3.8.3.5 *Avoidance and Minimization*

Due to the proximity of known threatened and endangered species occurrences to the corridors and the mobility of certain species, threatened and endangered species identified in Section 3.8.3.3 and Section 3.8.3.4 may be present within the corridors. Development of the corridors included consideration of avoidance and minimization of affects to threatened and endangered species. A comprehensive threatened and endangered species assessment for species identified as occurring or having potential to occur will be completed in the Tier Two NEPA studies.

3.8.3.6 *Mitigation*

The sequence of addressing threatened and endangered species impacts is avoidance and minimization, and then for those impacts that cannot be avoided or further minimized, mitigation. Measures to mitigate threatened and endangered species impacts will be detailed in the Tier Two NEPA studies. Mitigation measures will include, but not be limited too, field surveys, identification of best management practices, and avoidance of sensitive seasons. Specific mitigation measures will be developed as necessary based on the types of species that may occur in the region.

3.9 Water Resources and Aquatic Habitats

This section describes the water resources (e.g., streams and ponds) and aquatic habitats in the corridors, identifies methodologies for assessing impacts to water resources, describes the impacts from the working alignments within the corridors, and discusses potential mitigation strategies.

3.9.1 Existing Conditions

3.9.1.1 *Watersheds*

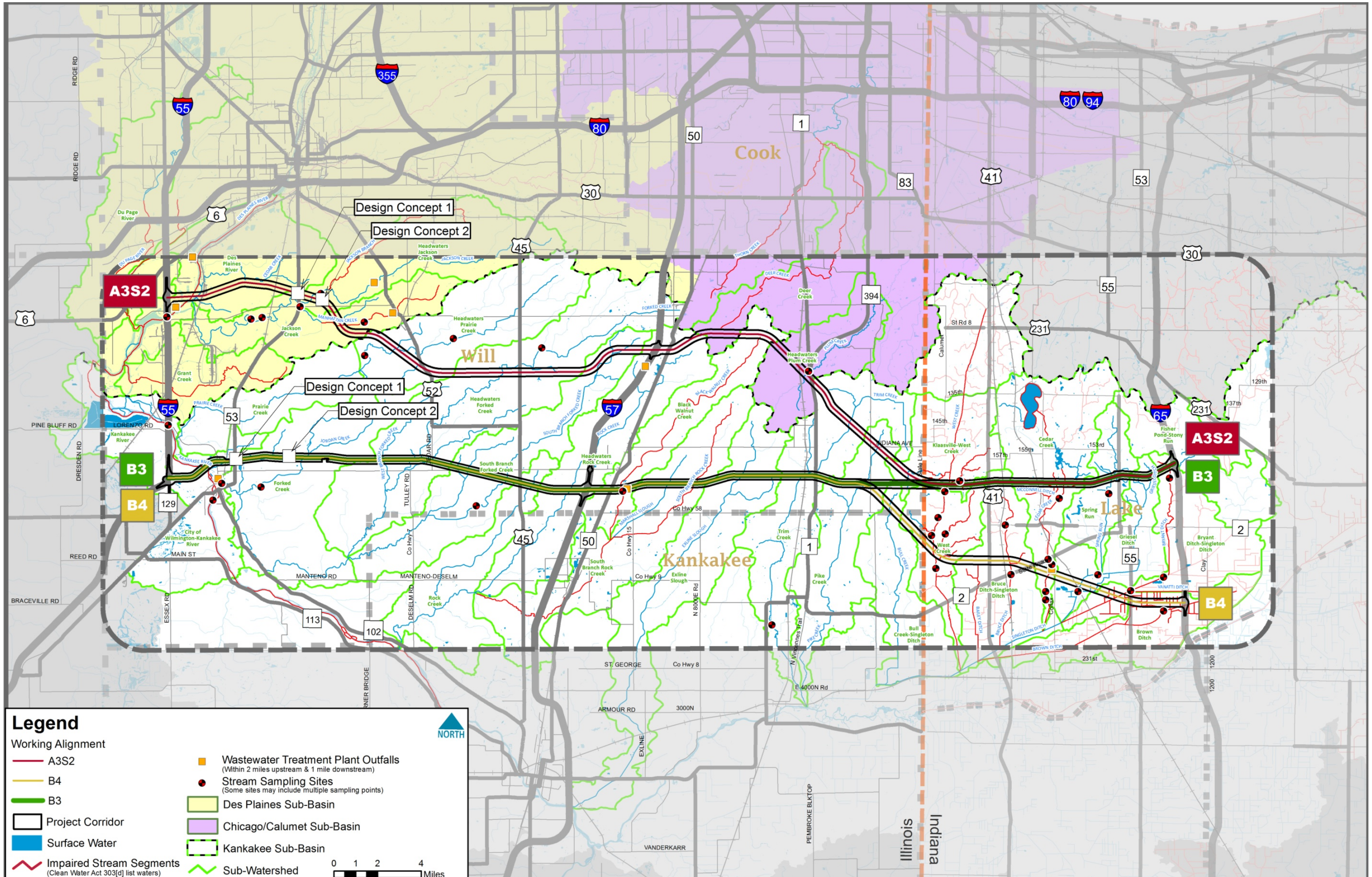
The three corridors are located within three drainage sub-basins as catalogued by the USGS: the Kankakee (Hydrologic Unit Code (HUC) 07120001), the Chicago/Calumet (HUC 07120003), and the Des Plaines (HUC 07120004).[12] Corridor A3S2 crosses through all three sub-basins. Corridors B3 and B4 are entirely located in the Kankakee sub-basin. The three sub-basins collectively drain a total of 5,072 square miles in four states: Illinois, Indiana, Michigan, and Wisconsin. The sub-basins have been divided into smaller sub-watersheds, which vary in size from 7.7 to 91.7 square miles (Figure 3-25).[13]

Land use within a sub-watershed may impact receiving waters. Assessing the drainage area and characteristics of a sub-watershed provides information relative to stream health and potential causes of water quality impairment. The predominant sub-watershed land use near the corridors is agriculture, mainly row crops such as corn and soybeans. If not managed properly, agricultural practices and stormwater runoff can impact water quality and result in elevated nutrient levels/eutrophication, increased sedimentation, and fecal coliform bacteria in receiving waters (see Section 3.9.1.5). Open

[12] The Chicago/Calumet sub-basin name is based on nomenclature of the Illinois State Water Survey.

[13] The sub-watersheds are derived from 12-digit HUCs in Illinois and 14-digit HUCs in Indiana.

Figure 3-25. Surface Water Resources



Source:
Surface Waters: U.S. Geological Survey and U.S. Environmental Protection Agency, 2008 a-b. Impaired Streams: Illinois Environmental Protection Agency, 2010; Indiana Department of Environmental Management, 2010 (rev.)
Wastewater Treatment Plant Outfalls: Illinois Environmental Protection Agency, 2002; Indiana Department of Environmental Management, 2002 Stream Sampling Sites: Holtrop, 2012 a-d; Fisher 2012 a-b; Sobat, 2011
Sub-Basin/Watershed Boundary: US Geological Survey, 2002

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space, vacant land/wetlands, and residential land uses are also prevalent near the corridors. Additional information regarding land use is provided in Section 3.2.

3.9.1.2 Surface Water Resources

Surface water resources in the corridors are primarily riverine and, to a lesser extent, lacustrine (e.g., ponds and lakes). The riverine resources are comprised of rivers and creeks with a permanent or intermittent flow regime. The majority of the creeks associated with the three corridors flow south/southwest to the Kankakee River. The lacustrine surface waters consist of ponds and lakes that do not meet the definition of a wetland due to the lack of hydrophytic vegetation (see Section 3.12). Surface water bodies are discussed below in more detail and are depicted in Figure 3-25.

The total number and acreage of lacustrine surface waters vary by corridor (see Table 3-59). Corridor A3S2 has the greatest number of lakes and ponds (28 sites), and the most acreage (39.8 acres). Corridor B4 has the fewest lakes and ponds (7 sites; 6.1 acres). The lacustrine surface waters consist of excavated farm ponds, inactive gravel pits, settling ponds, aesthetic ponds, and borrow pits, as well as naturally occurring depressions containing open water and wetland fringes. Not including the inactive gravel pit and settling ponds at the west end of Corridor A3S2, roughly half of the lacustrine water bodies located in the Illinois

Table 3-59. Lake/Pond Summary

Description	Corridor A3S2			Corridor B3			Corridor B4		
	Illinois	Indiana	Total	Illinois[1]	Indiana	Total[1]	Illinois[1]	Indiana	Total[1]
Sites (number)	20	8	**28**	5	9	**14**	5	2	**7**
Acreage in Corridor[2]	27.64	12.19	**39.83**	2.15	12.67	**14.82**	2.15	3.91	**6.06**

[1] Data does not include a group of three man-made, excavated ponds (prior farmland) (approximately 28.6 acres in total size) located northeast of IL-52 and Wilmington-Peotone Road (County Highway 25).
[2] Acreage within the corridor is provided. Some lakes and ponds extend beyond the limits of the corridor.
Sources: USGS and USEPA, 2008a; USGS and USEPA, 2008b.

portion of the corridors are small farm ponds; predominately 1 acre or less in total size.[14] The farm ponds are most likely excavated for stock watering or personal use. Within Indiana, the corridors pass through the Valparaiso Moraine that is dotted by numerous glacial kettle ponds and wetlands (Hartke, 1975). The corridors contain a number of these naturally occurring water bodies. Throughout the Indiana portion of the corridors, the water bodies range in size from almost a third of an acre to 17.7 acres in total size. None of the open water ponds within the corridors have been identified as high quality.

[14] In Illinois, the lakes and ponds range from roughly 0.1 acre to 25.4 acres in total size.

A total of 29 rivers and creeks and their tributaries occur within the three corridors (Figure 3-25 and Table 3-60). Of that total, two of the rivers (the Des Plaines River and the Kankakee River) are listed as navigable waters of the US under Section 10 of the River and Harbors Act of 1899 (US Army Corps of Engineers (USACE), 2012). The Des Plaines River is crossed by Corridor A3S2 and the Kankakee River is crossed by both Corridors B3 and B4 at a common location. Both the Des Plaines River and Kankakee River crossings are located in Illinois near the west project limits, east of I-55.

Both Illinois and Indiana designate high quality streams as Outstanding State Resource Waters. Outstanding State Resource Waters include surface water bodies or water body segments that are of exceptional ecological or recreational significance as designated by the Illinois or Indiana Pollution Control Boards. No stream segments within the corridors have been designated as Outstanding State Resource Waters.

In Illinois, one Biologically Significant Stream (BSS), Trim Creek, is crossed by Corridors B3 and B4 near IL-1 in Will County.[15] Corridor A3S2 also crosses Trim Creek but in an area that has not been identified as biologically significant. Another BSS segment, a portion of the Kankakee River (south of the confluence with Forked Creek), is located near the west end of the project approximately 3,000 feet south of Corridors B3 and B4. Indiana does not have a BSS designation.

Two of the streams crossed by the corridors have also been listed by the Illinois DNR as aquatic Natural Areas. These streams include Manhattan Creek within Corridor A3S2 and a portion of the Kankakee River within Corridors B3 and B4. See Section 3.15 for additional discussion regarding Illinois Natural Areas.

3.9.1.3 Nationwide Rivers Inventory (NRI)

No rivers or creeks within the corridors are listed as Wild and Scenic Rivers (Interagency Wild and Scenic Rivers Council, 2011).[16] However, Corridor A3S2 crosses two creeks in Will County (Manhattan Creek and Plum Creek) that are listed on the Nationwide Rivers Inventory (NRI) for their Outstandingly Remarkable Values (ORVs). The NRI is a compilation of free-flowing rivers and river segments that appear to have one or more ORVs that could qualify them for inclusion in the National Wild and Scenic Rivers System. The NRI is managed by the NPS Rivers, Trails, and Conservation Assistance Program.

The entire reach of Manhattan Creek (Figure 3-26) from its headwaters to its confluence with Jackson Creek (approximately 10 miles) is potentially eligible for listing as a Wild and Scenic River for recreation. Its ORVs include "Fish" and "Other Values." The NRI describes Manhattan Creek as having habitat or spawning grounds for rare or

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[15] In Illinois, BSS are unique free-flowing water resources that are considered to be the highest quality streams in the state. Designation as a BSS is defined in *Integrating Multiple Taxa in a Biological Stream Rating System* (Illinois DNR-Office of Resource Conservation, 2008).

[16] The Wild and Scenic Rivers Act (16 U.S.C. 1271-1287) provides protection for free-flowing rivers/river segments with outstanding wild, scenic, or recreational values.

