APPENDIX 5C

Project Evaluation Justification

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YCB SWRP Project A1:
Gilsizer North Detention Basin Modifications
Project Evaluation

Project Evaluation Background:

The Gilsizer North Detention Basin (GNDB) is an existing detention basin with approximately 43 acre-feet of storage volume. This project involves modifications to GNDB including:

- Replacing existing concrete low flow channels with vegetated swales and small rocks to promote infiltration and re-routing the low flow channel alignments to create native-vegetated swales along the outer edge of the basin bottom. This will increase infiltration by incorporating specific bio-retention soil and removing fines from the proposed low flow channel alignments, improving treatment capacity, and increasing space available for public recreation.
- Installing end-of-pipe "rigid basket" trash capture devices on pipes discharging to the detention basin in order to satisfy the State's Trash Amendment requirements.
- Creating a recreational area in the bottom of the detention basin which will provide community benefit.
- Constructing roofs and covers over the gas station and material stockpile in the City Corp Yard to reduce contaminants in runoff.

The following sections describe the process and results for evaluation of the project, which is consistent with the California State Water Resource Control Board's Storm Water Resource Plan Guidelines (December 15, 2015). Projects were evaluated both quantitatively and qualitatively for how well they meet the State's Storm Water Management Benefit Categories. Categories and metrics below are organized corresponding to Table 4 of the State Guidelines.

Water Quality Benefit Category

This project will provide treatment of storm water runoff in the new swales via both infiltration to the channel bottom and channel flow-through (bio-treatment). The new roof and covers constructed over the City Corp Yard facilities will reduce the transport of contaminants to the storm water system through the reduction of flow from these previously uncovered surfaces. Trash will be captured by devices which meet the State's Trash Amendment requirements for full capture.

Key design and evaluation criteria for determining pollutant removals as part of the water quality category include:

- The design storm used to estimate the water surface elevation in the detention basin for trash capture device sizing was a 1-year, 1-hour storm per the State's Trash Amendment requirements. The magnitude of this storm was determined by extrapolating from data in the Sutter County Design Storm Runoff document (July 1998).
- Rainfall data used to estimate mean annual watershed flow (for pollutant removal and infiltration calculations) was taken from the California Irrigation Management Information System (CIMIS) rain gauge station database. A mean annual precipitation depth was determined for the area, and the year 2006 was determined to represent the mean annual rainfall. Hourly rainfall data for January 1, 2006 to

December 31, 2006 was obtained for the Sacramento Valley's Verona Station (Station ID No. 235).

- The swales to be established near the basin perimeter are intended to provide new area for increased infiltration and pollutant removal. The hydrology model (SacCalc) and hydraulic model (XPSWMM) were used to confirm that the top of the swales will be above the high-water level during the design storm (1-year, 1-hour) and thus be available for additional infiltration (i.e. the detention basin will not be full). The XPSWMM model shows water level depth in the existing detention basin to be approximately 0.1 feet during the design storm event. The SacCalc model shows a total inflow of approximately 11.4 acre-feet, compared to the total detention basin volume of approximately 43 ac-ft. Because the top of the low flow channels are below the pump on/off elevations, the swales will provide increased area and travel time for low flows in the detention basin, increasing the infiltration capacity of the basin.
- Swale area and volume were calculated using the approximate length from the project schematic and an estimated 7.5-foot infiltration area width (approximately a 7.5-foot top width; 5-foot bottom width; 3H:1V channel side slopes; 1 percent channel longitudinal slope; and 1 foot/second velocity).
- The soil in the detention basin is Hydrologic Soil Group C and has a hydraulic conductivity of approximately 0.32 inches per hour (accessed from Natural Resources Conservation Service web soil survey), which was used to calculate the total infiltrated and treated volume of the swales.
- TSS loading for runoff from the material stockpile in the City Corp Yard was estimated using data from the CalTrans Construction Sites Runoff Characterization Study (September 2002), estimated at the 75th percentile of the TSS sample group.
- Other parameters used in the evaluation were detailed in the Multiple Benefit TM (December 21, 2017), including: Typical Impervious Percent for Land Uses (Table 5); Annual Runoff Depth, Depression Storage and Infiltration Rates (Table 6); Average Inflow Concentrations for Urban Storm Water Runoff Pollutants and Percent Removals for LID (Table 7); and Trash Generation Rates by Land Use (Table 8).

Evaluation of water quality benefit criteria are described below. Although no site-specific water quality testing was performed, the following contaminants have been included because they were included on the 303(d) lists for receiving waters, in the City's MS4 Permit, or are common storm water contaminants.

Natural water drainage and treatment:

- The swales/low flow channels will increase natural drainage and treatment by allowing more infiltration.

Sediment, mercury, Group A pesticides, and oxygen-demanding substances: These contaminants were evaluated using sediment as a proxy, as explained below. Mercury and Group A pesticides were included because they are included on the 303(d) list for

receiving waters. Sediment and oxygen-demanding substances are common contaminants found in urban storm water.

- Sediment (TSS): The amount of sediment to be removed annually was calculated by estimating the volume of flow that would be infiltrated through the swales, the volume of swale flow-through, and a typical loading of sediment in urban storm water. Additionally, a new cover over the stockpiled material storage will reduce the amount of sediment that is carried to the storm water system in surface runoff. The amount of sediment-laden runoff prevented was calculated by estimating the volume of flow from the area to be covered, an estimated prevention level of 90 percent, and an estimated loading of sediment for a construction site.
- Mercury (303(d) List Pollutant): Mercury is a common urban stormwater contaminant. Although its presence is typically associated with mining activities, it's also found in urban stormwater runoff. The Sutter Bypass and the Feather River, both receiving waters for Yuba City drainage, have mercury listed as a 303(d) pollutant. The method of treatment for the swales is infiltration and flow-through. The amount of mercury potentially removed is related to the amount of sediment removed, and therefore, the amount of sediment removed from receiving waters is used as a proxy for estimating mercury reduction. The amount of sediment removed was calculated as described in the Sediment (TSS) category.
- DDT (303(d) List Pollutant): DDT is a pesticide, banned in 1972, that is still found in the environment due to its ability to adsorb to soil particles and its resistance to degradation. DDT can be re-mobilized with disturbance; however, its removal is found to be associated with sediment removal. The amount of DDT potentially removed is related to the amount of sediment removed, and therefore, the amount of sediment removed from receiving waters is used as a proxy for estimating DDT reduction. The amount of sediment removed was calculated as described in the Sediment (TSS) category.
- Dieldrin (303(d) List Pollutant): Dieldrin is similar to DDT: its use is banned, it adsorbs to soils, and is persistent in the environment. Dieldrin has been found in urban storm water, and is found to be associated with sediment removal. The amount of Dieldrin potentially removed is related to the amount of sediment removed, and therefore, the amount of sediment removed from receiving waters is used as a proxy for estimating Dieldrin reduction. The amount of sediment removed was calculated as described in the Sediment (TSS) category.
- Oxyfluorfen (303(d) List Pollutant): Oxyfluorfen is a common pesticide. There are currently no pesticides being used at this detention basin. Although this project involves the planting of native grasses in swales, they would not require pesticide use. Therefore, this project is not anticipated to change the levels of Oxyfluorfen in storm water.
- Chlorpyrifos (MS4 Pollutant): Chlorpyrifos is a restricted-use pesticide used mostly in agricultural settings. There are currently no pesticides being used at this detention basin. Although this project involves the planting of native grasses in swales, they

would not require pesticide use. Therefore, this project is not anticipated to change the levels of Chlorpyrifos in stormwater.

- Diazinon (MS4 Pollutant): Diazinon is a restricted -use pesticide used mostly in agricultural settings. There are currently no pesticides being used at this detention basin. Although this project involves the planting of native grasses in swales, they would not require pesticide use. Therefore, this project is not anticipated to change the levels of Diazinon in stormwater.
- PCBs (303(d) List Pollutant): PCBs can enter a watershed through transformers, atmospheric deposition, and eroded or re-suspended particles. PCBs tend to behave like sediment, which settle out during infiltration and treatment. The estimated quantity of PCBs removed was calculated by estimating the volume of flow that would be treated through the swales per year and a typical loading of PCBs in urban storm water.
- Trash: The proposed trash capture devices will trap all particles retained by a 5-mm mesh screen and a design treatment capacity of not less than the peak flow rate from a 1-year, 1-hour storm event in the watershed area. The quantity of trash removed was calculated by applying an estimated trash loading (from the Bay Area Stormwater Management Agencies Association, Trash Generation Rates, 2014) by land use for the entire watershed, and normalizing the total trash generated by watershed area.

Common storm water contaminants (removal rates and data sources for the following contaminants are listed in Table 7 of the Multiple Benefits Evaluation Methodology Technical Memorandum, published on December 21, 2017):

- Pathogens and Bacteria: Fecal coliform is used as an indicator organism for pathogens and bacteria. The quantity of pathogens and bacteria removed was estimated by calculating the volume of flow that would be treated through the swales per year and a typical loading of fecal coliform in urban storm water.
- Heavy Metals (cadmium, copper, lead, and zinc): The quantity of heavy metals removed was calculated by estimating the volume of flow that would be treated through the swales per year and a typical loading of heavy metals in urban storm water.
- Oils and grease (polyaromatic hydrocarbons, PAHs): The quantity of oils and grease removed was calculated by estimating the volume of flow that would be treated through the swales per year and a typical loading of PAHs in urban storm water. Additionally, a new roof on the gas station will reduce the amount of PAHs that are carried to the storm water system in surface runoff. The amount of PAH-laden runoff prevented was calculated by estimating the volume of flow underneath the roof, and an estimated loading of PAH for this land use type.
- Total Nitrogen: The quantity of nitrogen removed was calculated by estimating the volume of flow that would be treated through the swales year and a typical loading of nitrogen in urban storm water.

- Total Phosphorus: The quantity of phosphorus removed was calculated by estimating the volume of flow that would be treated through the swales year and a typical loading of phosphorus in urban storm water.
- Infiltration: The increase in infiltration was calculated by estimating the volume of flow that would be infiltrated through swales per year.

The overall normalized score for water quality was 28.9 out of 80 possible points.

Water Supply Benefit Category

Evaluation of water supply benefit criteria are described below.

- Water supply reliability: This project has the potential to augment a water supply through recharge of groundwater and surface water sources, however, watering requirements from new recreational areas will likely offset any augmentation of the water supply from infiltration. Therefore, the water supply reliability was evaluated as none, or zero points.
- Conjunctive Use: The stormwater captured in this project is not being used as an alternative water supply.
- Water Conservation: This project does not involve any water conservation.

The overall normalized score for water supply was 0 out of 81 possible points.

Flood Management Benefit Category

The project will reduce runoff conveyed to receiving waters and slightly increase the available capacity of the detention basin through increased infiltration. Evaluation of flood management benefit criteria are described below.

- Reduction of runoff rate/volume: The swales will reduce the volume and rate of runoff that reaches receiving waters through increased infiltration capacity in the detention basin.
- Sanitary sewer overflow reduction: This project will not reduce the area of urban floodplain, and therefore no reduction of sanitary sewer overflows will occur.
- Improved flood protection: This project will not provide any significant improvement in flood protection.
- Reduction of flood risk-life and safety: This project has the potential to reduce flooding slightly in the area around the detention basin, but the reduction is not significant.

The overall normalized score for flood management was 14.1 out of 94 possible points.

Environmental Benefit Category

Evaluation of environmental benefit criteria are described below.

