

## Mill Slough Water Quality Plan Description

### Introduction

The City of Middleton ("**City**") is engaged in a three-phase plan to significantly improve non-point source surface water quality in the Mill Slough before discharging into the Boise River ("**Plan**"). The City and Drainage District No. 2 ("**DD2**") entered a Memorandum of Understanding ("**MOU**") to implement Phase I of the Plan by agreeing to jointly removing phosphorous-rich sediment from the Mill Slough ("Mill Slough Sediment Basin Project" and "Project").

The partnership between the City and DD2 demonstrates how a city and drainage district can work together to reduce non-point source loads from agricultural and urban sources in an 8,500 acre area in the middle of the Boise River watershed (see USGS data at the top of Figure A).

To help finance the Project, the City and DD2 jointly applied for a matching grant of \$172,500 from the Lower Boise Watershed Council ("**LBWC**"). The Plan was described in the LBWC's grant application to the Idaho Department of Environmental Quality ("**DEQ**") for funding from the State of Idaho's Agricultural BMP General Fund ("**State Fund**") to help finance the continuation of the LBWC's Treasure Valley BMP Program ("**LBWC Program**"). DEQ awarded the LBWC Subaward No. S567 in the amount of \$250,000 from the State Fund. On October 12, 2017, the LBWC approved a grant in the amount of \$172,500 for the joint City/DD2 Project.

### Mill Slough and the Drainage System

The Mill Slough is an integral part of DD2's drainage system that discharges to the Boise River south of the City of Middleton after passing through agricultural land owned land by the City. DD2's drainage system conveys both subsurface and surface flows that include agricultural return flows, return flows from urban irrigation systems, and return flows or tail water from a various canal companies which deliver irrigation water to lands within the DD2's boundaries.

The Mill Slough is located in the DD2's management area and generally begins north and east of the City of Middleton and then continues to flow to the southwest through the City of Middleton to a point where it intersects with the Lawrence-Kennedy Drain, another component of DD2's drainage system, The Lawrence-Kennedy Drain generally begins on the east side of the City of Star draining agricultural lands north of the Boise River but south of Highway 44.

The Mill Slough is one of 10 Boise River tributaries identified in the 2013 modeling for the 2015 Lower Boise River TMDL (Total Maximum Daily Load) that needs to reduce loads of sediment, bacteria and nutrients. Relative to the phosphorus discharges, it has the fifth highest total phosphorus load, and averages 125 pound per day based on DEQ data (bottom of Figure A).

