September 9, 2008

ProgressiveAE

Mr. Joe Brezvai
Posey Lake Improvement Board
320 Springbrook Avenue, Suite 102
Adrian, MI 49221

Re: Posey Lake Bypass Project

Dear Mr. Brezvai:

I have prepared this correspondence to update the estimate of probable construction costs for the Seeley Drain bypass around Posey Lake. As you are aware, our original estimate of probable costs was submitted to the office of the Lenawee County Drain Commissioner in a letter report dated June 1, 2004. A copy of the 2004 cost estimate is attached for reference. Our updated cost estimate for the project is as follows:

General Conditions	1	LS	$15,000	$15,000
Manholes to 12' Depth	7	EA	$3,000	$21,000
Trenching/Backfilling	3,450	LF	$25	$86,250
24" Diameter N-12 WT	3,450	LF	$17	$58,650
Inlet Berm	1	LS	$10,000	$10,000
Inlet Structure	1	LS	$10,000	$10,000
Outlet Structure	1	LS	$10,000	$10,000
Soil Erosion Controls	1	LS	$9,000	$9,000
Restoration, Spoils removal, Culverts	1	LS	$15,000	$15,000
Construction Subtotal				$234,900
Legal/Administration/ Engineering/Inspections				$47,000
Project Subtotal				$281,900
Contingency				$42,000
TOTAL				**$323,900**

Note that our current cost estimate of $323,900 is not substantially greater than our earlier cost estimate of $299,000. Fortunately, while some construction costs have increased since our last estimate, competition for work has helped to keep contractor's prices down. In addition to the costs presented above, it is our understanding that a final easement agreement for the placement of the bypass is near completion, and that the total cost of the easement will be $100,000. Thus, the estimate of total cost for the project is $423,900.

This project is proposed to be financed via special assessment of benefitting properties under provisions of Part 309, Inland Lake Improvements, of the Natural Resources and Environmental Protection Act, PA 451 of 1994. It is recommended that the special assessment district for the project include all waterfront properties and back lots that have deeded or dedicated access to Posey Lake. Waterfront properties are proposed to be assessed one unit of benefit and back lots with access are proposed to be assessed one-quarter unit of benefit. In addition, is recommended that contiguous lots in common ownership be assessed as a single

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parcel provided only one house exists on the parcel. Once we have the final counts of waterfront parcels versus back lot parcels, unit assessment amounts and amortized costs can be readily determined.

Please feel free to contact me if you have any questions.

Sincerely,

PROGRESSIVE ARCHITECTURE ENGINEERING

Anthony F. Groves, M.S.
Water Resources Director

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Enclosures
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June 1, 2004

Mr. Stephen R. May
Lenawee County Drain Commission
320 Springbrook Avenue
Adrian, MI 49221

ProgressiveAE

Re: Seeley Drain Bypass around Posey Lake

Dear Mr. May:

A preliminary engineering review has been completed for the proposed Seeley Drain bypass around Posey Lake. This review only addresses the feasibility of hydraulically diverting the flow around Posey Lake from the Seeley Drain to the Posey Lake Drain. It is not meant for this report to support or contradict any effects the proposed bypass would have on the water quality of Posey Lake. Potential water quality benefits which may occur as a result of the project will be discussed at a later date.

A survey was completed of the area around Posey Lake from the Seeley Drain to the Posey Lake Drain. A copy of this survey is attached with proposed routing for the bypass. The Seeley Drain crosses Plank Road through a 72-inch diameter culvert. The upstream invert of the culvert was measured to be 945.90 feet. The Posey Lake Drain has relatively little fall from the Posey Lake Dam to point where it crosses onto parcel HD0-104-1000-00 which is adjacent to the south of Plank Road. It is assumed that an invert entering the Posey Lake Drain in this area would be at or just lower than 943.36 feet which is the invert of the 7 foot x 10 foot culvert located approximately 60 feet west of the Posey Lake Dam. The difference between the Seeley Drain invert at Plank Road and the proposed Posey Lake Drain inlet is 2.54 feet.

A number of different options and routes were evaluated for the bypass. The selected route intercepts the Seeley Drain just north of Plank Road and follows the right-of-way along the north side of Plank Road until it turns from bituminous to gravel. At this point the bypass turns to the southwest until it intercepts the Posey Lake Drain approximately 800 feet west of the Posey Lake Dam. This route was selected because it only crosses one property south of Plank Road. An alternate route intercepts the Posey Lake Drain approximately 200 feet west of the Posey Lake Dam. The alternate route reduces the overall length of the bypass by approximately 250 feet but was not selected because it crosses an additional property and has the potential to impact structures on that property. The total length of the proposed drain route is approximately 3,500 feet.