- Create or improve wetland/riparian habitat: The planting of native grasses with the creation of the swales will improve about 12,600 square feet of newly vegetated area.
- Environmental flow (Instream Flow): The increase in infiltration through installation of the swales helps to partially restore the local hydrology to pre-development conditions. Restoring the natural hydrograph in this area will help restore environmental flows to more natural conditions, and therefore, the environmental flow is enhanced.
- Urban green space: This project includes an increase in urban green space from construction of the recreational areas in the detention basin bottom.
- Energy use and Greenhouse Gas: The increase in infiltration through installation of the swales will require less volume to be pumped out of the detention basin by the pump station. Therefore, energy use and greenhouse gasses will be decreased.
- Restore natural hydrograph: The increase in infiltration through installation of the swales helps to partially restore the local hydrology to pre-development conditions and to restore the natural hydrograph. Therefore, the natural hydrograph is improved.
- Water temperature: The increase in infiltration through installation of swales will help to partially restore the local hydrology to pre-development conditions, however, the impact on water temperature is not expected to be significant.

The overall normalized score for environmental benefit was 34.5 out of 40 possible points.

Community Benefit Category

This project involves construction of recreational areas in the detention basin bottom and allowing public access that can be limited during heavy rainfall. This provides an opportunity for public education of storm water best practices. This could be achieved through encouraging community involvement in construction and/or maintenance of the facility, or through signage, media coverage, or educational programs for the site. Evaluation of the community benefit criteria are described below.

- Employment opportunities: This project will have a temporary increase in jobs during construction. Long-term maintenance work will be required for the trash capture devices, swales, and recreational area.
- Public education: This project provides an opportunity for the City to educate the public on storm water best practices and the benefits of reducing runoff. There are plans for implementing safety signage, but no plans for educational signage or media coverage, so the project was given a score of Low.

- Community involvement: This project provides an opportunity for the City to involve the community during construction and/or maintenance of the facility, or through or citizen-run educational programs for the site. Although there are no current plans for community involvement, the project was given a score of Low due to the potential for involvement.
- Public use/recreation: This project includes construction of a recreational area in the detention basin bottom. Evaluation was based on the number of acres to be constructed.

The overall normalized score for community benefit was 28.6 out of 54 possible points.

Evaluation Result

The project received a total of 106.2 out of 349 possible points from the multiple benefit evaluation. Based on the results of the multiple benefit evaluation, the project ranked sixth out of the ten total projects, and third out of the three detention basin improvement projects. Among detention basin projects, the score within the water quality category was the most variable. This was a result of the large difference in soil hydraulic conductivity values, which determines infiltration rate and associated pollutant removals. This ranking is based solely on the multiple benefit evaluation results and will be adjusted to incorporate regulatory requirements and funding availability.

Permit and Approval Requirements

Permits required for this project include applicable City permits and a general construction permit from the State Water Resources Control Board to implement water quality controls during construction.

The proposed "rigid basket" trash capture devices are not currently included on the State's Certified Trash Amendment devices list. As discussed in the Trash Rack Selection Process document (March 7, 2018), the City would be required to seek Water Board approval for use of this device. Approval would be based on the criteria of a full capture device that has a 5-mm mesh screen and a design treatment capacity of not less than the peak flow rate from a 1-year, 1-hour storm event in the watershed area. Once certified, the trash capture devices would meet the State's Trash Amendment requirements for full capture, allowing the City to maintain their Track 1 Trash Amendment status.

Environmental Impact Report Requirements

The purpose of this project is to improve the environment; however, the construction of this project could result in temporary impacts. An environmental review of this project will be performed prior to construction.

Initial Cost Estimate

Cost estimates include initial capital cost and annual operation and maintenance (O&M) costs. The capital cost is a Class 3 budget estimate as defined by the Association for the Advancement of Cost Engineering (AACE) with a best-expected accuracy of minus 20 percent to plus 30 percent. A Class 3 cost estimate is used for budget authorization level design, characterized by a 10 to

40 percent design definition. Based on the Class 3 characteristics and engineering judgement, a 30 percent contingency was selected for this project. Unit costs used in the estimate were developed using recently completed Bay Area projects, scaled to wages in Sutter County (current wage information was obtained from the State's Occupational Employment Statistics and Wages program). The cost estimates are based on the engineer's perception of current conditions in the project area and are subject to variances in the costs of labor, materials, equipment, and services provided by others as well as economic conditions.

- Estimated Capital Cost: The cost of installing this facility is estimated to be $612,000. Table A.1-1 provides a detailed cost breakdown.

Table A.1-1. Estimated Project Costs, Gilsizer North Detention Basin Modifications

Item No	Item Description	Units	Quantity	Unit Cost	Total Cost
Trash Capture Device					
1	End-of-Pipe 72" diameter	ea.	1	$36,000	$36,000
2	End-of-Pipe 60" diameter	ea.	1	$30,000	$30,000
3	End-of-Pipe 36" diameter	ea.	1	$18,000	$18,000
Recreational Area					
4	Top Soil & Hydroseed	yd^2	3,455	$5	$67,276
5	Project/Rec Area Signage	ea.	2	$500	$1,000
6	Drip Irrigation (incl. line, backflow, controls, power)	LS	1	$11,000	$11,000
City Corp Yard					
7	Stockpiled Material Retractable Cover	LS	2	$2,500	$5,000
8	Gas Station Roof	LS	1	$15,000	$15,000
Bio-Swale					
9	Excavation	cy	951	$15	$14,266
10	Splash Pad (Concrete)	cy	3	$700	$2,100
11	Splash Pad Cobbles	cy	3	$315	$945
12	Bioretention Soil (12" Depth)	cy	654	$108	$70,627
13	Wood Mulch (Matting Variety 3" Depth)	cy	133	$126	$16,735
14	Drain Rock	cy	104	$315	$32,861
15	Vegetation - 4" Pots	ea.	845	$45	$38,025
General Items					
16	Mobilization/Demobilization & Insurance (10%)	LS	1	$35,900	$35,900
17	Construction Contingency (30%)	LS	1	$118,500	$118,500
				Construction Costs	*$513,300*
18	Engineering, Administration, Permitting & CM (25%)	LS	1	$98,700	$98,700
				Total Estimated Capital Project Cost	**$612,000**

- Estimated Annual Operations and Maintenance Costs: The annual cost for operating and maintaining this facility is estimated to be $26,800. Table A.1-2 provides a detailed cost breakdown. Operation and maintenance tasks will include:

  — Cleaning of end-of-pipe trash capture devices; the frequency of cleaning will be determined by trash loadings and storm frequency. Frequency was estimated at four times per year.

  — Minor maintenance of low flow channels/swales

  — Maintenance of recreational area

Table A.1-2. Estimated Annual Maintenance Costs, Gilsizer North Detention Basin Modifications

Item No	Item Description	Units	Quantity	Unit Cost	Total Cost
Trash Capture Maintenance - Frequency: 4 times per year, 2 hours per device					
1	Vac Truck	hour	24	$150	$3,600
2	2 Person Maintenance Crew	hour	24	$100	$2,400
Recreational Area/Swale Maintenance - Frequency: 4 hours per week					
3	2 Person Maintenance Crew	hour	208	$100	$20,800
				Total Estimated Project Cost	**$26,800**

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YCB SWRP Project A4:
Shanghai Bend Detention Pond Modifications Project Evaluation

Project Evaluation Background:

The Shanghai Bend Detention Pond is an existing detention basin with approximately 83 acre-feet of storage volume. The project involves the following modifications:

- Replacing existing low flow channels with vegetated swales and small rocks to promote infiltration and re-routing the low flow channel alignments to the outer edge of the basin bottom. This will increase infiltration by incorporating specific bio-retention soil and removing fines from the proposed low flow channel alignments, improving treatment capacity, and increasing space available for public recreation.
- Installing end-of-pipe "rigid basket" trash capture devices on pipes discharging to the detention basin in order to satisfy the State's Trash Amendment requirements.
- Creating a recreational area in the bottom of the detention basin which will provide community benefit.

The following sections describe the process and results for evaluation of the project which is consistent with the California State Water Resource Control Board's Storm Water Resource Plan Guidelines (December 15, 2015). Projects were evaluated both quantitatively and qualitatively for how well they meet the State's Storm Water Management Benefit Categories. Categories and metrics below are organized corresponding to Table 4 of the State Guidelines.

Water Quality Benefit Category

This project will provide treatment of storm water runoff in the new swales via both infiltration to the channel bottom and channel flow-through (bio-treatment). Trash will be captured by devices which meet the State's Trash Amendment requirements for full capture.

Key design and evaluation criteria for determining pollutant removals as part of the water quality category include:

- The design storm used to estimate the water surface elevation in the detention basin for trash capture device sizing was a 1-year, 1-hour (1yr1hr) storm as per the State's Trash Amendment requirements. The magnitude of this storm was determined by extrapolating from data in the Sutter County Design Storm Runoff document (July 1998).
- Rainfall data used to estimate mean annual watershed flow (for pollutant removal and infiltration calculations) was taken from the California Irrigation Management Information System (CIMIS) rain gauge station database. A mean annual precipitation depth was determined for the area, and the year 2006 was determined to represent the mean annual rainfall. Hourly rainfall data for January 1, 2006 to December 31, 2006 was obtained for the Sacramento Valley's Verona Station (Station ID No. 235).

- The swales to be established near the basin perimeter are intended to provide new area for increased infiltration and pollutant removal. The hydrology model (SacCalc) was used to confirm that the top of the swales will be above the high-water level during the design storm (1-year, 1-hour) and thus be available for additional infiltration (i.e. the detention basin will not be full). The model shows a total inflow of approximately 6.7 ac-ft, compared to the total detention basin volume of approximately 83 ac-ft. Because the top of the low flow channels are below the pump on/off elevations, the swales will provide increased area and travel time for low flows in the detention basin, increasing the infiltration capacity of the basin.
- Swale area and volume were calculated using the approximate length from the project schematic and an estimated 7.5-foot infiltration area width (approximately 7.5-foot top width; 5-foot bottom width; 3H:1V channel side slopes; 1 percent channel longitudinal slope; and 1foot/second velocity).
- The soil in the detention basin is Hydrologic Soil Group B and has a hydraulic conductivity of approximately 1.28 inches per hour (accessed from Natural Resources Conservation Service web soil survey), which was used to calculate the total infiltrated and treated volume of the swales.
- Other parameters used in the evaluation were detailed in the Multiple Benefit TM (December 21, 2017), including: Typical Impervious Percent for Land Uses (Table 5); Annual Runoff Depth, Depression Storage and Infiltration Rates (Table 6); Average Inflow Concentrations for Urban Storm Water Runoff Pollutants and Percent Removals for LID (Table 7); and Trash Generation Rates by Land Use (Table 8).

Evaluation of water quality benefit criteria are described below. Although no site-specific water quality testing was performed, the following contaminants have been included because they were included on the 303(d) lists for receiving waters, in the City's MS4 Permit, or are common storm water contaminants.

Natural water drainage and treatment:

- The swales/low flow channels will increase natural drainage and treatment by allowing more infiltration.

Sediment, mercury, Group A pesticides, and oxygen-demanding substances: These contaminants were evaluated using sediment as a proxy, as explained below. Mercury and Group A pesticides were included because they are included on the 303(d) list for receiving waters. Sediment and oxygen-demanding substances are common contaminants found in urban storm water.

- Sediment (TSS): The amount of sediment removed was calculated by estimating the volume of flow that would be infiltrated through the swales, the volume of swale flow-through, and a typical loading of sediment in urban storm water.
- Mercury (303(d) List Pollutant): Mercury is a common urban stormwater contaminant. Although its presence is typically associated with mining activities, it's also found in urban stormwater runoff. The Sutter Bypass and the Feather River, both receiving waters for Yuba City drainage, have mercury listed as a 303(d) pollutant.

