure completed by Reclamation for the Minidoka Project. The dam raises the level of the Snake River to reach the headworks for two gravity-operated canals that supply the two irrigation units the Minidoka Project originally served. The dam also provides irrigation water storage and creates power that is delivered to Bonneville Power Administration (BPA) for marketing. If the irrigation districts receive reserve power, they pay BPA the current government rate to generate hydroelectricity at the pumping stations. However, if the districts do not receive reserve power, they pay market cost. Built in 1904 to 1906, the dam stands at the head of Lake Walcott, near the intersection of the Minidoka, Cassia, and Blaine county lines. The main North Side Canal headworks are located just north of the powerplant, while the main South Side Canal headworks lie to the south of the dam, at the end of a 2,237-foot long spillway beginning at the facility's south dike. The

original powerplant, completed in 1910, immediately north of the dam's north abutment, supplies electricity to run the Project pumping plants (Hess et al. 2002). Lands around Lake Walcott are withdrawn by Reclamation and managed by the USFWS as part of the Minidoka Refuge which was established in 1909 (Upper Snake Basin 1996).

As originally planned, the Project was composed of two irrigation delivery units: the Gravity Unit and the Pumping Unit. The division of lands into these two units was based upon whether water could be delivered through the system primarily using the force of gravity, or whether mechanical pumping was required to raise the water in the canals up to higher terraces. Initial development focused on the Gravity Unit, which officially opened in 1907 and has been operated by Minidoka Irrigation District (MID) since January 1, 1917. The Pumping Unit did not officially open until November 1915, although Reclamation delivered water to some areas of the division as early as 1909. The Pumping Unit lies on the south side of the Snake River and contains approximately 50,000 acres. The ground on this side of the Snake rises steadily to the south, resulting in the Pumping Unit relying on three electric pumping plants, or "lift stations," to raise water from the main South Side Canal (Hess et al. 2002). Burley Irrigation District (BID) has operated the Pumping Unit, including the South Side Canal but not the gravity diversions, since January 1, 1917.

The Minidoka Dam spillway was designed to pass the largest flood that the facility would be expected to experience. Starting at the south abutment of the dam, a simple overflow spillway of the ogee weir type was to run southward for approximately 2,237 feet. The headworks for the main South Side Canal are located at the south end of the structure. In order to increase the capacity of Lake Walcott, Reclamation placed reinforced concrete piers fitted with 6-foot stoplogs along the top of the spillway during the winter of 1909 to 1910. A walkway along the top of the piers allowed workers to place and remove the stoplogs by hand, thus controlling the height of the reservoir (Hess et al. 2002).

Throughout much of the 20th century, modifications were made to Minidoka Dam facilities to increase efficiency at the dam and to improve the ability to convey water supplies to water users. In 1913, Reclamation removed several piers at the center of the spillway and installed four 10-by-12 foot, motor-operated radial gates to better control the discharge. In 1989, these devices were replaced by three 20-by-15 foot radial gates. The remaining sections of spillway (298 bays) still include hand-placed stoplog boards. Also, as more land came under cultivation, Reclamation increased pumping capacity by adding extra pumping units to all of the stations, installing new pump runners, and replacing pumps. As Reclamation expanded the pumping system in the 1910s and 1920s, they found they needed to increase power production to meet Project needs and keep abreast of a growing market for power in nearby towns. The original powerplant had a total capacity of 7.5 megawatts. Therefore, in the powerplant, Reclamation installed Unit 6 in 1927 and Unit 7 in 1942.

Units 1 through 5 in the Minidoka Powerplant were decommissioned in 1993 to 1994 and are preserved in place in the powerplant. Unit 6 has been replaced and modern controls have been installed for both Units 6 and 7. Units 8 and 9 were added in 1997 with the completion of a new powerplant, the Allen Inman Powerplant (Inman Powerplant), constructed near the left abutment of the embankment portion of the dam. With these changes, the nameplate combined generating capacity was increased from 13,400 kilowatts to about 28,500 kilowatts. These activities were completed in 1997.

1.5 Scoping

The scoping process for this Draft EIS provided an opportunity for the public, governmental agencies, and Tribes to identify their concerns or other issues and assure a full range of potential alternatives were identified that address replacement of the Minidoka Dam spillway and canal headworks. To accomplish this, Reclamation (1) published notices in the *Federal Register*, (2) provided information to the public through local media, (3) met with potentially affected Tribes, (4) solicited oral and written comments from the general public, and (5) held public scoping meetings. See Chapter 4 for a more detailed discussion of the scoping process.

Federal Register Notices

Reclamation published a “Notice of Intent to Prepare an Environmental Impact Statement” in the *Federal Register* on November 13, 2008 (FR 73 67206).

Scoping Documents

On November 10, 2008, Reclamation mailed a scoping letter to 106 individuals, organizations, agencies, and congressional delegates. The letter discussed the proposed action and served as notification of the public scoping meetings. A similar letter was sent to 28 tribal governments.

Public Scoping Meetings

Reclamation held three public scoping meetings. The first one was held in Idaho Falls, on December 3, 2008 from 6:00 – 9:00 p.m. The second was held in Burley, Idaho, on December 4, 2008 from 6:00 – 9:00 p.m. Sixteen people in total attended the scoping meetings. The dates and purpose of the meetings were published in the local newspapers and other media, including the *Federal Register*. A news release providing information about the scoping meetings was issued. The meetings were held in an informal setting in which Reclamation presented the proposed action alternatives, provided an overview of the NEPA

process, and provided an opportunity for the public to identify issues and concerns associated with the proposed action.

On April 7, 2009, Reclamation also met with the Fort Hall Business Council of the Shoshone-Bannock Tribes on the Fort Hall Reservation. This meeting was followed by the third public meeting that evening. One person attended the meeting.

1.5.1 Results of Scoping

In addition to comments received at the scoping meetings, Reclamation received only five comment letters. Comments received during the scoping process were considered by Reclamation in the preparation of this Draft EIS. A Scoping Report was prepared and distributed to those who attended the scoping meetings and to those who provided comments (Appendix A). Expressed issues and concerns that are within the scope of this EIS centered on the following issues:

- Elimination of winter drawdown
- Analysis of alternatives
- Economic impact to the MID
- Fish entrainment in canal diversions, hydroelectric generators, and the spillway
- Spillway fishery below Minidoka Dam
- Wetland habitat below Minidoka Dam spillway
- Potential mitigation for affected spillway flows
- Lake Walcott water levels
- Threatened and endangered species present in the action area
- Species of greatest conservation need
- Previous mitigation commitments
- Water resources impacts
- Habitat, vegetation, and wildlife
- Wetlands and riparian areas
- Air quality
- Climate change
- Cumulative impacts
- Environmental justice
- Historic and cultural resources
- Monitoring

Additional issues will also be considered as they arise.

1.5.2 Issues Considered to be Outside the Scope of the Project

The following issues were identified but are outside of the purpose and need for action and thereby the project scope.

1. Potential debris deposit if a planned coal plant is built near American Falls.

2. Potential impacts on the Snake River aquifer from pollution or reservoir change.

3. Potential impacts of chemicals from Simplot Plant on Lake Walcott.

4. Potential delay to spillway replacement if dam raise is pursued.

Tribal Government to Federal Government Consultation

The following items, although not considered within the scope of the project, are considered to be important comments received as part of Consultation.

1. The Lake Walcott area was once in the area included in the Shoshone-Bannock Treaty and is identified as an important area to the Tribes. However, the Treaty was never ratified so the land was lost to the Tribes.

2. Potential employment opportunities for tribal members due to construction of the project. Due to current economic conditions, the Tribal Council seeks employment opportunities for Tribal members and therefore asks Reclamation to consider adding language to the contract that would permit hiring of Native American employees. This would include Reclamation working with the Tribal Employment Rights Office (TERO).

1.6 Legal Authorities and Constraints

The Minidoka Project was authorized by the Secretary of the Interior on April 23, 1904, under the 1902 Reclamation Act. Investigation and construction funds for the Gravity Extension Unit (Gooding Division) were provided by the Interior Department Appropriation Act, 1927, the Act of January 12, 1927 (44 Stat. 934) and the Secretary's finding of feasibility July 2, 1928, and was approved by the President on July 3, 1928 pursuant to Section 4 of the Act of June 25, 1910 (36 Stat. 836) and subsection B of Section 4 of the Act of December 5, 1924 (43 Stat. 702). The Upper Snake River Storage Project was authorized by a finding of feasibility by the Secretary of Interior on September 6, 1935, and approved by the President on September 20, 1935, pursuant to the foregoing acts. The North Side Pumping Division was authorized for construction by the Act of September 30, 1950 (64

Stat. 1083, Public Law 81-864). Replacement of American Falls Dam was authorized by Act of December 28, 1973 (87 Stat. 904, Public Law 93-206). Subsequently however, the Act of September 25, 1979 (93 Stat. 437, Public Law 96-69) authorized that unobligated appropriations made for the payment of Teton Dam failure claims of up to $19 million could be used to pay some of the American Falls Dam replacement costs and would be nonreimbursable pursuant to the Reclamation Safety of Dams Act.

Transfer of facilities and rights-of-way of the South Side Pumping Division to the BID was authorized by the Congress on January 27, 1998 (112 Stat. 3219-3221; Public Law 105-351).

The Snake River Water Rights Act of 2004 (P.L. 108-447), allows Reclamation's continued delivery of flow augmentation water for a 30-year period (through 2034). The provisions of this act improve Reclamation's ability to provide water for flow augmentation by increasing the long-term probability of obtaining 427,000 acre-feet, and in some years providing as much as 487,000 acre-feet, and by minimizing the uncertainties related to the ability to protect the water in accordance with State law.

1.7 Regulatory Compliance

Various laws and Executive Orders apply to the Proposed Action. The legal and regulatory environment within which the Federal activity would be conducted depends on which alternative is implemented. A summary of major laws and Executive Orders follows.

1.7.1 Federal Laws

National Environmental Policy Act

The National Environmental Policy Act of 1969 (NEPA) requires that the action agency use a public disclosure process to determine whether or not there are any environmental impacts associated with proposed Federal actions. This document is an EIS. If the action agency completes both a draft and final EIS and conforms to NEPA requirements for public involvement, comment, and review, then the action agency may sign a Record of Decision (ROD) as an initial step toward implementation. This step would complete the NEPA compliance process.

Endangered Species Act

The Endangered Species Act (ESA) requires all Federal agencies to ensure that their actions do not jeopardize the continued existence of listed species, destroy, or adversely modify their critical habitat. As part of the ESA's Section 7 process, an agency must request a list of species from the USFWS and the National Marine Fisheries Service (NOAA Fisheries) that

identifies threatened and endangered species within or near the action area. The agency then must evaluate impacts to those species. If the action may impact any listed species, the agency must consult with USFWS or NOAA Fisheries.

Fish and Wildlife Coordination Act

The Fish and Wildlife Coordination Act (FWCA) provides for equal consideration of wildlife conservation in coordination with other features of water resource development programs. The FWCA requires that any plans to impound, divert, control, or modify any stream or other body of water must be coordinated with the USFWS and State wildlife agency through consultation directed toward prevention of fish and wildlife losses and development or enhancement of these resources.

National Historic Preservation Act

The National Historic Preservation Act (NHPA) of 1966, as amended, requires that Federal agencies consider the effects that their projects have on properties eligible for or on the National Register of Historic Places. The 36 CFR 800 regulations provide procedures that Federal agencies must follow to comply with the NHPA. For any undertaking, Federal agencies must determine if there are properties of National Register quality in the project area, the effects of the project on those properties, and the appropriate mitigation for adverse effects. In making these determinations, Federal agencies are required to consult with the State Historic Preservation Office (SHPO), Native American tribes with a traditional or culturally-significant religious interest in the study area, the interested public, and the Advisory Council on Historic Preservation (in certain cases). For details regarding this consultation, see Chapter 4.

Native American Graves Protection and Repatriation Act

Native American Graves Protection and Repatriation Act (NAGPRA) of 1990 regulates tribal consultation procedures in the event of discoveries of Native American graves and other NAGPRA "cultural items." NAGPRA Act requires consultation with tribes during Federal project planning if graves and other NAGPRA cultural items are discovered. NAGPRA details procedures for repatriation of human skeletal remains and other cultural items with appropriate tribes.

Clean Water Act (33 U.S.C. 1251 et seq.)

Section 404 of the Clean Water Act (CWA) regulates the discharge of dredge and fills material into waters of the United States, including wetlands. The U.S. Army Corps of Engineers (Corps) evaluates applications for Section 404 permits. Permit review and issuance follows a sequence process that encourages avoidance of impacts, followed by

minimizing impacts and, finally, requiring mitigation for unavoidable impacts to the aquatic environment. This sequence is described in the guidelines at Section 404(b)(1) of the CWA.

1.7.2 Executive and Secretarial Orders

Executive Order 11990: Wetlands

Executive Order (EO) 11990 dated May 24, 1977, directs Federal agencies to take action to minimize the destruction, loss, or degradation of wetlands and to preserve and enhance the natural and beneficial value of wetlands in carrying out programs affecting land use. Wetlands provide great natural productivity, hydrological utility, environmental diversity, natural flood control, improved water quality, recharge of aquifers, flow stabilization of streams and rivers, and habitat for fish and wildlife resources.

Executive Order 13007: Indian Sacred Sites

EO 13007, dated May 24, 1996, instructs Federal agencies to promote accommodation of access to and protect the physical integrity of American Indian sacred sites. A “sacred site” is a specific, discrete, and narrowly delineated location on Federal land. An Indian tribe or an Indian individual determined to be an appropriately authoritative representative of an Indian religion must identify a site as sacred by virtue of its established religious significance to, or ceremonial use by, an Indian religion. However, this is provided that the tribe or authoritative representative has informed the agency of the existence of such a site.

Executive Order 12898: Environmental Justice

EO 12898, dated February 11, 1994, instructs Federal agencies, to the greatest extent practicable and permitted by law, make achieving environmental justice part of its mission by addressing, as appropriate, disproportionately high and adverse human health or environmental effects on minority populations and low income populations. Environmental justice means the fair treatment of people of all races, income, and cultures with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. Fair treatment implies that no person or group of people should shoulder a disproportionate share of negative environmental impacts resulting from the execution of environmental programs.

Executive Order 11988: Flood Plain Development

EO 11988, dated May 24, 1977, instructs Federal agencies prior to taking an action to the greatest extent practicable, determine whether the Proposed Action will occur in a flood plain and if so, consider alternatives to avoid adverse effects. If the only feasible alternatives occur within a flood plain, the agency shall take action to design or modify its action in order

to minimize potential harm to or within the flood plain consistent with regulations accompanying this EO.

Executive Order 13175: Consultation and Coordination with Tribal Governments

EO 13175 instructs Federal agencies to consult, to the greatest extent practicable and to the extent permitted by law, with tribal governments prior to taking actions that affect federally-recognized tribes. Each agency shall assess the impact of Federal Government plans, projects, programs, and activities on tribal trust resources and assure that government rights and concerns are considered during the development of such plans, projects, programs, and activities.

Secretarial Order 3175: Department Responsibilities for Indian Trust Assets

Indian Trust Assets (ITAs) are legal interests in property held in trust by the United States (with the Secretary of the Interior acting as trustee) for Indian tribes or Indian individuals. Examples of ITAs are lands, minerals, hunting and fishing rights, and water rights. In many cases, ITAs are on-reservation; however they may also be found off-reservation.

The United States has an Indian trust responsibility to protect and maintain rights reserved by or granted to Indian tribes or Indian individuals by treaties, statutes, and EOs. These rights are sometimes further interpreted through court decisions and regulations. This trust responsibility requires that officials from Federal agencies, including Reclamation, take all actions reasonably necessary to protect ITAs when administering programs under their control.

1.8 Document Organization

This EIS closely follows the format recommended by the Council on Environmental Quality (CEQ).

Chapter 1 identifies the Proposed Action, the purpose and the need for action; provides background information; and summarizes scoping activities and results, and applicable laws and regulations.

Chapter 2 presents discussion on the No Action alternative and action alternatives and summarizes the process of formulating the proposed action alternatives. A table presenting a summary comparison of the alternatives is also included.

Chapter 3 presents the affected environment and relevant resource components that make up the baseline environment and describes the environmental impacts of the alternatives considered in detail in addition to identifying mitigation measures.

Chapter 4 summarizes consultation and coordination activities, including public scoping efforts relevant to the EIS.

In addition, the following have been included:

- Acronyms
- Bibliography
- List of Preparers
- Glossary
- Contacts and Distribution List
- Appendices A – G

CHAPTER 2 ALTERNATIVES

Chapter 2 ALTERNATIVES

2.1 Alternative Formulation

To address the deterioration and potential structural failure of the existing spillway and canal headworks, Reclamation began an alternative formulation process in March of 2000 with the preparation of an appraisal-level design which studied two different options for buttressing the existing spillway crest and providing gated spillway sections.

In January of 2002, Reclamation's Snake River Area Office (SRAO) completed a Value Planning Study which considered 15 options for spillway replacement. Three options were eliminated due to feasibility or cost. Twelve options were considered feasible and carried forward. The study team included staff and experts from Reclamation. Representatives for each of the two irrigation districts were included in the discussions, because they are responsible for paying their allocation portion of the project costs. Consequently, the irrigation districts want to keep the cost of the project as low as possible.

In 2003, Reclamation completed an appraisal study which investigated the two most favorable options from the 2002 Value Planning Study. The two options studied were (1) complete replacement of the existing spillway with a new concrete overflow section and a set of 12 new radial gates; and (2) complete replacement of the existing spillway with a combination of overflow sections and rubber dam sections. Both options were considered feasible with Option 1 being considered as the most cost-effective solution.

The appraisal study was followed in 2006 by a realignment study which considered three different alignments for the new spillway. The goal of the study was to shorten the overall length of the new spillway thereby reducing costs. During a briefing between Reclamation and the irrigation districts in May 2007, Reclamation proposed alignment alternatives for consideration during the feasibility study. The irrigation districts and their consultants proposed additional alignment configurations for study by Reclamation. These included fusegates to replace the existing spillway and some of the existing radial gates. The fusegates would be combined with an alternative to encase a portion of the existing spillway in a rockfill embankment. Additionally, it was proposed that Reclamation consider replacing concrete sections with non-overflow embankment sections wherever practical.

In June of 2008, Reclamation conducted a Value Engineering (VE) study of the spillway replacement. This study resulted in 16 different options or combinations of options being considered. The study team included staff and experts from Reclamation as well as representatives for each of the two irrigation districts. Reclamation's Technical Service Center

(TSC) subsequently completed an Accountability Report on the VE study and determined that 14 of the options had merit and should be carried forward for further study.

In 2009, the TSC completed a feasibility study and alternative selection. This study investigated five different alternatives and three different alignments incorporating feasibility-level cost estimates (Appendix B – Figure 2–1). This study determined that Alternative B – Spillway and Headworks Replacement would provide the highest level of constructability, technical merit, cost effectiveness, and therefore, should be carried forward to final design. As an option, Alternative C was formulated based on potential costs. As a key funding source of the project, the two irrigation districts are very concerned about project costs and their ability to pay. Consequently, as a potential cost savings measure, the project was analyzed without replacement of the canal headworks.

As indicated in the Proposed Action section of this document, Reclamation is also proposing to designate Special Use Areas at the project site in accordance with 43 CFR Part 423 *Regulations, Public Conduct on Bureau of Reclamation Facilities, Lands, and Waterbodies*.

The 43 CFR Part 423 rules and regulations restrict certain historic recreational uses on the Reclamation lands, facilities, and waterbodies associated with the proposed action area. In order to allow continuation of historic recreational uses, Reclamation has determined that it would be in the best public interest to provide modifications to the rules. Reclamation will restrict uses which affect public safety.

2.2 Alternative A – No Action

2.2.1 Construction

The No Action alternative represents continuation of the current conditions which would leave the existing spillway and headworks in their present configuration and state of extensive deterioration (Photograph 2-1 below; Appendix B – Figure 2–2). Under the No Action alternative, it will be necessary to continue the seasonal 5-foot drawdown. As the concrete in the existing spillway and headworks continue to deteriorate, maintenance requirements will increase, subsequently increasing annual maintenance costs. As the existing spillway concrete deteriorates further, a program of pier replacement will become necessary. The pier replacement program will involve ongoing replacement of piers to maintain the existing spillway in a usable condition. As material and labor costs increase and as the location of piers to be replaced becomes more difficult to access, the ongoing pier replacement costs will increase considerably.

Maintenance requirements and costs will continue to escalate for the headworks. Eventually, annual concrete repairs on the headworks will become necessary. These repairs will continue until the headworks reach the end of their service life and full replacement becomes necessary.

Photograph 2-1. Photograph showing the current state of deterioration of the Minidoka Dam spillway.

2.2.2 Public Use

Reclamation would allow the existing public use restrictions in 43 CFR Part 423 to remain in effect. The applicable sections of 43 CFR Part 423 which affect historic recreational uses in the near vicinity of Minidoka Dam and spillway are Subpart Sections 423.36 Swimming and 423.37 Winter Activities. These subparts state:

Section 423.36 Swimming

(a) You may swim, wade, snorkel, scuba dive, raft, or tube at your own risk in Reclamation waters, except:

(1) Within 300 yards of dams, powerplants, pumping plants, spillways, stilling basins, gates, intake structures, and outlet works;

(2) Within 100 yards of buoys or barriers marking public access limits;

(3) In canals, laterals, siphons, tunnels, and drainage works;

(4) At public docks, launching sites, and designated mooring areas; or

(5) As otherwise delineated by signs or other markers.

(b) You must display an international diver down, or inland diving flag in accordance with State and U.S. Coast Guard guidelines when engaging in any underwater activities.

(c) You must not dive, jump, or swing from dams, spillways, bridges, cables, towers, or other structures.

Section 423.37 Winter Activities

(a) You must not tow persons on skis, sleds, or other sliding devices with a motor vehicle or snowmobile, except that you may tow sleds designed to be towed behind snowmobiles if joined to the towing snowmobile with a rigid hitching mechanism, and you may tow disabled snowmobiles by any appropriate means.

(b) You must not ice skate, ice fish, or ice sail within 300 yards of dams, powerplants, pumping plants, spillways, stilling basins, gates, intake structures, or outlet works.

(c) You must comply with all other posted restrictions.

See Appendix B – Figure 2–3 for the 300-yard zone where these use restrictions would be in effect under this alternative.

2.2.3 Operations

Under the No Action alternative, current operations will remain the same. Minidoka Dam is operated as a run-of-the-river project with a few seasonal variations. Water is routed through turbines in the two powerplants, through the existing radial gates, and over the spillway. Depending upon the water conditions and time of year, the flows between the powerplant and spillway are partitioned differently as follows:

- Minimum flow released over the existing spillway:
  - April 15 through June 30: 1,300 cfs
  - July 1 through August 31: minimum flow increased to 1,900 cfs
  - September 1 through September 14: 1,300 cfs
  - April 1 through April 14 and September 16 through October 31:
    - First 5,035 cfs through the powerplant
    - Next available 1,300 cfs over existing spillway
    - Flows in excess of 6,335 cfs routed through the powerplant up to plant capacity.
    - Additional flow above plant capacity is discharged over existing spillway.

Spillway releases travel through a constructed wetland. A portion of water supplying the wetlands is from subsurface seepage locally enhanced by the reservoir and seepage through the spillway. Additionally, the pipeline from the Inman Powerplant headworks feeds the wetland ponds that were constructed as mitigation for the powerplant.

There are no controlled spillway releases during the winter months. The physical condition of the existing spillway constrains winter operations because the ogee crest is not capable of resisting the loads imposed by ice on the reservoir surface. Additionally, if water was stored above the crest, leakage through the joints of hundreds of boards would cause an unmanageable accumulation of ice immediately below the structure. Construction joints and other voids in the existing concrete ogee pass some water from the reservoir to the spillway area.

During the irrigation season, typically defined as April through October, the reservoir is maintained at full pool (elevation 4245 feet). After irrigation season and during the winter months, the reservoir is held between elevation 4239.5 and 4240.0 (5.5 feet to 5.0 feet below full) because of the deteriorated structural condition of the existing spillway. Once the ice cover melts, or the threat of substantial freezing has passed, the reservoir is brought up to full pool elevation. Depending on demand and weather, this usually begins mid-March and is completed by the end of April. Reservoir draft and refill rates are dependent upon water year type, irrigation demands, and water availability.

In drier type years when system storage above the project is nearing depletion, reservoir drafting may begin as early as mid-August. If the upstream reservoirs are not severely depleted, water may be delivered later, late September through mid-October for irrigation demands, thus keeping the reservoir at full pool longer. Capacity of the South Side Canal is reduced as Lake Walcott drops below elevation 4243.0 feet and is severely constrained at elevation 4240.0 feet. Because of the limited head available through the headworks, changes in water surface elevation are avoided to reduce headgate operations or fluctuations in canal flow. Drafting of Lake Walcott storage is avoided until diversion demand, especially on the southside, is reduced.

The minimum flow measured below the project at the U.S. Geological Survey (USGS) gage (USGS 13081500 Snake River near Minidoka Idaho, at Howells Ferry) during the period between 2000 and 2008, is 500 cfs, typically occurring during the winter months. This recorded minimum flow is comprised of both powerplants and spillway flows as well as seepage.

2.3 Alternative B – Spillway and Headworks Replacement (Preferred Alternative)

This alternative consists of the following new structures and improvements:

- Spillway
  - Overflow, Sections 1 and 2
  - Radial Gate Section
  - Dike, Sections 1 and 2
- South Side Canal Headworks
- North Side Canal Headworks
- Public Use Improvements
- Special Use Areas

2.3.1 Spillway

Overflow Section

The new overflow section of the spillway would be constructed entirely downstream of the existing spillway in two segments: section 1 is between existing spillway bay 36 and bay 128; section 2 is between bay 136 and bay 224 separated by the existing gated spillway (Appendix B – Figure 2–4). By constructing the new overflow sections downstream of the existing spillway, the existing spillway can be used as a cofferdam while constructions of the new overflow sections are being completed. The new overflow sections would have a total length of approximately 1,326 feet with a uniform crest elevation of 4245.0 feet and be constructed of roller-compacted concrete (Photograph 2-2 and Photograph 2-3).

Following completion of the new spillway sections, partial demolition of the existing spillway would be completed. The demolition would include removal of the metal walkway and handrails, and removal of the concrete piers above the ogee section. Portions of the pier removal may occur in wet conditions, depending on the reservoir elevation and the elevation of the surrounding ground surface (Appendix B – Figure 2–5). Total removal of the existing spillway would be necessary in certain areas such as upstream of the new radial gate sections. Best management practices (BMPs), such as the use of silt curtains or other appropriate sediment control actions, would be employed to control sediment releases during pier removal in order to protect water quality and endangered snail habitat.

Photograph 2-2. "Before" photograph of a section of the existing Minidoka spillway (Reclamation photograph taken by D. Walsh, June 30, 2005).

Photograph 2-3. "After" photograph simulation of the same section of the Minidoka spillway showing the new overflow sections situated 10 feet downstream of the existing spillway. The concrete service road runs through the foreground.

It is anticipated that construction of the new overflow sections may reduce the current rate of structural leakage to the wetland. Therefore, as part of the new design to satisfy post-construction wetland flow needs, a total of five water release point features (referenced in Appendix B – Figure 2–6 as numbers 1, 2, and 3) with slide gates and steel pipes would be constructed. Included with all slide gates would be a hand operator, pedestal, gate stem, stem guide, frame, and all other equipment necessary for complete slide gate installations. The slide gates and steel pipe would be installed along the new overflow sections as shown on Figure 2–6 (Appendix B) to maintain the wetland habitat conditions downstream of Minidoka Dam's existing spillway over the full range of reservoir water surface elevations. The maximum design flow through four of the water release features is 100 cfs. The maximum design flow through the fifth water release feature is 300 cfs. The fifth water release structure, with the 300 cfs capacity, would be located in on the north side of the new radial gate section. Proposed water releases are discussed under Section 2.3.8 – Operations.

Radial Gate Section

A new radial gate section would be constructed entirely downstream of the existing spillway, which would serve as the cofferdam during construction. The new radial gated section would be located between the new overflow sections and new dike sections. From the southern end of the new overflow sections, the new radial gate section would extend approximately 311 feet south across an existing discharge channel with a naturally low invert elevation (estimated at elevation 4222 feet) and connect to the northern end of the new dike. The new radial gate section has been modeled after the existing gated spillway at Minidoka Dam. The new spillway would consist of twelve 20-foot 8-inch by 17-foot gated sections separated by 5-foot-wide piers and 4-foot-wide end walls. The crest of the ogee shaped weir would be at elevation 4229.5 feet. Due to the expansive length of the new radial gate section, a new 6-ton capacity gantry crane would be provided for installation and removal of the new radial gate stoplogs. The crane would travel on steel rails along the entire length of the radial gate section into the storage area and have the capacity to raise the stoplog section from the guide seat to clear the spillway bridge. It is anticipated that blasting would be required to remove rock for the foundation of the new radial gate section. In addition, blasting would be required to improve the channel upstream and downstream of the structure. In order to hold the winter reservoir to the current elevation, it would be necessary for the contractor to complete the upstream excavation partially in wet conditions. The blasting operation would be conducted mostly on the dry rock surface; however, the removal of the blasted material would occur in wet conditions. The blasting and material removal would be required to take place during the non-irrigation season when reservoir surface is at its lowest elevation. BMPs, such as the use of silt curtains, would be employed to control sediment releases during blasting and the removal of blasted material in order to protect water quality and endangered snail habitat. Depending on construction timing and methods, it may also be possible to move sediment laden water down the South Side Canal rather than through the new spillway.

A 14-foot-wide gate hoist bridge would be constructed over the new radial gate section. This bridge would accommodate setting the radial gate hoists and lift motors and allow maintenance personnel to cross the structure. Security fencing would be installed around the structure.

Twelve new 25,000-pound capacity, electrically-operated, dual-drum wire rope hoists would be required to operate the new radial gates.

New stoplog guides would be required upstream of the new radial gates in each of the twelve spillway bays. Each guide is required to be embedded structural steel, creating a slot approximately 21-foot wide by 20-foot high. No new stoplogs would be required, since the current stoplogs for the existing radial gates would also be used on the new radial gate section.

2.3.2 Dike

The new dike sections for this alternative would be constructed entirely downstream of the existing spillway, which would serve as the cofferdam during construction. The new dike sections would be constructed of roller-compacted concrete faced with structural concrete. Roller-compacted concrete is a special blend of concrete that has the same ingredients as conventional concrete but in different ratios. It has the same cement, pozzolan, water, aggregates, and chemical additives, but roller-compacted concrete has lower cementitious materials content (cement and pozzolan) and less water, making it much drier and essentially having no slump. Roller-compacted concrete is placed in a manner similar to paving, often utilizing dump trucks or conveyors to deliver the material to the placement where it is spread by bulldozers or special modified asphalt pavers in one foot thick lifts. After spreading, the roller-compacted concrete is compacted by vibratory rollers. Conventional slump concrete or a bedding mortar is generally placed on the foundation prior to spreading the roller-compacted concrete to promote bond. The roller-compacted concrete would be faced with conventional concrete that is placed within the forms immediately prior to the roller-compacted concrete placement.

Section 1 of the new dike would extend approximately 201 feet from the southern end of the new radial gated sections and continue south where it would connect to a new South Side Canal headworks structure. Included in the new dike reach is a segment to effectively widen the crest to allow for loading and crane equipment to access the new radial gated sections and new South Side Canal headworks. Additional roller-compacted concrete material would extend along the side of the new South Side Canal headworks structure, connecting to the new embankment roadway, which would parallel the South Side Canal. Section 2 of the new dike would extend approximately 334 feet southeast from the new South Side Canal headworks structure toward the existing south dike. Roller-compacted concrete material will extend along the South Side Canal headworks structure to connect to the new roadway embankment, which would parallel the South Side Canal.

2.3.3 South Side Canal Headworks

The new South Side Canal headworks would be reconstructed in the existing canal about 300 feet downstream of the existing headworks. The majority of the work would be performed during the non-irrigation season (October to March). The existing South Side Canal headworks gates would be closed during construction, serving as the upstream cofferdam while providing operational flexibility during the subsequent irrigation seasons. Following completion of the new headworks, the majority of the existing structure, including metalwork, would be removed. The southern-most bay would remain as support for the embankment endwall.

The new headworks would be constructed adjacent to new connecting dike sections. Seepage barriers along the end walls would extend into the new dike sections, and would connect to the concrete core wall within the new dike section. The top of the sidewalls at the gate location would be set at elevation 4250 feet. When the 17-foot-high gate is in the fully raised position, approximately one-third of the gate will remain in the vertical sides of the structure.

The new side embankments would extend approximately 450 feet downstream of the new headworks structure, paralleling the existing South Side Canal alignment. A transition section from the canal embankment crest (elevation 4247 feet) to the new dike crest (elevation 4250 feet) would be constructed. On the right side of the new headworks structure, the new connecting dike embankment crest would be widened to accommodate equipment such as cranes, which would be required for installing new stoplogs.

The new canal headworks would use two new radial gates. Each radial gate would be 20-foot 8-inches wide by 17-feet high and include wall plates, sill plates, arms, trunnions, brackets, trunnion pins, and all other equipment necessary for two complete radial gate installations. Normal freeboard on the gates would be 2 feet. A minimum of 1 foot is normally required for wave action. The maximum water surface against the gates is to be elevation 4246.6 feet to accommodate a flood event**.** Structural sidewalls at the gate section are set at elevation 4251 feet. If or when the 17-foot-high gate is fully raised, at least one-third of the gate would remain in the vertical sides of the structure. It is anticipated that blasting may be required to remove rock from the upstream side of the new radial gates in preparation for the installation of and to provide footing for these gates.

A 10-foot-wide gate hoist deck would be constructed over the structure. This deck would accommodate the radial gate lift motors, and allow maintenance personnel access across the structure. Security fencing would be installed around the structure.

Two new 25,000-pound capacity, electrically-operated, dual-drum wire rope hoists would be furnished and installed on the hoist deck.

New stoplog guides would be included upstream and downstream of the new radial gates in each of the two bays. It was assumed each guide would consist of embedded structural steel, approximately 20-foot wide by 22-foot high. Two sets of new stoplogs (20-foot wide by 18-foot high) and one lifting beam would be included. Two sets are required to allow one bay to be blocked off from the upstream and downstream direction. Separate stoplog sets are required for the new South Side Canal headworks structures, since they are operated by different entities and have significant distance between them. A mobile crane would be used to install and remove the new stoplogs.

The length of the new headworks structure is based on typical radial gate geometry and the connection to the new roller-compacted concrete section. On the upstream side, the length to the gate deck was increased to match with the top of the new roller-compacted concrete section. An inlet with sloping side walls would allow water from the reservoir to enter the gated section. Downstream of the rectangular gated section is a broken back style transition. This transition is designed to conform to the existing canal excavated into rock. The assumed side slopes are 1:1.

2.3.4 North Side Canal Headworks

The existing North Side Canal headworks are supported by a steel and/or concrete frame constructed in the sand layer between two basalt flows. The new North Side Canal headworks would be reconstructed in the existing canal about 115 feet downstream of the existing headworks. Work would be performed during the non-irrigation season (October to March). The existing North Side Canal headworks gates would be closed during construction, serving as the upstream cofferdam while providing operational flexibility during the subsequent irrigation seasons. Following completion of the new headworks, all metalwork would be removed from the existing headworks and the existing concrete structure would be permanently abandoned in place.

The new canal lining for the new North Side Canal headworks consists of three sections: (1) transition section, (2) flume section, and (3) shotcrete section. The transition section would consist of 2-foot walls and a 2-foot base, would be 30-feet long, and would provide a transition from the geometry of the existing headworks to the geometry of the flume section and new headgate structure. The flume section would also consist of 2-foot walls and a 2-foot base, would be 69-feet long, and would provide a watertight channel from the transition section to the new headworks. The shotcrete section would consist of a 3-inch shotcrete lining for 100-feet downstream of the new headworks. This section would provide a smooth transition from the new headworks to the existing canal lining.

The new canal headworks would use two new radial gates. Each 20-foot 8-inches-wide by 17-foot-high radial gate would include wall plates, sill plates, arms, trunnions, brackets, trunnion pins, and all other necessary equipment for complete installation. Normal freeboard on the new radial gates would be 2 feet. A minimum of 1 foot is usually recommended for wave

action. The maximum water surface against the gates is to be elevation 4246.6 feet, from a flood event. Structural sidewalls at the gate section are set at elevation 4251 feet. If or when the 17-foot-high gate is fully raised, at least one-third of the gate would remain in the vertical sides of the structure. It is anticipated that blasting may be required to remove rock from the upstream side of the new radial gates in preparation for the installation of and to provide footing for these gates.

Stoplog slots are provided on the upstream and downstream side to facilitate maintenance purposes. Water depth probes on the downstream center pier nose would be used for canal water surface monitoring and gate automation.

A 10-foot-wide gate hoist deck would be constructed over the structure. This deck would accommodate the radial gate lift motors and allow for maintenance personnel across the structure. Compacted backfill would be placed along the exterior of the vertical sidewall to transition to the existing ground surface elevations. Security fencing would be installed around the structure.

Two new 25,000-pound capacity, electrically-operated, dual-drum wire rope hoists would be furnished and installed.

New stoplog guides, upstream and downstream of the new radial gates, in each of the two bays would be included. Each guide would consist of embedded structural steel, approximately 20-feet wide by 22-feet high. Two sets of new stoplogs (20-feet wide by 21-feet high) and one lifting beam would be included. Two sets are required to allow one bay to be blocked off from the upstream and downstream direction. Separate stoplog sets are required for the new North Side Canal headworks structures, since they are operated by different entities and have significant distance between them. A mobile crane would be used to install and remove the new stoplogs.

The length of the structure is based on typical radial gate geometry. For example, the radial gate arm pins are set at a height above the floor and downstream from the operating deck based on the gate size. Downstream of the rectangular gate section is a broken back style transition. This transition is designed to conform to the existing canal excavated into the surface basalt rock. The assumed side slopes are 1:1.

The construction of the new North Side Canal headworks structure would require the removal of the existing bridge which spans the North Side Canal.

2.3.5 Public Use Improvements

Currently, substantial fishing and birding opportunities exist in association with the existing spillway. Under Alternative B, some fishing and birding opportunities would be eliminated as a result of structural limitations and the closure of the new spillway and canal headworks to public access. Reclamation proposes altering the existing spillway access bridge to meet

current accessibility standards. This bridge crosses the pool below where the new spillway radial gates would be located and is currently open to non-vehicular public use such as fishing and birding.

Additionally, a parking area that is accessible to people with disabilities would be provided near the south end of the bridge (Appendix B – Figure 2–7).

2.3.6 Special Use Areas

Reclamation is proposing to designate Special Use Areas as provided for in 43 CFR Part 423 in order to allow the continuance of historic recreational uses which would otherwise be prohibited. Reclamation will restrict uses which affect public safety. The Special Use Areas would allow for wading and float tubing associated with fishing and birding, and ice fishing as shown in Figure 2–7. Existing restrictions as described in 43 CFR Part 423, Subpart C, would remain in effect. See Section 2.2.2 – Public Use for a complete listing of restricted uses.

2.3.7 Construction

Construction is expected to take approximately 31 months and would involve one prime and numerous subcontractors. Due to the large size of the construction zone, the contractor would most likely require multiple staging and waste areas. Five staging and/or waste areas have been identified, three on the north end of the construction zone and two on the south end (Appendix B – Figure 2–8).

- North end:
  - A 0.36-acre staging area would be located just north of and adjacent to the main powerplant switchyard. This would be the contractor's main staging area on the north side and would contain the contractor's office trailers and material storage. This area would be accessed via the western-most road within the State Park.
  - A 0.82-acre rock/soil waste area would be northwest of the switchyard. This would be a waste area for the contractor for soil and rock only. The contractor would be required to restore and reseed the area, with appropriate seed mix, prior to leaving the site. This area would be accessed via the western-most road within the State Park.
  - A 2.68-acre staging/waste area would be located approximately 2,200 feet northwest of the switchyard. The contractor would use this area to waste concrete rubble. It would be possible to access this area from the facility administration area via an existing access road or from the start of the facility access road. The contractor would be required to restore and reseed the area, with appropriate seed mix, prior to leaving the site.
- South end:
  - The main staging area would be 10.88 acres and would be located directly west of the existing South Side Canal headworks. This area will most likely contain the

contractor's office trailers, material storage, and the Government's office and laboratory trailers. The area would be accessed via the end of the 900 N. County Road. Some haul road construction may be required in this area. The contractor would be required to restore and reseed the area, with appropriate seed mix, prior to leaving the site.

- The second area on the south is an 8.68 acre staging and waste area directly west of the existing reservoir dike. This area will most likely contain the contractor's concrete batch plant, sand and aggregate storage, and material storage. Currently, the only access to this site is via the South Side Canal access road. The contractor will not be allowed to use this access road during construction except for minimal use when no other access is available. In order for the contractor to utilize this staging/waste area it would be necessary to build a crossing over the South Side Canal. The contractor will most likely use large concrete culverts for this crossing. It would be necessary for the contractor to construct a haul road from the main staging area across the new canal crossing to this staging/waste area. The culverts for this canal crossing would be removed after construction is completed. The contractor would be required to restore and reseed the area, with appropriate seed mix, prior to leaving the site.

It would be necessary for the contractor to stage construction in such a way that water delivery to the canals continues uninterrupted during construction. This would most likely be accomplished by conducting construction in and around the canals in winter months only.

It is not anticipated that the quantity of spillway releases would be significantly affected during the construction period. It is expected that the location of the spillway releases would be adjusted during the construction period, as necessary, in order to direct water away from where the contractor is working. Reclamation personnel would routinely monitor construction activities to ensure flows are sustained through the south channel and that contract requirements are fulfilled.

All public access, including fishing, would temporarily cease in the construction zone during the entire construction period.

Service Road

Included with the new spillway would be a new service road. The new service road would be located just downstream of the new overflow section and will be constructed in two segments (service road A and B as indicated on Figure 2–4 in Appendix B). The first section would run from the existing Inman Powerplant headworks south to the existing radial gates. The second section would run from the existing spillway access bridge north to the existing radial gates. The service road would be constructed using roller-compacted concrete and would be used by the contractor as the test section. In addition, the contractor would be required to remove the present asphalt surface from the existing access bridge. The service road would be closed to public vehicular traffic, but would be open to public pedestrian traffic.

2.3.8 Operations

After construction of the new spillway, Lake Walcott's water surface would no longer be constrained to elevation 4240.0 feet, or below, in winter. This reservoir operation will allow for increased power generation, complies with the requirements of the current BiOp, and maintains recreational opportunities. However, it may be necessary to utilize approximately the top 5 feet of Lake Walcott Storage as the end of the irrigation season approaches in order to maintain adequate storage in American Falls Reservoir to address water quality concerns. This drawdown occurs every year under current conditions (see Section 2.2.3). Water rights, provisions of spaceholder contracts, commitments to implement Biological Opinions, and Total Maximum Daily Loads (TMDL) would not change under this alternative. Once irrigation demand is less than the natural supply and water is available for storage, and absent any extraordinary needs, Lake Walcott would be raised to its normal full capacity. Among water rights for irrigation storage, Lake Walcott has the earliest priority date below Jackson Lake allowing the early refill of Lake Walcott once the storage season commences.

Water rights allow refill of Lake Walcott in a matter of days once its water rights are in priority. Consideration for habitat and water quality needs in American Falls Reservoir and the river reach between American Falls and Lake Walcott may affect timing of reservoir refill.

To replace the leakage which currently occurs across the existing spillway during the non-irrigation season, up to 100 cfs would be discharged through the new spillway at release point 3 as shown on Figure 2–6 (Appendix B). The non-irrigation season flows of 100 cfs would consist of a combination of structural leakage, subsurface seepage, and controlled releases. It is anticipated that the winter release flow through the conduits would not exceed 100 cfs. During the irrigation season, approximately April 1 through October 15, minimum spillway release flows would be 500 cfs. Spillway releases would be as follows: approximately 50 cfs through each of the four northern-most release points and approximately 300 cfs through the southern-most release point (Appendix B – Figure 2–6). Spillway flows could be increased during the irrigation season, when sufficient water is available after powerplant hydraulic capacity is met. This flow regime was selected because it will allow for increased power generation, complies with the requirements of the current BiOp, maintains recreational opportunities, and should be adequate to maintain the existing wetland community within the spillway area.

With construction of the new spillway, the minimum flow through the project would increase to 525 cfs during dry water type years and to 600 cfs for average to high water type years. These minimum flows are typically experienced during the winter months and are comprised of both powerplant and spillway releases measured at the downstream USGS gage (USGS 13081500 Snake River near Minidoka Idaho, at Howells Ferry).

2.4 Alternative C – Spillway Replacement

This alternative consists of the following new structures and improvements:

- Spillway
  - Overflow (Sections 1 and 2)
  - Radial Gate Section
  - Dike
- Public Use Improvements
- Special Use Areas

Under Alternative C, some fishing and birding opportunities would be eliminated as a result of structural limitations and the closure of the new spillway and canal headworks to public access (Appendix B – Figure 2–9). Reclamation proposes altering the existing spillway access bridge to meet current accessibility standards (Appendix B – Figure 2–7). This bridge is located across the pool below the new spillway radial gates and is currently open to non-vehicular public use such as fishing and birding.

Additionally, a parking area that is accessible to people with disabilities would be provided near the south end of the bridge.

2.4.1 Overflow Sections

The construction of the new overflow sections would be the same as described for Alternative B except for a slightly different alignment in the southern section where it would follow the existing spillway alignment to the existing South Side Canal headworks.

2.4.2 Radial Gate Section

Same as previously described for Alternative B.

2.4.3 Dike

The new dike section for this alternative would be constructed entirely downstream of the existing spillway, which would serve as the cofferdam during construction. The new dike section would be constructed of roller-compacted concrete material to effectively widen the crest to allow for loading and crane equipment to access the new radial gate section. The new dike would extend approximately 150 feet from the southern end of the new radial gate section continuing south to the South Side Canal, then extend east, paralleling the canal, until it ties into the existing South Side Canal headworks.

2.4.4 Public Use Improvements

Reclamation proposes to make the same public use access improvements as described in Alternative B.

2.4.5 Special Use Areas

Reclamation is also proposing to designate Special Use Areas as provided for in 43 CFR Part 423 as discussed in Alternative B.

2.4.6 Construction

Same as described in Alternative B, except that the staging area and the rock and soil waste area near the existing North Side Canal headworks would not be needed. A new service road would also be constructed as described in Alternative B.

2.4.7 Operations

Operations for Alternative C are the same as those described for Alternative B.

2.5 Alternatives Eliminated from Further Study

Over the past 10 years, Reclamation has studied over 50 alternatives, including a combination of alternatives, options, and alignments for repair or replacement of the spillway and modification or replacement of both North and South Side Canal headworks. Alternatives were eliminated for a number of reasons including cost, technical considerations, potential length of service following the replacement, future operation and maintenance issues, and constructability. Consideration was also given to some type of staged construction but was eliminated due to steadily increasing construction costs over a lengthy period of time.

2.6 Summary Table Comparison of Alternatives

The environmental impacts of each alternative are compared in Table 2-1 against the environmental impacts that would result under Alternative A – No Action. The environmental consequences of the alternatives arranged by resource are described in detail in Chapter 3. The terms “environmental consequences” and “environmental impacts” are synonymous in this document.

There would be some element of construction for all alternatives consisting of a short-term construction component. Alternative A will require routine and potentially annual construction to replace or repair stoplog piers. Alternatives B and C would involve more

extensive construction; however, once completed there would no longer be construction equipment or intrusion into the spillway area.

Also, as a result of the two action items being considered, designs have identified an avenue to provide a more consistent flow through the area below the spillway. Consistent flow would improve fisheries and habitat.

Table 2-1. Summary comparison of alternatives.

Resource	Alternative A – No Action	Alternative B – Spillway and Headworks Replacement	Alternative C – Spillway Replacement
Hydrology and Reservoir Operations			
o Lake Walcott Target Elevations	4245 feet (April through October)	Dry water type years: 4245 feet (November through August). Average/wet water type years: 4245 feet (November through September)	Same as Alternative B.
	4240 feet (November through March)	Dry water type years: 4240 feet (September through October). Average/wet water type years: 4240 feet (October)	Same as Alternative B.
o Target Flows below Minidoka Dam (includes both powerplant and spillway flows measured at the USGS gage)	500 cfs	Dry water type years: 525 cfs. Average/wet water type years: 600 cfs	Same as Alternative B.
o Spillway Flow Targets	1,300 cfs (April 15 through June 30) 1,900 cfs (July 1 through August 31) 1,300 cfs (September 1 through September 15) First 5,035 cfs through the powerplant (April 1 through April 14 and September 16 through October 31). Next 1,300 cfs over the existing spillway additional flows above a total of 6,335 cfs through powerplant until hydraulic capacity reached, then excess flow is discharged over the existing spillway	Minimum 500 cfs (April through October)	Same as Alternative B.
	0 cfs (October to March)	Up to 100-cfs (November through March)	Same as Alternative B.
Groundwater	Continuation of current groundwater conditions, groundwater levels, and seepage flows.	Total measured seepage volume would increase by about 4 percent downstream of the north abutment (maximum measured seepage is 860 gpm). Water levels in the	Same as Alternative B.

Resource	Alternative A – No Action	Alternative B – Spillway and Headworks Replacement	Alternative C – Spillway Replacement
		sand interbed will increase by about 1.5 feet and basalt water levels will increase by about a foot. Water levels in the regional basalt aquifer would remain below the elevation of the Snake River so there would be no change of flow between the river and aquifer.	
Water Quality	Reservoir bank erosion and upstream reach (in-channel) suspension of sediment during drawdown would continue. No change in downstream reach.	Brief periods of elevated turbidity in the spillway area due to construction activities; no change in downstream reaches. Slight sediment delivery reduction from upstream reaches.	Same as Alternative B.
Minidoka Hydropower Generation	No change.	Increase in gross generation and economic value.	Same as Alternative B.
Aquatic Biota			
Reservoir Fish Community	Extensive areas of aquatic macrophytes along the littoral zone of Lake Walcott provide good spawning and rearing habitat and protection from predation. However the lengthy drawdown period during winter can force juveniles from the cover of aquatic macrophytes, as well as lava rock and boulders, increasing their exposure to predation. While this can increase prey availability for large predators, it can reduce overall juvenile survival of species such as smallmouth bass.	The change in reservoir operations will not adversely affect aquatic macrophytes which provide spawning and rearing habitat and cover from predation. Juvenile fish that rely on the cover of aquatic macrophytes or lava rock and boulder habitat for predator escape will benefit through the reduced period of reservoir drawdown. Overall there will be a benefit to the fish community in general and smallmouth bass in particular because of the reduction in drawdowns and improved juvenile survival. Approximately 5.2 acres of reservoir habitat would be created.	Same as Alternative B.
Spillway Fish Community	No effect to the fish species present in the spillway area will occur.	With proper implementation of BMPs there would be no adverse construction impacts. Replacing the flows that occur as a result of leakage with pipes that will deliver a minimum of 500 cfs in summer and 100 cfs in winter will allow a similar fish population to continue in the spillway area. Fish entrainment rates would be similar to the present condition.	Same as Alternative B.

Resource	Alternative A – No Action	Alternative B – Spillway and Headworks Replacement	Alternative C – Spillway Replacement
Terrestrial Biota			
Vegetation	Existing upland and riparian vegetation will not change and will not be disturbed by construction except for maintenance and the gradual replacement of piers.	Little or no change to existing upland and riparian vegetation. More stable water levels would allow better control of trespass grazing on the Minidoka Refuge by reducing the opportunity for cattle to go around fences during reservoir drawdown. No effects to noxious weed control efforts with the exception of Eurasian milfoil which may increase because of the elimination of winter drawdown and subsequent freezing. Spring full pool may allow better survival of riparian plantings. Temporary drawdowns are generally beneficial for emergent vegetation which exists in the drawdown zone of the reservoir. Overall extent of emergent vegetation should not be affected. Reduction of approximately 5.2 acres of spillway habitat. Reservoir wetlands – Elimination of winter drawdown and the implementation of late summer, early fall short-term drawdowns during the irrigation season would not adversely affect emergent vegetation in the reservoir littoral zone. Creation of approximately 5.2 acres of reservoir habitat.	Same as Alternative B.
Spillway Wetlands	There will be no changes in wetland function or extent.	Replacing the flows that occur as a result of leakage with 5 pipes that will deliver a minimum of 500 cfs in summer and 100 cfs in winter will allow the wetland to continue to function. The overall extent of the wetland should remain unchanged. The construction of the new headgates would primarily be completed outside the wetland area so would have little impact A small amount (less than 1/10 of an acre) of vegetation in the spillway area would be eliminated with the construction of the new spillway and service road	Same as Alternative B.
Avian, Mammalian, Amphibian, and Reptile Communities	No changes in the wildlife community would occur.	Little or no effect to avian communities, except temporary disturbance of birds in the construction area. No effect to large mobile wildlife such as deer	Under Alternative C the new headworks would not be built only the existing spillway sections would be

Resource	Alternative A – No Action	Alternative B – Spillway and Headworks Replacement	Alternative C – Spillway Replacement
		and antelope. Muskrat and beaver populations would likely increase. Increasing beaver populations may put the few cottonwoods at risk. Elimination of winter drawdown would likely benefit amphibians. Wildlife species would be temporarily disturbed during the approximate 31 months of construction and may experience some increased mortality due to collisions with heavy equipment on the haul road, or as a result of displacement to already occupied habitats. The presence of humans may also cause some wildlife species to avoid the area while construction is taking place. Avoidance of the area by some species should change when construction is completed and the construction noise stops. Blasting to remove rock in the spillway area is likely to result in temporary adverse impacts to reptiles and amphibians including mortality of any individuals in the immediate area of the blasting activities.	constructed. These would primarily be completed outside the wetland area and should have no impact.
Threatened and Endangered Species Spillway Flow	Operations – No winter release; 1,300 to 1,900 cfs irrigation season No change in habitat for, ESA snails, wetland acres, bald eagle, or Yellow-billed cuckoo habitat. No construction.	Operations – Up to 100 cfs in winter; 500 cfs minimum in summer 2005 BiOp operations – Summer reduction; winter increase 5.2 acres converted from spillway habitat to permanently watered reservoir habitat. ESA snail - Winter Improvement, no summer change Eagle Habitat – Winter Improvement; no summer change Yellow-billed cuckoo – Winter improvement; summer improvement Construction – Reduce flows maintained	Same as Alternative B.

Resource	Alternative A – No Action	Alternative B – Spillway and Headworks Replacement	Alternative C – Spillway Replacement
Reservoir	Operations – 5-foot winter draft; April refill No change in habitat for, ESA snails, wetland acres, bald eagle, or Yellow-billed cuckoo habitat. No construction.	Operations – 5-foot winter draft; December refill 2005 BiOp operations – Earlier pre-irrigation season fill 5.2 acres converted from spillway habitat to permanently watered reservoir habitat. ESA snail – No change Eagle Habitat –No change Yellow-billed cuckoo – No change Construction – Annual operations maintained	Same as Alternative B.
Geology	Weathering and erosion of the exposed rock would continue at a very slow rate. Over time some foundation areas below the existing spillway will be affected by erosion from spillway discharges and require treatment such as concrete aprons over the rock.	Rock excavation and soil concrete fill would be required along the new spillway alignment and in the foundation of the new headworks. Staging and waste areas are required for using and disposal of construction materials.	Rock excavation and soil concrete fill would be required along the new spillway alignment. Staging and waste areas are required for using and disposal of construction materials.
Soils	Normal operations and maintenance would have no impacts on soils in the project area.	Construction activities would cause disturbance of vegetation and compaction of soil from traffic, stockpiled material, and construction supplies. Dust abatement at stockpiles is necessary.	Construction activities would cause disturbance of vegetation and compaction of soil from traffic, stockpiled material, and construction supplies. Dust abatement at stockpiles is necessary. Potential staging and waste areas may not be used or perhaps reduced in size.
Flood Plain	Under continuance of existing spillway and powerplant operating conditions at the site no new impacts on the existing flood plain are anticipated.	During flood control releases that result in higher spillway flows the increased discharge may redistribute bedload sediments in the river but would not adversely impact the flood plain areas.	Similar impacts as Alternative B.
Cultural Resources	Spillway replacement will not be implemented; no immediate effect on the historic dam. However, no action could result in major changes later from repairs that will affect the dam's	Impacts from removal of original components of the historic dam would include: the existing spillway, the historic bridge at the North Side Canal, the South Side Canal headworks, and the historic lining material on the North Side	Impacts to dam integrity would be at a reduced scale relative to Alternative B. Impacts from removal of original components of the historic dam would include

Resource	Alternative A – No Action	Alternative B – Spillway and Headworks Replacement	Alternative C – Spillway Replacement
	National Register status. There will be no effect on archaeological sites.	Canal. Additional impacts would result from introducing new elements: new overflow sections downstream of the existing spillway; new North Side Canal and South Side Canal headworks structures; new North Side Canal lining; a new radial gate section with 12 radial gate bays; accessible parking area and security fences; new service roads; and new concrete dikes. These new elements adversely affect the integrity and historic environment of the dam. Of the three alternatives, Alternative B would have the greatest impact to the dam's historic integrity. There would be no effect on archaeological sites.	removal of the existing spillway. Impacts from introducing new elements would include: new overflow sections; a new radial gate section; accessible parking area and security fences; new service roads; and new concrete dikes. These new elements would adversely affect the integrity and historic environment of the dam. There would be no effect on archaeological sites.
Indian Trust Assets (ITAs)	No change, assets will not be affected.	Alternative B would temporarily affect fishing and hunting rights in the direct vicinity of the new spillway and canal headworks during construction. These fishing and hunting rights would be restored at project completion	Expected impacts from construction and dewatering would be identical to the impacts described for Alternative B.
Sacred Sites	No known sites in the area, sacred sites will not be affected.	There are no known Indian sacred sites in the area of the existing spillway or the adjacent area surrounding the project. There is potential of uncovering a sacred location if the water is dropped below normal management levels for the spillway replacement. No impacts are expected from the construction work when replacing the headworks.	There are no known Indian sacred sites in the area of existing spillway or the adjacent area surrounding the project. There is potential of uncovering a sacred location if the water is dropped below normal management levels for the spillway replacement.
Recreation	Use restrictions in 43 CFR Part 423 would be in place indefinitely.	Ice fishing use would shift northeastward; bank fishing from the existing dike would cease if private landowner denied public access; no access would be provided to the new dike; all recreation using existing spillway would cease; fishing would be available immediately below outflow points of both the existing radial gates and the new radial gates; more difficult to access south side of river; public access to the south half of area below the new spillway including existing	Same as Alternative B.

Resource	Alternative A – No Action	Alternative B – Spillway and Headworks Replacement	Alternative C – Spillway Replacement
		radial gates improved; accessible parking constructed and fishing access improved for people with disabilities, which could result in increased visitation below the new spillway.	
Aesthetics	No change; occasional construction activities would be expected due to intermittent pier replacement.	Short-term impacts associated with activities during construction of the new spillway and headworks. New spillway would have less visual impact than existing spillway.	Short-term impacts associated with activities during construction of the new spillway. New spillway would have less visual impact than existing spillway.
Noise	Temporary noise and groundborne vibration generated by equipment and machinery associated with pier replacement and headworks maintenance will attenuate to acceptable levels at the park and private residences. Noise impacts associated with implementation will be temporary and less than significant. Following maintenance noise levels will be the same as the current condition; therefore, there would be no operational noise impact. Noise impacts are localized in nature and decrease substantially with distance. No other construction projects are currently located or expected in the immediate vicinity of Minidoka Dam. Therefore, pier replacement and headworks maintenance will not contribute to cumulative construction noise impacts.	Potential temporary noise and groundborne vibration impacts generated by equipment and machinery used during construction of the new spillway and headworks replacement would attenuate to acceptable levels at the park and private residences. Noise impacts associated with implementation would be temporary and less than significant. Following construction noise levels would be the same as the current condition; therefore, there would be no operational noise impact. Noise impacts are localized in nature and decrease substantially with distance. No other construction projects are currently located or expected in the immediate vicinity of Minidoka Dam. Therefore, replacement of the existing spillway and headworks would not contribute to cumulative construction noise impacts.	Same as Alternative B.
Air Quality	Compliance with all applicable DEQ emission standards and BMPs would reduce potential impacts to less than significant levels. Air quality impacts associated with pier replacement and existing headworks maintenance are localized	Compliance with all applicable DEQ emission standards and BMPs including those for operation of portable rock crushers, and concrete and/or asphalt batch plants would reduce potential impacts to less than significant levels. Thus air quality impacts associated with Alternative B would be temporary and less than	Same as Alternative B.

Resource	Alternative A – No Action	Alternative B – Spillway and Headworks Replacement	Alternative C – Spillway Replacement
	in nature and decrease substantially with distance. No other construction projects are currently located or expected in the immediate vicinity of Minidoka Dam. Air quality following maintenance would be the same as the current condition; therefore, there would be no operational air quality impact.	significant. Air quality following construction would be the same as the current condition; therefore, there would be no operational air quality impact. Air quality impacts associated with the construction of the new spillway and headworks are localized in nature and decrease substantially with distance. No other construction projects are currently located or expected in the immediate vicinity of Minidoka Dam.	
Socioeconomics	No construction related impacts. Annual O&M related expenditures will increase resulting in 3 jobs, $292,300 of output, and $111,700 of labor income.	Construction-related expenditures, mainly due to wage earner's spending, result in 291 jobs, $28.5 million in output, and $10.0 million in labor income. These impacts are spread over the construction period. Annual O&M expenditures result in 1 job, $74,600 output, and $28,500 labor income; all categories of impacts are less than No Action.	Construction-related expenditures, mainly due to wage earner's spending, result in 204 jobs, $20 million in output, and $7.0 million in labor income. These impacts are spread over the construction period. Annual O&M expenditures result in 1 job, $86,000 output, $32,900 and labor income, all categories of impacts are less than No Action.
Environmental Justice	No disproportionate adverse human health or environmental impacts on minority and/or low-income populations have been identified.	No disproportionate adverse human health or environmental impacts on minority and/or low-income populations have been identified.	Same as Alternative B.

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CHAPTER 3 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

Chapter 3 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

3.1 Introduction

This chapter describes the affected environment and evaluates the environmental consequences of implementing each of the alternatives described in Chapter 2. The level and depth of the environmental analysis corresponds to the context and intensity of the impacts anticipated for each environmental component. Where the alternatives would have the same impacts on an environmental component, the analysis is presented once and summarized or referenced in subsequent analyses to eliminate redundancy. The No Action alternative (Alternative A) describes conditions most likely to occur if the Proposed Action were not implemented and provides the basis to compare the action alternatives (Alternatives B and C).

