RECLAMATION
Managing Water in the West

Sunnyside Division Board of Control Water Conservation Program

Yakima Project, Washington

FINDING OF NO SIGINIFICANT IMPACT
and
FINAL ENVIRONMENTAL ASSESSMENT

U.S. Department of the Interior
Bureau of Reclamation
Pacific Northwest Region
Upper Columbia Area Office
Yakima, Washington

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ACRONYMS AND ABBREVIATIONS

BA - Biological Assessment
EA – Environmental Assessment
BEA - Bureau of Economic Analysis
ESA – Endangered Species Act
ESU - Evolutionarily Significant Unit
EFH - Essential Fish Habitat
FEMAT - Federal Ecosystem Management Assessment Team
FONSI - Finding of No Significant Impact
ITA - Indian Trust Asset
MCR - Middle Columbia River
MSA - Magnuson-Stevens Fishery Conservation and Management Act
National Register - National Register of Historic Places
NEPA – National Environmental Policy Act
NHPA - National Historic Preservation Act
NOAA-Fisheries - National Oceanographic and Atmospheric Administration-Fisheries
NRCC - National Research Council Committee
PCB - Polychlorinated Biphenyls
PEIS - Programmatic Environmental Impact Statement
Reclamation - Bureau of Reclamation
RID - Roza Irrigation District
RSBOJC - Roza-Sunnyside Board of Joint Control
SCADA - Supervisory Control and Data Acquisition
SHPO - State Historic Preservation Office
SVID - Sunnyside Valley Irrigation District
TWSA - total water supply available
USFWS - U.S. Fish and Wildlife Service
USFS - U.S. Forest Service
WDFW - Washington Department of Fish and Wildlife
YKFP - Yakima-Klickitat Fisheries Program

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Chapter 1. Purpose of and Need for Action

This chapter presents the purpose of and need for the project, project location, project history, relationship of other activities to the project and document scope.

1.1 Introduction

The Sunnyside Division of the Yakima Project has requested funds from the Bureau of Reclamation (Reclamation) for water conservation within the district. Funds for water conservation would come through the Yakima River Basin Water Enhancement Program (YRBWEP).

Congress enacted the YRBWEP, Title XII of Public Law 103-434, on October 31, 1994. Title XII of Public Law 103-434 authorized the Secretary of Interior, acting through Reclamation, to establish and administer the Yakima River Basin Water Conservation Program, in consultation with the State of Washington, the Yakama Nation, the Yakima River basin irrigators, and other interested parties. Title XII is considered to be Phase II of the YRBWEP. The goal of this program is "to realize sufficient reductions in irrigation water diversions through implementation of water conservation measures so that additional water is available for instream flows for fish and wildlife and the water supplies for irrigation in dry years are improved." (Yakima River Basin Conservation Advisory Group, 1998).

Congress authorized YRBWEP in recognition of the "inadequate water supplies for irrigation during drought years and declining anadromous fish populations" in the Yakima River Basin. Phase I of the Project, authorized in 1984, focused on "an immediate improvement of the fish passage and protective facilities to reduce the loss of anadromous fish."

Title XII section 1201 states:

> The purposes of Title XII are:
>
> (1) to protect, mitigate, and enhance fish and wildlife through improved water management; improved instream flows; improved water quality; protection, creation and enhancement of wetlands; and by other appropriate means of habitat improvement;
>
> (2) to improve the reliability of water supply for irrigation;
>
> (3) to authorize a Yakima River Basin Water Conservation Program that will improve the efficiency of water delivery and use; enhance basin water supplies; improve water quality; protect, create and enhance wetlands; and determine the amount of basin water needs that can be met by water conservation measures;
>
> (4) to realize sufficient water savings from the Yakima River Water Conservation Program so

that not less than 40,000 acre-feet (AF) of water savings per year are achieved by the end of the fourth year [1998] of the Basin Conservation Program, and not less than 110,000 AF of water savings per year are achieved by the end of the eighth year [2002] of the program, to protect and enhance fish and wildlife resources; and not less than 55,000 AF of water saving per year are achieved by the end of the eighth year [2002] of the program for availability for irrigation;

(5) to encourage voluntary transactions among public and private entities which result in the implementation of water conservation measures, practices, and facilities; and

(6) to provide for the implementation by the Yakama Nation at its sole discretion of (A) an irrigation demonstration project on the Yakama Reservation using water savings from system improvements to the Wapato Irrigation Project, and (B) a Toppenish Creek corridor enhancement project integrating agricultural, fish, wildlife and culture resources.

Through the YRBWEP Conservation Program, grants are available to eligible entities (e.g. irrigation districts) that fulfill requirements such as furnishing all surface water delivery systems with volumetric measuring devices within 5 years and completing agreements that conserved water cannot be used to expand irrigation. Exceptions for the Yakama Indian Nation are provided.

Participation in the YRBWEP is voluntary. Participating entities can acquire Federal and State funds to assist in the cost of preparation of water conservation plans, feasibility studies, and ultimately in the implementation of approved conservation measures. The Sunnyside Division is a participant in the program.

The YRBWEP legislation specifies that water savings achieved through implementation of measures under the Basin Conservation Program should increase the YRBWEP instream target flows by 50 cfs for each 27,000 acre-feet of reduced annual water diversions by participants in the conservation program. The 50 cfs increase in target flows for every 27,000 AF of conserved water is derived by assuming that 2/3 of the annual water savings are dedicated to instream flows and 1/3 of the annual water savings are reserved for use at the discretion of the Conservation Program participant (i.e. either used for irrigation or left in the reservoirs and diverted back to water supply forecasts in the following year). The total amount of instream flow augmentation (in cfs) resulting from annual water savings is calculated by partitioning the total water savings (2/3 portion of 27,000 AF) over a 180 day time period. This period corresponds to the length of the average irrigation season (e.g. 50 cfs for 180 days = 18,000 AF = 2/3 of 27,000 AF).

A feasibility study was prepared for this project in March, 2000 by UMA Consultants, Inc. This study describes the technical aspects of the proposed project.

1.2 Purpose and Need

The purpose of the Sunnyside conservation project is to make the Sunnyside system more efficient by implementing water conservation improvements, thereby conserving water for fish benefit. The need for the project will be met by improving the canal system, less water will be diverted and more water will be available for fish, in so doing meeting the purposes of the YRBWEP legislation.

1.3 Project Location and General Description of the Area

The Sunnyside Division is located in south-central Washington near Yakima, Washington in Yakima County (See locator map). The Sunnyside Division consists of some 103,000 acres of land lying mostly north of the Yakima River, and extends from the Sunnyside Diversion Dam, on the Yakima River near Parker, to the vicinity of Benton City. Water is diverted from the Yakima River at the Sunnyside Diversion Dam and flows generally southeast through the Sunnyside Canal, which supplies the distribution system of the division. Four irrigation districts in the Sunnyside Division pump water to their lands by hydraulic turbine pumps at drops on the Sunnyside Canal.

The lower Yakima River Basin has a semi-arid climate with dry, warm summers and moderately cold winters. Average precipitation for the area is 8 inches per year, about half of which is snowfall. This climate supports shrub-steppe plant communities in the undisturbed area and topography is gently rolling.

By virtue of long standing water rights and contractual agreements with Reclamation's Yakima Project, the Sunnyside Division diverts and supplies Yakima River water to about 99,000 acres of irrigated lands in the lower Yakima Valley.

The Yakima Project area, which includes the Sunnyside Division, is among the leading agricultural areas in the United States. It is or has ranked first in the United States in producing several crops. It is also a major center for producing beef cattle. Yakima County ranked fifth in the United States in total agricultural production.

1.4 Project History and Background

The Sunnyside Division dates back to 1890 when the Northern Pacific Railroad began construction of the Sunnyside Canal. The United States Bureau of Reclamation (then known as the United States Reclamation Service) purchased the Sunnyside Canal in 1905 and by 1923 completed the project. On March 10, 1906, the Sunnyside Water Users Association formed to provide a liaison between the federal government and the landowners. On January 22, 1917, the Sunnyside Valley Irrigation District (SVID) replaced the Sunnyside Water Users Association. Reclamation operated the Sunnyside Division until 1945. Beginning with the 1946 irrigation season, the Sunnyside Division has operated and maintained its facilities. The Sunnyside Division receives water through works constructed under the auspices of the Yakima Reclamation Project, administered by Reclamation. The origin of the Sunnyside Canal dates back to 1878 when the Konnewock Ditch was constructed with a point of diversion about 400 feet upstream of the Sunnyside Diversion Dam. In 1880 the Konnewock Ditch Company was formed and 35 cfs of water were diverted from the Yakima River to irrigate about 3,500 acres. Initial construction of the Sunnyside Canal began in 1890. Several irrigation projects were undertaken during this time period. In 1900 the Sunnyside Canal was purchased by the Washington Irrigation Company, and then later sold to the United States Reclamation Service in 1905.

The Sunnyside Canal is the main canal for conveying water to lands within the Sunnyside Division. The Sunnyside Canal extends over 60 miles eastward from the Sunnyside Diversion Dam near Parker to lands northeast of Prosser, and has a capacity of 1,316 cfs. The canal generally serves lands north and east of the Yakima River, but also includes land south of the river in the vicinity of the communities of Mabton and Prosser.

The various entities that receive water from the Sunnyside Canal are collectively referred to as the Sunnyside Division of the Yakima Project. These entities include: Grandview Irrigation District, Benton Irrigation District, Sunnyside Valley Irrigation District, Piety Flat Ditch Company, Konnewock Water Users, Zillah Irrigation District, City of Sunnyside, City of Grandview, and City of Prosser. In 1945, a Board of Control was established by contract between Reclamation and each of these entities. The selected operating agent for the Sunnyside Division Board of Joint Control is SVID, which provides operation and maintenance of the joint use and ancillary facilities. In 1958, SVID entered into a contract with Reclamation to construct a system of drain channels. Upon completion of construction, operation and maintenance of the drains was transferred to the Sunnyside Division, with SVID serving as the operating agent.

The Yakima Reclamation Project is an extensive water storage and delivery system serving some 460,000 acres of irrigated lands in the basin. Reclamation administers the Project and operates the storage facilities. It also has an obligation in the basin, under YRBWEP, to try an improve fish habitat conditions.

1.5 Water Source and Rights

The water supply source for the Sunnyside Division is the Yakima River. The Yakima has an average annual runoff of approximately 3.4 million AF. It has been a partially regulated river since completion of the storage reservoir system by Reclamation in 1933. The reservoirs are reported to have a combined storage capacity of 1.07 million AF.

To meet the contract obligations to deliver water and to supply claimed rights, Reclamation distributes water to the various users under the concept of total water supply available (TWSA). TWSA is the amount of water available in any year from natural flow of the Yakima River and tributaries, from storage in the various Yakima Project reservoirs, from return and from other sources. Each year the Reclamation forecast for the TWSA consists of:

- April 1 to July 31 forecast of runoff
- Plus the August to September projected runoff
- Plus the April 1 reservoir storage contents
- Plus the usable return flow above Parker

Through operating experience, Reclamation has determined that when the April 1 to September 30 TWSA forecast is less than 2.25 million AF, water shortages for irrigation are likely to occur. Under terms of a Federal Court judgment, known locally as the 1945 Consent Decree, proration of supply for junior water users takes place during years of water shortage. This proration applies during the period when storage must be released from the reservoirs to meet entitlements (storage control period). Over the past 70 years of record, the average date for starting storage control is June 24.

The water rights of all entities claiming water from the Yakima River Basin are pending final determination in the ongoing general adjudication of water rights (filed in 1977 in the Superior Court of Yakima County). The case is State of Washington, Department of Ecology vs James J. Acquavella, et. al. No. 77-2-01484-5).

The water rights comprising the Sunnyside Division are set forth in the "Sunnyside Division Water Right Settlement Agreement" as a part of the Washington State Department of Ecology v. Acquavella adjudication. Priority dates for those water rights are as follows:

June 29, 1878
June 30, 1878
September 3, 1890
July 18, 1893
May 9, 1905
May 10, 1905

The point of diversion for Sunnyside's canal system is the Sunnyside Diversion Dam located 1500 feet west and 130 feet south from the east quarter corner of Section 28, T12N, R19E, W.M.

1.6 Related National Environmental Policy Act and Endangered Species Act Documents

A Programmatic Environmental Impact Statement (PEIS) was completed in January, 1999 for YRBWEP (Reclamation, 1999). This Environmental Assessment (EA), where appropriate, will tier sections of the PEIS. Section 1508.28 of the National Environmental Policy Act (NEPA) defines tiering of NEPA documents as "coverage of general matters in broader environmental impact statements (such as national program or policy statements) with subsequent narrower statements or environmental analyses (such as regional or basinwide program statements or ultimately site-specific statements) incorporating by reference the general discussions and concentrating solely on the issues specific to the statement subsequently prepared." This PEIS is available for review at the Upper Columbia Are Office.

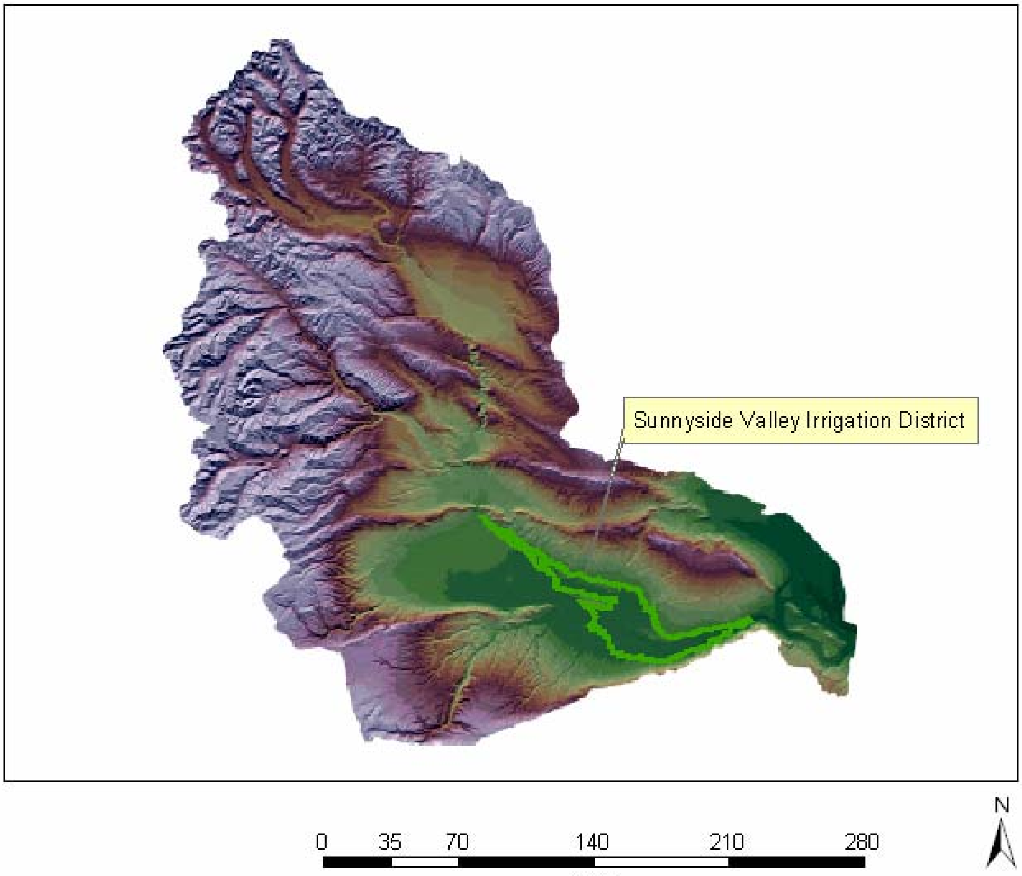
Reclamation has submitted a Biological Assessment (BA) for the operation and maintenance of the Yakima Project to National Oceanic and Atmospheric Administration Department of Fisheries (NOAA-Fisheries) (Reclamation, 2000).

