Summary of Pipeline Route Wetland Impacts for Project Alternatives

PREPARED FOR: Wisconsin Department of Natural Resources
FROM: CH2M HILL
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This technical memorandum presents the response to the following Wisconsin Department of Natural Resources (WDNR) request for additional information in the Waukesha Water Supply Environmental Report:

> *"Use of a temporary/permanent distinction in the Environmental Impact Report is inadequate. Identify impacts to the natural communities and wetlands that may be impacted for each alternative. Identify specific communities along each pipeline route and discuss how each is likely to be impacted. This includes the location, size, and type of wetlands that will be crossed under each of the alternatives."*

Pipeline wetland crossings for the proposed project and alternatives to the proposed project are described in the following subsections and in attached tables.

Pipeline Wetland Crossings

Pipeline wetland crossings for each of the water supply and return flow alternatives are included in Attachment 1. The table includes a listing of all wetlands crossed, crossing lengths, and areas.

Wetland impacts were calculated assuming a 75-foot-width pipeline construction corridor and then comparing the pipeline corridor width to Wisconsin Wetland Inventory wetland mapping using geographic information system (GIS). This same wetland impact assessment approach was conducted for all alternatives to consistently compare potential impacts of one alternative to another. Note that, in many cases during design of the proposed project, wetland resources could be avoided altogether and, where wetlands would be crossed, the construction corridor could be made narrower than 75 feet to minimize, if not avoid, impacts. However, to conservatively estimate wetland impacts for alternative comparison, a consistent construction width was used to assess potential wetland impacts. Crossing lengths in Attachment 1 are listed in reference to the pipeline centerline. Where no crossing width is included, the pipeline construction infringes upon the adjacent wetland.

The two groundwater alternatives cause a drawdown in groundwater levels and impact wetlands. The impacts have been documented separately in the Environmental Report Appendix 4, *Vernon Marsh Wetland Impact Analysis*, and in a separate response to a WDNR request for additional information.

A summary of pipeline wetland crossing impacts by wetland type and alternative is included in Table 1. The values in this table are conservative where water supply and return flow pipelines parallel each other because impacts were calculated individually for each pipeline to be conservative.

TABLE 1

Pipeline Wetland Crossings of the Alternatives (Acres)

Alternative Name	Emergent/Wet Meadow Wetlands Affected[a]	Scrub/Shrub Wetlands Affected[a]	Forested Wetlands Affected[a]	Open Water Wetlands Affected[a]	Other[b] Wetlands Affected[a]	Total Wetlands Affected[a]
Water Supply Alternatives						
Deep and Shallow Wells Pipeline	3.4	5.2	2.2	0.0	<0.1	10.8
Shallow Aquifer and Fox River Alluvium Pipeline	4.2	6.8	10.9	0.0	<0.1	21.9
Lake Michigan Supply Alternatives						
Lake Michigan (City of Milwaukee)[c]	1.0	2.0	3.9	<0.1	0.0	6.9
Lake Michigan (City of Oak Creek) Alignment 1[c]	2.9	4.4	5.9	<0.1	0.0	13.2
Lake Michigan (City of Oak Creek) Alignment 2[c]	0.07	0.10	0.36	0	0	0.53
Lake Michigan (City of Racine)[c]	15.8	22.4	6.9	1.6	5.2	51.9
Return Flow Alternatives						
Underwood Creek to Lake Michigan[c]	1.9	2.3	5.1	<0.1	0.0	9.4
Root River to Lake Michigan Alignment 1[c]	2.2	2.7	7.5	<0.1	0.0	12.4
Root River to Lake Michigan Alignment 2[c]	0.07	0.10	0.37	0	0.04	0.58
Direct to Lake Michigan[c]	2.4	2.3	0.6	<0.1	0.1	5.5

Source: WWI

[a] Includes all areas being temporarily impacted by the construction of the pipelines for supply and return flow alternatives. Total values are slightly different due to rounding.

[b] Includes filled/drained wetlands, and flats/unvegetated wet soil areas.

[c] The majority of pipeline alignments follow previously disturbed areas and maintained utility corridors. Forested wetlands are generally not present in maintained utility corridors. Potential permanent wetland impacts are consequently conservative.

Wetland Crossing Methods

Wetland and waterway crossing methods have been previously documented in Appendix 5-2 of the Environmental Report. Additional discussion is provided here.

