APPENDIX A:

INTEGRATED REPORT TABLES (REVISED)

Table 1: Summary of designated use support by waterbody type.

Designated Beneficial Use	Total Size	Size Assessed	Size Fully Supporting	Size Not Supporting	Size Not Attainable
Rivers and Streams (Miles)					
Full Body Contact (Recreational Use)	63,130	31,683	8,122	23,561	0
Human Health and Wildlife (Fishable Use)	63,130	8,873	3,418	5,455	0
Public Water Supply[1]	354	25	0	25	0
Warm Water Aquatic Life (Aquatic Life Use)	63,130	37,693	25,793	11,900	122
Lake Michigan Shoreline (Miles)					
Full Body Contact (Recreational Use)	59	59	4	55	0
Human Health and Wildlife (Fishable Use)	59	59	0	59	0
Public Water Supply	35	31	31	0	0
Warm Water Aquatic Life (Aquatic Life Use)	59	59	59	0	0
Lake Michigan (Acres)					
Human Health and Wildlife (Fishable Use)	154,176	154,176	0	154,176	0
Lakes and Reservoirs (Acres)					
Full Body Contact (Recreational Use)	127,607	37,047	29,035	8,012	0
Human Health and Wildlife (Fishable Use)	127,607	77,845	27,290	50,555	0
Public Water Supply	29,541	16,615	230	16,385	0
Warm Water Aquatic Life (Aquatic Life Use)	127,607	10,379	3,754	6,625	0

Source: IDEM's assessment database

[1]While all waterbodies in Indiana are designated for aquatic life and recreational uses, not all are designated for public water supply. There are a total of 29,541 lake acres, 354 stream miles, and 35 miles along Lake Michigan's shoreline designated for public water supply in Indiana. The values for lake acres does not include the 154,176 acres of Lake Michigan.

Table 2: Atlas information.

Description	Value	Units
Indiana population[1]	6,483,802	People
Indiana surface area[2]	36,291	Square Miles
Total miles of rivers and streams[3]	63,130	Miles
Number of publicly-owned lakes, reservoirs and ponds[4]	575+	-
Publicly-owned lakes, reservoirs, and ponds[4]	106,205	Acres
Great Lakes[4]	154,176	Acres
Great Lakes shoreline[5]	59	Miles
Fresh water wetlands[6]	813,000	Acres

[1]U.S. Census Bureau, 2010 census [2]State Information Center [3]2014 Reach Index [4]U.S. EPA (1993) [5]Indiana Reach Index [6]Rolley (1991)

Table 3: 205(j) and 319(h) Investments in SFY 2003-2013. Table does not include an additional $434,328 from the American Recovery and Reinvestment Act of 2009, which was awarded through the SRF Program.

205(j)			319(h)		
FFY	Number of Projects	Amount Awarded	FFY	Number of Projects	Amount Awarded
2003	6	$507,054	2003*	34	$4,544,480
2004	6	$497,220	2004**	27	$4,159,332
2005	3	$254,430	2005***	21	$3,747,145
2006	2	$251,310	2006	18	$3,374,538
2007	2	$148,915	2007	12	$3,022,961
2008	0	0	2008	8	$2,967,181
2009	2	$271,432	2009	9	$2,759,609
2010	2	$293,753	2010	11	$3,653,209
2011	4	$699,775	2011	8	$2,457,215
2012	2	$331,250	2012	8	$2,221,471
2013	2	$337,750	2013	7	$2,276,973
2014	3	$341,000	2014	9	$2,628,234
2015	2	$340,000	2015	9	$2,317,768

* includes 2 in-house projects totaling $526,122
** includes 2 in-house projects totaling $248,792
*** includes 1 in-house project totaling $155,686

Table 4: Reductions in sediment, phosphorus, and nitrogen reaching Indiana waters.

FFY(s)	Sediment Reduction (tons/year)	Phosphorus Reduction (lbs/year)	Nitrogen Reduction (lbs/year)
2000-2003	35,870	42,662	85,710
2004	18,561	21,993	44,527
2005	33,415	39,347	79,349
2006	25,831	40,538	99,434
2007	23,279	126,529	125,848
2008	18,119	25,400	65,367
2009	7,965	15,479	15,319
2010	33,420	31,374	66,400
2011	28,880	33,434	70,450
2012	47,616	94,980	141,709
2013	54,507	92,360	170,376
2014	67,403	168,542	168,710
2015	97,212	132,737	228,334

Source: IDEM OWQ nonpoint source project tracking database

Table 5: Water quality improvements in Indiana watersheds reported to U.S. EPA for measures SP-12 and WQ-10.

Stream Name	Watershed Hydrologic Unit Code	Stream Miles Improved	Impairment Removed	Year Removed from 303(d) List
Pigeon	05140202	32	Chlordane	2002
Lower Clifty Creek	051202060107	8.12	E. coli	2010
West Fork Big Walnut	051202030104	34.64	E. coli	2010
East Fork Big Walnut	051202030102	15.76	E. coli	2010
Bull Run	071200011308	25.09	Impaired biotic communities	2012
Metcalf Ditch	041000030504	14.33	Impaired biotic communities	2012
North Prong Stotts Cr	051202011404	1.25	Impaired biotic communities	2012
South Prong Stotts Cr	051202011405	13.23	Impaired biotic communities	2012
Mill Creek	051201011404	13.14	Impaired biotic communities	2012
Jenkins Ditch	051201070308	2.13	Impaired biotic communities	2012
Emma Creek	040500011201	38.2	Ammonia	2014
Devils Backbone Indian Cr	051401040502	21	Impaired biotic communities	2015

Table: 6: Binational phosphorus load reduction targets for Lake Erie under the Great Lakes Water Quality Agreement, Annex 4.

<table>
<tr><th>Great Lakes Water Quality Agreement Lake Ecosystem Objectives</th><th colspan="2">Annex 4 Phosphorus Reduction Goals</th></tr>
<tr><td>Minimize the extent of hypoxic zones in the Waters of the Great Lakes associated with excessive phosphorus loading, with particular emphasis on Lake Erie</td><td colspan="2">40 percent reduction in total phosphorus entering the Western Basin and Central Basin of Lake Erie – from the United States and from Canada – to achieve 600 metric-ton Central Basin load</td></tr>
<tr><td rowspan="3">Maintain algal species consistent with healthy aquatic ecosystems in the nearshore Waters of the Great Lakes</td><td colspan="2">40 percent reduction spring total and soluble reactive phosphorus loads from the following watersheds where localized algae is a problem:</td></tr>
<tr><th>Western Basin of Lake Erie</th><th>Central Basin of Lake Erie</th></tr>
<tr><td>• Thames River (Canada)
• Maumee River (U.S.)
• River Raisin (U.S.).
• Portage River (U.S.)
• Toussaint Creek (U.S.)
• Leamington Tributaries (Canada)</td><td>• Sandusky River (U.S.)
• Huron River (U.S.)</td></tr>
<tr><td>Maintain cyanobacteria biomass at levels that do not produce concentrations of toxins that pose a threat to human or ecosystem health in the Waters of the Great Lakes</td><td>40 percent reduction in spring total (860 metric tons) and soluble reactive phosphorus (186 metric tons) loads from the Maumee River (U.S.)</td><td>N/A</td></tr>
</table>

Table 7. SRF investments in SFY 2014 and 2015.

