

Gang of Lakes Intercounty Drain Assessment Report

Calhoun and Jackson Counties, Michigan

Geotechnical
Environmental
Water Resources
Ecological

Submitted to:

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Development

Mrs. Christine Kosmowski, Calhoun
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Commissioner

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GEI Project No. 1509010



Table of Contents

1. Introduction	2
2. Methods	3
3. Results	4
4. Discussion and Recommendations	5
5. References	8

Figures

1. Project Location Map – Gang of Lakes Drain, Calhoun and Jackson County, Michigan 2015
2. Drain Assessment Area Maps (Sheets 1-11) - Gang of Lakes Drain, Calhoun and Jackson County, Michigan 2015

Tables

1. Site Descriptions and Recommendations - Gang of Lakes Drain, Calhoun and Jackson County, Michigan 2015

Appendices

- A. Calhoun County Water Resource Commissioners September 13, 2013 Field Report
- B. Representative Photographs
- C. Conceptual Figures
 - Figure A – Removal and Relocation of Large Woody Debris
 - Figure B – Vegetation Removal from Mid-Channel

1. Introduction

GEI Consultants of Michigan, P.C. (GEI) was requested by members of the Gang of Lakes Drain Intercounty Drainage Board (GOLDICDB) to conduct a comprehensive assessment of the Gang of Lakes Drain, with specific attention to obstructions to flow that could be contributing to upstream flooding of L Road and Prairie Lake. Recent inspections conducted by the Calhoun County Water Resource Commissioners maintenance staff identified blockages to flow within the drain upstream of L Drive along with sediment deposits within the Lake from sediment being transported downstream within the drain (CCWRC 2013 – Appendix A).

GEI provided a proposed scope and costs to the GOLDICDB to conduct a comprehensive assessment of the drain which was subsequently approved by board members. Updates to the scope and cost were made to focus primarily on an evaluation of the obstructions to flow within the drain system. What was evident during our initial review was that recent precipitation events over the previous month had exacerbated high water and flooding conditions around Prairie Lake and other areas expected to be associated with this drainage system. As a result, the entirety of the Gang of Lakes Drain (also known as the North Branch of Rice Creek) was assessed from its confluence with Rice Creek (south of H Drive North) to the drains terminus (just west of 29 ½ Road)(Figure 1).

2. Methods

GEI assessed the Gang of Lakes Drain the week of July 21-26, 2015. The assessment was completed by walking/wading the upper most reaches of the drain and canoeing the middle and lower reaches. Use of a canoe was necessary given the unconsolidated bottom substrates of various reaches of the drain and deep water within and near the various lakes. Existing (apparent) and potential obstructions to flow, inclusive of private and public crossings of the drain, were identified, documented and mapped. Areas of erosion, deposition, or other features that were visible and which could impact the stability and sustainability of the drain channel were also documented.

A Trimble[®] GPS unit was used to map the location of areas recommended for maintenance or corrective action and other features associated with the drain. Representative photographs of the various features or apparent problem areas associated with the drain were taken. Sites identified for maintenance, potential corrective action or for future assessment were assigned priority ratings (e.g. Low, Medium, or High).

3. Results

One hundred and fifty-six (156) sites were identified, mapped and described throughout the 12 mile reach of the drain and are reported in Table 1. The majority of these sites have some level of maintenance/corrective action that is being recommended. One hundred and twenty-six (126) of the 156 sites consisted of large woody debris obstructing the natural flow of the drain; 76 of the 126 sites were given a high priority for either removal from the drain or relocation to the outer banks of the drain to serve as a combination of bank protection/stabilization and fish/aquatic habitat.

There are some areas where no action is recommended but the features were still identified to provide an overall understanding of what is contained within this drainage course (e.g., road crossings and tributaries). In addition to the 156 sites mentioned above, 29 locations were identified and used to provide photographic documentation of the features of the drain. At these locations the depth, width and bottom substrates associated with the drain were recorded.

All of the sites and associated photograph numbers presented in Table 1 and in Appendix B, respectively, provide the reader an ability to visualize the drain commencing at its confluence with Rice Creek (downstream end) and traveling upstream to its terminus (west of 29 ½ Road). Figure 2 shows the locations of each of these sites and can be cross-referenced with Table 1 which provides context such as the specific location, site description, recommended actions, and priority rating for each site.

The field assessment also included an inspection of a short distance of Rice Creek downstream of its confluence with the Gang of Lakes Drain (Sites 1 and 2). Downstream of the drain's confluence with Rice Creek the creek was out of its banks and extending into adjacent wetlands. Very few obstructions were observed in this lower end and where present were of low priority (i.e., not having any significant impact on upstream high water conditions).

4. Discussion and Recommendations

Having assessed the Gang of Lakes Drain, inclusive of the upstream and downstream reaches associated with Prairie Lake, GEI is providing the following comments, professional opinions and recommendations:

- Contrary to apparent riparian owner and local opinions, there were no “large beaver or debris dams” within the Gang of Lakes Drain that were significantly obstructing flow, neither in the vicinity of Prairie Lake or elsewhere within the twelve mile reach of this drain.
 - Of the 126 sites that were given a high priority for removal or relocation, none of them formed a dam or obstructions that caused a measurable upstream rise in water elevation within the drain. None of the obstructions created a difference in water elevation (or head) between the upstream and downstream ends of the obstruction in excess of ½ an inch. In nearly all locations the obstructions were not completely across the drain and water was able to flow around and/or under the obstructions. The majority of the large woody debris flow obstructions were in the lower to middle reaches of the drain (above H Drive).
 - **It is GEI’s professional opinion that:**
 - High priority obstructions such as large woody material (i.e. downed trees, logs, and large branches - in excess of a few inches in diameter) should be relocated to the outer banks of the drain to serve as bank stabilization and fish/aquatic habitat (Figure A of Appendix C).
 - High priority obstructions caused by small woody or vegetative material (i.e. sticks, branches, leaves, overhanging vegetation that should be trimmed back to the banks) and other relatively small debris should be removed from the drain and placed on upland or within the drain easement on historic spoil.
 - High priority obstructions such as vegetation growing within and overhanging the drain should be cut-out/removed as illustrated in Figure B of Appendix C. This will remove the obstructions to flow while not removing the bank/erosion protection the existing vegetation provides along with its thermal shading of the drain for fish and aquatic biota.
- Water elevations of the drain were above normal levels due in large part to rainfall events in June and July that reported over 8.25 and 3.53 inches of rainfall, respectively, as reported at USGS rain gages for Marshall, Michigan (USGS 2015). Where in normal or average rainfall for these months is approximately 4.0 inches.

- The Gang of Lakes Drain courses through thousands of acres of wetland, inclusive of several waterbodies/lakes. These wetlands typically “absorb/store” excess waters during storm events, however the above normal precipitation amounts in June and July appear to be the main contributor to the high water levels of the drain and its associated lakes. Conversely, during low water periods, water from adjacent wetlands will discharge water back into the drainage system.
- The general morphological features of the drain consist of a wide channel with relatively low flows (other than those observed following storm and flooding events). The drain channel, despite high water elevations, showed signs of having low shear stress along the banks and minimal areas of erosion throughout the drainage system.
- There were signs of sediment accumulating in the drain channel at a few locations. The accumulation of sediment at most of these locations is not considered unusual given the morphology of the drain channel and its eventual discharge into an over-widened channel or one of the many lakes or large wetland complexes that this drain flows through.
 - A large deposit of sediment was observed in Prairie Lake downstream of the drain’s discharge into the lake. The sediment deposit here is a result of the relatively faster flows of the drain (transporting sediment) discharging into the much slower and wider portions of the lake (depositing sediment). This depositional process is seen elsewhere throughout Michigan in its various rivers that discharge into lakes and Lake Michigan as well as throughout the United States, with the Mississippi River being the best example with its natural sediment load depositing and forming the Louisiana Delta.
 - The accumulation of sediment at the upstream ends of the various lakes that the drain discharges into/courses through is a natural process that will continue to occur regardless of water elevations (i.e. high or low). The difference will be in where the sediment accumulates. During normal time periods when the drain channel is narrower and flows are more concentrated in the drain channel, sediment will be pushed further downstream into the lake before depositing in deeper water where it may not be visible. . In contrast, during periods of high flow where water flow is over a much large cross section of the river, sediments are dispersed over a wider area and will likely fall out of suspension in the water column sooner and into areas that are more visible. Photographs contained within the CCWRC (2013) inspection report shows the accumulation of sediment in Prairie Lake (Appendix A).
 - **It is GEI’s professional opinion that:**
 - Removal of the sediment load within Prairie Lake is a low priority and should only be removed if determined to be an obstruction to navigation and flow once water levels receded. As water elevations and flows return to “normal conditions” the sediment load should be transported downstream into deeper areas of the lake and

subsequently should result in no adverse impacts to navigation or use of these waters.

- Visual observations made of the road crossings showed the majority of them to be flowing at or near capacity during the July assessments. The width of each of most of these crossings also, whether a bridge or set of culverts, were much narrower than the bankfull width of the drain and the ordinary high water mark width of the drain channel itself. All of the crossings are described in Table 1. Three are presented below as they represent apparent obvious obstructions to natural flow:
 - At H Drive North an old bridge crossing (Site 8) was left in place after the installation of a new road crossing (Site 9) to the north. The old bridge (Site 8) had no clearance between the bottom of its structure and the water surface. This structure showed an apparent obvious obstruction to flow.
 - At 26 ½ Road (Site 70) the existing culvert was completely full of water and was forming a whirlpool affect at the upstream end.
 - Upstream of 27 Road the drain channel was approximately 30 feet wide however there was only a 9 foot wide culvert under the roadway to pass the flow of the drain (Site 84, photographs 125 and 126 of Appendix B).
 - **It is GEI's professional opinion that:**
 - A primary contributor to the above normal water elevations in the drain and adjacent lakes is likely that of one or more of the road crossings of the drain. GEI contacted the Calhoun County Road Commission (CCRC) to get dimensions and hydraulic information about the various road crossing in this areas of the county. Unfortunately, the CCRC does not have historical records of these crossings.
 - GEI recommends that surveys of these road crossing be obtained, at a minimum, for the above 3 crossings. If resources are available or funding can be obtained in collaboration with CCRC, surveying the remaining eight public and private road crossings of the drain would be of benefit in determining the most critical points of flow restriction that could contribute to upstream flooding.
- Due to high water conditions at the time of the assessment, signs of erosion and scour upstream and downstream of the crossings could not be documented. As recommended previously, relocation of large woody debris that is obstructing flow should be relocated to the outer banks of the drain to retain both aquatic habitat and provide additional bank stabilization and protection from any potential erosion and sedimentation issues.

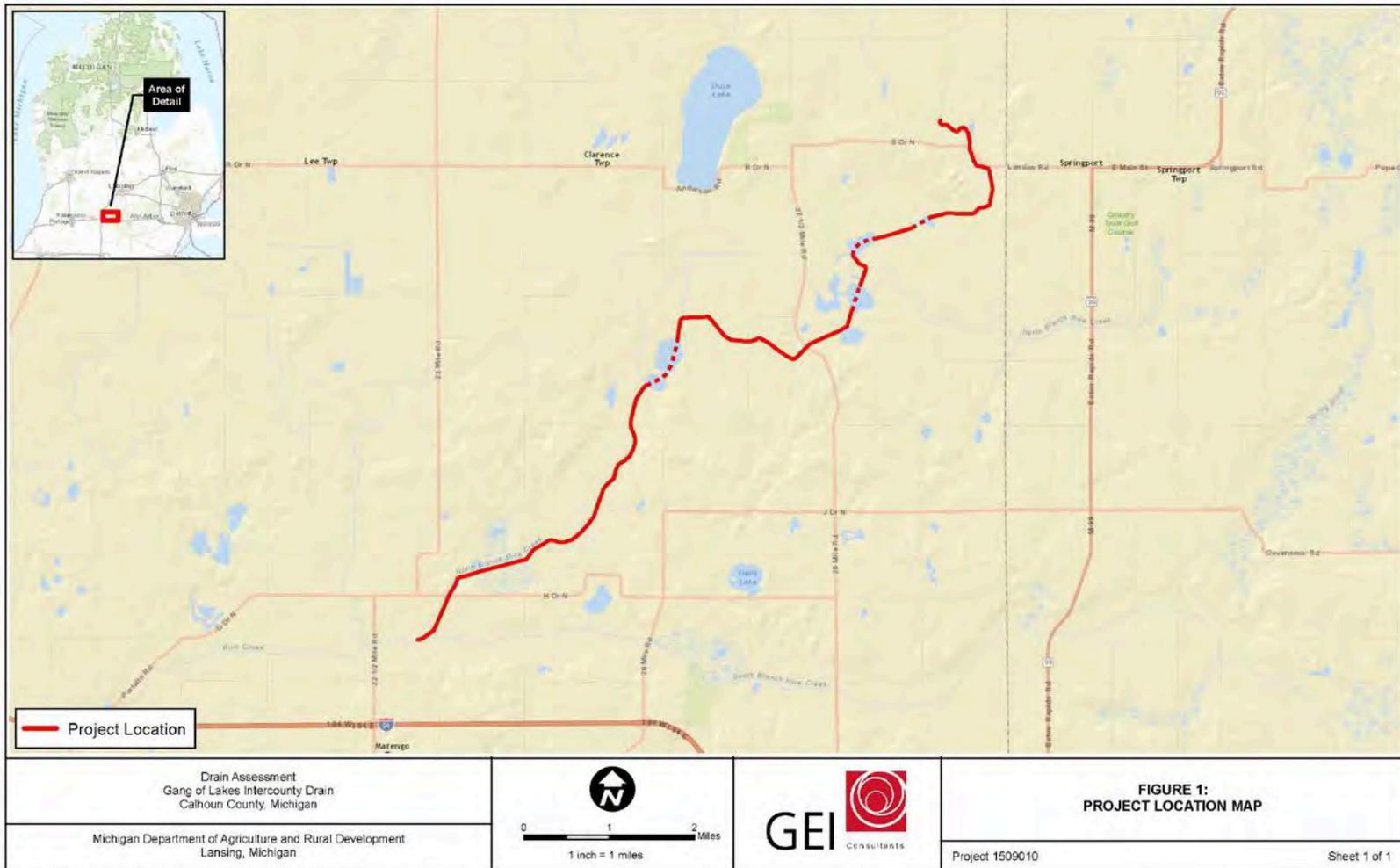
5. References

CCWRC. 2013. Calhoun County Drain Inspection Report. Calhoun County Water Resource Commissioners (CCWRC) drain inspection report from September 25, 2013 and October 1, 2013.