The method of treatment for the swales is infiltration and flow-through. The amount of mercury potentially removed is related to the amount of sediment removed, and therefore, the amount of sediment removed from receiving waters is used as a proxy for estimating mercury reduction. The amount of sediment removed was calculated as described in the Sediment (TSS) category.

- DDT (303(d) List Pollutant: DDT is a pesticide, banned in 1972, that is still found in the environment due to its ability to adsorb to soil particles and its resistance to degradation. DDT can be re-mobilized with disturbance; however, its removal is found to be associated with sediment removal. The amount of DDT potentially removed is related to the amount of sediment removed, and therefore, the amount of sediment removed from receiving waters is used as a proxy for estimating DDT reduction. The amount of sediment removed was calculated as described in the Sediment (TSS) category.
- Dieldrin (303(d) List Pollutant): Dieldrin is similar to DDT: its use is banned, it adsorbs to soils, and is persistent in the environment. Dieldrin has been found in urban storm water, and is found to be associated with sediment removal. The amount of Dieldrin potentially removed is related to the amount of sediment removed, and therefore, the amount of sediment removed from receiving waters is used as a proxy for estimating Dieldrin reduction. The amount of sediment removed was calculated as described in the Sediment (TSS) category.
- Oxyfluorfen (303(d) List Pollutant): Oxyfluorfen is a common pesticide. There are currently no pesticides being used at this detention basin. Although this project involves the planting of native grasses in swales, they would not require pesticide use. Therefore, this project is not anticipated to change the levels of Oxyfluorfen in storm water.
- Chlorpyrifos (MS4 Pollutant): Chlorpyrifos is a restricted-use pesticide used mostly in agricultural settings. There are currently no pesticides being used at this detention basin. Although this project involves the planting of native grasses in swales, they would not require pesticide use. Therefore, this project is not anticipated to change the levels of Chlorpyrifos in stormwater. Diazinon (MS4 Pollutant): Diazinon is a restricted -use pesticide used mostly in agricultural settings. There are currently no pesticides being used at this detention basin. Although this project involves the planting of native grasses in swales, they would not require pesticide use. Therefore, this project is not anticipated to change the levels of Diazinon in stormwater. PCBs (303(d) List Pollutant): PCBs can enter a watershed through transformers, atmospheric deposition, and eroded or re-suspended particles. PCBs tend to behave like sediment, which settle out during infiltration and treatment. The estimated quantity of PCBs removed was calculated by estimating the volume of flow that would be treated through the swales per year and a typical loading of PCBs in urban storm water.
- Trash: The proposed trash capture devices will trap all particles retained by a 5-mm mesh screen and a design treatment capacity of not less than the peak flow rate from a 1-year, 1-hour storm event in the watershed area. The quantity of trash removed was calculated by applying an estimated trash loading (from the Bay Area Stormwater

Management Agencies Association, Trash Generation Rates, 2014) by land use for the entire watershed, and normalizing the total trash generated by watershed area.

Common storm water contaminants (removal rates and data sources for the following contaminants are listed in Table 7 of the Multiple Benefits Evaluation Methodology Technical Memorandum, published on December 21, 2017):

- Pathogens and Bacteria: Fecal coliform is used as an indicator organism for pathogens and bacteria. The quantity of pathogens and bacteria removed was estimated by calculating the volume of flow that would be treated through the swales per year and a typical loading of fecal coliform in urban storm water.
- Heavy Metals (cadmium, copper, lead, and zinc): The quantity of heavy metals removed was calculated by estimating the volume of flow that would be treated through the swales per year and a typical loading of heavy metals in urban storm water.
- Oils and grease (polyaromatic hydrocarbons, PAHs): The quantity of oils and grease removed was calculated by estimating the volume of flow that would be treated through the swales per year and a typical loading of PAHs in urban storm water.
- Total Nitrogen: The quantity of nitrogen removed was calculated by estimating the volume of flow that would be treated through the swales year and a typical loading of nitrogen in urban storm water.
- Total Phosphorus: The quantity of phosphorus removed was calculated by estimating the volume of flow that would be treated through the swales year and a typical loading of phosphorus in urban storm water.
- Infiltration: The increase in infiltration was calculated by estimating the volume of flow that would be infiltrated through swales per year.

The overall normalized score for water quality was 34.9 out of 80 possible points.

Water Supply Benefit Category

Evaluation of water supply benefit criteria are described below.

- Water supply reliability: This project has the potential to augment a water supply through recharge of groundwater and surface water sources, however, watering requirements from new recreational areas will likely offset any augmentation of the water supply from infiltration. Therefore, the water supply reliability was evaluated as none, or zero points.
- Conjunctive Use: The stormwater captured in this project is not being used as an alternative water supply.
- Water Conservation: This project does not involve any water conservation.

The overall normalized score for water supply was 0 out of 81 possible points.

Flood Management Benefit Category

The project will reduce runoff conveyed to receiving waters and slightly increase the available capacity of the detention basin through increased infiltration. Evaluation of flood management benefit criteria are described below.

- Reduction of runoff rate/volume: The swales will reduce the volume and rate of runoff that reaches receiving waters through increased infiltration capacity in the detention basin.
- Sanitary sewer overflow reduction: This project will not reduce the area of urban floodplain, and therefore no reduction of sanitary sewer overflows will occur.
- Improved flood protection: This project will not provide any significant improvement in flood protection.
- Reduction of flood risk-life and safety: This project has the potential to reduce flooding slightly in the area around the detention basin, but the reduction is not significant.

The overall normalized score for flood management was 14.1 out of 94 possible points.

Environmental Benefit Category

Evaluation of environmental benefit criteria are described below.

- Create or improve wetland/riparian habitat: The planting of native grasses with the creation of the swales will improve about 18,600 square feet of newly vegetated area.
- Environmental flow (Instream Flow): The increase in infiltration through installation of the swales helps to partially restore the local hydrology to pre-development conditions. Restoring the natural hydrograph in this area will help restore environmental flows to more natural conditions, and therefore, the environmental flow is enhanced.
- Urban green space: This project includes an increase in urban green space from construction of the recreational areas in the detention basin bottom.
- Energy use and Greenhouse Gas: The increase in infiltration through installation of the swales will require less volume to be pumped out of the detention basin by the pump station. Therefore, energy use and greenhouse gasses will be decreased.
- Restore natural hydrograph: The increase in infiltration through installation of the swales helps to partially restore the local hydrology to pre-development conditions and to restore the natural hydrograph. Therefore, the natural hydrograph is improved.
- Water temperature: The increase in infiltration through installation of swales will help to partially restore the local hydrology to pre-development conditions, however, the impact on water temperature is not expected to be significant.

The overall normalized score for environmental benefit was 34.5 out of 40 possible points.

Community Benefit Category

This project involves construction of recreational areas in the detention basin bottom and allowing public access that can be limited during heavy rainfall. This provides an opportunity for public education of storm water best practices. This could be achieved through encouraging community involvement in construction and/or maintenance of the facility, or through signage, media coverage, or educational programs for the site. Evaluation of the community benefit criteria are described below.

- Employment opportunities: This project will have a temporary increase in jobs during construction. Long-term maintenance work will be required for the trash capture devices, swales, and recreational area.
- Public education: This project provides an opportunity for the City to educate the public on storm water best practices and the benefits of reducing runoff. There are plans for implementing safety signage or media coverage, but no plans for educational signage, so the project was given a score of Low.
- Community involvement: This project provides an opportunity for the City to involve the community during construction and/or maintenance of the facility, or through or citizen-run educational programs for the site. Although there are no current plans for community involvement, the project was given a score of Low due to the potential for involvement.
- Public use/recreation: This project includes construction of a recreational area in the detention basin bottom. Evaluation was based on the number of acres to be constructed.

The overall normalized score for community benefit was 35.1 out of 54 possible points.

Evaluation Result

The project received a total of 118.6 out of 349 possible points from the multiple benefit evaluation. Based on the results of the multiple benefit evaluation, the project ranked fifth out of the ten total projects, and second out of the three detention basin improvement projects. Among detention basin projects, the score within the water quality category was the most variable. This was a result of the large difference in soil hydraulic conductivity values, which determines infiltration rate and associated pollutant removals. This project was ranked first in the community benefit category out of all the projects due to the recreation area created, and associated potential for community and public involvement. This ranking is based solely on the multiple benefit evaluation results and will be adjusted to incorporate regulatory requirements and funding availability.

Permit and Approval Requirements

Permits required for this project include applicable City permits and a general construction permit from the State Water Resources Control Board to implement water quality controls during construction.

The proposed "rigid basket" trash capture devices are not currently included on the State's Certified Trash Amendment devices list. As discussed in the Trash Rack Selection Process document (March 7, 2018), the City would be required to seek Water Board approval for use of this device. Approval would be based on the criteria of a full capture device that has a 5-mm mesh screen and has a design treatment capacity of not less than the peak flow rate from a 1-year, 1-hour storm event in the watershed area. Once certified, the trash capture devices would meet the State's Trash Amendment requirements for full capture, allowing the City to maintain their Track 1 Trash Amendment status.

Environmental Impact Report Requirements

The purpose of this project is to improve the environment; however, the construction of this project could result in temporary impacts. An environmental review of this project will be performed prior to construction.

Initial Cost Estimate

Cost estimates include initial capital cost and annual operation and maintenance (O&M) costs. The capital cost is a Class 3 budget estimate as defined by the Association for the Advancement of Cost Engineering (AACE) with a best-expected accuracy of minus 20 percent to plus 30 percent. A Class 3 cost estimate is used for budget authorization level design, characterized by a 10 to 40 percent design definition. Based on the Class 3 characteristics and engineering judgement, a 30 percent contingency was selected for this project. Unit costs used in the estimate were developed using recently completed Bay Area projects, scaled to wages in Sutter County (current wage information was obtained from the State's Occupational Employment Statistics and Wages program). The cost estimates are based on the engineer's perception of current conditions in the project area and are subject to variances in the costs of labor, materials, equipment, and services provided by others as well as economic conditions.

- Estimated Capital Cost: The cost of installing this facility is estimated to be $786,800. Table A.4-1 provides a detailed cost breakdown.