Discussions are arranged by resources in the following order:

- Hydrology and Reservoir Operations
- Groundwater
- Water Quality
- Minidoka Hydropower Generation
- Aquatic Biota
- Terrestrial Biota (including Wetlands)
- Threatened and Endangered Species
- Geology, Soils, and Flood Plains
- Cultural Resources
- Indian Trust Assets
- Sacred Sites
- Recreation
- Aesthetics
- Noise
- Air Quality

- Socioeconomics
- Environmental Justice

The following resources are not affected by the alternatives and therefore, are not discussed in this EIS:

- Land Status and Use
- Hazardous or Toxic Wastes
- Climate Change

3.2 Hydrology and Reservoir Operations

3.2.1 Affected Environment

General Discussion

Most of Reclamation's storage above Milner Dam is used as a supplemental water supply for irrigation. As a result, most irrigators relying on surface water use a combination of storage and natural flows, including reach gains. Providing a sufficient amount of water in the river for out-of-stream diversion requires a high degree of coordination among irrigators, storage operators, and the State watermaster. Essentially, this involves storing water as physically high (upstream) in the system as possible, then moving water downstream only when required. In general, demands are met from the nearest storage reservoir upstream from the point of diversion, then from reservoirs progressively upstream as the water supply diminishes.

Through most of the irrigation season, the water surface at Lake Walcott is maintained at or near maximum elevation to ensure water deliveries to the MID and the BID and to provide maximum hydraulic head for hydropower generation at the Minidoka Powerplant. In the late irrigation season, drawdown of Lake Walcott in preparation for winter can meet some downstream irrigation demands. Currently, Lake Walcott is drafted approximately 5 feet below full pool during the winter to keep ice buildup from interfering with and further damaging the existing spillway.

Modeling of Reservoir Operations

This section discusses the upper Snake River basin modeling effort. In order to assess the reservoir system under different operating schemes or hydrologic conditions, a model of the Snake River system was constructed. The model output of river flows and reservoir contents provides a basis for comparative analyses of the range of possible conditions resulting from

modifications to operational constraints. The alternatives analysis utilized the Snake River MODSIM Model, version 8.1, a general-purpose river and reservoir operations computer simulation model.

Varying hydrologic conditions and numerous other factors influence the way reservoir projects operate. Daily operations of the projects are influenced by many factors, including the amount of recent precipitation influencing project inflow, reservoir carryover at the end of the storage season, spatial water supply distribution, temperature, amount of irrigation demand, special operating requests, or emergency situations. These types of circumstances are difficult to predict or simulate in modeling activities. Therefore, it is important to note that when model output is compared to historical data, differences would be apparent as the model is incapable of predicting the day-to-day decisions made on a real-time basis.

This surface water distribution model was structured with a monthly time-step. While the monthly time-step of the model output does not capture the variations of day-to-day circumstances and real-time operational decisions, it does provide a means to make relative comparisons between the alternatives under different hydrologic conditions and system constraints. The MODSIM Model output was used to compare the effects between different operational constraints on resource conditions

3.2.2 Environmental Consequences

Methods for Evaluating Impacts

The potential impacts of reservoir operations were evaluated by:

1. Developing a calibrated model of project operations, utilizing available data, for the purposes of assessing potential impacts to reservoir elevations and changes to flows discharged through the powerplant and existing spillway for the No Action and the proposed alternatives.

2. Analyzing and comparing results of the model output between the No Action alternatives to the proposed alternatives.

Impact Indicators

1. Impacts to reservoir elevations.

2. Impacts to flows measured below the project.

3. Changes to operations during construction.

Alternative A – No Action

The MODSIM model network of the Snake River basin was developed to replicate historical data and system operations. Once completed, the model was configured to represent the current level of water resource development activities and operations within the Snake River basin. This model configuration was defined as Alternative A – No Action for the proposed action.

As previously mentioned, day-to-day real-time operations are difficult to simulate over a long term; however, model constraints were configured to best represent the general operational guidelines. The model constraints for the Minidoka/Lake Walcott project under this alternative were defined as follows:

Reservoir Target Elevations:

- Full pool: 4245 feet (April through October)
- Winter draft: 4240 feet (November through March)

Target Flows:

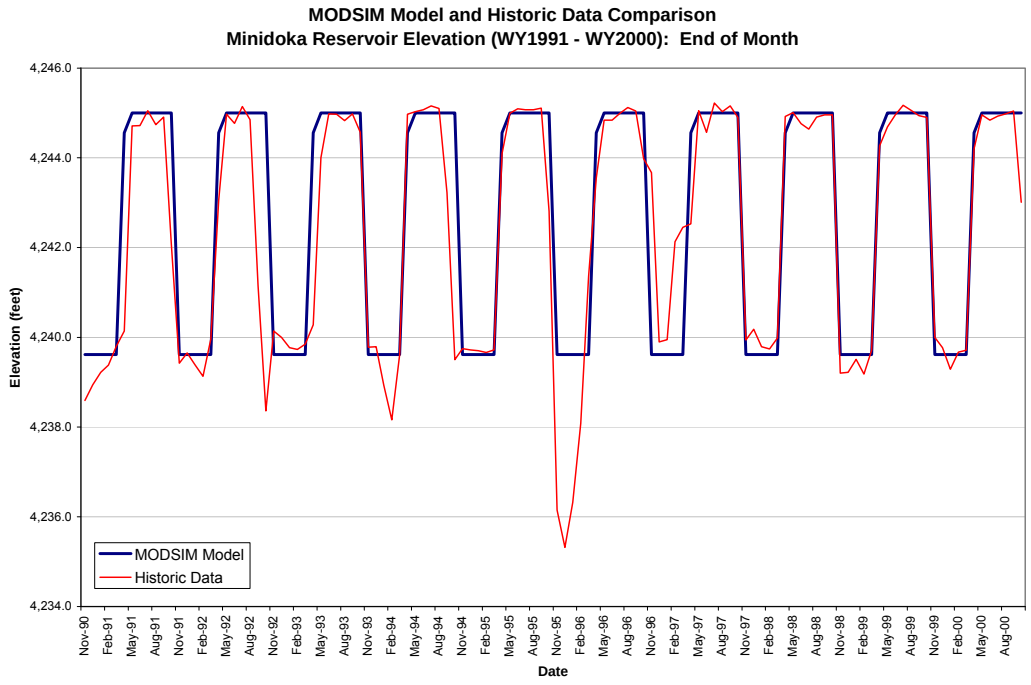
- Minimum flow below project: 500 cfs (year round) measured at the U.S. Geological Survey (USGS) gage. The minimum flow comprises both existing spillway and powerplant flows.
- Existing spillway flow targets:
  - Winter controlled spillway releases: 0 cfs (November through March)
  - Irrigation season spillway releases:
    - April 15 through June 30: 1,300 cfs
    - July 1 through August 31: 1,900 cfs
    - September 1 through September 15: 1,300 cfs
    - April 1 through April 14 and September 16 through October 31: First 5,035 cfs though powerplant, next 1,300 cfs over existing spillway. Additional flows in excess of 6,335 cfs total, is routed through the powerplant, up to plant capacity. Additional flow above plant capacity is discharged over the existing spillway.

The minimum flow target, identified below the proposed action area, is measured at USGS gage no. 13081500, Snake River near Minidoka, Idaho, at Howells Ferry.

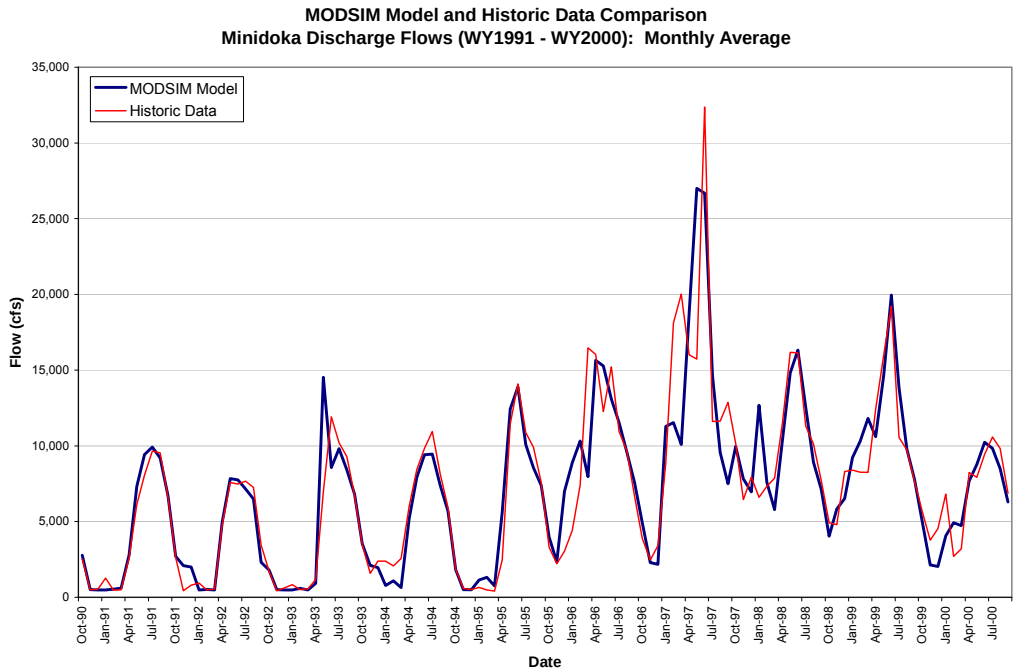
Model Calibration

An initial comparison between the model output and historical data was made between water years (WY) 1991 through 2000. This 10-year period of record was chosen as it is most likely to represent the current level of system resource development and operations for confirmation of model constraints and configurations. The MODSIM model output shows that the model successfully represents the existing conditions, defined as the No Action alternative, for the purposes of comparing the other alternatives operational constraints to assess the resource effects.

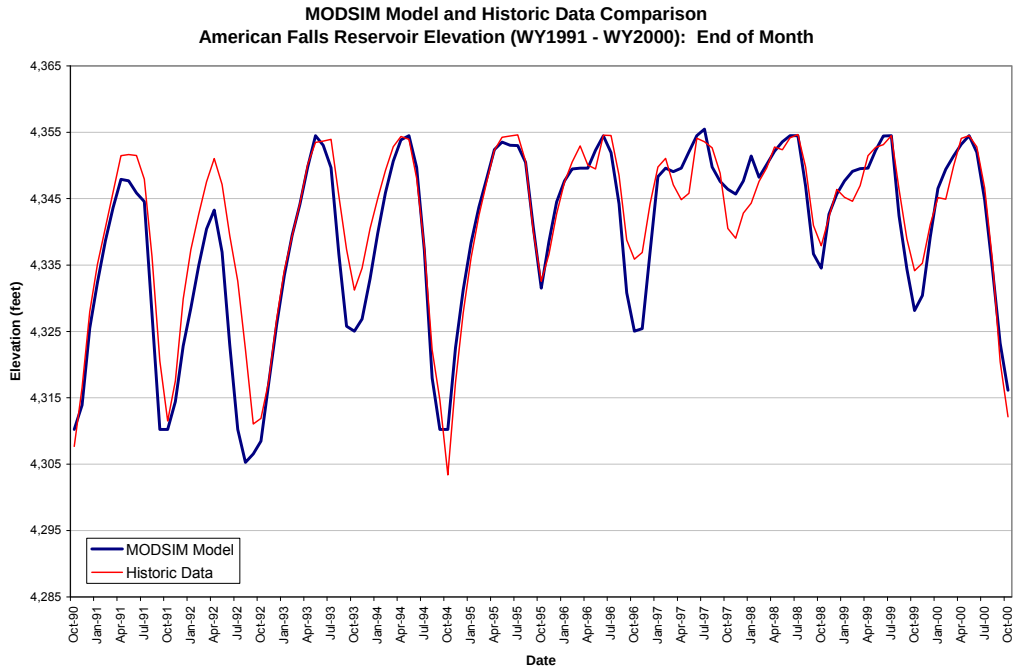
Graph 1 and Graph 2 illustrate the monthly ending reservoir elevations and monthly average flows for WY 1991 through 2000, respectively for Minidoka, comparing the No Action alternative with measured historic data. Similarly, Graph 3 and Graph 4 illustrate comparisons for American Falls Reservoir and discharge flows. Table 3-1 presents a summary of modeled and historic flow represented graphically in Graph 5 through Graph 8.



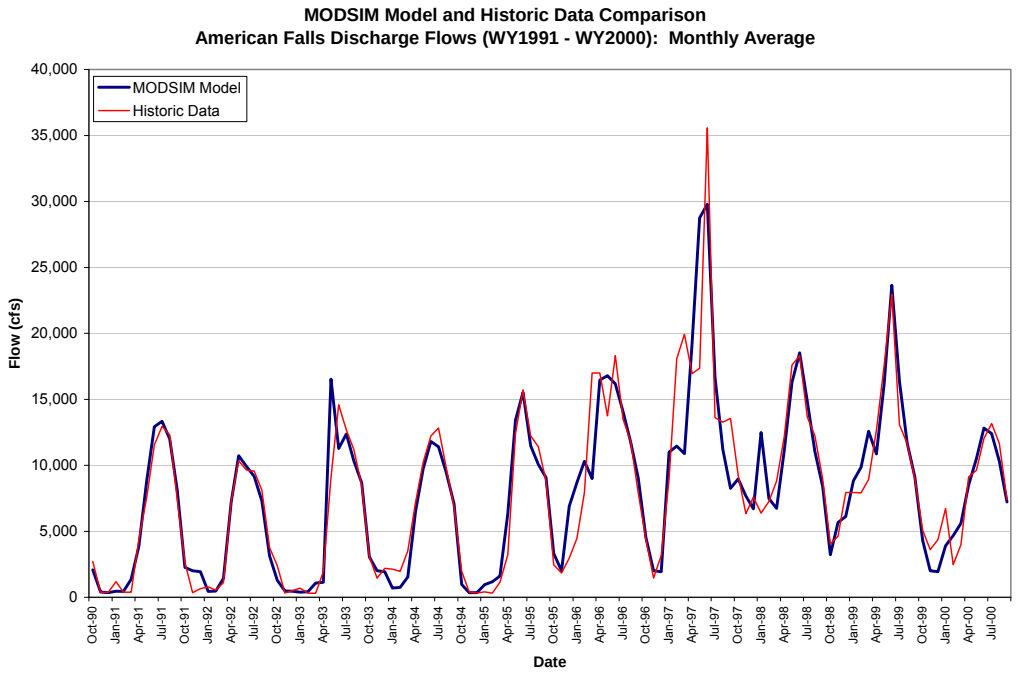
Graph 1. Comparison of model output to historic data for Minidoka end-of-month reservoir elevations (WY 1991 through WY 2000).



Graph 2. Comparison of model output to historic data for Minidoka monthly average flows (WY 1991 through WY 2000).



Graph 3. Comparison of model output to historic data for American Falls end-of-month reservoir elevations (WY 1991 through WY 2000).

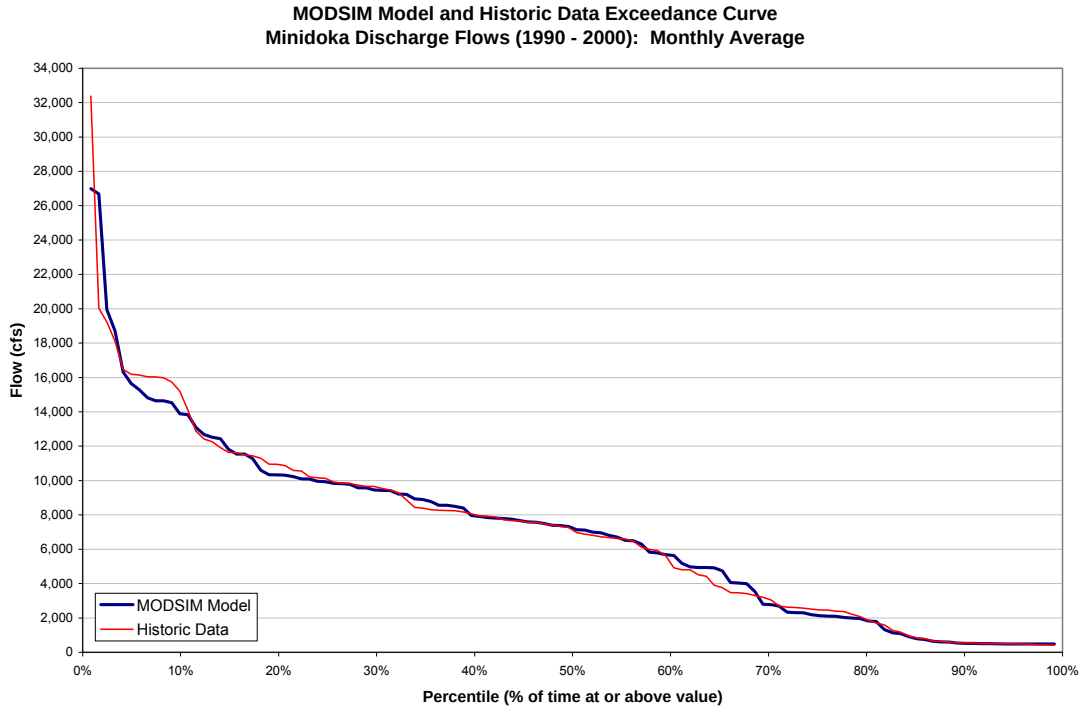


Graph 4. Comparison of model output to historic data for American Falls monthly average flows (WY 1991 through WY 2000).

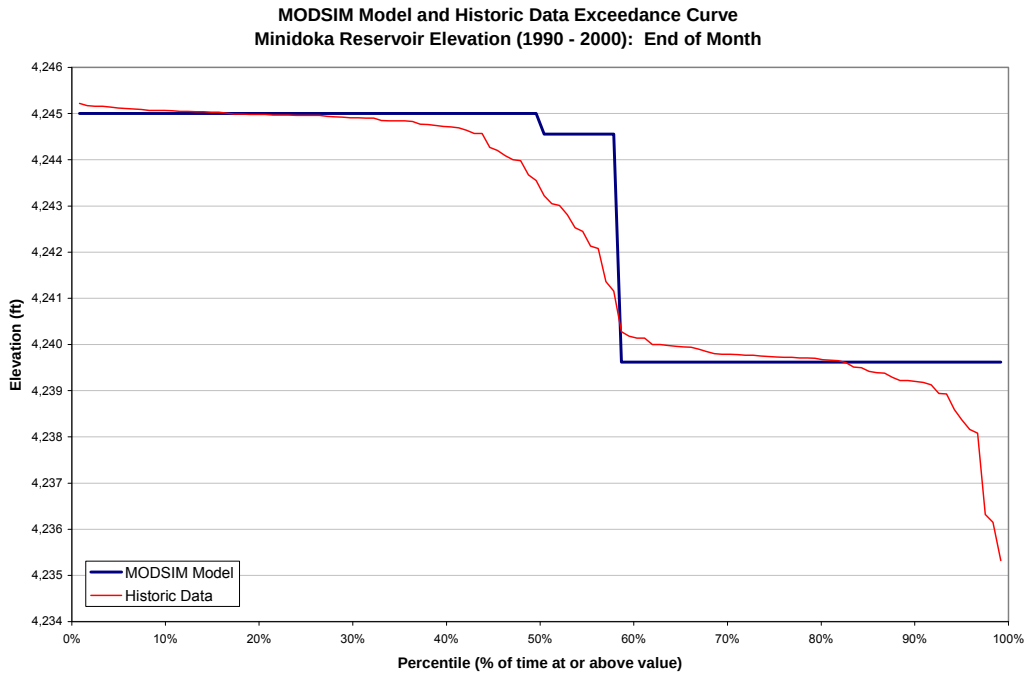
Table 3-1. Exceedence comparison of modeled and historic data.

	Minidoka Monthly Ending Reservoir Elevation (ft)		Minidoka Monthly Average Flow (cfs)		American Falls Monthly Ending Reservoir Elevation (ft)		American Falls Monthly Average Flow (cfs)	
Percentile	Historic Data	MODSIM Model	Historic Data	MODSIM Model	Historic Data	MODSIM Model	Historic Data	MODSIM Model
1%	4,245	4,245	32,373	27,000	4,355	4,356	35,583	29,792
5%	4,245	4,245	16,183	15,649	4,354	4,354	18,079	16,786
10%	4,245	4,245	15,210	13,889	4,354	4,354	16,960	16,178
15%	4,245	4,245	11,638	11,819	4,353	4,352	13,557	13,338
20%	4,245	4,245	10,941	10,330	4,353	4,352	12,829	12,380
25%	4,245	4,245	10,126	9,925	4,351	4,350	12,245	11,455
30%	4,245	4,245	9,657	9,454	4,350	4,350	11,635	11,020
35%	4,245	4,245	8,396	8,899	4,349	4,349	9,838	10,323
40%	4,245	4,245	8,063	7,965	4,348	4,348	9,097	9,468
45%	4,244	4,245	7,650	7,674	4,347	4,347	8,784	8,970
50%	4,244	4,245	7,263	7,321	4,345	4,345	7,929	8,386
55%	4,242	4,245	6,620	6,712	4,344	4,344	7,258	7,238
60%	4,240	4,240	5,633	5,681	4,342	4,340	6,343	6,480
65%	4,240	4,240	3,907	4,919	4,340	4,337	4,361	4,543
70%	4,240	4,240	3,204	2,798	4,339	4,335	3,224	3,143
75%	4,240	4,240	2,515	2,185	4,337	4,332	2,479	2,017
80%	4,240	4,240	2,074	1,958	4,335	4,328	1,959	1,952
85%	4,240	4,240	947	919	4,331	4,325	1,142	1,181
90%	4,239	4,240	557	540	4,322	4,318	514	703
95%	4,239	4,240	502	489	4,317	4,310	381	441
100%	4,235	4,240	412	488	4,303	4,305	306	342

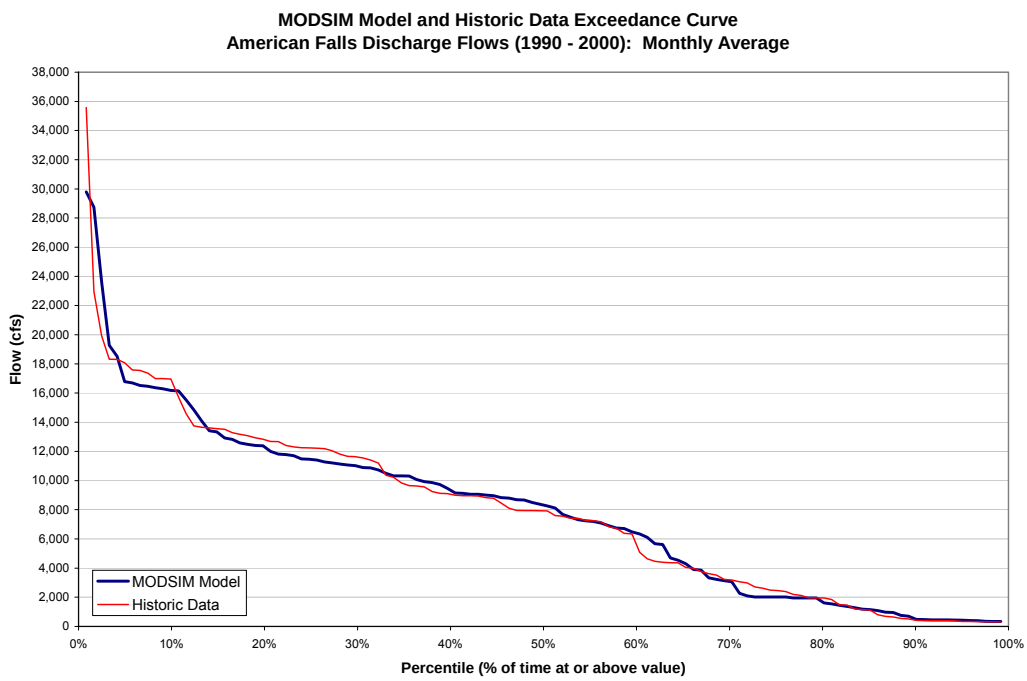
Exceedence curves are presented in Graph 5 through Graph 8 for both Minidoka and American Falls. The exceedence curves illustrate that the model captures the anticipated range of flows and reservoir elevations. The one exception is Lake Walcott, the reservoir above Minidoka Dam. The differences between modeled and historic end-of-month graphs result from the real-time nature of reservoir operations. Reservoirs are operated to meet demands while minimizing departures from recognized target flows. Minimum pool is unlikely to occur at precisely the last day of the month. In real-time, Lake Walcott may be drafted to its minimum point mid-month. In contrast, monthly simulation models are unable to hit a mid-month target and must settle for an end-of-month target. The monthly modeling done for this study provides an adequate basis for comparison between alternatives.



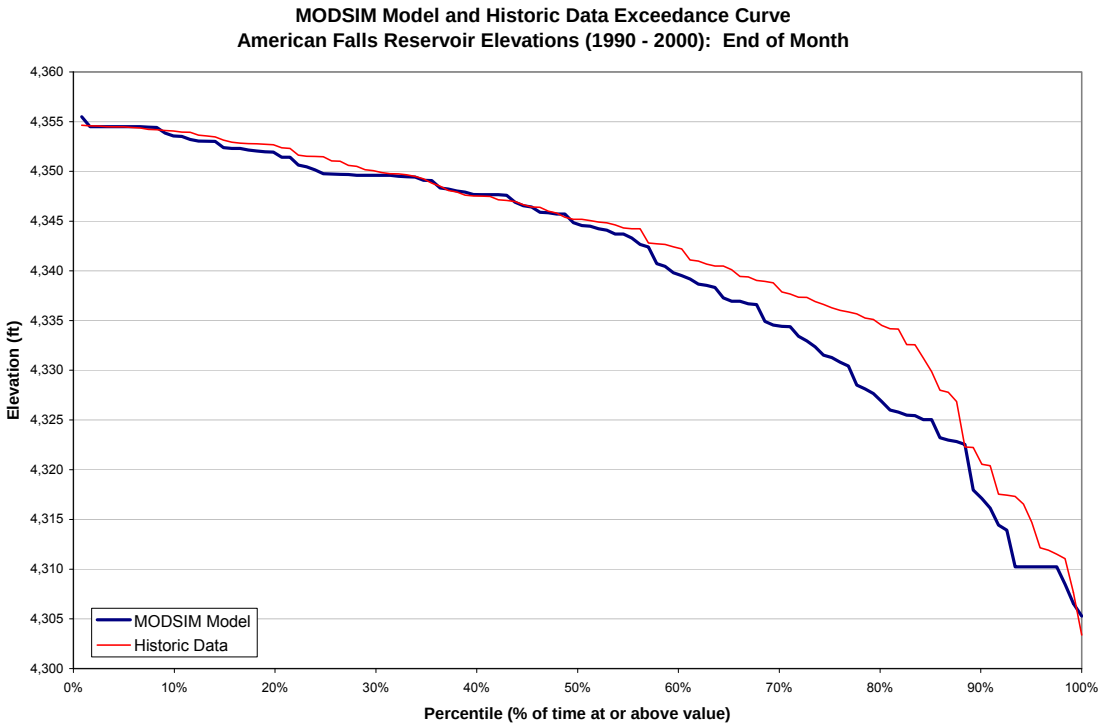
Graph 5. Exceedence curves for flows below Minidoka Dam comparing modeled and historic data.



Graph 6. Exceedence curves for Minidoka Reservoir elevations comparing modeled and historic data.



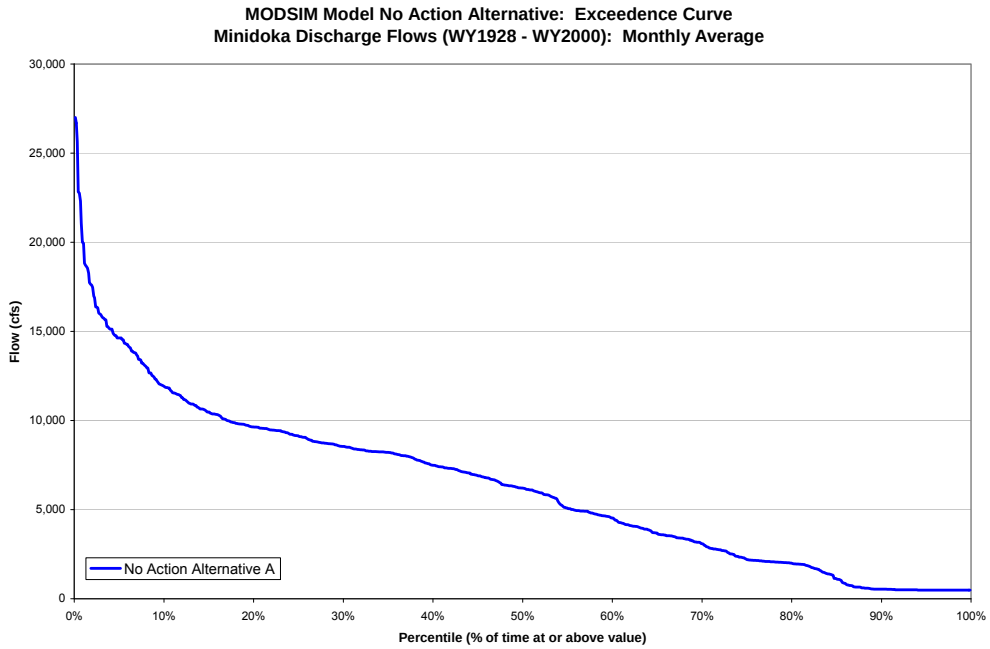
Graph 7. Exceedence curves for flows below American Falls Dam comparing modeled and historic data.



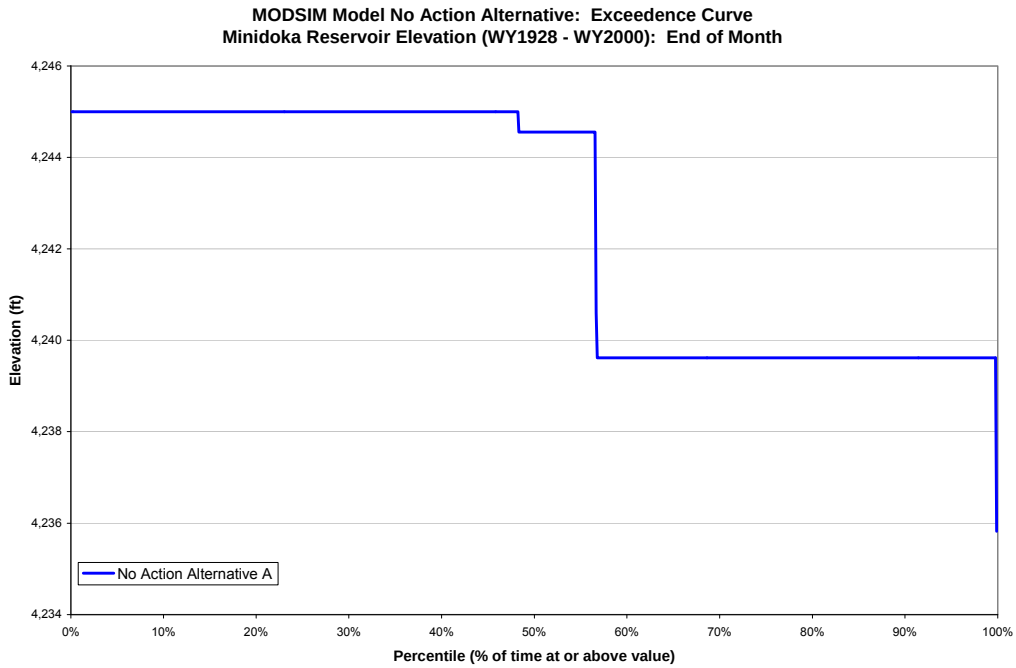
Graph 8. Exceedence curves for American Falls Reservoir elevations comparing modeled and historic data.

Model Output

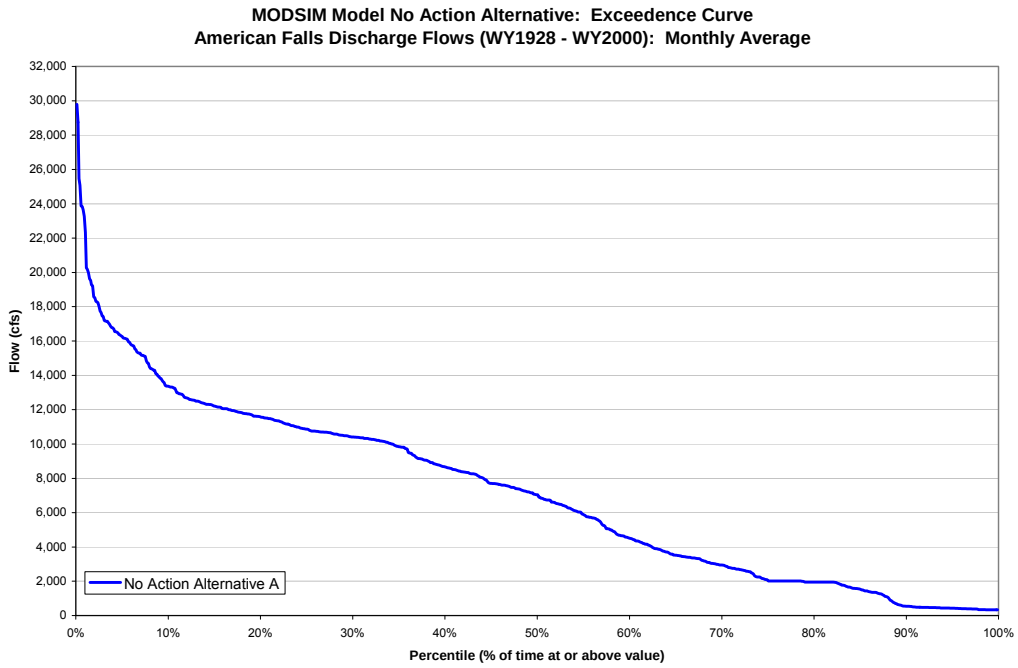
The MODSIM Model used the period of hydrology (WY 1928 through WY 2000) to define the No Action alternative baseline for resource impact assessment. This hydrology provided the boundary conditions, under the current level of system development depicted in the model, in order to capture the varying hydrologic conditions that may be experienced by the basin for analysis. The following figures are exceedence curves representing the model results encompassing the 72-year hydrologic record.



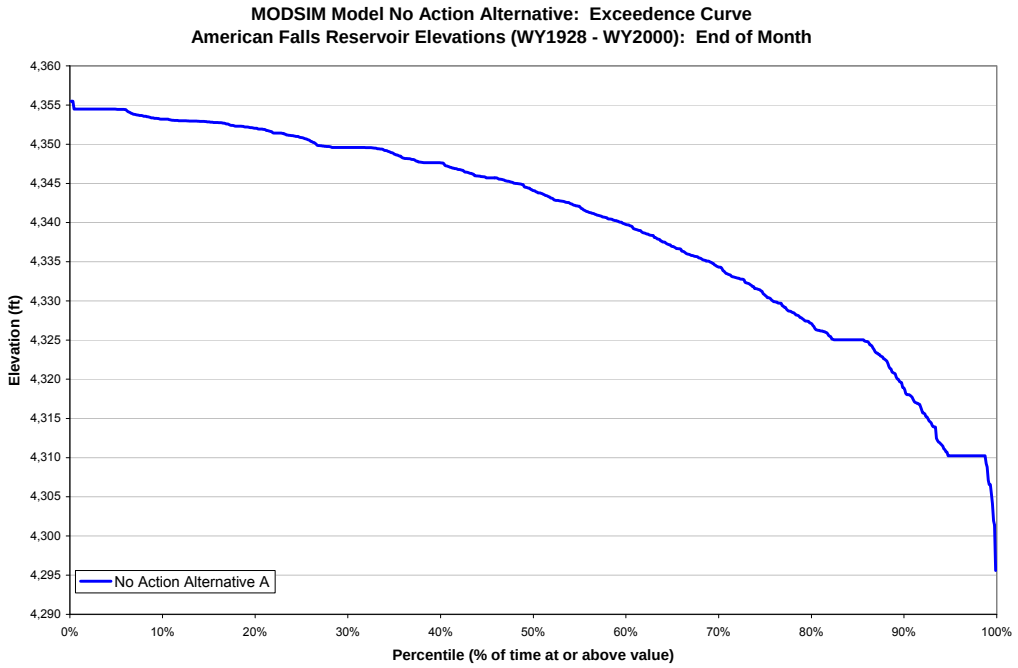
Graph 9. Exceedance curve of model output of Minidoka discharge flows for WY 1928 through WY 2000.



Graph 10. Exceedance curve of model output of Minidoka reservoir elevation for WY 1928 through WY 2000.



Graph 11. Exceedance curve of model output of American Falls Reservoir discharge flows for WY 1928 through WY 2000.



Graph 12. Exceedance curve of model output of American Falls Reservoir elevations for WY 1928 through 2000.

Alternatives B and C

In order to assess the impacts to Alternative B – Spillway and Headworks Replacement and Alternative C – Spillway Replacement, a specific MODSIM model network was configured to represent both of the alternatives. The model assumptions and constraints for both Alternatives B and C are identical.

The model constraints under these alternatives were defined as follows:

Reservoir Target Elevations:

- Full pool: 4245 feet
  - Dry water type years: November through August
  - Average and wet water type years: November through September
- Winter draft: 4240 feet
  - Dry water type years: September through October
  - Average and wet water type years: October

During drier years, a minimum volume in American Falls Reservoir is targeted in order to meet water quality compliance standards and to comply with ESA requirements below American Falls Dam. The model is allowed to draft Lake Walcott below full pool in late summer/fall in order to satisfy water right demands and attempt to maintain as much of the target volume in American Falls Reservoir as possible for compliance. Model configuration allows Lake Walcott to refill and remain full during the winter months.

It should be noted that in real time, the two reservoirs are operated to meet the same targets. Departures typically occur due to daily inflow and diversion variations through the month. Model representation of future operations was used to assess the impact of different operational constraints. It is anticipated that real-time future operations will deviate slightly from the model output due to daily variations, similar to that presented under Alternative A – No Action.

Target Flows:

- Minimum flow below project: The minimum flow comprises both new spillway and powerplant flows.
  - Dry water type years: 525 cfs at the USGS gage 13081500.
  - Average and wet water type years: 600 cfs at the USGS gage 13081500.
- New spillway flow targets:
  - Winter controlled releases: up to 100 cfs (November through March)

- Irrigation season releases: 500 cfs minimum (April through October)

Winter releases over the new spillway are expected to range from 30 cfs up to 100 cfs. For this analysis, 60 cfs spillway flow during the winter months was utilized in the model configuration because it is assumed that an average of 40 cfs would be seeping through the dam under both Alternatives B and C. During wet years, flow in excess of the powerplant hydraulic capacity would be released over the new spillway. The minimum flow target identified below the project for operations is located at USGS gage no. 13081500, Snake River near Minidoka, Idaho at Howells Ferry.

Construction Impacts

It is not anticipated that spillway releases would be significantly affected during the construction period. It is expected that the location of the spillway releases would be adjusted during the construction period, as necessary, in order to direct water away from where the contractor is working. Reclamation personnel would routinely monitor construction activities to ensure flows are sustained through the south channel and that contract requirements are fulfilled. It is not anticipated that reservoir operations or flows measured below the project will differ from the No Action alternative during the construction phase of the project.

Operational Impacts

A comparison of the model output between the Alternative A – No Action and Alternatives B and C were made using hydrology for WY 1928 through WY 2000. The MODSIM output illustrates the relative differences between the scenarios for the purpose of assessing the effects of the alternatives. The impact indicators resulting from project operations, under Alternatives B and C, are illustrated in the following figures. Under the proposed alternatives, Minidoka reservoir elevation remains full for a longer period during the year. In addition, as a result of the reservoir remaining full over the winter months, flows measured below the project will be different; typically less during November, when the reservoir is filling and more during March and April when the reservoir is full under the proposed alternatives.

Table 3-2. Monthly averaged flows below Minidoka for the modeled period of record.

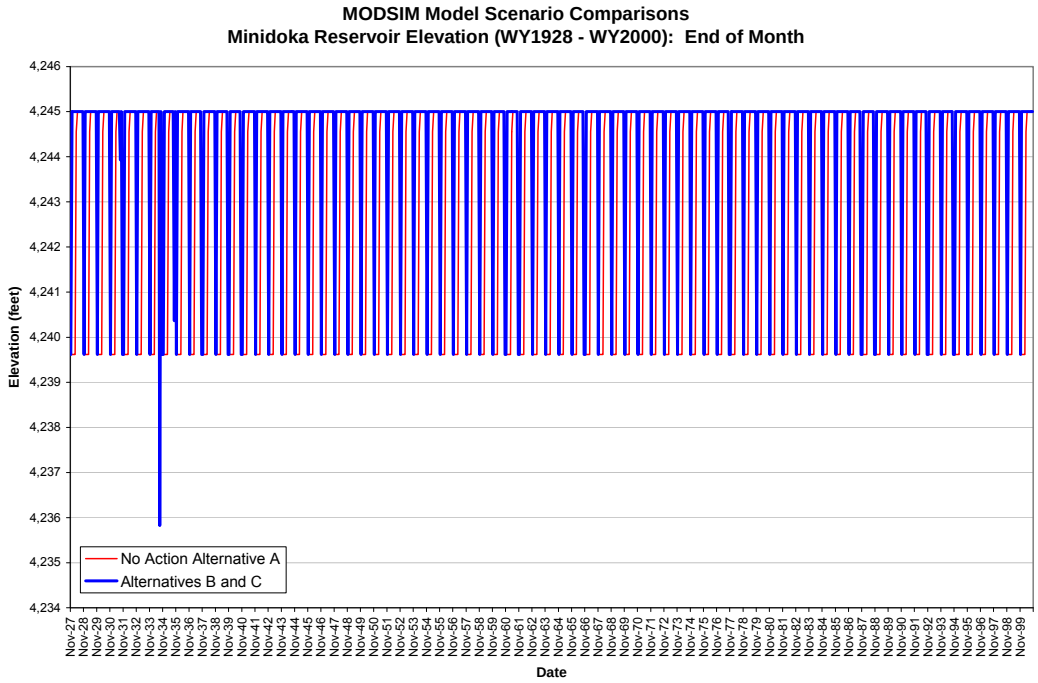
	Modeled Period of Record (WY 1928 through WY 2000)	
Month	**No Action Alternative Average Monthly Flows (cfs)**	**Alternatives B and C Average Monthly Flows (cfs)**
October	3,587	3,587
November	2,207	1,606
December	2,666	2,669
January	3,961	3,905
February	3,975	3,914
March	3,488	4,037
April	7,369	7,488
May	11,949	11,943
June	11,812	11,818
July	10,134	10,142
August	8,424	8,426
September	6,258	6,264

Under Alternatives B and C, the minimum flow over the new spillway during the irrigation months is 500 cfs. The following table compares the annual average spillway flow during the irrigation months between the modeled alternatives. Alternatives B and C, on average, released more than 500 cfs over the spillway during the irrigation season as shown in Table 3–3. Typically, spring months experience higher flows, and as a result exceed the minimum release of 500 cfs. However, most years experienced at least one month that released the 500 cfs minimum flow. This minimum flow of 500 cfs over the new spillway typically occurred during the months of either September or October.

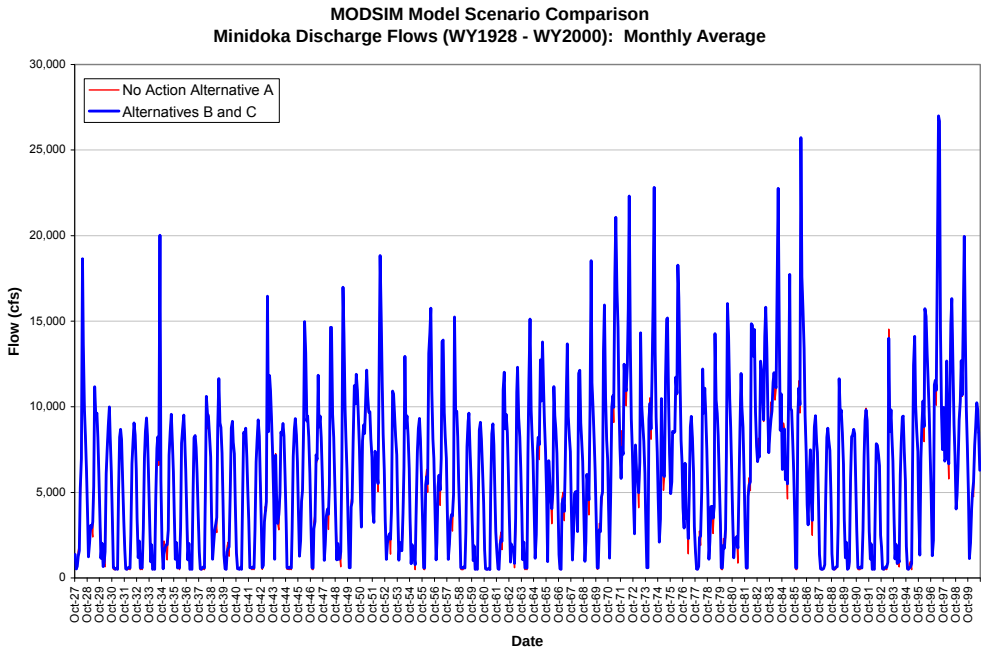
Table 3-3. Comparison of the annual average spillway flow during irrigation season between modeled flows for Alternatives B and C.

Water Year	Alternative A – No Action Average Monthly Flows (cfs)	Alternatives B and C Average Monthly Flows (cfs)	Water Year	Alternative A – No Action Average Monthly Flows (cfs)	Alternatives B and C Average Monthly Flows (cfs)
1928	3,556	2,985	1965	2,815	2,485
1929	1,793	1,146	1966	1,787	1,046
1930	1,526	798	1967	2,215	1,605
1931	1,471	580	1968	2,209	1,549
1932	1,471	605	1969	3,318	2,826
1933	1,471	680	1970	3,021	2,478
1934	2,939	2,199	1971	6,527	6,314
1935	1,477	695	1972	5,223	4,909
1936	1,473	728	1973	2,275	1,597
1937	1,471	546	1974	5,177	4,881
1938	1,615	1,068	1975	3,403	3,048
1939	1,818	1,162	1976	4,306	3,895
1940	1,509	658	1977	1,533	692
1941	1,471	631	1978	2,111	1,665
1942	1,471	620	1979	2,316	1,729
1943	2,925	2,550	1980	3,138	2,654
1944	1,471	662	1981	1,874	1,286
1945	1,471	693	1982	4,143	3,876
1946	2,810	2,289	1983	3,562	3,204
1947	1,828	1,174	1984	5,826	5,575
1948	2,956	2,359	1985	3,079	2,602
1949	3,428	2,853	1986	6,561	6,280
1950	2,320	2,031	1987	1,537	689
1951	2,120	1,618	1988	1,474	584
1952	4,146	3,821	1989	1,888	1,272
1953	1,887	1,293	1990	1,471	633
1954	1,977	1,333	1991	1,567	867
1955	1,472	676	1992	1,471	500
1956	3,714	3,306	1993	2,165	1,525
1957	2,744	2,156	1994	1,531	742
1958	2,399	1,776	1995	2,617	2,080
1959	1,518	751	1996	3,927	3,652
1960	1,504	651	1997	8,743	8,465
1961	1,493	621	1998	3,704	3,471
1962	2,050	1,572	1999	4,583	4,318
1963	2,090	1,473	2000	1,619	1,005
1964	2,613	2,033			

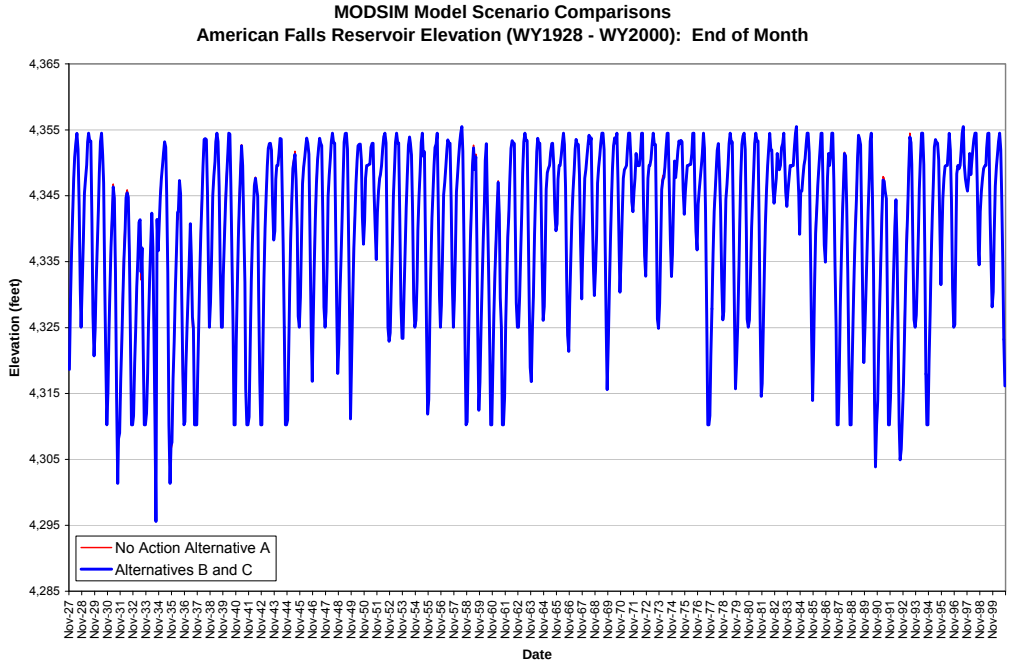
Graph 13 and Graph 14 illustrate the monthly ending reservoir elevations and monthly average flows, respectively for Minidoka, comparing Alternative A – No Action with Alternatives B and C. Similarly, Graph 15 and Graph 16 illustrate comparisons for American Falls Reservoir and discharge flows. Lake Walcott was used to keep American Falls Reservoir near target for water quality while meeting water delivery obligations. In extremely dry water type years, the entire reservoir system was stressed and significant reservoir drawdowns were made to meet obligations. Lake Walcott's capacity is small relative to the American Falls Reservoir target of 100,000 acre-feet and very small compared with the monthly delivery of stored water from the storage system. Draft on American Falls storage often exceeds 400,000 acre-feet in July or August.



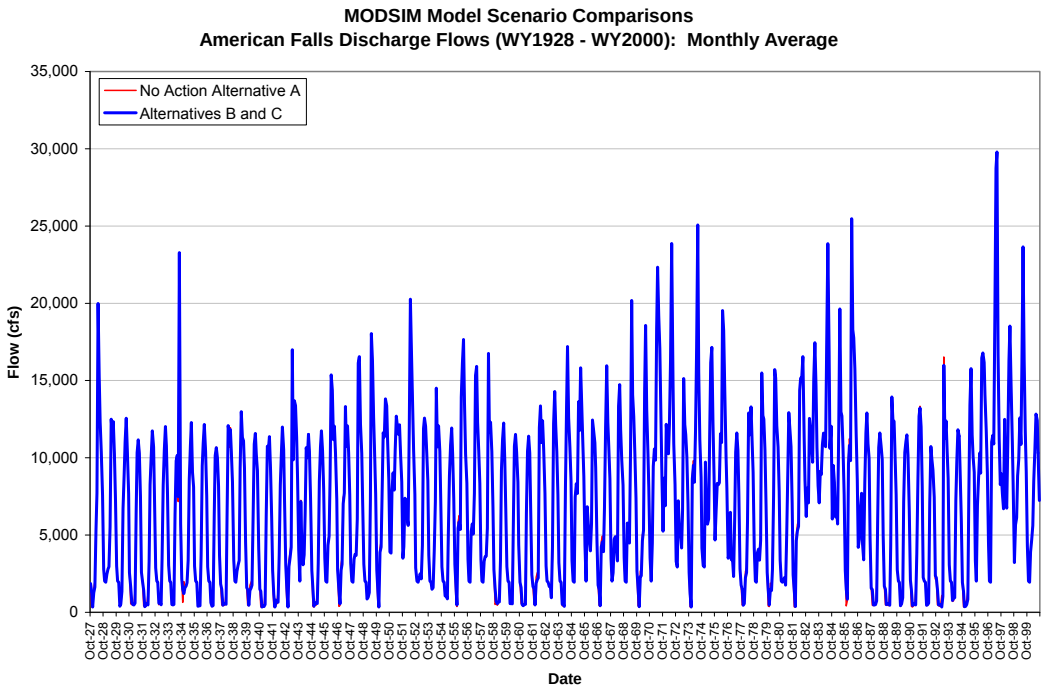
Graph 13. Comparison of model output between alternatives for Minidoka Reservoir end-of-month reservoir elevations (WY 1928 through WY 2000).



Graph 14. Comparison of model output between alternatives for Minidoka discharge (WY 1928 through WY 2000).

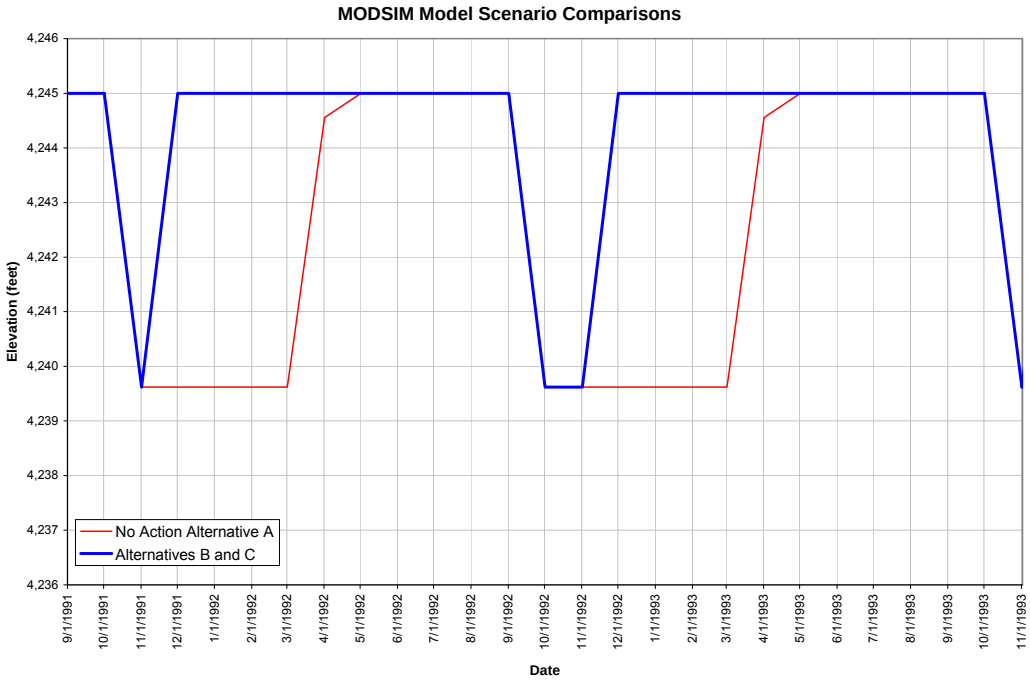


Graph 15. Comparison of model output between alternatives for American Falls Reservoir end-of-month reservoir elevations (WY 1928 through WY 2000).



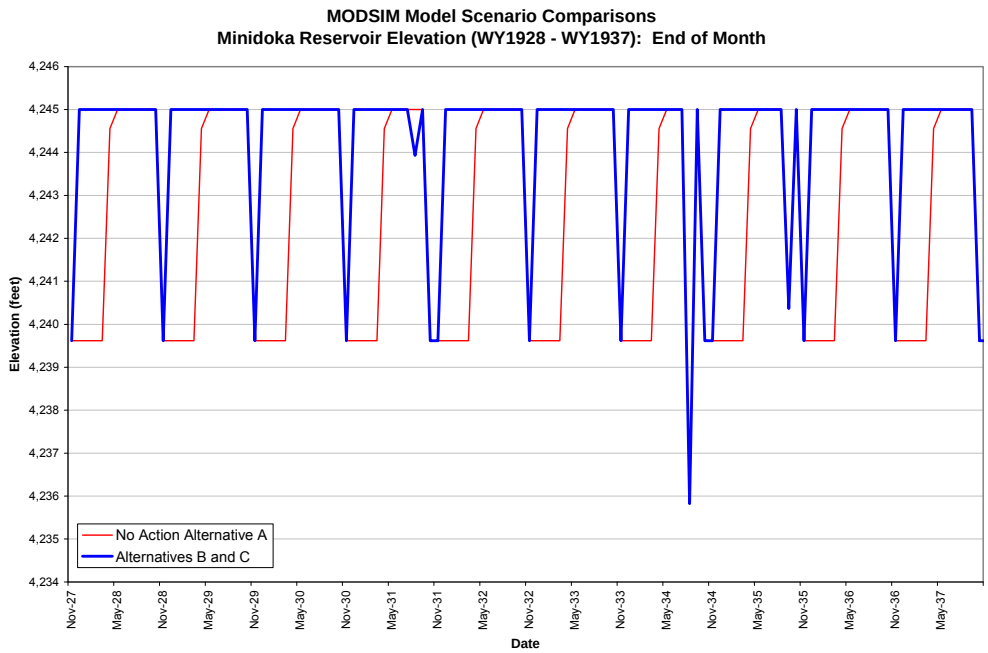
Graph 16. Comparison of model output between alternatives for American Falls Reservoir discharges (WY 1928 through WY 2000).

Graph 17 illustrates differences in reservoir elevations for dry water type years and average to wet water type years.

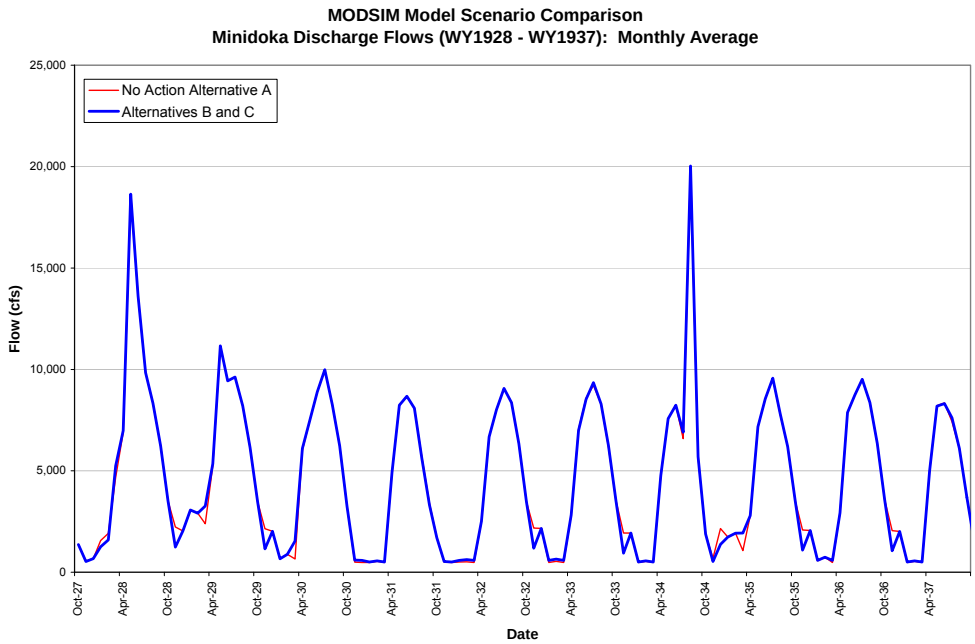


Graph 17. Minidoka Reservoir elevation comparison between average/wet water type year (1991) and dry water type year (1992).

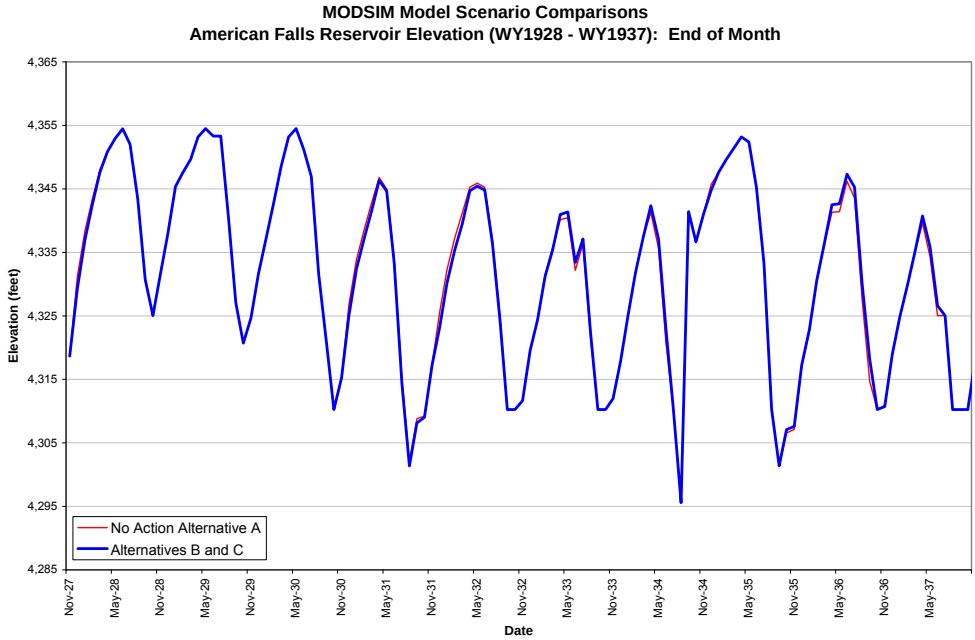
Graph 18 through Graph 21 illustrate differences in model output for the alternatives in the first 10 years of the simulation.



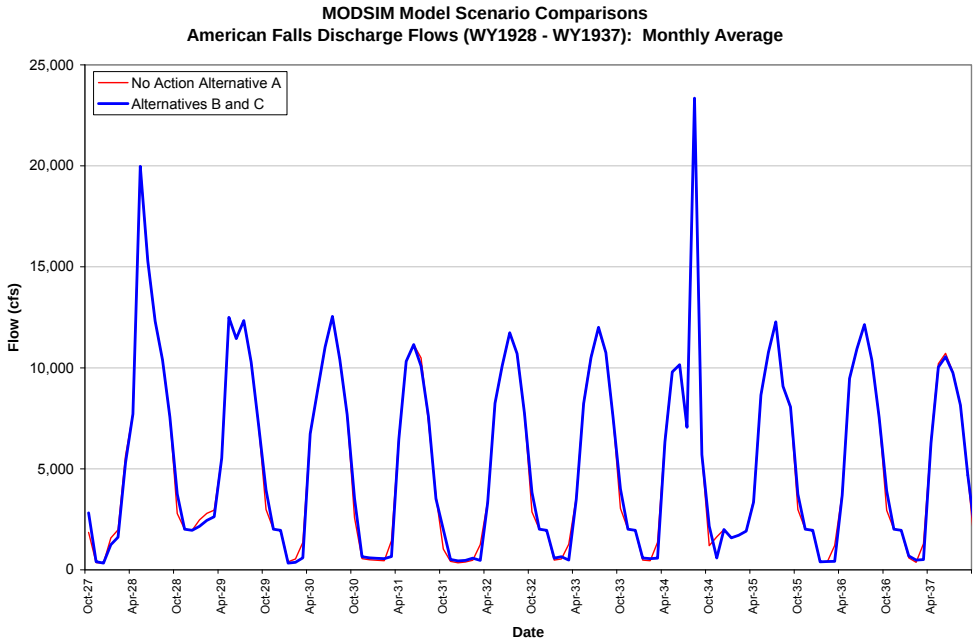
Graph 18. Minidoka Reservoir elevation comparisons between alternatives.



Graph 19. Comparison of Minidoka discharges between alternatives.