Table 3-60. Summary of Physical Parameters and Sub-Watershed Characteristics

Stream[1]	Corridor[2]	Sub-Watershed Area (sq mi)[3]	Predominant Sub-Watershed Land Use	Flow Characteristics[4]	WWTP[5]
Illinois (Chicago/Calumet Sub-Basin)					
Plum Creek	A3S2	20.1	Agriculture	Intermittent	No
Illinois (Des Plaines Sub-Basin)					
Cedar Creek	A3S2	37.2[6]	Agriculture	Intermittent	No
Des Plaines River	A3S2	37.2[6]	Agriculture	Perennial	Yes (A3S2)
Jackson Creek	A3S2	29.5	Agriculture	Perennial	Yes (A3S2)
Manhattan Creek	A3S2	22.9	Agriculture	Perennial	Yes (A3S2)
Illinois (Kankakee Sub-Basin)					
Black Walnut Creek	A3S2 B3 B4	20.6	Agriculture	Perennial	Yes (B3, B4)
Bull Creek	B4	20.7	Agriculture	Intermittent	No
Exline Slough	B3 B4	44.0	Agriculture	Perennial	No
Forked Creek	A3S2 B3 B4	60.1[6]	Agriculture	Perennial	Yes (B3, B4)
Jordan Creek	B3 B4	40.0	Agriculture	Perennial	No
Kankakee River	B3 B4	21.5	Agriculture	Perennial	No
Marshall Slough	B3 B4	39.5[6]	Agriculture	Intermittent	No
Pike Creek	A3S2 B3 B4	26.0	Agriculture	Intermittent	No
Prairie Creek	A3S2	33.4	Agriculture	Perennial	No
Rock Creek	B3 B4	36.6	Agriculture	Perennial	Yes (A3S2)
South Branch Forked Creek	A3S2 B3 B4	35.6	Agriculture	Intermittent	No
South Branch Rock Creek	B3 B4	39.5[6]	Agriculture	Perennial	No
Trim Creek	A3S2 B3 B4	37.9	Agriculture	Perennial	No

Table 3-60. Summary of Physical Parameters and Sub-Watershed Characteristics (continued)

Stream[1]	Corridor[2]	Sub-Watershed Area (sq mi)[3]	Predominant Sub-Watershed Land Use	Flow Characteristics[4]	WWTP[5]
West Branch Forked Creek	B3 B4	60.1[6]	Agriculture	Perennial	No
Indiana (Kankakee Sub-Basin)					
Brown Ditch	B4	21.4	Agriculture	Perennial	No
Bruce Ditch	B4	24.7	Agriculture	Perennial	No
Bryant Ditch	A3S2 B3	23.5[6]	Agriculture	Perennial	No
Cedar Creek	A3S2 B3 B4	31.3[6]	Agriculture/ Residential	Perennial	Yes (B4)
Griesel Ditch	A3S2 B3 B4	16.6	Agriculture	Intermittent (A3S2, B3) Perennial (B4)	No
McConnell Ditch	A3S2 B3	31.3[6]	Agriculture/ Residential	Intermittent	No
Singleton Ditch	B4	23.5[6]	Agriculture	Perennial	No
Spring Run	A3S2 B3	12.7	Agriculture	Perennial	No
Vanatti Ditch[7]	B4	23.5[6]	Agriculture	Intermittent	No
West Creek	A3S2 B3 B4	16.2, 17.8[8]	Agriculture	Perennial	No

[1] This table includes named creeks that occur in the corridors. Unnamed tributaries are not included.
[2] This column identifies the corridor that includes a portion of the identified stream based on available data. No public flood control projects were identified in the corridors.
[3] Based on 12-digit (Illinois) and 14-digit (Indiana) HUC sub-watershed area associated with the creek segment in the corridor. Sub-watersheds may be located in both Illinois and Indiana.
[4] Periodicity of flow based on USGS 7.5-minute Quadrangle Maps and USGS Hydrologic Atlases.
[5] Indicates presence of a WWTP or Sewage Treatment Plant outfall located within 2 miles upstream or 1 mile downstream of the corridor. Respective corridor is noted in parentheses.
[6] Includes more than one named tributary.
[7] Mainstem Vanatti Ditch is not crossed by the corridors.
[8] The sub-watershed area associated with the West Creek crossing of Corridors A3S2 and B3 is 17.8 square miles. The sub-watershed area associated with the West Creek crossing of Corridor B4 is 16.2 square miles.

ecologically significant fish species. The habitat supports an unusually wide diversity of fish species. The NRI also states that Manhattan Creek has outstanding hydrologic features and is one of the area's few remaining undeveloped fully functioning high order streams.

Figure 3-26. Manhattan Creek looking upstream from S. Ridge Road (photo by CBBEL, December 2011)

A 15-mile segment of Plum Creek (Figure 3-27) from Goodenow Road in Will County to Dyer, Indiana, is also listed on the NRI. "Recreation" is listed as the Plum Creek ORV. Based on the NRI, Plum Creek is a small stream that is used for fishing and floating, but is somewhat limited by its size. Plum Creek also has some archaeological and historic value.

Corridors B3 and B4 do not cross any streams listed on the NRI. However, approximately 10 miles south of Corridor B3 and 8 miles south of Corridor B4 (near the Illinois and Indiana state line) a 22-mile segment of the Kankakee River (from its confluence with the Iroquois River in Kankakee County to the Indiana state line) is listed on the NRI. "Recreation" is listed as the Kankakee River ORV. Based on the NRI, this segment of the Kankakee River is a good recreational stream used for canoeing and fishing.[17] Public fishing areas with access to the Kankakee River are provided upstream and downstream of Corridors B3 and B4 near I-55.[18]

Figure 3-27. Plum Creek looking upstream from Burville Road (photo by CBBEL, December 2011)

3.9.1.4 Aquatic Habitat and Biota

The majority of the streams and tributaries within the corridors appear to have been channelized (or excavated) to improve drainage for agricultural purposes or development. Channelized streams typically have a narrow

[17] Both Manhattan Creek and Plum Creek are closer to Corridors B3 and B4 than the Kankakee River. However, neither of these creeks is tributary to the Kankakee River, and both Corridors B3 and B4 are located in the Kankakee sub-basin.
[18] For additional information see http://www.ifishillinois.org/profiles/rivers&creeks/KankIroq/Kankakee.html.

floodplain, and the trapezoidal channels tend to be linear (with limited meandering) with a steep embankment (Will County Stormwater Management Planning Committee, 2009). Linear creeks and ditches are especially evident near the eastern terminus of Corridor B4 associated with the Kankakee River floodplain. Channelization tends to result in increased flow velocities, erosion, and downstream sedimentation, which can affect aquatic habitat. Sedimentation and/or turbidity can diminish habitat quality for fish and aquatic macroinvertebrates by filling in-stream pool volumes and interstitial spaces in the stream substrate, reducing the feeding activity of filter feeders (e.g., mussels), diminishing the feeding success of visual predators (e.g., sight feeding fish), and may indirectly result in lower dissolved oxygen concentrations.

In streams, habitat is usually closely linked to biological diversity. Aquatic habitat can also be influenced by the riparian environment. The riparian environment includes the vegetated portion of the floodplain adjacent to rivers, streams, and creeks and functions may include erosion control, streambank stabilization, water quality benefits, treatment of contaminated stormwater runoff, habitat for plants and animals, a source of organic and nutrient input, moderation of stream temperatures (keep streams cool), and recreational or aesthetic value.

Figure 3-28. Narrow riparian corridor adjacent to Marshall Slough (photo by CBBEL, December 2011)

In Will and Kankakee counties, the majority of the streams have a relatively narrow riparian corridor of trees, shrubs, or herbaceous vegetation near the corridors. The riparian corridor is generally not extensive and is typically confined by agricultural land use activities (Figure 3-28). A narrow riparian environment provides less stormwater filtration/runoff control and generally limits the beneficial buffer functions that the riparian corridor could provide. Near the state line and moving east into Lake County, a wider wooded and/or wetland riparian corridor becomes more prevalent for Corridors A3S2 and B3.

Streams may have an ephemeral, intermittent, or perennial flow regime. In general, a perennial stream usually maintains constant flow throughout the year and is capable of supporting fish and mussels. An intermittent stream flows when the water table is seasonally high or during periods of precipitation that generate surface flow. Intermittent streams may support a limited assemblage of fish species. Ephemeral streams flow only during or after storms or snow melt or during short periods of elevated water tables. Stream flow within the corridors was based on a review of USGS 7.5-minute Quadrangle Maps and Hydrologic Atlases (see Table 3-60). The majority of the streams within the corridors have perennial flow.

In 2008, the Illinois DNR released biological stream ratings for Illinois (Illinois DNR/Office of Resource Conservation (ORC), 2008).[19] These ratings can be used to evaluate aquatic resource quality, including biologically diverse streams and those with a high degree of biological integrity. The diversity and integrity scores fall within one of five ratings ranging from A to E. Streams that are rated as Class A or B are considered to be high quality with the highest biological integrity or diversity. In general, the higher quality streams are located within the west portion of the corridors. None of the stream segments in the corridors received an A rating for diversity or integrity.[20] Two stream segments in Corridor A3S2 (Jackson Creek and Forked Creek) and three stream segments in Corridors B3 and B4 (Forked Creek, Kankakee River, and Trim Creek) have a B rating for biological diversity. Segments of Forked Creek and the Kankakee River (in Corridors B3 and B4) also received a B rating for integrity. No stream segments in Corridor A3S2 have a B rating for integrity (see Table 3-61). No ratings were available for Indiana streams.

<u>*Fish*</u>

Available fish data for streams in the corridors was from obtained from Illinois DNR and the Indiana Department of Environmental Management (IDEM) (Holtrop, 2012a; Holtrop, 2012c; Sobat, 2011) (see Table 3-61). Of the streams in which fish assemblages were assessed near the corridors, the Kankakee River (crossed by Corridors B3 and B4), had the highest species diversity (36 species; Index of Biotic Integrity (IBI) = 53). The lowest species diversity was found in three Indiana streams: Brown Ditch (one to two species; IBI = 12), Bryant Ditch (three species; IBI = 22), and Cedar Creek (three species; IBI = 14). Brown Ditch is crossed by Corridor B4. Bryant Ditch and this particular segment of Cedar Creek are crossed by Corridors B3 and A3S2. Overall, IBI scores ranged from moderate (IBI = 53) to very poor (IBI = 12).[21]

Dominant fish species in the vicinity of the corridors included: bluntnose minnow (*Pimephales notatus*), central mudminnow (*Umbra limi*), central stoneroller (*Campostoma anomalum*), creek chub (*Semotilus atromaculatus*), green sunfish (*Lepomis cyanellus*), hornyhead chub (*Nocomis biguttatus*), Johnny darter (*Etheostoma nigrum*), orangethroat darter

[19] Based on information from Illinois DNR; the new stream ratings replace the Biological Stream Characterization (BSC) and BSS list developed in 1984 and 1992, respectively.

[20] A segment of the Kankakee River and a segment of Forked Creek (near their confluence) have an A rating for diversity roughly 3,000 feet south of Corridors B3 and B4.

[21] IBI scores range from 0 to 60, with higher scores indicating better quality. For Illinois, scores of 30 or less represent streams where the biotic integrity is much lower than that expected for streams least impacted by human activities (i.e., degraded conditions with a near complete loss of intolerant species). For Indiana streams, a score of less than 35 indicates that top carnivores and many expected species are absent or rare; omnivores and tolerant species dominate.