Table A.4-1. Estimated Project Costs, Shanghai Bend Detention Pond Modifications

Item No	Item Description	Units	Quantity	Unit Cost	Total Cost
Trash Capture Device					
1	End-of-Pipe 72" diameter	ea.	1	$36,000	$36,000
2	End-of-Pipe 54" diameter	ea.	1	$27,000	$27,000
Recreational Area					
3	Top Soil & Hydroseed	yd^2	25,991	$5	$129,954
4	Project/Rec Area Signage	ea.	2	$500	$1,000
5	Drip Irrigation (incl. line, backflow, controls, power)	LS	1	$11,000	$11,000
Existing Channel Removal					
6	Concrete Removal	ea.	1	$1,000	$1,000
Bio-Swale					
7	Excavation	cy	1398	$15	$20,977
8	Splash Pad (Concrete)	cy	2	$700	$1,400
9	Splash Pad Cobbles	cy	1	$315	$315
10	Bioretention Soil (12" Depth)	cy	962	$108	$103,851
11	Wood Mulch (Matting Variety 3" Depth)	cy	195	$126	$24,607
12	Drain Rock	cy	153	$315	$48,319
13	Vegetation - 4" Pots	ea.	1243	$45	$55,913
General Items					
14	Mobilization/Demobilization & Insurance (10%)	LS	1	$46,200	$46,200
15	Construction Contingency (30%)	LS	1	$152,300	$152,300
				Construction Costs	*$659,900*
16	Engineering, Administration, Permitting & CM (25%)	LS	1	$126,900	$126,900
				Total Estimated Capital Project Cost	**$786,800**

- Estimated Annual Operations and Maintenance Costs: The annual cost for operating and maintaining this facility is estimated to be $24,800. Table A.4-2 provides a detailed cost breakdown. Operation and maintenance tasks will include:
  - — Cleaning of end-of-pipe trash capture devices; the frequency of cleaning will be determined by trash loadings and storm frequency. Frequency was estimated at four times per year.
  - — Minor maintenance of low flow channels/swales
  - — Maintenance of recreational area

Table A.4-2. Estimated Annual Maintenance Costs, Shanghai Bend Detention Pond Modifications

Item No	Item Description	Units	Quantity	Unit Cost	Total Cost
Trash Capture Maintenance - Frequency: 4 times per year, 2 hours per device					
1	Vac Truck	hour	16	$150	$2,400
2	2 Person Maintenance Crew	hour	16	$100	$1,600
Recreational Area/Swale Maintenance - Frequency: 4 hours per week					
3	2 Person Maintenance Crew	hour	208	$100	$20,800
				Total Estimated Project Cost	**$24,800**

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YCB Project A7:
Detention Pond East of WWTP Modifications
Project Evaluation

Project Evaluation Background:

The Detention Pond East of the WWTP is an existing detention basin with approximately 14 acre-feet of storage volume. This project involves the following modifications:

- Modifying the low flow channel alignments to create swales/small ponds and re-routing the existing alignment to the edge of the basin bottom. This will increase infiltration for low flows by incorporating specific bio-retention soil and removing fines from the proposed low flow channel alignments, and improving treatment capacity.
- Installing in-line "rigid basket" trash capture devices at the existing concrete basin containment structure, upstream of both existing pump intakes in order to satisfy the State's Trash Amendment requirements.

The following sections describe the process and results for evaluation of the project which is consistent with the California State Water Resource Control Board's Storm Water Resource Plan Guidelines (December 15, 2015). Projects were evaluated both quantitatively and qualitatively for how well they meet the State's Storm Water Management Benefit Categories. Categories and metrics below are organized corresponding to Table 4 of the State Guidelines.

Water Quality Benefit Category

This project will provide treatment of storm water runoff in the new swales via both infiltration to the channel bottom and channel flow-through (bio-treatment). Trash will be captured by devices which meet the State's Trash Amendment requirements for full capture.

Key design and evaluation criteria for determining pollutant removals as part of the water quality category include:

- The design storm used to estimate the water surface elevation in the detention basin for trash capture device sizing was a 1-year, 1-hour (1yr1hr) storm as per the State's Trash Amendment requirements. This storm was extrapolated using data from the Sutter County Design Storm Runoff document (July 1998).
- Rainfall data used to estimate mean annual watershed flow (for pollutant removal and infiltration calculations) was taken from the California Irrigation Management Information System (CIMIS) rain gauge station database. A mean annual precipitation depth was determined for the area, and the year 2006 was determined to represent the mean annual rainfall. Hourly rainfall data for January 1, 2006 to December 31, 2006 was obtained for the Sacramento Valley's Verona Station (Station ID No. 235).
- The swales to be established near the basin perimeter are intended to provide new area for increased infiltration and pollutant removal. The hydrology model (SacCalc) was used to confirm that the top of the swales will be above the high-water level during the design storm (1-year, 1-hour) and thus be available for additional infiltration (i.e. the detention basin will not be full). The model shows a total inflow of approximately 4.3 ac-ft, compared to the total detention basin volume of

approximately 14 ac-ft. Because the top of the low flow channels are below the pump on/off elevations, the swales will provide increased area and travel time for low flows in the detention basin, increasing the infiltration capacity of the basin.

- Swale area and volume were calculated using the approximate length from the project schematic and an estimated 7.5-foot infiltration area width (approximately 7.5-foot top width; 5-foot bottom width; 3H:1V channel side slopes; ~1 percent channel longitudinal slope; and 1ft/s velocity).
- The soil in the detention basin is Hydrologic Soil Group B and the hydraulic conductivity is approximately 13.0 inches per hour (accessed from Natural Resources Conservation Service web soil survey), which was used to calculate the total infiltrated and treated volume of the swales.
- Other parameters used in the evaluation were detailed in the Multiple Benefit TM (December 21, 2017), including: Typical Impervious Percent for Land Uses (Table 5); Annual Runoff Depth, Depression Storage and Infiltration Rates (Table 6); Average Inflow Concentrations for Urban Storm Water Runoff Pollutants and Percent Removals for LID (Table 7); and Trash Generation Rates by Land Use (Table 8).

Evaluation of water quality benefit criteria are described below. Although no site-specific water quality testing was performed, the following contaminants have been included because they were included on the 303(d) lists for receiving waters, in the City's MS4 Permit, or are common storm water contaminants.

Natural water drainage and treatment:

- The swales/low flow channels will increase natural drainage and treatment by allowing more infiltration.

Sediment, mercury, Group A pesticides, and oxygen-demanding substances: These contaminants were evaluated using sediment as a proxy, as explained below. Mercury and Group A pesticides were included because they are included on the 303(d) list for receiving waters. Sediment and oxygen-demanding substances are common contaminants found in urban storm water.

- Sediment (TSS): The amount of sediment to be removed annually was calculated by estimating the volume of flow that would be infiltrated through the swales, the volume of swale flow-through, and a typical loading of sediment in urban storm water.
- Mercury (303(d) List Pollutant): Mercury is a common urban stormwater contaminant. Although its presence is typically associated with mining activities, it's also found in urban stormwater runoff. The Sutter Bypass and the Feather River, both receiving waters for Yuba City drainage, have mercury listed as a 303(d) pollutant. The method of treatment for the swales is infiltration and flow-through. The amount of mercury potentially removed is related to the amount of sediment removed, and therefore, the amount of sediment removed from receiving waters is used as a proxy for estimating mercury reduction. The amount of sediment removed was calculated as described in the Sediment (TSS) category.

- DDT (303(d) List Pollutant): DDT is a pesticide, banned in 1972, that is still found in the environment due to its ability to adsorb to soil particles and its resistance to degradation. DDT can be re-mobilized with disturbance; however, its removal is found to be associated with sediment removal. The amount of DDT potentially removed is related to the amount of sediment removed, and therefore, the amount of sediment removed from receiving waters is used as a proxy for estimating DDT reduction. The amount of sediment removed was calculated as described in the Sediment (TSS) category.
- Dieldrin (303(d) List Pollutant): Dieldrin is similar to DDT: its use is banned, it adsorbs to soils, and is persistent in the environment. Dieldrin has been found in urban storm water, and is found to be associated with sediment removal. The amount of Dieldrin potentially removed is related to the amount of sediment removed, and therefore, the amount of sediment removed from receiving waters is used as a proxy for estimating Dieldrin reduction. The amount of sediment removed was calculated as described in the Sediment (TSS) category.
- Oxyfluorfen (303(d) List Pollutant): Oxyfluorfen is a common pesticide. There are currently no pesticides being used at this detention basin. Therefore, this project is not anticipated to change the levels of Oxyfluorfen in storm water.
- Chlorpyrifos (MS4 Pollutant): Chlorpyrifos is a restricted-use pesticide used mostly in agricultural settings. There are currently no pesticides being used at this detention basin. Therefore, this project is not anticipated to change the levels of Chlorpyrifos in storm water.
- Diazinon (MS4 Pollutant): Diazinon is a restricted -use pesticide used mostly in agricultural settings. There are currently no pesticides being used at this detention basin. Therefore, this project is not anticipated to change the levels of Diazinon in storm water.
- PCBs (303(d) List Pollutant): PCBs can enter a watershed through transformers, atmospheric deposition, and eroded or re-suspended particles. PCBs tend to behave like sediment, which settle out during infiltration and treatment. The estimated quantity of PCBs removed was calculated by estimating the volume of flow that would be treated through the swales per year and a typical loading of PCBs in urban storm water.
- Trash: The proposed trash capture devices will trap all particles retained by a 5-mm mesh screen and a design treatment capacity of not less than the peak flow rate from a 1-year, 1-hour storm event in the watershed area. The quantity of trash removed was calculated by applying an estimated trash loading by land use (from the Bay Area Stormwater Management Agencies Association, Trash Generation Rates, 2014) for the entire watershed, and normalizing the total trash generated by watershed area.

Common storm water contaminants (removal rates and data sources for the following contaminants are listed in Table 7 of the Multiple Benefits Evaluation Methodology Technical Memorandum, published on December 21, 2017):

- Pathogens and Bacteria: Fecal coliform is used as an indicator organism for pathogens and bacteria. The quantity of pathogens and bacteria removed was estimated by calculating the volume of flow that would be treated through the swales per year and a typical loading of fecal coliform in urban storm water.
- Heavy Metals (cadmium, copper, lead, and zinc): The quantity of heavy metals removed was calculated by estimating the volume of flow that would be treated through the swales per year and a typical loading of heavy metals in urban storm water.
- Oils and grease (polyaromatic hydrocarbons, PAHs): The quantity of oils and grease removed was calculated by estimating the volume of flow that would be treated through the swales per year and a typical loading of PAHs in urban storm water.
- Total Nitrogen: The quantity of nitrogen removed was calculated by estimating the volume of flow that would be treated through the swales year and a typical loading of nitrogen in urban storm water.
- Total Phosphorus: The quantity of phosphorus removed was calculated by estimating the volume of flow that would be treated through the swales year and a typical loading of phosphorus in urban storm water.
- Infiltration: The increase in infiltration was calculated by estimating the volume of flow that would be infiltrated through swales per year.

The overall normalized score for water quality was 65.5 out of 80 possible points.

Water Supply Benefit Category

This project will provide an increase in infiltration which can potentially provide a benefit to water supply by augmenting the water supply or recharging surface water sources. Evaluation of water supply benefit criteria are described below.

- Water supply reliability: This project has the potential to augment a water supply through recharge of groundwater and surface water sources.
- Conjunctive Use: The stormwater captured in this project is not being used as an alternative water supply.
- Water Conservation: This project does not involve any water conservation.

The overall normalized score for water supply was 8.1 out of 81 possible points.

Flood Management Benefit Category

The project will reduce runoff conveyed to receiving waters and slightly increase the available capacity of the detention basin through increased infiltration. Evaluation of flood management benefit criteria are described below.

- Reduction of runoff rate/volume: The swales will reduce the volume and rate of runoff that reaches receiving waters through increased infiltration capacity in the detention basin.
- Sanitary sewer overflow reduction: This project will not reduce the area of urban floodplain, and therefore no reduction of sanitary sewer overflows will occur.
- Improved flood protection: This project will not provide any significant improvement in flood protection.
- Reduction of flood risk-life and safety: This project has the potential to reduce flooding slightly in the area around the detention basin, but the reduction is not significant.

The overall normalized score for flood management was 14.1 out of 94 possible points.

Environmental Benefit Category

Evaluation of environmental benefit criteria are described below.

- Create or improve wetland/riparian habitat: Hydro-mulching in the swales will improve about 7,800 square feet of the detention basin bottom.
- Environmental flow (Instream Flow): The increase in infiltration through installation of the swales helps to partially restore the local hydrology to pre-development conditions. Restoring the natural hydrograph in this area will help restore environmental flows to more natural conditions, and therefore, the environmental flow is enhanced.
- Urban green space: This project does not include an increase in urban green space.
- Energy use and Greenhouse Gas: The increase in infiltration through installation of the swales will require less volume to be pumped out of the detention basin by the pump stations. Therefore, energy use and greenhouse gasses will be decreased.
- Restore natural hydrograph: The increase in infiltration through installation of the swales helps to partially restore the local hydrology to pre-development conditions and to restore the natural hydrograph. Therefore, the natural hydrograph is improved.
- Water temperature: The increase in infiltration through installation of swales will help to partially restore the local hydrology to pre-development conditions, however, the impact on water temperature is not expected to be significant.

