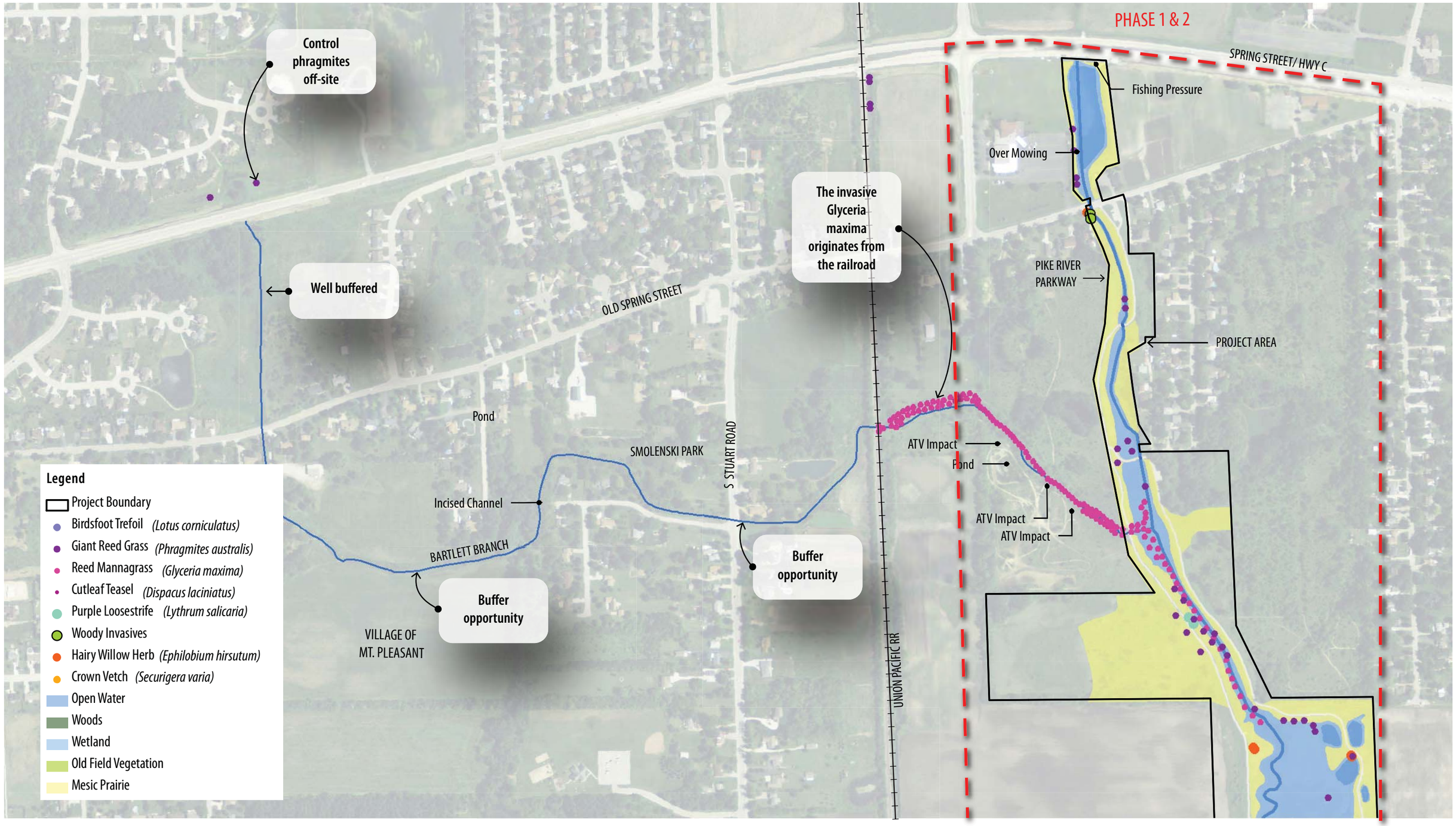
CHAPTER SIX Appendix

Document	Page
Tributary Maps	163
Storm Structure Summary Table	168
Vegetation Data Summary	173
Tributary Data Summary Threats	180
Vegetation Data Form	181
Runoff Modeling Analysis Results	182
Fish and Aquatic Species Collected	189
Prairie and Wetland Worksheets	190
Public Engagement Summary	192
Stormwater Inspection Form	203
Stormwater Structure Photographs	205
US Army Corps Management Plan	223



Bartlett Branch Vegetation/Management Issues

Pike River Maintenance Plan

Mount Pleasant, Wisconsin

1 inch = 483 feet

0 240 480 960 FEET

N

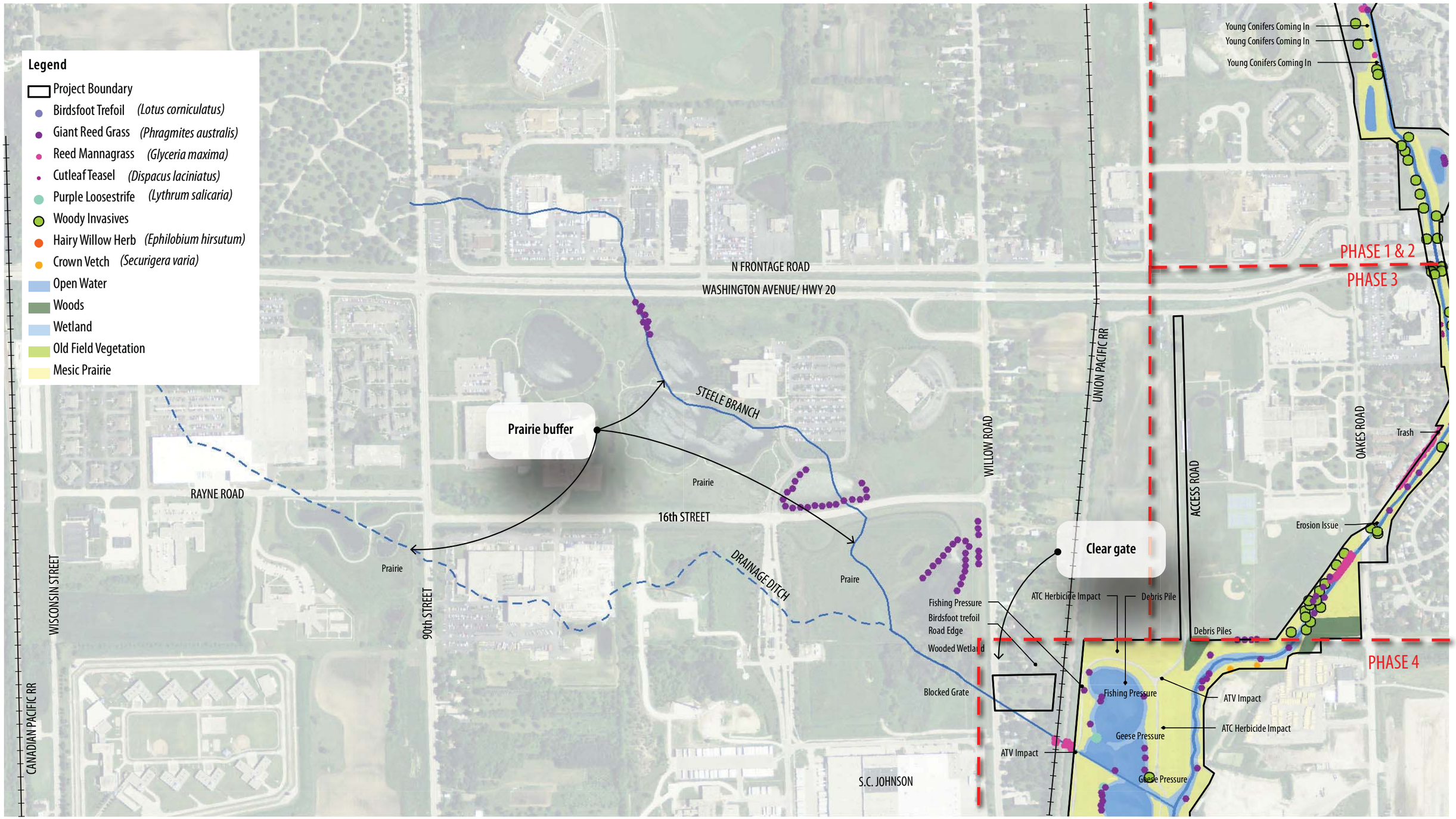
ISSUE DATE: 3/19/2015

PROJECT NUMBER: 04-1083-001

All drawings are preliminary and subject to change.

© 2014 Hitchcock Design Group

Vegetation
Bartlett Branch



Steele Branch Vegetation/Management Issues

Pike River Maintenance Plan

Mount Pleasant, Wisconsin

1 inch = 637 feet

0 320 640 1,280

N

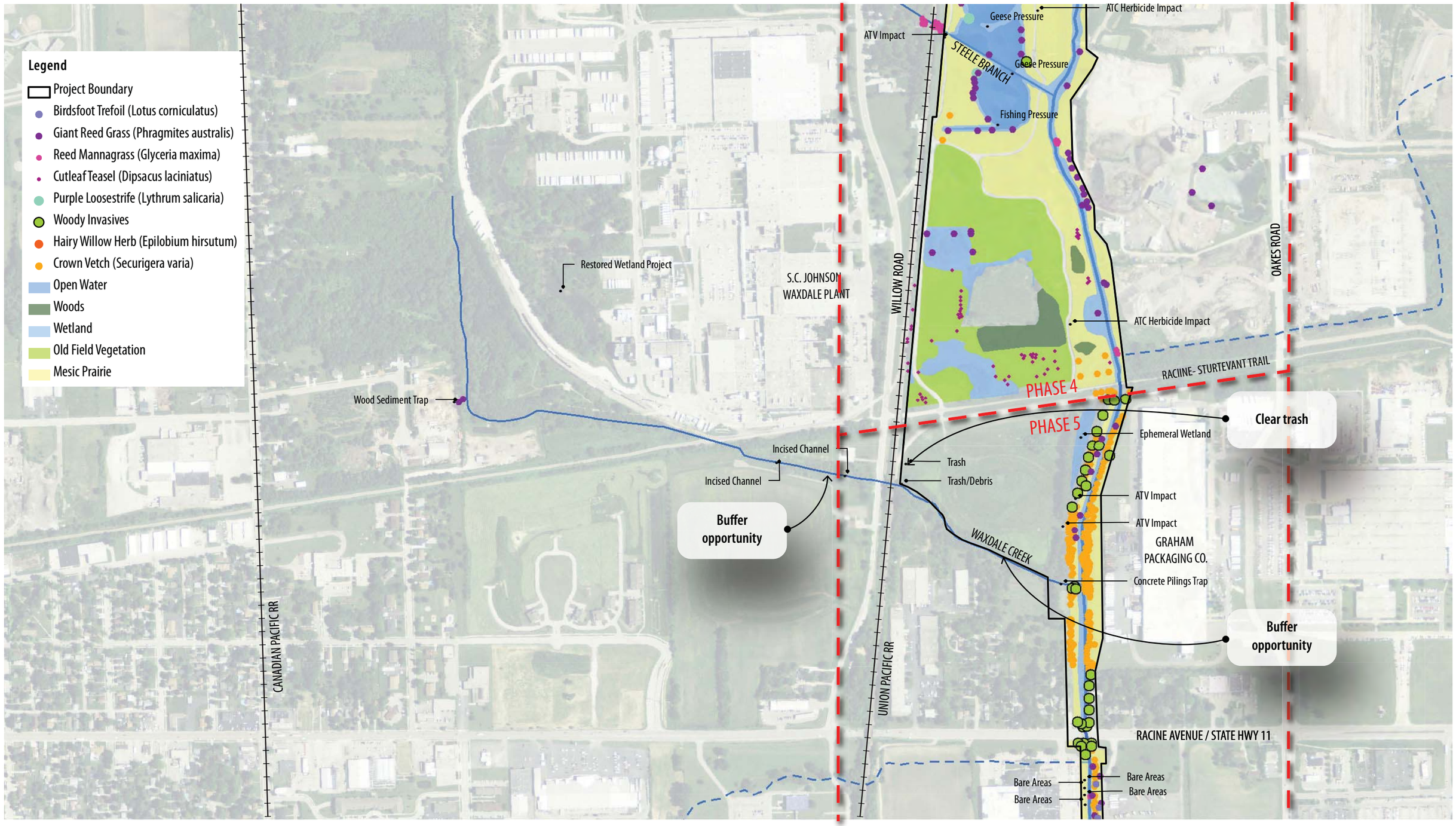
ISSUE DATE: 3/19/2015

PROJECT NUMBER: 04-1083-001

All drawings are preliminary and subject to change.

© 2014 Hitchcock Design Group

Vegetation
Steele Branch



Waxdale Creek Vegetation/Management Issues

Pike River Maintenance Plan

Mount Pleasant, Wisconsin

1 inch = 583 feet

0 290 580 1,160 FEET

N

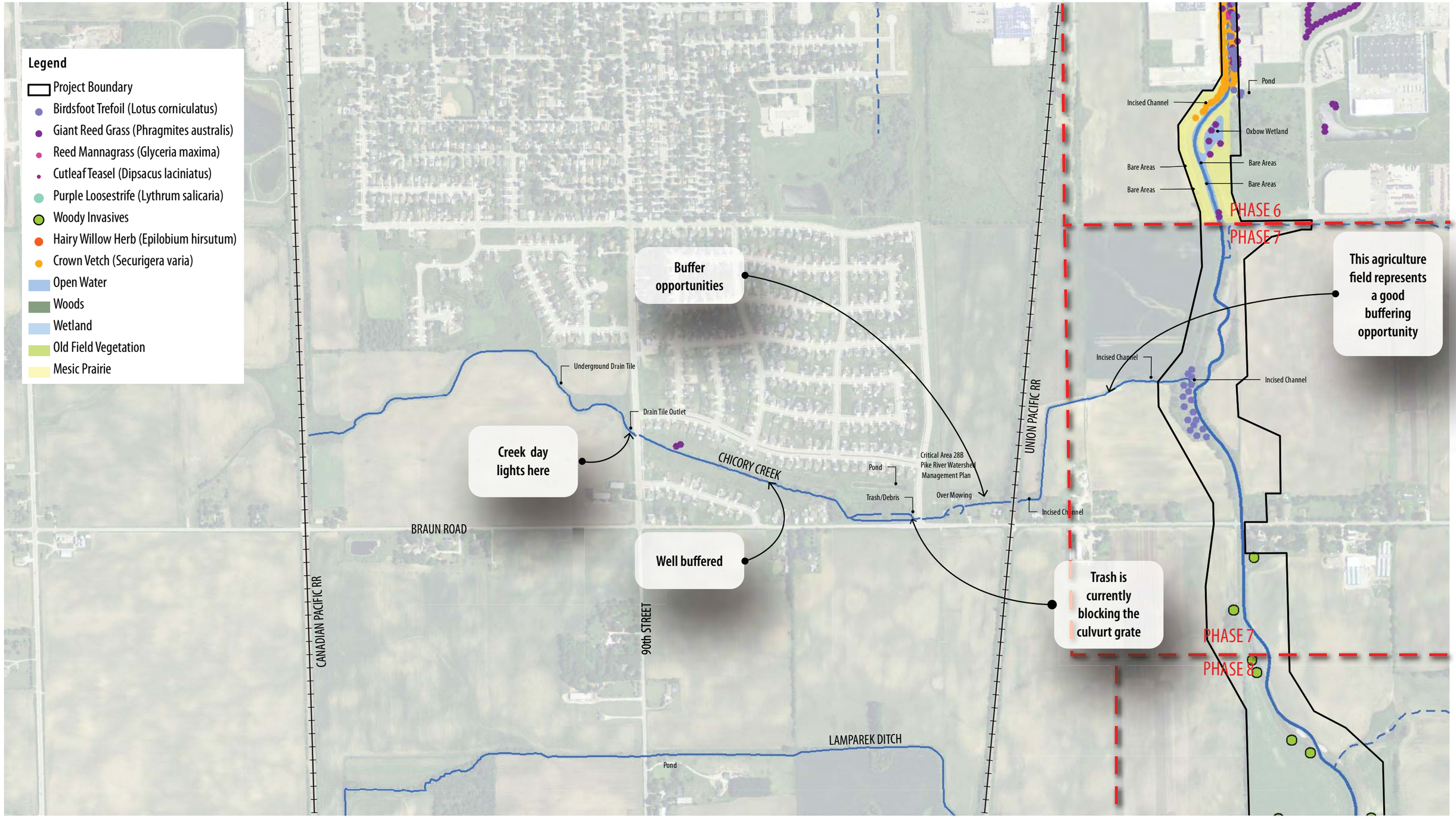
ISSUE DATE: 3/20/2015

PROJECT NUMBER: 04-1083-001

All drawings are preliminary and subject to change.

© 2014 Hitchcock Design Group

Vegetation
Waxdale Creek



Chicory Creek Vegetation/Management Issues

Pike River Maintenance Plan

Mount Pleasant, Wisconsin

1 inch = 793 feet

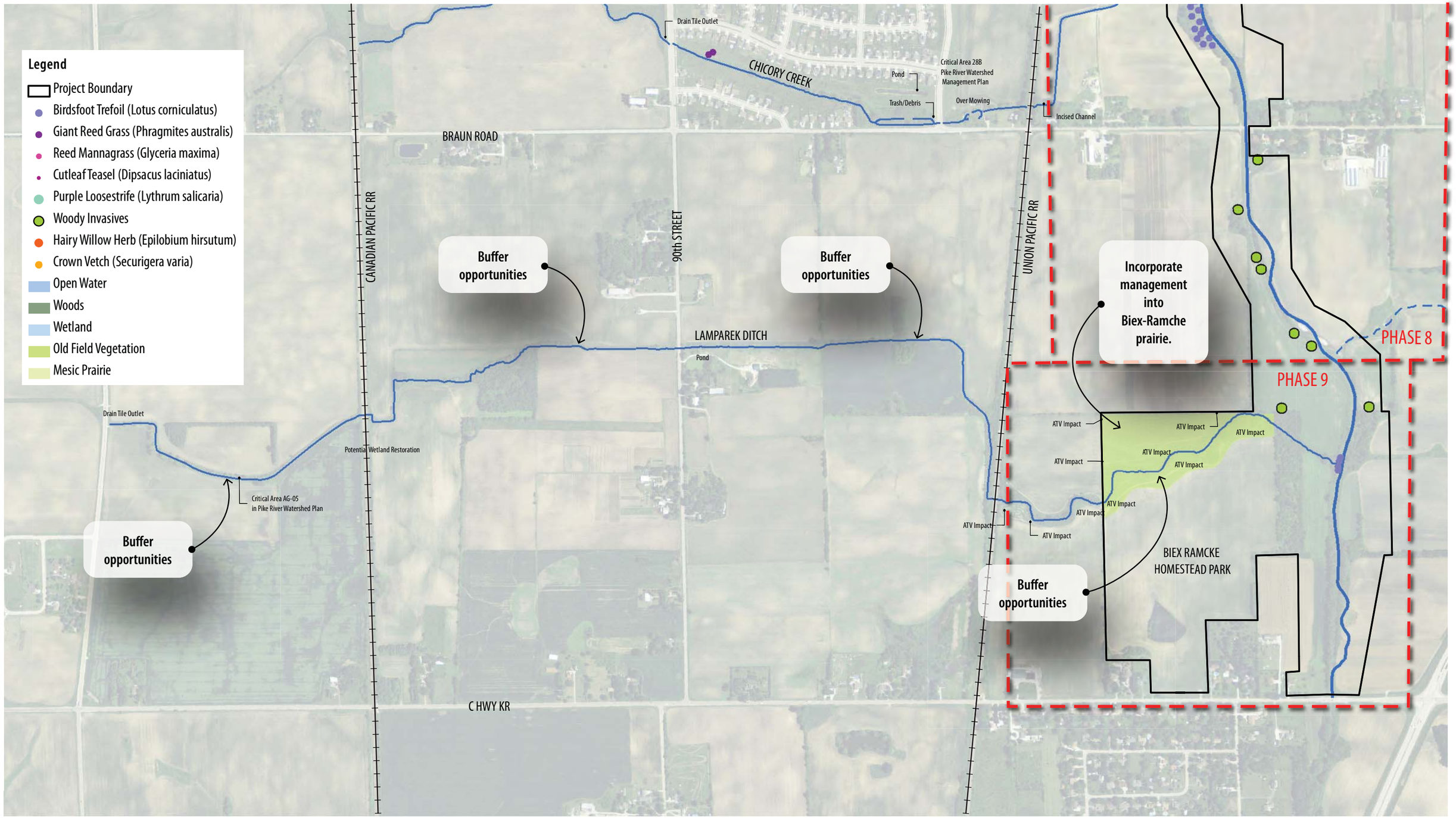
ISSUE DATE: 3/20/2015

PROJECT NUMBER: 04-1083-001

All drawings are preliminary and subject to change.

© 2014 Hitchcock Design Group

Vegetation
Chicory Creek



Lamparek Ditch Vegetation/Management Issues

Pike River Maintenance Plan

Mount Pleasant, Wisconsin

1 inch = 833 feet

0 420 840 1,680 FEET

N

ISSUE DATE: 3/20/2015

PROJECT NUMBER: 04-1083-001

All drawings are preliminary and subject to change.