Table 3-61. Summary of Biological Parameters [1]

Stream	Corridor	Fish Species Present (number)	Dominant Fish Species[2]	Intolerant Fish Species	IBI	Diversity[3]	Integrity[3]	Mussel Species Collected[4]
Illinois (Chicago/Calumet Sub-Basin)								
Plum Creek	A3S2	13	creek chub (20%)	hornyhead chub	32 (moderately low)	C (0.67)	not scored	fatmucket
Illinois (Des Plaines Sub-Basin)								
Jackson Creek[5]	A3S2	25, 23, 23	striped shiner (47%, 20%) bluntnose minnow (20%)	black redhorse, hornyhead chub, longear sunfish, slender madtom	47, 46 (moderate) 40 (moderately low)	B (0.93)	C (0.68)	cylindrical papershell, fatmucket, giant floater, white heelsplitter
Manhattan Creek[5]	A3S2	14, 17	bluntnose minnow (20%) central stoneroller (35%) striped shiner (33%)	hornyhead chub, longear sunfish	38, 40 (moderately low)	C (0.71)	C (0.60)	cylindrical papershell, fatmucket, giant floater, slippershell, white heelsplitter

Table 3-61. Summary of Biological Parameters (continued)

Stream	Corridor	Fish Species Present (number)	Dominant Fish Species[2]	Intolerant Fish Species	IBI	Diversity[3]	Integrity[3]	Mussel Species Collected[4]
Illinois (Kankakee Sub-Basin)								
Black Walnut Creek	B3, B4	12	silverjaw minnow (28%)	hornyhead chub, rosyface shiner	30 (low)	D (0.57)	C (0.60)	cylindrical papershell, lilliput, slippershell, squawfoot, white heelsplitter
Forked Creek[5]	A3S2	17	green sunfish (41%)	hornyhead chub	32 (moderately low)	B (0.86)	C (0.60)	data not available
	B3, B4	31	no dominant species	black redhorse, hornyhead chub, longear sunfish, mimic shiner, northern hogsucker, rosyface shiner, stonecat	52 (moderate)	B (0.86)	B (0.80)	data not available
Jordan Creek	B3, B4	16	central stoneroller (35%) striped shiner (20%)	hornyhead chub	37 (moderately low)	C (0.71)	C (0.60)	data not available

Table 3-61. Summary of Biological Parameters (continued)

Stream	Corridor	Fish Species Present (number)	Dominant Fish Species[2]	Intolerant Fish Species	IBI	Diversity[3]	Integrity[3]	Mussel Species Collected[4]
Kankakee River[5]	B3, B4	28, 36	spotfin shiner (25%, 41%)	black redhorse, longear sunfish, mimic shiner, northern hogsucker, river redhorse, rosyface shiner	47, 53 (moderate)	B (0.82)	B (0.75)	black sandshell, deertoe, elktoe, ellipse, fatmucket, fawnsfoot, fluted shell, fragile papershell, mapleleaf, monkeyface, mucket, pimpleback, pink heelsplitter, plain pocketbook, purple wartyback, round pigtoe, spike, squawfoot, threehorn wartyback, three ridge, Wabash pigtoe, white heelsplitter
Prairie Creek[5]	A3S2	19, 19	striped shiner (51%, 43%)	hornyhead chub, rosyface shiner, slender madtom	37, 37 (moderately low)	C (0.71)	C (0.60)	creek heelsplitter, cylindrical papershell, fatmucket, giant floater, lilliput, plain pocketbook, slippershell, squawfoot
South Branch Forked Creek	B3, B4	12	central stoneroller (39%) orangethroat darter (21%)	hornyhead chub	41 (moderately low)	C (0.64)	C (0.60)	data not available

Table 3-61. Summary of Biological Parameters (continued)

Stream	Corridor	Fish Species Present (number)	Dominant Fish Species[2]	Intolerant Fish Species	IBI	Diversity[3]	Integrity[3]	Mussel Species Collected[4]
Trim Creek[6]	B3, B4	21	hornyhead chub (23%)	hornyhead chub, longear sunfish, rosyface shiner	47 (moderate)	B (0.89)	C (0.68)	creek heelsplitter, cylindrical papershell, ellipse, fatmucket, giant floater, lilliput, mucket, plain pocketbook, slippershell, squawfoot, three ridge, white heelsplitter
Indiana (Kankakee Sub-Basin)								
Brown Ditch[5]	B4	1, 2	central mudminnow (86%, 100%)	none	12, 12 (very poor)	not scored	not scored	data not available
Bruce Ditch[5]	B4	11, 12	central stoneroller (33%) creek chub (20%)	none	40, 40 (fair)	not scored	not scored	data not available
Bryant Ditch	A3S2, B3	3	creek chub (93%)	none	22 (very poor)	not scored	not scored	data not available
Cedar Creek[5]	A3S2, B3	3	green sunfish (78%)	none	14 (very poor)	not scored	not scored	Asian clam, fatmucket, giant floater, paper pondshell, white heelsplitter

Table 3-61. Summary of Biological Parameters (continued)

Stream	Corridor	Fish Species Present (number)	Dominant Fish Species[2]	Intolerant Fish Species	IBI	Diversity[3]	Integrity[3]	Mussel Species Collected[4]
	B4	9, 9, 17	hornyhead chub (34%) bluntnose minnow (42%) western blacknose dace (20%)	hornyhead chub	20 (very poor) 26, 34 (poor)	not scored	not scored	Asian clam, fatmucket, giant floater, white heelsplitter
Griesel Ditch[5]	B4	23, 16	green sunfish (21%) Johnny darter (21%)	hornyhead chub, ironcolor shiner, longear sunfish, northern hogsucker	44, 38 (fair)	not scored	not scored	data not available
Singleton Ditch[5]	B4	10	central mudminnow (32%)	ironcolor shiner	20 (very poor)	not scored	not scored	Asian clam, cylindrical papershell, fatmucket, giant floater, white heelsplitter
Spring Run	A3S2, B3	11	creek chub (28%) central stoneroller (23%)	hornyhead chub	36 (fair)	not scored	not scored	data not available

Table 3-61. Summary of Biological Parameters (continued)

Stream	Corridor	Fish Species Present (number)	Dominant Fish Species[2]	Intolerant Fish Species	IBI	Diversity[3]	Integrity[3]	Mussel Species Collected[4]
West Creek[5]	A3S2, B3	15	green sunfish (26%) white sucker (24%)	none	38 (fair)	not scored	not scored	Asian clam, cylindrical papershell, fatmucket, giant floater, white heelsplitter
	A3S2, B3, B4	15, 14	green sunfish (49%, 43%)	longear sunfish, rosyface shiner	38, 40 (fair)	not scored	not scored	data not available
	B4	16, 10	green sunfish (24%, 59%)	hornyhead chub	36 (fair) 22 (very poor)	not scored	not scored	data not available
Tributary to West Creek[5]	A3S2, B3	8	creek chub (47%) western blacknose dace (24%)	none	30 (poor)	not scored	not scored	data not available
	B4	4	central stoneroller (61%)	none	34 (poor)	not scored	not scored	data not available

[1] Table is based on most recent available sampling data provided by Illinois DNR, Indiana DNR, and IDEM from sites located within approximately 1.5 miles from the corridor, unless otherwise noted. Only streams with available data are included in this table. Data from multiple sampling events are provided, as indicated.
[2] Dominant fish species make up 20 percent or more of the total catch at a sampling site. Percentage of dominant species per sampling site is provided. Creeks may have more than one sampling site.
[3] From Illinois DNR/ORC (2008). Illinois streams without available data or that did not fit the assessment tools (e.g., IBI) were "not scored." Indiana streams were "not scored."
[4] Includes live, dead, and relic (weathered dead shell) mussel shells collected during sampling.
[5] Stream has more than one fish or mussel sampling location within approximately 1.5 miles of the corridor and/or more than one sampling event took place at one location. Data from multiple sampling locations/events are provided in the table.
[6] The sampling location for Trim Creek is more than 1.5 miles downstream of the corridor. However, sampling data was included in this table because Trim Creek has a "B rating" for diversity and the relevant stream segment extends into Corridors B3 and B4.
Sources: Holtrop, 2012a; Holtrop, 2012b; Holtrop, 2012c, Holtrop, 2012d; Fisher, 2012a; Fisher, 2012b; Sobat, 2011; Illinois DNR/ORC, 2008.

(*Etheostoma spectabile*), silverjaw minnow (*Notropis buccatus*), spotfin shiner (*Cyprinella spiloptera*), striped shiner (*Luxilis chrysocephalus*), western blacknose dace (*Rhinicthys atratulus*), and white sucker (*Catostomus commersoni*). In general, streams in the corridors were dominated by pollution tolerant to moderately intolerant fish species.

The greatest diversity of pollution intolerant fish species was collected in Forked Creek and the Kankakee River, near the west limits of Corridors B3 and B4 in Illinois. These were the widest of the sampled streams. Forked Creek was approximately 45 feet wide and the Kankakee River was approximately 400 feet wide at the respective sampling locations.[22] The following pollution intolerant fish species were collected at one or both of these sites (see Table 3-61): black redhorse (*Moxostoma duquesnei*), hornyhead chub, longear sunfish (*Lepomis megalotis*), mimic shiner (*Notropis volucellus*), northern hogsucker (*Hypentelium nigricans*), river redhorse (*Moxostoma carinatum*), rosyface shiner (*Notropis rubellus*), and stonecat (*Noturus flavus*). The river redhorse, a state-threatened species, was collected from the two Kankakee River sites in July 2010 (Holtrop, 2012a). The state-endangered western sand darter (*Ammocrypta clara*) and pallid shiner (*Hybopsis amnis*) are also listed as occurring in the Kankakee River in Will County and are mapped as present within Corridors B3 and B4 (see Section 3.8.3) (INHS, 2011; GIS database, 2012).

The other streams that included pollution intolerant fish species (typically hornyhead chubs) in the samples were 45 feet wide or less. In general, the smaller sampled streams included fewer intolerant fish species and were lower in diversity or integrity. In addition to the species listed above, intolerant fish species in these smaller streams also included ironcolor shiner (*Notropis chalybaeus*) and slender madtom (*Noturus exilis*). The ironcolor shiner was collected in Griesel Ditch and Singleton Ditch near the east end of Corridor B4 in Indiana. The ironcolor shiner is a state-threatened species in Illinois, but it is not listed as threatened or endangered in Indiana.

A majority of the streams in Corridor A3S2 and all of the streams in Corridors B3 and B4 are located in the Kankakee sub-basin. The Kankakee River is used for recreational fishing. Based on a study by Illinois DNR in 2000, smallmouth bass (*Micropterus dolomieu*) were the most numerous sportfish collected from the Kankakee River. Bluegill (*Lepomis macrochirus*), largemouth bass (*Micropterus salmoides*), rock bass (*Ambloplites rupestris*), and channel catfish (*Ictalurus punctatus*) were also collected at most sampling locations. Sportfish, except for channel catfish, were also collected from Kankakee River tributaries (Pescitelli and Rung, 2003). The Des Plaines River and other streams, lakes, and ponds within the corridors may also be used for recreational fishing.

Mussels and Clams[23]

Based on information provided by the Illinois DNR and the Indiana DNR, freshwater mussels and clams were sampled in 10 of the streams in the vicinity of the corridors

[22] There were multiple sampling locations on both streams. The widest distance is provided. Forked Creek was only approximately 12 feet wide at the sampling location near Corridor A3S2.
[23] Other than mussels, aquatic macroinvertebrate data was limited and/or not available near (within 1.5 miles) of the corridors.

(Holtrop, 2012b; Holtrop, 2012d; Fisher, 2012a; Fisher, 2012b) (see Table 3-61). In general, the mussels and clams that were collected are relatively common and/or widespread species. However, four state-threatened species were collected in five of the Illinois streams. The Kankakee River sampling data (near Corridors B3 and B4) included three state-threatened mussel species: purple wartyback (*Cyclonaias tuberculata*) (dead shell only), spike (*Elliptio dilatata*) (relic or weathered dead shell), and black sandshell (*Ligumia recta*) (one live specimen collected). One live state-threatened slippershell mussel (*Alasmidonta viridis*) was collected from Manhattan Creek near Corridor A3S2. Relic slippershell mussel shells were collected from Black Walnut Creek, Prairie Creek, and Trim Creek during sampling. No state or federal listed species were included in the Indiana sampling data. See Section 3.8.3 for additional information regarding mapped locations of threatened and endangered mussels.

The other mussel and clam species in the vicinity of the corridors included: Asian clam (*Corbicula fluminea*), creek heelsplitter (*Lasmigona compressa*), cylindrical papershell (*Anodontoides ferussacianus*), deertoe (*Truncilla truncata*), elktoe (*Alasmidonta marginata*), ellipse (*Venustaconcha ellipsiformis*), fatmucket (*Lampsilis siliquoidea*), fawnsfoot (*Truncilla donaciformis*), fluted shell (*Lasmigona costata*), fragile papershell (*Leptodea fragilis*), giant floater (*Pyganodon grandis*), lilliput (*Toxolasma parvis*), mapleleaf (*Quadrula quadrula*), monkeyface (*Quadrula metanevra*), mucket (*Actinonaias ligamentina*), paper pondshell (*Utterbackia imbecillis*), pimpleback (*Quadrula pustulosa*), pink heelsplitter (*Potamilus alatus*), plain pocketbook (*Lampsilis cardium*), round pigtoe (*Pleurobema coccineum*), squawfoot (*Strophitus undulatus*), threehorn wartyback (*Obliquaria reflexa*), three ridge (*Amblema plicata*), Wabash pigtoe (*Fusconaia flava*), and white heelsplitter (*Lasmigona complanata*).