USGS. 2015. Monthly rain gage data for Marshall, Michigan. Accessed on August 17, 2015.
<https://www.ncdc.noaa.gov/cdo-web/datatools/normals>

Figures

1. Project Location Map – Gang of Lakes Drain, Calhoun and Jackson County, Michigan 2015
2. Drain Assessment Area Maps (Sheets 1-11) - Gang of Lakes Drain, Calhoun and Jackson County, Michigan 2015



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Drain Assessment Gang of Lakes Intercounty Drain Calhoun County, Michigan	  1 inch = 300 feet		<p align="center">FIGURE 2: DRAIN ASSESSMENT</p> <hr/> Project 1509010 Sheet 1 of 11
Michigan Department of Agriculture and Rural Development Lansing, Michigan			

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<p>Drain Assessment Gang of Lakes Intercounty Drain Calhoun County, Michigan</p>			<p>FIGURE 2: DRAIN ASSESSMENT</p>
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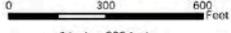


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August, 2015



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Tables

1. Site Descriptions and Recommendations - Gang of Lakes Drain, Calhoun and Jackson County, Michigan 2015

Site No. #	Bank or Channel	Description	Cubic Yards	Recommendations	Priority	Field Photographs
1	LDB RDB MC	Large woody debris, consisting of submerged branches and overhanging trees, obstructing natural flow	3	Remove, Relocate to LDB/RDB, and cut back vegetation from mid channel	H	1 - View d/s
2	LDB MC	Large woody debris, consisting of submerged branches and trees, obstructing natural flow	1/4	Remove to upland; Cut back vegetation from mid channel	L	2 - View u/s
3		Confluence of north branch of Rice Creek (Gang of Lakes Drain)				NP
4	LDB RDB MC	Large woody debris, consisting of submerged branches, obstructing natural flow	1/4	Remove to upland	L	3 - View d/s
Photograph Point A		Photograph Point A - Open reach of drain showing no apparent signs of obstruction to flow or erosion; mid channel approximately 6 ft. deep; center of drain channel is silt and detrital bottom; no action recommended				4 - View u/s 5 - View d/s
5	LDB RDB MC	Large woody debris, consisting of submerged logs and overhanging vegetation, obstructing natural flow	1/2	Remove and cut back vegetation from mid channel	L	6 - View d/s 7 - View u/s
6	LDB RDB MC	Large woody debris, consisting of submerged logs and overhanging trees, obstructing natural flow	1	Remove to upland; Relocate to LDB/RDB	H	8 - View d/s
7	LDB RDB MC	Large woody debris, consisting of submerged logs and overhanging shrubs and vines, obstructing natural flow	1	Remove to upland	H	9 - View d/s 10 - View u/s
8	MC	Old Road Crossing - 20' wide; I-beam completely full of water		Check hydraulics of crossing	H	11 - View d/s
9	MC	H Drive N. Road Crossing, nearly 100% submerged		Check hydraulics of crossing	H	12 - View d/s
10	LDB RDB ML	Large woody debris, consisting of submerged logs and branches, obstructing natural flow	>10	Relocate to LDB/RDB	H	13 - View d/s 14 - View mid reach 15 - View mid reach 16 - View u/s
11	LDB RDB MC	Large woody debris, consisting of submerged branches and overhanging vegetation, obstructing natural flow	1/2	Remove to upland; Cut back vegetation from mid channel	L	17 - View d/s
12	LDB RDB MC	Large woody debris, consisting of overhanging vegetation and submerged logs and vines, obstructing natural flow and catching pondweeds	1/2	Remove to upland	M	18 - View u/s
13	LDB MC	Large woody debris, consisting of submerged trees and branches, obstructing natural flow	1	Relocate to LDB/RDB	M	19 - View d/s
14	MC	Large woody debris obstructing natural flow	2	Relocate to LDB/RDB	M	20 - View d/s
Photograph Point B		Photograph Point B - Open reach of drain showing no apparent signs of obstruction to flow or erosion; mid channel approximately 5.5 ft. deep; center of drain channel is silt; area contains dense community of yellow pond lily; no action recommended				21 - View d/s 22 - View u/s
Photograph Point C		Photograph Point C - Open reach of drain showing no apparent signs of obstruction to flow or erosion; mid channel approximately 4.5 ft. deep; center of drain channel is silt; area contains dense community of yellow pond lily; no action recommended				23 - View u/s 24 - View d/s
15	MC	Large woody debris, consisting of overhanging shrubs and vegetation, obstructing natural flow	1/4	Cut back vegetation from mid channel	L	25 - View d/s
16	MC	Large woody debris, consisting of overhanging branches, shrubs, and vegetation, obstructing natural flow	1	Cut back vegetation from mid channel	L	26 - View d/s
17	LDB RDB MC	Large woody debris, consisting of overhanging trees, branches, shrubs, and vegetation, obstructing natural flow	3 to 5	Relocate to LDB/RDB	H	27 - View d/s 28 - View u/s
18	LDB RDB MC	Large woody debris, consisting of overhanging and submerged trees and branches, obstructing natural flow	>5 to 10	Relocate to LDB/RDB	H	29 - View d/s 30 - View u/s
19	MC	24 Road Crossing - 25' wide steel I-beam/concrete bridge; 24' width of stream; 3" bottom of steel beam/concrete bridge to the water surface		Check hydraulics of crossing	M	31 - View d/s 32 - View u/s

Site No. #	Bank or Channel	Description	Cubic Yards	Recommendations	Priority	Field Photographs
20	LDB RDB MC	Large woody debris, consisting of overhanging vegetation and trees and submerged logs, obstructing natural flow	1	Remove to upland; Relocate to LDB/RDB; Cut back vegetation from mid channel	H	33 - View d/s
21	MC	Large woody debris, consisting of submerged branches and logs, obstructing natural flow and catching pondweeds	1/2	Relocate to LDB/RDB	M	34 - View d/s
22	LDB RDB MC	Large woody debris, consisting of submerged logs, obstructing natural flow	1/4	Relocate to LDB/RDB	H	35 - View u/s
23	RDB MC	Large woody debris, consisting of overhanging vegetation and branches, obstructing natural flow; approximately 50 LF	1	Cut back and remove overhanging vegetation from mid channel	L-M	36 - View d/s
24	LDB RDB MC	Large woody debris, consisting of submerged trees and overhanging branches and vines, obstructing natural flow	1/2	Remove to upland (too small)	H	37 - View d/s
25	MC	Large woody debris, consisting of overhanging branches and vines, obstructing natural flow		Cut back and remove overhanging vegetation from mid channel	L-M	38 - View d/s 39 - View u/s
26	LDB RDB MC	Large woody debris, consisting of overhanging trees and submerged logs, trees, and branches, obstructing natural flow and catching pondweeds	3/4	Relocate to LDB/RDB	M-H	40 - View d/s 41 - View u/s
27	LDB RDB MC	Large woody debris, consisting of overhanging trees and submerged logs, branches, and trees, obstructing natural flow and catching pondweeds	3	Relocate to LDB/RDB	M	42 - View d/s 43 - View u/s
28	LDB RDB MC	Large woody debris, consisting of overhanging branches and submerged logs and trees, obstructing natural flow	1	Relocate to LDB/RDB	H	44 - View d/s 45 - View u/s
29	LDB MC	Large woody debris, consisting of submerged logs, obstructing natural flow	1/2	Relocate to LDB/RDB	M	46 - View d/s
30	LDB RDB MC	Large woody debris, consisting of submerged logs and trees, obstructing natural flow and catching pondweeds; approximately 50 LF	1	Relocate to LDB/RDB	H	47 - View u/s
31	LDB RDB MC	Large woody debris, consisting of overhanging trees and submerged logs and trees, obstructing natural flow	2	Remove to upland; Relocate to LDB/RDB	H	48 - View u/s 49 - View d/s
32	LDB RDB MC	Large woody debris, consisting of overhanging trees and submerged branches and trees, obstructing natural flow	5	Remove to upland; Relocate to LDB/RDB	H	50 - View u/s 51 - View d/s
33	LDB RDB MC	Large woody debris, consisting of overhanging branches and submerged logs, trees, and branches, obstructing natural flow	3	Relocate to LDB/RDB	H	52 - View d/s
34	RDB MC	Large woody debris, consisting of submerged logs and trees, obstructing natural flow	1/2	Relocate to RDB	L-M	53 - View u/s
35	LDB RDB MC	Large woody debris, consisting of submerged logs and overhanging trees and branches, obstructing natural flow and catching pondweeds	1	Relocate to LDB/RDB	H	54 - View u/s
36	LDB RDB MC	Large woody debris, consisting of submerged logs, obstructing natural flow		Relocate to LDB/RDB	H	NP
37	LDB RDB MC	Large woody debris, consisting of submerged logs and overhanging trees and branches, obstructing natural flow	1/2	Relocate to LDB/RDB	H	55 - View d/s 56 - View u/s
38	MC	Large woody debris obstructing natural flow	1/2	Relocate to LDB/RDB	M	57 - View d/s
39	MC	Large woody debris obstructing natural flow; approximately 50 LF	2	Relocate to LDB/RDB	H	58 - View d/s
40	LDB RDB	Large woody debris, consisting of submerged logs, obstructing natural flow	1/2	Remove cut logs - Relocate to LDB/RDB	L-M	59 - View d/s

Site No. #	Bank or Channel	Description	Cubic Yards	Recommendations	Priority	Field Photographs
41	MC	Bridge - 22" wide steel I-beam/concrete bridge; 2" galvanized pipe up/steam end; sagging and catching material; cable on downstream end sagging and catching material; 22" bottom of steel beam/concrete bridge to the water surface		Raise up and relocate galvanized pipe and cables so they are not obstructing flow	M-H	60 - View d/s 61 - View of powerline 62 - View d/s 63 - View u/s
42	LDB MC	Large woody debris, consisting of overhanging trees and branches, obstructing natural flow	1/2	Relocate to LDB/RDB	M	64 - View d/s
43	LDB RDB MC	Large woody debris, consisting of submerged logs and overhanging branches, obstructing natural flow and catching pondweeds	2	Relocate to LDB/RDB	H	65 - View d/s
Photograph Point D		Photograph Point D - Open reach of drain showing no apparent signs of obstruction to flow or erosion; mid channel approximately 5 ft. deep; center of drain channel is gravel; no action recommended				66 - View u/s 67 - View d/s
44	LDB RDB MC	Large woody debris, consisting of submerged logs, obstructing natural flow and catching pondweeds	1 to 2	Relocate to LDB/RDB	H	68 - View d/s
45	RDB LDB	Large woody debris, consisting of submerged logs, obstructing natural flow	1/2	Relocate to LDB/RDB	M	69 - View u/s
46	LDB RDB MC	Large woody debris, consisting of submerged logs and overhanging trees, branches, and vines, obstructing natural flow	2	Relocate to LDB/RDB	H	70 - View d/s
47	LDB RDB MC	Large woody debris obstructing natural flow	1/2	Relocate to LDB/RDB	H	71 - View u/s
48	LDB RDB MC	Large woody debris obstructing natural flow and catching pondweeds	3 to 5	Relocate to LDB/RDB	H	72 - View d/s
49	LDB RDB MC	Large woody debris, consisting of submerged logs and overhanging vines, obstructing natural flow and catching pondweeds	1	Relocate to LDB	H	73 - View d/s
50	LDB RDB MC	Large woody debris, consisting of overhanging trees and vines, obstructing natural flow	1/2	Relocate to LDB/RDB	H	74 - View d/s
51	LDB RDB MC	Large woody debris, consisting of submerged logs and overhanging branches and vines, obstructing natural flow and catching pondweeds	1	Relocate to LDB/RDB	H	75 - View u/s
52	LDB RDB MC	Large woody debris, consisting of submerged logs and overhanging trees and vines, obstructing natural flow and catching pondweeds	1 1/2	Relocate to LDB	H	76 - View d/s
53	LDB RDB MC	New timber pole walkway/bridge - 5' wide, 40' long; 18" above the water surface and not obstructing natural flow (current high water)		Get under permit - leave in place	NA	77 - View d/s
54	LDB RDB MC	Old footbridge is trapping large woody debris and catching material - 16" wide, 30' long	1/4	Remove footbridge - Relocate to RDB	H	78 - View u/s
55	LDB RDB MC	Large woody debris, consisting of overhanging trees, shrubs, and vines, obstructing natural flow	1/4	Cut back and remove overhanging vegetation from mid channel	L-M	79 - View d/s 80 - View u/s
56	LDB RDB MC	Large woody debris and vines obstructing natural flow and catching pondweeds	1/4	Remove to upland; Relocate larger LWD to RDB/LDB	H	81 - View d/s