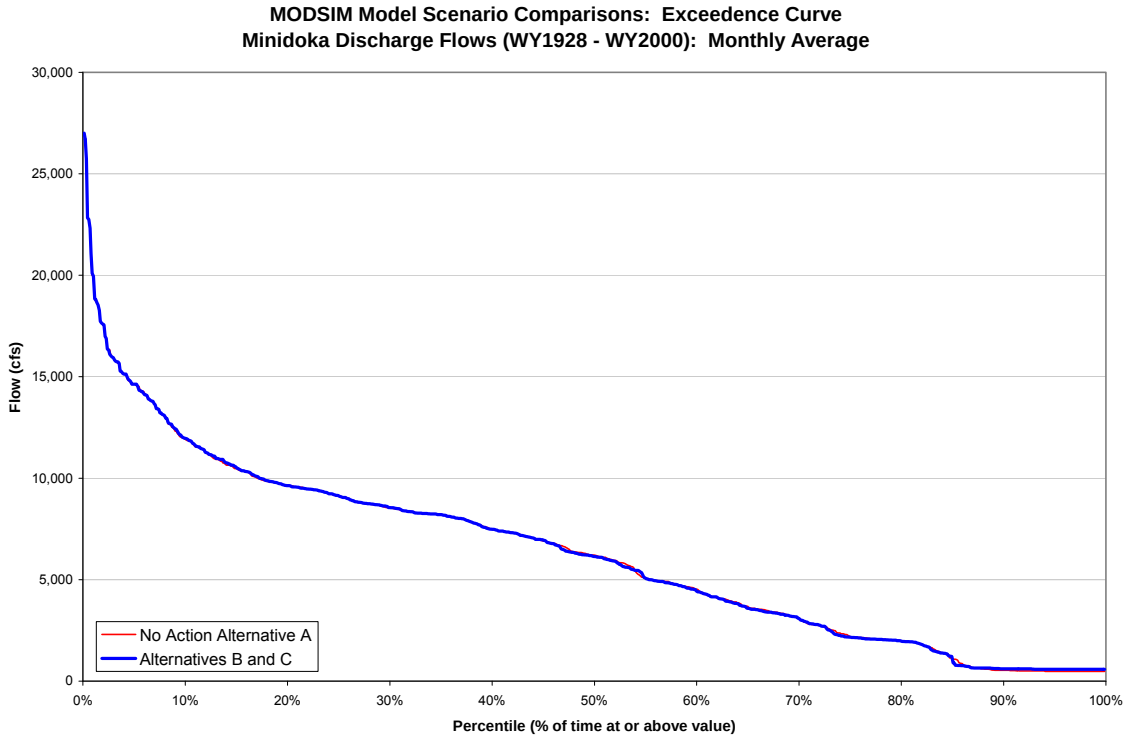


Graph 20. Comparison of American Falls Reservoir elevations between alternatives.

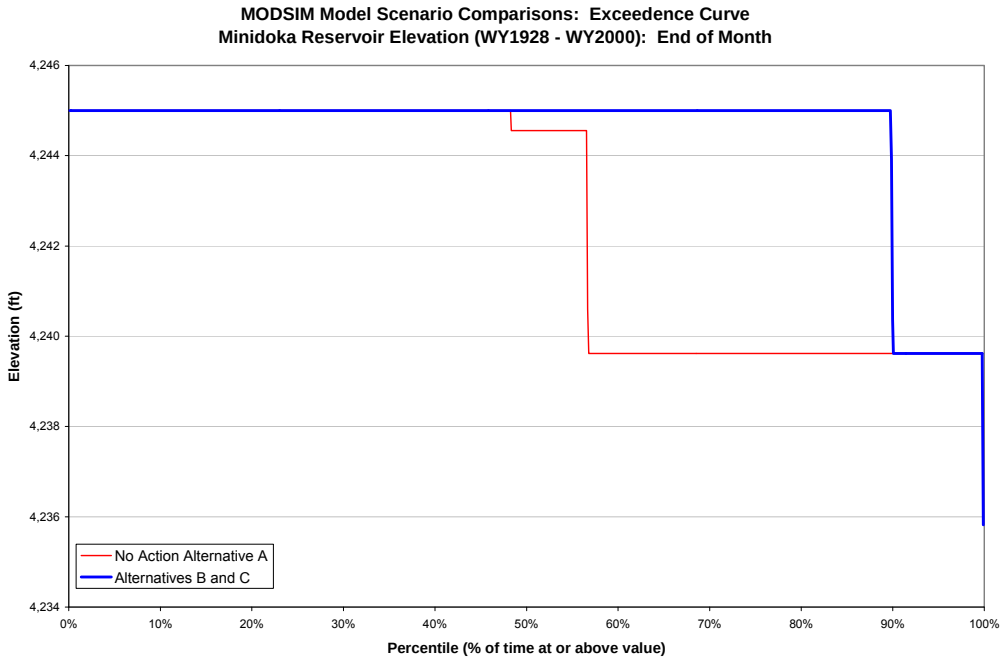


Graph 21. Comparison of American Falls discharges between alternatives.

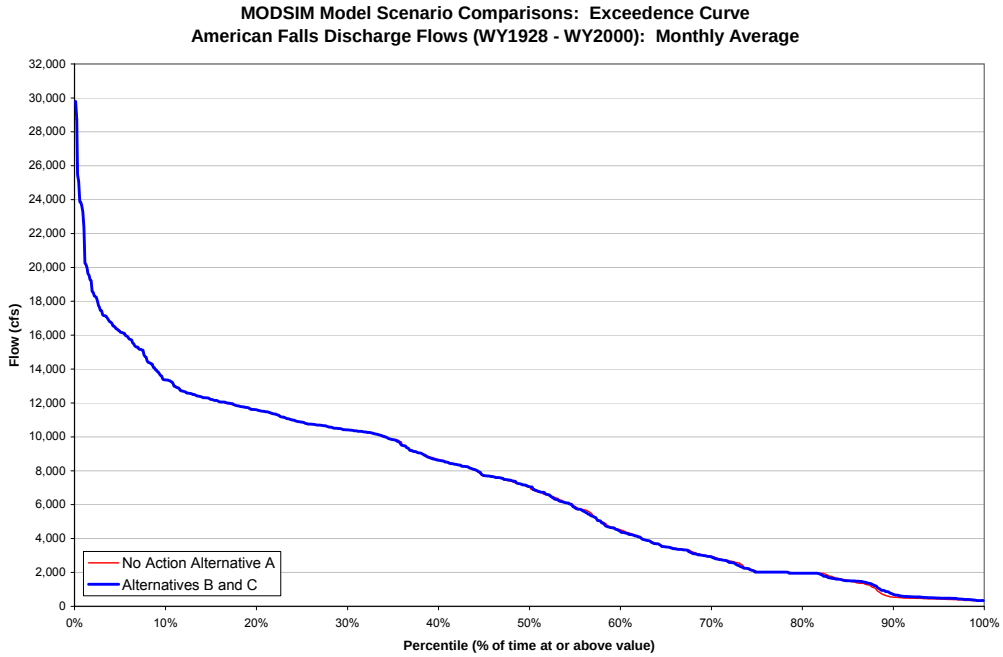
Exceedence curves are presented in Graph 22 through Graph 25 for both Minidoka and American Falls. The exceedence curves illustrate the differences as a result of the proposed alternatives, to flows or reservoir elevations. For example, the exceedence curves comparing Minidoka Reservoir elevations illustrate that just over 50 percent of the time for the period of record modeled (WY 1928 through WY 2000) the reservoir is above elevation 4240 feet under the No Action alternative. Under both Alternatives B and C, Minidoka Reservoir is above elevation 4240 feet roughly 90 percent of the time for the same period of record modeled.



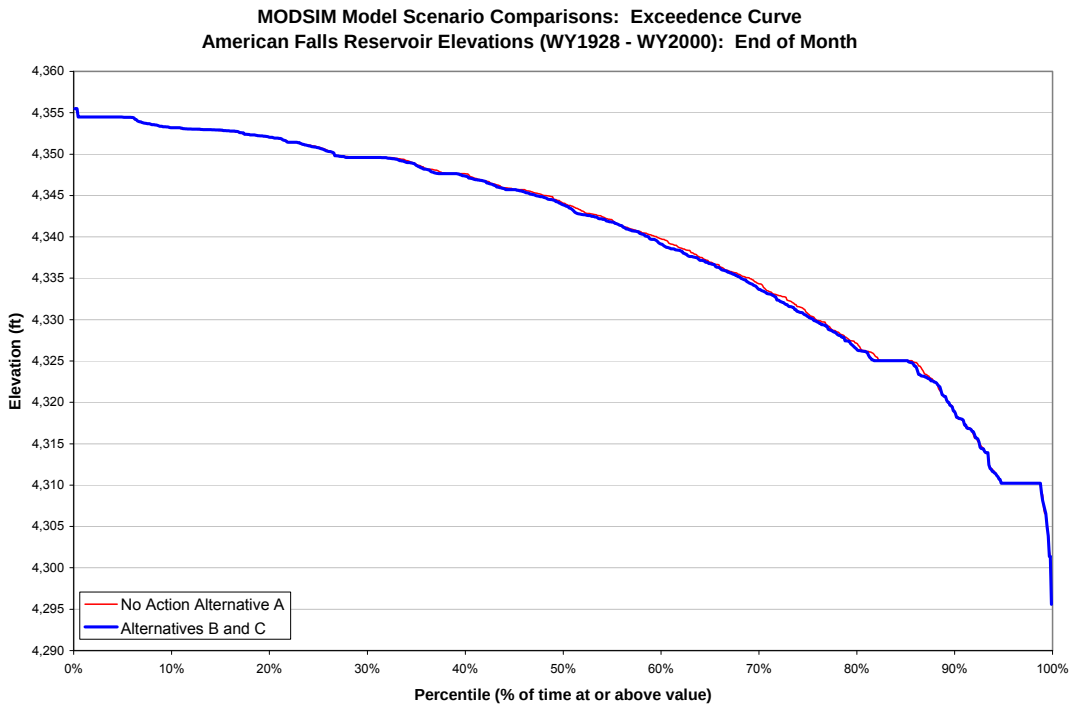
Graph 22. Exceedence curves for flows below Minidoka Dam for comparing alternatives.



Graph 23. Exceedence curves for Minidoka Reservoir elevations for comparing alternatives.



Graph 24. Exceedence curves for flows below American Falls Dam for comparing alternatives.



Graph 25. Exceedence curves for reservoir elevations at American Falls for comparing alternatives.

3.2.3 Cumulative Impacts

No additional construction or new operations are currently being implemented at Minidoka Dam. Therefore, no cumulative effects are anticipated.

3.2.4 Mitigation

Under Alternatives B and C, Reclamation is proposing to reduce irrigation-season spillway flows from the current 1,300 to1,900 cfs flow range down to a minimum flow of 500 cfs. As mitigation, Reclamation would no longer make surface releases from the reservoir into the spillway. Instead, releases would be made from the lower water column of the reservoir which would likely increase entrainment of trout into the spillway. This mitigation would result in flows sufficient to maintain the ESA-listed snails in the spillway area as well as improved trout fishing. In addition, the new spillway would likely reduce or eliminate structural leakage, as currently exists. Reclamation is proposing to provide non-irrigation season flows of up to 100 cfs as mitigation for the likely reduction or elimination of the existing structural leakage. This mitigation would result in year-round flows through the new spillway.

Under both Alternatives B and C, construction activities would be conducted upstream of the spillway pool containing ESA-listed snails. Reclamation is proposing to maintain flows to the pool containing ESA-listed snails both during and after construction of the project.

3.3 Groundwater

3.3.1 Affected Environment

Minidoka Dam and Lake Walcott are located along the southern margin of the Eastern Snake River Plain on Quaternary basalt of the Snake River Basalts. The area is characterized as a gently rolling basalt surface mantled by windblown silt. The basalts are interbedded with pyroclastic rocks and sediments of alluvial and lacustrine origin, especially toward the margins. The upper part of the basalt regional aquifer system is unconfined, highly transmissive, and yields large quantities of water to wells and springs. The basalt aquifer supplies irrigation, municipal, and domestic water to a large portion of southern Idaho.

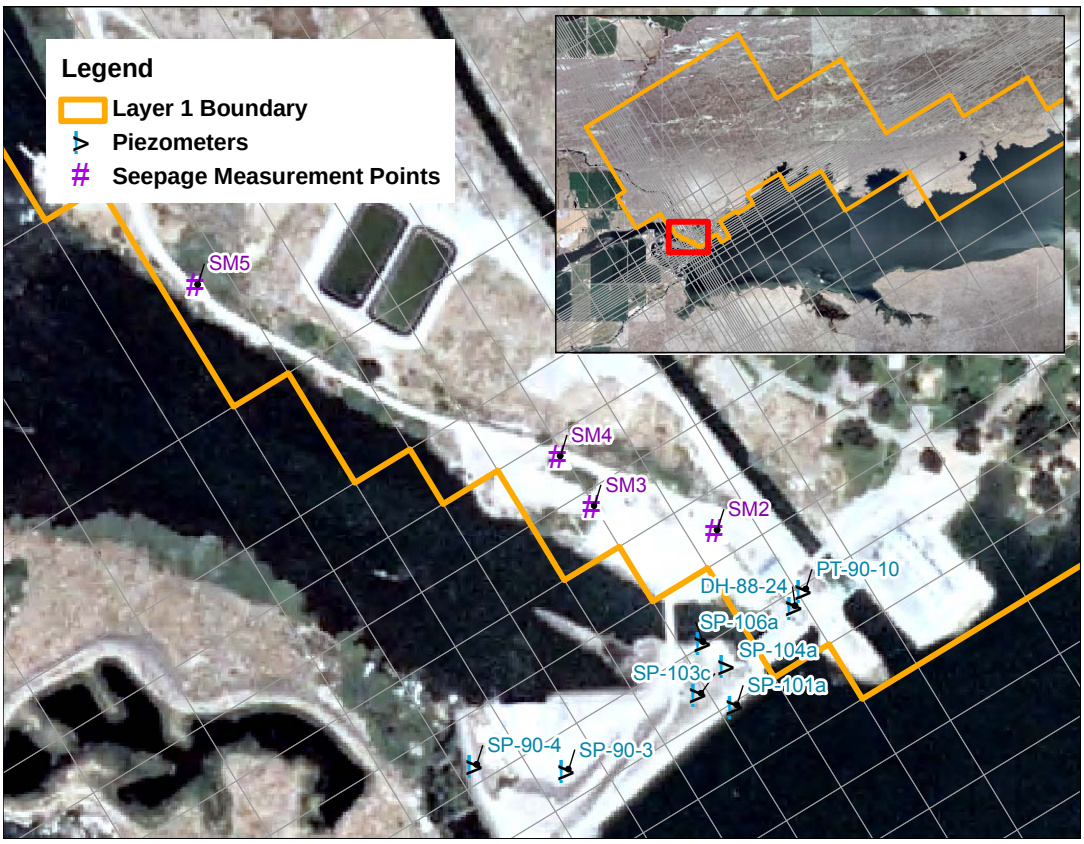
Groundwater Occurrence

The regional aquifer is thousands of feet thick in places and individual basalt flows of the Snake River Basalts average about 20 to 25 feet in thickness, although some range to more than 100 feet. Generally, the flow tops are the most permeable part of each flow due to the number of fractures and vesicles (small circular cavities). Vesicles are formed when gases within the lava escape during cooling. Vesicular porosity of the flow tops is as much as 30 percent and the permeability is increased where these openings are interconnected (Whitehead 1992). As the basalt is formed, various internal structures are created, owing mostly to differences in cooling rates and the presence of water in the pathway of the flowing lava.

Water movement is mostly horizontal within the flow tops and along the flow bottoms (together called an interflow zone) and lesser water movement occurs in the vertical direction along joints and faults. Vertical movement is dependent on the presence or absence of sedimentary layers (interbeds) between the basalt flows, which may impede water movement.

At Minidoka Dam, a 20-foot thick silty sand interbed lies between the upper two basalt flows. The interbed was mapped under the right abutment of the dam and extends for at least a mile downstream (Buehler 1985). The upper-most reach and existing headworks of the North Side Canal are founded on the upper basalt layer. The top of the sand layer is mapped within a few feet of the headgate foundation. The sand layer provides a hydraulic connection and seepage path from the reservoir, underneath the canal, to the area downstream of the dam. Reservoir and canal seepage discharges from the sand interbed as springs and seeps. A series of water measurement flumes measure the flow downstream of the dam (Photograph

3-1). The sand interbed was not encountered south of the right abutment; it was not found in the seven drill holes that were constructed just upstream of the existing spillway gates in 1987 (Hubbs 1991) nor downstream of the existing spillway in drill holes that were constructed as part of the spillway replacement feasibility study (Acree and Heisler 2009). Aerial extent of the sand layer to the east and north along the reservoir has not been fully characterized. However, surface mapping of the geology indicates that the north rim of the reservoir is mostly flood-scoured basalt. Downstream of the dam are gravel deposits of the Pleistocene age Bonneville flood (Scott 1982). These deposits form a terrace along the Snake River that hosts a perched aquifer above the basalt regional aquifer.



Photograph 3-1. Location of water measurement flumes.

Hydraulic Properties

Aquifer testing of the Snake River Basalts has indicated transmissivities of up to one million square feet per day (ft^2/day) (Whitehead 1992). Transmissivity is equal to the average hydraulic conductivity (a measure that describes the rate at which water can move through permeable material) multiplied by the saturated thickness of the aquifer. Horizontal hydraulic conductivity in the upper basalts ranges from less than 100 to 9,000 feet per day (Lindholm 1996). Vertical hydraulic conductivity is several orders of magnitude lower and is related to the number of joints and to the amount of secondary filling by minerals such as

calcite and silica. The sedimentary interbeds and terrace deposits have widely ranging hydraulic conductivities, depending on the quantity of fine-grained materials and texture of the sediments.

The specific yield is a ratio of the volume of water that will drain by gravity to the volume of rock or soil in the aquifer. The specific yield of the unconfined basalt aquifer ranges from about 0.01 to 0.2 (dimensionless) based on aquifer test data (Lindholm 1996). These are normal values for unconfined aquifers and the variable range is expected from fractured and heterogeneous rock.

Aquifer Recharge and Discharge

Water budgets developed as part of the USGS Regional Aquifer System Analysis in 1980 indicated that the largest amount of groundwater recharge to the eastern Snake Plain comes from the infiltration of surface water used for irrigation. The next largest source is underflow from tributary valleys along the boundaries of the plain. Less than 10 percent of total recharge comes from precipitation on the plain (Lindholm 1996). From water budget analyses, leakage to groundwater from Lake Walcott is estimated at 40 to 50 cfs (Kjelstrom 1988).

Groundwater discharge from the basalt aquifer is primarily seepage and spring flow to the Snake River and secondarily to groundwater pumping (Lindholm 1996). Groundwater levels throughout the aquifer system have been decreasing since the 1950s due to reduced surface water irrigation recharge and increased groundwater pumping for irrigation.

Water levels in the vicinity of the dam and existing spillway are related to the reservoir level and the North Side Canal and spillway flows. An increase of reservoir level will raise local groundwater levels and quantities of seepage from the springs downstream.

Analysis of the geology in the vicinity of Minidoka Dam showed that the Minidoka to Milner reach of the Snake River is hydrologically disconnected from the regional aquifer except for the portion of the river just downstream of the dam. Changes in returns to the Minidoka to Milner reach of the river are assumed to be due to changes in seepage on the north side of the river, and changes to seepage through the wetlands on the south side of the river with a small amount of water returning to the river itself just downstream of the dam.

3.3.2 Environmental Consequences

Methods for Evaluating Impacts

The potential impacts to groundwater were analyzed by:

1. Reviewing all available data about the groundwater resource, including groundwater levels, seepage and hydrographs from Reclamation and Idaho State databases,

regional groundwater study reports, previous seepage and construction reports for the proposed action area and regional groundwater modeling of the Eastern Snake Plain Aquifer.

2. Results of new groundwater modeling that refines the regional groundwater model for a more detailed study of the proposed action area. Reclamation developed a groundwater flow model to evaluate potential impacts to water levels and seepage flows and the differences between the No Action and action alternatives. The groundwater flow model is based on the Enhanced Eastern Snake Plain Model (ESPAM1) (Cosgrove et al. 2006) with refinements made to provide greater resolution in the Minidoka proposed action area.

   Both flow models use the USGS MODFLOW software package (Harbaugh et al. 2000), a computer program that provides a mathematical representation of the groundwater flow system. MODFLOW is recognized as the industry standard for groundwater flow models, and it has been peer reviewed and used in a variety of groundwater settings for more than 20 years. It numerically solves the three-dimensional groundwater flow equation for a porous medium by using a finite-difference method. The modeled area is represented by a three-dimensional grid of cells that are laid out in a series of rows, columns, and layers. The modeled layers simulate confined or unconfined aquifers. Each cell has a single point, called a node, where head is calculated. Hydraulic boundary conditions, hydraulic parameters and stresses to the system (such as pumping wells, flow to riverbeds, aerial recharge) are defined as model input. Model output includes head and flow at each node within the model domain.

   Modifications to the ESPAM1.1 model include:

   - The MODFLOW flow package was converted from the Block Centered Flow package to the Layer Property Flow package (Harbaugh et al. 2000).
   - A layer was added on top of the ESPAM model grid to represent the silty sand layer on the north side of the reservoir.
   - The model grid was modified to give greater resolution near the dam.
   - The locations of the river cells used to represent the reservoir were modified to match the refined model grid.
   - The reservoir was represented as a general head boundary along the south side of the silty sand layer.

   The model was designed to determine the quantity of water that will impact the river by way of seepage in the silty sand layer (represented as the first/top model layer),

and the quantity of water that will impact the regional aquifer (represented as the second/bottom model layer).

The model was first used to represent current conditions in the model area (called the base case or No Action alternative) for the historical period of May 1980 to April 2002. Then the model input was changed to represent the action alternatives (maintaining a full reservoir for a longer period each year, change of conditions at the new canal headworks and spillway that may alter seepage flow). The model was re-run to predict the impacts that could be expected from those changes.

Impact Indicators

1. The impacts to the local basalt groundwater levels from maintaining a full reservoir for a longer period each year**.**

2. The impacts to seepage discharge and water levels in the shallow sand layer from maintaining a full reservoir for a longer period each year.

3. The impacts to groundwater discharge to the Snake River downstream of Minidoka Dam from maintaining a full reservoir for a longer period each year.

4. Construction impacts – the amount of dewatering required.

Alternative A – No Action

The No Action alternative would result in the continuance of current groundwater conditions at the site. Local groundwater levels and seepage responds to reservoir levels and canal flow, especially on the north side where the canal invert is underlain by a permeable sand layer. There are four seepage measurement locations downstream of the right (north) abutment: SM2, SM3A, SM4, and SM5. No data are available for SM3A during the modeled time period because SM3A was not in operation. Therefore, the flows that are now measured in SM3A were accounted for in the model by assigning them to SM4. Maximum total flow measured from the right abutment flumes is almost 860 gallons per minute (gpm) (1 gpm = 0.002cfs). The highest flows occur during high canal flows and full reservoir conditions. Table 3-4 lists the maximum and minimum flows at each seepage flume measured since 1998 below the right abutment.

Table 3-4. Measured seepage downstream of right abutment (1998 through 2008).

Instrument	Maximum Measured Flow (gpm)*	Minimum Measured Flow (gpm)*
SM2	12.1	0
SM3A	169.4	19.9
SM4	189.2	11.8
SM5	490.7	62.3
* 449 gpm = 1 cfs		

There are also three seepage measurement locations on the left side, near the powerplant: SM1/SM06-1 near the powerplant drainage gallery, and Flumes 7 and 8, located near the powerplant inlet structure. A new weir plate was installed at SM1 in 2006 and it was renamed SM06-1. Maximum flows from SM1 were 32.5 gpm and about 29 gpm from SM06-1. The higher flows occur during full pool reservoir elevations. Minimum flows are about 5 gpm from SM06-1. Flume 7 has been dry since its installation. Flows at Flume 8 are much more varied than the other seepage measurements and do not clearly correspond to the reservoir level. Maximum flow since 1998 measured 91.1 gpm with minimum flows of about 18 gpm. The average flows seem to have decreased slightly during the past three years.

Several boreholes were drilled at the dam during 1977. Multiple piezometers were installed in those holes for the purpose of monitoring groundwater levels in the foundation basalt and the dam embankment. All of the basalt piezometers show a similar pattern of groundwater level decline from 1977 to 1995, a small recovery during the wetter years of 1996 and 1997 and then a continued decline to the present time. On average, water levels in the basalt have declined more than 20 feet since installation. The decline reflects the larger, regional water level declines throughout the Eastern Snake Plain. Annual fluctuations of the water levels in the basalt at the dam site correspond to fluctuations of the regional aquifer system, and, secondarily, to reservoir fluctuations, indicating a hydrologic connection and seepage from the reservoir to the underlying basalt. The water level fluctuations in the basalt are about one to one, which means that for each foot of higher reservoir level, the corresponding basalt water level is a foot higher also.

A drill hole and basalt piezometer was installed on the north side of the North Side Canal during 2007 (DH-07-1). The water level has shown a slow decline of about 5 feet since installation and does not appear to fluctuate with the reservoir level or North Side Canal flows. This suggests that the cutoff wall near the existing canal headworks is effective in reducing flow from the reservoir and canal to this area downstream. Two drill holes south of the North Side Canal, DH88-24 and DH-90-10, have piezometers completed in the sand interbed between the uppermost and second (underlying) basalt flows. This is the same sand layer that underlies the canal headgate and transmits seepage that is measured in the flumes

downstream. The water level in each piezometer fluctuates with the reservoir level and canal flow; DH88-24 has a subdued response relative to the response in DH-90-10. The response in DH-90-10 is about 1:0.8; a one foot change in reservoir level results in about a 0.8 foot change in water level in the piezometer.

Groundwater seepage under and through the existing spillway is estimated at 25 to 75 cfs and is relied on to meet environmental target flows downstream (Newman 2009a). The seepage is supplemented with controlled releases to meet downstream target flows (see Section 3.2. Hydrology and Reservoir Operations).

Alternative B – Spillway and Headworks Replacement

Construction Impacts

Spillway Replacement

Replacement of the existing spillway would require an excavation into basalt of approximately 2 feet to key into the rock foundation. The depth of excavation for the new radial gated section would be approximately 5 feet and excavation for the concrete core wall in the new dike section would be approximately 3 feet. Based on drill holes that were installed to determine the basalt rock properties for the spillway replacement feasibility study (Acree and Heisler 2009), the shallow basalt is slightly weathered and fractured and has low permeability. Based on these drill holes and previous construction activities, the need for dewatering is not anticipated for the excavations and all water control would be handled with ditches, berms, and sump pumps (Reclamation 2008). The existing spillway would act as a cofferdam during construction and only leakage from the existing spillway is expected to enter the construction site.

North Side and South Side Canal Headworks Replacement

Construction would occur during the winter months when the existing canal headworks would be closed and function as an upstream cofferdam. The South Side Canal invert is on basalt bedrock, at approximate elevation 4232.0 feet. The assumed depth of excavation for the new South Side Canal Headworks would be 1 or 2 feet. As with the new spillway excavation, dewatering is not anticipated for construction of the new South Side Canal Headworks.

The new North Side Canal Headworks would be constructed during the winter months in the existing canal about 115 feet downstream of the existing headworks. The existing headworks would be closed and function as an upstream cofferdam. Elevation of the groundwater level in the sand layer, as measured in DH-90-10, will be about elevation 4220 feet (well below the canal invert of 4230 feet) during the construction period. Dewatering will not be required for

construction of the headwork replacement, although there may be some surface water leakage past the existing gates that would need to be controlled.

Operational Impacts

Maintaining a full reservoir of Lake Walcott for a longer period each year would result in a slight rise of average water level in the surrounding basalt aquifer and increased seepage flows through the basalt into the wetlands downstream. Water levels in the basalt fluctuate about 5 feet annually; currently ranging from about 4160 to 4165 feet elevation. If the reservoir is held at full pool elevation (4245 feet) through the winter, the average basalt water levels are expected to rise slightly in the local area but would still show the trend of declining water levels due to the influence from the regional aquifer. The basalt water levels would remain below the elevation of the Snake River so there would be no increase or change of flow between the river and the aquifer.

An increase of head (due to maintaining a full reservoir for a longer period each year) would increase the amount of seepage traveling through the basalt interflow zones under the new spillway. Since the quantity of seepage flow is not able to be measured, indirect methods (such as mapping the land area covered by water) may be used to estimate the amount of seepage entering the wetland area. The natural seepage provides a fraction of the water that is needed to maintain the wetlands and the flows would be supplemented with controlled releases to meet target flows downstream.

Maintaining a full reservoir for a longer period each year would also increase seepage downstream of the dam through the north abutment sand layer. Currently, when seepage is not impacted by flows in the North Side Canal, the majority of seepage is through the sand layer that travels under the canal from the reservoir further upstream. Flows in the downstream area would increase due to maintaining a full reservoir for a longer period each year.

Alternative B was represented in the groundwater model by holding the reservoir elevation at 4245 feet during the historical calibration period. Since the model was developed with 6-month stress periods, the short drawdown period at the end of the irrigation season was not simulated. The results of this simulation are compared to the No Action alternative model solution. The modeling analysis confirms the hydrogeologic interpretation.

Alternative B shows an increase in the head of water entering the sand layer in the right abutment when compared to the No Action alternative. The water level in the sand layer (as measured at DH-90-10) was simulated to rise about 1.5 feet and the water level in the basalt was simulated to rise by about 0.7 feet. Seepage into the sand layer would increase and flows at the downstream flumes, especially at SM5, would remain higher throughout the year. Maximum seepage measured at the flumes is about 860 gpm and the model simulation shows total seepage volume will increase by 4 percent. The largest increase will impact

flume SM5 since it has the largest drainage area. The increased seepage would contribute to Snake River flows.

Alternative C – Spillway Replacement

Construction Impacts

Expected impacts from construction dewatering would be identical to the impacts described under Alternative B.

Operational Impacts

Impacts are expected to be identical to those described in Alternative B.

3.3.3 Cumulative Impacts

No cumulative impacts are anticipated as a result of the proposed action alternatives.

3.3.4 Mitigation

Due to a potential increase of seepage from the sand layer downstream of the North Side Canal, slope stabilization or drainage mitigation may be required. Mitigation would depend on the location of any new seepage. If the new seepage can be captured by existing measurement devices (flumes), then no mitigation would be necessary. However, if additional seepage daylights in new areas, then channelization or installation of new measurement devices might be required.

3.4 Water Quality

3.4.1 Affected Environment

Water quality of Lake Walcott and the Snake River is managed by the State under the framework of the CWA. Idaho has established water quality standards for specific physical and chemical parameters in order to provide suitable conditions to support beneficial uses, including irrigation water supply, public water supply, recreation, and aquatic life (DEQ 2008a). The designated beneficial uses of Lake Walcott and the Snake River above the reservoir include cold water aquatic life, primary contact recreation, and domestic water supply. The beneficial uses designated for the segment of the Snake River below the Lake Walcott Reservoir are cold water aquatic life, salmonid spawning, and primary contact recreation.

Section 303(d) of the CWA requires states and tribes to identify water bodies that do not meet water quality standards. States and tribes must publish a list of these impaired waters every 2 years. The most recent approved 303(d) list for the State is the 2002 Integrated Report (DEQ 2005). The State has submitted a draft 2008 Integrated Report to the Environmental Protection Agency (EPA). It is currently being reviewed and may be approved sometime in 2009. For lakes, rivers, and streams identified on this list, states and tribes must develop water quality improvement plans known as total maximum daily loads (TMDLs). These TMDLs establish the amount of a pollutant a water body can carry and still meet water quality standards.

In 1999, the Idaho Department of Environmental Quality (DEQ) developed the TMDL for the Lake Walcott subbasin. The Lake Walcott subbasin assessment includes the portion of the Snake River below the Minidoka Dam Spillway and segments of the Snake River above Lake Walcott (Lay 2000). DEQ is currently reviewing the Lake Walcott TMDL and has been completing TMDLs for several small streams that feed the Snake River above Lake Walcott.

Table 3-5 summarizes the water quality impaired water bodies in the 2002 Integrated Report and TMDL development on those reaches.

Table 3-5. State of Idaho 2002 integrated report listings for the Snake River segments of the Lake Walcott subbasin.

Assessment Unit	Listed Pollutants	TMDL Target Completion
Snake River – from Raft River to Lake Walcott		
ID17040209SK005_07	Low Dissolved Oxygen and Pesticides	Proposed for delisting from the Draft 2008 Idaho DEQ Integrated Report
Snake River – from Minidoka Dam to the Burley/Heyburn Bridge		
ID17040209SK002_07	Nutrients	6/28/2000

Applicable Water Quality Standards

The water quality criteria (narrative and numeric) that protect the designated and existing beneficial uses for the Snake River upstream of Lake Walcott, Lake Walcott, and the Snake River downstream of Minidoka Dam Spillway are discussed below.

Numeric water quality standards have been developed, by the State of Idaho and approved by the EPA, for temperature and dissolved oxygen among others. The Idaho State temperature standard for cold water aquatic life is: water temperatures of 22 °C (71.6 °F) or less with a maximum daily average of no greater than 19 °C (66.2 °F) (DEQ 2008a). The State standard for salmonid spawning is for water temperatures of 13 °C (55.4 °F) or less with a maximum daily average no greater than 9 °C (48.2 °F) (DEQ 2008a).

The State of Idaho turbidity standard for cold water aquatic life indicates that turbidity below any applicable mixing zone shall not exceed background turbidity by more than 50 NTU instantaneously or more than 25 nephelometric turbidity units (NTU) for more than 10 consecutive days (DEQ 2008a).

The State of Idaho dissolved oxygen standard for cold water aquatic life indicates that dissolved oxygen concentrations should be greater than or equal to 6 mg/L at all times.

The standards for nutrients and sediment are narrative standards. A narrative standard states that the level of a pollutant cannot exceed quantities that impair beneficial uses. Because these pollutants do not have numeric standards, surrogate numeric targets are often proposed in TMDLs or water quality assessments.

The State of Idaho standard for excess nutrients indicates that surface waters shall be free from excess nutrients that can cause visible slime growth or other nuisance aquatic growths impairing designated beneficial uses (DEQ 2008a).

The State of Idaho standard for excess sediment indicates that sediment shall not exceed quantities which impair designated beneficial uses. Determinations of impairment shall be based on water quality monitoring and surveillance and the information utilized as described in Section 350 (DEQ 2008a).

Snake River Upstream of Lake Walcott

The Snake River upstream of Lake Walcott supports the designated and existing beneficial uses; however, the reach is currently listed due to low dissolved oxygen and pesticide concerns. These pollutants have been removed from the 2008 draft integrated report prepared by Idaho DEQ (DEQ 2009). The 2008 draft integrated report is currently being reviewed by EPA. The *Lake Walcott Subbasin Assessment* and TMDL indicated that these pollutants were not impacting the beneficial uses and no load allocations were prescribed. Additionally, this segment of the Snake River was assigned a sediment load allocation in an antidegradation TMDL to protect the high quality of water rather than to restore degraded water quality as is the case with most TMDLs (Lay 2000). Water quality targets proposed by the State of Idaho for this reach of the Snake River were for less than 25 mg/L of total suspended solids (TSS), and no more than 40 mg/L TSS as a daily maximum.

Flows in the Snake River above Lake Walcott are controlled by American Falls Dam. Reclamation releases a minimum of 300 cfs during the non-irrigation season to maintain a healthy coldwater fishery. Additionally, Idaho Power monitors dissolved oxygen in the penstocks at American Falls Dam and introduces air when dissolved oxygen levels fall below State water quality standards. In some years when American Falls Reservoir is emptied, sediment can be delivered in high quantities to this reach of the Snake River. Reclamation monitors water quality below American Falls Dam when the reservoir contents fall below

100,000 acre-feet. This monitoring provides feedback to help inform operational decisions concerning pool volume in American Falls Reservoir and delivery from upstream reservoirs.

The surface elevation of this reach of the Snake River changes dramatically on a seasonal basis. In the spring and summer, the river elevation and volume of water moving through the system is quite high. During the winter, river flows are reduced and the elevation of Lake Walcott is reduced. These conditions lower the river elevation substantially which may cause sediment deposited and stored at higher bank elevations to be redistributed and transported to lower reaches of the river and to the Lake Walcott Reservoir. Sediment carried into this reach of the Snake River from American Falls Reservoir and tributary streams generally deposits in the lower portions of the river where the river gradient changes and the river emerges from the confining canyon. The sediment depositional area typically begins downstream from Eagle Rock through the Massacre Rocks area.

Lake Walcott Reservoir

Flows into the reservoir are controlled by American Falls Dam to meet downstream demands for irrigation and other water rights. Sediment carried into Lake Walcott by the Snake River and other tributary streams generally deposits in the upstream portions of the reservoir where it transitions from river-like to lake-like. This transitional area begins approximately 4 river miles downstream from the confluence with Raft River. Sediment deposited in this area may be redistributed to lower areas of Lake Walcott each year when the reservoir is drawn down in the winter for spillway protection. In addition, Lake Walcott also retains much of the nutrient load passing through from American Falls Reservoir as well as the nutrient loads from tributary streams and other point and nonpoint sources located upstream from the reservoir.

Water quality conditions in Lake Walcott currently support the designated and existing beneficial uses. These beneficial uses are domestic water supply, cold water aquatic life, and primary contact recreation. As part of an ongoing reservoir monitoring program for operating projects, Reclamation collects water quality data every 3 years from Lake Walcott. These samples are analyzed for chemical, physical, biological, and trace metal parameters. In addition, the State of Idaho has collected water quality data from the reservoir in 2007 to review the status of the *Lake Walcott Subbasin Assessment* and TMDL.

Snake River Downstream of Minidoka Dam Spillway

Due to the sediment and nutrient retention in Lake Walcott, the water passing Minidoka Dam is typically of excellent quality. Water quality degrades downstream due to several large point sources as well as many smaller agricultural drains and tributaries which carry nonpoint source loads of nutrients. As a result, the Snake River downstream of Lake Walcott does not currently support the designated and existing beneficial uses. Waste load and load allocations for total phosphorus were developed by the State and are prescribed in the *Lake*

Walcott Subbasin Assessment and TMDL. This segment of the Snake River was also assigned load allocations for sediment as well as oil and grease in anti-degradation TMDLs (Lay 2000). Total phosphorus (TP) targets for the Snake River downstream from Minidoka Dam were set at an average annual concentration of 0.08 mg/L of TP and a 0.128 mg/L TP daily maximum concentration to allow for natural variability. TP concentrations passing Minidoka Dam typically average 0.06 mg/L. However, this data is collected at Jackson Bridge approximately 5 miles downstream from Minidoka Dam.

3.4.2 Environmental Consequences

Methods for Evaluating Impacts/Impact Indicators

Water quality impact analysis is based on available water quality data, Idaho State Water Quality Standards, and the Lake Walcott TMDL water quality targets. These standards and guidelines were described previously. There are several water quality concerns to be addressed.

- Movement of sediment as channel substrate
- Suspended sediment concentration and movement through the water column
- Water temperature
- Nutrients – TP concentration and movement through the water column

Alternative A – No Action

Drawdown of the Lake Walcott Reservoir would continue on an annual basis as needed for winter-time spillway protection from ice buildup. The existing spillway would continue to be operated within the existing criteria during the irrigation season, and for flood control as needed. Water quality effects described for Alternative A – No Action would be expected to occur every year during reservoir drawdown and refilling.

Snake River Upstream

Sediment would be remobilized annually from depositional areas located at the high water line and adjacent near shore shallow areas. This remobilization would occur during the first few days of the annual winter drawdown, and potentially during the first few days in the spring when the reservoir is refilled. Turbidity would temporarily increase at these times due to sediment remobilization, and sloughing of unstable banks. After an undetermined period of time, water clarity would increase, with turbidity and sediment transport stabilizing to upstream conditions and concentrations. Specific turbidity and sediment concentrations during these events could not be determined from the available data. However, background conditions measured approximately 9 RM upstream from the Massacre Rocks State Park boat

ramp, near the Neeley pipeline are representative of river conditions during stable downstream reservoir elevations. Turbidity from November to March ranges from 1.6 to 19 NTU and averages 5.2 NTU. Over this same period, total suspended sediment ranges from 2 to 31 mg/L and averages 7 mg/L. Sediment remobilized during drawdown events would most likely pass through into Lake Walcott Reservoir. It is not expected that sediment or turbidity would rise above State water quality standards or Lake Walcott TMDL instream sediment targets during drawdown or refilling events for extended periods of time, if at all. A precise estimate cannot be made because upstream channel scouring would vary with inflow volume, velocity, and the ramping rate for both the drawdown and refilling.

Water temperature of the Snake River during drawdown periods is expected to vary with inflow temperature and solar radiation; however, temperatures would not be expected to rise above State water quality standards due to the time of year (autumn) the drawdown period occurs as well as travel time through the reach. Water temperature during the summer irrigation period occasionally exceeds State instantaneous water quality standards. These exceedances are dependant on inflow temperature, solar radiation, humidity, and wind speed among other factors. The No Action alternative should not affect the current water temperature regime in the Snake River above Lake Walcott.

The No Action alternative would not affect the current cycling of nutrients in the river reach. However, the remobilization of sediments to the lower reaches may accelerate the transport of TP covalently bonded to sediment particles. A specific increase in TP concentrations during drawdown events has not been documented in any water quality investigation to date. In fact, data from these investigations indicate that monthly average TP concentrations decrease through the fall to spring period which coincides with the drawdown of the reservoir. As a result the slight increase that may be associated with current reservoir operations is masked by the seasonal changes normally associated with TP concentrations in the river.

Lake Walcott

During the annual drawdown, turbidity and suspended sediment concentration in the Lake Walcott pool may increase due to sloughing of unstable banks and the redistribution of sediment from upstream and bottom sources. After pool level stabilization, the upper reservoir area will begin to clear until it is similar with upstream conditions. Sediment deposition into the pool will occur further into the reservoir as a result of the lake level change in the winter time. However, sediment loads after drawdown during the winter period are very low and historically do not exceed water quality standards or guidelines. The reservoir will retain most of the remobilized sediment and turbidity and will pass through with only minimal background concentrations and loads to the Snake River below the reservoir. No changes to existing water quality conditions are expected during the irrigation season in the No Action alternative.

The No Action alternative would not affect the current water temperature regime in Lake Walcott.

The No Action alternative should not affect the normal cycling and transport of TP in the reservoir.

Snake River Downstream

Lake Walcott effectively retains most sediment delivered to the reservoir from upstream locations. Monthly annual TSS concentrations below Lake Walcott range from 4.2 to 14.3 mg/L. These values are well below the 25 mg/l concentration target used in the Lake Walcott TMDL to develop load and waste load allocations for Milner Pool. The No Action alternative should maintain the current levels of sediment transport from Lake Walcott into the Snake River and Milner Pool. Under current conditions a slight seasonal effect can be seen in the TSS data below Minidoka Dam. In March and April, sediment transport from the reservoir increases slightly, which corresponds with the annual spring freshet and flood control releases from upstream storage reservoirs. Additionally, in the fall months of September, October, and November, TSS also increases above the annual average of 9.2 mg/L. Also, in these months there are occasional spikes in TSS above the water quality targets. These spikes and monthly average concentration increases may be the result of the reservoir level changes, or they may simply be a reflection of the natural increase in TSS due to the die-off of aquatic plants or wind events mixing bottom sediments leading to higher export of sediment coinciding with reservoir drawdown. In general, these spikes account for less than 10 percent of the overall TSS concentrations in the Snake River on an annual basis.

The No Action alternative should not affect the current water temperature regime in the Snake River below Lake Walcott.

The No Action alternative should not affect the normal cycling and transport of nutrients from the reservoir to the Snake River below Lake Walcott.

Alternative B – Spillway and Headworks Replacement

Under Alternative B, Lake Walcott Reservoir would no longer need to be drawn down on an annual basis for spillway protection, but it would still be drafted annually as needed at the end of the irrigation season or when storage above the project is nearing depletion. The new spillway would continue to be operated during the irrigation season, and for flood control as needed, but there would be decreased water routed across the spillway area during the irrigation season. There are no controlled spillway releases across the existing spillway during the winter period under current operations. During the non-irrigation season a maximum of 100 cfs would be routed across the spillway area. In low water years, these releases will likely exceed current operations. In normal and wet water years, these releases will likely result in a reduction of flow across the new spillway until powerplant capacity is

reached. During high water events, the new spillway will be used when flows exceed the powerplant capacity and will likely not result in changes from current operations. Water quality effects described below for Alternative B would be expected to occur every year.

Snake River Upstream

Construction Impacts

There would be no impacts to water quality in the Snake River above Lake Walcott associated with construction activities for this alternative.

Operations Impacts

Alternative B would not change the current sediment mobilization that occurs in the Snake River during spring freshets or other high water events. However, the timing of sediment mobilizations associated with the annual winter time drawdown will change. Sediment will instead be mobilized during annual drawdown events as needed for end of season irrigation, or drawdown events when the storage in reservoirs above the project are nearing depletion. Dewatering and sediment mobilization from reservoir drawdown will still occur, but for a much shorter period. Dewatering in response to system storage depletion above the project may last for several weeks, while dewatering in response to irrigation needs may range from several days to weeks. Refill will begin once irrigation demand is less than the natural supply and water is available to store in the lower valley reservoirs. As a result, sediment deposits in the delta areas of Lake Walcott and the shallow near-shore areas in the river above Lake Walcott will begin to stabilize and develop rooted or emergent macrophytes. These plants should contribute to the stabilization of the near shore shallow areas and riparian zones. Furthermore, sediment delivery from sloughing, unstable banks may be reduced throughout the years because the riparian community located along the shoreline will not be dewatered annually for the entire winter period in some sections of the river. Dewatering from reservoir drawdown would still occur, but only in response to system storage depletion above the project.

Alternative B would not change the current summertime water temperature regime in the Snake River above Lake Walcott. The effects of pool stabilization, during the wintertime, on the temperature regime of the Snake River would be minimal as the time of year and amount of solar radiation preclude water quality standards violations.

Alternative B would not change the current summer time cycling of nutrients in the river reach. The effects of pool stabilization on the remobilization of sediments to the lower reaches may decrease the transport of TP associated with those sediment particles allowing for more assimilation of nutrients by the aquatic plants in the river environment before the nutrients are transported into the reservoir environment.

Lake Walcott

Construction Impacts

Due to the need to excavate upstream of the new South Side Canal headworks and new gated spillway to improve flow conditions into the structures there will be short term water quality impacts to the reservoir associated with construction activities. The construction activities will occur during the annual drawdown event, which will reduce or eliminate additional sediment delivery to the reservoir from upstream sources from a more sever drawdown. The excavation will require the contractor to drill and blast the existing structures. The drilling will occur at an elevation above the annual drawdown elevation. The majority of the area to be blasted consists of a submerged basalt bench and outcroppings. Some depositional areas may exist within the basalt in cracks and seams. After the localized blasting, the area will require mucking and further excavation. This activity will occur below the annual reservoir drawdown elevation. As a result, there may be sediment dislodged and resuspended into the water column from the cracks and seams. A very limited amount of new sediment will be introduced into the water column from the blasting activities. Due to the distance from the upstream riverine sediment sources, the sediments near the dam in the cracks and seams are likely very fine textured and easily resuspended which may lead to periods of high turbidity, post blasting and mucking, lasting for several hours to days depending on sediment density and water velocities through the area. However, again due to the distance from the upstream riverine sediment sources, the quantity of sediment overlaying the areas where blasting and mucking will occur is minimal. In addition, the normal discharge through the existing South Side Canal headworks and existing radial gates likely scoured the overlying sediments down to a rocky substrate, which will reduce the sediment resuspension impacts from the mucking activities. Due to these combined factors, it is expected that these localized turbidity issues will exist during the excavation phase, and that these turbidity issues may last up to 24 hours. The new structures will be in place prior to this activity occurring. As a result, they will minimize the sediment mobilization to downstream reaches. Sediment control management practices will be in place prior to the blasting and mucking activities. These BMPs are expected to minimize the intrusion of sediment into the reservoir. Post blasting and mucking, discharge through the newly constructed South Side Canal headworks should mobilize any remaining suspended material. Discharge through the canal will reduce the sediment impacts that may occur to the Snake River as a result of the blasting and mucking.

Water quality impacts from staging and waste areas should be minimal. Staging and waste areas are located downstream from the existing spillway or dikes which would prevent sediment from being carried into the reservoir during storm events.

Operations Impacts

No changes to existing water quality conditions are expected as a result of Alternative B.

Alternative B should not affect the current summertime water temperature regime of Lake Walcott. The increase in late season pool volume may have some slight effects on the fall temperatures and wintertime temperatures. Pool stabilization and the resulting increased pool volume in the late summer and early fall during wet to normal years may delay the onset of isothermal conditions by a few days to weeks. However, Lake Walcott only weakly stratifies; consequently, there may be no difference in impacts between the alternatives.

Alternative B should not affect the normal cycling and transport of nutrients in the reservoir.

Snake River Downstream

Construction Impacts

There may be some temporary impacts to the river below Lake Walcott due to construction. The dominant impact will likely be a temporary increase in turbidity and sediment delivery due to activities in support of the construction efforts. Essentially, the existing spillway will act as a cofferdam eliminating much of the water flowing through the construction zone. Construction can then be completed in the dry with appropriate BMPs in place to reduce or eliminate sediment and turbidity impacts. However, complete elimination of sediment and turbidity impacts due to construction activities is unavoidable. These effects on sediment would be of short-term duration and would not contribute to any long-term effects. During the construction of Alternative B, small amounts of sediment would be delivered downstream across the spillway area and into the Snake River. Turbidity in the water running across the new spillway will likely exceed the State water quality standard for brief periods of time throughout the construction phase associated with various construction activities, such as during blasting for the new radial gates or during excavations along the new spillway. However, the Snake River will provide ample dilution to this turbid water from the new spillway. As a result, turbidity in the Snake River below the new spillway may be elevated for short periods, but likely will not exceed the turbidity standard below even a very conservative mixing zone.

Because new material would be placed in the spillway area, a Section 404 permit from the Corps would be required for Alternative B. In addition, the State will then provide a CWA Section 401 water quality certification for the construction activities for either alternative. These permits and certifications will outline requirements to minimize the impacts to water quality associated with the construction activities.

In addition to the sediment delivery from the actual construction activities, some sediment impacts from the haul roads and staging areas located near the existing spillway are also likely to occur.

Construction activities associated with Alternative B would not change the nutrient transport or assimilative capacity of the Snake River below the new spillway.

Operations Impacts

As stated previously, Lake Walcott effectively retains most sediment delivered to the reservoir from upstream locations and passes through very little. Seasonally, this amount increases slightly, potentially as a result of the reservoir being drawn down. With the length of time the reservoir is drawn down being shortened considerably for Alternative B, this seasonal increase in sediment concentration associated with drawdown would be reduced or eliminated. No changes from the No Action alternative should occur in drier type years when the reservoir is drawn down in response to storage depletion.

Alternative B would have similar effects on the river temperature. The flow reduction across the new spillway during the summer period would be substantial. Currently, a minimum of 1,300 cfs is delivered across the existing spillway during the summer months. Alternative B would reduce this to a minimum of 500 cfs, thus effectively reducing the spillway delivery by at least 60 percent. As a result the width-depth ratio of the spillway area will change. The consequences of this change would be an increase in the total solar loading which will result in a warming of the waters discharged across the spillway area in comparison with the no action alternative. Travel time across the area below the spillway to the Snake River will also increase slightly due to the reduction in flow. Both changes allow for increased solar loading and warming of the discharged waters. However, the magnitude of this change on average temperature in the spillway area is likely less than a few tenths of a degree Celsius, and the change in the Snake River below the spillway area even less due to the thermal mass of the Snake River being much greater than the spillway water.

Alternative B should not affect the normal cycling and transport of nutrients from the reservoir to the Snake River below Lake Walcott.

Alternative C – Spillway Replacement

Impacts would be the same as described for Alternative B. Construction impacts associated with the in-reservoir excavation for the existing South Side Canal headworks would be eliminated. However, the in-reservoir excavation for the new radial gate sections would remain and be the same as described for Alternative B.

3.4.3 Cumulative Impacts

Land management practices in the Lake Walcott subbasin such as irrigated agriculture, dry land agriculture, grazing, and road construction and maintenance among others have all introduced some sediment and/or nutrients into the Snake River and Lake Walcott Reservoir. These eroded and transported materials have been deposited in the river, stored in near shore areas, or settled out along the banks within the riparian zone of the Snake River. In the No Action alternative these sources ultimately are transported into Lake Walcott. Transport typically occurs during the spring runoff period, but can also occur during reservoir drawdown and refilling phases of the No Action alternative. Since these actions are considered to be incorporated into the baseline condition, there would be no cumulative impacts due to this alternative.

3.4.4 Mitigation

On-site actions are incorporated or required under several water quality permitting and certification processes. These include CWA Section 404 dredge and fill permits issued by the Corps, Section 401 water quality certification by the State of Idaho, and storm water discharge National Pollution Discharge Elimination System (NPDES) permit issued by EPA. Other activities that are incorporated into Alternatives B and C include the use of the existing spillway and headworks as bulkheads or cofferdams during construction.

3.5 Minidoka Hydropower Generation

3.5.1 Affected Environment

Two powerplants, the Minidoka Powerplant and the Inman Powerplant are located at Minidoka Dam. The Minidoka Powerplant was added to Minidoka Dam in 1909 through 1910 and included 5 generating units. The Minidoka Powerplant was originally authorized and constructed to provide power to the Minidoka Project, allowing for irrigation water to be pumped to the lands lying above the gravity-fed canals. Because the hydraulic capacity of the original powerplant could not utilize all the water that passed through Minidoka Dam, Unit 6 was added in 1927 and Unit 7 was added in 1942.

In 1995, the original 5 units were decommissioned. Unit 6 was rebuilt in 1997; Units 8 and 9 were added in 1997 with the completion of the Inman Powerplant. The Minidoka Powerplant, the original plant, continues to house Units 6 and 7.

The Minidoka Powerplant is operated by Reclamation from the Black Canyon Control Center near Emmett, Idaho. The Minidoka Powerplant currently has 4 units with a combined

installed capacity of 28,500 kilowatt (kW). The maximum hydraulic capacity of the powerplants combined is 8,670 cfs, assuming all units are operating at full capacity.

Minidoka Dam also provides irrigation water storage and creates power that is delivered to BPA for marketing. If the irrigation districts receive reserve power, they pay BPA the current government rate to generate hydroelectricity at the pumping stations. However, if the districts do not receive reserve power, they pay market cost. The majority of the power is generated during April through September, within the typical irrigation demand period. In 2007, net generation was approximately 113,594,220 kilowatt per hour (kWh). On average, project power makes up 75 percent of the net generation.

3.5.2 Environmental Consequences

Methods for Evaluating Impacts

The effects on power generation at Minidoka Dam due to each alternative were evaluated using the MODSIM model output. Model constraints for each alternative are defined in Section 3.2.2. The hydrologic period of record analyzed for impacts to generation encompassed water years 1928 through 2000. Average generation for each month in addition to annual generation and value was computed over the period of record for comparison of the alternatives. The annual generation value was estimated using an average of BPA's monthly wholesale prices (Cocks 2009).

Alternative A – No Action

There would be no construction or long-term impacts on Minidoka hydropower generation under the No Action alternative.

Alternative B – Spillway and Headworks Replacement

Construction Impacts

The powerplants will continue to operate normally during the construction period.

Operations Impacts

Alternative B is expected to result in a net increase in the amount and value of Minidoka hydropower generation. Table 3-6 summarizes the monthly change in generation for each alternative in average megawatts (MW).

Table 3-6. Change in gross monthly average generation for water years 1928 through 2000 in megawatt hours (MWh).

Month	Change in monthly average generation (Alternative A – No Action subtracted from Alternative B or C) (MWh)
October	2,244
November	(1,240)
December	590
January	435
February	399
March	1,423
April	2,022
May	430
June	115
July	581
August	2,101
September	2,314
Annual average increase in gross generation	11,414 MWh

The decrease in generation during the month of November under Alternatives B or C is an artifact of the reservoir refilling during this period. The reservoir under the No Action alternative, refills in March and April. While 60 cfs of winter spillway flow is modeled under Alternatives B and C, the increased reservoir elevation provides a net increase in overall generation during these months. Under the No Action alternative, the winter spillway release is 0 cfs. It should also be noted that the increased generation during April through October is a result of reduced spillway release flows when compared to the No Action alternative. The reservoir elevation during the irrigation months is the same under all alternatives (see Section 3.2.2.).

Over the modeled period of record, an average increase in gross annual generation under either Alternatives B or C is 11,414 MWh. Depending on water year conditions and actual reservoir operations, the annual generation may either increase or decrease from the average annual generation stated.

Annual forward market prices were obtained from BPA (Cocks 2009). The flat Mid-C prices are presented in Table 3-7 for years 2013 through 2020. The estimated change in value of

the increased average annual gross generation is presented as well using these forecasted energy prices.

Table 3-7. Estimated change in generation value of the spillway replacement.

Year	Average Annual Energy Prices ($/MWh)	Average Annual Increase in Generation (MWh)	Total Increase ($/year)
2013	$51.45	11,414	$587,250
2014	$53.75	11,414	$613,503
2015	$55.40	11,414	$632,336
2016	$55.70	11,414	$635,760
2017	$57.60	11,414	$657,446
2018	$61.95	11,414	$707,097
2019	$63.90	11,414	$729,355
2020	$64.95	11,414	$741,339
		average	$663,011

Alternative C – Spillway Replacement

Construction Impacts

The powerplants would continue to operate normally during the construction period.

Operations Impacts

The long-term impacts are expected to be the same as Alternative B and are summarized in Table 3-7 above.

Cumulative Impacts

No cumulative impacts have been identified for any of the alternatives.

Mitigation

No mitigation required.

3.6 Aquatic Biota

3.6.1 Affected Environment

Reservoir Fish Community

Lake Walcott, one of six storage reservoirs in the Minidoka Project, inundates 38.3 miles of the Snake River near Rupert, Idaho. The reservoir provides a mixed fishery for both cold water and warm water species and overall receives light fishing pressure. Hatchery rainbow trout are regularly stocked in Lake Walcott providing a "put and take" fishery. Smallmouth bass were introduced in 1985 in the upper Snake River below American Falls Dam (Teuscher and Scully 2008). Since then bass populations rapidly increased and are now self-sustaining in Lake Walcott. Three important aspects of the reservoir fish community at Lake Walcott include the aquatic food base, fish habitats in the littoral zone, and fish populations.

Aquatic Food Base

Biological production in reservoirs is based on primary productivity (plant growth) which is dependent on nutrients and sunlight. Primary production by reservoir phytoplankton (microscopic drifting plants) refers to the conversion of light and nutrients into organic carbon and resulting phytoplankton growth and biomass. Phytoplankton which serves as food for zooplankton (microscopic drifting invertebrates), forms the base of the food web. Reservoir fluctuations increase or decrease the surface area which receives the sunlight thus affecting phytoplankton production.

Zooplankton primarily consume phytoplankton and, in turn, is eaten by animals higher in the food web. Once produced, zooplankton survive in the reservoir for an indefinite period of time until they are eaten by predators such as fish or invertebrates, die from natural causes and sink, or are lost through the dam. Enough individuals survive through fall and winter that zooplankton provide the primary winter food for many species.

Benthic invertebrates are animals without backbones that live on rocks, logs, sediment, debris, and aquatic plants during some period in their lives. These include crustaceans such as crayfish, mollusks such as clams and snails, aquatic worms, and immature aquatic insects such as stonefly and mayfly nymphs. Aquatic plants and attached organisms, such as algae, protozoa, and bacteria (referred to as periphyton), as well as detritus, provide food and habitat for a wide variety of organisms. High invertebrate densities are usually associated with aquatic plants (Hoyer et al. 1997). Very few invertebrates or fish feed directly on the large aquatic plants; instead, they feed on the attached organisms and detritus (Heckey and Hesslein 1995).

Benthic invertebrates that live in sediments also collect beneath macrophytes. Some use plant remains as food and shelter. Others eat algae that cover sediments. In one reservoir

benthic invertebrates were more than tenfold greater in number in a coontail (*Ceratophyllum demersum*) bed than in an adjacent barren area with the same substrate (Miller et al. 1989). The inshore area under macrophyte beds in another lake contained 60 percent of the midge larvae and over 90 percent each of snails, fingernail clams, caddisfly, dragonfly, damselfly, and mayfly larvae (Engle 1985) in the lake.

Invertebrates are a major food source for forage fish and young life stages of many game fish. Young waterfowl depend heavily on invertebrates as a high-protein food source needed for rapid early growth (Hoyer and Canfield 1997).

Important Fish Habitats in the Littoral Zone

The littoral zone (shore) of Lake Walcott extends from the shore just above the influence of waves and spray to a depth where light is barely sufficient for rooted aquatic plants to grow. This biologically critical zone supports aquatic macrophytes (primarily cattails, bulrush and sedges) that provide spawning habitat and nursery areas for many of Lake Walcott's fish species. Water levels not only determine the extent of littoral habitat, but affect that habitat when fluctuations occur (Hoyer and Canfield 1997; Ploskey 1986). Several studies on littoral zone habitats in lakes have documented decreases in total cover and changes in substrate composition with decreases in water level as small as 0.6 meters (m) (2 feet) (Irwin and Noble 1996). In another case up to 20 percent of rocky substrate, important as cover for small native fishes, was exposed during a drought that lowered lake level by 2 m (6.5 feet) (Beauchamp et al. 1992). When water level declines dewatered shallow water gravel substrates that supported age-0 largemouth bass (less than 1 year old) in another lake system, bass populations were adversely affected (Dibble 1993). Research at other reservoirs has shown that spring and summer drawdowns have the most adverse impact on juvenile bass (Miranda and Lowery 2007; Clark et al. 1998; Guy and Willis 1995).

Three distinct littoral zone habitats exist at Lake Walcott. The first consists of shallow bays and shoreline areas sheltered from much of the wind and wave action with well developed communities of aquatic macrophyte species such as cattails, bulrushes and sedges. The second habitat consists of shallow unvegetated bays and flats and the third habitat consists of lava rock and boulders.

Aquatic Macrophytes

The major vegetation community within the littoral zone of Lake Walcott that may be affected by changes in reservoir levels consists of aquatic macrophytes in shallow low gradient bays and shorelines. Aquatic macrophytes are large enough to be seen with the unaided eye. There are four widely recognized growth forms that include emergent, submersed, floating-leaved and free-floating. Emergent macrophytes are rooted in substrate with the tops of the plant extending into the air. Common emergent macrophytes include reeds (*Phragmites*), bulrushes (*Scirpus spp.*); cattails (*Typha spp.*), and spikerushes

(*Eleocharis spp.)*. Submersed macrophytes grow completely submersed under the water and include such diverse species as pondweeds (*Potamogeton spp*.) and Eurasian watermilfoil. Floating-leaved macrophytes are rooted to the lake bottom with leaves that float on the surface of the water, occurring generally in areas of lakes that do not periodically dry out. Typical species are water lilies (*Nymphaea spp.*), spatterdock (*Nuphar spp.*), and watershield (*Brasenia*). Free-floating macrophytes are plants that float on or just under the water surface with their roots in the water and not in sediment such as duckweed (*Lemna spp*.).