The overall normalized score for environmental benefit was 26.7 out of 40 possible points.

Community Benefit Category

This project is located near an industrial area and thus limits the potential for public and community involvement. Evaluation of the community benefit criteria are described below.

- Employment opportunities: This project will have a temporary increase in jobs during construction. Long-term maintenance work will be required for the trash capture device.
- Public education: This project does not provide any public education benefit.
- Community involvement: This project does not provide any community benefit.
- Public use/recreation: This project does not provide any public use or recreational benefit.

The overall normalized score for community benefit was 13.5 out of 54 possible points.

Evaluation Result

The project received a total of 127.9 out of 349 possible points from the multiple benefit evaluation. Based on the results of the multiple benefit evaluation, the project ranked fourth out of the ten total projects. This project was ranked first out of all the projects in the water quality category, primarily due to the high soil hydraulic conductivity value, which determines infiltration rate and associated pollutant removals. This ranking is based solely on the multiple benefit evaluation results and will be adjusted to incorporate regulatory requirements and funding availability.

Permit and Approval Requirements

Permits required for this project include applicable City permits and a general construction permit from the State Water Resources Control Board to implement water quality controls during construction.

The proposed "rigid basket" trash capture devices are not currently included on the State's Certified Trash Amendment devices list. As discussed in the Trash Rack Selection Process document (March 7, 2018), the City would be required to seek Water Board approval for use of this device. Approval would be based on the criteria of a full capture device which traps all particles retained by a 5-mm mesh screen and has a design treatment capacity of not less than the peak flow rate from a 1yr1hr storm event in the watershed area. Once certified, the trash capture devices would meet the State's Trash Amendment requirements for full capture, allowing the City to maintain their Track 1 Trash Amendment status.

Environmental Impact Report Requirements

The purpose of this project is to improve the environment; however, the construction of this project could result in temporary impacts. An environmental review of this project will be performed prior to construction.

Initial Costing

Cost estimates include initial capital cost and annual operation and maintenance (O&M) costs. The capital cost is a Class 3 budget estimate as defined by the Association for the Advancement of Cost Engineering (AACE) with a best-expected accuracy of minus 20 percent to plus 30 percent. A Class 3 cost estimate is used for budget authorization level design, characterized by a 10 to 40 percent design definition. Based on the Class 3 characteristics and engineering judgement, a 30 percent contingency was selected for this project. Unit costs used in the estimate were developed using recently completed Bay Area projects, scaled to wages in Sutter County (current wage information was obtained from the State's Occupational Employment Statistics and Wages program). The cost estimates are based on the engineer's perception of current conditions in the project area and are subject to variances in the costs of labor, materials, equipment, and services provided by others as well as economic conditions.

- Estimated Capital Cost: The cost of installing this facility is estimated to be $236,100. Table A.7-1 provides a detailed cost breakdown.

Table A.7-1. Estimated Project Costs, Detention Pond East of WWTP Modifications

Item No	Item Description	Units	Quantity	Unit Cost	Total Cost
Trash Capture Device					
1	End-of-Pipe 54" diameter	ea.	1	$27,000	$27,000
2	End-of-Pipe 48" diameter	ea.	1	$24,000	$24,000
Bio-Swale					
3	Excavation	cy	585	$15	$8,779
4	Splash Pad (Concrete)	cy	2	$700	$1,400
5	Splash Pad Cobbles	cy	2	$315	$630
6	Bioretention Soil (12" Depth)	cy	402	$108	$43,463
7	Wood Mulch (Matting Variety 3" Depth)	cy	82	$126	$10,298
8	Drain Rock	cy	64	$315	$20,222
9	Hydroseed	yd^2	867	$3	$2,600
General Items					
10	Mobilization/Demobilization & Insurance (10%)	LS	1	$13,900	$13,900
11	Construction Contingency (30%)	LS	1	$45,700	$45,700
				Construction Costs	*$198,000*
12	Engineering, Administration, Permitting & CM (25%)	LS	1	$38,100	$38,100
				Total Estimated Capital Project Cost	**$236,100**

- Estimated Annual Operations and Maintenance Costs: The annual cost for operating and maintaining this facility is estimated to be $4,000. Table A.7-2 provides a detailed cost breakdown. Operation and maintenance tasks will include:
  - — Cleaning of end-of-pipe trash capture devices; the frequency of cleaning will be determined by trash loadings and storm frequency. Frequency can be estimated at four times per year.
  - — Minor maintenance of low flow channels/swales

Table A.7-2. Estimated Annual Maintenance Costs, Detention Pond East of WWTP Modifications

Item No	Item Description	Units	Quantity	Unit Cost	Total Cost
Trash Capture Maintenance - Frequency: 4 times per year, 2 hours per device					
1	Vac Truck	hour	16	$150	$2,400
2	2 Person Maintenance Crew	hour	16	$100	$1,600
				Total Estimated Project Cost	**$4,000**

YCB Project F1, F2 & F4: Gilsizer Slough at Lincoln Road Trash Capture Project Evaluation

Project Evaluation Background:

The Gilsizer Slough at Lincoln Road Trash Capture project involves installing an in-line "rigid basket" trash capture device in Gilsizer Slough, downstream of Lincoln Road, in order to satisfy the State's Trash Amendment requirements.

The following sections describe the process and results for evaluation of the project which is consistent with the California State Water Resource Control Board's Storm Water Resource Plan Guidelines (December 15, 2015). Projects were evaluated both quantitatively and qualitatively for how well they meet the State's Storm Water Management Benefit Categories. Categories and metrics below are organized corresponding to Table 4 of the State Guidelines.

Water Quality Benefit Category

This project will provide trash capture in Gilsizer Slough which meets the State's Trash Amendment requirements for full capture.

Key design and evaluation criteria as part of the water quality category include:

- The design storm used to estimate the water surface elevation in the slough for trash capture device sizing was a 1-year, 1-hour storm as per the State's Trash Amendment requirements. The magnitude of this storm was determined by extrapolating from data in the Sutter County Design Storm Runoff document (July 1998).
- Other parameters used in the evaluation were detailed in the Multiple Benefit TM (December 21, 2017), including Trash Generation Rates by Land Use (Table 8).

Evaluation of water quality benefit criteria are described below.

- Natural water drainage and treatment: This project does not improve natural water drainage or infiltration.
- Nonpoint source pollutants (Sediment, mercury, Group A pesticides, and oxygen-demanding substances): This project does not provide removal of any nonpoint source pollutants.
- Trash: The proposed trash capture devices will trap all particles retained by a 5-mm mesh screen and a design treatment capacity of not less than the peak flow rate from a 1-year, 1-hour storm event in the watershed area. The quantity of trash removed was calculated by applying an estimated trash loading by land use for the entire watershed, and normalizing the total trash generated by watershed area.
- Common storm water contaminants (pathogens, heavy metals, PAHs, nitrogen, and phosphorus): This project does not provide removal of any common storm water contaminants.
- Infiltration: This project does not provide any infiltration.

The overall normalized score for water quality was 7.3 out of 80 possible points.

Water Supply Benefit Category

Evaluation of water supply benefit criteria are described below.

- Water supply reliability: This project does not augment a water supply.
- Conjunctive Use: The stormwater in this project is not being used as an alternative water supply.
- Water Conservation: This project does not involve any water conservation.

The overall normalized score for water supply was 0 out of 81 possible points.

Flood Management Benefit Category

Evaluation of flood management benefit criteria are described below.

- Reduction of runoff rate/volume: This project does not reduce the volume or rate of runoff.
- Sanitary sewer overflow reduction: This project does not reduce acres of urban floodplain, and therefore no reduction of sanitary sewer overflows will occur.
- Improved flood protection: This project does not provide any improvement in flood protection for adjacent properties.
- Reduction of flood risk-life and safety: This project does not reduce flooding risk in the area around the slough.

The overall normalized score for flood management was 0 out of 94 possible points.

Environmental Benefit Category

Evaluation of environmental benefit criteria are described below.

- Create or improve wetland/riparian habitat: This project may cause an enhancement in riparian habitat from the creation of small pools around the in-line trash capture device. However, this benefit will be insignificant and is difficult to quantify in terms of acreage. Therefore, this project was determined to provide no improvement to habitat.
- Environmental flow (Instream Flow): This project does not involve any impact on environmental flows.
- Urban green space: This project does not increase urban green space.
- Energy use and Greenhouse Gas: This project does not provide any decrease in energy use or greenhouse gas production.
- Restore natural hydrograph: This project does not improve or restore the natural hydrograph.

- Water temperature: This project may cause some ponding to occur behind the trash screen and in association, a slightly higher water temperature. However, the impact on water temperature is not expected to be significant.

The overall normalized score for environmental benefit was 16.7 out of 40 possible points.

Community Benefit Category

This project is located in an existing slough and thus limits the potential for public and community involvement. Evaluation of community benefit criteria are described below.

- Employment opportunities: This project will have a temporary increase in jobs during construction. Long-term maintenance work will be required for the trash capture device.
- Public education: This project does not provide any public education benefit.
- Community involvement: This project does not provide any community benefit.
- Public use/recreation: This project does not provide any public use or recreational benefit.

The overall normalized score for community benefit was 13.5 out of 54 possible points.

Evaluation Result

The project received a total of 37.4 out of 349 possible points from the multiple benefit evaluation. Based on the results of the multiple benefit evaluation, the project ranked ninth out of the ten total projects. This project was ranked first for the trash capture criteria within the water quality category due to the watershed's large tributary area and large acreage of high trash generating land use. This ranking is based solely on the multiple benefit evaluation results and will be adjusted to incorporate regulatory requirements and funding availability.

Permit and Approval Requirements

Permits and notifications required for this project include:

- Applicable City permits
- General construction permit from the State Water Resources Control Board to implement water quality controls during construction
- U.S. Army Corps of Engineers – Clean Water Act Section 404 Permit: According to the current US EPA definition, Gilsizer Slough may be considered a navigable water of the United States (Clean Water Act, 40 CFR 230.3(s)). Section 404 requires USACE authorization prior to discharging dredged or fill materials into waters of the United States.
- Regional Water Quality Control Board – Clean Water Act Section 401 Permit: Section 401 of the CWA requires that any application for a federal permit or license, which may result in a discharge of pollutants into waters of the United States, must obtain a state water quality certification that the activity complies with all applicable

water quality standards, limitations, and restrictions. A USACE Section 404 Permit triggers a RWQCB 401 Permit.

- California Department of Fish and Wildlife – Lake and Streambed Alteration (LSA) notification: Installation of the trash capture device in Gilsizer Slough will involve alteration of the slough bottom. This work will require an LSA notification to the California Department of Fish and Wildlife (Fish and Game, Code Section 1602).
- Gilsizer Slough is a local drainage course which is pumped into to the Sutter Bypass. Modifications to the slough may require permits from local drainage agencies including Gilsizer County Drainage District.
- The proposed "rigid basket" trash capture device is not currently included on the State's Certified Trash Amendment devices list. As discussed in the Trash Rack Selection Process document (March 7, 2018), the City would be required to seek Water Board approval for use of this device. Approval would be based on the criteria of a full capture device that has a 5-mm mesh screen and a design treatment capacity of not less than the peak flow rate from a 1-year, 1-hour storm event in the watershed area. Once certified, the trash capture device would meet the State's Trash Amendment requirements for full capture, allowing the City to maintain their Track 1 Trash Amendment status.