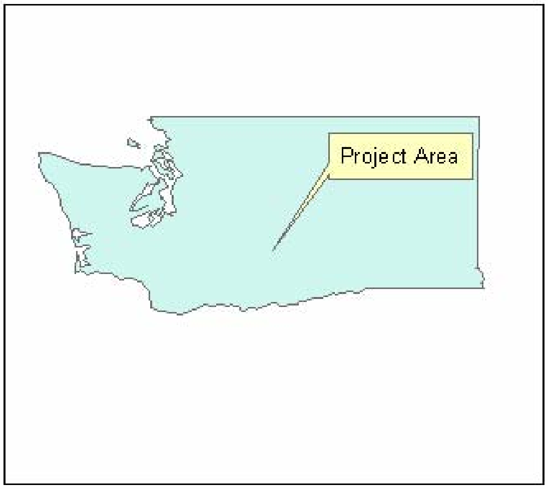
1.7 Permits required for Implementation of Project

A Benton County mining permit for construction of the 59.29 re-regulation reservoir would be needed but the other two reservoir sites would not require such a permit.

A storm water permit from the Washington Department of Ecology would not be obtained since any storm water from construction will not flow into waters of the United States.

Sunnyside Valley Irrigation District
Locator Map





Chapter 2. Alternatives Including the Proposed Action

This chapter addresses the proposed action alternative as well as the No Action alternative as directed by NEPA.

2.1 No-Action Alternative

The no-action alternative assumes that the Sunnyside Division will continue to operate under its present operating criteria with no system improvements. The assumptions listed under the no-action alternative in the YRBWEP PEIS would apply, whereby, diversions would be reduced to proratable entitlement holders when water supply is not sufficient to meet all entitlements. The proratable entitlements in the Sunnyside Division would share the impact on a proportionate basis with other proratable entitlement holders in the event of a shortage.

2.2 Main Canal Improvements Alternative

This alternative would consist of the following:

- Three re-regulation (re-reg) reservoirs constructed within the Sunnyside Main Canal, located at canal miles 23.7, 37.25, and 59.29.
- Replacement of 30 existing drop structures with new, fully automated electrically powered gates.
- Addition of two new checks with fully automated electrically powered gates, to improve the operation of the lower end of the Sunnyside Main Canal.
- A new chute drop spillway at Spring Creek and new hoists and automation of the Sunnyside Diversion, Sulphur Creek, and the new Spring Creek Spillway gate systems
- A Supervisory Control and Data Acquisition (SCADA) system communicating by radio between the central office and all automated control sites; 35 in all

The automation of the Sunnyside Canal and the addition of re-regulation reservoirs will allow the operation of the Sunnyside Canal to more closely match the demand. It is therefore the catalyst for the water conservation plan. The automation of the Sunnyside Canal check drop structures will provide for more precise and continuous control of canal water levels. The SCADA system will provide the tools to remotely adjust the canal and provide extensive real time information as to what is happening in the system. The ability to remotely monitor the system and make changes with little effort, in combination with the creation of re-regulation reservoir storage provides the tools to reduce spill in the system.

The proposed action will be conducted over a nine year time period with constituent actions being phased in over that time period. Construction of the first of three proposed re-regulation reservoirs (at canal mile 59.29) will begin at the end of the 2004 irrigation season. The two additional re-regulation reservoirs will be constructed at the end of the 2009 and 2011 irrigation seasons, for the reservoirs proposed for canal miles 37.6 and 28.3, respectively. Replacement and installation of new electronically powered gates and canal check drop structures will be phased in as time and cost-share fund acquisition allows.

All construction activities will be limited to the non-irrigation season (mid-October through early April), at a time when no water will be present in the Sunnyside Main Canal or in areas of re-regulation reservoir construction. Construction techniques, timing, logistics and equipment required to construct major project features (e.g. re-regulation reservoirs and check drop structures) will be described below.

Re-regulation Reservoirs

Conservation of Sunnyside Canal operational spillage requires that there be new reservoir facilities. As a result, the proposed action includes the construction of three new re-regulation reservoirs at canal miles 28.3, 37.6, and 59.29, respectively. Areas for re-regulation reservoir siting were located at intervals that are reflective of the size of the service area between them and that were likely to achieve the highest water savings possible. All three re-regulation reservoirs will be located adjacent to and on the downslope (south) side of the Sunnyside Canal. Proposed capacity for these reservoirs ranges between 336 and 491 AF with useable capacity of the three reservoirs being 300, 400 and 450 AF, respectively (UMA 2000). Additional structures will be required at each site to make the reservoirs function effectively (i.e. to divert water into the reservoirs, to pump back stored water in response to new demand or to system balancing requirements), and to accurately measure flow. Reservoir inlet structures will be hydraulically and structurally substantial, and will be designed to be more responsive to the automation and SCADA system.

Re-regulation reservoir construction will require the use of several pieces of large construction equipment including: excavators, bulldozers, front-end loaders, cranes and dump trucks. Access to the proposed reservoir sites will be through SVID owned lands and Sunnyside Canal access right-of-ways adjacent to the reservoir sites. Reservoirs will be excavated and shaped to dimensions specified in the design criteria by excavators, bulldozers and front-end loaders. Because the re-regulation reservoirs are proposed to be built on topography that is sloping away from the main canal, little material will need to be excavated from reservoir sites. Dams built at each reservoir site will be of earth fill construction and will be built at the same time as the reservoirs are being excavated. Excavated material from the reservoir sites will be used as fill material during dam construction. Alternating layers of fill material will be delivered and packed until the dams reach the specified design height.

Reservoir inlet and outlet structures along with pumping and water measuring devices will be installed between the respective re-regulation reservoirs and the Sunnyside Main Canal. Excavations will be made in the right bank of the main canal and the site prepared for equipment installation. Inlet and outlet pipes and associated pumps and other required equipment will then be installed before the canal bank is rebuilt. The Sunnyside Main Canal banks will be packed and rip-rap material reinstalled to ensure proper structural integrity of the canal banks.

A 20 mil PVC liner will be installed at all three re-regulation reservoirs to reduce water losses due to groundwater infiltration. When the reservoir bottoms are excavated to the proper design specification the PVC liner will be placed on the reservoir bottom. The PVC liner will also be extended from the base to the top of the earth fill dam and will be built into the dam surface near the upstream side. A 1.5 foot deep cover layer of packed clay material will then be installed on the reservoir bottom to complete reservoir construction.

Sunnyside Canal Check Drop Structures and Automation

The Sunnyside Canal, the re-regulation reservoirs, and the diversion laterals need to work as an integral unit to effect a high level of recovery of spills. To facilitate water delivery through the Roza-Sunnyside Board of Joint Control (RSBOJC) drainage network in the most efficient manner possible, improvements need to be carried out in the canal itself to facilitate the diversion of spill water, but also to maintain near constant water levels throughout the 60 mile main canal system, thereby stabilizing turnout diversion rates into the lateral canals. Water diversion into the SVID laterals and into the headings of the smaller districts in the Division is facilitated by 30 canal check drop structures. Theses structures are required to control the diversion into proposed new re-regulation reservoirs, providing a place for temporary storage of excess water which would otherwise have to be discharged and wasted down the Sunnyside Canal spillway system. Currently, operators manually adjust boards in each of the stoplog bays at each structure in order that canal water levels, and thus flow rates into the turnouts, remain as constant as possible. The process of manually installing and removing stoplogs in these large hydraulic structures is inefficient, time consuming, difficult, and is often hazardous.

The current system of check drop structures in the Sunnyside Main Canal is aging (most are more than 85 years old), spalling of the concrete surfaces is occurring particularly on the central pier foundations and sides, and considerable bed grade erosion is evident below most of the drop structures, suggesting that the structure sills are much higher than the current bed elevation. Field surveys of canal bed elevation in 1999 showed that the current structural seals are generally 3 to 4 feet above the existing canal bed giving them the appearance of being suspended (UMA 2000). Continued bed erosion at these structures can be expected in the Main Canal exacerbating the problem even further.

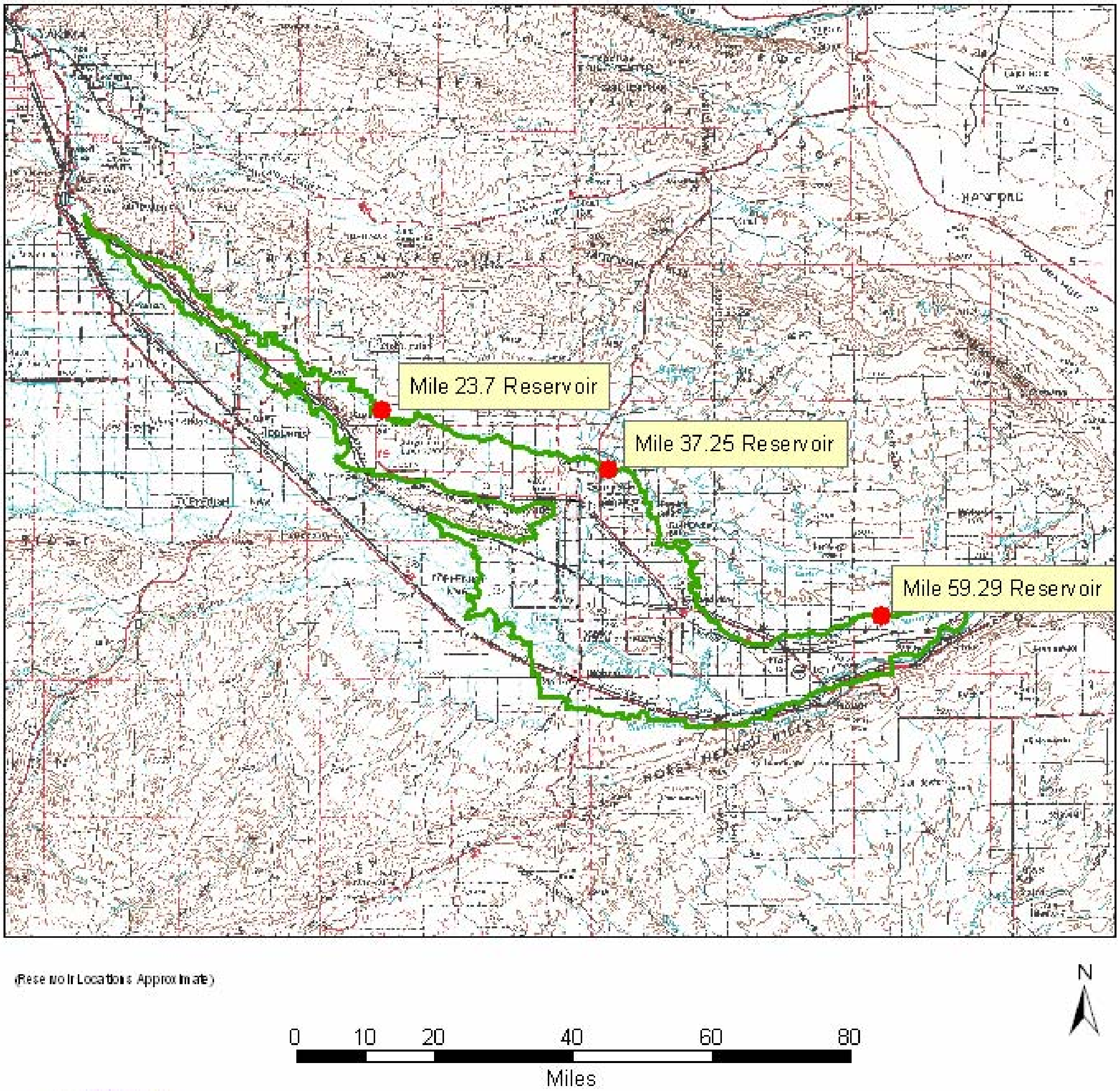
The proposed action is to replace all check drop structures with new reinforced concrete check drops, and install a new electrically powered automated gate control system, and replace the existing five bays of hand operated stoplogs. Some 30 check drop structures are required including two additional structures to improve the checking capability of the lower end of the canal. Check drops and the proposed new reservoir inlet chute drops will be designed in accordance with Reclamation standards for width and energy dissipation.

To correct the deficiencies at the 30 existing check drop structures in the Main Canal the SVID is proposing to fully remove and then reinstall new concrete check drop structures along the length of the 60 mile canal system. By replacing the existing structures with new structures, the opportunity exists to relocate some of them to better locations. This, along with the addition of two new check drop structures lower in the canal system, will allow for better or more reliable service to critically high delivery points in the system. The installation of check structure automation at these sites will also decrease the need for manual stoplog adjustments during operational changes and will increase water delivery efficiency leading to water savings in the canal system. The SVID is proposing to replace the structures with their upstream sills at the same elevation as the existing sills, and their downstream sill elevations the same as the existing canal elevations downstream of the structures. The lowered downstream basins will dissipate much of the highly turbulent, erosive flow that is typical of most of the current check drop structures.

In order to replace the current check drop structures with new structures, the existing structures will be removed. This will require the demolition of the central pier foundations and concrete sides of the existing structures. Heavy equipment and jack-hammers will be used to demolish the existing structures. For those locations where new structures will be rebuilt at the same location as the old structure, the upstream and downstream sill elevations will not be modified. For check drop structures installed in new locations in the main canal the upstream and downstream sill elevations will be nearly even. Removal of the existing structures will require some excavation of both the right and left canal banks to fully remove all of the old structural material. All material removed from the demolished check drop structures will be removed from the site and transported to proper disposal sites. Once the footings are prepared for the new check structures, including the canal bed and banks, new concrete foundations and structural components will be poured. After the structural foundation of the new check drop structures are in place the control gates and automation equipment will be installed and connected to the SCADA network.

The capital cost for Alternative 2 is $32.6 million, with water savings of 29,162 AF at a unit capital cost of $1,117 per AF (Table 2-1).