In the semi-arid and arid portions of the West, water availability to plants from rain and snow-melt infiltration is limited and sporadic. To survive in these harsh conditions riparian and emergent vegetation draw much of their seasonal water needs from relatively reliable groundwater sources (Stromberg 1994; Mahoney and Rood 1991). However, significant change in groundwater elevation during the growing season can potentially affect these vegetation communities adversely (Stromberg 1992). Mortality or stress in these species can result in changes in vegetation community composition.

Aquatic macrophytes provide refuge for prey species and interfere with the feeding of some predator species. Exposure to predators strongly determines small fish feeding behavior. If they are relatively safe from predators, they can forage more effectively. For large predators, the visual barriers of plant stems decrease foraging efficiency; hence, growth declines as habitats become more complex (Colle and Shireman 1980).

Small species of fish and juveniles of larger species live in aquatic macrophytes seeking food (Pardue 1973; Keast 1984) and predator protection (Crowder and Cooper 1982; Savino and Stein 1989). Differences in density and morphology of plants influence foraging intensity and degree of predator avoidance which, in turn, influence fish growth and survival (Dionne and Folt 1991; Lillie and Budd 1992; Dibble, Dick, and Killgore 1996). Foraging efficiency decreases in dense plant beds (Savino and Stein 1989; Anderson 1984). High-density plant beds provide greater protection from predators than medium- or low-density beds (Hayse and Wissing 1996). Studies have suggested that juvenile bluegills select higher vegetation densities to reduce predation (Savino and Stein 1982; Gotceitas and Colgan 1987; Hayse and Wissing 1996). Conversely, largemouth bass prefer to wait at the periphery of plant beds or in areas of lower plant densities. Drawdowns can potentially affect fish in Lake Walcott when water levels expose beds of aquatic macrophytes that provide cover from predation as well as substrate for food organisms. Photograph 3-2 shows beds of aquatic macrophytes exposed during the winter drawdown at Lake Walcott.

Photograph 3-2. Aquatic macrophytes are common in Lake Walcott in coves, bays, and shorelines protected from wind and wave action. Winter drawdown has exposed this bed of aquatic macrophytes.

Sustainable predator-prey relationships in general require the presence of prey refuge to prevent the elimination of the prey species. Numerous studies have shown the increased use of complex cover such as aquatic macrophytes, woody debris, substrate interstices (such as those found in lava rock) by prey fishes in the presence of predators, and reduced foraging efficiency of predators due to habitat complexity (e.g., Bugert and Bjornn 1991; Persson and Eklov 1995; Werner and Hall 1988; Tabor and Wurtsbaugh 1991). In another study, Savino and Stein (1989) showed that refuge is critical for prey fish survival; their study found that largemouth bass captured all prey fish that strayed from areas with aquatic vegetation into open water. Schlosser (1987) demonstrated that bass eliminated all prey fish from pools that provided no cover. Conversely Hixon and Beets (1993) found that predator and prey were able to coexist in pools with complex cover. Gotceitas and Colgan (1989) found that prey fish in fresh water preferentially selected refuge habitat with greater complexity than was necessary to significantly reduce foraging success of predators.

The time and duration of inundation and the type of substrate inundated influences the reproductive success of fish that spawn near the shore in reservoirs (Aggus 1979). Water levels determine the amount of nursery area available by inundating or receding from vegetation. Survival of young fish of many species is increased when cover is abundant. Lack of habitat exposes young-of-year fish to increased predation. The density of young-of-

year largemouth bass (M. salmoides) in August in Bull Shoals Lake was directly related to acre-days of flooding of terrestrial vegetation (Aggus and Elliott 1975).

Shallow Unvegetated Bays and Flats

Shallow unvegetated flats provide good habitat for the juveniles of many species of fish such as the one near Smith Springs (Photograph 3-3) and between Gifford Springs and Massacre Rocks State Park (Photograph 3-4).

Photograph 3-3. Shallow unvegetated flats, like this one near Smith Springs, provide good habitat for many species of fish when the lake is at full pool. These flats become exposed during the winter drawdown at Lake Walcott.

Photograph 3-4. Shallow mudflats exposed during winter drawdown in the area between Gifford Springs and Massacre Rocks State Park.

Lava Rock and Boulders

Rocky bluffs (lava rock) and boulders compose a particularly important habitat at Lake Walcott, providing spawning and rearing habitat for a number of fish species including smallmouth bass and sculpins. Additionally, the young of some species found in Lake Walcott move offshore in summer after rearing for a number of weeks along the shallow vegetated littoral zone. Lava rock and boulders provide refugia from predators, particularly for smallmouth bass. This type of habitat has not been mapped or characterized at Lake Walcott other than through anecdotal information. One good source of information on the extent and character of this habitat type is obtained from soil maps from the U.S. Department of Agriculture (USDA). The soil map (USDA 2009) has classified much of the north side of Lake Walcott in Minidoka County as being composed of 10 percent rock outcrop consisting of unweathered bedrock derived from basalt.

The soil map for the south shoreline of Lake Walcott in Cassia County indicates that much of the area is characterized by lava fields and ridges. From 20 to 45 percent of this complex consists of rock outcrops. These lava fields within the lake bed provide excellent habitat for fish such as the smallmouth bass (see Photograph 3-5, Photograph 3-6,and Photograph 3-7). This species is increasing in abundance in Lake Walcott. Complex rocky substrate extends below the drawdown zone providing year round cover for young fish and smaller fish species.

Photograph 3-5. Rocky littoral zones provide excellent cover for many species of juvenile fish; however, they can become exposed during seasonal drawdowns.

Photograph 3-6. However, some littoral zones with large rock and cobble remain submerged even during seasonal drawdowns.

Photograph 3-7. Rocky shoreline bluffs such as this area across from Smith Springs, provide excellent habitat for smallmouth bass.

The discussion above emphasizes the importance of aquatic macrophytes in providing cover from predators for many species of juvenile fish, particularly during the early larval stages. Boulders, cobble, and other debris, as well as turbid water, also provide cover for juvenile fishes. Juveniles of many species of fish rely on aquatic macrophytes in shallow areas for predator protection throughout the year including: largescale sucker, Utah sucker, Utah chub, and yellow perch. Species such as mottled sculpins and smallmouth bass seek cover in lava rock and boulders in the shallow littoral zone. Water level drops that force juveniles out of the stands of aquatic macrophytes or shallow lava rock and boulders into open water without cover are likely to result in increased predation on those species. Juveniles of other fish species such as common carp, move into deeper water during late summer and no longer depend on the cover in littoral zones and thus would not be affected by drawdowns.

Fish Populations

Lake Walcott is relatively shallow and composed of large marsh areas along the shoreline. The reservoir currently supports a substantial non-game fish community comprised primarily of carp, Utah chub, and sucker species. Game fish present include smallmouth bass, rainbow trout, and yellow perch. Table 3-8 lists the principal fish species found in Lake Walcott along with a life history summary.

Table 3-8. Life history summary of principal fish species in Lake Walcott.

Species	Adult habitat in lakes	Spawning					Food of young-of-year fish
		Substrate	Depth	Temp	Dates	Reproductive characteristics	
Largescale sucker	Backwaters and shallows of lakes on the bottom, but can be as deep as 80 feet	Gravel	Shallow gravel areas.	41°F	Mid-April to mid-May	No nest built. Eggs adhere to gravel and substrate. Young remain in gravel for 1-2 weeks before moving away from spawning area. Young remain in shallow, weedy areas.	Young feed on zooplankton until they become bottom dwellers then feed on benthic aquatic inverts, diatoms and other plant material. Young serve as forage for larger predaceous fishes
Utah Sucker	Bottom feeders at all depths in lakes.	Move out of lakes into streams to spawn	From 6 inches to 24 inches deep.	60°F	Spring	Young remain near shore in shallow water feeding on algae.	Algae. Bottom feeders on both plants and benthic organisms. Often graze on filamentous algae attached to rocks.
Mottled Sculpin	Rocky shorelines. Hides on bottom among rocks, bedrock crevices filled with gravel or debris.	Spawn in spring in crevice or under rocks.	Shallow shoreline areas less than 1 mile		April - June	Young are limnetic (open water) for short time then concentrate under rocks along exposed shorelines or quiet bays. Important as forage for trout.	Aquatic invertebrates
Paiute sculpin	In lakes adults feed in deep water.	Spawn in spring – under-sides of rocks. Guarded by male.			May - June	Eggs laid In clusters on undersides of rocks. Guarded by male. Young remain in protect nest site until yolk sac is absorbed.	Aquatic invertebrates
Utah chub	Lakes and rivers associated with dense vegetation. Some adults not associated with vegetation.	Rooted aquatic vegetation .	Shallow water	54°F	Late spring - early summer	Rooted aquatic vegetation important for spawning and rearing areas.	Young feed mostly on zooplankton. Adults become omnivorous using aquatic plants, insects and crustaceans.
Redside shiner	Shallow water.		Shallow water.		Early summer	Spawn in schools.	Feed on small plankton, switch to insects mainly terrestrial as adults
Common carp	Quiet water in dense vegetation	Sub-merged weeds, grasses, roots	3 feet to less than 4 inches	65 to 68°F	Late spring – early summer	Yolk sac absorbed within a few days after hatching. Fry form large schools in shallow water. Young move into deeper water as they grow.	Zooplankton initially, then add aquatic plants, insects, clams.
Yellow perch	Seasonal movements follow 68°F isotherm. Uses wide variety of habitats	Sand, gravel, rubble, vegetation and brush.	Shallow water near shore.	45 to 54°F	April or May	No nest – eggs deposited in gelatinous mass near vegetation, brush, or over sand, gravel or rubble. Young move from shallow water to deeper water in late fall. Young and adults preyed on by almost all other predatory	Cladocerans, ostracods and chironomid larvae.

Species	Adult habitat in lakes	Spawning					Food of young-of-year fish
		Substrate	Depth	Temp	Dates	Reproductive characteristics	
						fishes and other yellow perch	
Smallmouth Bass	Rocky reefs and gravel bars	Sand, gravel, rocks near logs, rocks or vegetation	2 feet to 20 feet	61°F to 65°F	Late spring – early summer	Male builds and guards nest. After hatching, yolk sac is absorbed in 5-7 days and young rise off bottom of nest. Male guards several days until dispersal.	Zooplankton initially, switching to insects and fish
Rainbow Trout	In lakes, prefer temps less than 70°F. Move to deeper water if oxygen content is adequate	Population comprised of hatchery stockers.	Spawning unlikely in Lake Walcott.		.	Spawning occurs in tributary streams	Aquatic insects, worms, fish eggs.

The most recent fish survey was conducted in 2006 by Idaho Department of Fish and Game (IDFG) (Ryan, Gutknecht, and Megargle 2008a). Table 3-9 summarizes the results of fish sampling for all gear types (electrofishing, traps, gill nets).

Table 3-9. 2006 Fish sampling results – Lake Walcott (Ryan, Gutknecht, and Megargle 2008a)

Species	Number Caught
Common Carp	151
Rainbow Trout	28
Redside Shiner	67
Sculpin Spp	7
Smallmouth Bass	1,267
Sucker Spp	363
Utah Chub	30,993
Yellow Perch	77

Utah chub and smallmouth bass were the most abundant species in the catch. IDFG found that the relative weight ranged from 99 to 124 grams (g) (3.5 to 4.4 oz) for smallmouth bass indicating average to above average weight for a given length smallmouth bass, and that harvestable fish (305 mm) (12 in) are relatively abundant. Yellow perch were below average weight for this species, ranging from 62 to 95 g (2.2 to 3.4 oz). Rainbow trout ranged from 94 to 107 g (3.3 to 3.8 oz) indicating slightly below average weight for Lake Walcott rainbow trout. Fish abundance varied by reservoir location. IDFG indicates that difference in relative abundance of all species and specifically smallmouth bass between main and upper reservoir areas may be related to habitat differences and the influence of annual water level fluctuations on the available habitat (Ryan, Gutknecht, and Megargle 2008a).

IDFG observed a shift in fish species composition from the 1987 sample efforts to the 2004 sample efforts. Previous records indicated yellow perch was the only naturally reproducing game fish present, along with the annually stocked rainbow trout (Grunder et al. 1987; Grunder et al. 1988). Smallmouth bass were introduced in 1988 and 1990 and have expanded through natural recruitment (Ryan, Gutknecht, and Megargle 2008a). IDFG indicates that it is not surprising that smallmouth bass have done well in Lake Walcott given the abundance of rocky shoreline bluffs. The increase in smallmouth bass population levels is likely responsible for the observed decline in yellow perch in 2004, 2005, and 2006 sampling efforts.

The smallmouth bass fishery greatly expanded between the years 2000 and 2006 from Eagle Rock down through Lake Walcott (Tuesher and Scully 2008). Bass tournaments centered on the Massacre Rocks boat launch increased from two in 2000 to 10 in 2006, as bass anglers recognized the increasing opportunity to catch quality size smallmouth bass. Boaters are not allowed in 19 of the 44 miles between Lake Walcott Dam and American Falls Dam. Additionally road access is very limited to this reach. The boat closure is a USFWS rule within the Minidoka Refuge. This rule greatly reduces angler use. A June 2005 electrofishing survey in the reach closed to boats found that 30 percent of the fish captured were at least 17 inches long and many ranged in age from 8 to 13 years. In the reach above Massacre Rocks State Park, where boating is allowed, no bass 17 inches or larger were sampled. Total annual mortality in the boat-closure reaches was 25 percent. In reaches where boats are allowed, total annual mortality was 45 percent. A 2006 telemetry study documented that some of the large bass from the boat-closure reach seasonally migrate into areas accessible by boat anglers. For this reason, quality of bass in angler catches has so far remained very good compared to other smallmouth bass fisheries in the State.

IDFG's management goals for Lake Walcott call for stocking subcatchable or catchable rainbow trout annually. Management of trout and bass will be based on ongoing fish monitoring. Management goals also call for increasing angler access and working with State and Federal agencies to optimize water management to benefit fisheries.

White Sturgeon

Historically white sturgeon was abundant, ranging freely throughout the Columbia and Snake River basins as far upriver as Shoshone Falls, a natural migration barrier. Dam construction on the Snake River from the early to mid-1900s eliminated or severely reduced sturgeon access to spawning, rearing, and feeding habitats. Presently, there are only two viable populations of white sturgeon in the Snake River in Idaho: (1) the free flowing reaches between Bliss and C.J. Strike dams; and (2) from Hells Canyon Dam downstream to Lower Granite Dam in Washington. Estimated numbers of fish over 0.6 m (2 feet) in the two reaches are 2,700 and 3,600, respectively. Populations in other reaches of the Snake River are small (Dillon and Grunder 2008).

IDFG stocked juvenile hatchery-reared Snake River white sturgeon outside their native range below American Falls Dam to diversify angling opportunity beginning in 1990. Stocking rates have been quite low, with a total of less than 600 fish planted between 1990 and 2005. Survival and growth of the stocked fish has been good, and a very popular catch-and-release fishery has developed with most of the effort and catch in the vicinity of the dam tailrace. However, no reproduction occurs. The fishery is expected to be dependent on periodic stocking of hatchery-reared sturgeon. Appropriate stocking rates are unknown and will be developed by IDFG over time in an adaptive management framework (Dillon and Grunder 2008).

Individual white sturgeon from these plants have frequently been observed moving downstream of both Minidoka and Milner dams and becoming entrained into canal systems (Dillon and Grunder 2008). When possible, these fish are collected and transported upstream to Lake Walcott or to the American Falls tailrace. The likelihood of hatchery white sturgeon from the American Falls reach successfully emigrating into downstream reaches (below Shoshone Falls) appears very small. However, Idaho Power Company has documented one hatchery white sturgeon stocked below American Falls Dam at rkm 1136 and recaptured downstream of Pillar Falls at rkm 983.4.

Canal Entrainment

Fish are entrained into both the South Side and North Side canals. Exact fish loss into these systems is unknown at present. However, anecdotal information suggests that significant numbers of both game and nongame fish enter the canal system during the irrigation season (IDWR 1999). As discussed above, white sturgeon are also occasionally entrained into these canals.

Spillway Fish Community

Fish Populations

The spillway area and Snake River immediately downstream of Minidoka Dam have become an important fishery resource. Stream channels in the spillway area spread over a wide area and contain many riffles, pools, and runs for fish. Flows from the reservoir provide for vigorous growth of algae and aquatic invertebrates. The abundant food source of aquatic insects enhances the area's fish populations and sustains a valuable fishery (USFWS 1989). Many of the trout in the spillway area grow to be trophy-size, ranging from 2 to 6 pounds (IDFG 2007c). The trout fishery in the spillway area is maintained primarily by hatchery fish planted each year in the reservoir. Hiebert and Bjornn (1980) observed through tag returns that 80 percent of the trout stocked in the reservoir were recovered downstream from the release site. Grunder, Barrett, and Bell (1987) reported rainbow trout were commonly entrained through Minidoka Dam.

Recent changes in structure and operation in Minidoka Dam related to the installation and operation of the Inman Powerplant has reportedly reduced entrainment (Newman 2009b). Prior to the construction of the Inman Powerplant in 1997, Reclamation released much of the spillway flows through the existing radial gates. Once the powerplant was constructed and put into operation, the radial gates were no longer utilized to pass spillway flows. The existing radial gates have since served as a back-up release point in the event the powerplant trips and flows are no longer released through the plant. In order to maintain downstream flows for irrigation delivery, the existing radial gates automatically open to equal the flow lost by the powerplant. Therefore, following construction of the new powerplant, radial gate use had to be reserved for emergency use only. Since that time, the removal of existing stoplogs has been the primary means of regulating spillway flows.

Large numbers of fisherman were observed by Reclamation personnel in the existing spillway immediately below the existing radial gates prior to the construction of the new powerplant. Fisherman reported good fishing resulting from this operation. It is assumed that this fishery was supported by entrainment resulting from use of the radial gate structure. The existing radial gates release water from depths ranging from approximately 10 to 15 feet.

Since the construction of the new powerplant and subsequent use of existing stoplogs as opposed to existing radial gates, Reclamation personnel have observed reductions in recreational fishing in the existing spillway, particularly below the existing radial gates. In addition, Reclamation routinely receives verbal and written complaints from the angling public regarding current use of existing stoplogs to release spillway flows. The current use of existing stoplogs results in surface releases only, as the existing stoplogs release water only to a depth of 5 feet. It is likely this operation results in the entrainment of less fish.

Occasionally, the existing radial gate structures are utilized to release flows into the existing spillway, although it is not a standard practice. Feedback by the angling public to Reclamation personnel indicate that the quality of fishing in the existing spillway improves substantially when the existing radial gates are used to release water.

Anecdotal information from fishermen and observations from Reclamation personnel as well as data from IDFG surveys show that the fish community in the spillway area is greatly influenced by entrainment through the existing radial gates of Minidoka Dam. It is likely that changes in spillway operations will affect the spillway fish community.

Creel survey results from 2006 indicate that rainbow trout abundance in the existing spillway was limited. An estimated harvest of 66 rainbow trout occurred in the spillway area compared to the main reservoir area which had an estimated harvest of 2,033 trout. The mean length was 19.6 inches. A limited abundance of rainbow trout is possibly an indication that either habitat may not be suitable or entrainment of rainbow trout from Lake Walcott occurs on a limited basis.

An estimated 22 smallmouth bass were harvested in the spillway area, compared to an estimated 4,472 bass caught and released in the main reservoir area. Fish movement may have occurred to downstream areas following spillway shutdown, potentially biasing results. A total of 14,982 hours of fishing effort were estimated for the spillway area compared to 15,952 hours for the main reservoir area.

Fish Habitats

IDFG (2007b) conducted a fish survey of the spillway area in September 2007. Habitats sampled included riffle, pool, run, and isolated pool. Fish species detected in the spillway area included common carp, dace species, rainbow trout, redside shiner, sculpin species, smallmouth bass, Utah chub, sucker species, and yellow perch. The dominant species detected was smallmouth bass, collected at 91 percent of the sampled locations (Table 3-10). Redside shiner, rainbow trout, and yellow perch were sampled at 50 percent, 41 percent, and 41 percent of sampled sites, respectively.

Pool habitat was the primary occupied habitat by most fish species. Pool habitat was also the most available habitat sampled. Approximately 68 percent of sampled areas were described as pool habitat. Riffle type habitat was described at 14 percent of the sampled locations. Runs, isolated pools, and combinations of habitat type made up the remaining 18 percent. Table 3-10 shows the percent of fish sampled by species in the existing spillway.

Table 3-10. Percent of sample sites where species was captured (IDFG 2007b).

Carp	Dace	Rainbow Trout	Redside Shiner	Sculpin Spp.	Small mouth Bass	Sucker Spp	Utah Chub	Yellow Perch	None
31.8	13.6	40.9	50.0	4.5	90.9	31.8	36.4	40.9	4.5

Relationship Between Temperature and Flows in the Spillway Area

The current 1,300 to 1,900 cfs release scenario is a result of mitigation for the Inman Powerplant constructed in 1997. This release was agreed to in an effort to provide for a rainbow trout fishery in the spillway area. It was assumed that this flow would result in lower water temperatures throughout the spillway area, thereby supporting a rainbow trout put-and-take fishery. Water temperature data collected by Reclamation personnel in the existing spillway and reservoir in 2005 indicate no water temperature benefit from this increase in flow.

Temperature monitoring in the spillway area was conducted by Reclamation in 2005 (Newman 2009b). Table 3-11 summarizes average temperature, and minimum and maximum temperatures from 4 representative data loggers (11 data loggers were successfully

deployed in the spillway area). Temperature data was collected from April 15 through October 15. Only the four warmest months are summarized.

Table 3-11. Temperature summary of four data loggers deployed in the spillway area for the four warmest months.

Data-logger #	Month	Average Temp °F	Minimum Temp °F	Maximum Temp °F	Location	Observations
13	June July Aug Sept	62.2 70.5 71.5 63.1	58.2 64.5 66.4 56.9	67.0 75.2 76.5 70.2	170 ft. below radial gates	July and August maximum temperatures approaching Upper Incipient Lethal Temperatures (UILT) for rainbow trout.
1	June July Aug Sept	62.3 70.5 71.4 63.0	58.5 63.8 66.5 56.8	68.0 75.8 76.4 69.1	130 ft. below radial gates	July and August maximum temperatures approaching UILT for rainbow trout.
15	June July Aug Sept	62.2 70.4 71.3 63.2	58.0 64.8 71.6 54.9	67.2 74.6 73.7 68.9	730 ft below radial gates	Note that temperatures for all months for all data loggers are above optimum for rainbow trout.
11	June July Aug Sept	62.2 70.5 71.4 62.9	58.0 64.9 66.3 53.3	67.5 74.9 76.8 69.5	2,180 ft below radial gates	Temperatures for all months and data loggers are within the preferred temperature range ranges.
Reference:						
Rainbow trout: Optimum Temperature: 39.2 to 53.6°F						
Rainbow trout: UILT: 77 to 80.1°F						
Smallmouth Bass: Preferred Temperature: 64.4 to 87.8°F						
Smallmouth Bass: Upper and lower avoidance temperatures: 91.4°F and 57°F						

Water temperature data for Lake Walcott was also collected during this same period (Table 3-12). Loggers were placed at three locations in the water column: surface, mid, and bottom.

Table 3-12. Water temperature monitoring at Lake Walcott taken at the surface, mid water column, and the bottom during the four warmest months of the year.

Temperature	Surface	Mid	Bottom
June	64.6	63.6	63.1
July	70.3	69.2	68.7
August	71.3	70.9	70.5
September	62.8	62.5	62.5

Water temperature data collected by Reclamation indicates a fairly uniform temperature in Lake Walcott from the surface to the bottom of the lake. The small size of the reservoir relative to inflow and outflow rates and short water retention times during irrigation season prevents stratification from occurring. Thus, there is no layer of cold water available for release. Note that the average spillway temperatures and the average lake temperatures by month are nearly the same. This indicates that increased flows that were released to the existing spillway as mitigation for the Inman Powerplant to lower temperatures in the spillway area for rainbow trout enhancement are not effective.

The major factor to consider is whether the water temperatures that occur during the warmest months of the year in the spillway area are suitable for rainbow trout. The optimum temperature for most trout and salmon species ranges from 39.2 to 53.6^{o}F. The UILT for rainbow trout ranges from 77 to 80.1^{o}F (McCullough et al 2001). The UILT is an exposure temperature given a previous acclimation to a constant temperature that 50 percent of the fish can tolerate for 7 days (conversely 50 percent of the fish experience stress and mortality). The data summary in Table 3-11 indicates that temperatures in various locations throughout the existing spillway are very close to the UILT and far exceed the optimum temperatures for rainbow trout.

High summer water temperatures in the spillway area are more suitable for smallmouth bass which have a broad range of thermal requirements for growth and survival. The preferred temperatures for young smallmouth bass range from 64.4^{o}F to 87.8^{o}F depending on season; upper and lower avoidance temperatures were 91.4^{o}F and 57°F (Wallus 2008). Temperatures indicated in the spillway area during summer are within the preferred temperature range for smallmouth bass. While temperatures in the spillway area are not lethal for rainbow trout, they are not optimum.

IDFG's management goals for this area includes establishment of self-sustaining warm water fish species; continued stocking of channel catfish; and increasing angler access and optimizing water management to benefit resident fisheries (IDFG 2007c).

Typical fish habitats in the spillway area consist of pools, riffles, and runs (Photograph 3-8 and Photograph 3-9).

Photograph 3-8. Spillway area habitat

Photograph 3-9. Minidoka spillway area habitats shown here include pools and riffles.

3.6.2 Environmental Consequences

Impact Indicators

Reservoir Fish Community

The key factors in determining the magnitude and extent of impacts to the littoral zone are the time of year, length of time the reservoir is drawn down, and the extent of drawdown that exposes the littoral zone to desiccation and/or freezing. The focus of this analysis centers on this narrow, but crucial zone of the reservoir.

The following indicators were analyzed for the No Action and action alternatives to determine the environmental consequences to fish habitat and fish populations from reservoir operations: (1) aquatic food base; (2) littoral zone fish habitats; and (3) fish populations.

Spillway Fish Community

The impact indicators for the spillway fish community include (1) the changes in fish habitat as a result of changes in spillway operations, and (2) changes in fish populations as a result of changes in entrainment. The primary species of concern in the spillway area are smallmouth bass and rainbow trout.

Alternative A – No Action

Reservoir Fish Community

Reservoir Operations Impacts

Aquatic Food Base

Table 3-13 summarizes reservoir levels for the No Action and action alternatives during normal and wet years as well as dry years.

Table 3-13. Summary of reservoir levels for No Action and action alternatives.

Alternative	Water Type Year	Full Pool Elevation 4245 feet	5 feet Transition to Drawdown	Drawdown Elevation 4240 feet	5 feet Transition to Refill
A – No Action	Normal/Wet	Apr – Sept up to 6 months	Oct	Nov– Feb 4 months	Mar
A – No Action	Dry	Apr – Aug up to 5 months	Sep	Oct – Feb 5 months	Mar
B – Spillway and Headworks Replacement; C – Spillway Replacement	Normal/Wet	Nov – Sept up to 11 months	Oct	Oct Less than a month	Nov
B – Spillway and Headworks Replacement; C – Spillway Replacement	Dry	Nov – Aug up to 10 months	Sept	Sept – Oct 1 – 2 months	Nov

There would be no change to reservoir operations under the No Action alternative. The current stands of aquatic macrophytes would remain relatively unchanged providing both food directly for fish, as well as substrate for algae (periphyton). Nutrient levels in the reservoir will remain unchanged, at least as it relates to reservoir operations. Entrainment through dams is a major source of loss of zooplankton and phytoplankton in reservoirs. In the case of Lake Walcott, entrainment rates will remain unchanged thus zooplankton and phytoplankton populations will remain relatively unchanged. The ramping rates for drawdown will remain unchanged and the total amount of the littoral zone exposed during late fall and winter will also remain unchanged, thus benthic invertebrate populations should continue at present levels.

Littoral Zone Fish Habitat

The current reservoir operation has been in effect for several years and has allowed the establishment of stands of aquatic macrophytes in shallow bays and shoreline areas sheltered from much of the wind and wave action. Drawdown has not occurred during the critical spring spawning period under the current reservoir operations (No Action). These stands will continue to provide spawning and nursery habitat for fish during the spring period. Shallow, unvegetated flats would continue to be available during the spring spawning and rearing period for most fish species as well. Rocky bluffs composed of lava rock and boulders would also be inundated during critical spring spawning and rearing periods providing excellent juvenile and adult habitat.

Lake Walcott water levels would remain at elevation 4245 feet at least through August, keeping aquatic macrophytes available to juvenile fish for cover and protection from predation. This water level also provides the maximum amount of habitat in lava rock and boulder habitats which benefit species such as smallmouth bass. The present level of predation on juvenile fish would likely continue, and fish populations would not change from the present condition.

Overwintering habitat is important for both young and juvenile fish, particularly for smallmouth bass which need adjacent cover for optimum survival. Under the current reservoir operation regime (No Action) with the 4 to 5 month drawdown beginning in September or October (depending on water type year) and continuing through winter until refill begins March 1st, all of the aquatic macrophytes are exposed and hence not available as cover. Additionally, much of the cover provided by lava rock and boulders is also exposed, greatly reducing the overwintering value of this habitat. Young smallmouth bass would be at increased risk of predation because of the reduced amount of hiding cover.

Fish Populations

Overall, the present species diversity and fish population levels are expected to continue to remain unchanged. Young smallmouth bass would continue to be exposed to predation

during drawdown periods. Rainbow trout populations are dependent on stocking levels. Conditions in the reservoir will remain unchanged for rainbow trout.

White sturgeon stocked to provide a sport fishery below American Falls Dam will continue to enter Lake Walcott as presently occurs and would encounter the same lacustrine conditions as presently occurs.

Both nongame and game fish, including white sturgeon will be subject to the same risk of entrainment both through the dam's powerplant, existing spillway, and existing radial gates as well as irrigation canals as presently occurs.

Construction Impacts

The only construction activities that may occur in the No Action alternative are the periodic replacement of piers as they continue to deteriorate. This may result in short-term disturbance to fish in pools adjacent to the piers, but would not result in habitat loss or injury as construction BMPs are designed to avoid adverse impacts.

Spillway Fish Community

Spillway Operations Impacts

Fish Populations

There will be no changes in entrainment rates under the No Action alternative. Thus, the current level of entrained rainbow trout and smallmouth bass will continue.

Fish Habitat

Under the current operation there are no controlled spillway releases in winter. The only water in the spillway area occurs from seepage in winter. From April 15 through September 15 the minimum spillway flow is 1,300 cfs and from July 1 through August 31 the minimum spillway flow is 1,900 cfs. Additional spillway releases during the irrigation season can occur especially during wet years. Habitat conditions will remain unchanged for this alternative

Construction Impacts

Construction activities will occur periodically for maintenance, repair, or replacement of the deteriorating piers. This may result in temporary disturbance of fish habitat in the immediate area, but construction BMPs will be required for all work performed, reducing the risk of adverse impacts.

Alternative B – Spillway and Headworks Replacement

Reservoir Fish Community

Reservoir Operations Impacts

Aquatic Food Base

The overall extent of aquatic macrophytes in Lake Walcott is likely to remain unchanged; however, species composition may change as species intolerant of longer inundation periods are eliminated. Entrainment rates for zooplankton and phytoplankton would remain at similar levels, thus overall population levels would remain unchanged. Ramping rates for drawdown would remain the same, although the total time the reservoir would remain drawn down will be decreased several months. Mortalities from drawdown would decrease slightly from the No Action alternative.

Littoral Zone Fish Habitat

Alternative B eliminates the winter drawdown. The reservoir would be kept at full pool for roughly 10 to 11 months depending on the water year type. To our knowledge the aquatic macrophyte community in the Lake Walcott littoral zone has not been surveyed in detail. Six typical wetland plant species were profiled in Table 3-14 based on communities listed in Jankovsky-Jones (2001) for the Middle Snake River Plains. These species are used heavily by wildlife as well as for spawning and rearing habitat for several species of fish present in Lake Walcott. The major effect to aquatic macrophytes would be the reduction of the drawdown period from 4 to 5 months in the late fall to winter period under the No Action alternative to an abbreviated drawdown ranging from less than a month to 2 months, September through October, depending on water year type.

Drawdown tolerant species, including broad-leaved and narrow-leaved cattail, softstem and hardstem bulrush, and creeping spikerush are unlikely to be adversely affected by the change in drawdown regime. Conversely, species that are sensitive to prolonged inundation may be adversely affected, such as the Nebraska sedge.

Stands of aquatic macrophytes are likely to continue to persist in the littoral zone of Lake Walcott under Alternative B to the same extent as currently exists. While it is difficult to predict with certainty, it is possible that some changes in species composition of the aquatic plant community would occur as those species sensitive to long-term inundation are replaced by species more tolerant of nearly continuous inundation. In some hydrological regimes, cattails can become a nuisance by forming extremely dense, extensive stands. However, it is unlikely that this drawdown scenario would increase the extent of cattails because the drawdown occurs at the end of the growing season and is similar to the present condition.

Overall, the present level of aquatic macrophytes would continue to be available for spawning and rearing in the littoral zone.

Table 3-14. Drawdown tolerance of aquatic macrophyte species common in the middle Snake River plains.

Species	Characteristics	Tolerance to water level fluctuations	Notes
Broad-leaved Cattail *(Typha latifolia)* USDA 2003(a)	Occurs in shallower water than *T angustifolia.*	Tolerant of water level fluctuations.	Tends to invade native plant communities when hydrology, salinity or fertility changes. Can out-compete native species, often becoming monotypic stands of dense cattails. Maintaining water flows into wetland and reducing nutrient input would help maintain desirable species composition.
Narrowleaf Cattail *(Typha angustifolia)* USDA 2003(b)	Has fewer and larger rhizomes resulting in low rate of cloning, but enabling it to grow in deeper water than *T. latifolia.*	Spreads both vegetatively and by seed, particularly under drawdown conditions.	Cattails can become extremely aggressive and would form monotypic stands of dense cattails.
Softstem Bulrush *(Schoenoplectus tabernaemontani)* USDA 2003(c)	Occurs in deep or shallow water or in muddy or marshy ground around lakes and wetlands. Perennial.	Can survive periodic draining and flooding of marshes, but softstem bulrush stands can be reduced if prolonged draining and flooding continuously occurs.	Provides food and cover for fish, muskrats, raccoons and otters. Hard-coated fruits are an important food source for ducks, shore birds and marsh birds.
Hardstem Bulrush *(Schoenoplectus acutus)* USDA 2003 (d)	Has clonal growth, with stout rootstocks and thick rhizomes.	Found in areas with standing water from 10 cm to 2.5M +. Does not tolerate long periods with very deep water.	Can out-compete other species in wetland area. Provides important food for wetland birds, Canada geese.
Nebraska Sedge *(Carex nebrascensis)* USDA 2003 (e)	Native, perennial, heavily rhizomatous wetland plant.	Can tolerate standing water for long periods as long as there are periods when soils dry. Can tolerate total inundation for about 3 months.	Forms dense stands; often is dominant member of wetland community. Shoots from rhizomes produced throughout growing season and into late fall.
Creeping Spikerush (*Eleocharis palustris)* USDA 2003 (f)	Perennial, heavily rhizomatous plant. Spreads rapidly by rhizomes and occasionally from seed.	Grows on sites that are permanently or seasonally flooded. Can thrive in permanent water up to 1 m deep and can survive in areas where water table drops to 30 cm below the surface late in the season.	It is a pioneering species that populates mud flats very quickly as the water draws down.

Suitability of the shallow unvegetated flats would remain at the same level for the crucial spring rearing period, as drawdowns would not occur until after juvenile fish of most species have left the shallow shoreline areas later in summer. Overall, these shallow habitats would be available for 4 to 5 months longer every year.

The lava/boulder habitat would remain unchanged from the no action condition, as reservoir levels would remain at full pool during the spring spawning and rearing period. The major change to the lake habitat that juvenile fish would encounter is that the lake would remain full during the winter period. Only a relatively brief period of drawdown starting in September 1 during dry years and October 1 during normal to wet years and refilling in November would occur under the action alternatives. This would reduce the amount of time that juveniles that rely on the cover of aquatic macrophytes or lava rock and boulder habitat for escape from predators would be forced into open water habitat. Juveniles of species such as largescale and Utah sucker, redside shiners, carp and yellow perch would have the ability to remain in cover longer, thus reducing some predation pressure. Conversely, it is unlikely that populations of these species would increase to nuisance levels because of the presence of adult smallmouth bass and rainbow trout which would maintain predation pressure.

Juvenile smallmouth bass would likely benefit by being able to seek cover from predators in lava rock and boulders during an additional 4 to 5 months through the winter months. As this species is dependent on cover for optimum survival (Wallace 2008), this improvement in the lake levels would benefit smallmouth bass. Reducing drawdown periods in nearby Milner Reservoir on the Snake River has apparently led to a significant increase in smallmouth bass recruitment (Megargle 2009). In addition, the creation of approximately 5.2 acres of permanently watered reservoir habitat adjacent to the new gated spillway will provide additional smallmouth bass habitat, as the area is dominated by bedrock and large boulder substrate with multiple basalt outcrops

Fish Populations

Spawning and rearing conditions would remain at similar levels to the No Action alternative. Stands of aquatic macrophytes should remain at similar levels, though species composition within the stands may change somewhat. Nursery habitats would remain fully inundated during the critical spring period. Drawdown periods would be greatly reduced, lasting from only 1 to 2 months during September through October. The game fish populations in Lake Walcott would likely remain at present or increasing levels. It is likely that smallmouth bass populations would increase because the lava rock/boulder habitat would remain fully inundated for 4 to 5 months longer every year. Juvenile smallmouth bass would have an increased opportunity to seek cover from predators in the rocks and crevices throughout the fall and winter except for a brief period from September through October. Their overall survival should improve considerably. Habitat for hatchery rainbow trout would likely remain good as the overall reservoir productivity would not be adversely affected.

Habitat for hatchery white sturgeon stocked below American Falls Dam would remain good for those fish moving downstream into Lake Walcott as the overall reservoir productivity would not be adversely affected. No significant changes would be made to the overall flow conditions in the river reach below Minidoka Dam. The reach would remain highly

regulated and constrained by Federal and State water delivery contracts. The need for continued stocking to provide a sport fishery would continue.

Entrainment into the South Side and North Side canals would continue unchanged as no provisions for screening have been made due to the high installation and operating costs of such screening facilities.

Construction Impacts

The reservoir habitat will be protected from direct construction related impacts during most of the construction period because the new spillway would be constructed below the existing dam which would serve as a cofferdam. However, some rock would need to be removed above the existing dam structure which will cause direct effects to the lacustrine environment (Appendix B – Figure 2–4). Blasting or hoe ramming may be employed to remove the rock. Blasting would have short-term, but adverse impacts to fish in the immediate reservoir area.

The adverse effect of underwater blasting on fish has been extensively documented. Swim bladder rupture caused by rapid contraction and overextension in response to the explosive shock waveform is the most common cause of mortality and injury to fish (Wiley et al. 1981). Hemorrhaging in the pericardial and coelomic cavities is also commonly observed injuries. Damage to the kidney, liver, and spleen has also been observed, and are possibly related to the rapid contraction and expansion of the swim bladder (Keevin and Hempen 1997). Teleki and Chamberlain (1978) found that the magnitude of the blasting effect on fish depends on several physical and biological characteristics including detonation velocity, density of material to be blasted, and charge weight. Additionally, fish shape, swim bladder development, and location of the fish in the water column are important biological characteristics. The explosion pressure wave and resulting fish kill is influenced by the interaction of additional physical components including the type of explosive, water depth, and bottom composition (Teleki and Chamberlain 1978).

Any fish in the immediate area during blasting operations in the reservoir adjacent to the existing spillway would likely be killed. The overall impact is expected to be relatively minor. Game fish mortality in these areas would be enumerated and replacement fish stocked after construction is completed.

Spillway Fish Community

Spillway Operations Impacts

Fish Populations

Fish entrainment rates are anticipated to be similar under Alternatives B and C to the present condition. The 300 cfs release point would be at a depth of 10 to 15 feet in Lake Walcott. This corresponds to current take depths presently used by the existing radial gates.

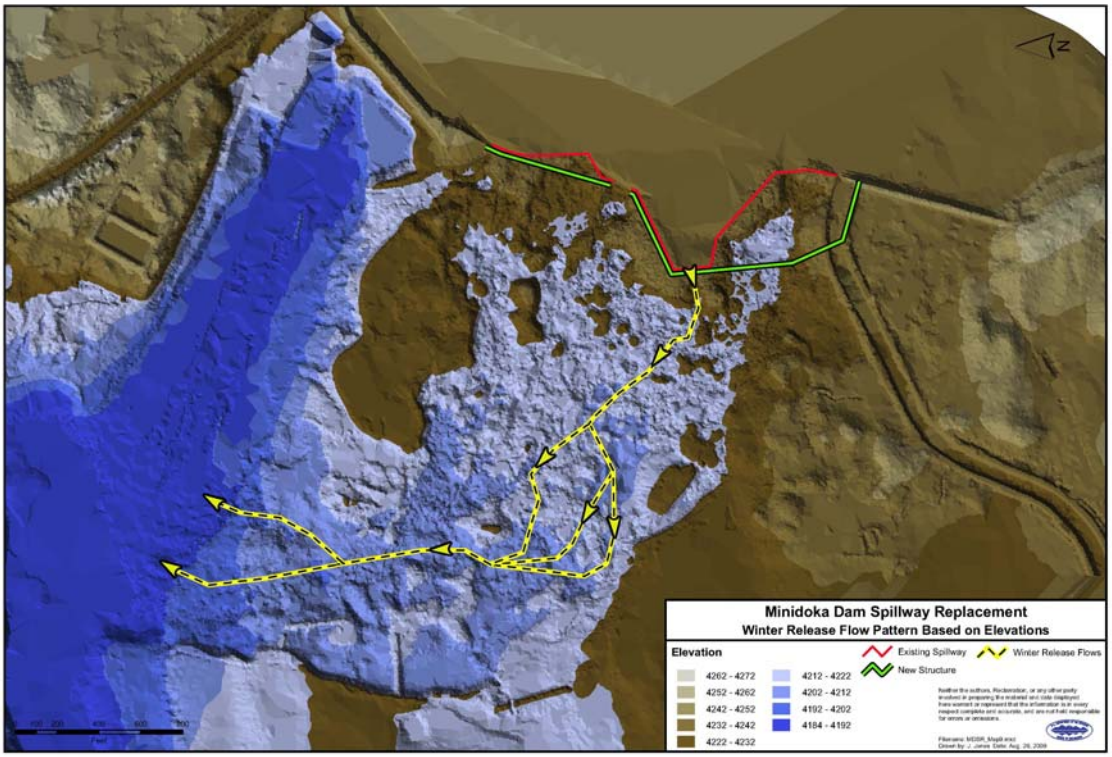
Hydroacoustic surveys found that fish density was higher in deeper areas greater than 6 m (18.7 feet) with a value of 36.1 fish/hectare (fish/ha). A somewhat lower fish density of 11.2 fish/ha was found in the top 6 m (Butts and Nelson 2006). Therefore, the pipe would be slightly above the zone with the highest fish density, but will be in the zone with a moderate density of 11.2 fish/ha). It is assumed that the pipe or radial gate would entrain enough rainbow trout and smallmouth bass to support a fishery in the new spillway below the new radial gates. Some of the entrained fish would likely associate with turbulent conditions resulting from the 300 cfs release point.

Fish Habitat

Alternative B would reduce the minimum spillway flows from 1,300 cfs from April 15 to September 15 and 1,900 cfs from July 1 to August 31 to a minimum of 500 cfs during the irrigation season and 100 cfs during the winter. This water would be distributed from five new water release points. Four of these points will provide 50 cfs while the fifth structure would provide 300 cfs in conjunction with the north radial gate either through an outlet tube or the radial gate itself.

While a 500 cfs minimum release is a substantial reduction in flow from current operations, it is not anticipated that it would result in negative impacts to the recreational fishery in the new spillway. The primary factors to consider are whether changes to water temperatures in the spillway area and changes to the fish entrainment rates would occur. As has been discussed in the affected environment section, temperatures in the spillway area were nearly the same as those in the reservoir in spite of increased minimum flows. Basically, the spillway flows will be the same temperature as the water in the reservoir. Thus, decreases in flows resulting from operational changes in spillway releases would not affect water temperatures. Overall water temperatures in the new spillway would remain above optimal for rainbow trout although temperatures will not reach lethal limits. Temperatures for smallmouth bass in the new spillway would continue to be optimal.

The overall amount of habitat available for rainbow trout and smallmouth bass would remain similar to the no action condition with the exception of the 5.2 acres of spillway to be permanently converted to reservoir habitat. This area is currently approximately ½ fluvial and ½ terrestrial habitat. Photograph 3-10 is a digital elevation map that shows how the 100 cfs non-irrigation season release would appear. The single point of release would be combined with seepage which would allow most of the currently available fish habitat to remain.



Photograph 3-10. Photo showing winter release flow point and calculated flow route over 3-D elevation model output.

Construction Impacts

Construction of 1,316 feet of new overflow sections and 330 feet of new radial gated section with 12 new radial gates and appurtenant facilities would be completed behind the existing dam which will serve as a cofferdam. In addition, Service Road A would be placed adjacent to the existing spillway section. Service Road B would be located primarily adjacent to the existing dike with a section connecting to the existing bridge. Leaving the old dam in place during construction to serve as a cofferdam will protect the lacustrine (lake) habitat from direct construction impacts, but will not protect the pools and channels in the immediate spillway area are from construction-related impacts. These impacts would be controlled through BMPs (see Section 3.6.4).

Rock outcrops will need to be removed in several areas. The first area is adjacent to the existing spillway extending into the reservoir several feet as discussed in the previous section. The second area extends from the existing spillway downstream below the existing spillway. The third area will be excavated 4 to 9 feet for the new radial gated section and the fourth area will be excavated 4 to 5 feet to improve the channel. Photograph 3-11, Photograph 3-12, and Photograph 3-13 show the area that would be affected. The rock

would be removed either through blasting or with the use of a hoe ram, with blasting being more likely.

Any fish in the immediate area during blasting operations both upstream in the reservoir adjacent to the existing spillway as well as downstream in the spillway area will likely be killed. The overall impact is expected to be relatively minor. Game fish mortality in these areas would be enumerated and replacement fish stocked after construction is completed.

A minor amount of pool habitat would be replaced by the new spillway, but a nearly equal amount of new lacustrine (lake) habitat would be created upstream of the dam.

Photograph 3-11. Area of existing spillway that would be replaced (February 2009).

Photograph 3-12. Wetland area immediately downstream of Minidoka Dam (February 2008).

Photograph 3-13. Area immediately below the spillway on the south side of the dam (February 2009).

Alternative C – Spillway Replacement

The conditions for all of the impact indicators for the Reservoir Fish Community and the Spillway Fish Community would be the same as described for Alternative B. Construction impacts would also be the same as those described for Alternative B.

3.6.3 Cumulative Impacts

Implementation of the Minidoka North Side Resource Management Plan (RMP) (Reclamation 2004a) is expected to result in the protection and enhancement of natural resource values at Lake Walcott. The enhancements include development of additional drain water wetlands with emphasis on high quality habitat; improved enforcement and control of ad hoc camping and off-road vehicle (ORV) use to protect soils and vegetation, elimination of encroachment and trespassing on Reclamation lands, and protection of rare and sensitive species in grazing and fire management plans.

Implementation of IDFG's Fisheries Management Plan 2007 – 2012 calls for stabilizing winter water levels at Lake Walcott to benefit fish habitat. Both Alternatives B and C would dovetail with IDFG's management goal at Lake Walcott by eliminating the need for winter drawdown. IDFG would also stock subcatchable or catchable rainbow trout annually; monitor bass and trout populations and adjust management directions accordingly. In the Snake River immediately downstream of Minidoka Dam, IDFG's management emphasizes establishment of self-sustaining warmwater fish species particularly the stocking of channel catfish. IDFG is working with management agencies to optimize water management to benefit fish.

The DEQ (2009) has developed and is implementing the Lake Walcott subbasin TMDL plan which is moving water quality in the subbasin toward improvements.

The improvements in winter water levels at Lake Walcott through improvements in the spillway structures, along with improvements that are occurring through implementation of the Minidoka RMP and the Fisheries Management Plan would lead to an overall improvement in aquatic habitats at Lake Walcott and in the spillway area that would offset short-term construction related impacts.

3.6.4 Mitigation

Reclamation requires that contractors comply with the following mitigation requirements:

Construction Practices

1. Use appropriate construction methods to isolate in-channel construction areas from flowing water to minimize turbidity and sediment released from site.

2. Insure that petroleum products, chemicals, or other harmful materials are not allowed to enter the water.

3. Perform as much machine work as possible from the streambanks to minimize disturbance to the streambed.

4. Minimize disturbance to riparian vegetation.

5. Restore the site to near-original conditions/grade. Remove spoils from the construction area when it is not possible to shape them to near-original conditions.

6. Dispose of construction spoils and waste materials at proper sites away from the stream channel.

7. Use silt screens to minimize the overland flow of fine sediments from construction sites into the stream during precipitation events.

8. Capture game fish that are inadvertently trapped in sections of ditch or river isolated for construction, and liberate them into adjacent flowing water.

9. Obtain all required Federal, State, and local permits.

10. Enumerate game fish incidentally killed during blasting operations and replace in kind after construction is completed.

Site Recovery

1. Stabilize disturbed upland, riparian and wetland areas with native grasses and vegetation.

2. Vacate construction sites leaving a positive visual impact blending with the natural landscape.

3.7 Terrestrial Biota

3.7.1 Affected Environment

The proposed action area, Minidoka Dam and spillway, are on lands withdrawn by Reclamation located on the Snake River Plain in south-central Idaho, 12 miles northeast of the town of Rupert. The Minidoka Refuge extends upstream approximately 25 miles from the Minidoka Dam along both shores of the Snake River, encompassing a total of 20,699 acres, of which 11,300 acres are the open water of Lake Walcott, the Snake River, and some

small marsh areas. The remaining 9,399 acres of upland are classified as sagebrush-grass (3,519 acres) and grassland (5,880 acres).

Minidoka Refuge is managed as a unit of the Southeast Idaho Refuge Complex along with Bear Lake, Camas and Grays Lake National Wildlife Refuges, and Oxford Slough Waterfowl Production Area. The Complex Office is located in Chubbuck, Idaho about 74 miles away. Minidoka Refuge has been designated as an Important Bird Area (IBA) of global importance for its colonial nesting bird populations and for the numbers of molting waterfowl. This program identifies areas that have high value for birds throughout the world. In the United States the IBA Program is coordinated by the National Audubon Society.

The area where the reservoir now lies was used for livestock grazing historically. At the time Minidoka Dam was constructed, the vast Snake River Plain was covered by shrub/steppe vegetation dominated by sagebrush and a wide variety of bunch grasses and forbs.

Following the construction of Minidoka Dam and its associated irrigation canals, some of the surrounding lands are now farmed. Potatoes, sugar beets, beans, alfalfa, and wheat are the primary crops. Grazing is still a vital part of the local economy. No farming is presently being done on the refuge. Grazing was eliminated in 1995, except where there is no boundary fencing. The reservoir and existing spillway is immediately surrounded primarily by a sagebrush landscape of Bureau of Land Management (BLM) lands (Reclamation 2004a).

Upland Vegetation

Historically, the vegetation on uplands within and surrounding the proposed action area consisted of shrub-steppe habitat (Tisdale and Hironaka 1981). Shrub-steppe habitats in western North America are characterized by woody, mid-height shrubs, perennial bunchgrasses, and forbs (Daubenmire 1978; Dealy et al. 1981; Tisdale and Hironaka 1981; Short 1986). Periodic drought, extreme temperatures, wind, poor soil stability, and only fair soil quality (Wiens and Dyer 1975; Short 1986) create a stressful environment for biotic communities. The original shrub-steppe vegetation of the proposed action area was dominated by big sagebrush (*Artemisia tridentata*) with an understory of native perennial grasses and forbs, consisting mainly of bluebunch wheatgrass (*Agropyron/ Pseudoroegneria spicatum*), Sandberg's bluegrass (*Poa secunda*), needlegrasses (*Stipa spp*.), lupine (*Lupinus spp*.), Indian paintbrush (*Castilleja spp*.), and penstemon (*Penstemon spp*.) (Hironaka, Fosberg, and Winward 1983).

Most of the original bunchgrass-sagebrush communities in the vicinity of the proposed action area have been replaced by irrigated agriculture and pasture or are dominated by exotic species that have become established as a result of human disturbance, livestock grazing, and a higher fire frequency compared to pre-European settlement. Habitat value of the original shrub/steppe for wildlife has been substantially reduced and degraded by agricultural and

related development, which eliminated most of the original habitat and fragmented much of what remains within predominantly agricultural areas. Remaining habitats have been further degraded by grazing and noxious weed invasion (Reclamation 2004a).

Currently, most of the terrestrial lands within the proposed action area have had disturbance and are dominated by rabbitbrush (*Chrysothamnus spp*.) and cheatgrass (*Bromus tectorum*). The cheatgrass-dominated areas are a result of increased fire frequency depressing the competitive ability of native vegetation. Some areas designated as grasslands were seeded with the nonnative perennial grass crested wheatgrass (*Agropyron cristatum*). These areas were distinguished from native perennial grasslands dominated by native grass species because they lack structural diversity and have few, if any, forbs or other plant species that would make them as valuable to wildlife as the native perennial grassland species. Sites that have been protected from livestock grazing for several years and have not burned recently contain a variety of native grasses and forbs mixed with cheatgrass. These sites are typical of the shrub-steppe that is in relatively good range condition. Some of the native plants found in these areas are Sandberg's bluegrass, squirreltail (*Sitanion hystrix*), bluebunch wheatgrass, western wheatgrass (*Agropyron smithii*), basin wildrye (*Elymus cinereus*), needlegrass, Indian ricegrass (*Oryzopsis hymenoides*), lupine, penstemon, phlox (*Phlox hoodii*), paintbrush, death camas (*Zigadenus spp*.), larkspur (*Delphinium spp*.), and gooseberryleaf globemallow (*Sphaeralcea grossulariifolia*).

Riparian Vegetation

Martin and Meuleman (1989) and Meuleman et al. (1991) list 41 acres of riparian habitat following construction of Minidoka Dam (37 acres of deciduous scrub-shrub wetland and 4 acres of deciduous forested wetland). Shrub species (usually less than 3 feet) present include skunkbush sumac, Wood's rose, and golden currant. Mid-sized species (less than 10 feet) is primarily coyote willow with some skunkbush sumac. Taller species include eastern cottonwood, peachleaf and Pacific willows, Russian olive, green ash, and Chinese elm. There are a few areas with sizable patches of riparian habitat, but for the most part the riparian zone is narrow and linear, in most places only one tree wide where it goes from open water to basalt rock in only a few feet. Nevertheless, it is quite important to some songbird species, such as Bullock's orioles. The oriole territories include a couple hundred feet of shoreline with trees for nesting, but much of their foraging is in the adjacent sagebrush.

The primary threat to the riparian zone is invasive weeds. Much of the riparian habitat is degraded by Russian olive, which is an invasive weed in this area. Past grazing practices may have encouraged the Russian olives as they are less palatable than native willows. The riparian zone has been degraded by several other invasive weeds primarily Canada thistle, Scotch thistle, and poison hemlock. Other species on the proposed action area that are difficult to control are perennial pepperweed, hoary cress, and Russian and diffuse

knapweeds. These weeds grow primarily in herbaceous riparian areas, but can grow under trees also.

Prior to the construction of Minidoka Dam in the early 1900s, the Snake River fluctuated seasonally. This fluctuation was likely beneficial to the riparian vegetation but no longer occurs because of current reservoir operations. The reservoir is raised 5 feet to full pool around early April and remains there until early October when it is drawn down to winter levels.

Wooded areas are defined by the presence of trees, whether native or invasive. The native species, Rocky mountain juniper (*Juniperus scopulorum*) and Utah juniper, are both present on the north and south side of the reservoir. The stands vary from scattered old trees and open savannah on the north shore to smaller trees in open savannah and closed canopy stands in the step canyons on the southeast side of the reservoir. Southern Idaho is the northern edge of the juniper habitats. The understory of the stands on the reservoir contains brush with exotic and native grasses. Under closed canopy stands there is often very little understory.

Wetlands

Reservoir Area

Extensive stands of aquatic macrophytes (emergent vegetation) occur in Lake Walcott in coves, bays, and shorelines protected from wind and wave action. Common species include reeds (*Phragmites*), bulrushes (*Scirpus spp.*), cattails (*Typha spp.*), and spikerushes (*Eleocharis spp.)*. Submersed macrophytes grow completely submersed under the water and include such species as pondweeds (*Potamogeton spp.*). Floating-leaved macrophytes are rooted to the lake bottom with leaves that float on the surface of the water, occurring generally in areas of lakes that do not periodically dry out. Typical species are water lilies (*Nymphaea spp.*), spatterdock (*Nuphar spp.*), and watershield (*Brasenia*). Free-floating macrophytes are plants that float on or just under the water surface with their roots in the water and not in sediment such as duckweed (*Lemna spp.*). Note that the wetland vegetation within the drawdown zone of the reservoir has been described in the aquatic biota section previously.

Spillway Area

The extensive wetland area immediately below Minidoka Dam is composed of complex physical features that join to create very productive habitats for fish and wildlife. The leakage from the flashboard sections and flow through the existing radial gates and flashboard bays pass through numerous channels across a fractured basalt shelf with many exposed lava outcrops (Photograph 3-14). Stream channels are composed of bedrock substrate with small pockets of shallow gravel in deeper pools. Most of the soils are

moderate to highly permeable. These stream channels are interspersed with upland silt and sandy loams that overlay the basalt and sedimentary rocks forming pockets of upland vegetation.

Photograph 3-14. Numerous channels flow across fractured basalt in the spillway wetland area.

A wetland map showing the extent and types of wetlands present is shown in Figure 3-1. Most of the wetland is classified as riverine upper perennial rocky shore temporarily flooded (R3RSA), or riverine upper and perennial rock permanently flooded (R3RBH). There are also pockets of palustrine habitats (wetlands dominated by trees, shrubs, emergents).

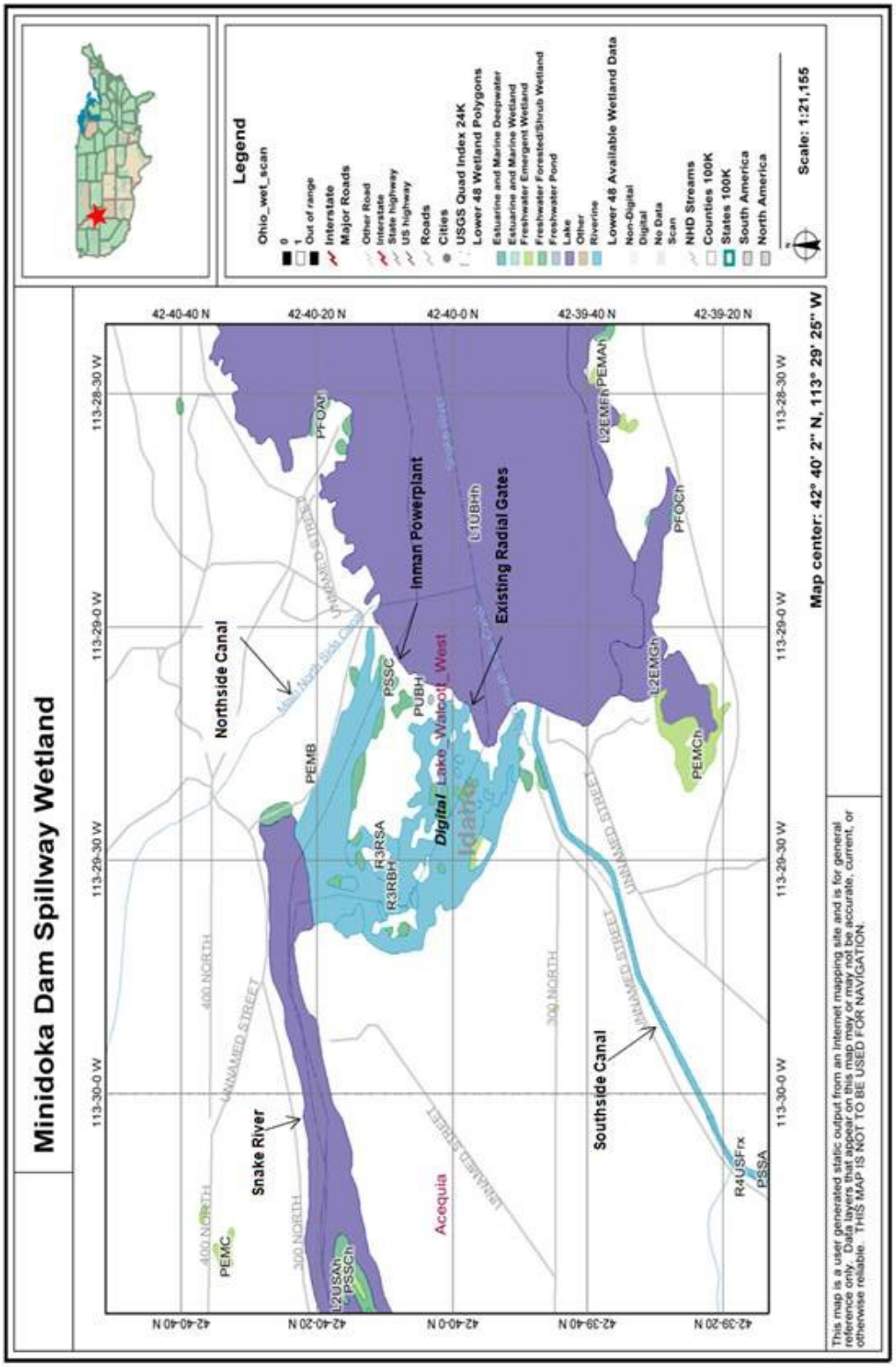


Figure 3-1. Wetland map for the Minidoka Dam spillway area (USFWS National Wetlands Inventory (www.fws.gov/wetlands/Data/Mapper.html)

Vegetation of the higher upland areas within the existing spillway is a characteristic sagebrush-steppe association. Narrow strips of riparian vegetation consisting mostly of willow grow along the stream channels. Small areas of cattails, bulrush, and reed canary grass grow in shallow depressions where seepage is slower and more constant. These areas are typically found adjacent to the existing spillway (Photograph 3-15). Wood's rose, golden currant, and skunkbush sumac are also common in the spillway area.