Site No. #	Bank or Channel	Description	Cubic Yards	Recommendations	Priority	Field Photographs	
57	LDB RDB MC	Large woody debris, consisting of submerged logs, obstructing natural flow; approximately 75 LF	2	Relocate to LDB/RDB	M	82 - View u/s	
58	LDB RDB MC	Large woody debris and vines obstructing natural flow; approximately 50 LF	1	Remove if small - Relocate larger LWD RDB or LDB	H	83 - View d/s	
Photograph Point E		Photograph Point E - Gravel sand bottom substrates, 5-6 foot water depths					84 - View u/s 85 - View d/s
59	LDB RDB MC	Large woody debris obstructing natural flow	1/4	Relocate to LDB/RDB	H	86 - View u/s	
60	LDB RDB MC	Large woody debris and vines obstructing natural flow	1/2	Relocate to LDB/RDB	M	87 - View d/s	
61	LDB RDB MC	Large woody debris obstructing natural flow	1/2	Relocate to LDB/RDB	M	88 - View d/s	
62	LDB RDB MC	Large woody debris and shrubs obstructing natural flow	1/2	Relocate to LDB/RDB	M	89 - View d/s	
63	MC	L Drive Road Crossing - Two elliptical culverts; upstream end of west culvert: 5'10" water depth, ~3'10" sediment depth, 14" space between top of culvert and water surface; upstream end of east culvert: 4'8" water depth, 3' sediment depth, 16" space between top of culvert and water surface; showing no apparent signs of erosion around the upstream or downstream ends; no action recommended.		Stable. No action recommended	NA	80 - View u/s 81 - View d/s 92 - View u/s	
64	MC	Large woody debris, consisting of submerged logs, obstructing natural flow	1/2	Relocate to LDB/RDB	H	93 - View u/s	
65	MC	Large woody debris, consisting of overhanging trees, shrubs, branches, and vines, obstructing natural flow		Cut back and remove overhanging trees, shrubs, branches, and vines from mid channel	M	94 - View u/s	
65.5		Photograph Point F - Open reach of drain showing no apparent signs of obstruction to flow or erosion; mid channel approximately 5 ft. deep; center of drain channel is gravel; no action recommended					95 - View d/s 96 - View u/s
66	MC	Large woody debris, consisting of overhanging branches, obstructing natural flow	1/4	Cut back and remove overhanging branches from mid channel	L	97 - View u/s	
67	LDB RDB MC	Large woody debris, consisting of submerged logs and overhanging trees and branches, obstructing natural flow; approximately 250 LF	3 to 5	Relocate to LDB/RDB	H	98 - View u/s 99 - View d/s	
68	LDB RDB MC	Large woody debris, consisting of submerged logs and overhanging branches, obstructing natural flow and catching pondweeds; approximately 100 LF	1	Relocate to RDB	M	100 - View u/s	
69	LDB RDB MC	Large woody debris, consisting of submerged logs and overhanging branches, obstructing natural flow and catching pondweeds; approximately 200 LF	1 - 1/2	Relocate to RDB	H	101 - View d/s	
69.25		Photograph Point G - Prairie Lake					102 - View d/s 103 - View of lake
69.5		Photograph Point H - Prairie Lake; discharge of drain into the northern end of Prairie Lake; extensive high water; numerous buildings and appurtenances affected by the high water					104 - View u/s 105 - View d/s
70	MC	26 1/2 Road Crossing; Culvert submerged and completely full of water		Check hydraulics of crossing	NA	106 - View d/s 107 - View u/s 108 - View d/s 109 - View u/s	

Site No. #	Bank or Channel	Description	Cubic Yards	Recommendations	Priority	Field Photographs	
71	RDB	Unnamed tributary/drain entering along RDB		No action recommended	NA	NP	
71.5		Photograph Point I - Open reach of drain acting as a depositional area above 26 mile road; showing no apparent signs of obstruction to flow or erosion; mid channel approximately 7 ft. deep; center of drain channel is silt; no action recommended					110 - View u/s 111 - View d/s
72	MC	Large woody debris, consisting of overhanging branches and shrubs, obstructing natural flow	1/2	Relocate to LDB	M-H	112 - View d/s	
73	LDB	Large woody debris, consisting of overhanging trees and branches, obstructing natural flow; approximately 50 LF	1	Relocate to LDB	H	113 - View u/s	
74		Large woody debris, consisting of overhanging trees, obstructing natural flow and catching pondweeds	1/2	Relocate to LDB	H	114 - View d/s	
75		Large woody debris, consisting of overhanging trees and branches, obstructing natural flow and catching pondweeds	1	Relocate to LDB	H	115 - View d/s	
76		Large woody debris, consisting of overhanging branches, obstructing natural flow and catching pondweeds; apparent tributary/drain entering along RDB	1/2	Relocate to LDB - HSB	H	116 - View u/s	
77	MC	Large woody debris, consisting of overhanging branches, obstructing natural flow and catching pondweeds	1/4	Relocate to LDB - HSB	M	117 - View u/s	
78	RDB	Large woody debris, consisting of overhanging trees and branches, obstructing natural flow and catching pondweeds	1/4	Relocate to LDB - HSB	M	118 - View u/s	
296		Large woody debris, consisting of overhanging trees, obstructing natural flow and catching pondweeds	1/2	Relocate to LDB - HSB	H	119 - View d/s	
80		Large woody debris obstructing natural flow and catching pondweeds	1/2	Relocate to LDB - HSB	H	120 - View d/s	
81		Large woody debris obstructing natural flow	3/4	Relocate to LDB - HSB	H	121 - View d/s	
81.5		Photograph Point J - Open reach of drain showing no apparent signs of obstruction to flow or erosion; mid channel approximately 6.5 ft. deep; center of drain channel is silt; no action recommended					122 - View u/s 123 - View d/s
82	MC	Large woody debris, consisting of overhanging trees and vines, obstructing natural flow	1/4	Remove to upland (too small)	M	124 - View d/s	
83	LDB	Large woody debris, consisting of overhanging branches, obstructing natural flow	1/4	Remove to upland (too small)	M	125 - View d/s	
84	MC	27 Road Crossing - 9' CMP; upstream end of culvert: 6'2" water depth, ~2' sediment depth, 10" space between top of culvert and water surface; downstream end of culvert: 5'6" water depth, ~3' sediment depth, 6" space between top of culvert and water surface; showing no apparent signs of erosion around the upstream or downstream ends; no action recommended			NA	126 - View d/s 127 - View u/s	
85		Large woody debris, consisting of overhanging branches, obstructing natural flow	1/2	Relocate to RDB	H	128 - View d/s	
86		Large woody debris, consisting of overhanging trees and shrubs, obstructing natural flow	3/4	Relocate to RDB	H	129 - View d/s	
87	LDB MC RDB	Large woody debris, consisting of overhanging trees, obstructing natural flow and catching pondweeds; approximately 200 LF	1	Relocate to RDB	H	130 - View d/s	
88		Large woody debris obstructing natural flow and catching pondweeds	1/4	Relocate to RDB	M	131 - View d/s	
89		Large woody debris obstructing natural flow and catching pondweeds	1	Relocate to RDB	H	132 - View u/s	
90		Large woody debris obstructing natural flow and catching pondweeds	1/4	Relocate to RDB	H	133 - View d/s	
90.5		Photograph Point K - Open reach of drain acting as a depositional area; showing no apparent signs of obstruction to flow or erosion; mid channel approximately 5 ft. deep; center of drain channel is silt and detrital material; no action recommended					134 - View u/s 135 - View d/s
91		Large woody debris, consisting of submerged logs and overhanging branches, obstructing natural flow	2	Relocate to LDB	H	136 - View d/s	
91.5		Photograph Point L - Open reach of drain showing no apparent signs of obstruction to flow or erosion; mid channel approximately 5.5 ft. deep; center of drain channel is sand and gravel; historic spoil berm present on the RDB; no action recommended					137 - View u/s 138 - View d/s
92		Large woody debris, consisting of overhanging trees and vines, obstructing natural flow	1/2	Relocate to RDB	H	139 - View d/s	
93		Large woody debris, consisting of submerged logs and overhanging shrubs and vines, obstructing natural flow	1/2	Remove to upland (too small)	H	140 - View d/s	
94		Large woody debris, consisting of submerged logs and overhanging vines, obstructing natural flow	1/2	Remove to upland (too small)	H	141 - View d/s	
95		Large woody debris, consisting of submerged logs and overhanging shrubs and vines, obstructing natural flow	1/4	Remove to upland (too small)	H	142 - View d/s	

Site No. #	Bank or Channel	Description	Cubic Yards	Recommendations	Priority	Field Photographs	
96	LDB MC RDB	Large woody debris, consisting of overhanging trees, shrubs, and vines, obstructing natural flow and catching pondweeds; approximately 30 LF	1/2	Remove to upland (too small)	H	143 - View d/s	
97		Large woody debris, consisting of overhanging trees, obstructing natural flow and catching pondweeds (i.e. <i>Potamogeton pectinatus</i>)	1/2	Remove to upland (too small)	H	144 - View d/s	
97.5		Photograph Point M - Open reach of drain showing no apparent signs of obstruction to flow or erosion; mid channel approximately 5.5 ft. deep; center of drain channel is sand; trees and shrubs along RDB and LDB; no action recommended					145 - View u/s 146 - View d/s
98		Large woody debris obstructing natural flow	1/4	Relocate to RDB	H	147 - View u/s	
99		Large woody debris obstructing natural flow	1/2	Relocate to RDB	H	148 - View d/s	
100	MC	28 Road Crossing; 72" CMP (maybe elliptical)		Stable - No action recommended	NA	149 - View u/s from d/s end of crossing	
101	MC	Large woody debris, consisting of overhanging branches and vines, obstructing natural flow	1/4	Remove to upland (too small)	M	150 - View d/s	
102	MC	Large woody debris, consisting of submerged logs, obstructing natural flow; approximately 30 LF	1 1/2	Remove to upland (too small)	M	151 - View d/s	
103	LDB RDB MC	Large woody debris, consisting of overhanging shrubs, obstructing natural flow and catching pondweeds; approximately 200 LF	1	Remove to upland (too small)	M	152 - View d/s	
104	MC	Large woody debris obstructing natural flow and catching pondweeds	1/4	Remove to upland (too small)	L	153 - View d/s	
105	MC	Large woody debris obstructing natural flow and catching pondweeds	1/4	Relocate to RDB	L	154 - View d/s	
Photograph Point N		Photograph Point N					155 - View u/s 156 - View d/s
Photograph Point O		Photograph Point O					157 - View of drain outlet into Bell Lake 158 - View of north end of Bell Lake
106	LDB RDB MC	Large woody debris, consisting of overhanging shrubs, obstructing natural flow		Cut back and remove overhanging shrubs from mid channel	H	159 - View d/s	
Photograph Point P		Photograph Point P - Open reach of drain showing no apparent signs of obstruction to flow or erosion; mid channel approximately 6.3 ft. deep; center of drain channel is sand and silt; Large woody debris is not obstructing flow; no action recommended					160 - View u/s 161 - View d/s
107	LDB MC	Large woody debris, consisting of overhanging branches and shrubs, obstructing natural flow		Relocate to LDB/RDB	H	162 - View d/s 163 - View d/s 164 - View d/s 165 - View u/s	
108	LDB RDB	Large woody debris, consisting of overhanging shrubs and vines, obstructing natural flow	1/2	Relocate to LDB/RDB	H	166 - View d/s	
Photograph Point Q		Photograph Point Q - Upper end of White Lake					167 - View u/s 168 - View d/s
109	LDB RDB	Large woody debris, consisting of overhanging branches and shrubs, obstructing natural flow	1/2	Cut back and remove overhanging vegetation from mid channel	H	169 - View d/s	
110	LDB RDB MC	Large woody debris, consisting of overhanging shrubs and vines, obstructing natural flow	> 20	Relocate to LDB/RDB	H	170 - View d/s	
111	LDB RDB MC	Large woody debris, consisting of overhanging shrubs, obstructing natural flow	1/2	Relocate to LDB/RDB	H	171 - View d/s 172 - View u/s	
Photograph Point R		Photograph Point R - Open reach of drain showing no apparent signs of obstruction to flow or erosion; mid channel approximately 18" deep; center of drain channel is sand, gravel, cobble; 5' wide undercut bank; no action recommended					173 - View u/s 174 - View d/s