Sunnyside Valley Irrigation District
Re-regulation Reservoir Locations



(Reservoir Locations Approximate)

Chapter 3. Affected Environment

This chapter describes resources in the study area that may be affected by the alternative implemented. Resources and related topics presented include surface water hydrology, groundwater hydrology, water quality, fish, vegetation and wildlife, threatened and endangered species, economics, historic properties, Indian Trust Assets (ITA), soil quality, and environmental justice.

3.1 Issues Considered but Eliminated from Further Analysis

Recreation was analyzed in the YRBWEP PEIS and no impacts were found, therefore it is not discussed here.

3.2 Surface Water Hydrology

The Sunnyside Division diverts its water at the Sunnyside Diversion Dam near Parker, Washington (River Mile [RM]103.0). The Sunnyside Division diverts between 600 to 1,300 cubic feet per second of water during the irrigation season (Reclamation, 2002). Return flows from the Sunnyside Division reenter the Yakima River at several locations including Sulphur Creek Wasteway (RM 61) and Spring Creek Wasteway (RM 41.8). All return flows from the Division reenter the river above the Kiona gage (RM 29.9)

The proposed action could affect flows in the reach of the Yakima River from the Sunnyside Diversion Dam near Parker to about Kiona during the irrigation season from about March through mid-October. Flows in this each of the Yakima River are regulated by reservoir operations and diversions for irrigation during this period. In the spring, from about March through early June, flows are generally on the rise Flows in March at Parker are normally in the range of 2000 to 4000 cfs, although higher or lower flows may occur depending upon snowpack and runoff conditions. Conditions are similar at Kiona though flows tend to be slightly higher, in the 4000 to 5000 cfs range. From March through late May flows are generally increasing due to spring runoff not captured in the reservoirs. Peak discharge usually occurs from April through early June. Depending on the water year peak flows can vary from around 1,500 – 2,000 cfs to over 10,000 cfs with flows in the 3,000 to 6,000 cfs range occurring most frequently. Beginning in late May to mid-June, streamflows decline to baseflow conditions. When natural flows can no longer meet diversion entitlements, storage control begins, and flows at Parker are managed to meet the target flows set as part of YRBWEP. These target flows vary from 300 to 600 cfs, year to year, depending upon TWSA. The target flows are maintained through the end of the irrigation season in mid-October. During this period flows at Kiona are higher, in the 1,500 to 2,000 cfs range. Flows in the fall and winter at Parker and Kiona would not be affected by the proposed action. . The average annual natural flow at Parker is 3,390,551 AF, of which 1,713,282 AF (51%) is regulated by storage reservoirs.

3.2.1 Wasteways

The Sunnyside Division utilizes two major wasteways: Sulphur Creek Wasteway and Spring Creek Wasteway. These wasteways return both surface and subsurface water from The Sunnyside Division lands directly to the Yakima River. Sulphur Creek Wasteway enters the Yakima River from the north at River Mile (RM) 61.0 and is a combined wasteway for the Roza Irrigation District (RID) and SVID. Several county drainage districts and the city of Sunnyside's storm water system and sewage treatment plant drain into Sulphur Creek Wasteway. The Spring Creek Wasteway enters the Yakima River at RM 41.8. It merges with Snipes Creek before entering the Yakima River. During the irrigation season, Spring Creek receives nearly all surface flows from a hydraulic pump station that supplies water to a lateral of the Sunnyside Canal (Cramer, 2001).

Flows in wasteways during the irrigation season are several times higher than during the non-irrigation season. Source of water for the drains during October 21 through March 14 (non-irrigation season) is mostly emerging groundwater. During the non-irrigation season flows range from approximately 1 cfs in Snipes Creek Wasteway to near 90 cfs in Sulphur Wasteway. During the irrigation season flows are greatest in Sulphur Wasteway and average between 276 and 375 cfs. Irrigation season flows in Snipes and Spring Creek Wasteways generally range from 30 to 60 cfs (Romey and Cramer 2001).

3.3 Groundwater Hydrology

The Prosser groundwater aquifer underlies the Sunnyside Division. This aquifer receives much of its recharge from irrigation return flow and canal seepage. The main discharge from this portion of the aquifer is through open drains and directly discharges into the Yakima River. Groundwater is a minimal source of irrigation water in the division.

3.4 Water Quality

This section of the Yakima River is listed on the Washington State’s 303(d) list for violating several water quality parameters including: pesticides, Polychlorinated Biphenyls (PCBs), temperature, fecal coliform (FC), pH, DO, and turbidity. Low river flows and agricultural return flows are a main source of degraded water quality. Pesticides and PCBs are lethal to fish and bio-accumulate, and result in human consumption advisories for fish captured in this reach. Elevated water temperatures are lethal to salmonids and other cold water fish, and limit the amount of time this reach is suitable for salmonid rearing. In most years, the water temperatures get too warm to support salmonid rearing in this reach of the river during the summer months. However, groundwater inflows do provide some cool water refuges that provide some very limited rearing habitat for salmonids. High water temperatures and elevated pH can also exacerbate the effects of toxic chemicals and either stress fish, which may result in death from secondary causes, or kill them directly. Elevated turbidity indicates high sediment loading and results in the armoring of spawning gravel, siltation of redds, and decreased macro-invertebrate production. The high nutrient loading along with warmer water temperatures create habitat conditions more favorable to non-native species, some of which are predators upon anadromous salmonids. Recent improvements to farming practices have improved water quality in this reach, especially for turbidity and total suspended sediments. (Reclamation, 2002).

3.5 Soil Quality and Erosion

The soils of the basin were formed from alluvium, eolian sand, lake sediment, loess, and residuum derived from basalt and sandstone. The soils are sandy to clayey in texture and vary from shallow to deep. The soils are generally very productive with low organic matter, medium textures, good water holding capacity, and good structure. Soil quality is generally good with only minor areas of salinity and/or sodicity and few toxic trace element problems.

Erosion ranges from slight to severe, depending on soil texture and topography. Dawson and Domka (1987) reported that farming practices in the Yakima Basin in the mid 1980s led to over 90,000 acres exceeding the soil loss tolerance values defined as the maximum soil loss that can be sustained without reducing the long-term productivity of the soil. Irrigation practices in the lower basin have improved dramatically since the time of the Dawson report, mostly from converting to sprinklers from rill irrigation.

Erosion caused by surface water is generally low on irrigated slopes of less than 2 percent. Under drip or sprinkler irrigation steeper slopes can be irrigated with low to moderate erosion. Row crops under furrow irrigation are the largest source of erosion, although over-irrigation from sprinklers can also cause serious erosion.

Blowing soil is a hazard in the basin on the sandy, droughty soils with low organic matter and crop residue.

Most of the soils are well-drained; however, drainage is restricted in some of the low-lying areas, resulting in excessive salts and a high water table. Agricultural drains have been installed in some areas to lower the water table. In other areas the water-logged areas are used for pasture or have developed into wetlands.

3.6 Fisheries

The Pacific salmon species produced in the Yakima River Basin include steelhead, spring chinook salmon, fall chinook salmon, and coho salmon. These fish spawn and rear within the basin, migrate to the ocean to grow to adult size, and return to the Yakima system to spawn. Each species uses specific areas within the basin for its respective life stages. This discussion focuses on those aspects of salmon and steelhead migration, spawning, and rearing that could be affected by changes in instream flows, river operations, or water quality as a result of this proposed project. It focuses on the reach of the Yakima River from Parker to about Kiona and changes to flows and water quality during the irrigation season from March through October.

The river below Prosser Dam is important for fall chinook spawning, migration, and rearing. The reach below Sunnyside Dam is used by spring chinook and steelhead for juvenile rearing, primarily in the fall and winter when temperatures are suitable or in areas of upwelling groundwater or cooler tributary inflow. Fall chinook spawning and rearing also occurs in this reach. Adult upstream and juvenile downstream migration of all species occurs from Sunnyside Diversion Dam to the mouth of the Yakima River.

Fall Chinook

Adult Migration – The spawning run of Yakima River fall chinook at Prosser begins in early September, peaks in late September and is usually finished by the second week of November. Run timing variability is related to flow but not water temperature; higher flows accelerate passage (NPPC 2001).

Spawning and Incubation – Spawning begins immediately after arrival of adults in early October and is complete by the end of November. In the lower mainstem some spawning occurs later from late

December to early January. It is estimated that about 70 percent of fall chinook spawning occurs below Prosser Diversion Dam. Incubation occurs from mid October through April.

Emergence and Rearing – The emergence period ranges from mid February to late April with a peak in late February to early March. Emergence occurs earliest in the Marion Drain (RM 82.6), ranging from mid-February to late March. In the cooler mainstem, emergence doesn't begin until late March, extending into the third week of April (NPPC 2001).

Fry Colonization – Fry colonization begins March 1 and extends through May 31. Fry rearing above Prosser are not seen in significant numbers at the juvenile bypass facilities at Prosser until smolts are observed in the last week of April or first week in May (Fast et al. 1986).

Smolt Outmigration – All fall chinook outmigrate as subyearlings. Ten percent of the smolts have passed Prosser Diversion Dam by May 9; 50 percent by June 6 and 90 percent by July 1. There is considerable variability in outmigration timing, with the migration ending as late as July 15.

Spring Chinook

Adult Migration – Adult migration into the Yakima River begins in late April (the earliest observation was April 11) continuing through late June. Cumulative passage of spring chinook spawning run at Prosser Diversion Dam for 1983 through 2000 indicates the dates of 10, 50 and 90 percent cumulative passage are April 10, May 13 and June 3. There is considerable variability from year to year, as the run has been 90 percent complete as early as May and as late as June 24.

Spawning and Incubation – Spring chinook do not spawn in the reaches potentially affected by this proposed action.

Fry Colonization and Overwintering –Highest juvenile densities in summer are found well below the major spawning areas in the upper parts of the Yakima basin but above Sunnyside Dam. No juveniles are found in the lower Yakima mainstem below Sunnyside because of excessive summertime water temperatures (Fast et al. 1991). An extensive downstream winter migration of pre-smolts occurs from October 1 through January 31 in response to falling water temperatures in late fall. From 10 to 35 percent of brood year juveniles migrate below Prosser Diversion Dam during winter, with the remaining juveniles overwintering in deep, low velocity portions of mainstem Yakima between Marion Drain and Prosser Diversion Dam.

Smolt Outmigration – Outmigration of smolts ranges from March through the end of June, with peaks occurring the second week of April.

Coho

Adult Migration – In 2002 the adult spawning run passing the counting facilities at Prosser Diversion Dam began the second week of September and continued through November (YKFP 2003).

Spawning and Incubation – Most coho spawn from early October through late December in proximity to their acclimation and release points. In the past spawning occurred in the middle Yakima River below Sunnyside Dam (from RM 95 - RM 104) near previous hatchery release sites. Spawning also has occurred in side channels in mainstem Yakima between Rosa Dam and Wapato (~ RM 100) and in Yakima Canyon (RM 129-RM 146); in the mainstem and tributaries of the Naches River; Marion Drain, and Toppenish Creek. Spawning sites also include Spring Creek and Sulphur Creek wasteways. Incubation occurs from November 1 through March. More recently, hatchery Coho are outplanted in the upper Yakima and Naches Rivers in order for them to reestablish in more favorable conditions.

Emergence and Rearing – Emergence occurs from March through April. Coho juveniles rear for one year in the Yakima River, from April 1 to the following April 1. It is unknown if coho juveniles enter the mainstem of the lower Yakima River during any portion of this year-long rearing period.

Smolt Outmigration – In 2002, coho outmigration past Prosser Diversion Dam began March 25, peaked mid-May and was completed by mid-June (YKFP 2003).

Smolt Outmigration. Smolt outmigration in the lower Yakima River at Prosser begins in March and ends in early July (YKFP 2003).

3.6.1 Fish Populations in Snipes/Spring Creek and Sulphur Drain

Fish from the Yakima River are able to access some areas within the RSBOJC drainage networks. None of these facilities were developed for the expressed purpose of providing fish and wildlife habitat, but animals are present and using the habitat that is available. Most often salmonid use of the irrigation network occurs in lower reaches of channels carrying return water back to the Yakima River, where there is open access for fish migrating in the upstream direction. Coho and fall chinook salmon and steelhead trout are present within the RSBOJC drainage network and currently use select drains and wasteways for spawning and juvenile rearing. These species have been observed spawning in the drainage network for over a decade (Cuffney et al. 1997).

However, the extent of anadromous and resident fish distribution, and the seasonality of fish use of the drains has not been extensively studied. As a result, fish population information is limited for the system of wasteways and drains associated with the Roza and Sunnyside Canal network.

Spring and Snipes Creek Wasteways and Sulphur wasteway have been the most extensively studied drainage networks associated with the RSBOJC drainage network. Monk (2001) surveyed adult salmonid spawning populations and monitored juvenile production and distribution within these drainages in the most detailed study of fish use of these networks to date. Annual redd surveys for these species have also been performed in these drainage networks since 2000 (Pat Monk, RSBOJC biologist, personal communication). Results of these surveys show that the most abundant salmonid populations in these drainages is composed of coho and fall chinook salmon.

Electrofishing surveys conducted in 2000 and 2001 indicated that the fish community in Sulphur Creek was dominated by native minnows and suckers. Very little salmonid production was observed in Sulphur Creek which had a reported density of only 0.07 coho fry $\cdot$ 100 m^{-2}. Juvenile salmonids were the most abundant fish species observed in Spring and Snipes Creeks during the 2000 and 2001 surveys.

Coho densities of 4.73 fry · 100 m^{-2} were observed in these drainages during the electroshocking surveys. Based on density estimates it appears that coho spawning was only marginally successful in Spring and Snipes Creeks and was extremely poor in Sulphur Drain (Monk 2001).

Although coho and fall chinook are the primary species utilizing these drains, steelhead are also known to use these drains and wasteways. Steelhead adults were observed in Spring and Snipes Creeks and in Sulphur Drain during redd surveys, but in very low numbers. One or two steelhead were observed in Sulphur Creek on at least three occasions between February and April 2001, but spawning activity was not observed. A dead steelhead kelt was found in Sulphur Creek in June 2001 (Monk 2001). A trout redd and a spawning male rainbow trout were found in Snipes Creek, and a rainbow/steelhead trout was seen on a redd in Spring Creek during surveys in 2001. Additional signs of steelhead spawning activity was scarce as adult fish were not abundant in the drainages surveyed in 2001 (Monk 2001). Similar to coho salmon, very low densities of juvenile rainbow/steelhead (0.22 and 0.18 trout fry · 100 m^{-2} in Sulphur and Snipes/Spring Creeks, respectively) were observed in the drains surveyed by Monk (2001) in 2000.

