A. General Project Information

1. Organization / Project Sponsor Name:
   Shasta Valley Resource Conservation District (SVRCD)

2. Project Name:
   Irrigation Ditch Pipeline and Water Efficiency Improvement Project

3. Has the organization implemented similar projects in the past? ☒ yes ☐ no

4. **If the project sponsor has worked with NCRP in the past, describe the project and outcome.**
   1) Siskiyou County Prescribed Burn Association and Demonstration Projects
   NCRP RFFCP Block Grant - Successfully established the Siskiyou Prescribed Burn Association in 2020. To date 35 groups, 114 people trained and 145 acres treated.

   2) Shasta River Drought Response and Irrigation Efficiency Project
   NCRP Prop 84 Round 2015 IRWM Implementation Grant
   Completed design, permit and implementation of diversion upgrades to improve flow measurement capability for Shasta River Water Users Association.

5. **Please describe the qualifications, experience, and capacity of the project team that will be overseeing project implementation.**

The Shasta Valley Resource Conservation District (SVRCD) serves central Siskiyou County with an office in Yreka, the county seat. Since inception in 1953, SVRCD has worked cooperatively with private landowners and agencies on a voluntary basis to enhance the management and sustainable use of natural resources in order to ensure the long-term economic viability of the community. Our staff has experience in environmental sciences, agricultural and natural resources, grant management and finances.

6. **Is this project part of a larger project or program? If so, what effectiveness monitoring is being conducted and what are the results?**

This project is a continuation of previous large scale restoration efforts. Landowners participate in multiple additional programs with monitoring components including: TMDL Conditional Waiver, SGMA Surfacewater/Groundwater connectivity monitoring, NOAA Safe Harbor Program, and the Scott Shasta Water Master District efforts. Each program has a monitoring/measurement component. Upstream flows are positively impacted by groundwater inputs. Projects that keep these flows instream improve habitat.

7. **Project Abstract** [500 characters max.]

This project aims to increase the water efficiency for agricultural production, provide environmental benefits to threatened species, and strengthen the economic viability for landowners. This is achieved through 14,600 feet of pipe, irrigation valves, and soil moisture sensors. The result is a reduction in the diversion time and an increase in time a full water right of 11.9 cfs can be left instream. Resulting, in roughly 1,480 acre-feet a year of conserved water.

8. **Project Description** [3,000 characters max.]

In 2011 The Huseman Ditch moved from its original Point of diversion co-located at the Grenada Irrigation District (GID) point of diversion to a pump station located approximately 5.5 river miles downstream. Huseman Ditch transitioned from a gravity ditch to a lift pump station supplied by electric pumps when moving their point of diversion. Huseman Ditch Company pays for the electrical costs to operate the pumps; an additional cost of doing business. By moving the point of diversion (POD) to a location within the place of use, 18 cfs of quality water now remains in the stream for 5.5 miles. The effected reach of the Shasta River is a critical reach where coho Salmon and steelhead are known to utilize the varied habitats throughout the year. Chinook Salmon also spawn and rear in this critical reach. The long-term objective of Huseman Ditch has been to increase the efficiency of the Huseman Ditch as an irrigation system resulting in a reduced diversion volume, thereby leaving more water instream to benefit aquatic habitat.

The current method of irrigation is wild flood irrigation using tarps and flashboard structures to control and direct water. This method of irrigation requires a large amount of water, limits the ability to irrigate in several places at once, contributes to irrigating beyond crop demand, and can generate tail-water resulting from lack of finite volume control.

The purpose of the project as a whole is threefold. It is to allow for more efficient use of scarce water resources for agricultural production (livestock and hay production), to provide environmental benefits to threatened salmon and other sensative species, and to strengthen the economic viability for landowners. This is achieved through the implementation of approximately 14,600 feet of 24 inch #80 PIP pipe, appropriately sized irrigation valves, and soil moisture sensors. The pipeline eliminates the losses due to ditch seepage and evaporation associated with use of open earthen irrigation canals. Open irrigation ditches take additional water and time to wet and fill the ditch, whereas piplines can remain charged even when water is not actively being diverted. The net result is a reduction in the active diversion time and an increase in the time that the full water right of 11.9 cfs can be left instream. The period of time between irrigation cycles when the diversion is inactive usually lasts from 4-7 days, (depending on how much water was being diverted) and typically occur 8-10 times throughout the irrigation season (April 1-September 30). In exchange for the extended pipeline, the irrigators will permanently reduce Huseman Ditch's diversion from a maximum of 11.9 cfs to 9.4 cfs, conserving 2.5 cfs. This would result in roughly 1,480 acre-feet per year minimum of conserved water that will remain in the Shasta River and will provide instream benefits for aquatic species, including, but not limited to, threatened and sensatsive salmonids.

9. Specific Project Goals/Objectives

Goal 1: Water Efficiency [100 characters max.]
Goal 1 Objective: Improve drought resilience by allowing farmers to use only what they need [200 characters max.]
Goal 1 Objective: Reduce ditch losses and excess diversion with improved infrastructure
Goal 1 Objective: Provide water conservation data to landowners in order to promote voluntary water conservation through leak detection and ditch loss assessments
Goal 1 Objective: Provide soil moisture data to landowners in order to promote voluntary water conservation through applied irrigation efficiency

Goal 2: Water Quality and Quantity
Goal 2 Objective: Leave more water instream for salmonids during all life stages
Goal 2 Objective: Reduce the Mean Weekly Maximum Temperatures (MWMT) for over-summering Coho with increased water instream
Goal 2 Objective: Improving the minimum daily dissolved oxygen values in the Shasta River
Goal 2 Objective:

Goal 3: Economic Viability
Goal 3 Objective: Improve irrigation efficiency infrastructure in a disadvantaged community which has most recently been under increased scrutiny from regulators to meet conservation targets
Goal 3 Objective: Provide jobs and commerce to qualified local contractors and vendors
Goal 3 Objective: Resilience for landowners against lawsuits or costly legal issues
Goal 3 Objective:

Additional Goals & Objectives (List)

10. Describe how the project addresses the NCRP Goals and Objectives selected. [1,000 characters max.]

Goal 3: Obj. 6 and 7 are met by the conservation of 2.5 cfs in Shasta River resulting in the continued effort to improve flows in the Shasta River. Low flows are a limiting factor for salmonids in the Shasta River.

Goal 4: Obj. 8 ensures that the landowners will efficiently receive enough water to support their agricultural needs while leaving conserved water instream. Water left instream minimizes impacts to threatened coho and sensitive aquatic species and habitat, especially during critical life stages. The conserved volme of water is also available for downstream ag, rec, and Tribal use.

Goal 5: Obj: 11 and 12 are also met through increased steam flow. The increased instream flow has the benefit of buffering water temperatures during periodic summer heat waves and increasing dissolved oxygen. Both temperature and dissolved oxygen are listed as constituients in the Shasta River TMDL. Whenever possible, project money will be spent locally on labor and materials within DAC and EDAs.

11. **Describe the physical, biological and/or community need for the project**. [1,000 characters max.]

SONCC Coho is state and federally listed as threatened. Current irrigation practices present challenges for certain life stages of coho, Chinook, and steelhead. Outmigration of Chinook coincides with the onset of irrigation season (Apr 1-Sep 30). Late summer marks the outmigration of coho smolts and returning adult Chinook which are often impeded by low flows and poor water quality conditions typical during this time. Low flows are associated with reduced habitat and fish passage issues, high water temperature and low dissolved oxygen, and ultimately, reduced juvenile survivorship.

Persistent periodic drought conditions have hampered agricultural output since 2014. Emergency flow regulations by the SWB enacted in 2021 shut down many irrigatiors. Projects that increase on-farm efficiency and put water instream benefit salmonids and go a long way toward making water available for downstream agricultural uses like stockwater while still achieving regulatory flow targets.

12. **Describe the financial need for the project**. [1,000 characters max.]

This project provides irrigation water efficiency improvements to agricultural users in the Shasta Valley. Existing resources are limited in this Economically Disadvantaged Community (DAC). The improvements will be installed within a private ditch company which typically struggles to maintain their aging infrastructure and keep up with technological advancements that can drastically improve their measuring and efficiency capabilities. The ongoing drought and supply chain issues continue to compound the financial and management difficulties for the landowners and irrigation districts. While some grant funding has been secured by them for this effort to date, it is not enough to accomplish all that is possible to maximize efficiency. The ranchers in this reach are proactively pursuing available state, federal, and private resources, primarily through the SVRCD, and this funding opportunity can bring benefits that otherwise may be unobtainable.

13. **Describe potential adverse impacts from project implementation and how they will be mitigated.**

At this point no adverse physical effects are expected as new water conveyance structures will make use of the existing open ditch where appropriate for stockwater and wildlife. This work will occur on established irrigated pasture lands with predominately non-native grasses and forage that is grazed by cattle, making them unlikely locations for rare or endangered plants. These working landscapes have roads and common staging areas that are already well established.

14. **Will this project mitigate an existing or potential Cease and Desist Order or other regulatory compliance enforcement action?** ☐ yes ☒ no

    If yes, please describe. [500 characters max.]

15. **Does the project address a contaminant listed in AB 1249 (nitrate, arsenic, perchlorate, or hexavalent chromium)?**

    ☐ yes ☒ no

    If yes, provide a description of how the project helps address the contamination. [500 characters max.]

16. **Describe how the project contributes to regional water self-reliance and addresses climate change.** [1,000 characters max.]

In light of current and persistent drought conditions, there is increasing pressure on private agricultural landowners within the Shasta Valley to both improve water conservation and irrigation efficiencies to maintain instream flow while also providing the water needed to continue agricultural livelihoods. The project outlined in this proposal would aid these SDAC, DAC, and EDAs in achieving their voluntary water conservation targets while also strengthening their economic viability and resilience. This project will also assist with extending cold water plumes further down the river by bolstering the instream flows. Increased instream flow has the added benefit of buffering water temperatures during our periodic summer heat waves and increasing the associated dissolved oxygen. Reducing these water quality standards also benefit salmonids during all life stages which have been severely affected by climate change.

17. **Does the project increase public safety with regards to flood protection, wildfire hazard risk reduction, increasing firefighting capacity, or in other ways contribute to regional emergency resiliency?**

    ☒ yes ☐ no

    Please explain. [500 characters max.]

Greenbelts are required to prevent fires from burning into housing developments. Agricultural areas are far less fire prone. Well-managed rangelands and farmlands can help protect the entire region from uncontrolled wildfires. Grazing animals shorten grass height and prevent shrub encroachment, reducing the excess fuel loads. In addition, well-managed rangelands and forests maintain healthy habitat and biodiversity, encouraging water retention in soils that can slow the progress of wildfire.

18. Does the project employ new or innovative technologies or practices, including Decision Support Tools that support the integration of multiple jurisdictions, including, but not limited to, water supply, flood control, land use, and sanitation? ☒ yes ☐ no

If yes, please describe. [500 characters max.]

Soil moisture sensors and pump data will be viewed and managed from a smartphone, helping to increase the precision of irrigation. The project also makes use of SGMA monitoring equipment, where a transect of piezometers (monitoring wells) help track impacts of applied irrigation on the water table and groundwater temperature near the river, and track when the river shifts between a gaining or a losing reach.

19. Describe the population served by this project, including any economically disadvantaged communities or Tribes that will directly benefit.

This project provides direct benefits to local ranchers within DAC and EDAs. The water conservation benefits to the river will make more water available for downstream ranchers located in DAC and SDACs, and provide improvements to water quality and aquatic habitat in the project area. Improving conditions that support threatened and sensitive salmonids helps recovery and resiliency and ensures that future generations will be able to enjoy these species.

20. Describe local and/or political support for this project. [500 characters max.]

Locally, this project has support from the Siskiyou County Board of Supervisors, landowner groups including the Shasta Water Association and Montague Water Conservation District, as well as private landowners both within the project boundary and this reach of the Shasta River. Politically, this project supports actions from Governor Gavin Newsom's water conservation measures detailed in Executive Order N-7-22.

21. List all collaborating partners and agencies and nature of collaboration. [750 characters max.]

Natural Resource Conservation Service - Initial pipeline and appurtenances designs in 2011 and 2012. As built drawings for a portion of pipeline that was implemented in 2012. In 2022 committed matching funds to conduct analysis of designs.

Vestra Resources, Inc. - Independent engineer to analyze designs and assess ditch loss calculations. Will develop 100% design.

Huseman Ditch Company - Association of landowners who irrigate 544 acres of pasture

California Department of Fish and Wildlife

Wildlife Conservation Board - Former funder of the first phases of the project to remove the flashboard dam and relocate the point of diversion downstream.

National Oceanic Atmospheric Administration -

North Coast Regional Water Quality Control Board -

22. Is this project part or a phase of a larger project? ☒ yes ☐ no

Are there similar efforts being made by other groups? ☒ yes ☐ no

If yes to either, please describe. [500 characters max.]

The first phase was completed as part of The Grenada Irrigation District (GID) diversion instream upgrade. The Huseman Ditch Association diversion was uncoupled from the GID diversion. A new fish screen, intake gallery, pump station and instream riffle structure were constructed in 2011. The existing pipeline terminates at the edge of Huseman Ditch and this proposal would continue the pipeline to the end of the ditch. CalTrout has implemented several similar projects in an upstream reach.

B. Project Location

1. **Describe the latitude and longitude of the project site.**
   Latitude: 41.640776° Longitude: -122.503994°

2. **Site Address (if relevant):**
   Three ranches between Grenada and Montague CA. Addresses for the ranch headquarters are on Siskiyou County Road A-12 and DeSoza Lane. The project runs along the west side of the Shasta River, between A-12 and DeSoza Lane, paralleling the Shasta River and Montague-Grenada Road.

3. **Does the applicant have legal access rights, easements, or other access capabilities to the property to implement the project?**

☒	yes	If yes, please describe below
☐	no	If no, please provide a concise narrative below with a schedule, to obtain necessary access
☐	NA	If NA, please describe below why physical access to a property is not needed

Explanation. [500 characters max.]

The Shasta Valley RCD maintains and annually renews signed Landowner Access Agreements for private lands that participate in our TMDL Monitoring program. The Shasta Valley RCD has occupied several sites for over 10 years. The Shasta Valley RCD regularly accesses properties which receive irrigation water from the Huseman Ditch. The Shasta Valley RCD anticipates continued cooperation and participation in TMDL monitoring by landowners.

4. **Project Location Notes:**

The former location of the point of diversion for the Huseman Ditch was:
41.608996° -122.475143°
The current point of diversion is located at:
41.637552° -122.496036°
The current start of the Huseman Ditch is located at:
41.640776° -122.503994°
The location of the spring input is:

41.665172° -122.505665°
The current end of the Huseman Ditch is located at:
41.676063° -122.508386°

C. Benefits To Disadvantaged Communities and/or Tribes

1. **Does the project provide direct water-related benefits to a project area comprised of Disadvantaged Communities or Economically Distressed Communities?** If partially, please estimate percentage of project that benefits disadvantaged communities and list the communities.
   ☐ Entirely
   ☒ Partially; estimate the percentage of benefits provided directly to DAC: 20%
   ☐ No
   List the Disadvantaged Community(s)

20% of the total proposed pipeline are within Census Tract 7.01 Block 4, a DAC, and would provide direct water-related benefits. The remaining 80% of the proposed project improvements are within Census Tract 7.01 Block 1, an EDA by 2020 US Census Bureau numbers (85% of Statewide MHI). Additionally, Implementation of this project leaves 2.4 cfs of high quality cold water in the Shasta River year round, making it available for fisheries and wildlife habitat and agricltural purposes within the area of improvements and downstream, passing through several additional DACs, SDACs, and EDAs.

2. **Does the project provide direct water-related benefits to a project area comprised of Severely Disadvantaged Communities (SDAC)**? If partially, please estimate percentage of project that benefits disadvantaged communities and list the SDACs.
   ☐ Entirely
   ☒ Partially; estimate percentage of benefits provided directly to SDAC: 50%
   ☐ No
   List the Severely Disadvantaged Community(s)

Immediately across the Shasta River from the proposed project improvements is Census Tract 3, Block 3, which meets the criteria for SDAC. While implementation of this project and associated infrastructure improvements would not occur on lands within a SDAC, the conservation benefit of the project leaves 2.4 cfs of cold quality water in stream year round, improving the scenic beauty, aquatic species, and aquatic and terrestrial habitat of SDAC lands. Additionally, the conservation benefit would make more water available for downstream agricultural users within the SDAC and fisheries purposes, furthing these benefits to additional DACs.

3. **Does the project provide direct water-related benefits to a Tribe or Tribes**? If partially, please estimate percentage of project that benefits Tribe(s) and list the Tribes.
   ☐ Entirely

☒ Partially; estimate percentage of benefits provided directly to Tribe(s): 20%
☐ No

List the Tribal Community(s)

Salmon are an essential cultural resource to regional Tribes and the improvement of habitat and survivability of salmonids benefits all Tribes within the Klamath River Basin. However, the Shasta Tribe and Karuk Tribe stand to benefit the most from this project. If implemented, this project would see more high quality, cold water remain in the Shasta River, helping to expand thermal refugia, and improving access to critical spawning and juvenile rearing habitat for anadromous fish, especially coho and Chinook salmon. Improving access and quality of fish spawnaing and rearing habitat helps support the recovery of this valuable resource and helps build resiliency and esnures that future generations can practice their culture and enjoy wild salmon. Letters of support have been requested.

If yes, please provide a letter of support from each Tribe listed as receiving these benefits.

4. **If the project provides benefits to a DAC, EDA or Tribe, explain the water-related need of the DAC, EDA or Tribe and how the project will address the described need.** [750 characters max.]

Cattle ranching and pasture cropping is the primary economic activity in the Shasta Valley and requires large inputs of water. Ranching activities are located in EDA, DAC, and SDACs downstream of the project area and depend on availability of surface water. Emergency curtailments have drastically reduced the availability of water for ag. purposes. Salmon are an essential cultural resource for Klamath R. Tribes, and also make use of the Shasta River for spawning and rearing purposes. This project is uniquely located to be able to leverage high quality water in the Shasta River, and would leave 2.4 cfs of cold water in stream year round, furthering benefits to fisheries and downstream ag. uses while still meeting regulatory flow requirements.

5. **Describe the kind of notification, outreach and collaboration that has been completed with the county(ies) and/or Tribes within the proposed project impact area, including the source and receiving watersheds, if applicable.** [500 characters max.]
   Per AB52 SVRCD staff submitted request for tribal contact info to NAHC. That request is being processed. To be proactive, SVRCD staff used an old NAHC contact list to send letters and a map notifying tribes of the project proposal, discuss potentially supporting the proposal, and to solicit input or a dialogue regarding the project, previous work, or simply to share historical or cultural information pertinant to the greater project area. Tribes include Shasta, Winnemem Wintu, Karuk, and QVIR.

D. Project Benefits & Justification

1. **For each of the Potential Benefits that the project claims, complete the following table to describe an estimate of the benefits expected to result from the proposed project. Provide**

quantitative benefit amounts for at least the primary and secondary benefits. Provide a qualitative narrative description of expected benefits that cannot be quantified. *See the NCRP Project Application Instructions for more information and a listing of potential benefits.*

PROJECT BENEFITS TABLE

Benefit Description	Units	Quantitative Amount	Qualitative Description
Water Supply			
Increase instream flow for several miles	af	678	Af per year instream
Increase instream flow for several miles	af	178	Af per year instream
Increase instream flow for several miles	af	56	
Water Quality			
Reduced water temperature	C	0.25	Temp reduction
Increased dissolved oxygen	mg/L	0.5	Improve average
Reduce Tailwater	af	56	Reduce tailwater
Climate Change			
Thermal Refugia	cu. ft.	200	increase access/vol.
Increase aquatic resilience			greater thermal mass
Increase water self reliance			
Other Ecosystem Service Benefits			
Improve river functi	tons		Sediment transport
Improve aqua habitat	sq. ft.	150	Refugia/alcove
Decrease disease			Lower C. Shasta rate
Jobs Created or Maintained			
Project Construction	FTE	1	Construction
SVRCD	FTE	0.5	Project Management
Agricultural	FTE	1.5	Irrigator/Ranch Tech
Other Benefits			
Improve cultural resilience and practices			Salmon recovery

Benefit Description	Units	Quantitative Amount	Qualitative Description
Incentivize other ranchers to make improvements	af	10-20	water conservation

2. **Does the proposed project provide physical benefits <u>outside</u> of the North Coast Region?**
   ☐ yes ☒ no
   If yes, describe the impacts to areas outside the North Coast Region. [500 characters max.]

3. **List the impaired water bodies (303d listing) that the project benefits**:
   Klamath River HU 180102; Shasta River HUA 18010207

4. **Describe how the project benefits salmonids, endangered/threatened species and sensitive habitats.**
   This reach of the Shasta River this irrigation ditch project's point of diversion records the coldest water temperatures during the summer months; providing critical habitat for juvenile Southern Oregon and Northern California Coastal (SONCC) coho salmon which are ESA Listed as Threatened. This reach contains high quality spawning gravels and supports the highest concentration of redds within the watershed. This reach has a dearth of surface water diversions and regularly sees 55-75 cfs or more of water year round. Nearer to County Road A12, surface water diversions can remove up to 20 cfs of water decreasing the thermal mass and downstream impacts of this coldwater reach. Benefits of this project are three-fold: directly improving water efficiency and productivity in DAC and EDAs; increasing availability of water supplies for working lands in SDACs; extension of downstream benefits of cold water habitat and refugia for threatened and sensative species.

5. **Have alternative methods been considered to achieve the same types and amounts of physical benefits as the proposed project?**
   ☒ yes ☐ no
   Please explain. [500 characters max.]

The original point of diversion was located 5 miles upstream of its current location and impounded the river to build enough head to put water into the ditch. A previous project removed the impoundment and barrier to fish passage, abandoned several miles of existing open ditch, and moved the point of diversion 5+ miles downstream, leaving approximately 18 cfs instream 5+ miles longer than it would have. Various configurations of pipeline and point of diversion continue to be explored.

6. Is the proposed project the lowest cost alternative to achieve the physical benefits?
   ☒ yes ☐ no
   Please explain. [500 characters max.]
   In 2013, CDFW and WCB funded the removal of an irrigation diversion impoundment on the Shasta River, and relocated the point of diversios downstream, requiring the use of electric pumps. Adjusted for 2022 dollars, this project cost is approximately $5,225,000. Project alternatives that move the point of diversion even farther downstream would negate some $1,500,000 of public funds, and increase the carbon footprint of agriculture by requiring even more consumption of electricity to irrigate.

7. How will the project be monitored to determine whether it is producing the desired benefits?
   The Shasta Valley RCD has a long term record of meteorological, water temperature and dissolved oxygen data upstream and downstream of project improvements. The Shasta Valley RCD is also collecting ditch loss and shallow groundwater data within the envelope of project impacts. A majority of the funding for these monitoring sites come from a combination of individual planning and restoration projects. To a lesser extent funding is provided using contracts with State Agencies that utilize discressionary funds. A portion of this proposal's budget is dedicated to specifically monitoring water temperature and dissolved oxygen levels within this reach.

8. Provide a narrative for project technical justification. Include any other information that supports the justification for this project, including how the project can achieve the claimed level of benefits listed below. [3,000 characters max.]

- This proposal is seeking to deliver water to the property irrigated by Husaman Ditch via a pipeline to reduce/eliminate transmission or delivery loss through converting from an open earthen ditch to a piped conduit with no or minimal loss. Previous and preliminary delivery loss measurements show approximately 15% transmission loss from the current point of diversion to a location approximately 50% down the canal from the point of diversion. As a reference, ditch loss for the entire length of the ditch was determined to be 3.4 acre-feet per day, or 1.71 cfs. This number was determined during a time span where Huseman Ditch Company has been exercising two-thirds of the 11.9 cfs water right. Assuming this relationship is linear, when diverting their full amount of 11.9 cfs, the maximum ditch loss value for the Huseman Ditch Company is 2.59 cfs. Water conservation will be evaluated from several aspects. A result of irrigation efficiency is completing an irrigation rotation, with a reduced volume of water while also reducing the duration of the irrigation period. This allows the diversion to be turned off entirely for several days between irrigation cycles, allowing 100% of the potentially diverted water to remain in stream. Currently, Huseman

Ditch irrigates about every 14-18 days. When Huseman diverted via gravity prior to changing its point of diversion in 2012, the maximum diversion volume of 11.9 cfs was continuously diverted throughout the irrigation season. As a result of the change in point of diversion, approximately 6,000' of pipeline and irrigation efficiency improvement that benefit roughly 25% of the irrigated area. The savings cannot be quantified until full design is completed. Regardless, based on loss measurements taken over time and Husman Ditch users personal experience with converting open earthen ditches to pipeline with flood risers, Huseman Ditch commits to reducing the maximum diversion by at least 2.4 cfs (11.9 cfs to 9.5 cfs), regardless of ditch loss and irrigation efficiency determination.

- The SVRCD has been engaged in flow enhancement projects for the purpose of supporting historic Chinook fall migration which starts in late August. Chinook typically arrive in mid-September at the mouth of the Shasta River. Forbearance agreements and voluntary participation in various programs increase the instream flows during the target period. Similar to the need of Chinook, the SONCC Coho Salmon Recovery Plan details that the most vital Coho habitat in the Shasta River basin are its cold springs, which create cold water refugia for juvenile coho salmon, decrease overall water temperatures throughout the basin, and allow for successful summer rearing of individuals in natal and non-natal creeks and mainstream. Instream flows are necessary to keep individual fish at specific life stages in good condition by determining suitable physical and thermal habitat conditions.

9. List and include any studies, plans, designs or engineering reports completed for the project as a "Technical & Reference Supporting Materials" into one document that includes a Table of Contents and is limited to approximately 50 pages. *Please see the instructions for more information about submitting these documents with the final application.*

10. Project Justification & Technical Basis Notes: Please provide any additional information *not included above* that you think is important.

Additional Studies, Reports and Plans that call for increase in water, cold water habitat, river functionality, and improved temperature and dissolved oxygen conditions are:

Shasta River TMDL Action Plan
NOAA SONCC Coho Recovery Plan
CDFW Recovery Strategy for California Coho Salmon
USFWS CA Statewide Biological Opinion

and numerous studies by private consultants such as McBain and Trush.

E. Project Tasks, Budget, And Schedule

1. **Projected Project Start Date:** 6/1/23
   Anticipated Project End Date: 12/31/25

2. **Describe the basis for the costs used to derive the project budget in each budget category.** [500 characters max.]

This budget is based on pre-project estimates as developed by the SVRCD and our consultant using the best available information. Staff costs can be tied to COLA and other metrics which make them more stable than other catagories. Project planning costs are derived from SVRCD experience, and are generally conservative projections. Construction costs are subject to a myriad of supply chain and materials availability constraints. Due to these factors, a contingency has been built in.

3. **Provide a narrative on cost considerations including alternative project costs.** [500 characters max.]

Project alternatives are being developed by our consulting firm, Vestra Engineering from Redding, California. All the alternatives will include large diameter PVC buried plastic pipe to replace the Huseman Ditch. This is the single largest construction element in the budget. Finding alternatives to large diameter PVC are not being considered due to crop types, climate and private landowner preferences. Flood irrigation of grass pasture is considered the most practical use of this farmland.

4. **List the sources of non-state matching funds, amounts and indicate their status**. Proposition 1 requires a minimum cost share of 50% of the total project costs, though a waiver may apply (see Question 6 below).

   NRCS Design and Alternatives engineering: $15,000.00 committed.

   See question 11 below. We are requesting a waiver.

5. **List the sources and amount of State matching funds.**

   Wildlife Conservation Board: $200,000 requested for planning and permits.

6. **Cost Share Waiver Requested (DAC or EDA)?** ☒ yes ☐ no

   Describe what percentage of the proposed project area encompasses a DAC/EDA, how the community meets the definition of a DAC/EDA, and the water-related need of the DAC/EDA that the project addresses. In order to receive a cost share waiver, the applicant must demonstrate that the project will ***directly*** provide benefits that address a water-related need of a DAC/EDA.

At least 20% of the project is within DAC designated land. The remaining 80% of project improvements are on lands that meet the definition of EDA, according to 2020 US Census Bureau data. Additionally, the instream benefits from water conserved by this project can be utilized by ranch lands in SDAC and DAC downstream. This is of great benefit because agriculture is the primary economic acitivity within these SDAC, DAC, and EDA lands. Drought and Emergency Flow Regulations have drastically hindered economic output. This project benefits economic activity on SDAC, DAC, and EDA lands while still meeting regulatory flow targets in the Shasta River and help benefit sensative and threatened species.

7. **Is the project budget scalable?** ☒ yes ☐ no

8. **Describe how a scaled budget would impact the overall project,** its expected benefits and state the minimum budget amount that would be viable (see Instructions E.7 for scaled budget examples). [500 characters max.]

A scaled budget would reduce the length of the pipeline, materials, and labor cost, and some project management costs. Admin, permits, and mobilization costs remain fixed. Benefits are maximized if the total pipeline is implemented, but soil moisture sensors and sections of completed pipeline will still provide improvement to water efficiency. We judge that 20% of the total pipeline length is the shortest viable segment and can be implemented for approx. $450,000 of IRWM Round 2 funds.

9. **Major Tasks, Schedule and Budget for Project Solicitation**
   Please complete MS Excel table available at https://northcoastresourcepartnership.org/ncrp-proposition-1-irwm-round-2-solicitation/see instructions for the information to be included in this document and for how to submit the required excel document with the application materials.

10. **Project Tasks, Budget and Schedule Notes:**

Budget detail has been mostly left blank as the breakout was not needed. Pipeline segments are displayed.

11. **Project Information Notes.** Please provide any information that that has not been specifically requested that you feel is important for the NCRP to know about your project.

Long term planning and funding of projects takes time and patience. USFWS, NRCS, other agencies were sources of funding. Previous work on the project going back to 2010 includes installation of a fish screen, a new pump station and pipeline installation for a total of 7800 feet. We consider this Phase Three of the project. While some of these project elements and costs may not qualify for match, they are mentioned here to provide awareness of the long term nature of this multi-phased project.

