Sulfur Dioxide (SO_2)

Monitoring Requirements

The monitoring requirements for SO_2 are detailed in 40 CFR Part 58 Appendix D, 4.4. §4.4.2 of the Appendix lists the number of monitors to be located in a CBSA based on the PWEI. The PWEI combines the population of the area and the SO_2 emissions from National Emissions Inventory for each county. The population from the most current census data or estimates is multiplied by the emissions and divided by one million. The PWEI value dictates the number of sites required:

PWEI	# of Sites
>1,000,000	3
100,000 to 1,000,000	2
5,000 to 100,000	1
<5,000	0

The CBSAs in Indiana which require monitoring sites are listed in Table 14 along with the other areas which have monitoring sites. The emissions data was provided from the most current U.S.EPA figures and the population used was the 2012 estimated population for the updated CBSAs from the U.S Census Bureau.

Table 14 – Number of SO_2 Sites Required by CFR

CBSA Name - Required Areas	2009 Points & 2008 v2 SO2 (tpy) [1]	2012 Pop. Estimate [2]	July 2012 PWEI Values	July 2012 PWEI Required Monitors	Current No. of Sites	2014 No. of Sites
Chicago-Naperville-Elgin, IL-IN-WI (total CBSA)	157,003	9,461,105	1,485,425	3	3	-
Chicago-Naperville-Elgin, IL-IN-WI (IN only)					2	2
Cincinnati, OH-KY-IN (total CBSA) [3]	115,862	2,128,603	246,624	2	5	-
Cincinnati, OH-KY-IN (IN only)					0	0
Indianapolis-Carmel-Anderson, IN [3]	58,161	1,928,982	112,192	2	3	3
Evansville, IN-KY (total CBSA) [3]	56,799	313,433	17,803	1	2	-
Evansville, IN-KY (IN only)					1	1
Louisville-Jefferson County, KY-IN (total CBSA) [3]	67,858	1,251,351	84,914	1	4	-
Louisville-Jefferson County, KY-IN (IN only)					1	1
Terre Haute, IN	72,395	172,493	12,488	1	1	1
CBSA Name - Non-required Areas						
Fort Wayne, IN	1,697	421,257	715	0	1	1
Columbus, IN	320	79,129	25	0	1	1
# of sites needed to meet full CBSA requirements				10		
Sites in Indiana Network					**10**	**10**

[1] Emissions data from U.S.EPA Table

[2] Population estimates from US Census Bureau

[3] Population from revised CBSAs (Feb 2013), emissions from old CBSAs

Indiana meets the minimum monitoring requirements in four of the six areas which require monitors. For the Chicago-Naperville-Elgin, IL-IN-WI CBSA Indiana has an agreement with Illinois EPA for the remaining required site to be operated by them. For the Cincinnati, OH-KY-IN CBSA,

SWOAQA meets the monitoring requirements in that area as per an agreement between Indiana and SWOAQA.

Monitoring of SO_2 is also required at the NCore sites as per 40 CFR Part 58 Appendix D, 4.4.5.

Monitoring Methodology

Indiana's SO_2 monitoring network collects data with Thermo Electron Models 43c, 43i and the API Model 100E using pulsed ultra-violet fluorescence monitoring methodology. A trace level/Ultra-sensitive analyzer is used to collect trace level SO_2 data at the NCore, Indpls - Washington Park site (180970078).

Monitoring Network

Indiana operates 10 SO_2 monitors located throughout the state, as displayed in Figure 12. The current network, is listed in Table 15.

Network Modifications

No network modifications are scheduled to occur in 2014.

