

**UNION SOIL AND WATER CONSERVATION DISTRICT**

**IRRIGATION CANAL COMPANY**

**WATER CONSERVATION ASSESSMENT**

**2015**



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**ANDERSON PERRY & ASSOCIATES, INC.**

La Grande, Oregon  
Walla Walla, Washington

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## Introduction

The Union Soil and Water Conservation District (Union SWCD) and the Irrigation Canal Company (ICC) entered into an agreement with Anderson Perry & Associates, Inc. (AP) to provide an engineering assessment for the ICC - Water Conservation Assessment project. The ICC Canal is located in and adjacent to the City of La Grande, Oregon, in Union County. The location of the project site is shown on Figure 1. This Water Conservation Assessment (Assessment) includes an evaluation of ICC's existing system, evaluation of proposed improvements to this system, conceptual designs, and cost estimates. The design alternatives include methods for improving the ICC Canal water efficiency while also improving fish passage conditions along the Grande Ronde River. The Assessment is funded through an Oregon Water Resources Department (OWRD) Water Conservation, Reuse and Storage Grant (Grant). The project team for this project consists of the Union SWCD, ICC, City of La Grande, landowners, and AP.

## Background

The Grande Ronde River is located in Union County, Oregon, and is fed from numerous tributaries, including Chicken Creek, Fly Creek, Beaver Creek, Clear Creek, Meadow Creek, Jordan Creek, Bear Creek, and others. The main stem of the river flows in a northeasterly direction through the Wallowa-Whitman National Forest and private lands before bending east at Hilgard to pass through the City of La Grande into the Grande Ronde Valley. For the purposes of this Assessment, the upper Grande Ronde River watershed includes the drainage basin between the headwaters of the Grande Ronde River in the Blue Mountains to the ICC Canal point of diversion located on the west side of the City of La Grande, as shown on Figure 1. The drainage basin encompasses an area of approximately 689 square miles.

The upper Grande Ronde River hosts several anadromous salmonid species listed as threatened under the Endangered Species Act (ESA), including Snake River steelhead and spring Chinook salmon. Stream flow and temperature have been identified as limiting factors for the abundance of local species. The river has been listed as water quality limited for temperature and several other parameters under Section 303(d) of the Clean Water Act.

The ICC operates a diversion on the Grande Ronde River at approximately river mile 163 that diverts water into the ICC Canal. The ICC Canal is plagued by significant canal losses and maintenance issues. The canal capacity and losses make it difficult for users to take advantage of the full allotted water right and require water rotations to be put into effect for some users. Seepage from the open canal causes the adjacent water table to rise; when the canal is flowing at capacity, it raises the water table enough to cause basement flooding. The ICC has a water right of 25.5 cubic feet per second (cfs).



A pump located on the ICC Canal for lawn watering.

The Bureau of Reclamation (BOR) completed the Grande Ronde River Water Efficiency Study (Study) in January 2015. The Study collected data during the summer of 2014 and found that the ICC Canal had an average efficiency of 58 percent through the City of La Grande. The two highest flow rates recorded at

the diversion during the Study were 6.6 and 5.3 cfs; of those flows, measurements of 3 and 1.9 cfs were recorded in the canal after flowing through the City of La Grande, which equates to efficiencies of 46 and 37 percent, respectively. The low efficiencies are likely contributed to seepage from the canal and non-allocated use by individuals living adjacent to the canal.

## **Project Goals and Scope**

The purpose of this Assessment is to evaluate the existing ICC system and develop water delivery alternatives for ICC Canal users. Goals identified to guide the development of these alternatives include the following:

- Reduce ditch losses and increase water efficiency.
- Improve in-stream flows and fish passage.

The Grant agreement requires the project scope of work to be broken into key tasks. The following key tasks were defined and completed in preparing this Assessment for the ICC Canal to meet the goals listed above:

- Survey, assess, and analyze the diversion, delivery, and application system and develop alternatives for improvement based on the analyses.
- Meet with landowners and stakeholders to present alternatives and cost estimates.

## **Data Collection**

### ***General***

This section discusses the data-gathering effort performed by AP for conducting analyses for the project. The results of the data-gathering effort discussed in this section are presented in the Existing Conditions section later in this Assessment. The data were used to evaluate the conceptual design improvement alternatives discussed later in this Assessment.

### ***Site Visits***

Site visits were conducted by AP to gather field information important for evaluating the project site. Site visits were conducted at the existing diversion site, the existing canal and pipeline route, as well as proposed pipeline routes and diversion locations. During the site visits, field data such as scour indicators, canal dimensions, pipe dimensions, culvert locations and dimensions, etc., were identified.



**The ICC Canal flowing through a residential area on the west side of La Grande.**

## ***Survey***

The needed topographic survey data were also identified during the site visits and the needed survey data were collected. The survey data included key elevations at the existing diversion site, including the fish screen, return culvert, canal thalweg, Grande Ronde River thalweg, etc. In addition, invert elevations of key culverts along the proposed pipeline alignment were collected. The data were compiled and imported into AutoCAD to be used to prepare the improvement alternatives. In addition to the survey data collected, LiDAR data from the Oregon Department of Geology and Mineral Industries LiDAR Data Quadrangle Series were compiled. These LiDAR data were used to develop and evaluate the improvement alternatives.

## **Existing Conditions**

### ***Water Availability***

Based on the Upper Grande Ronde River Watershed Storage Feasibility Study completed in 2013 by AP, mean flows through this reach of the Grande Ronde River during July through August vary between 104 and 24 cfs. The BOR Study presented hydrographs of the Grande Ronde River at the Perry gauge during the July through September period. The data was composed of 18 years of record, and the hydrographs included the lowest and highest irrigation season flows; 2007 and 2011, respectively; the average daily flow; and the 2014 flow.

### ***Water Supply, Rights, and Use***

The BOR Study compiled the existing water rights served by the ICC Canal. The total maximum water right flow was determined to be 25.5 cfs with a total irrigated area of 1,021 acres. The water rights have priority dates ranging from 1882 to 1904. The irrigated land served by the ICC Canal consists of alfalfa hay, non-alfalfa hay, wheat, and fallow. Based on an analysis performed in the BOR Study, the total irrigation demand for the ICC Canal based on evapotranspiration rates and effective precipitation is 8.2 cfs. When an irrigation efficiency of 65 percent was applied, the amount of water delivered to the end users would need to be 12.6 cfs. When the BOR Study's ICC Canal conveyance efficiency of 0.38 is considered, the required diversion rate would be 32.9 cfs. Therefore, based on crop evapotranspiration rates, the existing canal efficiency, and existing irrigation efficiency, the ICC Canal would need to divert 32.9 cfs. Improved on-farm delivery systems such as center pivots or wheel lines could increase the irrigation efficiency to between 75 and 85 percent. Further evaluation of the on-farm delivery systems is outside the scope of this Assessment.

### ***Diversion System***

The diversion consists of the natural channel with a series of rock weirs to maintain the channel grade. During summer base flows in the Grande Ronde River, the diversion is unable to provide the amount of head to supply adequate irrigation flows. The diverted water flows down the ICC Canal approximately 600 feet through a 6-foot 5-inch by 3-foot headgate before flowing to a paddle wheel operated rotary drum fish



**Looking downstream of the Grande Ronde River with the ICC Canal on river right.**

screen that returns fish to the Grande Ronde River. The Oro Dell Ditch Company operates a diversion at the same location as the ICC diversion, but on the opposite side of the river. See Figure 2 for an aerial photograph of the existing diversion site.

The diversion operated by the ICC requires annual maintenance in the Grande Ronde River to maintain diversion rates. The in-stream maintenance disrupts the streambed and increases the sediment load in the Grande Ronde River, affecting critical fish habitat and passage along this reach of the river.

Paddle wheel operated rotary drum fish screens are usually designed for a minimum and maximum submergence of 65 and 85 percent, respectively, and an approach velocity of 0.4 foot per second. Based on the screen dimensions collected during the survey and the approach velocity, the existing fish screen was designed for an operation flow range of approximately 19 to 23 cfs.



Existing ICC paddle wheel operated fish screen.

Based on the survey data collected, the Grande Ronde River thalweg elevation at the ICC Canal point of diversion (POD) is approximately 2 feet below the elevation required to maintain 70 percent submergence on the fish screen. It is important to maintain 70 percent submergence for proper operation. When the screen is properly submerged, debris floats to the upper portions of the rotary drum, which enables the drum to transfer the debris to the downstream side of the screen as the drum rotates. When the drum is not properly submerged, debris accumulates on the lower portion of the drum and clogs the screen, which requires manual maintenance to clear. It will be important for the ICC to have the proper screen submergence on the existing fish screen as part of any system improvements.

### ***Delivery System***

After flowing through the fish the screen, the ICC Canal flows through an open canal for approximately 3,500 feet through a residential area on the west side of La Grande before crossing under the railroad tracks and entering an underground pipe. The underground pipe runs approximately 7,500 feet and includes an inverted siphon at the Island Avenue crossing and another railroad crossing before temporarily daylighting into an open ditch for approximately 20 feet near the south end of Pratt Street. The 20-foot open ditch is a convergence of the ICC Canal and a portion of the City of La Grande's stormwater collection system. The convergence is reportedly a concern for the ICC and should be addressed with the City in the future.