Project Name: Huseman Ditch Pipeline and Water Efficiency Improvement Project
Organization Name: Shasta Valley Resource Conservation District

Task #	Major Tasks	Task Description	Major Deliverables	IRWM Task Budget	Non-State Match	Other Match	Total Task Budget	25% Scaled IRWM Budget	50% Scaled IRWM Budget	Current Stage of Completion (%)	Start Date	Completion Date
A	**Category (a): Direct Project Administration**											
1	Project Management	In cooperation with the County of Humboldt sign a sub-grantee agreement for work to be completed on this project. Develop invoices with support documentation. Provide audited financial statements and other deliverables as required	Invoices, audited financial statements and other deliverables as required. Staff and contract book keeper	$17,700.00	$0.00	$5,440.00	$23,140.00	$13,275.00	$8,850.00	0%	Day 1 of Grant Award	Close out of Grant estimated to be 3 years after NCRP award.
2	Reporting	Develop monthly reports describing work completed, challenges, and strategies for reaching remaining project objectives. Develop Final Report	Quarterly and Final Reports. Staff (Project Manager)	$2,400.00	$0.00	$1,040.00	$3,440.00	$1,800.00	$1,200.00	0%	Day 1 of Grant Award	Close out of Grant estimated to be 3 years after NCRP award.
B	**Category (b): Land Purchase/Easement**											
1		N/A		$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	0%		
C	**Category (c): Planning/Design/Engineering/Environmental Documentation**											
1	Final Design /Plans	Complete additiional survey, design and develop alternatives.	Deliver 90% design and final 100% design stamped plans for selected alternative	$0.00	$15,000.00	$85,000.00	$100,000.00	$0.00	$0.00	65%	7/1/22	7/1/23
2	Project Performance Monitoring Plan	Develop Monitoring Plan to include goals and measurable objectives	Implement Monitoring Plan throughout project as well as pre and post monitoring. Final Monitoring Plan and completed Monitoring Report.	$6,400.00	$0.00	$750.00	$7,150.00	$4,800.00	$0.00	0%	1/1/23	12/31/25
2	Environmental Documentation: CEQA	Complete environmental review pursuant to CEQA. Prepare all necessary environmental documentation.	Environmental Information Form approved by DWR	$15,000.00	$0.00	$15,000.00	$30,000.00	$0.00	$0.00	0%	1/1/23	6/30/23
3	Environmental Documentation: NEPA (if required)	Complete NEPA compliance requirements if needed including NOAA, USFWS and ACE	Deliver all permits and NEPA complaince documents	$15,000.00	$0.00	$0.00	$15,000.00	$0.00	$0.00	0%	1/1/23	6/30/23
4	Permit Development 1602 CDFW	Complete permit compliance if needed	Deliver 1602 if needed.	$5,000.00	$0.00	$10,000.00	$15,000.00	$0.00	$0.00	0%	1/1/23	6/30/23
5	Permit Development 401 Water Quality Cert.	Complete permit compliance if needed	Deliver 401 Water Quality Certification	$5,000.00	$0.00	$10,000.00	$15,000.00	$0.00	$0.00	0%	1/1/23	6/30/23
D	**Category (d): Construction/Implementation**											
1	Contract Services	Staff work, see project admin above	Bid Documents; Proof of Advertisement; Award of Contract; Notice to Proceed	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	0%	7/1/23	12/31/23
2	Construction Administration	G S Black Inc. Construction Management	Construction Management Logs; Completed construction administration tasks documented in progress reports; DWR Certificate of Project Completion	$20,000.00	$0.00	$20,000.00	$40,000.00	$15,000.00	$10,000.00	0%	9/1/23	12/31/24
3	Project Construction/Implementation: 14,600 ft	NR Construction or comparable: Equipment and Labor	Construction Implementation completed	$963,600.00	$0.00	$0.00	$963,600.00	$722,700.00	$481,800.00	0%	9/1/23	12/31/24
4	Project Constrction - Materials 24 inch 80#PVC underground plastice pipe	Soil Moisture Sensors, 14,600 feet of Large Diameter PVC #80	see breakdown from draft design in budget detail	1,248,640	$0.00	$0.00	$1,248,640.00	$936,480.00	$624,320.00	0%	9/1/23	12/31/24
5	Water Transactions	Work with Huseman Ditch group to improve instream flows during construction.	Table or schedule of water forbearance	$0.00	$0.00	$12,000.00	$40,000.00	$0.00	$0.00	0%	6/1/23	12/31/25
6	Project Close Out, Inspection & Demobilization	Inspect project components and establish that work is complete. Verify that all project components have been installed and are functioning as specified will be conducted as part of construction inspection and project closeout. Conduct project completion photo monitoring. Prepare record drawings.	As-Built and Record Drawings; Project completion site photos	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	0%	12/31/24	3/31/25
7	Project Performance Monitoring	The performance of the project will be monitored in accordance to the Monitoring Plan using the following measurement tools and methods	see item 2 above	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	0%	3 year duration	3 year duration
8	Final Project Report	Draft Final and Final Report - see item 2 above	Final Report	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	0%	9/30/25	12/31/25
9	Overhead, Mileage, Equipment	Staff support, administrative and contingency	None	$241,690.00	$0.00	$27,305.00	$268,995.00	$181,267.50	$8,850.00			
	Total North Coast Resource Partnership IRWM Grant Request			**$2,540,430.00**	**$15,000.00**	**$186,535.00**	**$2,769,965.00**	**$1,875,322.50**	**$1,135,020.00**			
	Percentage of Total Project Cost			**92%**	**1%**	**7%**	**100%**	**68%**	**41%**			

BUDGET DETAIL

Row (a) Direct Project Administration Costs					
Project Management Type	**Personnel by Discipline**	**Number of Hours**	**Hourly Wage**	**% of Cost ***	**Total Admin Cost**
Labor					
Materials					
Equipment					
Total					
*** What is the percentage based on (including total amounts)?**		**n/a**			
*** How was the percentage of cost determined?**		**n/a**			

Row (b) Land Purchase/Easement

Row (c) Planning/Design/Engineering & Environmental Documentation					
Personnel (Discipline)	**Major Task Name**	**Number of Hours**	**Hourly Wage**	**Total Cost**	
Total					

Row (d) Construction/Implementation				
Personnel (Discipline)	**Work Task and Sub-Task (from Work Task Table)**	**Number of Hours**	**Hourly Wage**	**Total Cost**
Materials	**Work Task and Sub-Task (from Work Task Table)**	**Number of Units**	**Unit Cost**	
Soil Measure Sensors	Task 4	6	20,000	120,000
Pipeline - Rice Field		2800	184,800	184,800
Pipeline - Rice to Water Control Stucture		1200	79,200	79,200
Pipeline - Rice Field to Jackson		3100	204,600	204,600
Pipeline to DeSoza Lane		1200	79,200	79,200
Pipeline - Nicoletti		6300	415,800	415,800
Contingency @20%				165,040
	Subtotal			1,248,640
Total				

ORGANIZATION INFORMATION

1. **Project Name:**
   Irrigation Ditch Pipeline and Water Efficiency Improvement Project

2. **Applicant Organization Name:**
   Shasta Valley Resource Conservation District

3. **Contact Name/Title**
   Name: Ethan Brown
   Title: Project Manager
   Email: ebrown@svrcd.org
   Phone Number (include area code): (530) 859-2077

4. **Organization Address (City, County, State, Zip Code):**
   215 Executive Court, Suite A
   Yreka, CA
   96097

   Siskiyou County

5. **Organization Type**
   ☒ Public agency
   ☐ 501(c)(3) Non-profit organization
   ☐ Public utility
   ☐ Federally recognized Indian Tribe
   ☐ California State Indian Tribe listed on the Native American Heritage Commission's California Tribal Consultation List
   ☐ Mutual water company
   ☒ Other: Special District

6. **Authorized Representative** (if different from the contact's name)
   Name: Rod Dowse
   Title: District Manager
   Email: rdowse@svrcd.org
   Phone Number (include area code): (530) 572-3120

7. **List all projects the organization is submitting to the NCRP for this Solicitation in order of priority.**
   1. Irrigation Ditch Pipeline and Water Efficiency Improvement Project

8. Organization Information Notes:

The Shasta Valley Resource Conservation District is a Special District which is committed to working with private landowners and stakeholders on a voluntary basis to help improve economic and sustainable resource management. The SVRCD has a long history of project success and working with private landowners to help address issues related to fisheries and agricultural practices.

ELIGIBILITY

1. North Coast Resource Partnership Goals and Objectives

GOAL 1: INTRAREGIONAL COOPERATION & ADAPTIVE MANAGEMENT

☒ Objective 1 - Respect local autonomy and local knowledge in Plan and project development and implementation

☐ Objective 2 - Provide an ongoing framework for inclusive, efficient intraregional cooperation and effective, accountable NCRP project implementation

☐ Objective 3 - Integrate Traditional Ecological Knowledge in collaboration with Tribes to incorporate these practices into North Coast Projects and Plans

GOAL 2: ECONOMIC VITALITY

☒ Objective 4 - Ensure that economically disadvantaged communities are supported and that project implementation enhances the economic vitality of disadvantaged communities by improving built and natural infrastructure systems and promoting adequate housing

☒ Objective 5 - Conserve and improve the economic benefits of North Coast Region working landscapes and natural areas

GOAL 3: ECOSYSTEM CONSERVATION AND ENHANCEMENT

☒ Objective 6 – Conserve, enhance, and restore watersheds and aquatic ecosystems, including functions, habitats, and elements that support biological diversity

☒ Objective 7 - Enhance salmonid populations by conserving, enhancing, and restoring required habitats and watershed processes

GOAL 4: BENEFICIAL USES OF WATER

☒ Objective 8 - Ensure water supply reliability and quality for municipal, domestic, agricultural, Tribal, and recreational uses while minimizing impacts to sensitive resources

☐ Objective 9 - Improve drinking water quality and water related infrastructure to protect public health, with a focus on economically disadvantaged communities

☐ Objective 10 - Protect groundwater resources from over-drafting and contamination

GOAL 5: CLIMATE ADAPTATION & ENERGY INDEPENDENCE

☒ Objective 11 - Address climate change effects, impacts, vulnerabilities, including droughts, fires, floods, and sea level rise. Develop adaptation strategies for local and regional sectors to improve air and water quality and promote public health

☒ Objective 12 - Promote local energy independence, water/ energy use efficiency, GHG emission reduction, and jobs creation

GOAL 6: PUBLIC SAFETY

☒ Objective 13 - Improve flood protection, forest and community resiliency to reduce the public safety impacts associated with floods and wildfires

2. **Does the project have a minimum 15-year useful life?**
   a) ☒ yes ☐ no
   b) If yes, will the organization be able to provide compliance documentation outlined in the instructions should the project be selected as a Priority Project?
      ☒ yes ☐ no

3. **Other Eligibility Requirements and Documentation**

CALIFORNIA GROUNDWATER MANAGEMENT SUSTAINABILITY COMPLIANCE

a) Does the project directly affect groundwater levels or quality?
   ☐ yes ☒ no
b) If yes, will the organization be able to provide compliance documentation outlined in the instructions including a Groundwater Sustainability Agency letter of support, to include in the NCRP Regional Project Application should the project be selected as a Priority Project?
   ☐ yes ☐ no

CASGEM COMPLIANCE

a) Does the project overlie a medium or high groundwater basin as prioritized by DWR?
   ☒ yes ☐ no
b) If yes, list the groundwater basin and CASGEM priority: Medium Priority Groundwater Basin
c) If yes, please specify the name of the organization that is the designated monitoring entity: Siskiyou County Flood Control and Water Conservation District (GSA)
d) If yes, please specify whether the local Groundwater Sustainability Agency has endorsed the project: Yes

URBAN WATER MANAGEMENT PLAN

a) Is the organization required to file an Urban Water Management Plan (UWMP)?
   ☐ yes ☒ no
b) If yes, has DWR verified the current 2020 UWMP?
   ☐ yes ☐ no

c) If the 2020 UWMP has not been verified by DWR, explain and provide anticipated date for verification:

d) Has DWR verified a water loss audit report in accordance with SB 555 as submitted by the urban water supplier?

☐ yes ☐ no

e) Does the urban water supplier meet the water meter requirements of CWC 525?

☐ yes ☐ no

f) Does the urban water supplier meet the State Water Resources Control Board's Water Conservation and Production Reporting requirement?

☐ yes ☐ no

g) If yes, will the organization be able to provide compliance documentation outlined in the instructions, to include in the NCRP Regional Project Application should the project be selected as a Priority Project?

☐ yes ☐ no

AGRICULTURAL WATER MANAGEMENT PLAN

a) Is the organization – or any organization that will receive funding from the project – required to file an Agricultural Water Management Plan (AWMP)?

☐ yes ☒ no

b) If yes, will the organization be able to provide compliance documentation outlined in the instructions, to include in the NCRP Regional Project Application should the project be selected as a Priority Project?

☐ yes ☐ no

SURFACE WATER DIVERSION REPORTS

a) Is the organization required to file State Water Resources Control Board (SWRCB) annual surface water diversion reports per the requirements in CWC Part 5.1?

☒ yes ☐ no

b) If yes, will the organization be able to provide compliance documentation outlined in the instructions, to include in the NCRP Regional Project Application should the project be selected as a Priority Project?

☒ yes ☐ no

STORM WATER MANAGEMENT PLAN

a) Is the project a stormwater and/or dry weather runoff capture project?

☐ yes ☒ no

b) If yes, does the project benefit a Disadvantaged Community with a population of 20,000 or less?

☐ yes ☐ no

c) If this is a stormwater/dry weather runoff project but does not benefit a small DAC population, please provide documentation that the project has been included in a Stormwater Resource Plan that has been incorporated into the NCRP IRWM Plan:

d) If no, will the organization be able to provide documentation that the project is included in a Stormwater Resource Plan that has been incorporated into the NCRP IRWM Plan, should the project be selected as a Priority Project?

☐ yes ☒ no

4. Eligible Project Type under 2022 IRWM Grant Solicitation
   - ☐ Water reuse and recycling for non-potable reuse and direct and indirect potable reuse
   - ☒ Water-use efficiency and water conservation
   - ☐ Local and regional surface and underground water storage, including groundwater aquifer cleanup or recharge projects
   - ☐ Regional water conveyance facilities that improve integration of separate water systems
   - ☒ Watershed protection, restoration, and management projects, including projects that reduce the risk of wildfire or improve water supply reliability
   - ☐ Stormwater resource management projects to reduce, manage, treat, or capture rainwater or stormwater
   - ☐ Stormwater resource management projects that provide multiple benefits such as water quality, water supply, flood control, or open space
   - ☐ Decision support tools that evaluate the benefits and costs of multi-benefit stormwater projects
   - ☐ Stormwater resource management projects to implement a stormwater resource plan
   - ☐ Conjunctive use of surface and groundwater storage facilities
   - ☐ Decision support tools to model regional water management strategies to account for climate change and other changes in regional demand and supply projections
   - ☒ Improvement of water quality, including drinking water treatment and distribution, groundwater and aquifer remediation, matching water quality to water use, wastewater treatment, water pollution prevention, and management of urban and agricultural runoff
   - ☐ Regional projects or programs as defined by the IRWM Planning Act (Water Code §10537)
   - ☐ Other:

5. Describe how the project provides a benefit that meets at least one of the Statewide Priorities as defined in DWR's Final 2022 Guidelines (see page 7) and Tribal priorities as defined by the NCRP?

   This Project meets Multiple Statewide Priorities. Specifically 2 - Drought Preparedness by promoting water conservation, improving landscape agricultural irrigation efficiencies, achieving a long term reduction in water use, and ecosystem restoration that yields an increase in water supply.

CERTIFICATION OF AUTHORITY

By signing below, the Authorized Representative executing the certificate on behalf of the Project Sponsor affirmatively represents that s/he has the requisite legal authority to do so on behalf of the Project Sponsor. The Authorized Representative executing this proposal on behalf of the project sponsor understands that the NCRP is relying on this representation in receiving and considering this proposal. The person signing below hereby acknowledges that s/he has read the entire NCRP 2022 Project Review and Selection Process Guidelines and the NCRP 2022 Proposition 1 IRWM Round 2 Project Application & Instructions documents and has complied with all requirements listed therein.

Official Authorized to Sign for Proposal

Signature

Rod Dowse

Date
11/4/2022

NCRP – Prop 1 Round 2 IRWM Funding Program

Technical & Reference Supporting Document

For

Irrigation Ditch Pipeline and Water Efficiency Improvement Project

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Huseman Ditch Loss Assessment

Project Introduction

Project Location

The Shasta River watershed is located wholly in the central portion of Siskiyou County, California. The Shasta River watershed drains approximately 793 square miles and is bounded to the west by the Klamath Mountains, and the southern and eastern boundaries are formed by Cascade volcanics. The slopes of Mt. Shasta comprise approximately 170 square miles, or nearly 20% of the total watershed (Mack, 1960). The Shasta River originates from snowmelt in the Klamath Mountains, while the eastern portions of the watershed garner significant groundwater from precipitation percolating through porous volcanic rocks. This groundwater issues as springs which dot the margins of the valley and the upper reaches of the Shasta River. The mainstem of the Shasta River flows north, then northwest, approximately 50 miles before entering the Klamath River. The mainstem Shasta River is impounded by Dwinnell Dam. Primary tributaries are Eddy Creek, Parks Creek, Big Springs Creek, Little Shasta River, and Yreka Creek. Accretion from tributaries and springs, combined with agricultural diversions and return flows, contribute to a complex annual flow regime seasonally and longitudinally (McBain and Trush, 2013).

Figure 1 – Location Map of the current Huseman Ditch Company ditch and key monitoring and diversion sites.

Historic populations of Southern Oregon and Northern California Coastal coho salmon, an Evolutionarily Significant Unit, spawn and rear in the Shasta River and its tributaries. Spawning gravel supplies have been attenuated in the mainstem of the Shasta River since the construction of Dwinnell Reservoir and Parks Creek has also seen significant sediment coarsening due to consistently lower flow volumes in the lower reaches of this tributary. However, the upper reaches of the Shasta River and Parks Creek have still been identified as having significant intrinsic potential as habitat for these State and Federally Endangered Species Act listed species (NOAA 2014; CDFW 2004).

Agriculture and Irrigation in the Shasta Watershed

A majority of the Shasta River Watershed is in private ownership with some federal land-holdings in the forested portions of the upper watershed. Private land management activities adjacent to the Shasta River mainly consist of small cow-calf and hay farming operations. These operations predominantly depend on numerous surface water diversions from the Shasta River and its tributary and springs to flood irrigate pastures.

Surface irrigation is the most common method of irrigation, accounting for over half of the irrigated acreage in the United States (USDA, 2022). Flood irrigation as it is also called, is a historic method of irrigation using gravity to divert amounts of surface water and convey and spread it on agricultural fields. Using systems of earthen ditches, concrete turn-out boxes and tarps; flows are directed across graded or gradual slopes where it is allowed to sink into the ground. Improvements to historical irrigation practices include land smoothing or leveling, installation of pipelines, risers, tailwater return systems, soil moisture sensors where feasible. In the Shasta Valley, this system of irrigation is under the jurisdiction of the Scott-Shasta Watermaster, who administers the Shasta River Adjudication and Decree (1932). This is a legal document that lays out who can irrigate, where, when and how much can be diverted.

Another common irrigation method is sprinkler irrigation. This is common in Shasta Valley for alfalfa and some other crops. While more water efficient; it requires electricity and other cost inputs including labor that are more difficult to justify for pasture/hay crops grown by cow/calf producers

Soils

The most prevalent soils along the length of the Huseman Ditch, based on the soil map (see Appendix A) are Dotta, Gazelle and Settlemeyer loams. The properties of these three soils help define the key characteristics of the Huseman Ditch itself. While all loams have similar textures, there are also some notable differences. Gazelle silt loam is a shallow soil with a slow permeability rate. Dotta and Settlemeyer loams are deeper with more rapid infiltration or “Capacity of the most limiting layer to transmit water (Ksat): as listed in the soils survey table “Soil Physical Properties”.

Field measurements will be used to further confirm the irrigation flow characteristics and ditch losses. Soils with disparate permeability rates, depths and depth to water make a uniform infiltration rate more elusive.

While these characteristics represent field conditions in the Huseman ditch area, there are specific and important characteristics of the ditch prism itself that should be noted. A ditch such as this one, that is in continuous use for over 100 years has textural and permeability differences from the soils mapped in the field itself. Silt, vegetative detritus and other human management operations, tend to modify its default or baseline ability to transmit water to the water table or river itself.

Additional rates of transmission or temporal modifications will exist throughout the year as the gradient to the river itself rises and falls.

Background on Huseman Ditch Project

(See Chapter 2)

Projects Similar in Scope

DATE APPROVED	PROJECT NAME	GRANTEE	PROJECT CATEGORY	WCB AWARD	STATUS	ENHANCEMENT
2017	Hart Ranch Instream Flow Enhancement	California Trout	Implementation	$2,181,282	In Progress	+1.5 cfs
2020	Parks Creek Flow Enhancement and Fish Passage	California Trout	Implementation	$3,807,868	Completed	+2.98 cfs
2021	Little Shasta River Flow	California Trout	Planning	$589,586	In Progress	

	Enhancement Planning				
2022	Evans Spring Analysis and Design Phase 2	California Trout	Planning	$283,119	In Progress

Table 1 – Shasta River watershed water conservation projects similar to Phase III Huseman Pipeline Project and funded by SFEP

Aside from previous financial contributions towards the relocation of the Huseman Ditch Company point of diversion approximately six miles downstream from its original location, the WCB has awarded SFEP funds to numerous other projects in Siskiyou County that successfully enhanced flow. Most notably, in 2017 the WCB awarded nearly $2.2 million to CalTrout for the Hart Ranch Instream Flow Enhancement Project. This funding provided for an irrigation conveyance efficiency pipeline, off channel stockwater systems and improvement to fish passage that allowed for 1.5 cfs to be dedicated to the Little Shasta River.

In 2020 the WCB awarded over $3.8 million dollars to CalTrout for the Parks Creek Flow Enhancement and Fish Passage Project. This funding provided for an irrigation conveyance efficiency pipeline, changing of a point of diversion downstream, power, and helped improve water quality on Parks Creek.

Summary of the WBC SFEP

The Stream Flow Enhancement Program (SFEP) funds projects that enhance stream flows across the state of California. The SFEP defines enhanced streamflow to mean: a change in the amount, timing, and/or quality of water flowing down a stream, or a portion of a stream, to benefit fish and wildlife. Funded projects are also consistent with the objectives and actions outlined in the California Water Action Plan, with the primary focus on enhancing flow in streams that support anadromous fish; support special status, threatened, endangered, or at-risk species; or provide resilience to climate change.

California voters approved the Water Quality, Supply, and Infrastructure Improvement Act of 2014 (Proposition 1) to provide funding to implement the three objectives of the California Water Action Plan, namely: 1) more reliable water supplies, 2) the restoration of important species and habitat, and 3) a more resilient and sustainably managed water resources system that can better withstand inevitable and unforeseen pressures in the coming decades. Proposition 1 authorized the Legislature to appropriate $200 million to the Wildlife Conservation Board (WCB) to fund projects that result in enhanced stream flows and which WCB distributes through a competitive basis via the SFEP.

Chapter One – Water Accounting

Purpose and Need

Accounting for water is much like accounting for finances, where debits and credits, or income and expenses, are tallied against each other to come up with a net change in the parameter of interest. Most useful in a water accounting of irrigated lands can be solving for the change in storage of the soil moisture. If the change in storage is known and a different variable is unknown, the equation can be rearranged to solve for any of the missing variable. This can be helpful when one of the variables is not easily directly measured due to access, extent, or scope of the water accounting.

Accounting for the water in terms of a ranch can be helpful to identify parameters that have unusual magnitude, or to better understand what management actions or practices would be most efficacious.

WCB staff recommended that SVRCD staff conduct an accounting of the water for irrigated lands served by the Huseman Ditch Company to provide robust evidence and justification for the efficacy of the project design that meets both SFEP program and ranch management goals.

Methods

Piezometers

In April of 2020 the SVRCD utilized funding from the Department of Water Resources (DWR) Prop 1 Sustainable Groundwater Planning (SGWP) grant program to implement a shallow piezometer transect study. A series of shallow piezometers, or shallow monitoring wells, were installed along the Shasta River just north of A12 (see Figure 1). This shallow piezometer transect consists of five measurement sites: four shallow piezometers and a temporary stilling well in the river; two piezometers were located on each riverbank with one nearer and one farther from the river, and the stilling well in the center of the transect. These five measurement sites were installed in a straight line approximately perpendicular to the flow of the river.

Each piezometer site was drilled to an average depth of 27 feet, with two of the borings on either side of the Shasta River. Borings were outfitted with solid two-inch diameter PVC pipe for the first several feet below the ground surface and two-inch diameter perforated PVC pipe was installed in the remainder of the boring (see APPENDIX B for boring logs). Piezometers were outfitted with Onset U20-001-04 Data Loggers to measure temperature and water surface elevations. All elevations of piezometer well heads were surveyed at installation, and again on April 18, 2022.

Data collected from the piezometers informs estimates of deep percolation and can show if the given reach of river is gaining (accretions) or losing (depletions) water.

Stage

Stage or height or water was measured in fifteen-minute intervals using a Hobo Onset Pressure Transducer (Part No. U20-001-04) located inside a two-inch diameter stilling well, suspended from a Solinst 2 lockable well cap by a stainless-steel chain. The stilling well will be affixed to a heavy-duty T-post pounded into the channel bed at locations that will ensure the sensor submersion during fluctuations in water level. Reference measurements of total stilling well height, distance between the point of suspension and the measurement port on the sensor, and distance between the bottom of the stilling well to the channel bottom will be made to ensure stage is measured from the same arbitrary elevation throughout the season. The stilling wells will be located near existing SWCG real-time stage equipment, and near manual flow discharge measurement transect sites. Spatial proximity to existing measurement equipment or manual flow measurement locations will ensure that data collected is redundant, and comparisons can be made between stage readings to assess data quality. Manual measurements using an engineer's scale ruler will be made to measure total depth of water at the stilling well location at the time when manual flow measurements are made as another means to check and validate accuracy of data.

The U20-001-04 pressure transducers are a non-vented model. In order to gain the most accurate measurement of stage, an additional pressure transducer has been installed at the highest and lowest elevation sites. These are installed in a separate stilling well on the stream bank to measure barometric pressure. Using Onset's Hoboware Pro software will allow for the extrapolation of the barometric shift or correction to sites that do not have their own barometric measurements collocated with the stage measurements. Correcting for the barometric effect on river stage data will ensure accuracy of stage measurement data and generate the most accurate and reliable stage-discharge relationship.

Discharge

Manual flow discharge measurements were be made with a SonTek FlowTracker handheld current profiler. Flow discharge measurements were made perpendicular to flow at locations that have laminar flow characteristics. Sites were cleared of vegetation and large objects that may create turbulence. This practice was maintained throughout the measurement season. Manufacturer's recommended practices and protocols will be followed when operating the device, including taking a minimum of twenty measurements, and gathering more measurements in order to reduce measurement error. Onboard computing software automatically calculates measurement error and variation by accounting for several parameters, including velocity angle, signal to noise ratio, a high number of spikes in the velocity data, any large difference in data as compared to the previous measurement in the sequence, any calculated discharge that is greater than five percent of the total calculated discharge volume. By taking care to reduce these variables in the measurement, a very precise measurement can be made.

The SonTek FlowTracker also records average temperature of the transect and will be recorded in the field notes to assess the validity of the data. For example, temperature data may be useful in deciding if an unexpected increase in flow may be the result of tailwater returning upstream of the measurement site, or in assessing baseflow conditions.

Ditch Volume

Ditch volume was calculated using cross-sectional measurements gathered during the time discharge was measured. The SonTek FlowTracker instrumentation provides a readout of several dimensional parameters such as cross-sectional area. The distance of the Huseman Ditch was gathered from Google Earth using the measure tool. The cross-sectional area and distance measurements were then multiplied. The product was then converted into acre-feet (ac-ft) (NRCS, 2022).

Equation for a Volume of an Open Ditch Waterway

$$Distance\ (ft) \times cross - sectional\ area\ (ft^2) = Volume\ (ft^3)$$

$$ft^3\ \times\ 0.0000229568 = ac - ft$$

Evapotranspiration

The SVRCD utilized DWR SGWP funding to implement two California Irrigation Management Information System (CIMIS) stations to the Shasta Valley. CIMIS is a program unit in the Water Use and Efficiency Branch, Division of Regional Assistance, DWR. That manages a network of over 145 monitoring stations that calculate evapotranspiration (ET). Developed by DWR and University of California at Davis, it was designed to help irrigators manage their water resources more efficiently. CIMIS stations use flood irrigated pasture as the reference crop (ETo) to help improve irrigation efficiency and track ET within the watershed. Station #260-Montague and #261-Gazelle were added to the statewide network in 2019.

Rating Curves

A rating curve is a graph of discharge (i.e., flow over time) and stage (i.e., height of water), (Peterson-Overleir, 2006). The goal of creating a rating curve is to calculate corrected discharge using the variable stage; discharge is a difficult variable to measure continuously in the field whereas stage can be efficiently measured in the field (Strelkoff & Clemmens, 2000). Corrected discharge, calculated using the rating curve, is then illustrated using a hydrograph.

A hydrograph is an illustration of one water flow variable (e.g., discharge) over a period of time. Hydrographs are used to better understand the relationships between each of the four sampling points studied.

This stage-discharge relationship typically takes the form of a power law equation, stage (D) and discharge (Q) (Strelkoff & Clemmens, 2000). By using this mathematical relationship between stage and discharge we can convert a continuous stage record to a continuous discharge record using the coefficients (a) and (b) (Strelkoff & Clemmens, 2000).

Stage-Discharge Power Law Equation:

$$Q = aD^b$$

*Where a and b are coefficients for curve fitting

Water Balance Equation

Water Balance Equation Modified for a Ranch:

$$\Delta S = I_{AW} + P + SF_{in} - ET - S - R - SF_{out}$$

Where: ΔS = Change in Soil Storage; I_{AW} = Applied Irrigation Water; P = Precipitation; SF_{in} = Subsurface Flow In; ET = EvapoTranspiration of Crops; S = Ditch Leakage; R = Run-off or Tailwater; SF_{out} = Subsurface Flow Out.

Results

Evapotranspiration

Table 2 – Table of daily ETo values in inches and the daily maximum air temperature

DATE	DAILY ETO (IN)	DAILY MAX AIR TEMP (F)
7/27/2022	0.31	107.8
7/28/2022	0.29	108.4
7/29/2022	0.27	109.7
7/30/2022	0.25	109.0
7/31/2022	0.22	102.3
8/1/2022	0.11	88.0
8/2/2022	0.23	94.6
8/3/2022	0.25	97.0
8/4/2022	0.29	98.2
8/5/2022	0.25	95.0
8/6/2022	0.29	94.4
8/7/2022	0.33	98.5
8/8/2022	0.31	98.3
8/9/2022	0.36	93.1
8/10/2022	0.3	88.3
8/11/2022	0.28	90.7
8/12/2022	0.28	91.8
8/13/2022	0.27	90.8
8/14/2022	0.29	94.1
8/15/2022	0.29	96.9
8/16/2022	0.27	101.2
8/17/2022	0.23	101.9
8/18/2022	0.16	93.0
8/19/2022	0.28	96.9
8/20/2022	0.28	97.4
TOTAL	6.69	n/a

Table 2 displays the daily ETo values in inches and the daily maximum air temperature for CIMIS station 260 – Montague.

Rating Curves and Ditch Flow

HDC1 – A12

Table 3 – Manual discharge measurements at HDC1

DATE	START TIME	END TIME	CORRECTED STAGE	QCALC (CFS)	UNCERTAINTY	TEMPERATURE
8/3/2022	8:10	9:50	1.5989	5.397	5	66.3
8/20/2022	11:40	1:13	1.7410	6.76	5.4	68.5
7/28/2022	7:05	9:23	1.7103	6.679	18.3	68.4

Table 3 displays manual discharge measurements (Qcalc) with corresponding corrected stage and temperature reading for the Huseman Ditch at A12 (HDC1).

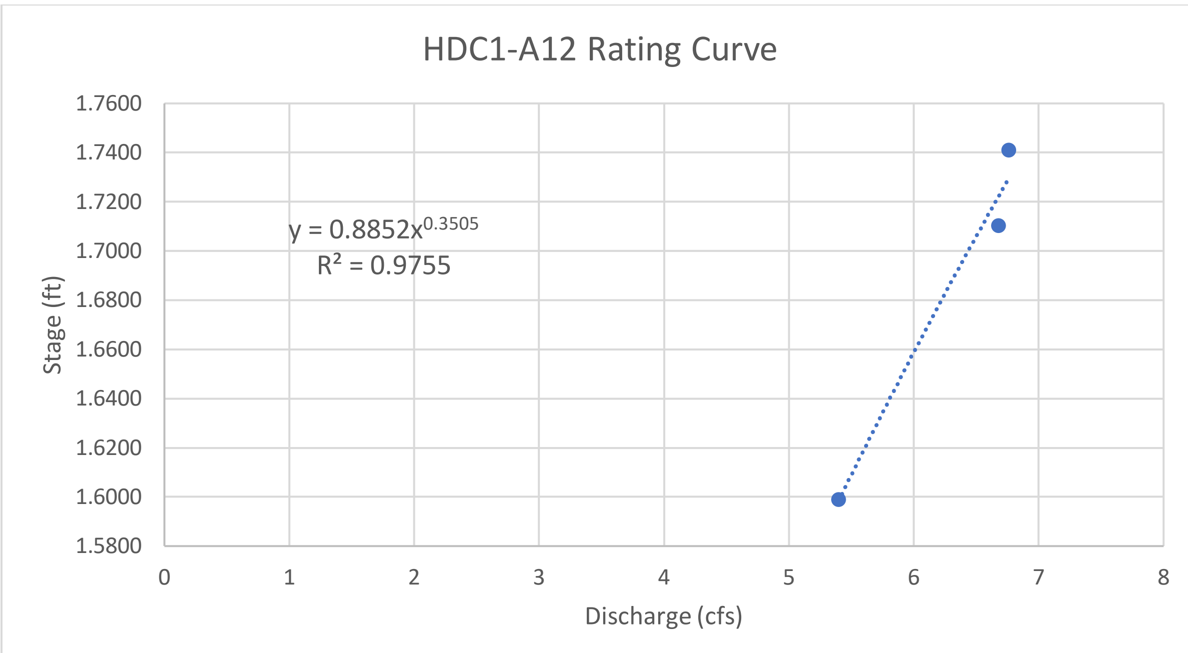


Figure 2 – Measured values and the equation of the line describing the stage-discharge relationship for HDC1 at A12

Rating curve of discharge compared to corrected stage. Figure 2 resulted with the curve fitting coefficients of 0.8852 and 0.3505, with a R^2 of 0.9755.

