GOLDER
MEMBER OF WSP

REPORT

R.M. SCHAHFER GENERATING STATION
CCR LANDFILL
RUN-ON AND RUN-OFF CONTROL SYSTEM PLAN

Wheatfield, Indiana Pursuant to 40 CFR 257.81

Submitted to:

Northern Indiana Public Service Company
2755 Raystone Drive
Valparaiso, IN 46383

Submitted by:

Golder Associates Inc.

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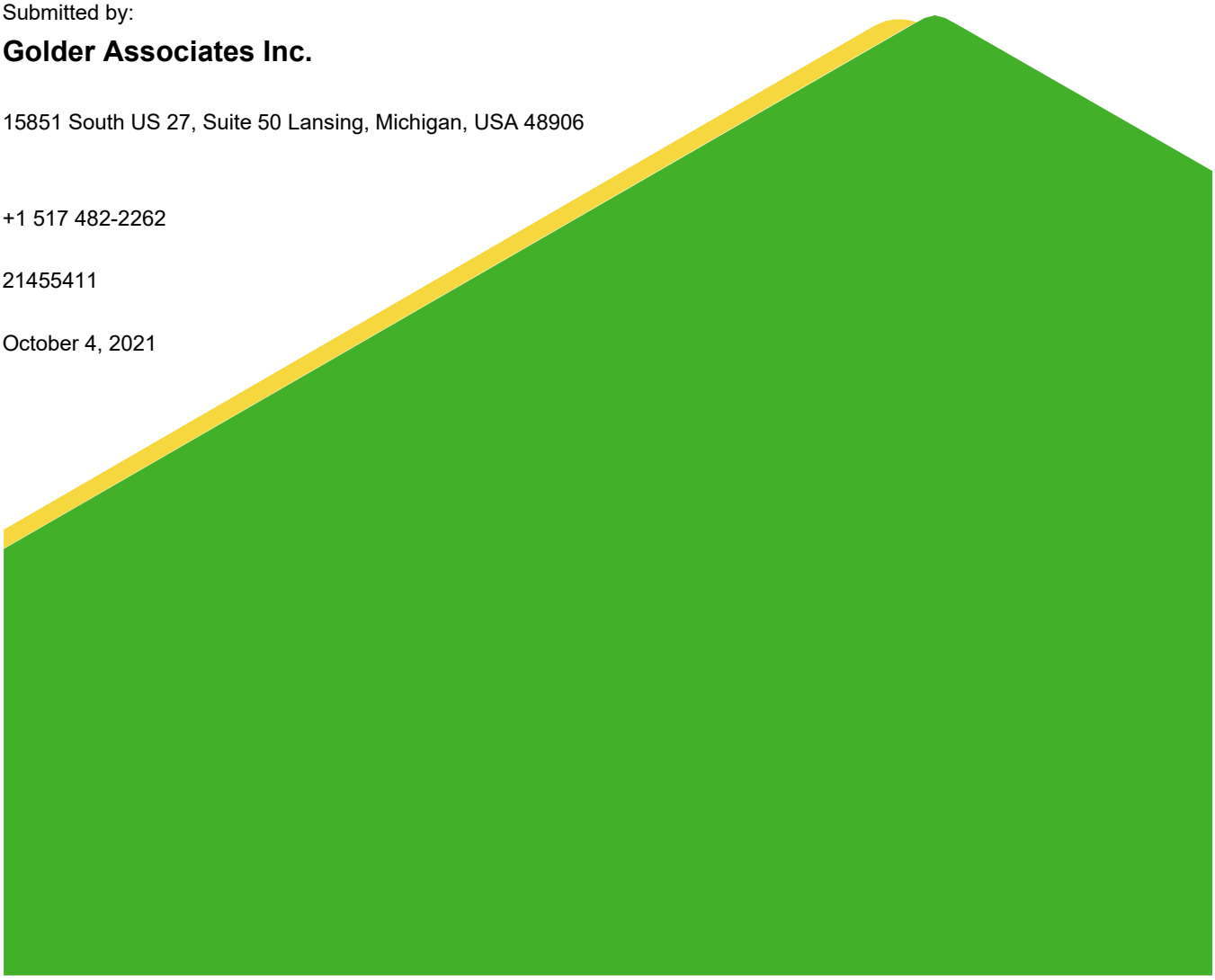
October 4, 2021



Certification

Professional Engineer Certification Statement [40 CFR 257.81(c)(5)]

I hereby certify that, having reviewed the attached documentation and being familiar with the provisions of Title 40 of the Code of Federal Regulations Section 257.81 (40 CFR Part 257.81), I attest that this Run-On and Run-Off Control System Plan is accurate and has been prepared in accordance with good engineering practices, including the consideration of applicable industry standards, and with the requirements of 40 CFR Part 257.81.

Golder Associates Inc.

Signature

10/4/21

Date of Report Certification

TIFFANY D. JOHNSON REGISTERED No. PE11500730 STATE OF INDIANA PROFESSIONAL ENGINEER

Tiffany D. Johnson, P.E.