The downstream end of the inverted siphon under Island Avenue.

After the convergence, the canal returns to underground piping for approximately 1,500 feet before returning to an open canal on the east side of La Grande. From here, the open canal runs approximately 2,500 feet through a residential and industrial area on the east side of La Grande. Once outside the City of La Grande, the open canal flows approximately 5.5 miles to the area irrigated by the canal. See Figure 3 for an aerial photograph of the existing system.

## **Design Criteria**

Design criteria are the parameters utilized to help determine the size, shape, function, operating conditions, etc., for a given system to meet the objectives of the project. The following outlines the design criteria to be used for this project.

### ***Irrigation Requirements***

The ICC currently serves 1,021 acres with a water right of 25.5 cfs. Based on current irrigation practices, the ICC has indicated they would be willing to use 15.5 cfs for the design flow rate, which would provide a possible diversion flow rate reduction of 10 cfs below their water right. Designing a system that provides for more flow than that used would increase initial capital and long-term operation and maintenance (O&M) costs when compared to a system that is designed for actual water use (with some factor of safety for drier years). This 15.5 cfs flow rate would provide sufficient irrigation water while not oversizing the system.

### ***Pipeline Requirements***

The pipeline would need to be sized appropriately to provide the peak flow rate for the area being served based on the above design flow rate of 15.5 cfs. Pipeline rating would need to be provided for the working pressure of the pipe plus anticipated surges that can be experienced in a distribution system similar to the one proposed. Because the proposed system is a gravity irrigation system with low differential pressures, low-head high-density polyethylene would be appropriate. Appropriate soil cover of 2.5 feet would need to be provided. Special consideration needs to be given for anti-floatation of the pipelines in the area of shallow groundwater to ensure the pipeline does not float to the surface when it is empty.

### ***Fish Passage***

Fish passage criteria, as published in the National Marine Fisheries Service (NMFS) Anadromous Salmonid Passage Facility Design and Oregon Administrative Rule (OARs) 635-412-0035, will be utilized in the design process to maintain upstream and downstream movement of fish through the project reach located in and around the ICC diversion on the Grande Ronde River.

## **Alternative Development**

Evaluating the project objectives and the design criteria provides a basis for identifying possible improvements that could be pursued to meet the needs of ICC Canal users. Improvement alternatives developed with the ICC for the ICC Canal irrigation delivery system include the following:

**Alternative 1 - Diversion Improvements and Canal Piping.** This consists of piping the existing open canal through the City of La Grande and improving the existing POD. This alternative consists of two phases for piping the canal.

**Alternative 2 - Moving the Point of Diversion and Rehabilitating the Grande Ronde Ditch (GRD).**

This consists of moving the POD downstream to the City of La Grande's GRD POD and abandoning the existing ICC diversion. Rehabilitating the GRD would include piping a portion of the open ditch and cleaning and repairing the remaining portion of the existing ditch.

**Alternative 3 - Evaluating the Potential for Aquifer Storage and Pumping.** This consists of a preliminary analysis to determine if aquifer storage recovery may be an option and if it would be cost-effective.

***Alternative 1 - Diversion Improvements and Canal Piping***

**Diversion**

This existing diversion does not provide the required water surface elevation to properly operate the rotary drum fish screen or provide the required diversion rates for the ICC. Based on the preliminary data collected, the water surface elevation in the Grande Ronde River needs to be raised approximately 2 feet in order to provide the required water surface elevation for proper fish screen operation and diversion flow rates.

Several diversion improvement options were discussed, including re-grading the channel with streambed simulation material and installing rock vanes to construct a roughened channel, installing a radial gate, and installing a structure that would allow wooden checkboards to be installed when the water surface elevation in the Grande Ronde River drops during summer base flows. Based on river channel conditions and economic constraints, it was determined that installing a radial gate would not be feasible, so it was not evaluated further.

**Alternative 1A**

Alternative 1A consists of installing a structure that would allow wooden checkboards to be installed when the water surface elevation in the Grande Ronde River drops during summer base flows. The structure would consist of hollow precast concrete diversion units filled with streambed simulation material and installed flush with the streambed. The precast units would include steel checkboard post that lie flush with the streambed when not being used. In order to provide fish passage when checkboards are installed, a precast concrete fishway bypass containing a roughened channel constructed of streambed simulation material and large-scale roughness boulders would be constructed. The Alternative 1A diversion improvements are shown on Figure 4.

**Alternative 1B**

Alternative 1B consists of re-grading the existing Grande Ronde River channel with streambed simulation material and installing rock vanes to construct a roughened channel. The upstream rock vane would be installed at an elevation to provide the required water surface elevation for proper fish screen operation and diversion flow rates. Large-scale roughness boulders would be installed along the roughened channel to cause a significant increase in roughness for improved fish passage conditions. The roughened channel would be designed to provide fish passage for all life stages of fish species present along this reach of the Grande Ronde River. The Oro Dell Ditch Company is able to remove checkboards on a sediment sluice at their diversion box and allow high spring flows to flush sediment down

their canal and past their diversion box. This diversion improvements alternative would utilize the existing return flow culvert, located on the ICC Canal just upstream of the fish screen, to provide a sediment sluice similar to the Oro Dell Ditch Company's to control sedimentation in the canal during high spring flows. This alternative would require less operation and maintenance associated with installing checkboards like in Alternative 1A, and would provide a more natural diversion constructed of rock instead of concrete. The Alternative 1B diversion improvements are shown on Figure 5.

## Pipeline

Regardless of the diversion alternative chosen, piping the existing open channel portions of the canal through the City of La Grande would be included. The piping was broken into two phases to reduce the project size and increase funding options while still seeing increased efficiency and delivery rates with only one phase completed. Phase I would include piping the existing canal from the fish screen to the railroad crossing located approximately 3,500 feet away; this portion of the canal appeared to have the lowest efficiency. The pipe would tie into the existing canal at this location in order to utilize the existing culverts to cross beneath the railroad tracks. At the tie-in location, a concrete structure would be installed to prevent scour and control flows. The structure would have a headgate to prevent backwatering the existing canal during the irrigation season; the headgate would be opened during the non-irrigation season to allow for stormwater to flow down the existing canal piping.

Based on the design flow of 15.5 cfs, a pipeline diameter of 30 inches is needed. This phase runs the pipeline along Harrison Avenue between the asphalt pavement and the railroad tracks. Running the pipe in the existing canal was considered; however, this would require additional pipe and custom fittings and would eliminate stormwater management provided by the canal for this area of the City. The Phase I piping improvements are shown on Figure 6.



Harrison Avenue looking southeast down the Phase I pipe alignment.

Phase II would include piping the open canal on the east side of the City of La Grande from North Willow Street to the east end of H Avenue. This phase runs the pipeline along the existing canal alignment to minimize utility conflicts, asphalt restoration, and easement acquisition. A pipeline diameter of 30 inches would be utilized for this section of piping as well. The Phase II piping improvements are shown on Figure 7.

## Easements and Rights-of-Way

The pipeline alignment shown for Phase I is located on some public properties and would require obtaining a permit. Based on preliminary discussions with the City of La Grande, the alignments shown appear to be permittable. The pipeline alignment shown for Phase II is located in the existing canal alignment, and it was assumed the piping could be placed within the existing ICC easements.

## Operation and Maintenance

This piping system would require some O&M that would include regular visits to the diversion and fish screen to ensure proper operation, installing removable checkboards during low flows depending on the selected diversion improvement, maintaining the fish screen cleaning system, and flushing the system to reduce sediments and biological growth that may accumulate in the pipeline. It is estimated that this effort would require approximately 200 hours of work each year and should not require any special equipment. An additional minor allotment per year should be budgeted for supplies to complete the maintenance activities.

The proposed Phase I and II piping is anticipated to eliminate the high water losses the ICC is experiencing within the City of La Grande by eliminating canal seepage and preventing illegal pumping from the canal. The piping would also eliminate the concern of flooding basements. The proposed diversion improvements would eliminate the annual in-stream maintenance in the Grande Ronde River, which would improve fish habitat and passage along this reach of the river by reducing the sediment load and not disrupting the streambed. Currently, diverted water not used for irrigation returns to Catherine Creek. Piping the open canal would improve the water quality by eliminating contaminants gathered in the open canal through the City.

The preliminary estimated total capital cost for Alternative 1A diversion improvements and Phase I piping is \$828,000, as shown on Figure 8. The preliminary estimated total capital cost for Alternative 1B diversion improvements and Phase I piping is \$716,000, as shown on Figure 9. The Alternative 1B diversion improvements appear to be the most cost-effective alternative. The preliminary estimated total capital cost for the Phase II piping is \$439,000, as shown on Figure 10.