SRF Program	Number of Projects	Loan Amount	Savings Realized
Clean Water	34	$297,390,310	$64,582,500
Drinking Water	22	$39,657,401	$19,243,179

Source: SRF tracking database

Table 8. A comparison of means for selected nonpoint source pollution-related parameters at two sites on Emma Creek, before (2007–2008) and after (2009–2010) BMP implementation. All parameters expressed as milligrams per liter unles otherwise noted.

Parameter	Site 1 (Tributary of Emma Creek)		Site 13 (Mouth of Emma Creek)	
	2007–2008	2009–2010	2007-2008	2009-2010
Turbidity (nephelometric turbidity units)	13	8.8	74	56
Total Suspended Solids	23.4	17.2	107	27
Nitrate	1.1	1.1	3.1	2.8
Total Phosphorus	0.497	0.287	2.01	0.57
Biological Oxygen Demand	1.31	0.72	2.05	1.15
Ammonia	0.15	0.11	0.11	0.09
E. coli (colony-forming units per 100 milliliters)	1,147	750	17,109	16,483

Table 9. Pathogen concentrations in colony-forming units per 100 milliters (cfu/100mL) and dissolved oxygen levels in milligrams per liter (mg/L) in the Devils Backbone segment of Indian Creek, 2000 and 2010. Values in bolded red font indicate exceedances of state water quality criteria.

Pre-project E. coli Data		
Sample Date	**Site Number**	**E. coli (cfu/100 mL)**
7/12/2000	OBS100-0006	**243**
7/19/2000	OBS100-0006	**708**
7/26/2000	OBS100-0006	40
8/2/2000	OBS100-0006	20
8/9/2000	OBS100-0006	**833**
Geometric Mean:		**162.88**

Pre-project Dissolved Oxygen (DO) Data		
Sample Date	**Site Number**	**DO (mg/L)**
5/16/2000	OBS100-0001	9.87
7/12/2000	OBS100-0006	7.83
7/19/2000	OBS100-0006	**3.98**
7/26/2000	OBS100-0006	**4**
8/2/2000	OBS100-0006	**2.52**
8/9/2000	OBS100-0006	**3.06**

Post-project E. coli Data		
Sample Date	**Site Number**	**E. coli (cfu/100 mL)**
5/17/2010	OBS100-0010	35.5
5/24/2010	OBS100-0010	142.1
6/1/2010	OBS100-0010	20.9
6/7/2010	OBS100-0010	12
6/14/2010	OBS100-0010	16.9
Geometric Mean:		29.24

Post-project Dissolved Oxygen Data		
Sample Date	**Site Number**	**DO (mg/L)**
5/17/2010	OBS100-0010	9.16
6/1/2010	OBS100-0010	8.72
6/7/2010	OBS100-0010	7.63
6/14/2010	OBS100-0010	7.16
7/28/2010	OBS100-0010	7.46

[1]

Table 10: OWQ's primary water quality monitoring objectives and the monitoring approaches needed to meet them.

Key	Monitoring Objective	Probabilistic	Targeted	Priority Rationale
A	Conduct water quality assessments pursuant to CWA Section 305(b) to support the development of Indiana's Integrated Report to U.S. EPA	X	X	Required for CWA Section 106 funding to meet CWA goals
B	Development of Indiana's CWA Section 303(d) List of Impaired Waters for Indiana's Integrated Report	X	X	Required for CWA Section 106 funding to meet CWA goals
C	Develop Total Maximum Daily Loads to address impairments identified on Indiana's 303(d) list	X	X	Required for CWA Section 106 funding to meet CWA goals
D	Determine trends and trophic status of Indiana's lakes and reservoirs under CWA Section 314		X	Required for CWA Section 106 funding to meet CWA goals
E	Develop water quality criteria, including nutrient criteria for lakes and reservoirs, rivers and streams	X	X	Required for CWA Section 106 funding to meet CWA goals
F	Support watershed planning and restoration efforts	X	X	Required for to CWA Section 319 funding and to meet performance measures in U.S. EPA's Strategic Plan
G	Identify water quality improvements accomplished by watershed restoration efforts funded through CWA programs		X	Required to meet performance measures in U.S. EPA's Strategic Plan
H	Support the development of public health advisories related to the use of Indiana's water resources, including fish consumption advisories and recreational use advisories		X	Supports protection of human health
I	Determine ambient ground water quality and extent of contaminated areas		X	Supports protection of human health
J	Support source water protection including both ground water and surface source water supplies		X	Supports protection of human health
K	Support development of National Pollutant Discharge Elimination System permit limits	X	X	Required for CWA Section 106 funding to meet CWA goals
L	Develop environmental indicators, including indices of biological integrity, for use in making water quality assessments	X		Supports primary monitoring objectives (A-C, E)
M	Responding to citizen complaints about activities that may be impacting private wells		X	Mandated by State Statute

Modified from IDEM OWQ's Surface Water Monitoring Strategy, 2011-2019.

Table 11: External data sets that met the data quality requirements for the 305(b) and 303(d) assessment and listing processes under the draft External Data Framework.

Source	Type of Assessment
American Water Company	Drinking water use support
City of Elkhart	Aquatic life use support; Fishable use support
City of Indianapolis	Recreational use support; Drinking water use support; Aquatic life use support
City of Muncie	Recreational use support; Drinking water use support; Aquatic life use support
City of South Bend	Recreational use support
City of Valparaiso	Recreational use support; Drinking water use support; Aquatic life use support
Marion County Health Department	Recreational use support; Drinking water use support; Aquatic life use support

Table 12: Summary of water quality assessment methodology for determining designated use support.

<table>
<tr><th colspan="3">Aquatic Life Use Support - Rivers and Streams</th></tr>
<tr><td rowspan="3">Toxicants</td><td colspan="2">Dissolved metals, pesticides, polynuclear aromatic hydrocarbons (PAHs), free cyanide, and ammonia were evaluated on a site-by-site basis and judged according to the magnitude of the exceedance(s) of Indiana's WQS and the number of times the exceedance(s) occurred. For any one pollutant (grab or composite samples), the following assessment criteria are applied to data sets consisting of three or more measurements.</td></tr>
<tr><td>Fully Supporting</td><td>Not Supporting</td></tr>
<tr><td>No more than one exceedance of the acute or chronic criteria for aquatic life within a three year period[1].</td><td>More than one exceedance of the acute or chronic criteria for aquatic life within a three year period.</td></tr>
<tr><td rowspan="3">Conventional inorganics</td><td colspan="2">Dissolved oxygen, pH, sulfate, and chloride were evaluated for the exceedance(s) of Indiana's WQS. For any one pollutant, the following assessment criteria are applied to data sets consisting of three or more measurements.</td></tr>
<tr><td>Fully Supporting</td><td>Not Supporting</td></tr>
<tr><td>Criteria are exceeded in less than or equal to 10% of measurements.</td><td>Criteria are exceeded in greater than10% of measurements.</td></tr>
<tr><td>Nutrients</td><td colspan="2">Nutrient conditions were evaluated on a site-by-site basis using the benchmarks described below. In most cases, two or more of these conditions must be met on the same date in order to classify a waterbody as impaired. This methodology assumes a minimum of three sampling events:
Total Phosphorus -- One or more measurements greater than 0.3 mg/L
Nitrogen (measured as NO3 + NO2) – One or more measurements greater than 10.0 mg/L
Dissolved Oxygen (DO) – One or more measurements below the water quality standard of 4.0 mg/l or measurements that are consistently at/close to the standard, in the range of 4.0-5.0 mg/L or values greater than 12.0 mg/L
pH measurements – One or more measurements exceed the water quality standard of no more than 9.0 pH units or measurements are consistently at/close to the standard, in the range of 8.7- 9.0 pH units
Algal Conditions -- Algae are described as "excessive" based on field observations by IDEM scientists.</td></tr>
</table>