Site No. #	Bank or Channel	Description	Cubic Yards	Recommendations	Priority	Field Photographs
112	MC	29 1/2 Road Crossing - 80' RCP culvert; upstream end of culvert: 48" water depth, 0 sediment depth, 32" space between top of culvert and water surface; downstream end of culvert: 2'3" water depth, 0 sediment depth, 2'7" space between top of culvert and water surface; showing no apparent signs of erosion around the upstream or downstream ends; no action recommended		Check hydraulics of crossing	NA	175 - View u/s 176 - View u/s 177 - View d/s 178 - View d/s
113	LDB RDB MC	Large woody debris obstructing natural flow and catching material (i.e. corn stalks)	1/4	Remove to upland (too small)	H	179 - View u/s
114	RDB MC	Large woody debris obstructing natural flow	1/2	Remove to upland (if too small); Relocate to LDB	M	180 - View u/s
115	LDB RDB MC	Large woody debris, consisting of overhanging shrubs and vines, obstructing natural flow	1/4	Remove and cut back vegetation from mid channel	M	181 - View u/s
116	LDB	4" drain tile - 12" below water surface; 3" above the bed of the drain		No action recommended	NA	182
117	LDB MC	Large woody debris obstructing natural flow	1/4	Relocate to RDB	M	183
Photograph Point S		Photograph Point S - Open reach of drain showing no apparent signs of obstruction to flow or erosion; mid channel approximately 12" deep; 17' stream width; center of drain channel is sand; no action recommended				184 - View u/s 185 - View d/s
118	LDB RDB MC	Large woody debris obstructing natural flow		Relocate to RDB	M	186 - View u/s
119	LDB RDB MC	Large woody debris, consisting of overhanging shrubs, obstructing natural flow	1/4	Remove and cut back vegetation from mid channel	L-M	187 - View u/s
120	LDB RDB MC	Large woody debris, consisting of submerged logs and overhanging trees and vines, obstructing natural flow and catching pondweeds	3/4	Remove to upland; Relocate to RDB	H	188 - View u/s
Photograph Point T		Photograph Point T - Open reach of drain showing no apparent signs of obstruction to flow or erosion; mid channel approximately 15" deep; 12 to 13' stream width; center of drain channel is cobble, gravel, and sand (10%,40%,50% respectively); no action recommended				189 - View u/s 190 - View d/s
121	LDB RDB MC	Large woody debris obstructing natural flow and catching pondweeds	10	Relocate to RDB	H	191 - View u/s 192 - View u/s 193 - View d/s
122	LDB RDB MC	Large woody debris, consisting of overhanging shrubs, obstructing natural flow; approximately 100 LF	1/2	Remove to upland	L-M	194 - View u/s
123	MC	Wooden pallets dumped into the drain are obstructing natural flow	42038	Remove to upland	H	195 - View across reach
124	LDB RDB MC	Large woody debris, consisting of overhanging trees and branches, obstructing natural flow		Remove small debris - Relocate medium to large LWD to RDB	H	196 - View u/s 197 - View u/s
Photograph Point U		Photograph Point U - Open reach of drain showing no apparent signs of obstruction to flow or erosion				198 - View d/s 199 - View u/s
125	MC	Large woody debris obstructing natural flow	3	Remove small debris - Relocate medium to large LWD to RDB	H	200 - View u/s
126	LDB MC	Large woody debris, consisting of overhanging shrubs and vines, obstructing natural flow	1	Remove to upland	H	201
127	LDB RDB MC	Large woody debris, consisting of overhanging shrubs, obstructing natural flow	>10	Remove and cut back vegetation from mid channel	H	202 - View u/s 203 - View d/s 204 - View d/s

Site No. #	Bank or Channel	Description	Cubic Yards	Recommendations	Priority	Field Photographs
128	LDB RDB MC	Large woody debris, consisting of submerged branches, obstructing natural flow	1 to 2	Relocate to LDB/RDB	H	205 - View u/s 206 - View d/s
Photograph Pointe V	Photograph Point V - Open reach of drain dominated by reed canary grass; mid channel contains overhanging shrubs; no action recommended					207 - View d/s 208 - View u/s
129	LDB RDB MC	Large woody debris, consisting of overhanging shrubs, obstructing natural flow	5	Remove to upland	H	209 - View u/s
130	LDB RDB MC	Large woody debris obstructing natural flow	5	Remove and cut back vegetation from mid channel	H	210 - View d/s
131	LDB RDB MC	Large woody debris, consisting of overhanging shrubs, obstructing natural flow		Remove and cut back vegetation from mid channel	M	211 - View u/s
132	LDB RDB	Large woody debris, consisting of overhanging shrubs, obstructing natural flow		Remove and cut back vegetation from mid channel	H	212 - View u/s 213 - View d/s
Photograph Pointe W	Photograph Point W - Open reach of drain showing no apparent signs of obstruction to flow or erosion; 3' stream width; mid channel approximately 32" deep; 12" soft deposition; banks dominated by reed canary grass; no action recommended					214 - View d/s 215 - View u/s
Photograph Pointe X	Photograph Point X - Open reach of drain dominated by reed canary grass; 2.5' stream width; mid channel approximately 36" deep; no apparent signs of obstruction to flow or erosion; no action recommended					216 - View d/s
133	LDB MC	Large woody debris, consisting of overhanging shrubs, obstructing natural flow		Remove and cut back vegetation from mid channel	L	217 - View d/s 218 - View u/s
134	MC	Farm Road Crossing - 48" width		No action recommended	NA	219 - View d/s 220 - View u/s
135	LDB	Deposition of sand and gravel from unnamed tributary along the LDB immediately downstream of its S Drive N crossing; ~40 linear feet of sand deposits; 45' long; 40 wide; >12" deep; approximately 45 LF	~65	Remove all sediment deposits from the main channel of the tributary and the over bank area	H	221 - View South 222 - View South
Photograph Pointe Y	Photograph Point Y - Open reach of drain acting as a depositional area showing no apparent signs of obstruction to flow or erosion; 12' stream width; mid channel approximately 2 ft. deep; center of drain channel is silt; vegetation present within drain channel; banks lined with reed canary grass; no action recommended					223 - View d/s 224 - View u/s
136	LDB RDB MC	16'X3' wood foot bridge		Remove or elevate	M	225 - View d/s
137	LDB RDB MC	Large woody debris obstructing natural flow	1/4	Relocate to LDB/RDB	M	226 - View u/s
138	MC	Farm Road Crossing - 54" CMP; upstream end of culvert: 26" water depth, 8" sediment depth, 20" space between top of culvert and water surface		Check hydraulics of crossing	L	227 - View d/s 228 - View u/s
139	RDB	Large woody debris, consisting of overhanging trees, obstructing natural flow		Remove to upland; Relocate to LDB/RDB	L	NP
140	LDB RDB MC	Large woody debris, consisting of overhanging trees and branches, obstructing natural flow	3	Relocate to upper bank	H	229 - View d/s
141	MC	S Drive N Road Crossing; 60" RCP with flared end		Stable - No action recommended	NA	230 - View d/s 231 - View d/s 232 - View u/s
Photograph Pointe Z	Photograph Point Z - Open reach of drain acting as a depositional area showing no apparent signs of obstruction to flow or erosion; dominated by reed canary grass, watercress, and jewelweed; 32' valley width; 2.5' max channel width; mid channel approximately 12" deep; center of drain channel is >12" of silt; no action recommended					233 - View d/s
142	MC	Farm Road Crossing - 60" CMP; upstream end of culvert: 22" water depth, 26" sediment depth, 12" space between top of culvert and water surface; downstream end of culvert: 5'6" water depth, ~3' sediment depth, 6" space between top of culvert and water surface		None at this time - await hydraulic calculations to determine limiting factor, if any, of this crossing	NA	234 - View d/s 235 - View u/s 236 - View u/s
Photograph Pointe ZA	Photograph Point ZA - Open reach of drain showing no apparent signs of obstruction to flow or erosion; mid channel approximately 16" deep; 12 ft wetland valley; center of drain channel is >3' silt deposition; no action recommended					237 - View u/s

Site No. #	Bank or Channel	Description	Cubic Yards	Recommendations	Priority	Field Photographs
Photograph Pointe ZB	Photograph Point ZB - Open reach of drain showing no apparent signs of obstruction to flow or erosion; mid channel approximately 16" deep; 14 ft wetland valley; 6 to 7 ft channel width; center of drain channel is >3' silt deposition; no action recommended					238 - View u/s
143	Tributary on LDB	Large woody debris obstructing natural flow	1	Remove and cut back vegetation from mid channel	M	239 - View d/s 240 - View u/s
144	LDB RDB MC	Vegetation obstructing natural flow	3/2	Remove and cut back vegetation from mid channel	M	261 - View u/s
145	LDB RDB MC	Vegetation obstructing natural flow		Remove to upland	L	242 - View d/s
Photograph Pointe ZC	Photograph Point ZC - Open reach of drain showing no apparent signs of obstruction to flow or erosion; mid channel approximately 12" deep; 6 to 13 ft wetland valley width; banks dominated by reed canary grass; center of drain channel is >30" silt deposition; no action recommended					243 - View u/s
146	LDB RDB MC	Vegetation and overhanging branches obstructing natural flow	1/2	Remove vegetation from mid channel - Relocate LWD to RDB/LDB	L-M	244 - View u/s 245 - View d/s
147	RDB MC	Large woody debris, consisting of overhanging and submerged shrubs, obstructing natural flow	1/4	Relocate to LDB/RDB	L-M	246 - View u/s
148	MC	Farm Road Crossing - 48" CMP; upstream end of culvert: 19" water depth, 2" sediment depth, 27" space between top of culvert and water surface; downstream end of culvert: 18" water depth, 11" sediment depth, 19" space between top of culvert and water surface		Check hydraulics of crossing	M	247 - View u/s 248 - View u/s 249 - View d/s
149	MC	Large woody debris, consisting of submerged logs and vegetation, obstructing natural flow		Remove to upland	L	250 - View u/s 251 - View across channel 252 - View log home 253 - View d/s 254 - View d/s
150	RDB MC	Overhanging shrubs obstructing natural flow		Relocate to RDB	M-H	255 - View d/s
151	MC	29 1/2 mile Road Crossing - 42" CMP; no apparent signs of obstruction to flow or erosion; upstream end of culvert: 40" water depth, 0 sediment depth, 2" space between top of culvert and water surface; downstream end of culvert: 22" water depth, 11" sediment depth, 9" space between top of culvert and water surface		Check hydraulics of crossing	H	256 - View d/s 257 - View u/s 258 - View u/s
152	MC	Roadside ditch culvert apparently connecting roadside ditch south of farm road; 15" CMP		No action recommended recommended	NA	259 - View u/s
153	LDB	Large woody debris, consisting of overhanging trees and branches, obstructing natural flow		Relocate to LDB/RDB	L-M	260
154	LDB MC	Large woody debris, consisting of overhanging trees and branches, obstructing natural flow		Remove and cut back vegetation from mid channel	L-M	261 - View d/s
155	RDB	Drainage Pipe; orange 10" PVC		No action recommended recommended	NA	261 - View across to East
156	MC	Drainage Pipe; 6" PVC		No action recommended recommended	NA	263 - View across to East 264 - View d/s

Appendix A

Calhoun County Water Resource Commissioners September 13, 2013 Field Report



CALHOUN COUNTY
 WATER RESOURCES COMMISSIONER

Calhoun County Drain Inspection Report

County Drain: Gang of Lakes Drain	Township: Clarence	Section Number: 28 & 32
Land Owner: Elmer Heisler	Address:	City & State:
Office Contact: Christine Kosmowski	Date of Inspection: 9/25/13 & 10/1/13	