© 2014 Hitchcock Design Group

Vegetation
Lamparek Ditch

Storm Structure Summary Table

Struct. ID	Phase	Structure Type / Function	Size	Material	Shape	End-wall or Wing-wall? (Y/N)	Grate/ Trash Rack? (Y/N)	Rock Reinf? (Y/N)	Stable Slope? (Y/N)	Field Observations	Maintenance recommendations
1	1	Pond outfall / Roadside ditch drainage	36" (est.)	Reinforced concrete	Round	Y	Y	Y	Y	Owned by County	No action required.
2	1	Pond outfall / Roadside ditch drainage	38" x 60" (est.)	Reinforced concrete	Horizontal elliptical	Y	N	Y	Y	Owned by County	No action required.
3	1	Pond outfall / Connecting storm sewer	15"	Corrugated metal	Round	Y	N	N	Y	Fully submerged. Appears functional. Aerial (Bing maps) shows riprap; but no visible signs during site visit. Densely vegetated. No erosion.	Continue to monitor every three to five years.
4	1	Pond	N/A	N/A	N/A	N/A	N/A	N/A	Y	Minor, but noticeable cattail encroachment into permanent pool area, 0'-8' width. Presence of migratory birds.	Continue to monitor every three to five years.
5	1	Pond outfall / Yard drainage	15"	Corrugated metal	Round	Y	N	N	Y	Aerial (Bing maps) shows riprap; but no visible signs during site visit. Densely vegetated. No erosion.	**Install trash rack.** Continue to monitor every three to five years.
6	1	Pond weir wall	35' x 50'	Heavy riprap	N/A	N/A	N/A	Y	Y	Appears intact and with slight vegetative growth between rocks.	Continue to monitor every three to five years.
7	1	Pond outfall / Connecting storm sewer	15"	Reinforced concrete	Round	Y	N	Y	Y	Dry and clean; riprap intact with stable vegetation	Continue to monitor every three to five years.
8	1	Bridge crossing / Old Spring Street	Did not measure	Reinforced concrete	Conspan Arch	Y	N	Y	Y	Structure appears intact. Guard rail appears intact. Negligible flow, creek bed nearly dry. No asbuilt plan available at time of report preparation.	Continue to monitor every three to five years.
9	1	Channel outfall / Roadside ditch drainage	15"	Corrugated metal	Round	N	N	Y	Y	Small area of bare soil at downstream end but stable, riprap has shifted 2-3' down slope.Upstream end daylights on east side of Pike River Parkway parking lot entrance and was filled in with approx. 4" sediment/vegetation.	**Maintain/clean upstream end. Install trash racks on both ends.**
10	1	Bridge Crossing / Pedestrian	4' x 8'	Reinforced concrete	Box	N	N/A	N	Y	Concrete is spalling and exposing aggregate on the top of the box culvert and on the downstream edge . Nearly blocked by cattails at both ends and full of standing water with only 2-6" of freeboard.	**Maintain box opening and continue to monitor the integrity of the concrete every year.**
11	1	Channel outfall / Connecting storm sewer	48"	Reinforced concrete	Round	Y	Y	N	Y	Channel end section was partially submerged under 10-12" of standing water, 2-3" of that was sediment/debris depth. End section edges spalling slightly. Still appears to be functional.	**Maintain/clean channel end section. Continue to monitor the integrity of the concrete every year.**
12	1	Channel outfall / Ditch drainage	15"	Corrugated metal	Round	Y	N	N	Y	Channel end section was halfway full of standing water and 2-3" of sediment depth; Upstream (east) end was overgrown with shrubs and has 2" sediment depth.	**Maintain/clean channel end section.**
13	1	Bridge Crossing / Pedestrian (Wendi Ct. future extension)	4' x 8' (est.)	Reinforced concrete	Box	N	N	N	Y	Concrete edges are spalling with exposed rebar on upstream (north) top edge of box. Approx. 12" depth standing water through box with 2-3" of that as sediment depth. Upstream channel has well-defined banks; however, cattails are encroaching on both banks on the downstream end. Did not view inside of structure.	**Continue to monitor the integrity of the concrete every year.**
14	1	Channel outfall /Trail crossing	15"	Corrugated metal	Round	Y	N	Y	Y	Channel end section was dry and clean with no obstructions. Riprap intact with stable vegetation. Upstream (west) end was 42" diameter inlet manhole with beehive grate, which still has original construction inlet protection fabric in it; standing water in sump.	**Remove inlet protection (fabric) from inlet manhole.**
15	1	Channel outfall / Trail crossing	15"	Corrugated metal	Round	Y	N	Y	Y	Channel end section was dry and was partially obstructed with 2-3" of sediment and vegetation growth inside of the end section. Riprap has shifted downslope approximately 5 feet, but was stable with vegatation between end section and riprap. Upstream (east) end was 42" diameter inlet manhole with beehive grate with standing water in sump.	**Maintain/clean channel end section.**
16	1	Bridge crossing / Bartlett Branch	4' x 8'	Reinforced concrete	Box	N	N	N	Y	Minor spalling on the edges of the box opening on both ends. 18" of standing water. Did not view inside of structure. Both ends are densely vegetated with Glyceria maxima grass standing as high as top of box which may obstruct flow through box.	**Vegetation could use maintenance and/or invasive species control.**
17	1	Channel outfall /Trail crossing	15"	Corrugated metal	Round	Y	N	N	Y	Channel end of pipe was partially submerged under 2-3" of standing water and sediment depth. Tall reeds are densely growing inside of end section. Surrounded by stable vegetation. Upstream (west) end was 42" diameter inlet manhole with beehive grate, which still has original construction inlet protection fabric in it; not able to view inside manhole.	**Maintain/clean channel end section.**
18	1	Channel outfall / Trail crossing	15"	Corrugated metal	Round	Y	N	N	Y	Channel end of pipe was partially submerged under 2-3" of standing water and sediment depth. Grasses are densely growing inside of end section. Surrounded by stable vegetation. Upstream (east) end was 42" diameter inlet manhole with beehive grate with standing water in sump. A 6-inch PVC surface drainage pipe connects into the east side of the manhole.	**Maintain/clean channel end section.**
19	1	Channel outfall / Connecting storm sewer	36"	Reinforced concrete	Round	Y	N	Y	Y	Channel end section was partially submerged under 10-12" of standing water, 2-3" of that was sediment/debris depth. End section edges are spalling and rebar was exposed. Still appears to be functional.	**Maintain/clean channel end section. Continue to monitor the integrity of the concrete every year.**
20	1	Channel outfall / Trail crossing	15"	Corrugated metal	Round	Y	N	Y	Y	Channel end section was wet (but not submerged) with 2-3" sediment depth and little vegetation. Riprap appears intact.	**Maintain/clean channel end section.**
21	1	Channel outfall / Connecting storm sewer	53" x 83"	Reinforced concrete	Horizontal elliptical	Y	N	Y	Y	Minor spalling on the edges of the end section. Partially submerged under 6" standing water.	Continue to monitor every three to five years.
22	1	Channel outfall / Trail crossing	24"	Reinforced concrete	Round	Y	Y (DS); N (US)	Y	Y	Channel end section was partially submerged with 2-3" of sediment depth and has small diameter (1/2" to 1") trees growing within the end section and through the grating. Upstream (west) end of pipe was partially submerged under 2-3" of standing water surrounded by dense brush/vegetation.	**Maintain/clean both end sections.**
23	1	Channel outfall / Connecting storm sewer	19" x 30"	Reinforced concrete	Horizontal elliptical	Y	Y	Y	Y	Outfall was roughly half-submerged under standing water. Pipe was in good condition.	Continue to monitor every three to five years.
24	1	Connected ponds	N/A	N/A	N/A	N/A	N/A	N/A	N/A	No apparent vegetation encroachment; but algae is present in the north pond.	Continue to monitor every three to five years.
25	1	Pond connection / Trail crossing	24"	Corrugated metal	Round	Y	N	N	Y	Both end sections are roughly half-submerged under standing water with approximately 2" sediment depth.	**Maintain/clean both end sections.**

Storm Structure Summary Table (con't)

Struct. ID	Phase	Structure Type / Function	Size	Material	Shape	End-wall or Wing-wall? (Y/N)	Grate/ Trash Rack? (Y/N)	Rock Reinf? (Y/N)	Stable Slope? (Y/N)	Field Observations	Maintenance recommendations
26	1	Pond connection / Trail crossing	24"	Corrugated metal	Round	N	N	N	Y	East end appears clean and dry, but is obstructed by woody vegetation. West end is partially submerged about halfway, but appears in good condition.	**Maintain/clean east end section.**
27	1	Pond connection	30" x 26"	Corrugated metal	Arch	Y	N	N	Y	Completely submerged. Structure type, size, and material were taken from asbuilt plans. Assumed functioning as intended based on aerial photo showing equalized ponding at approximate 674 elevation.	Continue to monitor every three to five years.
28	1	Pond connection / Trail crossing	15"	Corrugated metal	Round	Y	N	N	Y	East end of pipe appears clean and dry, but end section has debris in the invert and is obstructed by woody vegetation. West end is partially submerged with 2" of ice, but appears in good condition.	**Maintain/clean east end section.**
29	1	Pond connection	15"	Corrugated metal	Round	Y	N	N	Y	East end appears clean with trickle flow in the invert. West end is eroded at the shoreline and approximately 10 feet landward over the top of pipe with gully erosion adjacent to the south of pipe. West end also has 2" ice in the invert. West end section is moderately rusty, especially in the invert.	**Repair erosion and gully at west end of pipe. Monitor weekly until vegetation is established.** Then continue to monitor integrity of end section every three to five years.
30	1	Channel outfall / Trail crossing	42"	Reinforced concrete	Round	Y	Y (DS); N (US)	Y	Y	Channel end section was partially submerged under 8-10" of standing water with 3-4" of sediment depth. Upstream end was dry with leaves in the invert (negligible depth).	Continue to monitor every three to five years.
31	2	Channel outfall / Trail crossing	24"	Reinforced concrete	Round	Y	Y	Y	Y	Channel end section was dry and was roughly half-full of rock riprap. Minor sediment build-up in the last 10'+/- of the pipe.	**Remove riprap and sediment from inside of end section and place around structure. Remove debris and vegetation growing over the top of the beehive inlet grate.**
32	2	Pond outfall	48"	Reinforced concrete	Round	Y	N	Y	Y	End section has several rock riprap pieces in the invert with 1"-2" of standing water. Not sure if by human intervention or by gravity. Difficult to access because outfall is surrounded by thick brush growth.	**Remove riprap from inside of end section and place around structure.**
33	2	Pond	N/A	N/A	N/A	N/A	N/A	N/A	Y	Moderate cattail encroachment into permanent pool area; however, comparison of the 2005 and 2010 orthophotos shows an overall increase in water surface area. Presence of migratory birds.	Continue to monitor every three to five years.
34	2	Multi-stage outlet structure / Pond connection to channel	5' DIAM. / 36"	Reinforced concrete	Round	Y	Y	Y	Y	Channel end section has minor spalling on edges. Outfall was damp but not flowing and has negligable sediment/debrwas depth. Trace water in invert of pipe from the multi-stage outlet structure to roughly halfway through pipe. 12" orifice has approximately 1" water and floating debrwas (reeds, grass, leaves) building up on outside with water trickling into the structure. 24" orifice was dry. Trash racks on both orifices are intact. Structure also appears to be intact.	**Remove debris from 12" orifice and from inside of structure.** Continue to monitor the integrity of the concrete every three to five years.
35	2	Channel outfall / Connecting storm sewer	18"	Reinforced concrete	Round	Y	N	Y	Y	Channel end section has 3-4" undermining at the edge. 2-3" diameter trees are growing directly in front of the outfall and through the riprap. Asbuilt plan shows trash rack, but none exists.	**Remove trees growing in front of the end section. Install trash rack.**
36	2	Bridge crossing / Mariner Drive future extension	10' Rise x 28' Span	Reinforced concrete	Conspan Arch	Y	N/A	Y	Y	Structure appears intact. Wooden railing appear intact. Standing water depth of approximately 6-8". Near zero velocity. Creek bed upstream is densely vegetated.	Continue to monitor every three to five years.
37	2	Two-stage outlet structure / Pond connection to channel	5' DIAM. / 24"	Reinforced concrete	Round	Y	Y	Y	Y	Outlet structure and grating appears intact. Structure has standing water in it below the outlet pipe invert. 4" orifice and sump have vegetation in them. Pine trees and other evergreens are beginning to grow within access area to outlet structure. Channel end of pipe at outfall has same type of vegetation hung up on trash rack approximately 1/4-1/3 the way up. Trace amount of flow in the invert. A 2" diameter tree is growing directly in front of the outfall and through the riprap.	**Remove debris from orifice and sump on outlet structure. Remove evergreens from access area to outlet structure. Remove tree growing in front of the end section.**
38	2	Pond	N/A	N/A	N/A	N/A	N/A	N/A	Y	Minor cattail encroachment into permanent pool area. Presence of migratory birds.	Continue to monitor every three to five years.
39	2	Emergency spillway	40' x 10' x 1'	Fieldstone over geotextile fabric	N/A	N/A	N/A	N/A	Y	Fieldstone is stable and appears intact with some vegetation growing between rocks.	
40	2	Pond outfall	54"	Reinforced concrete	Round	Y	Y	Y	Y	Pond end section has very minor spalling. Outfall was dry with 1-2" sediment roughly 10' into the pipe. 2-3" of debris was was hung up on trash rack. Standing water right up to the edge of the end section.	**Remove debris from trash rack.**
41	2	Pond outfall	24"	Reinforced concrete	Round	Y	N	Y	Y	Pond end section was dry and clean. Concrete appears intact with no visible signs of spalling. Asbuilt plan shows trash rack, but none exists.	**Village to determine whether or not they want a trash rack installed per original plan.**
42	2	Retaining walls (both sides)	N/A	Concrete	Keystone interlocking modular block	N/A	N/A	N/A	Y	Walls appear intact with no visible signs of overturning or damage.	Continue to monitor every three to five years.
43	2	Pond outfall with headwall / Connecting storm sewer	Twin 48" (est.)	Reinforced concrete	Round	Y	Y	Y	Y	This structure was in existence prior to construction of the Pike River project; however, it is located within the corridor. Structure appears intact. Trash racks are rusty. Vine-type vegetation has established growth within the trash racks and have collected floating debris. Pipes are partially submerged with 12-18" of standing water.	**Remove vegetation and debris from the trash racks and pipes.**
44	2	Pond	N/A	N/A	N/A	N/A	N/A	N/A	Y	Moderate cattail encroachment around the pond perimeter and into permanent pool area. Presence of migratory birds.	Continue to monitor every three to five years.
45	2	Pond connection to channel	21"	Corrugated metal	Round	Y	N	Y	Y	Pond end section was partially submerged in 1-2" standing water with little grass debris. Invert of pipe and end section was corroded and showing signs of deterioration. Riprap appears intact. Channel end section was detached from pipe. Cause appears to be from undermining immediately beneath end section. Riprap appears to have shifted 4-5' downslope. Asbuilt plan shows trash racks, but none exist.	**Cut channel end of pipe to a point where the ground can support the end section if re-attached, then replace the riprap around the end section and slope. Another option would be to remove end section from the site and stabilize the point discharge area with medium riprap to prevent scour and erosion. Continue to monitor the pond end section and pipe rate of deterioration. Village to determine whether or not they want a trash rack installed per original plan.**
46	2	Emergency spillway	60' x 10' x 1'	Medium riprap	N/A	N/A	N/A	Y	Y	Appears intact and with slight vegetative growth between rocks.	Continue to monitor every three to five years.

Storm Structure Summary Table (con't)

Struct. ID	Phase	Structure Type / Function	Size	Material	Shape	End-wall or Wing-wall? (Y/N)	Grate/ Trash Rack? (Y/N)	Rock Reinf? (Y/N)	Stable Slope? (Y/N)	Field Observations	Maintenance recommendations
47	2	Pond outfall / Connecting storm sewer	27"	Reinforced concrete	Round	Y	N	Y	Y	This structure was in existence prior to construction of the Pike River project; however, it is located within the corridor. Minor spalling on edges of concrete end section. end section is partially submerged in 1-2" standing water. Leaf debris in end section. Pipe invert is also wet, but not flowing. Long grasses surround outfall and sediment has built up downstream of end section causing partial obstruction of free flow to channel.	Continue to monitor every three to five years.
48	2	Channel outfall / Connecting storm sewer	12"	Reinforced concrete	Round	Y	N	Y	Y	End section was dry with 2-3" sediment and leafy debrwas and several pieces of riprap in the end section invert. Downstream end of pipe has 1" of gravel in the invert.	**Maintain/clean channel end section. Remove riprap from end section and place around structure.**
49	3	Channel outfall / Connecting storm sewer	60"	Reinforced concrete	Round	Y	Y	N	Y	STH 20 storm sewer outfall, owned by State? Spalling with exposed rebar in end section. Approx. 12" depth standing water with 4-6" of that as sediment depth. Debris collected along trash rack which is misaligned as a result of only two anchor points. A few pieces of riprap are in the end section invert.	**Realign trash rack. Maintain/clean channel end section. Remove riprap from end section and place around structure.**
50	3	Rock Dam in River	N/A	Medium riprap	N/A	N/A	N/A	Y	Y	Two foot drop caused by rock dam, may hinder fish passage.	**Village's ecological consultant to evaluate.**
51	3	Channel outfall / Connecting storm sewer	12"	Reinforced concrete	Round	Y	N	Y	Y	Channel end section was dry and undermined 3-4".	Continue to monitor every three to five years.
52	3	Channel outfall / Connecting storm sewer	12"	Reinforced concrete	Round	Y	N	Y	Y	Channel end section had 0.5" of flow containing suds. The inspection occurred during dry conditions so it could be an illicit discharge. A few pieces of riprap are in the end section invert.	**Add outfall to illicit discharge inpection list. Remove riprap from end section and place around structure.**
53	3	Channel outfall / Connecting storm sewer	6"	Clay	Round	N	N	Y	Y	End of pipe is about halfway full of sediment which appears to be caused by obstruction. Pipe appears to be discharging sediment causing a small pile to form at the discharge point. Unable to tell is this occurred over time or if it was caused by one occurrence.	**Clean out end of pipe and clear away sediment pile.**
54	3	Channel outfall / Connecting storm sewer	12"	Corrugated metal	Round	Y	N	Y	Y	Channel end section had flow trickling through. The last 2' of CMP pipe is not flush with the existing upstream RCP pipe. The brick and mortar collar and end of RCP pipe is broken with exposed rebar and a large piece of pipe in the flow line.	**Repair the broken pipe and end section connection.**
55	3	Channel outfall / Connecting storm sewer	8"	Reinforced concrete	Round	N	N	Y	Y	End of pipe opening is nearly blocked with sediment, vegetation, and trash build-up.	**Clean out end of pipe and remove trash.**
56	3	Channel outfall / Connecting storm sewer	27"	Reinforced concrete	Round	Y	Y	Y	Y	Spalling with exposed rebar in end section. Channel end section has flow trickling through and is undermined 12". Trash rack has a large piece of riprap and leaf debris caught on the upstream side. Erosion matting around end section is exposed and sloughing.	**Maintain/clean channel end section. Place riprap in the undermined area and stabilize fabric.**
57	3	Channel outfall / Connecting storm sewer	8"	Reinforced concrete	Round	Y	N	Y	Y	Unable to locate. Assumed either buried or overgrown with vegetation.	**Locate to determine if still functioning.**
58	3	Channel outfall / Connecting storm sewer	18"	Reinforced concrete	Round	Y	N	Y	Y	Channel end section was dry and is undermined 2". Erosion matting around riprap downstream of end section exposed. Asbuilt plan shows trash rack, but none exists.	**Monitor annually to determine whether or not undermining is getting worse. Village to determine whether or not they want a trash rack installed per original plan.**
59	3	Channel outfall / Connecting storm sewer	42"	Reinforced concrete	Round	Y	N	Y	Y	Channel end section had flow trickling through and is undermined 6". Erosion matting around riprap downstream of end section exposed. Asbuilt plan shows trash rack, but none exists.	**Place riprap in the undermined area. Village to determine whether or not they want a trash rack installed per original plan.**
60	3	Channel outfall / Connecting storm sewer	24"	Corrugated metal	Round	N	N	N	Y	Pipe outfall is missing end section and trash rack. Outfall also had 2-3" of standing water with dense vegetation surrounding it. Upstream catchbasin has standing water in sump. The steel fan type grate sitting atop at ground level does not fit the standpipe opening and is resting crookedly.	**Install apron end section and trash rack. Modify the steel fan type grate to fit the standpipe opening or remove and replace with other type of grate.**
61	3	Culvert Crossing / Oakes Road	Triple 120" (10' diam)	Corrugated metal	Round	Y	N	Y	Y	Asphalt lining crumbling and falling off. Trees/brush/grass growing in the upstream ends of the west and center pipes with 1-2' sediment depth. Flow only through east culvert at time of visit. Downstream ends are partially full of riprap and inverts sit at least 12" above the water surface. West and center pipes are dry and are half-full of riprap/sediment/vegetation.	**Replace culverts with a bridge and lower existing culverts to allow for fish passage.**
62	3	Channel outfall / Connecting storm sewer	24"	Reinforced concrete	Round	Y	Y	Y	Y	Channel end section was dry but spalling with 2 spall holes. Debris caught in trash rack. Dense vegitation downstream of end section.	**Clear vegetation. Maintain/clean channel end section.**
63	3	Channel outfall / Connecting storm sewer	30"	Reinforced concrete	Round	Y	Y	Y	Y	Channel end section had flow trickling through. Riprap in pipe. Dense vegitation/tree growth around end section.	**Clear vegetation. Maintain/clean channel end section.**
64	4	Pond Outfall	36"	Reinforced concrete	Round	Y	Y	N	Y	Outfall fully submerged, plans show top of pipe 2' below normal water level. Could not locate. North field inlet is a 36" RCP end section with grate located in a depression in the field was dry and heavily vegetated. 60" diameter catchbasin located between inlet and outfall still had inlet protction under grate.	**Locate to determine if still functioning.**
65	4	Pond Outfall / Connecting storm sewer	34" x 53" & 60" parallel	Reinforced concrete	Horizontal elliptical & Round	Y	Y	Y	Y	SC Johnson storm sewer outfall. No flow was observed in the north end section (elliptical) but there was standing water. 8"-10" of steady flow was observed in the south end section (60" round). Riprap is missing over and along the sides of both end sections.	**Replace riprap over and along the sides of both end sections.**
66	4	Pond outfall / Trail crossing	Twin 60"	Corrugated metal	Round	N	N	N	Y	Steele Branch culverts. 2-3" of sediment in both pipes with another 2" of standing water. No riprap at the east end of the culverts.	Continue to monitor every three to five years.
67	4	Channel outfall / Connecting storm sewer	Twin 36"	Reinforced concrete	Round	Y	Y	Y	Y	Both channel end sections had flow trickling through. Debris caught on trash rack. Heavily vegetated around outfall.	**Clear vegetation. Maintain/clean channel end section.**
68	4	Bridge crossing / Steele Branch	6'H x 10'W	Reinforced concrete	Box	Y	N	N	Y	Structure and riprap in good shape with ~1' of flow observed.	Continue to monitor every three to five years.
69	4	Channel outfall / Connecting storm sewer	24" & 60" parallel	Reinforced concrete	Round	Y	Y	Y	Y	No flow observed in either pipe but both had standing water. South pipe (24") had 4"-5" of sediment.	
70	4	Pond	N/A	N/A	N/A	N/A	N/A	N/A	Y	Appears healthy with no cattail encroachment.	Continue to monitor every three to five years.
71	4	Pond	N/A	N/A	N/A	N/A	N/A	N/A	Y	Appears healthy with no cattail encroachment.	Continue to monitor every three to five years.
72	4	Pond	N/A	N/A	N/A	N/A	N/A	N/A	Y	Appears healthy with no cattail encroachment.	Continue to monitor every three to five years.
73A	4	Slope reinforcement	5'W x 60'L	Medium riprap	N/A	N/A	N/A	Y	Y	Appears intact and with slight vegetative growth between rocks.	Continue to monitor every three to five years.
73B	4	Slope reinforcement	8'W x 35'L	Medium riprap	N/A	N/A	N/A	Y	Y	Appears intact and with slight vegetative growth between rocks.	Continue to monitor every three to five years.