Figure 12 – SO_2 Monitoring Network

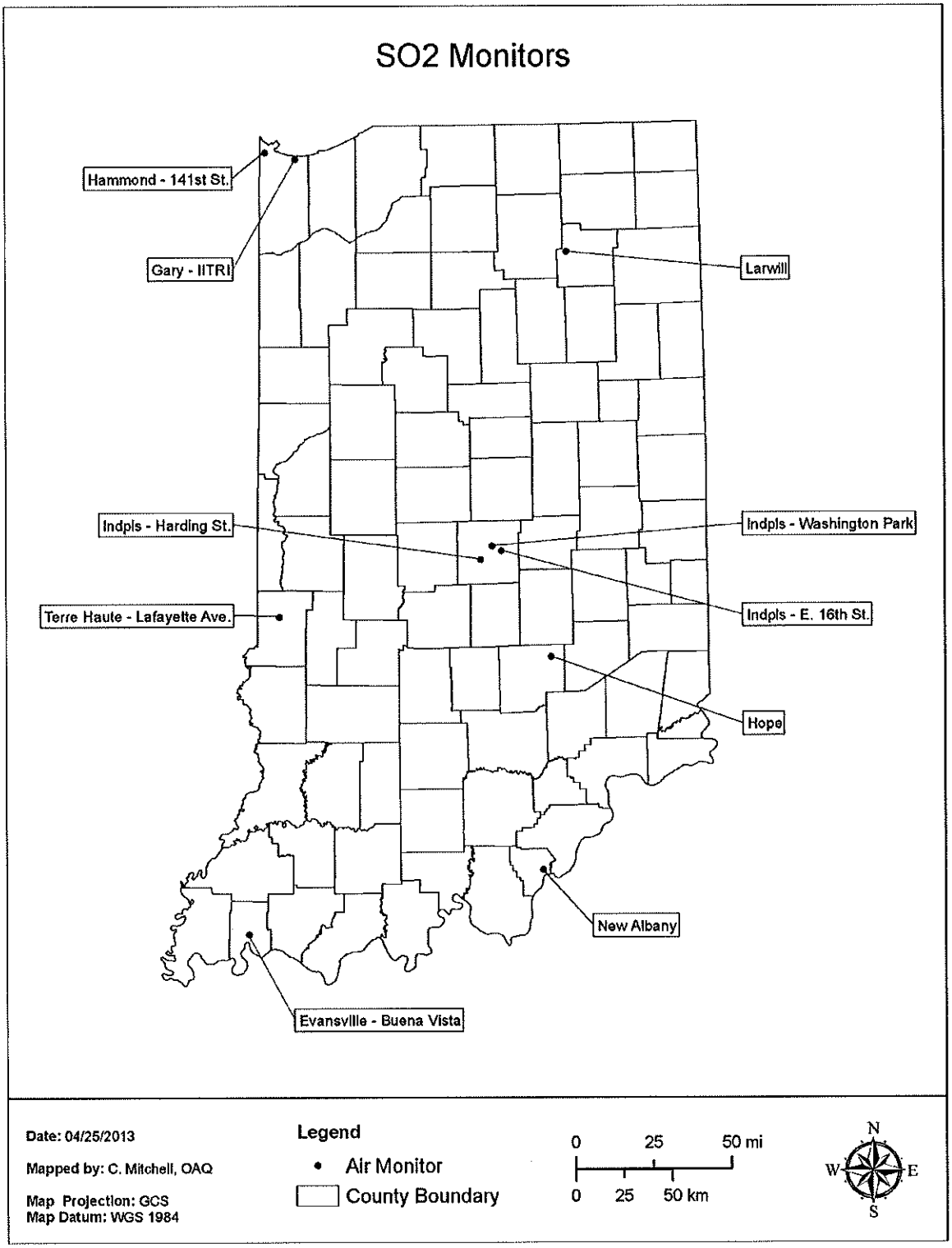

Table 15 – SO_2 Monitoring Network

Parameter Code: 42401 **SO_2 - Sulfur Dioxide**

RO: 0520 OPERATING AGENCY: Indiana Department of Environmental Management

Site ID	Site Name	County	City	Address	Monitor Type	Start Date	Operating Schedule	Monitoring Method	Scale	Monitoring Objective	Latitude	Longitude	MSA	Site Change Proposed?
180050007	Hope	Bartholomew		9404 N775 E.	SPM	05/02/13	Continuous	060	Urban	Background	39.294322	-85.766816	Columbus	No
180431004	New Albany	Floyd	New Albany	Green Valley Elem. Sch., 2230 Green Valley Rd.	SLAMS	11/01/76	Continuous	060	Neigh	Pop Exp	38.308056	-85.834167	Louisville/Jefferson County, KY-IN	No
180890022	Gary - IITRI	Lake	Gary	IITRI Bunker, 201 Mississippi St.	SLAMS	06/12/97	Continuous	060	Neigh	Pop Exp	41606667	-87.304722	Chicago-Naperville-Elgin, IL-IN-WI	No
180892006	Hammond - 141st St.	Lake	Hammond	1300 E. 141st Street	SLAMS	08/01/75	Continuous	060	Neigh	Highest Conc	41639444	-87.493611	Chicago-Naperville-Elgin, IL-IN-WI	No
180970057	Indpls - Harding St.	Marion	Indianapolis	1321 S. Harding St.	SLAMS	03/04/82	Continuous	060	Neigh	Highest Conc	39.749019	-86.186314	Indianapolis-Carmel-Anderson	No
180970073	Indpls - E. 16th St.	Marion	Indianapolis	6125 E. 16th St.	SLAMS	04/02/90	Continuous	060	Neigh	Pop Exp	39.789167	-86.060833	Indianapolis-Carmel-Anderson	No
180970078	Indpls - Washington Park	Marion	Indianapolis	Washington Park, 3120 E. 30th St	NCORE	01/01/10	Continuous	600	Neigh	Pop Exp	39.811097	-86.114459	Indianapolis-Carmel-Anderson	No
181630021	Evansville - Buena Vista	Vanderburgh	Evansville	1110 W. Buena Vista Rd	SLAMS	07/08/09	Continuous	060	Neigh	Pop Exp	38.013333	-87.577778	Evansville, IN-KY	No
181670018	Terre Haute - Lafayette Ave.	Vigo	Terre Haute	951N. Lafayette Ave.	SLAMS	07/01/83	Continuous	060	Neigh	Pop Exp	39.486111	-87.401389	Terre Haute	No
181830003	Larwill	Whitley		Whitko Middle School, 710 N. State Rd. 5	SPM	01/01/13	Continuous	060	Urban	Background	41.169646	-85.629292	Fort Wayne	No

SO2 MONITORING METHOD: 060 - THERMO ELECTRON 43C, 43i
600 - TELEDYNE INSTR. 100EU

$PM_{2.5}$ Speciation

Monitoring Requirements

Monitoring requirements in 40 CFR Part 58 Appendix D 4.7.4 states that "each state shall continue to conduct chemical speciation monitoring and analyses at sites designated to be part of the STN $PM_{2.5}$."

Monitoring Methodology

Intermittent speciation samples are collected on three different filter mediums, each for a specific analysis and list of compounds. A Teflon filter using the Energy Dispersive X-ray Fluorescence analysis methodology is used to target the mass and 33 trace metals. A nylon filter using Ion Chromatography for an analytical method is used to target sulfates, nitrates, and three cations; ammonium, potassium, and sodium. And a quartz fiber filter using Thermal Optical Analysis is used to target organic, elemental, and total carbon.

The Met One SASS is used to collect Mass-$PM_{2.5}$, trace elements, Cations-$PM_{2.5}$, Nitrate-$PM_{2.5}$, and Sulfate-$PM_{2.5}$ data. The URG-3000N sampler is used to collect organic and elemental carbon data. Samples are collected on a 1/6 day sampling frequency at all sites except Indpls - Washington Park (180970078), which samples every third day.

Indiana also operates continuous speciation monitors at four different locations. A Magee Aethalometer, using optical absorption analysis methodology, is used for sampling black carbon at Indpls - Washington Park, Gary - IITRI (180890022), Evansville - Buena Vista (181630021), and Elkhart - Prairie St.(180390008). A Thermo Electron Sulfate Particulate Analyzer, using Catalytic Thermal Reduction and Pulsed Fluorescence analysis, monitors sulfates at Indpls - Washington Park.

Monitoring Network

A Thermo Electron 5020 Sulfate Particulate Analyzer, using Catalytic Thermal Reduction and Pulsed Fluorescence analysis to monitor for sulfates, was removed from Evansville - Buena Vista. The decision to discontinue this monitoring was due to the poor data comparison between the values generated, and the values from the Met One SASS. The sulfate monitor's values were always near baseline. The sulfate monitor also required significant maintenance as well as expensive replacement parts, and supplies. Thermo Electron no longer manufacturers this type of monitor.

A carbon screening study started in January 2013. This study is focusing on four locations in Indiana. The monitors used in this study include either a small portable Aethalometer or a rack mount Aethalometer. Black carbon (elemental component) and possibly UV carbon (organic component) will be collected by the Aethalometer. Each site will collect data for one quarter. The data are collected continuously for a 24-hour period, showing episodes down to 5 minutes. The data will be evaluated to determine if more monitoring is needed for that specific area of the State, whether it is a continuous $PM_{2.5}$ sampler and/or a stationary Aethalometer. Human activities produce black carbon, which can harm public health. The data collected will help contribute to making effective policy decisions. The four sites slated for this special study include; 1) Jeffersonville - Walnut Street (180190006) (Jan-Mar), an existing site currently collecting $PM_{2.5}$, PM_{10}, and speciation data; 2) A site located at the Hammond - Water Works (Apr-Jun); 3) A site in Lawrenceburg, IN, an upwind site for the Cincinnati area (Jul-Sep); and; 4) A site located in Northeast, IN near the I-69 and Toll Road interchange (Oct-Dec).

Network Modifications

The Indiana speciation network consists of seven sites across the state. The current network, along with any changes planned for 2014, is listed in Table 16, and displayed in Figure 13.

An Aethalometer will be installed at Indpls – I-70 E Near-Road NO_2 site in January 2014.