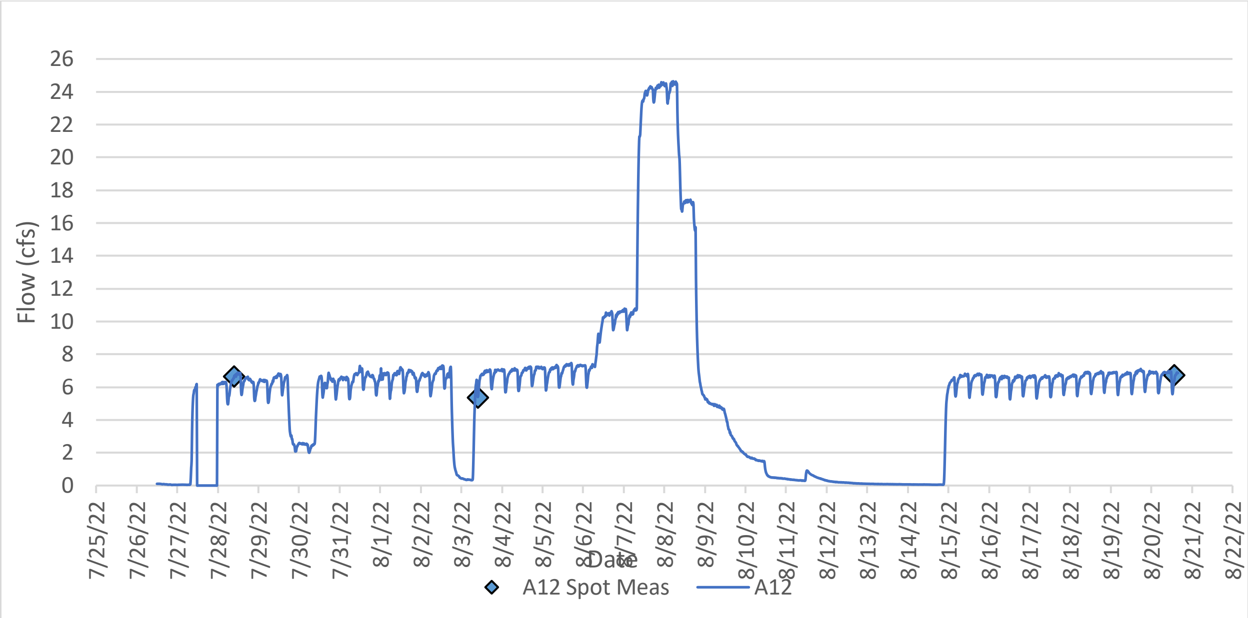


Figure 3 – Huseman Ditch Flow Volume at HDC1 near County Road A12

Stage data was collected from the Huseman Ditch at site HDC1 (see Figure 3) from July 27, 2022 to present. Periodic manual measurements of flow volume were made near HDC1 using a handheld acoustic current profiler on July 28, August 3, and 20, 2022. Ditch flow began on July 28, 2022. Minor incursions to the flow data occur approximately every eight hours throughout the study period. On August 3, 2022 a large incursion to the flow lasted for sixteen hours. August 6 to 8, 2022 flow spiked reaching values as high as 24 cfs. From August 8 to15, 2022 flow volume steadily receded down to zero before returning to regular values until the end of the study period.

HDC2 – Rice-Jackson

Table 4 – Manual discharge measurements at HDC2

DATE	START TIME	END TIME	CORRECTED STAGE	QCALC (CFS)	UNCERTAINTY	TEMPERATURE
8/8/2022	9:50	11:00	0.558	1.02	5	68.2
8/19/2022	11:25	1:00	1.6456	7.739	2.3	67.5
8/19/2022	1:48	3:17	1.5987	7.499	2.7	72.3

Table 4 displays manual discharge measurements (Qcalc) with corresponding corrected stage and temperature reading for the Huseman Ditch at the Rice-Jackson land boundary (HDC2).

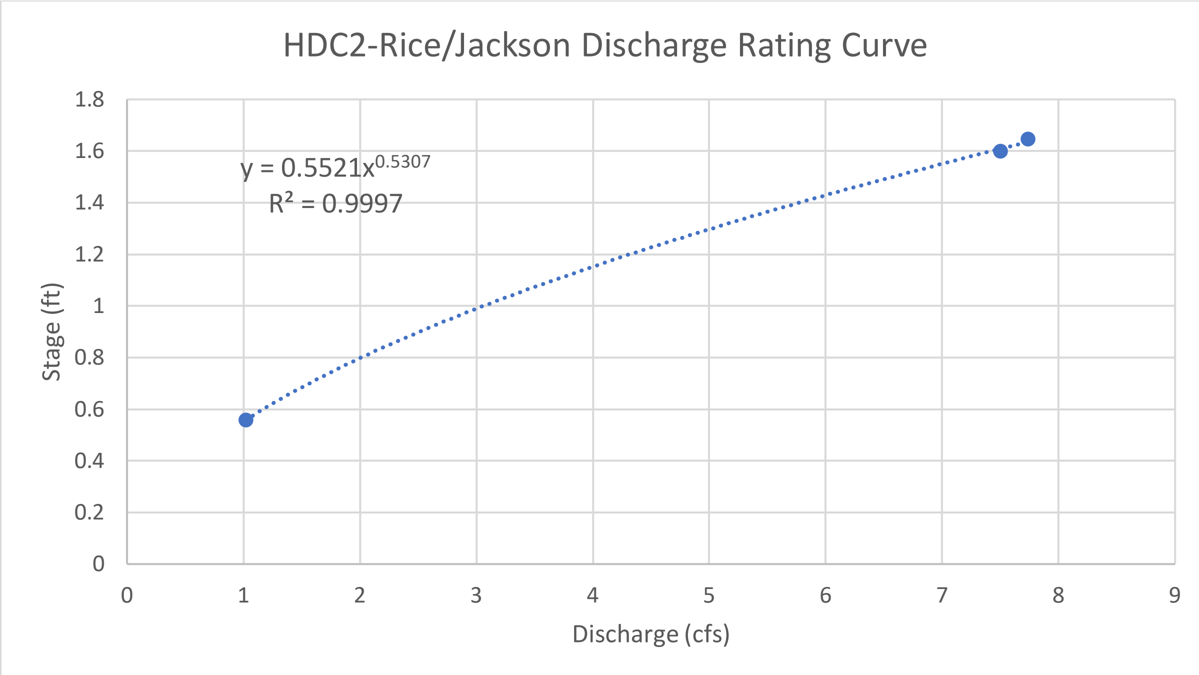


Figure 4 – Measured values and the equation of the line describing the stage-discharge relationship for HDC2 at Rice-Jackson property line

Figure 4 shows the rating curve of discharge compared to corrected stage. Figure 4 resulted with the curve fitting coefficients of 0.5521 and 0.5307, with a R^2 of 0.9997.

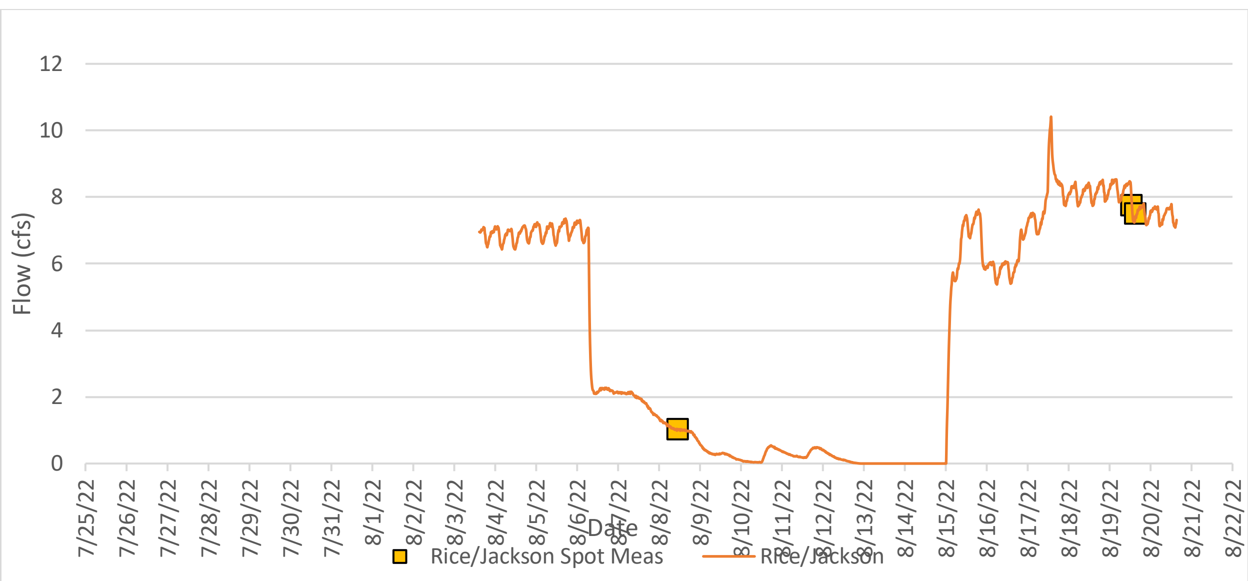


Figure 5 – Huseman Ditch Flow Volume at HDC2 near the property boundary between Rice and Jackson

Stage data was collected from the Huseman Ditch at site HDC2 (see Figure 5) from August 3, 2022 to present. Periodic manual measurements of flow volume were made near HDC2 using a handheld acoustic current profiler on August 8, 19, 2022. Minor incursions to the flow data occur approximately every eight hours throughout the study period. On August 3, 2022 site HDC2 was moved during a large incursion to the flow lasted for thirteen hours. From August 6 to15, 2022 flow volume steadily receded down to zero before recording flow values of approximately 6 to 8 cfs until the end of the study period.

HDC3 - Shop

Table 5 – Manual discharge measurements at HDC3

DATE	START TIME	END TIME	CORRECTED STAGE	QCALC (CFS)	UNCERTAINTY	TEMPERATURE
8/5/2022	1:50	2:58	0.5978	4.703	8.4	75.2
8/19/2022	2:05	2:34	0.7627	7.046	1.6	70.1
8/19/2022	2:40	3:04	0.77154	6.982	2.1	71.1

Table 5 displaysTable 5 – Manual discharge measurements at HDC3 manual discharge measurements (Qcalc) with corresponding corrected stage and temperature for the Huseman Ditch at the Shop location (HDC3).

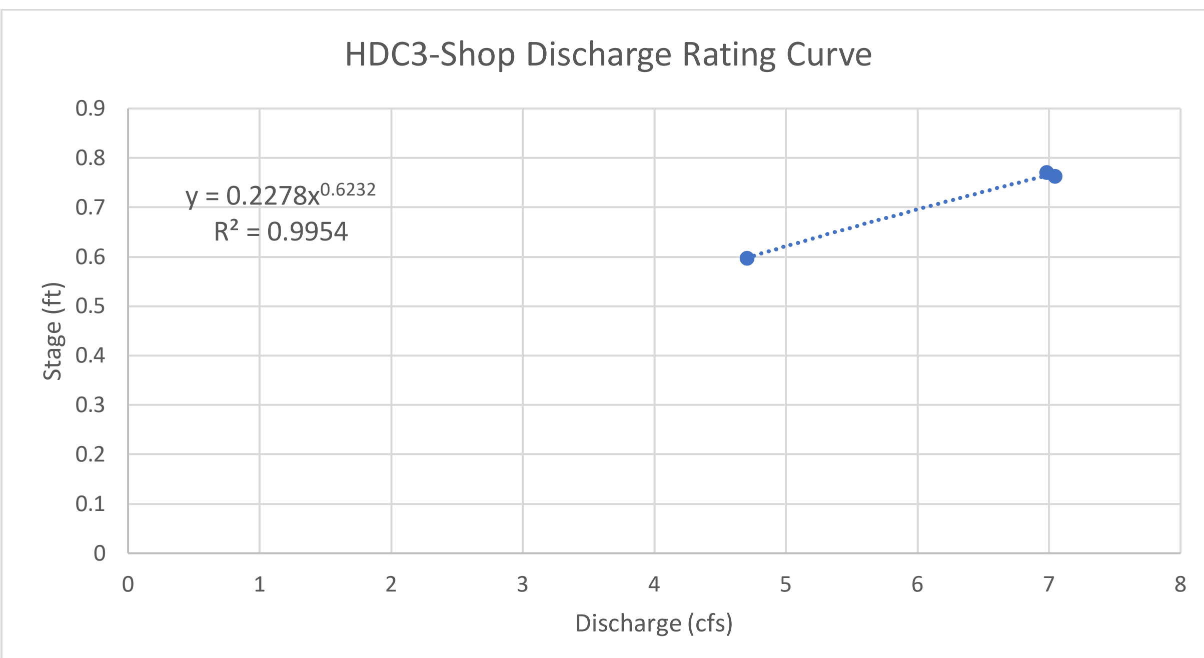


Figure 6 – Measured values and the equation of the line describing the stage-discharge relationship for HDC3 at the Shop

Rating curve of discharge compared to corrected stage (Figure 6) resulted with the curve fitting coefficients of 0.2278 and 0.6232, with a R^2 of 0.9954.

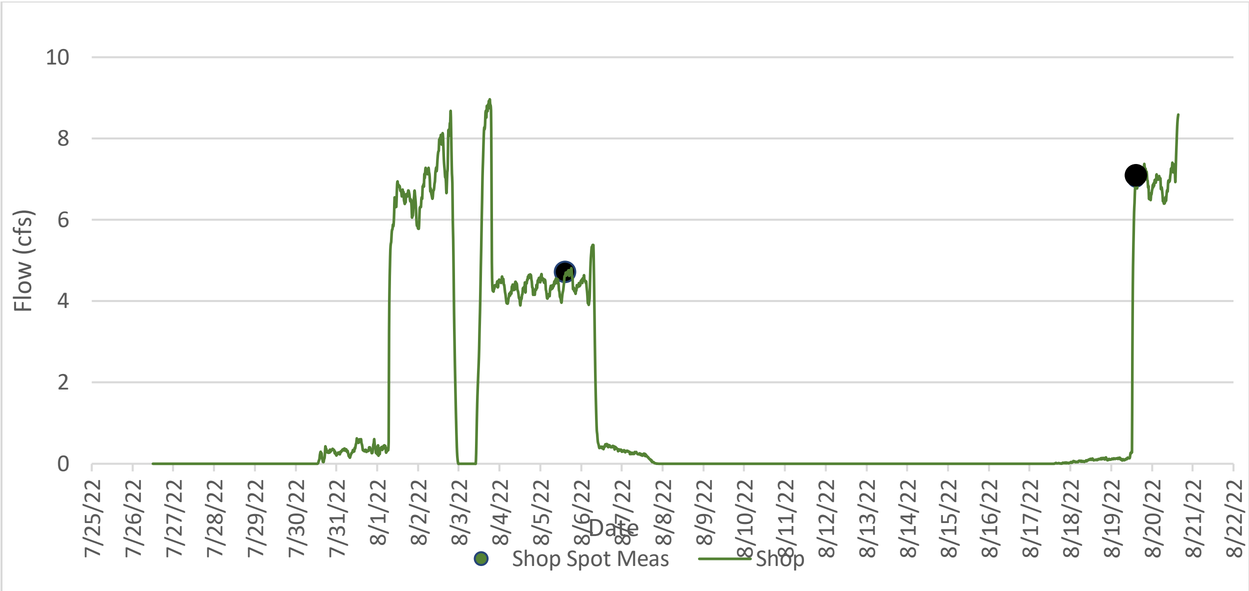


Figure 7 – Huseman Ditch Flow Volume at HDC3 near the Shop

Stage data was collected from the Huseman Ditch at site HDC3 (see Figure 7) from July 27, 2022 to present. Flow was not measured until approximately August 1, 2022. Periodic manual measurements of flow volume were made near HDC3 using a handheld acoustic current profiler on August 5, and 19, 2022. Minor incursions to the flow data occur approximately every eight hours throughout the study period. On August 3, 2022 a large incursion to the flow lasted for thirteen hours. From August 6 to 19, 2022 flow volume steadily receded down to zero before recording flow values of approximately 6 to 8 cfs until the end of the study period.

HDC4 – DeSoza Lane

Table 6 – Manual discharge measurements at HDC4

DATE	START TIME	END TIME	CORRECTED STAGE	QCALC (CFS)	UNCERTAINTY	TEMPERATURE
8/5/2022	9:50	11:20	1.4707	7.162	4.6	67.5
8/19/2022	4:25	6:11	1.6005	7.653	6.7	74.2
8/20/2022	8:48	10:25	1.589	7.787	3.2	63.7

Table 6Table 6 – Manual discharge measurements at HDC4 displays manual discharge measurements (Qcalc) with corresponding corrected stage and temperature reading for the Huseman Ditch at DeSoza Ln (HDC4).

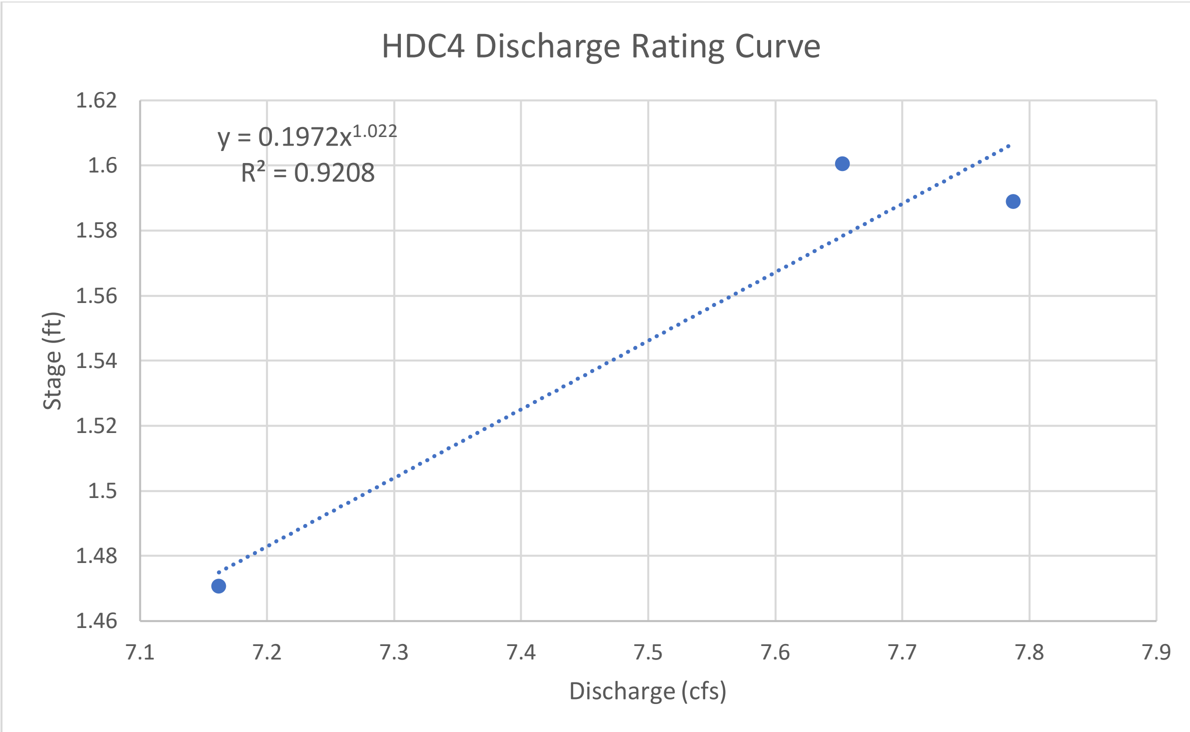


Figure 8 – Measured values and the equation of the line describing the stage-discharge relationship for HDC4 at DeSoza Lane

Rating curve of discharge compared to stage height at the Huseman Ditch and DeSoza Ln sampling point. Rating curve of discharge compared to corrected stage (Figure 8) resulted with the curve fitting coefficients of 0.1972 and 1.022, with a R^2 of 0.9208.

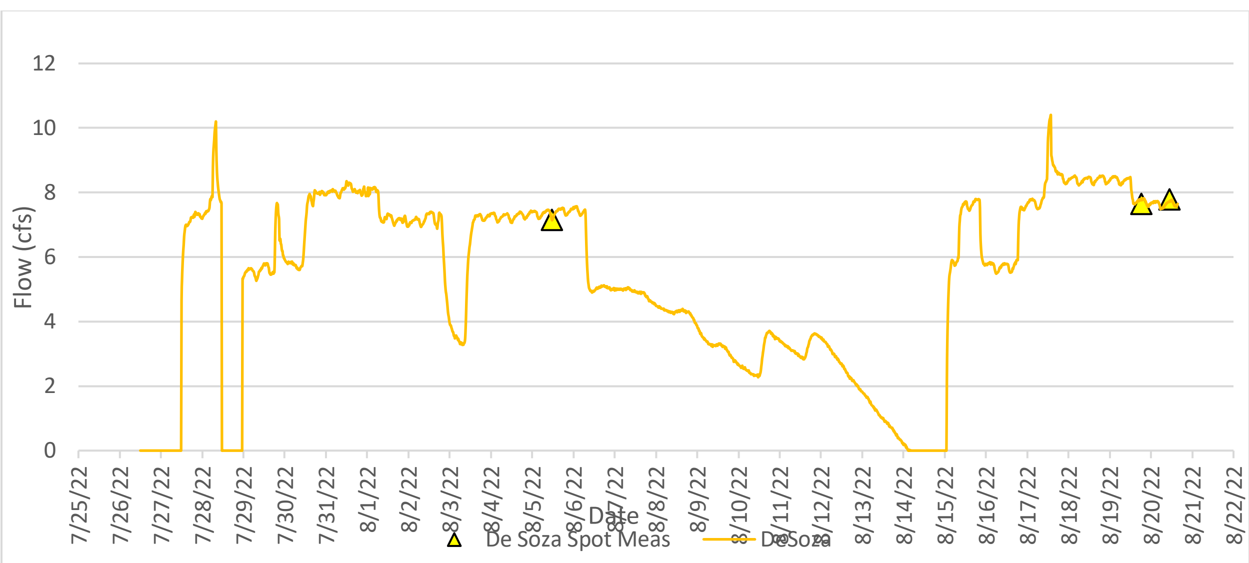


Figure 9 – Huseman Ditch Flow Volume at HDC4 near DeSoza Lane

Stage data was collected from the Huseman Ditch at site HDC4 (see Figure 9) from July 27, 2022 to present. Periodic manual measurements of flow volume were made near HDC4 using a handheld acoustic current profiler on August 5, and 19, 2022. Minor incursions to the flow data occur approximately every eight hours throughout the study period. On August 3, 2022 a large incursion to the flow lasted for thirteen hours. From August 6 to 15, 2022 flow volume steadily receded down to zero before recording flow values of approximately 6 to 8 cfs until the end of the study period.

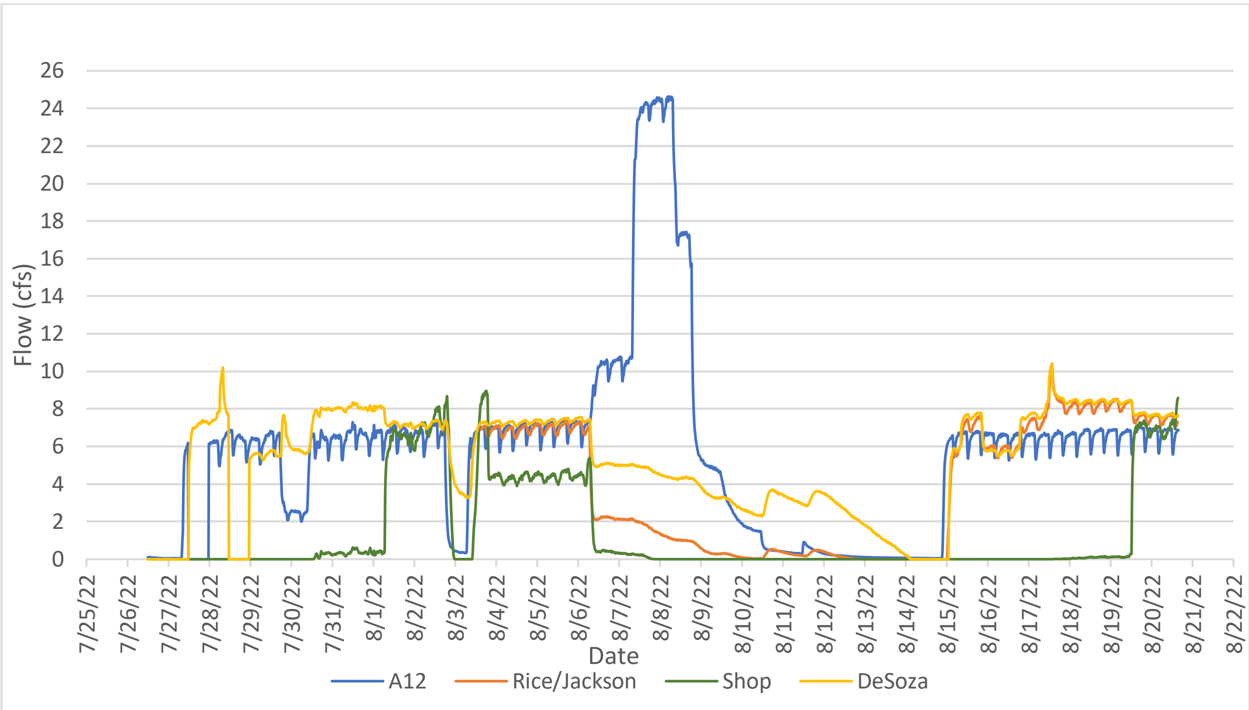


Figure 10 – All Huseman Ditch Flow Data recorded at HDC1, HDC2, HDC3, and HDC4

The highest calculated discharge occurred at the A12 sampling point between the time period of 8/7/2022 and 8/10/2022, (24.64 cfs). The average discharge at each of the four sampling points, (A12, Rice-Jackson, DeSoza, Shop), was 5.67, 3.42, 1.33, and 5.28, respectively. The repetitious minor incursions occurring every 8 hours during sustained periods of flow are caused by a scheduled break in pumping. In order to self-clean the fish screen and ensure proper functionality, the sophisticated pump uses backflow to clean the fish screen.

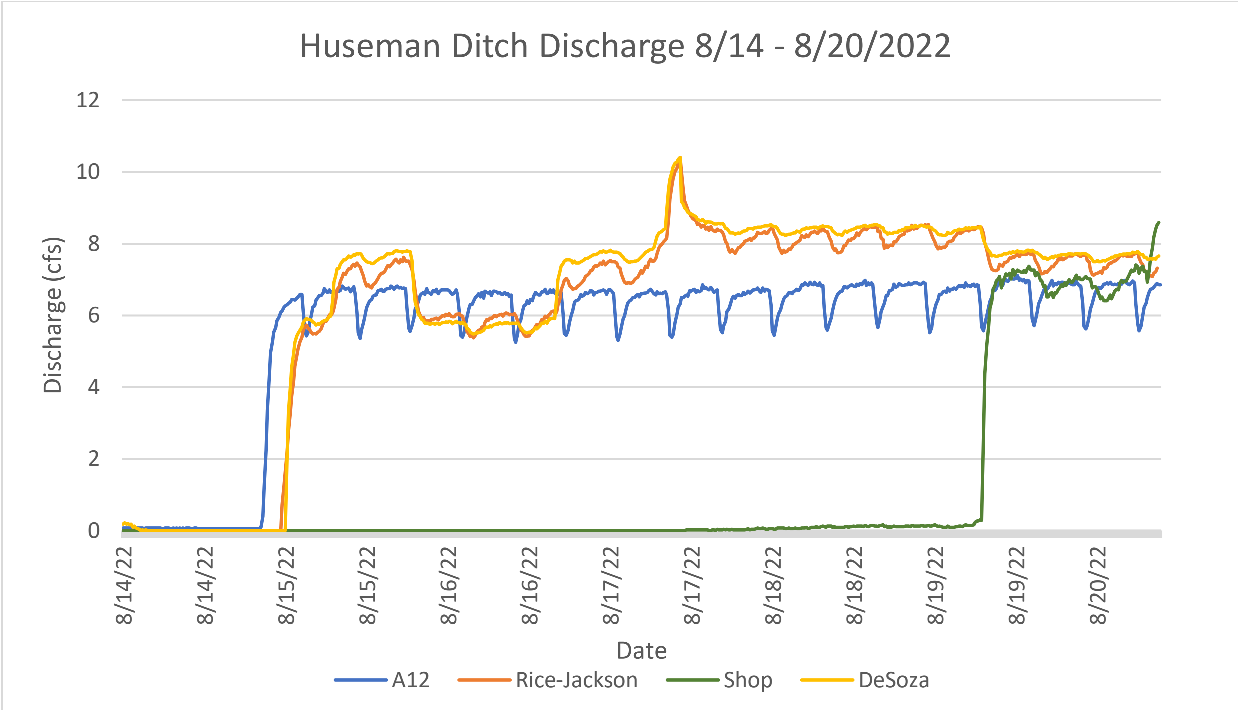


Figure 11 – Timespan of focus during the period of study of the Huseman Ditch.

The average discharge over 8/14 – 8/20/2022 at each of the four sampling points, (A12, Rice-Jackson, DeSoza, Shop), was 5.60, 6.17, 1.20, and 6.34, respectively.

Huseman Ditch Volume

Table 5: Volume (ac-ft) calculation of Huseman Ditch from A12 to the Shop sampling point at 8 cfs discharge. This total was calculated from the cross-sectional measurements from discharge sampling using SnoTek FlowTracker during 8/19-8/20/2022.

Table 7 – Volume calculation of the Huseman Ditch

LOCATION	DISTANCE (FT)	VOLUME (FT^3)	VOLUME (AC FT)
A12	3090	101510	2.330365
RICE-JACKSON	4368	143493	3.294151
DESOZA	1234	40538	0.930625
SHOP	2088	52,200	1.1983489
RETURN	5517	110340	2.5330616
TOTAL	16297	447881	10.283

The approximate volume of water within the Huseman Ditch, is 7.75 ac-ft when the diverting approximately 8 cfs.