Stated Problem:

Property owner requested inlet and Outlet of Prairie lake be cleaned of sediment and trees.(Outlet)

Inspection Report:

The section between L Drive North & Prairie Lake water depth varied between 12" & 23", measured 14 different locations. This section has a very sandy bottom.
With the amount of debris in the drain and the sandy bottom is why the depth of water varies

Items for Drain Improvements:

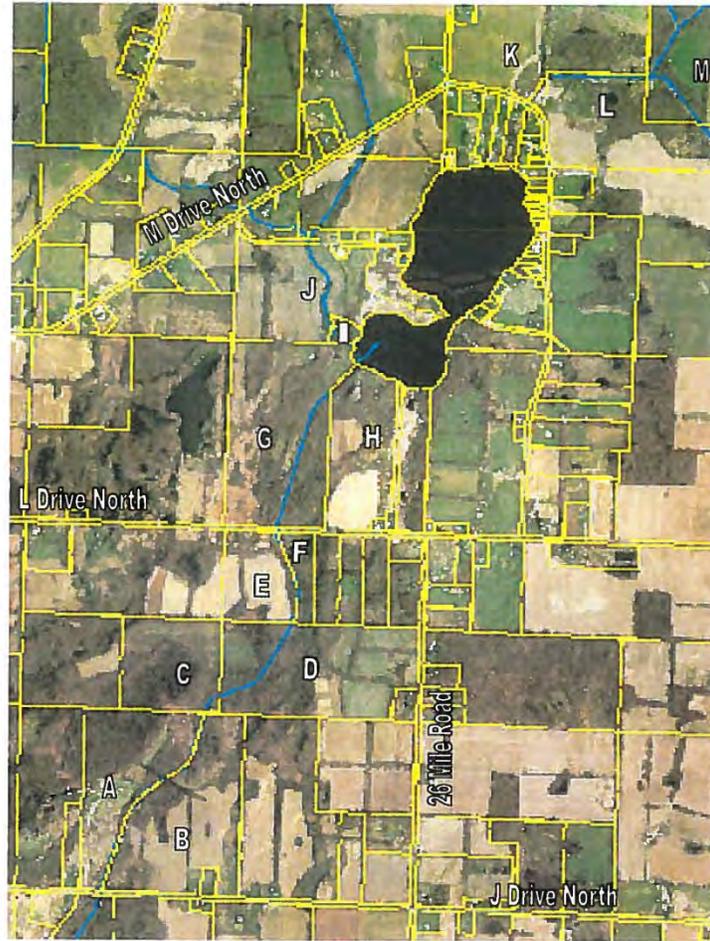
Remove dead falls
Remove sediment

Tree Removal	Yes	Debris Removal	Yes	Sed. Removal	Yes
Repair Culvert	No	Chop Brush	?	Fix Tile	No
Repair Inlet	No	Repair Outlet	No	Seed & Mulch	Depends
Spray	No				

Drain Inspector: _____

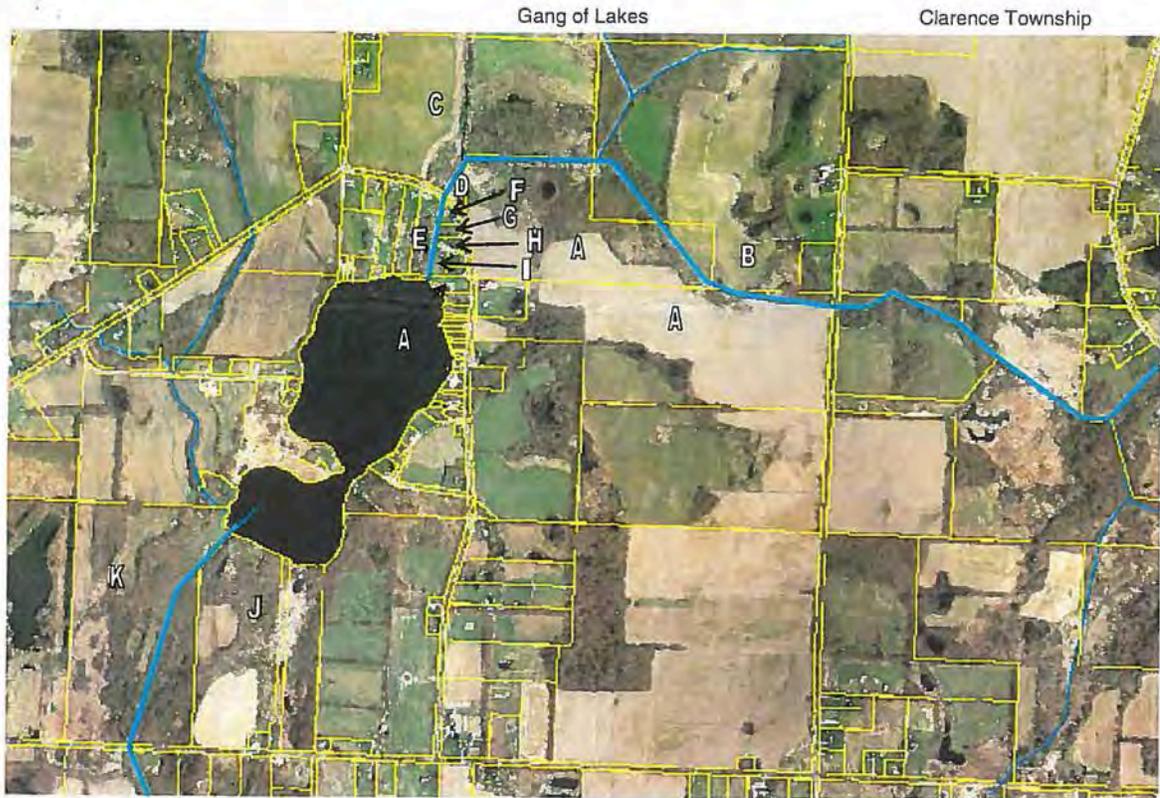
Gang of Lakes Drain

Clarence Sheridan Township



A	19-050-027-20	Mary & Calbert England, 25231 J Dr No, Albion MI 49224	517-629-8957
B	19-050-024-00	Raymond Coats, 17750 19 Mile Road, Marshall MI 49068	781-4186
C	19-050-021-00	Brenda Dane, 17006 26 Mi Rd, Albion MI 49224	517-629-3746
D	19-050-003-00	Brenda Dane, 17006 26 Mi Rd, Albion MI 49224	
E	19-050-012-00	John & Clare Owdziej, 25156 L Dr No, Albion MI 49224	517-629-7615
F	19-050-009-00	taxpayer = Mary Louise Berger, 25156 L Dr No, Albion MI 49224	
G	06-132-033-00	Travis Moore, 25648 L Dr No, Albion MI 49224	
H	06-132-036-00	Dolores Sandusky, 12804 Iroquois Dr, Grand Ledge MI 48837	517-627-7871
I	06-132-006-01	Judy McGuigan, 1200 E Michigan Ave, Albion MI 49224	
J	06-132-009-20	Dolores Sandusky, 12804 Iroquois Dr, Grand Ledge MI 48837	
K	06-128-036-00	David & Joanne Vermay, 25368 M Dr No, Albion MI 49224	517-629-6445
L	06-128-042-00	Robert & Clemeny Pletcher, 7238 Smith Road, Alanson MI 49706-9725	
M	06-128-060-00	Elmer Heisler Jr, 19900 27 Mi Rd, Albion MI 49224	
		Raymond & Victoria Reed, 19221 27 Mi Rd, Albion MI 49224	

Twp, Sheridan Twp, Gis Map10/23/2013



- | | | |
|---|---------------|---|
| A | 06-128-042-00 | Elmer Heisler Jr, 19900 27 Mile Road, Albion, MI 49224 |
| B | 06-128-060-00 | Raymond & Victoria Reed, 19221 27 Mile Road, Albion, MI 49224 |
| C | 06-128-060-00 | Robert & Clenary Pletcher, 7238 Smith Road, Alanson MI 49706-9725 |
| D | 06-128-039-00 | Delmer Mann, 24050 O Drive North, Albion, MI 49224 |
| E | 06-128-027-00 | Molly Ilene & Dale Winnie, 19077 26 Mile Road, Albion, MI 49224 |
| F | 06-128-057-00 | Dale & Molly Winnie, 19119 26 1/2 Mile Rd, Albion MI |
| G | 06-128-054-00 | Brian Gochenour, 19055 26 1/2 Mile Road, Albion, MI 49224 |
| H | 06-128-051-02 | Wayne & Karen Merwin, 19051 26 Mile Road, Albion, MI 49224 |
| I | 06-128-048-00 | Elizabeth Ann Nicka, 19049 26 1/2 Mile Road, Albion, MI 49224 |
| J | 06-132-036-00 | Judy McGuigan, 1200 E Michigan Ave, Albion, MI 49224 |
| K | 06-132-033-00 | Dolores Sandusky, 12804 Iroquois Dr, Grand Ledge MI 48837 |

Twp, Clarence, Gis Map,10/11/2013

Pictures taken 12-10-13

Gang of Lakes Drain South of L Drive South

Sheridan Township



Gang of Lakes - L Dr N-South sec,12/11/2013

Pictures taken 12-10-13

Gang of Lakes Drain South of L Drive South

Sheridan Township

2400 feet of the drain, South of L Drive North was inspected and the following pictures represent that area. No specific picture was referenced to a location on the drain.



Gang of Lakes - L Dr N-South sec,12/11/2013

Gang of Lakes

Clarence Township

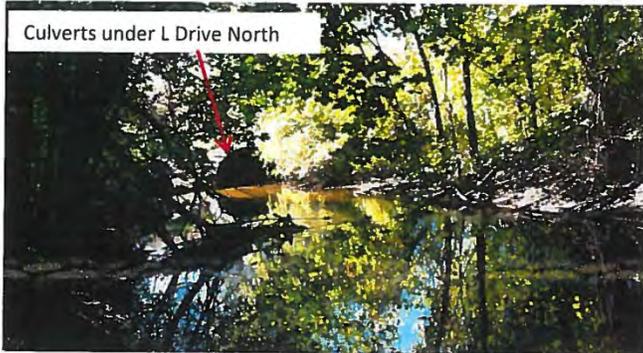
Some pictures along Gang of Lakes Drain
between L Drive North and the South
edge of Prairie Lake



Twp, Clarence, Gis Map,10/11/2013

Gang of Lakes

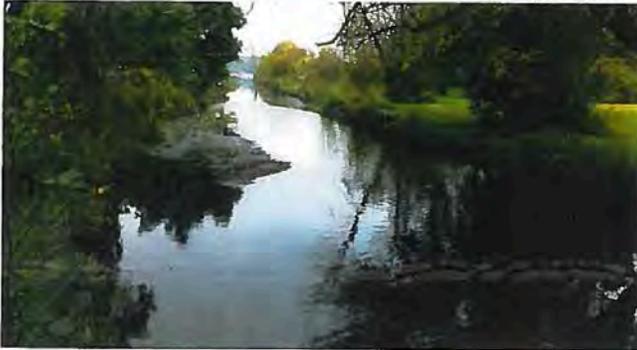
Clarence Township



Some pictures along Gang of Lakes Drain
between L Drive North and the South
edge of Prairie Lake

Twp, Clarence, Gis Map,10/11/2013

Gang of Lakes



Clarence Township

Picture of drain South of 26 Mile Road showing some of the sediment deposit just South of the Road Culverts

Pictures along the drain Channel between the Road and the Lake.

Pictures along the drain Channel between the Road and the Lake.

Picture of the drain North of the Road. There was a Sediment basin put in back in the "70's" at this location.

Twp. Clarence, Gis Map,10/11/2013

Gang of Lakes

Clarence Township



Shows three(3) spots where sediment deposit have been deposited in Prairie Lake. Also the flow of the Gang of Lakes drain is shown with a broken arrow line



Spot One(1)
Close-up of sediment deposit.



Spot two (2)
Close-up of sediment deposit.



Spot three (3)
Close-up of sediment deposit.