Figure 13 – Speciation Monitoring Network

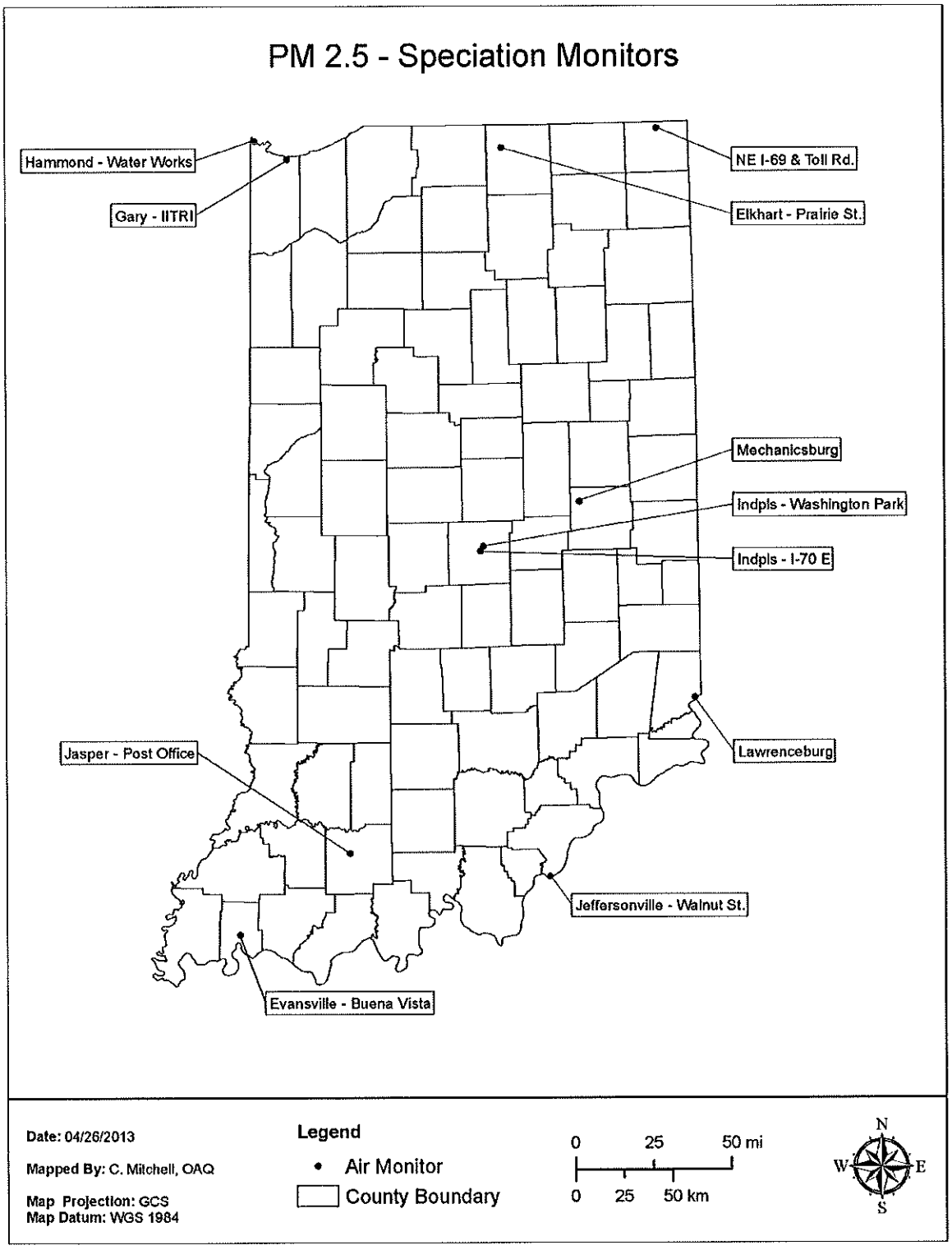

Table 16 – $PM_{2.5}$ Speciation Monitoring Network

PM2.5 Speciation (Sulfate, Nitrate, Carbon, etc.)

RO: 0520 OPERATING AGENCY: Indiana Department of Environmental Management

Site ID	Site Name	County	City	Address	Monitor Type	Start Date	Operating Schedule	Monitoring Method	Scale	Monitoring Objective	Latitude	Longitude	MSA	Site Change Proposed?
180190006	Jeffersonville-Walnut St.	Clark	Jeffersonville	Jeffersonville PFAU, 719 Walnut St.	Suplmntl Speciation / Special Purpose	07/01/08	6-Day	831,838,839,840 ,841,842,MicroAeth	Neigh	Pop Exp	38.277675	-85.740153	Louisville/Jefferson County, KY-IN	No
18029____	Lawrenceburg	Dearborn		US 50 Flood gate structure	Special Purpose	07/01/13	3-Day	MicroAeth	Neigh	Pop Exp			Cincinnati, OH-KY-IN	No
180372001	Jasper - Post Office	Dubois	Jasper	Post Office, 206 E. 6th St	Suplmntl Speciation	01/04/05	6-Day	810,811,812,826, 831,838,839,840 ,841,842	Neigh	Pop Exp	38.391389	-86.929167	Non-MSA County	No
180390008	Elkhart - Prairie St.	Elkhart	Elkhart	2745 Prairie St.	Suplmntl Speciation	01/01/08	6-Day	810,811,812,826, 831,838,839,840 ,841,842	Neigh	Pop Exp	41656905	-85.968371	Elkhart-Goshen	No
180390008	Elkhart - Prairie St.	Elkhart	Elkhart	2745 Prairie St.	Special Purpose	10/01/11	Continuous Black Carbon	867	Neigh	Pop Exp	41656905	-85.968371	Elkhart-Goshen	No
180650003	Mechanicsburg	Henry		Shenandoah HS, 7354 W. Hwy. 36	Suplmntl Speciation	02/01/02	6-Day	810,811,812,826, 831,838,839,840 ,841,842	Regional	Regional Trans	40.009525	-85.523455	Non-MSA County	No
180890022	Gary - IITRI	Lake	Gary	IITRI Bunker, 201Mississippi St.	Suplmntl Speciation	04/03/03	6-Day	810,811,812,826, 831,838,839,840 ,841,842	Middle	Pop Exp	41606667	-87.304722	Chicago-Naperville-Elgin, IL-IN-WI	No
180890022	Gary - IITRI	Lake	Gary	IITRI Bunker, 201Mississippi St.	Special Purpose	04/01/05	Continuous Black Carbon	866	Middle	Pop Exp	41606667	-87.304722	Chicago-Naperville-Elgin, IL-IN-WI	No
18089____	Hammond - Water Works	Lake		Hammond Water Works, 925 Casino Center Dr.	Special Purpose	04/16/13	3-Day	866	Neigh	Pop Exp			Chicago-Naperville-Elgin, IL-IN-WI	No
180970078	Indpls - Washington Park	Marion	Indianapolis	Washington Park, 3120 E. 30th St	Trends Speciation NCore	12/13/00	3-Day	810,811,812,826, 831,838,839,840 ,841,842	Neigh	Pop Exp	39.811097	-86.114469	Indianapolis-Carmel-Anderson	No
180970078	Indpls - Washington Park	Marion	Indianapolis	Washington Park, 3120 E. 30th St	Special Purpose	10/01/03	Continuous Black Carbon	866	Neigh	Pop Exp	39.811097	-86.114469	Indianapolis-Carmel-Anderson	No
180970078	Indpls - Washington Park	Marion	Indianapolis	Washington Park, 3120 E. 30th St	Special Purpose	01/01/06	Continuous Sulfate	875	Neigh	Pop Exp	39.811097	-86.114469	Indianapolis-Carmel-Anderson	No
180970087	Indpls - I-70 E	Marion	Indianapolis	1650 Ludlow Ave.	Near-Road	01/01/14	Continuous Black Carbon	867	Neigh	Pop Exp	39.788793	-86.131121	Indianapolis-Carmel-Anderson	Add
18151____	NE I-69 & Toll Road	Steuben		Angola Toll Plaza, MP 144 on IN Toll Rd.	Special Purpose	10/01/13	3-Day	MicroAeth	Neigh	Pop Exp			Non-MSA County	No
181630021	Evansville - Buena Vista	Vanderburgh	Evansville	1110 W. Buena Vista Rd	Suplmntl Speciation	07/12/09	6-Day	810,811,812,826, 831,838,839,840 ,841,842	Neigh	Pop Exp	38.013333	-87.577778	Evansville, IN-KY	No
181630021	Evansville - Buena Vista	Vanderburgh	Evansville	1110 W. Buena Vista Rd	Special Purpose	07/08/09	Continuous Black Carbon	867	Neigh	Pop Exp	38.013333	-87.577778	Evansville, IN-KY	No