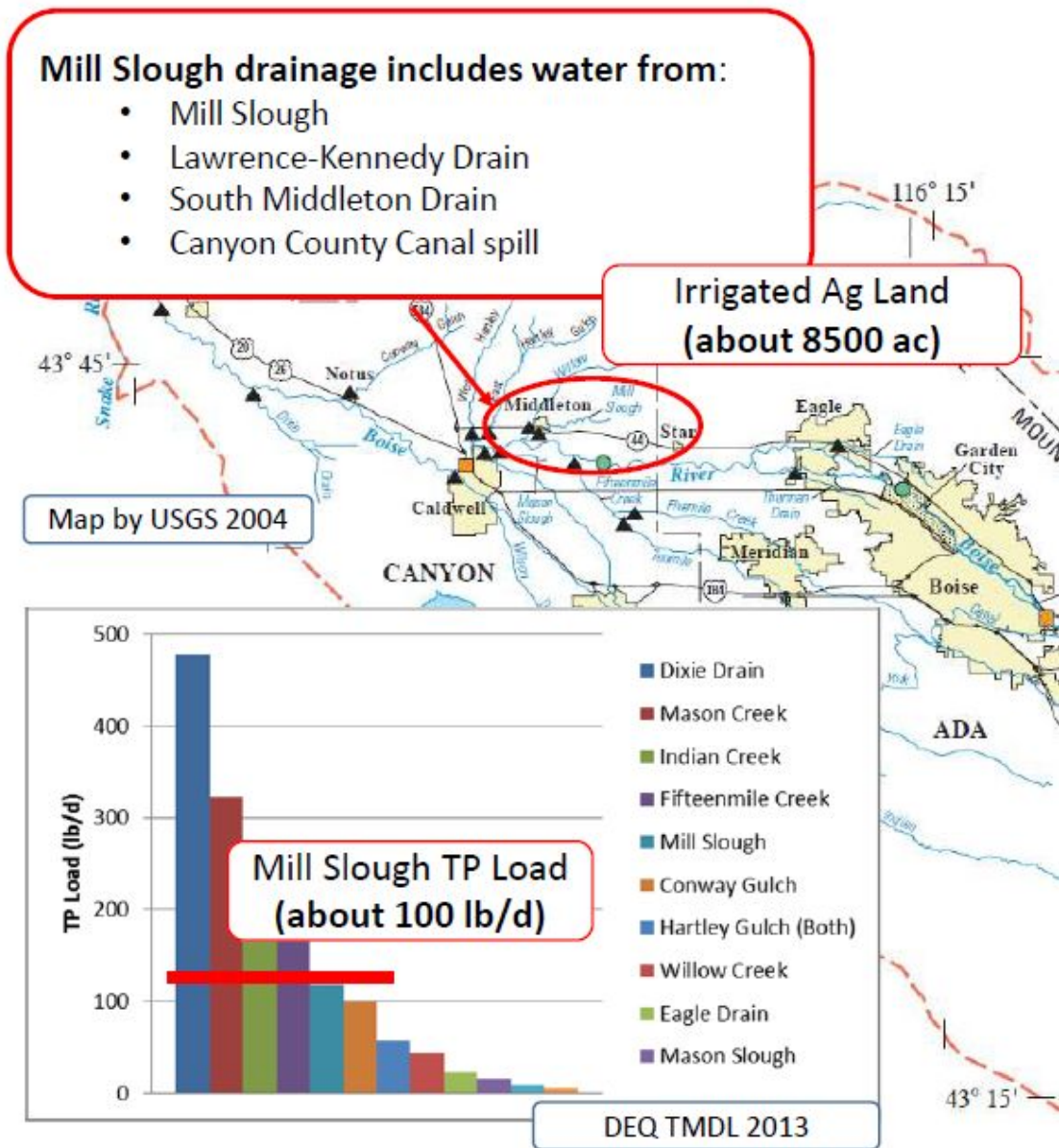


Figure A –Annual loading of total phosphorus (TP) from the Mill Slough to the Boise River.

**The Mill Slough Sediment Basin Project: Phase One of the City’s Mill Slough Water Quality Improvement Plan**

Figure B shows the location and components of the Mill Slough Project. An automatic weir structure will be installed in the Mill Slough a short distance upstream from the confluence with the Boise River to form a settling basin in a portion of the Mill Slough that is on 3.7 acres of City-owned land. The automated weir will be used to slow water flow upstream from the weir

and increase the Mill Slough water level to the highest extent possible without causing upstream flooding concerns. Sediment and associated nutrients in the ponded water behind the weir will settle in Mill Slough. The amount of sedimentation will depend on weir elevation, water flow rates, and sediment characteristics, all of which vary throughout the year. The weir will allow the treated water, water without much of the phosphorous-rich sediment to flow through the Mill Slough to the Boise River.



Figure B – Project location showing Mill Slough passing through City owned agricultural lands and discharging to the Boise River just east of the City’s wastewater treatment facility (map by Civil Dynamics, the contracted City Engineer).

DD2 and City will work together to remove sediment and phosphorus from the settling basin. The sediment will be sampled and removal rates tracked to demonstrate the effectiveness of this "in-channel" treatment. Sediment and phosphorus removed from the settling basin will be applied to City-owned land, including, but not limited to the land areas marked and highlighted in green as "AA," "BB," and "CC" in Figure C.

### **Mill Slough Sediment Basin Project: Estimated Water Quality Benefits**

It is estimated that the Project will result in an average sediment load reduction to the Boise River of about 900 tons/year and a total phosphorus load reduction of about 365 pounds/year.

### **Mill Slough Water Quality Improvement Plan: Phases**

**Phase 1.** The Project will allow the City to measure water quantity and quality in the Mill Slough at the automatic weir, and DD2 and the City to remove settled sediment and phosphorus. Successful completion of the Project will facilitate Phases 2 and 3 of the City’s Mill Slough Water Quality Improvement Plan, illustrated in Figure C, for which future LBWC Program grant funding may be sought.