## ***Alternative 2 - Moving the Point of Diversion and Rehabilitating the Grande Ronde Ditch***

### **Diversion**

The GRD POD is located approximately 1.7 miles downstream of the existing ICC Canal POD. The GRD has been inactive for multiple decades and the Grande Ronde River has down-cut along this



**The concrete-encased water line is evidence of the river degradation.**



**At the abandoned GRD POD looking upstream.**

reach caused in part by aggregate mining in the river during the mid-twentieth century. Evidence of the degradation is readily apparent from the exposure of the concrete-encased water line that used to be buried below the river bottom.

Diversion improvements would need to be made in order to utilize this POD site with the

existing GRD elevations. The river bed would need to be raised or a diversion structure capable of raising the water surface elevation several feet would need to be installed, and the diversion improvements would need to meet fish passage criteria.

If the streambed were to be raised several feet, a hydraulic model would need to be run to determine the change in water surface elevation in the Grande Ronde River during high flow events to determine the potential flooding impacts to adjacent property, including Riverside Park.

## **Fish Screen**

The irrigation diversion would need to be improved to include an approved fish screening facility. Four options were identified as possible screening types: a vertical flat plate screen, belt screen, rotary drum screen, and horizontal flat plate screen.

The vertical flat plate screen would be mounted on the side of the screen channel where the water enters the screen bay and runs along the face of the screen toward the smaller bypass channel back to the river. In the screen channel, the water would flow horizontally through the screen. The screen would be cleaned using a mechanical wiper system, and debris would be washed down the bypass channel and back into the river.

The belt screen can be mounted vertically or on a slope in a variety of geometric configurations. Water would pass through the screen and debris would be cleaned by the screen's circular rotation. Debris would be removed from the screen by water flowing through the screen, air blowing through the screen, or by a brush system sweeping it off the screen.

The rotary drum screen would be similar to the existing screen in use at the ICC Canal POD. The drum would rotate from the river side to the downstream side to be cleaned and debris would be washed off the screen as water passes through it.

The horizontal flat plate screen is similar to the vertical screen, but the screening material would be on the bottom of the channel instead of on the side. It does not have a mechanical cleaning system. Debris would be carried over the top of the screen, down the bypass channel, and back into the river. This screen may be susceptible to plugging by items such as algal moss that can grow in the screen matrix and would require mechanical cleaning to remove.



At the mouth of the abandoned GRD looking upstream.

Some considerations for screen type selection include available bypass flows, power, and water depth. During the irrigation season, flows in the river are low, which would not provide a significant amount of water to be used in the screen bypass system for fish and debris to be returned to the river. Power is not currently available at the site to operate the mechanical screens, but it is available within a few hundred feet of the diversion location. The capital cost

and O&M requirements for these different types of screens are comparable within the scope of this Assessment.

### **Fish Ladder**

Depending on the type of diversion improvements implemented, a fish ladder would likely need to be installed in order to meet fish passage criteria. The fish ladder would likely be a vertical slot fish ladder to accommodate the varying flows in the Grande Ronde River and the associated varying water surface elevations in the fish ladder forebay.

### **Ditch Rehabilitation and Piping**

This alternative includes piping the existing GRD on the north side of Interstate 84 (I-84) between the proposed POD and the existing I-84 culvert. Based on the design flow of 15.5 cfs, a pipeline diameter of 30 inches would be needed. This alternative places the pipeline in the abandoned GRD alignment. The City of La Grande sold the right-of-way (ROW) associated with this portion of the GRD, and the ditch has since been filled in in multiple locations with pathways, parking lots, fences, etc.



**Filled-in abandoned culvert and GRD alignment.**

The existing GRD would be rehabilitated from the I-84 culvert to the tie-in with the existing ICC Canal at the east end of H Avenue. This portion of the GRD is still in place and is currently utilized for stormwater management. Rehabilitating the lower portion of the GRD would include clearing vegetation from the existing ditch and repairing damage caused from years of little or no maintenance. Due to the inactivity of the ditch, it could be susceptible to seepage caused from rodents burrowing through the ditch. The improvements associated with this alternative are shown on Figure 11.



**A portion of the GRD proposed rehabilitation.**

### **Easements and Rights-of-Way**

The pipeline alignment shown for this alternative is located mostly on private properties and would require obtaining an easement. This may be difficult with the amount of infrastructure that has been installed in the abandoned ROW. If some landowners were opposed to working with the ICC to provide easements for a pipeline, localized alternative alignments are possible. Existing freeway, highway, and railroad crossings would be utilized to the greatest extent possible.

## **Operation and Maintenance**

The O&M associated with this alternative would be similar to Alternative 1; however, only a portion of the proposed system would be piped, so there would be additional maintenance on the open ditch portions.

Moving the POD downstream would improve fish habitat and passage by leaving the diverted flow in the Grande Ronde River for the 1.7 miles between the existing and the proposed POD. The proposed diversion improvements would also improve fish passage by improving the degraded channel at the proposed POD and, similar to Alternative 1, this alternative would eliminate the annual maintenance in the Grande Ronde River that is currently required to maintain diversion rates.

The preliminary estimated capital cost for the diversion improvements is between \$1.4 and \$1.6 million, not including the variable cost of easement acquisition. This alternative would incorporate more open canal than Alternative 1, which would have lower water efficiency and be susceptible to illegal pumping for lawn watering. This alternative was not considered feasible due to the high capital and O&M costs, as well as the lower water efficiency when compared to Alternative 1.

### ***Alternative 3 - Evaluating the Potential for Aquifer Storage and Pumping***

The current diversion and canal delivery system does not have the capacity to provide the required irrigation flows. This alternative consists of diverting water during the non-irrigation season and obtaining a storage right to store water in an alluvial aquifer. The stored water would be pumped out of the alluvial aquifer during the irrigation season to supplement existing canal flows.

During the non-irrigation season, the ICC Canal would continue to divert water from the Grande Ronde River. The diverted water would flow through the existing ICC Canal from the diversion through the City of La Grande to the east end of H Avenue. An infiltration pond would be located near the City limits, where the diverted water would infiltrate into the alluvial aquifer. The stored water would flow through the alluvial aquifer along the valley slope. During the irrigation season, the water would be pumped out of the alluvial aquifer, down valley from the infiltration pond, and to the point of use.

Based on the existing ICC Canal capacity, which is limited by flooding of basements, only enough water could be stored during the non-irrigation season to supplement flows during the irrigation season. Water would still need to be diverted from the Grande Ronde River during summer base flows. Diverting water during the wintertime would increase O&M costs, and ice accumulation in the diversion, fish screen, and canal would be an issue. Because water would be diverted year-round, the canal would need to be closely monitored during flooding events so the diversion could be turned off and the system utilized for stormwater management. This alternative does not address the low efficiency of the existing ICC Canal.

This alternative was not considered feasible because of the high capital cost of constructing an infiltration pond, the required year-round operation of the diversion and ditch, the high O&M cost associated with pumping water, and the ICC Canal would continue to have low efficiencies during low summer flows in the Grande Ronde River when flows are critical for fish habitat.

## ***Alternative Evaluation***

Of the three alternatives presented, only Alternative 1 was considered feasible. Alternative 1 provides for water conservation, reliable water delivery, fish passage, and fish screening and meets the other objectives of the project.

## **Preliminary Environmental Review**

### ***Introduction***

This section presents a preliminary environmental review of the potential impacts resulting from the implementation of Alternative 1 - Diversion Improvements and Canal Piping. This analysis considers potential direct, indirect, and cumulative effects on the environment from project implementation. This analysis also describes potential permits that may need to be obtained and regulatory requirements that may need to be met, as well as potential mitigation measures to minimize impacts to identified resources. As the project is further developed and funding is sought, a more detailed report may be completed to meet specific agency requirements.

### ***Land Use***

The City of La Grande is located in Union County in northeast Oregon. The majority of land in the vicinity is privately owned and is either residential or used for livestock grazing or irrigated crop farming. The City occupies a 4.61-square mile area.

The entirety of the project is located within the City limits or urban growth boundary of La Grande. Work will take place within existing City rights-of-way (ROWs) and, as such, is likely to be a permitted use.

### **Important Farmland**

According to the Natural Resources Conservation Service (NRCS) Soil Survey of Union County, the soils in the La Grande area are generally considered good for farming and agriculture. The soils adjacent to the project area are primarily designated as silt loams. The main soil type adjacent to the project area where excavation will occur is Veazie-Voats complex, a loam, which is classified as well drained and as Farmland of Statewide importance. Farming is not a permitted use within the City limits, and, as designed, it is anticipated that this project will not impact farmland in any way. The piping will occur in City ROWs and will be buried underground. If the project design is modified in such a way that farmland is impacted, consultation under the Farmland Protection Program may be necessary. It is anticipated that this project will have no effect (direct, indirect, or cumulative) on important farmland and that no mitigation will be required.

### **Formally Classified Lands**

Formally classified lands are lands designated by federal, state, and local governments for special purposes. These include parks, monuments, landmarks, historic trails, wild and scenic areas, wilderness areas, Native American-owned lands, etc.