Storm Structure Summary Table (con't)

Struct. ID	Phase	Structure Type / Function	Size	Material	Shape	End-wall or Wing-wall? (Y/N)	Grate/ Trash Rack? (Y/N)	Rock Reinf? (Y/N)	Stable Slope? (Y/N)	Field Observations	Maintenance recommendations
73C	4	Slope reinforcement	8'W x 30'L	Medium riprap	N/A	N/A	N/A	Y	Y	Appears intact and with slight vegetative growth between rocks.	Continue to monitor every three to five years.
74	4	Stone core filter	11'W x 140'L	Light riprap over crushed limestone	N/A	N/A	N/A	Y	Y	Appears intact and with slight vegetative growth between rocks.	Continue to monitor every three to five years.
75	4	Channel outfall / Connecting low area on private industrial property to the east	24"x18"	Corrugated metal	Arch	Y	Y	Y		**NOT YET OBSERVED**	
76	4	Trail crossing	15"	Corrugated metal	Round	Y	N	N	Y	Pipe appears clean and dry. The edge of pipe at the east end is slightly bent. Dense vegetation starting to grow over the east end.	**Clear vegetation from around the ends of the pipes to prevent woody vegetation from taking root.**
77	4	Trail crossing	15"	Corrugated metal	Round	Y	N	N	Y	Pipe appears clean and dry. Dense vegetation starting to grow over the east end.	**Clear vegetation from around the ends of the pipes to prevent woody vegetation from taking root.**
78	4	Slope reinforcement	8'W x 30'L	Light riprap	N/A	N/A	N/A	Y	Y	Appears intact and with slight vegetative growth between rocks.	Continue to monitor every three to five years.
79	5	Channel outfall / Connecting storm sewer	24"	Reinforced concrete	Round	Y	Y	Y	Y	Channel end section had flow trickling through and is undermined 4".	Continue to monitor every three to five years.
80	5	Channel outfall / Connecting storm sewer	18"	Corrugated metal	Round	Y	N	N	Y	Channel end section was dry.	Continue to monitor every three to five years.
81	5	Slope reinforcement	10' wide	Medium riprap	N/A	N/A	N/A	Y	Y	Appears intact and with slight vegetative growth between rocks.	Continue to monitor every three to five years.
82	5	Slope reinforcement	4' wide	Light riprap	N/A	N/A	N/A	Y	Y	Appears intact and with slight vegetative growth between rocks.	Continue to monitor every three to five years.
83	5	Slope reinforcement	4' wide	Light riprap	N/A	N/A	N/A	Y	Y	Appears intact and with slight vegetative growth between rocks.	Continue to monitor every three to five years.
84	5	Slope reinforcement	4' wide	Light riprap	N/A	N/A	N/A	Y	Y	Appears intact and with slight vegetative growth between rocks.	Continue to monitor every three to five years.
85	5	Channel outfall / Connecting storm sewer	60"	Reinforced concrete	Round	Y	Y	Y	N	0.5" of steady flow observed through channel end section whch is undermined 10". Riprap has washed away and erosion matting is folded over itself. A permanant pool has formed around outfall. Multiple dead salmon were observed in and around this pool. Banks around end section show signs of erosion.	**Remove and dispose of geotextile fabric. Stabilize slopes around end section with heavy riprap. Rebuild energy dissipation pool with heavy riprap.**
86	6	Channel outfall / Connecting storm sewer	60"	Reinforced concrete	Round	Y	N	N	Y	Steady flow observed through end section. Pipe invert elevation was ~2' above the water level.	Continue to monitor every three to five years.
87	6	Channel outfall / Ditch drainage	Twin 33" x 49"	Corrugated metal	Horizontal elliptical	N	N	Y	Y	No end sections. Both pipes were dry and were undermined 3".	Continue to monitor every three to five years.
88	6	Channel outfall / Connecting storm sewer	24"	Corrugated metal	Round	N	N	Y	Y	No end section. Pipe had flow trickling through it. Initial plans called for this pipe to be abandoned, but this pipe was found to be active.	Continue to monitor every three to five years.
89	6	Channel outfall / Connecting storm sewer	18"	Reinforced concrete	Round	Y	N	Y	Y	Channel end section was wet but no flow was observed. The pipe is high-density polyethylene with a reinforced concrete end section. Just south of the outfall, multiple 12" gullies have formed and seeapge was observed.	**Add topsoil, seed, and erosion mat to the gullies and associated bare areas.**
90	6	Channel outfall / Connecting storm sewer	24"	Corrugated metal	Round	Y	N	Y	Y	Channel end section had flow trickling through.	Continue to monitor every three to five years.
91	6	Channel outfall / Connecting storm sewer	18"	Reinforced concrete	Round	Y	N	Y	Y	Channel end section was dry. Just north of the outfall, multiple 12" gullies have formed and seeapge was observed.	Continue to monitor every three to five years.
92	6	Channel outfall / Connecting storm sewer	18"	Reinforced concrete	Round	Y	N	Y	Y	Channel end section was dry. Erosion matting was exposed under riprap.	Continue to monitor every three to five years.
93	6	Channel outfall / Connecting storm sewer	24"	Corrugated metal	Round	Y	N	Y	Y	Channel end section was dry and undermined 12".	**Place riprap in the undermined area.**
94	6	Channel outfall / Connecting storm sewer	30"	Reinforced concrete	Round	Y	N	Y	Y	Channel end section had flow trickling through.	Continue to monitor every three to five years.
95	6	Channel outfall / Connecting storm sewer	24"	Reinforced concrete	Round	Y	Y	Y	Y	Channel end section was dry.	Continue to monitor every three to five years.
96	6	Channel outfall / Connecting storm sewer	18"	Reinforced concrete	Round	Y	N	Y	Y	Channel end section was dry and undermined 4". Bank around outfall is heavily vegetated making it difficult to locate.	**Place riprap in the undermined area.**
97	6	Channel outfall / Connecting drain tile	8"	High-density polyethylene	Round	Y	Y	Y	Y	Channel end section had flow trickling through. Vegetation growing through riprap and around outfall making it difficult to locate.	Continue to monitor every three to five years.
98	6	Channel outfall / Connecting drain tile	10"	High-density polyethylene	Round	Y	Y	Y	Y	Channel end section was dry.	Continue to monitor every three to five years.
99	7	Channel outfall / Connecting drain tile	12"	Corrugated metal	Round	Y	Y	Y	TBD	Proposed structure, not yet installed.	Once installed, monitor every three to five years.
100	7	Channel outfall / Connecting drain tile	4"	Plastic	Round	N	Y	Y	TBD	Proposed structure, not yet installed.	Once installed, monitor every three to five years.
101	7	Wetland crossing / Drainage ditch	TBD	TBD	TBD	TBD	TBD	TBD	TBD	Proposed structure, not yet installed.	Once installed, monitor every three to five years.
102	7	Waterway crossing / Chicory Creek	TBD	TBD	TBD	TBD	TBD	TBD	TBD	Proposed structure, not yet installed.	Once installed, monitor every three to five years.
103	7	Channel outfall / Connecting yard inlet	24"	Corrugated metal	Round	Y	Y	Y	TBD	Proposed structure, not yet installed.	Once installed, monitor every three to five years.
104	8	Channel outfall / Connecting storm sewer	60"	Reinforced concrete	Round	Y	Y	Y	N	Concrete appears in good condition. Part of the riprap reinforcement has washed out into the river caused by storm sewer discharge cutting a new drainage path around the riprap and into the side slope.	Based on discussion with Tony Beyer from the Village, this erosion problem will be removed during the contruction of Phase 8.
105	8	Water quality feature connection to channel	24"	Reinforced concrete	Round	Y	Y	Y	Y	Proposed structure, not yet installed.	Once installed, monitor every three to five years.
106	8	Channel outfall / Connecting drain tile	12" (est.)	Corrugated metal	Round	Y	Y	Y	Y	Proposed structure, not yet installed.	Once installed, monitor every three to five years.
107	8	Channel outfall / Connecting drain tile	12"	Corrugated metal	Round	Y	Y	Y	Y	Proposed structure, not yet installed.	Once installed, monitor every three to five years.
108	8	Channel outfall / Connecting drain tile	12" (est.)	Corrugated metal	Round	Y	Y	Y	Y	Proposed structure, not yet installed.	Once installed, monitor every three to five years.
109	8	Channel outfall / Connecting drain tile	12" (est.)	Corrugated metal	Round	Y	Y	Y	Y	Proposed structure, not yet installed.	Once installed, monitor every three to five years.
110	8	Channel outfall / Connecting drain tile	12"	Corrugated metal	Round	Y	Y	Y	Y	Proposed structure, not yet installed.	Once installed, monitor every three to five years.
111	9	Waterway crossing / Lamparek Ditch	TBD	Corrugated metal	Round	Y	Y	Y	TBD	Proposed structure, not yet installed.	Once installed, monitor every three to five years.
112	9	Channel outfall / Connecting drain tile	12"	Clay	Round	Y	Y	Y	Y	Proposed structure, not yet installed.	Once installed, monitor every three to five years.

This Page Intentionally Left Blank

Upland Vegetation Phases 1-6 and Biex- Ramche 2014

Grasses, Sedges, Rushes		Phase I	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Biex-Ramche
Species	**Common Name**	**1 = A few individuals, 2 < 50% cover, 3 > 50% cover**						
Andropogon gerardii	big bluestem	1	1	1	2	2		2
Bouteloua curtipendula	side oats grama	2		1	2	1	1	
Bromus inermis	common brome grass	1			1	1	2	2
Carex trichocarpa	hairy fruit sedge	1	1					
Dactylis glomerata	orchard grass				1			
Echinocloa crus-galli	barnyard grass				1		1	
Elymus canadensis	Canada wild rye	2	1	1	2	1	2	2
Elymus virginicus	Virginia wild rye				1		3	2
Elytrigia repens	quackgrass					1	2	
Juncus dudleyi	Dudley's rush					1		
Juncus effusus	soft rush	1						
Juncus torreyi	Torrey's rush	1			1	1	1	
Lolium multiflorum	annual rye					1	1	
Lolium perenne	perennial rye		1	1		1	2	
Panicum virgatum	switch grass	2	1	1	2	1	1	
Phalaris arundinacea	**reed canary grass**	**1**	**1**	**1**	**3**	**3**	**2**	**1**
Phleum pratense	timothy	1			1			
Phragmites australis	**Giant reed grass**	**1**			**1**		**2**	
Poa compressa	Canada bluegrass		1	1		3		
Poa pratensis	Kentucky bluegrass	1	1		2	3	1	
Scirpus atrovirens	green bulrush				1	1		
Schyzachyrium scoparium	little bluestem	1	1	1	2			2
Setaria faberi	giant foxtail							
Sorghastrum nutans	indian grass	2	1	1	2	2	1	2
Spartina pectinata	prairie cordgrass	1			1		1	
Typha angustifolia	narrow-leaved cattail				1			

Forbs		Phase I	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Biex-Ramche
Species	**Common Name**	**1 = A few individuals, 2 < 50% cover, 3 > 50% cover**						
Abutilon theophrasti	velvetleaf	1						
Achillea millefolium	yarrow	1	1	1	1		1	
Ambrosia artemisiifolia	common ragweed	1	1	1	2	1	2	
Ambrosia trifida	giant ragweed			1	2	3	2	
Apocynum cannabinum	Indian hemp	1	1	1	1			
Arctium minus	**burdock**	1			1	3	1	
Asclepias syriaca	common milkweed	1			1	1	1	
Aster ericoides	heath aster				1	1		
Aster laevis	smooth blue aster						1	
Aster lanceolatum	white panicled aster	1				2	1	
Aster lateriflorus	side-flowering aster		1	1	1		1	
Aster novae-angliae	New England aster	2	1	1	2	2	2	
Aster pilosus	frost aster	1	1	1	1	2	2	2
Baptisia alba	white wild indigo				1			1
Bidens frondosa	common beggar-ticks				1	1	1	
Boltonia asteroides	false aster				1	2		
Calystegia sepium	hedge bindweed						1	
Carduus nutans	nodding thistle					2	2	
Chamaecrista fasciculata	partridge pea					1	1	
Chenopodium album	lamb's quarters						1	
Chrysanthemum leucanthum	common daisy				1		1	
Cichorum intybus	chickory	1			1		2	

Cirsium arvense	**Canada thistle**	1	1	1	2	2	2	
Cirsium discolor	prairie thistle					2	1	
Cirsium vulgare	**bull thistle**		1	1	1	2	1	
Conyza canadensis	Canadian horseweed						1	
Coreopsis palmata	prairie coreopsis						1	
Coronilla varia	**crown vetch**	1			2	3	3	
Dalea purpurea	purple prairie clover				1			1
Daucus carota	**Queen Anne's lace**	1	1	1	2	3	3	2
Dipsacus laciniatus	**cut-leaved teasel**			1	2			
Echinacea purpurea	purple coneflower	1		1	2	2	1	1
Epilobium coloratum	willow-herb							1
Erigeron philadelphicus	common fleabane	1			2		1	
Eryngium yuccifolium	rattlesnake-master							1
Euthamia graminifolia	grass-leaved goldenrod	1	1	1	2	1	1	2
Eupatorium altissimum	upland boneset				1			
Eupatorium rugosum	white snakeroot				1	2		
Fragaria virginiana	Virginia strawberry	1			1			
Geum canadense	white avens				1			
Glechoma hederacea	creeping Charlie		1	1	1			
Gnaphalium uliginosum	marsh cudweed						2	
Helenium autumnale	sneezeweed				1	2	2	
Helianthus giganteus	giant sunflower	1					1	
Helianthus grossesseratus	saw-toothed sunflower	1			2	3	2	
Hesperis matronalis	**dames rocket**	1			2			
Hibiscus trionum	flower of the hour					1		
Hypericum perforatum	**St John's-wort**	1			1			
Linaria vulgaris	**butter and eggs**			1	1		1	
Lotus corniculatus	**birds foot trefoil**				2	2	3	
Medicago sativa	alfalfa		1	1			2	
Melilotus alba	**white sweet clover**	2	1	1	2	3	3	2
Monarda fistulosa	bergamot	1	1	1	2	3	1	2
Oenothera biennis	evening primrose	1	1	1	1	1	1	1
Parthenocissus quinquefolia	Virginia creeper				1	1		
Pastinaca sativa	**wild parsnip**				1			
Plantago major	common plantain	1			1		1	
Potentilla simplex	common cinquefoil						1	
Prunella vulgaris	heal-all					1		
Pycnanthemum virginicum	common moutain mint				1	2		
Ratibida pinnata	yellow coneflower	1	1	1	2	2	2	2
Rubus idaeus	red raspberry				1			
Rubus strigosus	American red raspberry				2			
Rudbeckia hirta	black-eyed Susan	1	1	1	2		2	2
Rudbeckia triloba	brown-eyed Susan				1	1	1	
Rumex crispus	curly dock				2	1	2	1
Scrophularia lanceolata	lance-leaved figwort							1
Silene latifolia	bladder campion						1	
Silphium integrifolium	rosinweed	1			2		1	
Silphium laciniatum	compass plant				2	2	1	2
Silphium perfoliatum	cup plant	2	1	1	2	2	1	
Silphium terebinthinaceum	prairie dock		1		1	2	1	
Solanum dulcamara	bittersweet nightshade				1			
Solidago canadensis	Canada goldenrod	2	1	1	3	2	2	2
Solidago gigantea	giant goldenrod		1	1	1			
Solidago patula	swamp goldenrod						1	
Solidago rigida	stiff goldenrod	1	1	1	2	2	1	2
Sonchus oleraceus	common sow-thistle	1			2	2	1	

Tanacetum vulgare	common tansy						1	
Taraxacum officinale	common dandelion	1			2		1	
Trifolium hybridum	alsike clover				2		2	
Trifolium pratense	red clover		1	1	1		2	
Trifolium repens	white clover				2			
Verbascum thaspus	**common mullein**		1	1	1		1	
Verbena hastata	blue vervain				1			
Zizia aurea	golden Alexander				1		1	
	Species Richness	**48**	**34**	**35**	**82**	**54**	**73**	**25**
	Number of Invasives	**4**	**1**	**3**	**6**	**4**	**5**	**1**

Note: Tree and Shrub Data are combined for wetlands and uplands and shown separately

Wetland Vegetation Phases 1-6 2014

Grasses, Sedges, Rushes		Phase 1	Phase 2	Phase 3	Phase 4	Phase 4 Ponds	Phase 5	Phase 6
Species	**Common Name**	**1 = A few individuals, 2 < 50% cover, 3 > 50% cover**						
Agrostis gigantea	red top grass	1	1	1	1	1	1	2
Andropogon gerardi	big bluestem	1	1		2	1	1	1
Calamagrostis canadensis	Canada bluejoint grass	1			1			
Carex granularis	limestone meadow sedge	1	1	1				
Carex bebbii	Bebb's oval sedge	1	1		1			
Carex hystericina	porcupine sedge				1			
Carex lacustris	lake sedge	1			2			1
Carex stipata	common fox sedge				1			
Carex stricta	tussock sedge	1	1	1	1	1		
Carex trichocarpa	hairy-fruit sedge	2	1	1	1	1		1
Carex vulpinoidea	brown fox sedge	2	1	1	1	1	2	2
Cyperus esculentus	chufa	1		1	1	1		
Echinochloa crusgalli	barnyard grass	1	1	1			1	1
Eleocharis palustris (erythropoda)	red-footed spike rush	1	1	1	1	2	3	1
Elymus canadensis	Canada wild rye	2	1	1	2	1	1	2
Elymus virginica	Virginia wild rye	1	1	1	2	1		2
Glyceria maxima	**reed manna grass**	**3**	**1**	**2**	**2**	**1**		
Juncus tenuis	path rush	1	1	1	2	1		
Juncus torreyi	Torrey's rush	2	1	1	2	1	2	2
Juncus dudleyi	Dudley's rush				2		2	
Juncus effusis	rush	1			1	1		2
Leersia oryzoides	rice cut grass	1	1	1	1		3	3
Lolium multiflorum	annual rye			1	1		1	1
Poa pratensis	Kentucky blue grass	1	1	1	1	1	1	1
Panicum virgatum	switch grass	1	1	1	3	1	2	
Phalaris arundinacea	**reed canary grass**	**2**	**2**	**2**	**3**	**2**	**3**	**1**
Phleum pratense	timothy				1			
Phragmites australis	**common (giant) reed grass**	**1**	**1**	**1**	**1**	**1**	**1**	**1**
Poa palustris	fowl meadow grass							1
Schizachyrium scoparium	little bluestem	1	1	1	1			
Scirpus atrovirens	dark-green bulrush	1	1	1	2	2	2	2
Scirpus cyperinus	woolgrass	1		1	1	1		2
Scirpus fluviatilis	river bulrush	1						
Scirpus validus	soft stemmed bulrush		1	1	1	1		
Setaria glauca	yellow foxtail		1	1				
Sorghastrum nutans	Indian grass	1	1	1	2	1	2	
Sparganium eurycarpum	bur-reed	1		1	1	1		
Spartina pectinata	prairie cord grass	2	1	1	2	1	2	1
Typha angustifolia	narrow leaved cattail	3	1	1	2	2	2	3
Typha x glauca	hybrid cattail							1