MONITORING METHOD:	*810 - MET ONE SASS NYLON / GRAVIMETRIC*
	811 - MET ONE SASS TEFLON / ANALYSIS METHOD: ENERGY DISPERSIVE XRF
	812 - MET ONE SASS NYLON / ANALYSIS METHOD: ION CHROMATOGRAPHY
	826 - URG 3000 w. PALL QUARTZ FILTER AND CYCLONE INLET / IMPROVE_A TOT
	831 - URG 3000 w. PALL QUARTZ FILTER AND CYCLONE INLET / EC1+EC2+EC3-(OP(TOR))
	838 - URG 3000 w. PALL QUARTZ FILTER AND CYCLONE INLET / IMPROVE TOT
	839 - URG 3000 w. PALL QUARTZ FILTER AND CYCLONE INLET/OC1+OC2+OC3+OC4+(OP(TOT))
	840 - URG 3000 w. PALL QUARTZ FILTER AND CYCLONE INLET / EC1+EC2+EC3-(OP(TOT))
	841 - URG 3000N w. PALL QUARTZ FILTER AND CYCLONE INLET / IMPROVE_A
	842 - URG 3000N w. PALL QUARTZ FILTER AND CYCLONE INLET / IMPROVE_A TOR
	866 - MAGEE AETHALOMETER AE21 / ANALYSIS METHOD: OPTICAL ABSORPTION
	867 - MAGEE AETHALOMETER AE22 / ANALYSIS METHOD: OPTICAL ABSORPTION
	875 - THERMO ELECTRON 5020 / CATALYTIC THERMAL REDUCT, PULSED FLUORESCENCE

PAMS Ozone Precursors (VOCs)

Monitoring Requirements

Ozone precursor monitoring is required as part of the PAMS program. The specific requirements are addressed in Table D-6 of 40 CFR Part 58 Appendix D. According to the Modified Network Plan for the Chicago Nonattainment Area, Indiana operates one Type 2 PAMS site. A Type 2 site requires measurements for speciated VOCs, carbonyls, NO_x, CO (at one Type 2 site; Chicago-Jardine), O_3, and surface met.

This section deals with the speciated VOCs. The other parameters are addressed in their own area. According to the plan, 56 speciated VOCs are to be collected at Indiana's PAMS site.

Monitoring Methodology

Ozone precursor VOCs are collected continuously using a Perkin Elmer Clarus 500 GC, with dual FIDs and a TurboMatrix thermal desorber. In addition, canister samples are collected on a 1/6 day sampling schedule. These canisters are analyzed using the same analytical method. These are the 56 PAMS target compounds:

Ethylene	Acetylene	Ethane	Propylene
Propane	Isobutane	1-Butene	n-Butane
t-2-Butene	c-2-Butene	*Isopentane*	1-Pentene
n-Pentane	Isoprene	t-2-Pentene	c-2-Pentene
2,2-Dimethylbutane	Cyclopentane	2,3-Dimethylbutane	2-Methylpentane
3-Methylpentane	n-Hexane	Methylcyclopentane	2,4-Dimethylpentane
Benzene	Cyclohexane	2-Methylhexane	2,3-Dimethylpentane
3-Methylhexane	2,2,4-Trimethylpentane	n-Heptane	Methylcyclohexane
2,3,4-Trimethylpentane	Toluene	2-Methylheptane	3-Methylheptane
n-Octane	Ethylbenzene	m-Xylene	p-Xylene
Styrene	o-Xylene	n-Nonane	Isopropylbenzene
n-Propylbenzene	m-Ethyltoluene	p-Ethyltoluene	1,3,5-Trimethylbenzene
o-Ethyltoluene	1,2,4-Trimethylbenzene	n-Decane	1,2,3-Trimethylbenzene
m-Diethylbenzene	p-Diethylbenzene	n-Undecane	Dodecane

In addition to these individual compounds, there are two aggregated parameters reported; sum of PAMS compounds and total NMOC.

Monitoring Network

Indiana operates one PAMS monitoring site collecting ozone precursors VOCs at Gary - IITRI (180890022) for the Chicago PAMS area, and one PAMS-like site at Indpls - Washington Park (180970078) to collect data for the Indianapolis MSA. The normal PAMS monitoring season is June, July, and August, but Indiana began collecting data year-round in 2011 to observe values outside the season as well. The site details are in Table 17.

Network Modifications

No changes are planned for ozone precursor VOC monitoring in 2014.