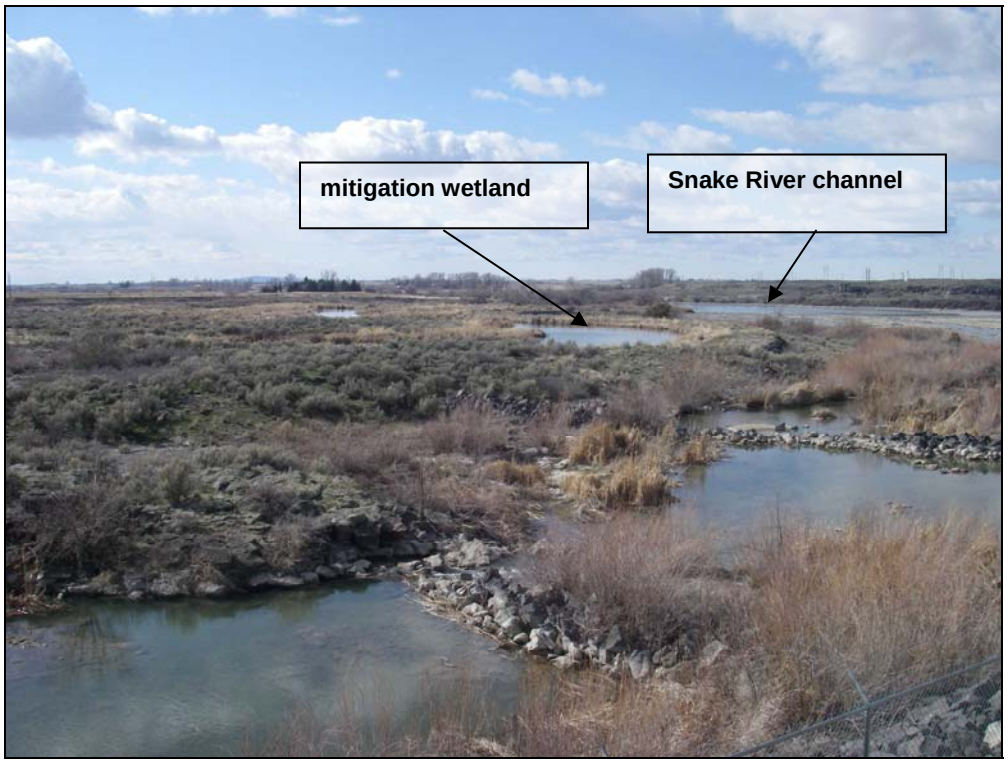
As discussed in the previous section on the Spillway Fishery, this productive area receives water from the reservoir which, along with the various riffles, runs, and pools, results in vigorous algae and aquatic invertebrate growth that supports an abundant fish community.

Photograph 3-15. Mix of uplands in the spillway wetland area.

As part of the mitigation measures for construction of the replacement powerplant (1997), Reclamation developed a 4-acre wetland area on the sagebrush peninsula in the middle of the spillway area (Photograph 3-16; Photograph 3-17).

This wetland was developed by constructing a dike about 1,300 feet long on the north side of the peninsula. The dike was constructed with gently sloping sides and covered with soil which facilitated revegetation. Inlet and outlet structures were constructed to maintain a flow of water through the wetland, drain the wetland for control of undesirable fish and aquatic plants, and for maintenance of the dike.

Photograph 3-16. Aerial view of the wetlands in the spillway area of Minidoka Dam. A 4-acre mitigation wetland was constructed to offset impacts of constructing the Inman Powerplant in 1997.



Photograph 3-17. View from the dam looking downstream toward the mitigation wetland constructed in the spillway area. The Snake River channel can be seen in the upper right of the photo. Note the extensive area of sagebrush and other upland plant species mixed in with the wetlands.

Avian Communities

EO 13186 defines the responsibilities of Federal agencies to protect migratory birds under the four Migratory Bird Treaties (MBT Conventions) to which the United States is a signatory. Most birds in North America are considered migratory under one or more of the MBT Conventions. The EO mandates that all Federal agencies cooperate with the USFWS to increase awareness and protection of the nation's migratory bird resources. Reclamation is in the process of finalizing an MOU with USFWS, which includes provisions for analyzing Reclamation's effect on migratory birds.

In 1989, the USFWS completed a study of wildlife and wildlife habitat on a portion of Reclamation withdrawn lands in the Minidoka North Side RMP study area (USFWS 1989). The study was conducted to prepare a wildlife habitat management plan for parcels within the proposed Minidoka North Side Extension project. That project was not completed. However, data collected on the Reclamation parcels in the RMP study area provide the most comprehensive discussion of wildlife and wildlife habitat for the proposed action area. Information presented in that report (USFWS 1989) was supplemented with information

from Reclamation and IDFG biologists, Reclamation GIS files, published and unpublished literature, Idaho CDC data, and observations by CH2M HILL biologists.

The large expanse of reservoir and existing spillway with its dry surrounding uplands attracts numerous avian species including waterfowl, shorebirds, and wading birds. The Minidoka Refuge bird list currently shows 243 species, of which 85 species are known to nest on the refuge. More than 230 species of birds have been observed at the Minidoka Refuge since 1950, according to USFWS (2002). The more common breeding raptors are northern harrier (*Circus cyaneus*), red-tailed hawk (*Buteo jamaicensis*), American kestrel (*Falco sparverius*), and burrowing owl (*Athene cunicularia*). Less common raptors that are present during migration or summer include prairie falcon (*E. mexicanus*), Swainson's hawk (*B. swainsoni*), ferruginous hawk (*B. regalis*), turkey vulture (*Cathartes aura*), short-eared owl (*Asio flammeus*), Osprey (*Pandion halaietus*) and great horned owl (*Bubo virginianus*). The most abundant wintering raptors are the rough-legged hawk (*Buteo lagopus*), bald eagles (*Haliaeetus leucocephalus*), red-tailed hawk (*Buteo jamaicensis*), and prairie falcon (*Falco mexicanus*). Northern goshawks (*Accipiter gentilis*) may be present in the winter, especially near the Snake River, and golden eagles (*Aguila chrysaetos*) may also be present during winter.

The Minidoka Refuge bird lists (USFWS 1989; 2002) indicate that the waterfowl species most likely to use proposed action area wetlands and nearby grain fields include mallards (*Anas platyrhynchos*), gadwalls (*A. strepera*), and cinnamon teal (*A. cyanoptera*). Fewer numbers of redheads (*Aythya americana*), ruddy ducks (*Oxyura jamaicensis*), pintails (*Anas acuta*), American wigeon (*Anas americana*), and northern shovelers (*Anas clypeata*) breed in the refuge area and may occasionally use drain water wetlands. Wintering waterfowl include Canada geese (*Branta canadensis*), mallards, pintails, gadwalls, American wigeon, northern shovelers, and green-winged teal (*Anas crecca*). Tundra swans (*Cygnus columbianus*) forage in grain fields in relatively low numbers during migration.

Great blue herons (*Ardea herodias*), American avocets (*Recurvirosta americana*), long-billed curlews (*Numenius americanus*), killdeer (*Charadrius vociferous*), and other shorebirds would also be expected to use the larger wetlands, as would red-winged blackbirds (*Agelaius phoeniceous*). In addition, white pelicans (*Pelicanus erythrohynchus*), grebes, Sabines gull (*Xema sabini*), and several other species of gulls use the area just below the dam during the summer.

From 1966 to 2005 aerial waterfowl surveys were conducted on the Minidoka Refuge and Lake Walcott (Bouffard 2009). Table 3-15 below indicates that dates these flights were conducted, the waterfowl species, and numbers identified:

Table 3-15. Aerial waterfowl surveys at Minidoka Refuge (1966 to 2005).

Date	Ducks	Geese	Coots	Grebes	Pelican	Cormorant	Swans	Remarks
9/17/1966	99,600	900	25,000					IDFG
10/15/1966	82,702	1,832	6,000				6	IDFG
11/12/1966	117,000	1,225	500				1,000	IDFG
12/17/1966	28,635	1,300	100				100	IDFG
9/20/1969	80,945	20	20,700				1	IDFG
10/18/1969	114,870	1,239	11,400				35	IDFG
11/15/1969	82,313	1,354	3,240				933	IDFG
12/12/1969	160,500	898					373	IDFG
9/16/1972	59,159	526	16,000					IDFG
10/14/1972	64,565	895	16,650					IDFG
11/25/1972	93,925	791	3,000				510	IDFG
12/9/1972	17,115	1,500	500				230	IDFG
9/27/1975	86,600	200	24,000					IDFG
10/25/1975	46,050	813	7,500				50	IDFG
11/22/1975	31,550	1,683	1,000				365	IDFG
12/21/1975	25,925	626					810	IDFG
9/23/1978	39,800	300	7,800					IDFG
10/21/1978	60,500	1,338	6,200				9	IDFG
11/18/1978	60,500	2,605	3,200				469	IDFG
12/16/1978	12,675	1,400					47	IDFG
9/18/1981	39,750	1,645	6,700					IDFG
10/17/1981	23,800	3,050	7,000					IDFG
11/15/1981	38,900	1,630	1,500					IDFG
12/12/1981	39,800	1,272	75					IDFG
10/16/1982	29,150	1,190	4,329					IDFG
11/13/1982	25,350	1,300	1,000					IDFG
12/11/1982	3,600	2,178	600					IDFG
8/8/2000	15,892	30		600		500		Bad Weather Count
9/5/2003	21,780	1,368	2,567	1,741	691	972		IDFG
8/30/2004	4,090	97	16	127	1,090	430		Bad Weather Count
9/17/2005	2,025	1,920			128	65		Bad Weather Count

For these surveys, mallards were the most abundant waterfowl species, followed by redhead, gadwall, and teal. During fall migration, ruddy ducks and canvasbacks were also among the most abundant species. During the winter, mallards are the most abundant species followed by common goldeneye. Aerial surveys were weekly or biweekly through 1977. Data included here for historical perspective start in 1966, every 3rd year subsequently, and 1982. Prior to 1977 the count closest to the 15th day is entered here. Over the past few decades waterfowl numbers appear to have declined on the refuge. The cause of the decline is not apparent and does not correlate well with continental population estimates.

Peak bird species diversity on the reservoir occurs from June through September. Peak waterfowl numbers occur from August through October. Some of this peak could be due to reproduction during early summer, molt migration into the refuge later in summer, and migrating birds during fall. Reproduction is fairly important on the refuge. A ground count conducted July 15, 1986, reported 80 broods with an average of about 5 young per brood. Surveyors estimated that they were seeing only 1/3 of the broods active on that day. Considering that many early broods (including all the geese) would have been fledged by that date, overall production on the refuge could be substantial.

Some of the conspicuous nongame birds breeding on parcels with native vegetation include common nighthawks (*Chordeiles minor*), western kingbirds (*Tyrannus verticalis*), sage thrashers (*Oreoscoptes montanus*), loggerhead shrikes (*Lanius ludovicianus*), and Brewer's sparrows (*Spizella breweri*).

Historically, Minidoka County had some of the highest densities of pheasants in Idaho (Thomas 1985; USFWS 1985). The pheasants reached peak densities between 1955 and 1965. The increase in grain production—in combination with weedy areas along canals, roadside vegetation, spoil areas, and interspersion of remaining sagebrush lands—created excellent habitat for pheasants (Reclamation 1986). In recent years, however, pheasants have declined drastically (Rybarczyk and Connelly 1990). Much of the decline is due to loss of permanent and carry-over wintering and nesting habitat that resulted from changes in farming practices. Conversion of rangelands to agriculture, and more efficient and intensive farming, has resulted in larger farms, loss of roadside cover, removal of riparian vegetation, increased use of herbicides and insecticides, and burning of fence rows and ditch banks. Croplands are usually fallowed during fall and winter, making waste grain unavailable as a pheasant food source.

In addition to pheasants, other upland game species in the proposed action area include gray partridge (*Perdix perdix*), mourning dove (*Zenaida macroura*), and Nuttall's cottontail (*Sylvilagus nuttallii*). Sharp-tailed grouse (*Tympanuchus phasianellus*) and greater sage-grouse (*Centrocercus urophasianus*) both occur in low numbers near the reservoir, sharp-tails year round and sage-grouse at least during the spring through the fall.

Mammalian Communities

Big game species on the proposed action area include a few mule deer (*Odocoileus hemionus*) and pronghorn (*Antilocarpa americana*). Some mule deer are resident and some are migrant mule deer. In recent years, the number of migrant mule deer has increased to a few hundred deer during severe winters. Fires occurring north of the proposed action area have destroyed winter range, apparently forcing mule deer south onto the Minidoka North Side area (USFWS 1985). The loss of native shrublands from fire and past conversion to agriculture has reduced and degraded mule deer winter range, resulting in increased depredations on private lands (USFWS 1985; Reclamation 1986).

Large fur-bearing mammals occurring in upland parts of the proposed action area include coyote (*Canis latrans*), red fox (*Vulves vulpes*), badger (*Taxidea taxus*), and striped skunk (*Mephitis mephitis*). Raccoons (*Procyo lotor*), muskrats (*Ondatra zibethica*), long-tailed weasels (*Mustela frenata*), and mink (*Mustela vison*) occur below the existing spillway and around the reservoir shoreline and wetlands. Small mammals common to the area include black-tailed jackrabbits (*Lepus californicus*), montane voles (*Microtus montanus*), and deer mice (*Peromyscus maniculatus*).

Pygmy rabbits have also been surveyed for presence in the proposed action area by the USFWS. According to USFWS survey records, pygmy rabbit (*Brachylagus idahoensis*) have never been detected within or near the proposed action area (Bouffard 2009).

Amphibian and Reptile Communities

Amphibians and reptiles expected to occur in the proposed action area include long-toed salamanders (*Ambystoma macrodactylum*), pacific treefrogs (*Hyla regilla*), leopard frogs (*Rana pipiens*), western chorus frogs (*Pseudacris triseriata*), longnose leopard lizards (*Gambelia wislizenii*), side-blotched lizard (*Uta stansburiana*), racers (*Coluber constrictor*), gopher snakes (*Pituophis melanoleucus*), garter snakes (*Thamnophis spp.*), and western rattlesnakes (*Crotalus viridis*).

Prime and Unique Farmlands

Prime farmland, as a designation assigned by the USDA, is land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and is avaible for these uses. Unique farmland is land other than prime farmland that is used for the production of specific high value food and fiber crops. The Farmland Protection Policy Act (7 U.S.C. 4201 et seq.) requires Federal agencies to identify and take into account the adverse effects of their programs on the preservation of farmlands. Any subsequent actions considered in an environmental document tiered to this EIS would be evaluated to determine whether or not those actions would convert farmland to other uses or

cause physical deterioration and/or reduction in productivity of farmlands. A farmlands assessment would be prepared if any prime or unique farmland were affected. 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.

There are no prime and unique agricultural lands within the boundaries of the proposed action area but the effects of changing water levels within the proposed action area may affect the distribution of some wildlife species onto prime and unique agricultural lands adjacent to Lake Walcott.

3.7.2 Environmental Consequences

This section includes impacts to terrestrial vegetation communities, avian, mammalian, reptile, and amphibian communities and residual effects for each alternative.

Methods for Evaluating Impacts

The following factors impact wildlife and vegetation communities above and below existing spillway: water levels; water distribution; water/spillway release locations, wildlife habitat, vegetation type; and human disturbance. Each of these factors will be evaluated according to the presence, absence, or alteration in habitat quality anticipated under each alternative.

Impact Indicators

Many factors influence the quality of habitat and abundance of wildlife species in and adjacent to the proposed action area including reservoir levels, aquatic vegetation in the reservoir, the amount of water released below the existing spillway, the distribution of water below the existing spillway, and level of human disturbance in the area. The wildlife impact indicators are determined by evaluating water, vegetation changes, and human disturbance in each geographical area for each wildlife community and vegetative community under each alternative.

The following indicators were used for this analysis of wildlife and vegetation community effects:

- Reservoir Operations – Changes to upland and riparian vegetation and reservoir wetlands due to changes in the amount and timing of reservoir water levels. Ability of wildlife to adjust to the different water levels and resulting vegetation changes.
- Spillway Operations – Changes to upland and riparian vegetation and spillway wetlands due to changes in the operations of the spillway. Ability of wildlife

communities to adjust to the vegetation and wetland changes caused by spillway operations.

- Construction Impacts – Changes to vegetation, wetland, and wildlife communities resulting from short-term construction impacts.

Alternative A – No Action

Reservoir Operational Impacts

Upland and Riparian Vegetation & Reservoir Wetlands

Under the No Action alternative, the reservoir operations will essentially stay the same and the water levels will continue to fluctuate and be drawn down during the winter months. Generally, some water fluctuation is beneficial for wetlands and will have positive impacts on the quality of the submergent beds. The 5-foot drawdown allows a large area to dry each fall. When re-flooded, this area is more likely to have sago pondweed than other submergent species. Sago pondweed is a preferred waterfowl forage plant; the vegetative portion, and the seeds are edible, but the tubers are highly selected by swans and diving ducks. Sago pondweed responds to drying lake substrates. With the drawdowns, sago will continue to grow and other species should decrease.

The present distribution of riparian vegetation in the narrow zone around the reservoir would remain unchanged.

Eurasian milfoil is a highly prolific invasive exotic weed. It is not known to be present on the refuge at this time. It is easily spread by fragments carried on boat motors and trailers. It floats into shallow water, roots and spreads. However, it cannot withstand freezing substrates. The current drawdown allows the lake bottom less than 5 feet deep to freeze every winter killing any Eurasian milfoil that may have become established.

Development and implementation of an Integrated Pest Management Plan is likely to improve weed control efforts under all alternatives, but it is unlikely to improve native plant diversity or restore historic habitat values under this alternative.

Avian Communities

The avian community will remain essentially the same as presently occurs.

Mammalian Communities

The fluctuating reservoir pool that currently exists for mammalian communities will continue and these wildlife species habitats would not change. The big game species such as mule

deer and pronghorn will continue using the food and water resources around the reservoir as it exists.

Large fur-bearing mammals occurring in uplands such as coyotes, red fox, badger, and striped skunk will continue to benefit from the drawdowns as they create access onto many flats and provide food and travel corridors. Raccoons, muskrats, long-tailed weasels, and mink will also be able to forage better and benefit from the drawdowns. Small mammals such as the black-tailed jackrabbits, montane voles, and deer mice will not be affected by the current drawdowns since they are mostly terrestrial species.

Amphibian and Reptile Communities

Amphibian and reptile communities in the proposed action area are not expected to be adversely impacted by the No Action alternative. The diversity, distribution, and relative abundance of amphibians and reptiles using the habitat around the reservoir are expected to remain the same as current conditions under the No Action alternative.

Spillway Operations

Upland and Riparian Vegetation & Reservoir Wetlands

The upland vegetation that surrounds and intersperses the spillway area will not be affected by the No Action alternative. Riparian vegetation in the spillway area which includes various shrubs, but no trees, will not be affected by the No Action alternative.

The current minimum spillway release of 1,300 cfs from April 15 through September 15 increasing to 1,900 cfs from July 1 through August 31 will continue unchanged. The basic hydrologic regime of the spillway wetland will remain unchanged. It is unlikely there would be much, if any, change to the existing wetland vegetation (primarily cattails, bulrushes, and reed canarygrass).

Avian Communities

Avian communities are not expected to be adversely impacted by the No Action alternative. The diversity, distribution, and relative abundance of birds using the spillway area are expected to remain the same as current conditions under the No Action alternative.

Mammalian Communities

Mammalian communities are not expected to be adversely impacted by the No Action alternative. The diversity, distribution, and relative abundance of mammals using the spillway area and are expected to remain the same as current conditions under the No Action alternative.

Amphibian and Reptile Communities

Amphibian and reptile communities are not expected to be adversely impacted by the No Action alternative. The diversity, distribution, and relative abundance of amphibians and reptiles using the spillway area are expected to remain the same as current conditions under the No Action alternative.

Prime and Unique Farmlands

There are no prime and unique agricultural lands within the boundaries of the proposed action area but under the current reservoir operations "loafing areas" are available to migrating waterfowl during the winter months. This may prevent displacement of waterfowl during this time period and keep them on the refuge and off of any adjacent farmlands. Under the No Action alternative, the existing spillway will not change thus existing wildlife distribution and habits are expected to remain the same.

Construction Impacts

The No Action alternative represents continuation of the current conditions which will leave the existing spillway and headworks in their present configuration. It will be necessary to continue the seasonal 5-foot drawdown. As the concrete in the existing spillway and headworks continues to deteriorate, maintenance requirements will increase. As the spillway concrete deteriorates further, a program of pier replacement will probably become necessary. The pier replacement program will involve ongoing replacment of piers to maintain the existing spillway in a usable condition.

It is likely replacement activities associated with the pier replacement program will be conducted consistent with past pier replacement projects. In 2004, Reclamation replaced a pier at Minidoka Dam. All construction activities associated with the project were conducted following irrigation season (October) when Lake Walcott was drawn down to the winter maintenance elevation, and the existing spillway was receiving no flows. To accommodate vehicular access, sand bags and washed gravel was used to create temporary access routes. No permanent roads were constructed and materials were removed following the replacement. A backhoe was utilized to extract the pier and remove it from the spillway area for disposal. Concrete forms were hand built and concrete was pumped into the form to create the new pier. Construction activities were localized and very minor. The replacement was a small, localized project with no known impacts to adjacent fish, wildlife, or vegetative communities.

It is anticipated that a pier replacement program will have no impacts to vegetation communities or wildlife due to the timing (post-irrigation season), duration (short term), location and nature of the actual replacement activities.

Alternative B – Spillway and Headworks Replacement

Reservoir Operational Impacts

Upland and Riparian Vegetation & Reservoir Wetlands

There would be positive effects for trespass grazing control on the refuge. Currently, the 5-foot water drop allows livestock on BLM allotments adjacent to the refuge to use the exposed reservoir bottom to get around the fence and trespass on the refuge. The proposed operation would reduce this unwanted grazing. It is difficult to maintain fences in the current drawdown zone because of the soft substrate, and also from wind driven ice and rafts of submergent vegetation.

There is not likely to be an increase in subsurface flow creating moister swales in currently upland habitats. Any such areas are already willow habitats. These areas are currently affected by full pool levels during the growing season. Higher pools and more subsurface flow during the winter would likely not affect the existing vegetation much.

Noxious weed control is a major program around the reservoir. Canada thistle, Scotch thistle, and poison hemlock are the primary weeds species found in the riparian zone. Having a full pool over winter is not likely to have any significant impact on populations of these species. Canada thistle and hemlock are especially associated with riparian habitats. Higher water levels during the non-growing season are not likely to have any effect on the noxious weed problem.

Stable water levels would eliminate the winter freeze period that would have acted to prevent colonization of Lake Walcott by Eurasian milfoil, thus increasing the chance that this invasive species would invade the reservoir.

The Minidoka Refuge employees (USFWS) have been trying to improve the riparian areas by planting willows for wildlife habitat and erosion control. The species planted were primarily coyote and Pacific willows, but also cottonwood and peach-leafed willow. Stem cuttings were planted into the water table to start the growth. Cuttings were planted in spring after ice out and before the leaves erupt on the trees. Higher spring levels would expand the time window for planting. At less than full pool, planters often had to penetrate 2 to 3 feet of soil before reaching the water table. Reaching the water table is imperative as the cuttings have no roots and must be in water to survive. Having full pool levels in spring would make planting easier and would result in better percentage of cuttings surviving.

Under Alternative B, the existing spillway and headworks would be replaced and current operations would change. To prevent ice damage on the existing spillway the reservoir is currently dropped each winter. After replacement of the splashboards, the water would most likely remain stable all year and the need for a winter drawdown would not be necessary

except for the late summer and early fall irrigation season drawdown. Generally, some water fluctuation is beneficial for wetlands. It is likely that stable water levels would have negative impacts on the quality of the submergent beds in the reservoir. The 5-foot drawdown allows a large area to dry each fall. When re-flooded, this area is more likely to have sago pondweed than other submergent species. Sago pondweed is a preferred waterfowl forage plant; the vegetative portion, and the seeds are edible, but the tubers are highly selected by swans and diving ducks. Sago pondweed responds to drying lake substrates. Without the drawdowns, sago would probably decline and other species should increase.

Avian Communities

The impacts to specific species and avian communities existing on the reservoir are as follows:

Song Birds: Migrant song birds peak in the spring and fall, and nesting species are present all summer. Since they are terrestrial there would be little impact on these species during proposed operations.

Shore Birds: Generally there is minor use of the refuge by shore birds during spring and fall due to the lack of mudflats. Red-necked phalaropes (several 1,000's) can be present in fall but they use the reservoir and the pool at Bishop's Hole. There should be minor impacts on shore birds as a group.

Common Loon: There are approximately 100 to 200 loons in the area during spring and fall migrations, mostly in the reservoir, but also below the dam. They use deeper water for foraging. There would be little impact to them during proposed operations.

Eared Grebe: There are approximately 5,000 to 10,000 eared grebes using the reservoir during spring and fall migration. They primarily forage in deep water within the reservoir. There would be little impact on them during proposed operations.

Western and Clark's Grebes: Several hundred to a few thousand pairs of Western and Clark’s grebes nest on the reservoir and are present spring though summer. The birds nest in late summer on the reservoir and upstream to the Bonanza Bar area. They nest in emergent vegetation and forage in deep water. Construction would be unlikely to have an adverse effect on the birds; however, they may be affected by emergent vegetation due to the absence of yearly reservoir drawdown. Bulrush Island, an area of shallow emergent vegetation was an important nesting area for Franklin's gull and white-faced ibis. The island was lost during the high water levels in the 1960s and 1970s. There would be little impact to them during proposed operations.

American White Pelican: Approximately 1,400 to 1,700 pelican nests have been recorded on islands throughout the reservoir and there are likely many nonbreeders also

present. They forage in shallow water and most will migrate out of the area by October and only a few individuals will remain over the winter. The adult pelicans routinely fly long distances to forage and Lake Walcott may be the sole nesting site for most of birds in southern Idaho. The pelicans would not be affected by the proposed operations.

Double-crested Cormorant: Cormorants nest on 2 islands located on the south side of the reservoir. The birds forage mostly on the reservoir and downstream in the Snake River. Since they forage in deeper water, they should not be affected by proposed operations.

Great Blue Heron: Approximately 20 to 40 herons nest in cottonwoods on south side of reservoir. The birds forage in shallow water along the reservoir edge, the edge of river below dam, and in the spillway area. There would be little impact to them during proposed operations.

Black-crowned Night-heron; Snowy Egret, Cattle Egret: These birds nest in small numbers (10 to 50 nests per colony) on small islands on the south side of the reservoir. The birds forage in shallow water below the dam, below the new spillway, and down river. Post nesting, many birds would roost in shrub willows in the spillway area near Bishop's Hole. The birds should not be affected by proposed operations.

California Gull: Gulls nest on small islands along the south shore of the reservoir and most leave the refuge after breeding. The gulls forage in a wide variety of habitats, mostly off reservoir. Gulls should not be affected by proposed operations.

Ring-billed Gull: Several thousand ring-billed gulls are present during spring and fall migration but do not breed on the reservoir. The birds would forage in a wide variety of habitats, mostly off reservoir and should not be affected by proposed operations.

Franklin's Gull: Franklin’s gulls nest on higher elevation marshes elsewhere in Idaho, but 5,000 to 10,000+ are present during the spring and fall. The gulls roost on the reservoir and forage in a wide variety of habitats located mostly off the reservoir. Bishop's Hole below the dam is an important feeding area, especially during fall. The birds forage on emerging caddisflies that emerge from late July through September in the river below the dam. There would be little impact to them from proposed operations.

Sabine's Gull: Sabine’s gull are present in small numbers from late August through mid-September and nest in the Arctic Region of North America. This is a highly sought after bird by Idaho birders and Bishop's Hole is the most reliable location to find this bird in Idaho. It feeds on the caddisfly hatch below the dam powerplant and roosts on the reservoir at night. Therefore, there would be no effects from operations

as long as flow through the dam does not impede the caddisfly population. There would be no other effects from proposed operations.

Tundra Swan: As many as 500+ tundra swans are present during spring and fall migration. They use the shallow water for foraging and exposed mudflats and rocks for roosting. They are seldom present below the new spillway or on the river within 1 mile below dam. The swans forage mostly on submergent vegetation, invertebrates, and sago pondweed tubers. Having a full pool in fall may positively affect roosting area in the reservoir as well as the sago tuber supply. The exposed mud flats near Tule Island are an important fall and winter use area. Some swans remain in this area as long as there is open water. There would be little impact to them during proposed operations.

Trumpeter Swan: The trumpeter swan follows similar seasonal patterns as the tundra swan, but is uncommon and has not been detected on the reservoir every year. They also have similar foraging patterns as tundra swans. Minidoka Refuge is identified as a future release site for establishing nesting trumpeters on the mid-Snake River. There would be little impact to them during proposed operations.

Bald Eagle: One pair of bald eagles nests in a cottonwood tree on Bird Island. The proposed operation would allow higher winter water levels, which would favor increased beaver population. The nesting pair forages over the entire proposed action area, but there should be ample undisturbed foraging habitat during construction. During winter, up to 20 bald eagles can use the reservoir and spillway area and forage on waterfowl concentrations. As the reservoir freezes the waterfowl and eagles follow the open water downstream. There would be little impact to them during proposed operations.

Osprey: Ospreys are present in small numbers during spring and fall. They forage throughout the reservoir and downstream on the river. They have not been recorded as nesting, but a nest structure has been available for around 20 years, but has never been used. There should be little effect of proposed operations on ospreys.

Peregrine Falcon: Falcons do not nest on the reservoir, but are present in small numbers spring and fall until freeze up. Most observations were near vicinity of the dam, the existing spillway, and Bishop's Hole. No effect is expected from proposed operations.

Other Raptors: Several species of raptors are common on the reservoir, but are terrestrial and should not be affected by the project. The Northern harrier is the only species that could be affected, as they frequently nest in emergent vegetation. However, they are not totally dependent on emergent vegetation for nesting and forage mostly in upland habitats. No effects are expected from proposed operations.

Sharp-tailed Grouse and Greater Sage-grouse: Both species occur in low numbers within close proximity of the reservoir, sharp-tails are year round residents and sage-grouse are present during the spring through fall. Neither species should be affected by the proposed operations.

Mammalian Communities

Potential impacts to mammalian communities would be minimal. Large vertebrates such as mule deer and antelope use the reservoir as a source of drinking water. Any effects on the ability of larger vertebrates to access the reservoir from the proposed operation are unlikely. These vertebrates are mobile and there are no current barriers and would be no future barriers to water access.

There is likely to be an increase in muskrat and beaver populations. The current 5-foot drawdown exposes their winter dens allowing predator access. Muskrats forage on emergent vegetation. This vegetation is sparsely scattered in coves around the refuge. Moderate foraging would create muskrat houses which are used by nesting geese and swans. However, muskrats can also eliminate all emergent vegetation, reducing benefits to waterfowl. The emergent vegetation is also used by nesting redheads, which are the second or third most abundant duck on the refuge during the nest season. Beavers would increase and there would be increased predation on the few cottonwood trees (less than 30) on the refuge. Cottonwoods support the only bald eagle nest, and the great blue heron colony.

Pygmy rabbits have also been surveyed for presence in the proposed action area by the USFWS. According to USFWS, pygmy rabbits have not been detected on the refuge or Federal lands associated with the reservoir (Bouffard 2009).

Amphibian and Reptile Communities

There could be effects on amphibians, primarily northern leopard frogs. Leopard frogs can be found all around the reservoir shoreline in summer. They breed in shallow bays, especially those with emergent vegetation. These frogs use mud under water to avoid ice formation during winter hibernation. Ice can form in the water above them as long as they do not freeze. The higher winter levels would likely mean they would simply select similar water depths for hibernation. Water level rises after they enter hibernation could be a problem if the added depth leads to anaerobic conditions at the substrate in which they are buried. Leopard frogs are fairly common around the shoreline of the reservoir despite heavy predation by introduced fish species. There should be no effect on frogs from the construction or proposed operations. The greatest danger to the frog is freezing during drawdowns. If it can thrive with the current 5-foot winter drawdown, the proposed operation should have a positive effect.

The reservoir operation change should have little effect on other amphibians and reptiles because they do not use the drawdown areas of the reservoir in the winter months.

Spillway Operations

Upland and Riparian Vegetation and Spillway Wetlands

The only loss of vegetation in the spillway area would be that associated with the new footprint of the roller-compacted concrete structure and access road and the 5.2-acre portion of the wetland to be converted to reservoir habitat. However, the vegetation that currently grows within these areas is very sparse (typically less than 1 plant per square meter). This is the vegetation that currently grows out of the cracks in the basalt below the existing dam structure. This is estimated to be less than one tenth of an acre.

Spillway releases would be reduced to a minimum of 500 cfs during the irrigation season. This flow would be distributed to the wetland though 4 water release points of 50 cfs each and 1 with 300 cfs. Aerial photos taken by Reclamation in August 2009 of the spillway wetlands during a 500 cfs release indicates the extent of the wetlands would not significantly change when compared to the No Action alternative (Appendix B – Figure 3–2). These flows would likely be sufficient to keep the wetland vegetation (cattails, bulrushes, and reed canarygrass) as well as various mosses and algae alive and functioning.

A total of 100 cfs (including seepage) would be released to the wetlands during the non-irrigation season. This would improve flows in the wetlands.

Avian Communities

Operation of the powerplant would be similar to operations in the past with flows through the powerplant and releases through the new spillway would be about the same. Distribution changes of water out-flow below the new spillway during construction would displace avian species for a period of time but they should respond without any affects. One significant effect for dabbling waterfowl would be the loss of the deep pool at the south end of the new spillway. The total replacement of the existing spillway and headworks would expand the reservoir and a portion of the existing habitat will be inundated by water. Although this portion of habitat would be lost, the new spillway would enhance avian habitat over time because of the more stable water flows.

The impacts to specific species and avian communities existing below the new spillway are as follows:

> **Song Birds**: Since they are mostly terrestrial species there will be little impact on these species during proposed operations.

Shore Birds: Red-necked phalaropes (several 1,000s) can be present in fall and use the pool at Bishop's Hole. There should be little impact on them from proposed spillway operations.

Common Loon: There are approximately 100 to 200 loons in the area during spring and fall migrations, mostly in the reservoir, but also below the dam. They use deeper water for foraging. There will be little impact to them during proposed spillway operations.

American White Pelican: Approximately 1,400 to 1,700 pelican nests have been recorded on islands throughout the reservoir and there are likely many nonbreeders also present. The few that forage in the spillway area may be displaced during construction. The pelicans would likely not be affected from proposed operations except for the change in spillway flow during construction.

Great Blue Heron: The herons forage in shallow water along reservoir edge, and the edge of river below dam and in the spillway area. No impacts are expected for this species from proposed spillway operations.

Black-crowned Night-heron; Snowy Egret, Cattle Egret: These herons forage in shallow water along the edge of the reservoir, below the new spillway and below dam, also down river. Post nesting, many birds will roost in shrub willows in the spillway area near Bishop's Hole. The birds should not be affected by proposed spillway operations.

Franklin's Gull: The gulls roost on the reservoir and forage in a wide variety of habitats located mostly off reservoir. Bishop's Hole below the dam is an important feeding area, especially during fall. The birds forage on emerging caddisflies that emerge from late July through September in the river below the dam. There should be no effect on the birds from spillway operation if new flow through dam does not affect the caddisfly population.

Sabine's Gull: Sabine’s gull are present in small numbers from late August through mid-September and nests in Arctic. This is a highly sought after bird by Idaho birders and Bishop's Hole is the most reliable location to find this bird in Idaho. It feeds on the caddisfly hatch below the dam powerplant and roosts on reservoir at night. Therefore, there would be no effects from spillway operations as long as flow through the dam does not impede the caddisfly population.

Bald Eagle: During winter up to 20 bald eagles can use the reservoir and spillway area and forage on waterfowl concentrations. As the reservoir freezes, the waterfowl and eagles follow the open water downstream. Proposed operation may keep open water and therefore waterfowl present in the proposed action area longer over the winter;

therefore, keeping bald eagles longer on the proposed action area during the winter. There would be no effects to bald eagles from spillway operations.

Osprey: Ospreys are present in small numbers during spring and fall. They forage throughout the reservoir and downstream on the river. They have not been recorded as nesting, but a nest structure has been available for around 20 years, but has never been used. Therefore, there would be no effects from proposed spillway operations on ospreys.

Peregrine Falcon: Falcons do not nest on the reservoir, but are present in small numbers spring and fall till freeze up. Most observations were near vicinity of the dam, the existing spillway and Bishop's Hole. No effect is expected from proposed spillway operations.

Mammalian Communities

Alternative B would expand the reservoir and a portion of the existing habitat would be inundated by water. The loss of habitat at the south end of the new spillway would be a minimal impact since the area is small and the mammals using the area are terrestrial and mobile. Although this small portion of habitat would be lost, the benefits of the new structure and its distribution of water would enhance the mammalian habitat below the new spillway over time by increasing the number of wet areas and adding slightly more wetland type vegetation.

Large vertebrates such as mule deer use the spillway area as a place to hide and feed. Some mule deer are resident below the existing spillway and others are migrant. Any effects on the ability of mule deer to access the spillway area from the proposed operation are unlikely. Mule deer are mobile and there are no current barriers and would be no future barriers to habitat access.

Large fur-bearing mammals occurring in spillway area such as coyotes, red fox, badger, and striped skunk should not be affected by the proposed action except by avoiding the area during construction times. Raccoons, muskrats, long-tailed weasels, and mink will be displaced when the water flow is altered but should benefit with the operation of the new spillway and their food sources should increase. Small mammals common to the spillway area such as black-tailed jackrabbits, montane voles, and deer mice should not be affected by the project. According to USFWS survey records, pygmy rabbit (*Brachylagus idahoensis*) have never been detected in the spillway area (Bouffard 2009).

Amphibian and Reptile Communities

Alternative B would expand the reservoir and a portion of the existing habitat would be inundated by water. The loss of habitat at the south end of the new spillway would be a

minimal impact since the area is small and the amphibians and reptiles using the area are terrestrial and mobile. Although this portion of habitat would be lost, the benefits of the new structure and proposed spillway flows would enhance the amphibian and reptile habitat below the new spillway over time.

Prime and Unique Farmlands

There are no prime and unique agricultural lands within the boundaries of the proposed action area. The only effects Alternative B may have on farmlands would be the displacement of any wintering waterfowl using the reservoir. These waterfowl species, primarily geese and mallard ducks may "loaf" on adjacent farm fields during the winter when the reservoir remains at full capacity. There are so few waterfowl using the reservoir during the winter that there is a very small chance of any farmland impacts from waterfowl.

Construction Impacts

There are five staging and soil waste areas that would be constructed below the dam (Appendix B – Figure 2–8). However, all of these areas are located in dry rocky or upland areas interspersed throughout the wetlands. No wetland areas would be affected.

Avian Communities

Song Birds: Migrant song birds peak in the spring and fall, and nesting species are present all summer. Since they are terrestrial there would be little impact on these species during construction phase.

Shore Birds: There would be minor effects to shore birds as a group during construction.

Common Loon: There are approximately 100 to 200 loons in the area during spring and fall migrations, mostly in the reservoir, but also below the dam. They use deeper water for foraging. There would be little impact to them during construction.

Eared Grebe: There are approximately 5,000 to 10,000 eared grebes using the reservoir during spring and fall migration. They primarily forage in deep water within the reservoir. There would be little impact on them during construction.

Western and Clark's Grebes: Several hundred to a few thousand pairs of Western and Clark's grebes nest on the reservoir and are present spring though summer. There would be little impact to them during construction.

American White Pelican: Approximately 1,400 to 1,700 pelican nests have been recorded on islands throughout the reservoir and there are likely many nonbreeders also present. They forage in shallow water and most will migrate out of the area by October

and only a few individuals will remain over the winter. The few that forage in the spillway area may be displaced during construction.

Double-crested Cormorant: Cormorants nest on two islands located on the south side of the reservoir. The birds forage mostly on the reservoir and downstream in the Snake River. Since they forage in deeper water, they should not be affected by construction.

Great Blue Heron: Approximately 20 to 40 herons nest in cottonwoods on the south side of the reservoir. The birds forage in shallow water along the reservoir edge, the edge of river below dam, and in the spillway area. Some of the foraging herons may be displaced from the new spillway during construction, but alternate feeding areas should be available, resulting in little impact to this species.

Black-crowned Night-heron; Snowy Egret, Cattle Egret: These birds nest in small numbers (10-50 nests per colony) on small islands on the south side of the reservoir. The birds forage in shallow water below the dam, below the existing spillway, and down river. Post nesting, many birds would roost in shrub willows in the spillway area near Bishop's Hole. Many of these birds may be displaced during construction, but alternate foraging and roosting sites should be available.

California Gull: Gulls nest on small islands along south shore of reservoir and most leave the refuge after breeding. The gulls forage in a wide variety of habitats, mostly off reservoir. Gulls should not be affected by construction.

Ring-billed Gull: Several thousand ring-billed gulls are present during spring and fall migration but do not breed on the reservoir. The birds would forage in a wide variety of habitats, mostly off reservoir and should not be affected by construction.

Franklin's Gull: Franklin’s gulls nest on higher elevation marshes elsewhere in Idaho, but 5,000 to 10,000+ are present during the spring and fall. The gulls roost on the reservoir and forage in a wide variety of habitats located mostly off reservoir. Bishop's Hole below the dam is an important feeding area, especially during fall. The birds forage on emerging caddisflies that emerge from late July through September in the river below the dam. There would be little impact to them during construction.

Sabine's Gull: Sabine’s gull are present in small numbers from late August through mid-September and nest in the Arctic Region of North America. This is a highly sought after bird by Idaho birders and Bishop's Hole is the most reliable location to find this bird in Idaho. It feeds on the caddisfly hatch below the dam powerplant and roosts on the reservoir at night. Therefore, there would be no effects from construction or operation as long as flow through the dam does not impede the caddisfly population. There would be no other effects from construction.

Tundra Swan: As many as 500+ tundra swans are present during spring and fall migration. They use the shallow water for foraging and exposed mudflats and rocks for roosting. They are seldom present below the existing spillway spillway or on the river within 1 mile below dam. The swans forage mostly on submergent vegetation, invertebrates and sago pondweed tubers. Having a full pool in fall may positively affect roosting area in the reservoir as well as the sago tuber supply. The exposed mud flats near Tule Island are an important fall and winter use area. Some swans remain in this area as long as there is open water. There would be little impact to them during construction.

Trumpeter Swan: The trumpeter swan follows similar seasonal patterns as the tundra swan, but is uncommon and has not been detected on the reservoir every year. They also have similar foraging patterns as tundra swans. Minidoka Refuge is identified as a future release site for establishing nesting trumpeters on the mid Snake River. There would be little impact to them during construction.

Bald Eagle: One pair of bald eagles nests in a cottonwood tree on Bird Island. The proposed operation would allow higher winter water levels, which would favor increased beaver population. The nesting pair forages over the entire proposed action area, but there should be ample undisturbed foraging habitat during construction. During winter, up to 20 bald eagles can use the reservoir and existing spillway area and forage on waterfowl concentrations. As the reservoir freezes the waterfowl and eagles follow the open water downstream. There would be little impact to them during construction.

Proposed operation may keep open water and therefore waterfowl present in the proposed action area longer over the winter, therefore keeping bald eagles longer on the proposed action area during the winter. Construction during the winter would disturb eagles from the new spillway downstream, but they should suffer no ill effects.

Osprey: Ospreys are present in small numbers during spring and fall. They forage throughout the reservoir and downstream on the river. They have not been recorded as nesting, but a nest structure has been available for around 20 years, but has never been used. There should be little effect of construction.

Peregrine Falcon: Falcons do not nest on the reservoir, but are present in small numbers spring and fall until freeze up. Most observations were near vicinity of the dam, the existing spillway, and Bishop's Hole. Some disturbance may occur during construction, but alternate foraging sites are available, thus minimal impacts to this species is expected.

Other Raptors: Several species of raptors are common on the reservoir, but are terrestrial and should not be affected by the project. The Northern harrier is the only

species that could be affected, as they frequently nest in emergent vegetation. Northern harriers would not be affected by construction activities.

Sharp-tailed Grouse and Greater Sage-grouse: Both species occur in low numbers within close proximity of the reservoir, sharp-tails are year round residents and sage-grouse are present during the spring through fall. Neither species should be affected by construction.

Mammalian Communities

Under Alternative B, construction activities would have some effects on wildlife communities as described above and the vegetative communities would be altered until the construction was completed and the vegetation could be rehabilitated and replanted.

An increase in noise and human activity would occur in the vicinity of the new spillway and headworks during the construction period. This additional noise and human activity would likely not have significant adverse effects on the wildlife using the spillway area but could cause wildlife displacement during work hours.

Amphibian and Reptile Communities

Amphibians and reptiles occurring in the spillway area such as long-toed salamanders, pacific treefrogs, leopard frogs, western chorus frogs, longnose leopard lizards, side-blotched lizard, racers, gopher snakes, garter snakes, and western rattlesnakes should not be affected by Alternative B but would be displaced for a short period of time during construction activities. Blasting to remove rock in the spillway area is likely to result in temporary adverse impacts to amphibians and reptiles including mortality of those individuals in the immediate area of the blasting activities.

Alternative C – Spillway Replacement

Alternative C would have the same impacts as those described for Alternative B.

3.7.3 Cumulative Impacts

Implementation of the Minidoka North Side RMP (Reclamation 2004a) is expected to result in the protection and enhancement of natural resource values at Lake Walcott. The enhancements include development of additional drain water wetlands with emphasis on high quality habitat; improved enforcement and control of ad hoc camping and ORV use to protect soils and vegetation, elimination of encroachment and trespassing on Reclamation lands and protection of rare and sensitive wildlife species in grazing and fire management plans.

Implementation of IDFG's Fisheries Management Plan 2007 – 2012 calls for stabilizing winter water levels at Lake Walcott to benefit fish habitat, this will also affect wildlife species using the reservoir. Alternatives B and C will accomplish IDFG's management goal at Lake Walcott by eliminating the need for a winter drawdown. Some wildlife species won't be affected by eliminating the drawdown the reservoir and other species will be affected by the loss of "loafing" islands. According to USFWS documentation, there are not many avian species that use the reservoir during the winter but waterfowl that use the exposed islands will be forced to find new places to loaf, most likely American Falls Reservoir.

The IDFG has also recently passed legislation to reduce the number of pelicans in the area. A reduction of pelicans on Lake Walcott and the area immediately below the dam should reduce the competition for food with other avian and mammalian species using the area. The pelican population will be reduced to address depredation on trout farms in the local area.

The USFWS is currently updating their RMP for the Minidoka National Wildlife Refuge. The USFWS RMP will be essentially be the same as the previous document but will include the alternative selected by Reclamation for this project. When an alternative is selected, management goals and objectives considering the perpetuation of wildlife on the refuge will be discussed and the plan will be implemented. Wildlife mitigation in relation to the selected alternative will also be addressed.

3.7.4 Mitigation

Mitigation measures for the following species will be addressed for this project:

Western and Clark's Grebes: Effects of the new operation on emergent vegetation should be monitored according to published or approved scientific research protocol to determine impacts to these species. If it is determined that the species is being impacted, appropriate mitigation measures will be considered.

Great Blue Heron: The proposed operation would allow higher winter water levels, which would favor increased beaver population. Since beavers like to eat cottonwood bark, the grove of cottonwoods that supports the great blue heron colony will be protected with wire to prevent girdling by beavers after construction.

Franklin's Gull: There should be no effect on the birds from construction or operation if new flow through the dam does not affect the caddisfly population. The caddis hatch may need to be monitored according to published or approved scientific research protocol to determine affects to the gull's food source. Once it is determined that the species is being impacted, appropriate mitigation measures will be considered.

Trumpeter Swan: There should be no effect on the trumpeter swan from construction or proposed operations. The emergent vegetation may need to be monitored according to published or approved scientific research protocol to determine if the proposed operations will affect trumpeter swans. If it is determined that the species is being impacted, appropriate mitigation measures will be considered.

Bald Eagle: The proposed operation would allow higher winter water levels, which would favor increased beaver population. Beavers like to eat cottonwood bark, and since there is only one tall tree suitable for nesting on one of the islands on the reservoir, it will be protected from beavers with wire.

Mammalian Communities

Recent attempts to increase the number of cottonwoods by planting cuttings failed, primarily because of beaver predation on the cuttings before they could root. Existing trees will be protected with wire as discussed above.

Wetlands

Aerial photos taken by Reclamation in August 2009 of the spillway wetlands during a 500 cfs release indicates the extent of the wetlands would not significantly change when compared to the No Action alternative. However, the velocity of water flowing through this wetland would be reduced. As it is uncertain what effects velocity reduction may have on wetland function, monitoring will be conducted to determine any effects that would occur.

Additionally, the extent of aquatic macrophytes and species composition of those stands along the littoral zone of the reservoir (which serves critical habitat functions for both fish as well as wildlife species) will be monitored.

3.8 Threatened and Endangered Species

The area of impact is located within parts of four counties (Cassia, Minidoka, Blaine, and Power), but occupies only a small portion of each county. This area also includes a limited number of vegetative communities and cover types, compared to the wide variety of these present in the four counties. Topographic variation within the area of impact is also limited compared to that of these four counties. The USFWS web site for Idaho (USFWS 2009) lists all the listed, proposed, and candidate species for each of the counties. Species that are known or expected to occur in the area of impact or that occur near the area of impact are the Utah valvata, Snake River physa, bald eagle, and Yellow-billed cuckoo. Expected presence in the area of impact is based on habitat suitability, occurrence of similar habitats, and available literature.

3.8.1 Affected Environment

Aquatic Mollusks

Five species of aquatic mollusks in the middle Snake River were listed as endangered or threatened in 1992 (57 FR 59244). The Banbury Springs lanx (*Lanx sp.*), the Idaho springsnail (*Pyrgulopsis idahoensis*), the Snake River physa (*Physa natricina*), and the Utah valvata (*Valvata utahensis*) were listed as endangered. The Bliss Rapids snail (*Taylorconcha serpenticola*) was listed as threatened. The Federal Register notice provided summary information for the species. All five species are endemic to the Snake River and/or some springs and tributaries, and all are thought to be generally intolerant of pollution. These species were listed due to declining distribution within the Snake River, adverse habitat modification and deteriorating water quality from hydroelectric development, peak-loading effects from water and power operations, water withdrawal and storage, water pollution, and inadequate government regulatory mechanisms.

The USFWS (1995) recovery plan for these species includes short- and long-term multi-agency objectives to restore viable, self-reproducing colonies of the listed snails. Downlisting or delisting will depend on the detection of increasing, self-reproducing colonies at monitoring sites within each species' recovery area for at least a 5-year period. The recovery area for these species extends from American Falls Dam (RM 709) downstream to C.J. Strike Reservoir (RM 518) (USFWS 1995). Two of the five listed species are known to occur within the area of impact. Utah valvata and Snake River physa. This EIS focuses on these two species.

Utah Valvata

Utah valvata are usually found in lower velocity habitats of free-flowing river or spring habitat, or in reservoirs (USFWS 1995; Weigel 2002, 2003; Newman 2007, 2008). They are typically associated with fine sediments (less than 0.25 mm diameter) or gravels mixed with interspersed fines and can tolerate a wide range of dissolved oxygen concentrations (Newman 2007, 2008). The species is absent from boulder and bedrock substrates (Weigel 2003). Although laboratory sediment selection experiments found a preference for pebble-size substrates (Lysne 2003), the species is very strongly associated with fines (Newman 2007; Weigel 2002). Laboratory temperature tolerance experiments found that temperatures above 30°C were lethal, and temperatures below 7°C caused the snails to become inactive (Lysne 2003). Significant mortality occurs when the snails are dried; however, they appear to tolerate dewatering if conditions are damp (Lysne 2003).

Utah valvata occur throughout the entire area of impact, with highest densities found in Lake Walcott. Lake Walcott has a uniform bottom, dominated by fine substrates (Newman 2007; Weigel 2002) providing vast expanses of suitable habitat for Utah valvata.

Utah valvata are found throughout Lake Walcott, with densities as high as 2,004 live Utah valvata per square meter being encountered (Weigel 2003). Although Utah valvata are found throughout Lake Walcott, there is considerable variability in their densities. Utah valvata exist in colonies, located in substrates dominated by fines. Colony locations and size are driven by the amount of fine substrate available, water depth and water stability. Where water levels fluctuate, Utah valvata are unable to colonize as readily and are therefore found in lower densities as compared to permanently watered areas. In addition, research conducted by Reclamation (Weigel 2002, 2003; Newman 2007, 2008) indicate Utah valvata persist in higher densities in depths ranging from 2 to 8 meters.

Reservoir operations at Lake Walcott are consistent and driven by structural limitations at the existing Minidoka Dam spillway (USBR 2004). The reservoir is drawn down 5 feet annually during the winter and refilled to full pool (elevation 4245 feet) in April. Reclamation maintains a full pool during the spring and summer to provide irrigation water into the canals on each side of the dam. The annual, consistent drawdown of Lake Walcott results in relatively stable year-to-year habitat availability. In the 0- to 2-meter water depth zone, live Utah valvata densities range from 0 to 7 snails per 0.25 square miles ($m^{2)}$, with most snails being found at depths below the annual 5-foot drawdown (i.e., greater than 5 feet) (Weigel 2002). For example, in October 2001 at the Lower Lake Walcott survey site, Utah valvata densities were 0 snails per 0.25 m^2 in the 0- to 2-meter sampling stratum and 107 snails per 0.25 m^2 in the 2- to 8-meter sampling stratum (Weigel 2002). This relationship between depth and Utah valvata density is consistent throughout the reservoir and from year-to-year, as found in annual Reclamation Utah valvata monitoring reports

Stranding of live Utah valvata in Lake Walcott is approximately 1 percent of the individuals detected during Reclamation monitoring collections (Weigel 2003). This low rate of stranding indicates that Utah valvata are unable to effectively colonize this fluctuation zone due to the annual 5-foot drawdown following each irrigation season. Individuals that do occupy this zone are desiccated (dried up) each year following irrigation season, preventing further colonization by the species. In the USFWS 2005 BiOp for Reclamation's operations above Brownlee Reservoir, Reclamation received an incidental take statement for the Utah valvata occupying the drawdown zone at Lake Walcott. The BiOp expires in 2035.

The exact volume of water flowing though the spillway portion of Minidoka Dam, via structural leakage and subsurface seepage, is difficult to determine. A USGS gaging station is located in the Snake River below the spillway outlet to the river. By subtracting power plant flows from flows recorded at the gaging station, one can determine an estimate of flows through the spillway. Estimated flows have ranged from 8 cfs to 55 cfs. The exact number is hard to determine for a number of reasons. Standard error associated with the respective gaging devices (i.e., Reclamation powerplant and USGS gaging station) and icing during the winter months results in small variability in the recorded values. In addition, subsurface seepage into the spillway and seepage back into the basalt at the lower end of the spillway

further complicate Reclamation's ability to estimate non-irrigation season flows through the spillway.

During the irrigation season, Minidoka Dam passes up to approximately 10,000 cfs for downstream users. Any water that does not go through the powerplant is released over the dam's existing spillway. Currently, an average of 1,300 to 1,900 cfs is released over the existing spillway during the irrigation season, which extends from April through September. Water is released along the existing spillway structure in several ways. About 250 cfs leaks through the base of the existing stoplogs along the entire existing spillway length. In addition, existing stoplogs are pulled out of certain bays to release water into established channels. In the middle of the existing spillway, three existing radial gates provide the greatest control of water releases. Summer water releases over the existing spillway occur as mitigation for the construction of the Inman Powerplant at Minidoka Dam in 1991 and 1992. The *Biological Assessment for Bureau of Reclamation operations and maintenance in the Snake River basin above Brownlee Reservoir* (Reclamation 2004c) describes these releases.

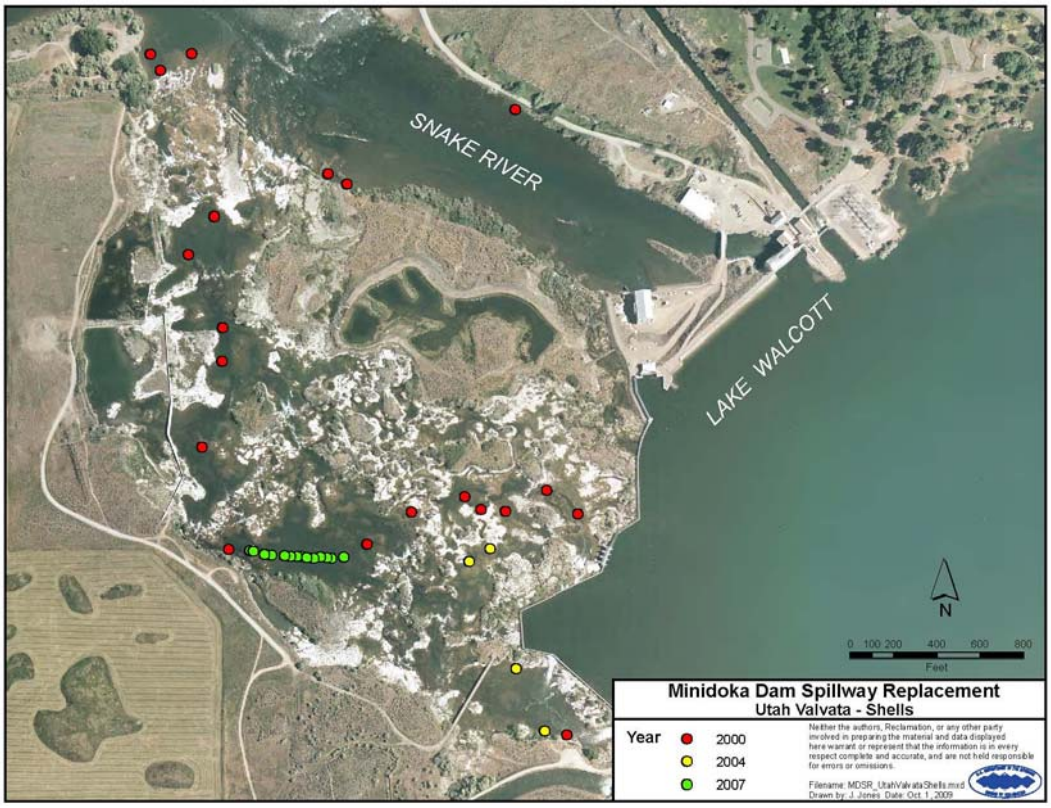
In the winter, the existing radial gates are the only path for water releases from the existing spillway because the reservoir is drawn down 5 feet to an elevation below the base of the existing stoplogs. Water passed through the powerplants does not reach the downstream spillway area. During most winters, no water is spilled through the existing radial gates, and the existing spillway dries up with the exception of a few small pools. However, during high-water years the powerplants alone sometimes cannot accommodate all of the flow and water must be released through the existing radial gates. Due to the morphology of the existing spillway, portions of the spillway remain dry when only the existing radial gates are used.

Few snail samples have been collected in the existing spillway below Minidoka Dam. In June 2000, Reclamation conducted random sampling in the existing spillway (Weigel 2000). Fifty samples were collected with live Utah valvata being found at 2 locations and empty shells being found at 20 locations. Random surveys were again conducted in the existing spillway in July 2004. Twenty-one samples were collected with Utah valvata shells being found at 4 locations. No live Utah valvata were found in 2004 (Newman 2004). It is likely that Utah valvata disperse into the spillway area below Minidoka Dam during the irrigation season.

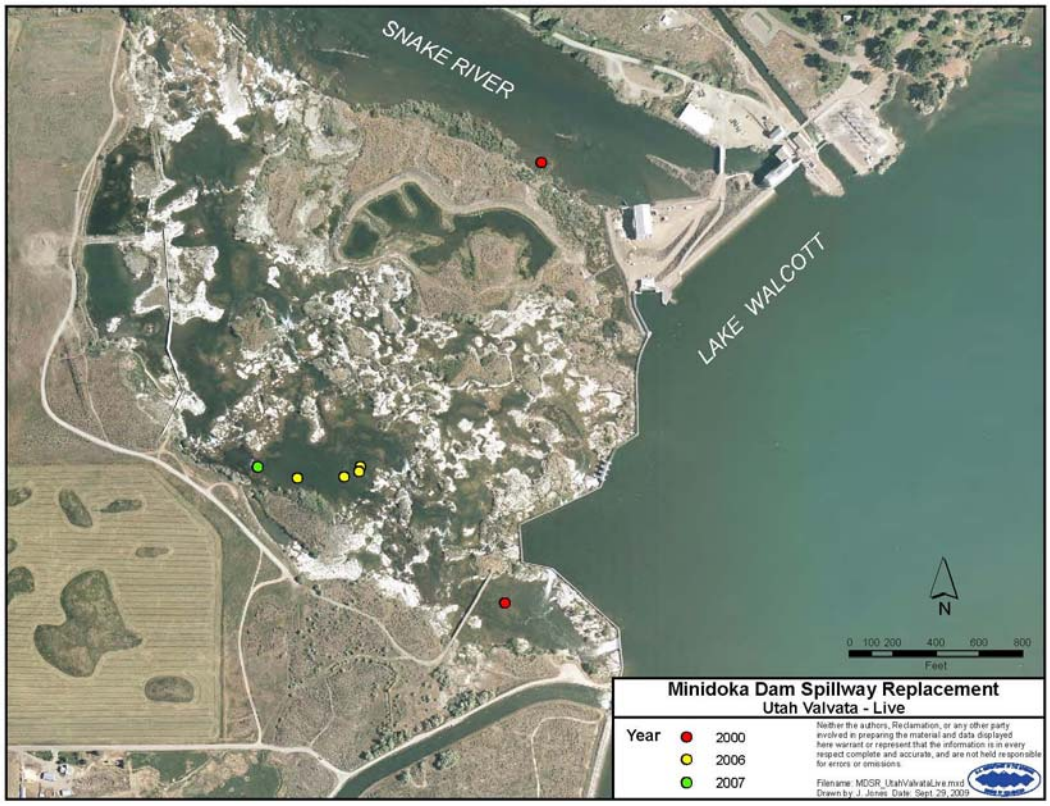
Although Utah valvata have been found in two different pools located below the Minidoka Dam in the existing spillway, their densities are very low and despite repeated efforts, collections are very inconsistent. It should be noted, the one live Utah valvata collected in 2000 in the upper pool on the south side of the spillway was collected on boulder substrate. It is likely this individual represents the collection of a snail dispersing downstream as opposed to a resident of the pool from which it was collected. Suitable habitat is very limited in the area of impact below Minidoka Dam, with fines consistently being found in only one pool in the existing spillway. Annual reservoir operations prevent the collection of fine

substrates in much of the existing spillway and Snake River immediately below the dam and spillway outflow. High river and spillway flows during irrigation season do not allow fines to settle in the area of impact. Further, annual dewatering of the existing spillway outside of irrigation season further reduces available suitable habitat for Utah valvata in the existing spillway. Subsurface seepage through the porous basalt substrate and leakage associated with the existing spillway provide water to pools on the south side of the existing spillway throughout the entire year; including the pool where many Utah valvata shells were encountered in 2007 (Photograph 3-18). This permanently watered pool was surveyed in 2006 and 2008 as part of Reclamations survey effort for Snake River physa. Live Utah valvata were found in this pool each year (Photograph 3-19).

Utah valvata have been encountered in the 7.5-mile reach of river below Minidoka Dam, downstream to Milner Pool; however, that is outside of the area of impact. The current status of Utah valvata in this reach will not be discussed. Construction activities and post-construction operations at Minidoka Dam and the new spillway will result in no changes to the river below the spillway outlet. In addition, no impacts or alterations are anticipated below this point as a result of construction activities.



Photograph 3-18. Location of Utah valvata shells in the existing spillway in 2000, 2004, and 2007.



Photograph 3-19. Locations of live Utah valvata in the existing spillway.