Environmental Impact Report Requirements

The purpose of this project is to improve the environment; however, the construction of this project could result in temporary impacts. An environmental review of this project will be performed prior to construction.

Initial Cost Estimate

Cost estimates include initial capital cost and annual operation and maintenance (O&M) costs. The capital cost is a Class 3 budget estimate as defined by the Association for the Advancement of Cost Engineering (AACE) with a best-expected accuracy of minus 20 percent to plus 30 percent. A Class 3 cost estimate is used for budget authorization level design, characterized by a 10 to 40 percent design definition. Based on the Class 3 characteristics and engineering judgement, a 30% contingency was selected for this project. Unit costs used in the estimate were developed using recently completed Bay Area projects, scaled to wages in Sutter County (current wage information was obtained from the State's Occupational Employment Statistics and Wages program). The cost estimates are based on the engineer's perception of current conditions in the project area and are subject to variances in the costs of labor, materials, equipment, and services provided by others as well as economic conditions.

- Estimated Capital Cost: The cost of installing this facility is estimated to be $398,100. Table F.1-1 provides a detailed cost breakdown.

Table F.1-1. Estimated Project Costs, Gilsizer Slough at Lincoln Road Trash Capture					
Item No	Item Description	Units	Quantity	Unit Cost	Total Cost
Slough Trash Capture					
1	In-Line Trash Capture Device	ea.	1	$210,000	$210,000
2	Channel Slope Modifications (Excavation)	cy	1,556	$15	$23,333
General Items					
3	Mobilization/Demobilization & Insurance (10%)	LS	1	$23,400	$23,400
4	Construction Contingency (30%)	LS	1	$77,100	$77,100
				Construction Costs	*$333,900*
5	Engineering, Administration, Permitting & CM (25%)	LS	1	$64,200	$64,200
				Total Estimated Capital Project Cost	**$398,100**

- Estimated Annual Operations and Maintenance Costs: The annual cost for operating and maintaining this facility is estimated to be $6,000. Table F.1-2 provides a detailed cost breakdown. Operation and maintenance tasks will include:
  - Cleaning of in-line trash capture device; the frequency of cleaning will be determined by trash loadings and storm frequency. Frequency was estimated at four to six times per year.

Table F.1-2. Estimated Annual Maintenance Costs, Gilsizer Slough at Lincoln Road Trash Capture					
Item No	Item Description	Units	Quantity	Unit Cost	Total Cost
Trash Capture Maintenance - Frequency: 6 times per year, 4 hours per device					
1	Vac Truck	hour	24	$150	$3,600
2	2 Person Maintenance Crew	hour	24	$100	$2,400
				Total Estimated Project Cost	**$6,000**

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YCB SWRP Project F3:
Madrone and Orchard/Parktrash Capture Project Evaluation

Project Evaluation Background:

The Madrone and Orchard/Park Trash Capture project involves installing an in-line "rigid basket" trash capture device in Gilsizer Slough, just downstream of Madrone Drive in order to satisfy the State's Trash Amendment requirements.

The following sections describe the process and results for evaluation of the project which is consistent with the California State Water Resource Control Board's Storm Water Resource Plan Guidelines (December 15, 2015). Projects were evaluated both quantitatively and qualitatively for how well they meet the State's Storm Water Management Benefit Categories. Categories and metrics below are organized corresponding to Table 4 of the State Guidelines.

Water Quality Benefit Category

This project will provide trash capture in a concrete-channelized portion of Gilsizer Slough which meets the State's Trash Amendment requirements for full capture.

Key design and evaluation criteria as part of the water quality category include:

- The design storm used to estimate the water surface elevation in the slough for trash capture device sizing was a 1-year, 1-hour storm as per the State's Trash Amendment requirements. The magnitude of this storm was determined by extrapolating from data in the Sutter County Design Storm Runoff document (July 1998).
- Other parameters used in the evaluation were detailed in the Multiple Benefit TM (December 21, 2017), including Trash Generation Rates by Land Use (Table 8).

Evaluation of water quality benefit criteria are described below.

- Natural water drainage and treatment: This project does not improve natural water drainage or infiltration.
- Nonpoint source pollutants (Sediment, mercury, Group A pesticides, and oxygen-demanding substances): This project does not provide removal of any nonpoint source pollutants.
- Trash: The proposed trash capture devices will trap all particles retained by a 5-mm mesh screen and a design treatment capacity of not less than the peak flow rate from a 1-year, 1-hour storm event in the watershed area. The quantity of trash removed was calculated by applying an estimated trash loading by land use for the entire watershed, and normalizing the total trash generated by watershed area.
- Common storm water contaminants (pathogens, heavy metals, PAHs, nitrogen, and phosphorus): This project does not provide removal of any common storm water contaminants.
- Infiltration: This project does not provide any infiltration.

The overall normalized score for water quality was 1.7 out of 80 possible points.

Water Supply Benefit Category

Evaluation of water supply benefit criteria are described below.

- Water supply reliability: This project does not augment a water supply.
- Conjunctive Use: The storm water in this project is not being used as an alternative water supply.
- Water Conservation: This project does not involve any water conservation.

The overall normalized score for water supply 0 out of 81 possible points.

Flood Management Benefit Category

Evaluation of flood management benefit criteria are described below.

- Reduction of runoff rate/volume: This project does not reduce the volume or rate of runoff.
- Sanitary sewer overflow reduction: This project does not reduce acres of urban floodplain, and therefore no reduction of sanitary sewer overflows will occur.
- Improved flood protection: This project does not provide any improvement in flood protection for adjacent properties.
- Reduction of flood risk-life and safety: This project will reduce flood risk by improving the ability to clear the Park Avenue trash rack.

The overall normalized score for flood management was 7.1 out of 94 possible points.

Environmental Benefit Category

Evaluation of environmental benefit criteria are described below.

- Create or improve wetland/riparian habitat: This project does not involve any impact on wetland/riparian habitat.
- Environmental flow (Instream Flow): This project does not involve any impact on environmental flows.
- Urban green space: This project does not increase urban green space.
- Energy use and Greenhouse Gas: This project does not provide any decrease in energy use or greenhouse gas production.
- Restore natural hydrograph: This project does not improve or restore the natural hydrograph.
- Water temperature: This project does not involve any impact on water temperature.

The overall normalized score for environmental benefit was 16.7 out of 40 possible points.

Community Benefit Category

This project is located in an existing slough and thus limits the potential for public and community involvement. Evaluation of community benefit criteria are described below.

- Employment opportunities: This project will have a temporary increase in jobs during construction. Long-term maintenance work will be required for the trash capture device.
- Public education: This project does not provide any public education benefit.
- Community involvement: This project does not provide any community benefit.
- Public use/recreation: This project does not provide any public use or recreational benefit.

The overall normalized score for community benefit was 13.5 out of 54 possible points.

Evaluation Result

The project received a total of 38.9 out of 349 possible points from the multiple benefit evaluation. Based on the results of the multiple benefit evaluation, the project ranked eighth out of the ten total projects. This project was ranked third for the trash capture criteria within the water quality category due to the watershed's large amount of high trash generating land use.

Permit and Approval Requirements

Permits and notifications required for this project include:

- Applicable City permits
- General construction permit from the State Water Resources Control Board to implement water quality controls during construction
- U.S. Army Corps of Engineers – Clean Water Act Section 404 Permit: According to the current US EPA definition, Gilsizer Slough may be considered a navigable water of the United States (Clean Water Act, 40 CFR 230.3(s)). Section 404 requires USACE authorization prior to discharging dredged or fill materials into waters of the United States.
- Regional Water Quality Control Board – Clean Water Act Section 401 Permit: Section 401 of the CWA requires that any application for a federal permit or license, which may result in a discharge of pollutants into waters of the United States, must obtain a state water quality certification that the activity complies with all applicable water quality standards, limitations, and restrictions. A USACE Section 404 Permit triggers a RWQCB 401 Permit.
- California Department of Fish and Wildlife – Lake and Streambed Alteration (LSA) notification: Installation of the trash capture device in Gilsizer Slough will involve alteration of the slough bottom. This work will require an LSA notification to the California Department of Fish and Wildlife (Fish and Game, Code Section 1602).

- Gilsizer Slough is a local drainage course which is pumped into the Sutter Bypass. Modifications to the slough may require permits from local drainage agencies, including Gilsizer County Drainage District.
- The proposed "rigid basket" trash capture device is not currently included on the State's Certified Trash Amendment devices list. As discussed in the Trash Rack Selection Process document (March 7, 2018), the City would be required to seek Water Board approval for use of this device. Approval would be based on the criteria of a full capture device that has a 5-mm mesh screen and a design treatment capacity of not less than the peak flow rate from a 1-year, 1-hour storm event in the watershed area. Once certified, the trash capture device would meet the State's Trash Amendment requirements for full capture, allowing the City to maintain their Track 1 Trash Amendment status.

Environmental Impact Report Requirements

The purpose of this project is to improve the environment; however, the construction of this project could result in temporary impacts. An environmental review of this project will be performed prior to construction.

Initial Cost Estimating

Cost estimates include initial capital cost and annual operation and maintenance (O&M) costs. The capital cost is a Class 3 budget estimate as defined by the Association for the Advancement of Cost Engineering (AACE) with a best-expected accuracy of minus 20 percent to plus 30 percent. A Class 3 cost estimate is used for budget authorization level design, characterized by a 10 to 40 percent design definition. Based on the Class 3 characteristics and engineering judgement, a 30 percent contingency was selected for this project. Unit costs used in the estimate were developed using recently completed Bay Area projects, scaled to wages in Sutter County (current wage information was obtained from the State's Occupational Employment Statistics and Wages program). The cost estimates are based on the engineer's perception of current conditions in the project area and are subject to variances in the costs of labor, materials, equipment, and services provided by others as well as economic conditions.

- Estimated Capital Cost: The cost of installing this facility is estimated to be $180,800. Table F.3-1 provides a detailed cost breakdown.

Table F.3-1: Estimated Project Costs, Madrone and Orchard Park Trash Capture

Item No	Item Description	Units	Quantity	Unit Cost	Total Cost
Trash Devices					
1	Gilsizer Slough Trash Capture	ea.	1	$96,000	$96,000
2	Orchard/Park Trash Rack Replacement	ea.	1	$10,000	$10,000
General Items					
3	Mobilization/Demobilization & Insurance (10%)	LS	1	$10,600	$10,600
4	Construction Contingency (30%)	LS	1	$35,000	$35,000
				Construction Costs	*$151,600*
5	Engineering, Administration, Permitting & CM (25%)	LS	1	$29,200	$29,200
				Total Estimated Capital Project Cost	**$180,800**

- Estimated Annual Operations and Maintenance Costs: The annual cost for operating and maintaining this facility is estimated to be $6,000. Table F.3-2 provides a detailed cost breakdown. Operation and maintenance tasks will include:
  - Cleaning of in-line trash capture device; the frequency of cleaning will be determined by trash loadings and storm frequency. Frequency was estimated at four to six times per year.

Table F.3-2: Estimated Annual Maintenance Costs, Madrone and Orchard Park Trash Capture

Item No	Item Description	Units	Quantity	Unit Cost	Total Cost
Trash Capture Maintenance - Frequency: 6 times per year, 4 hours per device					
1	Vac Truck	hour	24	$150	$3,600
2	2 Person Maintenance Crew	hour	24	$100	$2,400
				Total Estimated Project Cost	**$6,000**

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YCB SWRP Project F5:
Jefferson Ditch Improvements
Project Evaluation

Project Evaluation Background:

The Jefferson Ditch Improvements project involves the following modifications:

- Installing an end-of-pipe "rigid basket" trash capture device downstream of the existing 84-inch Harter storm drain outlet in order to satisfy the State's Trash Amendment requirements.
- Widening Jefferson Ditch for approximately 100-feet in length downstream of the new trash capture device. This will increase infiltration and improve treatment capacity.

