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EDEN VALLEY IRRIGATION & DRAINAGE DISTRICT

Master Plan – Executive Summary

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Executive Summary

1. Introduction

Eden Valley Irrigation and Drainage District (EVIDD) has never had a master plan completed. In June of 2016, J-U-B Engineers contracted with the Wyoming Water Development Commission (WWDC) to provide professional engineering services to complete a Level 1 Master Plan Study. The study was to address the following items:

- Review water rights
- Perform an inventory and assessment of all water delivery structures and facilities
- Consider current operations and irrigation efficiencies
- Prepare a rehabilitation plan, including concept level designs, cost estimates and project prioritization
- Prepare a project funding plan for all projects identified
- Prepare a GIS database to include all mapping, modeling and data collected

2. Water Rights

To assist with a comprehensive analysis of the Eden Valley Irrigation and Drainage District Level I Master Plan Study, all surface water rights with the State Engineers Office (SEO) were reviewed and tabulated. Surface water rights in the district date back as early as 1887. Water rights were organized by permit type. A summary is included in Appendix B of the Master Plan.

The most significant water right is the Eden Canal No.1 which is also known as the Means Canal. This is a diversion of the Big Sandy River, which is a tributary of the Green River. This water right has a total permitted flow of 1,386 cubic feet per second (cfs). That water is shared among various users (over 90 separate certificates) for irrigation and domestic use. The SEO permits 1 cfs to every 70 acres of irrigable land. The Means Canal water right is used for irrigation in the district of up to 97,000 acres. This water right is a primary supply and a direct diversion from the Big Sandy River.

The majority of the permittees with rights to utilize the Means Canal as a primary supply also have a similar secondary right to use water stored from the Eden Irrigation and Land Company No. 1 Reservoir. A secondary right allows the permittee to utilize water from storage for irrigation of specific lands.

There are also various diversion permits from various creeks, canals, and draws. All of these smaller surface water structures are tributaries of the Big Sandy River, and therefore the Green River.

3. Structural Inventory and Assessment

Field inventory and assessments were performed during the fall and early winter months when no water was in the system. The process involved visiting each site, collecting coordinates using GPS, taking measurements

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of the structures (where appropriate), taking photos and completing an assessment form. All data collected, including photos and completed original assessment forms, were included in the EVIDD Geographic Information System (GIS).

Many of the larger concrete structures on the Means and Eden Canals were found to be aging and in need of replacement. Other smaller structures on the canals and laterals were found to be aging but not in immediate need of repair or replacement. Many of these facilities on the unpiped laterals will be obsolete when the laterals are piped. These are identified in the Rehabilitation Plan along with opportunities to modernize both canal and laterals.

A few minor maintenance items were identified on the piped laterals. One exception is the upper 32,000 feet of the West Side Lateral that was piped in 2012 using Steel Reinforced Polyethylene (SRPE) pipe. The first three irrigation seasons experienced two failures and multiple leaks which have since been repaired. In addition to the leaks and failure experienced initially, an inspection of the pipe in the fall of 2016 revealed that the pipe was not installed to grade as specified, resulting in two high points which may restrict flow in the pipe if air pockets are allowed to form. Three new air vents were added in 2017 in an attempt to remove any air pockets that might form and restrict flow. The replacement of this pipe is identified in the Rehabilitation Plan as a project.

4. Current Operations, Irrigation Efficiency Analysis and SCADA Integration

A seepage loss study was conducted of the Eden Canal. The study resulted in losses between 17% and 29% with an average annual seepage loss of 18,500 acre-feet.

Because of the canal response time and inconsistency between the ways individual water users exercise their use of the orders, there are times when significant flow is spilling out of the end of the system. This spill is unquantified but is significant.

Approximately 25 percent of existing irrigated acres are still being flood irrigated. Application efficiencies for flood irrigation are typically significantly less than sprinkle application methods.

The existing SCADA has been in for 7 years. Some of the technology (hardware and software) needs to be updated. Recommendations also include backing up the database and obtaining spare equipment (radios and PLC) for quicker replacements in the event of equipment failure. The most significant recommendation is the automation of canal gates and lateral gates to prevent much of the overflow at the end of the canal. This automation was identified in the Rehabilitation Plan as a project.