Where wetlands are unavoidable, temporary impacts will occur. Potential impacts resulting from the construction of the proposed project include vegetation clearing and soil disturbance for construction access and pipeline construction. Trenches would be excavated to install the pipeline. Soil disturbance would be minimized by segregating the topsoil layer from the subsoil layer over the proposed trench line in unsaturated or non-inundated wetlands during excavation. All wetland soils excavated during construction would be segregated from other subsoils. The soil profile would be restored by replacing the layers in reverse order of the initial excavation when backfilling. Following construction, wetland areas would be restored to their pre-existing contours to allow for natural re-vegetation, supplemented with plantings where necessary to achieve full restoration. Excess fill would be removed from the construction corridor, including from floodplain areas. However, many of the impacts can be minimized through the use of best management practices (BMPs) as described in the following subsections, and many wetland functions would only be temporarily impacted until restoration is completed. In most cases, the construction would be completed in a matter of days, or weeks at the most, followed immediately by restoration, re-vegetation, and monitoring to achieve successful re-vegetation and restoration of drainage/hydraulic characteristics.

Although there are opportunities for careful pipe alignments that will avoid or greatly minimize impacts, the assessment assumes worst case impacts using the very conservative GIS estimates of wetland encroachment acreages that might occur *only if* the pipelines cannot be installed completely within the road bed or shoulders where available. Pipeline routes followed existing roadway and utility corridors to minimize impacts where possible and are documented in Environmental Report Table 6-53.

The impact analysis in Table 4 also considers worse case impacts based upon the 75-foot pipeline construction width. Minimization and mitigation of wetland function impacts will be realized by the use of pipeline construction and water/wetland crossing methods that incorporate proactive environmental BMPs that are widely accepted by federal and state regulators, including the U.S. Army Corps of Engineers (USACE) and the Federal Energy Regulatory Commission (FERC). A subset of the most relevant USACE- and FERC-approved construction methods and BMPs for water and wetland crossings were submitted to WDNR as Appendix 5-2 of the Environmental Report.

During pipeline design, the City of Waukesha will work with the resource agencies to determine the appropriate construction techniques for each crossing to minimize and mitigate construction impacts. Regulatory permits will be required for each surface water and wetland crossing and the design will be developed to meet the permit regulatory requirements. In general, construction techniques that range from horizontal directional drilling to open cut could be used for wetland crossings based upon the site specific geotechnical, construction, and other constraints.

For each crossing where avoidance cannot be achieved, a wetland permit or other regulatory approval will be required. In each case the permitting process will identify the specific avoidance and mitigation measures. As part of this process there will also be post restoration monitoring and additional restoration as required to achieve reestablishment goals.

Wetland Functional Values

Impacts to wetland functional values from pipeline construction are anticipated to be similar for all alternatives being considered due to the fact that identical construction techniques and wetland mitigation measures would be implemented regardless of the alternative ultimately selected for the project. However, the quantity of the impacts could be variable depending on the number of wetland resources crossed by a particular alternative and the quality/rarity of the particular resources. Consequently, the functional value impacts, evaluated using the WDNR Wetland Rapid Assessment Methodology, Version 2.0 (2014), and discussed in the following subsections, are applicable to all pipeline alternatives.

Human Use Values

No adverse permanent impacts to human use functional values of wetlands will occur as a result of the alternative pipeline routes. Temporary restrictions on access to wetlands during construction will be limited to the actual construction window, which is anticipated to be very brief and a return to existing conditions will occur shortly after construction is complete.

Wildlife Habitat Values

Wildlife will leave the palustrine scrub-shrub wetlands (PSS) and palustrine forested wetlands (PFO) habitats adjacent to or within construction areas and, due to the short duration of construction, in most cases will return after pipeline installation and site restoration. For most species they can still occupy/forage in the construction area during periods (e.g. at night) when there would be no human activity.

Trench spoils from within wetlands will be segregated and replaced in the original soil profile to preserve the topsoil seed bank and to facilitate rapid natural regeneration of the original wetland vegetation from root sprouts and the seed bank. Because palustrine emergent wetlands (PEM) wetlands typically recover fully from the seed bank within a single growing season, the temporary disturbance of the plant community would be expected to be minor and ecologically insignificant to the wildlife habitat functions and values of PEM wetlands. Many species of flush-cut wetland shrubs (e.g., alders, dogwoods) and trees (e.g., red maple) can recover from stump sprouts within a few growing seasons and, consequently, disturbances of the woody plant community within PSS wetlands will be temporary and insignificant. Similarly, trees cut within PFO wetlands will recover from existing stumps left in place; however, the timeline for full regrowth will be more significant than for PSS wetland resources. Ultimately, no loss of functional value are anticipated within PFO wetlands within temporary construction workspaces.