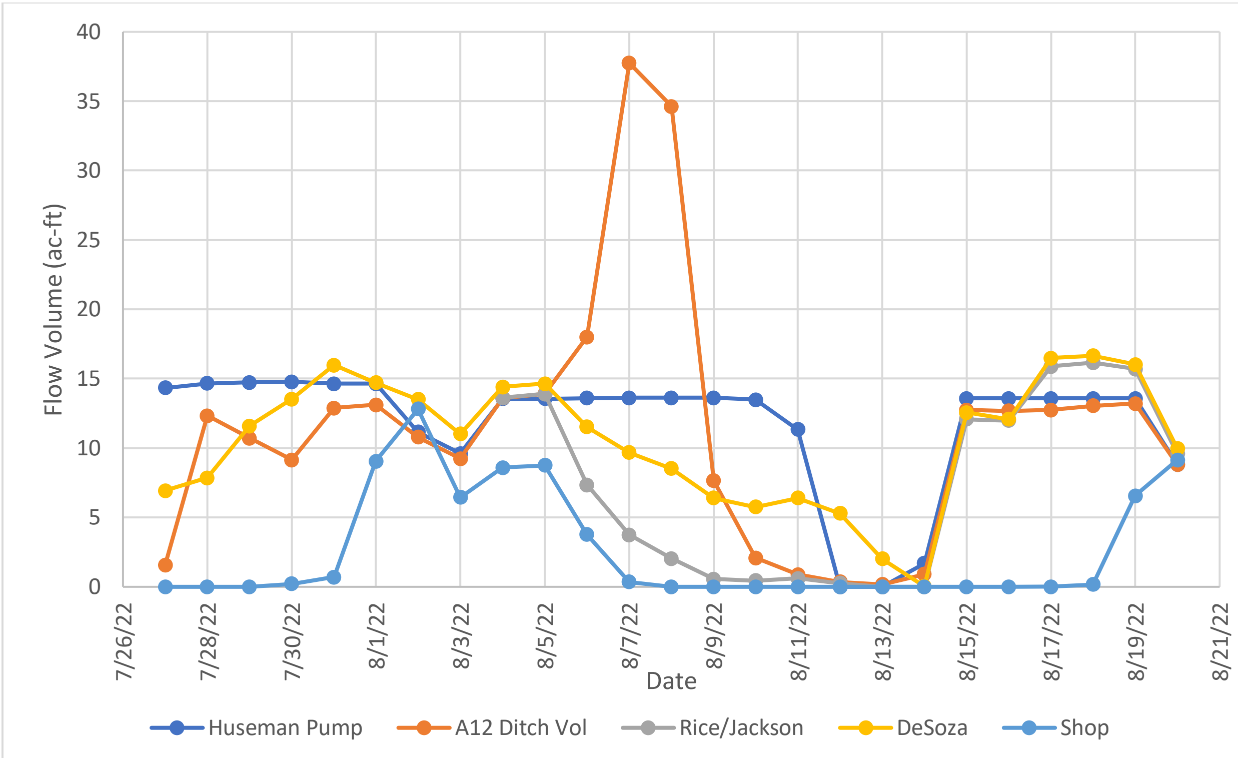


Figure 12 – Daily Flow Volumes of the Huseman Diversion and the Huseman Ditch at HDC1, HDC2, HDC3, and HDC4.

Figure 12 shows daily totals of flow volume in acre-feet pumped by the Huseman Diversion and at each monitoring site along the Huseman Ditch. Trends largely follow the continuous data plotted in Figure 10 with recorded values fairly similar between most sites on August 4 and 5, and again beginning August 14 to 16, 2022.

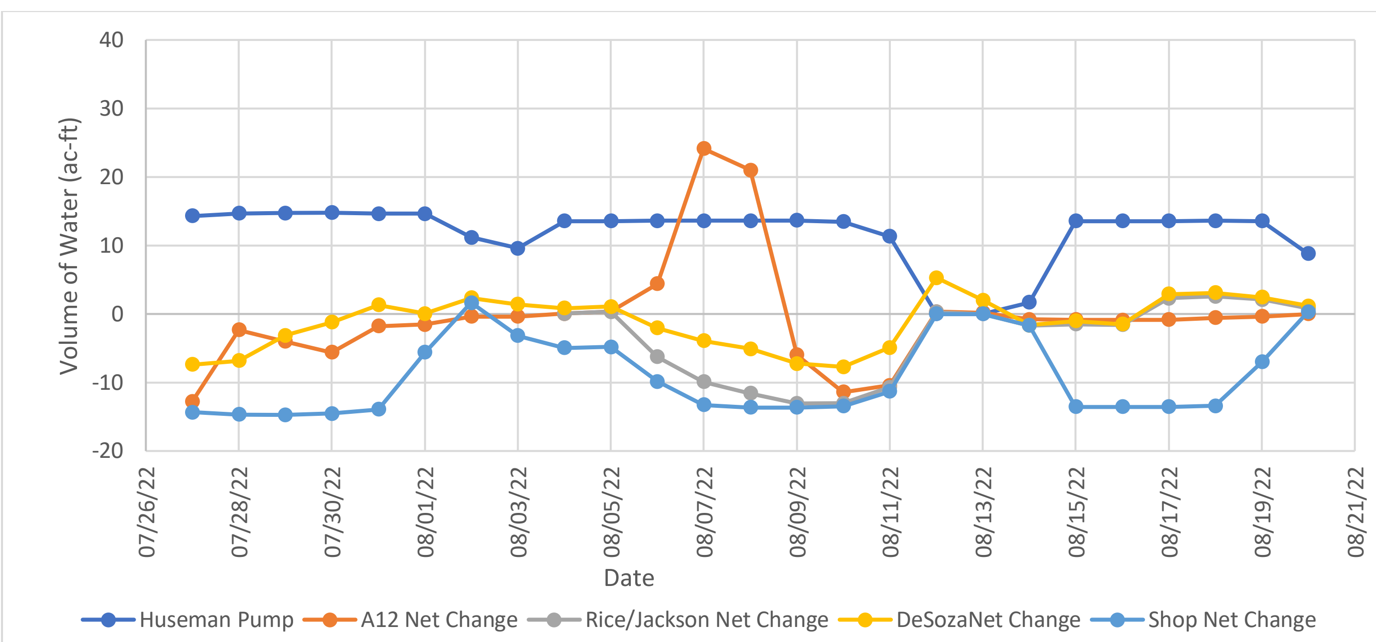


Figure 13 – Daily Difference Between Huseman Diversion and Huseman Ditch Flow Volume at HDC1, HDC2, HDC3, and HDC4.

Figure 13 displays the daily difference between the volume of Shasta River water diverted at the Huseman Diversion and the volume of water flowing past each monitoring site along the Huseman Ditch. Monitoring site values converge towards zero beginning July 31 through August 5, 2022, and again from August 11 to August 14, 2022. Diversion volumes converge toward zero briefly on August 2 and 3, 2022, and substantially from August 11 to 14, 2022. HDC3 shows a majority of negative values, representing the greatest difference between diverted volumes, from July 27 to July 31, August 6 to August 10, and August 15 to August 18, 2022. HDC1 values are positive and exceed pumped values beginning August 6 and continuing to August 9, 2022. HDC4 values are positive and exceed pumped values beginning August 12 and 13, 2022. HDC2 and HDC4 show positive values but do not exceed pumped values beginning August 16 to August 20, 2022.

Piezometers

Each transect includes five measurement sites (two piezometers with pressure transducers on each side of the river, one nearer and one further, and one stilling well in the river itself measuring stage). The individual location in each transect is marked as follows: LBF – left bank far, LBN – left bank near, WSE – water surface elevation (of surface water), RBN – right bank near, and RBF – right bank far. Table 8 below includes the SiteID, site name, and location of each site.

Table 8 – Naming Convention for the A12 Piezometer Transect Study

SITEID	SITE NAME	LATITUDE	LONGITUDE
SR-A12-LBN	Shasta River near A12 Road, Left Bank near River	41.65021	-122.50050
SR-A12-LBF	Shasta River near A12 Road, Left Bank further from River	41.65003	-122.50195
SR-A12-RBN	Shasta River near A12 Road, Right Bank near River	41.65031	-122.49952
SR-A12-RBF	Shasta River near A12 Road, Right Bank further from River	41.65038	-122.49820
SR-A12-SWE	Shasta River near A12 Road, Surface Water Elevation	41.65018	-122.50008

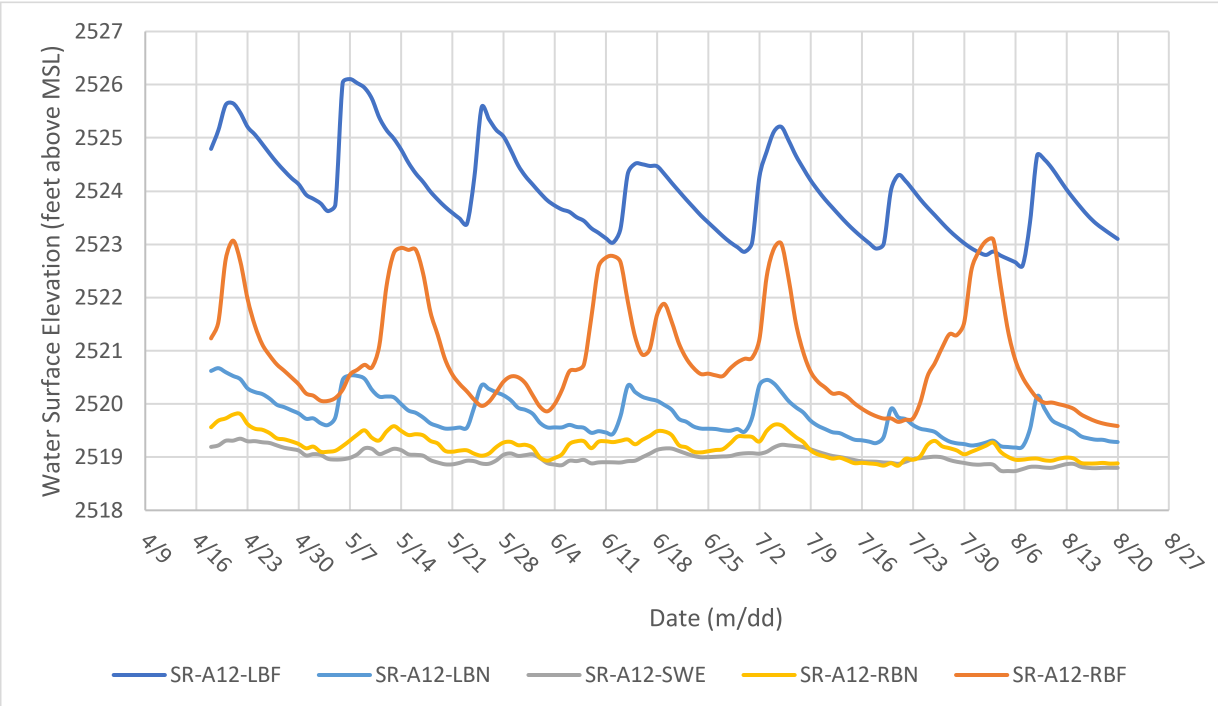


Figure 14 – Daily average water surface elevation from the piezometer transect at A12.

Figure 14 displays daily average water surface elevation above mean sea level for the piezometer transect located north of A12. The saw tooth pattern is created from regular rises and falls in the local water surface elevation. The magnitude of the peaks and valleys of LBN and RBN sites are smaller than those of LBF and RBF sites. LBF is closer to the Huseman Ditch on the west side of the Shasta River and LBN is closer to the Shasta River. Similarly, RBF is closer to the Novy-Rice-Zenkus irrigation conveyance on the east side of the Shasta River, and RBN is closer to the Shasta River. Peaks and valleys do not necessarily coincide on the east and west sides of the river. Surface water elevation is nearly continuously the lowest elevation, and downgradient from the water surface elevations surrounding it.

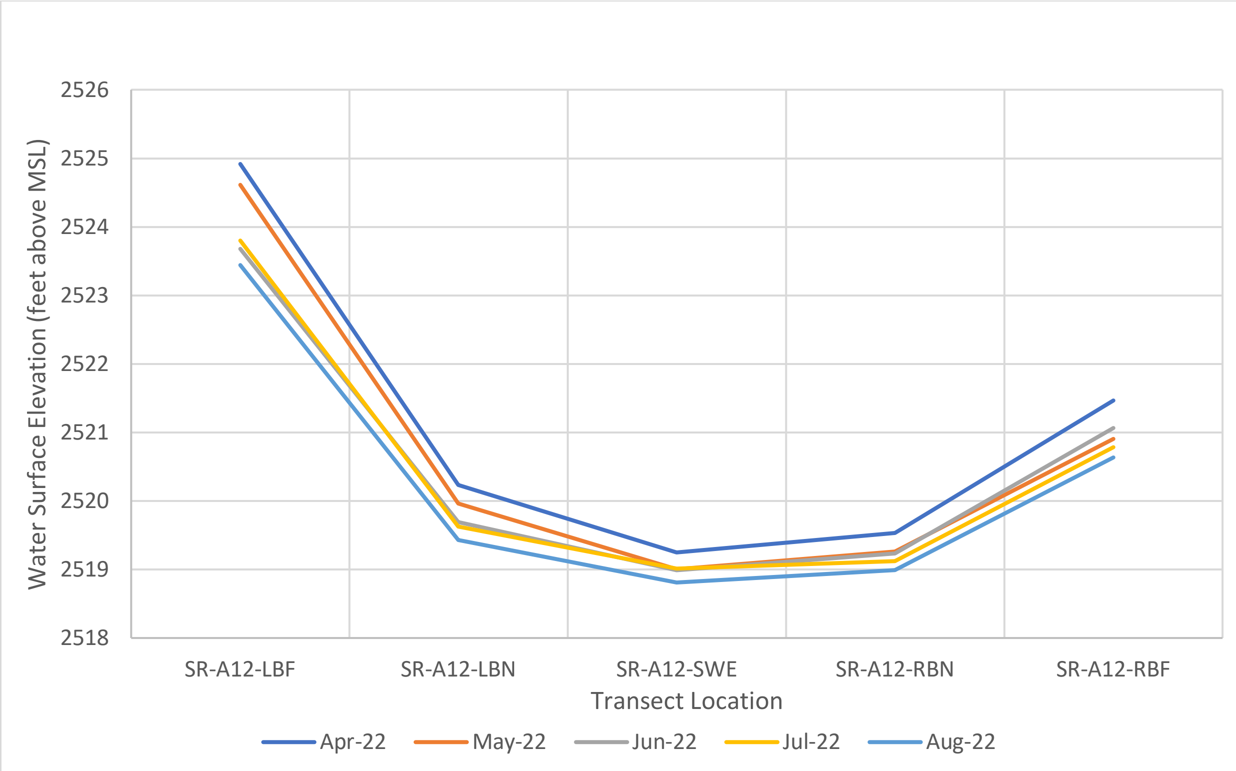


Figure 15 – 2022 monthly averages of water surface elevations at each piezometer site

Figure 15 displays the monthly averages from mid April to mid August 2022. Each line represents a different monthly average elevation of the water surface. This is effectively a cross section of the water table across time, as if you were standing on the A12 bridge looking northward downriver. The highest average water elevation occurred in April, and the lowest occurred in August, 2022. The surface water elevation (Shasta River surface) is the lowest in each monthly average, indicating that despite the average water surface elevation dropping, this is still a gaining reach.

Water Balance

Table 9 – Daily Water Balance Results for Huseman Ditch Company and Associated Irrigated Lands.

Period	Inflows (ac-ft)			Outflows (ac-ft)				Net Change in Storage (ac-ft)
	Huseman Diversion	Precipitation	Baseflow Sub In	ET	Ditch Leakage	Tailwater	Baseflow Sub Out	
7/27/2022	14.32942536	0	0.2885	18.393333	3.58993597	6.89669544	0.2885	-14.55053939
7/28/2022	14.67201548	0	0.2885	17.206667	3.675764715	7.06158271	0.2885	-13.27199861
7/29/2022	14.73130603	0	0.2885	16.02	3.690618715	7.09011901	0.2885	-12.0694317
7/30/2022	14.77734675	0	0.2885	14.833333	3.70215325	7.11227823	0.2885	-10.87041806
7/31/2022	14.65006283	0	0.2885	13.053333	3.670264942	7.05101699	0.2885	-9.124552429
8/1/2022	14.64754081	0	0.2885	6.5266667	3.669633102	7.04980315	0.2885	-2.598562106
8/2/2022	11.15263727	0.593333333	0.2885	13.646667	2.794058569	5.36771997	0.2885	-10.0624746
8/3/2022	9.608169274	1.186666667	0.2885	14.833333	2.407124614	4.62437367	0.2885	-11.06999567
8/4/2022	13.54814555	0	0.2885	17.206667	3.394202755	6.52066858	0.2885	-13.57339245
8/5/2022	13.5464105	0	0.2885	14.833333	3.393768077	6.51983351	0.2885	-11.20052442
8/6/2022	13.60247489	0	0.2885	17.206667	3.407813829	6.54681708	0.2885	-13.55882268
8/7/2022	13.62637428	0	0.2885	19.58	3.413801318	6.55831976	0.2885	-15.92574679
8/8/2022	13.62530196	0	0.2885	18.393333	3.41353267	6.55780365	0.2885	-14.7393677
8/9/2022	13.63396336	0	0.2885	21.36	3.415702602	6.56197235	0.2885	-17.70371159
8/10/2022	13.47485961	0	0.2885	17.8	3.375842506	6.48539635	0.2885	-14.18637924
8/11/2022	11.33181141	0	0.2885	16.613333	2.838946879	5.45395577	0.2885	-13.57442457
8/12/2022	0	0	0.2885	16.613333	0	0	0.2885	-16.61333333
8/13/2022	0	0	0.2885	16.02	0	0	0.2885	-16.02
8/14/2022	1.685420567	0	0.2885	17.206667	0.422246654	0.81118622	0.2885	-16.75467897
8/15/2022	13.57291476	0	0.2885	17.206667	3.400408159	6.5325899	0.2885	-13.56674997
8/16/2022	13.57128557	0	0.2885	16.02	3.4	6.53180578	0.2885	-12.38052021
8/17/2022	13.57933027	0	0.2885	13.646667	3.402015431	6.53567766	0.2885	-10.00502949
8/18/2022	13.58395551	0	0.2885	9.4933333	3.403174188	6.53790377	0.2885	-5.850455782
8/19/2022	13.57464059	0	0.2885	16.613333	3.400840531	6.53342054	0.2885	-12.97295381
8/20/2022	8.803501033	0	0.2885	16.613333	2.20553192	4.23709004	0.2885	-14.25245426
Study Period Totals	293.3288937	1.78	7.2125	396.94	73.4873814	141.17803	7.2125	-316.4965179

Inputs

Huseman Ditch Company daily diversion totals are metered and converted to acre feet.

Precipitation was measured using a nearby Hobo Onset weather station provided by the State Water Board and cooperated by the SVRCD.

Baseflow Sub-In is an assumed value based on simultaneous instream flow measurements made on August 20 between 2:00 and 3:00 pm at the SRA12 and SRDZ locations (see Figure 1). At that time, the difference in flow measured downstream was approximately +0.280 cfs. This was divided in half to account for hydraulic activity on the east side of the river and converted to acre-feet.

Outputs

ETo was directly measured by CIMIS Station 260-Montague. Because Huseman Ditch Company flood irrigates grass pasture, ETo is effectively ETc.

Ditch leakage was calculated by selecting the most representative span data while being conveyed from the point of diversion to north of DeSoza Lane without impediment. Using the incremental loss from the outflow to HDC1, and then from HDC1 to HDC2. The greater of the values within this span were selected and loss was calculated per segment of ditch, and multiplied to extend the entire length of the dtich, even beyond where accurate measurements are were made. Ditch loss was calculated for the entire length of the Huseman Ditch and was then divided by the total daily volume of water diverted and converted into acre-feet. Values are given in acre-feet per day. This gives a constant that is then multiplied by every daily total volume of water diverted, such that loss is proportional to how much water was diverted in a given day.

Table 10 – Table data of the difference between the volume of water diverted and volume of water measured at HDC1, HDC2, HDC3, and HDC4.

Date	Huseman Pump	A12 Net Change	Rice/Jackson Net Change	DeSozaNet Change	Shop Net Change
7/27/22	14.32943	-12.7501		-7.40579	-14.3294
7/28/22	14.67202	-2.34461		-6.80837	-14.672
7/29/22	14.73131	-4.00912		-3.13437	-14.7313
7/30/22	14.77735	-5.62553		-1.23523	-14.557
7/31/22	14.65006	-1.77444		1.320399	-13.9478
8/1/22	14.64754	-1.53661		0.068795	-5.59633
8/2/22	11.15264	-0.36654		2.347211	1.652875
8/3/22	9.608169	-0.36484		1.414716	-3.1667
8/4/22	13.54815	0.061065	0.06462	0.863679	-4.96561
8/5/22	13.54641	0.366296	0.343474	1.084524	-4.79612
8/6/22	13.60247	4.395031	-6.2631	-2.07683	-9.8439
8/7/22	13.62637	24.12564	-9.88573	-3.94536	-13.2684
8/8/22	13.6253	21.00059	-11.5944	-5.10542	-13.6253
8/9/22	13.63396	-5.99466	-13.066	-7.22498	-13.634
8/10/22	13.47486	-11.402	-13.0324	-7.72365	-13.4749
8/11/22	11.33181	-10.4446	-10.7157	-4.92127	-11.3318
8/12/22	0	0.352381	0.267963	5.288073	0
8/13/22	0	0.168064	0	2.014534	0
8/14/22	1.685421	-0.78089	-1.68542	-1.65448	-1.68542
8/15/22	13.57291	-0.82873	-1.4921	-1.01048	-13.5729
8/16/22	13.57129	-0.88832	-1.57872	-1.50059	-13.5713
8/17/22	13.57933	-0.83863	2.296499	2.91512	-13.5677
8/18/22	13.58396	-0.5446	2.573218	3.066114	-13.413
8/19/22	13.57464	-0.37237	2.117163	2.440189	-7.01634
8/20/22	8.803501	-0.00668	0.776076	1.150444	0.3485

Volume of tailwater was determined using the value recorded at the SBG gauge just after simultaneously measuring Shasta River flow on August 20, 2022 between 2:00 pm and 3:00 pm. The difference in volume of water recorded downstream at SBG was 3.29 cfs. August 20, 2022. Dividing against the daily volume of water diverted gives a proportion which was multiplied against every other daily total volume of water diverted such that tailwater is reported as a proportion of water diverted.

Baseflow Sub-out was determined using the same method as Baseflow Sub-in. Additional controls are needed for a more precise number. However, Piezometer data indicate a gaining reach through August despite a decreasing trend of the water surface elevation.

The Daily Change in Storage is calculated for every day that the study had sufficient data. Values for August 20 are underreported as there is not complete data for this day. The Daily Change in Storage is a negative value, indicating water is leaving the soil storage on the ranches. This is corroborated by the piezometer data, again showing that this is a gaining reach of the Shasta River.

Discussion/Conclusion

Ditch loss

Ditch leakage was calculated by selecting the most representative span data while being conveyed from the point of diversion to north of DeSoza Lane without impediment. Using the incremental loss from the outflow to HDC1, and then from HDC1 to HDC2. The greater of the values within this span were selected and loss was calculated per segment of ditch, and multiplied to extend the entire length of the ditch, even beyond where accurate measurements are were made. Ditch loss was calculated for the entire length of the Huseman Ditch and was then divided by the total daily volume of water diverted and converted into acre-feet. This gives a constant that was then multiplied by every daily total volume of water diverted, such that loss was proportional to how much water was diverted in a given day. As a reference, ditch loss for the entire length of the ditch was determined to be 3.4 acre-feet per day, or 1.71 cfs. This number was determined during a time span where Huseman Ditch Company has been exercising 2/3 of the 11.9 cfs water right. Assuming this relationship is linear, when diverting their full amount of 11.9 cfs, the maximum estimated ditch loss value for the Huseman Ditch Company is 2.59 cfs.

A maximum ditch loss value of 2.59 cfs nearly perfectly coincides with the 2.4 cfs forbearance agreement by the Huseman Ditch Company. A piped ditch would allow this total of water to be left instream for the benefit of aquatic species and the enhancement of stream flow.

Piped ditches can be left at constant pressure, meaning that it takes less time to fill the ditch, and more time the full 11.9 cfs can be left instream during periods when diverting is stopped. These periods usually last from 4-7 days, and occur several times throughout the irrigation season.

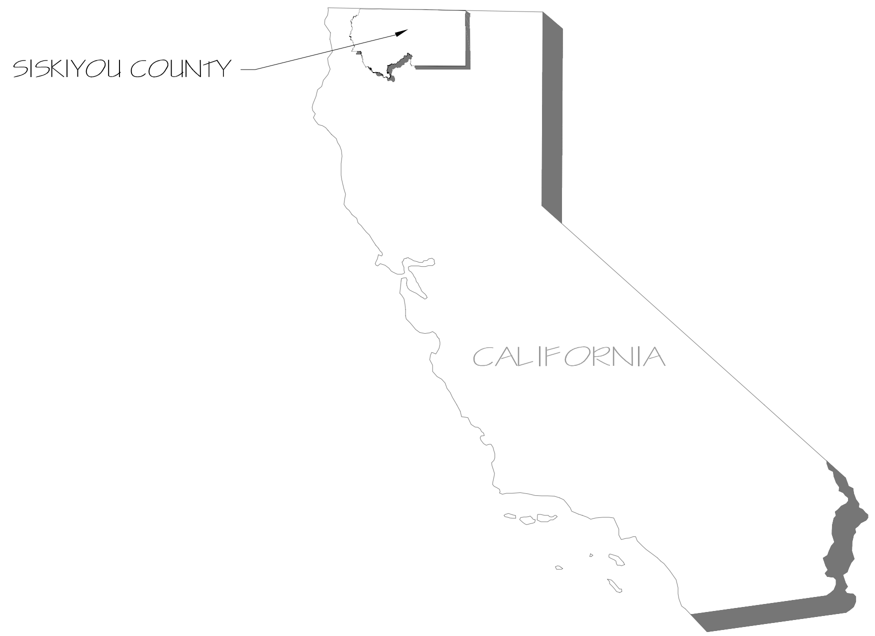
Piping this ditch leverages existing funding and restoration efforts by the WCB to enhance the Shasta River flow when in 2011 they contributed $1.5 million towards an over $3.9 million project to move the Huseman Ditch Company point of diversion approximately 6 miles downstream.

Next Steps

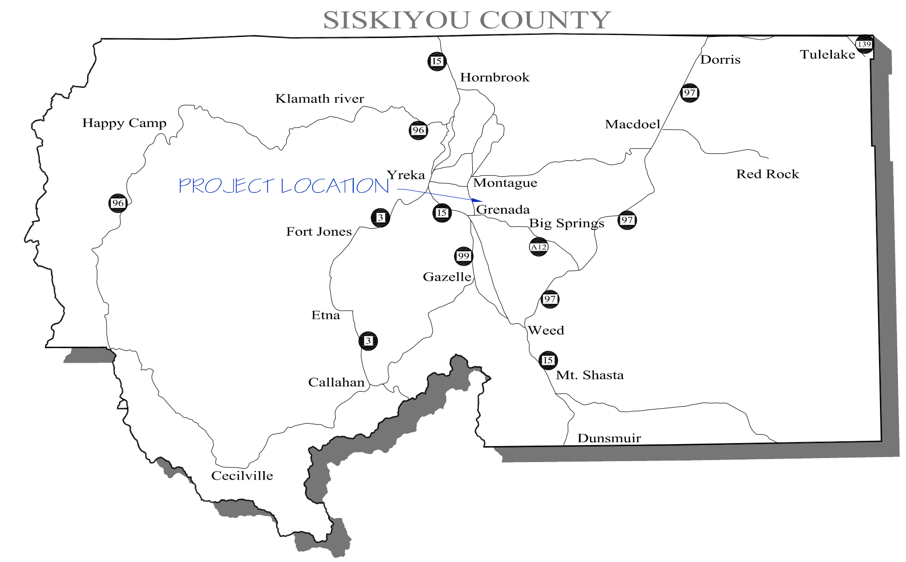
Lands on both sides of the Shasta River are actively irrigated and quantifying and separating tailwater versus subsurface baseflow returns within this reach is difficult to precisely measure and attribute to specific fields. These terms could be improved with continued measurements. Additionally, the SVRCD began measuring Huseman Ditch flow immediately following removal of vegetation from the ditch, which likely caused some settling over the subsequent weeks and during our initial data gathering. The SVRCD expects measurements of ditch flow to become more precise as time passes, and additional data can be used to inform estimates of ditch loss and the efficiency of applied irrigation water.

The difference in volume of water recorded at SBG (downstream of SRDZ) was 3.29 cfs. August 20, 2022 marked approximately thirteen days since Rice Livestock Co last irrigated, and is corroborated by the piezometer data in Figure 13. NB Ranch's fields downstream of the SRDZ spot flow measurement and upstream of the SBG river gauge site had just recently been irrigated. NRCS values for wild flood irrigation methods indicate a range of 40%-60% irrigation efficiency. 3.29 cfs is roughly 40% of the rate of diversion during this time period, meaning applied irrigation water has an approximate efficiency of 60% which is consistent with NRCS theoretical values. Also noteworthy is the fact that water returns to the stream via applied irrigation water at a greater rate than that of ditch loss.

APPENDIX A – Pipeline Designs



SHASTA VALLEY
RESOURCE CONSERVATION DISTRICT



NATURAL RESOURCES CONSERVATION SERVICE
SISKIYOU COUNTY CALIFORNIA

GENERAL NOTES

1. All Construction shall be in accordance with these drawings and attached specifications.
2. Landowner shall be responsible for obtaining any needed permits, easements, and/or right-of-ways.
3. Landowner will be responsible for locating and protecting all utilities. Special safety precautions to be taken when working in the vicinity of gas, oil, and electrical lines.
4. Cal-OSHA safety requirements shall be in effect during all construction.
5. All lines and grades shown on these drawings are approximate. The proposed structure's Location, excavation limits, and fill limits will be staked in the field by the engineer.
6. Benchmark is as shown on plan drawings. (If required)
7. Contact the Natural Resources Conservation Service at least 7 days prior to construction at (530) 842-6123 ext-119.