3.9.1.5 Water Quality

The goal of the Clean Water Act (CWA) is "to restore and maintain the chemical, physical, and biological integrity of the Nation's waters" (33 U.S.C. §1251(a)). Under CWA Section 303(d), states are required to classify waters with respect to impairments. Waters that do not, or are not anticipated to, meet applicable water quality standards are considered impaired and are cataloged in the 303(d) list, requiring total maximum daily loads (TMDLs). TMDLs establish pollution reduction goals to improve the quality of impaired waters.

In Illinois, waters are protected and evaluated under the General Use Water Quality Standards (Title 35 Illinois Administrative Code, Subtitle C, Chapter I, Part 302, Subparts A and B). Waters that do not fully support their designated uses are considered impaired. Designated uses include: aquatic life (AL), fish consumption (FC), primary contact (PC), secondary contact (SC), and aesthetic quality (AQ).[24]

[24] Additional uses include "Public and Food Processing Water Supply" and "Indigenous Aquatic Life." Attainment of the "Public and Food Processing Water Supply" use is only assessed in waters where this use currently occurs (e.g., the Kankakee River). The "Indigenous Aquatic Life" use applies to specific waters (e.g., lower Des Plaines River) identified in Title 35 Illinois Administrative Code, Part 303.

In Indiana, water quality standards are established under Title 327 Indiana Administrative Code (IAC), Article 2, Rule 1. Similar to Illinois, Indiana assesses its waters for compliance with state water quality standards and determines whether waters are attaining designated uses, such as supporting a well-balanced warm water aquatic community (and maintenance of trout populations where natural temperatures permit), being safe for full body contact (FBC) recreation, and protective of wildlife and human health. In Indiana, designated uses include: warm water AL, FBC, and FC.

Table 3-62 provides water quality assessment designations for surface water resources within the corridors.

Of the streams listed in Table 3-62, almost half are classified as impaired. The majority of the impaired streams are located east of I-57 and do not support their AL use or FBC use. The 303(d) impairment sources for the streams within the corridors generally include channelization, habitat modification, agricultural-related activities, and/or municipal point source discharges (MPSDs)/stormwater associated with development. These sources are consistent with the current agricultural land use of the corridor sub-watersheds and urban development.

Stormwater runoff from agricultural lands, including livestock operations, can carry nutrients, bacteria, pesticides, and large quantities of sediment to receiving waters. These pollutants can directly harm aquatic biota or they may indirectly affect the environment. Nutrients, for example, can stimulate algal blooms and excessive plant growth, which can lead to reduced dissolved oxygen concentrations in streams through plant respiration and decomposition.

A common impairment cause listed for the Indiana streams includes *Escherichia coli* (*E. coli*) bacteria.[25] *E. coli* can be used as an indicator to test for fecal contamination and/or the potential presence of disease causing organisms (e.g., pathogenic bacteria, viruses, etc.). Potential *E. coli* sources include animal feeding operations, runoff from fertilizer applications, Waste Water Treatment Plants (WWTP), urban stormwater runoff, and leaking/faulty septic systems. Eight WWTP (and sewage treatment plant) outfalls were identified in the vicinity of the corridors. The majority (five) of these are located along Corridor A3S2 in Illinois (Figure 3-25).

The majority (over 70 percent) of Corridor A3S2 and the all of Corridors B3 and B4 are located in the Kankakee sub-basin. In-stream sedimentation has been a noted concern for the Kankakee sub-basin for many years (Ivans, et al., 1981; NIRPC, 2005). Unprotected cropland and disturbed construction sites are susceptible to water and wind erosion, which can lead to sedimentation. Soil erosion and sedimentation can impact in-stream habitat and aquatic biota.

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[25] For the Indiana streams within the corridor, "impaired biotic communities" is also frequently noted as an impairment cause. This cause is noted when IDEM monitoring data shows that streams are not supporting healthy fish and/or aquatic macroinvertebrate communities. This cause is actually a symptom of one or more unidentified sources in the environment.

Table 3-62. Use Support and Impairment Summary for Streams within the Corridors

Stream[1]	Corridor	Designated Use[2]	Cause of Impairment	Source of Impairment	303(d) Impaired Waters[3]
Illinois (Chicago/Calumet Sub-Basin)					
Plum Creek AUID: IL_HBE-02	A3S2	Fully supporting: AL Not assessed: AQ, FC, PC, SC	Not applicable	Not applicable	No
Illinois (Des Plaines Sub-Basin)					
Cedar Creek AUID: IL_GD	A3S2	Not assessed: AL, AQ, FC, PC, SC	Not applicable	Not applicable	No
Des Plaines River AUID: IL_G-12	A3S2	Not supporting: FC Fully supporting: IAL Not assessed: SC	Mercury, polychlorinated biphenyls (PCBs)	Atmospheric deposition - toxics, source unknown, contaminated sediments	Yes
Jackson Creek AUID: IL_GC-03	A3S2	Fully supporting: AL Not assessed: AQ, FC, PC, SC	Not applicable	Not applicable	No
Manhattan Creek AUID: IL_GCA-M-C1	A3S2	Not supporting: AL Not assessed: AQ, FC, PC, SC	Alteration in stream-side or littoral vegetative covers, sedimentation/siltation, phosphorus (total), cause unknown, changes in stream depth and velocity patterns	Channelization, habitat modification – other than hydromodification, site clearance (land development or redevelopment), agriculture, MPSD, source unknown	Yes

Table 3-62. Use Support and Impairment Summary for Streams within the Corridors (continued)

Stream[1]	Corridor	Designated Use[2]	Cause of Impairment	Source of Impairment	303(d) Impaired Waters[3]
Illinois (Kankakee Sub-Basin)					
Black Walnut Creek AUID: IL_FFBA	A3S2 B3 B4	Not supporting: AL Fully supporting: AQ Not assessed: FC, PC, SC	Alteration in stream-side or littoral vegetative covers, chlorine, other flow regime alterations, phosphorus (total), changes in stream depth and velocity patterns	Channelization, habitat modification – other than hydromodification, MPSD, agriculture	Yes
Bull Creek AUID: IL_FRA	B4	Not assessed: AL, AQ, FC, PC, SC	Not applicable	Not applicable	No
Exline Slough AUID: IL_FKA-01	B3 B4	Not supporting: AL Fully supporting: AQ Not assessed: FC, PC, SC	Alteration in stream-side or littoral vegetative covers, changes in stream depth and velocity patterns, loss of in-stream cover	Channelization, agriculture, habitat modification – other than hydromodification, loss of riparian habitat	No[4]
Forked Creek AUID: IL_FB-02	A3S2 B3 B4	Fully supporting: AL Not assessed: AQ, FC, PC, SC	Not applicable	Not applicable	No
Jordan Creek AUID: IL_FBA	B3 B4	Not assessed: AL, AQ, FC, PC, SC	Not applicable	Not applicable	No
Kankakee River AUID: IL_F-16	B3 B4	Not supporting: FC, PFPWS Fully supporting: AL, PC, SC, AQ	Mercury, PCBs, manganese	Atmospheric deposition - toxics, source unknown	Yes
Marshall Slough AUID: IL_FFBB	B3 B4	Not assessed: AL, AQ, FC, PC, SC	Not applicable	Not applicable	No

Table 3-62. Use Support and Impairment Summary for Streams within the Corridors (continued)

Stream[1]	Corridor	Designated Use[2]	Cause of Impairment	Source of Impairment	303(d) Impaired Waters[3]
Pike Creek AUID: IL_FQA	A3S2 B3 B4	Not assessed: AL, AQ, FC, PC, SC	Not applicable	Not applicable	No
Prairie Creek AUID: IL_FA-01	A3S2	Fully supporting: AL, AQ Not assessed: FC, PC, SC	Not applicable	Not applicable	No
Rock Creek AUID: IL_FF-01	B3 B4	Fully supporting: AL, AQ Not assessed: FC, PC, SC	Not applicable	Not applicable	No
South Branch Forked Creek AUID: IL_FBC-02	A3S2 B3 B4	Not assessed: AL, AQ, FC, PC, SC	Not applicable	Not applicable	No
South Branch Rock Creek AUID: IL_FFB-01	B3 B4	Not supporting: AL Fully supporting: AQ Not assessed: FC, PC, SC	Alteration in stream-side or littoral vegetative covers, other flow regime alterations, pH, phosphorus (total)	Livestock (grazing or feeding operations), channelization, habitat modification – other than hydromodification	Yes
Trim Creek AUID: IL_FQ-01	A3S2 B3 B4	Fully supporting: AL, AQ Not assessed: FC, PC, SC	Not applicable	Not applicable	No
Indiana (Kankakee Sub-Basin)					
Brown Ditch[5] AUID: INK01D7_03, INK01D7_T1004	B4	Fully supporting: FBC Not supporting: AL Not assessed: FC	Impaired biotic communities	Source unknown	Yes

Table 3-62. Use Support and Impairment Summary for Streams within the Corridors (continued)

Stream[1]	Corridor	Designated Use[2]	Cause of Impairment	Source of Impairment	303(d) Impaired Waters[3]
Bruce Ditch[5] AUID: INK01DB_T1001, INK01DB_T1002	B4	Fully supporting: AL Not supporting: FBC Not assessed: FC	Impaired biotic communities, *Escherichia coli* (*E. coli*)	Animal feeding operations (non-point source), combined sewer overflows, non-point source, unspecified urban stormwater	Yes
Bryant Ditch AUID: INK01D5_T1002	A3S2 B3	Not supporting: AL, FBC Not assessed: FC	Impaired biotic communities, *E. coli*	Animal feeding operations (non-point source), non-point source, source unknown, unspecified urban stormwater	Yes[6]
Cedar Creek AUID: INK01D6_07	A3S2 B3 B4	Not supporting: AL Not assessed: FBC, FC	Impaired biotic communities	Impervious surface/parking lot runoff, livestock (grazing or feeding operations), package plant or other permitted small flows discharges	Yes
Griesel Ditch[7] AUID: INK01D4_02	A3S2 B3 B4	Fully supporting: AL Not supporting: FBC Not assessed: FC	*E. coli*	Non-point source, unspecified urban stormwater	No[6]
McConnell Ditch AUID: INK01D6_T1006	A3S2 B3	Not supporting: FBC Not assessed: AL, FC	*E. coli*	Animal feeding operations (non-point source), MPSD, package plant or other permitted small flows discharges	Yes[6]
Singleton Ditch AUID: INK01D5_01	B4	Not supporting: AL, FBC Not assessed: FC	Impaired biotic communities, *E. coli*	Animal feeding operations (non-point source), non-point source, source unknown, unspecified urban stormwater	Yes[6]
Spring Run[5] AUID: INK01D3_03, INK01D3_T1013	A3S2 B3	Not assessed: AL, FBC, FC	Not applicable	Not applicable	No
Vanatti Ditch[5] AUID: INK01D5_T1003	B4	Not supporting: AL, FBC Not assessed: FC	Impaired biotic communities, *E. coli*	Animal feeding operations (non-point source), non-point source, source unknown, unspecified urban stormwater	Yes[6]

Table 3-62. Use Support and Impairment Summary for Streams within the Corridors (continued)

Stream[1]	Corridor	Designated Use[2]	Cause of Impairment	Source of Impairment	303(d) Impaired Waters[3]
West Creek[5] AUID: INK01D9_03, INK01D9_T1014, INK01D9_T1015	A3S2 B3	Not supporting: AL, FBC Not assessed: FC	Impaired biotic communities, *E. coli*	Animal feeding operations (non-point source), non-point source, source unknown	Yes
INK01DA_01	B4	Fully supporting: AL, FC Not supporting: FBC	*E. coli*	Animal feeding operations (non-point source), non-point source, unspecified urban stormwater	Yes[6]
INK01DA_T1001	B4	Fully supporting: FC Not supporting: AL, FBC	Impaired biotic communities *E. coli*	Animal feeding operations (non-point source), non-point source, source unknown, unspecified urban stormwater	Yes

[1] Information is provided for water body segment AUID associated with the corridors. AUID are from IEPA/BOW, 2012; IDEM/OWQ, 2012. Water body segments within the corridors that do not have an AUID are not listed in the table. Designated uses and impairments may vary per AUID.
[2] Abbreviations for Illinois Streams: AL: Aquatic Life; AQ: Aesthetic Quality; FC: Fish Consumption; IAL: Indigenous Aquatic Life; PC: Primary Contact; PFPWS: Public and Food Processing Water Supplies; and SC: Secondary Contact. In any Illinois inland lake or stream where PC use is assessed as "fully supporting," SC use is also assessed as "fully supporting." In all other circumstances, SC use is not assessed. Abbreviations for Indiana Streams: AL: Warm Water Aquatic Life; FBC: Full Body Contact; and FC: Fish Consumption.
[3] Impairment status is based on the Illinois Draft Integrated Water Quality Report and Section 303(d) List (IEPA/BOW, 2012) and the Indiana Draft 303(d) List of Impaired Waters (IDEM/OWQ, 2012).
[4] Failure to meet an applicable water quality standard is not caused by a pollutant. AL use is impaired by habitat related condition(s).
[5] Includes AUID for Unnamed Tributary.
[6] Water body segment may be impaired or threatened for a designated use. However, a TMDL has been completed that is expected to result in attainment of applicable water quality standards.
[7] Griesel Ditch (AUID: INK01D4_02) is also known as Griesel Ditch (AUID: INK01D4_T1005) in some stream reaches.
Source: IEPA/BOW, 2012; IDEM/OWQ, 2012; Arthur, 2012a; Arthur, 2012b; and Arthur, 2012c.