Figure 14 – Ozone Precursors Network

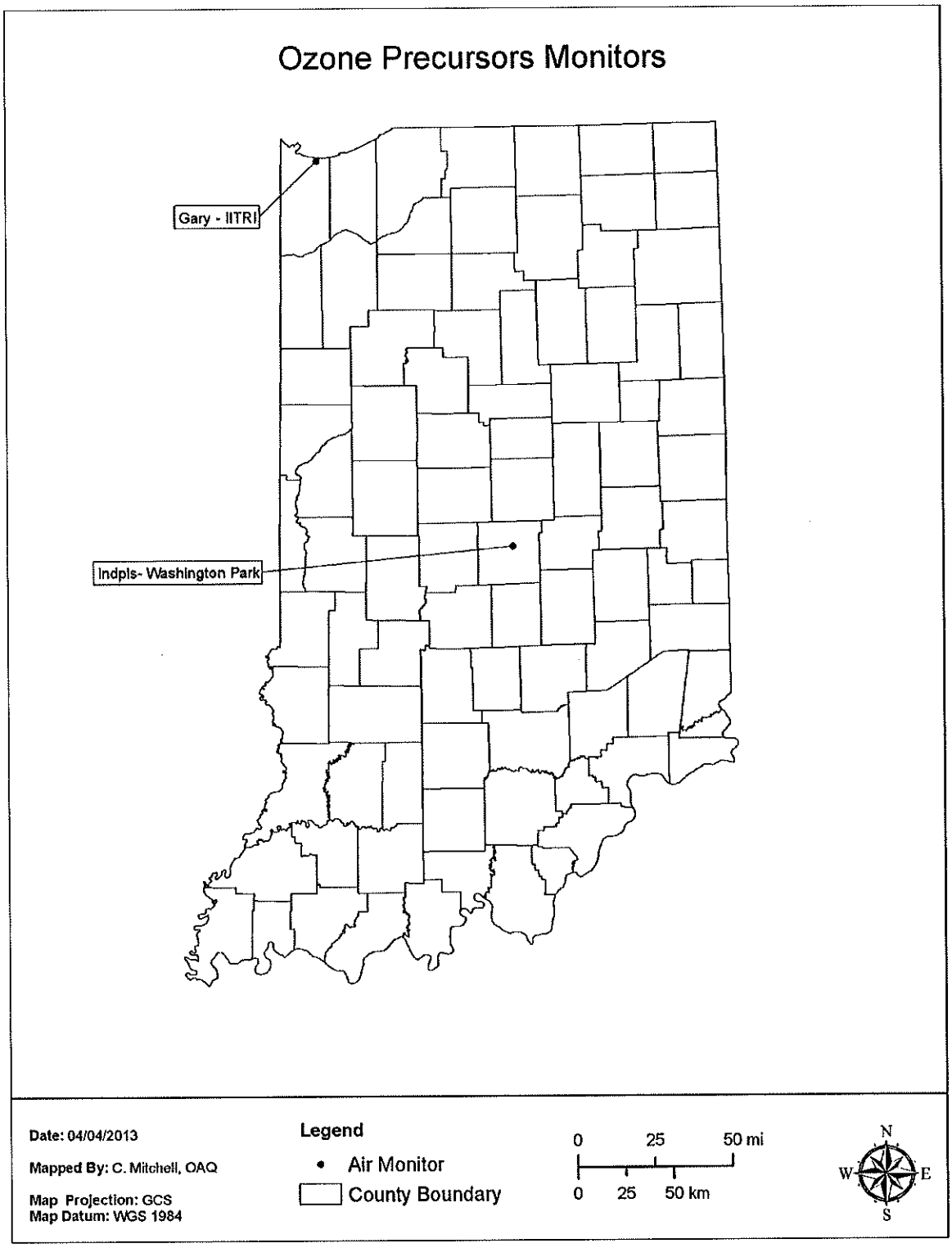

Table 17 – Ozone Precursor Monitoring Network

Ozone Precursors

RO: 0520 OPERATING AGENCY: Indiana Department of Environmental Management

Site ID	Site Name	County	City	Address	Monitor Type	Start Date	Operating Schedule	Monitoring Method	Scale	Monitoring Objective	Latitude	Longitude	MSA	Site Change Proposed?
180890022	Gary - IITRI	Lake	Gary	IITRI Bunker, 201 Mississippi St.	Unofficial PAMS	07/06/95	Continuous	128	Middle	Max Prec. Em. Impact	41606667	-87.304722	Chicago-Naperville-Elgin, IL-IN-WI	No
180890022	Gary - IITRI	Lake	Gary	IITRI Bunker, 201 Mississippi St.	Unofficial PAMS	07/06/95	6-Day	146	Middle	Max Prec. Em. Impact	41606667	-87.304722	Chicago-Naperville-Elgin, IL-IN-WI	No
180970078	Indpls - Washington Park	Marion	Indianapolis	Washington Park, 3120 E. 30th St	Special Purpose	07/01/11	Continuous	128	Middle	Max Prec. Em. Impact	39.811097	-86.114469	Indianapolis-Carmel-Anderson	No
180970078	Indpls - Washington Park	Marion	Indianapolis	Washington Park, 3120 E. 30th St	Special Purpose	07/01/11	6-Day	146	Middle	Max Prec. Em. Impact	39.811097	-86.114469	Indianapolis-Carmel-Anderson	No

MONITORING METHOD: 128 - AUTO GC; SUBAMBIENT - DUAL FID
146 - AUTO GC; SUBAMBIENT - DUAL FID

Toxics (VOCs)

Monitoring Requirements

There are no requirements for toxics monitoring listed in 40 CFR Part 58.

Monitoring Methodology

Indiana uses a modification of the TO-15 method to collect toxics VOC data. TO-15 is part of U.S.EPA's Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air and consists of guidance for the sampling and analysis of volatile organic compounds in air. Ambient air is collected in a stainless steel canister in the field using either the Meriter MCS-1-R or the ATEC 2200 Air Toxic Samplers and analyzed using a GC/MS to determine the concentration of the compounds found in the sample obtained. Samples are collected for 24 hours on a 1/6 sampling schedule. Following are the 62 different VOCs currently being analyzed and reported:

Propene	Freon-12	Chloromethane	Freon-114
Vinyl Chloride	1,3-Butadiene	Bromomethane	Chloroethane
Ethanol	Acrolein	Acetone	Freon-11
Isopropanol	Vinylidene Chloride	Dichloromethane	Carbon Disulfide
Freon-113	t-1,2-Dichloroethene	1,1-Dichloroethane	Methyl Tert-Butyl Ether
Vinyl acetate	Methyl Ethyl Ketone	c-1,2-Dichloroethene	Hexane
Ethyl Acetate	Chloroform	Tetrahydro-Furan	1,2-Dichloroethane
1,1,1-Trichloroethane	Benzene	Carbon Tetrachloride	Cyclohexane
1,2-Dichloropropane	Bromodichloromethane	Trichloroethene	1,4-dioxane
Heptane	c-1,3-Dichloropropene	Methyl Isobutyl Ketone	t-1,3-Dichloropropene
1,1,2-Trichloroethane	Toluene	Methyl Butyl Ketone	Dibromochloromethane
1,2-Dibromoethane	Tetrachloroethene	Chlorobenzene	Ethylbenzene
m+p-Xylenes	Bromoform	Styrene	1,1,2,2-Tetrachloroethane
o-Xylene	p-Ethyltoluene	1,3,5-Trimethylbenzene	1,2,4-Trimethylbenzene
Benzyl Chloride	m-Dichlorobenzene	p-Dichlorobenzene	o-Dichlorobenzene
1,2,4-Trichlorobenzene	Hexachloro-1,3-butadiene	Total NMOC	

Monitoring Network

Indiana will operate 10 sites. The current network, along with any changes planned in 2014, is listed in Table 18.

Network Modifications

A Toxics (VOC) canister sampler will be added to Plummer (180550001) to support a chemiluminescent O_3 monitor being used to determine if VOCs are interfering with the traditional photometric method of O_3 monitoring.