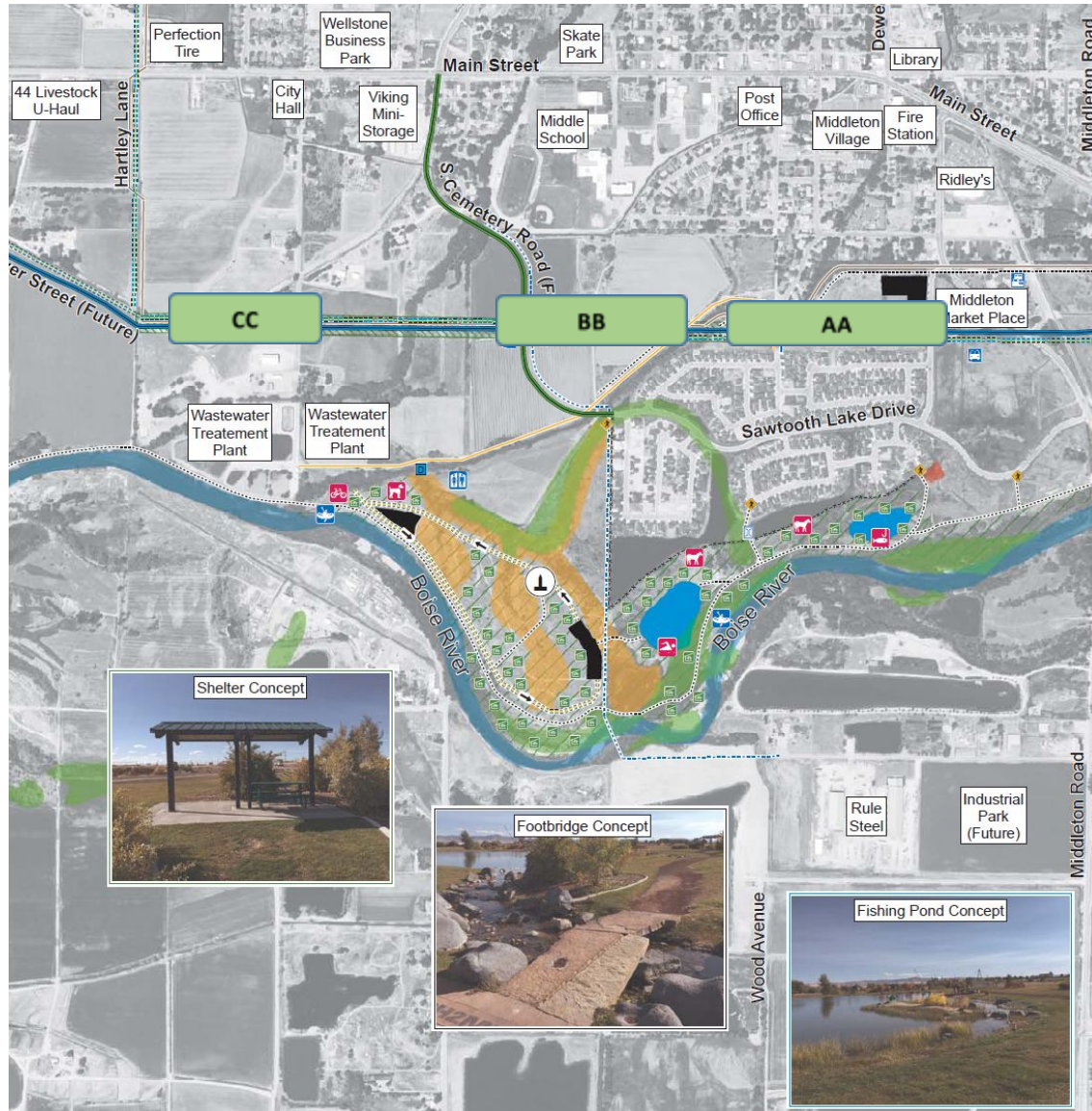


Figure C – Middleton City River District Concept Plan showing location of the automatic weir (small dark blue box labeled “D”) and some of the areas for land application of sediment and phosphorus (areas marked AA, BB and CC). The light brown areas south of Mill Slough are for future Phases 2 and 3 water diversion and treatment by natural filtration (map by City’s Engineer, Civil Dynamics).