Name

PE11500730

Professional Engineer License Number

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APPENDIX A

1.0 INTRODUCTION

1.1 Background

The Northern Indiana Public Service Company (NIPSCO) Rollin M. Schahfer Generating Station (RMSGS, Site or Facility) is a 1,943 megawatt (MW) capacity coal-fired, steam turbine electric generating plant in Wheatfield, Jasper County, Indiana (see Figure 1). RMSGS began operations in 1976 and occupies an area of approximately four square miles centrally located at 2723 E 1500 N Road in Wheatfield, Jasper County, Indiana. The station includes an electric substation, coal storage and handling operations, bottom ash/boiler slag and fly ash ponds, a dry ash landfill, cooling towers, cooling water intake and discharge structures, infrastructure and roadways, train tracks and other support facilities.

1.1.1 Landfill

NIPSCO was given approval for a minor modification to their operating permit from the Indiana Department of Environmental Management (IDEM) to operate a Type I, Restricted Waste Landfill (RWS I) at RMSGS on May 23, 2018 (Operating Permit 37-01). The active portions of the CCR Landfill take dry fly ash and other approved coal combustion wastes from the RMSGS Units and Michigan City Generating Station Units. The landfill is located east of the generating station and has a total permitted area (closed, active, and future) of waste placement of approximately 170 acres. As shown on Figures 1 and 2, the current landfill footprint is divided into seven phases. Phases I, II, III, and IV were closed prior to the effective date of the CCR Rule. Phase V is lined and has been closed, and Phase VI is lined and will be closed in the 4th quarter (Q4) 2021. Phase VII construction was completed in 2018 and began receiving waste in Q2 2021. Phase V, Phase VI, and Phase VII have a soil/geosynthetics floor liner with a 3 horizontal to 1 vertical (3H:1V) perimeter containment berm with a crest elevation of approximately 668.5 (north Phase VII) to 670 (western and southern berms) feet above mean sea level (msl). The maximum height of the closed portion of the landfill is approximately 726 feet msl.

NIPSCO has determined that Phases V, VI, and VII of the landfill are subject to the CCR Rule. As such, this analysis pertains to Phases V, VI, and VII. Phase V is an approximately 18-acre phase located in the southwestern corner of the landfill footprint. At the writing of this report, Phase VI was currently under construction of closure activities and Phase V was closed in 2017. Phase VI is an approximately 15-acre phase located directly to the north of Phase V. Phase VII is approximately 14-acres (partial cell) and is located north of Phase VI. As of the timing of this report, waste placement activities were only occurring within Phase VII.

Leachate Collection System

The landfill collects leachate within each of the lined landfill phases through a layer of granular material in combination with a series of perforated pipes placed beneath the ash and on top of the composite base liner system. The leachate is conveyed outside the landfill footprint through a network of solid piping where it is pumped through a series of manhole lift stations to the onsite leachate collection pond. Leachate remains in the pond until the level in the pond becomes too high to accept additional flow and it is pumped into water trucks and then sprayed on the active landfill area for dust control. Based on discussions with NIPSCO personnel and review of the site operation plan, stormwater that comes in contact with landfilled ash within the active phase is managed and treated as leachate.

Surface Water

The overall surface water run-off from the non-active areas of the landfill is collected in onsite drainage ditches located around the perimeter of the landfill. These ditches convey drainage to an onsite stormwater pond (Landfill

Run-Off pond) located northwest of the landfill footprint. The Landfill Run-Off pond discharges through Outfall 003S (East Stormwater Outfall), regulated under the site's current NPDES permit (No. IN0053201, dated October 1, 2020). Outfall 003S discharges into Stalbaum Ditch (when the valve is opened) and ultimately to the Kankakee River.

The landfill is protected from run-on from the surrounding areas by the perimeter stormwater drainage ditches and a compacted fill perimeter dike that provides grade separation between the surrounding grade and the landfill floor.

1.2 Purpose

The purpose of the Run-On and Run-Off Control System Plan (Plan) is to provide a basis for the certification required by 40 CFR 257.81 Run-On and Run-Off Controls for Landfills. 40 CFR 257.81(a) requires the owner or operator of an existing or new CCR landfill or any lateral expansion of a CCR landfill to design, construct, operate, and maintain the following:

- A run-on control system to prevent flow onto the active portion of the CCR unit during the peak discharge from a 24-hour, 25-year storm.
- A run-off control system from the active portion of the CCR unit to collect and control at least the water volume resulting from a 24-hour, 25-year storm.
- Handle run-off from the active portion of the CCR unit in accordance with the surface water requirements under 40 CFR 257.3-3.

2.0 RUN-ON AND RUNOFF CONTROL SYSTEM

To meet the requirements of 40 CFR 257.81(a), the run-on and run-off control system must prevent flow onto the active portion of the CCR unit during the peak discharge from a 24-hour 25-year storm and collect and control at least the water volume resulting from a 24-hour 25-year storm. The 24-hour 25-year storm depth is 5.22 inches as provided in Appendix A – Rainfall Data. Run-off from the active portion of the CCR unit must be handled in accordance with the surface water requirements under 40 CFR 257.3-3.

The Run-on and Run-off Control System Plan was developed by assessing the 2017 Minor Permit Modification Drawings (Weaver Consultants Group, 2017) and the 2018 Phase VII Construction Drawings (Weaver Consultants Group, 2018) for a probable grading scenario that could be modeled with the 24-hour 25-year storm event to document certification pursuant to 40 CFR 257.81. As discussed above, at the writing of this Plan, only landfill Phases V, VI and VII are currently active. As such, this plan discusses the run-on control system for Phases V, VI and VII.