An open cut drain and a buried closed conduit were reviewed as options for the bypass. The invert of the bypass would range from approximately 943.4 feet to 945.9 feet. The surface elevation over the majority of the route ranges from 953 feet to 955 feet. Therefore, the drain would be 10 to 13 feet deep. Assuming a 10 foot deep drain with a five foot bottom, the total width of the drain would be approximately 45 feet. This assumes a side slope of 1 on 2 for each side and the five foot wide bottom. This equates to the removal of approximately 32,000 cubic yards of soil followed by slope stabilization. Using an excavation and disposal cost of $8/cubic yard, the excavation cost alone would exceed $250,000. This does not include, land procurement for the 45 foot wide drain, general conditions, slope stabilization, road crossings, permitting, engineering, etc... The Lenawee County Road Commission has indicated that an open drain would not be allowed within the road right-of-way. Property owners have also expressed that an open cut drain would not be desired if the drain were to cross their property.

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The bottom of the closed conduit would also be approximately 10 to 13 feet below grade. However, the pipe trench would be backfilled and have little to no impact on surface uses due to its depth of bury. Manholes would be placed at turns in the conduit and at approximately 500 foot intervals to aid in potential cleaning activities. In fields which are being actively farmed these manholes could be buried below the surface so that they wouldn't impede farming activities. The closed conduit option would require the conduit to be placed at a slope of approximately 0.07 percent (2.54 feet/3,500 feet x 100 percent) from Seeley Drain to the Posey Lake Drain. Due to the minimal slope, a smooth pipe with good flow characteristics is desired. In addition, it is recommended that the pipe be water tight as it may be under minimal pressure when flowing full. A number of different materials were reviewed. The recommended pipe is a HDPE dual wall pipe with an annular corrugated exterior for strength and a smooth inner wall for maximum flow capacity. The characteristics of this pipe also provide for simplified installation and/or increased longevity over other options such as corrugated metal pipe, ductile iron or concrete. Information on one manufacturer of the proposed pipe is attached. The specific system available from this manufacturer is the N-12 Pro-Link WT.

It is reported (Posey Lake Water Quality Studies 1995 – 2003, Water Quality Investigators) that the average Seeley Drain flow is 2.8 cubic feet per second (cfs). It is intended that the proposed bypass would divert the full flow from Seeley Drain under normal conditions. During periods of high flow the bypass would handle the initial flush. Flows in excess of the bypasses capacity would then be allowed to flow into Posey Lake. A 24-inch diameter smooth lined HDPE pipe was sized for the bypass. When flowing full this pipe at a 0.05 percent slope can pass 5.5 cfs and 7.7 cfs at 0.10 percent slope. This value will increase slightly if the Seeley Drain level rises above the top of the bypass drain pipe. Velocity within the pipe, when flowing full, will be approximately two feet per second. This velocity should be sufficient to prevent settling of solids such as clays which are being carried downstream. At this velocity, travel time through the bypass will be approximately 30 minutes.

In order to divert the flow, a berm is proposed to be constructed within the Seeley Drain just south of where the bypass enters the Seeley Drain (See Drawing). This berm would be armored with rip rap and set at a top elevation equal to or just above the top of the bypass pipe. This would divert all the water though the bypass drain until such a point that the bypass pipe is flowing full. At that flow, the berm would be overtopped and the excess flow would enter Posey Lake via the Seeley Drain. As the flow decreases the level in Seeley Drain would recede and the full flow would again be bypassed around Posey Lake. During periods of draught when flows from the Seeley Drain may be desired to maintain the water level within Posey Lake, the 24-inch bypass pipe could be blocked causing all the flow to enter Posey Lake.

Following is a preliminary construction cost estimate for the proposed bypass drain.

ITEM	QUANTITY	$/EACH	$
General Conditions	1 LS	$ 15,000	$15,000
Manholes to 12' Depth	6 EA	$ 2,500	$15,000
Trenching/Backfilling	3,500 LF	$ 25	$87,500
24" Diameter HDPE	3,500 LF	$ 25	$87,500
Inlet Berm	1 LS	$ 10,000	$10,000
Outlet Structure	1 LS	$ 10,000	$10,000
Construction Subtotal			$225,000
Legal/Admin/Eng/Insp			$45,000
Permits[1]			$2,000
Project Subtotal			$272,000
10% Contingency			$27,000
TOTAL			**$299,000**

In summary, the Seeley Drain can be hydraulically diverted to bypass Posey Lake. The proposed bypass would be a 24-inch diameter pipe smooth lined HDPE pipe to Posey Lake Drain. An open cut drain was reviewed as well but the space requirements coupled with the cost appear prohibitive.

If you have any questions or require additional information regarding this matter please don't hesitate to contact us at 616/361-2664.

Sincerely,

PROGRESSIVE ARCHITECTURE ENGINEERING

Eric Van Orman, P.E.

Anthony F. Groves, M.S.
Water Resources Director

ELV/js
50300604/002
Enclosures
cc: Progressive AE - Brad Thomas
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[1] A permit from the Michigan Department of Environmental Quality will be required for this project under Part 301 (Inland Lakes and Streams) of the Natural Resources and Environmental Protection Act, PA 451 of 1994.