5. Rehabilitation Plan

Whether related to the canals or laterals, generally the rehabilitation needs fall into the following categories:

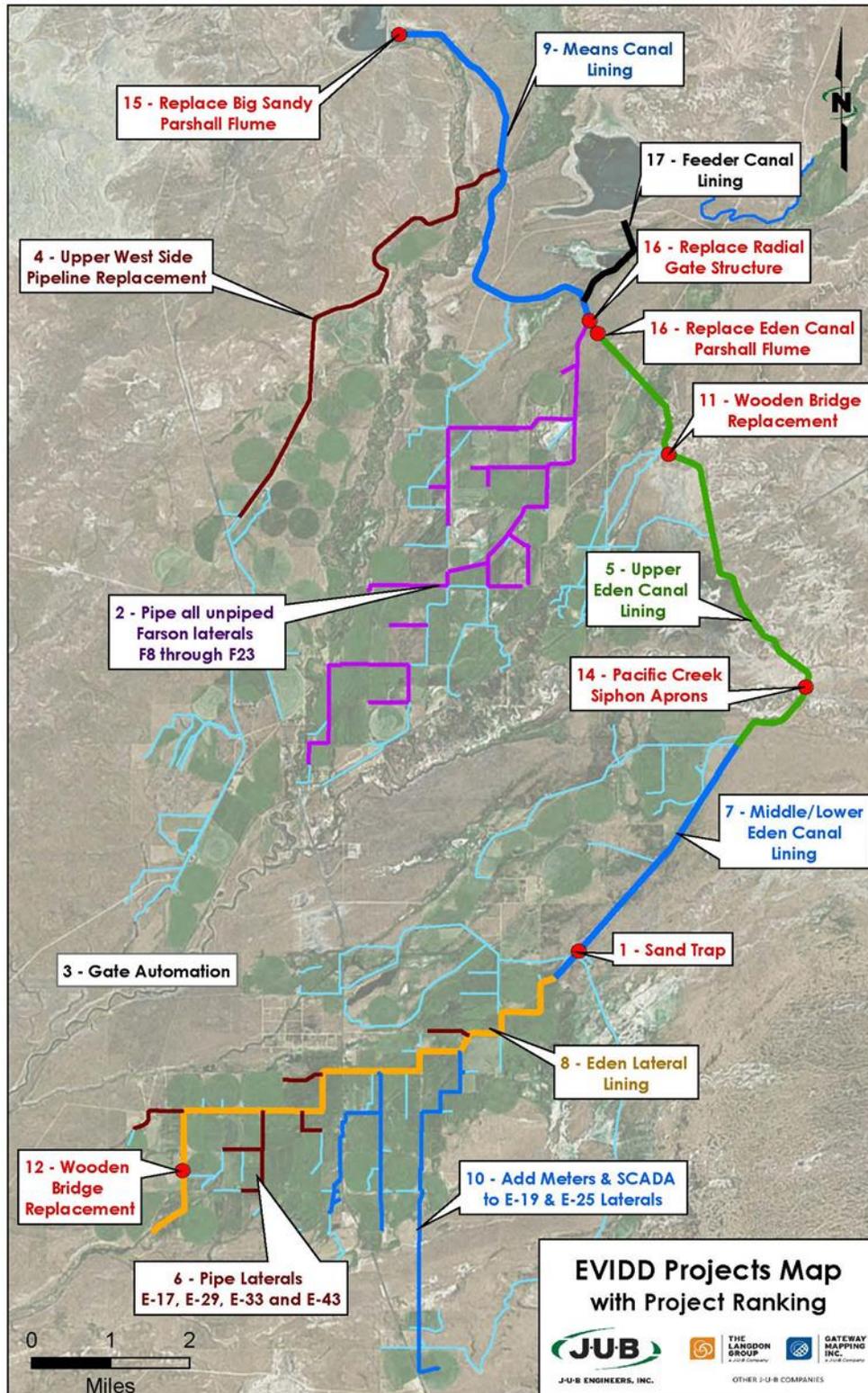
1. **Replace** – The original project components are over 60 years old and some have significant deterioration. Examples include replacing structures and gates.
2. **Repair** – Some problems with the original project components can be remedied through repair rather than replacement. Some of the more modern system components also require ongoing maintenance and repair. Examples include concrete joint repair and regarding at structure inlets and outlets.
3. **Modernize** – The most significant modernization is the piping of laterals and lining of canals. Other examples are automation and SCADA.