2.1 Run-on Design Verification

Phases V, VI and VII are surrounded by a perimeter dike that provides protection from run-on into the active area. The permanent perimeter dike is 10 feet wide at the top with 3 horizontal to 1 vertical (3H:1V) exterior sideslopes and 4H:1V interior sideslopes. The lowest crest elevation for this permanent perimeter berm is approximately 670-ft msl. The perimeter dike is constructed from compacted fill and provides approximately 3 to 5 feet of grade separation between the surrounding grade and the top of the dike around the southern and western limits of the active area. In addition, on the outside toe of the southern and western perimeter dike, there is a 10-foot wide, trapezoidal –shaped, grass-lined perimeter ditch to collect and divert potential run-on away from the active area. The northern limit of Phase VII is constructed with a temporary run-out and rain-flap berm, as on a 14-acre portion

of the full 20-acre Phase VII cell was constructed in 2018. The crest elevation of the run-out and rain-flap berm varies but the minimum elevations are approximately 3.5 feet above the liner grades (approximately 668.5-ft amsl at the lowest elevation). The eastern limit of Phases V, VI and VII abuts the western limit of the currently closed Phases II and III. At its current configuration surface water run-on from the adjacent Phase II and III closed landfill sideslopes is controlled, separated and diverted from the active area by a 2 foot wide temporary ditch at the interface between active area Phases VI and VII and closed areas Phase II and III. The eastern limit of Phase V is piggy-backed over the existing Phase III sideslope and is therefore treated as contact stormwater and managed as active area leachate.

Run-on to the active portions of the Landfill is controlled using two methods. The first method, as described above, is a perimeter berm around the landfill that creates a barrier that does not allow stormwater to enter the active areas. A drainage channel (approximately 6.75 ft bottom width with 2H:1V slopes and 2.5 feet deep) exists on the outboard slope of the permanent perimeter berm that collects stormwater from the adjacent areas and directs it towards the site's existing stormwater basin northwest of the landfill footprint. The invert elevation of the western ditch is approximately 657.5 ft msl.

The second method is positive grading away from the active areas so that run-off from closed areas (non-contact water) is not diverted into the leachate collection system. There is a temporary northern channel that collects stormwater from future expansion Phases VII and VIII from entering the existing Phase VII. Water from the temporary 1.5-feet deep, 2-foot bottom width, 2H:1V perimeter ditch is directed to the west which leads to the existing stormwater basin northwest of the landfill footprint. This northern channel has an invert elevation of approximately 661-ft msl at the highest point on the northeastern side of Phase VII.

2.1.1 Run-on Calculations

The current 24-hour, 25-year storm run-on volume calculation assumes that the contributing run-on areas for Phases V, VI and VII include the closed areas of Phase II and III and the areas that are unconstructed to the north. Run-on from Phases I and IV were not included in this volume assessment as the stormwater from these areas is collected and conveyed to the stormwater retention pond and therefore does not contribute to the active area run-on volume.

Based on point precipitation frequencies compiled by the National Oceanic and Atmospheric Administration (NOAA), the 24-hour, 25-year storm event in Wheatfield, Indiana is anticipated to generate 5.22 inches of precipitation (see Appendix A). The analysis conservatively assumes that all of the 5.22 inches of precipitation from the design storm is uniformly applied across the site and no infiltration or evapotranspiration occurs (i.e. all precipitation/stormwater that falls on Phases II and III watersheds was assumed to contribute to the run-on volume). The analysis conservatively evaluated if the run-on volume could be maintained within the stormwater ditches around the perimeter of Phase V, Phase VI, and Phase VII.

The results of the analysis indicated that the run-on stormwater volume would fill the ditches and the northern channel north of Phase VII to an elevation of approximately 662.9-feet (1.9-feet depth of water). This elevation corresponds to leaving approximately 5.6-feet of freeboard for the northern side of Phase VII. **Based on this analysis, the run-on from the 24-hour, 25-year storm will not flow into the active areas and thus satisfies the requirements of 40 CFR 257.81.**

Table 1: 25-Year, 24-Hour Storm Run-on Summary

Channel	24-hr, 25-yr Flow (cfs)	Highest 24-hr, 25-yr Flow Elevation (ft)	Lowest Perimeter Berm Elevation (ft)	Minimum 24-hr, 25-yr Freeboard (ft)	Meets 40 CFR 257.81 Requirements?
North Channel	33.4	662.9	668.5	5.6	Yes

Note: Elevations provided are in feet above mean sea level. Run-on calculations were performed in HydroCAD version 9.00

2.2 Run-Off Engineering Design Verification

To satisfy the requirements of 40 CFR 257.81(a)(2), the run-off control system must control flow from the active portion of the CCR unit resulting from a 24-hour, 25-year storm. In addition, the run-off from the active portion of the CCR unit must be managed in accordance with the surface water requirements under 40 CFR 257.3-3. As discussed previously, at the writing of this Plan, only landfill Phases V, VI and VII are currently active. Therefore this plan discusses the run-off control system for Phases V, VI and VII.

Based on discussions with NIPSCO personnel and review of the active Operation Plans, we understand that precipitation that falls in the active portions of the facility and comes in contact with landfilled material, will percolate into the leachate collection system and be managed as leachate. Therefore, the active area run-off control system is actually the Phase V, VI and VII leachate collection system and the run-off is operationally managed as leachate, not stormwater (surface water) run-off.