Twp, Clarence, Gis Map,10/11/2013

Pictures taken 12-10-13

Gang of Lakes Drain South of L Drive South

Sheridan Township

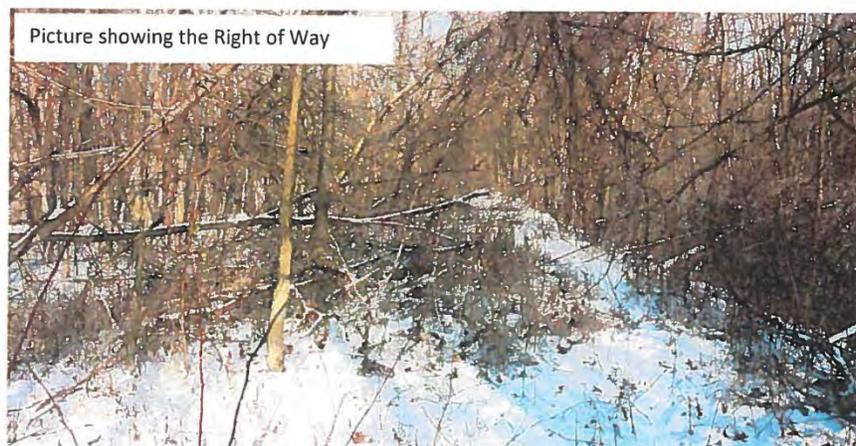
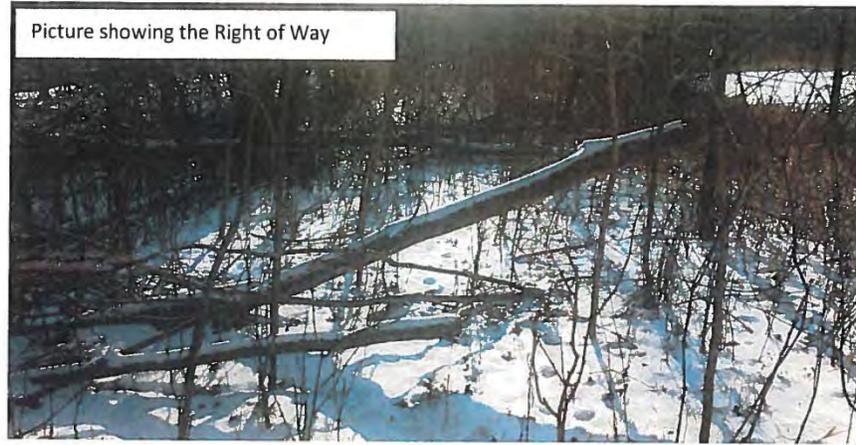


Gang of Lakes - L Dr N-South sec,12/11/2013

Pictures taken 12-10-13

Gang of Lakes Drain South of L Drive South

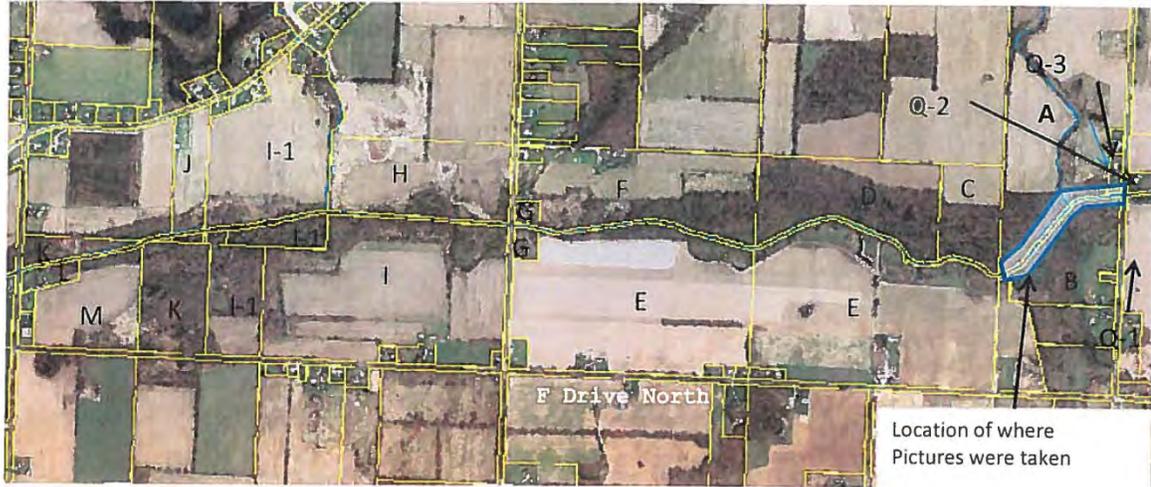
Sheridan Township



Gang of Lakes - L Dr N-South sec,12/11/2013

Gang of Lakes County Drain

Marengo Township



- Q-1 Blain Van Sickle, 16828 21 Mi Rd, Marshall MI 49068
- Q-2 Joseph Shelters & Vincent Bethany, 15490 22 1/2 Mile Road, Marshall MI 49068
- Q-3 Rolene Amsler & Maurice Bauman, 15533 22 1/2 Mile Road, Marshall MI 49068
- A Penny Shafer, 2201 Country Club Way, Albion MI 49224
- B Alice Roddy, 15103 22 1/2 Mile Road, Marshall MI 49068
- C Victor Postula, Box 933, Marshall MI 49068
- D Robert & Deborah Withee, 1441 Breezy Point Ln, Kalamazoo MI 49019
- E Roy & Donna Hazel, 21137 F Drive North, Marshall MI 49068

- F Albert P. & Brenda K. Pace, 15508 21 Mile Road, Marshall MI 49068
- G Patrick Stillson 15350 21 Mile Road, Marshall MI 49068
- H John & Kerry Hupenbecker, 15911 21 Mile Rd, Marshall MI 49068
- I Larry & WF Huepenbecker, 20570 F Dr No, Marshall MI 49068
- I-1 Larry & Melanie Hupenbecker, 20570 F Dr No, Marshall MI 49068
- J Clifton & Wf Wise 20390 Partello Rd, Marshall MI 49068
- K Carl Behnke (Estate of) PO Box 2102, Battle Creek MI 49016
- L John & Margaret Taylor, 15206 20 Mile Rd, Marshall MI 49068
- M Estill & Arbadella Spradlin, 14600 20 Mile Rd, Marshall MI 49068

Pictures taken between 22 1/2 Mi Rd
The Deforest Chittenden (1550 Ft)

Gang of Lakes Drain

Marquette Township



These series of pictures were taken along the drain between 22 1/2 Mile Road and the Deforest & Chittenden County Drain. This section of drain is approx. 1550 feet long. The stretch of drain West of this section was looked at during the summer of 2013. The land owner at that time had been keeping the dead falls out of the drain. The water at this time was too deep to determine if any sediment needs to be removed.

I talked to Blaine VanSickle, who owns land East of the 22 1/2 Mile Road bridge, & he stated that they do not have a water problem on their land.

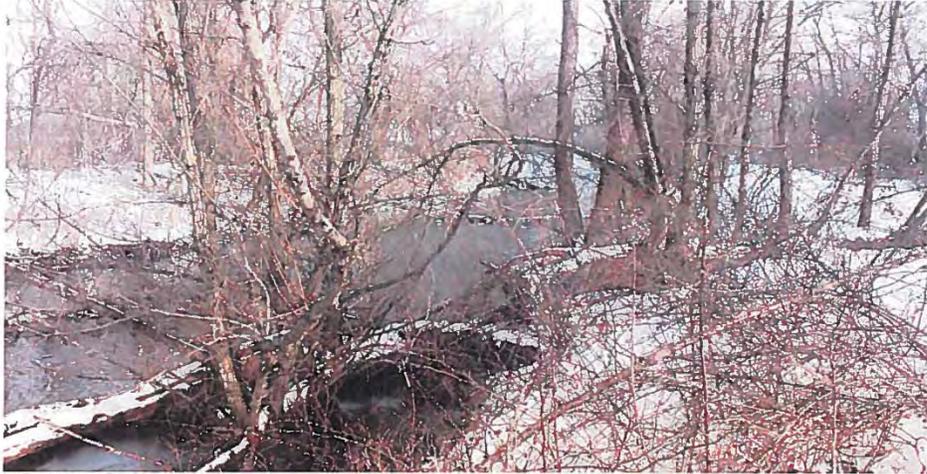
12226
Taken 11/25/13

Book1,12/11/2013

Pictures taken between 221/2 Mi Rd
The Deforest Chittenden(1550 Ft)

Gang of Lakes Drain

Marengo Township



This picture shows the Pool & Bryant, Eaton & Baker Drain

Book1,12/11/2013

Pictures taken between 221/2 Mi Rd
The Deforest Chittenden(1550 Ft)

Gang of Lakes Drain

Marengo Township



Book1,12/11/2013

Pictures taken between 221/2 Mi Rd
The Deforest Chittenden(1550 Ft)



Book1,12/11/2013

Appendix B

Representative Photographs



Photo 1. View downstream of site #1



Photo 2. View upstream of site #2

 <p>GEI Consultants</p>	<p>Geotechnical Environmental Water Resources Engineering</p>	<p>Gang of Lakes Drain Intercounty Drainage Board MI Dept. of Agriculture and Rural Development Calhoun Water Resource Commissioner and Jackson County Drain Commissioner</p>	<p>GEI Project #: 1509010</p>
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Photo 3. View downstream of site #4



Photo 4. View upstream of Photograph Point A

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Photo 5. View downstream of Photograph Point A



Photo 6. View downstream of site #5



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Photo 7. View upstream of site #5



Photo 8. View downstream of site #6

 <p>GEI Consultants Geotechnical Environmental Water Resources Engineering</p>	<p>Gang of Lakes Drain Intercounty Drainage Board MI Dept. of Agriculture and Rural Development Calhoun Water Resource Commissioner and Jackson County Drain Commissioner</p>	<p>GEI Project #: 1509010</p>
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Photo 9. View downstream of site #7



Photo 10. View upstream of site #7

 <p>GEI Consultants</p>	<p>Geotechnical Environmental Water Resources Engineering</p>	<p>Gang of Lakes Drain Intercounty Drainage Board MI Dept. of Agriculture and Rural Development Calhoun Water Resource Commissioner and Jackson County Drain Commissioner</p>	<p>GEI Project #: 1509010</p>
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Photo 11. View downstream of site #8



Photo 12. View downstream of site #9

 <p>GEI Consultants</p>	<p>Geotechnical Environmental Water Resources Engineering</p>	<p>Gang of Lakes Drain Intercounty Drainage Board MI Dept. of Agriculture and Rural Development Calhoun Water Resource Commissioner and Jackson County Drain Commissioner</p>	<p>GEI Project #: 1509010</p>
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Photo 13. View downstream of site #10



Photo 14. View mid reach of site #10

	 <p>Geotechnical Environmental Water Resources Engineering</p>	<p>Gang of Lakes Drain Intercounty Drainage Board MI Dept. of Agriculture and Rural Development Calhoun Water Resource Commissioner and Jackson County Drain Commissioner</p>	<p>GEI Project #: 1509010</p>
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Photo 15. View of mid reach of site #10 (additional)



Photo 16. View upstream of site #10



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Photo 17. View downstream of site #11



Photo 18. View upstream of site #12

 <p>GEI Consultants</p>	<p>Geotechnical Environmental Water Resources Engineering</p>	<p>Gang of Lakes Drain Intercounty Drainage Board MI Dept. of Agriculture and Rural Development Calhoun Water Resource Commissioner and Jackson County Drain Commissioner</p>	<p>GEI Project #: 1509010</p>
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Photo 19. View downstream of site #13



Photo 20. View downstream of site #14



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Photo 21. View downstream of Photograph Point B



Photo 22. View upstream of Photograph Point B

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Photo 23. View upstream of Photograph Point C



Photo 24. View downstream of Photograph Point C



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Photo 25. View downstream of site #15



Photo 26. View downstream of site #16

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Photo 27. View downstream of site #17



Photo 28. View upstream of site #17

	 <p>Geotechnical Environmental Water Resources Engineering</p>	<p>Gang of Lakes Drain Intercounty Drainage Board MI Dept. of Agriculture and Rural Development Calhoun Water Resource Commissioner and Jackson County Drain Commissioner</p>	<p>GEI Project #: 1509010</p>
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Photo 29. View downstream of site #18



Photo 30. View upstream of site #18

	 <p>Geotechnical Environmental Water Resources Engineering</p>	<p>Gang of Lakes Drain Intercounty Drainage Board MI Dept. of Agriculture and Rural Development Calhoun Water Resource Commissioner and Jackson County Drain Commissioner</p>	<p>GEI Project #: 1509010</p>
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Photo 31. View downstream of site #19



Photo 32. View upstream of site #19



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Photo 33. View downstream of site #20



Photo 34. View downstream of site #21



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Photo 35. View upstream of site #22



Photo 36. View downstream of site #23

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Photo 37. View downstream of site #24



Photo 38. view downstream of site #25

GEI	 Geotechnical Environmental Water Resources Engineering Consultants	Gang of Lakes Drain Intercounty Drainage Board MI Dept. of Agriculture and Rural Development Calhoun Water Resource Commissioner and Jackson County Drain Commissioner	GEI Project #: 1509010
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Photo 39. View upstream of site #25



Photo 40. view downstream of site #26

	 <p>Geotechnical Environmental Water Resources Engineering</p>	<p>Gang of Lakes Drain Intercounty Drainage Board MI Dept. of Agriculture and Rural Development Calhoun Water Resource Commissioner and Jackson County Drain Commissioner</p>	<p>GEI Project #: 1509010</p>
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Photo 41. View upstream of site #26