Forbs		Phase 1	Phase 2	Phase 3	Phase 4	Phase 4 Ponds	Phase 5	Phase 6
Species	**Common Name**	**1 = A few individuals, 2 < 50% cover, 3 > 50% cover**						
Alisma triviale	water plantain	2				1	1	1
Allium canadense	wild onion				1		2	
Ambrosia artemisiifolia	ragweed	1			2	1	2	1
Ambrosia trifida	giant ragweed	1			2	1	2	2
Apocynum cannabinum	Indian hemp						1	
Asclepias incarnata	swamp milkweed	2	1	1	1	2	1	1
Asclepias syriaca	common milkweed				1			
Aster ericoides	heath aster				1			
Aster firmus	shining aster				1			1
Aster lanceolatum	white panicle aster				1			
Aster lateriflorus	calico aster	1	1	1			2	1
Aster novae-angliae	New England Aster	2			2	1	3	2

Aster pilosus	frost aster		1	1	2	1	2	2
Aster puniceus	purple-stem aster					1		1
Bidens cernua	nodding bur-marigold		1	1		2		1
Bidens frondosa	common beggar-ticks	1			2	1	2	2
Boltonia asteroides	false aster	1			2	1	3	2
Calystegia sepium	hedge bindweed							1
Ceratophyllum demersum	coontail	1				1		
Chrysanthemum leucanthemum	common daisy							1
Cichorium intybus	chicory							2
Cirsium arvense	**Canada thistle**					1		1
Cirsium vulgare	**bull thistle**							1
Conyza canadensis	Canada horseweed							1
Coreopsis palmata	prairie coreopsis				1			
Daucus carota	**Queen Annes Lace**	1	1	1	1	1	2	2
Dipsaucus laciniatus	**cut-leaved teasel**			**1**	**2**			
Echinacea purpurea	purple coneflower				1			1
Epilobium coloratum	willow-herb	1			1	1	2	1
Epilobium hirsutum	**hairy willow herb**	**1**						
Equisetum arvense	field horsetail	1	1	1				
Erigeron philadelphicus	common fleabane	1			1	1	1	
Eupatorium altissimum	upland boneset				1			
Eupatorium maculatum	Joe pye weed	1	1	1	1			
Eupatorium perfoliatum	boneset	2	1	1	2			
Eupatorium rugosum	white snakeroot				1			1
Euthamia graminifolia	grass leaved goldenrod	1	1	1	2	1	1	1
Fragaria virginiana	Vriginia strawberry		1	1	1	1		
Geum aleppicum	yellow avens		1	1	1			
Geum canadense	white avens				1			
Gnaphalium uliginosum	marsh cudweed							2
Helenium autumnale	sneezeweed	2	1	1	2	1	3	2
Helianthus giganteus	giant sunflower	1			1			
Helianthus grosseserratus	saw-tooth sunflower	2	1	1	2	1	3	1
Hesperis matronalis	**dame's rocket**				**1**	**1**		
Impatiens capensis	touch-me-not				1	1	1	1
Iris virginica	Virginia blueflag					2		
Lemna minor	lesser duckweed	2				1		
Lobelia siphilitica	great blue lobelia	1			1	1		1
Lycopus americanus	American water horehound				2	1	2	1
Lythrum salicaria	**purple loosestrife**	**1**			**1**	**1**		
Melilotus alba	**white sweet clover**				**2**	**1**	**2**	**1**
Mentha arvensis	field mint	1	1	1	1			1
Mimulus ringens	monkeyflower	1						1
Monarda fistulosa	wild bergamot				1	1		2
Myosotis scorpioides	**forget-me-not**	**2**						
Nasturtium officinale	**watercress**	**1**					**1**	
Oenothera biennis	evening primrose	1	1	1	1			1
Penthorum sedoides	ditch stonecrop							1
Plantago major	plantain				1	1		2
Polygonum amphibium	water smartweed	1						1
Polygonum hydropiper	water-pepper					1		1
Polygonum hyperpiperoides	mild water-pepper						2	1
Polygonum lapathifolium	dock-leaved smartweed	1			1			1
Polygonum pensylvanicum	Pennsylvania smartweed						1	1
Polygonum persicaria	lady's thumb	1	1	1	1	1	1	1
Prunella vulgaris	common selfheal					1		
Pycnanthemum virginianum	Virginia mountain-mint				1	1	1	
Ratibida pinnata	yellow coneflower	1	1	1	1	1		2
Rhamnus cathartica	**common buckthorn**	**1**	**1**	**1**	**1**			
Rosa carolina	Carolina rose				1			
Rudbeckia hirta	black-eyed Susan	1			1	1		1

Rudbeckia triloba	three-lobed coneflower	1						1
Rumex crispus	curly dock	1	1	1	2	1	1	2
Saggitaria laterifolia	arrowhead		1			1		1
Silphium perfoliatum	cup plant	1	1	1	1	2	2	1
Silphium laciniatum	compass plant				2			1
Silphium terebinthinaceum	prairie dock	1			1			
Solanum dulcamara	nightshade	1	1	1				
Solidago canadensis	Canada goldenrod	1	1	1	3	2	2	2
Solidago gigantea	late goldenrod	1	1	1	1	1	2	1
Solidago rigida	stiff goldenrod				1			
Sonchus arvensis	field sow thistle				1			
Sonchus oleraceus	common sow-thistle	1	1	1	1	1		1
Stachys hispida	narrow-leaved hedge nettle							1
Taraxacum officinale	common dandelion	1	1	1	1			
Trifolium hybridum	alsike clover				1			1
Trifolium pratense	red clover				1			1
Verbena hastata	blue vervain		1		2	1		1
Veronia fasciculata	prairie ironweed					1		1
Wolffia punctata or (brasiliensis)	Brazilian water meal	2						
Vitis riparia	riverbank grape				2			
Xanthium strumarium	cocklebur				1			1
	Species Richness	**74**	**53**	**53**	**93**	**67**	**46**	**80**
	Number of Invasives	**9**	**4**	**5**	**7**	**4**	**3**	**2**

Note: Tree and Shrub Data are combined for wetlands and uplands and shown separately

Tree, Sapling and Shrub 2014 Data, Wetlands and Uplands Combined

Trees		Phase 1	Phase 2	Phase 3	Phase 4	Phase 4 Ponds	Phase 5	Phase 6
Species	**Common Name**	**1 = A few individuals, 2 < 50% cover, 3 > 50% cover**						
Acer negundo	box elder	1	1	2	1			
Acer saccharinum	silver maple	1					2	
Acer saccharum	sugar maple	1			1			
Ailanthus altissima	**tree of heaven**			2				
Elaeagnus angustifolia	**russian olive**		1					
Fraxinus pennsylvania	green ash	1	1	1	1		1	1
Gleditsia triacanthos	honey locust				1			
Pinus strobus	white pine		2		2			
Pinus rubra	red pine				1			
Populus alba	white poplar	1		1				
Populus deltoides	cottonwood	1		1			2	1
Populus tremuloides	quaking aspen	1		1	2			
Robinia pseudoacacia	**black locust**		1	2				
Salix babylonica	**weeping willow**			2				
Ulmus pumila	**siberian elm**				1			

Saplings and Shrubs		Phase 1	Phase 2	Phase 3	Phase 4	Phase 4 Ponds	Phase 5	Phase 6
Species	**Common Name**	**1 = A few individuals, 2 < 50% cover, 3 > 50% cover**						
Acer negundo	box elder	1	1	1	1	1	1	1
Acer saccharinum	silver maple	1		1				
Ailanthus altissima	**tree of heaven**			1				
Cornus alba	red-osier dogwood	1	1	1	1	1		
Cornus ammomum	silky dogwood	1						
Cornus racemosa	gray dogwood	1		1	1			
Elaeagnus angustifolia	**russian olive**	1			1	1	1	
Fraxinus pennsylvania	green ash	1	1	1	1	1		
Juniperus virginicus	red cedar	1						
Lonicera tartarica	**honeysuckle**			1	1			
Morus alba	**white mulberry**	1		1				
Pinus strobus	white pine		1		1			
Populus deltoides	cottonwood	1	1	1	1	1	2	1
Populus tremuloides	quaking aspen	1		1	1			
Prunus serotina	black cherry				1			
Quercus macrocarpa	bur oak	1						
Quercus rubra	red oak	1						
Rhamnus cathartica	**common buckthorn**	1	1	1	2	1	1	
Rhus typhina	staghorn sumac				1		1	
Rosa multiflora	**multiflora rose**				1			
Salix babylonica	**weeping willow**	1		1				
Salix discolor	pussy willow	1		1	1			
Salix exigua	sandbar willow	1	1	1	1	1		1
Salix fragilis	**crack willow**			1				
Sambucus canadensis	common mulberry			1	1			
Ulmus pumila	**siberian elm**				1			
Viburnum trilobum	American high bush cranberry	1		1	1			
Vitis riparia	riverbank grape	1	1	1	1	1	1	1

Pike River Tributaries- Vegetation "threats" 2014 Field Review		Bartlett Branch Phase 1	Steele Branch Phase 4	Waxdale Creek Phase 5	Chicory Creek Phase 7	Lamparek Ditch phase 9
Non- Native Grasses, Sedges, Rushes						
Species	*Common Name*					
Glyceria maxima	**reed mannagrass**	2	1	0	0	0
Lythrum salicaria	**purple loosestrife**	0	0	0	0	0
Phalaris arundinacea	**reed canary grass**	3	3	2	3	3
Phragmites australis	**common (giant) reed grass**	1	1	1	1	0

Non-Native Forbs		1= few, 2 <50%, 3 >50% of cover				
Species	*Common Name*					
Alliaria petiolata	**garlic mustard**	0	0	0	0	1
Arctium minus	**common burdock**	0	0	0	0	1
Cichorium intybus	**chicory**	0	0	0	1	0
Coronilla varia	**crown vetch**	1	1	1	2	1
Daucus carota	**Queen Anne's lace**	0	0	0	2	0
Dipsacus laciniatus	**cut-leaved teasel**	1	0	0	0	0
Epilobium hirsutum	**hairy willow herb**	0	0	0	0	0
Fallopia japonica	**Japanese knotweed**	0	0	0	0	0
Hesperis matronalis	**dame's rocket**	0	0	0	0	0
Lotus corniculatus	**birds foot trefoil**	0	1	0	2	1
Melilotus alba	**white sweet clover**	0	1	0	1	1
Myosotis scorpioides	**forget-me-not**	0	0	0	0	0
Nasturtium officinale	**watercress**	0	0	0	0	0

Non-Native Trees						
Species	*Common Name*					
Ailanthus altissima	**tree of heaven**	0	0	0	0	0
Elaeagnus angustifolia	**russian olive**	0	0	0	0	0
Gleditsia triacanthos	**honey locust**	0	0	0	0	0
Salix babylonica	**weeping willow**	0	1	1	1	2
Ulmus pumila	**siberian elm**	0	0	0	0	2

Non-Native Shrubs and Saplings						
Species	*Common Name*					
Ailanthus altissima	**tree of heaven**	0	0	0	0	0
Elaeagnus angustifolia	**russian olive**	0	0	0	0	0
Euonymus alata	**winged burning bush**	1	0	0	0	0
Lonicera x bella	**white bell honeysuckle**	0	0	1	0	0
Lonicera tartarica	**Tartarian honeysuckle**	1	1	2	1	2
Rhamnus cathartica	**common buckthorn**	1	1	2	2	2
Rhamnus frangula	**glossy buckthorn**	0	0	0	0	0
Salix babylonica	**weeping willow**	0	1	0	1	0
Ulmus pumila	**siberian elm**	0	0	1	0	0

Pike River Phase _____ **Investigators:** _____

Date:_____

Adaptive Management Field Worksheet

Understory		Previous Years	Dominance	Presence
Species	Common Name		0 1 2 3	
Glyceria maxima	**reed mannagrass**		0 1 2 3	
Phalaris arundinacea	**reed canary grass**		0 1 2 3	
Phragmites australis	**common (giant) reed grass**		0 1 2 3	
Lythrum salicaria	**purple loosestrife**		0 1 2 3	
Epilobium hirsutum	**hairy willow herb**		0 1 2 3	
Myosotis scorpioides	**forget-me-not**		0 1 2 3	
Nasturtium officinale	**watercress**		0 1 2 3	
Fallopia japonica	**Japenese knotweed**		0 1 2 3	
Allaria petiolata	**garlic mustard**		0 1 2 3	
Coronilla varia	**crown vetch**		0 1 2 3	
Dipsacus laciniatus	**cut-leaved teasel**		0 1 2 3	
Lotus corniculatus	**birds foot trefoil**		0 1 2 3	
Hesperis matronalis	**dame's rocket**		0 1 2 3	

Trees		Previous Years	Dominance	Presence
Species	Common Name		0 1 2 3	
Ailanthus altissima	**tree of heaven**		0 1 2 3	
Elaeagnus angustifolia	**russian olive**		0 1 2 3	
Robinia pseudoacacia	**black locust**		0 1 2 3	
Salix babylonica	**weeping willow**		0 1 2 3	
Ulmus pumila	**siberian elm**		0 1 2 3	

Shrubs and Saplings		Previous Years	Dominance	Presence
Species	Common Name		0 1 2 3	
Ailanthus altissima	**tree of heaven**		0 1 2 3	
Elaeagnus angustifolia	**russian olive**		0 1 2 3	
Lonicera tartarica	**honeysuckle**		0 1 2 3	
Rhamnus cathartica	**common buckthorn**		0 1 2 3	
Rhamnus frangula	**glossy buckthorn**		0 1 2 3	
Salix babylonica	**weeping willow**		0 1 2 3	
Ulmus pumila	**siberian elm**		0 1 2 3	
Additonal Plant Species				
			0 1 2 3	
			0 1 2 3	
			0 1 2 3	
			0 1 2 3	
			0 1 2 3	
			0 1 2 3	
			0 1 2 3	
			0 1 2 3	
			0 1 2 3	
			0 1 2 3	
			0 1 2 3	
			0 1 2 3	
			0 1 2 3	
			0 1 2 3	

Hot spots identified: culverts, erosion, farm runoff, industrial, trash, ATV, poor buffer etc.

Strengths: diversity, habitat notes

Management Notes- prescibed burn? Herbicide? Mow/cut?

Other Notes:

Any significant change indicated to 2015 Management Plan?

Factors	Relevant characteristics
Flow properties	Magnitude, frequency and variability of stream discharge; Magnitude and distribution of velocity and
Sediment composition	Sediment size, gradation, cohesion and stratification
Climate	Rainfall amount, intensity and duration; Frequency and duration of freezing
Subsurface conditions	Seepage forces; Piping; Soil moisture levels
Channel geometry	Width and depth of channel; Height and angle of bank; Bend curvature
Biology	Vegetation type, density and root character; Burrows
Anthropogenic factors	Urbanization, flood control, irrigation

Types of Channel Design	Variables
Independent variables	Design discharge Channel roughness Design hydrograph Channel-forming discharge Bed-material sediment inflow Bed material Stream bank characteristics
Dependent variables	Width Depth Slope Roughness, if there is a choice of boundary materials Planform

Original material excavated for canals	Mean velocity, for straight canals of small slope, after aging with flow depths less than 3 ft (0.9 m)					
	Clear water, no detritus		Water transporting colloidal silts		Water transporting noncolloidal silts, sands, gravels, or rock fragments	
	ft/s	m/s	ft/s	m/s	ft/s	m/s
Fine sand (noncolloidal)	1.50	0.46	2.50	0.76	1.50	0.46
Sandy loam (noncolloidal)	1.75	0.53	2.50	0.76	2.00	0.61
Silt loam (noncolloidal)	2.00	0.61	3.00	0.91	2.00	0.61
Alluvial silt (noncolloidal)	2.00	0.61	3.50	1.07	2.00	0.61
Ordinary firm loam	2.50	0.76	3.50	1.07	2.25	0.69
Volcanic ash	2.50	0.76	3.50	1.07	2.00	0.61
Stiff clay (very colloidal)	3.75	1.14	5.00	1.52	3.00	0.91
Alluvial silt (colloidal)	3.75	1.14	5.00	1.52	3.00	0.91
Shales and hardpans	6.00	1.83	6.00	1.83	5.00	1.52
Fine gravel	2.50	0.76	5.00	1.52	3.75	1.14
Graded, loam to cobbles (when noncolloidal)	3.75	1.14	5.00	1.52	5.00	1.52
Graded silt to cobbles (when colloidal)	4.00	1.22	5.50	1.68	5.00	1.52
Coarse gravel (noncolloidal)	4.00	1.22	6.00	1.83	6.50	1.98
Cobbles and shingles	5.00	1.52	5.50	1.68	6.50	1.98

Boundary Category Boundary Type	Allowable Shear Stress (lb/sq-ft)
Fine colloidal sand	0.02 -0.03
Sandy loam (noncolloidal)	0.03-0.04
Alluvial silt (noncolloidal)	0.045-0.05
Silty loam (noncolloidal)	0.045-0.05
Firm loam	0.075
Fine gravels	0.075
Stiff clay	0.26
Alluvial silt (colloidal)	0.26
Graded loam to cobbles	0.38
Graded silts to cobbles	0.43
Shales and hardpan	0.67
Gravel/Cobble	
1-in.	0.33
2-in.	0.67
6-in.	2
12-in.	4

Land Use	Hydrologic Soil Group	Acres	Suspended Sediment (lbs./yr.)
Water	A	0.89	-
Water	B	32.91	-
Water	C	56.48	-
Water	D	36.03	-
LD Residential 1/2 acre	A	5.11	278
LD Residential 1/2 acre	B	292.9	25,310
LD Residential 1/2 acre	C	1,613.48	188,498
LD Residential 1/2 acre	D	552.43	76,012
HD Residential 1/8 acre	A	5.56	585
HD Residential 1/8 acre	B	187.26	25,766
HD Residential 1/8 acre	C	1,013.01	175,360
HD Residential 1/8 acre	D	259.31	49,841
Commercial	A	24.69	5,444
Commercial	B	135.21	35,179
Commercial	C	532.86	156,231
Commercial	D	144.11	44,585
Forest	A	5.56	2
Forest	B	76.73	105
Forest	C	348.49	734
Forest	D	215.28	553
Grass/Pasture	B	56.04	92
Grass/Pasture	C	608.25	1,419
Grass/Pasture	D	183.69	523
Agricultural	A	0.89	170
Agricultural	B	374.51	97,328
Agricultural	C	2,963.86	966,047
Agricultural	D	1,204.05	432,366
Total		**10,929.59**	**2,282,428**

River Station	Stream Length (ft)	Q Total	Min. Channel Elevation (ft)	Water Surface Elevation (ft)	2-Year			5-Year	
					Top Width (ft)	Channel Shear Stress (lbs./ft^2)	Channel Velocity (ft/s)	Channel Shear Stress (lbs./ft^2)	Channel Velocity (ft/s)
16.4	36098.93	229	679	682.99	164.24	0	0.39	0.01	0.48
16.37	36033.93	229	680.5	682.99	177.82	0.01	0.55	0.01	0.64
16.34	35903.93	229	680.5	682.98	180.52	0.01	0.56	0.01	0.65
16.33	35833.93	229	680.5	682.98	178.86	0.01	0.56	0.01	0.65
16.31	35683.93	229	680.5	682.97	187.41	0.01	0.55	0.01	0.64
16.3	35618.93	229	680.5	682.96	145.47	0.01	0.72	0.02	0.83
16.29	35573.93	229	680.5	682.94	96.13	0.04	1.21	0.05	1.38
16.28	35548.93	229	680.5	682.85	60.38	0.15	2.38	0.19	2.73
16.275	**35478.93**	**Struct**							
16.27	35478.93	229	679.5	681.41	54.33	0.28	2.92	0.24	2.82
16.245	35378.93	229	678	681.12	27.13	0.29	3.3	0.35	3.75
16.2425	**35298.93**	**Culvert**	**Old Spring Street**						
16.24	35298.93	229	678	680.71	39.46	0.27	3.09	0.35	3.58
16.21	35183.93	229	677	680.48	54.46	0.33	2.29	0.41	2.62
16.15	34983.93	229	676.52	679.47	48.29	1.36	4.49	1.26	4.46
16.11	34783.93	229	675.89	679.06	74.28	0.19	1.72	0.21	1.85
16.093	34693.93	229	675.5	678.95	86.29	0.21	1.85	0.21	1.91
16.092	**34658.93**	**Culvert**	**Path**						
16.09	34658.93	229	675.5	678.85	84.95	0.2	1.8	0.18	1.79
16.08	34588.93	229	675	678.68	65.15	0.43	2.62	0.35	2.44
16.04	34383.93	229	675	678.55	127.12	0.07	1.03	0.06	1.02
16	34183.93	229	674	678.51	125.41	0.04	0.9	0.04	0.93
15.98	34078.93	229	674	678.48	144	0.05	0.92	0.04	0.9
15.97	33970.93	229	674.53	678.44	126.5	0.07	1.08	0.06	1.04
15.965	**33943.93**	**Culvert**	**Path**						
15.96	33943.93	229	674.52	678.4	133.15	0.05	0.9	0.04	0.85
15.95	33888.93	229	674	678.4	144.22	0.03	0.66	0.03	0.72
15.93	33783.93	229	675	678.36	152.32	0.06	1.46	0.04	1.26
15.92	33623.93	447	674	678.33	268.61	0.04	0.9	0.05	0.95
15.91	33478.93	447	674	678.09	73.61	0.69	3.51	0.62	3.43
15.85	33303.93	447	673	677.91	82.22	0.19	1.88	0.21	2.01
15.83	33203.93	447	672.94	677.78	61.05	0.34	2.49	0.41	2.83
15.81	33073.93	447	672.54	677.61	63.9	0.29	2.32	0.36	2.65
15.78	32943.93	447	672.16	677.48	67.38	0.25	2.17	0.33	2.54
15.76	32843.93	447	672	677.39	68.05	0.25	2.24	0.31	2.56
15.65	32546.93	447	672	676.81	57.86	0.75	3.68	0.73	3.73
15.62	32476.93	447	672	676.34	41.11	1.31	4.62	1.37	4.92
15.605	32335.93	447	672	676.34	120.93	0.14	1.6	0.13	1.6
15.6	32215.93	447	672	676.32	361.36	0.04	0.89	0.03	0.75
15.56	31485.93	447	671.56	676.24	369.55	0.02	0.55	0.02	0.55
15.49	31080.93	447	671.25	676.21	350.2	0.01	0.52	0.01	0.49
15.47	30850.93	447	671.08	676.18	132.17	0.05	0.98	0.06	1.09