Benthic aquatic macroinvertebrate Index of Biotic Integrity (mIBI) Scores (Range of possible scores is 12-60)	**Fully Supporting**	**Not Supporting**
	mIBI greater than or equal to 36	mIBI less than 36
Fish community (IBI) Scores (Range of possible scores is 0-60)	IBI greater than or equal to 36	IBI less than 36
Aquatic Life Use Support – Rivers and Streams		
Qualitative habitat use evaluation (QHEI) (Range of possible scores is 0-100)	The Qualitative Habitat Evaluation Index (QHEI) is not used to determine aquatic life- use support. Rather, the QHEI is an index designed to evaluate the lotic habitat quality important to aquatic communities and is used in conjunction with mIBI or IBI data, or both, to evaluate the role that habitat plays in waterbodies where impaired biotic communities (IBC) have been identified. QHEI scores are calculated using six metrics: substrate, instream cover, channel morphology, riparian zone, pool/riffle quality, and gradient. A higher QHEI score represents a more diverse habitat for colonization of aquatic organisms. IDEM has determined that a QHEI total score of <51 indicates poor habitat. For streams where the macroinvertebrate community (mIBI or mHab) or fish community (IBI) scores indicate IBC, QHEI scores are evaluated to determine if habitat is the primary stressor on the aquatic communities, or if there may be other stressors/pollutants causing the IBC.	
Aquatic Life Use Support – Lakes and Reservoirs		
Indiana Department of Natural Resources surveys of the status of sport fish communities in lakes and information on trout stocking.	**Fully Supporting**	**Not Supporting**
	Supports cold water fishery, including native Cisco and stocked trout, or both.	Native Cisco population is gone and/or the lake unable to support stocked trout and/or the lake's attributes appear to contribute to warm water fishery condition.
Temperature and pH	Lakes in which thermal modifications have caused an adverse effect on aquatic life and lakes that do not meet Indiana's WQS for pH have been assessed as not supporting of aquatic life use.	
Fish Consumption Use Support (Human Health) – All Waters		
Available fish tissue data for the most recent 12 years of data collection are evaluated. Only waters for which sufficient fish tissue data were available were assessed for fish consumption. All results from sampling locations considered representative of a given assessment unit (lake or reservoir; stream or stream reach) must be below the benchmarks for mercury and PCBs in order to be assessed as fully-supporting. For mercury, all waters with a trophic level weighted arithmetic mean result (calculated with all the samples collected during the same sampling event) that exceeds the applicable benchmark are classified as impaired. For PCBs, all waters with a single sample result for a given species exceeding the applicable benchmark are classified as impaired.		
Mercury in Fish Tissue	**Fully Supporting**	**Not Supporting**
	Trophic level weighted arithmetic mean concentration values for all sampling events are less than or equal to 0.3 mg/kg wet weight	Trophic level weighted arithmetic mean concentration values for one or more sampling events are greater than 0.3 mg/kg wet weight
PCBs in Fish Tissue	**Fully Supporting**	**Not Supporting**
	Actual concentration values for all samples are less than or equal to 0.02 mg/kg wet weight	Actual concentration values for one or more samples are greater than 0.02 mg/kg wet weight

<table>
<tr><th colspan="3">Recreational Use Support (Human Health) – All Waters</th></tr>
<tr><td colspan="3">IDEM has two different methods for determining recreational use support, depending on the type of data set being used in making the assessment. For data sets consisting of five equally-spaced samples over a 30-day period, IDEM applies two tests, both of which are based on the U.S. EPA's Ambient Water Quality Criteria for Bacteria - 1986 (U.S. EPA, 1986), which provides the foundation for Indiana's WQS for recreational use. For data sets with 10 or more grab samples but without the five samples equally-spaced over the 30 days required to calculate a geometric mean, the 10% rule is applied. When both types of data sets are available, the assessment decision is based on the data set consisting of five samples, equally-spaced over a 30-day period.</td></tr>
<tr><td rowspan="2">Bacteria (E. coli): at least five equally-spaced samples over 30 days. (cfu = colony forming units)</td><td>Fully Supporting</td><td>Not Supporting</td></tr>
<tr><td>Geometric mean does not exceed 125 cfu/100mL</td><td>Geometric mean exceeds 125 cfu/100mL.</td></tr>
<tr><td>Bacteria (E. coli): grab samples (cfu = colony forming units)</td><td>Not more than 10% of measurements are greater than 576 cfu/100ml (for waters infrequently used for full body contact) or 235 cfu/100mL (for bathing beaches)[2].

And

Not more than one sample is greater than 2,400 cfu/100mL.</td><td>More than 10% of samples are greater than 576 cfu/100mL or more than one sample is greater than 2,400 cfu/100mL.</td></tr>
<tr><th colspan="3">Drinking Water Use Support – Rivers and Streams</th></tr>
<tr><td colspan="3">River and stream segments are designated for drinking water uses if a community water supply has a drinking water intake somewhere along the segment. When IDEM has data for a segment with a drinking water intake, those data are compared to the applicable ambient water quality criteria in Indiana's WQS to determine if the drinking water use is met. The appropriate water quality criteria are applied for specific substances identified in the WQS. Information regarding non-naturally occurring taste and odor-producing substances not specifically identified in the WQS are reviewed within the context of a water treatment facility's ability to meet Indiana's drinking WQS using conventional treatment.</td></tr>
<tr><td rowspan="3">Toxicants</td><td colspan="2">Dissolved metals, pesticides, PCBs, and free cyanide were evaluated on a site by site basis and judged according to magnitude of the exceedance(s) of Indiana's WQS for point-of-water intake and the number of times exceedance(s) occurred. For any one pollutant (grab or composite samples), the following assessment criteria are applied.</td></tr>
<tr><td>Fully Supporting</td><td>Not Supporting</td></tr>
<tr><td>Not more than one exceedance of the acute or chronic criteria for human health within a three year period.</td><td>More than one exceedance of the acute or chronic criteria for human health within a three year period.</td></tr>
<tr><td rowspan="3">Conventional inorganics</td><td colspan="2">Total dissolved solids, specific conductance, sulfate, chloride, nitrite-N and nitrogen (measured as NO_3 + NO_2) were evaluated for the exceedance(s) of Indiana's WQS for point-of-water intake and the number of times the exceedance(s) occurred. For any single pollutant (grab or composite samples), the following assessment criteria are applied to data sets consisting of three or more measurements.</td></tr>
<tr><td>Fully Supporting</td><td>Not Supporting</td></tr>
<tr><td>Not more than one exceedance of the acute or chronic criteria for human health within a three year period.</td><td>More than one exceedance of the acute or chronic criteria for human health within a three year period.</td></tr>
</table>