Figure 15 – Toxics Monitoring Network

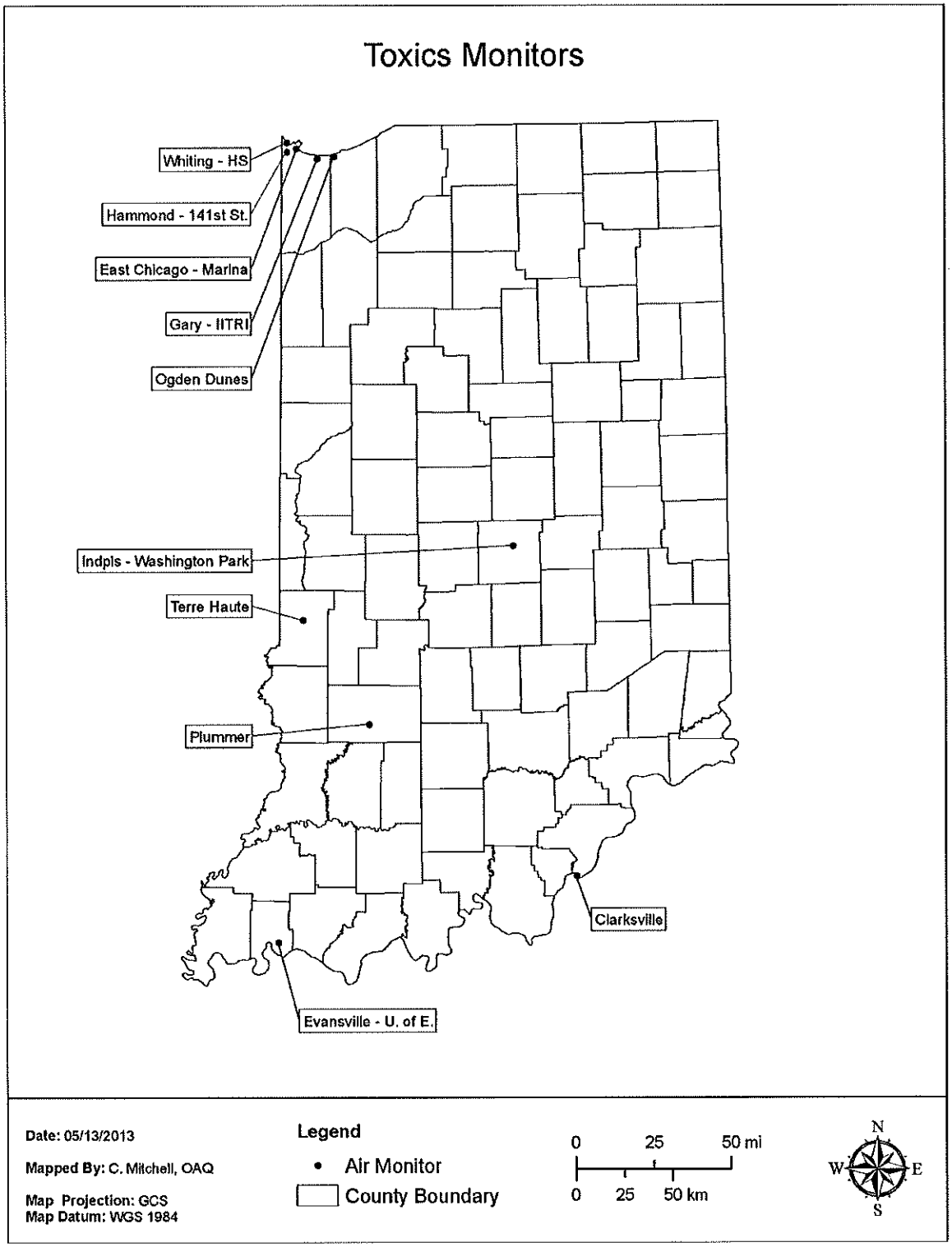

Table 18 – Toxics Monitoring Network

Toxics - VOC

RO: 0520 OPERATING AGENCY: Indiana Department of Environmental Management

Site ID	Site Name	County	City	Address	Monitor Type	Start Date	Operating Schedule	Monitoring Method	Scale	Monitoring Objective	Latitude	Longitude	MSA	Site Change Proposed?
180190009	Clarksville	Clark	Clarksville	Falls of the Ohio SP, 201W. Riverside Dr. Clarksville, IN	Special Purpose	03/07/08	6-Day	126,150	Neigh	Pop Exp	38.276628	-85.763811	Louisville/Jefferson County, KY-IN	No
180550001	Plummer	Greene		2500 S. 275 W	Special Purpose	2014	6-Day	126,150	Neigh	Pop Exp	38.985578	-86.990120	Non-MSA County	Add
180890022	Gary - IITRI	Lake	Gary	IITRI Bunker, 201 Mississippi St.	Special Purpose	07/06/95	6-Day	126,150	Middle	Pop Exp	41.606667	-87.304722	Chicago-Naperville-Elgin, IL-IN-WI	No
180890030	Whiting HS	Lake	Whiting	Whiting HS, 1751 Oliver St.	Special Purpose	04/01/04	6-Day	126,150	Neigh	Pop Exp	41.681384	-87.494722	Chicago-Naperville-Elgin, IL-IN-WI	No
180890034	East Chicago - Marina	Lake	East Chicago	East Chicago Marina 3301 Aldis St.	Special Purpose	10/30/12	6-Day	126,150	Neigh	Pop Exp	41.653580	-87.435650	Chicago-Naperville-Elgin, IL-IN-WI	No
180892008	Hammond - 141st St.	Lake	Hammond	1300 E. 141st St.	Special Purpose	02/01/89	6-Day	126,150	Neigh	Pop Exp	41.639444	-87.493611	Chicago-Naperville-Elgin, IL-IN-WI	No
180970078	Indpls - Washington Park	Marion	Indianapolis	Washington Park, 3120 E. 30th St.	Special Purpose	04/18/99	6-Day	126,150	Neigh	Pop Exp	39.811097	-86.114469	Indianapolis-Carmel-Anderson	No
181270024	Ogden Dunes	Porter	Ogden Dunes	Water Treatment Plant, 84 Diana Rd.	Special Purpose	08/15/98	6-Day	126,150	Neigh	Pop Exp	41.617500	-87.199167	Chicago-Naperville-Elgin, IL-IN-WI	No
181630016	Evansville - U of E	Vanderburgh	Evansville	Carson Center, Walnut St.	Special Purpose	05/05/99	6-Day	126,150	Neigh	Pop Exp	37.974444	-87.532222	Evansville, IN-KY	No
18167___	Terre Haute	Vigo	Terre Haute		Special Purpose	2013	6-Day	126,150	Neigh	Pop Exp			Terre Haute	No

MONITORING METHOD: 126 - CRYOGENIC PRECONCENTRATION GC/FID DETECTION
150- Cryogenic Preconcentration GC/MS

Carbonyls

Monitoring Requirements

Carbonyl monitoring is required as one of the components of the PAMS monitoring program. The overall requirements are addressed in Table D-6 of 40 CFR Part 58 Appendix D. The specific requirement of monitoring for carbonyls at Indiana's PAMS site is listed in the approved PAMS network plan for the Chicago nonattainment area.

Monitoring Methodology

Carbonyl data are collected using Method TO-11A of the U.S.EPA's Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air Compendium of Method. Currently Indiana uses the ATEC 2200 2C for 1/6 day sampling at Indpls - Washington Park (180970078) and the ATEC 8000 Automated Sampler for 1/6 day sampling at the Gary - IITRI (180890022) PAMS site. Samples are collected by drawing a known volume of air through a cartridge filled with silica gel coated with activated DNPH. These samples are analyzed using HPLC with a UV absorption detector.

Monitoring Network

Indiana currently operates two carbonyl monitoring sites. Gary - IITRI collects data for the Chicago PAMS network. Sampling at Indpls - Washington Park is conducted as part of Indiana's toxics network, and as parameters for the Indianapolis PAMS-like monitoring network. The details of the network are in Table 19.

Network Modifications

No changes are planned for the carbonyl monitoring network in 2014.