The leachate collection system designs for Phases V, VI and VII are similar. The floor of both phases was constructed with a series of peaks and valleys running north to south. Perforated leachate collection pipes are located in the valleys and drain to the north or south of the phase. A layer of granular leachate collection soil is placed over the floor of the phase. A perforated leachate collection system header runs along the northern or southern edge of the phase. The collection header drains to the west, and discharges through a solid header pipe, beneath the perimeter dike and ultimately to a leachate lift station manhole. From each leachate manhole lift station, leachate is pumped to a leachate loadout structure and ultimately to the onsite leachate collection pond. Leachate is removed from the pond and applied to the active landfill face as necessary to ensure sufficient storage capacity is maintained in the pond for leachate collection. The Operation Plan indicated that daily leachate application on the landfill is required until the liquid level in the leachate collection pond is within 12 inches of the pond bottom.

2.2.1 Run-off Calculations

To verify that the leachate collection system is sufficiently designed to control run-off during a 24 hour, 25 year storm event over the active area, a conservative analysis of the leachate collection and control system was performed as described below.

Based on point precipitation frequencies compiled by the National Oceanic and Atmospheric Administration (NOAA), the 24-hour, 25 year storm event in Wheatfield, Indiana is anticipated to generate 5.22 inches of precipitation. The runoff volumes from the 24-hour, 25 year design storm event were calculated using Hydrologic Evaluation of Landfill Performance (HELP) software. The runoff volumes for Phases V, VI and VII were analyzed independently as the landfill phases manage/operate stormwater run-off independently. The purpose of the

calculation was to evaluate if the runoff from the 24-hr, 25 year storm event for each phase could be contained entirely within the granular leachate collection soil layers and leachate collection piping associated with each area. We recognize that there is additional storage capacity for the leachate collection system within the leachate collection pond but this analysis conservatively omits this additional volume in the pond. The analysis for the active areas is summarized below.

Run-off from active portions of the Landfill is controlled within the active landfill cells. Precipitation that comes in contact with CCR infiltrates within the unit and is collected in leachate pipes where it is then pumped from a sump to the leachate storage pond. The run-off control system was developed with two active area watersheds. Area 1's watershed is approximately 34.3 acres and utilizes the currently open portions of Phase VI for storage of contact water from Phases II, III, V and VI. Since Phase VI will be closed as of Q4 2021, those areas contributing to the watershed will then be considered non-contact water and will not need to be included in run-off calculations going forward. Area 2's watershed is approximately 17.1 acres and utilizes Phase VII for storage of contact water from the overliner from Phase VII onto Phase II and the floor of Phase VII.

Area 1 was modeled with topography that was surveyed by DLZ Industrial, LLC in 2015 and 2017. Area 2 was modeled with probable grading conditions that were presented in 2018 Phase VII Construction Plan (Weaver Consultants Group, 2018) and surveys by DLZ Industrial, LLC in 2015 and 2017. The volume of runoff from the 24-hour 25-year storm event was modeled in HydroCAD version 9.00 and the runoff in Area 1 and Area 2 is contained by the landfill perimeter berms and thus satisfies the requirements of 40 CFR 257.81.

The runoff calculations are summarized in Table 2.

Table 2: 24-hour 25-year Storm Run-off Summary

Dry Ash Landfill Area	Total Effective (6-inch depth max.) Storage Capacity of Leachate Collection Layer (cubic feet)	Volume of Run-off (cubic feet)	Minimum Berm Elevation (feet)	Peak Water Elevation (feet)	Meets 40 CFR 257.81 Requirements?
Area 1 (Phase V & VI)	718,740	405,353 (9.3 acre-feet)	664.9 (Phase V) 665.6 (Phase VI)	664.2	Yes
Area 2 (Phase VII)	304,710	165,283 (3.8 acre-feet)	668.5 (Phase VII)	664.4	Yes

Notes: Elevations provided are in feet above mean sea level. Run-off calculations were performed in HydroCAD version 9.00.

3.0 PLAN REVISION AND RECORDKEEPING

Per 40 CFR 257.81(c)(2): "The owner or operator of the CCR unit may amend the written run-on and run-off control system plan at any time provided the revised plan is placed in the facility's operating record as required by §257.105(g)(3). The owner or operator must amend the written run-on and run-off control system plan whenever there is a change in conditions that would substantially affect the written plan in effect."

Per 40 CFR 257.81(c)(4); “The owner or operator must prepare periodic run-on and run-off control system plans required by paragraph (c)(1) of this section every five years. The date of completing the initial plan is the basis for establishing the deadline to complete the first subsequent plan. The owner or operator may complete any required plan prior to the required deadline provided the owner or operator places the completed plan into the facility's operating record within a reasonable amount of time. In all cases, the deadline for completing a subsequent plan is based on the date of completing the previous plan. For purposes of this paragraph (c)(4), the owner or operator has completed a periodic run-on and run-off control system plan when the plan has been placed in the facility's operating record as required by §257.105(g)(3).”

Per 40 CFR 257.812(d); “The owner or operator of the CCR unit must comply with the recordkeeping requirements specified in §257.105(g), the notification requirements specified in §257.106(g), and the internet requirements specified in §257.107(g).”