Water Quality Trends

Since the 1970s, various environmental regulations (at the federal, state, and local levels), flood control projects, public awareness, and activism have played a role in improving water quality and reducing flooding. Regulations, such as the federal CWA and local ordinances, are reducing the adverse effects of development upon water resources. In 1977, the Indiana General Assembly created the Kankakee River Basin Commission to plan and coordinate the environmental demands placed on the Kankakee River, its tributaries, and surrounding land. Areas of concern include drainage, flooding, water quality, fish and wildlife management, protection/preservation of remaining wetlands and forests, and recreation potential (IDEM/OWQ, 2001). Illinois designated the Kankakee River Basin Commission Ecosystem Partnership in 1996 to bring together local citizens and government to address land and water issues in the Kankakee River Basin. These groups coordinate projects in the Kankakee River Basin to help improve the quality of the aquatic resources.

Agriculture is currently the dominant land use near and within the corridors. However, over the past several years, urban development has been expanding in Will County and Lake County; this trend is expected to continue. Studies have shown that the biological quality of streams may be impacted if the percentage of urban land use within a watershed exceeds between 10 and 30 percent (Midwest Biodiversity Institute, 2008). In an effort to maintain or improve water quality, stormwater/watershed management plans and/or strategies have been prepared that minimize impacts to aquatic resources and downstream properties as a result of development and/or agricultural activities (Will County Stormwater Management Committee, 1998; IDEM/OWQ, 2001; Northeastern Illinois Planning Commission (NIPC), 2001; NIRPC, 2005; Campaign for Sensible Growth, Metropolitan Planning Council, and Openlands, 2005).[26]

Advances in wastewater and combined sewer overflow controls during the 1970s through the 1990s improved some of the worst pollution problems in northeastern Illinois (NIPC, 2001). The number and frequency of bacteria-related water quality impairments was expected to continue to decrease as municipalities and industrial facilities upgraded treatment facilities and improved operations in the Kankakee River Basin (Indiana DNR-Division of Water (DOW), 1990). Progress has continued in developing tools and strategies (e.g., green infrastructure, low impact development, treatment technologies, operation and maintenance practices, etc.) that can be implemented to manage stormwater runoff, reduce the frequency/volume of sewer overflows, and minimize water pollution (USEPA, 2004).

With respect to the corridors and surrounding area, agricultural/rural runoff, and to a lesser extent urban runoff, is considered to be the principal source of the bacteria impairments. A TMDL has been prepared for the Kankakee/Iroquois Watershed to

[26] This section concentrates on the Kankakee sub-basin, where the majority of the corridors are located. However, watershed plans have also been prepared for other sub-watersheds along Corridor A3S2 (such as Jackson Creek and Deer Creek/Thorn Creek), which are located in the Des Plaines and Chicago/Calumet sub-basins, respectively (Will County Stormwater Management Planning Committee, 2009; Thorn Creek Ecosystem Partnership, 2000).

address fecal coliform bacteria and *E. coli* impairments in Illinois and Indiana, respectively (Tetra Tech, Inc., 2009).[27] TMDLs by themselves will not lessen future degradation, but with regulatory oversight, stakeholder initiatives, and implementation of Best Management Practices (BMPs), water quality in the local sub-watersheds and the larger Kankakee River drainage sub-basin should improve.

BMP implementation by landowners will be key to improving water quality, especially with respect to sediments and other potential pollutants from agricultural land. For example, conservation tillage (leaving at least 30 percent crop residue on the ground after planting) and no-till practices are effective methods that can be used to minimize soil erosion. Conservation tillage can reduce soil loss to roughly half of what can be expected from conventional tilling. No-till practices can be even more effective (NIRPC, 2005). In Illinois and Indiana, conservation tillage is becoming a more common practice. Other practices that can be used to minimize sedimentation and improve water quality include maintaining a vegetated buffer between the field and a stream and participation in a CREP.

Nonpoint source pollution from agricultural land and urban areas was identified by IDEM as a primary contributor to impaired biotic communities in a segment of West Creek located upstream of the corridors. To address this concern (starting in the 1990s and continuing through 2004), IDEM and other project partners used CWA Section 319 funds (and other revenue sources) to provide stakeholders with educational opportunities, guidance, and assistance with agricultural and stormwater quality BMPs. Water quality data collected in 2011 showed that stream health has improved and that the biotic community in a segment of West Creek is no longer impaired. IDEM anticipates proposing to the USEPA that the upstream segment of West Creek be removed from Indiana's 2012 Section 303(d) list (USEPA, 2011).

3.9.2 Methodology

Using existing information, an overview of surface water, water quality, and aquatic life within the Study Area was prepared for the corridors studied in detail. The potential impacts on these resources relied on published research and available data. No water quality testing or modeling was performed. Sub-watersheds and surface water resources within the corridors were described and evaluated based on available resources, including land uses within the sub-watershed, approximate drainage area, flow characteristics of identified streams, and designated uses of streams.

GIS data was used to identify mapped water resources (e.g., rivers, creeks, lakes, and ponds) within the corridors. The GIS database was supplemented with information provided by and/or available through state agencies including the Illinois Environmental Protection Agency (IEPA), IDEM, Illinois DNR, and Indiana DNR.

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[27] A small portion (3.4 percent) of Corridor A3S2 drains to Deer Creek. A Stage 1 TMDL report has been prepared to address fecal coliform in the segment of Deer Creek located near Corridor A3S2 (AECOM, 2011).

Based on available mapping, approximate water resource boundaries were added to the GIS database along with recent aerial photography. The data was plotted to identify potential water resources in the corridors. Aquatic sampling/field surveys were not conducted as part of the study; instead, available databases were searched for information. More detailed analysis will be completed during the Tier Two NEPA studies.

The GIS database and professional interpretation of available data was used to estimate potential impacts that the working alignments could have on water resources and water quality, emphasizing potential impacts at stream crossings or other project impacts on surface waters.

3.9.3 Impacts

This section discusses potential surface water impacts that would be associated with the construction, operation, and maintenance of the working alignments, including the pollutants that could be deposited into receiving waters, potential impacts to water quality, and direct impacts through construction and the placement of fill material. Pollutants, such as sediments, solids, heavy metals (e.g., Pb, zinc, and copper), oil and grease, deicing chemicals, and fertilizers/nutrients may be released into the environment during construction or may accumulate on roadway surfaces and adjoining rights-of-way as a result of motor vehicle operations and maintenance. They can be transported to receiving waters in stormwater runoff.

3.9.3.1 Construction Impacts to Surface Waters

Direct impacts to surface waters could result from construction and the placement of structures or fill material. Construction associated with transportation projects includes earthmoving practices (e.g., clearing/grubbing, grading, filling, excavation, etc.) that remove vegetative cover and expose soils. Such activities increase the potential for erosion and sedimentation by exposing disturbed soils to precipitation.

Increased impervious surface area and compaction of soils by heavy equipment may result in less stormwater infiltration and additional stormwater runoff. In-stream construction, streambank modification, and placement of structures in the streams could cause minimal increases in turbidity and sedimentation and temporarily alter downstream hydraulics and substrate conditions. Downstream aquatic systems could be temporarily impacted by the increases in turbidity and sedimentation. The magnitude of impact would vary based on several conditions, such as proposed type of crossing, stream characteristics, and soil type. Temporary construction-related impacts could result even if a waterway is not directly impacted, depending on the proximity of the activity to the waterway and drainage patterns. Potential impacts would be minimized through the implementation of BMPs.

The working alignments would be predominantly constructed on new location, and would result in approximately 26-53 stream crossings, depending on the working alignment (see Table 3-63). The working alignment within Corridor A3S2 has the lowest number of stream crossings and the working alignment within Corridor B4 has the

Table 3-63. Stream Crossing Summary

Stream Crossing[1]	Corridor A3S2			Corridor B3			Corridor B4			Special Designation(s) for Stream Segment at Crossing						
	Crossings of Working Alignment (number)	Stream Length in Corridor (feet)	Stream Length in Working Alignment (feet)	Crossings of Working Alignment (number)	Stream Length in Corridor (feet)	Stream Length in Working Alignment (feet)	Crossings of Working Alignment (number)	Stream Length in Corridor (feet)	Stream Length in Working Alignment (feet)	NRI	BSS	IL DNR A/B Stream Rating	IL Natural Area	CWA Navigable Waters	State-Listed Species[2]	CWA 303(d) List Impaired
Illinois (Chicago/Calumet Sub-Basin)																
Plum Creek	1	2,282	459	0	0	0	0	0	0	X						
Illinois (Des Plaines Sub-Basin)																
Des Plaines River	3	5,784	1,356	0	0	0	0	0	0					X		X
Unnamed Trib. to Des Plaines River	0	650	0	0	0	0	0	0	0							
Cedar Creek	0	3,218	0	0	0	0	0	0	0							
Jackson Creek	1	2,792	404	0	0	0	0	0	0			X				
Manhattan Creek	1	2,442	430	0	0	0	0	0	0	X			X		X	X
Unnamed Trib. to Manhattan Creek	0	585	0	0	0	0	0	0	0							

Table 3-63. Stream Crossing Summary (continued)

Stream Crossing[1]	Corridor A3S2			Corridor B3			Corridor B4			Special Designation(s) for Stream Segment at Crossing						
	Crossings of Working Alignment (number)	Stream Length in Corridor (feet)	Stream Length in Working Alignment (feet)	Crossings of Working Alignment (number)	Stream Length in Corridor (feet)	Stream Length in Working Alignment (feet)	Crossings of Working Alignment (number)	Stream Length in Corridor (feet)	Stream Length in Working Alignment (feet)	NRI	BSS	IL DNR A/B Stream Rating	IL Natural Area	CWA Navigable Waters	State-Listed Species[2]	CWA 303(d) List Impaired
Illinois (Kankakee Sub-Basin)																
Prairie Creek	1[3]	3,812	1,145[3]	0	0	0	0	0	0						X	
Unnamed Trib. to Prairie Creek	0[3]	852	0[3]	0	0	0	0	0	0							
Prairie Creek Trib.	1	1,593	516	0	0	0	0	0	0							
Kankakee River	0	0	0	1	2,721	486	1	2,721	486			X	X	X	X	X
Unnamed Trib. to Kankakee River	0	0	0	1	2,812	411 – 506[4]	1	2,812	411 – 506[4]							
Unnamed Trib. to Forked Creek	0	0	0	3	10,143	2,381 – 2,964[4]	3	10,143	2,381 – 2,964[4]							
Jordan Creek	0	0	0	1	3,173	940	1	3,173	940							
Unnamed Trib. to Jordan Creek	0	0	0	0	157	0	0	157	0							
West Branch Forked Creek	0	0	0	1	2,104	419	1	2,104	419							

Table 3-63. Stream Crossing Summary (continued)

Stream Crossing[1]	Corridor A3S2			Corridor B3			Corridor B4			Special Designation(s) for Stream Segment at Crossing						
	Crossings of Working Alignment (number)	Stream Length in Corridor (feet)	Stream Length in Working Alignment (feet)	Crossings of Working Alignment (number)	Stream Length in Corridor (feet)	Stream Length in Working Alignment (feet)	Crossings of Working Alignment (number)	Stream Length in Corridor (feet)	Stream Length in Working Alignment (feet)	NRI	BSS	IL DNR A/B Stream Rating	IL Natural Area	CWA Navigable Waters	State-Listed Species[2]	CWA 303(d) List Impaired
Unnamed Trib. to Forked Creek	1	5,821	1,416	1	3,224	479	1	3,224	479							
Forked Creek	1	2,582	447	1	2,821	411	1	2,821	411			X				
Forked Creek Trib.	0	0	0	1	3,274	432	1	3,274	432							
Unnamed Trib. to So. Branch Forked Creek	1	1,913	418	1	2,201	410	1	2,201	410							
So. Branch Forked Creek Trib.	0	0	0	1	2,086	409	1	2,086	409							
So. Branch Forked Creek	1	7,866	948	1	2,335	414	1	2,335	414							
Rock Creek Trib.	0	0	0	1	2,623	406	1	2,623	406							
Rock Creek	0	0	0	1	2,471	413	1	2,471	413							
Black Walnut Creek	0	434	0	1	2,055	424	1	2,055	424						X[5]	X
Marshall Slough	0	0	0	1	2,342	486	1	2,342	486							
So. Branch Rock Creek	0	0	0	1	2,409	508	1	2,409	508							X