The historic Oregon Trail passes near the City of La Grande; however, there are no formally classified lands within the proposed project area. According to the National Wild and Scenic Rivers System website, the Grande Ronde River is classified as wild and scenic from its confluence with the Wallowa River to the Oregon-Washington border, but not in the project area. Because there are no wild and scenic rivers in the project area, this project will have no effect (direct, indirect, or cumulative) on wild and scenic rivers, and no mitigation will be required.

### ***Floodplains***

According to maps provided by the City of La Grande, obtained from the Federal Emergency Management Agency Map Service Center, the project area does not appear to intersect with floodplains. The intent of this project is to avoid work within floodplains. There is only one portion of work located on in the City ROW on Harrison Avenue that may intersect with Zone X (Area of 500-year flood). This project will not increase permeable surfaces, the pipe will be buried, and the project will also retain the existing ICC open canal for stormwater use. No direct, indirect, or cumulative impacts to the floodplain are anticipated. No existing aboveground structures will be impacted as a result of the project. If the project design is altered in such a way that construction occurs in the floodplain, mitigation through modified project specifications may be required to ensure that the design meets all requirements for new construction within a 500-year floodplain.

The proposed modifications to the diversion include raising the streambed elevation approximately 2 feet for 175 feet along the Grande Ronde River. The entire channel width will not be raised, only the center 60 feet. The floodplain is confined through this reach of the Grande Ronde River; therefore, the associated rise in water surface elevation caused by the diversion improvements is not anticipated to increase flooding on adjacent property, but would be further evaluated during design.

### ***Wetlands and Waterbodies***

According to the City of La Grande Local Wetlands Inventory Map and National Wetlands Inventory Map, there are no wetlands located in the project area. As such, there will be no direct, indirect, or cumulative effects to wetlands, and no mitigation will be required.

The proposed diversion improvements will occur in the Grande Ronde River. This project has the potential to temporarily impact the upper Grande Ronde River. Removal and fill within this jurisdictional waterway requires a Joint Permit Application be submitted to the U.S. Army Corps of Engineers and Oregon Department of State Lands for a 404 removal/fill permit and 401 water quality certification from the Oregon Department of Ecology. It is possible that some of these requirements could be fulfilled under a nationwide general permit. The in-water portion of this project is likely to have direct impacts to the upper Grande Ronde River. The canal piping is unlikely to have direct, indirect, or cumulative impacts, but will be further evaluated as the project develops.

### ***Biological Resources***

Important fish and wildlife habitat in the proposed project area and vicinity include the riparian areas surrounding the upper Grande Ronde River. Riparian areas are critical to the health of

streams, as the riparian vegetation provides shade and temperature regulation, provides cover for aquatic organisms, and stabilizes streambanks, preventing erosion.

The upper Grande Ronde River hosts several anadromous salmonid species listed as threatened under the ESA, including bull trout, Snake River steelhead, and Snake River Chinook salmon. The upper Grande Ronde River is listed as Critical Habitat for these species. According to StreamNet, these species may use the project area for spawning and migration. Redband trout (state listed) may also be located in the area. Stream flow and temperature have been identified as limiting factors for the abundance of local species. Because this project will require in-water work for the construction of the diversion improvements, there is a potential to impact these aquatic species. A Biological Assessment will likely be needed to fulfill consultation under section 7 of the ESA. Best management practices (BMPs) and mitigating factors for this project will likely require all in-water work for this project to occur in the Oregon Department of Fish and Wildlife in-water work window, the diversion improvement site isolated and dewatered, and fish salvage operations conducted to reduce project impacts to these species. The following table lists all threatened species and critical habitat in Union County.

**TABLE 1  
 THREATENED SPECIES AND CRITICAL HABITAT IN UNION COUNTY**

<b>Threatened Species and Critical Habitat</b>	<b>Potential Effect</b>
Snake River Steelhead <i>Oncorhynchus mykiss</i>	Any in-water work has the potential to affect the species and critical habitat.
Snake River Chinook <i>Oncorhynchus tshawytscha</i>	Any in-water work has the potential to affect the species and critical habitat.
Bull Trout <i>Salvelinus confluentus</i>	Any in-water work has the potential to affect the species and critical habitat.
Gray Wolf <i>Canis lupis</i>	None. Occurs in the County, but is a part of the Northern Rocky Mountain distinct population segment that has been delisted
Yellow-billed Cuckoo <i>Coccyzus americanus</i>	None. Occurs in the County, but prefers dense riparian forests that are not present in the project area.

This project will have no effect on upland species, but has the potential to have direct, indirect, and cumulative impacts to listed fish species in the upper Grande Ronde River. Analysis and mitigation measures will be finalized in the permitting process.

**Water Quality Issues**

The upper Grande Ronde River has been listed as water quality limited for temperature and several other parameters under Section 303(d) of the Clean Water Act.

This project is anticipated to have temporary water quality impacts during the in-water construction of the proposed diversion improvements. This may result in temporary increases in turbidity in the project area. Turbidity increases should be visually monitored and minimized through BMPs including options such as silt fencing on the shoreline, silt curtains, and project area isolation. This project is anticipated to have positive long-term impacts to water quality by eliminating annual in-stream maintenance.

The project area lies within the Columbia Plateau Regional Aquifer System. According to the U.S. Geologic Survey website, this system occupies about 50,600 square miles and extends across a large

part of southeastern and central Washington, a small part of northern Idaho, and northeastern Oregon, including nearly all of Union County. According to the U.S. Environmental Protection Agency (EPA), La Grande is not located in a sole source aquifer area.

No indirect or cumulative impacts to water quality are anticipated from this project, and short-term direct impacts from temporary turbidity increases are likely to be minimal.

### ***Cultural Resources***

According to the National Register of Historic Places, there are 11 locations listed in the City of La Grande. However, none of these are located in the project area. In addition to completing a Cultural Resource Inventory, the Oregon State Historic Preservation Office and the Confederated Tribes of the Umatilla Indian Reservation should be consulted prior to finalizing the project design. Direct, indirect, and cumulative impacts from this project will be determined through the Cultural Resources Inventory and associated consultation. Depending on the outcome of the consultation process, mitigation measures such as avoidance, drafting an inadvertent discovery plan, or monitoring may be required.

### ***Socioeconomic/Environmental Justice***

The population of La Grande, as of 2013, is estimated by the American Community Survey to be 13,114. The profile published by the U.S. Census Bureau shows that La Grande is a predominately white community at 91.3 percent; 4.6 percent Hispanic or Latino; 0.8 percent African American, 1.4 percent American Indian and Alaska Native; 1.1 percent Asian; 1.5 percent Native Hawaiian and other Pacific Islander; and 1.4 percent identifying as other. These percentages do not total 100 percent due to changes in Hispanic-origin Census questions. The 2013 U.S. Census estimate for Median Household Income for the City of La Grande is \$35,860, versus \$50,229 for the State of Oregon. The percent of families in the City of La Grande with income below the poverty level is estimated to be 15.9 percent, which is higher than the percent of families with incomes below the state poverty level of 11.2 percent.

It is not anticipated that elderly or minority populations residing in the vicinity of the proposed project area will be impacted by the project, because the pipeline will be buried beneath the ground. No business or residential relocations will be required as part of the proposed project. The pipeline alignment shown for Phase I is located on some public properties and may require obtaining a City permit. Based on preliminary discussions with the City of La Grande, the alignments shown appear to be permissible and will not result in displacement of residents. The pipeline alignment shown for Phase II is located in the existing canal alignment, and it was assumed the piping could be placed within the existing ICC easements. There may be temporary disruptions related to noise and traffic for residents near the project area during construction, but these will be mitigated by BMPs (limited work hours, traffic diversions, etc.) and will be of short duration.

### ***Miscellaneous Issues***

#### ***Air***

According to the Oregon Department of Environmental Quality (DEQ), La Grande is not in an air quality non-attainment area; however, it is an air quality maintenance area for particulates. Because this project will not create a source of particulates, it will not require an EPA air quality

permit. However, construction activities will be subject to any dust or particulate ordinances of Union County and La Grande. The project may have temporary direct impacts on air quality during construction; however, BMPs such as spraying dusty areas with water will be used to minimize dust and emissions during construction. Any potential impact to air quality is anticipated to be negligible and temporary. This project will have no indirect or cumulative effects on air quality.

## **Noise**

The diversion and piping improvements will not emit additional noise. However, construction activities will create significant intermittent and temporary noise. To minimize impacts, work will generally be confined to the project area during daylight hours. Construction activities will be subject to any noise ordinance of the City. This project will have no indirect or cumulative effects on overall noise levels in the area.

## **Traffic**

During construction, there may be temporary increases in traffic due to construction vehicles. No permanent or long-term impacts to transportation are anticipated as a result of the proposed project. If required, a traffic control plan may be drafted to minimize impacts to traffic during construction. This project will have no indirect or cumulative effects on overall traffic patterns in La Grande.