Where the permanent maintained right-of-way encroaches on wetland resources, those wetland areas will be operationally maintained as PEM conditions resulting in type class changes. However, the areas are very minor and the original hydrology, soils, and herbaceous component of those PSS and PFO communities will be fully restored such that the temporary disturbance of the non-plant community will be negligible, short-term, and ecologically insignificant to the wildlife habitat functions and values of the original PSS and PFO wetlands.

Fish and Aquatic Life Habitat Values

No adverse impacts will occur from either pipeline to fish and aquatic life habitat values (FA 1 to 4), since none of the wetlands to be disturbed directly provide these functions. The major waterbody crossings along the proposed and alternative pipeline routes occur at bridges or box culverts that cannot be open cut and, therefore, are most likely to be crossed using boring or horizontal directional drilling (HDD) methods. Consequently, any wetlands bordering aquatic habitats at a few locations will not be adversely impacted.

Shoreline Protection Functions

The major waterbody crossings along both pipeline routes occur at bridges or box culverts that cannot be open cut, but are most likely to be crossed using boring, HDD, or other trenchless construction methods; consequently, shoreline protection functions afforded by wetlands bordering aquatic habitats will not be adversely impacted. PEM resources adjacent to waterbodies that are disturbed during construction will be restored such that the existing seed bank can quickly reseed and stabilize the area. If necessary, additional BMPs including erosion control netting and temporary over seeding with an annual rye can be utilized to provide additional short-term shoreline protection. As a result of the implementation of these practices, any impacts to shoreline protection functions will be temporary and insignificant.

PSS and PFO resources adjacent to waterbody crossings that are temporarily disturbed during construction will be restored with the environmental BMPs discussed previously for PEM resources. In addition, shrubs and trees outside of the actual trench line will be flush-cut at the ground surface and the stumps left in place to continue to provide stabilization.

Flood and Stormwater Storage Functions

No adverse impacts will occur to flood and stormwater storage functions (ST 3 & 4), since pipelines will be installed within wetlands using BMPs so that there will be no net fill of wetlands that otherwise would reduce storage capacity. If a pipeline must be placed within a wetland due to utility conflicts within the road bed or shoulder, stumps from the trench line and a volume of trench spoil equal to the pipe volume(s) will be removed for upland disposal, thus resulting in no net filling of the wetland, as required under Section 404 of the Clean Water Act and Wisconsin wetland regulations.

Water Quality Protection Functions

Impacts to water quality functions will temporarily occur within PEM wetlands while construction is occurring due to vegetation removal. However, aside from the pipeline trench itself, construction equipment will operate on swamp mats to protect the roots of emergent herbaceous vegetation. Because emergent wetlands typically recover fully from the existing root systems and seed bank within one growing season, temporary disturbance of the plant community will be negligible and ecologically insignificant to the water quality preservation and renovation functions and values of the PEM wetlands.

For PFO wetlands, the permanent conversion to PEM conditions will not adversely affect the water quality functions of the wetland because the PEM will provide equivalent or superior water quality enhancement functions. Beyond the pipeline trench, there will be little or no disturbance of shrub or tree roots or soils that stabilize and promote soil microbial and fungal communities that help to attenuate pollution, so that there will be no adverse permanent or temporary impacts to water quality functions of disturbed PSS and PFO wetlands. Even if equipment must traverse wetlands during construction any such traffic could occur on swamp mats to protect the flush-cut root systems of shrubs, many of which then should re-sprout and recover fully within a few growing seasons. In some cases, moreover, a dense herbaceous wetland community can be more effective at renovating surface water quality than a more sparsely vegetated PSS or PFO wetland with little or no ground cover of herbaceous vegetation.

Groundwater Processes

Finally, there will be no adverse permanent or temporary impacts to groundwater processes, since the project will not significantly alter the hydrology of the existing wetlands, either during or following construction. Even if there are any PSS and PFO wetlands where trees and shrubs must be removed during construction and a permanent right-of-way within the wetland must be maintained as a PEM free of trees or shrubs, for access and pipeline integrity reasons, the surface and subsurface hydrology of the original PSS or PFO wetland will not be altered.