4.0 REFERENCES

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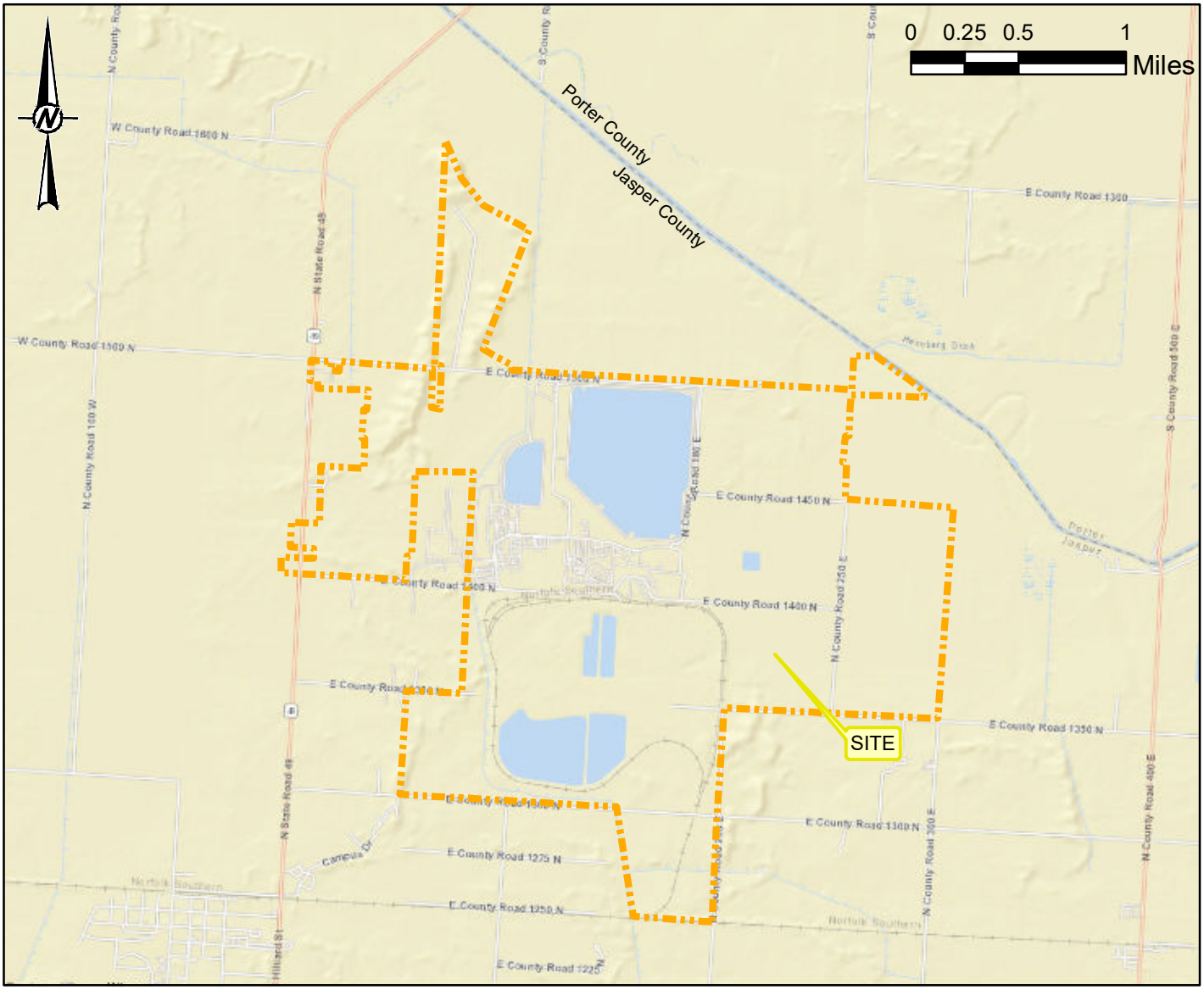
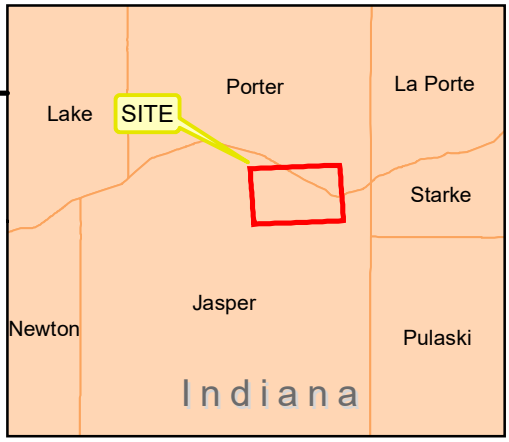
FIGURES





REFERENCE(S)

SERVICE LAYER CREDITS: SOURCES: ESRI, HERE, GARMIN, USGS, INTERMAP, INCREMENT P, NRCAN, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), ESRI KOREA, ESRI (THAILAND), NGCC, (C) OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY

CLIENT
NORTHERN INDIANA PUBLIC SERVICE COMPANY

PROJECT
LANDFILL RUN-ON AND RUN-OFF CONTROL SYSTEM
R.M. SCHAHFER GENERATING STATION
WHEATFIELD, INDIANA

CONSULTANT
GOLDER
MEMBER OF WSP

YYYY-MM-DD	2021-07-21
DESIGNED	JH
PREPARED	DJC
REVIEWED	JH
APPROVED	TDJ

TITLE
SITE LOCATION MAP

PROJECT No.	CONTROL	Rev.	FIGURE
21455411	21455411A001-GIS.mxd	0	1

LEGEND

- Approximate Landfill Phase Boundary
- Approximate Property Line
- PHASE V — Landfill Phase Designation

NARRATIVE

This figure shows the approximate phase boundaries for the closed, active, and future phases of the landfill and accompanies the run-on and run-off control system plan submitted for the active (Phase VI and VII) areas of the landfill for compliance with the final rule, 40 CFR, Part 257.81.