## **Hazardous Material**

No hazardous material is anticipated to be associated with this project. The project area does not appear to be located in any areas with hazardous material. A map obtained from the City of La Grande indicated the City's Diesel Fuel Contamination Area does not appear to intersect with the project area. If hazardous material is encountered during construction, mitigation measures will require that work stops and the DEQ be notified.

## ***Summary***

As previously mentioned, this limited environmental review is a brief collection of available information. A full Environmental Report and associated permits may be completed in conjunction with a funding application to meet specific agency requirements should the ICC decide to pursue funding for this project.

## **Project Financing**

Financing for this type of project must be developed considering several sources. The cost of this project is not economically viable without sources of grant funds, but this project could have significant benefit for water conservation and the environment. Many of the following programs will not entirely fund a project of this size, so several funding sources need to be used for a viable funding package. This section outlines possible funding sources and how these sources may be applied to this project. An overview of known funding programs is presented below; these programs should be further investigated to determine if they would be viable funding options for this project.

#### State Funding

- Oregon Watershed Enhancement Board (OWEB)
- Oregon Water Resources Department
  - In-stream Leasing Program
  - Senate Bill 839 Water Supply Development Account
- DEQ
  - Clean Water State Revolving Fund (CWSRF)

#### Federal Funding

- Department of Agriculture - NRCS
  - Environmental Quality Incentives Program (EQIP)
  - Conservation Stewardship Program (CSP)
  - Resource Conservation and Development Program (RC&D)
- Department of Interior - Bureau of Reclamation
  - Water SMART

### ***Oregon Watershed Enhancement Board***

OWEB focuses on projects that approach natural resources management from a whole-watershed perspective. OWEB encourages projects that foster interagency cooperation, include other sources of funding, provide for local stakeholder involvement, include youth and volunteers, and promote learning about watershed concepts. There are multiple categories of projects eligible for OWEB funding. The project would qualify by improving fish passage at the diversion point and reducing water losses in the ditch so that more water can be left in the stream.

This program is a statewide competitive program funded through lottery dollars. It requires a minimum of 25 percent cost share.

### ***Oregon Water Resources Department***

#### **In-stream Leasing**

Oregon's in-stream leasing program provides a voluntary means to aid in the restoration and protection of stream flows. This arrangement provides benefits both to water rights holders and to in-stream values by providing water users with options that protect their water rights while leasing water for in-stream benefits.

Water users who are at risk of forfeiture of their water rights due to non-use may find in-stream leases to be a good management option. In-stream water rights provide flows for fish and wildlife, scenic values, and improved water quality.

Most existing water rights are eligible to lease to in-stream use. However, to transfer water to in-stream uses, the transfer must not injure other existing water rights. Certificates and court decreed rights for surface water and water stored in a reservoir are eligible to lease to in-stream use. Water that is saved for use through this program may also be leased, as well as secondary rights for stored water.

## **Senate Bill 839 Water Supply Development Account**

In 2013, the Oregon Legislature passed Senate Bill (SB) 839 establishing a Water Supply Development Account to provide loans and grants for water resource projects that have economic, environmental, and community benefits. The Legislature authorized funding of \$10.2 million in lottery revenue bonds to be issued in the spring of 2015. The bill requires the OWRD to take a number of actions before developing rules and issuing grants and loans.

Projects eligible for SB 839 funding include, but are not limited to, those that increase water use efficiency, develop new or expanded storage, allocate federally stored water, promote water reuse or conservation, and protect or restore stream flows. Also eligible are projects developed in connection with newly-developed water that improve operations of existing water storage facilities; create new or improved water distribution, conveyance, or delivery systems; provide for water management or measurement; or determine seasonally varying flows. SB 839 is currently in the Rules Advisory Committee, and it will be a funding source to watch in the near future.

## ***Oregon Department of Environmental Quality***

### **Clean Water State Revolving Fund**

The CWSRF loan program provides low-cost loans for the planning, design, and construction of various water pollution control facilities. Any public agency in Oregon is eligible for a CWSRF loan. Eligible public agencies include soil and water conservation districts, irrigation districts, and various special districts. These funds have been used for piping irrigation districts in the past in an effort to reduce the amount of chemicals added to the ditches for algae and weed control.

## ***U.S. Department of Agriculture - Natural Resources Conservation Service***

### **Environmental Quality Incentives Program**

The EQIP was reauthorized in the Farm Security and Rural Investment Act of 2002 (Farm Bill) to provide a voluntary conservation program for farmers and ranchers that promotes agricultural production and environmental quality as compatible national goals. EQIP offers financial and technical help to assist eligible participants install or implement structural and management practices on eligible agricultural land.

The EQIP offers contracts with a minimum term that ends one year after the implementation of the last scheduled practices and a maximum term of ten years. These contracts provide financial assistance to implement conservation practices. Owners of land in agricultural production or persons who are engaged in livestock or agricultural production on eligible land may participate in the EQIP. Program practices and activities are carried out according to an EQIP plan of operations developed in conjunction with the producer that identifies the appropriate conservation practices or measures needed to address the resource concerns. The practices are subject to the NRCS technical standards adapted for local conditions.

The EQIP provides payments up to 75 percent of the incurred costs and income foregone of certain conservation practices and activities. However, certain historically underserved producers (limited resource farmers/ranchers, beginning farmers/ranchers, socially

disadvantaged producers) may be eligible for payments up to 90 percent of the estimated incurred costs and income foregone. Program participants may not receive, directly or indirectly, payments that, in the aggregate, exceed \$450,000 for all EQIP contracts entered into during the period of 2014 to 2018. Unlike the previous Farm Bill, this maximum payment limitation may not be waived.

### **Conservation Stewardship Program**

The CSP is a voluntary conservation program that encourages producers to address resource concerns in a comprehensive manner by undertaking additional conservation activities and improving, maintaining, and managing existing conservation activities.

The CSP provides equitable access to all producers, regardless of operation size, crops produced, or geographic location. The Secretary of Agriculture has delegated the authority for CSP to the NRCS Chief.

Through the CSP, NRCS will provide financial and technical assistance to eligible producers to conserve and enhance soil, water, air, and related natural resources on their land. Participation in the program is voluntary.

The CSP encourages land stewards to improve their conservation performance by installing and adopting additional activities and improving, maintaining, and managing existing activities on agricultural land. The NRCS will make the CSP available nationwide on a continuous application basis.

The State Conservationist, in consultation with the State Technical Committee and local work groups, will focus program impacts on natural resources that are of specific concern for a state or the specific geographic areas within a state. Applications will be evaluated relative to other applications addressing similar priority resource concerns to facilitate a competitive ranking process among applicants within a state who face similar resource challenges.

### **Resource Conservation and Development Program**

The purpose of the RC&D program is to accelerate the conservation, development, and utilization of natural resources, improve the general level of economic activity, and enhance the environment and standard of living in designated RC&D areas. It improves the capability of state, tribal, and local units of government and local nonprofit organizations in rural areas to plan, develop, and carry out programs for resource conservation and development. The program also establishes or improves coordination systems in rural areas. Current program objectives focus on improvement of quality of life achieved through natural resources conservation and community development which leads to sustainable communities, prudent use (development), and the management and conservation of natural resources. RC&D areas are locally sponsored areas designated by the Secretary of Agriculture for RC&D technical and financial assistance program funds.

## **U.S. Department of Interior - Bureau of Reclamation**

### **Water SMART**

The BOR provides 50/50 cost share funding to irrigation and water districts, tribes, states, and other entities with water or power delivery authority. Projects should seek to conserve and use water more efficiently, increase the use of renewable energy, protect endangered species, or facilitate water markets. Projects are selected through a competitive process and the focus is on projects that can be completed within 24 months that will help sustainable water supplies in the western United States.

The BOR published a Funding Opportunity Announcement in October 2014 with an estimated total program funding of \$19,000,000, and up to \$1,000,000 is available per project. The application deadline was January 2015, so any applications would need to be under future funding cycles.

### **Project Implementation**

In order to move forward with this project, several steps need to be taken and successfully accomplished. The first step will be to identify a viable funding source and apply for design and construction funding. The implementation steps to be pursued for this project are outlined as follows:

	<b>Item</b>	<b>Completion Date</b>
1.	Develop Funding	Spring/Summer 2016
2.	Design Improvements	Fall 2016
3.	Obtain Permits	Winter 2016
4.	Construct Improvements	Summer 2017

The timeline shown is estimated based on the construction of similar types of projects. Available funding and permitting schedules are difficult to predict and may cause this schedule to be modified.

### **Summary**

The proposed improvements would provide a long-term, low maintenance solution to the current low canal efficiency and inadequate diversion rates. The proposed improvements would provide adequate irrigation rates and conserve water to maintain in-stream flows during critical low summer flows.