Recreational Use Support (Aesthetics) – Lakes and Reservoirs		
	Fully Supporting	**Not Supporting**
Natural Lakes	Not more than 10% of all TP values greater than 54 ug/L and their associated Chlorophyll *a* values are less than or equal to20 ug/L	Less than 10% of all TP values are greater than 54 ug/L but their associated Chlorophyll *a* values are greater than 20 ug/L, and the TSI (CHL) score for the lake indicates eutrophic (50-70) or hypereutrophic (greater than 70) conditions Or More than 10% of all TP values are greater than 54 ug/L with associated Chlorophyll *a* values less than 4 ug/L, but the TSI (CHL) score for the lake indicates eutrophic (50-70) or hypereutrophic (greater than 70) conditions Or More than 10% of all TP values are greater than 54 ug/L with associated Chlorophyll *a* values greater than 4 ug/L
	Fully Supporting	**Not Supporting**
Reservoirs	Not more than 10% of all TP values greater than 51 ug/L and their associated Chlorophyll *a* values are less than 25 ug/L	Less than 10% of all TP values are greater than 51 ug/L but their associated Chlorophyll *a* values are greater than 25 ug/L and the TSI (CHL) score for the lake indicates eutrophic (50-70) or hypereutrophic (greater than 70) conditions Or More than 10% of all TP values are greater than 51 ug/L with associated Chlorophyll *a* values less than 2ug/L, but the TSI (CHL) score for the lake indicates eutrophic (50-70) or hypereutrophic (greater than 70) conditions Or More than 10% of all TP values are greater than 51 ug/L with associated Chlorophyll *a* values greater than 2 ug/L
Drinking Water Use Support – Lakes and Reservoirs		
	Fully Supporting	**Not Supporting**
Taste and odor-producing substances	Taste and odor substances not present in quantities sufficient to interfere with production of drinking water by conventional treatment	Taste and odor substances present in quantities requiring additional treatment by the public water supply to prevent taste and odor problems
Information on the application of pesticides to surface drinking water reservoirs	Reservoirs or lakes that serve as source water for public water supplies that received pesticide (algaecide) application permits for algae were classified as not supporting because additional treatment by the public water supply was required to prevent taste and odor problems.	

Other Assessments – Lakes and Reservoirs	
Carlson's Trophic State Index (TSI) for Chlorophyll *a* (CHL)	Chlorophyll *a* results were used to calculate Carlson TSI scores. Trophic scores were used to classify lakes according to their trophic state. Lake trends were also assessed for lakes with two or more trophic scores if at least one of the scores was less than five years old. Trophic scores and lake trends are not used to determine use support status. These assessments are conducted to fulfill Clean Water Act Section 314 reporting requirements for publicly owned lakes and reservoirs.

[1]For Indiana waters within the Great Lakes Basin, acute aquatic criteria refer to the "criterion maximum concentration (CMC) identified in 327 IAC 2-1.5, and the chronic aquatic criteria refer to the criterion continuous concentration (CCC) also described therein. For downstate waters (those located outside of the Great Lakes Basin, the acute aquatic criteria refer to the "AAC" values shown in 327 IAC 2-1 and the chronic aquatic criteria are shown as the "CAC" values.

[2]The value of 576 cfu/100mL comes from U.S. EPA's Ambient Water Quality Criteria for Bacteria - 1986 (U.S. EPA, 1986) and represents the single sample maximum applicable to waters infrequently used for full body recreation. For data collected from bathing beaches, the single day maximum value of 235 cfu/100mL is applied.

Source: IDEM OWQ 2016 Consolidated Assessment and Listing Methodology (Revised)

Table 13: Individual use support summary for Indiana streams.

Designated Beneficial Uses						
Designated Beneficial Use	**Total Size (Miles)**	**Size Assessed (Miles)**	**Percent Assessed**	**Size Fully Supporting (Miles)**	**Size Not Supporting (Miles)**	**Size Not Attainable* (Miles)**
Full Body Contact (Recreational Use)	63,130	32,730	52%	8,116	24,614	0
Human Health and Wildlife (Fishable Use)	63,130	8,935	14%	3,415	5,520	0
Public Water Supply	388	23	6%	0	0	0
Warm Water Aquatic Life (Aquatic Life Use)	63,130	38,043	60%	25,855	12,188	156

*"Size Not Attainable" refers to limited use waters as designated in Indiana's Water Quality Standards. See 327 IAC 2-1-11 and 2-1.5-8.
Source: IDEM 305(b) assessment database

Table 14: Summary of national and state causes impairing Indiana streams.

Causes of Impairment	Total Size (miles)
Pathogens	
Escherichia coli	24,437
Oxygen Depletion	
Oxygen, Dissolved	2,684
Flow Alterations	
Low flow alterations	91
Habitat alterations (Including Wetlands)	
Physical substrate habitat alterations	195
Thermal Impacts	
Temperature, water	103
Nutrients (Macronutrients/Growth Factors)	
Nutrient/Eutrophication Biological Indicators	3,064
Organic Enrichment (Sewage) Biological Indicators	97

Causes of Impairment	Total Size (miles)
Toxic Inorganics	
Ammonia (Un-ionized)	135
Chloride	228
Cyanide (as free cyanide)	158
Sulfate	439
Toxic Organics	
Dioxin (including 2,3,7,8-TCDD)	364
Hexachlorocyclohexane (mixture)	52
Polycyclic Aromatic Hydrocarbons (PAHs) (Aquatic Ecosystems)	20
PCB (Fish Tissue)	4,924
PCB (Water)	364
Metals	
Mercury (Fish Tissue)	768
Mercury (Water)	342
Pesticides	
Atrazine	7
pH/Acidity/Caustic Comditions	
pH	295
Sedimentation	
Sedimentation/Siltation	292
Oil and Grease	
Oil and Grease	22
Algae	
Chlorophyll-a	111
Biological Integrity (Bioassessments)	
Impaired Biotic Communities	8,539

Source: IDEM 305(b) assessment database

Table 15: Summary of national and state sources impairing Indiana streams.

Sources of Impairment	Total Size (miles)
Agriculture – Animal Feeding/Handling Operations (Nonpoint Source – Not Regulated)	
Animal Feeding Operations (NPS)	10,510
Managed Pasture Grazing	36
Permitted Runoff from Confined Animal Feeding Operations (CAFOs)	1,900
Agriculture	2,336
Livestock (Grazing or Feeding Operations)	6,300
Unrestricted Cattle Access	862
Agriculture – Crop Production	
Crop Production with Subsurface Drainage	2,660
Crop Production (Crop Land or Dry Land)	241

Sources of Impairment	Total Size (miles)
Construction	
Site Clearance (Land Development or Redevelopment)	49
Ground Water Loadings	
Contaminated Ground Water	13
Habitat Alterations (Not Directly Related to Hydromodification)	
Impacts from Hydrostructure Flow Regulation/modification	511
Loss of Riparian Habitat	1,357
Streambank Modifications/destabilization	488
Upstream Impoundments (e.g., PI-566 NRCS Structures)	15
Hydromodification	
Channelization	233
Dam Construction (Other than Upstream Flood Control Projects)	26
Industrial Permitted Discharge	
Industrial Point Source Discharge	342
RCRA Hazardous Waste Sites	3
Wet Weather Discharges (Point Source and Combination of Stormwater, SSO or CSO)	33
Land Application Waste Sites	
Illegal Dumps or Other Inappropriate Waste Disposal	680
On-site Treatment Systems (Septic Systems and Similar Decentralized Systems)	1,220
Legacy/Historical Pollutants	
Acid Mine Drainage	406
Contaminated Sediments	301
Historic Bottom Deposits (Not Sediment)	65
Impacts from Abandoned Mine Lands (Inactive)	18
Municipal Permitted Discharges (Direct and Indirect)	
Combined Sewer Overflows	1,652
Municipal Point Source Discharges	3,269
Package Plant or Other Permitted Small Flows Discharges	2,876
Sanitary Sewer Overflows (Collection System Failures)	20
Stormwater Permitted Discharges (Direct and Indirect)	
Unspecified Urban Stormwater	1,128
Natural Sources	
Waterfowl	3,975
Wildlife Other than Waterfowl	3,954
Upstream/Downstream Source	492
Natural Sources	1,420

Sources of Impairment	Total Size (miles)
Resource Extraction	
Dredge Mining	25
Reclamation of Inactive Mining	195
Spills and Unpermitted Discharges	
Sewage Discharges in Unsewered Areas	7,379
Urban-related Runoff/Stormwater (Other than Regulated Discharges)	
Golf Courses	60
Highways, Roads, Bridges, Infrastructure (New Construction)	14
Post-development Erosion and Sedimentation	19
Wastes from Pets	190
Impervious Surface/Parking Lot Runoff	461
Urban Runoff/Storm Sewers	205
Other Sources	
Source Unknown	10,182
Non-Point Source	16,035

Source: IDEM 305(b) assessment database

Table 16: Individual use support summary for Indiana's Great Lakes shoreline.