Table 3-63. Stream Crossing Summary (continued)

Stream Crossing[1]	Corridor A3S2			Corridor B3			Corridor B4			Special Designation(s) for Stream Segment at Crossing						
	Crossings of Working Alignment (number)	Stream Length in Corridor (feet)	Stream Length in Working Alignment (feet)	Crossings of Working Alignment (number)	Stream Length in Corridor (feet)	Stream Length in Working Alignment (feet)	Crossings of Working Alignment (number)	Stream Length in Corridor (feet)	Stream Length in Working Alignment (feet)	NRI	BSS	IL DNR A/B Stream Rating	IL Natural Area	CWA Navigable Waters	State-Listed Species[2]	CWA 303(d) List Impaired
Exline Slough	0	0	0	1	2,402	480	1	2,402	480							
Unnamed Trib. to Exline Slough	0	0	0	0	1,028	0	0	1,028	0							
Trim Creek	1	2,253	424	1	4,426	980	1	4,426	980		X[5]	X[5]			X[5]	
Trim Creek Trib.	0	0	0	0	368	0	0	368	0							
Pike Creek	1	2,139	462	1	2,707	404	1	2,159	413							
Bull Creek	0	0	0	0	0	0	1	2,619	494							
Unnamed Trib. to West Creek	1	3,910	484	1	2,175	561	0	0	0							
Subtotal (Illinois)	**15**	**50,928**	**8,909**	**22**	**62,057**	**11,854 – 12,532** [4]	**22**	**61,953**	**11,796 – 12,474** [4]							
Indiana (Kankakee Sub-Basin)																
West Creek	1[3]	2,191	563[3]	1	2,211	461	1	3,283	551							X
Unnamed Trib. to West Creek	1[3]	7,472	406[3]	1	6,323	407	2	5,484	1,018							X
Bruce Ditch	0	0	0	0	0	0	1	2,105	422							X
Unnamed Trib. to Bruce Ditch	0	0	0	0	0	0	1	3,152	461							X

Table 3-63. Stream Crossing Summary (continued)

Stream Crossing[1]	Corridor A3S2			Corridor B3			Corridor B4			Special Designation(s) for Stream Segment at Crossing						
	Crossings of Working Alignment (number)	Stream Length in Corridor (feet)	Stream Length in Working Alignment (feet)	Crossings of Working Alignment (number)	Stream Length in Corridor (feet)	Stream Length in Working Alignment (feet)	Crossings of Working Alignment (number)	Stream Length in Corridor (feet)	Stream Length in Working Alignment (feet)	NRI	BSS	IL DNR A/B Stream Rating	IL Natural Area	CWA Navigable Waters	State-Listed Species[2]	CWA 303(d) List Impaired
McConnell Ditch	1	3,105	505	1	3,105	505	0	0	0							X
Unnamed Trib. to McConnell Ditch	1	2,095	455	1	2,095	455	0	0	0							X
Cedar Creek	1	2,083	479	1	2,083	479	1	2,066	410							X
Unnamed Trib. to Cedar Creek	0	2,324	0	0	2,324	0	0	0	0							X
Spring Run	1[3]	3,268	2,481[3]	1	3,268	2,481	0	0	0							
Unnamed Trib. to Spring Run	2[3]	3,781	1,489[3]	2[3]	3,781	1,489[3]	0	0	0							
Unnamed Trib. to Griesel Ditch	1	1,526	40	1	1,526	40	2	4,077	834							
Griesel Ditch	1	2,798	566	1	2,798	566	1	2,011	401							
Singleton Ditch and Tribs.	0	0	0	0	0	0	5	10,133	2,095							X
Brown Ditch and Tribs.	0	0	0	0	0	0	15	29,621	15,552							X

Table 3-63. Stream Crossing Summary (continued)

Stream Crossing[1]	Corridor A3S2			Corridor B3			Corridor B4			Special Designation(s) for Stream Segment at Crossing						
	Crossings of Working Alignment (number)	Stream Length in Corridor (feet)	Stream Length in Working Alignment (feet)	Crossings of Working Alignment (number)	Stream Length in Corridor (feet)	Stream Length in Working Alignment (feet)	Crossings of Working Alignment (number)	Stream Length in Corridor (feet)	Stream Length in Working Alignment (feet)	NRI	BSS	IL DNR A/B Stream Rating	IL Natural Area	CWA Navigable Waters	State-Listed Species[2]	CWA 303(d) List Impaired
Vanatti Ditch Tribs.	0	0	0	0	0	0	0	3,375	0							X
Bryant Ditch	1	2,235	1,200	1	2,235	1,200	0	0	0							X
Unnamed Trib. to Brown Ditch	0	0	0	0	0	0	2	2,133	2,133							X
Subtotal (Indiana)	**11**	**32,878**	**8,184**	**11**	**31,749**	**8,083**	**31**	**67,440**	**23,877**							
Grand Total	**26**	**83,806**	**17,093**	**33**	**93,806**	**19,937 – 20,615[4]**	**53**	**129,393**	**35,673 – 36,351[4]**							

[1] Crossings are generally listed in order of occurrence from west to east within their respective sub-basin. Nomenclature is based on USGS Quadrangle Maps, USGS Hydrologic Atlases, and IEPA/IDEM 303(d) lists. Tributary is abbreviated as Trib.
[2] An "X" indicates that state-listed threatened or endangered fish or mussel species are mapped within the corridor and/or were recently collected at the nearest sampling location (includes relic mussel shells).
[3] Crossing is located near confluence with mainstem of creek. Impacts are included with mainstem.
[4] The range provided for the working alignments accounts for the range in impacts associated with the three design concepts. Design Concept 1 has the greatest impact.
[5] A portion of the stream is located in all three corridors. The special designation applies to the stream crossing at the working alignment within Corridors B3 and B4; it is not applicable to Corridor A3S2.

greatest number of stream crossings. In-stream construction may be required at these crossings to install new culverts and/or bridges, or to modify existing drainage structures. In-stream construction would follow standard practice, such as the IDOT and/or INDOT *Standard Specifications* (2012 or latest version), including isolating the work area as necessary.

The types of crossing structures would be determined as part of Tier Two NEPA studies. Additional details regarding construction methodology would be provided during CWA and floodplain/floodway construction permitting. Three interchange design concepts are being considered near the west project limits in the vicinity of IL-53. The number of general stream crossing locations associated with each working alignment does not vary between the design concepts. The design concepts do not affect the stream lengths that would be impacted by the working alignment within Corridor A3S2. However, the design concepts do affect the stream lengths that would be impacted by the working alignment within Corridors B3 and B4. The longest stream lengths are associated with Design Concept 1. When compared to Design Concept 1, both Design Concepts 2 and 3 include approximately 678 feet less stream length (combined) at the Unnamed Tributary to Kankakee River and at the Unnamed Tributary to Forked Creek crossings (see Table 3-63).

The working alignment within Corridor A3S2 crosses two streams listed on the NRI, Manhattan Creek and Plum Creek. If Corridor A3S2 is advanced to the Tier Two NEPA studies, coordination with the NPS will be initiated. The coordination response from the NPS would help with determining the magnitude of potential impacts to the NRI streams.

In addition to streams, the working alignments would impact lacustrine water bodies. Potential impacts to lakes and ponds (non-wetland) would vary between the working alignments. Based on available mapping, the working alignment within Corridor A3S2 would result in the greatest impact to lakes/ponds (7.7 acres at eight sites) and the working alignment within Corridor B4 would result in the least impact (0.2 acre at three sites) (see Table 3-64). The majority of the lake/pond sites that would be impacted are located in Illinois. The impacts do not vary between the design concepts.

Table 3-64. Lake/Pond Impact Summary

	A3S2 Working Alignment			B3 Working Alignment			B4 Working Alignment		
	Illinois	Indiana	Total	Illinois	Indiana	Total	Illinois	Indiana	Total
Sites (number)	7	1	**8**	3	1	**4**	3	0	**3**
Impact (acreage)	4.01	3.65	**7.66**	0.18	3.65	**3.83**	0.18	0	**0.18**

Impacts to Highly Erodible Soils

Based on available soils data from the USDA–NRCS), medium and highly erodible soils are mapped as being present within the corridors (see Figure 3-29). The extent varies by corridor, with the greatest acreage in Corridor A3S2 and the least amount in Corridor B4 (see Table 3-65). In Illinois, highly erodible soils are considered to be soils with slopes of

Table 3-65. Highly Erodible Soils Summary

	Corridor A3S2			Corridor B3			Corridor B4		
	Illinois	Indiana	Total	Illinois	Indiana	Total	Illinois	Indiana	Total
Corridor (acreage)	1,735.3	1,681.1	**3,416.4**	1,036.0	1,690.6	**2,726.6**	962.1	595.1	**1,557.2**
Working Alignment Impact (acreage)	488.1	465.4	**953.5**	197.6 – 203.9[1]	468.4	**666.0 – 672.3[1]**	184.3 – 190.6[1]	126.8	**311.1 – 317.4[1]**

[1] The range provided for the corridors accounts for the range in impacts associated with the three design concepts. Design Concept 2 has the greatest impact.

4 percent or greater. In Indiana, highly erodible land includes soils with either medium or high potential for erosion based on the following criteria: medium risk soils either have slopes of 7 percent to 12 percent or are soils with 3 percent to 6 percent slopes in which the surface horizon is brown or grey and the texture is clayey. High risk soils have slopes greater than 12 percent (Franzmeier, et al., 2009).

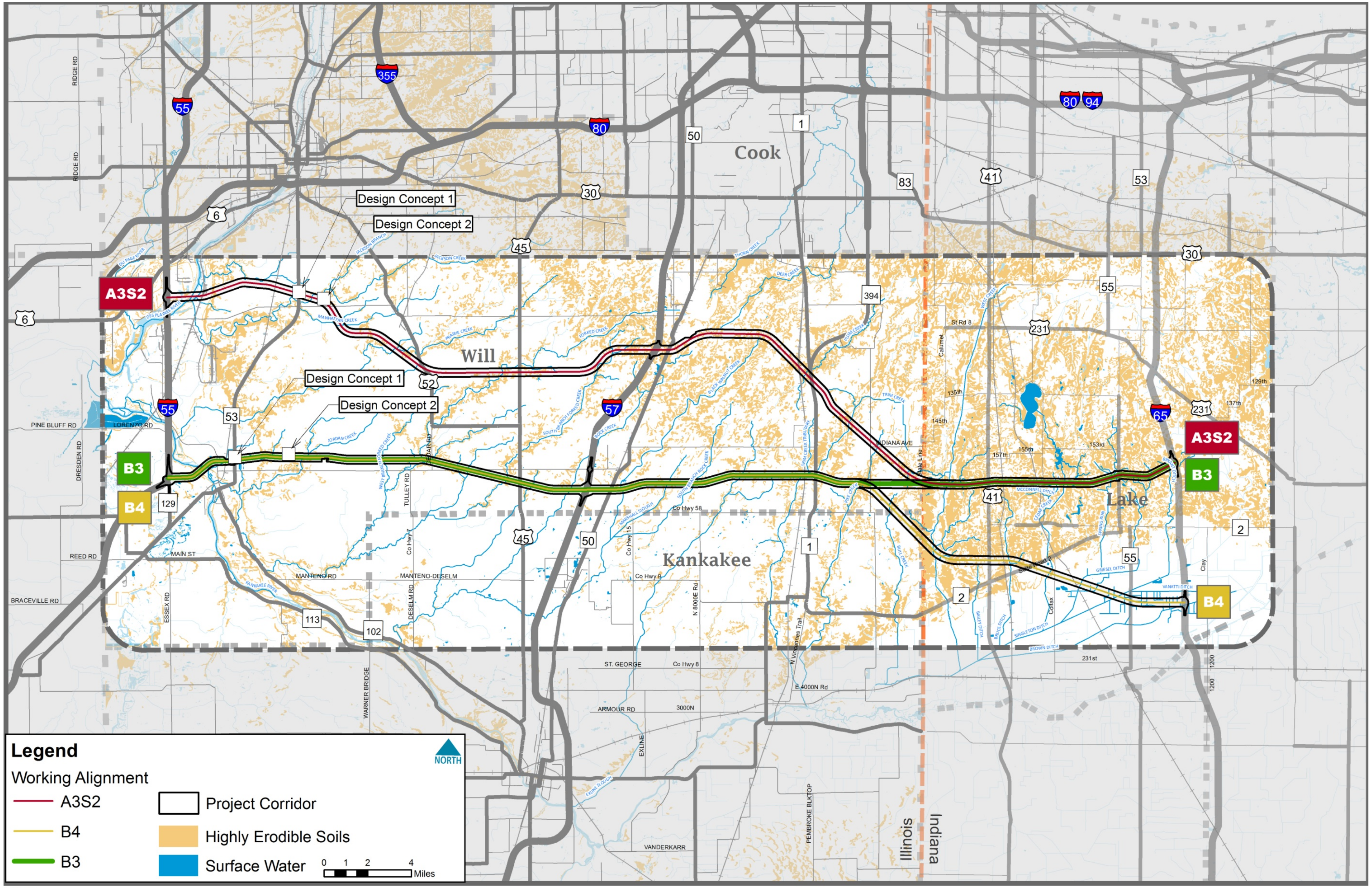
The working alignment within Corridor A3S2 would have the greatest impact to highly erodible soils (953.5 acres) and the working alignment within Corridor B4 would have the least impact (up to 317.4 acres). Increased sedimentation during construction has the potential to impact streams, thereby affecting habitat for some species of fish, mussels, and/or aquatic macroinvertebrates. The degree of impact would vary based on site-specific conditions, such as the type of crossing structure, stream substrate, stream depth, and stream velocity. With the implementation of BMPs, adverse impacts to aquatic organisms due to siltation, turbidity, and suspended solids are expected to be minimal.