REFERENCES

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Esri, HERE, Garmin, (c) OpenStreetMap contributors, and the GIS user community

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Feet

CLIENT
NORTHERN INDIANA PUBLIC SERVICE COMPANY

PROJECT
LANDFILL RUN-ON AND RUN-OFF CONTROL SYSTEM PLAN
R.M. SCHAHFER GENERATING STATION
WHEATFIELD, INDIANA

TITLE
EXISTING CONDITIONS

CONSULTANT
GOLDER
MEMBER OF WSP

YYYY-MM-DD	2021-07-21
PREPARED	DJC
DESIGN	JH
REVIEW	JH
APPROVED	TDJ

PROJECT No.	CONTROL	Rev.	FIGURE
21455411	21455411A002-GIS.mxd	0	2

Path: H:\21x-Projects\21455411-NIPSCO\figures\A-\21455411A002-GIS.mxd

APPENDIX A

NOAA Precipitation Data for Wheatfield, Indiana

NOAA Atlas 14, Volume 2, Version 3
Location name: Wheatfield, Indiana, USA*
Latitude: 41.2119°, Longitude: -87.013°
Elevation: 665.58 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

G.M. Bonnin, D. Martin, B. Lin, T. Parzybok, M.Yekta, and D. Riley

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.385 (0.349-0.426)	0.456 (0.413-0.503)	0.537 (0.486-0.593)	0.610 (0.553-0.672)	0.698 (0.630-0.768)	0.771 (0.693-0.848)	0.840 (0.752-0.924)	0.911 (0.812-1.00)	1.01 (0.890-1.11)	1.08 (0.952-1.19)
10-min	0.599 (0.543-0.662)	0.711 (0.645-0.785)	0.834 (0.756-0.921)	0.942 (0.854-1.04)	1.07 (0.963-1.17)	1.17 (1.05-1.29)	1.26 (1.13-1.39)	1.36 (1.21-1.50)	1.48 (1.31-1.63)	1.58 (1.39-1.74)
15-min	0.734 (0.665-0.812)	0.870 (0.789-0.960)	1.02 (0.928-1.13)	1.16 (1.05-1.28)	1.32 (1.19-1.45)	1.45 (1.30-1.59)	1.57 (1.41-1.73)	1.69 (1.51-1.86)	1.85 (1.63-2.03)	1.97 (1.73-2.17)
30-min	0.971 (0.880-1.07)	1.16 (1.06-1.29)	1.40 (1.27-1.55)	1.61 (1.46-1.77)	1.86 (1.68-2.05)	2.07 (1.86-2.28)	2.27 (2.03-2.50)	2.47 (2.20-2.72)	2.74 (2.42-3.01)	2.95 (2.60-3.25)
60-min	1.19 (1.08-1.31)	1.43 (1.30-1.58)	1.76 (1.60-1.94)	2.05 (1.86-2.26)	2.41 (2.18-2.66)	2.72 (2.45-3.00)	3.03 (2.71-3.34)	3.35 (2.99-3.69)	3.79 (3.35-4.16)	4.15 (3.65-4.57)
2-hr	1.36 (1.23-1.50)	1.65 (1.50-1.82)	2.10 (1.90-2.30)	2.49 (2.26-2.73)	3.01 (2.72-3.29)	3.46 (3.11-3.78)	3.92 (3.51-4.28)	4.41 (3.93-4.81)	5.09 (4.50-5.55)	5.67 (4.97-6.20)
3-hr	1.47 (1.34-1.62)	1.78 (1.62-1.97)	2.26 (2.06-2.50)	2.70 (2.45-2.97)	3.28 (2.96-3.61)	3.79 (3.41-4.16)	4.31 (3.86-4.73)	4.88 (4.33-5.34)	5.67 (5.00-6.21)	6.36 (5.56-6.97)