River Station	Stream Length (ft)	Q Total	Min. Channel Elevation (ft)	Water Surface Elevation (ft)	2-Year			5-Year	
					Top Width (ft)	Channel Shear Stress (lbs./ft^2)	Channel Velocity (ft/s)	Channel Shear Stress (lbs./ft^2)	Channel Velocity (ft/s)
15.42	30490.93	447	670.08	675.98	68.82	0.3	2.67	0.31	2.81
15.33	30030.93	447	669.71	675.56	69.46	0.23	2.12	0.23	2.19
15.295	29875.93	447	670	675.38	57.95	0.19	3.05	0.26	3.67
15.2925	**29740.93**	**Culvert**	**Path**						
15.29	29740.93	447	669	675.3	48.19	0.13	2.6	0.19	3.21
15.28	29705.93	447	669	675.29	57.8	0.27	2.58	0.31	2.82
15.26	29605.93	447	669	675.23	71.82	0.2	2.18	0.21	2.3
15.24	29505.93	447	669	675.15	65.8	0.27	2.57	0.3	2.76
15.077	29405.93	447	669	675.03	59.35	0.29	2.62	0.31	2.79
15.076	29305.93	447	669	674.92	57.82	0.33	2.8	0.34	2.94
15.075	29205.93	447	669	674.81	109.21	0.32	2.77	0.34	2.92
15.074	29105.93	447	669	674.72	140.87	0.28	2.61	0.3	2.77
15.073	29005.93	447	669	674.65	152.41	0.23	2.33	0.24	2.49
15.072	28905.93	447	669	674.49	147.15	0.41	3.14	0.41	3.2
15.071	28860.93	447	669	674.46	56.63	0.3	2.66	0.32	2.84
15.07	28630.93	447	669	674.37	72.36	0.11	1.67	0.13	1.84
15.005	28345.93	447	669	674.25	67.92	0.14	1.86	0.16	2.03
15	28250.93	447	668.37	674.2	63.8	0.13	2.13	0.15	2.37
14.97	28180.93	447	668.94	674.17	65.45	0.1	2.01	0.12	2.25
14.945	28080.93	447	669	673.65	53.09	1.25	5.42	1.74	6.56
14.9425	**27829.93**	**Culvert**	**STH 20**						
14.94	27829.93	447	668.6	673.57	44.38	2.04	5.01	3	6.2
14.89	27709.93	447	667.92	673.45	46.65	0.32	2.8	0.42	3.25
14.81	27244.93	447	667	672.99	51.63	0.3	2.66	0.39	3.12
14.66	26869.93	531	667	672.41	55.19	0.5	3.41	0.58	3.74
14.57	26399.93	531	666.06	670.92	48.69	1.07	4.84	0.98	4.77
14.515	25779.93	531	664.1	669.51	40.26	0.44	3.28	0.53	3.71
14.5125	**25553.93**	**Culvert**	**Oakes Road**						
14.51	25553.93	531	663.7	668.5	36.82	0.47	3.99	0.59	4.55
14.45	25263.93	531	662.43	667.93	54.48	0.43	3.83	0.49	4.19
14.38	24933.93	531	662	667.46	61.87	0.35	3.55	0.4	3.89
14.34	24773.93	531	662.04	666.81	76.52	0.97	5.82	1.07	6.24
14.31	24622.33	531	662.1	666.66	66.23	0.31	2.75	0.34	2.98
14.28	24446.33	531	662	666.28	62.25	0.48	3.65	0.5	3.83
14.26	24352.33	531	662	666.12	64.48	0.42	3.42	0.44	3.59
14.21	24122.33	531	662	665.71	66.48	0.41	3.28	0.4	3.37
14.19	24020.33	531	662	665.57	73.91	0.29	2.77	0.29	2.86
14.17	23921.33	531	662	665.45	148.31	0.25	2.48	0.17	2.09
14.15	23827.33	531	661	665.34	147.42	0.2	2.26	0.14	1.92
14.12	23636.33	531	661	665.15	793.11	0.18	2.16	0.11	1.76
14.1	23472.33	531	660	665.13	125.29	0.04	1.09	0.05	1.15
14.08	23373.33	531	659	665.11	95.98	0.06	1.26	0.06	1.35

River Station	Stream Length (ft)	Q Total	Min. Channel Elevation (ft)	Water Surface Elevation (ft)	2-Year			5-Year	
					Top Width (ft)	Channel Shear Stress (lbs./ft^2)	Channel Velocity (ft/s)	Channel Shear Stress (lbs./ft^2)	Channel Velocity (ft/s)
14.06	23263.33	599	658	665.04	91.8	0.12	1.82	0.13	1.89
14.02	23090.33	599	658	664.95	98.26	0.11	1.74	0.08	1.53
13.98	22871.33	599	657.96	664.85	86.07	0.1	1.68	0.1	1.76
13.96	22765.33	599	657.92	664.82	92.94	0.08	1.53	0.09	1.63
13.94	22636.33	599	658.1	664.73	74.15	0.16	2.07	0.16	2.17
13.92	22496.33	599	658	664.66	75.08	0.15	2.18	0.16	2.29
13.9	22416.33	599	658	664.64	77.52	0.13	2.07	0.14	2.19
13.88	22306.33	599	658	664.59	79.88	0.15	2.18	0.15	2.27
13.85	22166.33	599	658	664.55	83.32	0.12	1.99	0.13	2.09
13.83	22056.33	599	657	664.54	139.2	0.1	1.83	0.1	1.86
13.82	21976.33	599	657	664.53	167.78	0.07	1.48	0.07	1.52
13.79	21826.33	599	657	664.49	145.05	0.09	1.67	0.09	1.72
13.77	21726.33	599	657	664.41	82.39	0.2	2.56	0.22	2.72
13.74	21551.33	599	657	664.26	76.09	0.3	3.07	0.3	3.18
13.735	21506.33	599	655.9	664.14	34.5	0.37	3.28	0.44	3.64
13.7325	**21460.33**	**Bridge**							
13.73	21460.33	599	656.5	663.91	36.12	0.53	3.84	0.59	4.11
13.725	21440.33	599	656.5	663.9	48.13	0.39	3.31	0.41	3.52
13.72	**21382.33**	**Bridge**	**RR Tracks (Bike Path)**						
13.71	21382.33	599	656.7	663.84	69.48	0.3	3.52	0.32	3.72
13.66	21287.33	599	656.35	663.85	94.96	0.09	1.93	0.1	2.13
13.61	20897.33	599	656	663.77	91.55	0.1	2.01	0.11	2.21
13.56	20577.33	599	656	663.71	102.34	0.08	1.79	0.09	1.98
13.51	20297.33	599	655.96	663.66	103.13	0.07	1.74	0.08	1.92
13.43	20037.33	1030	655.68	663.54	111.19	0.19	2.81	0.21	3.02
13.37	19667.33	1030	655	663.41	113.93	0.16	2.61	0.18	2.82
13.34	19527.33	1030	655.14	663.32	89.6	0.21	3.02	0.24	3.29
13.31	19342.33	1030	655	663.19	76.28	0.23	3.65	0.26	3.95
13.295	19242.33	1030	656	662.83	52.97	0.5	4.94	0.56	5.38
13.2925	**19142.33**	**Bridge**	**CTH 11**						
13.29	19142.33	1030	656.2	662.08	44.66	1.06	6.91	1.01	6.98
13.27	19087.33	1030	655	661.46	34.69	1.43	8.41	1.43	8.68
13.24	18952.33	1030	655	661.84	74.88	0.3	3.96	0.3	4.06
13.22	18862.33	1030	655	661.77	76.77	0.27	3.76	0.27	3.85
13.17	18612.33	1030	655	661.59	77.44	0.28	3.81	0.27	3.85
13.16	18512.33	1030	655	661.53	77.24	0.26	3.71	0.25	3.77
13.12	18312.33	1030	655	661.39	78.17	0.25	3.58	0.24	3.64
13.08	18132.33	1030	654	661.24	69.38	0.28	3.88	0.28	3.96
13.05	17972.33	1030	654	661.16	79.16	0.24	3.58	0.23	3.61
13.02	17832.33	1030	653	661.09	80.16	0.22	3.48	0.22	3.51
12.98	17647.33	1030	653.16	661	86.9	0.2	3.29	0.19	3.31
12.93	17412.33	1030	653	660.87	95.83	0.34	3.03	0.5	3.75

River Station	Stream Length (ft)	Q Total	Min. Channel Elevation (ft)	Water Surface Elevation (ft)	2-Year			5-Year	
					Top Width (ft)	Channel Shear Stress (lbs./ft^2)	Channel Velocity (ft/s)	Channel Shear Stress (lbs./ft^2)	Channel Velocity (ft/s)
12.89	17182.33	1030	654	660.68	97.66	0.34	2.98	0.33	3.05
12.87	17082.33	1030	653	660.59	93.71	0.36	3.12	0.34	3.12
12.83	16812.33	1030	652.73	660.39	98.15	0.3	2.84	0.28	2.84
12.79	16612.33	1030	652	660.25	97.51	0.3	2.87	0.28	2.86
12.75	16442.33	1030	652	660.13	96.07	0.32	2.93	0.29	2.91
12.69	16112.33	1030	651.11	659.94	106.83	0.24	2.58	0.22	2.54
12.67	15932.33	1030	652	659.84	104.41	0.26	2.63	0.23	2.58
12.63	15732.33	1030	652	659.79	211.29	0.11	1.7	0.08	1.54
12.59	15572.33	1030	652	659.79	237.18	0.02	0.76	0.02	0.79
12.54	15297.33	1030	652	659.77	251.28	0.02	0.68	0.02	0.71
12.51	15147.33	1030	652	659.76	226.46	0.03	0.89	0.03	0.91
12.47	14947.33	876	652	659.73	193.94	0.05	1.18	0.05	1.2
12.44	14797.33	876	650.9	659.72	209.93	0.03	0.9	0.03	0.95
12.4	14607.33	876	650	659.71	228.88	0.02	0.8	0.02	0.85
12.38	14487.33	876	650.2	659.71	246.83	0.02	0.72	0.02	0.77
12.35	14357.33	876	650.03	659.71	318.03	0.01	0.53	0.01	0.57
12.31	14127.33	876	650	659.7	315.78	0.01	0.54	0.01	0.57
12.27	13957.33	876	649.85	659.7	290.02	0.01	0.61	0.01	0.65
12.24	13777.33	876	649.52	659.68	169.82	0.05	1.02	0.06	1.08
12.235	13697.33	876	648.98	659.47	35.23	0.19	3.48	0.26	4.14
12.2325	**13618.13**	**Culvert**	**Braun Road**						
12.22	13618.13	876	649.03	659.28	32.7	0.29	4.28	0.4	5.1
12.21	13550.13	876	649.13	659.27	46.02	0.75	3.97	0.88	4.4
12.14	13215.13	876	649	658.9	43.89	0.35	3.29	0.4	3.59
12.08	12915.13	876	649	658.57	45.6	0.48	4.19	0.58	4.69
12.04	12680.13	876	649	658.35	46.3	0.5	4.27	0.6	4.76
11.99	12395.13	876	648.11	658.12	44.6	0.34	3.22	0.39	3.54
11.93	12095.13	876	648	657.83	45.68	0.33	3.2	0.39	3.51
11.87	11765.13	876	647.82	657.45	45.5	0.38	3.39	0.43	3.68
11.78	11300.13	876	647.12	656.87	44.5	0.4	3.48	0.46	3.78
11.7	10915.13	876	647	656.38	43.31	0.41	3.51	0.47	3.84
11.63	10530.13	876	647	655.8	43.63	0.61	3.52	0.69	3.85
11.55	10084.13	689	646	655.38	49.01	0.21	2.5	0.25	2.78
11.5	9829.13	689	646	655.19	45.17	0.23	2.66	0.28	2.99
11.47	9696.13	689	646	655.11	47.28	0.21	2.54	0.26	2.85
11.41	9358.13	689	646	654.79	43.31	0.39	2.8	0.48	3.16
11.32	8891.13	689	646	654.27	42.61	0.3	2.97	0.36	3.34
11.25	8516.13	689	646	653.79	37.6	0.41	3.47	0.47	3.8
11.19	8196.13	689	646	653.26	36.73	0.49	3.79	0.58	4.26
11.155	8021.13	689	646.3	653.23	223.28	0.13	2.69	0.18	3.18
11.1525	**7972.63**	**Bridge**	**County Line Road (CTH KR)**						

Fish Abundance in the North Pike River for each Phase. Data are mean number collected per sampling event averaged over years for each Phase and Overall (all Phases combined). Species are presented in the order of overall abundance detected in the North Pike River from 2001-2012.

	Phase							
Species	**1**	**2**	**4**	**5**	**7**	**8**	**9**	**Overall**
Creek Chub	15.4	71.8	26.9	95.2	78.5	65.2	145	64.3
Green Sunfish	39.7	110.5	47.1	66.3	49.3	50.3	82.8	59.5
Blacknose Dace	0	3	5	17.7	71.2	15.4	64.3	26.1
Bluegill	24.4	46.2	13.8	24.1	18.8	9	19.8	21.9
White Sucker	0.1	6.8	2.6	15.6	27.1	12.2	19.2	12.3
Fathead Minnow	3.5	11.9	9.1	10.4	8.1	1.9	3.8	7.3
S. Redbelly Dace	0	1.1	0	4	15.2	9.9	12.5	6.1
Bigmouth Shiner	0	2.2	0.4	4.5	10.1	2.8	21.7	5.1
Black Bullhead	0.8	2.9	1.2	11.8	2.2	2.4	5.5	3.5
Bluntnose Minnow	3.3	5.1	3.1	1.7	2.3	0	8.2	3
Common Shiner	0	14.2	0	0	0.1	0.7	2.8	2
Brook Stickleback	3.6	4.8	0.5	2.8	0.2	0.2	0.2	1.7
Golden Shiner	0.1	9	0.5	0	0.2	1.4	2.2	1.5
Largemouth Bass	1.9	1.5	2.6	1.7	0.6	0.8	0.7	1.4
Sand Shiner	0	1.3	4.6	2.3	0.7	0	0	1.4
Sunfish Hybrid	1.4	1.9	0.6	1.4	0.6	0.9	0	1
Central Mudminnow	3.2	1.3	0.8	0.2	0.1	0.7	0.2	0.9
Black Crappie	0	0.4	0.2	0.5	0.3	2.6	4	0.8
Pumpkinseed	0	1.9	0.1	0.3	0.2	1	0.3	0.5
Green-Bluegill hyb.	0.1	0.6	0.3	0.3	0.1	0.4	0.3	0.3
Brown Bullhead	0.1	0.1	0.1	0.6	0	1.2	0	0.3
Rainbow Trout	0	0	0	0	0.3	0.1	1	0.2
Yellow Bullhead	0	0.2	0	0.1	0	1.1	0.3	0.2
Yellow Perch	0	0.1	0	0.1	0.1	1.7	0.3	0.2
Blacknose Shiner	0	0	0	0	0.3	0	0	0.1
Green-Pumpkin hyb.	0	0.4	0	0.2	0	0	0	0.1
Brook Trout	0	0	0	0	0	0	0.5	0
Common Carp	0	0	0	0.1	0	0	0.3	0
Coho Salmon	0	0	0	0.1	0.1	0.1	0	0
Gizzard Shad	0	0	0	0	0	0.1	0	0
Goldfish	0	0	0	0.3	0	0	0	0
White Crappie	0	0.1	0.1	0	0	0	0	0

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (FRONT)

STREAM NAME	LOCATION	
STATION #_____ RIVERMILE_____	STREAM CLASS	
LAT _____ LONG _____	RIVER BASIN	
STORET #	AGENCY	
INVESTIGATORS		
FORM COMPLETED BY	DATE _____ TIME _____ AM PM	REASON FOR SURVEY

	Habitat Parameter	Condition Category			
		Optimal	**Suboptimal**	**Marginal**	**Poor**
Parameters to be evaluated in sampling reach	**1. Epifaunal Substrate/ Available Cover**	Greater than 50% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	30-50% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
	SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	2. Pool Substrate Characterization	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.
	SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	3. Pool Variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.
	SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	4. Sediment Deposition	Little or no enlargement of islands or point bars and less than <20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
	SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
	SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (BACK)

	Habitat Parameter	Condition Category			
		Optimal	Suboptimal	Marginal	Poor
Parameters to be evaluated broader than sampling reach	**6. Channel Alteration**	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
	SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	7. Channel Sinuosity	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note - channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.)	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
	SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	8. Bank Stability (score each bank)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
	SCORE ___ (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
	SCORE ___ (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
	9. Vegetative Protection (score each bank) Note: determine left or right side by facing downstream.	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
	SCORE ___ (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
	SCORE ___ (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
	10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
	SCORE ___ (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
	SCORE ___ (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0

Total Score _____

Pike River Corridor Maintenance Plan

Public Workshop
November 6, 2014
Sign-In Sheet

Name	Association / Company	Address	Phone	Email
John Ramsche		7500 County Line Rd.	262 552 9504	
Joanne Ramsche		" " " "	" "	
Bill Sasse		5010 3 Mile Rd. Racine 53406	262-989-5669	wsasse@wi.rr.com
Jim Lehman		1732 WARWICK WAY 53406	262-895-9018	
Bill & Cindy Wilson		6815 Redstone Circle 53406	262-884-8932	wpw57@wi.rr.com
Bette-Ann & Steve Patkus		1317 Willow Rd, Mt. Pleasant WI 53177	262-321-0437	
Joe Sus		2816 W. Lawn Av Racine	(262) 637-1923	
David Ancinec		7511 Braun rd	262 554 1606	

Pike River Corridor Maintenance Plan

Public Workshop
November 6, 2014
Sign-In Sheet

Name	Association / Company	Address	Phone	Email
Melissa Warner		5866 Suna Ct		melissa.warner3@sbcglobal.net
Doris Dudek		1641 - Willow Rd.		
Scott Hudek		1617 willow		
BOB EATON				
THOMAS JOY		1635 WILLOW RD.	262 884 0960	JOYTW3@GMAIL.COM
Robert Sus		2018 Russet St. (Racine)	262-632-2055	—
Kristen Belan	RA Smith National		262-317-3224	kristen.belan@rasmithnational.com
Bob & Pat Suckow		7612 Durand Ave	262-598-0406	missypat@wi.rr.com
B.D.W. Land Co. -		5113 Stuart Rd.	262-632-2953	LaVerne Dykhuis
Charles Melcher		10001 Grant Road	262-88-5114	
Chris Litzau		9345 Dunkelson Rd.	262-880-4811	investmyoath@wi.rr.com
Joe Hand		7624 Durand	554 7259	
Terri Maier		5616 Pastel La	634-8460	
Harry G. Tood		2640 Cozy Acres RD	930-2667	
Fred Loomis		1717 Green Bay Rd.	262 552 8168	FLOOMIS@WI.RR.COM
Mimi & Jack Braun		7229 Braun Rd	554-6058	

Pike River Corridor Maintenance Plan

Public Workshop
November 6, 2014
Sign-In Sheet

Name	Association / Company	Address	Phone	Email
Sam Maier		5610 Pastel Ln	262-497-7870	
Ben Maier		↓	262-999-0929	
Jim Strom		1533 Cleveland	902 0958	
David Hooten		7529 old Spring	886 5171	

HITCHCOCK DESIGN GROUP
creating better places

221 W. Jefferson Avenue
Naperville, Illinois 60540
630.961.1787

hitchcockdesigngroup.com

Meeting Summary

Date: October 28th and 29th, 2014 (revised 11/21/2014)
Time: See Sign-Up Sheets
Location: Village of Mount Pleasant
Attendees: See Sign-Up Sheets
Tony Beyer, Village of Mount Pleasant
Tim Ehlinger, ERP
Alice Thompson, Thompson & Associates (10/28)
Steve Konters, HDG

RE: Pike River Long Term Maintenance Plan

Items Discussed:

10/28, 9:00 AM (Village staff)

- Storm Water funded development of the trail and river corridor improvements, Parks maintains the trail and 4 feet to each side
  - Parks has budget restrictions to consider in potential expansion of trail responsibilities
  - Need to define best way to fund continued maintenance, discuss tax levy use
  - ERU (equivalent runoff units) fees are a funding source
  - Funding likely to remain in Storm Water role due to Parks having limited funds
  - Look at revising impact fee ordinance for the two watersheds, recalculate impact fees as river development finishes
  - Evaluate tier structure for storm water fee impact with incentives
  - Look at trails as part of transportation system for funds
  - Look into sponsorship of furnishings and amenities, memorial program
  - Look into volunteer and adopt a trail or river section programs
- Goal is for all trails to be off road, phase 4 will connect to County system
- Value of corridor includes trail use, enjoying wildlife, and access to nature
- SEWRPAC in process of park and open space plan development
  - Identifies some improvements within corridor open space but not maintenance
  - Park focus
- Village can get funding through stewardship program
  - Trail development and land acquisition focus
  - Recently had two new property acquisitions
- CMAC grant funding trail development for phases 7, 8, and 9 with a match from stewardship fund
- Key challenges
  - Invasive species
  - Defining funding source(s) and responsibilities for additional maintenance, storm water infrastructure, and water quality improvements
  - Beaver dams
  - Wood plant invasion concern for DNR in flood zone, need to define what woody areas are appropriate and take beaver activity into account
  - Furnishings starting to show wear, looking at recycled options
  - Some minor issues with pet waste
  - Upper reaches have trash and debris issues (near motel)