3.9.3.2 Operational Impacts to Surface Waters

Operation includes the use and maintenance of the transportation system. Operational impacts associated with roadways include the accumulation of pollutants on roadway surfaces, medians, and rights-of-way as a result of roadway use, natural contributions, and deposition of air pollution. Stormwater runoff transports pollutants that have accumulated on impervious surfaces. Primary constituents of highway runoff associated with typical operations include total suspended solids (TSS) (from pavement wear, atmospheric deposition, and dirt), Pb (from tire wear), zinc (from tire wear, motor oil, and grease), copper (from moving engine parts and brake lining wear), and petroleum (from spills, leaks, gasoline, antifreeze, and hydraulic fluids). The concentrations of these pollutants are highly variable by site, and are affected by numerous factors, such as traffic characteristics, climate, maintenance activities, and adjacent land use.

Right-of-way would be acquired and additional travel lanes and other impervious surfaces would be constructed in the selected corridor(s). When undeveloped land is disturbed and converted to impervious surfaces, the volume of stormwater runoff typically increases and stormwater infiltration decreases. Use and maintenance of the additional impervious surfaces would generate and accumulate more pollutants, which

Figure 3-29. Highly Erodible Soils



Source:
Highly Erodible Soils: Indiana Geological Survey, 2002;
U.S. Department of Agriculture/ Natural Resources Conservation Service, 2005
Surface Waters: U.S. Geological Survey and U.S. Environmental Protection Agency, 2008 a-b.

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could be transported by stormwater runoff. Stormwater detention ponds would be constructed to control the volume of stormwater runoff associated with the additional disturbed land and impervious area within the project right-of-way. Detention ponds provide the temporary storage of stormwater runoff with a controlled release rate during and after a storm.

For the working alignments within the corridors, stormwater detention requirements were analyzed in accordance with the IDOT Drainage Manual and the INDOT Indiana Design Manual. Additionally, guidance from Will, Kankakee, and Lake counties' stormwater management ordinances was considered. These county ordinances are stricter than state requirements and were used in preliminary detention calculations. Per state policies, IDOT and INDOT compliance with county and local regulations is voluntary, and no commitment to comply with local ordinances should be implied herein.[28] Final methodology for assessing detention storage requirements will be determined by IDOT and INDOT with consideration of costs, benefits, public input, and current drainage policies and procedures. Table 3-66 provides a preliminary estimate of disturbed area, impervious surface, and requisite stormwater detention storage volume for the working alignments within the corridors. The majority of Corridor A3S2 and all of Corridors B3 and B4 are located in the Kankakee sub-basin. The disturbed area associated with the working alignments is similar for the three IL-53 design concepts. Design Concept 1 is presented in the table.

Highway runoff pollution may impact the quality of receiving waters through shock or acute loadings during storms and through chronic effects from long-term accumulation within the receiving water. The significance of these impacts is site-specific and depends heavily on the characteristics of the highway and the receiving waters. The degree of pollutant loading is linked to the amount of roadway traffic. Research indicates few substantial impacts for highways with less than 30,000 ADT (Young et al., 1996; Dupuis et al., 1985). Under these conditions, potential impacts are generally short-term, localized, acute loadings from temporary water quality degradation, with few (if any) chronic effects.

The estimated year 2040 ADT volumes vary per corridor. Based on the traffic demand model for this project, Corridor B3 is predicted to have the highest overall ADT at 34,548 vehicles per day (vpd) (for both directions); followed by Corridor A3S2 (33,992 vpd) and Corridor B4 (28,382 vpd). These traffic volumes are based on a non-tolled scenario. If broken down by roadway sections, the highest ADT are associated with Corridor A3S2. The ADT volumes for Corridor A3S2 range from 39,100 vpd (between US 52 and US 45 in Illinois) to 26,600 vpd (between SR 55 and I-65 in Indiana). The highest ADT associated with Corridor B3 roadway sections is slightly less than Corridor A3S2. Corridor B3 ranges from 38,700 vpd (between I-55 and IL-53 in Illinois) to 26,100 vpd (between SR 55 and I-65 in Indiana). Corridor B4 roadway sections are forecasted to have the lowest ADT; ranging from 34,300 vpd (between I-55 and IL-53 in Illinois) to 24,100 vpd (between IL-394 in Illinois and US 41 in Indiana). For streams receiving

[28] IDOT Drainage Manual 1-303.03 (2011) and Indiana Design Manual 28-3.06 (2011).

Table 3-66. Preliminary Impervious Area and Detention Storage Volumes by Sub-Watershed[1]

Sub-Watershed[2]	A3S2 Working Alignment			B3 Working Alignment			B4 Working Alignment		
	Disturbed Area (acres)	Impervious Area (acres)	Detention Storage Volume Required (acre-feet)	Disturbed Area (acres)	Impervious Area (acres)	Detention Storage Volume Required (acre-feet)	Disturbed Area (acres)	Impervious Area (acres)	Detention Storage Volume Required (acre-feet)
Chicago/Calumet Sub-Basin									
Deer Creek	86.19	20.69	16.38	0.00	0.00	0.00	0.00	0.00	0.00
Headwaters Plum Creek	138.16	33.16	26.25	0.00	0.00	0.00	0.00	0.00	0.00
Sub-Total	**224.35**	**53.85**	**42.63**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Des Plaines Sub-Basin									
Du Page River	102.73	24.66	19.52	0.00	0.00	0.00	0.00	0.00	0.00
Des Plaines River	391.72	94.01	74.43	0.00	0.00	0.00	0.00	0.00	0.00
Jackson Creek	126.85	30.44	24.10	0.00	0.00	0.00	0.00	0.00	0.00
Headwaters Jackson Creek	103.96	24.95	19.75	0.00	0.00	0.00	0.00	0.00	0.00
Sub-Total	**725.26**	**174.06**	**137.80**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Kankakee Sub-Basin									
Kankakee River	0.00	0.00	0.00	83.17	19.96	15.80	83.17	19.96	15.80
City of Wilmington-Kankakee River	0.00	0.00	0.00	316.32	75.92	60.10	316.32	75.92	60.10
Forked Creek	0.00	0.00	0.00	330.07	79.22	62.71	330.07	79.22	62.71
Headwaters Prairie Creek	264.38	63.45	50.23	0.00	0.00	0.00	0.00	0.00	0.00

Table 3-66. Preliminary Impervious Area and Detention Storage Volumes by Sub-Watershed (continued)

Sub-Watershed[2]	A3S2 Working Alignment			B3 Working Alignment			B4 Working Alignment		
	Disturbed Area (acres)	Impervious Area (acres)	Detention Storage Volume Required (acre-feet)	Disturbed Area (acres)	Impervious Area (acres)	Detention Storage Volume Required (acre-feet)	Disturbed Area (acres)	Impervious Area (acres)	Detention Storage Volume Required (acre-feet)
Headwaters Forked Creek	325.26	78.06	61.80	175.10	42.02	33.27	175.10	42.02	33.27
South Branch Forked Creek	147.00	35.28	27.93	145.10	34.82	27.57	145.10	34.82	27.57
Rock Creek	0.00	0.00	0.00	75.81	18.19	14.40	75.81	18.19	14.40
Headwaters Rock Creek	332.06	79.69	63.09	405.08	97.22	76.96	405.09	97.22	76.97
Black Walnut Creek	83.00	19.92	15.77	102.46	24.59	19.47	102.46	24.59	19.47
South Branch Rock Creek	0.00	0.00	0.00	172.44	41.39	32.76	172.44	41.39	32.76
Exline Slough	0.00	0.00	0.00	154.67	37.12	29.39	154.67	37.12	29.39
Trim Creek	170.16	40.84	32.33	137.81	33.07	26.18	137.81	33.07	26.18
Pike Creek	73.32	17.60	13.93	131.99	31.68	25.08	131.89	31.65	25.06
Bull Creek-Singleton Ditch	0.00	0.00	0.00	27.86	6.69	5.29	56.16	13.48	10.67
Klaasville-West Creek	202.25	48.54	38.43	154.84	37.16	29.42	0.00	0.00	0.00
West Creek	27.25	6.54	5.18	32.33	7.76	6.14	163.10	39.14	30.99
Bruce Ditch-Singleton Ditch	90.86	21.81	17.26	90.80	21.79	17.25	213.84	51.32	40.63
Cedar Creek	161.46	38.75	30.68	161.46	38.75	30.68	46.79	11.23	8.89
Spring Run	158.56	38.05	30.13	158.56	38.05	30.13	0.00	0.00	0.00
Griesel Ditch	62.96	15.11	11.96	62.96	15.11	11.96	102.28	24.55	19.43
Bryant Ditch-Singleton Ditch	178.31	42.79	33.88	178.31	42.79	33.88	75.14	18.03	14.28

Table 3-66. Preliminary Impervious Area and Detention Storage Volumes by Sub-Watershed (continued)

Sub-Watershed[2]	A3S2 Working Alignment			B3 Working Alignment			B4 Working Alignment		
	Disturbed Area (acres)	Impervious Area (acres)	Detention Storage Volume Required (acre-feet)	Disturbed Area (acres)	Impervious Area (acres)	Detention Storage Volume Required (acre-feet)	Disturbed Area (acres)	Impervious Area (acres)	Detention Storage Volume Required (acre-feet)
Fisher Pond-Stony Run	5.64	1.35	1.07	5.64	1.35	1.07	0.00	0.00	0.00
Brown Ditch	0.00	0.00	0.00	0.00	0.00	0.00	305.22	73.25	57.99
Sub-Total	**2,282.47**	**547.78**	**433.67**	**3,102.78**	**744.65**	**589.51**	**3,192.46**	**766.17**	**606.56**
Total	**3,232.08**	**775.69**	**614.10**	**3,102.78**	**744.65**	**589.51**	**3,192.46**	**766.17**	**606.56**

[1] Detention storage volume calculations were based on the Will County and Kankakee County 100-year allowable release rate of 0.15 cfs/acre and 2-year allowable release rate of 0.04 cfs/acre with 24 percent impervious area. This is conservative for the Lake County 100-year allowable release rate of 0.2 cfs/acre. The IDOT allowable release rate for the 10-, 50-, and 100-year post-developed condition is the 10-, 50-, and 100-year pre-developed condition, respectively. The INDOT allowable release rate for the 50-year post-developed condition is the 10-year pre-developed condition.

[2] Based on 12-digit HUC sub-watersheds in Illinois and 14-digit HUC sub-watersheds in Indiana.

runoff along these corridors, the pollutant loading from traffic would be higher and the potential impact could be greater depending upon the stream characteristics and the post construction stormwater BMPs that are implemented.