Figure 16 – Carbonyl Monitoring Network

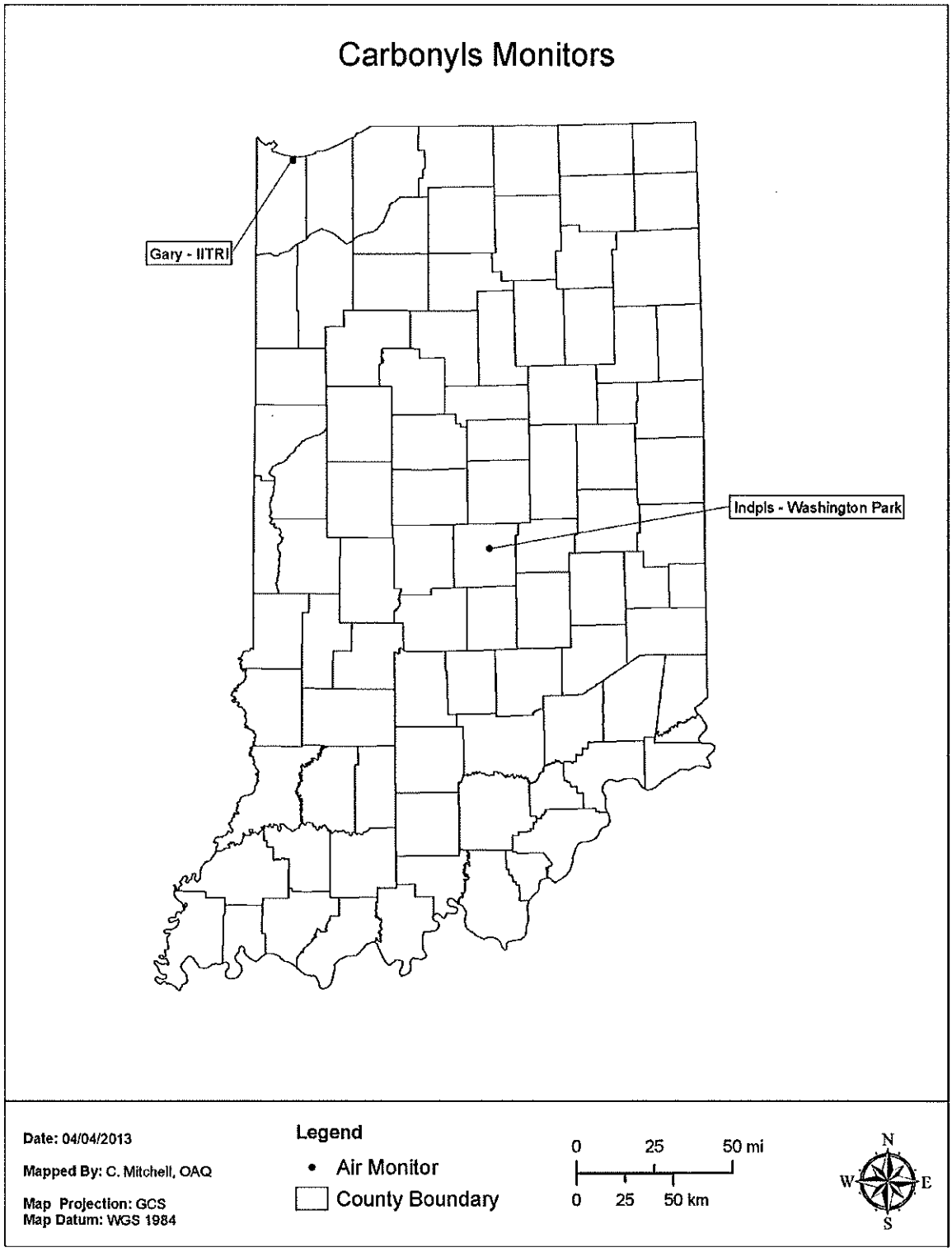

Table 19 – Carbonyl Monitoring Network

Carbonyls

RO: 0520 OPERATING AGENCY: Indiana Department of Environmental Management

Site ID	Site Name	County	City	Address	Monitor Type	Start Date	Operating Schedule	Monitoring Method	Scale	Monitoring Objective	Latitude	Longitude	MSA	Site Change Proposed?
180890022	Gary - IITRI	Lake	Gary	IITRI Bunker, 201Mississippi St.	Unofficial PAMS	06/01/95	6-Day	202	Neigh	Max Prec. Em. Impact	41606667	-87.304722	Chicago-Naperville-Elgin, IL-IN-WI	No
180970078	Indpls - Washington Park	Marion	Indianapolis	Washington Park, 3120 E. 30th St	Special Purpose	04/18/99	6-Day	202	Neigh	Max Prec. Em. Impact	39.811097	-86.114469	Indianapolis-Carmel-Anderson	No

MONITORING METHOD: 202 - HPLC (TO-11A) DNPH-COATED CARTRIDGES

Metals

Monitoring Requirements

There are no requirements for metals monitoring listed in 40 CFR Part 58.

Monitoring Methodology

Metals data are collected using a TSP sampler and collecting the sample on filters for a 24-hour period according to a 1/6 day sampling schedule. Filters are analyzed using the flameless atomic absorption method.

Monitoring Network

There are six sites that monitor TSP metals in Indiana. Arsenic, beryllium, cadmium, chromium, lead, manganese, and nickel are monitored at Indpls - Washington Park (180970078). Due to concern over possible elevated manganese values reported in the School Air Toxics monitoring program in 2009, it was decided to analyze all the Pb samples collected in Lake and Porter Counties for manganese. These sites began reporting the additional metals data on January 2, 2010. These sites are detailed in Table 20.

Network Modifications

No changes are planned for the metals monitoring network in 2014.