Snake River Physa

Prior to 2006, live verified specimens of the Snake River physa (*Physa natricina*) had not been collected during invertebrate surveys conducted on the Snake River for over 10 years; however, there were 2 unverified suspected sightings near Bliss, Idaho (Stephensen and Cazier 1999). In 2004, Keebaugh (2004) at the Orma J. Smith Museum of Natural History discovered 4 Snake River physa (alive when sampled) and 12 empty Snake River physa shells. The Orma J. Smith Museum of Natural History, located at the College of Idaho (formerly Albertsons College) in Caldwell, Idaho, is the Federal depository for Federal Snake River snail collections. Reclamation consultants collected the potential Snake River physa specimens during samplings in 1996 below Minidoka Dam. The specimens were verified as Snake River physa by the late Dr. Terrance Frest, a nationally recognized expert in the identification of snails from the family Physidae.

Very little is known about the general life history of Snake River physa. Life span is likely 2 years (USFWS 1994). Taylor (1982) reported finding live snails on boulders in the deepest accessible portion of the Snake River near rapid margins. Additionally, Pentec Environmental (1991) reported finding several snails on substrate ranging from 0.7 to 5

centimeters (m) in diameter at several locations 30 meters (m) offshore during low-water periods (46 and 52 centimers per second, dissolved oxygen 7.7 to 8 mg/L) (Pentec Environmental 1991). Snake River physa is thought to require clean, cold, well-oxygenated, swift water with low turbidity (USFWS 1995) but the specific environmental conditions necessary for Snake River physa reproduction and recruitment are unknown. Known distribution of Snake River physa is based on several empty shell and live specimen collections. Prior to 2006, less than fifty specimens of Snake River physa had ever been collected thus, population densities throughout much of the suspected range are not available. Historically, Snake River physa is thought to have existed on the Snake River in Idaho from Grandview (RM 486.5) upstream through the Hagerman Reach (RM 569.5) (USFWS 1995). Only three colonies are believed to remain including the colony located immediately downstream of Minidoka Dam (RM 675).

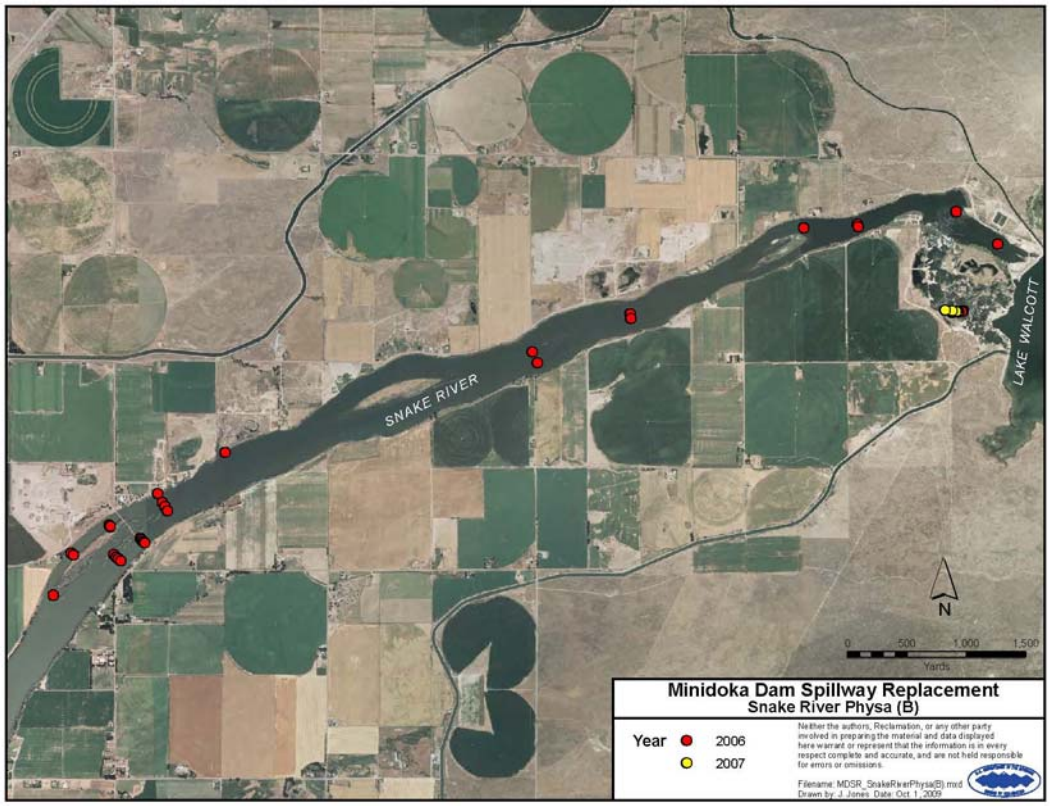
In 2005, Reclamation finalized Section 7 ESA consultation with USFWS for future Reclamation operations on 12 Federal projects located in the Snake River basin above Brownlee Reservoir (see Reclamation 2004b, 2005; USFWS 2005). One of Reclamation's proposed actions was to conduct 3 years (during a 5-year period) of Snake River physa surveys from below Minidoka Dam downstream to above Milner Pool. Data collection for the study began in 2006 and was completed in 2008.

Three-hundred and sixty-five samples were collected in 2006 by Reclamation and Montana State University research personnel. Live Snake River physa were found in 8 percent of the samples and shells were found in 28 percent of the samples. Samples from the existing spillway contained the most live Snake River physa specimens in any one sample (15 specimens). The remainder of the samples containing live Snake River physa had 8 or fewer specimens (with the exception of two samples). Snake River physa were found at an average depth 1.62 m (0.3-2.28 m range) on a range of substrate composition including mostly small gravel, medium gravel, and sand. Live Snake River physa were always found with Chironomids, *Ferrissia rivularis*, and *Helobdella stagnalis*.

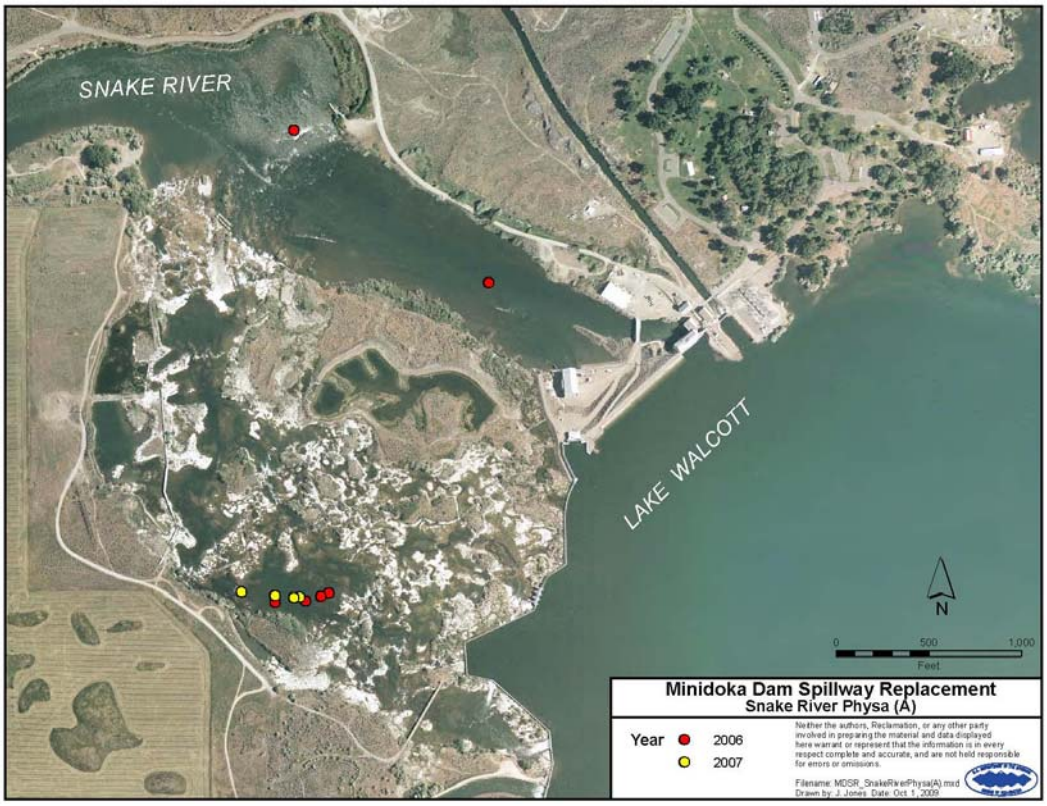
Live Snake River physa were generally found in the center of the river channel (thalweg) or along island margins below Minidoka Dam in 2006 (Photograph 3-20). This is consistent with Taylor's (1982) habitat descriptions; however, Snake River physa were found mostly on small to medium gravel substrate, not on boulders as suggested by previous researchers. Few boulders exist in the Snake River below Minidoka Dam where the Snake River physa were found, thus this habitat may not be a requirement for Snake River physa.

The existing spillway was sampled again in October 2007 by Montana State University and Reclamation personnel, but only within the permanently watered areas, including the pool where live Snake River physa were found in 2006. Live Snake River physa were again encountered in the existing spillway portion of Minidoka Dam in 2007, primarily on bedrock substrate (Photograph 3-21).

Snake River physa are not known to occur in the Snake River above Minidoka Dam. Reclamation (Weigel 2002) conducted extensive surveys for Snake River physa in the Snake River above Minidoka Dam near Massacre Rocks State Parks in 2002. Although snails from the family Physidae were encountered, no Snake River physa were found. It should be noted that all snails from the family Physidae were sent to a nationally recognized expert for final identification verification.



Photograph 3-20. Aerial photo showing of the location of Snake River physa in 2006 and 2007 from the river channel below the existing spillway.



Photograph 3-21. Aerial photo showing the locations of live Snake River physa when captured in existing spillway for 2006 and 2007.

Avian Species

Bald Eagle

The bald eagle (*Haliaeetus leucocephalus*) was removed from the Federal list of threatened and endangered species in June, 2007. Section 4(g)(1) of the ESA requires the USFWS, in cooperation with the States, to implement a monitoring plan for not less than 5 years for all species that have been recovered and delisted. USFWS is currently recommending monitoring bald eagles for 20 years. The Post-delisting Monitoring Plan (Plan) monitors the status of the bald eagle over a 20-year period with sampling events held once every 5 years. The Plan primarily is a continuation of State monitoring activities conducted by the States over the past 20 years. Historically, the States have attempted to census the bald eagle population by annually checking known occupied nests and by adding others found incidentally.

Throughout the Pacific bald eagle recovery area and in the area of impact, bald eagle numbers remain stable or are increasing. Productivity in Idaho during 2003 was reported as

1.12 young per occupied nest, which is above the recovery criteria established for the Pacific Recovery Region of 1.0 young per occupied nest (USFWS 1986).

Bald eagles are closely associated with lakes and large rivers in open areas, forests, and mountains. They nest near open water in late-successional forest with many perches or nest sites, and low levels of human disturbance (McGarigal 1988; Wright and Escano 1986). The nest site is usually within ¼- to 1 mile of open water with less than 5 percent of the shore developed within 1 mile. Perches are generally at the edge of forest stands, near foraging areas, or near the nest tree and have panoramic views of surrounding areas. They need large trees along rivers with good visibility, preferably snags, for perching. Critical winter habitat is located near food sources, such as lakes and rivers.

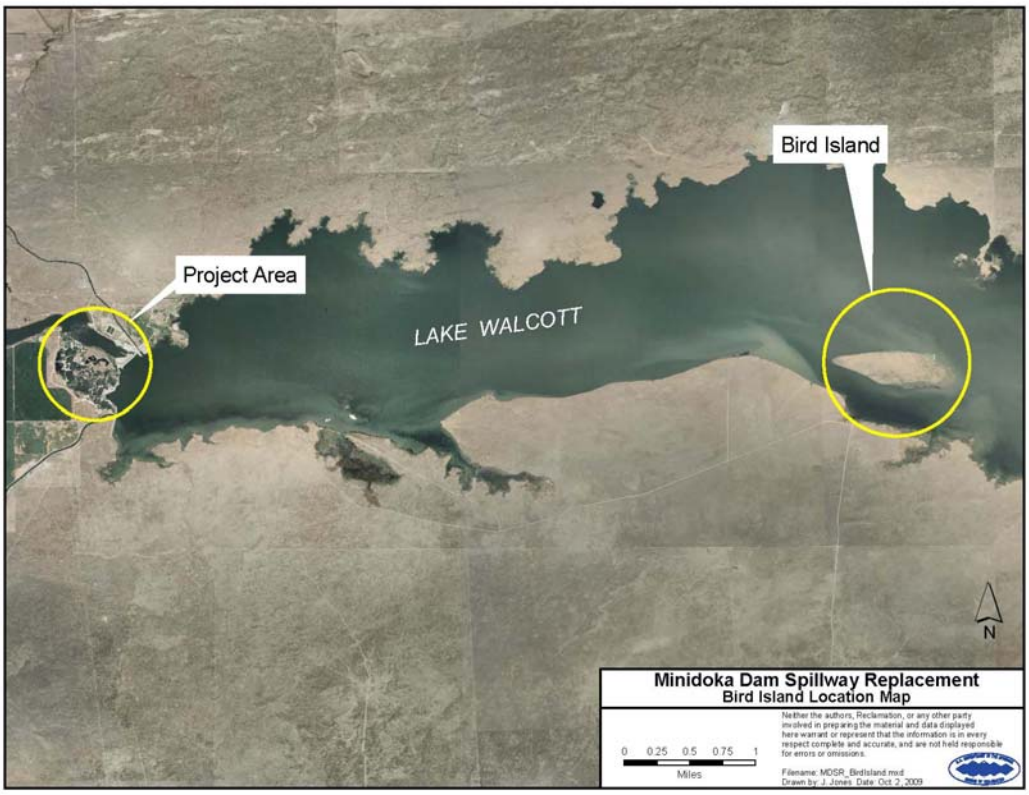
In Idaho, more than 60 routes are annually surveyed during the National Mid-winter Bald Eagle Count (Steenhof et al. 2004), including more than 10 routes and 25 surveys on the Snake River above Milner Dam. Bald eagles use the Snake River in this area extensively in the winter and are primarily associated with black or narrowleaf cottonwood galleries between Palisades Dam and American Falls Reservoir, although small numbers of Bald Eagles are annually observed in isolated cottonwood trees located along the Snake River from Lake Walcott downstream to Milner Dam. Data collected from 1986 to 2000 in this area indicate a generally increasing trend for wintering bald eagles, although declining numbers have been recorded at 7 of 13 routes (Steenhof et al. 2004).

The Snake River below the Henry's Fork confluence downstream to Milner Dam supports a substantial number of wintering eagles; an average of about 80 eagles has been documented there during mid-winter counts from 1986 to 2000 (Steenhof et al. 2004). A mature cottonwood forest above American Falls Reservoir provides day and night roosting opportunities. Cottonwood habitat is limited below American Falls Dam. In 2003, 10 recently occupied breeding territories from Twin Falls upstream to the Henry's Fork confluence produced young, including a new territory on Bird Island in Lake Walcott.

With the exception of the one bald eagle nest on Bird Island, in Lake Walcott (Photograph 3-22), most bald eagle activity in the area of impact consists of migrating and foraging eagles. There are typically 10 to 20 bald eagles along Lake Walcott during the winter until the water freezes. When the reservoir freezes, the eagles located at the west end of the reservoir move below Minidoka Dam to forage on fish and waterfowl. The remaining eagles travel to other foraging locations.

During over-winter, non-irrigation season months when river levels are at their annual minimums, bald eagles will use Lake Walcott and the Snake River below Minidoka Dam for foraging purposes. Low water levels associated with non-irrigation season operations increases the susceptibility of fish to bald eagle predation below Minidoka Dam. In addition, the high concentration of waterfowl on Lake Walcott and the Snake River below Minidoka Dam during the non-irrigation season when shoreline bar habitat is exposed presents further

foraging opportunities for bald eagles. Reclamation operations in the area of impact present adequate foraging opportunities to support migrating and wintering bald eagles.



Photograph 3-22. Aerial photo of Lake Walcott and location of Bird Island relative to the proposed action area.

Yellow-billed Cuckoo

A petition to list the Yellow-billed Cuckoo (*Coccyzus americanus*) was filed in 1998. The petitioners stated that "habitat loss, overgrazing, tamarisk invasion of riparian areas, river management, logging, and pesticides have caused declines in yellow-billed cuckoo." In the 90-day finding published on February 17, 2000, USFWS indicated that these factors may have caused loss, degradation, and fragmentation of riparian habitat in the western United States, and that loss of wintering habitat may be adversely affecting the cuckoo. The Yellow-billed cuckoo has status as a Candidate species for protection under ESA. In July 2001, USFWS announced a 12-month finding for a petition to list the Yellow-billed cuckoo as threatened or endangered in the western United States. As of April, 2009, this species continues to have Candidate status.

This bird is a neotropical species that breeds in North America and winters primarily south of the U.S.-Mexico border. Cuckoos may go unnoticed because they are slow moving and prefer

dense vegetation. In the West, they favor areas with a dense understory of willow (*salix spp*.) combined with mature cottonwoods (*Populus spp*.) and generally within 100 meters of slow or standing water (Gaines 1974; Gaines 1977; Gaines and Laymon 1984). It feeds on insects, mostly caterpillars, but also beetles, fall webworms, cicadas and fruit (primarily berries). Populations seem to fluctuate dramatically in response to fluctuations in caterpillar abundance. These fluctuations are erratic, but not necessarily cyclic (Kingery 1981).

Most Idaho records are of isolated, non-breeding individuals (USFWS 1985). Although occasional reports of this bird are noted, including several birds at Lawyers Creek in Lewis County in 1979 and six at Cartier Slough Wildlife Management Area on the Henry's Fork of the Snake River, in 1980, no nesting attempts or young have been observed. Breeding populations of Yellow-billed cuckoos in Idaho are believed to be extirpated (Reese and Melquist 1985). Suitable habitat may exist in the more dense riparian stands along Lake Walcott and in the existing spillway below Minidoka Dam.

3.8.2 Environmental Consequences

This section describes, assesses, and discusses the environmental consequences of the range of alternatives on threatened, endangered and candidate species located within the area of impact. This analysis is broken down by alternative, species, and impact type (i.e., construction, reservoir operations and spillway operations). Reclamation is conducting a formal consultation with the USFWS under Section 7 of the ESA. The consultation is being conducted concurrently with the NEPA process.

This analysis of potential impacts resulting from the three proposed alternatives will focus on the Snake River corridor and extend from below the Minidoka Dam spillway (RM 673.8) upstream to the upper most extent of Lake Walcott, at full pool capacity (RM 708.25). It is not anticipated that any of the proposed alternatives will impact ESA-listed species outside of the area of impact.

Alternative A – No Action

Utah valvata

Reservoir Operations Impacts

In the absence of a replacement spillway structure for Minidoka Dam, the reservoir will continue under its current operations. Lake Walcott water surface elevation will continue to be drafted 5 feet annually, to prevent ice damage to the existing structure. The portion of the reservoir within the 5-foot drawdown zone will continue to be exposed and dried annually. This annual drawdown will continue to prevent colonization of Utah valvata into suitable

habitat located within the draw-down zone. It is not anticipated that Utah valvata distribution, abundance, or colony viability would change under the No Action alternative.

Spillway Operations Impacts

Suitable Utah valvata habitat consistently exists within one pool in the spillway area below Minidoka Dam. Although Utah valvata have been encountered in other portions of the existing spillway, they are only known to consistently occupy one pool. Under the No Action alternative, no changes will result to Utah valvata located within the existing spillway. Annual water releases associated with irrigation and structural leakage will continue to provide year-round flow to the pool occupied by Utah valvata. Reclamation's current annual operations would continue, resulting in year-round flows through the snail pool.

Construction Impacts

It is likely that construction activities will occur periodically for maintenance, repair, or replacement of the deteriorating piers. Replacement work will be conducted outside of irrigation season. Pier replacement and spillway maintenance activities will be conducted above the water line and will likely be consistent with past spillway maintenance activities (i.e., pier replacement). In 2004, following irrigation season, Reclamation replaced one pier along the existing spillway portion of Minidoka Dam, due to excessive external deterioration, and to assess the degree of concrete degradation within the pier. The extraction and subsequent replacement of the pier was a minor, localized project that resulted in no impacts to Lake Walcott or the greater spillway area. However, depending on the location of the piers requiring replacement, some minor filling of depression in the basalt bench or construction of temporary bridges to cross channels may be required to facilitate equipment access to the respective piers. This activity would be conducted below the existing spillway, outside of irrigation season, on the dry basalt bench located immediately below the existing spillway. It is not anticipated this activity would have any impacts on Utah valvata. Further, consistent with current Reclamation requirements, construction BMPs would be implemented so as to ensure resource protection.

Snake River Physa

Reservoir Operations Impacts

Snake River physa are not known to occur above Minidoka Dam; therefore, current reservoir operations have no impacts to Snake River physa.

Spillway Operations Impacts

Snake River physa exist within the spillway area below Minidoka Dam. Snake River physa have been encountered in one pool on the south side of the existing spillway. Snake River

physa and Utah valvata are found within the same pool in the existing spillway. Current operations, structural leakage, and subsurface flows through fractured basalt prevent this pool from drying. Under the No Action alternative, this pool will continue to be watered year round. No adverse impacts or changes to this pool are anticipated in the absence of the project.

Construction Impacts

It is likely that construction activities will occur periodically for maintenance, repair, or replacement of the deteriorating piers. See "Construction Impacts" section above under Utah valvata for a detailed description of potential construction impacts associated with ongoing existing spillway maintenance requirements.

Bald Eagle

Reservoir Operations Impacts

Under the No Action alternative, bald eagle activity on Lake Walcott will continue consistent with current bald eagle activity. No impacts to bald eagles are anticipated under the No Action alternative. Reclamations annual operations will continue into the future consistent with past operations. It is anticipated bald eagle use of Lake Walcott for foraging activities would continue. In addition, bald eagles will continue to annually nest on Bird Island. Bald eagle nesting on Bird Island is dependent on the presence of large cottonwood trees. The water surface elevation of Lake Walcott supports the cottonwood trees due to its close proximity to the trees, thereby providing ample water for growth. Under Reclamation's current operations, this will continue to exist into the future.

Spillway Operations Impacts

Current bald eagle activity will continue into the future, in the absence of the proposed project. Bald eagles currently use the downstream portion of the existing spillway area below Minidoka Dam for foraging. Foraging use by bald eagles in this area increases during the winter months when Lake Walcott is covered with ice. Reclamation's current operations preclude ice formation on the Snake River below the Minidoka Dam. This open-water habitat provides resting areas for various avian species including waterfowl. Wintering bald eagles use waterfowl and fish below Minidoka Dam for forage when Lake Walcott is ice-covered.

Bald eagles use the spillway area below Minidoka Dam during irrigation season for foraging purposes but in lower numbers. When Lake Walcott is not covered by ice, bald eagles will travel up and down the river corridor and into the adjacent uplands for foraging purposes. No perching habitat exists within or adjacent to the existing spillway. Perching habitat is located on private property within a 1-mile radius of the spillway area. Although bald eagles

forage within the area of impact below the existing spillway, they perch elsewhere. In the absence of the proposed project these conditions will continue to exist.

Construction Impacts

It is likely that construction activities will occur periodically for maintenance, repair, or replacement of the deteriorating piers. See "Construction Impacts" section above under Utah valvata for a detailed description of potential construction impacts associated with ongoing spillway maintenance requirements.

Yellow-billed Cuckoo

Reservoir Operations Impacts

Yellow-billed cuckoos have never been observed in riparian habitat along Lake Walcott. Although small isolated pockets of habitat exist along Lake Walcott, it is not anticipated that yellow-billed cuckoos will occupy the habitat due to its isolated locations and lack of connectivity. Current reservoir operations support the existing habitat and will continue to do so under the No Action alternative.

Spillway Operations Impacts

Yellow-billed cuckoos have never been observed in suitable habitat located in the spillway area below of Minidoka Dam. Although small isolated pockets of habitat exist throughout the spillway area, it is not anticipated that yellow-billed cuckoos will occupy the habitat due to its poor quality (i.e., no cottonwoods, willows, or standing water), isolated location, and lack of connectivity. Current spillway operations support the existing habitat and will continue to do so under the No Action alternative.

Construction Impacts

It is likely that construction activities will occur periodically for maintenance, repair, or replacement of the deteriorating piers. See "Construction Impacts" section above under Utah valvata for a detailed description of potential construction impacts associated with ongoing spillway maintenance requirements.

Alternative B – Spillway and Headworks Replacement

Utah Valvata

Reservoir Operations Impacts

Reclamation's current operation of drafting Lake Walcott would continue with Alternative B. The new spillway would be designed to withstand winter ice loads, however, the annual

drafting of Lake Walcott would still continue due to contractual requirements, standard system operation, annual maintenance and inspection requirements, and operational thresholds established at American Falls Reservoir and Jackson Lake. Although Reclamation would continue to draft Lake Walcott annually, Reclamation would be able to return Lake Walcott to full pool following irrigation season. This flexibility in operations, attributed to the new spillway, would allow Reclamation to return Lake Walcott to its full-pool elevation of 4245 feet by early December, as opposed to current operations which result in an early April refill.

Under Alternative B, Reclamation would return Lake Walcott to full pool approximately 3 ½ months sooner than under the No Action alternative. This annual operation by Reclamation would continue to preclude the establishment of Utah valvata into the fluctuation zone, consistent with current operations and the 2005 BiOp. Utah valvata are dormant during winter months and are extremely difficult to encounter (Newman 2009b). Utah valvata dispersal and subsequent colonization is likely associated with reproduction, which occurs during summer, irrigation season months. However, as stated previously, Utah valvata are unable to effectively disperse into the fluctuation zone at Lake Walcott during a single year. The earlier fill date associated with Alternative B occurs outside of the period of time when Utah valvata are detectible through annual monitoring. Reclamation has been unable to detect live Utah valvata (at any monitoring site, including Lake Walcott) between December and May (Newman 2009b). It is not anticipated that Utah valvata distribution, abundance or colony viability would change under Alternative B.

The installation of the gated spillway into the southeast spillway pool will result in a small (approximately 5.2 acres) habitat change. A small portion of the spillway will become permanently watered reservoir habitat. The area is currently approximately ½ terrestrial basalt and ½ fluvial habitat; over basalt bedrock and boulder substrate. The wetted portion of this area is currently not occupied by Utah valvata. This is likely due to the unsuitable habitat and Reclamations non-irrigation season operations. Under Alternative B, this small area located upstream of the new gated spillway would be operated as the reservoir, consistent with previous reservoir operations discussions. Due to the unsuitable habitat and the unlikely deposition of fines immediately upstream of the radial gates (i.e., annual gate use will flush sediments), it is not anticipated Utah valavata will occupy this newly flooded area. In addition, surveys conducted by Reclamation in 2009 in the reservoir adjacent to this area have yielded no live Utah valvata.

Spillway Operations Impacts

As described earlier in Section 3.8.1 – Affected Environment, the exact volume of water flowing through the spillway portion of Minidoka Dam, via structural leakage and subsurface seepage, is difficult to determine. Regardless, the continued presence of Utah valvata in the south pool in the Minidoka Dam existing spillway area suggests the current flow regime through the existing spillway is adequate to sustain the species at this location. Under

Alternative B, Reclamation is proposing to provide year-round flows through this portion of the new spillway. It is assumed structural leakage would be reduced with the new structure, outside of irrigation season. To mitigate this loss, Reclamation is proposing to provide up to 100 cfs through a fixed point on the structure outside of irrigation season (Appendix B – Figure 3–3). During irrigation season, Reclamation is proposing to provide a minimum of 500 cfs into the entire new spillway to maintain wetland habitat and provide for a sport fishery. However, the average monthly flows through the new spillway during the irrigation season are typically higher. This proposed operation regime would provide adequate flows to sustain existing Utah valvata on a year-round basis.

The 100 cfs non-irrigation season release will take into account subsurface seepage and potential structural leakage. Releases from this point would ensure total, non-irrigation season, spillway flows total 100 cfs. For example, if it is determined 30 cfs are flowing through the new spillway as a result of structural leakage and subsurface seepage, 70 cfs would be released through the outlet structure to maintain approximately 100 cfs into the spillway area. As described above, the precise determination of water into the existing spillway, as a result of seepage, is difficult. Reclamation is proposing to utilize USGS gaging data along with Reclamation's powerplant outflow data to account for spillway flows, recognizing variations may exist within the spillway as a result of subsurface flow dynamics.

The proposed bank of 12 radial gates located upstream of the pool containing Utah valvata does possess the potential to displace sediment or alter depositional zone locations. Utah valvata are strongly associated with fine sediments. Any shifts in sediment movement and associated deposition would result in shifts in Utah valvata locations. Currently, Utah valvata are located within the snail pool in fine substrates located between large boulders and bedrock material. Alterations in flow patterns through this pool may alter sediment deposition and subsequent Utah valvata locations. It is not known exactly what changes in sediment transport and subsequent deposition may occur. However, physical characteristics of the spillway area will likely preserve depositional zones during high-flow events.

The Minidoka Dam spillway area comprises a basalt outcrop characterized by multiple fissures, large cracks, depressions, and large boulders. The high-degree of roughness within the spillway area creates many barriers to flow. This roughness does not allow for complete sediment flushing of the interstitial spaces associated with the substrate. To illustrate this point, during the spring of 1997, approximately 42,000 cfs was released through the Minidoka Dam spillway, in contrast to the annual spring spillway flow of 1,300 cfs. Spillway surveys conducted by Reclamation since 1997 have repeatedly found Utah valvata in the spillway area in fine sediments. It is likely the collected individuals represent a colony of Utah valvata that has existed in the spillway for a long period of time, as opposed to recent migrants. Given the species dependence on silt substrates and the location of the Minidoka Dam spillway relative to large, adjacent, upstream sediment traps (i.e., Lake Walcott and American Falls Reservoir), it is unlikely that sufficient sediment deposited into the spillway

to provide adequate habitat and successive colonization since 1997. It is not anticipated that, under Alternative B, the placement of new radial gate structures into the upper portions of the south channel in the spillway area would flush Utah valvata habitat from the spillway area.

Construction Impacts

Construction activities associated with Alternative B would be conducted in multiple upland areas or above the spillway pool containing Utah valvata. It is not anticipated that any construction activities would be conducted in, or adjacent to, the pool containing Utah valvata. Releases may be made at a variety of different locations to accommodate various stages of construction activities; however, flows would be continued through the south pool. Physical characteristics and associated flow dynamics of the spillway result in substantial portions of flows through the existing spillway passing through the south channel and the pool containing Utah valvata. Therefore, multiple release points would be able to be used to provide flows of sufficient quantity and quality through the pool containing Utah valvata.

All construction activities would be conducted on the basalt bench located immediately below the existing spillway, thereby preventing any impacts to Lake Walcott. Construction activities in the spillway will be localized to this area. The one exception is the construction of the new gated spillway. This portion of the new structure will cross the upper most pool on the south side of the spillway (Appendix B – Figure 3-3). Construction of the gated spillway will require removing all water from this pool, excavation for structure footings, and the respective installation of the gated spillway as discussed in Chapter 2. It is anticipated this activity will have no impacts to ESA-listed snails. Recent survey efforts conducted by Reclamation and Mr John Keebaugh of the College of Idaho on October 28, 2009, found no live Utah valvata, in or adjacent to this pool. These findings are consistent with previous investigations at this location. One live Utah valvata was collected by Reclamation personnel from this pool in 2000. That individual, however, was collected from boulder substrate. Further, it was the only live Utah valvata collected from that pool. It is likely the specimen represented an individual dispersing downstream as opposed to a resident of the subject pool.

Following construction, some minor excavation would be required upstream of the new radial gates to provide for adequate approach velocities to the new radial gates. This excavation would be among the final tasks to be completed in the construction sequence. Excavation would be conducted during the latter portion of the winter drawdown period, thereby reducing impacts to Lake Walcott. Much of the excavation would be conducted in the dry, above the non-irrigation season water line. Although, some minor excavation would be completed below the water line at this point. However, no impacts to Utah valvata are anticipated as a result of this action.

The portion of Lake Walcott requiring minor excavation consists of basalt substrate. Utah valvata are not known to occur on this type of substrate. Further, recent survey efforts by

Reclamation have not encountered Utah valvata on or adjacent to the proposed excavation area. Per standard Reclamation construction contract requirements, sediment control would be required at the excavation site to prevent released fines from dispersing into the reservoir. This would likely involve the use of a sediment curtain, as well as other relevant sediment control methods.

Snake River Physa

Reservoir Operations Impacts

Snake River physa are not known to occur above Minidoka Dam; therefore, current reservoir operations have no impacts to Snake River physa.

As previously discussed, the installation of the gated spillway into the southeast spillway pool will result in a small (approximately 5.2 acres) habitat change. A small portion of the spillway will become permanently watered reservoir habitat. The area is currently approximately ½ terrestrial basalt and ½ fluvial habitat; over basalt bedrock and boulder substrate. The wetted portion of this area is currently not occupied by Snake River physa. This is likely due to the unsuitable habitat and Reclamations non-irrigation season operations. Under Alternative B, this small area located upstream of the new gated spillway would be operated as the reservoir, consistent with previous reservoir operations discussions. Due to the unsuitable habitat, it is not anticipated Snake River physa will occupy this newly flooded area.

Spillway Operations Impacts

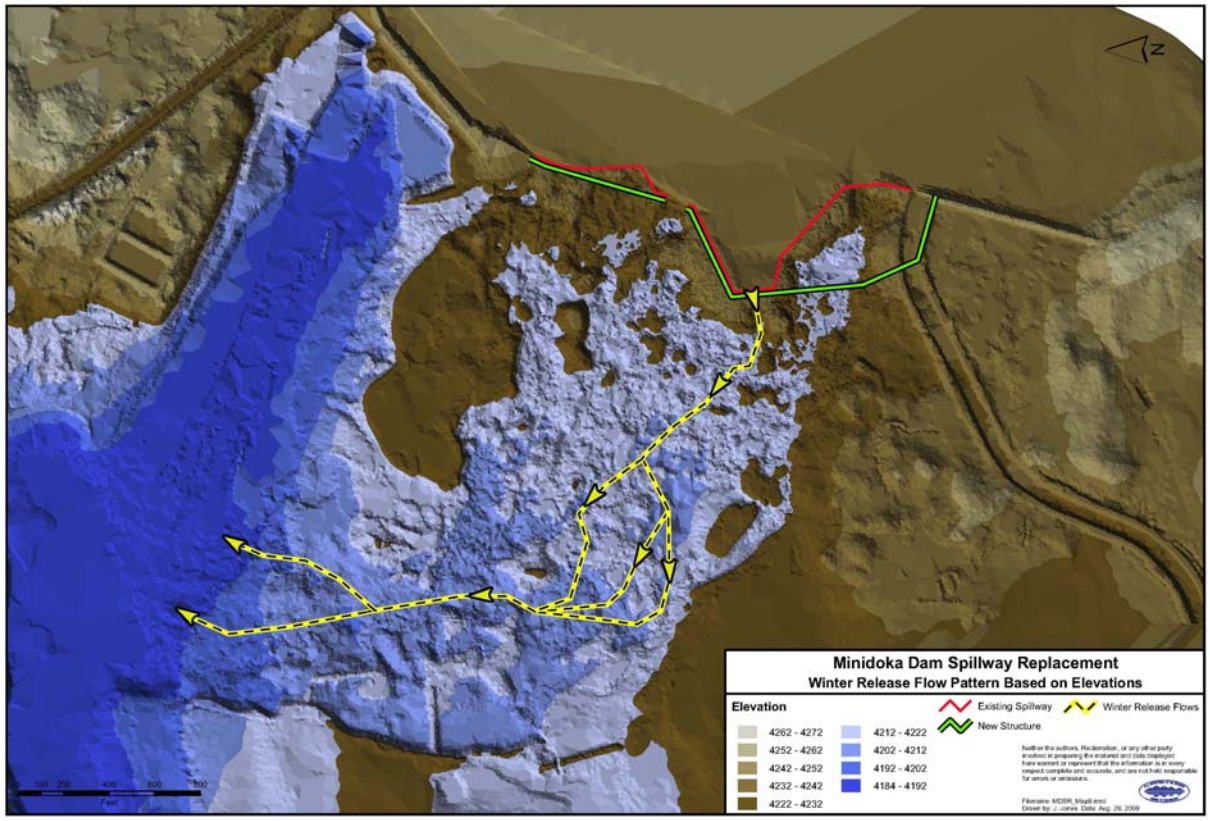
Snake River physa are located within the spillway area of Minidoka Dam in a large pool located on the south side of the existing spillway (Appendix B – Figure 3–4). Up to 15 individuals per .25 m^2 have been encountered during recent survey efforts in this pool. This portion of the spillway area receives flows throughout the entire year via irrigation delivery flows and seepage through the existing structure and underlying basalt. Unlike other portions of the spillway area, this south pool is not completely dewatered by Reclamation's annual operations. Structural leakage, along with subsurface seepage into this pool, provide adequate flows to sustain Snake River physa; as is evident by their repeated collection by Reclamation personnel.

The exact volume of water flowing though the spillway area of Minidoka Dam, via structural leakage and subsurface seepage, is difficult to determine. A USGS gaging station is located in the Snake River below the spillway outlet to the river. By subtracting powerplant flows from flows recorded at the gaging station, one can determine an estimate of flows through the spillway. Estimated flows have ranged from 8 cfs to 55 cfs. The exact number is hard to determine for a number of reasons. Standard error associated with the respective gaging devices (i.e., Reclamation powerplant and USGS gaging station) and icing during the winter

months results in small variability in the recorded values. In addition, subsurface seepage into the spillway area and seepage back into the basalt at the lower end of the existing spillway further complicate Reclamation's ability to estimate non-irrigation season flows through the existing spillway.

Regardless, the continued presence of Snake River physa in the spillway area the south pool suggests the current flow regime through the existing spillway is adequate to sustain the species at this location. Under Alternative B, Reclamation is proposing to provide year-round flows through this portion of the new spillway. It is assumed structural leakage would be reduced with the new structure, outside of irrigation season. To mitigate this loss, Reclamation is proposing to provide up to 100 cfs through a fixed point on the structure outside of irrigation season. See Appendix B – Figure 3–4 and and Photograph 3-23 showing winter release point and calculated flow route over aerial photo and 3D elevation model output. During irrigation season, Reclamation is proposing to provide a minimum of 500 cfs into the entire spillway area to maintain wetland habitat and provide for a sport fishery. However, the average monthly flows through the spillway area during the irrigation season are typically higher. This proposed operation regime would provide adequate flows to sustain existing Snake River physa on a year-round basis.

The 100 cfs non-irrigation season release would take into account subsurface seepage and potential structural leakage. Releases from this point will ensure total, non-irrigation season, spillway flows total 100 cfs. For example, if it is determined 30 cfs are flowing through the spillway as a result of structural leakage and subsurface seepage 70 cfs would be released through the outlet structure to maintain approximately 100 cfs into the spillway area. As described above, the precise determination of water into the spillway area, as a result of seepage, is difficult. Reclamation is proposing to utilize USGS gaging data along with Reclamation's powerplant outflow data to account for spillway flows, recognizing variations may exist within the spillway area as a result of subsurface flow dynamics.



Photograph 3-23. Aerial photo showing winter release flow point and calculated flow route over 3-D elevation model output.

Construction Impacts

Construction activities associated with Alternative B would be conducted in multiple upland areas or above the spillway pool containing Snake River physa. It is not anticipated that any construction activities would be conducted in, or adjacent to the pool containing Snake River physa. Throughout the entire construction period, flows of sufficient quantity and quality would be maintained to and through the new spillway. Releases may be made at a variety of different locations to accommodate various stages of construction activities; however, flows would be continued through the south pool. Physical characteristics and associated flow dynamics of the new spillway result in substantial portions of flows through the spillway passing through the south channel and the pool containing Snake River physa.

Per Reclamation's standard construction contract requirements, sediment and spill control structures would be required at all locations along the new spillway where construction activities have the potential to contact or reach wetted channels. Construction activities would be conducted on the basalt bench located immediately below the existing spillway area, thereby preventing any impacts to Lake Walcott. Most in-spillway construction

activities would be conducted on the basalt bench located immediately below the existing structure, thereby preventing any impacts to Lake Walcott. Construction activities in the spillway would be localized to this area. The one exception is the construction of the new gated spillway. This portion of the new structure will cross the upper most pool on the south side of the spillway (Appendix B – Figure 3-3). Construction of the gated spillway will require removing all water from this pool, excavation for structure footings, and the respective installation of the gated spillway as discussed in Chapter 2. It is anticipated this activity will have no impacts to Snake River physa. Recent survey efforts conducted by Reclamation and Mr John Keebaugh of the College of Idaho on October 28, 2009, found no live Snake River physa or any Snake River physa shells, in or adjacent to this pool. These findings are consistent with previous investigations at this location.

Snake River physa are not known to occur above Minidoka Dam; therefore, potential impacts to Snake River physa resulting from construction activities above Minidoka Dam will not be discussed.

Bald Eagle

Reservoir Operations Impacts

Bald eagle foraging, nesting and roosting activities associated with Lake Walcott are not expected to be impacted as a result of Alternative B. Bald eagles currently used Lake Walcott for foraging purposes on a year-round basis, although numbers increase during over-winter months (Bouffard 2009). Foraging eagles consume waterfowl and various species of fish from Lake Walcott. Distribution, abundance, and general availability of prey items for bald eagles are not expected to change as a result of Alternative B.

Filling Lake Walcott to its full-pool elevation of 4245 feet approximately 3-½ months earlier would not alter bald eagle activity. Bald eagle presence at Lake Walcott is based on prey availability and susceptibility. The earlier flooding of Lake Walcott would be independent of bald eagle prey availability because Lake Walcott is typically frozen during these months. When Lake Walcott is frozen, eagles move to below American Falls Dam, below Minidoka Dam, and to adjacent upland areas to forage.

Under Alternative B, no impacts to bald eagle nesting activity located on Bird Island are anticipated as a result of reservoir operations. No changes to reservoir operations are proposed during bald eagle nesting season (i.e., irrigation season).

Spillway Operations Impacts

Although bald eagle frequent the area throughout the entire year, the existing spillway portion of Minidoka Dam is primarily used by bald eagles during winter months when Lake Walcott is frozen (Bouffard 2009). Reclamation's operations prevent freezing from much of the area below Minidoka Dam, thereby providing resting habitat for wintering waterfowl and subsequent forage for eagles. Under Alternative B, Reclamation is proposing to maintain spillway flows at approximately 100 cfs, outside of irrigation season (approximately October 1 through April 15). The proposal to maintain 100 cfs through the new spillway outside of irrigation season will provide additional foraging opportunities for wintering eagles by providing additional resting areas for waterfowl.

Bald eagles would continue to use the spillway area below of Minidoka Dam under Alternative B consistent with current use. The proposed irrigation season operational change of reducing the minimum spillway flows from 1,300 to 1,900 cfs to 500 cfs should provide the same foraging opportunities to eagles as currently exists. The proposed minimum flow of 500 cfs should maintain the wetland habitat below the new spillway, resulting in no net loss of wetland habitat below the spillway area. Eagles would be able to continue to forage in this area. By reducing flows through the new spillway, it is anticipated that more slow-to-standing water habitat will be created. The current flow regime through the new spillway results in turbulent conditions, reducing the availability of resting pools, settling of fines and macrophytes formation. By reducing flows though much of the spillway area (primarily the central and northern portions), it is anticipated that the availability of resting pools would increase along with typical wetland attributes associated with slow-to-standing water. This change may increase foraging opportunities for bald eagle in the spillway area.

No roosting habitat exists in the spillway area. Available roosting habitat is located along the river downstream from the spillway area or in adjacent upland areas. Eagles are not observed roosting in the spillway area.

No eagle nesting habitat exists in the spillway area. Available nesting habitat is located upstream of the existing spillway on Bird Island and above American Falls Reservoir. Eagles are not observed nesting in the spillway area.

Construction Impacts

Construction activities associated with Alternative B would be localized to the new spillway, with the exception of hauling activities. Due to the very limited use of the spillway area of Minidoka Dam by bald eagles, it is not anticipated that construction and hauling activities would displace, disturb, or negatively impact in any way, bald eagles. The spillway area is small and constitutes a small fraction of suitable foraging habitat relative to the amount of adjacent foraging areas available for bald eagle use. Further, the absence of perching and nesting habitat in the spillway area reduces the potential for construction activities to impacts eagles.

Haul routes associated with construction activities do not pass any known bald eagle roosting, foraging or nesting locations. All hauling activities would be conducted through adjacent agricultural lands that do not possess the attributes associated with bald eagle activity.

Yellow-billed Cuckoo

Reservoir Operations Impacts

Yellow-billed cuckoos prefer dense vegetation in association with cottonwood overstory and slow-to standing water. Isolated pockets of dense vegetation exist along Lake Walcott, although dense vegetation in association with cottonwoods exists only on Bird Island. No changes to Bird Island vegetation and respective potential yellow-billed cuckoo habitat would result from Lake Walcott operations proposed under Alternative B. Lake Walcott operations would remain consistent with current operations with the exception of an earlier pre-irrigation fill date. Returning Lake Walcott to full-pool elevation 3 ½ months earlier than normal would result in no negative impacts to Bird Island vegetation. Dense vegetation stands associated with cottonwoods on Bird Island are located at or above the full-pool elevation of 4245 feet; therefore, damage associated with winter icing would likely not occur.

Spillway Operations Impacts

Marginal yellow-billed cuckoo habitat exists within the spillway area. Although dense vegetation stands do occur within the spillway area, no cottonwoods and very few willows exist. Further, no standing or slow-moving water currently exists within the spillway area.

No changes to spillway area riparian vegetative community attributes are anticipated under Alternative B. The proposed non-irrigation season maintenance flow of 100 cfs and minimum irrigation season flow of 500 cfs would not result in changes to riparian vegetation in the spillway area. However, slow moving and standing water habitats would likely occur as a result of decreased flows through the new spillway, resulting in slight improvements to Yellow-billed cuckoo habitat.

Construction Impacts

Yellow-billed cuckoos have never been documented in the area of impact. Further, the poor habitat characterized by no cottonwoods, very limited willows, no standing water and isolation from other potential yellow-billed cuckoo habitat makes the likelihood of impacts to yellow-billed cuckoos as a result of construction activities very low. It is not anticipated that construction activities associated with Alternative B would impact yellow-billed cuckoos.

Alternative C – Replacement of Spillway

Relative to ESA-listed species in the area of impact, Alternative C is the same as Alternative B with the exception of construction activities associated with the existing two canal headworks structures. No operational differences exist between the two alternatives. The previous impacts described for Alternative B applies to Alternative C.

3.8.3 Cumulative Impacts

No cumulative effects are anticipated as a result of the proposed alternatives.

3.8.4 Mitigation

Alternatives B and C

Under Alternative B, Reclamation is proposing to reduce irrigation-season spillway flows from the current 1,300 to 1,900 cfs flow range down to a fixed flow of 500 cfs. It is not anticipated this reduction in irrigation-season spillway flows would have negative effects on ESA-listed species known to occur within the spillway area. In addition, the new structure would likely reduce or eliminate structural leakage, as currently exists. Reclamation is proposing to provide non-irrigation season flows of up to 100 cfs as mitigation for the likely reduction or elimination of the existing structural leakage. This mitigation would result in year-round flows through the new spillway.

Under each action alternative, construction activities would be conducted upstream of the spillway pool containing ESA-listed snails. Reclamation is proposing to maintain flows to the pool containing ESA-listed snails throughout the duration of the construction project. Further, Reclamation is proposing to require contractors to implement standard BMPs so as to ensure construction materials do not enter the pool containing ESA-listed snails. Table 3-16 summarizes mitigation measures for each alternative.

Table 3-16. Mitigation measures for No Action and action alternatives.

Spillway		
Alternatives	Action	Associated Mitigation
A – No Action	None	None
B – Spillway and Headworks Replacement	Reduce spillway flows, reduce or eliminate structural leakage	Reclamation no longer makes surface releases from the reservoir into spillway. Releases would be made from lower in the reservoir water column to increase entrainment of trout into the spillway. Result in flows sufficient to maintain the ESA-listed snails, as well as improves trout fishing. Provide over-winter flows of 100cfs.
C – Spillway Replacement	Reduce spillway flows, reduce or eliminate structural leakage	Reclamation no longer makes surface releases from the reservoir into spillway. Releases would be made from lower in the reservoir water column to increase entrainment of trout into the spillway. Result in flows sufficient to maintain the ESA-listed snails, as well as improves trout fishing. Provide over-winter flows of 100cfs.
Reservoir (Lake Walcott)		
Alternatives	**Action**	**Associated Mitigation**
A – No Action	None	None
B – Spillway and Headworks Replacement	Earlier pre-irrigation season fill	None
C – Spillway Replacement	Earlier pre-irrigation season fill	None
Construction		
Alternatives	**Action**	**Associated Mitigation**
A – No Action	None	None
B – Spillway and Headworks Replacement	Work above snail pool	Implement BMPs; maintain flows
C – Spillway Replacement	Work above snail pool	Implement BMPs; maintain flows

Per Reclamation's standard construction contract requirements, sediment and spill control structures would be required at all locations along the new spillway where construction activities have the potential to contact or reach wetted channels.

Reclamation personnel would routinely monitor construction activities to ensure flows are sustained though the south channel and that contract requirements are fulfilled.

3.9 Geology, Soils, and Flood Plain

3.9.1 Affected Environment

Geology

Minidoka Dam and Reservoir are situated in the southern part of the east portion of the Snake River Plain. The primary geologic setting involves a gently undulating basalt surface with frequent rock outcroppings covered by a thin veneer of river and wind deposited sediments transitioning into soils. The Snake River Plain was formed in the Pliocene and extends across southern Idaho for 400 miles in an east-west direction. The western plain is near the eastern edge of the Basin and Range Physiographic Province and is characterized by fault-bounded basins filled by interbedded volcanic rocks and lakebed sediments of Tertiary and Quaternary age. The eastern Snake River Plain where Minidoka Dam lies is generally covered by Quaternary fissure basalt flows with some sediment interbeds. The geologic unit called the Snake River Group includes most of the basalt flows in the Snake River Plain that were extruded in Pliocene to Holocene times.

The vicinity of the dam site consists of a broad, relatively undissected plain formed by Quaternary fluid basalt lava flows. The surface is hummocky with irregular mounds and depressions a few tens of feet to over 100 feet across formed by pressure ridges. Pressure ridges typically form elongated mounds created by the congealing lava crust of a lava flow. The pressure is due to the underlying, still-flowing lava. Some areas of the lava surface have been reworked to varying degrees by the Bonneville Flood, which flooded the area of the dam and Lake Walcott during the Pleistocene. The Bonneville Flood eroded surficial sediments, possibly scoured the basalt surface, and left thin mantles of sand, silt, and minor gravel in areas of slack water.

Interlayered within the basalt flows are discontinuous to very continuous interflow zones. The interflow zones are variable in thickness and consist of weathered flow surfaces often with sediments transported and deposited in air, lakes, or streams. These interflow zones represent periods of sediment deposition at the same time as lava began to flow. The thickness of the basalts range from about 40 to 173 feet thick and sediment intervals are from 16 to 163 feet thick. Beneath the sequence of basalt and interbedded sediments are unknown thicknesses of sedimentary deposits.

Soils

Soil descriptions in the proposed action area were obtained from the Natural Resources Conservation Service (NRCS) web site (NRCS 2009) maintained by the USDA. The soil resource report for the areas near the dam and spillway references two predominant soil groups, the Trevino-Rock outcrop complex and the Vining-Kecko outcrop complex.

The Trevino-Rock outcrop complex covers most of the area downstream of the existing spillway and to the south of the South Side Canal. The complex is a group of well-drained soil and rock outcrops that occur on 2 to 12 percent slopes. Approximately 70 percent of the map unit composition is Trevino or similar soils and 20 percent is rock outcrop. The soils have been formed on lava fields and are composed of mixed alluvium and/or loess (wind blown soil) over basalt bedrock. These shallow, well-drained loamy soils are usually 1 to 2 feet in depth over rock. In deeper soil profiles the depth to water is greater than 80 inches.

The Vining-Kecko outcrop complex is present on the north side of the North Side Canal. This group of soils and rock outcrops often form as terraces with 1 to 8 percent slopes. The soils are typically a sandy loam composed of mixed alluvium and/or loess (wind blown soil) over basalt bedrock. These well-drained soils are usually 3 to 4 feet in depth over rock. In deeper soil profiles, the depth to water is greater than 80 inches. Approximately 50 percent of the map unit composition is Vining soils, 30 percent is Kecko soils, and 10 percent is rock outcrop.

The proposed staging and construction waste areas are located over these soil and rock outcrop complexes. The facility access and maintenance roads will also be founded on these soil and rock outcrop groups.

Flood Plain

The river bed and most of the flood plain area in the Snake River immediately downstream of Minidoka Dam are founded on basalt bedrock. The river has cut the main river channel into the rock and in most places has formed vertical to steeply sloping banks; therefore, the flood plain is actually a very narrow band along the river's edge. The alluvial material within the flood plain consists primarily of sand and gravel with minor fine-grained sediments and cobble and boulder-sized rock fragments. Discharges from the powerplants and exsting spillway are confined in the main channel and both transport and redeposit the materials in the river bed and flood plain areas.

3.9.2 Environmental Consequences

Geology

Methods for Evaluating Impacts

The potential impacts to geology, soils, and the flood plain were analyzed by contrasting the current operational effects on these features with the impacts from construction under the proposed action alternatives which would cause disturbance, removal of both rock and soil, and erosion or deposition in the flood plain area.

Impact Indicators

1. Disturbance of soil and vegetation especially in staging and waste areas where excavated rock and reusable construction materials are stockpiled and waste materials are discarded.

2. Nuisance dust from stockpiles of reusable construction materials.

3. Erosion or deposition of river bedload material in the flood plain area.

Alternative A – No Action

The No Action alternative will result in the continuance of existing spillway operating conditions at the site. Natural weathering and erosion of the exposed rock will continue slowly at the existing spillway toe. Most areas affected by erosion have been treated where the plucking away of rock from existing spillway discharges has threatened the undermining of the existing spillway foundation. The treatments are mostly concrete aprons over the rock benches at the toe of the existing spillway. The aprons are currently performing satisfactorily but future maintenance for the foundation undermining issue may be required and can be considered an operational impact. The new spillway design will minimize this impact by creating less potential for significant erosion.

Alternative B – Spillway and Headworks Replacement

Construction Impacts

Impacts could occur from blasting, hauling and stockpiling of rock material which produce noise, and compacting soil in the stockpile and waste areas. Rock excavation in the basalt and possibly foundation backfill in low areas would occur along the new spillway alignment downstream of the existing spillway. The depth of excavation may vary between 3 and 5 feet, and perhaps deeper for the foundation of the radial gate structures. Most soil and loose debris below the existing spillway have been naturally removed by water discharges along of the new

spillway alignment leaving bare rock outcrops. The new radial gate section planned for downstream of the new South Side Canal headworks would require rock excavation as would the bedrock channel upstream to handle increased discharges through the new radial gates.

Construction of the new headworks for the North Side and South Side canals would involve removal of fill material, excavation of basalt, stockpiling of reusable construction materials, and wasting of spoil material. The staging and waste areas proposed for the construction are primarily basalt surfaces with frequent rock outcroppings covered by a thin veneer of river and wind deposited sediments. The material in stockpiles or waste piles would be mostly rock fragments and some previously placed construction fill selected for reuse elsewhere on the project. The materials are expected to be mostly dry and would not require spreading for draining and drying.

Operational Impacts

No operational impacts on geology features are predicted under this alternative.

Alternative C – Spillway Replacement

Construction Impacts

Alternative C would potentially have fewer areas for construction-related impacts concerning noise, dust from hauling to stockpiles, and soil compaction in staging and waste areas. Rock excavation and foundation backfill in low areas would still occur along the new spillway alignment. The new radial gate section planned for downstream of the South Side Canal headworks would still involve rock excavation as would the bedrock channel upstream of the new radial gates. The construction-related impacts in and around the staging and waste areas still occur as described under Alternative B.

Without the construction of the new canal headworks, construction-related impacts are eliminated for the North Side Canal area and reduced for the South Side Canal area. The opening of additional staging and waste areas are not needed or can be reduced in size for this proposed construction activity.

Operational Impacts

No operational impacts on geology features are predicted under this alternative.

Soils

Construction Impacts

The impact of construction on soils is primarily related to the staging and waste areas since the new spillway alignment is mostly devoid of soil cover. Construction activities in and

around the staging and waste areas will create impacts from the disturbance of vegetation and soil compaction.

Operational Impacts

No operational impacts on soils are predicted under this alternative.

Alternative A – No Action

The No Action alternative will result in the continuance of current spillway operating conditions at the site, and no construction activities would occur. Normal operations and maintenance will have no impacts on soils in the proposed action area.

Alternative B – Spillway and Headworks Replacement

Construction Impacts

Alternative B would have the greatest construction-related impacts. More and potentially larger areas would be necessary for construction staging and waste areas during relocation of the new headworks and partial removal of the existing headworks. The construction activities would cause disturbance of vegetation and compaction of soil from traffic, stockpiled material, and construction supplies. The sandy and silty loam nature of the two soil complexes in the area results in a soil that is well draining. The soils can compact but when dried out, particles can be transported by wind causing dust. Blowing dust is enhanced where the vegetative cover is disturbed or removed.

Operational Impacts

No operational impacts on soils are predicted under this alternative.

Alternative C – Spillway Replacement

Construction Impacts

Alternative C would have less construction-related impacts than if the two existing canal headworks were relocated. The new spillway construction requires staging and waste areas but these same areas associated with construction of the new headworks would not be needed or would be reduced in size. Impacts to the soil and associated vegetation would occur as described in Alternative B.

Operational Impacts

No operational impacts on soils are predicted under this alternative.

Flood Plain

Alternative A – No Action

The No Action alternative will result in the continuance of current spillway and powerplant operating conditions at the site; therefore, no new impacts on the existing flood plain along the Snake River would occur.

Alternative B –Spillway and Headworks Replacement

Construction Impacts

Alternative B should not create any construction-related impacts on the existing flood plain. Following wet years or when formal flood control releases are made from upstream facilities, total flow into the reservoir may exceed powerplant capacity resulting in higher spillway flows. The increased discharge may redistribute bedload sediments in the river but would not adversely impact the flood plain margins with any erosion or deposition of sediments.

Operational Impacts

No operational impacts on the flood plain are predicted under this alternative.

Alternative C – Spillway Replacement

Alternative C would be the same as Alternative B.

3.9.3 Cumulative Impacts

None anticipated for any of the alternatives.

3.9.4 Mitigation

Following the abandonment of the staging and waste areas after construction of Alternative B some reclamation effort would be necessary to prevent wind erosion of soil and permit revegetation. Heavily-compacted areas of soil may require scarifying the ground to break up the surface prior to reseeding with natural vegetation.

Excavation of canal and road embankments may generate reusable fill materials. Some stockpiling of the fill material is anticipated. High winds could produce dust that would call for dust abatement procedures through the construction period. The piles of unconsolidated fill may need to be covered or kept damp.

3.10 Cultural Resources

3.10.1 Affected Environment

Overview

Evidence from archaeological investigations in southeastern Idaho indicates that people began moving through and utilizing the Snake River region more than 14,000 years ago. The Paleoindians of that time were highly nomadic, moving over the landscape in small groups, primarily hunting big game. Over time, as the climate and environment gradually changed around them to warmer and drier conditions, people adapted through increasing complexity in subsistence procurement practices and settlement systems.

The exploitation of broad ranges of resources over very large areas during the period of 11,500 to 4,200 BP (Before Present), shifted to a more intensive procurement focus on highly productive resources like camas and salmon, as well as the increase of food processing during the later period of 4,200 to 250 BP, evidenced by more mortar and pestle ground stone tools. This period also saw an increase in house pit building and the development of food storage methods as people began to settle for longer periods of time in order to take advantage of certain seasonal resources within one area.

The Snake River basin area is within the proposed action area and was traditionally used by the Shoshone and Bannock Tribes (Shoshone-Bannock Tribes), two linguistically distinct populations. Both Tribes practiced a way of life consistent with other Great Basin cultures, including their subsistence practices. Though the land contained a wide variety of resources, it could not sustain large groups of people in one place throughout the year. Therefore, people adopted a semi-nomadic lifestyle, moving from resource to resource as they became available, and utilizing many different kinds of foods, including plant resources such as roots, tubers, berries, and nuts, and animal resources like squirrels, marmots, rabbits, insects, large game, fish, and freshwater shellfish. By the time of the earliest Euro-American contact within the Snake River basin in the early 1800s, the Shoshone-Bannock Tribes had already been introduced to—and were utilizing with great efficacy—an important new resource, the horse (Reclamation 2000).

The earliest Euro-Americans in south-central Idaho came to develop the fur trade, to convert the Native Americans, or to explore and survey the region. The latter group helped to determine the best routes for military and immigrant roads to Oregon and California. Early trails to and along the Snake River were established by Indian peoples and then used by trappers and explorers. The major east-west travel route of these early explorers passed north of what is now the area around Minidoka Dam along the Snake River. Portions of the route later became the Oregon Trail, first used by emigrants in 1841 (Ozbun et al. 2000).

The earliest Euro-American settlements in south-central Idaho in the Snake River area are associated with the northward expansion of Mormon communities out of Utah in the 1870s. The arrival of Union Pacific's Oregon Short Line railroad in the early 1880s proved crucial to the development of southeastern Idaho, helping to speed up the settlement of the region. Agriculture served as the primary economic activity of settlers in south-central Idaho in the late 19th and early 20th centuries, and irrigation systems were of signal importance to that development by drawing on the upper Snake River watershed to support farming (Ozbun et al. 2000).

Under the Desert Land Act of 1877, individual farmers could receive 640 acres at no cost if they irrigated it for 3 years. Simple ditches were built individually or cooperatively by small farming operations to serve local and limited needs; however, private canal companies financed by eastern capitalists subsequently attempted to irrigate larger tracts of land. The task, however, often proved too expensive or technically-complex for private investors and the Federal Government stepped in to provide the financing and engineering skills to build the water storage and delivery systems on a large scale. In 1894, Congress passed the Carey Act to encourage State and private cooperation in developing irrigated agriculture; 8 years later, under the Newlands Act, it created the Reclamation Service (later renamed the Bureau of Reclamation) to fully federalize the irrigation effort in the West (Ozbun et al. 2000).

Previous Investigations and Identified Cultural Resources

Archaeological Resources

The area around the present-day Minidoka Dam and spillway contains evidence of a prehistoric presence at a number of archaeological sites. Site information research performed in conjunction with the Minidoka Northside RMP in 2000 (which encompassed the Minidoka Dam spillway and an area spanning more than 390,000 acres, mainly to the west of Minidoka Dam), reported 49 documented prehistoric cultural resources within that study area. The RMP narrative states "Most of the prehistoric archaeological sites are deposits of Native American artifacts, usually obsidian, ignimbrite, and cryptocrystalline silicate (chert, jasper, or chalcedony) flakes produced in tool manufacture, sometimes with associated flaked-stone tools, milling equipment (ground stone), pieces of animal bone, or ceramic pot shards" (Ozbun et al. 2000). Site types include rock shelters, stacked rock features, artifact scatters, a circular walled enclosure (possible hunting blind), rock walls, and various isolated artifact finds.