6-hr	1.76 (1.59-1.95)	2.12 (1.92-2.35)	2.69 (2.43-2.98)	3.21 (2.89-3.55)	3.91 (3.51-4.32)	4.53 (4.05-4.99)	5.17 (4.60-5.70)	5.87 (5.18-6.46)	6.86 (5.99-7.55)	7.72 (6.69-8.50)
12-hr	2.04 (1.85-2.26)	2.46 (2.22-2.72)	3.09 (2.80-3.42)	3.68 (3.32-4.06)	4.46 (4.01-4.92)	5.14 (4.60-5.66)	5.85 (5.21-6.44)	6.62 (5.85-7.28)	7.69 (6.74-8.46)	8.62 (7.50-9.49)
24-hr	2.32 (2.15-2.54)	2.83 (2.61-3.09)	3.62 (3.34-3.96)	4.28 (3.92-4.67)	5.22 (4.76-5.68)	6.01 (5.44-6.54)	6.86 (6.16-7.46)	7.78 (6.92-8.46)	9.11 (7.97-9.93)	10.2 (8.81-11.2)
2-day	2.71 (2.51-2.93)	3.26 (3.02-3.53)	4.10 (3.79-4.44)	4.79 (4.41-5.17)	5.76 (5.28-6.23)	6.57 (5.97-7.12)	7.43 (6.69-8.07)	8.34 (7.44-9.10)	9.65 (8.47-10.6)	10.7 (9.28-11.9)
3-day	2.87 (2.67-3.10)	3.45 (3.21-3.73)	4.29 (3.98-4.63)	4.98 (4.61-5.36)	5.95 (5.48-6.41)	6.74 (6.17-7.28)	7.58 (6.87-8.21)	8.47 (7.61-9.21)	9.72 (8.60-10.6)	10.8 (9.41-11.9)
4-day	3.04 (2.84-3.27)	3.64 (3.40-3.92)	4.48 (4.18-4.82)	5.17 (4.80-5.55)	6.13 (5.68-6.59)	6.91 (6.36-7.45)	7.73 (7.05-8.35)	8.59 (7.77-9.31)	9.79 (8.74-10.7)	10.8 (9.54-12.0)
7-day	3.63 (3.42-3.89)	4.33 (4.07-4.63)	5.22 (4.90-5.57)	5.93 (5.57-6.34)	6.92 (6.47-7.40)	7.71 (7.17-8.25)	8.52 (7.87-9.14)	9.35 (8.57-10.1)	10.5 (9.50-11.3)	11.4 (10.3-12.4)
10-day	4.09 (3.85-4.36)	4.85 (4.57-5.17)	5.82 (5.47-6.19)	6.60 (6.19-7.02)	7.69 (7.18-8.18)	8.58 (7.96-9.13)	9.49 (8.74-10.1)	10.4 (9.52-11.2)	11.7 (10.6-12.7)	12.8 (11.4-13.9)
20-day	5.53 (5.24-5.85)	6.53 (6.19-6.91)	7.68 (7.27-8.11)	8.58 (8.12-9.06)	9.80 (9.23-10.3)	10.7 (10.1-11.3)	11.7 (10.9-12.4)	12.6 (11.7-13.4)	13.8 (12.7-14.8)	14.7 (13.5-15.8)
30-day	6.88 (6.55-7.24)	8.10 (7.71-8.52)	9.37 (8.91-9.85)	10.3 (9.80-10.8)	11.5 (10.9-12.1)	12.4 (11.7-13.1)	13.2 (12.5-14.0)	14.0 (13.2-14.9)	15.0 (14.0-16.0)	15.7 (14.6-16.8)
45-day	8.69 (8.31-9.10)	10.2 (9.72-10.7)	11.6 (11.1-12.1)	12.6 (12.0-13.2)	13.9 (13.2-14.5)	14.8 (14.1-15.5)	15.6 (14.8-16.4)	16.4 (15.5-17.3)	17.3 (16.3-18.3)	17.9 (16.9-19.0)
60-day	10.4 (9.94-10.9)	12.2 (11.6-12.8)	13.8 (13.2-14.5)	15.1 (14.4-15.8)	16.6 (15.8-17.4)	17.7 (16.8-18.5)	18.7 (17.7-19.6)	19.6 (18.6-20.7)	20.7 (19.5-21.9)	21.5 (20.2-22.8)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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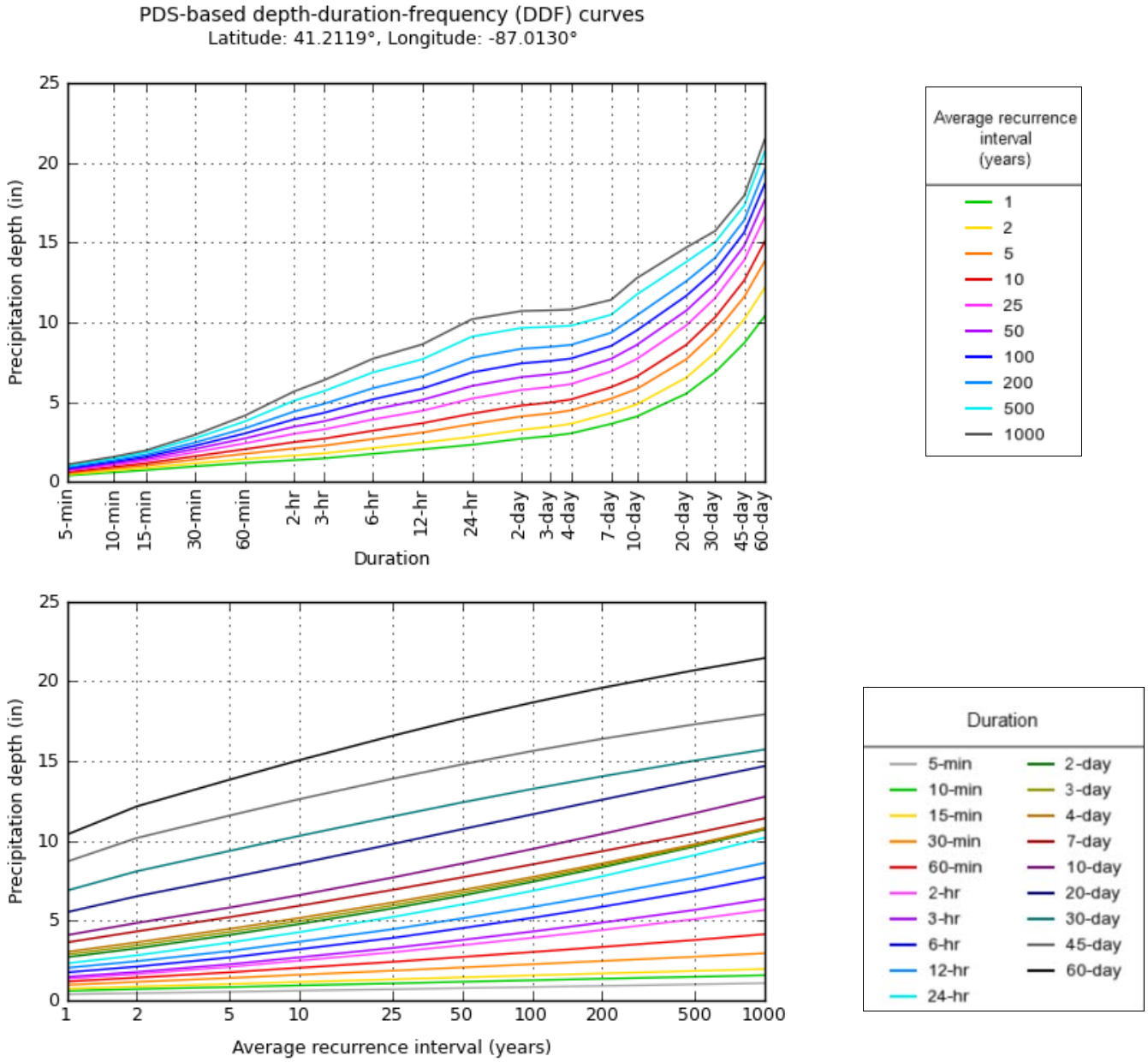
PF graphical