## **FIGURES**



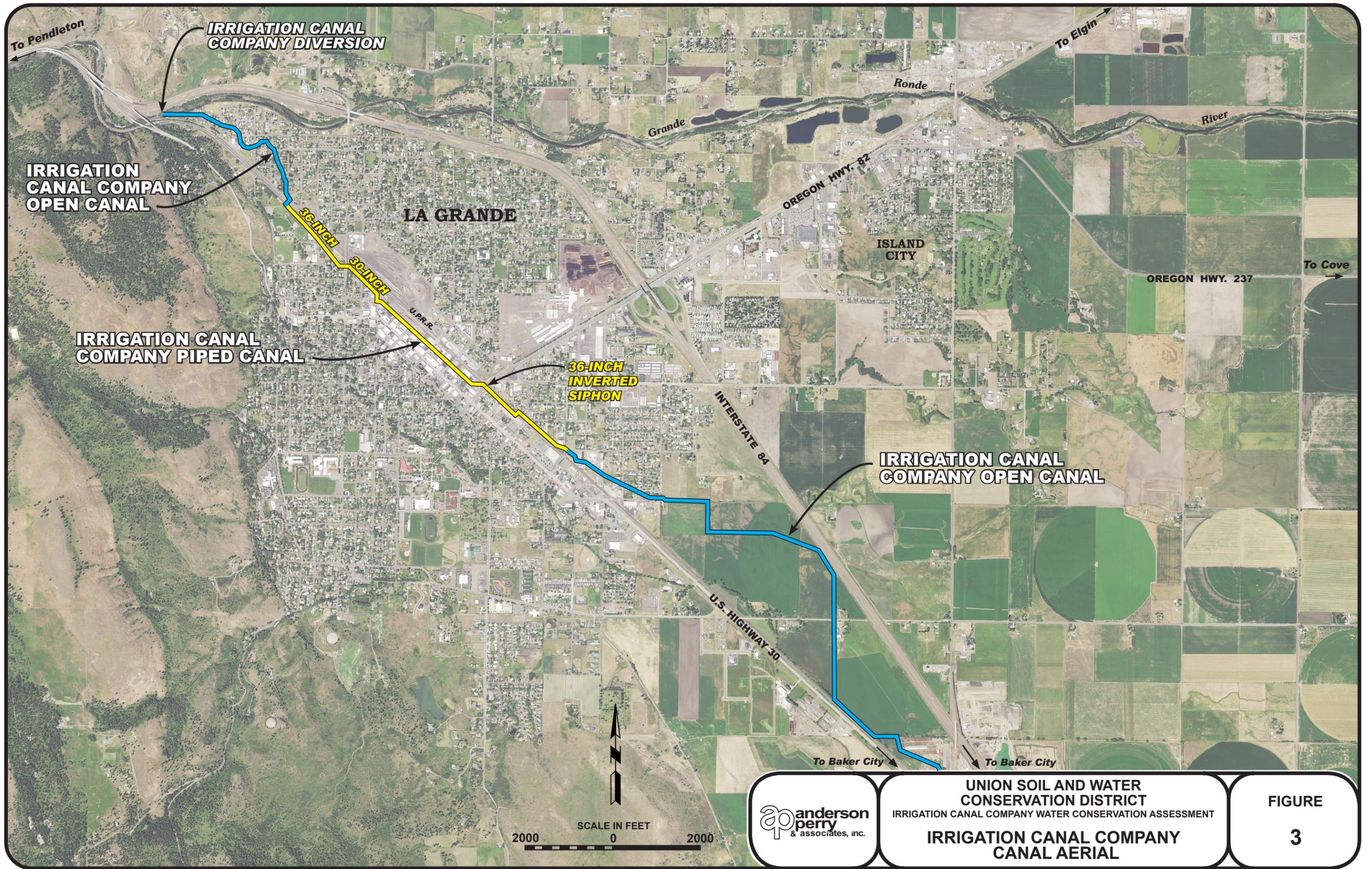


Job# 596-02-020 Jun. 11, 2015 lbauer



UNION SOIL AND WATER  
CONSERVATION DISTRICT  
IRRIGATION CANAL COMPANY WATER CONSERVATION ASSESSMENT  
**DIVERSION AERIAL**

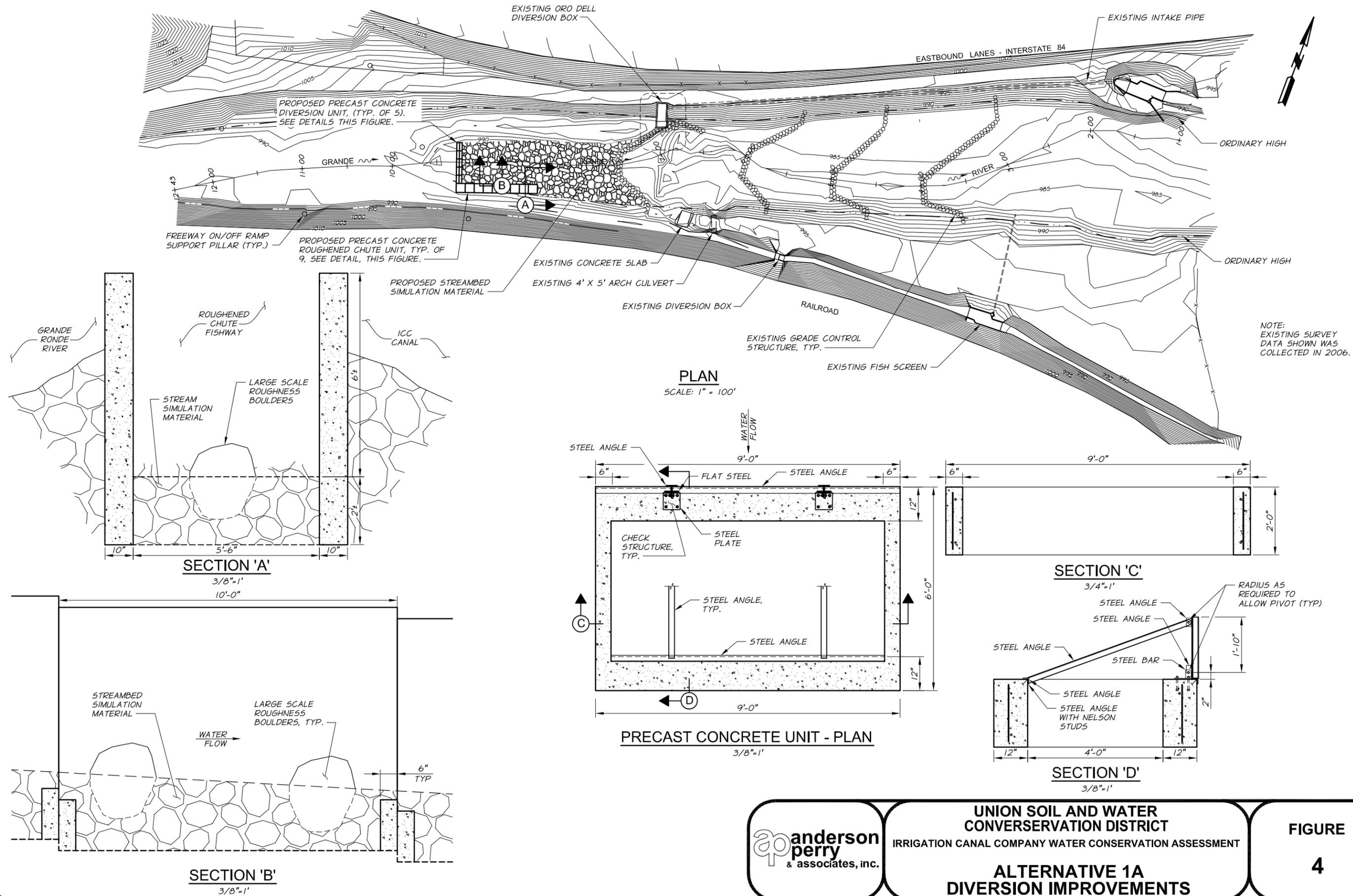
FIGURE  
**2**



UNION SOIL AND WATER  
 CONSERVATION DISTRICT  
 IRRIGATION CANAL COMPANY WATER CONSERVATION ASSESSMENT  
**IRRIGATION CANAL COMPANY  
 CANAL AERIAL**

FIGURE  
**3**

S:\UNTON\_SWCD\596-02\_IrrCanalCo\_Assessment\DWG\alt\_1A.dwg, FIG 4, 6/22/2015 2:16:54 PM, rasmussen



NOTE: EXISTING SURVEY DATA SHOWN WAS COLLECTED IN 2006.