Attachment 1
Pipeline Wetland Crossings

TABLE 1-1 (TABLE 6-42 OF THE ENVIRONMENTAL REPORT)
Wetland Crossings

Alternative	Wetland No.	Wetland Type	Crossing Width (ft)	Crossing Area (acres)
Supply				
Deep and Shallow Aquifers	7963	Emergent/wet meadow	556.9	1.60
	7982	Emergent/wet meadow	597.2	1.83
	8111	Flats/unvegetated wet soil	—	0.01
	8122	Scrub/shrub	—	0.13
	8129	Scrub/shrub	474.7	1.34
	8146	Scrub/shrub	872.4	1.50
	8178	Scrub/shrub	480.3	0.83
	8197	Scrub/shrub	526.8	0.71
	8246	Scrub/shrub	—	0.07
	8263	Scrub/shrub	283.3	0.58
	8315	Forested	—	0.02
	8325	Forested	—	0.02
	8392	Forested	—	0.84
	8395	Forested	235.7	0.40
	8399	Forested	611.9	0.95
	8401	Forested	—	0.01
Shallow Aquifer and Fox River Alluvium	7963	Emergent/wet meadow	556.9	1.60
	7982	Emergent/wet meadow	597.2	1.83
	8044	Emergent/wet meadow	—	0.52
	8089	Emergent/wet meadow	58.6	0.28
	8111	Flats/unvegetated wet soil	—	0.01
	8122	Scrub/shrub	—	0.13
	8129	Scrub/shrub	474.7	1.34
	8146	Scrub/shrub	872.4	1.50
	8178	Scrub/shrub	480.3	0.83
	8179	Scrub/shrub	45.8	0.31
	8184	Scrub/shrub	220.8	1.09
	8197	Scrub/shrub	526.8	0.71
	8246	Scrub/shrub	—	0.07
	8249	Scrub/shrub	—	0.11
	8263	Scrub/shrub	283.3	0.58
	8266	Scrub/shrub	—	0.15
	8303	Forested	782.9	1.34
	8315	Forested	—	0.02

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Alternative	Wetland No.	Wetland Type	Crossing Width (ft)	Crossing Area (acres)
	8324	Forested	—	1.23
	8325	Forested	902.8	2.06
	8392	Forested	—	0.84
	8395	Forested	235.7	0.40
	8399	Forested	611.9	0.95
	8401	Forested	248.5	1.59
	8402	Forested	213.5	2.42
Lake Michigan (City of Milwaukee)	4965	Scrub/shrub	216.7	0.38
	7962	Emergent/wet meadow	—	0.37
	8145	Scrub/shrub	—	0.16
	8239	Scrub/shrub	—	0.13
	8290	Scrub/shrub	—	0.49
	8465	Forested	—	0.12
	8723	Emergent/wet meadow	—	0.08
	8909	Scrub/shrub	—	0.30
	8911	Scrub/shrub	—	0.17
	8915	Scrub/shrub	—	0.001
	8920	Scrub/shrub	—	0.11
	8921	Scrub/shrub	—	0.14
	8923	Scrub/shrub	—	0.07
	9184	Forested	—	0.01
	9306	Open water	—	0.01
	10454	Emergent/wet meadow	—	0.02
	11047	Emergent/wet meadow	313.4	0.50
	11672	Scrub/shrub	—	0.02
	11796	Forested	637.4	1.08
	11799	Forested	1,286.9	2.53
	11973	Forested	—	0.002
	12645	Forested	—	0.02
	12650	Forested	—	0.15
	12660	Forested	—	0.01
Lake Michigan (City of Oak Creek) Alignment 1	4965	Scrub/shrub	—	0.38
	7962	Emergent/wet meadow	—	0.37
	8145	Scrub/shrub	—	0.16
	8239	Scrub/shrub	—	0.13

