Memo

To	**Chuck Brendeke**
From	**Coleman Miller**
Date	**December 3, 2012**

Subject **Fish Hatchery Surface Water Diversion**

This memo summarizes the feasibility analysis of diverting water from the Billingsley Creek to the small raceway of the Fish Hatchery. Attached is a drawing with a conceptual design of the diversion structure and pipe alignment. Also included is a feasibility level cost estimate of the improvements.

Design Assumptions

- Diversion location: Just upstream of the bridge at the same location as the existing diversion to the large raceway.
- Range of flowrates: 2 cfs – 10 cfs (900 gpm – 4,500 gpm)
- Normal flowrate: 7 cfs (3,000 gpm)
- Elevation of the bottom of the stream bed is approximately 10 feet below the small raceway elevation.

Hydraulic Calculations

Conceptual level hydraulic calculations were made in order to adequately estimate a pump size and pipe system requirements. A 14" pipe was found to be optimal for the pipe system. The following table and graph show the total dynamic head required for the water distribution system for the range of required flowrates.

Flow (cfs)	Calculated Dynamic Head (ft)	Static Head (ft)	Total Head (ft)
2.0	10.7	10	10.7
2.9	11.4	10	11.4
3.8	12.3	10	12.3
4.7	13.5	10	13.5
5.6	14.8	10	14.8
6.5	16.3	10	16.3
7.4	18.1	10	18.1
8.2	20.0	10	20.0
9.1	22.1	10	22.1
10.0	24.4	10	24.4

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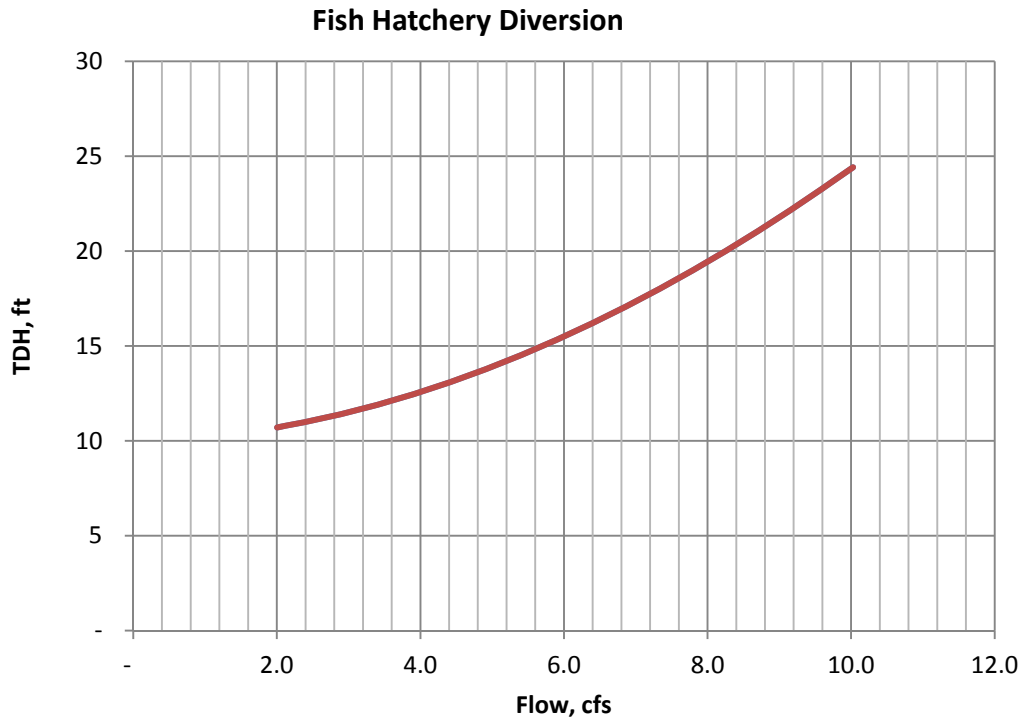

Summary of Conceptual Cost Estimate Items

- Precast concrete box installed in the river bank connected to a gated turnout situated such that it can collect low flow from the stream bed by gravity flow. A two-chamber box is recommended separated by a 3' high wall to allow sediments to drop out of the flow in the sediment trap before entering the sump which contains the pumps. A valve box to house the valves and fittings could be installed adjacent to the pump box.
- Ductile iron pipe (DIP) fittings for the pump and valve stations. Configuration of fittings is approximate, but typical of what is required for this type of pump station.
- Two 8" Gorman-Rupp ES 60Hz submersible pumps. Assuming a backup pump is required for emergency situations.
- Two variable frequency drives (VFD). A VFD is needed to accommodate the range of flowrates required.
- 200 linear feet of 14" HDPE pipe buried in an excavated trench from the pump station to the small raceway.
- Electrical work will be required for the setup of the pump motors.

Conceptual Cost Estimate

Item No	Description	Unit	Unit Cost (USD)	Quantity	Cost
1	Precast Concrete Box installed	ea	$10,000	1	$15,000
2	DIP fittings and valves				
2.1	8" Isolation Valve	ea	$1,800	2	$3,600
2.2	8" Check Valve	ea	$2,100	2	$4,200
2.3	8" 90° Bend	ea	$1,000	4	$4,000
2.4	8" DIP to 14" HDPE Coupling	ea	$1,800	1	$1,800
2.5	24" Sluice Gate	ea	$1,500	1	$1,500
2.6	8" DIP T Fitting	ea	$1,400	1	$1,400
2.7	DIP Coupling	ea	$1,500	2	$3,000
3	Vertical Turbine Pump	ea	$35,000	2	$70,000
4	Variable Frequency Drive	ea	$14,000	2	$28,000
5	14" HDPE buried pipe installed	l.f.	$60	200	$12,000
6	Electrical work	l.s.	$7,000	1	$10,000
				Subtotal:	$154,500
				Total	**$154,500**
				20% Contingency	**$30,900**
				Grand Total	**$185,400**