High return flows that occur annually during the irrigation season and during canal shutdown in the RSBOJC drainage network result in false attraction flows for adult salmonids. Salmon and steelhead that migrate into Spring and Snipes Creeks and Sulphur Drain are allowed to spawn naturally or, in the case of Sulphur Drain, are removed once they reach the terminus of the drain at the anadromous barrier at RM 7.0. The Yakama Nation has been seining and removing adults from these drains for a number of years. Some of the coho salmon have been used as broodstock for the Yakama Nation hatchery, while the surplus have been released in the Yakima River upstream of Sulphur Drain.

3.6.2 Fish Habitat Conditions in Sulphur Drain and Snipes/Spring Creek Wasteways

Anadromous fish have access to several miles of drain and wasteway habitat in the RSBOJC drainage network and are only limited in their distribution by impassible culverts at road crossings or barriers created by drop structures associated with the drainage network. Sulphur Drain has approximately 7 miles of accessible salmonid habitat, while Spring Creek and Snipes Creeks have 0.4 and 3.8 miles of available habitat, respectively. Based on redd survey data and fish population investigations, anadromous salmonids are currently distributed in all areas downstream of anadromous barriers and use available habitat to varying degrees (Monk 2001).

A study was conducted on the RSBOJC drainage network in 2001 by Romey and Cramer (2001) to characterize available habitat conditions and to determine the networks potential to support salmon and steelhead life history characteristics including; migration, spawning, egg incubation, and juvenile rearing. This study focused on Sulphur Drain as well as the Snipes and Spring Creek Wasteways.

Stream habitat was found to be generally unsuitable for salmonids in Sulphur Drain. Areas consisting of pool and riffle habitat types were scarce while less productive glide habitat dominated. High levels of fine sediment (45-80%) and highly embedded substrates (average of 64%) in the drain were indicative of a drainage channel that flowed through agricultural areas with highly erosive silt and sand deposits (Romey and Cramer 2001). The habitat survey also indicated that channel gradients were very low (0.3% to 0.4%). Romey and Cramer (2001) concluded that the low stream gradients and high sedimentation rates observed in Sulphur Drain would result in extremely poor spawning or egg incubation success rates for any species that spawned in this irrigation return flow channel. Negative effects from sedimentation are particularly high for fall spawning species, as sediment loads tend to drop out and settle on channel substrates when water levels decrease at the end of the irrigation season (mid-October). A readily observable layer of fine sediment accumulates and covers most substrate areas in Sulphur Drain during most years (Pat Monk, RSBOJC biologist, personal communication).

In contrast, Romey and Cramer (2001) observed that stream habitat conditions were fair to good for natural production of salmonids in both Snipes and Spring Creek Wasteways. These natural channels had gradients around 1%, flowed through areas of basalt geology, and had suitable amounts of gravel and cobble substrates. Habitat types were dominated by highly productive riffles (44-75% by area) with large areas of suitable spawning gravels. The remainder of habitat types consisted of pool and some glides (Romey and Cramer 2001). Stream habitat was more complex and was more likely to support juvenile salmonid rearing than that observed in Sulphur Drain. However, substrate embeddedness and levels of fine sediment in streambed gravels were also found to be high in Snipes and Spring Creek Wasteways. Embeddedness ratings were commonly measured in the 20% to 30% range, while percent fine sediments was often reported to be between 20 and 40% in some reaches of Snipes and Spring Creeks.

Water temperatures in all drains generally remained within ranges tolerated by salmonids (Romey and Cramer 2001), although high temperatures could result in growth reduction and sub-lethal stress during the warmest periods observed in summer. During the irrigation season, temperatures reached daily averages as high as 23˚C. Average summer temperatures are 16-21˚C in Sulphur Drain and 18-23˚C in Snipes and Spring Creeks.

3.7 Vegetation and Wildlife

The issue of vegetation and wildlife for this project would pertain to the areas of the re-regulation reservoirs and their impact to the vegetation and wildlife.

The area at reservoir 23.25 is currently fallow and has not been in production for about seven years. It was used as an irrigated pasture and the pasture is still present, but has not been irrigated or cultivated for those seven years. The reservoir would be about 29 acres in size at full pool and have a capacity at 480 AF.

The site at canal mile 32.7 is currently farmed produces mint and asparagus. This land would be purchased or leased by the Sunnyside Division for the reservoir. The reservoir will have a capacity of 336 AF and cover 26 acres at full pool.

The reservoir at 59.29 is scabland and low production pasture. There is only a partial water right on the property due to poor soil conditions. The Sunnyside Division would purchase or lease this property. Acreage at this is approximately 32 acres and the capacity is 300 AF. (Don Schramm, personal communication).

For a general description of the vegetation and wildlife of the Yakima Basin, refer to the YRPWEP PEIS, Section 3.7. Described in this section are the wetland resources that may be impacted by this project.

3.7.1 Wetlands

Wetlands are critical ecological systems of importance to fish and wildlife. Existing acreages of wetland habitat are reduced compared to historical conditions. Existing wetlands include wet meadows, seeps, small shallow ponds and lakes, marshes, and riparian wetlands along streams. Wetlands have also formed from artificial water sources such as reservoirs, sewage lagoons, stock ponds, irrigation canals, and irrigated cropland runoff. For impact analysis purposes at this feasibility level, the National Wetland Inventory maps have been used to assess wetland impact, together with initial field investigation and review of aerial photographs.

3.8 Threatened, Endangered, and Special Status Species

The Endangered Species Act requires Federal agencies to consult with FWS and NOAA Fisheries, as appropriate, to ensure that actions they authorize, fund, or carry out do not jeopardize the existence of a listed species or result in the adverse modification or destruction of their critical habitat.

The following list contains those species listed by FWS and NOAA Fisheries as threatened or endangered within the project area:

Federal Listed

Endangered

- None

Threatened

- Bald eagle *(Haliaeetus leucocephalus)*
- Bull trout *(Salvelinus conf/uentus)*
- Steelhead trout (*Oncorhynchus mykiss*)
- Ute Ladies'-tresses *(Spiranthes diluvialis*), plant

Reclamation is currently in the process of preparing a BA to assess any impacts to listed species from this proposed action.

3.8.1 Summer Steelhead

The Middle Columbia River (MCR) Evolutionarily Significant Unit (ESU) of inland steelhead was listed as "Threatened" by NOAA-Fisheries on March 25, 1999. The MCR ESU includes all naturally spawned populations of steelhead in streams from above the Wind River, Washington, and the Hood River, Oregon (exclusive), upstream to, and including, the Yakima River, Washington (64 Fed. Reg. 14517). Steelhead from the Snake River Basin are excluded from this ESU.

General Life History and Yakima River Population Characteristics

Steelhead are phylogenetically and ecologically complex, exhibiting perhaps the most diverse life history patterns of any Pacific salmonid species (Shapovalov and Taft 1954, Barnhart 1986). O. mykiss display varying degrees of anadromy, differences in reproductive biology, and plasticity of life history between generations (Busby et al. 1996).

Steelhead on the west coast of the United States have experienced declines in abundance in the past several decades as a result of natural and human factors. Forestry, agriculture, mining, and urbanization have degraded, simplified, and fragmented habitat. Water diversions for agriculture, flood control, domestic, and hydropower purposes have greatly reduced or eliminated historically accessible habitat. Loss of habitat complexity, such as reductions in wetlands and deep pools, has contributed to the decline of steelhead. Studies estimate that during the last 200 years, the lower 48 states have lost approximately 53 percent of all wetlands and the majority of the rest are severely degraded (Dahl 1990, Tiner 1991). Washington and Oregon's wetlands are estimated to have diminished by one-third, while California has experienced a 91 percent loss of its wetland habitat (Dahl 1990, Jensen et al. 1990, Barbour et al. 1991, Reynolds et al. 1993). In national forests in Washington, there has been a 58 percent reduction in large, deep pools due to sedimentation and loss of pool-forming structures such as boulders and large wood (Federal Ecosystem Management Assessment Team [FEMAT]). Similarly in Oregon, the abundance of large, deep pools on private coastal lands has decreased by as much as 80 percent (FEMAT 1993). Sedimentation from land use activities is recognized as a primary cause of habitat degradation in the range of west coast steelhead.

Critical habitat was designated in the Federal Register as a final rule for the Middle Columbia River steelhead ESU on February 16, 2000 (65 FR 7764). Critical habitat designated in this Federal Register Notice included all river reaches accessible to listed steelhead in the Columbia River tributaries (except the Snake River) between Mosier Creek in Oregon and the Yakima River (inclusive). Also included were river reaches and estuarine areas in the Columbia River from a straight line connecting the west end of the Clatsop jetty (south jetty, Oregon side) and the west end of the Peacock jetty (north jetty, Washington side) upstream to the Yakima River in Washington. Excluded were areas above Condit Dam in the White Salmon River and Pelton Dam on the Deschutes River, or above longstanding, naturally impassable barriers in the above defined area. However, since the original critical habitat rule was published a Federal Court vacated the rule and as a result, critical habitat is no longer designated for MCR steelhead.

All steelhead in the Columbia River Basin upstream from the Dalles Dam are summer-run, inland steelhead (Schreck et al. 1986). Life history information for steelhead of this ESU indicates that most Middle Columbia River steelhead smolt at 2 years and spend one, two, or rarely, three years in the ocean (i.e., 1-salt, 2-salt, or 3-salt fish, respectively) prior to re-entering fresh water. Adult steelhead on their spawning migration enter the Columbia River in mid-May and pass over Bonneville Dam between July and August. Summer-run steelhead adults remain up to a year in fresh water prior to spawning.

Middle Columbia River steelhead population size is substantially lower than historic levels, and at least two extinctions are known to have occurred in the ESU. Based on historic (pre-1960's) estimates, the run size of the MCR ESU could have been in excess of 300,000 fish (Busby et al. 1996) although this figure may be an overestimate since it is largely based on historical estimates of steelhead returns to the Yakima River basin. Other crude estimates, based on the size of the Yakima watershed and salmon and steelhead harvest in the Columbia River (Chapman 1986) lead to lower estimates of historical abundance for the entire MCR ESU. Similarly, there is uncertainty about how many steelhead existed in the Yakima River basin historically. Although run size estimates vary, numerous early surveyors and visitors to the Yakima Basin reported a robust and widespread steelhead population (Bryant and Parkhurst 1950; Davidson 1953; Fulton 1970; NPPC 1986; McIntosh et al. 1990). The Washington Department of Fisheries (WDF 1993) estimated that the Yakima River had annual run sizes of 100,000 steelhead prior to development. However, other historic run size estimates are substantially lower than this figure. For example, Cramer et al. (2003) suggests that production of steelhead in the Yakima River was less than 50,000 fish based on various estimates. Kreeger and McNeil (1993) estimated the historic run of steelhead to the Yakima River was about 20,800 adults based on Columbia River harvest statistics and amount of area the Yakima watershed occupies within the Columbia Basin.

Despite the variation in these historic estimates for the MCR ESU and the Yakima River, all estimates are higher than current abundance levels. In larger rivers across the entire ESU such as the John Day, Deschutes, and Yakima, steelhead abundance has been severely reduced. Currently, across the entire ESU, wild fish escapement has averaged 39,000 fish and total escapement has averaged 142,000, including hatchery fish. The large proportion of hatchery fish, concurrent with the decline of wild fish, is a major risk to the MCR ESU (WDF 1993; Busby et al. 1996).

Within the Yakima River Basin, wild adult steelhead returns have averaged 1,775 fish (range 505 to 4,491) over brood years 1985-2003 as monitored at Prosser Dam (RM 47.1; NPPC 2001, brood year 2003 data from Yakima-Klickitat Fisheries Program (YKFP), available at: www.ykfp.org). As of March 31, 2004, 2,528 wild adult steelhead had passed Prosser Dam. This is an above average run size, however it is smaller than the historic Prosser Dam count of 4,525 fish observed during the 2001 steelhead run into the Yakima basin.

Generally, adult MCR steelhead migration into the Yakima Basin peaks in late October and again in late February or early March. Steelhead adults begin passing Prosser Dam in late summer, suspend movement during the colder parts of December and January, and resume migration from February through June. The relative number and timing of wild adult steelhead returning during the fall and winter-spring migration periods varies from year to year (BOR 2000; NPPC 2001). Most adult steelhead over-winter in the Yakima River between Prosser and Sunnyside Dams (RM103.8) before moving upstream into tributary or mainstem spawning areas (Hockersmith et al. 1995).

The historical distribution of Yakima steelhead is thought to have included all reaches of the Yakima River mainstem and its tributaries that supported spring chinook salmon (O. tshawytshca), as well as many other tributaries (YIN et al. 1990). As steelhead spawners are capable of utilizing smaller streams with steeper gradients than spring chinook, most accessible permanent streams and some intermittent streams may have once supported spawning steelhead. Currently, Yakima River steelhead are found in nearly all mainstem and tributary reaches, however, access to portions of the headwaters of the Yakima River and some tributaries are blocked by dams and other passage barriers. As a result, anadromous steelhead cannot access the entire Yakima River watershed.

Hockersmith et al. (1995) identified the following spawning populations within the Yakima Basin: upper Yakima River above Ellensburg, Teanaway River, Swauk Creek, Taneum Creek, Roza Canyon, mainstem Yakima River between the Naches River and Roza Dam, Little Naches River, Bumping River, Naches River, Rattlesnake Creek, Toppenish Creek, Marion Drain, and Satus Creek. Of 105 radio-tagged fish observed from 1990 to 1992, Hockersmith et al. (1995) found that well over half of the spawning occurred in Satus and Toppenish Creeks (59%), with a smaller proportion in the Naches drainage (32%), and the remainder in the mainstem Yakima River below Wapato Dam (4%), mainstem Yakima River above Roza Dam (3%), and Marion Drain (2%), a Wapato Irrigation Project drain tributary to the Yakima River. Electrophoretic analyses have identified four genetically distinct spawning populations of wild steelhead in the Yakima Basin: the Naches, Satus, Toppenish, and Upper Yakima stocks (Phelps et al. 2000).

Hockersmith et al. (1995) found that steelhead passed Roza Dam from November through March, however, more recent data suggests that passage occurs from the end of September through May (Mark Johnston, Yakama Nation Fisheries Program, personal communication).

Steelhead spawning varies across temporal and spatial scales in the Yakima Basin, although the current spatial distribution is significantly decreased from historic conditions. Yakima Basin steelhead spawn in intermittent streams, mainstem and side-channel areas of larger rivers, and in perennial streams up to relatively steep gradients (Hockersmith et al. 1995; Pearsons et al. 1996).

Typically, steelhead spawn earlier at lower, warmer elevations than higher, colder waters. Overall, most spawning is completed within the months of January through May (Hockersmith et al. 1995), although steelhead have been observed spawning in the Teanaway River (RM 176.1), a tributary to the Upper Yakima into July (Todd Pearsons, WDFW, personal communication).

Steelhead eggs take about 30 days to hatch at 50 degrees Fahrenheit, and another two to three weeks before fry emerge from the gravel. However, time required for incubation varies significantly with water temperature. Fry emergence typically occurs between mid to late May, and early July, depending on time of spawning and water temperature during incubation.