Page 2

    - Worn foot path created in phase 3 area by Case High School
    - Rip rap near bridge gets thrown into the culvert
    - Fish passage impacted by erosion at culvert
    - First phase path beginning to show signs of wear with cracks and weeds, not in the CIP currently
    - Need to improve education about and promotion of the corridor
    - State highway crossings unsafe, some solutions have been discussed with the State but long term (8-10 years)
    - HWY 11 rebuild project will include underpass for trail, resurface project will have at grade crossing improvements in the short term
    - Phase 4 area has issue with ATV use
- Have seen residents take ownership
- Create more rest areas along the trail
- Provide area for tents to have for runs and other events
- Improve fishing access
- 2 homes at Willow road acquired from flood issues, use for trail connection but railroad is a barrier
- Look at County trail plans for abandoned railroad spur
- Opportunity for corridor connection in phase 1 west parcel with more active recreation
    - Oaks road connection to airline road
- Parking is typically enough, need to sign areas where nearby additional parking is available
    - Some vandalism issues along Oaks Road
- Parking planned from HWY 11 access near north pond
- North of phase 5 area open to more use ideas, not encumbered by stewardship restrictions
- Note archaeological sites and consider interpretive opportunities
- Look at fill plan for phase 7
- Kenosha County planning trail connection to KR
- Sewer extension project planned in phase 9
- Archery hunting allowed in phase 8 and 9
- Indian cultural exhibit north of phase 5

10/28, 10:30 AM (Environmental group)
Hike it Baby Racine

- 200 people on facebook
- Usually groups of around 15 plus kids meet up for hikes
- Do troll trail stories with treasure hunts
- Looking to expand to biking and kayaking
- Would like to see educational sign programs
- Need more information on trail locations and access
- Would like to see trail markers

Page 3

Sierra Club

- Have been less active and more cautious with litigation concerns on outings
- Mission is advocacy
    - Information programs
    - Political advocacy and policy
- 2012 provided award to Village for Pike River
- Can help with invasive species control work days

KR Land Trust

- Working with Kenosha Co. on land conservation
- Looking for robust native areas with diverse restoration
- Recommend developing strategies for accessibility, storm water runoff management, impervious surface management, and use of permeable pavement
- Question how funds will be set aside to maintain and not let corridor degrade
- Would like to see a detailed and strong stewardship plan
    - What can and can't be done, when, and by who
- Educate the stakeholders on the corridor benefits
    - Get buy-in on the plan early, create energy and excitement

General Comments

- Will there be equestrian use
- Provide picnic areas
- Facilities for citizen scientist and educational programs
    - Sierra club could be a partner
- Support birding activities
- Creating areas of higher use can help with community ownership, monitoring, and less issues of miss-use

10/28, 1:00 PM (business group)

- See a lot of jogging and biking
- Possibility of nature center for school use
- Need signage for trail system and way finding
- Interested in outdoor school programs, and career path for environmental studies (program area at pond)
- Scenic use more than transportation use
- Any link to rootworks in Racine, this connection could be important
- Improve public identity, people want destinations not just loops
    - 6 miles plus there and back desired
- Provide emergency call stations
- Employees nearby work/life opportunity, can help recruiting employees including from Racine
- CNH has organized biking groups as wellness program
    - Potential for volunteer groups
- Some businesses not interested if not adjacent
- Consider presenting to RAMAC board
- Any properties available nearby for commercial use i.e. restaurants
- Paddling opportunities? Make it known where (better to south), provide drop points
- Salmon migration occurs in this stretch until Oaks road

Page 4

- How could CNH and others partner in providing better access
- Racine/Kenosha bike club should be contacted
- How will adjacent families react (don't sense unhappiness from any)
- Consider trail width to accommodate multi-use
    - Mark it for uses to avoid conflict or signage
- Distance markers with signs and maps noting loop distances
- Add fitness equipment and play equipment, restrooms
- Host marathons or other races
- River bend nature center, will this compete with it or be similar to it

10/28, 2:30 PM (governmental organizations)

- Benefits and continued focus on correcting erosion and restoring wetlands, slowing water and increasing capacity
- Working with agricultural owners on water quality BMPs, holding rain water, buffers zones 75' each side of channels preferred for every tributary for easement areas
- NRCS provides programs that provide funds for conservation lands
    - Economic driven
    - could use regulations, NR151 on agricultural properties for ag fields
- Need to get tribs under control to avoid silt and other contamination to pike river storage areas
- Agricultural drain tiles are probably a key nitrate issue, work with owners to test their drain tile water quality
- Wisconsin drain tile water quality behind other states, more point source control and buffers with testing showing results
    - Work with agricultural owners to check nutrient management plans
- Native American arrow heads found
    - Interpretive programs considered
- US fish and wildlife would be interested in native fisheries and habitat
- Invasive species education and management programs/volunteer
    - Look to grants and partnerships to create buffers as part of invasive species management
    - NRCS enforces easements being kept up to standards
- Technical expertise could be provided by US fish and wildlife and NRCS to educate stakeholder and rally the cause
- Need clear communications so stakeholder understand how they are impacted and the benefits
    - Need to have answers ready to avoid assumptions and incorrect information spreading
- 60-70 % land owners looking for assistance, rest is complaint or regulation driven
- Have an on the ground representative meeting with landowners(i.e. CREP, SAFE programs)
- Government involvement is a perceived barrier with some landowners for working with them toward water quality and buffer development
    - Need education, build trust and relationships, conservation tours, financial benefits
- Takes time to get buy in and action with land owners along tribs
- Partners for fish and wildlife program, restoration with cost share and technical assistance along with invasive species management (10 year agreement, but can back out)
- Get summary from NRCS website annual reports show the available programs

Page 5

10/29, 8:30 AM (WDNR Peter Wood)

- Storm water discharge permits and storm water grant program for erosion control
- Regulate MS4 permit
- Have dealt with one water quality complaint on south stretch
- Goal to get is de-listed for impaired water status, avoid TMDL (total max daily load) development
    - Impaired for phosphorus and sediment
    - **Have a more detailed discussion on this goal
    - Tim – nitrate may be an issue, phosphorus probably not
- Need to maintain the storm water practices (off line ponds) built under IDNR permit
    - Normal inspection and maintenance
    - Permit focuses on urban area, approx. north of oaks road
    - IDNR has guidelines for maintenance – self regulating
- How can a credit amount be assigned to stream stabilization or other projects/activities for credit toward MS4 permit
- How to deal with cooling water chlorine discharge
    - EPA may establish a limit to allow IDNR to address it
    - Summer season has dependency on this flow
    - Is the discharge pond water of the state which would kick in other maintenance requirements (peter to answer this question)
- Base flow has improved with water retention facilities in the corridor
- How is village of Sturtevant MS4 discharger impact this corridor
- DNR permits the industrial land permits with little over site, can village involvement improve the process
    - Get the industrial owners to work together, establish goals, compare notes
    - Case, payne and dolan, bus company, waxdale (peter to provide list)
    - How can DNR or RPWIN help provide incentive and facilitate – reduce time, effort, money on permit implementation and maintenance
    - Green tier program available (PR benefits) – help companies recruit
- Can solutions be developed for large parking lot water quality treatment

10/29, 9:30 AM (RPWIN, Allison Thielen)

- Has a webpage dedicated to pike river – can be a PR partner
- Information and education goals can use some focus for watershed goals – involve volunteers
- Have a friends group for other areas – develop one hear
- Can organize groups for volunteer training and maintenance
- Educate home owners and respect our waters campaign event, can help with other events
- SE wis clean water network – education and outreach as part of MS4 permit requirements, tv and radio interviews, speak at schools, setup booths at community events – RPWIN is the education and outreach consultant for Mt. P. and 16 other municipalities
    - E-new letter
- Improve signage at entries, get people to know this is there, social media public awareness campaign – signs on wildlife and ecology, prairie plant scavenger hunt sign/activities
- Downloadable resources and activities
- Grant program RPWIN for educational (watershed based program meeting mission) 1/3, other 2/3 restoration activities
- RPWIN can fund water quality monitoring and citizen science programs, does not typically coordinate and implement them

Page 6

- RPWIN can oversee groups that adopt portions of the corridor
- Obstacles
    - Funding for RPWIN involvement
    - Leadership of other groups (volunteers, companies)
    - Have submitted for funding on seminar programs to educate landowners
    - Find other landowner champions for this work and build the relationships
- Work toward a self-sustaining corridor – community support, volunteer groups, large groups engages such as school and large companies, having people know about this asset
    - Grand opening events, education events
- Have walks and runs on these trails
- Trails are key element, fishing, expanding these opportunities
- Publicize what RPWIN objectives get met
- Help RPWIN leverage more funding

10/29, 11:30 AM (WDNR, Craig Helker)

- Water resource reviews for permitting
- Review reports
    - Improvement in habitat and water quality from poor to good
    - 303D listing for sedimentation discussion needs to occur
        - Goal is to delist
        - Funding benefit to be on the list for points
    - Toxicity and habitat are the impairments (primarily sedimentation)
    - Process is a written request to IDNR on reasons why is should be delisted, they will assist with EPA approval
    - Celebrate and showcase the improvements
    - 2016 next list update to target
- Initial jump in IBI scores for bugs,
    - Focus on how to maintain the quality
    - Look back on habitat improvements (assessment) of what worked and what didn't, how to adjust
- Trail is a key gem of the corridor, fishing access secondary
- Engage people into the wetlands
    - Will need active management to avoid negative impacts
- Aquatic plan management could be a key challenge for long term
    - Education so people know not what to do, what to look for, who to contact for invasive species
    - Monitoring program - could be challenging to use volunteers for quality control on data, technical knowledge, change over
- Increased recreation activity would be invaluable
    - Provide a part-time park ranger
- Need to manage for beaver and muskrat
- Getting pike back into the system still a goal
    - Oaks culvert still an impediment to fish, road widening will eventually be opportunity to improve
    - Look for grant opportunities
- Need local ownership of the compliance monitoring for plan to succeed (Tim), foster role for local expertise (Parks, GAI, citizen science, RPWIN)
- DNR can help facilitate monitoring
- Can help fund establishment of friends group through river grants

Page 7

    - Use friends group for education
- Have the process include a way to sell the plan to promote for other watersheds

10/29, 1:30 PM (Stephanie Meiri, Borzynski Farms) (Lori Artiomow and Joe Fonk, Hawthorn Hallow)

- Trail connection can be organized tours from HH
- Look at this plan as extension of watershed plan, don't forget south branch
    - Use pike project as message that there is more work to do in the watershed
- Connectivity north to south branch
- HH can help publicize/promote north branch improvements and amenities
- HWY 31 crossing will be Kenosha County?
- Invasive species management – will there be enough resources
- Educational partnership opps
    - Need to be closer to HH
    - HH open to public but also membership based with mostly Racine and Kenosha
    - HH has a friends group, could be a model
    - HH can help with build-up work groups and provide the expert leadership
- Use Pike to as model for Town of Sommers
- Heidy family is a large landholder, more to the south
- Improved use of the corridor will be a measure of success
    - Holding flood water
- More usage and education will help development of a friends group
- Long term vision of a nature or education center, rent bikes and kayaks
- HH seen as its own nature piece not as part of the river corridor identity
- Provide education on being part of a watershed and what it means
- Indian trail interpretation – may not go through pike corridor
- What is the vision and plan for citizen science role

Stephanie Meiri

- Food security audit to allow selling to larger providers
    - Issues of dogs, people, animals kept off property
    - Keep unauthorized people out of fields – bacterial contamination
    - Has not been an issue yet
    - Going to become law
    - Provide education to public on concerns
- Showcase agricultural history and importance to the community
- Guidelines for what is expected will likely be coming when the act is passed
- Showcase locally grown food source
- Use of plants for a barrier
- More outreach is needed for people to know about the trails and assets
- Need physical barrier to keep dogs out
- Mike Miller leases small property and stand - could be resource
- Partner with Borzynski's on education development

Mike Luba

- WIDNR, Basin Supervisor based out of Milwaukee
- Long bumpy history with the watershed, original application from the village included a dredge, straight, flood control only. Recreation was not originally considered in the

improvements. The DNR said no to the application. Lawyers spend a year in facilitation and prevailed with a permit with flood control, wetland restoration, storm controls, buffer strips that the original plan did not possess.

- Success: solved flooding issues in northern portion, there was no catastrophic flooding when other communities were having issues in the early 2000's
- Historically there was not a lot of support. Residents along the corridor adamantly opposed the project. 90% of condo owners near phase 1 opposed but by the end of the project were offering to cook construction workers meals. It is now seen as an amenity.
- Benefits to the community: biking, walking, babies in strollers, exercise.
- Largest plus: public support
- One opposed resident, continues to oppose due to concerns regarding maintenance. (does not live near the corridor, thus does not benefit)
- Invasive species a big issue.
- Amazed by lack of trash, gets a sense that someone is policing and taking care of the corridor.
- Programs and partnerships, provided examples of other successful groups and contacts including:
    - Adopt a "x" groups
    - Friends groups
    - Lampham Peak in Kettle Moraine (group driven cross country ski trails etc.
    - Lighthouse in Lake Park, Milwaukee
    - Root-Pike Win
- Grants and other funding mechanisms:
    - Jim Richie, Coordinates grant applications and could assist
- Glaring problems/issues:
    - Village opposed to woody vegetation in floodplain. Research indicates that the stream flows north/south. The water warms and is not hospitable for fish habitats. Rethinking this an getting the rights species to shade and cool water down to support habitat.
    - Tim identified a lack of sand and gravel in the stream. Tim asked if there we would be any issues with permitting the placement of sand and gravel at key locations to assist in controlling erosion and sedimentation.

- Consortium for businesses
    - Green Tier program discussed
    - Would be good to get commercial retailers to participate
    - Group applications are possible.

- Pike River Corridor as a case study?
    - Lessons learned: Expensive, economic benefits, added developable land that was once in the floodplain, tax base, amenity

- Regulatory environment:
    - Consider de-listing the Pike River. Water will be subject to new TMDL and TSS load reductions up to 80%. Milwaukee, KK and Menomonee may be the first on the block.

cc: Team
Tony Beyer, Village of Mount Pleasant

INSPECTION FORM

PIKE RIVER CORRIDOR STORM STRUCTURES

Structure ID: _____

Phase: _____

Structure Type / Function (circle one):

Pond outfall / Roadside ditch drainage
Pond outfall / Connecting storm sewer or drain tile
Pond outfall / Yard drainage
Riprap slope reinforcement
Bridge or culvert crossing
Road name:_____
Channel outfall / Roadside ditch drainage
Channel outfall / Connecting storm sewer or drain tile
Channel outfall / Trail crossing
Channel outfall / Pond connection
Pond connection
Pond connection / Trail crossing
Pond connection to channel
Multi-stage outlet structure
Riprap spillway
Stone core filter
Retaining wall
Other (please specify):_____

Size:

Diameter: _____

Box length and width: _____

Riprap protection length and width: _____

Material (circle one):

Reinforced concrete
Corrugated metal
Heavy riprap
Medium riprap
Light riprap
HDPE
Clay
Plastic
Other (please specify):_____

Shape (circle one):

Round
Horizontal elliptical
Conspan arch
Box
Arch
Modular block
Other (please specify):_____

End-wall or Wing-wall? (Check one): Yes_____ No_____

Grate / Trash rack? (Check one): Yes_____ No_____

Riprap apron? (Check one): Yes_____ No_____

Stable slope? (Check one): Yes_____ No_____

Description of field observations / condition of structure:

_____

_____

_____

_____

_____

_____

Maintenance recommendations:

_____

_____

_____

_____

_____

_____

STORMWATER STRUCTURES

Phase 1

Structure 1

Structure 2

Structure 3

Structure 4

Structure 4

Structure 4

Structure 4

Structure 4

Structure 4

Structure 4

Structure 5

Structure 7

Structure 7

Structure 7

Structure 8

Structure 8

Structure 8

Structure 8

Structure 8

Structure 9

STORMWATER STRUCTURES

Phase 1 (continued)

Structure 9

Structure 9

Structure 10

Structure 10

Structure 10

Structure 10 - DS Side

Structure 10 - DS Side

Structure 10 - DS Side

Structure 10 - DS Side

Structure 10 - DS Side

Structure 10 - DS Side

Structure 10 - DS Side

Structure 10 - DS Side

Structure 10 - DS Side

Structure 10 - US Side

Structure 10 - US Side

Structure 10 - US Side

Structure 10 - US Side

Structure 10 - US Side

Structure 10 - US Side

STORMWATER STRUCTURES

Phase 1 (continued)

Structure 10 - US Side

Structure 10 - US Side

Structure 10 - US Side

Structure 10 - US Side

Structure 10 - US Side

Structure 11

Structure 11

Structure 11

Structure 12 - DS West End

Structure 12 - DS West End

Structure 12 - US East End

Structure 12 - US East End

Structure 13 - DS

Structure 13 - DS

Structure 13 - US

Structure 13 - US

Structure 14

Structure 14

Structure 15

Structure 16

STORMWATER STRUCTURES

Phase 1 (continued)

Structure 16

Structure 16

Structure 16

Structure 16

Structure 17

Structure 17

Structure 17

Structure 17

Structure 17

Structure 18

Structure 18

Structure 18

Structure 18

Structure 18

Structure 19

Structure 19

Structure 19

Structure 20

Structure 20

Structure 20

STORMWATER STRUCTURES

Phase 1 (continued)

Structure 20

Structure 20

Structure 20

Structure 21

Structure 21

Structure 22

Structure 22

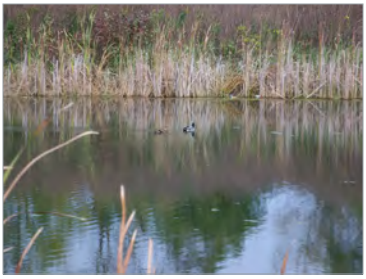
Structure 22

Structure 23

Structure 23

Structure 24

Structure 24


Structure 24

Structure 25

Structure 25

Structure 25

Structure 25

Structure 26 - East

Structure 26 - East

Structure 26 - East

STORMWATER STRUCTURES

Phase 1 (continued)

Structure 26 - East

Structure 26 - East

Structure 26 - East

Structure 26 - West

Structure 26 - West

Structure 26 - West

Structure 26 - West

Structure 28 - East

Structure 28 - East

Structure 28 - East

Structure 28 - West

Structure 28 - West

Structure 28 - West

Structure 29 - East

Structure 29 - East

Structure 29 - East

Structure 29 - East

Structure 29 - East

Structure 29 - West

Structure 29 - West

STORMWATER STRUCTURES

Phase 1 (continued) and Phase 2

Structure 29 - West

Structure 29 - West

Structure 29 - West

Structure 29 - West

Structure 29 - West

Structure 29 - West

Structure 30

Structure 30

Structure 30

Structure 30

Structure 31

Structure 31

Structure 31

Structure 31

Structure 31

Structure 32

Structure 32

Structure 33

Structure 33

Structure 34

STORMWATER STRUCTURES

Phase 2 (continued)

Structure 34

Structure 34

Structure 34

Structure 34

Structure 34

Structure 34

Structure 34

Structure 34

Structure 35

Structure 35

Structure 35

Structure 36

Structure 36

Structure 37

Structure 37

Structure 37

Structure 37

Structure 37

Structure 38

Structure 38

STORMWATER STRUCTURES

Phase 2 (continued)

Structure 38

Structure 38

Structure 39

Structure 39

Structure 39

Structure 39

Structure 40

Structure 40

Structure 41

Structure 41

Structure 41

Structure 42

Structure 42

Structure 42

Structure 42

Structure 42

Structure 43

Structure 43

Structure 44

Structure 44

STORMWATER STRUCTURES

Phase 2 (continued) and Phase 3

Structure 45

Structure 45

Structure 45

Structure 45

Structure 45

Structure 46

Structure 46

Structure 47

Structure 47

Structure 47

Structure 47

Structure 48

Structure 48

Structure 48

Structure 49

Structure 49

Structure 50

Structure 51

Structure 51

Structure 52

STORMWATER STRUCTURES

Phase 3 (continued)

Structure 53

Structure 53

Structure 53

Structure 53

Structure 54

Structure 54

Structure 55

Structure 55

Structure 56

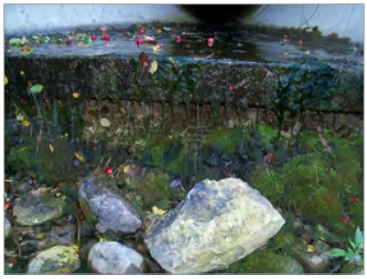
Structure 56

Structure 56

Structure 56

Structure 58

Structure 59


Structure 59

Structure 59

Structure 60

Structure 60

Structure 61 - DS

Structure 61 - DS

STORMWATER STRUCTURES

Phase 3 (continued) and Phase 4

Structure 61 - US

Structure 61 - US

Structure 62

Structure 62

Structure 62

Structure 63

Structure 63

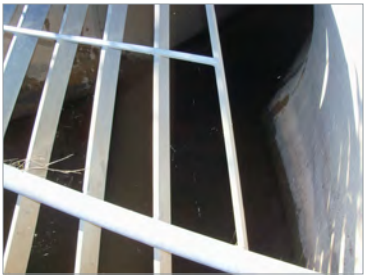
Structure 65

Structure 65

Structure 65

Structure 66

Structure 66


Structure 66

Structure 66

Structure 66

Structure 67

Structure 67

Structure 67

Structure 67

Structure 68

STORMWATER STRUCTURES

Phase 4 (continued)