Photo 42. View downstream of site #27

 <p>GEI Consultants</p>	<p>Geotechnical Environmental Water Resources Engineering</p>	<p>Gang of Lakes Drain Intercounty Drainage Board MI Dept. of Agriculture and Rural Development Calhoun Water Resource Commissioner and Jackson County Drain Commissioner</p>	<p>GEI Project #: 1509010</p>
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Photo 43. View upstream of site #27



Photo 44. View downstream of site #28

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Photo 45. View upstream of site #28



Photo 46. View downstream of site #29



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Photo 47. View upstream of site #31



Photo 48. View downstream of site #31

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Photo 49. View upstream of site #32



Photo 50. View downstream of site #32

 <p>GEI Consultants</p>	<p>Geotechnical Environmental Water Resources Engineering</p>	<p>Gang of Lakes Drain Intercounty Drainage Board MI Dept. of Agriculture and Rural Development Calhoun Water Resource Commissioner and Jackson County Drain Commissioner</p>	<p>GEI Project #: 1509010</p>
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Photo 51. View downstream of site #33



Photo 52. View upstream of site #34



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Photo 53. View upstream of site #35



Photo 54. View downstream of site #37



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Photo 55. View upstream of site #37



Photo 56. View downstream of site #38



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Photo 57. View downstream of site #39



Photo 58. View downstream of site #40

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Photo 59. View downstream of site #41



Photo 60. View of power line on site 41

 <p>GEI Consultants</p>	<p>Geotechnical Environmental Water Resources Engineering</p>	<p>Gang of Lakes Drain Intercounty Drainage Board MI Dept. of Agriculture and Rural Development Calhoun Water Resource Commissioner and Jackson County Drain Commissioner</p>	<p>GEI Project #: 1509010</p>
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Photo 61. View downstream of site #41



Photo 62. View upstream of site #41



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Photo 63. View downstream of site #42



Photo 64. View downstream from site #43



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Photo 65. View upstream of Photograph Point D



Photo 66. View downstream of Photograph Point D

 <p>GEI Consultants</p>	<p>Geotechnical Environmental Water Resources Engineering</p>	<p>Gang of Lakes Drain Intercounty Drainage Board MI Dept. of Agriculture and Rural Development Calhoun Water Resource Commissioner and Jackson County Drain Commissioner</p>	<p>GEI Project #: 1509010</p>
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Photo 67. View downstream of site #44



Photo 68. View upstream of site #45

 <p>GEI Consultants</p>	<p>Geotechnical Environmental Water Resources Engineering</p>	<p>Gang of Lakes Drain Intercounty Drainage Board MI Dept. of Agriculture and Rural Development Calhoun Water Resource Commissioner and Jackson County Drain Commissioner</p>	<p>GEI Project #: 1509010</p>
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Photo 69. View downstream of site #46



Photo 70. View upstream of site #47



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Photo 71. View downstream of site #48



Photo 72. View downstream from site #49

 <p>GEI Consultants</p>	<p>Geotechnical Environmental Water Resources Engineering</p>	<p>Gang of Lakes Drain Intercounty Drainage Board MI Dept. of Agriculture and Rural Development Calhoun Water Resource Commissioner and Jackson County Drain Commissioner</p>	<p>GEI Project #: 1509010</p>
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Photo 73. View downstream of site #50



Photo 74. View upstream from site #51

GEI	 Geotechnical Environmental Water Resources Engineering Consultants	Gang of Lakes Drain Intercounty Drainage Board MI Dept. of Agriculture and Rural Development Calhoun Water Resource Commissioner and Jackson County Drain Commissioner	GEI Project #: 1509010
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Photo 75. View downstream from site #52



Photo 76. View downstream from site #53

 <p>GEI Consultants</p>	<p>Geotechnical Environmental Water Resources Engineering</p>	<p>Gang of Lakes Drain Intercounty Drainage Board MI Dept. of Agriculture and Rural Development Calhoun Water Resource Commissioner and Jackson County Drain Commissioner</p>	<p>GEI Project #: 1509010</p>
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Photo 77. View upstream from site #54



Photo 78. View downstream from site #55

 <p>GEI Consultants</p>	<p>Geotechnical Environmental Water Resources Engineering</p>	<p>Gang of Lakes Drain Intercounty Drainage Board MI Dept. of Agriculture and Rural Development Calhoun Water Resource Commissioner and Jackson County Drain Commissioner</p>	<p>GEI Project #: 1509010</p>
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Photo 79. View upstream from site #55



Photo 80. View downstream from site #56

 <p>GEI Consultants</p>	<p>Geotechnical Environmental Water Resources Engineering</p>	<p>Gang of Lakes Drain Intercounty Drainage Board MI Dept. of Agriculture and Rural Development Calhoun Water Resource Commissioner and Jackson County Drain Commissioner</p>	<p>GEI Project #: 1509010</p>
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Photo 81. View upstream from site #57



Photo 82. View downstream from site #58

 <p>GEI Consultants</p>	<p>Geotechnical Environmental Water Resources Engineering</p>	<p>Gang of Lakes Drain Intercounty Drainage Board MI Dept. of Agriculture and Rural Development Calhoun Water Resource Commissioner and Jackson County Drain Commissioner</p>	<p>GEI Project #: 1509010</p>
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Photo 83. View upstream of Photograph Point E



Photo 84. View downstream of Photograph Point E



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Calhoun Water Resource Commissioner and Jackson
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Photo 85. View upstream of site #59



Photo 86. View downstream of site #60

GEI	 <p>Geotechnical Environmental Water Resources Engineering</p> <p>Consultants</p>	<p>Gang of Lakes Drain Intercounty Drainage Board MI Dept. of Agriculture and Rural Development Calhoun Water Resource Commissioner and Jackson County Drain Commissioner</p>	<p>GEI Project #: 1509010</p>
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Photo 87. View downstream of site #61



Photo 88. View downstream of site #62

	 <p>Geotechnical Environmental Water Resources Engineering</p>	<p>Gang of Lakes Drain Intercounty Drainage Board MI Dept. of Agriculture and Rural Development Calhoun Water Resource Commissioner and Jackson County Drain Commissioner</p>	<p>GEI Project #: 1509010</p>
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Photo 89. View upstream of site #63



Photo 90. View downstream from site #63

 <p>GEI Consultants</p>	<p>Geotechnical Environmental Water Resources Engineering</p>	<p>Gang of Lakes Drain Intercounty Drainage Board MI Dept. of Agriculture and Rural Development Calhoun Water Resource Commissioner and Jackson County Drain Commissioner</p>	<p>GEI Project #: 1509010</p>
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Photo 91. View upstream of site #63



Photo 92. View upstream of site #64



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Calhoun Water Resource Commissioner and Jackson
County Drain Commissioner

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Photo 93. View upstream of site #65



Photo 94. View downstream of Photograph Point F

 <p>Geotechnical Environmental Water Resources Engineering</p>	<p>Gang of Lakes Drain Intercounty Drainage Board MI Dept. of Agriculture and Rural Development Calhoun Water Resource Commissioner and Jackson County Drain Commissioner</p>	<p>GEI Project #: 1509010</p>
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Photo 95. View upstream of Photograph Point F



Photo 96. View upstream of site #66

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Photo 97. view upstream of site #67



Photo 98. View downstream of site #67

 <p>GEI Consultants</p>	<p>Geotechnical Environmental Water Resources Engineering</p>	<p>Gang of Lakes Drain Intercounty Drainage Board MI Dept. of Agriculture and Rural Development Calhoun Water Resource Commissioner and Jackson County Drain Commissioner</p>	<p>GEI Project #: 1509010</p>
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Photo 99. View upstream of site #68



Photo 100. View downstream of site #69

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Photo 101. View downstream of Photograph Point G



Photo 102. View of Prairie Lake



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Photo 103. View upstream of Photograph Point H



Photo 104. View downstream of Photograph Point H



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Photo 105. View downstream of site #70



Photo 106. View upstream of site #70



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Photo 107. View downstream of site #70



Photo 108. View upstream of site #70

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Photo 109. View upstream of Photograph Point I



Photo 110. View downstream of Photograph Point I

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Photo 111. View downstream of site #72



Photo 112. View upstream of site #73

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Photo 113. View downstream of site #74



Photo 114. View downstream of site #75

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Photo 115. View upstream of site #76



Photo 116. View upstream of site #77



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Photo 117. View upstream of site #78



Photo 118. View downstream of site #79

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Photo 119. View downstream of site #80



Photo 120. View downstream of site #81

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Photo 121. View upstream of Photograph Point J



Photo 122. View downstream of Photograph Point J

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Photo 123. View downstream of site #82



Photo 124. View downstream of site #83



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Photo 125. view downstream of site #84



Photo 126. View upstream of site #84



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Photo 127. View downstream of site #85



Photo 128. view downstream of site #86

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Photo 129. View downstream of site #87



Photo 130. View downstream of site #88

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Photo 131. View upstream of site #89



Photo 132. View downstream of site #90

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Photo 133. View upstream of Photograph Point K



Photo 134. View downstream of Photograph Point K

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Photo 135. View downstream of site #91



Photo 136. View upstream of Photograph Point L

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Photo 137. View downstream of Photograph Point L



Photo 138. View downstream of site #93



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Photo 139. View downstream of site #94



Photo 140. View downstream of site #95

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Photo 141. View downstream of site #96



Photo 142. View downstream of site #97

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Photo 143. View upstream of Photograph Point M



Photo 144. View downstream of Photograph Point M



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Photo 145. View upstream of site #98



Photo 146. View downstream of site #99

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Photo 147. View upstream of site #100



Photo 148. View downstream of site #101

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Photo 149. View downstream of site #102



Photo 150. View downstream of site #103

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Photo 151. View downstream of site #104



Photo 152. View downstream of site #105

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Photo 153. View upstream of Photograph Point N



Photo 154. View downstream of Photograph Point N



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Photo 155. View of drain outlet into Bell Lake, Photograph Point O



Photo 156. View of north end of Bell Lake, Photograph Point O



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Photo 157. View downstream of site #106

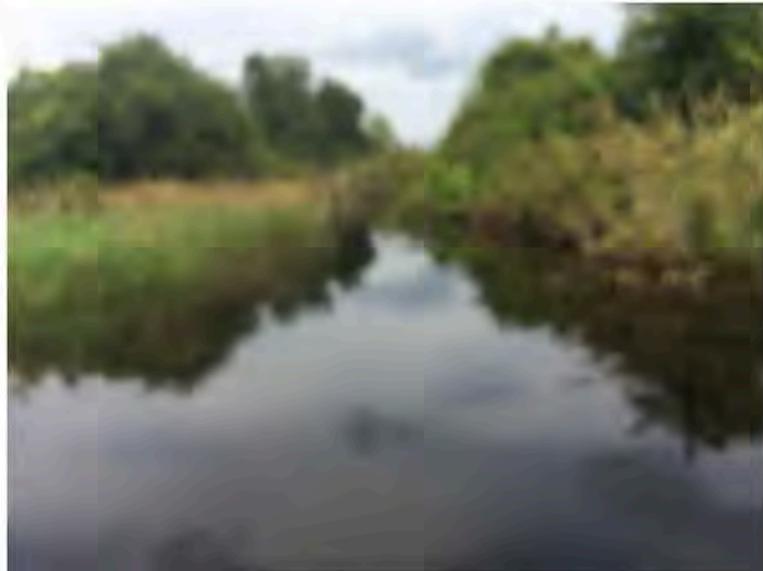


Photo 158. View upstream of Photograph Point P

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Photo 159. View downstream at Photograph Point P



Photo 160. View downstream of site #107



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Photo 161. View downstream of site #107

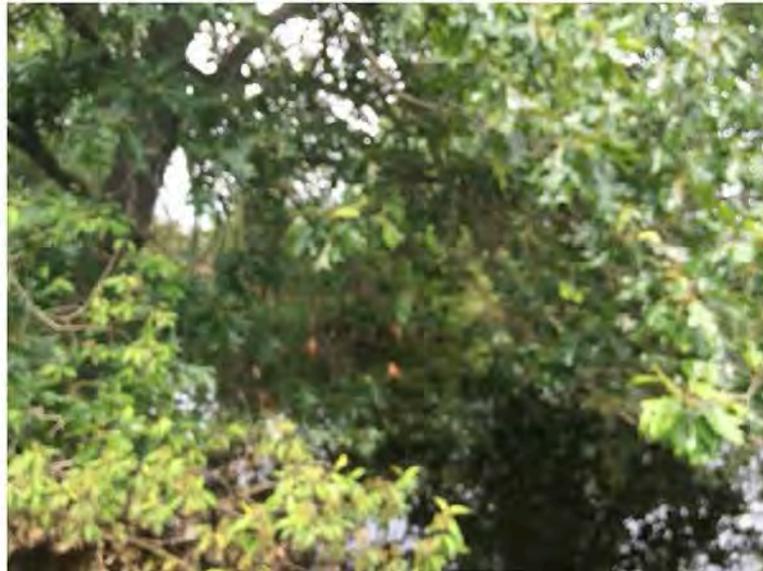


Photo 162. View downstream of site #107

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Photo 163. View upstream of site #107