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Wetland Crossings

Alternative	Wetland No.	Wetland Type	Crossing Width (ft)	Crossing Area (acres)
	8290	Scrub/shrub	—	0.49
	8465	Forested	—	0.12
	8723	Emergent/wet meadow	—	0.08
	8909	Scrub/shrub	—	0.30
	8911	Scrub/shrub	—	0.17
	8915	Scrub/shrub	—	0.001
	8920	Scrub/shrub	—	0.11
	8921	Scrub/shrub	—	0.14
	8923	Scrub/shrub	—	0.07
	9184	Forested	—	0.01
	9306	Open water	—	0.01
	10454	Emergent/wet meadow	—	0.02
	10748	Emergent/wet meadow	—	0.03
	10753	Emergent/wet meadow	—	0.52
	10810	Emergent/wet meadow	—	0.17
	10822	Emergent/wet meadow	—	0.13
	10931	Emergent/wet meadow	—	0.72
	11026	Emergent/wet meadow	—	0.04
	11030	Emergent/wet meadow	—	0.07
	11031	Emergent/wet meadow	—	0.28
	11047	Emergent/wet meadow	—	0.50
	11273	Scrub/shrub	—	0.01
	11346	Scrub/shrub	—	0.09
	11363	Scrub/shrub	—	0.10
	11381	Scrub/shrub	—	0.04
	11433	Scrub/shrub	—	0.15
	11437	Scrub/shrub	—	0.001
	11548	Scrub/shrub	—	0.19
	11564	Scrub/shrub	—	1.82
	11586	Scrub/shrub	—	0.02
	11638	Scrub/shrub	—	0.01
	11672	Scrub/shrub	—	0.02
	11772	Forested	—	0.40
	11796	Forested	—	0.01
	11799	Forested	—	2.49

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Alternative	Wetland No.	Wetland Type	Crossing Width (ft)	Crossing Area (acres)
	11970	Forested	—	0.16
	11972	Forested	—	1.14
	11973	Forested	—	0.002
	12265	Forested	—	0.09
	12285	Forested	—	0.04
	12294	Forested	—	0.47
	12299	Forested	—	0.26
	12384	Forested	—	0.43
	12505	Forested	—	0.09
	12645	Forested	—	0.02
	12650	Forested	—	0.15
	12660	Forested	—	0.01
	13168	Open water	—	0.03
	13185	Open water	—	0.02
Lake Michigan (City of Oak Creek) Alignment 2	8714	Emergent/wet meadow	—	0.07
	9020	Forested	—	0.02
	9026	Forested	—	0.07
	9028	Forested	—	0.01
	10401	Emergent/wet meadow	—	<0.01
	10573	Emergent/wet meadow	—	<0.01
	11286	Scrub/shrub	—	0.01
	11290	Scrub/shrub	—	0.02
	11369	Scrub/shrub	—	0.02
	11376	Scrub/shrub	—	0.05
	11539	Scrub/shrub	—	<0.01
	11896	Forested	—	0.07
	11897	Forested	—	<0.01
	11900	Forested	—	0.13
	11906	Forested	—	0.03
	11914	Forested	—	<0.01
	12293	Forested	—	0.01
	12301	Forested	—	0.01
	12314	Forested	—	<0.01
	12392	Forested	—	0.01
	12399	Forested	—	<0.01

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Wetland Crossings

Alternative	Wetland No.	Wetland Type	Crossing Width (ft)	Crossing Area (acres)
Lake Michigan (City of Racine)	3	Emergent/wet meadow	—	0.61
	4965	Scrub/shrub	—	0.38
	7512	Scrub/shrub	—	0.02
	7895	Open water	—	0.39
	7962	Emergent/wet meadow	—	0.37
	8050	Emergent/wet meadow	—	1.94
	8126	Scrub/shrub	—	0.51
	8139	Scrub/shrub	—	0.09
	8145	Scrub/shrub	—	0.16
	8168	Scrub/shrub	—	0.43
	8183	Scrub/shrub	—	0.96
	8188	Scrub/shrub	—	0.54
	8192	Scrub/shrub	—	0.70
	8239	Scrub/shrub	—	0.13
	8290	Scrub/shrub	—	0.49
	8338	Forested	—	1.14
	8382	Forested	—	0.03
	8383	Forested	—	0.05
	8436	Forested	—	0.20
	8465	Forested	—	0.12
	8625	Filled/drained wetland	—	0.17
	8632	Filled/drained wetland	—	0.37
	8766	Emergent/wet meadow	—	3.23
	8872	Scrub/shrub	—	3.46
	8873	Scrub/shrub	—	2.72
	8901	Scrub/shrub	—	0.47
	9139	Forested	—	0.06
	9184	Forested	—	0.01
	9309	Scrub/shrub	—	2.25
	9336	Emergent/wet meadow	—	0.22
	9337	Emergent/wet meadow	—	0.36
	9345	Emergent/wet meadow	—	0.40
	9353	Emergent/wet meadow	—	0.81
	9358	Emergent/wet meadow	—	0.001
	9366	Emergent/wet meadow	—	0.43