The following sections describe the process and results for evaluation of the project which is consistent with the California State Water Resource Control Board's Storm Water Resource Plan Guidelines (December 15, 2015). Projects were evaluated both quantitatively and qualitatively for how well they meet the State's Storm Water Management Benefit Categories. Categories and metrics below are organized corresponding to Table 4 of the State Guidelines.

Water Quality Benefit Category

This project will provide treatment of storm water runoff in the widened ditch via both infiltration to the channel bottom and channel flow-through (bio-treatment). Trash will be captured by devices which meet the State's Trash Amendment requirements for full capture.

Key design and evaluation criteria for determining pollutant removals as part of the water quality category include:

- The design storm used to estimate the water surface elevation in the ditch for trash capture device sizing was a 1-year, 1-hour storm as per the State's Trash Amendment requirements. The magnitude of this storm was determined by extrapolating from data in the Sutter County Design Storm Runoff document (July 1998).
- Rainfall data used to estimate mean annual watershed flow (for pollutant removal and infiltration calculations) was taken from the California Irrigation Management Information System (CIMIS) rain gauge station database. A mean annual precipitation depth was determined for the area, and the year 2006 was determined to represent the mean annual rainfall. Hourly rainfall data for January 1, 2006 to December 31, 2006 was obtained for the Sacramento Valley's Verona Station (Station ID No. 235).
- Widened ditch area and volume were calculated using the approximate length from the project schematic and an estimated 4-foot increase in bottom ditch width (while maintaining existing side and longitudinal slopes).
- The soil in the ditch is Hydrologic Soil Group C and has a hydraulic conductivity of approximately 0.32 inches per hour (accessed from Natural Resources Conservation Service web soil survey), which was used to calculate the total infiltrated and treated volume of the widened ditch.

- Other parameters used in the evaluation were detailed in the Multiple Benefit TM (December 21, 2017), including: Typical Impervious Percent for Land Uses (Table 5); Annual Runoff Depth, Depression Storage and Infiltration Rates (Table 6); Average Inflow Concentrations for Urban Storm Water Runoff Pollutants and Percent Removals for LID (Table 7); and Trash Generation Rates by Land Use (Table 8).

Evaluation of water quality benefit criteria are described below. Although no site-specific water quality testing was performed, the following contaminants have been included because they were included on the 303(d) lists for receiving waters, in the City's MS4 Permit, or are common storm water contaminants.

- Natural water drainage and treatment: The widened ditch will increase natural drainage and treatment by allowing more infiltration.

Sediment, mercury, Group A pesticides, and oxygen-demanding substances: These contaminants were evaluated using sediment as a proxy, as explained below. Mercury and Group A pesticides were included because they are included on the 303(d) list for receiving waters. Sediment and oxygen-demanding substances are common contaminants found in urban storm water.

- Sediment (TSS): The amount of sediment to be removed annually was calculated by estimating the volume of flow that would be infiltrated through the channel, the volume of channel flow-through, and a typical loading of sediment in urban storm water.
- Mercury (303(d) List Pollutant): Mercury is a common urban storm water contaminant. Although its presence is typically associated with mining activities, it's also found in urban storm water runoff. The Sutter Bypass and the Feather River, both receiving waters for Yuba City drainage, have mercury listed as a 303(d) pollutant. The method of treatment for the channel is infiltration and flow-through. The amount of mercury potentially removed is related to the amount of sediment removed, and therefore, the amount of sediment removed from receiving waters is used as a proxy for estimating mercury reduction. The amount of sediment removed was calculated as described in the Sediment (TSS) category.
- DDT (303(d) List Pollutant): DDT is a pesticide, banned in 1972, that is still found in the environment due to its ability to adsorb to soil particles and its resistance to degradation. DDT can be re-mobilized with disturbance; however, its removal is found to be associated with sediment removal. The amount of DDT potentially removed is related to the amount of sediment removed, and therefore, the amount of sediment removed from receiving waters is used as a proxy for estimating DDT reduction. The amount of sediment removed was calculated as described in the Sediment (TSS) category.

- Dieldrin (303(d) List Pollutant): Dieldrin is similar to DDT: its use is banned, it adsorbs to soils, and is persistent in the environment. Dieldrin has been found in urban storm water, and is found to be associated with sediment removal. The amount of Dieldrin potentially removed is related to the amount of sediment removed, and therefore, the amount of sediment removed from receiving waters is used as a proxy for estimating Dieldrin reduction. The amount of sediment removed was calculated as described in the Sediment (TSS) category.
- Oxyfluorfen (303(d) List Pollutant): Oxyfluorfen is a common pesticide. There are currently no pesticides being used at this detention basin. Although this project involves the planting of native grasses in swales, they would not require pesticide use. Therefore, this project is not anticipated to change the levels of Oxyfluorfen in storm water.
- Chlorpyrifos (MS4 Pollutant): Chlorpyrifos is a restricted-use pesticide used mostly in agricultural settings. There are currently no pesticides being used at this detention basin. Although this project involves the planting of native grasses in swales, they would not require pesticide use. Therefore, this project is not anticipated to change the levels of Chlorpyrifos in storm water.
- Diazinon (MS4 Pollutant): Diazinon is a restricted -use pesticide used mostly in agricultural settings. There are currently no pesticides being used at this detention basin. Although this project involves the planting of native grasses in swales, they would not require pesticide use. Therefore, this project is not anticipated to change the levels of Diazinon in storm water.
- PCBs (303(d) List Pollutant): PCBs can enter a watershed through transformers, atmospheric deposition, and eroded or re-suspended particles. PCBs tend to behave like sediment, which settle out during infiltration and treatment. The estimated quantity of PCBs removed was calculated by estimating the volume of flow that would be treated through the widened ditch per year and a typical loading of PCBs in urban storm water.
- Trash: The proposed trash capture devices will trap all particles retained by a 5-mm mesh screen and a design treatment capacity of not less than the peak flow rate from a 1-year, 1-hour storm event in the watershed area. The quantity of trash removed was calculated by applying an estimated trash loading by land use (from the Bay Area Stormwater Management Agencies Association, Trash Generation Rates, 2014) for the entire watershed, and normalizing the total trash generated by watershed area.

Common storm water contaminants (removal rates and data sources for the following contaminants are listed in Table 7 of the Multiple Benefits Evaluation Methodology Technical Memorandum, published on December 21, 2017):

- Pathogens and Bacteria: Fecal coliform is used as an indicator organism for pathogens and bacteria. The quantity of pathogens and bacteria removed was estimated by calculating the volume of flow that would be treated through the channel per year and a typical loading of fecal coliform in urban storm water.

- Heavy Metals (cadmium, copper, lead, and zinc): The quantity of heavy metals removed was calculated by estimating the volume of flow that would be treated through the channel per year and a typical loading of heavy metals in urban storm water.
- Oils and grease (polyaromatic hydrocarbons, PAHs): The quantity of oils and grease removed was calculated by estimating the volume of flow that would be treated through the channel per year and a typical loading of PAHs in urban storm water.
- Total Nitrogen: The quantity of nitrogen removed was calculated by estimating the volume of flow that would be treated through the channel year and a typical loading of nitrogen in urban storm water.
- Total Phosphorus: The quantity of phosphorus removed was calculated by estimating the volume of flow that would be treated through the channel year and a typical loading of phosphorus in urban storm water.
- Infiltration: The increase in infiltration was calculated by estimating the volume of flow that would be infiltrated through channel per year.

The overall normalized score for water quality was 9.2 out of 80 possible points.

Water Supply Benefit Category

This project will provide an increase in infiltration which can potentially provide a benefit to water supply by augmenting the water supply or recharging surface water sources. Evaluation of water supply benefit criteria are described below.

- Water supply reliability: This project has the potential to augment a water supply through recharge of groundwater and surface water sources.
- Conjunctive Use: The storm water captured in this project is not being used as an alternative water supply.
- Water Conservation: This project does not involve any water conservation.

The overall normalized score for water supply was 8.1 out of 81 possible points.

Flood Management Benefit Category

The project will reduce runoff conveyed to receiving waters and slightly increase the available capacity of the ditch through increased infiltration. Evaluation of flood management benefit criteria are described below.

- Reduction of runoff rate/volume: The ditch will slightly reduce the volume and rate of runoff that reaches receiving waters through increased infiltration capacity.
- Sanitary sewer overflow reduction: This project will not reduce the area of urban floodplain, and therefore no reduction of sanitary sewer overflows will occur.

- Improved flood protection: This project will not provide any significant improvement in flood protection.
- Reduction of flood risk-life and safety: This project has the potential to reduce flooding slightly in the area around the ditch, but the reduction is not significant.

The overall normalized score for flood management was 7.1 out of 94 possible points.

Environmental Benefit Category

Evaluation of environmental benefit criteria are described below.

- Create or improve wetland/riparian habitat: The planting of native grasses with the widening of the ditch will improve about 4,000 square feet of newly vegetated area.
- Environmental flow (Instream Flow): The increase in infiltration through widening of the ditch helps to partially restore the local hydrology to pre-development conditions. Restoring the natural hydrograph in this area will help restore environmental flows to more natural conditions, and therefore, the environmental flow is enhanced.
- Urban green space: This project does not include an increase in urban green space.
- Energy use and Greenhouse Gas: This project does not provide any decrease in energy use or greenhouse gas production.
- Restore natural hydrograph: The increase in infiltration through widening of the ditch helps to partially restore the local hydrology to pre-development conditions and to restore the natural hydrograph. Therefore, the natural hydrograph is improved.
- Water temperature: The increase in infiltration through widening of the ditch will help to partially restore the local hydrology to pre-development conditions, however, the impact on water temperature is not expected to be significant.

The overall normalized score for environmental benefit was 25.5 out of 40 possible points.

Community Benefit Category

This project is located in an existing drainage ditch and thus limits the potential for public and community involvement. Evaluation of community benefit criteria are described below.

- Employment opportunities: This project will have a temporary increase in jobs during construction. Long-term maintenance work will be required for the trash capture device.
- Public education: This project does not provide any public education benefit.
- Community involvement: This project does not provide any community benefit.
- Public use/recreation: This project does not provide any public use or recreational benefit.

The overall normalized score for community benefit was 13.5 out of 54 possible points.

Evaluation Result

The project received a total of 63.3 out of 349 possible points from the multiple benefit evaluation. Based on the results of the multiple benefit evaluation, the project ranked seventh out of the ten total projects. This project provides nominal benefit from increased infiltration and pollutant treatment. This ranking is based solely on the multiple benefit evaluation results and will be adjusted to incorporate regulatory requirements and funding availability.

Permit and Approval Requirements

Permits required for this project include applicable City permits and a general construction permit from the State Water Resources Control Board to implement water quality controls during construction. Jefferson Ditch is a local drainage course which discharges to Live Oak Canal. Modifications to the ditch may require permits from local agencies including Sutter County and Gilsizer County Drainage District.

The proposed "rigid basket" trash capture device is not currently included on the State's Certified Trash Amendment devices list. As discussed in the Trash Rack Selection Process document (March 7, 2018), the City would be required to seek Water Board approval for use of this device. Approval would be based on the criteria of a full capture device that has a 5-mm mesh screen and a design treatment capacity of not less than the peak flow rate from a 1-year, 1-hour storm event in the watershed area. Once certified, the trash capture device would meet the State's Trash Amendment requirements for full capture, allowing the City to maintain their Track 1 Trash Amendment status.