Photo 164. view downstream of site #108

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Photo 165. View upstream of Photograph Point Q



Photo 166. View downstream of Photograph Point Q

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Photo 167. View downstream of site #109



Photo 168. View downstream of site #110

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Photo 169. View downstream of site #111



Photo 170. View upstream of site #111

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Photo 171. View upstream of Photograph Point R



Photo 172. View downstream of Photograph Point R



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Photo 173. View upstream of site #112



Photo 174. View upstream of site #112

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Photo 175. View downstream of site #112



Photo 176. View downstream of site #112

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Photo 177. View upstream of site #113



Photo 178. View upstream of site #114

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Photo 179. View upstream of site #115



Photo 180. View of drain tile at site #116

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Photo 181. View of site #117



Photo 182. View upstream of Photograph point S



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Photo 183. View downstream of Photograph Point S



Photo 184. View upstream of site #118



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Photo 185. View upstream of site #119



Photo 186. View upstream of site #120

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Photo 187. View upstream of Photograph Point T



Photo 188. View downstream of Photograph Point T



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Photo 189. View upstream of site #121



Photo 190. View upstream of site #121

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Photo 191. View downstream of site #121



Photo 192. view of wooden pallets on site #123



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Photo 193. View upstream of site #124



Photo 194. View upstream of site #124

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Photo 195. View downstream of Photograph Point U



Photo 196. View upstream of Photograph Point U



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Photo 197. View upstream of site #125



Photo 198. View of site #126



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Photo 199. View upstream of site #127



Photo 200. View downstream of site #127

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Photo 201. View downstream of site #127



Photo 202. View upstream of site #128

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Photo 203. View downstream of site #128



Photo 204. View downstream of Photograph Point V

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Photo 205. View upstream of Photograph Point V



Photo 206. View upstream of site #129



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Photo 207. View downstream of site #130



Photo 208. View upstream of site #131

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Photo 209. View upstream of site #132



Photo 210. View downstream of site #132

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Photo 211. View upstream of Photograph Point W



Photo 212. View downstream of Photograph Point X



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Photo 213. View upstream of site #133



Photo 214. View upstream of site #133

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Photo 215. View downstream of site #134



Photo 216. View upstream of site #134

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Photo 217. View south of site #135



Photo 218. View south of site #135

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Photo 219. View downstream of Photograph Point Y



Photo 220. View upstream of Photograph Point Y



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Photo 221. View downstream of site #136



Photo 222. View upstream of site #137



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Photo 223. View downstream of site #138



Photo 224. View upstream of site #138



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Photo 225. View downstream of site #140



Photo 226. View downstream of site #141

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Photo 227. View downstream of site #141



Photo 228. View upstream of site #141



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Photo 229. View downstream of Photograph Point Z



Photo 230. View downstream of site #142



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Photo 231. View upstream of site #142



Photo 232. View upstream of site #142

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Photo 233. View upstream of Photograph Point ZA



Photo 234. View upstream of Photograph Point ZB

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Photo 235. View downstream of site #143



Photo 236. View upstream of site #143

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Photo 237. View upstream of site #144



Photo 238. View downstream of site #145



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Photo 239. View upstream of Photograph Point ZC



Photo 240. View upstream of site #146

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Photo 241. View downstream of site #146



Photo 242. View upstream of site #147

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Photo 243. View upstream of site #148



Photo 244. View upstream of site #148

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Photo 245. View downstream of site #148



Photo 246. View upstream of site #149



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Photo 247. View across channel of site #149



Photo 248. View of long home at site #149



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Photo 249. View downstream of site #149



Photo 250. View downstream of site #149

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Photo 251. View downstream of site #150



Photo 252. View downstream of site #151

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Photo 253. View upstream of site #151



Photo 254. View upstream of site #151



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Photo 255. View upstream of site #152



Photo 256. View downstream of site #154



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Calhoun Water Resource Commissioner and Jackson
County Drain Commissioner

GEI Project #: 1509010



Photo 257. View across to east of site #155



Photo 258. View across to east of site #156



Geotechnical
Environmental
Water Resources
Engineering

Gang of Lakes Drain Intercounty Drainage Board
MI Dept. of Agriculture and Rural Development
Calhoun Water Resource Commissioner and Jackson
County Drain Commissioner

GEI Project #: 1509010



Photo 259. View downstream of site #156

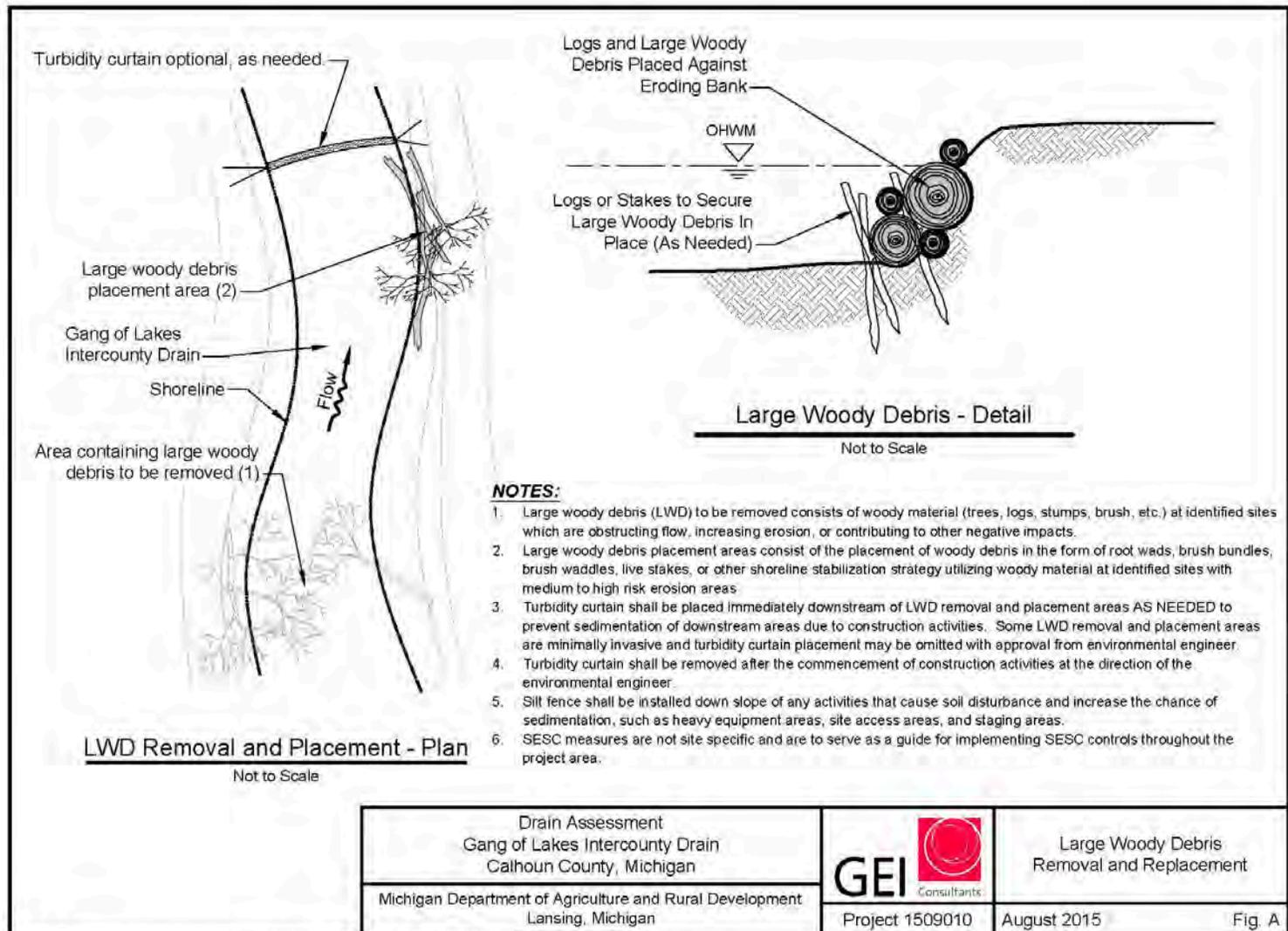
  <p data-bbox="553 1665 667 1766">Geotechnical Environmental Water Resources Engineering</p>	<p data-bbox="695 1675 1162 1766">Gang of Lakes Drain Intercounty Drainage Board MI Dept. of Agriculture and Rural Development Calhoun Water Resource Commissioner and Jackson County Drain Commissioner</p>	<p data-bbox="1182 1682 1357 1703">GEI Project #: 1509010</p>
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Appendix C

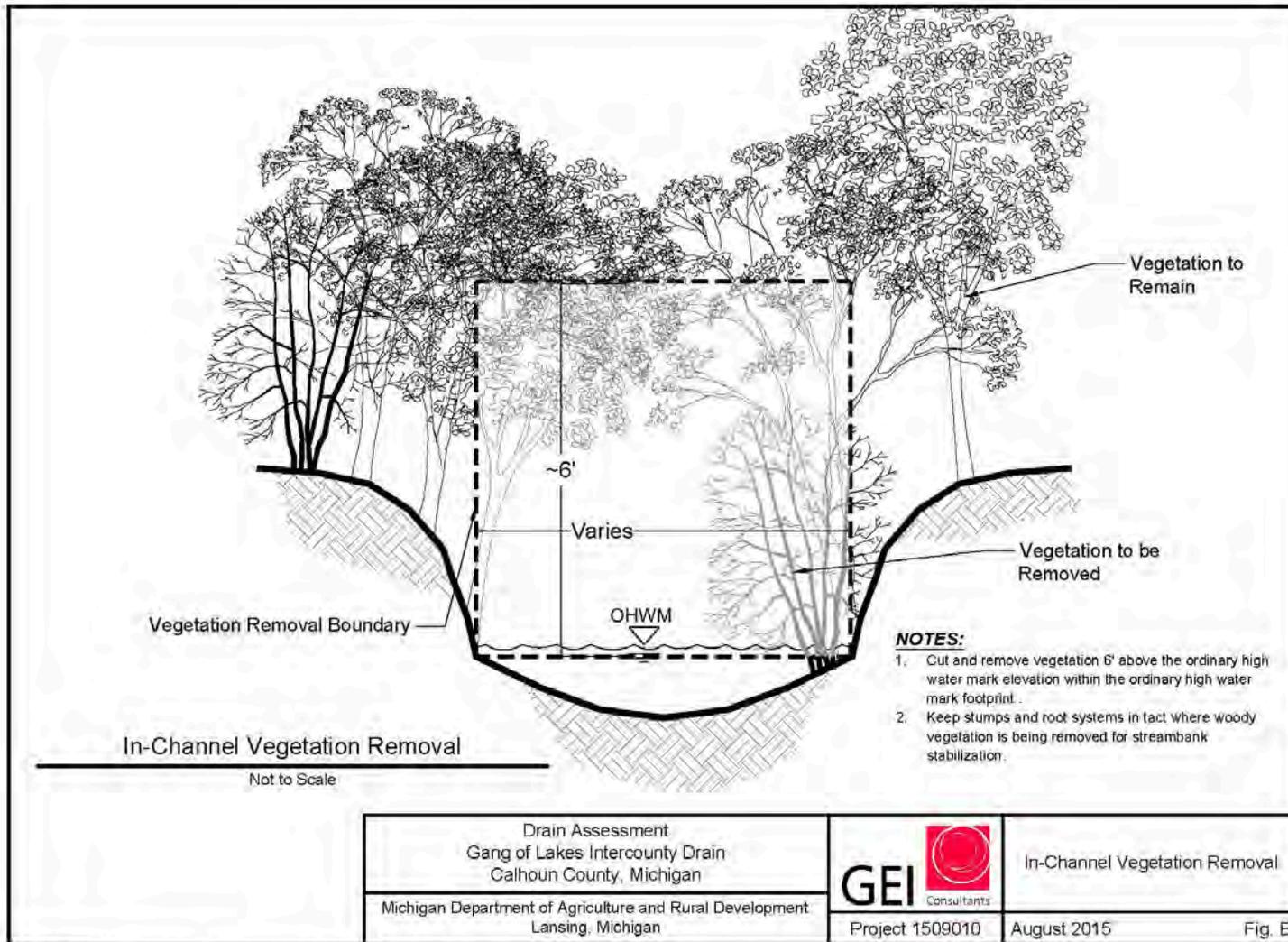
Conceptual Figures

Figure A – Removal and Relocation of Large Woody Debris

Figure B – Vegetation Removal from Mid-Channel



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