Juvenile steelhead utilize tributary and mainstem reaches throughout the Yakima Basin as rearing habitat, until they begin to smolt and emigrate from the basin. Smolt emigration begins in November, peaking between mid-April and May. Busack et al. (1991) analyzed scale samples from smolts and adult steelhead and found that the smolt transformation typically occurs after two years in the Yakima system, with a few fish maturing after three years and an even smaller proportion reaching the smolt stage after one year. When compared to spawning distribution and run timing, these data suggest that various life stages of listed steelhead are present throughout the Yakima Basin and its tributaries virtually every day of the calendar year.

Habitat alterations and differential habitat availability (e.g., dikes, levees, and fluctuating discharge levels) over time have imposed an upper limit on the production of naturally spawning populations of salmon and steelhead. The National Research Council Committee (NRCC) on Protection and Management of Pacific Northwest Anadromous Salmonids identified habitat problems as a primary cause of declines in wild salmon runs (NRCC 1996). Some of the habitat effects identified were the fragmentation and loss of available spawning and rearing habitat, migration delays, degradation of water quality, removal of riparian vegetation, decline of habitat complexity, alteration of streamflows and streambank and channel morphology, alteration of ambient stream water temperatures, sedimentation, and loss of spawning gravel, pool habitat and large woody debris (NMFS 1998; NRCC 1996; Bishop and Morgan 1996). These effects are readily observed in the MCR ESU, including the Yakima River and its tributaries.

Hatchery management practices are suspected to be a major factor in the decline of this ESU. The genetic contribution of non-indigenous, hatchery stocks may have reduced the fitness of the locally adapted native fish through hybridization and associated reductions in genetic variation or introduction of deleterious (non-adapted) genes. Hatchery fish can also directly displace natural spawning populations, compete for food resources, or engage in agonistic interactions (Campton and Johnston 1985; Waples 1991; Hilborn 1992; NMFS 1996).

Water temperatures in the lower Yakima River may contribute to lower survival of smolts and kelts during summer months (Vaccaro 1986; Lichatowich and Mobrand 1995; Lichatowich et al. 1995; Pearsons et al. 1996; Lilga 1998). Steelhead kelts and smolts have been observed at the Chandler Juvenile Enumeration Facility (RM 47.1) into the middle of July, when water temperatures can become lethal. Conditions in the lower Yakima River become suitable once again for salmonids in early fall, near the end of the irrigation season (NPPC 2001).

Steelhead in the Yakima River Basin have faced a number of challenges in the recent past, but continue to endure at significantly depressed population levels. The four genetically dissimilar stocks identified persist across widely varied conditions of streamflow, habitat, topography, elevation, and land management scenarios, in a fraction of their historic habitat.

3.8.2 Bull Trout

On June 10, 1998, the U.S. Fish and Wildlife Service (USFWS) (USFWS 1998) listed the Columbia River population segment of bull trout, which includes the Yakima basin, as threatened. Bull trout populations within this population segment have declined from historic levels and are generally considered to be isolated and remnant. Bull trout were likely widely dispersed throughout the Yakima River drainage, limited only by natural passage and thermal barriers. The historical range may have approximated that of spring, summer, and fall chinook salmon (*Oncorhynchus tshawytscha*), much as may have been the case in Idaho (Thurow 1987; Rieman and McIntyre 1993). The distribution of bull trout may parallel the distribution of potential prey such as whitefish and sculpins.

Yakima Basin studies indicate that bull trout typically occur in the upper reaches of several tributaries, in small populations that are mostly isolated from each other (Goetz 1994, Wissmar and Craig 1998, WDFW 1998). Studies have indicated that bull trout are most likely to occur, and to be strong in cold, high elevation, low- to mid-order watersheds with low road density (Rieman et al. 1997, Goetz 1994, MacDonald et al. 1996).

Bull trout have some of the most demanding habitat requirements of any native trout species mainly because they require water that is especially cold and clean. As a result, water temperature is a critical habitat characteristic for bull trout. Bull trout have demonstrated a unique adaptation for spawning, incubating, and rearing in colder water than salmon and steelhead which has allowed this species to survive in habitat areas that may be unsuitable for most other species of fish. Ratliff and Howell (1992) note that in many of the cold streams where bull trout spawn, they are the only fish present. McPhail and Murray (1979) demonstrated that survival of bull trout eggs was 80-95 percent to hatching at temperatures of 2-4ºC and dropped to 0-20 percent at temperatures of 8-10ºC. Buchanan et al. (1997) report observations from throughout Oregon and the published literature, and concluded that, while optimum temperatures for juvenile growth are between 4-10ºC, the optimum for adult bull trout is near 12-15ºC. Temperatures above 15˚C (59˚ F) exceed bull trout physiological preferences and are therefore thought to limit their distribution (Fraley and Shepard 1989).

Bull trout reach sexual maturity after 4 of more years and live up to 10 to 12 years. They typically spawn during September through November, in relatively cold streams that are clean and free of sediment. The incubation period for bull trout is extremely long, and young fry may take up to 225 days to emerge from the gravel (Craig 1997, USFWS 1998). Because of this long incubation period, eggs are particularly vulnerable to siltation problems and bed load movement in rivers and streams where spawning occurs. Any activity that causes erosion, increased siltation, removal of stream cover, or changes in water flow or temperature affects the number of bull trout that hatch and their ability to survive to maturity (Knowles and Gumtow 1996).

Bull trout exhibit both migrant and resident life history strategies. After rearing as juveniles for 2-4 years in their natal streams (Meehan and Bjornn 1991), migrant bull trout emigrate to larger rivers or lakes, whereas resident fish complete their entire life cycle within their natal stream. Migrant forms, including both fluvial (downstream migration to larger rivers) and adfluvial (downstream migration to lakes) grow rapidly, often reaching over 20 inches in length and 2 pounds by the time they are 5-6 years old. Migratory bull trout live several years in larger rivers or lakes, where they grow to a much larger size than resident forms before returning to tributaries to spawn. Growth differs little between forms during their first years of life in headwater streams, but diverges as migratory fish move into larger and more productive waters (Rieman and McIntyre 1993).

Although both the Fish and Wildlife Service (USFWS 2002) and the Washington Department of Fish and Wildlife (WDFW 1998) recognize the existence of a mainstem Yakima River sub-population of bull trout, very little information exists to document the abundance or status of this fish in the mainstem Yakima River. Bull trout have been sporadically caught during electrofishing surveys in the upper Yakima River by the WDFW and adult bull trout have been observed migrating upstream through the Roza Diversion Dam fish ladders between the years of 1999 and 2003. In addition, inconsistent spawning activity has been reported in the reach between Keechelus Dam and Lake Easton in the upper basin. Bull trout observations in the lower Yakima River are more infrequent, consisting of a single adult fish captured in the mainstem Yakima River near Benton City by WDFW biologists in 1997.

Based on this information, it seems that the mainstem Yakima River is primarily used as migratory or rearing habitat for small numbers of adult and sub-adult bull trout. This may be the extent of the historic usage of the mainstem river by these fish. The lack of juvenile and sub-adult bull trout in the mainstem river indicates that bull trout are not and have not been reproducing successfully in the mainstem Yakima River. Given the fact that habitat conditions are not suitable for bull trout in the lower river, particularly high water temperatures during the summer, it is not surprising that few fish have been observed in the lower sections of the mainstem Yakima River.

3.8.3 Bald Eagle

Historical Status and Distribution

The bald eagle is currently listed as Threatened in the 48 contiguous States. Historically, the bald eagle could be found nesting throughout most of the continent. However, reproduction in North America declined dramatically between 1947 and 1970, largely due to intake of organochloride pesticides

(USFWS 1986). Habitat degradation, illegal harassment and disturbance, poisoning, and reduced food base contributed to the decline. By 1978, the bald eagle was federally listed as threatened species in 5 of the conterminous 48 States and as an endangered species in the remaining 43 States.

The bald eagle, like most birds of prey, exhibits sexual dimorphism with the females weighing more than the males. Males and females are thought to mate for life, returning to the same nesting territory year after year. A clutch of one to three eggs is laid and incubated mostly by the female for about 35 days. The young fledge in 72 to 75 days. Often the younger, weaker bird is killed by its sibling in the competition for food.

Bald eagles require 4 to 5 years to reach sexual maturity and attain full adult plumage. Prior to that time, immature bald eagles are often confused with immature golden eagles.

Habitat

In the Pacific Northwest, bald eagles typically nest in multi-layered, coniferous forest stands with old growth trees that are located within 1 mile of bodies of water. Factors such as relative tree height, diameter, species, form, position on the surrounding topography, distance from the water, and distance from disturbance appear to influence nest site selection. Bald eagles usually nest in the same territories each year and often use the same nest repeatedly. Availability of suitable trees for nesting and perching is critical for maintaining bald eagle populations.
Nests are generally not constructed in areas with nearby human activity. The nesting season for bald eagles in the Pacific Northwest generally extends from January 1 to mid-August (USFWS 1994). Young are usually produced in March and fledged in July; however, they may stay near the nest for several weeks after fledging.

More than 25 percent of the wintering bald eagles in the lower 48 States are present in the Pacific Northwest (USFWS 1986). Bald eagles winter in the Northwest from approximately November through March and are primarily associated with open water near concentrated food sources. An important habitat feature is perch trees which provide an unobstructed view of the surrounding area near foraging sites (USFWS 1986). Ponderosa pine and cottonwood snags are preferred perches in some areas, probably sue to their open structure and height. Bald eagles may also use communal night roost sites in winter for protection from inclement weather. Characteristics of communal winter roost sites differ considerable from those of diurnal perch sites (USFWS 1986), although both are invariably located near concentrated food sources, such an anadromous fish runs or high concentration of waterfowl. Roost sites tend to provide more protection from the weather than diurnal perch sites. Communal roosts in the Pacific Northwest tend to be located in uneven-aged forest stands with some degree of old-growth forest structure. Conifers might provide a more thermally favorable microenvironment than dead or deciduous trees, which might explain their high use by wintering eagles. In eastern Washington, bald eagles have been observed roosting in mixed stands of Douglas fir and ponderosa pine, and in stands of black locust and black cottonwood.

Bald Eagles generally do not arrive until late in December, or, more typically, in early January. Mid-winter bald eagle surveys were conducted in Washington from the winter of 1981-1982. The counts on the Yakima River varied from a high of 39 to a low of 3, with a mean of 23.9 (Rees 1989). As part of the same survey counts, the Methow River averaged 4.9 eagles and counts on the Wenatchee River averaged 3.6 birds.

Bald eagles are opportunistic foragers throughout their range. In the Pacific Northwest, bald eagles consume a range of food including a variety of fish, waterfowl, jackrabbits, and mammalian carrion (USFWS 1994). Game and non-game fish tend to be the preferred foot, but diet is dependent on prey availability. Winter-killed mammals can be important on big game winter ranges, while waterfowl are important where concentrations are significant. Fish are also taken as carrion, especially spawned out kokoanee (USFWS 1986)

Habitat loss and an increasing human population will continue to be the greatest long-term threats to recovery of the bald eagle. Breeding, wintering, and foraging areas continue to be degraded by urban and recreational development, and resource extraction activities. Shootings continue to be a problem for bald eagles. Electrocution is also an ongoing problem where power lines to not conform to standards for raptor protection. Nesting habitat quality below dams may decline over the long term if flow releases do not permit perpetuation of forest riparian stands or if fisheries are negatively affected.

Bald eagles occur in the Yakima River basin along the shores of lakes, reservoirs, and streams. Suitable habitat includes areas that are close to water and provide a suitable food resource such as anadromous or resident fish, waterfowl, or carrion. There are no known bald eagle nests along the Yakima River from the Sunnyside Diversion Dam to the mouth. Wintering bald eagles may occur along this reach.

3.8.4 Ute Ladies'-tresses

Ute ladies' tresses is a member of the orchid family and is found in wetland, riparian areas, spring habitats, mesic to wet meadows, river meanders, and floodplains. The plant occurs between an elevation range of 1,500 to 7,000 feet and at lower elevations in the western part of its range. The orchid generally occurs below montane forests, in open areas of shrub or grassland, or in transitional zones. It is considered a lowland species, typically occurring beside or near moderate gradient - medium to large - streams and rivers. The plant is not found on steep mountainous parts of a watershed, nor out in the flats along slow meandering streams. This species tends to occupy grass, rush, sedge and willow sapling dominated openings.

3.9 Economics

According to Reclamation's 1993 Crop Report, the Roza and Sunnyside Divisions of the Yakima Project irrigated 146,390 acres with a total value of $310,586,560. This represents 47% of the revenue, but only 31% of the acreage of the Yakima Project.

While the economy of the region is diverse, it still has a strong agricultural base. According to the Bureau of Economic Analysis (BEA), between 1988 and 1993, personal income in this region grew annually at 8.9%. Through 2005, the BEA forecasts personal income growth to slow to 2.5% in the region. During the same time, employment (number of jobs) is forecast to grow at a 1.3% rate for the region, about 0.6% slower than the state as a whole.

In the Yakima region in 1993, agriculture provided about 9.3% of the jobs and construction provided 5.8%, with close to 18,000 jobs in the agricultural sector.

3.10 Historic Properties

The Sunnyside Canal, constructed between 1892-1912, is a property eligible for the National Register of Historic Places. Although the original canal will not be affected by the proposed project, the removal of check structures related to the original design may be an adverse effect. The determination of effect and any appropriate mitigation measures will be implemented following consultation with the Washington State Historic Preservation Officer at the Office of Archaeology and Historic Preservation, and the Advisory Council on Historic Preservation.

The area lies in lands ceded by the fourteen tribes and bands of the Yakama Nation. There is a potential for uncovering material evidence of occupations of ancestors of present-day Yakama tribal members, and the area may have traditional cultural or religious significance. Both the National Historic Preservation Act and Executive Order 13007 guides federal agencies to identify and consult with tribes with cultural connections with project areas.

3.11 Indian Trust Assets

ITAs are legal interests in property held in trust by the United States for Indian tribes or individuals. Examples of possible trust assets include lands, minerals, hunting and fishing rights, and water rights. The United States has a trust responsibility to protect and maintain rights reserved by or granted to Indian tribes or Indian individuals by treaties, statutes, and Executive Orders, which are sometimes further interpreted through court decisions and regulations. This trust responsibility requires Reclamation to take all actions reasonably necessary to protect trust assets.

The Sunnyside Division is within lands ceded in the Yakama Treaty of June 9, 1855. This treaty established the Yakama Reservation and reserved rights and privileges to hunt, fish, and gather roots and berries on open and unclaimed lands to the fourteen Tribes and bands who signed that treaty.

Indian Trust Assets of concern for this action may include the rights and privileges to fish, hunt, and gather. The resources that provide for these rights to be exercised include fish, wildlife, and vegetation.

3.12 Environmental Justice

Executive Order 12898 requires each Federal agency to consider environmental justice as part of its decision making process by identifying and addressing disproportionately high adverse human health or environmental effects, including social and economic effects, of its programs and activities on minority populations and low-income populations of the United States.