Stormwater runoff and highway pollutants could cause further degradation of receiving waters, erosion, harm or stress to aquatic life, and decreased recreational use and aesthetics. BMPs would be incorporated into the proposed improvements to minimize adverse impacts to the downstream aquatic environment. Water quality would be managed through a combination of stormwater runoff and drainage collection facilities, and the implementation of other post-construction BMPs in accordance with state and federal water quality goals of managing the water quality of impaired or degraded streams. To the extent practicable, improvements would be designed so that stormwater runoff quality would be improved with infiltration, detention, or other stormwater treatment before discharge to surface waters. Stormwater controls that treat typical highway pollutants (e.g., suspended solids, sediment, heavy metals, inorganic salts, and polycyclic aromatic hydrocarbons (PAHs)) and that control the volume of stormwater runoff are discussed in Section 3.9.4.2.

3.9.3.3 Maintenance Impacts

Maintenance practices associated with the proposed improvements would include implementation of deicing practices during the winter months and herbicide spraying for invasive/noxious vegetative species within the right-of-way.

Deicing salt (commonly sodium chloride) and plowing are the main tools used during winter to control ice and snow build-up on roadway surfaces. Deicing salt helps to maintain traffic flow and safe roadways in the winter, but road salt application contributes chloride loads to surface waters. Brine is also used as a pre-wetting and/or anti-icing agent. Brine can work faster and at lower temperatures than dry salt and also results in less waste (i.e., less chloride entering the environment). Based on the Illinois and Indiana 303(d) lists, none of the water body segments within the corridors list chloride as an impairment cause.

Road salt moves through the environment as runoff, splash, spray, and dust. The salt is carried by melt water runoff to the roadway drainage swales, ditches, or storm sewers to a receiving stream or other water body. Salt is also transported by splash, spray, or dust generated by moving vehicles coming in contact with brine, slush, or dried residue. Studies indicate that 60 to 80 percent of salt is carried by surface runoff into water bodies, 15 to 35 percent occurs as splash, and up to 3 percent occurs as spray (Frost, et al., 1981; Diment, et al., 1973; Lipka and Aulenbach, 1976; Sucoff, 1975). The amount of salt entering the environment depends on the number of snowstorms per season and salting events per storm.

Elevated levels of chloride in receiving streams are seasonal and occur predominantly during the winter months as a result of road salt application (CH2M HILL, 2004). In the winter, deicing salt moves primarily as surface runoff through the environment adjacent to the roadway where it was applied. It also percolates into the soil profile. The highest salt concentrations generally are found near the roadway shoulders because of plowing and splash and can have detrimental environmental effects. Salt deposition and concentrations adjacent to roadways decrease as the distance from a treated roadway increases (Kelsey and Hootman, 1992; Williams, et al., 2000). Sodium chloride can decrease soil permeability and raise soil pH, which could adversely affect soil fertility and plant growth (Transportation Research Board, 1991).

Surface Runoff

Surface runoff is the primary means of road salt transport following application. To the extent practicable, stormwater runoff would be directed into roadside ditches and other stormwater management structures/facilities before discharge into receiving waters. Studies of the effects of sodium chloride on fish, aquatic invertebrates, and aquatic plants—including acute and chronic toxicity—indicate that salt does not have significant harmful effects on aquatic biota in large or flowing bodies of water, where dilution takes place quickly (Jones and Jeffrey, 1992). However, the potential impact that stormwater containing chlorides may have on receiving waters is dependent on many factors, such as the concentration, size of the water body (water volume), precipitation, topography, soil type, and drainage patterns. Peak concentrations in waterways could be reduced by using detention basins.

Splash and Spray

Plants, soils, and to a limited extent aquatic biota, could be affected by salt brine splash and spray from the proposed improvements. The greatest effect from splash would generally be expected within 45 to 60 feet of the edge of the road in the splash deposition zone (Transportation Research Board, 1991; Public Sector Consultants, Inc., 1993; Williams and Stensland, 2006). Splash could increase soil erosion because of soil impact and subsequent flow concentration on embankments and other slopes. Spray consists of smaller sized droplets than splash and may be deposited further from the roadside. Roadside vegetation (trees, shrubs, ground cover, and grasses) may suffer salt injury with drought-like symptoms, such as inhibited growth, leaf discoloration, and defoliation. Some plant species are more susceptible than others (e.g., grasses are generally more tolerant of salt than trees). Vegetative damage generally increases with greater salt usage, traffic speed and volume, and steeper side slopes; vegetative damage generally diminishes as the distance from the road increases (Transportation Research Board, 1991; Public Sector Consultants, Inc., 1993; Shi, et al., 2009).

3.9.4 Mitigation

All required permits and approvals (e.g., National Pollutant Discharge Elimination System (NPDES), Section 404 CWA, Section 401 CWA water quality certification (WQC), state floodplain/floodway construction permits, and Section 9 and 10 of the River and Harbors Act) will be obtained prior to in-stream construction.[29] See Section 3.16 for a discussion of required permits and certifications.

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[29] Section 9 and 10 permits pertain to navigable waters, such as the Kankakee River and the Des Plaines River.

Measures to mitigate water quality impacts are described conceptually and will be detailed in the Tier Two NEPA studies as to type, extent, and location of mitigation. The Tier Two NEPA studies will also include detailed field surveys of the aquatic environment. Appropriate IDOT and INDOT construction and design guidance will be followed. BMPs will be implemented as dictated by required permits and approvals. With the implementation of BMPs, surface water impacts, including adverse impacts to fish, mussels, aquatic macroinvertebrate communities, water quality, and recreation, as a result of the proposed improvements are anticipated to be minimal.

Mitigation for permanent fill placed in jurisdictional waters of the US will be accomplished in conjunction with wetland mitigation either through purchasing credits in an USACE approved mitigation bank or at an off-site location (see Section 3.12). Consideration will also be given to on-site stream restoration and preservation of sites adjacent to impact areas. Depending on available sites, mitigation for unvegetated waters of the US could include re-meandering channelized streams, removing/replacing existing drain tiles/culverts with stabilized stream channels, stabilizing eroded streambanks, constructing in-stream habitat, creating riparian buffer, etc.

3.9.4.1 Construction

To protect the downstream aquatic environment, a Storm Water Pollution Prevention Plan (SWPPP) will be prepared (in accordance with NPDES requirements) that identifies soil erosion and sediment control practices to be used throughout the construction process. Appropriate practices (e.g., perimeter silt fence) will be implemented before any clearing, grading, excavating, or fill activities. To help protect water quality and reduce erosion and sedimentation during construction, guidance from both the IDOT *BDE Manual* (Chapters 41 (Construction Site Storm Water Pollution Control) and 59 (Landscape Design)) (2010) and IDEM *Storm Water Quality Manual* (2007) would be implemented. Compliance with Section 280 of the IDOT *Standard Specification for Road and Bridge Construction* (2012) and Section 205 of the INDOT *Standard Specifications* (2012) would also be met. Idle, disturbed, highly erodible soils and/or exposed soils adjacent to surface waters, and any work below the ordinary high water mark of a stream will be stabilized as soon as practicable. Diversion of "clear water" (water with low turbidity and suspended solids) flowing through the construction site and away from disturbed areas will be achieved by standard temporary diversion techniques.

Proper soil erosion and sediment control measures will be used to minimize erosion and sedimentation. These measures are a condition of Section 404 CWA permits, prescribed in design and construction guidance by IDOT and INDOT, and will be coordinated with the local Soil and Water Conservation District (SWCD), as necessary. Erosion control measures consist of applying mulch, straw, soil tackifiers, polymers, erosion control blankets, and vegetative soil stabilization. Vegetative soil stabilization includes temporary and permanent seeding. Disturbance of streamside and riparian vegetation will be kept to a minimum. In-stream construction and soil disturbing activities near streams will be conducted during low or no-flow conditions. Discharge points will be protected with rock (or an alternative measure) to minimize scour and erosion.

Perimeter sediment control devices will be installed before commencing soil disturbing activities, as necessary. Perimeter silt fence, stabilized construction entrances, drainage inlet protection, ditch checks, diversions, sediment traps, and other appropriate BMPs will be used to control sediment and runoff, and to protect receiving waters during construction. No-intrusion fencing also will be used in active pastures to divert livestock from construction areas, as necessary.

Flow will be maintained during construction in perennial streams by using dam and pumping, fluming, culverts, piped bypass, or other techniques. Cofferdams, if necessary, will be constructed of nonerodible materials; earthen embankments or dikes will not be used as cofferdams. If dewatering is required to perform "work in the dry" in perennial streams, the dewatering will be only temporary in nature. All materials used for temporary construction activities will be moved to upland areas following completion of the construction activity. Temporarily disturbed areas will be restored to preconstruction conditions, including grading, where possible, to original contours and installation of erosion control as soon as practicable in accordance with NPDES permit requirements.

Efforts will be made to avoid and minimize impacts to water resources. When impacts are unavoidable, waterway crossings will be enclosed in a culvert, bridged, or otherwise designed to accommodate anticipated high water flows; allow safe passage of fish and other aquatic organisms; and not impede low water flows in order to minimize negative effects to the aquatic ecosystem.

Accidental spills of hazardous materials and wastes during construction or operation of the transportation system require special response measures. Occurrences will be handled in accordance with state and federal law. The first response typically is through the fire department and emergency service personnel to ensure public safety and to prevent harm to the environment. Depending on the nature of the spill, the appropriate Emergency Management Agency and/or other applicable state agency will be notified, as necessary, to provide additional instruction regarding cleanup. Concrete washout, construction vehicle/equipment maintenance, and/or refueling will be performed in designated areas to prevent and/or minimize the discharge of concrete washout (wastewater) and mechanical fluids/fuel into downstream drainage facilities or watercourses.

3.9.4.2 Operation

BMPs will be implemented that minimize the volume of stormwater runoff discharge and will result in physical, chemical, or biological pollutant load reduction, increased infiltration, and evapotranspiration. Compensatory storage and stormwater detention facilities will be analyzed in the design phase of the Tier Two NEPA studies and will be completed in accordance with state requirements and will consider guidance from county and local ordinances. As state transportation agencies, IDOT and INDOT compliance with county and local regulations is voluntary. Stream crossings and structure sizing will be performed in accordance with state and federal guidelines regarding floodplain encroachment and hydraulic capacity. All new structures will comply with state and federal guidelines. Drainage systems, including ditches, will be maintained and restored so as not to impound water, unless designed to do so for a water quality benefit.

Other stormwater control practices may be needed to mitigate for potential water quality impacts. In addition to detention facilities, other practices, such as vegetated basins/buffers, infiltration basins, and bioswales will be evaluated to minimize transport of sediment, heavy metals, and other pollutants.

Studies show that BMPs such as infiltration basins/trenches, detention basins, and vegetated swales generally have pollutant removal effectiveness of between 50 and 90 percent for TSS with more variable removal percentages for metals (generally averaging between 35 and 85 percent). Sediment particles are a primary component of TSS. Other pollutants such as nutrients, trace metals, and HC have been known to attach to sediments and can be transported in stormwater runoff. As discussed in the FHWA's *Stormwater Best Management Practices in an Ultra-Urban Setting: Selection and Monitoring*, studies suggest that by controlling TSS, other constituents (e.g., metals and nutrients), could also be controlled (Shoemaker et al., 2002); this FHWA document also summarizes water quality BMPs and their pollutant removal effectiveness.

During final engineering, stormwater controls will be designed to meet state and federal regulatory requirements to treat the "first flush" of a storm, as necessary. The first flush is often referred to as the first 0.5 to 1 inch of runoff per impervious area in a drainage basin and typically includes a higher concentration of pollutants compared to later during the storm (Shoemaker et al., 2002; CMAP, 2008).

3.9.4.3 Maintenance

During the winter, practices such as the spreading of deicing salt (e.g., sodium chloride) and snow plowing will be used as necessary to provide public safety. Deicing management practices, such as application of anti-icing chemicals and additives, can minimize salt application quantities. The use of alternative deicing agents could be considered in relation to cost, applicability, feasibility, and public safety. Costs for sodium chloride alternatives tend to be substantially higher, and those alternatives cannot be used in all conditions or locations. In addition, alternatives may present potential adverse water quality impacts that must be taken into consideration. BMPs will be evaluated further in the Tier Two NEPA studies.

Herbicide application will follow the manufacturer's guidelines to minimize drift and runoff into surface waters. An NPDES permit for pesticide point source discharges will be obtained if required.

3.10 Groundwater Resources

This section evaluates the proposed project's potential impact on groundwater quality and quantity, and the potential impacts to community and private water supplies, seeps, and karst topography. Proposed mitigation measures are identified that could mitigate potential impacts to groundwater resources identified due to project construction or operation.