PROJECT LOCATION MAP
HUSEMAN PIPELINE

NOTES

1. Replace existing fences to original condition. Contact each landowner prior to removal of fence.
2. Thrust blocks are to be installed at all abrupt changes in pipeline grade, horizontal alignment, reduction in pipe size and at all isolation valves. See standard details sheet. Manufacture's recommendations for thrust control shall be followed. In absence of pipe manufacturer's requirements, follow the formula and specification on the standard detail sheet for Thrust Blocks.
3. A maximum deflection of 1° per joint will be allowed for curvature of pipeline alignment. Strictly follow pipe manufacture's recommendations.
4. Flow Meter, Drains, Isolation Valves, and Air-Vent locations are approximate, verify in field under the direction of the engineer or the engineer's representative.
5. Alfalfa Valve locations are approximate, verify location in the field under the direction of engineer or the engineer's representative and landowners

Date	
Designed	BBH
Drawn	BBH
Checked	
Approved	

Class VI

IRRIGATION CONVEYANCE PIPE & TAILWATER RECOVERY
Title Page

430

HUSEMAN PIPELINE PROJECT

MONTAGUE, SISKIYOU COUNTY, CALIFORNIA

United States Department of Agriculture
Natural Resources Conservation Service
215 Executive Court, Suite A
Yreka, CA 96097

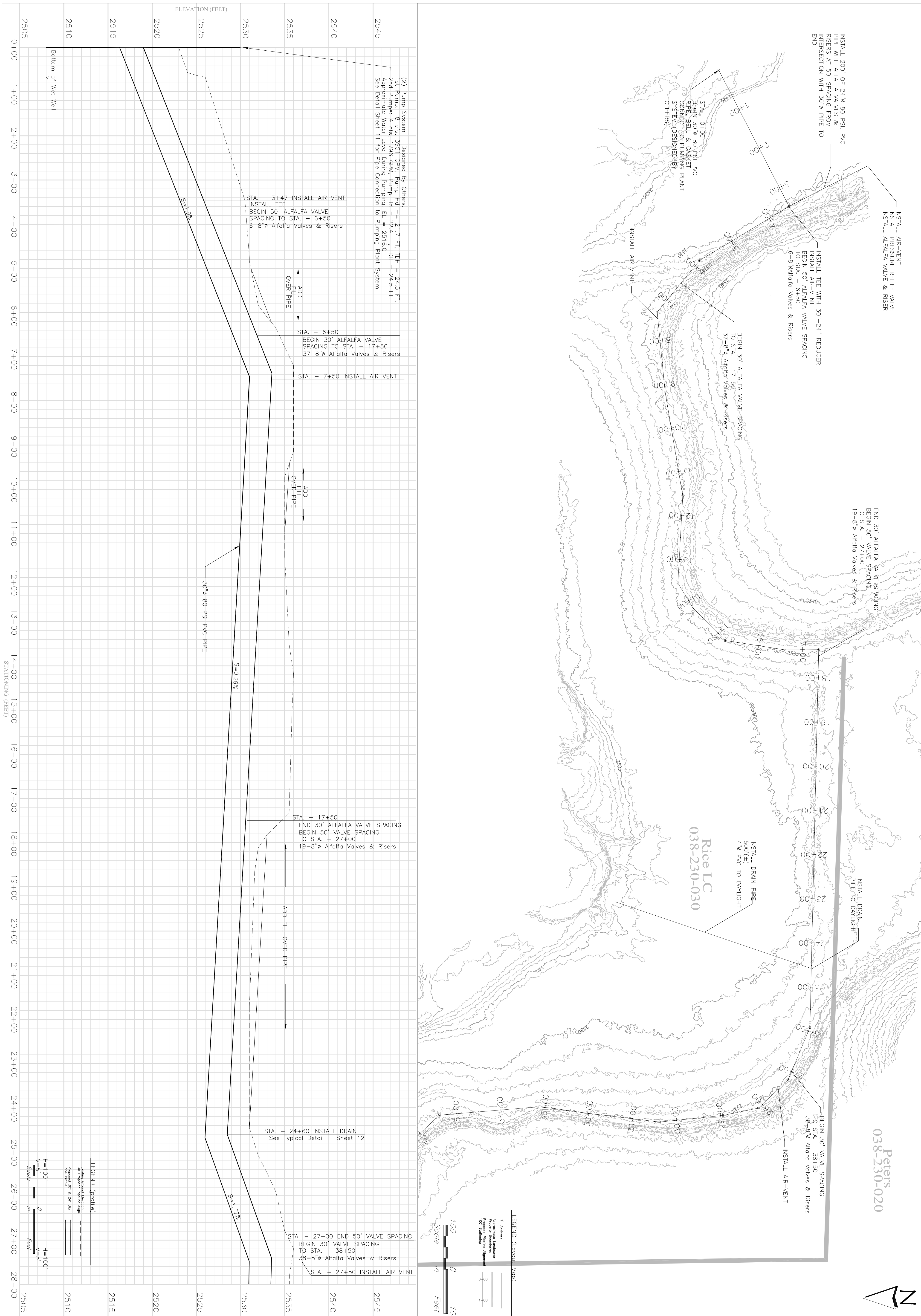
Sheet 2 of X	DRAWING NUMBER HUSE_001	FILE NAME	JOB CODE 430_EE

IRRIGATION WATER PIPELINE/SYSTEM ENG CLASS VI
PLAN & PROFILE

HUSEMAN DITCH

GRENADA, SISKIYOU COUNTY, CALIFORNIA

		Date
Designed	TB, BBH	
Drawn	BBH	
Checked		
Approved		



Sheet 3 of 14	DRAWING NUMBER HUSE_001
FILE NAME	

NRCS
Natural Resources Conservation Service
United States Department of Agriculture

JOB CODE 430_EE

IRRIGATION WATER CONVEYANCE PIPELINE/SYSTEM
PLAN & PROFILE

ENG CLASS VI

HUSEMAN DITCH

GRENADA, SISKIYOU COUNTY, CALIFORNIA

		Date
Designed	TB, BBH	
Drawn	BBH	
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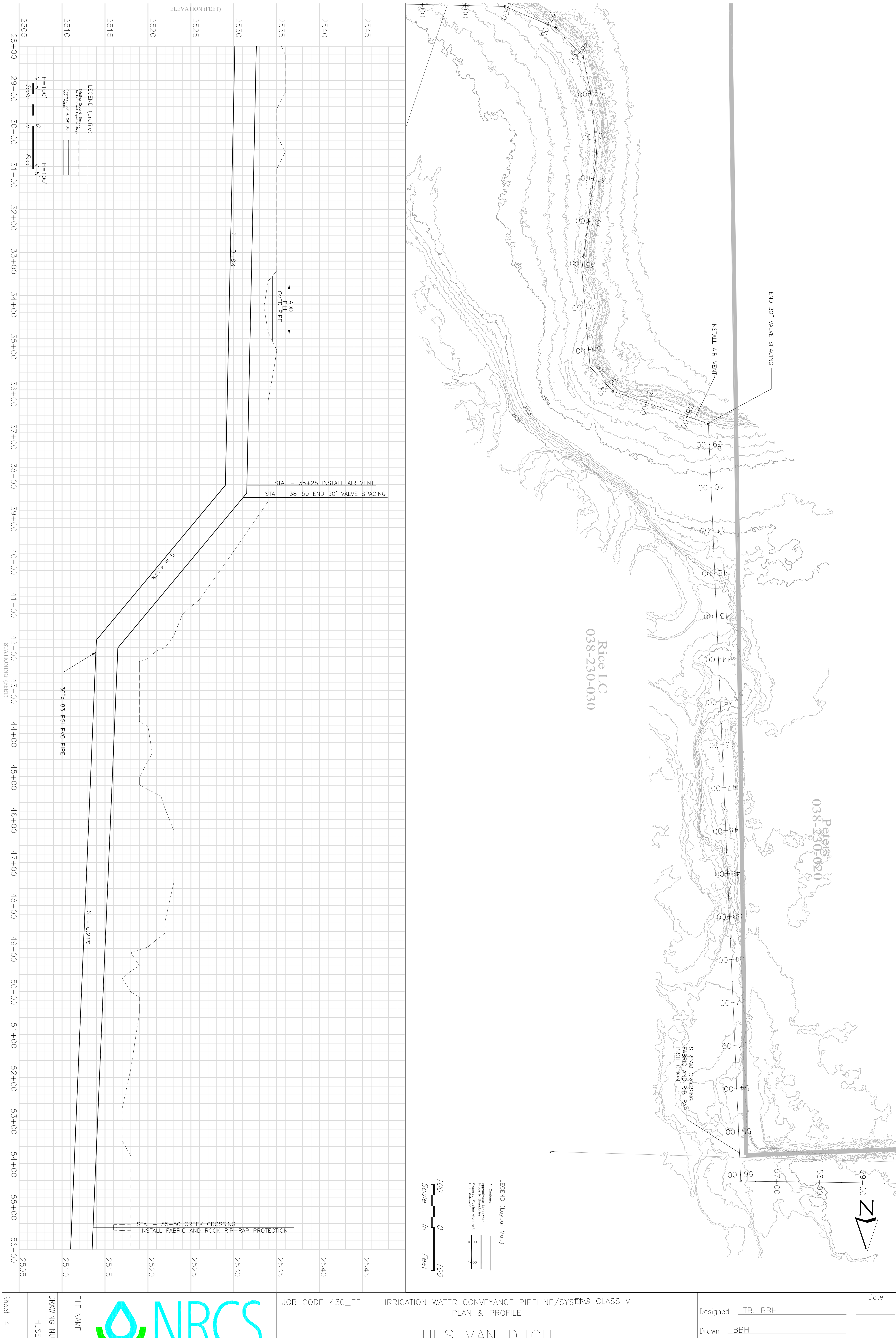

Sheet 4 of 14

DRAWING NUMBER HUSE_001

FILE NAME

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United States Department of Agriculture

JOB CODE 430_EE

ENG CLASS VI

IRRIGATION WATER CONVEYANCE PIPELINE/SYSTEM
PLAN & PROFILE

HUSEMAN DITCH

GRENADA, SISKIYOU COUNTY, CALIFORNIA

		Date
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Drawn	BBH	
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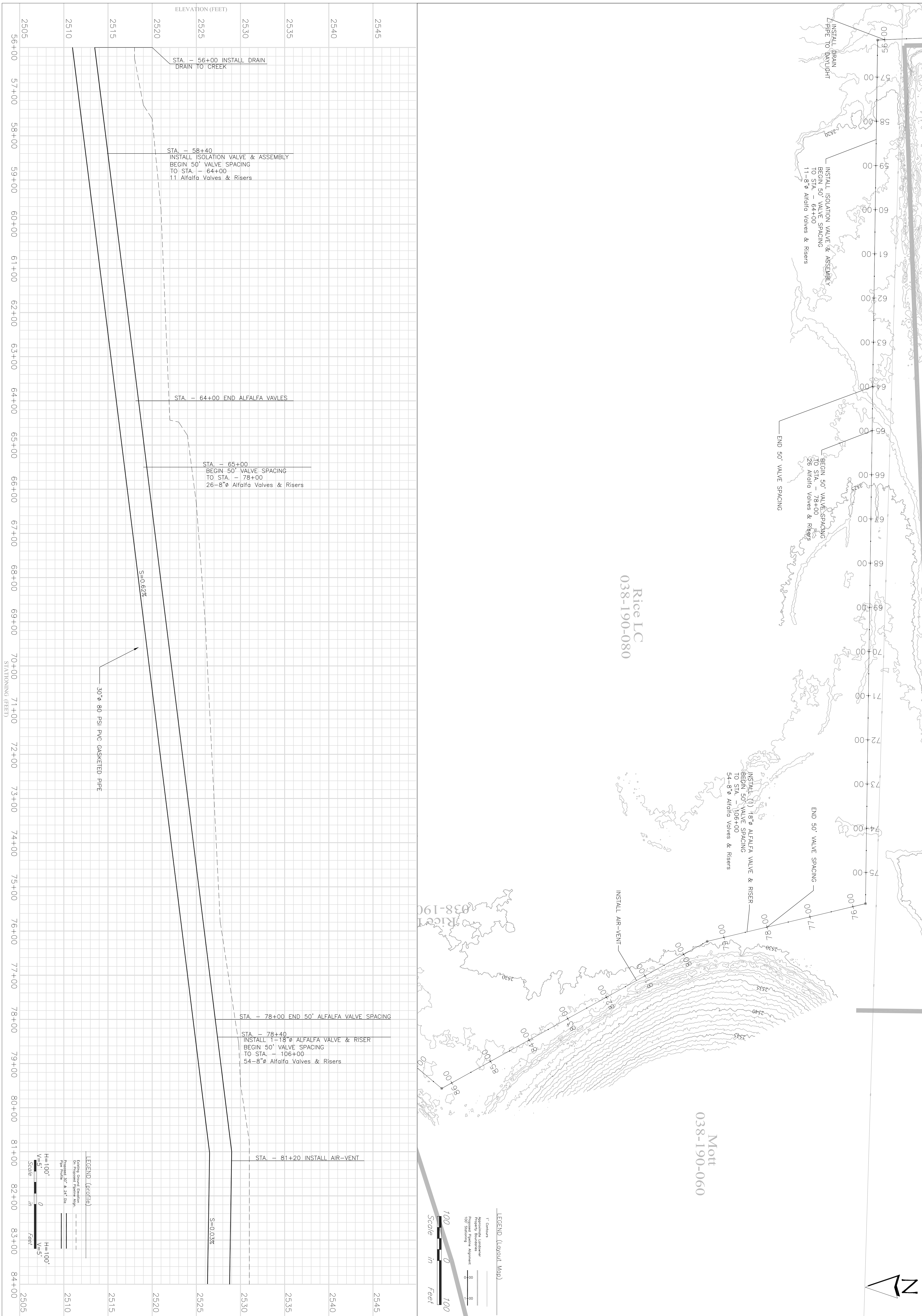
Approved		



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IRRIGATION WATER CONVEYANCE PIPELINE/SYSTEM ENG CLASS VI

PLAN & PROFILE

HUSEMAN DITCH

GRENADA, SISKIYOU COUNTY, CALIFORNIA

NRCS
Natural Resources Conservation Service
United States Department of Agriculture

FILE NAME

DRAWING NUMBER
HUSE_001

		Date
Designed	TB, BBH	
Drawn	BBH	
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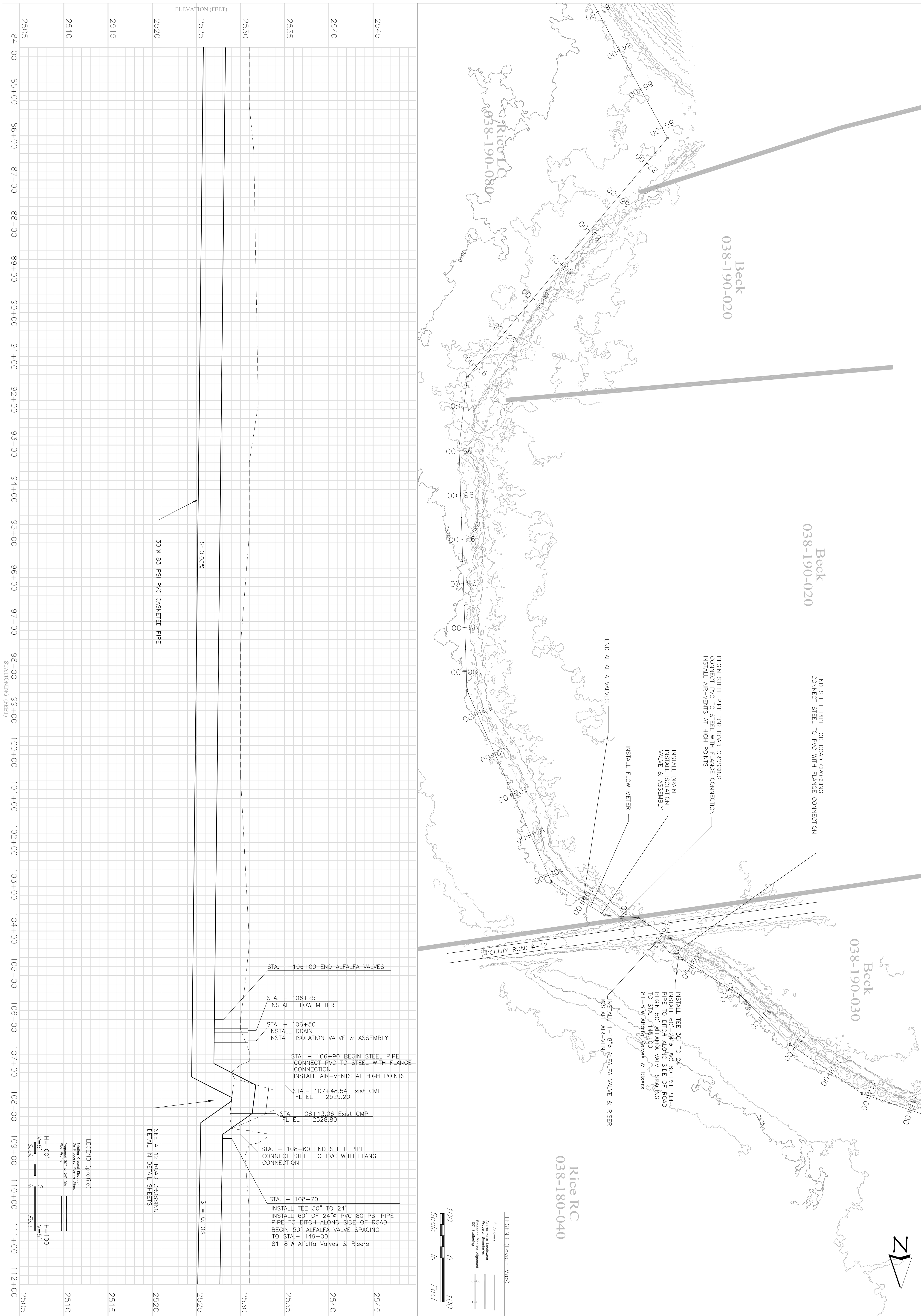
Approved		



DRAWING NUMBER
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United States Department of Agriculture

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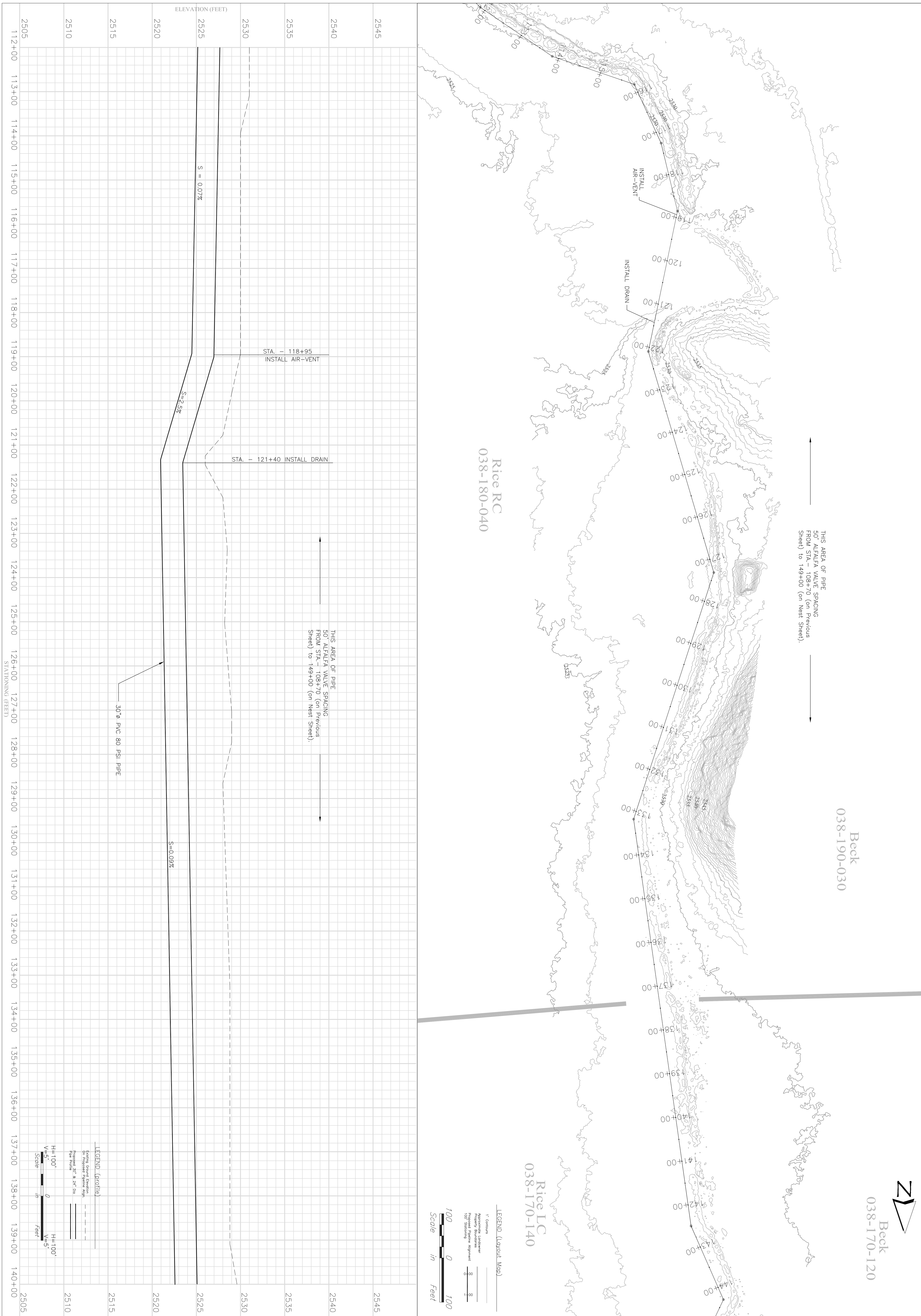
IRRIGATION WATER CONVEYANCE PIPELINE/SYSTEM
PLAN & PROFILE

ENG CLASS VI

HUSEMAN DITCH

GRENADA, SISKIYOU COUNTY, CALIFORNIA

		Date
Designed	TB, BBH	
Drawn	BBH	
Checked		
Approved		



Sheet 7 of 14

DRAWING NUMBER
HUSE_001

FILE NAME

NRCS
Natural Resources Conservation Service
United States Department of Agriculture

JOB CODE 430_EE

IRRIGATION WATER CONVEYANCE PIPELINE/SYSTEM ENG CLASS VI
PLAN & PROFILE

HUSEMAN DITCH

GRENADA, SISKIYOU COUNTY, CALIFORNIA

		Date
Designed	TB, BBH	
Drawn	BBH	
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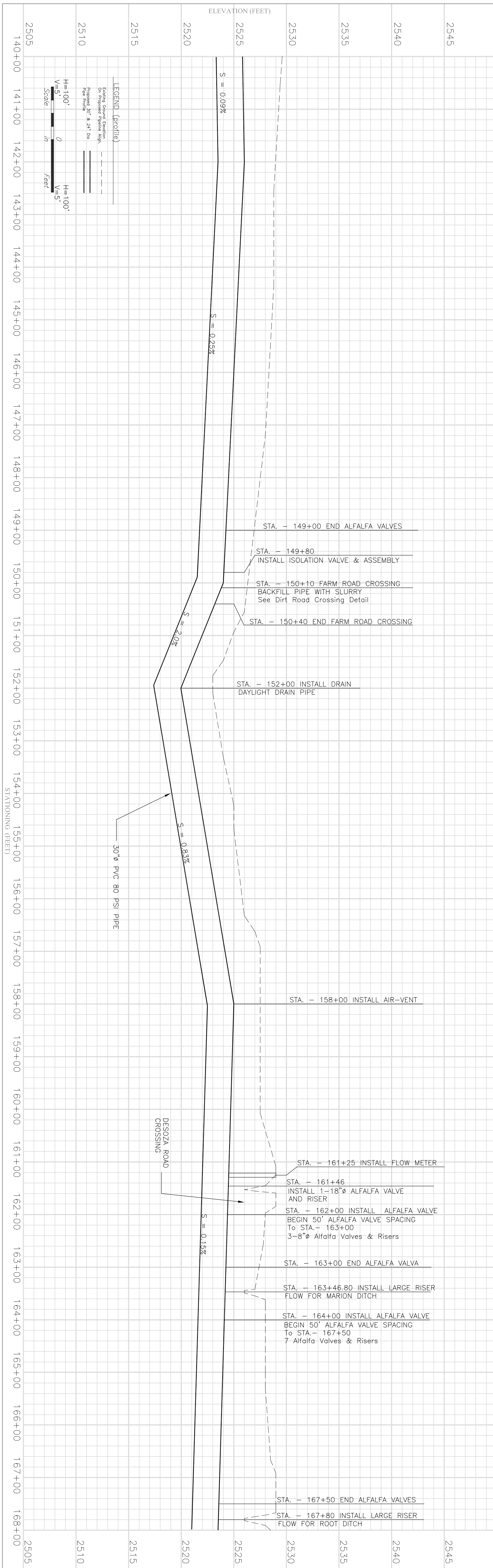
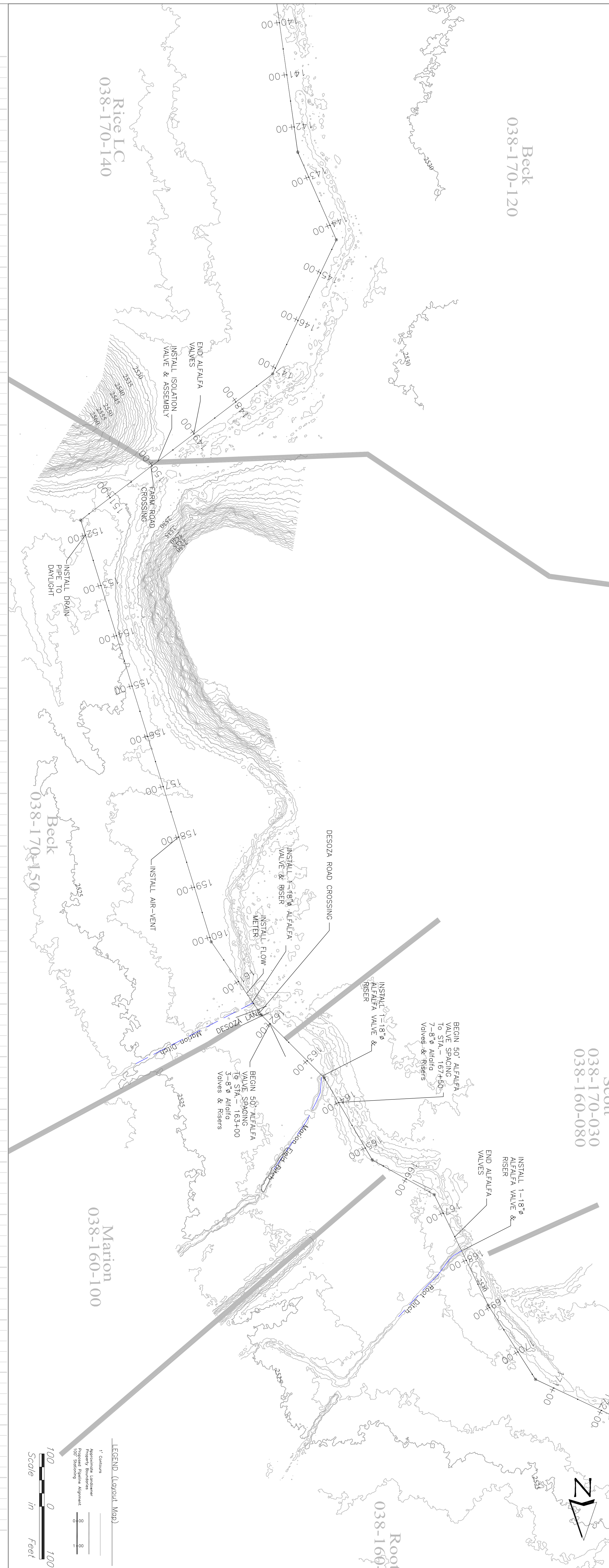
Approved		





JOB CODE 430_EE

IRRIGATION WATER CONVEYANCE PIPELINE/SYSTEM
PLAN & PROFILE

ENG CLASS VI

HUSEMAN DITCH

GRENADA, SISKIYOU COUNTY, CALIFORNIA

NRCS
Natural Resources Conservation Service
United States Department of Agriculture

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FILE NAME

DRAWING NUMBER HUSE_001

Sheet 8 of 14

FILE NAME

DRAWING NUMBER HUSE_001

Sheet 9 of 14

NRCS
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United States Department of Agriculture

JOB CODE 430_EE

IRRIGATION WATER CONVEYANCE PIPELINE/SYSTEM
PLAN & PROFILE

ENG CLASS VI

HUSEMAN DITCH

GRENADA, SISKIYOU COUNTY, CALIFORNIA

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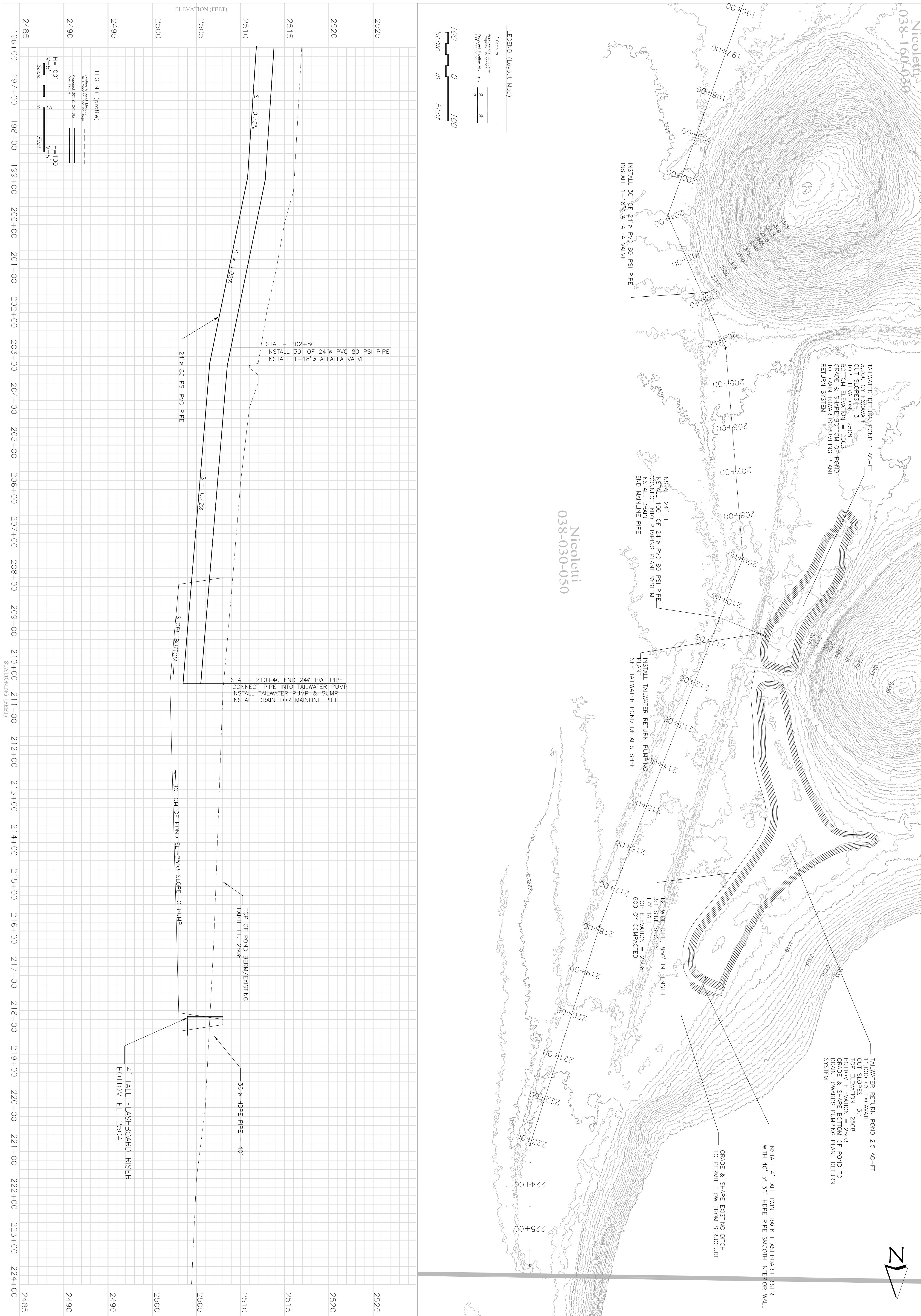

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IRRIGATION WATER CONVEYANCE PIPELINE/SYSTEM ENG CLASS VI

PLAN & PROFILE

HUSEMAN DITCH

GRENADA, SISKIYOU COUNTY, CALIFORNIA

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United States Department of Agriculture