Maintenance recommendations were also provided for both the canals and laterals.

A list of projects was created based on the Structural Inventory and Assessment and the Current Operations and Irrigation Efficiency Analysis. Projects identified were primarily replacement and modernization projects and were for both canals and laterals. Conceptual designs were created such that project cost estimates could be created. The projects were then prioritized based on the following criteria:

1. EVIDD Preference - Lower scores indicate more importance for EVIDD.
2. Water Efficiency – Lower scores indicate the project’s perceived beneficial effect on water use efficiency.
3. O&M Cost - Lower scores indicate the project will likely reduce O&M costs.
4. Fundability – Lower scores reflect the availability and likelihood of being funded.
5. Safety - Lower scores indicate the projects perceived effect on reducing safety risk.

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6. Economic Analysis and Project Funding

There are both grant and loan opportunities available for consideration as potential funding sources. Those sources include:

- Colorado River Basin Salinity Control Program (Salinity)
- Colorado River Storage Project Act – Memorandum of Agreement (MOA)
- US Bureau of Reclamation WaterSMART Program
- Wyoming Water Development Commission Grants & Loans

The following factors were considered when creating the Project Funding and Implementation Schedule.

- EVIDD opinion and willingness to implement a project
- Timing of funding sources associated with proposed project
- Strategic combination of funding sources to maximize funding opportunities
- Likelihood of successfully funding a proposed project

The EVIDD Board has not expressed a willingness to take on debt for implementation of projects. WWDC Loans have been considered, but not as the first option in creating funding strategies.

Project priorities were established after consideration of two main factors:

1. EVIDD Board input
2. Best potential for receiving grant funding

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Rank	Project	Year	Cost Estimate	Funding Source					Notes
				USBR			WWDC		
				Salinity FOA	MOA	WaterSMART	Grant	Loan	
2	Pipe all unpiped Farson laterals - F8 through F12 (Farson 3)	2019	\$ 4,219,724.00	\$ 1,392,508.92			\$ 2,827,215.08		2017 FOA/67% WWDC
1,5,6 & 14	Sand Trap, Canal Lining (incl. Pacific Creek Siphon Apron) & E-31 Lateral	2020	\$ 2,611,407.00	\$ 861,764.31			\$ 1,749,642.69		2017 FOA/67% WWDC
3	Gate Automation	2020	\$ 512,957.50			\$ 256,478.75	\$ 256,478.75		50% WWDC/50% WaterSMART
2	Pipe all unpiped Farson laterals - F12 through F23 (Farson 4)	2022	\$ 6,328,856.98	\$ 3,164,428.49			\$ 3,164,428.49		2020 FOA/50% WWDC
5	Eden Canal - Upper Canal Lining - Phase 1	2025	\$ 5,183,794.69	\$ 2,591,897.35			\$ 2,591,897.35		2023 FOA/50% WWDC
4	Upper West Side Pipeline Replacement	2027	\$ 10,105,801.04		\$ 5,052,900.52		\$ 5,052,900.52		50%MOA/50% WWDC
5	Eden Canal - Upper Canal Lining - Phase 2	2028	\$ 5,171,144.69	\$ 2,585,572.35			\$ 2,585,572.35		2026 FOA/50% WWDC
7	Eden Canal - Middle & Lower Canal Lining	2031	\$ 5,511,038.10	\$ 2,755,519.05			\$ 2,755,519.05		2029 FOA/50% WWDC
6	Pipe Laterals E-17, E-29, E-33 & E-43	2034	\$ 2,581,828.05	\$ 1,290,914.03			\$ 1,290,914.03		2032 FOA/50% WWDC
8	Eden Lateral Lining - Phase 1	2037	\$ 5,488,180.78	\$ 2,744,090.39			\$ 2,744,090.39		2035 FOA/50% WWDC
8	Eden Lateral Lining - Phase 2	2041	\$ 4,937,439.32	\$ 2,468,719.66			\$ 2,468,719.66		2038 FOA/50% WWDC
9	Means Canal Lining - Phase 1	2044	\$ 7,301,245.83	\$ 3,650,622.92			\$ 3,650,622.92		2041 FOA/50% WWDC
9	Means Canal Lining - Phase 2	2047	\$ 7,301,245.83	\$ 3,650,622.92			\$ 3,650,622.92		2044 FOA/50% WWDC
10	Add Meters & SCADA to E-19 & E-25 Laterals	2048	\$ 1,619,675.00			\$ 300,000.00	\$ 1,085,182.25	\$ 234,492.75	WWDC 67%/11% Grant/Loan+\$300,000 WaterSMART
13	Replace Radial Gate Structure	2049	\$ 143,500.00				\$ 96,145.00	\$ 47,355.00	WWDC 67/33 Grant/Loan
15	Replace Big Sandy Parshall Flume	2049	\$ 129,850.00				\$ 86,999.50	\$ 42,850.50	WWDC 67/33 Grant/Loan
16	Replace Eden Canal Parshall Flume	2049	\$ 129,850.00				\$ 86,999.50	\$ 42,850.50	WWDC 67/33 Grant/Loan
17	Feeder Canal Lining	2052	\$ 2,121,827.25			\$ 300,000.00	\$ 1,421,624.26	\$ 400,202.99	WWDC 67%/17% Grant/Loan+\$300,000
TOTALS			\$71,399,366.05	\$27,156,660.36	\$5,052,900.52	\$856,478.75	\$37,565,574.68	\$767,751.74	

7. Geographic Information Systems

As part of the master plan, J-U-B developed a comprehensive Geographic Information System (GIS). The purpose of the GIS is to provide information pertinent to the master plan in a visual, accessible, map-driven database. The datasets delivered are in industry-standard ESRI File Geodatabase format projected in published Wyoming State Plane Coordinates (NAD83 West Zone in US Feet). End users can access and use the data in a variety of ways, including ESRI’s Desktop GIS suite (ArcGIS Desktop 10.4 or later or ArcGIS Pro 1.4 or later) or a free GIS viewer such as ArcGIS Explorer or QGIS. Additionally, users can publish the data to an ArcGIS Online account for web/cloud access via web browsers or mobile devices.

The GIS includes principal features of EVIDD’s irrigation delivery system such as canals, laterals, and specific features along canals and laterals such as turnouts, air valves, drains, outlet boxes, etc. Our specialists structured each GIS feature with a database of information pertinent to its use. Additionally, we have hyperlinked field inspection reports photographs taken during field collection to the GIS.

The GIS deliverable for this project includes GIS data, two ESRI GIS projects (.mxd file), a printable mapbook in pdf format, and folders containing photographs taken in the field and conditional reports. The deliverable is structured into directories and files as follows:

Folder/File Name		Description	
EVIDD_GIS		Master folder containing GIS deliverables.	
→	EVIDD.gdb	File Geodatabase containing all deliverable GIS datasets	
→	Shapefiles	Folder containing all deliverable GIS datasets in shapefile format	
→	Hyperlinks	Parent folder for hyperlinks	
	→	Condition Assessments	Folder containing condition assessment pdfs
	→	Photos	Folder containing photographs taken in field
→	Mapbook	Mapbook folder	
	→	EdenValleyMapbook.pdf	Mapbook pdf document
→	EVIDD.mxd	Master GIS project file (ArcGIS v. 10.4.1)	
→	EVIDD_Mapbook.mxd	Mapbook GIS project file (ArcGIS v. 10.4.1 - can be used to regenerate EdenValleyMapbook.pdf)	