Environmental Impact Report Requirements

The purpose of this project is to improve the environment; however, the construction of this project could result in temporary impacts. An environmental review of this project will be performed prior to construction.

Initial Cost Estimate

Cost estimates include initial capital cost and annual operation and maintenance (O&M) costs. The capital cost is a Class 3 budget estimate as defined by the Association for the Advancement of Cost Engineering (AACE) with a best-expected accuracy of minus 20 percent to plus 30 percent. A Class 3 cost estimate is used for budget authorization level design, characterized by a 10 to 40 percent design definition. Based on the Class 3 characteristics and engineering judgement, a 30 percent contingency was selected for this project. Unit costs used in the estimate were developed using recently completed Bay Area projects, scaled to wages in Sutter County (current wage information was obtained from the State's Occupational Employment Statistics and Wages program). The cost estimates are based on the engineer's perception of current conditions in the project area and are subject to variances in the costs of labor, materials, equipment, and services provided by others as well as economic conditions.

- Estimated Capital Cost: The cost of installing this facility is estimated to be $110,000. Table F.5-1 provides a detailed cost breakdown.

Table F.5-1: Estimated Project Costs, Jefferson Ditch Improvements

Item No	Item Description	Units	Quantity	Unit Cost	Total Cost
Trash Capture Device					
1	End-of-Pipe 84" diameter	ea.	1	$42,000	$42,000
Bio-Swale					
2	Excavation	Cy	141	$15	$2,111
3	Wood Mulch (Matting Variety 3" Depth)	Cy	146	$108	$15,792
4	Drain Rock	Cy	17	$126	$2,100
5	Vegetation - 4" Pots	ea.	50	$47	$2,338
General Items					
6	Mobilization/Demobilization & Insurance (10%)	LS	1	$6,500	$6,500
7	Construction Contingency (30%)	LS	1	$21,300	$21,300
				Construction Costs	*$92,200*
8	Engineering, Administration, Permitting & CM (25%)	LS	1	$17,800	$17,800
				Total Estimated Capital Project Cost	**$110,000**

- Estimated Annual Operations and Maintenance Costs: The annual cost for operating and maintaining this facility is estimated to be $4,000. Table F.5-2 provides a detailed cost breakdown. Operation and maintenance tasks will include:
  - Cleaning of end-of-pipe trash capture device; the frequency of cleaning will be determined by trash loadings and storm frequency. Frequency was estimated at four times per year.

Table F.5-2: Estimated Annual Maintenance Costs, Jefferson Ditch Improvements

Item No	Item Description	Units	Quantity	Unit Cost	Total Cost
Trash Capture Maintenance - Frequency: 4 times per year, 2 hours per device					
1	Vac Truck	hour	16	$150	$2,400
2	2 Person Maintenance Crew	hour	16	$100	$1,600
				Total Estimated Project Cost	**$4,000**

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YCB Project F6:
Live Oak Canal at Franklin Road
Trash Capture Project Evaluation

Project Evaluation Background:

The Live Oak Canal at Franklin Road Trash Capture project involves installing an in-line "rigid basket" trash capture device in Live Oak Canal, downstream of Franklin Road, in order to satisfy the State's Trash Amendment requirements.

The following sections describe the process and results for evaluation of the project which is consistent with the California State Water Resource Control Board's Storm Water Resource Plan Guidelines (December 15, 2015). Projects were evaluated both quantitatively and qualitatively for how well they meet the State's Storm Water Management Benefit Categories. Categories and metrics below are organized corresponding to Table 4 of the State Guidelines.

Water Quality Benefit Category

This project will provide trash capture in Live Oak Canal which meets the State's Trash Amendment requirements for full capture.

Key design and evaluation criteria as part of the water quality category include:

- The design storm used to estimate the water surface elevation in the canal for trash capture device sizing was a 1-year, 1-hour storm as per the State's Trash Amendment requirements. The magnitude of this storm was determined by extrapolating from data in the Sutter County Design Storm Runoff document (July 1998).
- Other parameters used in the evaluation were detailed in the Multiple Benefit TM (December 21, 2017), including Trash Generation Rates by Land Use (Table 8).

Evaluation of water quality benefit criteria are described below.

- Natural water drainage and treatment: This project does not improve natural water drainage or infiltration.
- Nonpoint source pollutants (Sediment, mercury, Group A pesticides, and oxygen-demanding substances): This project does not provide removal of any nonpoint source pollutants.
- Trash: The proposed trash capture devices will trap all particles retained by a 5-mm mesh screen and a design treatment capacity of not less than the peak flow rate from a 1-year, 1-hour storm event in the watershed area. The quantity of trash removed was calculated by applying an estimated trash loading by land use for the entire watershed, and normalizing the total trash generated by watershed area.
- Common storm water contaminants (pathogens, heavy metals, PAHs, nitrogen, and phosphorus): This project does not provide removal of any common storm water contaminants.
- Infiltration: This project does not provide any infiltration.

The overall normalized score for water quality was 0.3 out of 80 possible points.

Water Supply Benefit Category

Evaluation of water supply benefit criteria are described below.

- Water supply reliability: This project does not augment a water supply.
- Conjunctive Use: The storm water in this project is not being used as an alternative water supply.
- Water Conservation: This project does not involve any water conservation.

The overall normalized score for water supply was 0 out of 81 possible points.

Flood Management Benefit Category

Evaluation of flood management benefit criteria are described below.

- Reduction of runoff rate/volume: This project does not reduce the volume or rate of runoff.
- Sanitary sewer overflow reduction: This project does not reduce acres of urban floodplain, and therefore no reduction of sanitary sewer overflows will occur.
- Improved flood protection: This project does not provide any improvement in flood protection for adjacent properties.
- Reduction of flood risk-life and safety: This project does not reduce flooding risk in the area around the slough.

The overall normalized score for flood management was 0 out of 94 possible points.

Environmental Benefit Category

Evaluation of environmental benefit criteria are described below.

- Create or improve wetland/riparian habitat: This project may cause an enhancement riparian habitat from the creation of small pools around the in-line trash capture device. However, this benefit will be insignificant and is difficult to quantify in terms of acreage. Therefore, this project was determined to provide no improvement to habitat.
- Environmental flow (Instream Flow): This project does not involve any impact on environmental flows.
- Urban green space: This project does not increase urban green space.
- Energy use and Greenhouse Gas: This project does not provide any decrease in energy use or greenhouse gas production.
- Restore natural hydrograph: This project does not improve or restore the natural hydrograph.

- Water temperature: This project may cause ponding and in association, a slight decrease in water temperature. However, the impact on water temperature is not expected to be significant.

The overall normalized score for environmental benefit was 16.7 out of 40 possible points.

Community Benefit Category

This project is located in an existing canal and thus limits the potential for public and community involvement. Evaluation of community benefit criteria are described below.

- Employment opportunities: This project will have a temporary increase in jobs during construction. Long-term maintenance work will be required for the trash capture device.
- Public education: This project does not provide any public education benefit.
- Community involvement: This project does not provide any community benefit.
- Public use/recreation: This project does not provide any public use or recreational benefit.

The overall normalized score for community benefit 13.5 out of 54 possible points.

Evaluation Result

The project received a total of 30.5 out of 349 possible points. This ranked the project tenth out of the ten total projects.

Permit and Approval Requirements

Permits and notifications required for this project include:

- Applicable City permits
- General construction permit from the State Water Resources Control Board to implement water quality controls during construction
- U.S. Army Corps of Engineers – Clean Water Act Section 404 Permit: According to the current US EPA definition, Live Oak Canal may be considered a navigable water of the United States (Clean Water Act, 40 CFR 230.3(s)). Section 404 requires USACE authorization prior to discharging dredged or fill materials into waters of the United States.
- Regional Water Quality Control Board – Clean Water Act Section 401 Permit: Section 401 of the CWA requires that any application for a federal permit or license, which may result in a discharge of pollutants into waters of the United States, must obtain a state water quality certification that the activity complies with all applicable water quality standards, limitations, and restrictions. A USACE Section 404 Permit triggers a RWQCB 401 Permit.

- California Department of Fish and Wildlife – Lake and Streambed Alteration (LSA) notification: Installation of the trash capture device in Live Oak Canal will involve alteration of the canal bottom. This work will require an LSA notification to the California Department of Fish and Wildlife (Fish and Game, Code Section 1602).
- Live Oak Canal is a local drainage course which is ultimately pumped into to the Sutter Bypass. Modifications to the canal may require permits from local drainage agencies, primarily Sutter County.
- The proposed "rigid basket" trash capture device is not currently included on the State's Certified Trash Amendment devices list. As discussed in the Trash Rack Selection Process document (March 7, 2018), the City would be required to seek Water Board approval for use of this device. Approval would be based on the criteria of a full capture device that has a 5-mm mesh screen and has a design treatment capacity of not less than the peak flow rate from a 1-year, 1-hour storm event in the watershed area. Once certified, the trash capture device would meet the State's Trash Amendment requirements for full capture, allowing the City to maintain their Track 1 Trash Amendment status.

Environmental Impact Report Requirements

The purpose of this project is to improve the environment; however, the construction of this project could result in temporary impacts. An environmental review of this project will be performed prior to construction.

Initial Cost Estimate

Cost estimates include initial capital cost and annual operation and maintenance (O&M) costs. The capital cost is a Class 3 budget estimate as defined by the Association for the Advancement of Cost Engineering (AACE) with a best-expected accuracy of minus 20 percent to plus 30 percent. A Class 3 cost estimate is used for budget authorization level design, characterized by a 10 to 40 percent design definition. Based on the Class 3 characteristics and engineering judgement, a 30 percent contingency was selected for this project. Unit costs used in the estimate were developed using recently completed Bay Area projects, scaled to wages in Sutter County (current wage information was obtained from the State's Occupational Employment Statistics and Wages program). The cost estimates are based on the engineer's perception of current conditions in the project area and are subject to variances in the costs of labor, materials, equipment, and services provided by others as well as economic conditions.

- Estimated Capital Cost: The cost of installing this facility is estimated to be $71,700. Table F.6-1 provides a detailed cost breakdown.

Table F.6-1: Estimated Project Cost, Live Oak at Franklin Road Trash Capture

Item No	Item Description	Units	Quantity	Unit Cost	Total Cost
Trash Capture Device					
1	In-Line Trash Capture Device	ea.	1	$42,000	$42,000
General Items					
2	Mobilization/Demobilization & Insurance (10%)	LS	1	$4,200	$4,200
3	Construction Contingency (30%)	LS	1	$13,900	$13,900
				Construction Costs	*$60,100*
4	Engineering, Administration, Permitting & CM (25%)	LS	1	$11,600	$11,600
				Total Estimated Capital Project Cost	**$71,700**

- Estimated Annual Operations and Maintenance Costs: The annual cost for operating and maintaining this facility is estimated to be $6,000. Table F.6-2 provides a detailed cost breakdown. Operation and maintenance tasks will include:
  - Cleaning of in-line trash capture device; the frequency of cleaning will be determined by trash loadings and storm frequency. Frequency was estimated at four to six times per year.

Table F.6-2: Estimated Annual Maintenance Costs, Live Oak at Franklin Road Trash Capture

Item No	Item Description	Units	Quantity	Unit Cost	Total Cost
Trash Capture Maintenance - Frequency: 6 times per year, 4 hours per device					
1	Vac Truck	hour	24	$150	$3,600
2	2 Person Maintenance Crew	hour	24	$100	$2,400
				Total Estimated Project Cost	**$6,000**

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