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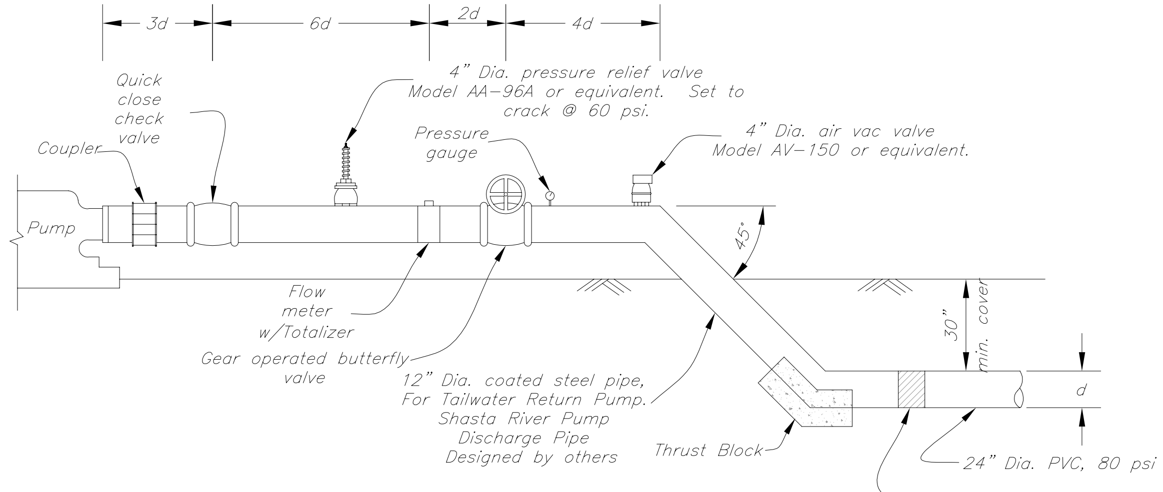


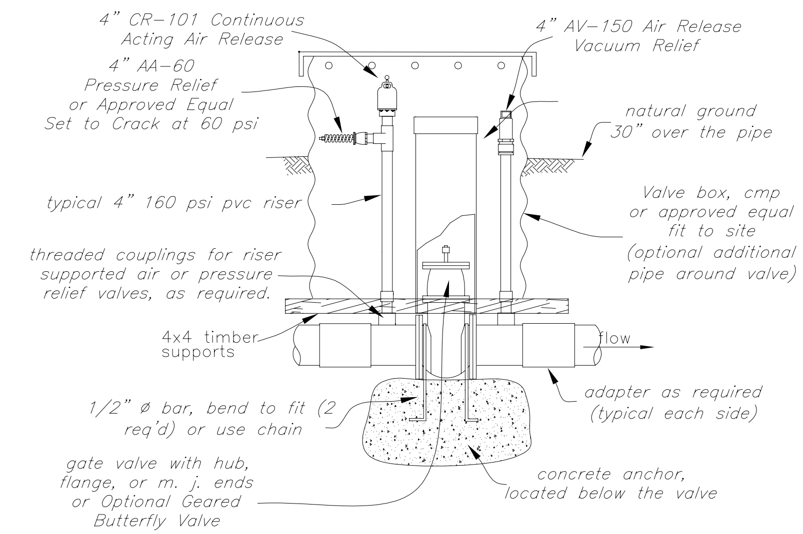
TYPICAL INDIVE DETAIL
TAILWATER RETURN SYSTEM

GENERAL PUMP & VALVE NOTES

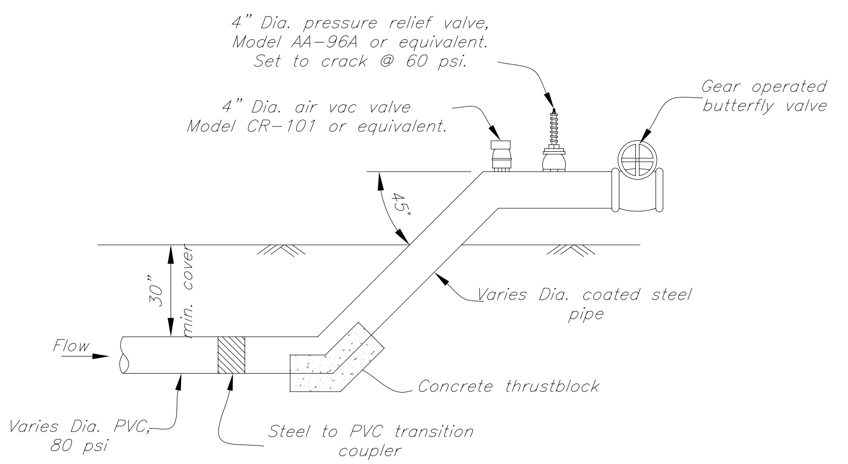
1. All materials necessary to connect butterfly/gate valve, air vents and pressure relief valve to the mainline shall be supplied as a part of the valve assembly.
2. Coat and wrap all buried metal parts.
3. All non-galvinized steel shall be painted with two coats of primer and one coat of aluminum paint or equivalant. (i.e. cold-tar)

To prevent possible damage by water hammer,observe the following precautions:

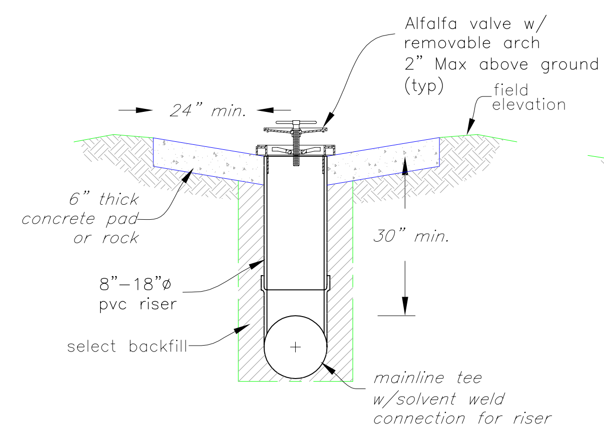
1. Fill pipeline slowly (1 ft/sec or slower) by slow pump speed or throttling with valve.
2. Insure that all air is purged from the system during filling.
3. Close valves slowly. Never less than 30 seconds.



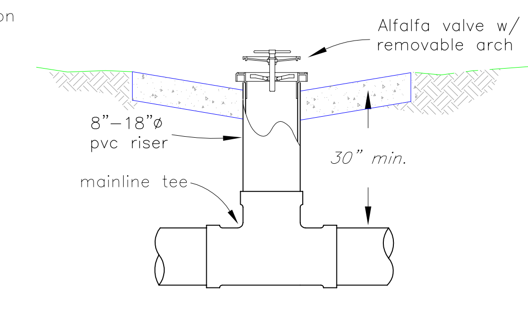
GATE VALVE ASSEMBLY



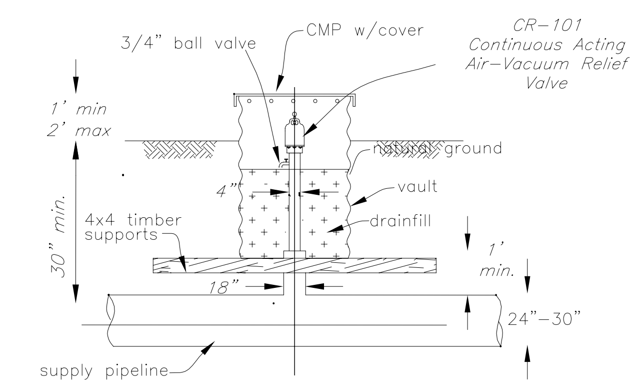
TYPICAL OUTDIVE DETAIL



ALFALFA VALVE DETAIL
Cross-section



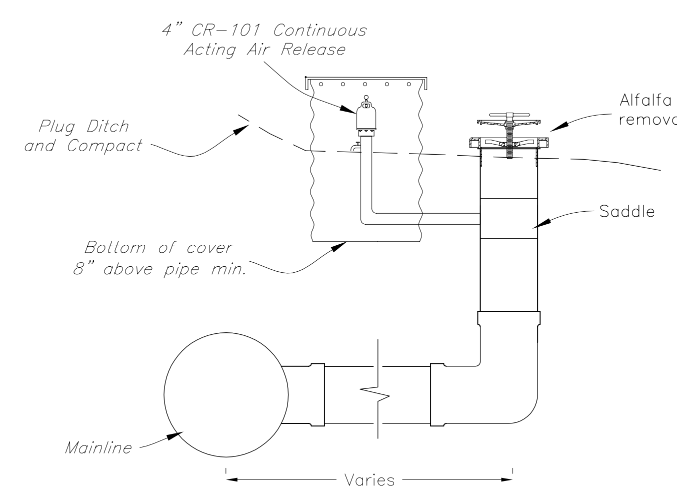
ALFALFA VALVE DETAIL
Profile



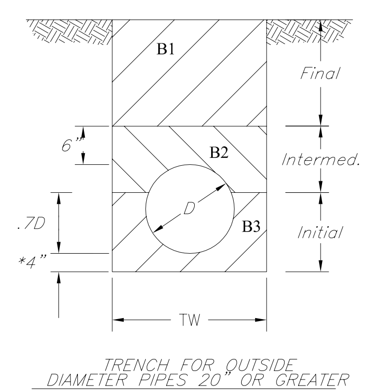
AIR-VACUUM VENT DETAIL

Air-Vacuum Release Valves & Pressure Relief Valves:

1. Valves may be connected to mainline by 18" saddle or a 30" tee w/ 18" solvent weld connection.
2. All vavles should be Waterman brand vales or approved equal.



ALFALFA VALVE DITCH OFFSET DETAIL



TRENCH FOR OUTSIDE DIAMETER PIPES 20" OR GREATER

TRENCH DETAILS

*See Trench Notes Below

TRENCH NOTES:

(*) IF NEEDED FOR ROCKY CONDITIONS

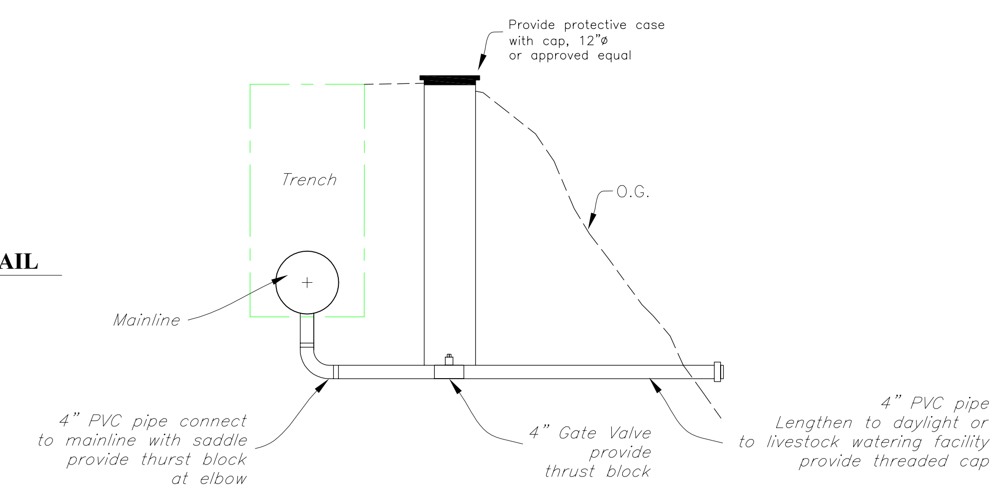
TW= Trench Width, See "Min/Max Trench Widths" Table below
B1= Final backfill and initial backfill for pipe sizes 18" or less Soil excavation from trench, compacted to same density as adjacent soil in trench banks.
B2= Intermediate backfill, soil material is sand, loamy sand, or sandy loam free from clods and rocks greater than 1" diameter
B3= Initial backfill, material soil types SW (well graded clean sand) or SP (poorly graded sand) with less than 12% passing 200 sieve.

MIN/MAX TRENCH WIDTHS FOR UNDERGROUND PLASTIC PIPELINES

Pipe Size (in)		Minimum Trench Width (in) Water Packed	Maximum Trench Width (in) Mechanical Compaction
18	26	36	42
24	32	42	46

MINIMUM DEPTH OF COVER

Pipe Diameter (inches)	Depth of cover (inches)
½ to 2	18
2-½ to 5	24
6 or greater	30



TYPICAL MAINLINE DRAIN & LIVESTOCK WATERING FACILITY SUPPLY DETAIL

NOTE:
1. If connection detail is to be used for livestock watering facility, a 2"ø supply line and 2" gate valve shall be used.

(Not to Scale)

JOB CODE 430_EE

IRRIGATION WATER CONVEYANCE PIPELINE/SYSTEM CLASS VI
CONVEYANCE PIPELINE DETAILS SHEET

HUSEMAN DITCH

GRENADA, SISKIYOU COUNTY, CALIFORNIA

		Date
Designed	TB, BBH	
Drawn	BBH	
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Natural Resources Conservation Service
United States Department of Agriculture

FILE NAME

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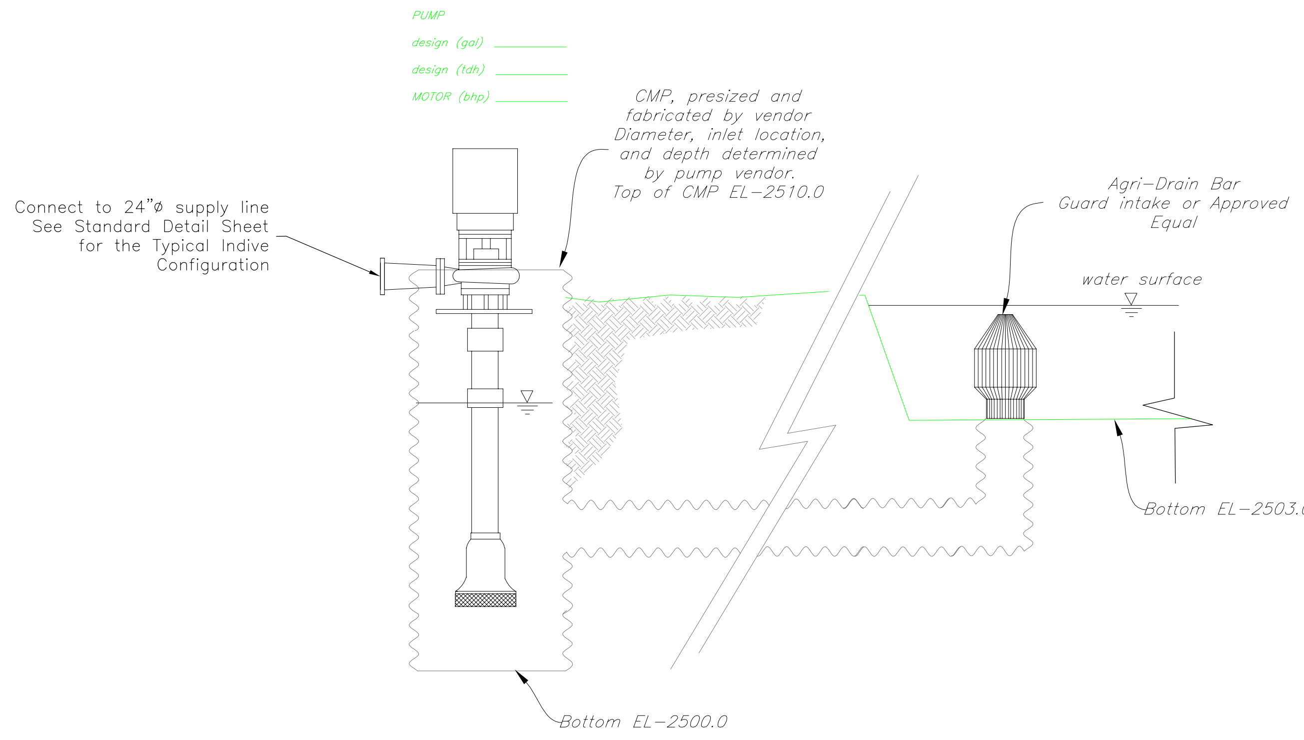
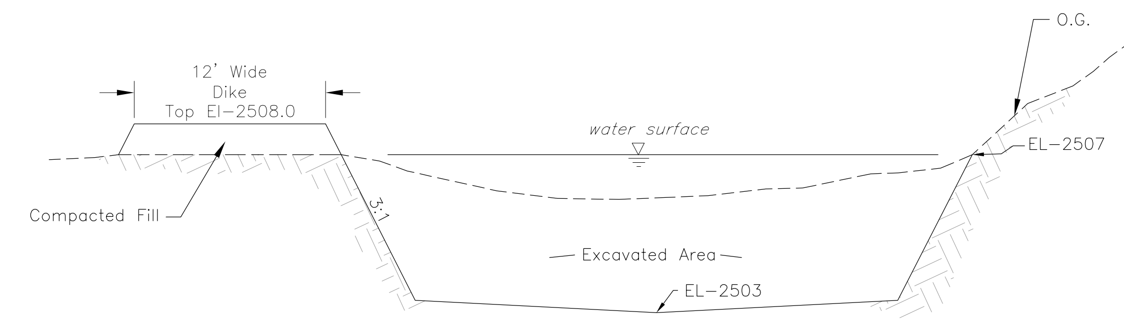
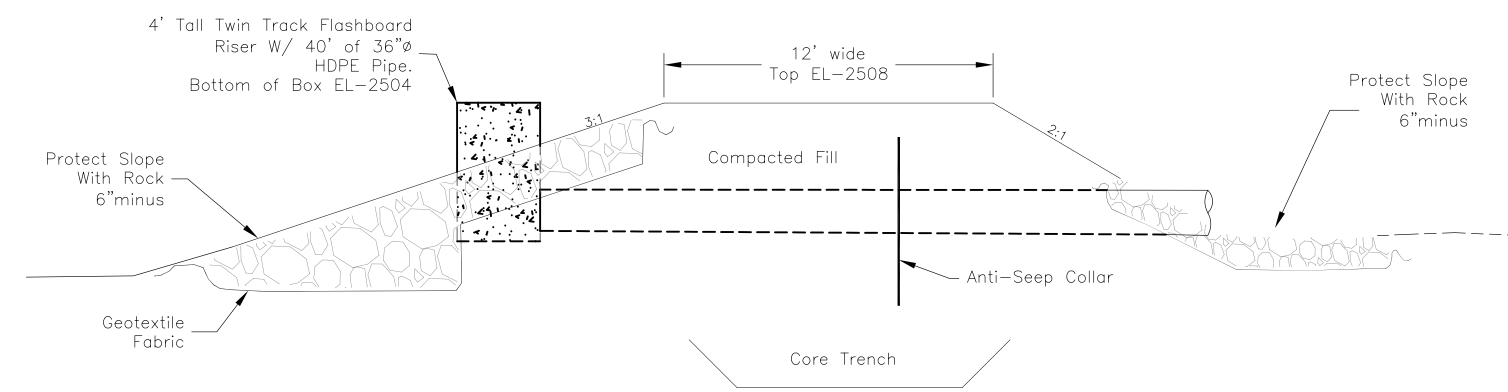


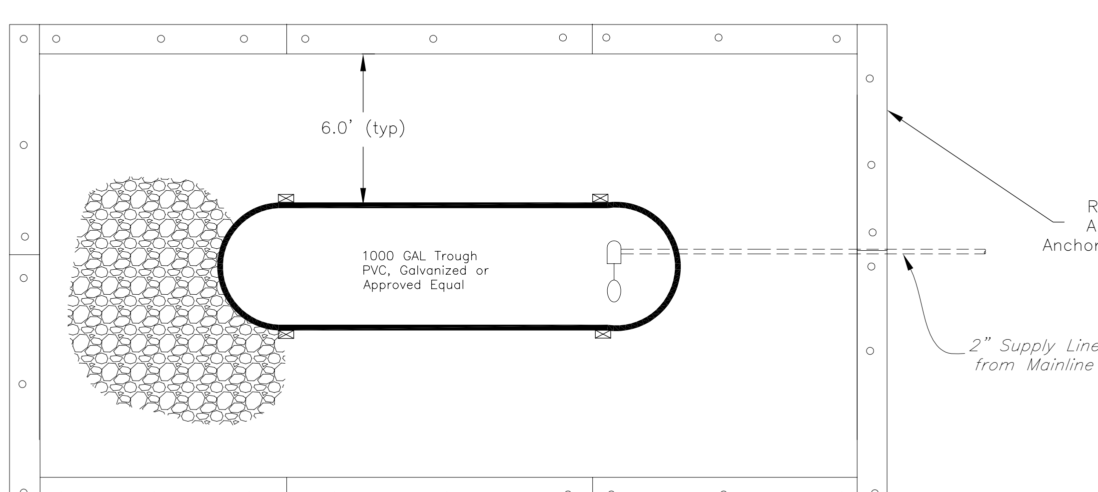
TAILWATER RETURN PUMP & INTAKE DETAIL



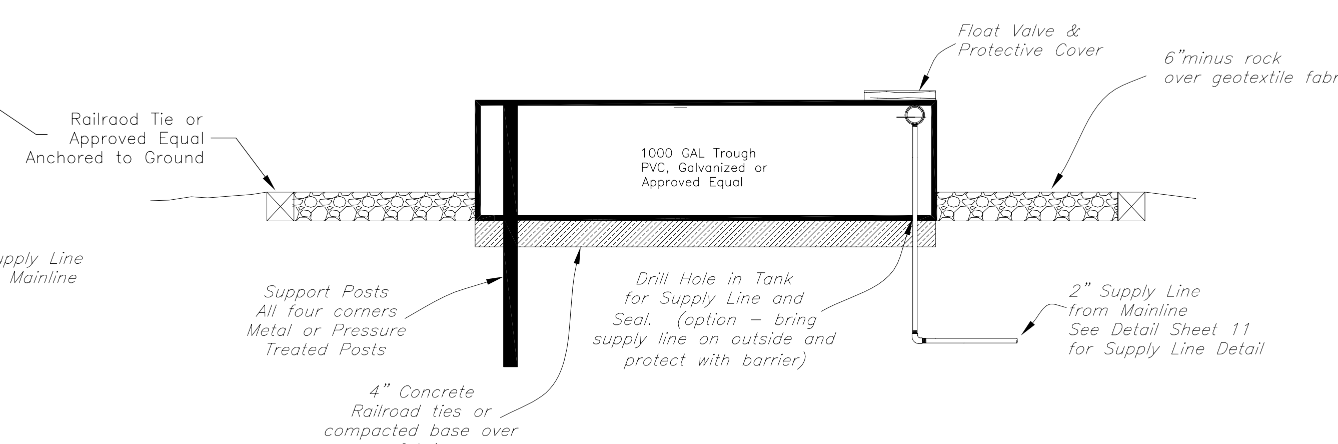
TAILWATER RETURN POND CROSS-SECTION



TAILWATER RETURN POND CROSS-SECTION



LIVESTOCK WATERING FACILITY DETAIL - PLAN VIEW



LIVESTOCK WATERING FACILITY DETAIL - PROFILE VIEW

(Not to Scale)

Designed	TB, BBH
Drawn	BBH
Checked	
Approved	

Date

ENG CLASS VI

IRRIGATION TAILWATER RETURN SYSTEM DETAILS
TAILWATER RETURN SYSTEM DETAILS

HUSEMAN DITCH

GRENADA, SISKIYOU COUNTY, CALIFORNIA

JOB CODE 430_EE

NRCS
Natural Resources Conservation Service
United States Department of Agriculture

FILE NAME

DRAWING NUMBER
HUSE_001

COUNTY ROAD A-12 CROSSING DETAIL

DETAILS TO BE COMPLETED

STREAM/DRAINAGE CROSSING DETAIL

PRIVATE ROADS CROSSING & DESOZA LANE CROSSING DETAIL

(Not to Scale)

JOB CODE 430_EE

IRRIGATION WATER CONVEYANCE PIPELINE/SYSTEM
CONVEYANCE PIPELINE ROAD CROSSING DETAILS SHEET

ENG CLASS VI

HUSEMAN DITCH

GRENADA, SISKIYOU COUNTY, CALIFORNIA

NRCS
Natural Resources Conservation Service
United States Department of Agriculture

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Drawn	BBH	
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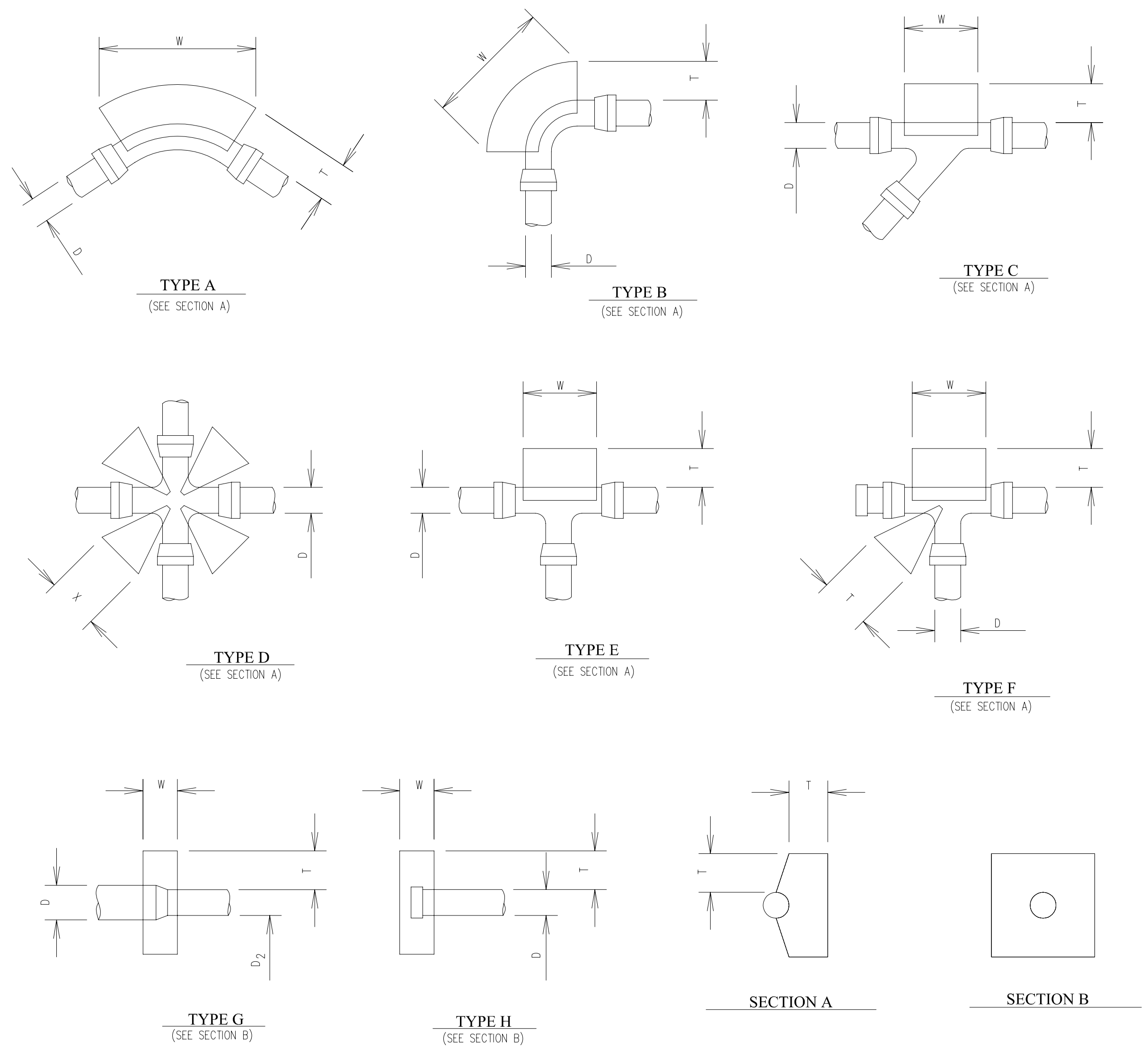
FILE NAME

DRAWING NUMBER
HUSE_001

Sheet 13 of 14



TYPE A (24" & 30" Pipe)	TYPE B, C, E, F (24" & 30" Pipe)	TYPE G & H (24" & 30" Pipe)
T = 8"	T = 8"	T = 1.0'
W = 2.5'	W = 4.0'	W = 2.0'

SECTION A (T) = 8"

GENERAL THRUST BLOCK NOTES

1. Anchors or thrust blocks shall be installed on pipelines having a working pressure of 25 psi or greater.

2. Anchors or thrust block shall be located at all abrut changes in pipeline grade, changes in horizontal alignment, reduction in pipe size, end of pipeline, and at all inline valves.

3. Thrust block shall be formed against a solid hand excavated earth trench wall. The blocks shall be constructed of concrete and the space between the pipe and trench wall shall be filled to a height of the outside diameter of pipe or as recommended by the pipe manufacturer.

4. The pipe manufacturer's recommendations for thrust control shall be followed. If the manufacturer does not provide recommendations the following formula should be used for the design of thrust blocks:

$$A = \frac{98\ H\ D^2}{B}\ \sin(a/2)$$

Where:

A = Area of thrust block required in ft²

H = Maximum working pressure in ft

D = Inside diameter of pipe in ft

B = Allowable passive pressure of the soil in lb/ft²

a = Deflection angle of pipe bend

Area of thrust block for dead ends and tees shall be 0.7 times the area of block required for a 90° deflection angle of pipe bend.

** Use a local soils manual or contact the Natural Resources Conservation Service in your area for the soils information.

The following soils information can be used to estimate the allowable bearing soil pressure -

Allowable Soil Bearing Pressure lb/ft²

Natural Soil Material	Depth of cover to center of thrust block 2 ft	3 ft	4 ft	5ft
Sound bedrock	8000	10000	10000	10000
Dense sand & gravel mixture (assumed 0 = 40°)	1200	1800	2400	3000
Dense fine to coarse sand (assumed 0 = 35°)	800	1200	1650	2100
Silt and clay mixture (assumed 0 = 25°)	500	700	950	1200
Soft clay & organic soils (assumed 0 = 10°)	200	300	400	500

(Not to Scale)

Designed TB, BBH
Drawn BBH
Checked
Approved
Date

ENG CLASS VI

IRRIGATION WATER CONVEYANCE PIPELINE/SYSTEM
THRUST BLOCK DETAILS SHEET

HUSEMAN DITCH

GRENADA, SISKIYOU COUNTY, CALIFORNIA

JOB CODE 430_EE

NRCS
Natural Resources Conservation Service
United States Department of Agriculture

FILE NAME

DRAWING NUMBER
HUSE_001

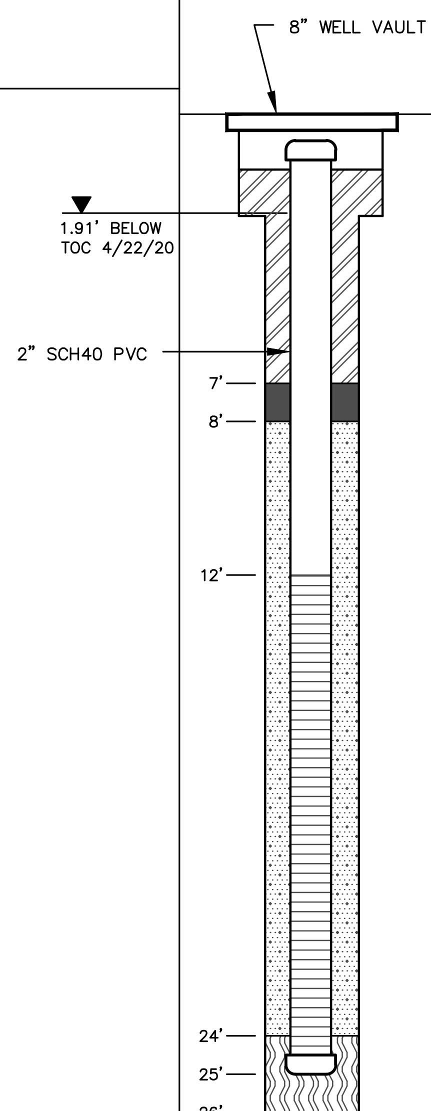
APPENDIX B – Piezometer Boring Logs

LAWRENCE & ASSOCIATES 3590 IRON COURT RD SHASTA LAKE, CA 96019	PHONE : (530) 275-4800 FAX : (530) 275-7970	PROJECT: **SHASTA VALLEY RCD**
		SHEET 1 OF 1
		WELL#: **P-1**
		JOB #: **020023.00**
		DATE: **4/21/2020**
FIELD LOCATION OF WELL	SEE ATTACHMENT A FOR WELL LOCATION	LOGGED BY: **D. KIRK** DRILLER: **L&A**
		TOP OF CAP ELEVATION: **2,520.85 FT MSL**
		EQUIPMENT AND SPECIFICATIONS: **BIG BEAVER ATV DRILL RIG WITH 6" HOLLOW STEM AUGERS**

DEPTH (FT)	SOIL GROUP USCS SYMBOL	LITHOLOGY PROFILE	DESCRIPTION
0'–16'	ML		SANDY SILT: VERY MOIST TO SATURATED AT 1' BGS, SOFT, MEDIUM BROWN (10YR 5/3), STIFFENS AT 16'.
16'–20'	CL		CLAY: STIFF, BLUE TO DARK GRAY (2.5YR 6/0).
20'–26'	GC		CLAYEY SMALL GRAVEL: DENSE, BROWN.