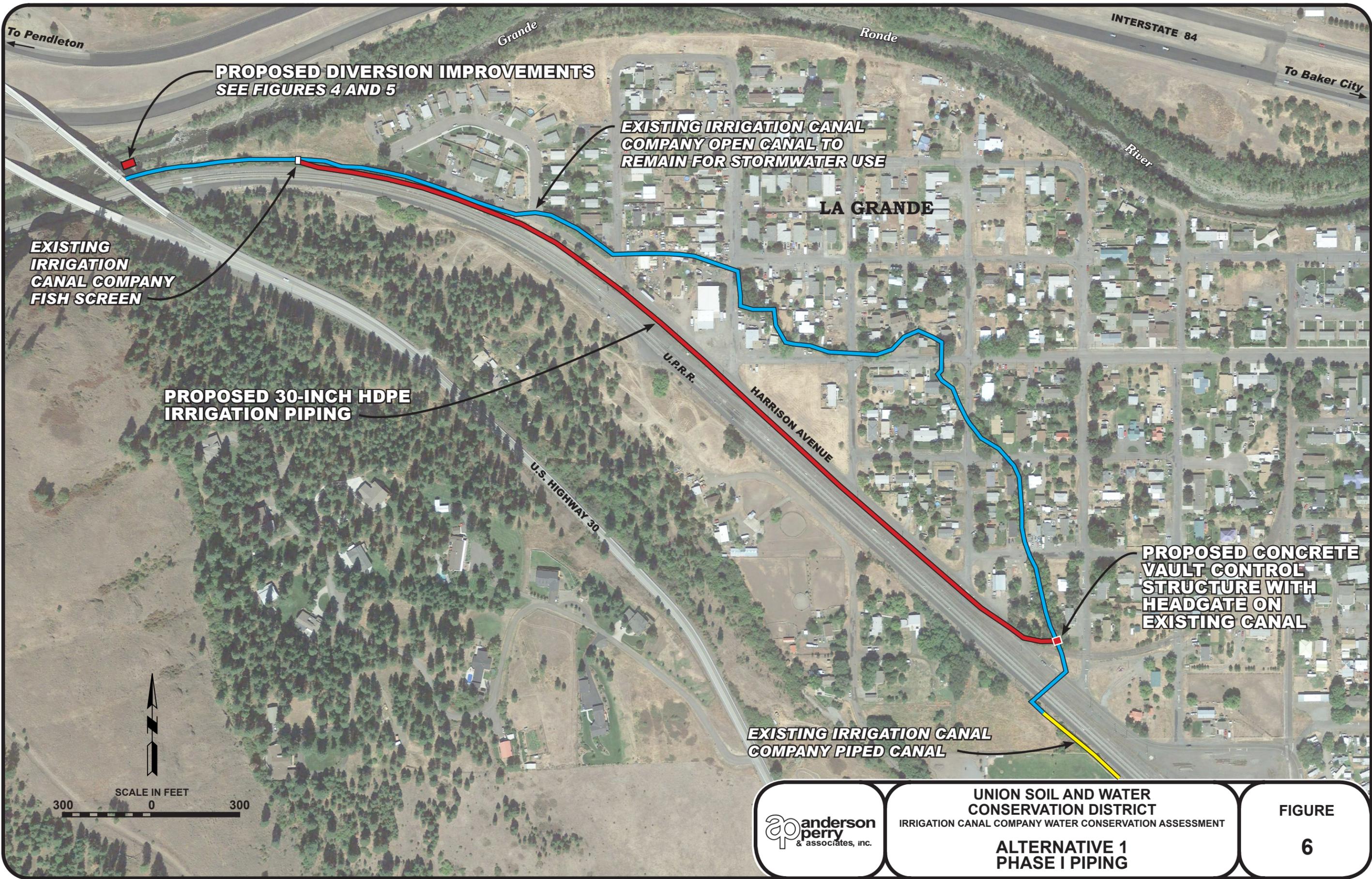
**anderson perry & associates, inc.**

**UNION SOIL AND WATER CONSERVATION DISTRICT**  
IRRIGATION CANAL COMPANY WATER CONSERVATION ASSESSMENT

**ALTERNATIVE 1A DIVERSION IMPROVEMENTS**

**FIGURE 4**



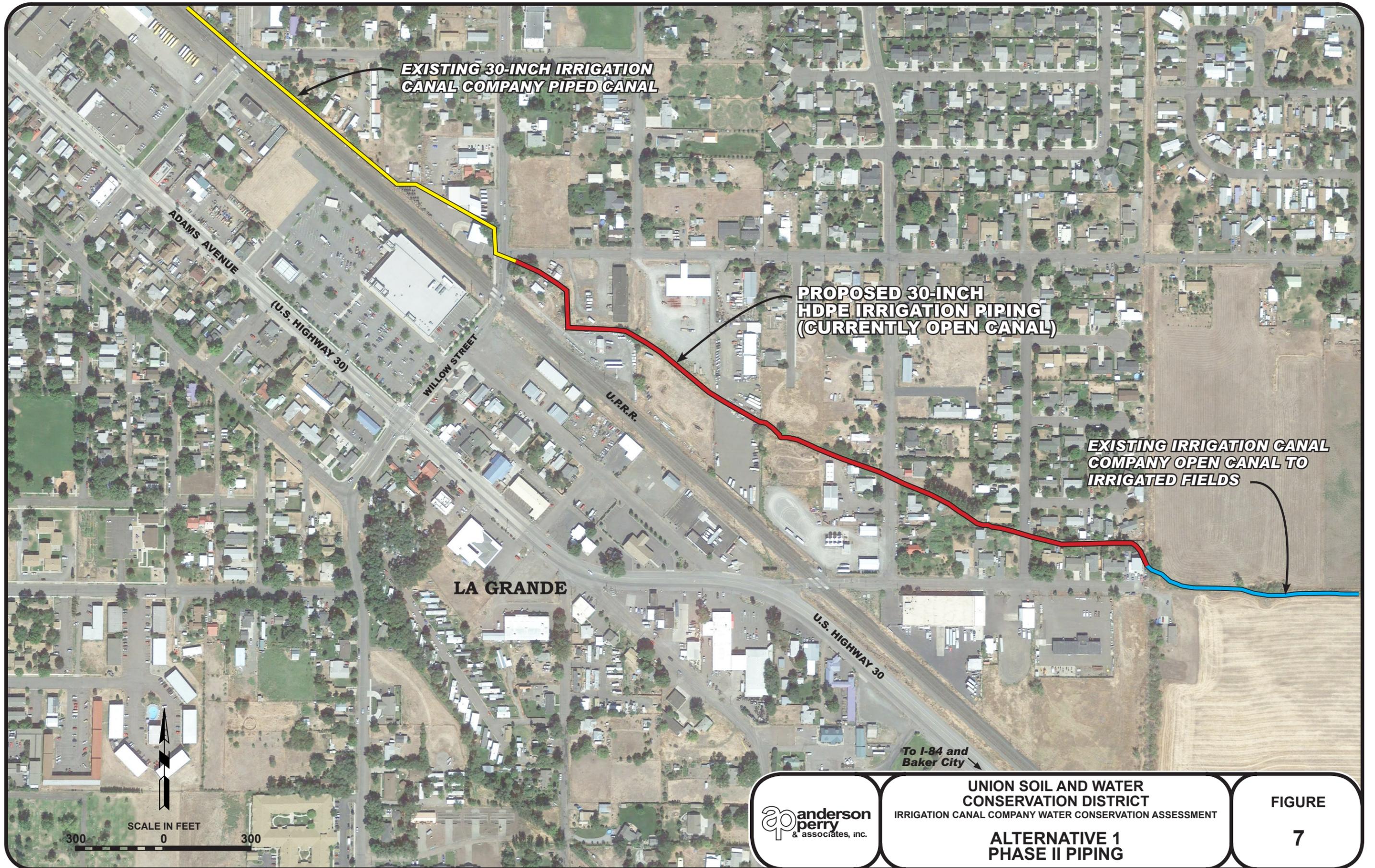


Job# 596-02-020 Jun. 30, 2015 lbauer



UNION SOIL AND WATER  
 CONSERVATION DISTRICT  
 IRRIGATION CANAL COMPANY WATER CONSERVATION ASSESSMENT  
**ALTERNATIVE 1  
 PHASE I PIPING**

FIGURE  
**6**



**UNION SOIL AND WATER CONSERVATION DISTRICT**  
IRRIGATION CANAL COMPANY WATER CONSERVATION ASSESSMENT

**ALTERNATIVE 1  
PHASE II PIPING**

**FIGURE  
7**

**UNION SOIL AND WATER CONSERVATION DISTRICT  
IRRIGATION CANAL COMPANY  
WATER CONSERVATION ASSESSMENT  
ALTERNATIVE 1A DIVERSION IMPROVEMENTS AND PHASE I PIPING  
COST ESTIMATE  
JUNE 2015**