Structure 68

Structure 68

Structure 68

Structure 68

Structure 68

Structure 69

Structure 69

Structure 69

Structure 69

Structure 69

Structure 69

Structure 69

Structure 70

Structure 70

Structure 70

Structure 70

Structure 71

Structure 71

Structure 71

Structure 71

STORMWATER STRUCTURES

Phase 4 (continued)

Structure 72

Structure 72

Structure 72

Structure 72

Structure 72

Structure 72

Structure 72

Structure 73

Structure 73

Structure 73

Structure 73

Structure 73

Structure 73

Structure 75 - DS

Structure 75 - DS

Structure 75 - DS

Structure 75 - DS

Structure 75 - DS

Structure 75 - US

Structure 75 - US

STORMWATER STRUCTURES

Phase 4 (continued) and Phase 5

Structure 75 - US

Structure 75 - US

Structure 76

Structure 76

Structure 76

Structure 76

Structure 76

Structure 77

Structure 77

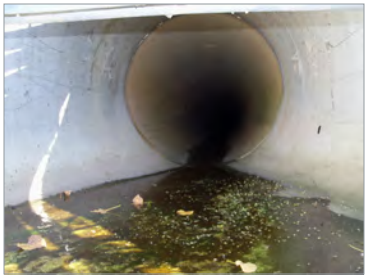
Structure 78

Structure 78

Structure 78

Structure 79

Structure 80


Structure 80

Structure 80

Structure 81

Structure 81

Structure 86

Structure 86

STORMWATER STRUCTURES

Phase 5 (continued) and Phase 6

Structure 86

Structure 86

Structure 87

Structure 87

Structure 87

Structure 87

Structure 88

Structure 88

Structure 88

Structure 88

Structure 89

Structure 89

Structure 89

Structure 89

Structure 90

Structure 90

Structure 90

Structure 90

Structure 92

Structure 93

STORMWATER STRUCTURES

Phase 6 (continued) and Phase 8

Structure 94

Structure 94

Structure 94

Structure 95

Structure 95

Structure 95

Structure 96

Structure 96

Structure 97

Structure 97

Structure 98

Structure 98

Structure 99

Structure 99

Structure 104

Structure 104

This Page Intentionally Left Blank

APPENDIX F - MONITORING AND ADAPTIVE MANAGEMENT PLANS

Phase 1 Restoration

Pike River Ecosystem Restoration
Phases 8 and 9

Village of Mount Pleasant
Racine County, Wisconsin

US Army Corps
of Engineers ®
Detroit District

TABLE OF CONTENTS

INTRODUCTION 1
Monitoring Plan 1
Adaptive Management Plan 1
MONITORING OBJECTIVES 2
Wetland Monitoring Objectives: 3
Prairie Monitoring Objectives: 3
MONITORING METHODS 4
Qualitative 4
Quantitative 4
MONITORING REPORTING 5
DISPOSITION AND ANALYSIS OF INFORMATION 6
COST OF MONITORING 6
PARTY RESPONSIBLE FOR MONITORING 6
Monitoring Plan 6
Monitoring 6
ADAPTIVE MANAGEMENT PLAN 7
ATTACHMENT 1 – Vegetation Transects 8

List of Figures

Figure 1. Six Steps of Adaptive Management 2

List of Tables

Table 1. Monitoring Costs 6

List of Appendices

Appendix F1 – Habitat Unit Analysis

Appendix F2 – Habitat Unit Computations

Appendix F3 – Habitat Unit USFWS Habitat Suitability Index

INTRODUCTION

Section 2039 of WRDA 2007 directs the Secretary of the Army to ensure, that when conducting a feasibility study for a project under the U.S. Army Corps of Engineers ecosystem restoration mission, that the recommended project include a monitoring plan to measure the success of the ecosystem restoration and to dictate the direction to which adaptive management, if needed, should proceed.

Monitoring Plan - A monitoring plan is an important tool to help establish post-construction success of an ecosystem restoration project. Monitoring provides data to compare pre- and post-project conditions, allowing one to gauge the success of the project, and/or recognize when or if implementation of adaptive management is necessary to achieve the project objectives. A monitoring plan includes a description of the monitoring activities to be carried out, the criteria for ecosystem restoration success, the estimated cost and duration of the monitoring, and a discussion of adaptive management.

The purpose of monitoring is to provide actionable information to assess whether implementing the project's recommended alternative plan has achieved the project's objectives. The objectives for the Pike River project include restoring the Pike River wetlands and prairie habitat located within the floodplain. Achieving this objective will require excavation of the floodplain, restoration of the river channel with meanders, riffles and pools, log jams, planting and seeding of the floodplain with native vegetation and monitoring to verify establishment of the wetlands and prairies. Operations and maintenance activities will also occur to remove non-native vegetation and re-seed and plant native vegetation, as required. Controlled burns and selected use of herbicide may also be used for prairie maintenance activities with appropriate coordination with WDNR.

Plant growth with prairie restoration takes time for the seeds to germinate and the plants to flower. Based on past prairie establishment projects, it is likely that the site will show an increase (positive trajectory) in wetland and prairie species from year 0-5. As such, the monitoring period for adaptive management may be extended to a 10 year period for successful ecosystem establishment. Monitoring will be conducted in year 0, 3 and 5 and as needed by the village after year 5. If monitoring success criteria are met in year 5, the recommendation will be made that further monitoring will not be required. The duration of monitoring may be lengthened past year 5 if adaptive management becomes necessary to achieve the project objectives. Monitoring the results of the restoration activities will commence after the construction contract has been concluded and would involve the monitoring objectives and methods identified on pages 2 - 5.

Adaptive Management Plan - Adaptive management is an iterative process (Figure 1) that integrates results and analysis of long term monitoring with adjustments to project operation to inform environmental protection and operational efficiency decisions. An adaptive management plan (AMP) describes the process for evaluating the results of the monitoring program, membership and responsibilities of the interagency team,

"triggers" or action points that would necessitate a restoration corrective action of the project and potential changes that would be implemented to mitigate adverse impacts.

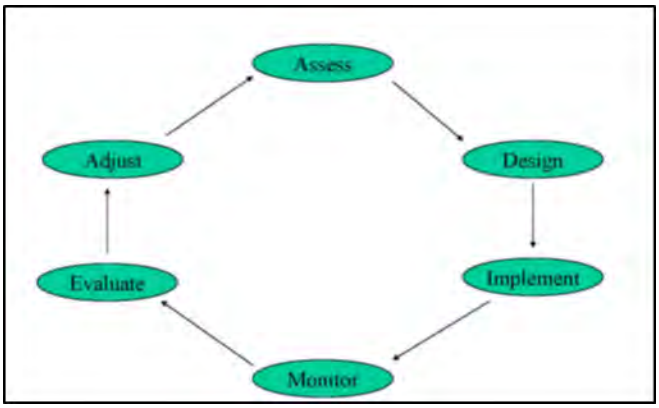


Figure 1. Six steps of adaptive management (USACE)

The Pike River AMP describes how the restoration of the Pike River AMP ecosystem, floodplain wetlands and prairie will be adjusted if long term monitoring finds that the restored habitats have not met the project's objectives. See Page 7 for further information on the AMP.

MONITORING OBJECTIVES

Key project specific parameters to be measured for this Pike River project were identified based on their relevance to determining whether the project's objectives would be met. The project specific parameters for monitoring include: monitoring of native and non-native vegetation within the planted floodplain wetland and prairie habitat.

The following assumptions are made regarding monitoring within the project area:

- **Access/mapping needs**: The monitoring plan assumes that the construction haul road is still usable for access to the project site by off road vehicles. Depending on which year the construction is completed the project area may need an "after" aerial photo taken independent of the Racine County aerial photos which are on a 5 year schedule (next photo 2015- not viewable until 2016). It is difficult to map the vegetation without a recent "after" construction aerial photograph.

- **Climate/off-site concerns:** The project objectives assume that the climatic conditions, especially in the first three years post construction are average or close to average particularly in regards to precipitation. The project objectives could be negatively impacted by successive very dry years or very wet years. The project could also be negatively impacted by off-site impacts that are beyond our control for example herbicide/pesticide over-spray on the margins of the site or extensive un-authorized off road vehicle damage.

After construction is complete, the floodplain that was excavated and seeded to restore prairie habitat should be inspected annually and invasive species removed. At year 5, vegetation surveys will be conducted along established transects to determine if the prairie habitats meet the minimum goal for success as outlined in the project's objectives. Prairie restoration can take many years and some of the prairie species do not exhibit identifiable characteristics until years 4-6. If the transect data results indicate that the prairie will not meet the goal for establishment as outlined in the project objectives, then re-plantings with native seeds or plants or further management would occur. The purpose of the inspections will be to identify whether the vegetation meets the definition for successful restoration and assist in the maintenance of the restoration to facilitate the best outcome.

Wetland Monitoring Objectives:

1. Wetland vegetation shall be evaluated by cover, relative cover, species richness and Floristic Quality Assessment (FQA). All wetland plots will be evaluated by facultative status (Midwest list, 2013). Relative cover of species with facultative, facultative wetland or obligate status will be greater than 50% in 75% of wetland plots by year 5.
2. Those plots not meeting Standard #1 shall either meet Prairie standards below, or a different wetland standard.
3. Wetland areas with ponding causing bare areas will be determined to be "mud flats" and meet standards if they are on an appropriate landscape position that ponds seasonally.
4. Vegetation species richness shall be on a positive trajectory from year 0-year 3-year 5.
5. Wetland forb-rich areas shall attract at least three-six species of butterflies by year 5.
6. Wetland areas shall be utilized by wildlife- use by a variety of mammals, birds and amphibians or reptiles shall be noted on monitoring visits by scat, nests, bedding, calls, tracks, presence or other means. All wildlife observations shall be reported. Wildlife usage shall be a positive trajectory from year 0-year 5.
7. Vegetation on the streambank shall provide cover to the stream by year 5, creating overhanging areas that shade the stream. These areas shall be located with GPS and documented on vegetation maps in years 3 and 5. Stream shading shall increase over time from year 0- year 5.
8. Wetland vegetation shall be analyzed by FQA as with prairie vegetation (standard #6) and shall also be reported as a test of the ability of FQA to monitor restoration success.

Prairie Monitoring Objectives:

1. Prairie vegetation shall be evaluated by cover, relative cover, species richness and Floristic Quality Assessment (WFQA).

2. Prairie vegetation species richness shall be on a positive trajectory from year 0-year 3-year 5.
3. Native Prairie vegetation as measured by cover or relative cover in plots shall increase over time from year 3 to year 5 and either 50% of plots shall have 50% or greater native species cover, OR native cover will be greater in year 5 compared to year 3 in a majority of plots. Prairie areas not meeting this objective shall met a different prairie objective.
4. Prairie forb-rich areas shall attract at least three species of butterflies by year 5.
5. Prairie areas shall be utilized by a variety of mammals, birds and amphibians or reptiles and shall be noted on monitoring visits by scat, nests, bedding, calls, tracks, presence or other means. All wildlife observations shall be reported. Wildlife usage shall be on a positive trajectory from year 0-year 5.
6. Prairie vegetation shall be analyzed using Floristic Quality Assessment (WFQA) methodology as developed by Coefficient of Conservatism Expert Group (Bernthal, Final Report to USEPA-Region 5, June, 2003). This project shall be a test of the FQA method to assess the success of native vegetation establishment as compared to cover, relative cover and species richness.
7. Data analyzed shall be reported to U.S. Army Corps of Engineers, Detroit District (COE), WDNR, and EPA and presented at a conference (e.g., Wisconsin Wetlands Association annual conference or other appropriate regional conference) by year 5. Although we cannot predict an actual target FQA with confidence, we will consider a positive trajectory of FQA over time from year 0-year 3- year 5 to be an indication of successful native vegetation establishment.

MONITORING METHODS

Monitoring will consist of gathering data on the botanical communities to indicate if restoration actions resulted in predicted benefits, i.e. establishment of wetlands and prairie types. Variables that will be monitored along established transects include native/non native vegetation, native plant species richness and abundance.

Qualitative: In years 1, 2 and 4 post construction annual monitoring visits shall assess vegetation, bare areas, invasive weeds, and other areas of concern. A species list shall be generated for wetland and prairie areas with species noted and few (<5%), common (5-20%) or dominant (>50%) as a qualitative measure of abundance. We will experiment with using a version of the “Best Professional Judgment visual a priori quality ranking scale for wetland mitigations” (Table 1 on page 151 from DeBoer, The Use of Floristic Quality Assessment as a tool for monitoring wetland mitigations in Michigan, The Michigan Botanist, vol. 50, 2011) as a measure of native vegetation success for wetlands and prairies. These qualitative methods shall be used to inform better management to meet native vegetation objectives in years 3 and 5. A short report shall detail these qualitative findings.

Quantitative: Vegetation shall be sampled in 1 square meter plots (1 x 1 meter) located along a vegetation transect. The transect locations are shown on the attached figure. Seven transects are located perpendicular to the river gradient to cover all habitat types.

The 1 square meter plots shall be located 100 meters apart, for example a 600 meter line shall have 6 plots located on it. Transects 1, 2, 4, 5, 6 and 7 shall have 6 plots each, and transect 3 shall have 9 plots for a total of 45 plots sampled. All plot locations shall be staked and identified by GPS coordinates to provide the ability to re-sample the same area in subsequent years.

Sampling shall be in mid to late summer when grasses and forbs are most readily identifiable. Plants within each plot will be identified to species and the total cover of all vegetation in the plots shall be measured by cover class according to the Daubenmire cover classes: 1 (0-5%), 2 (5-25%), 3 (25-50%), 4 (50-75%), 5 (75-95%), 6 (95-100%) (Daubenmire, Rexford.1959. A Canopy-coverage method of vegetational analysis. Northwest Science 33:43-64.) Vegetation that has 0-5% cover shall be recorded as a mean of 2.5, 6-25% cover shall be reported as a mean of 11.5, 26-50% cover shall be recorded as a mean of 37.5% cover, 51-75% cover shall be reported as 85% cover and 76-100% cover shall be recorded as 97.5% cover. Total cover and relative cover shall be calculated for all species found in the plots. Species shall be noted as native, non-native, wetland indicator status, and vegetation habitat classification as well as the C-Value. Species richness and Floristic Quality Assessment can also be measured.

Plots shall be located along a topographical and hydrologic gradient, those with over 50% upland species (Facultative upland and upland) shall be evaluated separately from those with over 50% wetland species (Facultative, Facultative wetland and Obligate) in order to distinguish between native dry and mesic (upland) prairie and wetland communities including sedge meadow, emergent aquatic and wet -mesic prairie. Vegetation communities shall be classified as emergent wetlands, sedge meadow, wet-mesic prairie, mesic prairie, upland prairie.

MONITORING REPORTING

Yearly reports on the quantitative data collected and management concerns and recommendations shall be made in years 1,2 and 4. A preliminary (3rd year) report shall be prepared with Management recommendations for particular areas, and a final report (5th year) shall be prepared comparing the three year and five year data, evaluation success of native prairie establishment and making any recommendations for the future. These reports shall be reported to the COE no later than February 28 in the following year of data collection.

The 3rd and 5th year reports shall include the method, results for wetland and upland areas including species, species richness, total cover, relative cover, and floristic quality assessment. A map of vegetation zones shall be prepared as well. Photos of representative areas shall be included. Discussion shall include how the project met, or failed to meet project objectives, trending of vegetation succession based on the three and five year data, and management recommendations for the future.
The final report shall include an evaluation of the use of FQA in assessing the restoration and results shall be presented at a regional conference and reported to all interested agencies (see Prairie Monitoring Objective # 6).

DISPOSITION AND ANALYSIS OF INFORMATION

The information gathered as part of the monitoring program should be collected in coordination with the WDNR to insure consistency and comparability with previously collected data. Results of the plant species sampling should be recorded and reported to the COE and project stakeholders not later than February 28 of the year following data collection years. The data should be presented in well organized and easy to follow excel spreadsheets that are accompanied by a narrative explaining the results and discussing whether they indicate the project is achieving its objectives.

COST OF MONITORING

Total cost per year for the required monitoring is shown in the following table and would be approximately $27,300 over 5 years. It is fully anticipated that the project objectives will be met by year 7 of monitoring and may be met by year 5. The following table details required estimated five year monitoring costs.

Table 1: Monitoring Costs

Year	Parameters to Monitor	Costs
1	Qualitative monitoring	$3500
2	Qualitative monitoring	$3500
3	Vegetation and habitat	$8300
4	Qualitative monitoring	$3500
5	Plan Vegetation and habitat	$8500
	Further Monitoring as needed	
6		
7		
8		
9		
10		
	Total	**$27,300**

PARTY RESPONSIBLE FOR MONITORING

Monitoring Plan - The monitoring plan for the Pike River project will be cost shared between the U.S. Army Corps of Engineers, Detroit District (COE) and the Village of Mount Pleasant (non-federal sponsor) for up to 5 years as expressed in the Project Partnership Agreement (PPA) or until the District Commander deems success of the project.

Monitoring - The Village of Mount Pleasant (non-federal sponsor) is responsible for performing or having the monitoring performed. The Village of Mount Pleasant can continue to monitor beyond the agreed upon 5 year period at their own cost.

ADAPTIVE MANAGEMENT PLAN

Adaptive management is the process of using post action monitoring data to determine whether additional actions are required to meet project objectives. Adaptive management needs to be driven by the information gathered during post action monitoring. It is expected that by year 5, sufficient information will be available to determine whether the project was a success. Success is defined as meeting the project objectives.

Adaptive management measures are not expected to be needed except in selected area as the proposed ecosystem restoration project is well understood and readily predictable and has occurred in the upstream areas by or after year 5. There is a high level of agreement among the resource agencies and other involved parties that the proposed restoration will effectively provide the desired project goals. The desired outcome of this restoration is well understood by the parties involved and is easy to predict and measure. The nature of this project and the project design combine to provide a high level of confidence that the project goals will be achieved.

The probability of failure to meet the project goals is considered low. The major items of concern for project function are:

- Invasive species due to the extensive soil surface modification and the slow growth of herbs and forbs that dominate the prairie habitats.
- Extremely wet or dry conditions during the first three (3) growing seasons.

These are not adaptive management items but are part of operation and maintenance of the project. Invasive species control will be addressed in the project's Operations and Maintenance manual, which will require annual project inspections, including observations of habitat and invasive species control.

Detailed adaptive management actions need to be devised based on the monitoring data as follows:

- Observe and record the plant species along the established transects. Identify any non-vegetated areas greater than 400 square feet in size unless they are ponded repeatedly and acting as a mud flat. Re-seed as necessary. Identify species along the transect and verify the restoration meets the established goal above.

- Annually conduct site inspections and remove any invasive plant species.

Adaptive management actions need to be tailored to the specific issues encountered and may vary depending on the magnitude of the discrepancy between post construction conditions and desired conditions. Therefore, the specifics of the adaptive management actions should involve a multi-disciplinary group that includes, at a minimum, the WDNR, non-federal sponsor and USACE.

Appendix F1 – Habitat Unit Analysis

Pike River, Village of Mount Pleasant

Racine County, Wisconsin

Section 206

Ecosystem Restoration

INTRODUCTION

In post ice age time up to the mid 1800's, the Pike River was similar to most rivers entering the Great Lakes. The river watershed consisted of emergent and submergent wetlands, meadows and prairies. A pre-settlement map depicts the vegetation as surveyed by the General Land Office prior to development (Figure 1). The lands which were to become Racine County were dominated by prairie consisting of prairie grasses including big bluestem and composites, oak savannahs consisting of bur oak, white oak and prairie grasses including big bluestem in the understory and sedge meadows with sedges, blue joint grass and cord grass. The pre-settlement landscape was typical of southern Wisconsin consisting of prairie, southern mesic forest and savannah, lowland hardwoods, sedge meadows. These lands were cleared of forests, ditched, tiled and converted to prime farmland in the 18th and 19th Century.

All features of this study have been determined to be within the Federal interest, policy (ER 1105-2-100) and the Section 206 authority. The proposed plant communities including emergent, sedge meadow, wet-mesic prairie and mesic prairie. These plant communities are scarce vegetation types and proposed for restoration within the floodplain restoration area in Phases 8 and 9. Project restoration activities also include the restoration of the Pike River with meanders, riffles and pools. The overall objective is to increase species richness of native plant prairie communities, increase the native plant herbaceous layer and restore the Pike River ecosystem.

HABITAT UNIT ANALYSIS

The US Army Corps of Engineers utilizes a cost effectiveness analysis in environmental restoration projects since benefits (i.e., habitat units- HUs) are not measured in monetary terms. More specifically, the analysis is used to evaluate the cost of implementing an alternative's plan to how effective the plan is at producing environmental benefits. Once cost effective plans are identified, an incremental cost analysis (ICA) is used to determine which alternative provides the greatest increase in output (i.e., habitat units) for the lowest increase in costs. The ICA is used to identify the plan or alternative that is the most efficient at producing environmental benefits as measured by the anticipated net average annualized habitat units (AAHU's) over the 50 year life of a project.

Four project alternatives were used in the Habitat Unit (HU) analysis. Alternatives include: 1) No Action; 2) Channel widening and bank slope stabilization; 3) Channel widening, bank slope stabilization and in-stream habitat improvements; 4) Channel widening, bank slope stabilization, in-stream habitat improvements and added 100 foot upland buffer strip. Alternative 2 would provide wetland and prairie restoration within the floodplain. Alternative 2 did not include any habitat improvements in the river which are required for stream stability. Without stream stability, the restored floodplain will erode over time and based on professional judgment, the rate of erosion will be 0.5-1 acre per

year from the restored wetland floodplain complex. The instream work in Alternative 3 with the log jams and riffles maintain bank and streambed stability by promoting a naturalized energy flow (and sediment bed load movement) and those features promote "reduced erosion" and are necessary to protect the investment in the floodplain wetlands restoration. The log jams promote the scouring of pools (increased depth) removing the sediment as bed load and significantly reducing sediment movement/erosion during construction that would occur with pool excavation. Alternative 3, the recommended alternative, provides restoration of scarce sedge meadow, wet-mesic and mesic prairie habitats within the floodplain, in-stream habitat restoration and bank stabilization which is required for long term floodplain stabilization and minimization of streambank erosion and thus wetland floodplain erosion. Without the in-stream work, the proposed restoration does not meet Section 206 ecosystem restoration criteria. Alternative 4 provides additional lands for vegetated filtering of overland runoff but the existing plan maintains a vegetated buffer that meets the design criteria for sediment and nutrient removal from the flatter lands above the floodplain elevation.