TOTAL DEPTH = 26 FEET

WELL CONSTRUCTION



WELL CONSTRUCTION SYMBOLS

- SCH. 40, 2-INCH PVC SCREEN, 10-SLOT (0.010-INCH SLOTS)
- #8 SAND
- CASING SEAL
- BENTONITE SEAL
- CAVED HOLE
- GWE
- GWE = GROUNDWATER ELEVATION
- TOC = TOP OF CASING

FIGURE 2

p:\020023.00_shasta_valley\piez_logs.dwg J.R.B. 5/20/2020

LAWRENCE & ASSOCIATES
3590 IRON COURT RD
SHASTA LAKE, CA 96019
PHONE : (530) 275-4800
FAX : (530) 275-7970

PROJECT: **SHASTA VALLEY RCD**

SHEET 1 OF 1

WELL#: **P-2**

JOB #: **020023.00**

DATE: **4/21/2020**

LOGGED BY: **D. KIRK** DRILLER: **L&A**

TOP OF CAP ELEVATION: **2,517.82 FT MSL**

EQUIPMENT AND SPECIFICATIONS:
BIG BEAVER ATV DRILL RIG WITH 6" HOLLOW STEM AUGERS

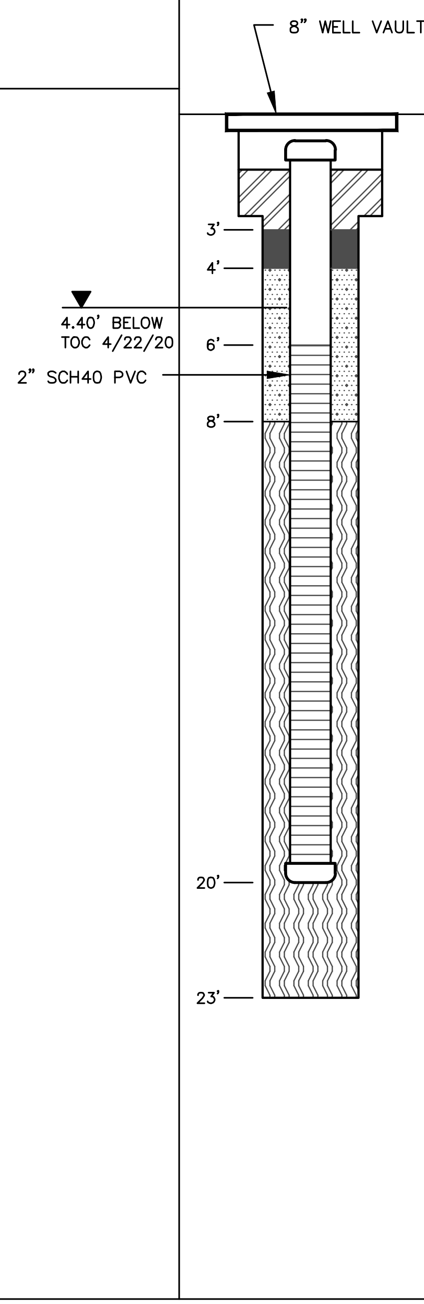
FIELD LOCATION OF WELL

SEE ATTACHMENT A FOR WELL LOCATION

DEPTH (FT)	SOIL GROUP USCS SYMBOL	LITHOLOGY PROFILE	DESCRIPTION
0'–13'	ML		SILT: SOFT, SLIGHTLY MOIST, VERY DARK GRAY (5YR 4/1).
13'–21'	GM		SILTY SMALL GRAVEL: LOOSE, SATURATED, DARK BROWN (10YR 3/3), WELL ROUNDED CLASTS.
21'–23'	GM		COARSE SAND & GRAVEL: VERY DENSE, SATURATED: PINKISH GRAY (7YR 6/2).

TOTAL DEPTH = 23 FEET

WELL CONSTRUCTION



WELL CONSTRUCTION SYMBOLS

- SCH. 40, 2-INCH PVC SCREEN, 10-SLOT (0.010-INCH SLOTS)
- #8 SAND
- CASING SEAL
- BENTONITE SEAL
- CAVED HOLE
- GWE
- GWE = GROUNDWATER ELEVATION
- TOC = TOP OF CASING

FIGURE 3

p: \020023.00_shasta_valley\piez_logs.dwg J.R.B. 5/20/2020

LAWRENCE & ASSOCIATES
3590 IRON COURT RD
SHASTA LAKE, CA 96019
PHONE : (530) 275-4800
FAX : (530) 275-7970

PROJECT: SHASTA VALLEY RCD	SHEET 1 OF 1
	WELL#: P-3
JOB #: 020023.00	DATE: 4/20/2020
LOGGED BY: D. KIRK	DRILLER: L&A
TOP OF CAP ELEVATION: 2,516.60 FT MSL	
EQUIPMENT AND SPECIFICATIONS: BIG BEAVER ATV DRILL RIG WITH 6" HOLLOW STEM AUGERS	

FIELD LOCATION OF WELL

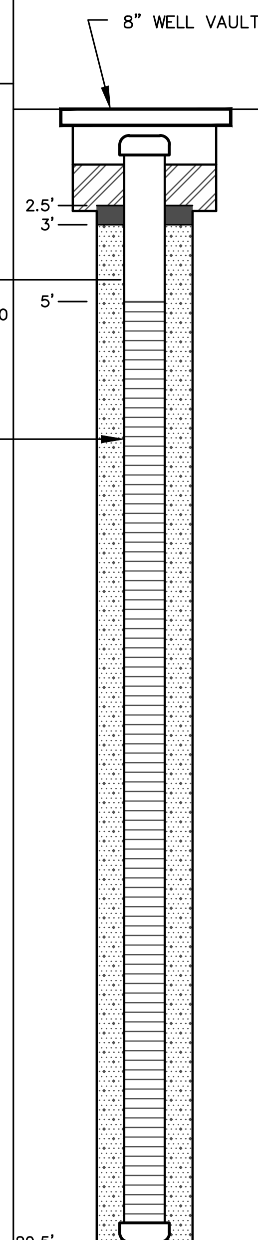
N

SEE ATTACHMENT A FOR WELL LOCATION

DEPTH (FT)	SOIL GROUP USCS SYMBOL	LITHOLOGY PROFILE	DESCRIPTION	
0–4.5	ML		0'–4.5'	SILT AND MINOR FINE SAND: SOFT, DRY, MEDIUM BROWN (10YR 5/3), SLIGHTLY MOIST AT 2'.
4.5–14.5	ML		4.5'–14.5'	SILT AND MINOR FINE SAND: WET/SATURATED: VERY DARK GRAY (2.5YR 3/0), NON-PLASTIC.
14.5–22	ML		14.5'–22'	SILT AND MINOR FINE GRAVEL: WET/SATURATED, VERY DARK GRAY (2.5YR 3/0), NON-PLASTIC, STIFFENS AT 22'.
22–29.5	GM		22'–29.5'	SILTY SMALL GRAVEL: SATURATED, GRAY (2.5YR 6/0), CLASTS ARE WELL ROUNDED AND SLIGHTLY SPHERICAL TO SPHERICAL.

TOTAL DEPTH = 29.5 FEET

WELL CONSTRUCTION



WELL CONSTRUCTION SYMBOLS

- SCH. 40, 2-INCH PVC SCREEN, 10-SLOT (0.010-INCH SLOTS)
- #8 SAND
- CASING SEAL
- BENTONITE SEAL
- CAVED HOLE
- GWE
- GWE = GROUNDWATER ELEVATION
- TOC = TOP OF CASING

FIGURE 4

p:\020023.00_shasta_valley\piez_logs.dwg J.R.B. 5/20/2020

LAWRENCE & ASSOCIATES
3590 IRON COURT RD
SHASTA LAKE, CA 96019
PHONE : (530) 275-4800
FAX : (530) 275-7970

PROJECT: SHASTA VALLEY RCD

SHEET 1 OF 1

WELL#: P-4

JOB #: 020023.00

DATE: 4/21/2020

LOGGED BY: D. KIRK

DRILLER: L&A

TOP OF CAP ELEVATION: 2,518.66 FT MSL

EQUIPMENT AND SPECIFICATIONS:
BIG BEAVER ATV DRILL RIG WITH 6" HOLLOW STEM AUGERS

FIELD LOCATION OF WELL

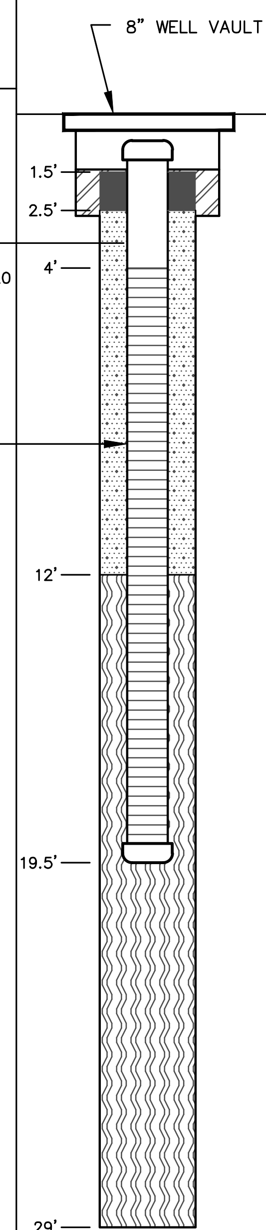
N

SEE ATTACHMENT A FOR WELL LOCATION

DEPTH (FT)	SOIL GROUP USCS SYMBOL	LITHOLOGY PROFILE	DESCRIPTION	
0–2	GM		0'–2'	ROAD BASE–ANGULAR GRAVEL
2–5	ML		2'–5'	SILT WITH MINOR CLAY: SOFT, SLIGHTLY MOIST TO VERY MOIST, REDDISH BROWN (5YR 4/2).
5–18	ML		5'–18'	SILT: VERY MOIST TO SATURATED AT 8', SOFT, REDDISH BROWN (5YR 5/3).
18–23	ML		18'–23'	18' DENSITY INCREASE, SOFT AT 23'
23–26	ML		23'–26'	SILT: SOFT, MOIST, MINOR ORGANIC (CARBON) STREAKS, DUSKY RED (2.5YR 3/2).
26–29	ML		26'–29'	GRAVELLY SILT

TOTAL DEPTH = 29 FEET

WELL CONSTRUCTION



WELL CONSTRUCTION SYMBOLS

- SCH. 40, 2-INCH PVC SCREEN, 10-SLOT (0.010-INCH SLOTS)
- #8 SAND
- CASING SEAL
- BENTONITE SEAL
- CAVED HOLE
- GWE
- GWE = GROUNDWATER ELEVATION
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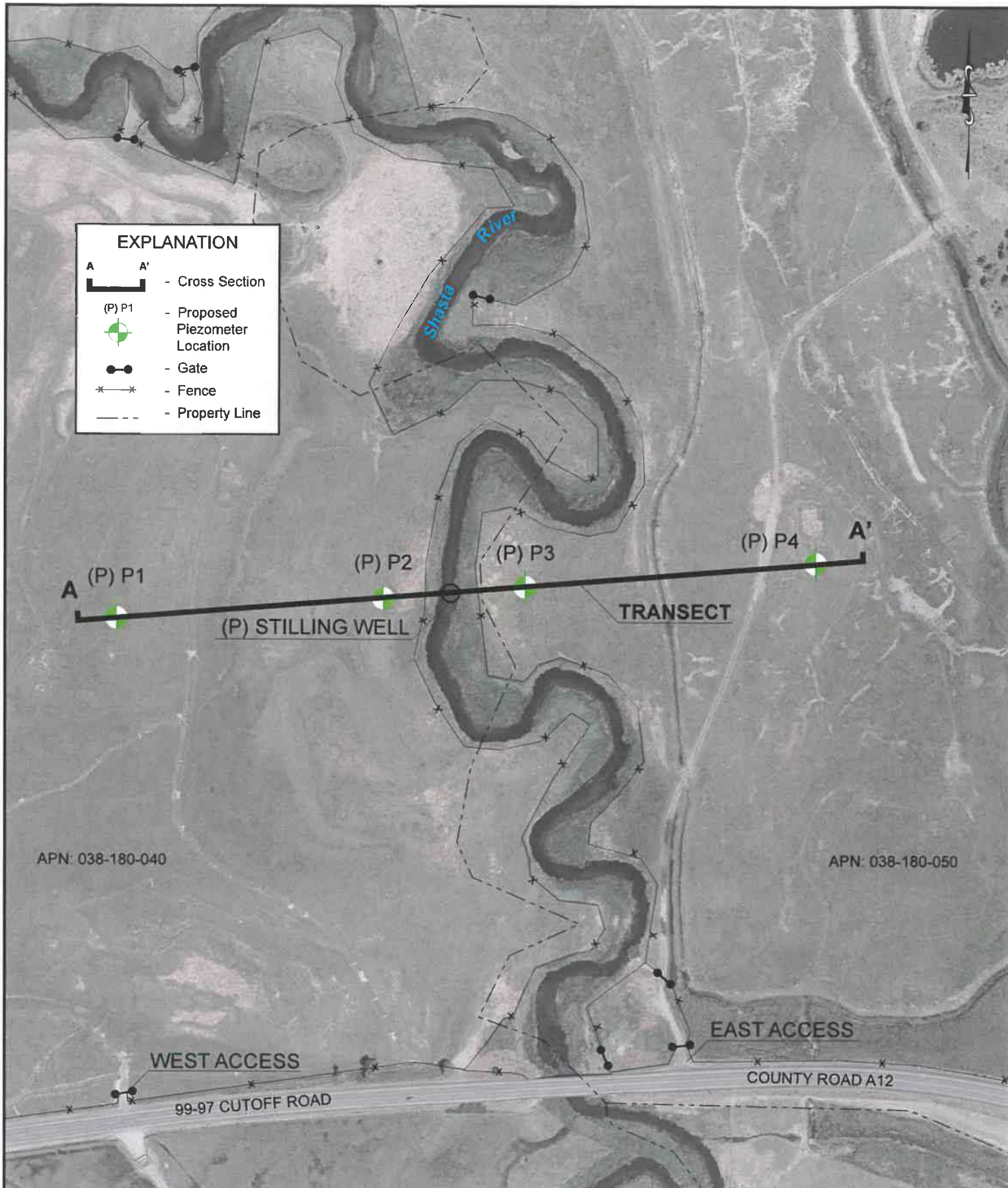
FIGURE 5

p:\020023.00_shasta_valley\piez_logs.dwg J.R.B. 5/20/2020



Note: This map is made to illustrate approximate location and relative positions of project features and is not intended for any other use.
Base: Google Earth Imagery; Image Date July 8, 2017; Image Accessed December 31, 2019

0 50 100 200 400 feet

RCD SHASTA VALLEY RESOURCE CONSERVATION DISTRICT

A12 SITE PLAN		
December 31, 2019	PROJECT: 18-PL01	
1 inch = 200 feet	DRAFTED BY: EB	EXHIBIT D

APPENDIX C – Tribal Correspondence

TEMPLATE TRIBAL NOTIFICATION EMAIL

SVRCD - Notification of Intention to Submit Project Proposal

Ethan Brown <ebrown@svrcd.org>

Tue 11/1/2022 1:26 PM

To: winnememwintutribe@gmail.com <winnememwintutribe@gmail.com>
Cc: Rod Dowse <rdowse@svrcd.org>;sherri@cieaweb.org <sherri@cieaweb.org>

4 attachments (540 KB)

IRWM Letter of Support Template.docx; IRWM Letter of Support Template.pdf; Project Area Map.pdf; Winnemem Wintu_Caleen Sisk_Pipeline.pdf;

Hello,

My request to the NAHC for updated Tribal contact info is being processed. If you are no longer the correct contact person, I would greatly appreciate if you could please forward to the appropriate person(s).

My name is Ethan Brown and I work for the Shasta Valley Resource Conservation District (SVRCD) in Siskiyou County. I'm reaching out to let you know about our anticipated proposal submission for the project titled: Irrigation Ditch Pipeline and Water Efficiency Improvement Project. This project proposal will be submitted through the North Coast Resource Partnership to the Department of Water Resources Prop 1 Round 2 Integrated Regional Water Management Grant Program.

The SVRCD values your input and would like to start a dialogue to better understand your perspective, historical knowledge, and look for ways to incorporate traditional cultural resource management practices into this project as well as future projects.

Attached is a brief letter describing the project and benefits, along with a map and, if you feel this project is of value and want to support and provide guidance to the SVRCD in its restoration and its salmonid recovery actions, a template letter of support is included for you to modify as you see fit.

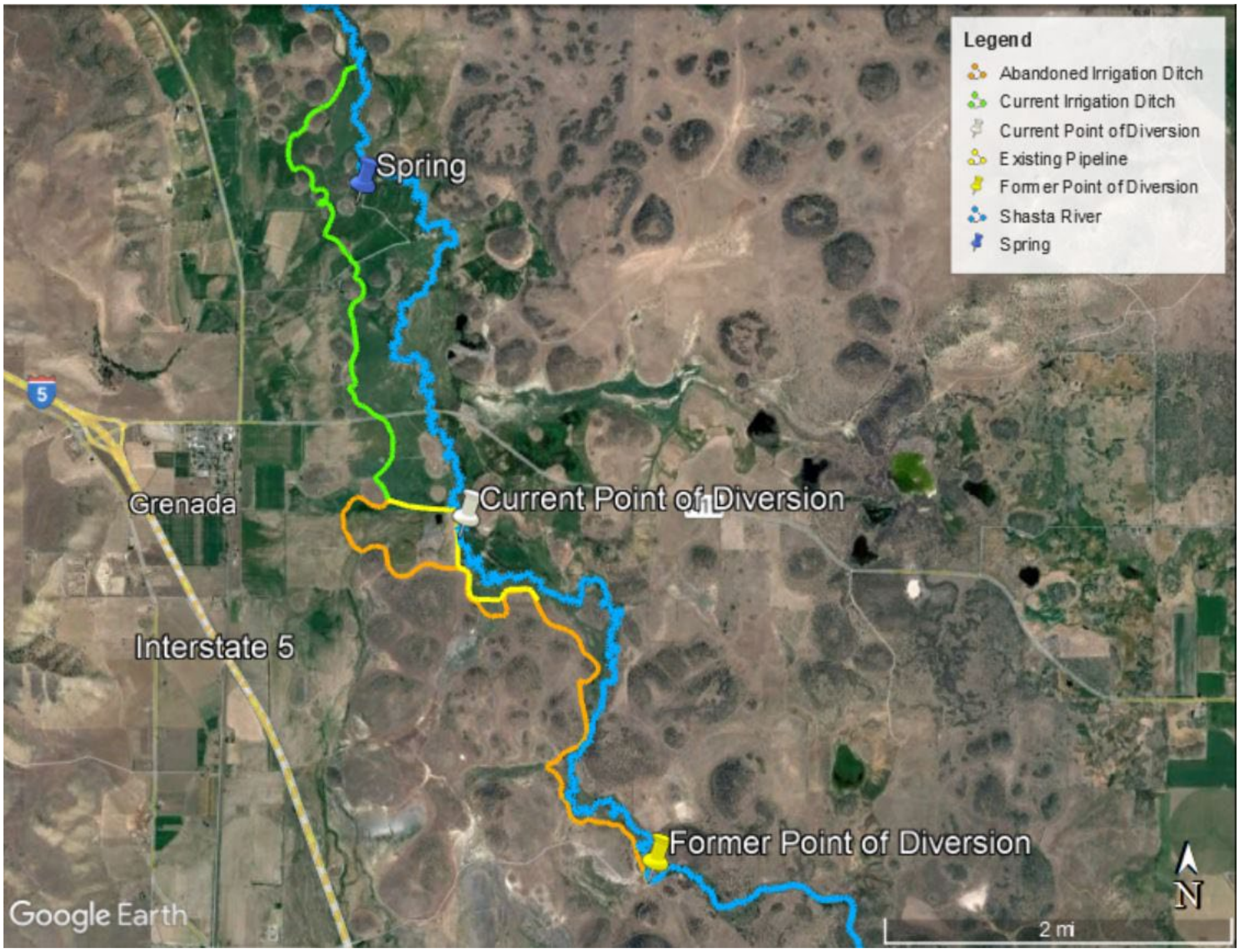
Of course, if you have any questions, comments, or would like to learn more about this project and the previously completed related work, we would be more than happy to set up a call or meeting. I can be reached on my cell phone at (530) 859-2077, or you can contact the SVRCD office at (530) 572-3120. We look forward to hearing from you.

Thank you for your time and consideration.

Respectfully,

Ethan Brown
Project Manager
Shasta Valley Resource Conservation District
530.572.3120

EXHIBIT A



Map of the Project Area for the Irrigation Ditch Piping and Water Efficiency Improvement Project

RCD
SHASTA VALLEY
RESOURCE CONSERVATION DISTRICT

TRIBAL NOTIFICATION - Attachment 2

215 Executive Court, Suite A, Yreka, CA 96097
(530) 572.3120
www.svrcd.org

October 31, 2022

MEMORANDUM TO: Karuk Tribe
Russell Atteberry, Chairperson

FROM: Ethan Brown, Project Manager of the Shasta Valley Resource Conservation District

SUBJECT: Notification of Project Submittal and Request for Letter of Support for *Irrigation Ditch Pipeline and Water Efficiency Improvement Project*, Siskiyou County

Dear Chairperson Atteberry,
The Shasta Valley Resource Conservation District (SVRCD) anticipates submitting a proposal through the North Coast Regional Partnership (NCRP) to the Department of Water Resources (DWR) Integrated Regional Water Management Prop 1 Round 2 funding program for an irrigation efficiency improvement project (Project). The Project seeks to improve Shasta River water quality, river function, and fish accessibility to critical salmonid spawning and juvenile rearing habitat by improving irrigation conveyance efficiency and leaving the conserved water (2.4 cubic ft./second) instream. This would be achieved by piping approximately 14,600 feet of open irrigation ditch and preventing any ditch leakage and improvement and dedication of water from a cold spring. The project would also fund soil moisture sensors which will further improve irrigation efficiency.

This Project leverages previous restoration efforts in 2013 by the California Department of Fish and Wildlife and the Wildlife Conservation Board which funded the removal of a seasonal-flashboard irrigation dam which was an impediment to fish passage. The project also relocated the point of diversion to its current location over four and a half miles downstream and abandoning several miles of open irrigation ditch. Doing so left approximately 18 cubic ft./second instream and greatly improves water quality and habitat throughout the reach. Attached is Exhibit A which shows a project map with key project features.

The SVRCD would like to hear your thoughts, questions, or concerns regarding this project and welcome the opportunity to learn about historical and cultural values and practices relevant to this area. If you feel this project is of value to the Karuk Tribe, please consider submitting a Letter of Support. We would appreciate a response, even if you have no comment, by November 30, 2022. You may respond verbally by phone (530-859-2077), by letter, or by email (ebrown@svrcd.org). Thank you.

Sincerely,

Ethan Brown

Enclosures: Map and Letter of Support Template

Your Letterhead Here

TRIBAL NOTIFICATION - Attachment 3 (.docx), and 4 (.pdf)

Name and Title
Affiliation
Address
Phone
Email

North Coast Resource Partnership
c/o: Katherine Gledhill
West Coast Watershed, Inc.
PO Box 262
Healdsburg, CA 95448
kgledhill@westcoastwatershed.com

Current Date,

RE: Shasta Valley RCD's proposal for the *Irrigation Ditch Pipeline and Water Efficiency Improvement Project*, Siskiyou County

To Ms. Gledhill and NCRP Technical Peer Review Committee,

My name is (Replace text with your name and/or affiliation) and I am writing in support of the Shasta Valley Resource Conservation District and their proposal to the Prop 1 Round 2 IRWM Implementation Grant Program for the Irrigation Ditch Pipeline and Water Efficiency Improvement Project located near Grenada, CA in central Siskiyou County.

This project leverages extensive previous restoration efforts to remove an impediment to fish passage, improve access to critical spawning and juvenile rearing habitat, and improve water quality and river function for an additional four and a half miles of the Shasta River. This reach is critical habitat for coho and Chinook because of the cold water from the Big Springs Complex. Implementation of this project would help push this cold water even farther downstream, expanding important thermal refugia and quality habitat. Implementation of this project also allows for additional water quality improvement projects. Through the use of soil moisture sensors, irrigation can be more precise and has the potential to use less water overall, as well as reduce tailwater which can contribute to low levels of dissolved oxygen and increase temperature.

The Shasta River Watershed has experienced extreme drought conditions and projects that improve irrigation practices are of the utmost importance during these critical times. The SVRCD has completed projects of similar size and scope, and has a history of working closely with stakeholders and achieving project success. (I/We/The) fully support the SVRCD and their effort and recommend this proposal be considered for funding.

Sincerely,

(Signature)
(Printed Name)

WINTU TRIBE OF NORTHERN CALIFORNIA - RESPONSE

Re:

Arthur Garcia <artgarciawintu@gmail.com>
Wed 11/2/2022 6:09 PM
To: Ethan Brown <ebrown@svrcd.org>

Thank you, I will let you know.

On Wed, Nov 2, 2022, 5:57 PM Ethan Brown <ebrown@svrcd.org> wrote:

> Thank you, Arthur.
>
> I completely understand the sentiment.
>
> Did you want to set up a meeting/call to discuss the project proposal? Or plan for a more general discussion when you have more time in your schedule? I, or other staff at the SVRCD, can be fairly flexible for what works best for you.
>
> As a side note, our district also covers the Upper Sacramento and McCloud watersheds. It would be great to hear about the focus of your work. The bulk of our work takes place on working lands within the Shasta River watershed, but we are always looking for ways to expand into the other parts of our district.
>
> Either way, I will update our contact information accordingly and thank you for getting back to me.
>
> Best,
>
> Ethan Brown
> Project Manager
> *Shasta Valley Resource Conservation District*
> 530.572.3120
>
> ---
>
> **From:** Arthur Garcia <artgarciawintu@gmail.com>
> **Sent:** Wednesday, November 2, 2022 5:26 PM
> **To:** Ethan Brown <ebrown@svrcd.org>
> **Subject:**
>
> My name is Arthur Garcia I am the cultural resource manager for the Northern California wintu tribe I am sending a contact number 530-605-9526 been pretty busy on this other project not trying to ignore anyone but I am the new cultural resource manager it is no longer Kelly Hayward.

SHASTA INDIAN NATION - RESPONSE

Re: SVRCD - Notification of Intention to Submit Project Proposal

sami difuntorum <samijodif@yahoo.com>
Tue 11/1/2022 1:44 PM
To: Ethan Brown <ebrown@svrcd.org>
Cc: Rod Dowse <rdowse@svrcd.org>;sherri@cieaweb.org <sherri@cieaweb.org>

I am the correct contact for the Shasta Indian Nation.

Thank you,
Sami Jo Difuntorum

Sent from Yahoo Mail on Android

On Tue, Nov 1, 2022 at 4:22 PM, Ethan Brown
<ebrown@svrcd.org> wrote:

> Hello,
>
> My request to the NAHC for updated Tribal contact info is being processed, so if you are no longer the correct contact person, I would appreciate if you could please forward to the appropriate person(s).
>
> My name is Ethan Brown and I work for the Shasta Valley Resource Conservation District (SVRCD) in Siskiyou County. I'm reaching out to let you know about our anticipated proposal submission for the project titled: Irrigation Ditch Pipeline and Water Efficiency Improvement Project. This project proposal will be submitted through the North Coast Resource Partnership to the Department of Water Resources Prop 1 Round 2 Integrated Regional Water Management Grant Program.
>
> The SVRCD values your input and would like to start a dialogue to better understand your perspective, historical knowledge, and look for ways to incorporate traditional cultural resource management practices into this project as well as future projects.
>
> Attached is a brief letter describing the project and benefits, along with a map and, if you feel this project is of value and want to support and provide guidance to the SVRCD in its restoration and its salmonid recovery actions, a template letter of support is included for you to modify as you see fit.
>
> Of course, if you have any questions, comments, or would like to learn more about this project and the previously completed related work, we would be more than happy to set up a call or meeting. I can be reached on my cell phone at (530) 859-2077, or you can contact the SVRCD office at (530) 572-3120. We look forward to hearing from you.
>
> Respectfully,
>
> Ethan Brown
> Project Manager
> *Shasta Valley Resource Conservation District*
> 530.572.3120

[illegible]

[illegible]

[illegible]

[illegible] Ken Sandusky called SVRCD staff and left a voicemail identifying himself as the Manager of Modoc Nation properties in Modoc and Siskiyou Counties.

On 11/3/2022, Mr. Brown returned the phone call and left a voicemail stating that the SVRCD intends to submit a proposal to the IRWM Round 2 funding opportunity, and would like to start a conversation to discuss the details of that project, send materials, and discuss generally the priorities of the Modoc Nation.

The two have yet to verbally connect, but anticipate doing so in the near future.

APPENDIX D – Priority Actions from Recovery Plans

Table 37-7. Recovery action implementation schedule for the Shasta River population. Recovery actions for monitoring and research are listed in tables at the end of Chapter 5.