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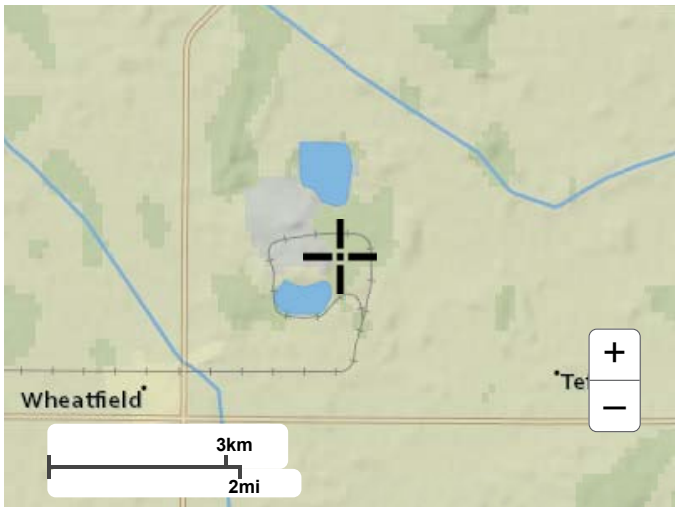
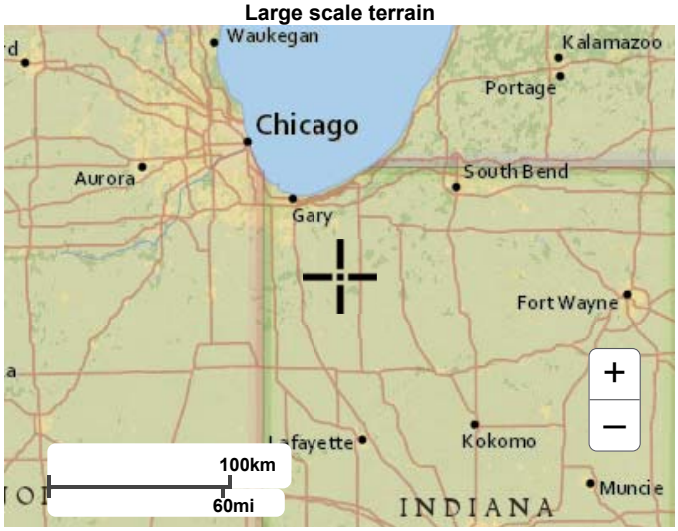
Maps & aerials

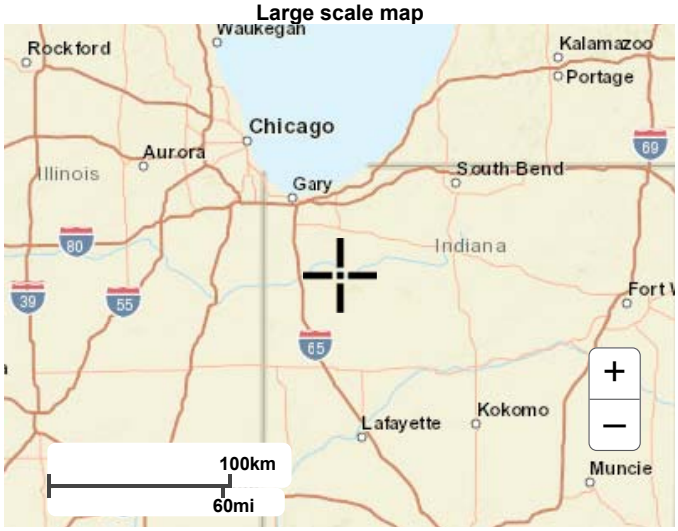
Small scale terrain



Large scale terrain



Large scale map



Large scale aerial

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