Designated Beneficial Uses						
Designated Beneficial Use	**Total Size (Miles)**	**Size Assessed (Miles)**	**Percent Assessed**	**Size Fully Supporting (Miles)**	**Size Not Supporting (Miles)**	**Size Not Attainable (Miles)**
Full Body Contact (Recreational Use)	59	59	100%	4	55	0
Human Health and Wildlife (Fishable Use)	59	59	100%	0	59	0
Public Water Supply	31	31	100%	31	0	0
Warm Water Aquatic Life (Aquatic Life Use)	59	59	100%	59	0	0

Source: IDEM 305(b) assessment database

Table 17: Summary of national and state causes impairing Indiana's Great Lakes shoreline.

Causes of Impairment	Total Size (Miles)
Pathogens	
Escherichia coli	55
Toxic Organics	
PCB (Fish Tissue)	59
Metals	
Mercury (Fish Tissue)	59

Source: IDEM 305(b) assessment database

Table 18: Summary of National and State Sources Impairing Great Lakes Shoreline.

Sources of Impairment	Total Size (Miles)
Land Application Waste Sites	
On-site Treatment Systems (Septic Systems and Similar Decentralized Systems)	19
Municipal Permitted Discharges (Direct and Indirect)	
Illicit Connections/Hook-ups to Storm Sewers	19
Other Sources	
Source Unknown	59
Non-Point Source	5

Source: IDEM 305(b) assessment database

Table 19: Individual use support summary for Lake Michigan.

Designated Beneficial Uses						
Designated Beneficial Use	**Total Size (Acres)**	**Size Assessed (Acres)**	**Percent Assessed**	**Size Fully Supporting (Acres)**	**Size Not Supporting (Acres)**	**Size Not Attainable (Acres)**
Aquatic life use	-	-	-	-	-	-
Fishable uses	154,176	154,176	100%	0	154,176	0
Drinking water supply	-	-	-	-	-	-
Recreational use (human health)	-	-	-	-	-	-

Source: IDEM 305(b) assessment database

Table 20: Summary of national and state causes impairing Lake Michigan.

Causes of Impairment	Total Size (Acres)
Bioaccumulative Chemicals of Concern	
PCBs (Fish Tissue)	154,176
Mercury (Fish Tissue)	154,176

Source: IDEM 305(b) assessment database

Table 21: Summary of national and state sources impairing Lake Michigan.

Sources of Impairment	Total Size (Acres)
Source Unknown (Applied to Fish Tissue Impairments)	154,176

Source: IDEM 305(b) assessment database

Table 22: Individual use support summary for Indiana lakes.

Designated Beneficial Uses						
Designated Beneficial Use	**Total Size (Acres)**	**Size Assessed (Acres)**	**Percent Assessed**	**Size Fully Supporting (Acres)**	**Size Not Supporting (Acres)**	**Size Not Attainable (Acres)**
Full Body Contact (Recreational Use)	127,607	37,047	29%	29,035	8,012	0
Human Health and Wildlife (Fishable Use)	127,607	77,845	61%	27,290	50,555	0
Public Water Supply Supply	29,541	16,615	56%	230	16,385	0
Warm Water Aquatic Life (Aquatic Life Use)	127,607	10,379	8%	3,754	6,625	0

Source: IDEM 305(b) assessment database

Table 23: Summary of national and state causes impairing lakes and reservoirs.

Causes of Impairment	Total Size (Acres)
Pathogens	
Escherichia coli	983
Thermal Impacts	
Temperature, water	1,556
Nutrients (Macronutrients/Growth Factors)	
Phosphorus (Total)	7,023
Toxic Organics	
PCB (Fish Tissue)	38,290
Metals	
Mercury (Fish Tissue)	14,736
Mineralization	
Taste and Odor	16,385
pH/Acidity/Caustic Conditions	
pH	105
Algae	
Chlorophyll-a	16,385
Other Causes	
Cause Unknown	6,520

Source: IDEM 305(b) assessment database

Table 24: Summary of national and state sources impairing lakes and reservoirs.

Sources of Impairment	Total Size (Acres)
Agriculture – Animal Feeding Operations (Nonpoint Source – Not Regulated)	
Agriculture	30
Industrial Permitted Discharges	
Industrial Point Source Discharge	1,556
Legacy/Historical Pollutants	
Acid Mine Drainage	105
Municipal Permitted Discharges (Direct and Indirect)	
Combined Sewer Overflows	30
Urban-related Runoff/Stormwater (Other than Regulated Discharges)	
Impervious Surface/Parking Lot Runoff	30
Other Sources	
Source Unknown	52,202
Nonpoint Source	7,054

Source: IDEM 305(b) assessment database

Table 25: Trophic states and predicted characteristics based on Carlson TSI scores for chlorophyll-*a* (CHL).

Trophic State	TSI (CHL)	Corresponding CHL values (ug/L)	Characteristics of Trophic State
Oligotrophic	Greater than 40	Less than 0.95 – 2.6	Low biological productivity • High transparency (clear water) • Low levels of nutrients • Low algal production and little/no aquatic vegetation • Well oxygenated hypolimnion year round; hypolimnion of shallower lakes may become anoxic at TSI scores >30
Mesotrophic	40-50*	2.6-7.3	Moderate biological productivity • Moderately transparency (moderately clear water) • Moderate levels of nutrients • Beds of submerged aquatic plants • Increasing possibility of anoxia in the hypolimnion during summer
Eutrophic	50-70	7.3-56	High biological productivity • Water has a low transparency • High levels of nutrients • Large amounts of aquatic plants or algae • At TSI scores >60, blue-green algae dominate and algal scums and excessive macrophytes possible • Hypolimnion commonly anoxic; fish kills possible
Hypereutrophic	Greater than 70	56-155	Very high biological productivity • Very low transparency, usually <3 feet • Very high levels of nutrients • Dense algae and aquatic vegetation; algal scums and few aquatic plants at TSI scores >80 • Fish kills and/or dead zones below the surface are common • Hypolimnion persistently anoxic; Fish kills and/or “dead zones” below the surface common

*Lakes with a TSI score of 50, which is on the boundary between mesotrophic and eutrophic conditions are evaluated with their corresponding TSI scores for TP and SD along with any other available information disk and classified in accordance to the best professional judgment of IDEM scientists.

Table 26: Trophic status of lakes assessed with Carlson Trophic State Index scores for Chlorophyll *a* 1990-2015.

Trophic Status	Number of Lakes	Total Size (Acres)*
Oligotrophic	95	19,000
Mesotrophic	130	24,061
Eutrophic	202	50,205
Hypereutrophic	28	5,267
Unknown	17	2,404

*Actual values are higher. These result do not reflect acres for non-indexed lakes for which size is currently unknown.
Source: IDEM 305(b) assessment database

Table 27: Trends in the trophic status of lakes assessed 1990-2015.