Environmental justice requires Reclamation programs, policies, and activities affecting human health or the environment to not exclude minorities and low income groups from participation in or the benefits of programs or activities based on race or economic status.

People are the primary resource for social assessment and the vast majority of the people that comprise the affected communities reside within the Yakima and Benton County areas. Also included in the affected area is the Yakama Indian Nation.

The area in and around the project area has a relatively high population of minorities (approximately 42 percent in Yakima County and approximately 14 percent in Benton County compared to approximately 18 percent statewide). According to the 2000 census, in Benton County, the Hispanic population is

12.5% of the total population and the Indian population is 0.8% of the total population. In Yakima County, the Hispanic population is 35.9% of the total population and the Indian population is 4.5% of the total population. The Yakama Nation Reservation boundary is located within the project area.

3.13 Sacred Sites

Executive Order 13007, Indian Sacred Sites (May 24, 1996), directs executive branch agencies to accommodate access to and ceremonial use of Indian sacred sites by Indian religious practitioners and to avoid adversely affecting the physical integrity of such sacred sites on Federal lands. The agencies are further directed to ensure reasonable notice is provided of proposed land actions or policies that may restrict future access to or ceremonial use of, or adversely affect the physical integrity of, sacred sites. The EO defines a sacred site as 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, an Indian religion."

Chapter 4 Environmental Consequences

This section analyzes impacts of the action alternatives compared with the No Action Alternative. Impacts are those that result from implementation of the action alternatives relative to the no action alternative.

4.1 Hydrology

Impacts to hydrology in the Lower Yakima River drainage from the proposed action are assessed in three areas: (1) Impact to flow in the Yakima River below the Sunnyside Diversion Dam, (2) impact to return flow to the Yakima River adjacent to the Sunnyside Valley Irrigation District, and (3) impact to flow in the Yakima River below all project influence. The period of historic river flow to assess average impacts were taken between 1939-1978, since that period represented the overlapping record between the USGS gage near Parker and at Kiona. Impacts to average annual flow, irrigation season flow (April 1 – October 18), pre-storage control flow (before June 24), and storage control flow (after June 23) are considered. For calculations of AF and cfs for these periods in table below, 365 days are used for the average annual flow period, 200 days are used for the irrigation season flows (April 1 – October 18), 85 days are used for calculating the pre-storage control period, and 115 days are included in the period under storage control (after June 23).

Instream flow improvements resulting from the Main Canal Improvements Alternative will take place during the irrigation season and will either increase target flows in the Yakima River between the point of diversion of the Sunnyside Canal and Spring Creek or will result in slightly decreased mainstem Yakima River flows downstream of the project by a very small amount. During the storage control period, instream flows in the Yakima River will be increased by approximately 54 cfs when the full suite of conservation measures in the Main Canal Improvement alternative are implemented. This 54 cfs increase will be added to the existing Title XII minimum instream target flow requirements of 300 to 600 cfs at Sunnyside and Prosser Diversion Dams (depending on TWSA calculations each year). For the reach between Sunnyside Dam and Sulphur Creek Wasteway the full amount of the 54 cfs diversion reduction will be realized as instream flow increases in the mainstem Yakima River. However, for the reach adjacent to the Sunnyside Division and downstream (i.e. from Sulphur Creek and Spring Creek to the Yakima River at Kiona) the amount of flow in the Yakima River will be reduced slightly (by approximately 12 cfs) due to return flow reductions (66 cfs) being greater than the diversion reduction (54 cfs) at the Sunnyside Canal.

4.1.1 Yakima River Impacts Below Sunnyside Diversion

Impacts to flow in the Yakima River below the Sunnyside Diversion Dam is dependent upon the time of year and the nature of the water supply. Since conservation estimates were only computed for a "typical" or "average" year, precise impacts by year are not possible. Several assumptions were necessary to allow meaningful analysis. It was assumed that any time storage control was in effect 1/3 of the conserved water was available for agricultural uses. In shortage years (about 1/3 of the time), the water was assumed to be retained in the Sunnyside Division to offset shortages with 80% consumption. In years with no water shortage, it was assumed that water would be held in storage for carryover uses. No attempt was made to assess the effectiveness of this strategy and how much of the stored water would be lost. Therefore, the assumption is conservative in terms of assessing impacts.

Table 4.1 shows the net change in diversion resulting from the Main Canal Improvement Alternative, with the portion of water retained for irrigation in the Sunnyside Division and the portion remaining in the river also shown. Based on the assumptions stated above, only about 9,720 AF (33%) of the conserved water would be used to meet irrigation demands or would be held in storage reserve for carryover to the next water year. The remainder (19,442 AF) would be available for flow augmentation below the Sunnyside Diversion.

For the proposed action, the total net impact of 29,162 AF for typical or average conditions would vary between about 12,000 AF in the driest years to as much as 40,000 AF in wet years, based on the history of recorded spills from 1981-1994. In the driest years, a higher percentage (up to 33%) of the flow would be available for irrigation district use to offset irrigation shortages.

The resulting impact to the Yakima River near Parker for the period 1939-1978 is shown in Table 4.1. Flows in the river are enhanced by 54 cfs or 8.7% during the storage control period. Also during this period, basin reservoir operators would have the option of releasing the water or holding it in storage for better release timing to improve habitat conditions in the river. During the periods when storage control is not in effect, the flow enhancement would be less, averaging about 43 cfs, since reservoirs would have adequate storage capacity to capture water that would have otherwise been spilled down wasteways early in the irrigation season when few deliveries would usually be made for agriculture and the historic spills were typically higher during this time of year.

Table 4.1
Summary of Net Changes in Sunnyside Diversion Quantities under Main Canal Improvements Alternative
(During "Typical" Years)

Category	Total Reduction (cfs)	Retained for Irrigation (cfs)	Net to River (cfs)	Total Reduction (AF)	Retained for Irrigation (AF)	Net to River (AF)
Proposed Action During "Typical" Year						
Average Annual	40	13	27	29,162	9,720	19,442
Non-irrigation (19 Oct-31 Mar)	-	-	-	-	-	-
Irrigation (1 Apr to 18 Oct)	74	25	49	29,162	9,720	19,442
Pre-storage control (<Jun 24)	63	21	43	10,718	3,578	7,140
Storage control (>Jun 23)	81	27	**54**	18,444	6,142	12,302

4.1.2 Project Return Flow Impacts

Timing of return flow impact is somewhat dependent upon the nature of the conservation. Operational savings as a result of less spill or operational waste will affect return flow in the same time period the diversion reduction occurs. This is not precisely correct, but given the gross time divisions used in the analysis, the assumption is adequate.

Impact locations were classified into three categories based on the probable return flow location: Sulphur Creek Wasteway, Spring Creek Wasteway, or cumulative small drains. The Sunnyside Canal operational spill savings will all accumulate in either the Sulphur Creek Wasteway or the Spring Creek Wasteway drainage networks. Modeling performed by UMA Consultants Inc (UMA 2000) provided the split between these two locations. Table 4.2 summarizes the impacts to return flow from the Main Canal Improvements for the three categories discussed. The flow in Sulphur Creek Wasteway would be reduced by an average of 16% ranging from 13% to 25%, depending on the time period, with the largest impact occurring during the pre-storage control portion of the irrigation season. Impacts to Spring Creek Wasteway range from 58% to 71% and average 57%. The greatest impact in the Spring Creek Wasteway occurs during the post-storage control period. There should be no impact to cumulative small drains as no operational spill changes will occur in these drains as a result of the proposed action.

The cumulative hydrologic impacts from implementation of the Main Canal Improvements Alternative on the SVID return flow drains range from 17% to 27% spill reductions depending on time period analyzed within the irrigation season. A total of 84 cfs (22% spill reduction) is predicted to occur over the irrigation season as a whole from additive operational spill savings in Sulphur and Spring Creek Wasteways (Table 4.2). The highest percentage of flow saving are predicted to occur early in the irrigation season prior to onset of storage control with a lesser degree of spill reduction occurring after storage control. Flow rates should be reduced by up to 108 cfs (27% flow reduction) during the pre-storage control period, while flow reductions of 66 cfs are predicted to occur from the onset of storage control to the end of the irrigation season in mid-October.

No flow changes or hydrologic impacts are expected to occur during the non-irrigation season in either the Sulphur or Spring Creek Wasteways or in the RSBOJC system of cumulative small drains as a result of the Main Canal Improvements.

4.1.3 Yakima River Impacts below the Project

The closest gage on the Yakima River that includes all conservation measure impacts is at Kiona. The impacts at this point are the sum of the flow enhancements below the Sunnyside diversion and the reduction in project return flows. Table 4.3 summarizes the components of impact at Kiona. During most time periods the average flow in the Yakima River below the project will be slightly decreased. During the other time periods the return flow is reduced by an amount larger than the flow increase due to diversion reduction, resulting in a reduction in river flow ranging from 5 to 45 cfs for the several time periods (Table 4.3). The flow increases would be expected to average about 12 cfs during the portion of the irrigation season while storage control is in effect.

When comparing the change to the total flow, the percent impact at Kiona is small. Table 4.4 summarizes the flow in the Yakima River at Kiona with and without conservation measures. The impacts are less than 1% of the total flow with the greatest percentage impact occurring during the pre-storage control period.

Table 4.2. Summary of Impacts to Irrigation Return Flow in cubic feet per second (cfs) for an "average" spill year. Numbers in parentheses represent the potential range of spills for a "low" and a "high" spill year, respectively.

Category	Average Flow (cfs)	Reduced Operational Spill (cfs)	Average Flow with Conservation (cfs)	Percent Flow Reduction
Sulphur Creek Wasteway -Average Spill Year				
Average Annual	192 (102-236)	28 (12-51)	164 (90-185)	15% (12%-22%)
Non-irrigation (19 Oct-31 Mar)	91 (68-101)	-	91 (68-101)	-
Irrigation (1 Apr to l8Oct)	276 (131-344)	52 (21-92)	224 (110-252)	19% (16%-27%)
Pre-storage control (<Jun 24)	299 (195-367)	76 (55-135)	223 (140-232)	25% (28%-37%)
Storage control (>Jun 23)	259 (102-324)	34 (7-57)	225 (95-267)	13% (7%-18%)
Spring Creek Wasteway - Average Spill Year				
Average Annual	30 (13-38)	17 (7-24)	13 (6-14)	57% (54%-63%)
Non-irrigation (19 Oct-31 Mar)	5 (3-7)	-	5 (3-7)	-
Irrigation (1 Apr to l8Oct)	50 (21-63)	32 (13-43)	18 (8-20)	64% (62%-68%)
Pre-storage control (<Jun 24)	55 (33-70)	32 (23-49)	23 (10-21)	58% (70%-70%)
Storage control (>Jun 23)	45 (16-57)	32 (8-38)	13 (8-19)	71% (50%-67%)
Total - Average Spill Year				
Average Annual	265 (158-317)	45 (19-75)	220 (139-242)	17% (12%-24%)
Non-irrigation (19 Oct-31 Mar)	128 (103-140)	-	128 (103-140)	-
Irrigation (1 Apr to l8Oct)	379 (205-460)	84 (34-135)	295 (171-325)	22% (17%-29%)
Pre-storage control (<Jun 24)	407 (281-490)	108 (78-184)	299 (203-306)	27% (28%-38%)
Storage control (>Jun 23)	357 (171-434)	66 (15-95)	291 (156-339)	18% (9%-22%)

Table 4.3
Impacts to Flow in the Yakima River at Kiona From the Main Canal Improvements Alternative

Category	Net Increase at Sunnyside (cfs)	Decrease in Wasteway Return Flow (cfs)	Net to River at Kiona (cfs)	Net Increase at Sunnyside (AF)	Decrease in Wasteway Return Flow (AF)	Net to River at Kiona (AF)
Main Canal Conservation						
Average Annual	40	45	(5)	29,162	32,522	(3,360)
Non-irrigation (19 Oct-31 Mar)	-	-	-	-	-	-
Irrigation (1 Apr to l8Oct)	74	84	(10)	29,162	33,201	(4,039)
Pre-storage control (<Jun 24)	63	108	(45)	10,718	18,176	(7,458)
Storage control (>Jun 23)	54	66	(12)	12,302	15,025	(2,723)

Table 4.4
Summary of Yakima River Flows at Kiona With And Without the Main Canal Improvement Alternative

Category	Average Flow (cfs)	Conservation Change (cfs)	Average Flow with Conservation (cfs)	Average Flow (AF)	Conservation Change (AF)	Average Flow with Conservation (AF)	Percent Change with Conservation
Average Annual	3,606	(5)	3,601	2,606,056	(3,360)	2,602,696	-0.13%
Non-irrigation (19 Oct-31 Mar)	-	-	-	1,240,360	-	1,240,360	-
Irrigation (1 Apr to l8Oct)	3,449	(10)	3,439	1,372,560	(4,039)	1,368,521	-0.29%
Pre-storage control (<Jun 24)	5,394	(45)	5,349	897,130	(7,458)	889,672	-0.83%
Post-storage control (>Jun 23)	2,052	(12)	2,040	475,430	(2,723)	472,707	-0.57%

4.1.4 Summary

Implementation of the Main Canal Improvements Alternative will provide for increased flows in the Yakima River between the Sunnyside Diversion and the confluence with Spring Creek Wasteway. The greatest relative flow increase is expected to occur during storage control while the greatest absolute increase occurs during the early part of the irrigation season prior to storage control.

Flow in Sulphur Creek Wasteway and Spring Creek Wasteway will be reduced substantially during the irrigation season, primarily as a result of reduced main canal spills.

Below the confluence with Spring Creek Wasteway, flow will be minimally decreased in the Yakima River due to reduced return flows. The maximum relative flow reduction is about 1% of the total flow, occurring during storage control.

While seasonal variation has not been examined in detail, review of historic system loss data indicate that the reduction in diversions into the Sunnyside Canal will likely vary from approximately 12,000 AF per year in extreme drought conditions to as much as 60,000 AF per year in wet years. The long term average is expected to be close to the "typical year" impacts documented here.

4.2 Water Quality

The RSBOJC, of which the Sunnyside Division is a member, began a water quality monitoring program in 1997. While data collection is on-going, the data for 1997 through 2003 was available for this study for various drains, the spillways and both main canals. Water quality data has been collected for the following parameters: temperature, pH, dissolved oxygen, specific conductance, discharge, turbidity, total suspended solids, fecal coliform, total phosphorus, nitrate+nitrite, and total Kjeldahl nitrogen. In this analysis most parameters were modeled based on simple concentration/dilution concepts. The remaining parameters do not follow these rules and their changes are not easily calculated. The proposed reduction in spills and seepage should not significantly affect dissolved oxygen, pH, or fecal coliform. Water temperature could change in the drains, but prediction of the resulting temperature was not attempted in this study.