**Phase 2 (future):** After water rights and other needed permits and approvals are received, phosphorous-rich water in Mill Slough would be diverted at the automatic weir over City owned land using historic overland flow channels (Figure C; **centerlines only** of light brown).

**Phase 3 (future):** Successful completion of Phase 2 will position the City to proceed with Phase 3, a higher level of water quality treatment via widened riparian flow channels that allow more

area for natural filtration (percolation), and newly constructed wetlands and/or treatment basins (Figure C; entire areas in light brown). **Project Costs and Operation and Maintenance**  
 The estimated Project Costs are shown in Table A along with anticipated 2018 completion dates. These dates may need to be adjusted due to weather conditions, contractor availability, or other factors beyond the City's control. Also shown in Table A are the estimated annual costs based on the general operation and maintenance commitments given in Table B.

Table A – Project tasks, estimated costs and anticipated completion

Task	City & DD2			Grant Funds	Total
	Cash	In-kind	Soft		
Land designated for WQ treatment (3.7ac)			\$66,709		\$66,709
			\$168,026		\$168,026
Land designated for land app. (9.31ac)			6		6
Develop plans, specs, permitting	\$11,500			\$25,500	\$37,000
Purchase Gate				\$80,000	\$80,000
Earthwork/Site Prep				\$29,500	\$29,500
Concrete Work				\$20,000	\$20,000
Electrical				\$2,500	\$2,500
Install Gate				\$5,000	\$5,000
Construction oversight				\$10,000	\$10,000

Anticipated

1-Jan

\$66,709

\$168,026

6

\$31,500

\$80,000

Maintain (DD2; 4 years)		\$20,000			\$20,000	
Operate & Maintain (City; 2 years)	\$11,500	\$10,000			\$21,500	
Admin, Monitor, Outreach, Assess Options	\$9,000	\$3,000	\$0	\$0	\$12,000	
Totals	\$32,000	\$33,000	\$234,735	\$172,500	\$472,235	\$351,735
Percent of total	6.8%	6.9%	49.70%	36.5%		74.5%

60% Maximum Match by LBWC

36.5%

City Land committed for Phase 1	13.0	ac
Land costs per ac (purchase price)	\$18,030.55	\$/ac
Value of Phase 1 land committed	\$234,735.00	

Table B – List of general project commitments (O&amp;M)

Middleton's General Project Commitments (Note: contractual commitments cannot exceed 2 yr.)

1. Land: City land for Mill Slough sediment basin (3.7 acres)
2. Land: City land for application of sediment, 365 lb/40 acres (9.1 acres),
3. Sediment and Nutrient Management: hauling and applying to City Property
4. Gate ownership and operation, responsibility and maintenance (life of project)
5. Monitoring: water quality sampling on Mill Slough
6. Reporting: water quality reporting to be provided on City web page

Drainage District No.2's General Commitments

1. Maintenance of Ditch: Sediment excavation from Mill Slough upstream of diversion

### Preliminary Design Drawings

The construction cost estimates are based on the Mill Slough structure preliminary design drawings, prepared by SPF Water, as shown in Figures E1 and E2. The gate cost estimate was provided by the manufacturer, Rubicon. A gate detail provided by the gate Rubicon is shown in Figure E3.