Trend	Number of Lakes	Total Size (Acres)*
Improving	46	13,773
Stable	100	1,6070
Fluctuating	89	36,314
Degrading	10	2,408
Unknown	227	32,372

*Actual values are higher. These result do not reflect acres for non-indexed lakes for which size is currently unknown.
Source: IDEM 305(b) assessment database

Table 28: Calls, spills and fish kills reported from 1998 to 2016.

Year	Calls	Spills	Fish Kills
1998	2,649	1,393	28
1999	2,507	1,246	41
2000	2,930	1,491	43
2001	3,093	1,591	51
2002	3,043	1,666	55
2003	3,026	1,551	30
2004	2,829	1,406	37
2005	3,319	1,271	40
2006	3,319	1,368	31
2007	2,852	1,354	36
2008	3,250	1,588	39
2009	2,889	1,226	39
2010	2,411	1,035	47
2011	2,160	934	10
2012	2,163	665	11
2013	2,162	653	38
2014	2026	788	9
2015	1931	1755	11
2016	206	170	

Source: IDEM TEMPO database

Table 29: Major sources of ground water contamination.

Contaminant Source	Highest Priority	Risk Factors*	Type of Contaminant**
Agricultural Activities			
Agricultural chemical facilities		A,C,H,I	5
Commercial fertilizer applications	X	A, C, D, E	5
Confined animal feeding operations	X	A, D, E	5, 9
Farmstead agricultural mixing and loading procedures			
Irrigation practices		A,C,H,I	1,2,5,8,9
Animal manure applications	X	A,C,H,I	5, 9
Pesticide applications		A,C,H,I	1,2
Storage and Treatment Activities			
Land application		A,C,H,I	5,9
Domestic and industrial residual applications		A,C,H,I	5,9
Material stockpiles		A,C,H,I	5,9
Storage tanks (above ground)		A,C,H,I	
Storage tanks (underground)	X	A, B, C, D, E, F	2, 3, 4
Surface impoundments			
Waste piles		A,C,H,I	5,9
Disposal Activities			
Deep injection wells			
Landfills (constructed prior to 1989)	X	A, B, C, D, E, F	1, 2, 3, 4, 5, 6, 7, 8, 9
Permitted landfills (constructed 1989- present)			
Septic systems	X	A, C, D, E, F, G	1, 2, 3, 4, 5, 7, 9
Shallow (Class V) injection wells	X	A, B, C, D, E, I	1, 2, 3, 4, 5, 7, 9
Other			
Hazardous waste generators		A	
Hazardous waste sites		A	
Industrial facilities	X	A, B, C, D, E, F	1, 2, 3, 4, 5, 7, 8, 9
Liquid transport pipelines (including sewer)		A	8
Materials spills (including during transport)	X	A, B, C, D, E, F	1, 2, 3, 4, 5, 7, 8, 9
Material transfer operations		A	
Small-scale manufacturing and repair shops		A, I	8
Mining and mine drainage		A	7,8
Salt storage (state and nonstate facilities) and road salting	X	A, C, D, E, F	6
Urban runoff		A, C, H, I	1, 2, 4, 5, 7, 8, 9

Source: U.S. EPA 2006a; 2007

*Factors considered in selecting the contaminant source: (A) human health and/or environmental risk (toxicity); (B) size of the population at risk; (C) location of source relative to drinking water source; (D) number and/or size of contaminant sources; (E) hydrogeologic sensitivity; (F) documented state findings, other findings; (G) high to very high priority in localized areas, but not over majority of Indiana; (H) geographic distribution/occurrence; and, (I) lack of information.

**Classes of contaminants associated with contamination source: (1) Inorganic pesticides; (2) Organic pesticides; (3) Halogenated solvents; (4) Petroleum compounds; (5) Nitrate; (6) Salinity/brine; (7) Metals; (8) Radionuclides; and, (9) Bacteria, protozoa and viruses.

Table 30: Ground water protection programs and activities currently established or under development in Indiana.

Program or Activity	Status	State Agency/Organization
Active SARA Title III Program	Fully established	IDEM-OLQ[1]
Ambient ground water monitoring program	Under development	IDEM-OWQ
Aquifer sensitivity assessment	Fully established	IDEM-OWQ, IDNR, IGS[2], OISC[3]
Aquifer mapping/basin studies	Under development	IDNR, IDEM-OWQ
Aquifer/ hydrogeologic setting characterization	Fully established	IGS, IDEM-OWQ, IDNR
Bulk storage program for agricultural chemicals	Fully established	OISC
Comprehensive data management system	Under development	IDEM-OWQ
Complaint response program for private wells	Fully established	IDEM-OWQ
Confined animal feeding program	Fully established	IDEM-OWQ
Ground water discharge permits for constructed wetlands	Under development	IDEM-OWQ
Ground water Best Management Practices	Under development	OISC*, IDEM-OWQ
Ground water legislation	Fully established	IDEM, IDNR, OISC, ISDH
Ground water classification	Fully established	IDEM-OWQ
Ground water quality standards	Fully established	IDEM-OWQ
Land application of domestic and industrial residuals	Fully established	IDEM-OLQ
Nonpoint source controls	Under development	IDEM-OWQ
Oil and Gas	Fully established	IDNR
Pesticide State Management Plan	Pending	OISC*, IDEM-OWQ, IDNR, IGS
Pollution Prevention Program	Fully established	IDEM-OPPTA[4]
Reclamation	Fully established	IDNR
Resource Conservation and Recovery Act (RCRA) Primacy	Fully established	IDEM-OLQ
Sensitivity assessment for drinking water/ wellhead protection	Fully established	IGS, IDEM-OWQ
Spill Monitoring	Fully established	IDEM-OWQ
State Superfund	Fully established	IDEM-OLQ
State RCRA Program incorporating more stringent requirements than RCRA primacy	Fully established	IDEM-OLQ
State septic system regulations	Fully established	ISDH
Underground storage tank installation requirements	Fully established	IDEM-OLQ
Underground Storage Tank Remediation Fund	Fully established	IDEM-OLQ
Underground Storage Tank Permit Program	Fully established	IDEM-OLQ
Underground Injection Control Program	Fully established for Class II wells	IDNR
Well abandonment regulations	Fully established	IDNR
Wellhead Protection Program	Fully established	IDEM-OWQ
Well installation regulations	Fully established	IDNR

*Indicates lead agency involved in enforcement or implementation.
"Pending" is used to describe those programs that have a written draft policy; "under development" is used to describe those programs still in the planning stage.
[1]OLQ, Office of Land Quality; [2]IGS, Indiana Geological Survey; [3]OISC, Office of the Indiana State Chemist; [4]OPPTA, Office of Pollution Prevention and Technical Assistance (IDEM).

Table 31: Indiana Ground Water Monitoring Network analytical results, 2012.