The data shows definite seasonal patterns that are strongly influenced by the excess spill water which dilutes the drain return flow during the irrigation season. The water quality of the canal water gradually deteriorates as suspended sediment, nutrients, and fecal coliform enter the Sunnyside Canal from lands above the canal. Changes in the water quality of the Roza Canal are less than those observed in the Sunnyside Canal.

The rehabilitation and re-operation of the Sunnyside Canal will impact the water quality of the canal, the drains, and the Yakima River. The main hydrologic effects will be (1) maintaining a greater flow in the Yakima River between the diversion and return flow points, and (2) less operational spill water in the drains. A major assumption used in this analysis of the proposed action is that only water savings from the rehabilitation and re-regulation of the canal are considered in the water routing and that the on-farm effects on water quality are unchanged. While there have been and will continue to be changes in on-farm practices to improve water quality, particularly sediment loading, these changes will occur independent of this study and are not discussed here. The analysis looks only at the changes induced from water conservation due to the regulation reservoirs, canal automation, and piped laterals. Although not quantified, it is assumed that the RSBOJC water improvement program will continue to improve the water quality in the drains and wasteways under its jurisdiction. Continued water quality improvement as a result of this RSBOJC program could result in significant improvements in water quality over the nine year implementation schedule for these proposed conservation measures.

Impacts during construction will be minimal because the regulation reservoirs and check drop structures will be constructed or installed during the non-irrigation season. Suspended solids in the canal may increase after the spring filling of the canal as the passing water first wets any disturbed canal sections. However, this effect will be temporary and minor in relation to background turbidity levels observed during the initial canal priming operation. Turbidity increases will also be minimal since only a few structural elements of the conservation plan will be built each year due to the phased-in implementation schedule. The solids suspended in the reservoirs should quickly settle out and should not enter the Main Canal. Re-regulation reservoirs will most likely act as stilling basins and become net sink areas for suspended sediment. Due to the relatively small volume of re-regulation reservoirs, however, the water quality improvement from reductions in suspended sediment load will be minor. The proposed reduction in spills should not significantly affect dissolved oxygen, pH, or fecal coliform.

Water temperature changes in the drains may occur as a result of flow reductions during the irrigation season. Although quantitative predictions of the resulting temperatures is these drains is difficult to ascertain is and not attempted here, qualitative changes can be estimated from past water temperature modeling attempts in the Yakima River (Vaccaro 1986). Modification of temperature regimes in the lower Yakima River during the summer has been speculated to be a very difficult task. For example, Vaccaro (1986) modeled water temperature in the Yakima River with four scenarios: 1) 1981 operations; 2) 1981 estimated-unregulated or "natural" stream flows without storage or diversions; 3) reductions in irrigation diversions and irrigation return flows over the entire basin; and 4) similar reductions, but limited to the Yakima River below Parker. Vaccaro's model estimated that reducing return flows and subsequently leaving such flows instream would actually increase water temperatures at Prosser during the high water temperature period because, in late summer, major irrigation return flow are generally cooler than the Yakima River at the point of return. Although the model indicated reducing return flows during the spring months could also help reduce water temperatures (because return flows in spring tended to be warmer than the river), spring temperatures did not exceed steelhead tolerances).

Most irrigation return flow facilities, including both Spring and Sulphur Creek Wasteways, collect and discharge both surface and subsurface water which tends to be cooler than river water in the summer (Vaccaro 1986). Reducing irrigation return flow volume may therefore produce a small, but likely immeasurable change in thermal dynamics of the Yakima River during summer, although other improvements in water quality may be expected. Relatively cool irrigation return flows may, however, create localized pockets of lower temperature where the flows enter the main river. Reduction in warmer surface water spills from the Sunnyside Canal will result in the majority of water remaining in the drains being derived from subsurface groundwater inflows. Since groundwater tends to be cooler than surface water, Spring and Sulphur Creek temperatures should become even cooler during the summer and may increase in value as cool refuge habitat where flows enter the main river.

Reduction in operational spills will reduce flows in the spillways in Sulphur Creek Wasteway and Spring Creek Wasteway. This reduction will mean that there will be less good quality irrigation water to dilute the seepage water entering the drains. Also the seepage loss will decrease along laterals which are piped. This reduction will mean that the seepage flow entering the drains and the river will decrease. The parameters measured during 1997 and 1998 were separated by drain type (spillways and other drains) and by seasons, then averaged and compiled into Table 4.5. The concentrations for each parameter are shown for Sulphur Creek Spillway, Spring Creek Spillway and "other drains". They are broken out as averages for the whole season, then for winter and irrigation season and finally by pre-storage control and storage control periods.

The highest concentrations of the parameters occur in the small drains which are mostly seepage fed and receive no dilution from spills. Sulphur Creek Wasteway has intermediate concentrations and Spring Creek has the lowest concentrations. Most water users peak in concentration during the irrigation season. Nitrate has the highest concentrations during the low flow periods in winter due to deep percolation from fields. The nutrient concentrations can fluctuate on a diurnal basis due to biological activity. The transit time through the drainage network is just a few days so the transient shifts are not readily measured and the possible short-term concentration changes were ignored.

The dilution effects of the reduced spills and seepage were calculated based on the hydrology data presented in Section 4.1 concerning impacts to drain and the concentrations shown in Table 4.5. The concentration of the various constituents in the seepage water was assumed the same as those measured in the winter months. The concentration of the various constituents in the spill water was assumed the same as measured in the Sunnyside Canal. The concentrations of the constituents in the drain water were the values measured during their respective times. The concentration, projected under reduced spill conditions, was then calculated by subtracting the load losses from the initial constituent loads and then dividing by the reduced flow volume. The projected concentrations are shown in Table 4.6.

Table 4.5
Summary of Average Water Quality Concentrations Measured During 1997-98

Category	Specific Conductance uS/cm	Turbidity NTU	Total Suspended Solids mg/l	Total Phosphorus mg/l	Nitrate + Nitrite mg/l	Total Kjeldahl Nitrogen mg/l
Sulphur Creek Wasteway - Typical Year						
Average Annual	347	41	135	0.28	3.3	0.61
Non-irrigation (19 Oct-31 Mar)	520	19	46	0.22	5.4	0.64
Irrigation (1 Apr to l8Oct)	287	43	147	0.29	2.5	0.57
Pre-storage control (<Jun 24)	229	50	177	0.28	1.7	0.54

Storage control (>Jun 23)	311	41	134	0.29	2.8	0.58
Spring Creek Wasteway - Typical Year						
Average Annual	299	20	64	0.13	1.6	0.32
Non-irrigation (19 Oct-31 Mar)	468	6	14	0.10	3.3	0.32
Irrigation (1 Apr to l8Oct)	233	23	74	0.14	1.0	0.30
Pre-storage control (<Jun 24)	204	27	108	0.14	0.8	0.33
Storage control (>Jun 23)	245	21	59	0.13	1.1	0.29
Cumulative Small Drains and Groundwater Discharge						
Average Annual	421	164	447	0.81	3.7	1.90
Non-irrigation (19 Oct-31 Mar)	727	50	153	0.40	7.5	1.23
Irrigation (1 Apr to l8Oct)	360	181	485	0.87	2.9	2.02
Pre-storage control (<Jun 24)	300	171	435	0.83	2.5	1.62
Post-storage control (>Jun 23)	382	184	503	0.89	3.0	2.17

Table 4.6
Summary Of Projected Water Quality Concentrations Due To Implementation Of Main Canal Improvements Alternative

Category	Specific Conductance uS/cm	Turbidity NTU	Total Suspended Solids mg/l	Total Phosphorous mg/l	Nitrate + Nitrite mg/l	Total Kjeldahl Nitrogen mg/l
Sulphur Creek Wasteway - Typical Year						
Average Annual	388	44	146	0.31	3.8	0.67
Non-irrigation (19 Oct-31 Mar)	520	19	46	0.22	5.4	0.64
Irrigation (1 Apr to l8Oct)	328	47	163	0.33	3.0	0.64
Pre-storage control (<Jun 24)	269	58	211	0.33	2.2	0.63
Storage control (>Jun 23)	342	43	143	0.32	3.2	0.63
Spring Creek Wasteway - Typical Year						
Average Annual	363	16	49	0.11	2.1	0.32
Non-irrigation (19 Oct-31 Mar)	468	6	14	0.10	3.3	0.32
Irrigation (1 Apr to l8Oct)	298	18	55	0.12	1.4	0.29
Pre-storage control (<Jun 24)	234	25	108	0.13	1.0	0.33
Storage control (>Jun 23)	348	12	21	0.09	1.7	0.27

No change in concentrations for any parameter was predicted during the non-irrigation season. The concentrations of all dissolved parameters in Sulphur Creek Spillway during the irrigation season were predicted based on the reduced return flows. The increases are expected to vary depending on the constituent or part of irrigation season. Concentration variations in Spring Creek Wasteway show both decreases and increases. Turbidity, TSS, and total phosphorus would decrease in concentration substantially, since the canal spill water is higher in these constituents than the base flow in the wasteway. Specific conductance and nitrate would increase significantly during the storage control months due to loss of dilution water from canal spills. Although the drains showed marked variations, the average annual concentrations would increase in Sulphur Creek Wasteway by less than approximately 15%; and change in Spring Creek Wasteway by about +- 25% depending on the parameter (Table 4.7). Specifically, total suspended solid would increase in Sulphur Creek Wasteway by less than 10% and decrease in Spring Creek Wasteway by approximately 25% annually. These calculations consider only the impacts of the conservation measures included in the Main Canal Improvements Alternative. On-farm practices implemented as a part of the RSBOJC water quality improvement program will substantially improve some water quality parameters, particularly suspended sediment, and the constituents transported by it, but are not considered here.

The water quality impact on the Yakima River will depend on location. Upstream of the confluence with Sulphur Creek Wasteway the water quality would remain essentially the same under the proposed conservation measures. The stream flow would increase, and the water quality would improve imperceptibly under the slightly reduced seepage above the spillway. Just below the confluence with Sulphur Creek Wasteway, the increased flow due to reduced diversion is still greater than the reduction in return flow, therefore the constituent concentration would be principally unchanged. Below Spring Creek Wasteway, the load delivered to the river will increase concentration in the river slightly since the predicted return flow reduction is greater than the increased flow due to reduced diversions. At this point there would be no further impact from the Sunnyside Division due to implementation of the conservation measures. If no additional depletions were to occur as a result of the conservation measures, then the water quality would be principally unchanged or slightly improved. However, since the conservation program proposes delivering up to 1/3 of the savings occurring during storage control to agricultural uses in the Sunnyside and Roza Divisions during years of prorationing, the loads returning to the Yakima River through the drains would increase slightly in those years.

Table 4.7
Summary of Percent Concentration Changes Due to Implementation Of Main Canal Improvements Alternative

Category	Specific Conductance uS/cm	Turbidity NTU	Total Suspended Solids mg/l	Total Phosphorous mg/l	Nitrate + Nitrite mg/l	Total Kjeldahl Nitrogen mg/l
Sulphur Creek Wasteway - Typical						
Average Annual	12%	7%	8%	10%	16%	10%
Non-irrigation (19 Oct 31 Mar)	0%	0%	0%	0%	0%	0%
Irrigation (1 Apr to l8Oct)	14%	9%	11%	13%	20%	12%
Pre-storage control (<Jun 24)	17%	16%	19%	18%	28%	17%
Storage control (>Jun 23)	10%	6%	7%	9%	14%	8%
Spring Creek Wasteway - Typical Year						
Average Annual	21%	-22%	-24%	-13%	28%	0%
Non-irrigation	0%	0%	0%	0%	0%	0%

(19 Oct-31 Mar)						
Irrigation (1 Apr to l8Oct)	28%	-22%	-25%	-15%	39%	-4%
Pre-storage control (<Jun 24)	15%	-7%	0%	-9%	21%	1%
Storage control (>Jun 23)	42%	-42%	-64%	-29%	58%	-8%

Table 4.8
Net Change in Water Quality Constituent Concentrations at Kiona
Main Canal Improvements Alternative

Total Conservation	Percent Change with Conservation
Average Annual	0.26%
Non-irrigation (19 Oct 31 Mar)	0.18%
Irrigation (1 Apr to l8Oct)	0.33%
Pre-storage control (<Jun 24)	-0.08%
Storage control (>Jun 23)	1.10%

Based on projected water savings in the Sunnyside system, and additional depletion in the Sunnyside and Roza systems during water short periods, the mean concentration of water quality constituents in the Yakima River at Kiona would increase very slightly on an annual basis (Table 4-8). The concentration effect would show a slight seasonal dip April through June, and then peak during storage control. There would be no change in the water quality of the river during the non-irrigation season. These calculations are based on the 1939-1978 period of flow records used in the hydrology analysis of the Yakima River. Based on the current precision of water quality measurements, such changes are likely not detectable even during the peak depletion period. The impact of the conservation measures on total suspended solids or turbidity would be inconsequential.

4.3 Fisheries

Fisheries Effects in the mainstem Yakima River

Impacts to fish resulting from the implementation of YRBWEP conservation programs are documented in Section 4.6 of the PEIS (Reclamation, 2002). The water conservation associated with this action will contribute to the achievement of the positive impacts listed. The reduction in diversion will enhance flows between the Sunnyside Diversion Dam and the confluence with the Spring Creek wasteway, particularly during critical base flow periods. This should benefit adult and juvenile spring Chinook, fall Chinook and coho which move through this reach of the river during portions of the irrigation season. It may also benefit fall Chinook juveniles who rear for a short time during the irrigation season in this reach. These benefits help fulfill one of the purposes of YRBWEP. Below the Spring Creek confluence, the flows will be slightly decreased, in all cases by less than 1 percent, due to reduced spills as a result of improved efficiency. The benefits in the reach from the Sunnyside Diversion Dam to the mouth of the Spring Creek wasteway, which at the dam may be on the order of a nearly 20 percent increase in flows, would more than offset an negative impacts below the mouth of the Spring Creek wasteway.

Fisheries Effects in Project Return Flow Drains

Implementation of proposed conservation measures will reduce flows in Sulphur Creek Wasteway by approximately 34 cfs (or by 13%) during the irrigation season as measured for a typical year. Non-irrigation seasonal discharge rates will remain unchanged as a result of the proposed action. This rate of flow reduction will have minimal effects on anadromous fish since it will not limit or restrict access for adult fish into the wasteway and it will not significantly reduce spawning or juvenile rearing habitat currently available in the wasteway. In addition, water quality parameters will not change substantially as a result of the conservation measures so there should be little affect to adult or juvenile fish from altered water chemistry or physical conditions in the Sulphur Creek Wasteway.