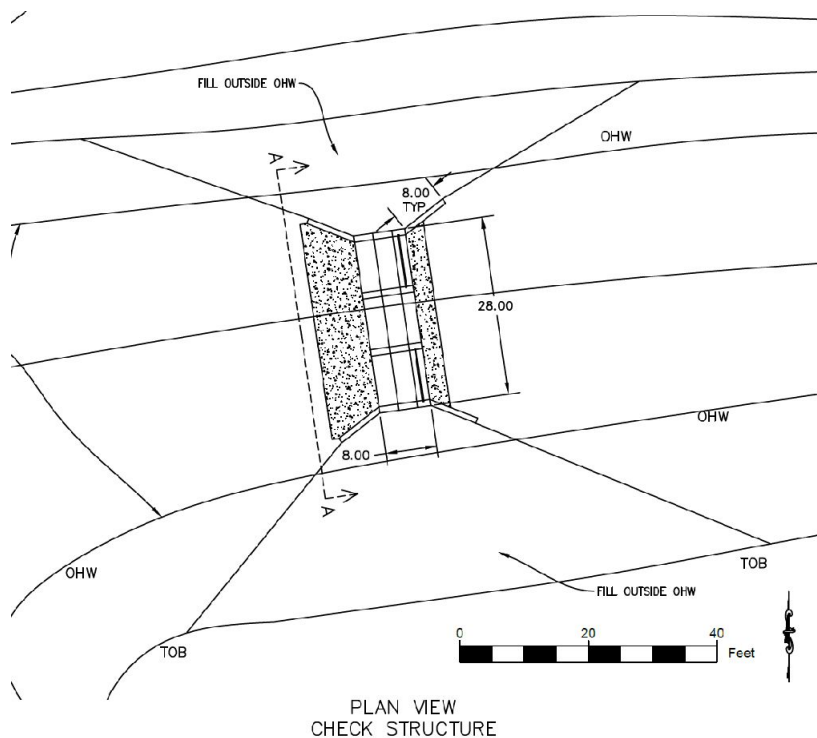


Figure E1. Plan View of Diversion Structure (draft by SPF Water)

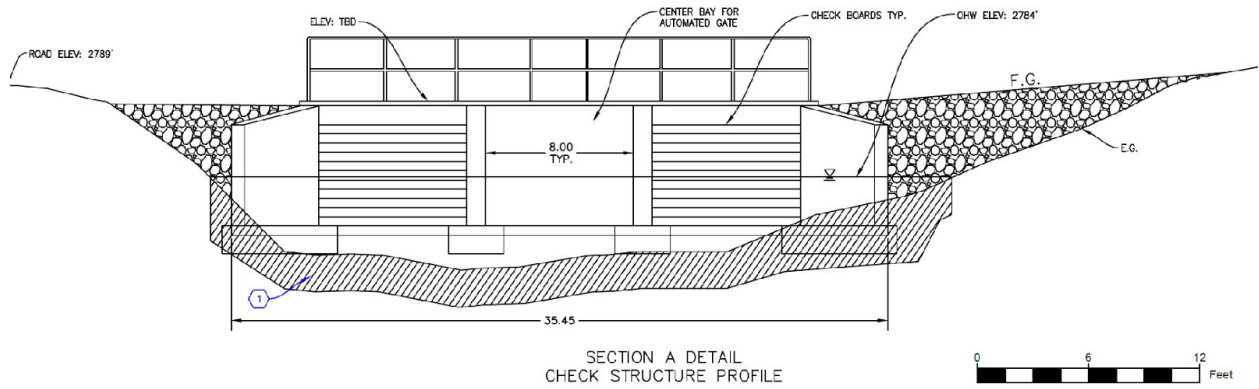


Figure E2. Section Detail of Diversion Structure (draft by SPF Water)

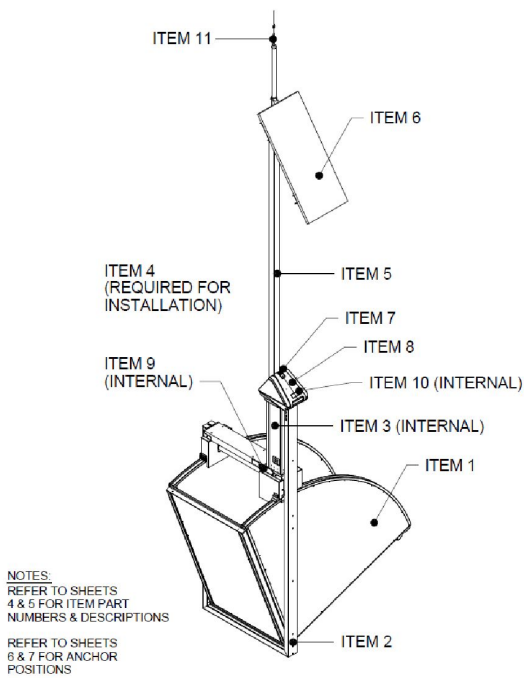


Figure E3. Section Detail of Example Gate ( by Rubicon) including the gate assembly in its entirety (gate, pedestal, solar, batteries, etc.) for a complete water level control and flow measurement installation.