Analyte Measured as Milligrams per Liter (mg/L) or Micrograms per Liter (ug/L)	Number of Samples (n)	n Below Detection Limit (BDL)	% BDL	DL	Median	Mean	Min	Max	Standard Deviation	EPA Maximum Contaminant Level (MCL)	EPA Secondary Maximum Contaminant Level (SMCL) or Recommendation (REC)	n > MCL or SMCL	% > MCL or SMCL
Alkalinity and Anions/Cations													
Alkalinity (mg/L)	326	0	0.00	1	273	267.30	21.6	767	82.75	--	--		
Calcium (mg/L)	326	8	2.50	0.1	80	79.68	0.1	300	39.55	--	--		
Chloride (mg/L)	326	37	11.30	2	12	23.63	2	400	39.75	--	--		
Magnesium (mg/L)	326	12	3.70	0.1	28	28.94	0.1	200	19.37	--	--		
Potassium (mg/L)	326	4	1.20	0.2	1.4	2.06	0.2	40	3.01	--	--		
Sodium (mg/L)	326	0	0.00	0.1	11	35.62	1.3	660	66.90	--	200 mg/L (rec)	11	3.37
Sulfate (mg/L)	326	46	14.10	5	34	69.46	5	1500	159.28	--	250 mg/L	15	4.60
Metals and Minerals													
Arsenic (ug/L)	326	211	64.70	2	2	4.18	2	69	6.79	10 ug/L	--	23	7.06
Barium (ug/L)	326	14	4.30	2	82.5	129.25	2	1100	148.30	2000 ug/L	--	0	0.00
Boron (ug/L)	326	3	0.90	5	28	102.24	5	1400	193.09	--	--		
Bromide (mg/L)	326	20	6.10	10	27	65.98	10	4000	257.81	--	--		
Chromium (ug/L)	326	324	99.40	2	2	2.02	2	6.2	0.26	100 ug/L	--	0	0.00
Copper (ug/L)	326	147	45.10	1	1.3	4.11	1	97	8.65	1300 ug/L	--	0	0.00
Iron (mg/L)	326	104	31.90	0.02	0.49	0.91	0.02	7.2	1.15	--	0.3 mg/L	180	55.21
Lead (ug/L)	326	323	99.10	1	1	1.05	1	10	0.59	15 ug/L	--	0	0.00
Nickel (ug/L)	326	91	27.90	1	1.6	2.07	1	19	1.71	--	100 ug/L (rec)	0	0.00
Silicon (mg/L)	326	0	0.00	0.1	14	14.69	6.7	36	4.36	--	--		
Strontium (mg/L)	326	10	3.10	2	0.18	1.68	0.002	37	4.20	--	4 mg/L (rec)	35	10.74
Zinc (ug/L)	326	106	32.50	5	11	32.67	5	600	71.03	--	5000 ug/L	0	0.00

Analyte Measured as Milligrams per Liter (mg/L) or Micrograms per Liter (ug/L)	Number of Samples (n)	n Below Detection Limit (BDL)	% BDL	DL	Median	Mean	Min	Max	Standard Deviation	EPA Maximum Contaminant Level (MCL)	EPA Secondary Maximum Contaminant Level (SMCL) or Recommendation (REC)	n > MCL or SMCL	% > MCL or SMCL
Nitrogen, Nitrate-Nitrite													
Nitrogen, Nitrate-Nitrite (mg/L)	326	167	51.20	0.1	0.1	2.02	0.01	27	4.30	10 mg/L	--	17	5.21
Pesticides and Breakdown Products													
Acetochlor ESA (ug/L)	50	46	92.00	0.1	0.1	0.21	0.1	3.8	0.57	--	--		
Acetochlor OA (ug/L)	51	48	94.10	0.1	0.1	0.13	0.1	1.6	0.21	--	--		
Alachlor ESA (ug/L)	43	40	93.00	0.1	0.1	0.14	0.1	1.2	0.19	--	--		
Atrazine (ug/L)	325	324	99.70	0.1	0.1	0.10	0.1	0.3	0.01	3 ug/L	--	0	0.00
Metolochlor ESA (ug/L)	46	39	84.80	0.1	0.1	0.21	0.1	2	0.34	--	--		
Metolochlor OA (ug/L)	47	44	93.60	0.1	0.1	0.12	0.1	0.6	0.08	--	--		
Volatile Organic Compounds													
Benzo(a)pyrene (ug/L)	326	325	99.70	0.02	0.02	0.02	0.02	0.03	0.0005	0.2 ug/L	--	0	0.00
Methyl-t-butyl ether (MTBE) (ug/L)	325	324	99.70	0.5	0.5	0.51	0.5	3.8	0.18	--	20 ug/L	0	0.00
Tetrachloroethylene (ug/L)	325	324	99.70	0.5	0.5	0.51	0.5	4.7	0.23	5 ug/L	--	0	0.00
Toluene (ug/L)	325	324	99.70	0.6	0.5	0.50	0.5	0.6	0.01	1000 ug/L	--	0	0.00

***Disinfection Byproducts and plasticizers have been omitted from this list until further analysis and sampling can be conducted to determine the source

Table 32: Summary statistics calculated from nitrogen concentrations measured as milligrams per liter (mg/L) nitrate-nitrite for Indiana's generalized hydrogeologic settings.

Hydrogeologic Setting	Number of Samples (n)	n Above Detection Limit (ADL)	% ADL	n Above Maximum Contaminant Level (MCL)	% Above MCL	Median	Mean	Min	Max	Standard Deviation
Ablation Sequence	5	0	0	0	0	0.005	0.005	0.005	0.01	0.00
Alluvial Valley	5	2	40	0	0	0.005	0.473	0.005	1.60	0.71
Dissected Bedrock	4	2	50	0	0	0.068	0.070	0.005	0.14	0.08
Dissected Bedrock Thin Till	17	11	65	1	6	0.170	1.736	0.005	13.00	3.28
Fan Head Complex	5	1	20	0	0	0.005	0.080	0.005	0.38	0.17
Ice Contact Deposits	2	1	50	1	50	7.003	7.003	0.005	14.00	9.90
Karst Plain and Escarpment	9	7	78	0	0	0.530	2.235	0.005	7.90	2.92
Lake Deposits	5	3	60	0	0	0.051	1.610	0.005	7.70	3.41
Meltwater Channel	1	0	0	0	0	0.005	0.005	0.005	0.01	
Outwash Complex	6	2	33	0	0	0.005	0.127	0.005	0.45	0.20
Outwash Plain	22	8	36	2	9	0.005	2.627	0.005	22.00	5.47
Sand Plains and Loess Sands	30	17	57	1	3	0.012	1.638	0.005	16.00	3.54
Sluiceway or Discrete Channel	34	15	44	2	6	0.005	1.802	0.005	15.00	3.69
Till Capped Fan	9	4	44	0	0	0.005	0.467	0.005	4.00	1.33
Till Cored Moraine	44	9	20	0	0	0.005	0.088	0.005	2.80	0.42
Till Plain	151	40	26	0	0	0.005	0.180	0.005	6.40	0.79
Trough System	4	1	25	0	0	0.005	0.379	0.005	1.50	0.75
Tunnel Valley	10	3	30	0	0	0.005	0.532	0.005	4.30	1.35
Unconfined Outwash Fan	16	6	38	0	0	0.005	0.344	0.005	1.90	0.71
Wabash River Valley	11	7	64	2	18	1.100	5.023	0.005	17.00	6.57

Table 33 Average nitrogen concentrations measured as milligrams per liter (mg/L) nitrate-nitrite for each hydrogeologic setting calculated for different well type and depth, aquifer conditions and aquifer sensitivity.