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Alternative	Wetland No.	Wetland Type	Crossing Width (ft)	Crossing Area (acres)
	9378	Emergent/wet meadow	—	1.85
	9381	Emergent/wet meadow	—	0.12
	9382	Emergent/wet meadow	—	0.10
	9395	Emergent/wet meadow	—	0.26
	9396	Emergent/wet meadow	—	0.55
	9406	Emergent/wet meadow	—	0.45
	9408	Emergent/wet meadow	—	0.15
	9423	Flats/unvegetated wet soil	—	0.21
	9432	Flats/unvegetated wet soil	—	0.61
	9434	Flats/unvegetated wet soil	—	0.44
	9450	Flats/unvegetated wet soil	—	1.84
	9451	Flats/unvegetated wet soil	—	0.63
	9457	Scrub/shrub	—	1.26
	9459	Scrub/shrub	—	0.54
	9461	Scrub/shrub	—	0.42
	9464	Scrub/shrub	—	1.22
	9477	Scrub/shrub	—	0.75
	9503	Forested	—	0.51
	9531	Forested	—	0.03
	9552	Open water	—	0.20
	9556	Open water	—	0.50
	9559	Open water	—	0.22
	9561	Open water	—	0.05
	9592	Emergent/wet meadow	—	0.46
	9597	Emergent/wet meadow	—	0.26
	10058	Emergent/wet meadow	—	0.72
	10090	Emergent/wet meadow	—	0.26
	10164	Scrub/shrub	—	0.02
	10195	Forested	—	1.31
	13701	Filled/drained wetland	—	0.05
	13719	Filled/drained wetland	—	0.07
	14241	Emergent/wet meadow	—	0.02
	14301	Emergent/wet meadow	—	0.23
	14655	Flats/unvegetated wet soil	—	0.12
	15492	Emergent/wet meadow	—	0.21

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Alternative	Wetland No.	Wetland Type	Crossing Width (ft)	Crossing Area (acres)
	15519	Emergent/wet meadow	—	0.32
	15593	Emergent/wet meadow	—	0.12
	15606	Emergent/wet meadow	—	0.26
	15748	Emergent/wet meadow	—	0.36
	15821	Emergent/wet meadow	—	0.73
	16339	Flats/unvegetated wet soil	—	0.05
	16468	Flats/unvegetated wet soil	—	0.66
	16601	Scrub/shrub	—	2.03
	16870	Scrub/shrub	—	0.68
	16945	Scrub/shrub	—	0.86
	16956	Scrub/shrub	—	0.001
	16957	Scrub/shrub	—	0.26
	16973	Scrub/shrub	—	0.14
	17124	Scrub/shrub	—	0.72
	17253	Scrub/shrub	—	0.18
	17860	Forested	—	0.85
	18252	Forested	—	0.30
	18661	Forested	—	0.02
	18669	Forested	—	0.75
	18679	Forested	—	1.47
	20167	Open water	—	0.26
Return Flow Alternatives				
Underwood Creek to Lake Michigan	6807	Emergent/wet meadow	187.0	0.30
	6934	Forested	20.0	0.04
	6937	Forested	1,380.9	2.52
	7003	Forested	—	0.05
	7962	Emergent/wet meadow	—	1.38
	7970	Emergent/wet meadow	—	0.00
	8015	Emergent/wet meadow	—	0.17
	8125	Scrub/shrub	—	0.75
	8145	Scrub/shrub	—	0.16
	8239	Scrub/shrub	—	0.13
	8290	Scrub/shrub	—	0.49
	8463	Forested	—	0.11
	8723	Emergent/wet meadow	—	0.08