The primary objective of this project is ecosystem restoration focusing on scarce prairie habitat and the restoration of natural stream habitat. This project (Phases 8 and 9), in conjunction with the upstream Phases 1-7, comprise an important part of the ecological and historical heritage of the region. This project supports several different plant communities as well as scarce plant and animal communities. The in-stream features of the log structures and meanders with riffles and pools are engineered structural components required to minimize long term erosion of the restored floodplain and river channel to a stable natural channel design. This project is consistent with National Ecosystem Restoration (NER) by restoring degraded ecosystem structure and creation of a more natural condition. The non-Federal sponsor has ecosystem restoration objectives that match the NER objective. Their goal is to restore and increase the aquatic and terrestrial habitats to improve the ecosystem of the Pike River with a sustainable, diverse plant community that features scarce plant and thus animal species. The quantity of surface and ground water will determine plant community restoration success at this site; there are no separable aquatic and upland units that could possibly function alone. Per Table 1, (Appendix F2) the HU output was computed by multiplying the acres of habitat (Column 1) by the habitat quality (Column 2) for the selected habitats for each of the three action alternatives over the 50 year life of the project.

The wetland and prairie habitat units for Alternative 2 and 3 are similar. The difference between Alternative 2 and Alternative 3 is Alternative 3 has a restored stream channel with meanders, riffles, pools and log structures. The natural channel design in Alternative 3 mimics a stable stream which is required to maintain the restored wetland floodplain. Construction of a natural channel lowers the stream gradient and the riffles act in a manner similar to check dams, slowing velocity. The log structures armor the banks and divert the flows back to the center of the river. These engineering features associated with the natural channel in Alternative 3 reduce velocity and lower erosion of the streambed and banks. Under Alternative 2, the incised river channel will seek to

form a natural channel with meanders and riffles and over time will cause erosion and loss of the adjacent wetlands and prairie habitat as the stream erodes the banks while forming the natural channel. Riffles, pools and hard structure in the stream have habitat value but the project value that is critical is the restoration of 73 acres of wetland and prairie habitat. Without stream stability as designed in Alternative 3, the habitat value of the restored wetlands within the floodplain prairie will be eroded over time and result in increased O&M costs and likely will not be substantial enough to move the project forward. A geomorphic analysis was conducted on constructed stream segments from Phases 1-6 and based on the collected cross sections, the low flow channel in Phases 8 and 9 was designed which consists of excavating a floodplain adjacent to an existing channel, and developing a low flow channel. This type of design for a habitat restoration project is ideal because the increased floodplain promotes river stability by mitigating high shear stresses that previously were focused on the stream bank, as well as promotes diversity in vegetation due to the relatively frequent flooding adjacent to the low-flow channel. Without stream stability as designed in Alternative 3, the habitat value of the floodplain ecosystem restoration will be lost through river erosion over time. Therefore, the entire project as depicted in Alternative 3, including in-stream structure is necessary for successful ecosystem restoration.

Plant diversity within the restored prairie areas will be considered as part of the O&M. As the native plant communities mature over the years and as vegetation monitoring dictates, additional prairie species should be added in order to enhance plant diversity. Additional plant species should be native to the area and a species suitable for addition to the site as either seeds or plugs. The goal is restoration of wetlands and scarce prairie habitat meeting the objectives in the Monitoring Plan based on the monitoring data collected in accordance with the plan.

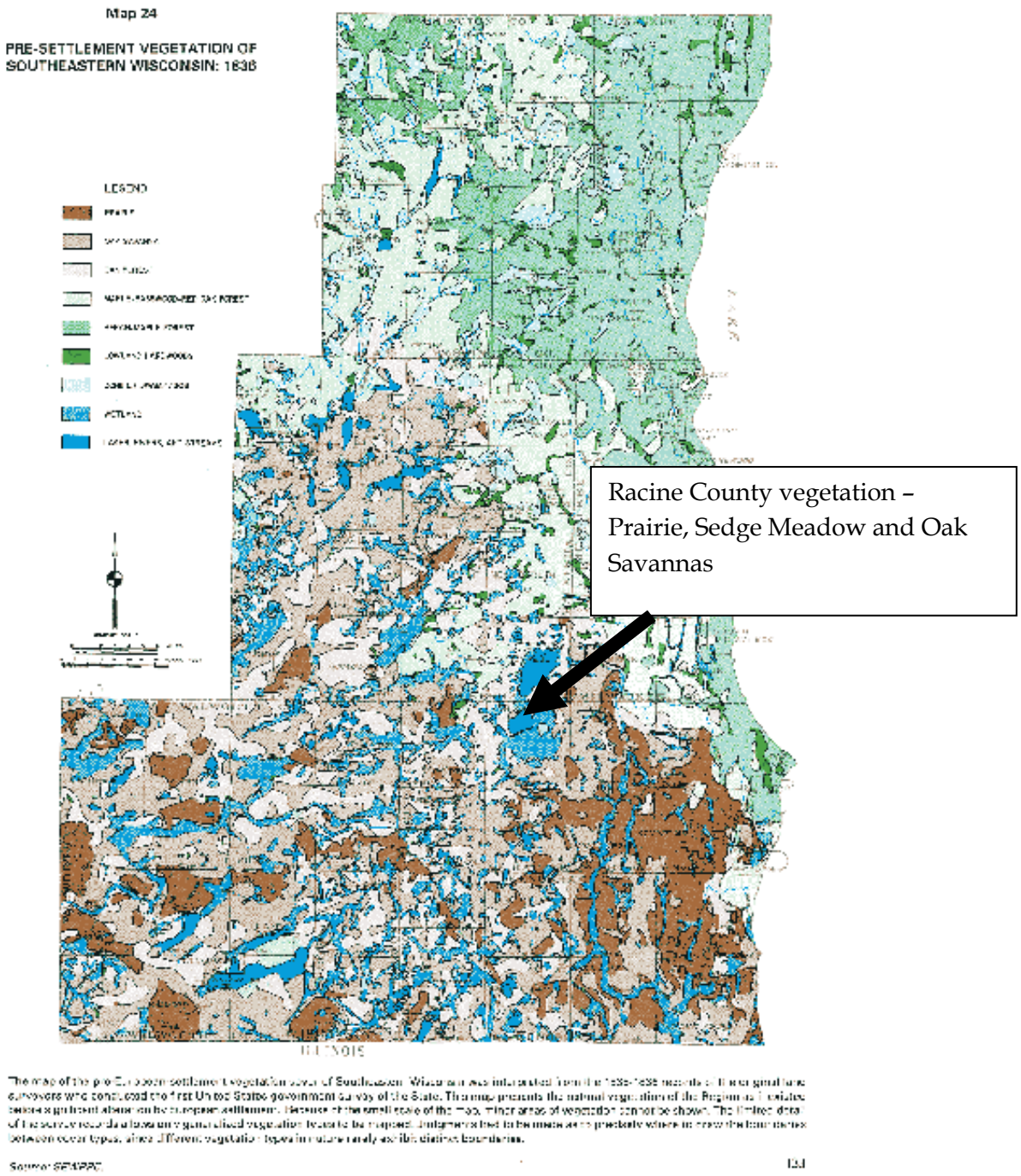
In summary, the HU value of the project consisted of adding the HU's for the habitat areas of wetlands, prairies and river habitats to compute the total habitat units (THU) as depicted in Table 1. The values for each species were based on the USFWS HSI's evaluation criteria and summed for the animal species (0-1). The prairie restoration was based on the Chicago model and anticipated restoration of prairie habitat over the years. The prairie habitat value increases as the plant community matures from year 1 to year 20 with more plant species but never reaches a pre-settlement condition. Since the USFWS HSI's are rated from 0-1 for Quality, the coefficient of conservatism for plants was converted from the normal 1-10 scale to the 0-1 scale to be consistent with the USFWS HSI's that would have a maximum rating of 1.

Under the no action alternative, Alternative 1, no wetlands or prairies are restored. The computed HU value for Alternative 1, the no action alternative is 365 THU. Alternatives 2 and 3 would restore the floodplain and associated habitats. Alternative 3 stabilizes the river channel and protects the restored wetland floodplain from further erosion and provides instream habitat. Alternative 4 provides additional filtering of overland runoff but the floodplain is vegetated and additional sediment removal within the vegetated strip is less as the vegetated area is on level ground above the floodplain slope. Additional buffering/filtering area is rated as lower as the ground is level and an

increased buffer width does not improve the removal of suspended solids and is thus rated as a 0.2. The additional width provides no additional suspended solids removal and it thus not required for in-stream habitat protection. The THU values for Alternatives 2, 3 and 4 are 1,584, 2,101 and 2,336 respectively. The average annual habitat units are computed from THU/50, the years of the project. The AAHU for Alternatives 1, 2, 3 and 4 are 7.3, 31.7, 42 and 46.7 respectively. Net AAHU's are computed by subtracting the base plan from the computed AAHU. To obtain the net AAHU's, the base plan (no action) AAHU's (7.3) are subtracted from the AAHU for each alternative resulting in 0, 24.4, 34.7 and 39.4 net AAHU's respectively.

Invasive Species, Contaminants and Other Harmful Pathogens: Environmental contaminants and harmful pathogens are not increased or accessed with implementation of the project. Implementation of this project could expand or create habitat for invasive plant species, thus the O&M requirement for invasive plant species control. No significant detriments caused by invasive species are anticipated with implementing this project. Monitoring the results of the restoration activities will commence after the construction contract has been concluded. Monitoring will consist of gathering data on the biological communities to indicate if restoration actions resulted in predicted benefits, i.e. establishment of wetland and prairies. Variables that will be monitored include native/non-native vegetation being native plant species richness and abundance.

Figure 1. Presettlement Plant Communities based on General Land Office Survey Records.



Appendix F2 – Habitat Unit Computations

Pike River, Village of Mount Pleasant

Racine County, Wisconsin

Section 206

Ecosystem Restoration

Table 1: Pike River Riparian Wetland Habitat Units

Alternatives	Quantity (acres)	Quality (0-1)	Year 1	Year 10 (9 yrs)	Year 20 (10 yrs)	Year 30 (10 yrs)	Year 40 (10 yrs)	Year 50 (10 yrs)	THU Total HU	AAHU = THU/ project life of 50 yrs	Net AAHU = AAHU -Base plan
Alternative 1 – No Action											
Wetlands – Emergent, grasslands, wet-mesic prairie	3	0.1	0.3	2.7	3.0	3.0	3.0	3.0	15		
Mesic prairie	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0		
Uplands	70	0.1	7.0	63.0	70.0	70.0	70.0	70.0	350		
River Channel Modifications	2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0		
100 ft strip of farmland	26	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0		
TOTAL	**101**								**365**	**7.3**	**0.0**
Alternative 2 – Excavation Floodplain											
Wetlands* – Emergent, sedge, wet-mesic prairie (lose 0.5 acres/yr erosion) QUANTITY X QUALITY	43 - 18	0.1 - 0.6	43 x 0.1 x 1 yr	38 x 0.4 x (10-1 yrs)	33 x 0.6 x (20-10 yrs)	28 x 0.6 x (30-20 yrs)	23 x 0.6 x (40-30 yrs)	18 x 0.6 x (50-40 yrs)	753.1		
Mesic prairie	30	0.1 - 0.6	30 x 0.1 x 1 yr	30 x 0.4 x (10-1 yrs)	30 x 0.6 x (20-10 yrs)	30 x 0.6 x (30-20 yrs)	30 x 0.6 x (40-30 yrs)	30 x 0.6 x (50-40 yrs)	831.0		
Uplands	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
River Channel Modifications	2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
100 ft strip of farmland	26	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
TOTAL	**101**								**1584.1**	**31.7**	**24.4**

*While prairie acreage is eroded, the acreage remains whether mud flat, sand bar or some type of wetland though the value is considered low at 0.05 Quality which rounds to 0.

Table 1: Pike River Riparian Wetland Habitat Units, continued

Alternative 3 - Excavation Floodplain, River Channel Modifications											
Wetlands – Emergent, sedge, wet-mesic prairie	43	0.1 - 0.6	43 x 0.1 x 1 yr	43 x 0.4 x (10-1 yrs)	43 x 0.6 x (20-10 yrs)	43 x 0.6 x (30-20 yrs)	43 x 0.6 x (40-30 yrs)	43 x 0.6 x (50-40 yrs)	1191.0		
Mesic prairie	30	0.1 - 0.6	30 x 0.1 x 1 yr	30 x 0.4 x (10-1 yrs)	30 x 0.6 x (20-10 yrs)	30 x 0.6 x (30-20 yrs)	30 x 0.6 x (40-30 yrs)	30 x 0.6 x (50-40 yrs)	831.0		
Uplands	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
River Channel Modifications	2	0.8	1.6	14.4	16.0	16.0	16.0	16.0	80.0		
100 ft strip of farmland	26	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0		
TOTAL	**101**								**2102.0**	**42.0**	**34.7**
Alternative 4 – Excavation Floodplain, River Channel Modifications, Buffer strip											
Wetlands – Emergent, grasslands, wet-mesic prairie	43	0.1 - 0.6	43 x 0.1 x 1 yr	43 x 0.4 x (10-1 yrs)	43 x 0.6 x (20-10 yrs)	43 x 0.6 x (30-20 yrs)	43 x 0.6 x (40-30 yrs)	43 x 0.6 x (50-40 yrs)	1191.0		
Mesic prairie	30	0.1 - 0.6	30 x 0.1 x 1 yr	30 x 0.4 x (10-1 yrs)	30 x 0.6 x (20-10 yrs)	30 x 0.6 x (30-20 yrs)	30 x 0.6 x (40-30 yrs)	30 x 0.6 x (50-40 yrs)	831.0		
Uplands	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
River Channel Modifications	2	0.8	1.6	14.4	16.0	16.0	16.0	16.0	80.0		
Vegetated buffer strip 100 ft wide	26	0.1 - 0.2	26 x 0.1 x 1 yr	26 x 0.1 x (10-1 yrs)	26 x 0.2 x (20-10 yrs)	26 x 0.2 x (30-20 yrs)	26 x 0.2 x (40-30 yrs)	26 x 0.2 x (50-40 yrs)	234.0		
TOTAL	**101**								**2336.0**	**46.7**	**39.4**

Appendix F3

Habitat Units USFWS Habitat Suitabilty Index

Pike River, Village of Mount Pleasant

Racine County, Wisconsin

Section 206

Ecosystem Restoration

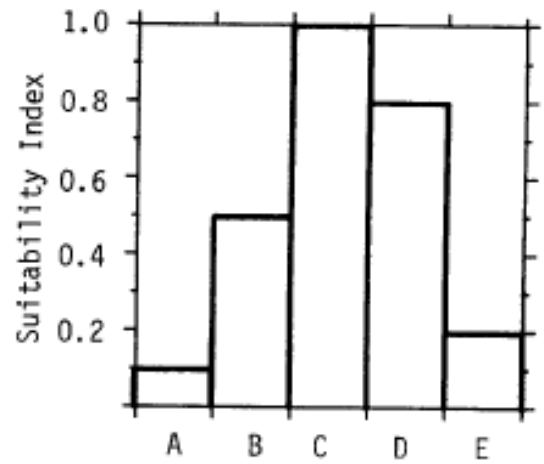
Habitat Suitability Indices for Pike River Restoration (From USFWS HSI's)

COMMON SHINER (Reproduction consists of components V_4, V_8, V_9 substrate, temperature and velocity. Reproduction component formula is: $([V_8]^2 \times V_4 \times V_9)^{1/4}$ Members of the minnow family would be likely candidates to spawn on the sand and gravel flats in the restored river section. The river will consist of gravel riffles, glides and pools and sandy substrate and is rated as V_4 HSI component of 0.7.

Estimated Existing Conditions** (to match HSI formula****)				Estimated Future Conditions** (to match HSI formula***)		
Acres	Percent	Substrate		Acres	Percent	Substrate
0	0 %	boulders/bedrock		0	0.0%	boulders/bedrock
0	10 %	gravel/rubble 2.5 to 15 cm in diameter***		1	33 %	gravel/rubble 2.5 to 15 cm in diameter***
2	20 %	sand***		2	66 %	sand***
0	0 %	dense vegetation****		0	0 %	dense vegetation****
1	70 %	silt/detritus		0	0 %	silt/detritus
0	0.0%	deep open water		0	0 %	deep open water
100	**100.0%**	**TOTAL**		**100**	**100 %**	**TOTAL**

R,L	V_4	Predominant substrate type in riffles or windy shore or shoal. A. Mud, silt, and detritus B. Fine sand C. Sand and gravel D. Rubble E. Large rocks and bedrock

Note: The area must be on a windy shore or shoal for the lacustrine model.

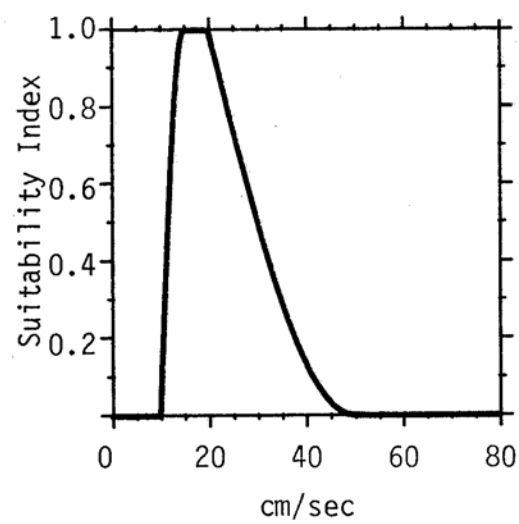


Common Shiner habitat

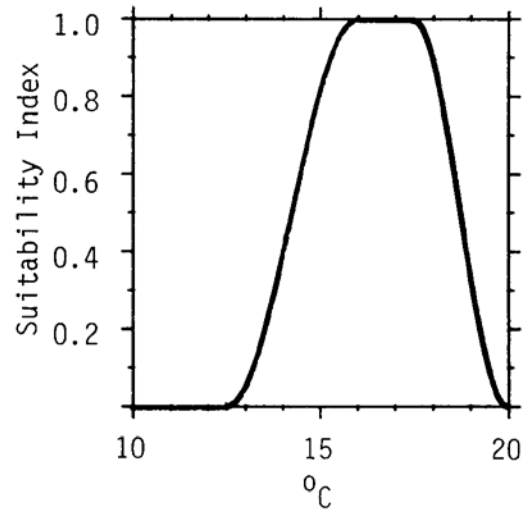
The restored river will consist of gravel riffles, pools and sandy bed material with 33 % of the river bed is gravel resulting in a suitability index = 0.7 for V4.

Habitat	Variable	
R	V_9	Average current velocity just above substrate in riffle areas.

Suitability graph



R,L	V_8	Average water temperature (°C) in spawning habitat during months of spawning.	8



The V_8 component, temperature during spawning is approximately 15 degrees C during spawning, resulting in a SI of 0.7. V_9 is the average current above the substrate and is rated 0.8. V_4= 0.7; V_8= 0.7, V_9 =0.8. The reproduction component for rivers is $(V_8)^2$ x V_4 X $V_9)^{1/4}$ = $(0.7)^2$ x 0.7 x 0.8) = $0.27^{1/4}$ = 0.7.

Snapping turtle Habitat Suitability Index. V_1-V_3 provides Suitability Food; V_4-V_5 Suitability Winter Cover; V_6 Suitability Reproduction and V_7 Interspersion Suitability distance to permanent water. Mean summer temperatures of V_1 provide a HSI of 0.8 . V_2 in the ponds (current) provides an HSI of 1 and V_3 % canopy cover in the ponds is 1, overall 0.9 for Suitability Food. The food suitability index is 0.9 from V_1-V_3. V_4 and V_5 components of the open water ponds are critical for overwintering of the adults. The 10 acres of open water provides 6 acres at a depth of greater than winter ice cover with a Habitat Suitability Index of 1 for V_4. The ponds have 60% silt/mud bed which provides an index of 0.5. V_4 x V_5 = 0.5 for overwinter habitat in 6 acres. Distance to small streams is less than 2km for an HSI of 1 for V_6 and the ponds provide access to permanent water with an HSI of 1 for V_7. The habitat suitability index of the snapping turtles within the proposed ponds and the Pike River is reflected in the equation:

Habitat Suitability Index =[(Suitability Food) x (Suitability Winter Cover) x (Suitability Reproduction)$^{1/3}$] x Suitability Interspersion = $(0.9 \times 0.5 \times 1)^{1/3}$ x 1 = 0.7 x 1= 0.7

Red Winged Blackbird Habitat Suitability Index. The open waters of the river and the wetland prairie and upland prairie will provide habitat for red winged blackbirds, the habitat is poor as it will not contain the preferred vegetation structure nor the mid and

upper story for feeding even though the habitat is in close proximity to the river and wetlands. The overall wetland prairie habitat suitability for red winged blackbird is listed at 0.5.

SUMMARY: Using 30 acres of wetland prairie, 10 acres of pond and 3 acres of stream, the overall wetland restoration habitat is averaged as 0.6. However, the primary value of the project is the restoration of over 70 acres of wetland, wet prairie and prairie habitat.