Hydrogeologic Setting	Well Type		Well Depth				Aquifer Conditions	Aquifer Conditions				
	Bedrock	Unconsolidated	0-50	50-100	100-150	>150	Oxidizing	High	Moderate	Low	Variable	Low , High
Ablation Sequence	ND	ND	ND	ND	ND	--	ND	ND	--	--	--	--
Alluvial Valley	0.473	--	--	0.803	--	0.253	1.175	0.473	--	--	--	--
Dissected Bedrock	0.092	0.070	--	--	0.130	0.050	0.092	0.070	--	--	--	--
Dissected Bedrock Thin Till	0.447	3.576	4.972	0.045	1.104	0.279	3.130	0.869	0.038	4.410	--	0.280
Fan Head Complex	0.193	ND	--	0.130	ND	--	ND	0.380	ND	--	ND	--
Ice Contact Deposits	--	7.003	--	14.000	ND	--	--	ND	14.000	--	--	--
Karst Plain and Escarpment	2.472	0.340		6.000	1.762	1.770	2.152	2.235	--	--	--	--
Lake Deposits	ND	2.012	ND	7.700	0.115	--	0.115	ND	ND	2.680	--	--
Outwash Complex	0.370	ND	--	ND	0.148	0.450	0.370	0.127	--	--	--	--
Outwash Plain	ND	2.752	4.038	1.332	ND	ND	9.140	2.627	--	--	--	--
Sand Plains and Loess Sands	3.041	0.825	0.829	1.760	2.683	1.965	3.473	0.485	2.923	6.800	--	--
Sluiceway or Discrete Channel	0.017	2.184	3.869	1.594	0.610	0.038	4.699	1.856	ND	--	--	--
Till Capped Fan	--	0.467	--	0.008	1.040	--	1.385	ND	ND	0.078	0.807	--
Till Cored Moraine	0.050	0.096	1.403	0.036	0.030	0.006	0.135	ND	0.034	0.119	ND	--
Till Plain	0.139	0.203	0.595	0.177	0.148	0.085	0.975	0.219	0.047	0.244	ND	--
Trough System	--	0.379	ND	0.503	--	--	1.500	0.379	--	--	--	--
Tunnel Valley	1.735	0.016	0.303	0.873	0.021	--	1.735	ND	--	--	0.663	--
Unconfined Outwash Fan	--	0.344	0.006	0.345	0.624	0.011	0.855	0.240	1.900	--	--	--
Wabash River Valley	0.007	6.904	8.515	3.376	6.179	ND	6.368	5.525	--	--	ND	--

Note: ND = not detected. Detailed averages were not compiled for the Meltwater Channel Setting, which consisted of only one sample.

Table 34: Summary statistics calculated from arsenic concentrations in micrograms per liter (ug/L) for Indiana's generalized hydrogeologic settings.

Hydrogeologic Setting	Number of Samples (n)	n Above Detection Limit (ADL)	% ADL	n Above Maximum Contaminant Level (MCL)	% Above MCL	Median (ug/L)	Mean (ug/L)	Minimum (ug/L)	Maximum (ug/L)	Standard Deviation (ug/L)
Ablation Sequence	5	3	60	1	20	2.5	5.3	1.0	16.0	6.32
Alluvial Valley	5	1	20	1	20	1.0	6.6	1.0	29.0	12.52
Dissected Bedrock	4	1	25	0	0	1.0	1.8	1.0	4.2	1.60
Dissected Bedrock Thin Till	17	3	18	0	0	1.0	1.3	1.0	3.8	0.74
Fan Head Complex	5	1	20	0	0	1.0	1.4	1.0	3.2	0.98
Ice Contact Deposits	2	1	50	1	50	6.5	6.5	1.0	12.0	7.78
Karst Plain and Escarpment	9	0	0	0	0	1.0	1.0	1.0	1.0	0.00
Lake Deposits	5	2	40	1	20	1.0	5.9	1.0	21.0	8.66
Meltwater Channel	1	1	100	0	0	6.1	6.1	6.1	6.1	
Outwash Complex	6	2	33	0	0	1.0	2.4	1.0	8.0	2.80
Outwash Plain	22	7	32	2	9	1.0	3.1	1.0	19.0	4.51
Sand Plains and Loess Sands	30	7	23	3	10	1.0	4.4	1.0	63.0	11.61
Sluiceway or Discrete Channel	34	13	38	3	9	1.0	5.9	1.0	68.0	13.99
Till Capped Fan	9	3	33	1	11	1.0	4.7	1.0	28.0	8.90
Till Cored Moraine	44	20	45	2	5	1.0	3.2	1.0	16.0	3.44
Till Plain	151	67	44	25	17	1.0	5.2	1.0	65.0	7.81
Trough System	4	1	25	0	0	1.0	1.4	1.0	2.7	0.85
Tunnel Valley	10	4	40	1	10	1.0	4.1	1.0	21.0	6.41
Unconfined Outwash Fan	16	8	50	1	6	1.8	4.5	1.0	17.0	4.64
Wabash River Valley	11	2	18	1	9	1.0	3.6	1.0	27.0	7.80

Table 35: Average arsenic concentrations in micrograms per liter (ug/L) for each hydrogeologic setting calculated for different well type and depth, aquifer conditions and aquifer sensitivity.

Hydrogeologic Setting	Well Type		Aquifer Conditions		Hydrogeologic Sensitivity					Well Depth			
	Bedrock	Unconsolidated	Oxidizing	Reducing	High	Moderate	Low	Variable	Low , High	0-50	50-100	100-150	>150
Ablation Sequence	16.00	2.65	6.10	5.13	2.50	--	--	--	--	1.00	3.55	9.25	--
Alluvial Valley	6.60	--	ND	10.33	ND	--	--	--	--	--	ND	--	10.33
Dissected Bedrock	2.07	ND	ND	4.20	1.80	--	--	--	--	--	--	ND	2.07
Dissected Bedrock Thin Till	1.11	1.56	1.12	1.49	ND	1.78	ND	--	ND	1.22	1.78	ND	1.00
Fan Head Complex	ND	1.73	ND	1.55	ND	ND	--	2.10	--	--	1.73	ND	--
Ice Contact Deposits	--	6.50	--	6.50	12.00	ND	--	--	--	--	ND	12.00	--
Karst Plain and Escarpment	ND	ND	ND	ND	ND	--	--	--	--		ND	ND	ND
Lake Deposits	ND	7.18	9.23	ND	21.00	1.00	2.57	--	--	ND	ND	9.23	--
Outwash Complex	ND	3.15	ND	3.15	2.43	--	--	--	--	--	3.87	ND	ND
Outwash Plain	ND	3.23	ND	3.75	3.13	--	--	--	--	1.55	4.73	8.05	ND
Sand Plains and Loess Sands	ND	6.29	1.74	5.86	6.29	ND	ND	--	--	3.06	2.98	11.33	ND
Sluiceway or Discrete Channel	2.10	6.67	ND	8.87	5.85	6.40	--	--	--	1.61	9.68	2.26	2.65
Till Capped Fan	--	4.74	1.43	6.40	ND	ND	15.15	2.08	--	--	2.08	8.08	--
Till Cored Moraine	2.01	3.49	1.58	3.43	2.10	3.25	3.25	3.15	--	3.15	2.66	3.11	4.10
Till Plain	3.93	5.88	1.24	5.89	3.67	3.81	5.63	6.59	--	5.08	4.61	8.49	3.60
Trough System	--	1.43	ND	1.57	1.43	--	--	--	--	2.70	ND	--	--
Tunnel Valley	1.67	5.11	ND	5.40	4.85	--	--	3.89	--	3.57	5.62	ND	--
Unconfined Outwash Fan	--	4.47	ND	4.96	4.32	6.70	--	--	--	2.75	5.66	5.20	ND
Wabash River Valley	10.43	ND	1.38	6.20	1.23	--	--	27.00	--	ND	ND	1.58	1.58

Note: ND = not detected