NO.	DESCRIPTION	UNIT	ESTIMATED QUANTITY	MATERIAL UNIT PRICE	LABOR UNIT PRICE	TOTAL PRICE
1	Mobilization	LS	All Req'd	\$ -	\$ 27,400	\$ 27,400
2	Temporary Protection and Direction of Traffic/Project Safety	LS	All Req'd	-	5,000	5,000
3	Excavation and Preparation Work for New Diversion and Fishway	HR	40	-	280	11,200
4	Precast Irrigation Diversion Units	EA	9	2,000	2,000	36,000
5	Precast Fishway Units	EA	10	3,500	3,500	70,000
6	Streambed Simulation Material	HR	30	-	280	8,400
	Streambed Simulation Material	CY	500	30	-	15,000
7	Large-Scale Roughness Boulders	HR	10	-	280	2,800
	Boulders	CY	80	40	-	3,200
8	Site Restoration	LS	All Req'd	2,000	3,000	5,000
9	Water Control	LS	All Req'd	2,000	13,000	15,000
10	30-inch Low-Head HDPE Pipe	LF	3,500	50	50	350,000
11	Concrete Control Structure	LS	All Req'd	5,000	5,000	10,000
12	Surface Restoration	LS	All Req'd	5,000	5,000	10,000
<b>Total Year 2015 Estimated Construction Cost</b>						<b>\$ 569,000</b>
Design Engineering (10%)						57,000
Agency Administration (3%)						18,000
Construction Engineering (7%)						40,000
Environmental Permitting						30,000
Contingency (20%)						114,000
<b>TOTAL ESTIMATED PROJECT COST (2015)</b>						<b>\$ 828,000</b>



UNION SOIL AND WATER  
CONSERVATION DISTRICT  
IRRIGATION CANAL COMPANY  
WATER CONSERVATION ASSESSMENT  
ALTERNATIVE 1A DIVERSION  
IMPROVEMENTS AND PHASE I PIPING  
COST ESTIMATE

**FIGURE  
8**

**UNION SOIL AND WATER CONSERVATION DISTRICT  
IRRIGATION CANAL COMPANY  
WATER CONSERVATION ASSESSMENT  
ALTERNATIVE 1B DIVERSION IMPROVEMENTS AND PHASE I PIPING  
COST ESTIMATE  
JUNE 2015**

NO.	DESCRIPTION	UNIT	ESTIMATED QUANTITY	MATERIAL UNIT PRICE	LABOR UNIT PRICE	TOTAL PRICE
1	Mobilization	LS	All Req'd	\$ -	\$ 23,160	\$ 23,160
2	Temporary Protection and Direction of Traffic/Project Safety	LS	All Req'd	-	5,000	5,000
3	Grade Control Structures (4)	HR	80	-	280	22,400
	Rock	CY	440	40	-	17,600
	Gravel	CY	220	30	-	6,600
4	Streambed Simulation Material	HR	30	-	280	8,400
	Streambed Simulation Material	CY	500	30	-	15,000
5	Large-Scale Roughness Boulders	HR	8	-	280	2,240
	Boulders	CY	40	40	-	1,600
6	Site Restoration	LS	All Req'd	2,000	3,000	5,000
7	Water Control	LS	All Req'd	2,000	13,000	15,000
8	30-inch Low-Head HDPE Pipe	LF	3,500	50	50	350,000
9	Concrete Control Structure	LS	All Req'd	5,000	5,000	10,000
10	Surface Restoration	LS	All Req'd	5,000	5,000	10,000
<b>Total Year 2015 Estimated Construction Cost</b>						<b>\$ 492,000</b>
Design Engineering (10%)						50,000
Agency Administration (3%)						15,000
Construction Engineering (7%)						35,000
Environmental Permitting						25,000
Contingency (20%)						99,000
<b>TOTAL ESTIMATED PROJECT COST (2015)</b>						<b>\$ 716,000</b>



UNION SOIL AND WATER  
CONSERVATION DISTRICT  
IRRIGATION CANAL COMPANY  
WATER CONSERVATION ASSESSMENT  
ALTERNATIVE 1B DIVERSION  
IMPROVEMENTS AND PHASE I PIPING  
COST ESTIMATE

**FIGURE  
9**

**UNION SOIL AND WATER CONSERVATION DISTRICT  
IRRIGATION CANAL COMPANY  
WATER CONSERVATION ASSESSMENT  
ALTERNATIVE 1 PHASE II PIPING  
COST ESTIMATE  
JUNE 2015**

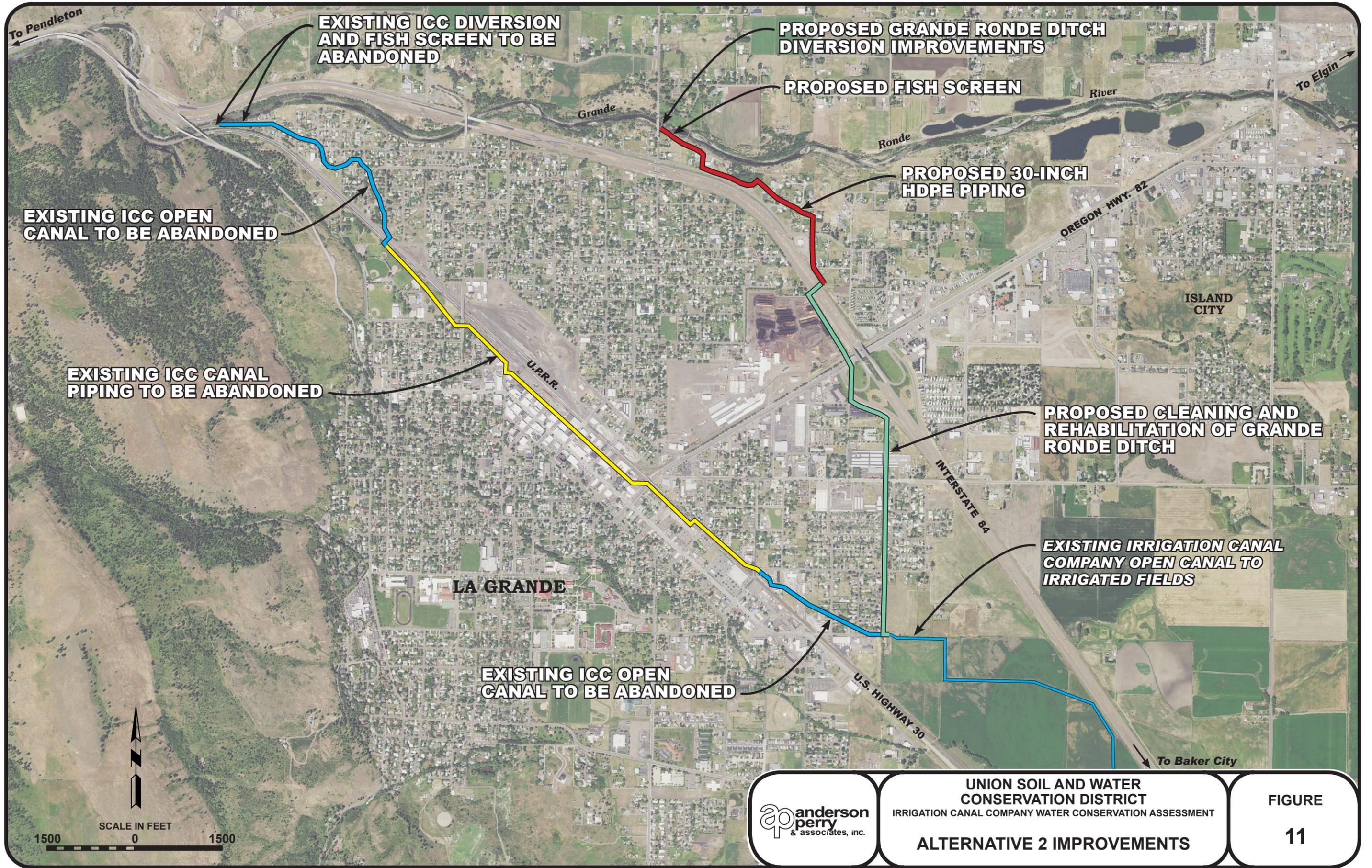
NO.	DESCRIPTION	UNIT	ESTIMATED QUANTITY	MATERIAL UNIT PRICE	LABOR UNIT PRICE	TOTAL PRICE
1	Mobilization	LS	All Req'd	\$ -	\$ 15,000	\$ 15,000
2	Temporary Protection and Direction of Traffic/Project Safety	LS	All Req'd	-	10,000	10,000
3	30-inch Low-Head HDPE Pipe	LF	2,700	50	50	270,000
4	Surface Restoration	LS	All Req'd	5,000	5,000	10,000
<b>Total Year 2015 Estimated Construction Cost</b>						<b>\$ 305,000</b>
Design Engineering (10%)						31,000
Agency Administration (3%)						10,000
Construction Engineering (7%)						22,000
Environmental Permitting						10,000
Contingency (20%)						61,000
<b>TOTAL ESTIMATED PROJECT COST (2015)</b>						<b>\$ 439,000</b>



UNION SOIL AND WATER  
CONSERVATION DISTRICT  
IRRIGATION CANAL COMPANY  
WATER CONSERVATION ASSESSMENT

ALTERNATIVE 1 PHASE II PIPING  
COST ESTIMATE

**FIGURE  
10**



UNION SOIL AND WATER  
 CONSERVATION DISTRICT  
 IRRIGATION CANAL COMPANY WATER CONSERVATION ASSESSMENT  
**ALTERNATIVE 2 IMPROVEMENTS**

FIGURE  
**11**