Action ID	Target	KLS/T	Strategy	Action Description	Area	Priority
Step ID	*Step Description*					
SONCC-ShaR.3.1.1	Hydrology	Yes	Improve flow timing or volume	Increase instream flows	Population wide, including upstream from Dwinnell Dam	1
SONCC-ShaR.3.1.1.1	*Identify, map, and quantify all surface water diversions*					
SONCC-ShaR.3.1.1.2	*Assess water diversions, prioritize, and adjust management to benefit life history requirements of coho, attaining at least a 55 cfs target summer base flow, or baseflow sufficient for recovery of all affected life stages of coho salmon, at the DWR Montague water gage*					
SONCC-ShaR.3.1.1.3	*Secure dedicated unused water diversion rights*					
SONCC-ShaR.3.1.1.4	*Verify permitted water diversions*					
SONCC-ShaR.3.1.1.5	*Establish a water trust to sustain and re-establish flow connectivity*					
SONCC-ShaR.3.1.1.6	*Use real time flow, precipitation, snowpack, groundwater, and climate information to guide Water Trust work to augment surface flows at priority locations for coho, via water leases and dedications*					
SONCC-ShaR.10.1.18	Water Quality	Yes	Reduce water temperature, increase dissolved oxygen	Increase cold water	Big Springs Lake Dam, Parks Creek, Kettle Springs, Bridge Field Springs Complex, Little Shasta River, and the upper Shasta River	1
SONCC-ShaR.10.1.18.1	*Evaluate quantity and quality of refugia habitat*					
SONCC-ShaR.10.1.18.2	*Conduct water rights assessment at spring complexes*					
SONCC-ShaR.10.1.18.3	*Dedicate cold water*					
SONCC-ShaR.10.1.19	Water Quality	Yes	Reduce water temperature, increase dissolved oxygen	Increase cold water	Dwinnell Dam, mainstem Shasta River and its downstream tributaries and springs, and upstream from Dwinnell Dam	1
SONCC-ShaR.10.1.19.1	*Investigate feasibility of changing drawdown location on Dwinnell Dam to maximize cold water and dissolved oxygen*					
SONCC-ShaR.10.1.19.2	*Investigate alternative sources of cold water (e.g., springs) for instream flow dedication, evaluate feasibility, and then dedicate cold water to provide instream flow benefits, guided by evaluation*					

Action ID	Target	KLS/T	Strategy	Action Description	Area	Priority
Step ID		*Step Description*				
SONCC-ShaR.10.1.16	Water Quality	Yes	Reduce water temperature, increase dissolved oxygen	Increase flow	Population wide, especially Big Springs Lake, Parks Creek, Kettle Springs, Bridge Field Springs Complex, and the upper Shasta River	1
SONCC-ShaR.10.1.16.1		*Conduct flow studies at key sites in priority watersheds to determine necessary minimum instream flows that will ensure survival and recovery of all relevant coho salmon life stages*				
SONCC-ShaR.10.1.16.2		*Implement plan to increase minimum instream flows in priority watersheds, using flow study information to guide priority flow augmentation projects*				
SONCC-ShaR.1.2.48	Estuary	No	Improve estuarine habitat	Improve estuary condition	Klamath River Estuary	1
SONCC-ShaR.1.2.48.1		*Implement recovery actions for Lower Klamath River population that address the target "Estuary", including the creation/restoration of off-channel rearing habitat throughout the lower Klamath River*				
SONCC-ShaR.30.1.70	Disease, Predation, Competition	No	Reduce disease	Disrupt the disease cycle between salmon, myxospore, polychaetes, and actinospore stages.	Population wide	1
SONCC-ShaR.30.1.70.1		*Assess all means possible to disrupt disease cycle and develop a plan to do so*				
SONCC-ShaR.30.1.70.2		*Disrupt the disease cycle, guided by assessment results*				
SONCC-ShaR.12.1.22	Agricultural Practices	Yes	Improve agricultural practices	Improve grazing practices	All areas where coho salmon would benefit immediately	2a
SONCC-ShaR.12.1.22.1		*Assess grazing impact on sediment delivery and riparian condition, identifying opportunities for improvement*				
SONCC-ShaR.12.1.22.2		*Develop grazing management plans to improve water quality and coho salmon habitat*				
SONCC-ShaR.12.1.22.3		*Plant vegetation to stabilize stream bank*				
SONCC-ShaR.12.1.22.4		*Maintain fencing or fence livestock out of riparian zones*				
SONCC-ShaR.12.1.22.5		*Remove livestock watering sources away from riparian areas, including springs*				
SONCC-ShaR.12.1.74	Agricultural Practices	Yes	Improve agricultural practices	Improve grazing practices	Population wide	2b
SONCC-ShaR.12.1.74.1		*Assess grazing impact on sediment delivery and riparian condition, identifying opportunities for improvement*				
SONCC-ShaR.12.1.74.2		*Develop grazing management plans to improve water quality and coho salmon habitat*				
SONCC-ShaR.12.1.74.3		*Plant vegetation to stabilize stream bank*				
SONCC-ShaR.12.1.74.4		*Maintain fencing or fence livestock out of riparian zones*				
SONCC-ShaR.12.1.74.5		*Remove livestock watering sources away from riparian areas, including springs*				

Action ID	Target	KLS/T	Strategy	Action Description	Area	Priority
Step ID	*Step Description*					
SONCC-ShaR.3.1.4	Hydrology	Yes	Improve flow timing or volume	Increase instream flows	GID Ditch diversion, Dwinnell Dam diversion	2a
SONCC-ShaR.3.1.4.1	*Reduce impacts to coho salmon from the GID ditch diversion*					
SONCC-ShaR.3.1.4.2	*Assess the effects of relocating or redesigning the diversion point to Dwinnell Dam Reservoir to decrease the impacts to coho salmon*					
SONCC-ShaR.3.1.4.3	*Relocate or redesign the diversion structure to Dwinnell Dam Reservoir guided by assessment results*					
SONCC-ShaR.3.1.4.4	*Improve infrastructure at the Parks Creek "cross canal" diversion, to both increase bypass flows for downstream fishes and to eliminate fish impingement/entrainment*					
SONCC-ShaR.10.1.20	Water Quality	Yes	Reduce water temperature, increase dissolved oxygen	Reduce warm water inputs	Bridge Field Springs Complex, Kettle Springs, Upper Shasta River, and Parks Creek	2a
SONCC-ShaR.10.1.20.1	*Develop a program that identifies, designs, and constructs projects that will reduce warm tailwater input to streams*					
SONCC-ShaR.10.1.20.2	*Implement tailwater reduction program*					
SONCC-ShaR.3.1.66	Hydrology	No	Improve flow timing or volume	Increase instream flows	All areas where coho salmon would benefit immediately	2a
SONCC-ShaR.3.1.66.1	*Identify and cease unauthorized water diversions*					
SONCC-ShaR.3.1.68	Hydrology	No	Improve flow timing or volume	Increase instream flows	All areas where coho salmon would benefit immediately	2a
SONCC-ShaR.3.1.68.1	*Identify diversions in tributaries that have subsurface or low flow barrier conditions during the summer*					
SONCC-ShaR.3.1.68.2	*Reduce diversions using a combination of incentives and enforcement measures*					
SONCC-ShaR.3.1.80	Hydrology	No	Improve flow timing or volume	Increase instream flows	Population wide	2b
SONCC-ShaR.3.1.80.1	*Identify and cease unauthorized water diversions*					
SONCC-ShaR.3.1.81	Hydrology	No	Improve flow timing or volume	Increase instream flows	Population wide	2b
SONCC-ShaR.3.1.81.1	*Identify diversions in tributaries that have subsurface or low flow barrier conditions during the summer*					
SONCC-ShaR.3.1.81.2	*Reduce diversions using a combination of incentives and enforcement measures*					
SONCC-ShaR.3.1.69	Hydrology	No	Improve flow timing or volume	Provide adequate instream flow for coho salmon	Population wide	2a
SONCC-ShaR.3.1.69.1	*Conduct study to determine instream flow needs of coho salmon at all life stages.*					
SONCC-ShaR.3.1.69.2	*If coho salmon instream flow needs are not being met, develop plan to provide adequate flows. Plan may include water conservation incentives for landowners and re-assessment of water allocation.*					
SONCC-ShaR.3.1.69.3	*Implement coho salmon instream flow needs plan.*					

Action ID	Target	KLS/T	Strategy	Action Description	Area	Priority
Step ID	*Step Description*					
SONCC-ShaR.3.1.6	Hydrology	Yes	Improve flow timing or volume	Improve irrigation practices	All areas where coho salmon would benefit immediately	2b
SONCC-ShaR.3.1.6.1	*Apply a variety of techniques (e.g., Farm Irrigation Rating Index Model) to make irrigation system water use efficiency comparisons, and implement efficiency improvements*					
SONCC-ShaR.3.1.6.2	*Implement improved irrigation techniques and monitor associated flow and water quality enhancements*					
SONCC-ShaR.3.1.6.3	*Design an irrigation schedule to maximize cold water influence/extension from Clear Springs and other cold water sources*					
SONCC-ShaR.3.1.79	Hydrology	Yes	Improve flow timing or volume	Improve irrigation practices	Population wide	2c
SONCC-ShaR.3.1.79.1	*Apply a variety of techniques (e.g., Farm Irrigation Rating Index Model) to make irrigation system water use efficiency comparisons, and implement efficiency improvements*					
SONCC-ShaR.3.1.79.2	*Implement improved irrigation techniques and monitor associated flow and water quality enhancements*					
SONCC-ShaR.3.1.79.3	*Design an irrigation schedule to maximize cold water influence/extension from Clear Springs and other cold water sources*					
SONCC-ShaR.3.1.5	Hydrology	Yes	Improve flow timing or volume	Improve water management techniques	All areas where coho salmon would benefit immediately	2b
SONCC-ShaR.3.1.5.1	*Develop integrated water management plan and water budget, including groundwater surface flow dynamics, and drought year emergency contingencies*					
SONCC-ShaR.3.1.5.2	*Improve water use efficiency through the investigation and implementation of alternative agricultural crops and practices (e.g., grass fed beef, winter wheat, alternative pasture crops)*					
SONCC-ShaR.3.1.5.3	*Upgrade and expand alternative off-channel stock watering systems to increase instream flows*					
SONCC-ShaR.3.1.5.4	*Develop and disseminate an on-farm water use efficiency monitoring system*					
SONCC-ShaR.3.1.5.5	*If current water use/management is determined to be inconsistent with coho salmon recovery, modify management accordingly*					
SONCC-ShaR.3.1.78	Hydrology	Yes	Improve flow timing or volume	Improve water management techniques	Population wide	2c
SONCC-ShaR.3.1.78.1	*Develop integrated water management plan and water budget, including groundwater surface flow dynamics, and drought year emergency contingencies*					
SONCC-ShaR.3.1.78.2	*Improve water use efficiency through the investigation and implementation of alternative agricultural crops and practices (e.g., grass fed beef, winter wheat, alternative pasture crops)*					
SONCC-ShaR.3.1.78.3	*Upgrade and expand alternative off-channel stock watering systems to increase instream flows*					
SONCC-ShaR.3.1.78.4	*Develop and disseminate an on-farm water use efficiency monitoring system*					
SONCC-ShaR.3.1.78.5	*If current water use/management is determined to be inconsistent with coho salmon recovery, modify management accordingly*					
SONCC-ShaR.3.1.7	Hydrology	Yes	Improve flow timing or volume	Increase instream flows	Yreka Creek, Little Shasta River, Parks Creek, upstream from Dwinnell Dam, and all streams where coho salmon would benefit immediately	2b
SONCC-ShaR.3.1.7.1	*Develop plans to detain stormwater runoff, increase infiltration, enhance floodplains, and deliver sub-surface flows*					
SONCC-ShaR.3.1.7.2	*Implement plans that increase groundwater recharge and connectivity*					

Action ID	Target	KLS/T	Strategy	Action Description	Area	Priority
Step ID		*Step Description*				
SONCC-ShaR.3.1.82	Hydrology	Yes	Improve flow timing or volume	Increase instream flows	Population wide	2c
SONCC-ShaR.3.1.82.1	*Develop plans to detain stormwater runoff, increase infiltration, enhance floodplains, and deliver sub-surface flows*					
SONCC-ShaR.3.1.82.2	*Implement plans that increase groundwater recharge and connectivity*					
SONCC-ShaR.10.1.12	Water Quality	Yes	Reduce water temperature, increase dissolved oxygen	Improve quality of water released from Dwinnell Reservoir	Dwinnell Dam and vicinity	2b
SONCC-ShaR.10.1.12.1	*Develop plan that includes range of alternatives to improve quality of water released from Dwinnell Reservoir to upper Shasta River*					
SONCC-ShaR.10.1.12.2	*Implement water quality improvement plan*					
SONCC-ShaR.5.1.13	Passage	No	Improve access	Reduce sediment barriers	Kettle Springs and Bridgefield Springs Complex, and all areas where coho salmon would benefit immediately	2b
SONCC-ShaR.5.1.13.1	*Inventory and prioritize barriers formed by alluvial deposits*					
SONCC-ShaR.5.1.13.2	*Remove alluvial deposits, construct low flow channels, or reduce stream gradient to provide fish passage at all life stages*					
SONCC-ShaR.5.1.83	Passage	No	Improve access	Reduce sediment barriers	Population wide	2d
SONCC-ShaR.5.1.83.1	*Inventory and prioritize barriers formed by alluvial deposits*					
SONCC-ShaR.5.1.83.2	*Remove alluvial deposits, construct low flow channels, or reduce stream gradient to provide fish passage at all life stages*					
SONCC-ShaR.5.1.15	Passage	No	Improve access	Remove barriers	Greenhorn Dam, Cardoza Diversion, mainstem Shasta River, Big Springs Water Wheel, and all streams where coho salmon would benefit immediately	2b
SONCC-ShaR.5.1.15.1	*Identify and prioritize all barriers and diversions, and develop a plan to provide short- and long-term passage which may include use of artificial passage designs*					
SONCC-ShaR.5.1.15.2	*Provide passage for all life stages, guided by plan*					
SONCC-ShaR.5.1.85	Passage	No	Improve access	Remove barriers	Population wide	2d
SONCC-ShaR.5.1.85.1	*Identify and prioritize all barriers and diversions, and develop a plan to provide short- and long-term passage which may include use of artificial passage designs*					
SONCC-ShaR.5.1.85.2	*Provide passage for all life stages, guided by plan*					

Action ID	Target	KLS/T	Strategy	Action Description	Area	Priority
Step ID		*Step Description*				
SONCC-ShaR.7.1.23	Riparian	No	Improve wood recruitment, bank stability, shading, and food subsidies	Improve protection and shading of spring complexes	All areas where coho salmon would benefit immediately	2b
SONCC-ShaR.7.1.23.1		*Identify and prioritize locations for planting and thinning*				
SONCC-ShaR.7.1.86	Riparian	No	Improve wood recruitment, bank stability, shading, and food subsidies	Improve protection and shading of spring complexes	Population wide	2d
SONCC-ShaR.7.1.86.1		*Identify and prioritize locations for planting and thinning*				
SONCC-ShaR.7.1.24	Riparian	No	Improve wood recruitment, bank stability, shading, and food subsidies	Increase conifer riparian vegetation	Population wide, unvegetated areas	2b
SONCC-ShaR.7.1.24.1		*Plant riparian vegetation to increase shade/cover and habitat complexity, guided by the plan*				
SONCC-ShaR.7.1.24.2		*Thin, or release conifers, guided by the plan*				
SONCC-ShaR.26.1.25	Low Population Dynamics	No	Increase population abundance	Implement an enhancement program	Population wide	2b
SONCC-ShaR.26.1.25.1		*Assess impacts and benefits associated with different enhancement programs such as captive broodstock, rescue rearing, supplementation, and conservation hatcheries*				
SONCC-ShaR.26.1.25.2		*Obtain a permit and develop a facility to rear fish*				
SONCC-ShaR.26.1.25.3		*Operate enhancement program as a temporary strategy to increase population abundance*				
SONCC-ShaR.26.1.25.4		*Monitor fish populations at all life stages including juvenile snorkel counts, downstream migrant counts, spawning surveys, and Passive Integrated Transponder (PIT) tagging*				
SONCC-ShaR.26.1.67	Low Population Dynamics	No	Increase population abundance	Rescue and relocate stranded juveniles	Population wide	2b
SONCC-ShaR.26.1.67.1		*Survey coho-bearing tributaries and relocate juveniles stranded in drying pools*				
SONCC-ShaR.8.2.29	Sediment	No	Increase spawning gravel	Enhance spawning substrate	Downstream of Dwinnell Dam, Parks Creek, and other tributary drainages where coho salmon would benefit immediately	2b
SONCC-ShaR.8.2.29.1		*Review the McBain and Trush (2010) spawning gravel plan that identifies quantity, quality, location, and timing of gravel supplements*				
SONCC-ShaR.8.2.29.2		*Supplement gravel, guided by the McBain and Trush (2010) spawning gravel plan for the Shasta River*				

Action ID	Target	KLS/T	Strategy	Action Description	Area	Priority
Step ID	*Step Description*					
SONCC-ShaR.8.2.89	Sediment	No	Increase spawning gravel	Enhance spawning substrate	Population wide	2d
SONCC-ShaR.8.2.89.1	*Review the McBain and Trush (2010) spawning gravel plan that identifies quantity, quality, location, and timing of gravel supplements*					
SONCC-ShaR.8.2.89.2	*Supplement gravel, guided by the McBain and Trush (2010) spawning gravel plan for the Shasta River*					
SONCC-ShaR.2.2.27	Floodplain and Channel Structure	No	Reconnect the channel to the floodplain	Construct off channel habitats, alcoves, backwater habitat, and old stream oxbows	All areas where coho salmon would benefit immediately, including upstream from Dwinnell Dam	2b
SONCC-ShaR.2.2.27.1	*Identify potential sites to create refugia habitats. Prioritize sites and determine best means to create rearing habitat*					
SONCC-ShaR.2.2.27.2	*Implement restoration projects that improve off channel habitats to create refugia habitat, as guided by assessment results*					
SONCC-ShaR.2.2.75	Floodplain and Channel Structure	No	Reconnect the channel to the floodplain	Construct off channel habitats, alcoves, backwater habitat, and old stream oxbows	Population wide	2d
SONCC-ShaR.2.2.75.1	*Identify potential sites to create refugia habitats. Prioritize sites and determine best means to create rearing habitat*					
SONCC-ShaR.2.2.75.2	*Implement restoration projects that improve off channel habitats to create refugia habitat, as guided by assessment results*					
SONCC-ShaR.2.2.46	Floodplain and Channel Structure	No	Reconnect the channel to the floodplain	Increase beaver abundance	All areas where coho salmon would benefit immediately, including upstream from Dwinnell Dam	2b
SONCC-ShaR.2.2.46.1	*Develop a beaver conservation plan that includes education and outreach, technical assistance for land owners, and methods for reintroduction and/or relocation of beaver as a last resort*					
SONCC-ShaR.2.2.46.2	*Implement education and technical assistance programs for landowners, guided by the plan*					
SONCC-ShaR.2.2.46.3	*Reintroduce or relocate beaver if appropriate, guided by the plan*					
SONCC-ShaR.2.2.77	Floodplain and Channel Structure	No	Reconnect the channel to the floodplain	Increase beaver abundance	Population wide	2d
SONCC-ShaR.2.2.77.1	*Develop a beaver conservation plan that includes education and outreach, technical assistance for land owners, and methods for reintroduction and/or relocation of beaver as a last resort*					
SONCC-ShaR.2.2.77.2	*Implement education and technical assistance programs for landowners, guided by the plan*					
SONCC-ShaR.2.2.77.3	*Reintroduce or relocate beaver if appropriate, guided by the plan*					
SONCC-ShaR.2.2.28	Floodplain and Channel Structure	No	Reconnect the channel to the floodplain	Restore natural channel form and function	All areas where coho salmon would benefit immediately	2b
SONCC-ShaR.2.2.28.1	*Identify and prioritize mining reaches, developing a plan to restore the floodplain and channel by removing tailing piles and reconstructing the channel*					
SONCC-ShaR.2.2.28.2	*Remove tailing piles and reconstruct the channel, guided by the restoration plan*					

Action ID	Target	KLS/T	Strategy	Action Description	Area	Priority
Step ID	*Step Description*					
SONCC-ShaR.2.2.76	Floodplain and Channel Structure	No	Reconnect the channel to the floodplain	Restore natural channel form and function	Population wide	2d
SONCC-ShaR.2.2.76.1	*Identify and prioritize mining reaches, developing a plan to restore the floodplain and channel by removing tailing piles and reconstructing the channel*					
SONCC-ShaR.2.2.76.2	*Remove tailing piles and reconstruct the channel, guided by the restoration plan*					
SONCC-ShaR.30.1.71	Disease, Predation, Competition	No	Reduce disease	Conduct monitoring and research actions as described in the Klamath River Fish Disease Research Plan	Population wide	2b
SONCC-ShaR.30.1.71.1	*Develop monitoring plan and research actions as described in the Klamath River Fish Disease Research Plan*					
SONCC-ShaR.30.1.71.2	*Implement Klamath River Fish Disease Research Plan*					
SONCC-ShaR.3.1.8	Hydrology	Yes	Improve flow timing or volume	Educate stakeholders	Population wide	2d
SONCC-ShaR.3.1.8.1	*Develop an educational program addressing water conservation programs, instream leasing and water dedication programs, and water diversion/screen hardware maintenance extension support information*					
SONCC-ShaR.3.1.3	Hydrology	Yes	Improve flow timing or volume	Manage flow	Population wide	2d
SONCC-ShaR.3.1.3.1	*Continue watermaster program to ensure water is allocated according to established water rights*					
SONCC-ShaR.3.1.2	Hydrology	Yes	Improve flow timing or volume	Monitor flow for compliance	Population wide	2d
SONCC-ShaR.3.1.2.1	*Install flow measuring devices*					
SONCC-ShaR.3.1.2.2	*Maintain all flow measuring devices*					
SONCC-ShaR.3.1.2.3	*Install head gates and NMFS compliant fish exclusion screens on all water diversions in coho salmon habitat*					
SONCC-ShaR.26.1.26	Low Population Dynamics	No	Increase population abundance	Reduce take of coho salmon	Population wide	2d
SONCC-ShaR.26.1.26.1	*Develop programs providing incidental take coverage for specified, legal agricultural activities, while simultaneously aiding SONCC coho salmon recovery*					
SONCC-ShaR.26.1.26.2	*Implement programs providing incidental take coverage for specified, legal agricultural activities, while simultaneously aiding SONCC coho salmon*					
SONCC-ShaR.10.2.21	Water Quality	Yes	Reduce pollutants	Set standard	Population wide	3b
SONCC-ShaR.10.2.21.1	*Continue implementation of TMDLs for water bodies listed under Clean Water Act Section 303(d)*					

APPENDIX E – Soils Report

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Siskiyou County, California, Central Part

August 5, 2022

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units).

Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded.

These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

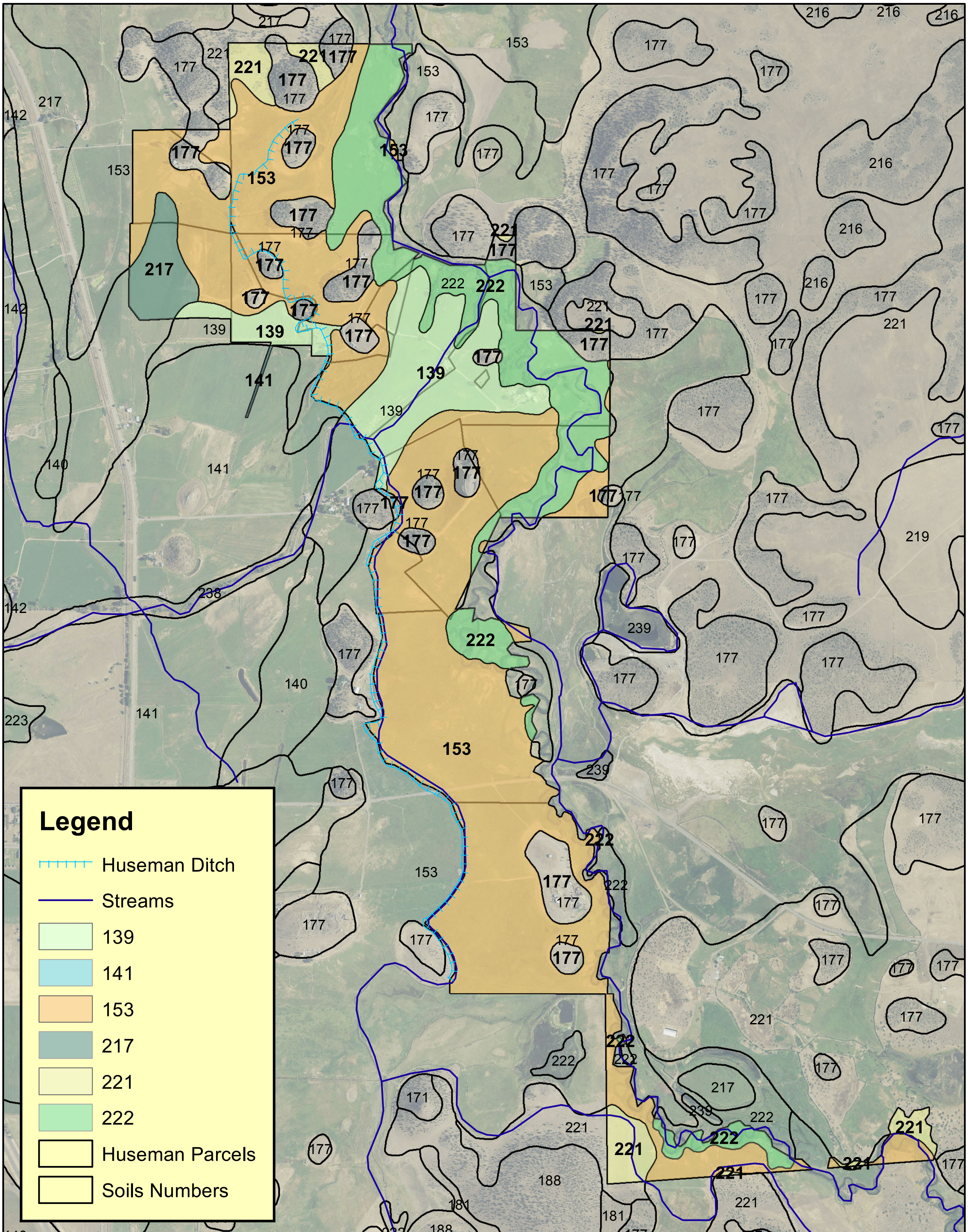
Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Huseman Ditch Soils Map

RCD
SHASTA VALLEY
RESOURCE CONSERVATION DISTRICT

N



7/22/jap/svrcd

Miles
0 0.125 0.25 0.5 0.75 1

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
139	Dotta loam, 0 to 2 percent slopes		12%
141	Dotta gravelly loam, 0 to 2 percent slopes		0.1%
153	Gazelle silt loam		63%
217	Salisbury clay loam, 0 to 2 percent slopes		0.3%
221	Salisbury cobbly loam, 0 to 9 percent slopes		4.0%
222	Settlemeyer loam, 0 to 2 percent slopes		18%
Totals for Area of Interest		**794**	**100.0%**

Summary

The most prevalent soils along the length of the Huseman Ditch, based on the soil map are Dotta, Gazelle and Settlemeyer loams. The properties of these three soils help define the key characteristics of the Huseman Ditch itself. While all loams have similar textures, there are also some notable differences. Gazelle silt loam is a shallow soil with a slow permeability rate. Dotta and Settlemeyer loams are deeper with more rapid infiltration or "Capacity of the most limiting layer to transmit water (Ksat): as listed in the soils survey table "Soil Physical Properties".

Field measurements will be used to further confirm the irrigation flow characteristics and ditch losses. Soils with disparate permeability rates, depths and depth to water make a uniform infiltration rate more elusive.

While these characteristics represent field conditions in the Huseman ditch area, there are specific and important characteristics of the ditch prism itself that should be noted. A ditch such as this one, that is in continuous use for over 100 years has textural and permeability differences from the soils mapped in the field itself. Silt, vegetative detritus and other human management operations, tend to modify its default or baseline ability to transmit water to the water table or river itself.

Additional rates of transmission or temporal modifications will exist throughout the year as the gradient to the river itself rises and falls.

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class.

Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

139—Dotta loam, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: hdp0
Elevation: 2,000 to 3,500 feet
Mean annual precipitation: 18 inches
Mean annual air temperature: 46 to 52 degrees F
Frost-free period: 125 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Dotta and similar soils: 85 percent
Minor components: 9 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of

Dotta

Setting

Landform: Alluvial fans
Landform position (two-dimensional): Summit *Landform position (three-dimensional):* Tread *Down-slope shape:* Linear
Across-slope shape: Linear
Parent material: Alluvium derived from igneous, metamorphic and sedimentary rock

Typical profile

H1 - 0 to 15 inches: loam
H2 - 15 to 62 inches: sandy clay loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: High (about 9.4 inches)

Interpretive groups

Land capability classification (irrigated): 2s *Land capability classification (nonirrigated):* 3s *Hydrologic Soil Group:* C
Ecological site: R021XE131CA - LOAMY

Hydric soil rating: No

141—Dotta gravelly loam, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: hdp2
Elevation: 2,000 to 3,500 feet
Mean annual precipitation: 18 inches
Mean annual air temperature: 46 to 52 degrees F
Frost-free period: 125 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Dotta and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Dotta

Setting

Landform: Alluvial fans
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from igneous, metamorphic and sedimentary rock

Typical profile

H1 - 0 to 15 inches: gravelly loam
H2 - 15 to 62 inches: gravelly sandy clay loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 6.4 inches)

Interpretive groups

Land capability classification (irrigated): 2s
Land capability classification (nonirrigated): 3s
Hydrologic Soil Group: C
Ecological site: R021XE159CA - GRAVELLY LOAM
Hydric soil rating: No

153—Gazelle silt loam

Map Unit Setting

National map unit symbol: hdpg
Elevation: 2,500 to 3,500 feet
Mean annual precipitation: 13 inches
Mean annual air temperature: 48 to 52 degrees F

Frost-free period: 110 to 140 days
Farmland classification: Not prime farmland

Map Unit Composition

Gazelle and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Gazelle

Setting

Landform: Basin floors
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from igneous, metamorphic and sedimentary rock

Typical profile

H1 - 0 to 11 inches: silt loam
H2 - 11 to 25 inches: silt loam
H3 - 25 to 38 inches: cemented
H4 - 38 to 60 inches: stratified loamy sand to silty clay loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: 20 to 40 inches to duripan
Drainage class: Very poorly drained
Runoff class: Low

Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 to 0.00

in/hr)
Depth to water table: About 0 inches
Frequency of flooding: FrequentNone
Frequency of ponding: Frequent
Maximum salinity: Slightly saline to moderately saline (4.0 to 8.0 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 4.0 inches)

Interpretive groups

Land capability classification (irrigated): 5w
Land capability classification (nonirrigated): 5w
Hydrologic Soil Group: B/D
Ecological site: R021XE161CA - SALINE MEADOW
Hydric soil rating: Yes

217—Salisbury clay loam, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: hdrj
Elevation: 2,500 to 4,500 feet
Mean annual precipitation: 13 inches
Mean annual air temperature: 48 degrees F
Frost-free period: 125 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Salisbury and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Salisbury

Setting

Landform: Terraces
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from igneous, metamorphic and sedimentary rock

Typical profile

H1 - 0 to 4 inches: clay loam
H2 - 4 to 24 inches: clay
H3 - 24 to 32 inches: indurated
H4 - 32 to 60 inches: stratified sand to stony sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: 20 to 40 inches to duripan
Drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 to 0.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 3.7 inches)

Interpretive groups

Land capability classification (irrigated): 3s
Land capability classification (nonirrigated): 3s

Hydrologic Soil Group: D
Ecological site: R021XE074CA - FINE LOAMY
Hydric soil rating: No

221—Salisbury cobbly loam, 0 to 9 percent slopes

Map Unit Setting

National map unit symbol: hdrn
Elevation: 2,500 to 4,500 feet
Mean annual precipitation: 13 inches
Mean annual air temperature: 48 degrees F
Frost-free period: 125 days
Farmland classification: Not prime farmland

Map Unit Composition

Salisbury and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Salisbury

Setting

Landform: Terraces
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Tread

Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from igneous, metamorphic and sedimentary rock

Typical profile

H1 - 0 to 4 inches: cobbly loam
H2 - 4 to 24 inches: gravelly clay
H3 - 24 to 32 inches: indurated
H4 - 32 to 60 inches: stratified sand to stony sand

Properties and qualities

Slope: 0 to 9 percent
Depth to restrictive feature: 20 to 40 inches to duripan
Drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 to 0.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 3.2 inches)

Interpretive groups

Land capability classification (irrigated): 3e *Land*
capability classification (nonirrigated): 3e
Hydrologic Soil Group: D
Ecological site: R021XE167CA - COBBLY LOAM
Hydric soil rating: No

222—Settlemeyer loam, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: hdrp

Elevation: 2,000 to 4,000 feet
Mean annual precipitation: 15 inches
Mean annual air temperature: 50 degrees F
Frost-free period: 125 days
Farmland classification: Not prime farmland

Map Unit Composition

Settlemeyer and similar soils: 85 percent
Minor components: 9 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Settlemeyer

Setting

Landform: Flood plains
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from igneous, metamorphic and sedimentary rock

Typical profile

H1 - 0 to 10 inches: loam
H2 - 10 to 66 inches: stratified fine sandy loam to clay

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Poorly drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: About 0 inches
Frequency of flooding: NoneOccasional
Frequency of ponding: Frequent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Moderate (about 8.0 inches)

Interpretive groups

Land capability classification (irrigated): 6w
Land capability classification (nonirrigated): 6w
Hydrologic Soil Group: C/D
Ecological site: R021XE139CA - WET MEADOW
Hydric soil rating: Yes

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