It is likely that adult coho and fall chinook salmon will continue to be falsely attracted to Sulphur Creek Wasteway because there will still be sufficient water available in the drain to provide attraction flow even with the full suite of conservation measures implemented. This assertion is supported by the fact that adult salmon species have been observed migrating into Sulphur Creek Wasteway during the non-irrigation season when this wasteway is typically at or approaching its lowest baseflow discharge. Since baseflow conditions during the winter period will not change as a result of the proposed action, conditions that permit false attraction and migration into Sulphur Creek Wasteway will remain. A contributing factor to the likelihood of continued false attraction in this drain is that a large component of the discharge in Sulphur Creek is derived from Roza Canal operational spills. Because Roza Canal operational spill will continue to occur at the current rate into Sulphur Creek and the fact that this return flow to the river is derived from the upper Yakima River, salmonids (especially coho), will continue to be attracted to this water source.

Habitat conditions will not change appreciably in Sulphur Creek Wasteway as a result of the proposed action due to the slight reduction in discharge predicted from project implementation to significantly affect adult or juvenile salmonids. Currently, habitat conditions are considered to be extremely unsuitable for salmon and steelhead spawning and embryo survival in this wasteway (Monk 2001, Romey and Cramer 2001). Implementation of proposed conservation measures will not improve or significantly degrade habitat conditions in the wasteway, although there may be an increase in turbidity or total suspended solids ranging between 6-11% over the course of the irrigation season as a result of proposed conservation measures. Turbidity or TSS concentrations will occur because relatively clean spill water from the main canal will be reduced leaving a higher proportion of dirtier lateral drain discharge in the wasteway.

Habitat conditions in the lower mile of Sulphur Creek Wasteway could see a slight degree of cooling due to the decrease in operational spill from the main canal and a slight increase in the proportion of groundwater. This area of Sulphur Creek Wasteway is thought to be an important thermal refuge for juvenile salmonid species in the lower river. Implementation of the proposed action will not degrade this important rearing area for juvenile salmon.

In contrast to Sulphur Creek Wasteway, Spring Creek Wasteway may be more negatively affected by flow reductions as a result of the proposed conservation measures. Return flows from this wasteway will be substantially reduced (by 57% to 71%) throughout the irrigation season. This reduction in operational spill may decrease the number of adult salmonids migrating into Spring and Snipes Creeks due to decreased attraction flows or creation of physical barriers resulting from the creation of more riffle habitat in areas near the confluence of the Yakima River. Some of these riffles may be too shallow to allow upstream migration and ultimately create a physical impediment to upstream migration into this area.

Decreased discharge rates throughout the irrigation season will also lead to a reduction in amount of summer rearing habitat for juvenile salmon using Spring Creek Wasteway. Riffle habitat types will likely increase in length as run, glide, and pool habitat types decrease in wetted area with decreases in discharge. Losses of slow flowing habitat types, used by coho and fall chinook during the period of early growth, may result in decreased survival of juveniles that are produced in Spring Creek or migrate into this wasteway to access and use available rearing habitat. It is important to note that habitat conditions will not change in Snipes Creek Wasteway as a result of Sunnyside Conservation Plan implementation. Snipes Creek is a RID facility and will not be operated differently as a result of this proposed action.

The slight improvement in water quality above Spring Creek will benefit aquatic habitat and the potential for aiding future sediment reduction actions in the drains will be beneficial. The possibility of a very slight increase in constituent concentrations below the Spring Creek confluence will not likely be measurable or detrimental to fish populations in the lower Yakima River.

4.4 Vegetation and Wildlife

A goal of YRBWEP is to protect, create, and enhance wetlands and associated riparian and flood plain habitats. The programs and likely impacts along the river Corridor are discussed in Section 4.7 of the PEIS. The discussion here deals with project specific impacts to wetlands.

4.4.1 Wetland Impacts

A field inspection was completed for each reservoir site. It was determined that the three components that define a wetland, hydrophitic vegetation, wetland hydrology, and hydric soils, are not found together at any location within the project boundaries. Therefore, no area was found that could be classified as a wetland. (Schweissing, 2004).

4.4.2 Wildlife

All of the improvements to the main canal, the drop structures, checks and automation equipment would be installed on the existing canal banks or within the canal prism. As such construction of those items would not affect wildlife or wildlife habitat. The 3 re-regulating reservoirs would eliminate some terrestrial habitat. All 3 sites, however, involve lands which are or have been heavily disturbed. The site at 23.25 was used as pasture and irrigated pasture up until seven years ago. The vegetation was heavily disturbed by the activity and as a result has little wildlife habitat value. The site at 32.7 is currently farmed for mint and asparagus and has no wildlife habitat value because of the heavy disturbance associated with the farming operation. The last site at 59.29 is a pasture, irrigated and non-irrigated with very low wildlife habitat values do to the ongoing disturbance.

4.5 Threatened and Endangered Species

4.5.1 Steelhead

The physical components of this conservation plan (e.g. construction of re-regulation reservoirs, and main canal check drop structures), and the hydrologic and water quality impacts (mainly increases in Yakima River flows and flow decreases in drains and wasteways) resulting from their construction will be spread over a large area and will be phased in gradually over time requiring several years to reach full implementation. Construction activities related to the installation of the physical components of the conservation plan will be located far from the mainstem Yakima River in dry canal or reservoir beds and will have little direct and immediate impact on fisheries biology or habitat features in the Yakima River. However, other components, such as reduced flows and altered water quality in return drains and wasteways during the irrigation season, may have a direct impact on fisheries biology or effect access to habitat in the SVID drainage network.

Because of the complex and diverse life history characteristics exhibited by steelhead trout, it is likely that at least one life history form (adult, egg, fry, juvenile, and smolt) will be present in the project vicinity during all times of the year. Proposed project timing of mid-October to mid-March (during the non-irrigation season) was chosen because the Main Canal had to be dry to allow construction activities to take place. But this time period was also known to correspond with a time that avoided conflicts with as many of these steelhead life history forms as possible.

Adult steelhead could be in the project area (Yakima River and SVID drain system from Sunnyside Dam to Kiona) as early as September, but more likely, adult steelhead will not be in the lower Yakima River Basin near the project area until October or November and could be moving up and down the river through the project area from November through June. The lower Yakima River downstream of Sunnyside Dam is not considered spawning habitat for steelhead, but steelhead will need to pass over both Sunnyside and Prosser Diversion Dams in the course of their upstream migration, during this time period. In addition, steelhead kelt downstream emigration will be occurring during the early spring to summer period (i.e. early irrigation season) so adults may be present in the vicinity of the project area during this time as well.

Recently emerged fry as well as juvenile steelhead (i.e. mixture of 1+ and 2+ fish) are likely to be present in the vicinity of the proposed project area in late summer through fall. These fish will be using the Yakima River in limited numbers for rearing and cover habitat during this time period. These fish are likely to be the most vulnerable life history forms affected by flow and water quality modifications in the mainstem Yakima River and drains due to their small size and distribution within the Yakima River relative to the project area.

As described in the changes in hydrology section above (Section 4.1), instream flows in the Yakima River will be increased by approximately 54 cfs when the full suite of Sunnyside Plan conservation measures are implemented. This 54 cfs increase will be added to the existing Title XII minimum instream target flow requirements of 300 to 600 cfs at Sunnyside and Prosser Diversion Dams (depending on TWSA calculations each year). For the reach between Sunnyside Dam and Sulphur Creek Wasteway the full amount of the 54 cfs diversion reduction will be realized as instream flow increases in the mainstem Yakima River. However, for the reach adjacent to the Sunnyside Division and downstream (i.e from Sulphur Creek and Spring Creek to the Yakima River at Kiona) the amount of flow in the Yakima River will be reduced slightly (by approximately 12 cfs) due to return flow reductions (66 cfs) being greater than the diversion reduction (54 cfs) at the Sunnyside Canal during the storage control period.

Instream flow improvements resulting from the Sunnyside Conservation Plan will take place during the irrigation season and will either increase target flows in the Yakima River between the point of diversion of the Sunnyside Canal and Spring Creek or will result in slightly decreased mainstem Yakima River flows downstream of the project by a very small amount. These flow modifications will lead to either improved migration and rearing conditions for Yakima River MCR steelhead in the reach downstream of Sunnyside Dam or will not change the current flow conditions significantly enough (i.e only a 12 cfs reduction below the project area) to harm steelhead in the lower Yakima River. Yakima River instream flow increases downstream of Sunnyside Dam may lead to improved passage conditions through both the Sunnyside and Prosser Dam fish ladders, especially during years of low flow when passage conditions have been speculated as being difficult. However, because steelhead adults migrate upstream between the months of September and April, flow improvements in the Yakima River as a result of conservation measures will only be helpful at the beginning (April) or end (October) of the irrigation season. As a result, flow improvements in the river during the bulk of the irrigation season will not help migrating adult MCR steelhead.

Construction activities related to the building of re-regulation reservoirs and canal check drop structures will not result in direct water quality, hydrology, or fish habitat impacts due to their location away from the main channel of the Yakima River, because they will be constructed in the dry in areas that do not provide current fish habitat, and because only a few components of the full conservation plan will be built each year. Indirect effects to fish physiology and fish habitat may result from construction activities when water is first diverted into the Sunnyside Main Canal during canal priming in March or April of the irrigation season following construction activities. At this time, turbidity may increase in the newly constructed reservoirs or Sunnyside Canal as disturbed construction areas are inundated with water. Increased turbidity due to canal priming will most likely be carried through the drainage network and will be allowed to flow into the Yakima River unchecked until canal priming is completed. Impacts to fish in the Yakima River and in the return drains should be minor however, since the turbidity levels should not be excessive, and the time period associated with the canal priming activities should be minor and last only a few days. A turbidity spike is normally associated with yearly canal priming activities in the canals and drain systems operated by the SVID and other irrigation divisions so turbidity increases resulting from sediments produced from construction areas will most likely be undetectable in comparison to background turbidity levels that occur as a result of canal priming.

Adult steelhead may be affected, primarily due to water quality disturbance in the area during priming of the canal when turbidity levels should be at their highest levels for a brief period of time. The distance from the river and the few number of structures built each year will minimize the level and duration of turbidity in the project area. The disturbance caused by decreased water quality from any construction activities and the canal priming operation may result in some minor delays to steelhead attempting to pass the diversion dams but will not prohibit passage of migrating adults, especially since the majority of steelhead have already migrated upstream of Sunnyside Dam by early April.

Steelhead smolts or juveniles are not known to use habitat in the Yakima River extensively for rearing or holding during the summer months due to elevated temperatures or low flow conditions. The increased flow conditions immediately downstream of Sunnyside Dam may lead to improved rearing conditions in those limited habitat areas where steelhead juveniles are located. The essentially unchanged flow conditions in the mainstem Yakima River downstream of project return flow drains will have no effect to adult steelhead migration or juvenile emigration from the basin a as a result of implementation of the proposed action.

Because the project will be constructed in the dry and far from the main river channel, there will be no destruction of rearing habitat from construction activities. However, project related increases in turbidity during the brief canal priming operation could result in the short term disturbance of rearing habitat used by juvenile steelhead and may result in some fry displacement to downstream areas. However, the short term impacts from sedimentation generated from project activities and the canal priming operation are not thought to be severe.

Impacts to steelhead as a result of project-induced changes in Sulphur Creek Wasteway and Spring Creek Wasteway would be similar to those outlined for anadromous fish in Section 4.3. Flow reductions during the end of the irrigation season, when adult steelhead might be present, would not be enough to alter the ability of steelhead to enter these wasteways. Rearing habitat in Sulphur Creek Wasteway would not be affected while there might be some slight reduction in available habitat in Spring Creek as a result of the reduction in spills due to improved efficiency.

4.5.2 Bull Trout

Implementation of the Sunnyside Conservation Plan will have no affect on bull trout in the project area because of the extremely low numbers of bull trout presently inhabiting or using the lower Yakima River. Bull trout would likely not be found in the project area, particularly below the mouth of Spring Creek Wasteway, where slight decreases in summer flows are projected. If present in the reach from Sunnyside Diversion Dam to the Spring Creek Wasteway, which is also unlikely, the increase in flows might benefit bull trout but any benefits would be immeasurable.

4.5.3 Bald Eagle

This project will not destroy or temporarily affect bald eagle wintering or nesting habitat. No trees potential used as nesting, roosting or perch sites would be removed. Construction activities in the winter would occur in developed agricultural areas where there is considerable disturbance during the winter and are located some distance from the river corridor. As a result, the disturbance associated with modifications to the canal would have no affect on wintering bald eagles. There are no known nesting sites in the project areas. Since nesting bald eagles are not present and habitat for wintering eagles would not be affected nor would disturbance increase along the river corridor, Reclamation concludes that the proposed action would have no affect on bald eagles.

4.5.4 Ute ladies' –tresses

Ute ladies' –tresses habitat consists of wetland, riparian areas, spring habitats, mesic to wet meadows, river meanders, and floodplains. These habitat types would not be affected by any of the construction activities included in the proposed action. Construction would take place on or within the canal and at the 3 re-regulating reservoir sites. Habitat for Ute ladies'-tresses is not present at any of these sites. Reclamation concludes that the proposed action will have no affect on the Ute ladies'-tresses.

4.6 Economics

The expenditure of $32,000,000 in the region during the construction period will have positive impacts on the local economy, although the impacts will be temporary. Increased employment, increases in local services to support the construction activities, and the primary and secondary effects on local businesses will be positive.

The increased water supply in short water years could limit reductions in lost crop production limiting adverse impacts to local income and employment in those years. The increase in water supply is about 1%, on average so any impacts would be very small.

4.7 Historic Properties

In order to comply with Section 106 of the National Historic Preservation Act, a survey has been conducted of the areas to be impacted by the proposed actions. The survey found no historic properties in the proposed re-regulation reservoirs; however, effects to the National Register eligible Sunnyside Canal may occur by replacing the check structures. These effects and potential mitigation measures, if warranted, are currently under review by the Washington State Historic Preservation Officer.

4.8 Indian Trust Assets

There would be no impacts to ITAs associated with the on-site activities of this action. The data show an increase in stream flows from Sunnyside Diversion Dam to the mouth of the Spring Creek Wasteway, which are expected to benefit anadromous fish stocks in the Yakima River (Reclamation, 1999).

4.9 Environmental Justice

Water is a limited resource, and in many years, demand is much higher than supply. This condition has prevailed in the area for several years. Under the No Action Alternative, this circumstance will continue into the future. Impacts to social well-being are positive compared to the no-action alternative, in that the improvement in water supply during water short times will likely lessen the potential conflict between water competing water users.

4.10 Cumulative Impacts

Cumulative impacts are those effects on the environment resulting from the incremental consequences of a proposed action alternative when added to other past, present, and reasonably foreseeable future actions, regardless of who undertakes these actions.

The YRBWEP PEIS addresses cumulative impacts for the portion of impacts attributable to the program actions. For this action, the impacts are also cumulative to the other elements of the YRBWEP that may be implemented. Since these impacts are considered in the PEIS they need not be addressed separately in this document. No additional cumulative impacts have been identified.

4.11 Sacred Sites

No sacred sites have been identified in the project area.

Chapter 5. Coordination and Consultation

The following agencies and individuals were consulted in preparation of this EA:

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