Within the immediate vicinity of the Minidoka Dam spillway encompassing a 1.5-mile radius, three prehistoric archaeological sites have been recorded. A lithic and ceramic scatter (10MA48) was found to exist on the promontory within the State Park northeast of the dam (MacDonald and Ross 1989). In 1958, Swanson discovered a "camp site" (10MA3) to the northwest of the damsite on the north side of the Snake River, although the exact location is unknown (Swanson et al. 1958). A single rhyolite flake was recorded as site 10CA540 in an area just west of the South Side Canal headworks. None of these sites has been determined eligible for listing on the National Register of Historic Places (NRHP). While technically

outside of cultural resources' purview, it may be worth noting that fossilized animal bones were recovered during the excavation for the Minidoka Dam diversion channel in 1905, and a possibility of additional fossils in the area may exist.

Historic Resources

Minidoka Dam and powerplant were listed on the NRHP in 1974 on the basis of their historical and technological significance. (Note that Senator George Norris of Nebraska used the experience with Minidoka power as a basis for justifying creation of the Rural Electric Administration) (National Register 1974).

In 1989, prior to altering the dam's existing spillway, Reclamation mitigated the adverse impact to that structure by recording the existing spillway construction according to the standards of the Historic American Engineering Record (HAER). Consisting of a brief historical narrative and 25 photographs, this documentation is filed at the Library of Congress. During the late 1980s, Reclamation also set in motion a program to decommission the five original units in the original powerplant and construct a new hydroelectric facility southwest of the original powerplant. To mitigate the adverse impact of these actions, Reclamation commissioned a more extensive HAER documentation of the technological and historical significance of the Minidoka Project and its earliest engineering facilities. In 1998, Reclamation completed a Historic American Buildings Survey, containing information and photographs, of Walcott Park, an area immediately adjacent to the Minidoka Dam and Powerplant. Finally, in 2000, Reclamation documented the Minidoka Dam South Side Pumping Division Lift Station #2 Operators' Housing Complex for the Historic American Buildings Survey (Hess et al. 2002).

3.10.2 Environmental Consequences

This cultural resource evaluation is limited to Minidoka Dam and Lake Walcott. None of the alternatives has the potential to affect cultural resources at other locations.

Because no Traditional Cultural Properties (TCPs) have been identified or are known to exist in the area of potential effect for this project, TCPs are not analyzed in this document.

Methods for Evaluating Impacts/Impact Indicators

Minidoka Dam has been in operation since 1906. Many of the adverse impacts to cultural resource properties (here recognized as archaeological or historic) have already occurred as a result of reservoir operations, maintenance, and new construction. If those activities continued unchanged, impacts to the cultural resource properties would continue to occur. Therefore, any adverse impacts of the alternatives to cultural resources would be incremental increases in an existing and typically adverse condition.

Archaeological sites (of an age greater than 100 years) are generally surface and/or buried occurrences that can be impacted through any number of activities of both human and natural causes. Actions including any type of surface scraping, soil churning, or excavation can negatively impact an archaeological site by moving or removing features and artifacts, therefore, destroying the site's context. Erosion by wind and water can also shift or remove soils within an archaeological site, adversely affecting that site's integrity. Negative impacts can severely diminish a site's potential to yield information important in prehistory or history that could aid in a determination of its eligibility for listing on the NRHP.

Various actions can also occur to historic properties (greater than 50 years old, but without an archaeological context) that adversely affect the qualities that render those properties eligible for the NRHP. Standards to be considered when modifying an historic property are set forth in the Secretary of the Interior's Standards for the Treatment of Historic Properties (2000). Those standards have particular relevance to the Minidoka Dam spillway replacement project, and provide a basis for evaluating impacts from that project. Relevant caveats include the following:

- The historic character of a property would be retained and preserved. The replacement or removal of intact or repairable historic materials or alteration of features, spaces, and spatial relationships that characterize a property would be avoided.
- Distinctive materials, features, finishes, and construction techniques or examples of craftsmanship that characterize a property would be preserved.
- Deteriorated historic features would be repaired rather than replaced. Where the severity of deterioration requires replacement of a distinctive feature, the new feature will match the old in design, color, texture, and where possible, materials.
- New additions, exterior alterations, or related new construction will not destroy historic materials, features, and spatial relationships that characterize the property.

Minidoka Dam is listed on the NRHP. Changes in the design, removal of original structural or operational elements, or the addition of new elements all reduce the historic integrity of the dam. Changes resulting from the proposed spillway replacement will alter the original design and appearance of the dam so as to make it no longer eligible for the National Register.

Alternative A – No Action

Archaeological Resources

Under the No Action alternative, archaeological resources within the vicinity of the existing dam and spillway will not be subjected to additional impacts if current operations and maintenance continue unchanged. If a pier replacement program is implemented in the future, and new service roads are required, archaeological resources that may exist in those areas could be affected. Partial or complete failure of the existing spillway may potentially

affect as yet unidentified archaeological sites in the proposed action area, but no existing sites of National Register eligibility are now known there.

Historic Resources

Under the No Action alternative, measures to replace the existing spillway and headworks will not be implemented. These structures, however, are rapidly reaching the end of their functional lifespan, as their condition presents increasingly difficult reliability and maintenance problems. After over 100 years of continued use, the concrete forming the existing spillway crest, piers, and stoplog structure shows extensive visible deterioration at numerous locations. The existing headworks at the North Side and South Side canals also show serious concrete deterioration similar to that seen along the existing spillway. In the event of partial or complete failure of these structures, actions might be necessary that would potentially alter the original design and appearance of the existing spillway and headworks; therefore, Minidoka Dam would no longer qualify for listing on the NRHP.

Alternative B – Spillway and Headworks Replacement

Construction Impacts

Archaeological Resources

Under Alternative B, spillway replacement with canal headworks replacement includes several activities that could potentially affect archaeological resources, including ground surface disturbance, road construction, and blasting. Firstly, five staging and waste areas would be delineated for construction purposes. Activities within the staging areas have the potential to affect archaeological sites; however, no known National Register eligible sites exist within these areas, and previous surveys have not revealed high site potential. Second, a single new haul road must be constructed over the South Side Canal to access the southern-most staging/waste area; however, no known archaeological resources exist in this location. The largely disturbed nature of the South Side Canal area largely diminishes site potential. Third, blasting will take place all along the alignment of the new spillway to remove basalt bedrock, as well as in the area of the new radial gate structures. The scouring action of the waters of the overflows of Lake Walcott over the last 100 years have effectively removed any soil that may have once existed in these locations, and no archaeological sites exist in these areas. Therefore, all actions to be undertaken that could potentially affect archaeological sites would have no impact on these resources due to the lack of archaeological sites of National Register eligibility in those activity areas.

Historical Resources

Of the three alternatives, Alternative B would result in the most severe adverse impacts to the historic integrity of Minidoka Dam. A primary impact would occur from the removal and

replacement of the 292 concrete piers and bays of the existing spillway. The original headworks at the North Side Canal would remain, to be replaced by new headworks downstream. The South Side Canal headworks would be removed (except for a single bay) and replaced by new headworks downstream. The concrete overflow portion of the existing spillway would remain, submerged under water and not in public view. The historic early 20th century concrete bridge that spans the North Side Canal would be removed under Alternative B, in conjunction with construction of the new North Side Canal headworks. The lining of the North Side Canal from the historic bridge to the intake structure is of concrete dating to the second decade of the 20th century; that original material would be removed and replaced.

The existing spillway and headworks are distinctive elements of the historic dam, with the concrete piers and bays of the spillway dating to 1909/1910, still featuring wooden stoplog boards that are manually-placed or removed from slots that accommodate the boards. By altering the physical setting of the dam and removing original components that help define this National Register property, the historic character of the dam is compromised and the feeling of historic sense associated with a bygone era is diminished.

Construction of new features in conjunction with the preferred alternative would introduce new visual elements, which would further affect the integrity of the historic property's setting and feeling. The additional elements include a new overflow sections to be constructed downstream of the existing spillway; new North Side and South Side canal headwork structures (to be located approximately 100 feet and 300 feet, respectively, downstream of the existing headworks); replacement of the North Side Canal lining; new radial gated section with 12 radial gate bays; a parking area on the south end of the new spillway access bridge; new service roads downstream of the new overflow section; and two new roller-compacted concrete dikes extending from the new radial gated section to the new South Side Canal headwork and from there to the existing rock wall and dike south of the South Side Canal. The new overflow section and headworks are not an "in-kind" replacement, but a modernized version bearing little resemblance to the original. The new gated spillway, although not an exact replica of the existing radial gates, would be modeled after the latter.

Modernizing with a new spillway and headworks under the preferred alternative does not constitute "in-kind" replacement; therefore, does not qualify as the type of modification recommended in the Secretary of the Interior's standards for treating historic properties. The nature of the changes proposed under Alternative B are direct impacts that reduce the historic integrity of the dam through adverse changes in materials, workmanship, design, and spatial relationships. Indirect impacts result from the public being deprived of the opportunity to view a primary feature of the dam in its original appearance and context.

Operational Impacts

No operational impacts on archaeological or historic resources are predicted under this alternative.

Alternative C – Spillway Replacement

Construction Impacts

Archaeological Resources

Impacts to archaeological resources under Alternative C would be similar to those discussed under Alternative B. Only two staging areas (the two southern-most as identified under Alternative B) would be used, the haul road would still be constructed, and blasting would occur in the same areas outlined for Alternative B. However, as Alternative C has no additional proposed action area relative to Alternative B, the absence of impacts to properties of National Register quality remains the same in Alternative C as in Alternative B.

Historical Resources

The potential for adversely impacting historic Minidoka Dam would be less for Alternative C than for Alternative B, although more than for the No Action alternative. Under Alternative C, the same direct impacts would occur in association with a new spillway that were described for Alternative B (removal of the existing overflow spillway piers and bays, construction of a new spillway, and the addition of new radial gates. Under either alternative, this is an adverse effect that completely and irreversibly alters defining features of the historic dam environment. The scale of Alternative C modifications, however, is reduced relative to those of Alternative B. Alternative C modifications do not include replacement of the existing North Side and South Side canal headworks, removal of the historic concrete bridge that crosses the North Side Canal, new dikes, or replacement of the North Side Canal lining. Indirect effects from Alternative C are similar to those described for Alternative B, although at a reduced scale.

Operational Impacts

No operational impacts on archaeological or historic resources are predicted under this alternative.

Cumulative Impacts

No cumulative impacts to cultural resources are anticipated under any of the alternatives.

Mitigation

Archaeological Resources

No mitigation would be necessary under any of the alternatives. Mitigation for adverse effects resulting from future Reclamation undertakings at Minidoka Dam will be addressed on a case by case basis through Section 106 consultation.

Historical Resources

Alternative A – No Action

No mitigation will be required under the No Action alternative. Mitigation for adverse effects resulting from future Reclamation undertakings at Minidoka Dam will be addressed on a case by case basis through Section 106 consultation.

Alternative B – Spillway and Headworks Replacement

Consultation pursuant to the 36 CFR 800 regulations has been initiated with the Idaho SHPO over effects of the spillway replacement on the historic features of Minidoka Dam. Reclamation and the SHPO concur that the undertaking, as proposed under Alternative B, would have direct and indirect adverse effects on the Minidoka Dam historic site, requiring specific action by Reclamation to mitigate those effects. The mitigation measures enumerated below have been developed by Reclamation in coordination with the SHPO. These measures would be formalized in a memorandum of agreement (MOA) between Reclamation and the SHPO. The National Advisory Council on Historic Preservation has chosen not to participate in the development of the MOA.

Reclamation agrees to perform the following actions to mitigate the adverse effects of the proposed project to the Minidoka Dam historic property:

1. Prepare large-format (4 X 5) black and white contact prints, archival processed, of the historic bridge that crosses the North Side Canal, early 20th century concrete lining and Civilian Conservation Corps (CCC) period lining along the North Side Canal, and close-up views of existing spillway piers and bays and action views of the process of pulling and placing stoplogs;

2. Create a publically accessible informational display near Minidoka Dam (possibly in the State Park), using salvaged sections of piers, bays, stoplogs, walkway, and ogee, removed from the existing spillway, if possible. The display will inform visitors about the history, construction, and function of the overflow spillway being replaced. Blueprint drawings, historic photographs, and narrative text will supplement the spillway display;

3. Retain, as agency museum property, the traditional hand tools used in the process of manually pulling and placing stoplogs.

Alternative C – Spillway Replacement

Same as Alternative B, except that large-format prints of the historic North Side Canal bridge and North Side Canal lining would not be necessary. These features will remain unaltered under Alternative C.

3.11 Indian Trust Assets

3.11.1 Affected Environment

Indian Trust Assets (ITAs) are legal interests in property held in trust by the United States for Indian tribes or individuals. The Secretary of the Interior, acting as the trustee, holds many assets in trust for Indian tribes or Indian individuals. Examples of things that may be trust assets are lands, minerals, hunting and fishing rights, water rights, monetary holdings, and gathering rights. ITAs exist on and off reservation lands.

The United States has an Indian trust responsibility to protect and maintain rights reserved by or granted to Indian tribes or Indian individuals by treaties, statutes and EOs. These can be further interpreted through court decisions and regulations.

The Shoshone-Bannock Tribes, a federally-recognized tribe, located at the Fort Hall Indian Reservation in southeastern Idaho have trust assets both on and off reservation lands. The Fort Bridger Treaty was signed and agreed to by the Bannock and Shoshone headman on July 3, 1868. The treaty states in Article 4, that members of the Shoshone-Bannock Tribes "…shall have the right to hunt on unoccupied lands of the United States…" this has been interpreted to mean unoccupied Federal lands and to include fishing as a form of hunting.

The tribes included fishing after the case of State of Idaho vs. Tinno, an off-reservation fishing case in Idaho. The Idaho Supreme court determined that the Shoshone word for "hunt" also included "fish." Under Tinno, the court affirmed the Tribal Members' right to take fish off-reservation pursuant to the Fort Bridger Treaty (Shoshone-Bannock Tribes, 1994).

The Nez Perce Tribe is a federally-recognized Tribe located at the Nez Perce Reservation in northern Idaho. The United States and the Tribe entered into three treaties (Treaty of 1855, Treaty of 1863, and Treaty of 1868) and one agreement (Agreement of 1893). The rights of the Nez Perce Tribes include the right to hunt, gather, and graze livestock on open and unclaimed lands, and the right to fish in all usual and accustomed places (Nez Perce Tribe 1995).

Other federally-recognized Tribes, the Shoshone-Paiute Tribes of the Duck Valley Reservation located on the Idaho/Nevada border, the Burns Paiute near Burns Oregon, and the Northwestern Shoshone in Pocatello, Idaho and Brigham City, Utah. These Tribes have cultural and religious interests in the area of Lake Walcott. These interests are protected under historic preservation laws, NAGPRA, and EO 13007 – Indian Sacred Sites.

3.11.2 Environmental Consequences

Methods for Evaluating Impacts

The potential impacts to ITAs were analyzed by assessing the potential to hunt, fish, graze cattle, gather, access mineral deposits, and effects to any monetary holdings.

Alternative A- No Action

The No Action alternative would result in the continuance of current conditions at the existing spillway. ITAs that exist on these Federal lands are the right to hunt and the right to fish. Because the United States would retain title, and no operations would change, there would be no effect on ITAs.

Alternative B – Spillway and Headworks Replacement

Construction Impacts

This alternative would temporarily affect fishing and hunting rights in the direct vicinity of the new spillway and canal headworks during construction because the area would be closed. These fishing and hunting rights would be restored at the completion of the project.

Operational Impacts

Maintaining the reservoir conditions within the RMP would have no adverse effect on ITAs.

Alternative C – Spillway Replacement

Construction Impacts

Expected impacts from construction and dewatering would be identical to the impacts described under Alternative B.

Operational Impacts

Impacts are expected to be identical to those described in Alternative B

3.11.3 Cumulative Impacts

No cumulative impacts are anticipated as a result of the proposed action for ITAs.

3.11.4 Mitigation

Even though areas will be closed to fishing during the construction of the new spillway and headworks, no mitigation is required to complete this project concerning ITAs.

3.12 Sacred Sites

3.12.1 Affected Environment

EO 13007, Indian Sacred Sites, directs agencies to seek to avoid adverse impacts to Indian sacred sites. In the EO, a sacred site is defined as a "specific, discrete, narrowly delineated location on Federal land that is identified by an Indian Tribe, or Indian individually determined to be appropriately authoritative representative of an Indian religion, as sacred by virtue of its established religious significance to, or ceremonial use by, an Indian religion."

Through notification from the Shoshone-Bannock and Northern Paiute tribes, there are no known Indian sacred sites in the area of the Minidoka Dam spillway or the adjacent area surrounding the project. Many places along the Snake River and its tributaries have been identified as sacred sites. Many of these locations still retain their natural integrity, thus enabling tribal members to conduct traditional ceremonial functions (Reclamation 1995). Across the landscape there are many natural and physical features that hold a spiritual or religious importance to tribes. This importance is difficult to determine because of the individual perspective on the level of significance for each Tribal member, clan, or Tribe. In the Shoshone, Bannock, Nez Perce, and Paiute cultures, many places are actually inhabited by spirits, thus making a place sacred or dangerous. Sacred places can be numbered anywhere from locations where the earth meets the sky to where water, the essence of life springs from the earth. Specific locations include mountains, foothills, buttes, springs, lakes, rivers, caves, burial sites, petroglyph or pictograph sites, massacre locations, traditional gathering locations or places where resources were hunted, fished, or collected.

3.12.2 Environmental Consequences

Methods for Evaluating Impacts

Lake Walcott has existed for 103 years. Within the Reservoir, many characteristics have been altered by the constant covering of water or the change of soils and deposits from upstream.

There is great potential that some of the integrity of sacred sites that have been covered has retained enough integrity to be recognized by religious practitioners. Even if the integrity of the physical site has been altered, the spiritual importance and feeling of place that is often dismissed because of its intangibility would still exist in those locations.

Where human burials or other sacred remains exist in the pool, additional erosion may occur from deep drawdowns. Periods of extreme drawdowns could expose graves that are not normally exposed to vandalism or surface caused erosion. Adverse effects that occur to sacred sites as a result of the drawdowns are irreversible. Sacred sites do not have the ability of replacement such as biological resources; when they are destroyed, they are lost forever.

If sacred sites are located within the reservoir and would be exposed at levels of deep drawdown, the tribes would need to be notified immediately.

Alternative A – No Action

Minidoka Dam spillway will continue operation and maintenance without change. Within the guidelines established by the EO, Reclamation would continue to ensure that its actions do not adversely affect Indian sacred sites. If sacred sites are present or become known, to the most practicable extent, access and ceremonial use of those sites will be accommodated.

Alternative B – Spillway and Headworks Replacement

Construction Impacts

There are no known Indian sacred sites in the area of the Minidoka Dam spillway or the adjacent area surrounding the project. There is potential of uncovering a sacred location if the water is dropped below normal management levels for the spillway replacement.

There are no known Indian sacred sites in the area of potential effect from construction for the replacement of the existing headworks. No impacts are expected from the construction work when replacing the headworks.

Operational Impacts

Maintaining the reservoir conditions within the Minidoka RMP (Reclamation 2004a) would have no adverse effect to Indian Sacred Sites.

Alternative C – Spillway Replacement

Construction Impacts

Effects from construction and dewatering would be identical to the impacts described under Alternative B.

Operational Impacts

Impacts are expected to be identical to those described in Alternative B.

3.12.3 Cumulative Impacts

No cumulative impacts are anticipated as a result of the proposed alternative.

3.12.4 Mitigation

No mitigation required.

3.13 Recreation

3.13.1 Affected Environment

Overview

Prior to the construction of Minidoka Dam, the area was part of a vast sagebrush desert bisected by the Snake River. Few people traveled through the inhospitable area on land or on the river (Stene 1997).

The construction of Minidoka Dam, powerplant, and pumping stations facilitated the transformation of the desert into farmland and created opportunities for economic development in the region (Stene 1997).

During the construction of the dam, trees were planted to provide shade for the construction workers' residences. The CCC enlarged and improved what became Walcott Park by building parking lots and stone retaining walls, and by planting trees (Stene 1997).

Walcott Park provided the settlers with a very attractive recreational facility for fishing, boating, and bathing. Gravel roads served most of the area irrigated by the two canals by the mid-1930s, making Lake Walcott available to most local settlers. It was well-kept and provided a beach, shade trees, picnic area with nearby bathing facilities, and dressing booths (Reclamation 1937).

Lake Walcott became a bird sanctuary for waterfowl as the State Park and the area below the dam became a favorite habitat for birds, with far more birds on the Minidoka Refuge than anywhere else in the area (Reclamation 1937).

The construction of Minidoka Dam facilitated the transformation of the irrigated area from desert to productive croplands and the dam camp into beautiful Walcott Park.

Recreation Above Minidoka Dam

Lake Walcott Recreational Opportunities

Idaho Department of Parks and Recreation (IDPR) signed a lease with Reclamation to manage operations and maintenance of Walcott Park in 1996, creating Lake Walcott State Park (State Park). The State Park lies within the northwest side of Minidoka Refuge, just north of Minidoka Dam.

In addition to providing approximately 45 acres of irrigated lawns shaded by mature trees, the State Park still offers facilities for picnicking, boating, and fishing. It also has a popular disc golf course, tent and RV campgrounds, rental cabins, and interpretive exhibits. Most of these facilities are accessible to people with disabilities. State Park fees include a $4 day use fee, $9 tent camping fee, $21.74 RV camping fee, $47 cabin rental fee, and an annual State Parks Pass for $25 per vehicle (Richardson 2009).

Fishing

Fishermen find smallmouth bass along the edges of the lake, and rainbow trout along the edges as well as in the river channel in the lake. The Tri-County Area (Minidoka, Cassia, and Power counties) has large bass fishing clubs. Bass tournaments occur on Lake Walcott to promote interest in recreational fishing, but they must be permitted by the County, IDFG, Minidoka Refuge, and the State Park, so fewer than ten occur annually due to the complexity of the permitting process (Richardson 2009).

Most anglers access the Lake Walcott fishery by boat (61 percent) and bank (38 percent) with the remainder using float tubes. Lake Walcott creel survey data indicated the fishery receives relatively low angler use (IDFG 2007).

Trout stocked at the east end of the lake move quickly west with the current. Spring fishing is quite popular on the lake, especially once the boat ramp opens in April. Some people fish off the existing dike at the south end of the existing spillway. While Lake Walcott is a relatively low use fishery compared to other fisheries in the State, it is very important locally, especially as a trout fishery (Megargle 2009).

Adult bass aggressively defend their eggs, which is advantageous to fishermen in the breeding areas along the east and north shores of Lake Walcott (Megargle 2009).

Ice fishing is popular above the existing spillway from December through March. It is estimated that 15 to 20 people ice fish this area on a typical weekday during this period, with approximately 23 to 40 on weekend days. Most ice fishermen access this area by parking below and going over

the south end of the existing spillway, or around the existing dike to the lake on foot (Bouffard 2009).

The Minidoka Refuge closes the lake to boats and motorized vehicles from October 1 through March 31, so ice fishermen must cross the ice on foot. The entire lake freezes over except for those areas in front of the two power plants and the existing radial gates.

The area near the switchyard is not as popular for ice fishing as the area offshore from the existing spillway, partly because of the park day use fee. Approximately 12 ice fishermen drive into the park to ice fish near offshore from the switchyard on a typical weekday from December through March. Ice fishing at this site usually increases to 18 to 24 fishermen on weekends. When the ice becomes too thin near the switchyard and existing spillway, some fishermen move to a sheltered cove near the park's boat ramp (Bouffard 2009).

Ice fishing also occurs at the springs on the north side of the Minidoka Refuge, occasionally at Smith or Gifford Springs, and at 5-Mile Hole, though access to these sites requires four-wheel drive (Bouffard 2009).

It's estimated that 90 percent of ice fishermen at Lake Walcott are from Minidoka or Cassia Counties, and another 10 percent are from other locations in the Snake River Plain. Very few, if any, ice fishermen come from out-of-state. Ice fishermen primarily harvest rainbow trout for their own consumption (Bouffard 2009).

Birding

Songbirds attract birders to wooded portions of the park in May and June. Although most park visitors come to use the lake, some also visit the areas below the dam or existing spillway to fish or bird watch. A small number of park visitors may also visit areas outside the park on the south side of the lake (Richardson 2009).

Other Activities

A large portion of the visitors to the lake use power boats, fishing boats, or wave runners. While a few people water ski, there are very few kayaks, canoes, or windsurfers because frequent high winds make these activities very dangerous. Many people camp at the park and use ATVs or motorcycles on the trails on the north side of the park (Richardson 2009). The lake is closed to swimming.

Lake Walcott is normally drafted down approximately 5 feet at the end of the irrigation season, beginning as early as mid-August in the drier years when system storage above Lake Walcott is nearing depletion. This exposes rocks along the shore line, leaves the boat ramp out of the water, and reduces the length of the boating season if the drafting occurs prior to October 1 when the seasonal boating closure on the Minidoka Refuge takes effect (Megargle 2009).

While Lake Walcott is a major water sport and activity destination for people from southeast Idaho, many visitors find the park because of the signs on the interstate. Some residents of Minidoka and Cassia counties camp at the park as an inexpensive mini-vacation (Richardson 2009).

Visitation

Annual visitation at Walcott Park in the mid-1970s was approximately 20,000. Thereafter, annual visitation climbed to over 40,000 in 1977 and nearly 60,000 in 1978. In 1985, visitation had climbed to over 87,000 (Hess and Hess 1998).

Of the 37,405 day-use visitors to the State Park in 2007, 85 percent were from Idaho. Of the 8,928 campers, 85 percent were from Idaho. Total visitation for 2007 was recorded as 46,333 (IDPR 2007).

Of the 38,488 day use visitors to the State Park in 2008, 85 percent were from Idaho. Of the 3,534 campers, 88 percent were from Idaho. Total visitation for 2008 was recorded as 42,022. There have been substantial changes in the methods used to estimate visitation in the park, even since 2006. This would account for the significant reduction in the number of visits estimated between 1987 and 2008 (IDPR 2008).

The State Park includes only the area of land immediately northeast of Minidoka Dam, so visitors, including ice fishermen accessing the lake from west of the dam and existing spillway are not included in park visitation counts. However, those ice fishermen who enter the park and fish offshore from the switchyard or cove near the boat ramp would most likely be included in park visitor counts.

Access

Closures to public access above the dam include buoy lines above the existing headworks of both canals, radial gates, and powerplants. Boaters are allowed to approach most of the existing spillway, dam, and dike. Pedestrians have access to the existing spillway catwalk, South Side Canal headworks catwalk, and dike. These routes are used by many fishermen and birders to access Lake Walcott (Newman 2009b).

Recreation Below Minidoka Dam

The area below Minidoka Dam is managed by Reclamation, although USFWS has enforcement authority. The “area below the dam” discussed in this section is shown on Figure 2–7 in Appendix B.

The Minidoka Boat Ramp is the only recreation improvement in the area below the dam. Located on the north side of the river, is a dock, accessible route and parking, and an accessible portable toilet during the use season. Public access to the area below the dam is

available along the E 300 North Road on the north side of the river, and along the road to the unimproved Bishop's Hole launch point on the south side of the river.

Just as in the State Park, bank fishing and birding are very popular activities below the dam. This area offers easy access on improved roads without an entrance fee. Visitors may walk to the North Side Canal from the park. The river below the dam can also be accessed by boat.

Fishing

Fishermen harvest primarily rainbow trout from this stretch of the river. Fishing is particularly good just below the powerplant on the south side of the river because the water is well-aerated and food is available in the form of fish damaged by going through the turbines. Some fishermen access this area using the existing spillway catwalk and its ladders, together with some cross-country travel. Footing is quite difficult in many areas below the existing spillway, so most people avoid this route (Bouffard 2009). When the water is low, some people access the south side of the river just below the dam by crossing east from Bishop's Hole.

The north side of the river is one of the most popular places to fish below the dam due to the easy access from the road. Visitors park either at the Minidoka Boat Ramp or along East 300 North Road. Rainbow trout congregate in this area for the insect hatches (Bouffard 2009).

The North Side Canal also has some rainbow trout, but fencing prevents fishermen from getting close enough to the existing headworks to access the most productive fishing in the canal. Therefore, the North Side Canal receives very little fishing pressure in comparison to the river, the South Side Canal or the area below the existing spillway (Bouffard 2009).

Although the river freezes, fishermen do not ice fish on it. Instead, they are able to bank fish into open water in several places along the river, such as the channel by the Minidoka Boat Ramp (Bouffard 2009). High water flows force people to bank fish, while low flows allow them to walk on gravel bars, or hop from rock to rock (Bouffard 2009).

Among locals, the area below the existing spillway and dam are generally preferred to American Falls Reservoir because it is closer and the bank fishing is at least comparable. Fishing pressure is too low to affect the quality of fishing opportunities below the dam (Bouffard 2009).

All but a small portion in the southwest end of this area below the dam is included in Minidoka Refuge. No game other than fish may be taken from this portion of the Refuge. The USFWS has only one ranger for four refuges, and IDFG has one conservation officer with a very large territory; therefore, enforcement is limited (Bouffard 2009).

Although no formal visitation studies have occurred below the dam, it is estimated that approximately 80 percent of fishing visitation is local fishermen from Minidoka and Cassia

Counties, 10 percent from other parts of the Snake River Plain, and 10 percent from out-of-state. An estimated 75 percent of the fishing is done with the intent to harvest, rather than catch and release (Bouffard 2009).

Birding

The area below the dam ranks high as a destination to watch unique birds, spring and fall migrations, and water birds in summer, especially Sabine's gulls. Sabine's gulls are transient in other areas in the region, but below the dam they reliably stay for about 2 weeks between late August and mid-September after nesting in the arctic. They are easily seen from the Minidoka Boat Ramp and Bishop's Hole, as are cormorants and pelicans (Bouffard 2009).

Several aspects of the area are particularly attractive to birds, including open water in winter, a high invertebrate population, the caddisfly hatch in July, and fish battered by the turbines for food (Bouffard 2009).

Minidoka is an "Important Bird Area" of global significance. Birds can be seen from a closer vantage point from below the dam than at other sites. Birding below the dam is more popular than below the existing spillway because there is significantly more biodiversity. For additional information about bird species found within the proposed action area see Section 3.7 – Terrestrial Biota.

In addition to Bishop's Hole and Minidoka Boat Ramp, good viewing and parking are available at the east end of East 300 North Road. Birders also drive slowly along East 300 North Road, parking at the side of the road if they see something interesting. Regardless of the flow level in the river, visitors use the same access points for birding. The only time the birds are normally disturbed is when there are several boats in the river nearby (Bouffard 2009).

Birders from Minidoka and Cassia counties are estimated to make up 70 percent of the birders visiting below the dam. Another 20 percent of the birders are estimated to come from elsewhere in the Snake River Plain, with the balance from out-of-state. Birding has increased in popularity at an estimated 10 percent per year since 2000 below the dam and in the park (Bouffard 2009).

Other Activities

In addition to fishing and birding, other visitors below the dam include sightseers, photographers, and boaters. The area below the dam is almost entirely within the Minidoka Refuge where there is a "no retrieval policy" which prohibits hunters from retrieving downed birds or animals; therefore, hunting is not popular in this area.

Visitation

Visitation below the dam cannot be definitively divided between fishermen, birders, and other visitors. Visitation is estimated based on the number of vehicles at the various parking areas multiplied by a range of 2 to 2.5 visitors per vehicle average. During the peak season between May 1 and September 15, it is estimated that there are 6 to 10 people on weekdays and 9 to 20 people on weekend days at the Minidoka Boat Ramp. Observed visitation at Bishop's Hole is between 10 to 12 people on weekdays and 15 to 25 people on weekend days. It must be noted that many of these people move to other locations periodically during the day. Observations have not been made as to how long the average visitor stays in the area below the dam and existing spillway (Bouffard 2009).

Both Minidoka boat ramp and Bishop's Hole accommodate fishing, birding, and launch points for boats. Boaters often have drivers shuttle them to the launch point and leave their vehicle and trailer at a take-out point down stream, so their vehicles would not be included in visitation estimates unless the vehicles were at the site at the time vehicles were counted.

During the use season, there are typically 6 to 10 people on weekdays and 9 to 20 people on weekend days at the east end of East 300 North Road where parking is available. Additional vehicles often are parked further west, along the East 300 North Road below the Minidoka Boat Ramp (Bouffard 2009).

No estimates were made for visitation along the south side of the river east of Bishop's Hole. Vehicles for these visitors would be parked somewhere between Bishop's Hole and the parking lot at the south end of the existing spillway.

Access

Closures to public access in this area include fences offset from the dam and powerplant facilities and a buoy line across the river below the powerplant. These measures allow power boats to run upstream on the river, but limit their approach to the dam facilities. Pedestrians may access the river up to the buoy line.

Recreation Below Minidoka Spillway

The "area below the spillway" discussed in this section is shown in (Appendix B – Figure 2–7). This area is managed by Reclamation, although USFWS has enforcement authority.

Improvements for recreation are limited to the Bishop's Hole road, an accessible vault toilet on the west side of the road approximately 450 feet before it ends at the launch point, the existing spillway access bridge, and existing spillway parking areas. Other improvements to the area are for management purposes, but benefit some visitors. These include ladders that provide access from the existing spillway catwalk to the area below the spillway, the existing

spillway catwalk itself, and roads that access the existing spillway, such as Gravity Canal Road, which provides somewhat accessible fishing along the South Side Canal.

Good roads access the south and west perimeter of the area below the spillway. Once off the roads, travel on foot becomes much more difficult. The eastern edge of the area can be accessed by walking along the existing spillway catwalk, down ladders from the existing spillway, and cross country to the desired location. Footing is quite difficult in many areas below the spillway, particularly when water is high. The rocks can be treacherous. There have been drownings by the bridge near the south end of the existing spillway and east of Bishop's Hole (Bouffard 2009).

When the water is low, pedestrian access improves making "rock-hopping" and wading possible. When water levels are high below the existing spillway, bank fishing is the safest option.

Fishing

Most fishermen harvest rainbow trout, smallmouth bass, yellow perch, and channel catfish below the existing spillway. Suckers, carp, and chubs are also present. The area provides a seemingly primitive experience with challenging pedestrian access and relatively little fishing pressure. The multitude of ponds below the existing spillway makes for an interesting variety of fishing opportunities. Smallmouth bass nest under the rocks in June and defend their nests aggressively, so the fishing is good. Favorite fishing locations are the large pool at the south end of the existing spillway, the pool below the existing radial gates (accessed via the existing spillway catwalk), and just below the existing headworks of the South Side Canal. When the water is extremely low, such as during drawdown, people can readily access additional pools for fish or crayfish (Bouffard 2009).

Most people fish the South Side Canal rather than the North Side Canal because of access and productivity. Rainbow trout fishing in the South Side Canal is best near the existing headworks. Crayfish can be caught easily when the canals are closed and the largest pools remaining are below either of the existing headworks (Bouffard 2009).

Although no formal visitation studies have occurred below the existing spillway, it is estimated that approximately 90 percent of fishing visitation below the existing spillway is local fishermen from Minidoka and Cassia counties, 10 percent from other parts of the Snake River Plain, with only a trace of visitation from out-of-state. It is estimated that nearly 100 percent of the fishing is done with the intent to harvest, rather than catch and release (Bouffard 2009).

The area below the existing spillway is one of the few places in Minidoka and Cassia counties where bank fishermen are able to catch rainbow trout from shore. Between May 1 and October 15, the area below the existing spillway averaged an estimated 90 visitor hours

per day. Although catch rates were low, fishermen visited the area steadily, though seldom in high densities (IDFG 2007).

Birding

Although far more birding occurs along the river below the dam because of the hatch, the biodiversity, and the ease of access, the area below the existing spillway remains popular from July through September for observation of shorebirds that like mudflats. Current water level fluctuations do not significantly affect the availability of shorebird observation opportunities below the existing spillway because there's always some water, except in winter (Bouffard 2009).

Birders enjoy observing ducks and geese from the existing spillway catwalk because of easy access and good view. Some birders drive the roads and park when they find birds they wish to observe. Others walk carrying binoculars or spotting scopes. Most birders remain in areas of sound footing, so there is relatively little danger of them falling due to the terrain (Bouffard 2009).

Water level fluctuations do not affect the way people access these locations. There are no boats in the area to disturb the birds, and fishermen have little effect on birding opportunities below the existing spillway (Bouffard 2009).

Other Activities

Fish are the only game legally taken from the Minidoka Refuge below the existing spillway. Rifles are not allowed in this part of the refuge where the prohibition against retrieval of game in the Minidoka Refuge is posted. The narrow strip of Reclamation land west of Minidoka Refuge sees limited waterfowl hunting use due to the non-retrieval rule on the Refuge (Bouffard 2009).

Locals are not forced to use the spillway area for hunting because the south side of Minidoka Refuge is open to waterfowl and upland bird hunting. Some private landowners allow goose hunting in their grain fields, and there are plenty of lands available outside this immediate area for deer and coyote hunting (Bouffard 2009).

Visitation

Visitation below the existing spillway cannot be definitively divided between fishermen, birders, and other visitors. Some visitors may be engaging in more than one activity. During the peak season between May 1 and mid-September, it is estimated that there are 10 to 12 people on weekdays and 15 to 25 people on weekend days parked at the existing spillway parking lot. There are typically few vehicles parked along the roads between the existing spillway parking lot and Bishop's Hole, which accounts for an estimated additional 6 to 10

people on weekdays and 9 to 20 people on weekend days. Some visitors periodically move around within the area (Bouffard 2009).

Access

Closures to public access below the existing spillway include a fence preventing public access to the dam and powerplant facilities from the area below the spillway. Pedestrians may access the existing spillway catwalk to reach the area below the spillway, or use the catwalk over the existing South Side Canal headworks to access the existing dike.

3.13.2 Environmental Consequences

This section includes impacts to water-based recreation, water-associated recreation, and mitigation for each alternative. Impacts for each alternative are differentiated by the geographic area they would affect in relation to the dam and spillway, and which recreationists would be affected within those geographic areas.

Methods for Evaluating Impacts

The following factors impact recreation visitation above and/or below Minidoka Dam and existing spillway: recreational fisheries; access to desirable reservoir, river, canal, or spillway locations; waterfowl or shorebird habitat; and boating access. Each of these factors will be evaluated according to the presence, absence, or alteration in quality anticipated under each alternative if any change is anticipated.

Impact Indicators

Many factors influence the quality and abundance of water and water-associated recreational use in and adjacent to the proposed action area including reservoir water levels, access to desired recreation activity locations, river and spillway area water levels related to safety, fishery productivity, user-conflicts, and others. Recreation impact indicators are determined by evaluating projected access availability and desirability of visitation in each geographic area for each popular activity under each alternative.

Impact indicators for recreation vary by location. If recreationists are not able to pursue recreational activities in what have been historically desirable locations, visitation would likely be displaced to other locations in proximity to the project. If no desirable locations are known to exist nearby, visitation likely would be displaced outside the general area.

The following impact indicators are used for this analysis of recreation effects:

- Above Minidoka Dam – Ability to ice fish offshore from the new spillway and switchyard; ability to bank fish Lake Walcott from the existing dike and new spillway catwalk.
- Below Minidoka Dam – Ability to fish below the powerplant on north and south sides of the river and North Side Canal; bird watch; and launch boats from both Minidoka Boat Ramp and the Bishop's Hole launch point.
- Below Minidoka Spillway – Ability to fish below the new spillway and in the South Side Canal and bird watch below the new spillway.

Alternative A – No Action

Recreation Above Minidoka Dam

Construction Impacts

There will be short-term impacts when routine maintenance activities cause construction closures to public access. Access closures to the Gravity Canal Road will close off parking at the south end of the existing spillway, access to the existing spillway catwalk, and the existing South Side Canal headworks catwalk to access the existing dike. These closures will result in short-term losses of the ability to ice fish above the existing spillway and to bank fish, observe birds, or pursue other recreational activities on Lake Walcott from the existing dike or spillway catwalk.

In addition to the reduction of choices of recreation activity locations during maintenance activities due to access closures, the quality of recreation experiences will potentially be diminished by construction-related impacts such as noise, dust, construction traffic, and displacement of aquatic or terrestrial species that would normally be present. These impacts will likely be intolerable to fishermen, birders, or others seeking solitude.

Operational Impacts

Under this alternative, use restrictions in 43 CFR Part 423 will be in place indefinitely. The applicable section of 43 CFR Part 423 which affects ice fishing above a spillway is Subpart 423.37 Winter Activities. This subpart states:

Section 423.37 – Winter Activities.

(a) You must not tow persons on skis, sleds, or other sliding devices with a motor vehicle or snowmobile, except that you may tow sleds designed to be towed behind snowmobiles

if joined to the towing snowmobile with a rigid hitching mechanism, and you may tow disabled snowmobiles by any appropriate means.

(b) You must not ice skate, ice fish, or ice sail within 300 yards of dams, power plants, pumping plants, spillways, stilling basins, gates, intake structures, or outlet works.

(c) You must comply with all other posted restrictions.

Under this subpart, ice fishing is not allowed on Lake Walcott within 300 yards of the spillway or switchyard where historic ice fishing occurs. Ice fishermen will be displaced either to the northeast where they will have to pay State Park entrance fees or go to other areas to ice fish.

See Appendix B – Figure 2–7 for the 300-yard zone where these use restrictions will be in effect under this alternative.

Recreation Below Minidoka Dam

Construction Impacts

The short-term impacts would be essentially the same as those described above under *Recreation Above Minidoka Dam* except that the impacts would occur below the existing spillway.

Operational Impacts

Under this alternative, use restrictions in 43 CFR Part 423 will be in place indefinitely. The applicable section of 43 CFR Part 423 which affects wading below a spillway is Subpart 423.36 Swimming. This subpart states:

Section 423.36 – Swimming

(a) You may swim, wade, snorkel, scuba dive, raft, or tube at your own risk in Reclamation waters, except:

(1) Within 300 yards of dams, power plants, pumping plants, spillways, stilling basins, gates, intake structures, and outlet works;

(2) Within 100 yards of buoys or barriers marking public access limits;

(3) In canals, laterals, siphons, tunnels, and drainage works;

(4) At public docks, launching sites, and designated mooring areas; or

(5) As otherwise delineated by signs or other markers.

(b) You must display an international diver down, or inland diving flag in accordance with State and U.S. Coast Guard guidelines when engaging in any underwater activities.

(c) You must not dive, jump, or swing from dams, spillways, bridges, cables, towers, or other structures.

Under this subpart, wading will not be allowed in the Snake River below Minidoka Dam. This will not displace fishermen or bird watchers because both activities are done from the bank or by walking on rocks, not by wading in the current of the river. The prohibition against swimming in Lake Walcott is unrelated to this subpart and will remain in place.

Recreation Below Minidoka Spillway

Construction Impacts

The short-term impacts would be essentially the same as those described above under *Recreation Above Minidoka Dam* except that the impacts would occur below the new spillway.

Operational Impacts

Under this alternative, the use restrictions in 43 CFR Part 423 will be in place indefinitely. The applicable section of 43 CFR Part 423 which affects swimming, tubing, and wading below the spillway is Subpart 423.36 Swimming. This subpart states:

Section 423.36 – Swimming

(a) You may swim, wade, snorkel, scuba dive, raft, or tube at your own risk in Reclamation waters, except:

(1) Within 300 yards of dams, power plants, pumping plants, spillways, stilling basins, gates, intake structures, and outlet works;

(2) Within 100 yards of buoys or barriers marking public access limits;

(3) In canals, laterals, siphons, tunnels, and drainage works;

(4) At public docks, launching sites, and designated mooring areas; or

(5) As otherwise delineated by signs or other markers.

(b) You must display an international diver down, or inland diving flag in accordance with State and U.S. Coast Guard guidelines when engaging in any underwater activities.

(c) You must not dive, jump, or swing from dams, spillways, bridges, cables, towers, or other structures.

Under this subpart, swimming, tubing and wading is not allowed in the area within 300 yards of the spillway. The prohibition against swimming in Lake Walcott is unrelated to this subpart and will remain in place.

Cumulative Impacts

No cumulative impacts to recreation are anticipated under the No Action alternative.

Alternative B – Spillway and Headworks Replacement

Recreation Above Minidoka Dam

Construction Impacts

Short-term impacts would primarily impact ice fishermen. Replacement of the North and South Side canal headworks would occur primarily during the non-irrigation season, which includes the December through March ice fishing season, so construction would potentially detract from the quality of the ice fishing experience for those visitors desiring a tranquil setting. Some ice fishermen would go to other reservoirs, such as American Falls, rather than fish off shore from the switchyard in proximity to headworks construction.

Construction of the new spillway would have only minor impacts on Lake Walcott visitors, most of whom would readily find alternative locations for recreational activities in other areas around Lake Walcott. Park visitors in the day use area at the southern corner of the park would be exposed to any noise and disturbance generated at the staging areas north of the North Side Canal, adjacent to the switchyard.

Operational Impacts

The new spillway would be permanently closed to public access. This would affect the various recreationists who currently use the existing spillway catwalk and ladders. Ice fishermen would not be able to go over the new spillway to get to the ice. There is no legal public access to the unimproved vehicle tracks south of the South Side Canal, so fishermen may not be able to go around the existing dike to get to the area above the new spillway to ice fish. Fishermen would no longer be able to fish Lake Walcott from the new spillway. Birders and other recreationists would not be able to use the new spillway catwalk to improve their views of Lake Walcott.

Title 43 CFR Part 423, as discussed in the Chapter 2, Section 2.2, states that “you must not ice skate, ice fish, or ice sail within 300 yards of dams, power plants, pumping plants, spillways, stilling basins, gates, intake structures, or outlet works.” While not a part of this

project, the designation of a Special Use Area is being evaluated in order to allow ice fishing in locations of historic use. In the proposed Special Use Area, ice fishing would be allowed within 300 yards of dam facilities except within buoy lines in front of the new radial gates, both new canal headworks, and powerplant intakes as shown in (Appendix B – Figure 2–6).

The Minidoka Refuge prohibits motorized travel over the ice and there would be no access to the ice over the new spillway, so ice fishermen would have to walk between 0.9 and 1.7 miles across the ice from parking areas in the State Park near the switchyard in order to ice fish above the new spillway. It is anticipated that most ice fishermen would park in the State Park and either ice fish offshore from the switchyard or in the cove near the boat ramp. Some people would go elsewhere to ice fish.

The public would not have access to the new South Side Canal headworks catwalk to access bank fishing on the existing dike. There is no legal public access to the unimproved vehicle tracks south of the South Side Canal, so fishermen have no guarantee that access to the existing dike will continue in the future.

Overall, the loss of access to the new spillway catwalk, South Side Canal headworks catwalk, and the existing dike would not significantly reduce visitation above the dam where the vast majority of visitation in the Lake Walcott area occurs. These alterations in access would, however, shift recreation use areas to the northeast, away from the new spillway and both the existing and new dikes. Ice fishermen would have to walk further to disperse themselves, and bank fishermen would not be able to fish off the new dike. The quality of the available recreation experiences in alternative areas above the dam after construction would be similar to those now available.

Recreation Below Minidoka Dam

Construction Impacts

The construction zone closure would temporarily stop public access to some of the south side of the North Side Canal. The portion of the canal that is currently available to the public is neither popular nor very productive, so the impact of this closure is minimal.

Some of the visitation on the north side of the river would be displaced to other locations in avoidance of the noise and traffic of construction operations. Visitors to the north side of the river who prefer access on paved roads, ease of navigation from the highway, and/or close proximity to the State Park would likely continue to visit the north side of the river.

Recreational visitation along the river may be reduced in the short term in response to the difficulty of recreational access on the south side of the river, construction traffic on the north side of the river, and the increase in visitation density in the remaining desirable locations open during the closure of the construction zone.

Overall, construction would have little impact on visitors below the dam, aside from birders who would potentially be unable to view some avian species that would avoid the area, visitors who dislike recreating near a haul route, and fishermen who would normally have accessed the south side of the river via the existing spillway catwalk.

Operational Impacts

Long-term impacts to recreational activities on the north side of the river would be minimal. Pedestrian access to the south side of the river would be significantly more difficult due to lack of access along the new spillway catwalk for those who cannot boat upstream to fish.

Since the majority of visitation occurs on the north side of the river, the loss of access to the new spillway catwalk would not significantly reduce visitation below the dam. Long-term impacts would be significant to birders if the diversity of the avian community in the area was not reestablished after construction.

The quality of recreational experiences below the dam would be similar to current experiences.

Recreation Below Minidoka Spillway

Construction Impacts

Closure of the construction zone would prevent fishing in the South Side Canal within approximately 1,400 feet of the headworks, thus making fishing success in the canal unlikely. Gravity Canal Road would be a haul road for construction, so fishing the canal near the construction zone would be neither safe nor desirable.

The construction zone closure would also prevent fishermen from accessing the most popular pools below the new spillway. Flows through the new spillway would be rerouted during construction, so some pools might only have water intermittently during construction. Fishing the lower pools outside the construction zone would potentially be unproductive if fish were no longer in the pools, so some fishermen would go elsewhere to fish.

The quality of recreation experiences below the new spillway would potentially be diminished by an increase in visitor density in those desirable locations not included in the construction zone. Some visitors would tolerate being more crowded, but others would go elsewhere to recreate. It is expected that there would be a temporary reduction in visitation below the new spillway because visitors would not be able to go to the most popular locations during construction. The reduction in visitation to the area below the new spillway is likely to be greater than construction related visitation reductions in the other areas around the project.

Access to key birding observation points off Gravity Canal Road would be closed during construction, but the Bishop's Hole Road would remain open. The desirability of birding in the area would be adversely affected if any of the species displaced by construction included those species birders most wish to view (see Section 3.7 Terrestrial Biota for additional information on impacts to avian species).

Overall, construction of the new spillway would have more impact on visitors below the new spillway than on visitors below the dam or on Lake Walcott.

Operational Impacts

All travel between the Bishop's Hole Road and the new spillway would be on foot, with the exception of a vehicle route from the Bishop's Hole Road to a new parking area near the south end of the bridge. The new spillway parking areas would no longer exist, but the new parking area at the bridge would more than meet existing demand in the area. Although it would be a longer walk than it was from the existing spillway parking area, fishermen would still have access to the South Side Canal.

The new parking area and resurfaced bridge would provide new recreational opportunities to people with disabilities and others who would have avoided the area below the spillway because of difficult pedestrian access over uneven terrain.

The new spillway structure would be permanently closed to public access, but the bridge would accommodate continued public use of the area north of the discharge channel of the new radial gates. Thus, fishermen would have the unique opportunity to fish both sets of new radial gates from immediately below the outflow points.

Enhanced fish habitat created during excavation for the installation of the new radial gates, in concert with the new piped spillway flows, may improve the quality of fishing below the new spillway. Improved access to improved fishing opportunities would likely increase visitation to the area below the new spillway in the long run.

Title 43 CFR Part 423 as referenced in Chapter 2, Section 2.2 states that "you may swim, wade, snorkel, scuba dive, raft, or tube at your own risk in Reclamation waters… except within 300 yards of dams, powerplants, pumping plants, spillways, stilling basins, gates, intake structures, and outlet works." These activities would be particularly dangerous in the discharge channels below the new radial gates. While not a part of the spillway replacement project, the evaluation of a proposed Special Use Area is included in this document in order to allow wading and float tubing associated with fishing and birding in specific locations of historic use within 300 yards of dam facilities, labeled the "300 yard zone," in Appendix B – Figure 2–7. This Special Use Area would not affect the swimming closure already in effect on Lake Walcott.

Alternative C – Spillway Replacement

Recreation Above Minidoka Dam

Construction Impacts

Short-term impacts would be the same as those of Alternative B, except that ice fishermen and visitors to the southwest corner of the State Park and the area offshore from it would not be affected by construction activities associated with the North Side Canal headworks replacement or staging areas north of the North Side Canal.

Operational Impacts

Long-term impacts would be the same as those of Alternative B.

Recreation Below Minidoka Dam

Construction Impacts

Short-term impacts would be the same as those of Alternative B.

Operational Impacts

Long-term impacts would be the same as those of Alternative B.

Recreation Below Minidoka Spillway

Construction Impacts

Short-term impacts would be the same as those of Alternative B.

Operational Impacts

Long-term impacts would be the same as those of Alternative B.

3.13.3 Cumulative Impacts

Implementation of the Minidoka North Side RMP (Reclamation 2004a) would provide improved habitat quality as well as enforcement and control of ad hoc camping and off-road vehicle use to protect soils and vegetation.

Implementation of IDFG's Fisheries Management Plan 2007-2012 would stock and monitor game fish species in Lake Walcott and downstream of Minidoka Dam.

The DEQ's Lake Walcott subbasin TDML plan implementation is intended to improve water quality, which would benefit fisheries.

Reclamation's Proposed Action would benefit fisheries with a reduction in the length of the Lake Walcott drawdown time, deeper flows being piped through the new spillway, and improved fish habitat in the new radial gate pool.

Implementation of the above plans should collectively enhance aquatic habitats above and below Minidoka Dam and new spillway, thereby improving the quality of recreational fishing.

3.13.4 Mitigation

During construction, signs may be posted with maps showing the availability of recreation opportunity alternatives outside the construction zone.

3.14 Aesthetics

3.14.1 Affected Environment

Minidoka Dam is a combined diversion, storage, and power structure located on the main stem Snake River approximately 10 miles northeast from the city of Rupert, Idaho. Minidoka Dam was constructed using methods consistent with building materials such as large boulders and poured-in-place concrete piers. The existing Minidoka Dam design and construction includes an earthfill and rockfill embankment structure consisting of the main embankment dam, North Side and South Side canal headworks, Minidoka Powerplant, Inman Powerplant intake, a controlled section comprised of three large radial gates, concrete overflow spillway made of 292 flashboard bays, and a dike on the south end. The main embankment dam has a structural height of 86 feet, crest length of 670 feet, and a crest width of 25 feet. A 3-foot-high concrete parapet wall on the upstream crest shoulder provides additional freeboard for splash during high winds. The upstream half of the main embankment dam is composed of earth and gravel fill, with a concrete facing layer on the upstream face; the downstream half is composed of rockfill.

Constructed in 1906 as part of the Minidoka Project, Minidoka Dam typifies construction practices of the period. The existing spillway is in poor condition with numerous highly weathered areas, cracks, and surface spalling. The concrete piers of this structure are also deteriorating as a result of alkali aggregate reaction and freeze thaw cycles. Also, several of the stoplog piers have exposed reinforcement steel.

In the area below the existing spillway the flows spread out creating a large wetland area intermixed with rock and shallow soils which supports a variety of aquatic plants. Cottonwood trees, sagebrush, and cheatgrass dominate the cover on the peninsula immediately west of the dam which is typically always above the existing spillway channel flows. The high waterline is generally identified with various riparian species such as cattail and willow.

3.14.2 Environmental Consequences

Methods of Evaluating Impacts

Aesthetics relates to the pleasurable characteristics of a physical environment as perceived through the five senses of sight, sound, smell, taste, and touch.

The basic visual elements of sight are form, line, color, and texture which result in varying levels of visual contrast. Modifications in a landscape that repeat the landscape's basic visual elements are said to be in harmony with their surroundings. Modifications in a landscape that do not harmonize often look out of place and are said to contrast in unpleasing ways. In analyzing visual contrast, the assumption is made that the less a structure attracts one's attention, the less visually intrusive the structure is in the environment.

Sounds heavily influence the aesthetic appeal of a site if they include noises that are intolerable to some visitors. Examples of construction noise that many people find intolerable include engine noises, metal scraping on or hitting metal, pile drivers, jack hammers, and blasting. Noise is analyzed in depth in Section 3.15 Noise, so sound will be acknowledged only cursorily in this analysis.

Odors are very subjective. Each individual has his own opinion about what odors are intolerable. Some people cannot tolerate the smell of diesel or gas fumes associated with construction equipment. Others cannot tolerate the smell of stagnant water. Therefore, anticipated odors will be considered in this evaluation of impacts to aesthetics.

Flavors are often associated with odors. The odors anticipated as a result of the proposed action, such as diesel fumes, are not associated with flavors, so the sense of taste will not be included in the evaluation of impacts to aesthetics.

Touching the new spillway, either of the headworks and or the radial gates will not be an integral part of most visitor experiences, so touch will not be used to evaluate the aesthetic values of the alternatives.

Therefore, the senses of sight, sound, and smell, but not taste and touch, will be used to evaluate the relative aesthetic merits of the alternatives.

Impact Indicators

Adverse visual impacts are modifications to the environment that interrupt the visual character of the landscape or disrupt the harmony of the basic visual elements. Elements in a project that have contrast are those that are unlike or in opposition to the forms, lines, colors, and textures in the native landscape. Therefore, the visual impact of a project is rated based on the relative contrast it would have to the landscape compared to the unmodified landscape. Greater visual contrasts will result in impacts more adverse to the aesthetic quality of the setting.

Sounds that are intolerable to some visitors would result in adverse impacts to the aesthetic quality of the spillway area. Since all alternatives will result in similar sound impacts, the duration of these impacts will be the relative audible impact indicator.

Odors that are intolerable to some visitors would also result in adverse impacts to the quality of the aesthetic setting of the spillway area. Again, since all alternatives will result in similar olfactory impacts, the duration of these impacts will be the relative olfactory impact indicator.

Alternative A – No Action

Construction Impacts

There will be short-term impacts associated with construction periodically required to maintain and replace portions of the existing spillway and both headworks. During these construction periods, the basic visual elements of these structures will have even greater visual contrast with the surrounding environment due to equipment extending above or in front of the structures, depending on one's observation point. Some of this equipment may be brightly or darkly colored, present diagonal lines, and/or in motion, either of which would further add to the existing visual contrast, diverging sharply from the intricate texture created by the linear mosaic of rectangles along the existing spillway, thus adding to the overall visual impact.

During these periods of construction there will be adverse impacts to the aesthetic appeal of the area surrounding the existing spillway due to the noise of equipment and odors from the fuels used to run the equipment. As these construction efforts occur with increasing frequency and duration due to the aging of the existing spillway, the total duration of the sum of periodic short-term construction will eventually exceed the time required to replace the whole existing spillway in one project. When this occurs, the construction impacts to aesthetics will exceed those of either of the action alternatives.

Operational Impacts

As seen from below, the overall form of the existing spillway is a horizontal series of tall rectangles made up of vertical piers and their shadows, topped with smaller rectangles made up of existing stoplogs, open space, the walkway, and walkway railings. As seen from above, the form is essentially the same, although the majority of the vertical component of the piers is not visible below the water line, and therefore, not visible when the water level is high.

The unmodified landscape in the surrounding area is composed of low hills vegetated primarily with sagebrush and native grasses, dotted with occasional darker rocky outcrops. The complex texture of geometric forms in linear alignment, with light concrete and metallic hues of the existing spillway and headworks structures presents significant visual contrast with the unmodified landscape. This series of rectangles, viewed from either above or below the existing spillway, creates a horizontal line generally following the horizon which is broken, and therefore creates additional contrast, wherever it changes direction or is interrupted by existing radial gates, headworks, powerplant, dike, or the dam. Due to significant visual contrast with the unmodified landscape, the existing spillway and headworks structures constitute a significant visual impact to aesthetic values in the spillway area.

During normal operations, auditory and olfactory impacts are negligible, and therefore do not contribute to adverse impacts to aesthetic values in the spillway area.

Alternative B – Spillway and Headworks Replacement

Construction Impacts

Visual, auditory, and olfactory impacts during the construction period would be similar to those of the No Action Alternative, although they would be concentrated in a shorter overall time period and therefore likely more intense over their duration. The sum of the months of construction is likely to be less for this alternative than for the No Action Alternative, so the overall impact to aesthetic values would be less than that of the No Action Alternative.

Operational Impacts

As seen from below, the overall form of the new spillway would be a horizontal band of roller compacted concrete that would be much cleaner visually than the existing spillway structure. While it would be topped with small rectangles made up of the walkway and its railings, these rectangles would not have the heavy shadows and contrasting existing stoplogs of the existing structure (see Chapter 2, Photographs 2–2 and 2–3). As seen from above, the form would be essentially the same simple structure, although most of the band of concrete would be below the water line during the irrigation season.

The new spillway would not have the complexity of form, line, color (shadows), and texture present in the existing spillway, and would therefore create less visual contrast with the unmodified landscape than the No Action alternative. The new radial gates would attract the attention of the viewer as a break in the clean lines of the new spillway, thereby offsetting the reduction of contrast created by reducing the number of changes in direction the new spillway would contain. Given the overall reduction in visual contrast afforded by the simplicity of design in the new spillway, this alternative would have less visual impact on aesthetic values than the No Action alternative.

During normal operations, auditory and olfactory impacts are negligible, and therefore do not contribute to adverse impacts to aesthetic values in the spillway area.

Alternative C – Spillway Replacement

Construction Impacts

Impacts to aesthetic values would be the same as those of Alternative B except that neither of the existing headworks would be replaced, so the construction period, and therefore the level of impacts to aesthetics, would be reduced.

Operational Impacts

Impacts to aesthetic values would be the same as those of Alternative B. Although neither of the existing headworks would be replaced, it is assumed that the visual contrast of the existing headworks would be comparable to that of the replacement headworks proposed in Alternative B.

3.14.3 Cumulative Impacts

No cumulative impacts have been identified under any of the alternatives for this resource.

3.14.4 Mitigation

No mitigation would be required.

3.15 Noise

This section defines noise, describes the existing noise setting in the proposed action area, and identifies potential sensitive receptors. It then evaluates the effects of the construction noise on sensitive human noise receptors, and identifies mitigation measures to minimize these impacts.

3.15.1 Affected Environment

Noise is defined as unwanted sound that is objectionable because it is disturbing or annoying due to its pitch or loudness. Pitch is the height or depth of a tone or sound. Higher pitched signals sound louder to humans than sounds with a lower pitch. Loudness is intensity of sound waves combined with the reception characteristics of the ear.

A decibel (dB) is a unit of measurement that is used to indicate the relative amplitude of a sound. Sound levels in decibels are calculated on a logarithmic scale. Subjectively, each 10-decibel increase in sound level is generally perceived as approximately a doubling of loudness. Technical terms are defined in Table 3-17.

Table 3-17. Noise terminology (Illingworth and Rodkin 2006).

Term	*Definition*
Decibel, dB	A unit describing the amplitude of sound, equal to 20 times the logarithm to the base 10 of the ratio of the pressure of the sound measured to the reference pressure, which is 20 micropascals (20 micronewtons per square meter).
Frequency, Hz	The number of complete pressure fluctuations per second above and below atmospheric pressure.
A-Weighted Sound Level, dBA	The sound pressure level in decibels as measured on a sound level meter using the A-weighting filter network. The A-weighting filter de-emphasizes the very low and very high frequency components of the sound in a manner similar to the frequency response of the human ear and correlates well with subjective reactions to noise. All sound levels in this report are A-weighted, unless reported otherwise.
L_{01}, L_{10}, L_{50}, L_{90}	The A-weighted noise levels that are exceeded 1, 10, 50, and 90 percent of the time during the measurement period.
Equivalent Noise Level, L_{eq}	The average A-weighted noise level during the measurement period.
Community Noise Equivalent Level, CNEL	The average A-weighted noise level during a 24-hour day, obtained after addition of 5 decibels in the evening from 7:00 p.m. to 10:00 p.m. and after addition of 10 decibels to sound levels measured in the night between 10:00 p.m. and 7:00 a.m.
Day/Night Noise Level, L_{dn}	The average A-weighted noise level during a 24-hour day, obtained after addition of 10 decibels to levels measured in the night between 10:00 p.m. and 7:00 a.m.
L_{max}, L_{min}	The maximum and minimum A-weighted noise level during the measurement period.
Ambient Noise Level	The composite of noise from all sources near and far. The normal or existing level of environmental noise at a given location.
Intrusive	That noise which intrudes over and above the existing ambient noise at a given location. The relative intrusiveness of a sound depends on its amplitude, duration, frequency, and time of occurrence and tonal or informational content as well as the prevailing ambient noise level.