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Alternative	Wetland No.	Wetland Type	Crossing Width (ft)	Crossing Area (acres)
	8909	Scrub/shrub	—	0.30
	8911	Scrub/shrub	—	0.17
	8915	Scrub/shrub	—	0.00
	8920	Scrub/shrub	—	0.11
	8921	Scrub/shrub	—	0.14
	8923	Scrub/shrub	—	0.07
	9184	Forested	—	0.01
	9306	Open water	—	0.01
	12683	Forested	1,454.2	2.38
Root River to Lake Michigan Alignment 1	7962	Emergent/wet meadow	—	1.38
	7970	Emergent/wet meadow	—	0.00
	8015	Emergent/wet meadow	—	0.17
	8125	Scrub/shrub	—	0.75
	8145	Scrub/shrub	—	0.16
	8239	Scrub/shrub	—	0.13
	8290	Scrub/shrub	—	0.49
	8463	Forested	—	0.11
	8723	Emergent/wet meadow	—	0.08
	8909	Scrub/shrub	—	0.30
	8911	Scrub/shrub	—	0.17
	8915	Scrub/shrub	—	0.00
	8920	Scrub/shrub	—	0.11
	8921	Scrub/shrub	—	0.14
	8923	Scrub/shrub	—	0.07
	9184	Forested	—	0.01
	9306	Open water	—	0.01
	11029	Emergent/wet meadow	—	0.01
	11030	Emergent/wet meadow	90.5	0.11
	11031	Emergent/wet meadow	175.3	0.30
	11047	Emergent/wet meadow	—	0.18
	11433	Scrub/shrub	114.5	0.20
	11638	Scrub/shrub	14.5	0.04
	11672	Scrub/shrub	—	0.10
	11794	Forested	—	0.00
	11796	Forested	15.3	0.03

TABLE 1-1 (TABLE 6-42 OF THE ENVIRONMENTAL REPORT)
Wetland Crossings

Alternative	Wetland No.	Wetland Type	Crossing Width (ft)	Crossing Area (acres)
	11799	Forested	2,261.4	3.58
	11970	Forested	—	0.01
	11972	Forested	503.7	0.92
	12578	Forested	304.8	0.52
	12581	Forested	—	0.22
	12585	Forested	82.7	0.13
	12587	Forested	—	0.00
	12645	Forested	—	0.72
	12650	Forested	284.7	0.69
	12656	Forested	—	0.25
	12660	Forested	—	0.28
Root River to Lake Michigan Alignment 2	8714	Emergent/wet meadow	—	0.07
	9020	Forested	—	0.02
	9026	Forested	—	0.07
	9028	Forested	—	0.01
	10573	Emergent/wet meadow	—	<0.01
	11209	Flats/unvegetated wet[a] soil	12.96	0.04
	11286	Scrub/shrub	—	0.01
	11290	Scrub/shrub	—	0.02
	11369	Scrub/shrub	—	0.02
	11376	Scrub/shrub	—	0.05
	11777	Forested	37.48	0.07
	11890	Forested	—	0.01
	11896	Forested	—	0.07
	11914	Forested	—	<0.01
	12263	Forested	—	0.11
	12314	Forested	—	<0.01
	12392	Forested	—	0.01
	12399	Forested	—	<0.01
Direct to Lake Michigan	7962	Emergent/wet meadow	—	1.38
	7970	Emergent/wet meadow	—	0.00
	8015	Emergent/wet meadow	—	0.17
	8125	Scrub/shrub	—	0.75
	8145	Scrub/shrub	—	0.16
	8239	Scrub/shrub	—	0.13

TABLE 1-1 (TABLE 6-42 OF THE ENVIRONMENTAL REPORT)
Wetland Crossings

Alternative	Wetland No.	Wetland Type	Crossing Width (ft)	Crossing Area (acres)
	8290	Scrub/shrub	—	0.49
	8463	Forested	—	0.11
	8723	Emergent/wet meadow	—	0.08
	8909	Scrub/shrub	—	0.30
	8911	Scrub/shrub	—	0.17
	8915	Scrub/shrub	—	0.00
	8920	Scrub/shrub	—	0.11
	8921	Scrub/shrub	—	0.14
	8923	Scrub/shrub	—	0.07
	9184	Forested	—	0.01
	9306	Open water	—	0.01
	10321	Filled/drained wetland	121.6	0.13
	11046	Emergent/wet meadow	270.9	0.45
	11053	Emergent/wet meadow	—	0.19
	11054	Emergent/wet meadow	—	0.10
	11676	Scrub/shrub	—	0.01
	12613	Forested	—	0.08
	12627	Forested	—	0.08
	12628	Forested	—	0.01
	12643	Forested	193.6	0.32

[a] Included in PEM summary because open flats will likely first transition to emergent vegetation.