There are several methods of characterizing sound. The most common is the A-weighted sound level or dBA. This scale gives greater weight to the frequencies of sound to which the human ear is most sensitive. Representative outdoor and indoor noise levels in units of dBA are shown in

Table 3-18. Most commonly, environmental sounds are described in terms of an average level that has the same acoustical energy as the summation of all the time-varying events. This energy-equivalent sound/noise descriptor is called Leq. The most common averaging period is hourly, but Leq can describe any series of noise events of arbitrary duration.

Table 3-18. Representative outdoor and indoor noise levels (in units of dBA) (Illingworth and Rodkin 2006; USDOT FHA 2006a).

At a Given Distance from Noise Source	*A-Weighted Sound Level in Decibels*	*Noise Environments*	*Subjective Impression Effect*
	— 140 —		
Civil Defense Siren (100')	— 130 —		
Jet Takeoff (200')	— 120 —		Pain Threshold
	— 110 —	Rock Music Concert	
Diesel Pile Driver (100')	— 100 —		Very Loud Hearing Damage After 15 Minutes Exposure
	— 95 —		Repeated Exposure Risks Permanent Hearing Loss
Heavy truck (50’)	— 90 —	Boiler Room	Very Annoying Hearing damage (8 hrs)
Freight Cars (50')		Printing Press Plant	
Pneumatic Drill (50')	— 80 —		Annoying, Intrusive Interferes With Conversation
Freeway (100')		In Kitchen With Garbage Disposal Running	
Vacuum Cleaner (10')	— 70 —		Moderately Loud Intrusive, Interferes with Telephone Conversation Noise Begins To Harm Hearing
		Data Processing Center	
Air conditioning unit (20’)	— 60 —		Intrusive
		Department Store	
Light Traffic (100')	— 50 —		
Large Transformer (200')		Private Business Office	
	— 40 —		Quiet
		Quiet Bedroom	
Soft Whisper (5')	— 30 —		Very Quiet
		Recording Studio	
	— 20 —		
	— 10 —		Threshold of Hearing
	— 0 —		

Since the sensitivity to noise increases during the evening and at night – because excessive noise interferes with the ability to sleep – 24-hour descriptors have been developed that incorporate artificial noise penalties added to quiet-time noise events. The Community Noise Equivalent Level (CNEL) is a measure of the cumulative noise exposure in a community, with a 5 dB penalty added to evening (7:00 p.m. to 10:00 p.m.) and a 10 dB addition to nocturnal (10:00 p.m. to 7:00 a.m.) noise levels. The Day/Night Average Sound Level, Ldn, is essentially the same as CNEL, with the exception that the evening period is dropped and all occurrences during this 3-hour period are grouped into the daytime period.

Blasting may be required as part of the construction process. The two primary environmental effects of blasting are airborne noise and groundborne vibration. A brief discussion of each of these effects and standards commonly used to assess the impacts of blasting follows.

Airblast

Energy released in an explosion creates an air overpressure (commonly called an airblast) in the form of a propagating wave. If the receiver is close enough to the blast, the overpressure can be felt as the pressure front of the airblast passes. The accompanying booming sound lasts for only a few seconds.

Because an airblast lasts for only a few seconds, use of Leq (a measure of sound level averaged over a specified period of time) to describe blast noise is inappropriate. Airblast is properly measured and described as a linear peak air overpressure (i.e., an increase above atmospheric pressure) in pounds per square inch (psi). Modern blast monitoring equipment is also capable of measuring peak overpressure data in terms of unweighted dB. Decibels, as used to describe airblast, should not be confused with or compared to dBA, which are commonly used to describe relatively steady-state noise levels. An airblast with a peak overpressure of 130 dB can be described as being mildly unpleasant, whereas exposure to jet aircraft noise at a level of 130 dBA would be painful and deafening.

Ground Vibration

Blasting creates seismic waves that radiate along the surface of the earth and downward into the earth. These surface waves can be felt as ground vibration. Airblast and ground vibration can result in effects ranging from annoyance of people to damage of structures. Varying geology and distance will result in different vibration levels containing different frequencies and displacements. In all cases, vibration amplitudes and high frequency content will decrease with increasing distance from the blasting source.

As seismic waves travel outward from a blast, they excite the particles of rock and soil through which they pass and cause them to oscillate. The actual distance that these particles move is usually only a few ten-thousandths to a few thousandths of an inch. The rate or

velocity (in inches per second) at which these particles move is the commonly accepted descriptor of the vibration amplitude, referred to as the peak particle velocity (ppv).

Human Response to Airblast and Vibration

Human response to blast vibration and airblast is difficult to quantify. Vibration and airblast can be felt or heard well below the levels that produce any damage to structures. The duration of the event has an effect on human response, as does blast frequency. Blast events are relatively short, on the order of several seconds for sequentially delayed blasts. Generally, as blast duration and vibration frequency increase, the potential for adverse human response increases. Studies have shown that a few blasts of longer duration will produce a less adverse human response than short blasts that occur more often. Table 3-19 summarizes the average human response to vibration and airblast that may be anticipated when a person is at rest in quiet surroundings. If the person is engaged in any type of physical activity, the level required for the responses indicated is increased considerably. It is important to understand that the foregoing describes the responses of average individuals. Individual responses can fall anywhere within the full range of the human response spectrum. At one extreme are those people who receive some tangible benefit from the blasting operation and probably would not be disturbed by any level of vibration and airblast, as long as it does not damage their property. At the opposite extreme are people who would be disturbed by even barely detectable vibration or airblast. Individuals at either of these two extremes were not considered in the listing of average human response or in the impact conclusions that follow.

Table 3-19. Human response to airblast and ground vibration from blasting.

Response	Ground Vibration Range ppv (inches per second)	Airblast Range (dB)
Barely to distinctly perceptible	0.02–0.10	50–70
Distinctly perceptible to strongly perceptible	0.10–0.50	70–90
Strongly perceptible to mildly unpleasant	0.50–1.00	90–120
Mildly unpleasant to distinctly unpleasant	1.00–2.00	120–140
Distinctly unpleasant to intolerable	2.00–10.00	140–170

Effects of Noise

Hearing Loss

Acoustic trauma is injury to the hearing mechanisms in the inner ear due to very loud noise. While physical damage to the ear from an intense noise impulse is rare, hearing loss can occur due to chronic exposure to excessive noise, but may be due to a single event such as an explosion. Natural hearing loss associated with aging may also be accelerated from chronic exposure to loud noise. The Occupational Safety and Health Administration (OSHA) have a noise exposure standard that is set at the noise threshold where hearing loss may occur from

long-term exposures. Under OSHA noise exposure standards, hearing conservation measures become mandatory at 85 dBA for an 8-hour day and feasible engineering or administrative noise controls are required when exposures exceed 90 dBA. The maximum allowable level is 90 dBA, averaged over 8 hours. If the noise is above 90 dBA, the allowable exposure time is correspondingly shorter.

Sleep and Speech Interference

The thresholds for speech interference indoors are about 45 dBA if the noise is steady and above 55 dBA if the noise is fluctuating. Outdoors the thresholds are about 15 dBA higher. Steady noise of sufficient intensity (above 35 dBA) and fluctuating noise levels above about 45 dBA affect sleep.

Annoyance

Attitude surveys determined that the causes for annoyance include interference with speech, radio and television, house vibrations, and interference with sleep and rest. When the Ldn is 60 dBA, approximately 10 percent of the population is believed to be highly annoyed. Each decibel increase to 70 dBA adds about two percentage points to the number of people highly annoyed. Above 70 dBA, each decibel increase results in about a three percent increase in the percentage of the population highly annoyed.

Fundamentals of Groundbourne Vibration

Vibration is sound radiated through the ground. The rumbling sound caused by the vibration of room surfaces is called groundborne noise. The ground motion caused by vibration is measured as particle velocity in inches per second and in the United States is referenced as vibration decibels (VdB).

Construction vibrations can either be transient, random, or continuous. Transient construction vibrations occur from blasting, impact pile driving, and wrecking balls. Continuous vibrations result from vibratory pile drivers, large pumps, and compressors. Random vibration can result from jack hammers, pavement breakers, and heavy construction equipment

The background vibration velocity level in residential areas is usually around 50 VdB. The vibration velocity level threshold of perception for humans is approximately 65 VdB. A vibration velocity level of 75 VdB is the approximate dividing line between barely perceptible and distinctly perceptible levels for many people. Most perceptible indoor vibration is caused by sources within buildings such as operation of mechanical equipment, movement of people, or the slamming of doors. Typical outdoor sources of perceptible groundborne vibration are construction equipment, steel-wheeled trains, and traffic on rough roads. If a roadway is smooth, the groundborne vibration from traffic is rarely perceptible. The range of interest is from approximately 50 VdB, which is the typical background

vibration velocity level, and 100 VdB, which is the general threshold where minor damage can occur in fragile buildings. Construction activities can generate groundborne vibrations, which can pose a risk to nearby structures. Constant or transient vibrations can weaken structures, crack facades, and disturb occupants. The general human response to different levels of groundborne vibration velocity levels is described in Table 3-20.

Table 3-20. Human response to groundborne vibration velocity levels (USDOT FTA 2006b).

Vibration Velocity Level	Human Reaction
65 VdB	Approximate threshold of perception for many people.
75 VdB	Approximate dividing line between barely perceptible and distinctly perceptible. Many people find that transportation-related vibration at this level is unacceptable.
85 VdB	Vibration acceptable only if there are an infrequent number of events per day.

Existing Noise Levels

Minidoka Dam is located in a primarily rural, agricultural area. Sensitive receptors for noise can be defined as people at various locations who are participating in activities for which low noise levels are important (e.g., activities conducted at residences, hospitals, schools, libraries, recreational areas, and places of worship). Sensitive noise receptors near Minidoka Dam include the park, refuge, and nearby residences. Noise sources in the reservoir area outside the immediate areas of the park and dam are predominantly natural, including insects, birds, wind, flowing water, and weather. Accordingly, existing ambient noise levels are low. Background noise levels in wilderness and rural areas typically range between 35 and 45 dBa. The primary sources of noise in the park, rural residential, and agricultural areas include roadway traffic, and boating and farm machinery on a seasonal basis. Background noise levels are approximately 40 dBA in rural residential areas and 45-dBA in agricultural cropland with equipment operating. The park is located upstream of the construction zones adjacent to the reservoir approximately 400 feet from the North Side Canal headworks and approximately 4,000 feet from the South Side Canal headworks. The closest private residences are downstream of the construction zone about 1,000 feet on the south side of the river and 2,600 feet on the north side of the river.

3.15.2 Environmental Consequences

The potential noise impact associated with the spillway, with or without the Proposed Action, is the temporary disturbance resulting from noise generated by equipment and machinery used during construction.

Construction hours will likely range from 8 to 12 hours per day; 24/7 work days are not anticipated. Therefore, only daytime impacts are described.

There are no Federal noise regulations pertaining to the proposed action. However, the Federal Transit Administration (FTA) provides vibration impact thresholds for sensitive buildings such as residential land uses. The threshold for infrequent activity (fewer than 70 events per day) is 80 VdB at residences and buildings where people normally sleep. The threshold for frequent activity (more than 70 events per day) is 72 VdB at residences and buildings where people normally sleep.

Noise levels associated with pieces of construction equipment at various distances are shown in Table 3-21. The highest level of noise would be generated by an impact pile driver, 89 dBA at 100 feet (Table 3-21).

Table 3-21. Estimated construction equipment noise levels (Dba) and distances.

		Equipment	25 Feet	50 Feet	100 Feet	200 Feet
Equipment Powered by Internal Combustion Engines	Earthmoving	Compactors (Rollers)	80	74	68	62
		Front Loaders	85	79	73	67
		Backhoes	91	85	79	73
		Tractors	91	85	79	73
		Graders	91	85	79	73
		Scrapers	94	88	82	76
		Pavers	95	89	83	77
		Trucks	97	91	85	79
	Materials Handling	Concrete Pumps	82	76	70	64
		Cranes (Derrick)	82	76	70	64
		Cranes (Movable)	89	83	77	71
		Concrete Mixers	91	85	79	73
	Stationary	Pumps	82	76	70	64
		Generators	82	76	70	64
		Compressors	87	81	75	69
Impact Equipment		Pneumatic Wrenches	91	85	79	73
		Jack Hammers and Rock Drills	94	88	82	76
		Pile Drivers (Peaks)	107	101	95	89
Other		Vibrator	82	76	70	64
		Saws	84	78	72	66

Section 24 of Reclamation's Safety and Health Standards (RSHS) provides general requirements for blasting operations. Section 24.1.8 Vibration and Damage Control requires precautions be taken to minimize earth vibration, air blast, and thrown fragments. Where vibration and blast damage is possible, a vibration and damage control section is to be included in the site blasting plan. A method of accurately measuring and documenting earth vibration and effects on nearby facilities or structures are to be established. The maximum peak particle velocity as recorded at the designated structure or location must not exceed 1

inch per second. The airblast is to be controlled so that it does not exceed 128 decibel linear-peak at designated locations or structures.

In addition to the items required by RSHS Section 24.1.3, the Blasting Plan will include the following measures to assure those in the area of Minidoka Dam are aware of the blasting operations and the peak limits for blasting are not exceeded:

- Notification of the date and time of blasting will be provided no less than 10 days in advance of commencing any blasting work to nearby residents, local law enforcement, newspapers, and sensitive receptors located within 1,000 feet of blasting including the refuge and park.
- Pre-blast alarms will be sounded. Immediately before blasting, the construction contractor will be required to sound a signal announcing the blast. Construction contractors will follow the construction safety plan that will provide for these measures.
- Best available practices will be employed to limit airblast from blasting to 128 dB and vibration to less than 1 inch per second at the nearest noise sensitive land uses.
- Noise and vibration monitoring will be performed at nearby residences and sensitive receptors to ensure that airblast from blasting is limited to 128 dB and that vibration is limited to less than the 1 inch per second criteria.

Equipment used during construction of the proposed action would create temporary groundborne vibration, also. Typical groundborne vibration levels from various pieces of construction equipment are shown in Table 3-22. At 95 feet away, the highest level of groundborne VdB, would be the 75 VdB generated by bulldozers.

Table 3-22. Vibration source levels for construction equipment.

Construction Equipment	Approximate VdB				
	25 Feet	50 Feet	60 Feet	75 Feet	100 Feet
Large Bulldozer	87	81	79	77	75
Loaded Trucks	86	80	78	76	74
Jackhammer	79	73	71	69	67
Small Bulldozer	58	52	50	48	46

American National Standards Institute (ANSI) Section A10.46-2007, Hearing Loss Prevention in Construction and Demolition Workers, applies to all construction and demolition workers with potential noise exposures (continuous, intermittent, and impulse) of 85 dBA and above.

Noise impacts would be considered significant if the project would:

- Expose persons to or generate noise levels in excess of established standards;

- Expose persons to or generate excessive groundborne vibration or groundborne noise levels;
- Cause a substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project; and/or
- Cause a substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project.

Alternative A – No Action

The No Action alternative will leave the existing spillway and headworks in their present configuration. As the concrete in the spillway and headworks continues to deteriorate, maintenance requirements will increase. While details and timing of the increased concrete work are unknown, some potential impacts are described below.

Construction Impacts

Deterioration of the existing spillway concrete will likely necessitate a program of pier replacement. The pier replacement program will involve ongoing replacment of piers to maintain the existing spillway in a usable condition. The ongoing maintenance period will likely last a few weeks to months. As shown in Table 3-21, typical noise levels of individual pieces of construction equipment range from of 80 to 107 dBA at a distance of 25 feet, and 62 to 89 dBA at a distance of 200 feet. Noise levels associated with this activity will vary depending on the numbers and types of equipment used.

Maintenance requirements for the headworks will also continue to escalate. At some point, annual concrete repairs on the headworks will also become necessary. These repairs will continue until the headworks reached the end of their service life and full replacement became necessary. The ongoing repair/replacement period will likely last a few weeks to months. Noise levels for repairs and or replacement will depend on the construction method selected and the pieces of equipment used. Noise levels from all construction zone activities will have attenuated to acceptable levels at the park and private residences.

Equipment used for the pier replacement will also create temporary groundborne vibration. Typical groundborne vibration levels from various pieces of construction equipment are shown in Table 3-22. As shown in the table, at 100 feet away, the highest level of groundborne vibration would be 75 VdB generated by bulldozers working within the construction zone. Vibration levels from all construction zone activities will have attenuated to acceptable levels at the park and private residences.

Noise impacts associated with construction of this alternative will be temporary and less than significant.

Operational Impacts

Noise levels will be the same as current condition; therefore, there will be no impact.

Alternative B – Spillway and Headworks Replacement

Construction Impacts

Replacement of the spillway and headworks would take approximately 31 months and require the use of construction equipment such as trucks, cranes, generators, and pumps. The engines and motors associated with the equipment would temporarily elevate noise levels in the construction zones, the park, the reservoir, and potentially the residences in close proximity to the site. As shown in Table 3-21, typical noise levels of individual pieces of construction equipment range from of 80 to 107 dBA at a distance of 25 feet, 62 to 89 dBA at a distance of 200 feet. Noise levels from all construction zone activities would have attenuated to acceptable levels at the park and private residences.

It is anticipated that blasting would be required to remove rock for the foundation of the new radial gated section. In addition, blasting would be required to improve the channel upstream and downstream of the structure. Also, blasting may be required to remove rock from the upstream side of the new North Side Canal headworks radial gates and the new South Side Canal headworks radial gates in preparation for the installation of and to provide footing for these gates. These blasting operations would be conducted mostly on the dry rock surface. Compliance with RSHS blasting requirements will assure blast noise and vibration at the park and private residences are less than significant, if any.

Equipment used for replacement of the spillway and headworks would also create temporary groundborne vibration. Typical groundborne vibration levels from various pieces of construction equipment are shown in Table 3-22. At 100 feet away, the highest level of groundborne vibration would be 75 VdB generated by bulldozers working within the construction zone. Vibration levels from all construction zone activities would have attenuated to acceptable levels at the park and private residences.

Homes or occupied buildings less than 100 feet from any uneven, rough, or unpaved roads could be adversely affected by the vibration levels caused by large loaded trucks making multiple daily trips to and from the construction zones. Vibration levels for such trucks range from 86 VdB at a distance of 25 feet to 74 VdB at a distance of 100 feet. Many people find vibration at the 75 VdB level unacceptable. As noted earlier, the threshold for infrequent activity (fewer than 70 events per day) is 80 VdB at residences and buildings where people normally sleep. The threshold for frequent activity (more than 70 events per day) is 72 VdB at residences and buildings where people normally sleep. The extent or likelihood of this potential impact is unknown since Reclamation does not designate material delivery routes on county roads. As part of the normal contracting process, the contractor would be required to take appropriate actions to assure this potential adverse impact is avoided.

Those entering the construction zone would be required to use hearing protection appropriately rated for the expected noise levels of the area.

Noise impacts associated with construction of this alternative would be temporary and less than significant.

Operational Impacts

Noise levels would be the same as current condition; therefore, there would be no impact.

Alternative C – Spillway Replacement

Construction Impacts

Same as Alternative B but with a shorter work period and less blasting since the North Side and South Side Canal headworks would not be replaced.

Operational Impacts

Noise levels would be the same as current condition; therefore, there would be no impact.

3.15.3 Cumulative Impacts

No cumulative impacts are anticipated.

3.16 Mitigation

No mitigation required.

3.17 Air Quality

3.17.1 Affected Environment

The Clean Air Act (CAA) requires the EPA to identify and set standards for pollutants that have an adverse effect on human health and the environment. The CAA established two types of national air quality standards. Primary standards set limits to protect public health, including the health of "sensitive" populations such as asthmatics, children, and the elderly. Secondary standards set limits to protect public welfare, including protection against decreased visibility, damage to animals, crops, vegetation, and buildings. Areas that exceed these standards are called non-attainment areas and are required by the EPA to implement special measures to bring them back into compliance.

To provide a quantifiable means to measure air quality, EPA's Office of Air Planning and Standards, has established standards for six criteria pollutants. These threshold concentrations are called National Ambient Air Quality Standards (NAAQS) and are listed below in Table 3-23. For each pollutant, the standard includes a maximum concentration above which adverse effects on human health may occur. Units of measure for the standards are parts per million (ppm) by volume, milligrams per cubic meter of air (mg/m^3), and micrograms per cubic meter of air ($\mu g/m^3$).

Table 3-23. National ambient air quality standards (EPA 2009).

	Primary Standards		Secondary Standards	
Pollutant	**Level**	**Averaging Time**	**Level**	**Averaging Time**
Carbon Monoxide (CO)	9 ppm	8-hour (1)	None	
	(10 mg/m^3)			
	35 ppm	1-hour (1)		
	(40 mg/m^3)			
Lead (Pb)	0.15 µg/m^3 (2)	Rolling 3-Month Average	Same as Primary	
	1.5 µg/m^3	Quarterly Average	Same as Primary	
Nitrogen Dioxide (NO_2)	0.053 ppm	Annual (Arithmetic Mean)	Same as Primary	
	(100 µg/m^3)			
Particulate Matter (PM_{10})	150 µg/m^3	24-hour (3)	Same as Primary	
Particulate Matter ($PM_{2.5}$)	15.0 µg/m^3	Annual (4) (Arithmetic Mean)	Same as Primary	
	35 µg/m^3	24-hour (5)	Same as Primary	
Ozone (O_3)	0.075 ppm (2008 std)	8-hour (6)	Same as Primary	
	0.08 ppm (1997 std)	8-hour (7)	Same as Primary	
	0.12 ppm	1-hour (8)	Same as Primary	
		(Applies only in limited areas)		
Sulfur Dioxide (SO_2)	0.03 ppm	Annual (Arithmetic Mean)	0.5 ppm	3-hour (1)
			(1300 µg/m^3)	
	0.14 ppm	24-hour (1)		

(1) Not to be exceeded more than once per year.

(2) Final rule signed October 15, 2008.

(3) Not to be exceeded more than once per year on average over 3 years.

(4) To attain this standard, the 3-year average of the weighted annual mean $PM_{2.5}$ concentrations from single or multiple community-oriented monitors must not exceed 15.0 µg/m^3.

(5) To attain this standard, the 3-year average of the 98th percentile of 24-hour concentrations at each population-oriented monitor within an area must not exceed 35 µg/m^3 (effective December 17, 2006).

(6) To attain this standard, the 3-year average of the fourth-highest daily maximum 8-hour average ozone concentrations measured at each monitor within an area over each year must not exceed 0.075 ppm. (effective May 27, 2008)

(7) (a) To attain this standard, the 3-year average of the fourth-highest daily maximum 8-hour average ozone concentrations measured at each monitor within an area over each year must not exceed 0.08 ppm.
(b) The 1997 standard—and the implementation rules for that standard—will remain in place for implementation purposes as EPA undertakes rulemaking to address the transition from the 1997 ozone standard to the 2008 ozone standard.

(8) (a) The standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above 0.12 ppm is less than 1.

(b) As of June 15, 2005 EPA revoked the 1-hour ozone standard in all areas except the 8-hour ozone nonattainment Early Action Compact (EAC) Areas.

States strive to achieve attainment with State and Federal air quality standards since remaining in compliance helps protect public health and contributes to economic growth. Non-attainment status can potentially limit production capabilities of existing industries and preclude siting of new industries that provide job opportunities. Attainment of air quality standards also helps avoid a potential loss of Federal highway funding that can result from nonattainment status. Once an area is in non-attainment status, it is costly and time-consuming to develop and implement plans to reach attainment status.

In addition to areas classified as attainment and non-attainment, some areas are described as "maintenance areas." Maintenance areas are those geographic areas that were classified as non-attainment, but are now consistently meeting the NAAQS. Maintenance areas have been re-designated by the EPA from "non-attainment" to "attainment with a maintenance plan;" commonly called "maintenance areas." These areas have demonstrated through monitoring and modeling they have sufficient controls in place to meet and main the NAAQS. They also have contingency measures in place that would be implemented should the areas start showing exceedances.

Idaho has adopted the Federal air quality standards and incorporates them in the Idaho Administrative Procedures Act (IDAPA) as part of IDAPA 58.01.01 Rules for the Control of Air Pollution in Idaho (DEQ 2008a). The DEQ routinely monitors outdoor air quality to satisfy Federal regulatory requirements and scientifically determine the quality of Idaho's airsheds. DEQ's monitoring network measures the levels of five of the six ambient air criteria pollutants identified by the CAA:

- Carbon Monoxide (CO)
- Nitrogen Dioxide (NO2)
- Particulate Matter (PM10 and PM2.5)
- Ozone (O3)
- Sulfur Dioxide (SO2)

The sixth criteria pollutant, airborne lead, is no longer considered a major health threat in most of the United States. With the phase-out of leaded gasoline and closure of the Bunker Hill Mine, DEQ no longer monitors airborne lead levels.

DEQ developed the Quality Assurance Project Plan for the State of Idaho Ambient Air Quality Monitoring Program, to assure ambient and meteorological data collected by Idaho's air monitoring network meets or exceeds required standards. The manual prescribes detailed operational procedures for sampling, analyzing, and reporting air pollution and meteorological conditions. The manual is reviewed annually and revised as needed, subject to approval by the EPA.

Four geographical areas in Idaho are classified as non-attainment or maintenance areas. Two areas are non-attainment areas for PM10: Sandpoint, located in Bonner County, on the northwest corner of Lake Pend Oreille within the Panhandle National Forest, and Pinehurst, located in Shoshone County, in the Silver Valley surrounded by the Coeur d'Alene and St. Joe National Forests. The Portneuf Valley, 96.6 square miles of Pocatello, Chubbuck, and surrounding areas is a Maintenance Area for PM10. Northern Ada County, located in southwestern Idaho, is a Limited Maintenance Area for CO. It is Idaho's only designated CO Maintenance Area. Northern Ada County is also a Maintenance Area for PM10.

The Craters of the Moon Wilderness Area, about 80 miles northeast of Minidoka Dam near Arco, Idaho, is the closest mandatory Class I air-shed under the CAA requiring its air receive the nation’s highest level of protection. Sections 160-169 of the Act establish a program to Prevent Significant Deterioration (PSD) of air quality in "clean air areas" of the country (i.e., attainment areas, which include Class I areas). Among the purposes of the PSD program are "to preserve, protect, and enhance air quality in national parks, monuments, national seashores, and other areas of special national or regional natural, recreational, scenic, or historic value." Congress provided additional protection for Class I areas in CAA Section 169A which specifies a national goal of "remedying any existing and preventing any future manmade visibility impairment" in these areas.

Minidoka Dam is located on the Snake River between Cassia and Minidoka Counties. Both counties are designated as attainment or unclassifiable for CO, NO2, O3, PM10, PM2.5, and SO2. (40 CFR 81.313)

3.17.2 Environmental Consequences

Potential air quality impacts would be associated with construction of the replacement spillway with or without replacement of the headworks. The primary types of air pollution during construction would be combustible pollutants from equipment exhaust and fugitive dust particles from disturbed soils becoming airborne.

DEQ requires air quality permits for the operation of portable rock crushers and concrete/asphalt batch plants and prescribes specific BMPs. DEQ also requires the use of specific BMPs to control fugitive dust at all construction sites (IDAPA 58.01.01.650-651) (DEQ 2008b). Other short-term emissions from construction sites are exempt from air quality permitting requirements. DEQ also requires the use of specific BMPs to control fugitive dust (IDAPA 58.01.01.650-651) (DEQ 2008b).

Construction hours will likely range from 8 to 12 hours per day, 5 days per week; 24/7 work days are not anticipated.

Air quality impacts would be considered significant if the construction or operation of Minidoka Dam violated applicable air quality standards.

Alternative A – No Action

The No Action alternative will leave the existing spillway and headworks in their present configuration. As the concrete in the existing spillway and headworks continues to deteriorate, maintenance requirements will increase. While details and timing of the increased concrete work are unknown, some potential impacts could occur.

Deterioration of the existing spillway concrete will likely necessitate a program of pier replacement. The pier replacement program will involve ongoing replacment of piers to maintain the existing spillway in a usable condition. Maintenance requirements for the headworks will also continue to escalate. At some point, annual concrete repairs on the headworks will also become necessary. These repairs would continue until the headworks reached the end of their service life and full replacement becomes necessary. The ongoing repair/replacement period will likely last a few weeks to months. Air quality impacts associated with these activities would vary year-to-year depending on the numbers and types of equipment used. Potential adverse air quality impacts will likely be from combustible pollutants and fugitive dust (PM10) associated with annual construction activities. Compliance with all applicable DEQ emission standards and BMPs will reduce potential impacts to less than significant levels.

Alternative B – Spillway and Headworks Replacement

Construction Impacts

Replacement of the existing spillway and headworks would take approximately 31 months and require the use of construction equipment such as trucks, cranes, generators, and pumps. Adverse air quality impacts would be from combustible pollutants and fugitive dust (PM10) associated with Alternative B. Construction emissions would vary from day-to-day and activity-to-activity depending on the timing and intensity of construction with each activity having its own potential to release emissions. Construction activities that can produce dust (PM10) emissions include excavation, earthwork, vehicle and truck travel over unpaved roads, wind blowing over disturbed land areas, and tail-pipe exhaust being emitted from vehicles and equipment. Compliance with all applicable DEQ emission standards and BMPs including those for operation of portable rock crushers, and concrete and/or asphalt batch plants would reduce potential impacts to less than significant levels.

Operational Impacts

Air quality would be the same as the current condition; therefore, no impact would occur.

Alternative C – Spillway Replacement

Construction Impacts

Same as impacts as identified for Alternative B.

Operational Impacts

Air quality would be the same as the current condition; therefore, no impact would occur.

3.17.3 Cumulative Impacts

Air quality impacts associated with construction under Alternatives B and C are localized in nature and decrease substantially with distance. No other construction projects are currently located or expected in the immediate vicinity of Minidoka Dam. Therefore, Alternative B or C would not contribute to cumulative construction air quality impacts.

3.17.4 Mitigation

No mitigation required.

3.18 Socioeconomics

3.18.1 Affected Environment

This section describes the affected environment in the proposed action area. The key parameters of the social and economic conditions within the proposed action area include population, industry output, employment/unemployment, and labor income. The study area encompasses Idaho's Minidoka and Cassia counties. Cassia and Minidoka counties are linked economically and are often referred to as the Mini-Cassia area (IDL 2008b). Burley and Rupert are the largest cities located within the study area. Burley lies in both counties, divided by the Snake River.

Population

The Bureau of Census estimated a 2000 population of 41,490 for the entire study area (Cassia and Minidoka counties). The 2007 population estimate for the study area declined to 39,424. Both Cassia and Minidoka counties have experienced declining population.

Industry Output

The common measures of economic impacts include industry output, employment, and labor income. These parameters are summarized in Table 3-24 below.

Industry output or sales represent the value of production of goods and services produced by business within a sector of the economy. The manufacturing sectors produce the highest level of output in the study area (39.6 percent of the total industry output). The vast majority of the manufacturing output stems from activities in the food processing related industries. The agricultural production sectors rank second in level of output (27.7 percent of the total industry output). Ranking third is the construction sector (21.4 percent to total industry output).

Table 3-24. 2007 industry output, employment, and labor income for Cassia and Minidoka counties (IMPLAN 2007 data files, including U.S. Bureau of Economic Analysis, U.S. Bureau of Labor, and Census).

	Industry Output (millions)	Percent of Total	Employment	Percent of Total	Labor Income (millions)	Percent of Total
Ag, Forestry, Fish and Hunting	806.918	24.7	4,039.53	18.1	96.916	13.7
Mining	46.989	1.4	1,200.99	5.4	28.066	4.0
Utilities	53.129	1.6	84.853	0.4	9.79	1.4
Construction	697.803	21.4	1,402.79	6.3	54.165	7.6
Manufacturing	1,295.37	39.6	8,058.98	36.1	303.77	42.9
Wholesale Trade	3.988	0.1	29.962	0.1	0.817	0.1
Transportation and Warehousing	102.54	3.1	1,865.24	8.4	52.811	7.5
Retail trade	11.581	0.4	360.536	1.6	4.056	0.6
Information	79.725	2.4	1,619.76	7.3	21.511	3.0
Finance and insurance	14.116	0.4	393.746	1.8	7.667	1.1
Real estate and rental	12.488	0.4	71.316	0.3	3.111	0.4
Professional- scientific and tech services	142.915	4.4	3,170.38	14.2	125.573	17.7
Totals	3,267.56	100.0	22,298.07	100.0	708.252	100.0

Employment

Employment measures the number of jobs related to the sector of the economy. In the study area, activities related to manufacturing generate the largest number of jobs (36.1 percent of total regional employment) in the study area. Agricultural sector ranks second in terms of overall number of jobs in the study area (18.1 percent of total regional employment).

Minidoka and Cassia counties have traditionally had a higher unemployment rate compared to the rest of south-central Idaho (IDL 2008a; 2008b). These publications note that marketing efforts have been successful in bringing new manufacturing businesses to the area. Traditionally, manufacturing jobs have been related to agricultural processing; however, marketing efforts have brought in new employers related to the manufacturing sector including a recreational vehicle manufacturer, a medical appliances manufacturer, and an ethanol plant. As a result of these marketing efforts, unemployment rates have declined. In Cassia County unemployment declined from 5.8 percent in 2003 to 3 percent in 2007. Unemployment in Minidoka County declined from 7.2 percent to 3.6 percent in the same 5-year period. Since the release of these publications, unemployment has been on the rise. The January 2009 unemployment rates are 4.1 and 4.9 percent for Cassia and Minidoka counties respectively, according to Idaho Department of Labor statistics (IDL 2008a; 2008b).

Labor Income

Labor income is the sum of Employee Compensation and Proprietor Income. The manufacturing sectors generate the largest portion of labor income in the region (42.9 percent of the total regional labor income). The sectors related to providing professional related services rank second (17.7 percent of the total regional labor income). Ranking third, closely behind professionally-related services, are the sectors related to agricultural production (13.7 percent of the total labor income).

3.18.2 Environmental Consequences

At the regional level, all of the alternatives would result in positive economic output. The most significant effect would result from construction activities and ongoing annual operation and maintenance (O&M).

Methods for Evaluating Impacts

The modeling package used to assess the regional economic effects stemming from construction and O&M expenditures for each alternative is IMpact Analysis for PLANning (IMPLAN). IMPLAN is an economic input-output modeling system that estimates the effects of economic changes in an economic region. The common measures of regional economic impacts include employment, regional income, and regional output (sales).

Input-output models measure commodity flows from producers to intermediate and final consumers. Purchases for final use (final demand) drive the model. Industries produce goods and services for final demand and purchase goods and services from other producers. These other producers, in turn, purchase goods and services. This buying of goods and services (indirect purchases) continues until leakages from the region (imports and value added) stop the cycle.

These indirect and induced effects (the effects of household spending) can be mathematically derived using a set of multipliers. The multipliers describe the change of output for each and every regional industry caused by a one dollar change in final demand for any given industry.

IMPLAN data files are compiled from a variety of sources, for the study area, including the U.S. Bureau of Economic Analysis, the U.S. Bureau of Labor, and the U.S. Census Bureau. This analysis uses 2007 IMPLAN data for Idaho's Cassia and Minidoka counties, which comprise the study area.

Construction

The construction expenditures that are made inside the area of impact were considered in the regional impact analysis. Construction expenditures made outside the two-county area were considered "leakages" and would have no impact on the local economy.

The study assumed that the workforce would move to the region and spend their wages inside the area during the construction period. This analysis also assumed that the vast majority of the construction expenditures will be funded from sources outside study area. Money from outside the region that is spent on goods and services within the region would contribute to regional economic impacts, while money that originates from within the study region is much less likely to generate regional economic impacts. Spending from sources within the region represents a redistribution of income and output rather than an increase in economic activity.

For the purpose of this project, the total regional construction costs were used to measure the overall regional impacts. These overall impacts would be spread over the construction period and would vary year-by-year proportionate to actual expenditures.

Operation and Maintenance

Expenditures that are made inside the area of impact related to O&M will also generate a positive economic output to the regional economy. This analysis quantifies annual impact resulting from annual costs related to O&M. The analysis does not quantify the positive impacts resulting from replacement costs given they are spread out over the entire study period. Like the construction-related expenditures, O&M expenditures made inside the area of impact associated with each alternative were placed into categories related to the each sector of the economy and run through IMPLAN to estimate impacts to the regional economy.

Alternative A – No Action

Construction Impacts

The No Action alternative leaves the existing spillway and headworks in their present configuration. No construction costs are anticipated from this alternative; therefore, no regional impacts related to construction will be generated.

Operational Impacts

As the concrete in the existing spillway and headworks continue to deteriorate, O&M requirements will increase under this alternative. These impacts are assumed to occur on an annual basis. Like the construction impacts, the majority of the O&M impacts are due to the expenditures of the wages earned by the workforce involved O&M related activities. Regional economic impacts stemming from O&M activities, for each alternative, are presented in Table 3-25.

Table 3-25. Regional impacts stemming from O&M activities.

Alternative	Output (Sales) ($)	Employment (jobs)	Labor Income ($)
A – No Action	292,300	3	111,700
B – Spillway and Headworks Replacement	74,600	1	28,500
C – Spillway Replacement	86,000	1	32,900

Alternative B – Spillway and Headworks Replacement

Construction Impacts

Construction activities associated with Alternative B would take approximately 31 months. The estimated impacts are representative of the entire construction period. These impacts would not occur each year; they vary year-by-year proportionate to annual expenditures. The majority of the employment, output, and income impacts are due to the expenditures of the wages earned by the workforce involved in the construction project and the construction activities. Regional economic impacts related to construction expenditures, for each Alternative, are presented inTable 3-26.

Table 3-26. Construction-related economic impacts by alternative.

Alternative	Output (Sales) ($ millions)	Employment (jobs)	Labor Income ($ millions)
A – No Action	-	-	-
B – Spillway and Headworks Replacement	28.5	291	10
C – Spillway Replacement	20.03	204	7

Operational Impacts

Alterative B requires annual O&M expenditures; however, they are less than those anticipated with the No Action alternative. Table 3-25 summarizes the regional impacts stemming from O&M activities.

Alternative C – Spillway Replacement

Construction Impacts

Construction activities associated with Alternative C would take approximately 31months. The regional impacts stemming from construction are summarized in Table 3-23.

Operational Impacts

The regional impacts stemming from annual O&M expenditures related to Alternative C are summarized in Table 3-25.

3.18.3 Cumulative Impacts

No cumulative impacts are anticipated.

3.18.4 Mitigation

No mitigation required.

3.19 Environmental Justice

EO 12898, “Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations,” dated February 11, 1994, requires agencies to identify and address disproportionately high and adverse human health or environmental effects of their actions on minorities and low-income populations and communities as well as the equity of the distribution of the benefits and risks. Environmental justice addresses the fair treatment

of people of all races and incomes with respect to actions affecting the environment. Fair treatment implies that no group should bear a disproportionate share of negative impacts.

3.19.1 Affected Environment

The closest private residences are about ¼-mile downstream of the dam on the south side of the river and about ½-mile downstream on the north side. There are no private residences immediately adjacent to the dam and reservoir. The State Park is located on the north shore of the reservoir. As described elsewhere, the Minidoka Refuge encircles the dam and reservoir area.

Cassia and Minidoka counties were selected as the local study area as smaller census areas were not appropriate due to the distance of populated areas from the construction area for the spillway replacement. Table 3-27 provides the numbers and percentages of population for seven racial categories (White, Black or African American, American Indian and Alaska Native, Asian, Native Hawaiian and Other Pacific Islander, Some Other Race, and Two or More Races), the total racial minority population, and the Hispanic or Latino population, a minority ethnic group, for each county, the combined county study area, and the State of Idaho (U.S. Census Bureau 2000). The percentage of total racial minority and ethnic (Hispanic or Latino) populations in the two-county study area is 24.2, about double the State's percentage of 12.0.

Table 3-27. Race and ethnicity.

	Cassia County		Minidoka County		Total		State of Idaho	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Total Population	21,416	—	20,174	—	41,590	—	1,293,953	—
Population of one race	21,016	98.1	19,665	97.5	40,779	98.1	1,268,344	98.0
White	18,137	84.7	15,749	78.1	33,971	81.7	1,177,304	91.0
Black or African American	36	0.2	53	0.3	89	0.2	5,456	0.4
American Indian and Alaska Native	171	0.8	178	0.9	350	0.8	17,645	1.4
Asian	79	0.4	84	0.4	163	0.4	11,889	0.9
Native Hawaiian and Other Pacific Islander	11	0.1	4	0.0	15	0.0	1,308	0.1
Some other race	2,582	12.1	3,597	17.8	6,191	14.9	54,742	4.2
Population of two or more races	400	1.9	509	2.5	911	2.2	25,609	2.0
Total Minority Population	4,434	20.7	5,622	27.9	10,056	24.2	154,662	12.0
Non-white, not Hispanic or Latino	421	2.0	485	2.4	906	2.2	52,972	4.1
Hispanic or Latino	4,013	18.7	5,137	25.5	9,150	22.0	101,690	7.9

Low-income populations are identified by several socioeconomic characteristics. As categorized by the 2000 Census, specific characteristics include income (median family and per capita), percentage of the population below poverty (families and individuals), unemployment rates, and substandard housing. Table 3-28 provides income, poverty, unemployment, and housing information for each county and the State.

Table 3-28. Income, poverty, unemployment, and housing (U.S. Census Bureau 2000)

	Cassia County	Minidoka County	State of Idaho
Income			
Median family income	$38,162	$36,500	$43,490
Per capita income	$14,087	$13,813	$17,841
Percent below poverty level			
Families	11.1	11.9	8.3
Individuals	13.6	14.8	11.8
Percent unemployed	5.2	6.5	5.8
Percent of Housing			
1.01 or more occupants per room	7.9	9.3	4.9
Lacking complete plumbing facilities	1.7	1.4	1.4

Median family income and per capita income for the two counties are less than the State. Compared to the State, the study area has greater percentages of families and individuals below the poverty level.

Other measures of low-income, such as unemployment and substandard housing also characterize demographic data in relation to environmental justice. The 6.5 percent unemployed in 2000 in Minidoka County was greater than the State's 5.8 percent while Cassia County at 5.2 percent was slightly less. The State of Idaho's preliminary March 2009 unemployment percentage was 6.8 compared to 3.9 and 4.9 for Cassia and Minidoka counties, respectively.

Substandard housing units are overcrowded and lack complete plumbing facilities. The percentage of occupied housing units with 1.01 or more occupants per room in the study area counties was greater than the percentage for the State. The percentage of housing units lacking complete plumbing facilities in the study area was about the same as for the State.

3.19.2 Environmental Consequences

Methods for Evaluating Impacts

Construction of the alternatives would most directly impact those recreating or pursuing other activities near the spillway replacement construction areas. To the extent these are minority and/or low-income populations, there is potential for disproportionate adverse impacts.

Environmental justice issues are focused on environmental impacts on natural resources (and associated human health impacts) and potential socioeconomic impacts. The following issues are evaluated to determine potential impacts:

- Are affected resources used by minority or low-income populations?
- Do the resources affected by the project support subsistence living?
- Are minority or low-income populations disproportionately subject to adverse environmental, human health, or economic impacts?

Environmental resources potentially used by low income and minority groups in the study area are primarily aquatic related resources. These groups currently use these resources and would be expected to do so in the future. They may use these resources disproportionately to the total population.

While much of the fishing in the dam and reservoir area is for consumption as noted in the Recreation section, it is not a defined subsistence fishery. Definitions of what constitutes "subsistence" tend to differ by geographic area and be influenced by perception. For example, the definition of "subsistence" may include social, cultural, and spiritual aspects of the harvest, or be the definition presented by the CEQ: "The dependence by a minority population, low-income population, Indian tribe or subgroup of such populations on indigenous fish, vegetation and/or wildlife, as the principal portion of their diet" (CEQ 1997). Although data are not available to determine the use of renewable natural resources, e.g., fish, wildlife, and vegetation, for subsistence by any group in the area, it is likely these resources are used to supplement their diet and do not constitute the principle portion of their diet.

Alternative A – No Action

No adverse impacts have been identified for this alternative.

Alternative B – Spillway and Headworks Replacement

Construction Impacts

Construction associated with Alternative B would most directly impact those recreating or pursuing other activities in the immediate dam and reservoir area. The two county study area potentially affected by implementation of the alternative has a greater percentage of minority and low-income populations than the State of Idaho. However, there would be no disproportionate adverse impact to those populations; everyone in the area, especially those nearest the construction areas would be equally affected.

Operational Impacts

Other than minor construction impacts that are temporary, no adverse impacts to aquatic related resources have been identified. No CEQ defined subsistence level of use of renewable natural resources by any population has been identified in the proposed action area. No adverse human health impacts for any human population have been identified. Therefore, this alternative would not have an adverse environmental justice impact.

Alternative C – Spillway Replacement

Construction Impacts

Same impacts as identified under Alternative B.

3.19.3 Cumulative Impacts

No cumulative impacts identified.

3.19.4 Mitigation

No mitigation required.

3.20 Unavoidable Adverse Effects

Unavoidable adverse impacts are environmental consequences that cannot be avoided either by changing the nature of the action or through mitigation, if the action is taken.

Both Alternatives B and C require construction activities which would result in some short-term increase in suspended sediment. Suspended sediment will exceed State water quality standards in some areas of the new spillway and in some areas of the reservoir. However, the

impacts associated with these increases are not expected to impact significant segments of either water body. State water quality standards will not be exceeded in the Snake River below the mixed discharge from the new spillway and the powerplant. Water quality standards will be exceeded for turbidity during the drilling, blasting, and mucking activities associated with the excavations for the new South Side Canal headworks and new radial gate section in the vicinity of those structures. Sediment delivery and resuspension from upstream sources will be minimized by completing the work using the annual drawdown elevation.

The proposed project design features, BMPs, and compensatory mitigation would avoid or minimize many of the potential adverse effects associated with Alternatives B or C. However, not all adverse effects could be avoided, nor would mitigation be 100 percent effective in remediating all impacts. There would be at least a minimal amount of unavoidable adverse impact on all resources present in the proposed action area for at least a short time, due to the presence of equipment and humans in the area and the time necessary for restoration to be effective. Unavoidable impacts associated with the proposed project include:

- Soil compaction for haul road and staging area construction.
- Temporary loss of vegetation associated with staging areas.
- Potential impacts to fish in the reservoir immediately adjacent to blasting activities, as well as in the spillway area adjacent to blasting activities.
- Potential impacts to birds, small mammals, amphibians, and reptiles during construction.
- Visual alteration of the spillway environment during construction.

The principal adverse effects regarding the cultural resource aspects of this project are from removal or replacement (or both) of defining features of historic Minidoka Dam, the overflow spillway, headworks, and other historical components. No reasonable alternative to avoid replacing the Minidoka Dam overflow spillway and meet the purpose and need for the project could be identified. Mitigation measures developed for both action alternatives would lessen some impacts, but the adverse effects on the historic integrity of Minidoka Dam and potential effects to other cultural resources would remain, even with mitigation.

Because both Alternatives B and C involve significant amounts of construction activity, they would all result in some short-term increase in construction-related noise and some effects to air quality. However, the impacts associated with these increases are not expected to be significant.

3.21 Irreversible and Irretrievable Commitments of Resources

Irreversible and irretrievable commitments of resources are effects to resources that cannot be recovered or uses of resources that are forgone over a period of time as a result of a decision. For example, most energy development projects, such as gas, oil, or coal fire plants, result in an irreversible and irretrievable commitment of the power-generating resources (fuel). Water is a renewable resource that would not be depleted or altered by the proposed project and the increased hydro-power generating potential could offset the need to consume fossil fuels.

No irreversible or irretrievable commitment of resources would occur as a result of implementing either Alternatives B or C. Minor loss of wetland habitat would occur immediately downstream of Minidoka Dam with the construction of new spillway facilities; however, new lacustrine habitat would be created immediately upstream of the new spillway structures.

The loss of productivity (e.g., forage, wildlife habitat) from lands used for the siting of the proposed project features (new spillway footprint, radial gate placement, new security features, etc.) would be an irreversible and irretrievable commitment of habitat resources for fish and wildlife species present in the spillway area. However, the proposed location for the new structure does not provide suitable fish or wildlife habitat and constitutes such a small percentage of the area, relative to the rest of the new spillway, the proposed commitment of habitat resources is negligible.

There would be an irreversible and irretrievable commitment of the energy used during the manufacture of proposed project components as well as during construction, production, and restoration associated with the project.

The physical alteration of Minidoka Dam under either action alternative has an irreversible effect on the historic integrity of that structure. Also, the practice of placing and removing stoplogs manually, a practice dating to the earliest beginnings of the dam, will be irretrievably lost. Although mitigation measures would preserve a historic record, the physical and cultural integrity of the dam would be changed forever. Irreversible and irretrievable commitments would not occur under the No Action alternative. If archaeological resources are affected through erosion or vandalism from increased recreation use, these too would be considered irreversible effects.

Recreational use of the present day fishery and avian habitat below the new spillway would be foregone during construction and for some recovery time after the construction period under either of the action alternatives.

3.22 Relationship between Short-term Uses and Long-term Productivity

This analysis examines the relationship between short-term uses of environmental resources and the maintenance and enhancement of long-term productivity.

The long-term productivity of the aquatic biota in Lake Walcott would remain intact. Stabilization of winter water levels would likely lead to improvements in game fish production in the reservoir. Over the short term, there will be increased disturbance to the aquatic biota in the spillway area during construction lasting for about 31months. Once construction is completed, the productivity of the spillway should return to previous conditions.

Under Alternatives B and C, the short-term loss of recreational use of the fishery below the new spillway due to construction and the corresponding cessation of flows through the spillway would be offset, at least to some degree, by the long-term improvement in the fishery below the new spillway. The long-term negative effects on the diversity of avian species and the corresponding loss of desirability to birding in the area may not recover after construction, so short-term negative effects due to cessation of spillway flows would not be offset by a corresponding improvement in avian habitat and diversity that would benefit recreational uses.

CHAPTER 4 COORDINATION AND CONSULTATION

Chapter 4 COORDINATION AND CONSULTATION

4.1 Public Scoping

Reclamation published a "Notice of Intent to Prepare an Environmental Impact Statement" in the *Federal Register* on November 13, 2008 (FR 73 67206). Reclamation also mailed a scoping letter to 106 individuals, organizations, agencies, and congressional delegates. The letter discussed the project and served as notification of the future public scoping meetings. A similar letter was sent to 28 tribal governments.

Public scoping meetings were held in Burley and Idaho Falls in December, 2008, to provide information to the public and to solicit input on the alternatives developed to address replacement of the Minidoka Dam spillway and associated structures. Reclamation also held a meeting in April 2009 with the Fort Hall Business Council of the Shoshone-Bannock Tribes at the Fort Hall Reservation followed by a public meeting in the evening.

Responses to scoping efforts were minimal; Reclamation received only five written letter of comment as a result of the public scoping meeting and no written comments from meetings with the Tribes. See Appendix A – Summary of Scoping Comments for details. Written comments were accepted through December 19, 2008.

4.2 Coordination with Federal and State Agencies

4.2.1 Cooperating Agencies

Reclamation requested that the IDFG, USFWS, IDEQ, EPA, and the Corps participate as cooperating agencies in the spillway replacement project. IDFG and IDEQ declined to participate as cooperating agencies. The EPA and the Corps also declined to participate as cooperating agencies; however, each stated their involvement would be in conjunction with the Section 404 permitting process. Reclamation received formal confirmation from the USFWS regarding their participation as a cooperating agency and an Inter-Agency agreement has been completed.

4.2.2 Endangered Species Act

Section 7 (a)(2) of the ESA of 1973 requires Federal agencies to consult with USFWS and NOAA Fisheries when a Federal action may affect a listed threatened or endangered species or its critical habitat. This is to ensure that any action authorized, funded, or carried out by a Federal agency is not likely to jeopardize the continued existence of a listed species or result in the destruction or adverse modification of its critical habitat.

A Biological Assessment (BA) analyzing the effects of the proposed project on federally-listed and candidate species is being prepared. USFWS was contacted to obtain a list of federally-listed species potentially present within and adjacent to the proposed action area. The list provided by the USFWS indicated that the Utah valvata (snail), Snake River physa (snail), Yellow-billed cuckoo, and bald eagle are the only threatened and endangered species that may occur in or adjacent to the proposed action area.

Reclamation will initiate formal consultation by submitting the BA to USFWS. USFWS will review the BA and prepare a BiOp for the proposed action. Depending upon USFWS determinations and associated requirements, Reclamation will proceed with the proposed project, consistent with Terms and Conditions and Reasonable and Prudent Measures outlined in the BiOp.

4.2.3 Fish and Wildlife Coordination Act

The FWCA of 1934, as amended 1946, 1977 (16 U.S.C. 661-667e), requires Federal agencies to coordinate with USFWS and state wildlife agencies when planning new projects or modifying existing projects so that wildlife resources receive equal consideration and are coordinated with other project objectives and features.

Coordination activities associated with the FWCA are being conducted with the USFWS. Reclamation entered into an Interagency Acquisition with USFWS in May 2009 for the purpose of providing funds to USFWS to assist Reclamation with meeting the appropriate levels of compliance activities associated with Reclamation's Minidoka Dam Spillway Replacement project. Reclamation and USFWS personnel are working cooperatively to prepare a FWCA report, conduct a timely consultation, and to ensure fish and wildlife resources are appropriately addressed in the NEPA process. A summary of the USFWS recommendations from their Planning Aid Memorandum (PAM) and Reclamation's responses are included in Appendix E. Reclamation has agreed to implement most, but not all of the recommendations.

4.2.4 National Historic Preservation Act

Pursuant to 36 CFR 800 regulations, Reclamation is required to consult with the National Advisory Council on Historic Preservation (ACHP) for the spillway replacement project due to potential adverse effects. Official consultation with the SHPO concerning the archaeological and historical features of Minidoka Dam began on November 25, 2008, during which SHPO attended a field tour with Reclamation of the Minidoka spillway. In a letter dated February 3, 2009, Reclamation formally notified ACHP and SHPO that we would be using the process and documentation required under NEPA to comply with the requirements of Section 106 NHPA. Reclamation subsequently met the SHPO on April 21, 2009, to discuss project impacts and to develop mitigation for the historic features that would be adversely affected. Impacts to the archaeological features were addressed in a separate meeting between Reclamation and the SHPO on April 27, 2009.

On June 4, 2009, Reclamation sent a follow-up letter to the ACHP detailing project impacts and proposed mitigation. At that time, the ACHP was invited to be a participant in the development of a memorandum of agreement that will stipulate the mitigation measures for dealing with adverse effects. The ACHP informed Reclamation that their participation in the consultation to resolve adverse effects is not needed at this time. These mitigation measures developed by Reclamation in coordination with the SHPO have been outlined in Chapter 3, Section 3.10 – Cultural Resources under *Mitigation.*

4.3 Tribal Government to Government Consultation

Since 2008, Reclamation has sought to keep the Tribes informed of the Minidoka project and hear their concerns (see Appendix G for a list of letters and meetings). The following summarizes the contacts Reclamation has made to the Tribes during the development of this EIS.

October 31, 2008	Reclamation sent a letter and pre-scoping package to the Shoshone-Bannock, Shoshone-Paiute, Northwestern Shoshone, Nez Perce, and the Burns Paiute Tribal councils.
November 4, 2008	Reclamation sent a letter requesting formal consultation to the Shoshone-Bannock, Shoshone-Paiute, Northwestern Shoshone, Nez Perce, and the Burns Paiute tribes. The request was answered by Lee Juan Tyler of the Shoshone-Bannock Tribal Council in which the Council requested a meeting with Reclamation to discuss the project.

March 25, 2009	Reclamation sent a letter requesting a formal meeting with the Shoshone-Bannock Tribal Council.
April 7, 2009	Reclamation met with the Shoshone-Bannock Tribal Council to provide information on the spillway replacement project. The Council concurred that the project would have no adverse effects, but stated that if water levels were drawn down to abnormally low conditions in the reservoir, they would like to have contractors hired to monitor the bottom of the reservoir for artifacts and remains.

Further consultation will occur throughout the NEPA process.

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GLOSSARY

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GLOSSARY

Acre-foot – The volume of water that could cover one acre to a depth of 1 foot; equivalent to 43,560 cubic feet or 325,851 gallons.

Action area – All areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action.

Active storage capacity – The reservoir capacity normally usable for storage and regulation of the reservoir inflows to meet the established reservoir operating requirement.

Aquatic – Growing in water; not terrestrial.

Aquatic macrophytes – Aquatic plants that are large enough to be apparent to the naked eye; i.e., larger than most algae.

Aquifer – A water-bearing stratum of permeable rock, sand, or gravel.

Appraisal study – A brief, preliminary investigation conducted for the purpose of determining whether a more detailed feasibility study should be undertaken.

Area of impact – The area being described for each affected resource. The baseline for one resource will often extend beyond the proposed action area.

Best management practices (BMPs) – A practice or combination of practices determined by a state or an agency to be the most effective and practical means (technological, economic, and institutional) of controlling point and nonpoint source pollutants at levels compatible with environmental quality.

Cofferdam – A temporary structure enclosing all or part of the construction area so that construction can proceed in the dry.

Cubic feet per second (cfs) – A measure of the rate of water flow. One cfs is equal to about 450 gallons per minute. One cfs delivers about 2 acre-feet per day.

Cumulative effect/impact – For NEPA purposes, these are impacts to the environment that result from the incremental impact of the action when added to other past, present, or reasonably foreseeable future actions, regardless of what agency (Federal or non-Federal) or person undertakes such action.

Dike – A long, low embankment. The height is usually less than 4 to 5 meters and the length more than ten or fifteen times the maximum height. Usually applied to dams built to protect land from flooding.

Drawdown – Releasing water from a hydroelectric project to lower the reservoir elevation. Drawdowns are used for energy production or to create additional space in the reservoir to hold back floodwaters; to reduce the cross-sectional area of the reservoir, increasing the current to aid downstream fish passage, and to expose normally submerged structures for maintenance.

Diversion – The removal of water from its natural channels.

Elevation – Elevation is always expressed as feet above mean sea level.

Endangered species – A species that is in danger of extinction throughout all, or a significant portion of its range.

Exceedance curve – A graphic that compares a function against time to show the percent of time that a specific value is exceeded.

Hectare – A unit of area equal to 10,000 square meters.

Flood plain – Low lands adjoining the channel of a river, stream, ocean, lake, or other body of water, which have been or may be inundated by flood water, and those other areas subject to flooding.

Freeboard – The height above the recorded high-water mark of a structure (i.e., dam) associated with the water.

Groundwater – Water that flows or seeps downward and saturates soil or rock, supplying springs and wells.

Habitat – The environment of a biological population.

Historic property – Any building, site, district, structure, or object (that has archeological or cultural significance) included in, or eligible for inclusion in, the *National Register*.

Hydrology – The science of water in nature, including its properties, distribution, and behavior.

Indian sacred site – A specific, discrete, narrowly delineated location on Federal land that is identified by an Indian tribe, or Indian individual determined to be an appropriately authoritative representative of an Indian religion, as sacred by virtue of its established religious significance to, or ceremonial use by, and Indian religion.

Irretrievable – A commitment of resources that causes a loss of production, use, or access to a resource. The yield of crops that could have been grown on fallowed farmland is an example of an irretrievable loss.

Irreversible – A commitment of resources that cannot be reversed, except perhaps in the extreme long term. An extinct species is an example of an irreversible loss.

Lacustrine – A freshwater system associated with a lake; lacustrine wetlands occur on the edges of lakes where the water depth is less than 6.6 feet.

Mitigation – A specific action that can be implemented to reduce or eliminate adverse project impacts.

MODSIM – A computer model used to simulate the hydrology of a stream.

No action alternative – The alternative is a projection of current conditions to the most reasonable future responses or conditions that could occur during the life of the project without any action alternatives being implemented. It is commonly referred to as "the future without the project." The No Action alternative serves as a base to measure the effects of the action alternatives.

Ogee crest – A common control structure shape for service spillways, including morning glory inlets, side channel inlets, and controlled and uncontrolled overfall chutes. Uncontrolled ogee spillway profiles are typically constructed to match the lower nappe surface produced by flow over a fully ventilated sharp-crested weir.

Proposed action area – The footprint of the location in which the proposed action will take place. For this EIS, the proposed action area consists of the Minidoka Dam, spillway, and associated facilities on Lake Walcott, Idaho

Radial gate – A pivoted gate, the face of which is usually a circular arc, with the center of curvature at the pivot about which the gate swings.

Resource management plan (RMP) – A land use plan that establishes coordinated land use allocations for all resource and support activities for a specific land area within a BLM district. It establishes objectives and constraints for each resource and support activity and provides data for consideration in program planning.

Riparian – Related to, living in, or located on a water course.

River mile – The distance in miles from the mouth of a river to a given point upstream as measured following the center of the streambed.

Record of decision (ROD) – An official document in which a deciding official states the alternative that will be implemented from a prepared EIS.

Run-of-river project – Hydroelectric dams without large reservoirs and, therefore, with only a limited capacity for water storage.

Sediment – Any very finely divided organic or mineral matter deposited by water in non-turbulent areas.

Seepage – The slow movement or percolation of water through small cracks, pores, interstices, from an embankment, abutment, or foundation.

Spillway – A structure over or through which floodflows are discharged.

Stoplog – Large log or timbers placed on top of each other with their ends held in guides on each side of a channel or conduit so as to provide a cheaper or more easily handled means of temporary closure than a bulkhead gates.

Storage capacity – The maximum volume of space available in a reservoir. Storage space is typically allocated amount the following: surcharge, active, inactive, and dead storage.

Study area – The area between logical termini in which alternatives can be developed that meet the Purpose and Need for the proposed project.

Terrestrial – Living on land or in the air, as opposed to aquatic.

Threatened species – A species that is likely to become endangered within the foreseeable future.

Total dissolved gases – A measure of the amount of atmospheric gases dissolved in water. Usually measured as a percentage, with 100 percent representing the maximum concentration under normal circumstances.

Total maximum daily load – The sum of the individual wasteload allocations for point sources, load allocations for nonpoint sources, natural background, and a margin of safety that a body of water can take without threatening beneficial uses. TMDL can be expressed in terms of mass per time, toxicity, or other appropriate measure that relates to a state's water quality standards.

Total storage capacity – The reservoir capacity below the normal maximum water surface elevation. Does not include surcharge capacity.

Total suspended solids – A quantitative measure of the residual mineral dissolved in water that remains after the evaporation of a solution. Usually expressed in milligrams per liter or parts per million. Total amount of dissolved material, organic and inorganic, contained in water.

Traditional Cultural Properties (TCPs) – Refer to that are properties affiliated with traditional religious and cultural importance to a Native American tribe and are eligible for the National Register. TCPs include sacred sites, natural resource collection areas, and the occasional archaeological site associated with ancestral Native American groups.

Wetland – Generally, an area characterized by periodic inundation or saturation, hydric soils, and vegetation adapted for life in saturated soil conditions.

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