Figure 17 – Metals Monitoring Network

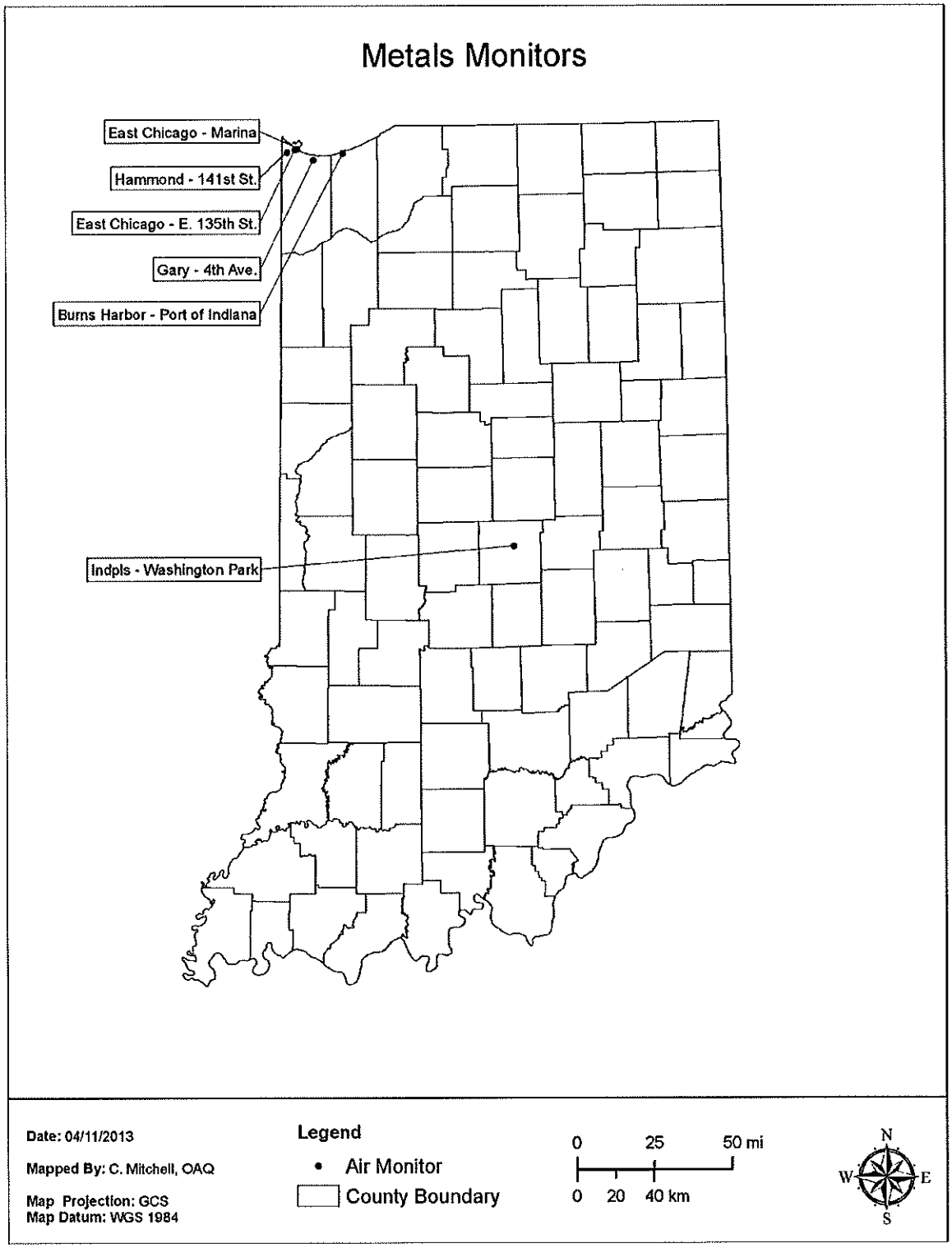

Table 20 – Metals Monitoring Network

Metals

RO: 0520 OPERATING AGENCY: Indiana Department of Environmental Management

Site ID	Site Name	County	City	Address	Monitor Type	Start Date	Operating Schedule	Monitoring Method	Scale	Monitoring Objective	Latitude	Longitude	MSA	Site Change Proposed?
180890034	East Chicago-Marina*	Lake	East Chicago	East Chicago Marina 3301 Aldis St.	Special Purpose	10/30/12	6-Day	107	Middle	Source Oriented	41653580	-87.435550	Chicago-Naperville-Elgin, IL-IN-WI	No
180890032	Gary - 4th. Ave *	Lake	Gary	Gary SouthShore RailCats, One Stadium Plaza	Special Purpose	01/02/10	6-Day	107	Middle	Source Oriented	41603582	-87.332658	Chicago-Naperville-Elgin, IL-IN-WI	No
180890033	East Chicago - E. 135th St. *	Lake	East Chicago	Abraham Lincoln Elem. Sch., E. 135 th St.	Special Purpose	01/02/10	6-Day	107	Middle	Source Oriented	41649064	-87.447256	Chicago-Naperville-Elgin, IL-IN-WI	No
180892008	Hammond - 141st St. *	Lake	Hammond	1300 E. 141st Street	Special Purpose	01/02/10	6-Day	107	Middle	Pop Exp	41639444	-87.493611	Chicago-Naperville-Elgin, IL-IN-WI	No
180892008	Hammond - 141st St. *	Lake	Hammond	1300 E. 141st Street	Special Purpose	01/02/10	6-Day	107	Middle	Quality Assurance	41639444	-87.493611	Chicago-Naperville-Elgin, IL-IN-WI	No
180970078	Indpls - Washington Park	Marion	Indianapolis	Washington Park, 3120 E. 30th St.	Special Purpose	04/18/99	6-Day	107	Neigh	Pop Exp	39.811097	-86.114469	Indianapolis-Carmel-Anderson	No
181270027	Burns Harbor-Port of Indiana*	Porter		E. Boundary Rd	Special Purpose	08/18/11	6-Day	107	Middle	Source Oriented	41635594	-87.150197	Chicago-Naperville-Elgin, IL-IN-WI	No

Metals Monitored

Manganese * Manganese Only
Nickel
Arsenic
Beryllium
Cadmium
Chromium

MONITORING METHOD: 107 - HI-VOL SAMPLER / ANALYSIS METHOD: FLAMELESS ATOMIC ABSORPTION

Meteorological Monitoring

Monitoring Requirements

Meteorological monitoring is generally not required for SLAMS ; however these data support the suitability of the site along with other data sets. Many factors determine the amount and types of meteorological data that are collected in Indiana. Some of the factors include the intended use of the data and the availability of representative meteorological data that is already being collected by the National Weather Service in any given area of interest. Meteorological monitoring is required at two types of sites: NCore and PAMS. 40 CFR Part 58 Appendix D, 3.(b) specifies that wind speed, wind direction, relative humidity, and ambient temperature, at a minimum, be measured at NCore sites. Meteorology measurements are required at PAMS according to 40 CFR Appendix D, 5. No specific parameters are defined. Guidance provided in the "Technical Assistance Document for Sampling and Analysis of Ozone Precursors", EPA/600-R-98/161, September 1998, recommends that wind speed, wind direction, ambient temperature, and relative humidity are monitored at all PAMS locations. Solar radiation, UV radiation, barometric pressure, and precipitation should be monitored at one site in the area.

The near-road NO_2 monitoring sites do not require meteorological monitoring according to 40 CFR Part 58, but meteorological monitoring is listed as a recommended Primary Priority in the Near-Road NO_2 Monitoring TAD. U.S.EPA suggests at a minimum to monitor wind speed, wind direction, temperature, and relative humidity. If possible, other measurements, such as precipitation, solar radiation, and barometric pressure, among others, should be considered as well.

Monitoring Network

Meteorological data are to be collected at 19 sites across Indiana in 2014. Sites are established to provide coverage in all areas of the state where pollutant monitoring is conducted. Table 21 details the meteorological sites and the parameters collected.

Network Modifications

The vertical wind unit at South Bend - Shields Dr. (181410015) will be discontinued as well as the horizontal wind unit at St. Philips (181290003). The wind unit at St. Philips will be replaced with a 3D ultrasonic wind unit. The 3D ultrasonic wind unit performs both functions of a horizontal and vertical unit at the same time with a higher rate of precision and accuracy. This will provide coverage of vertical wind data in three key areas of the state. Northwest Indiana will be covered by the unit at Gary IITRI (180890022), Central Indiana will be covered by Mechanicsburg (180650003), and Southwestern Indiana will be covered by St. Philips (181290003).

Outdoor temperature and relative humidity will be added to Plummer (180550001) to support a special study of VOC monitoring. Barometric pressure will be added to Mechanicsburg (180650003) to support any makeup samples for the Pb monitors at Muncie – Mt. Pleasant Blvd. (180350009). Wind speed, wind direction, ambient temperature, and relative humidity will be measured at the near-road NO2 monitoring site, Indpls – I-70 E (180970087) beginning January 1, 2014.

Figure 18 – Meteorological Monitoring Network

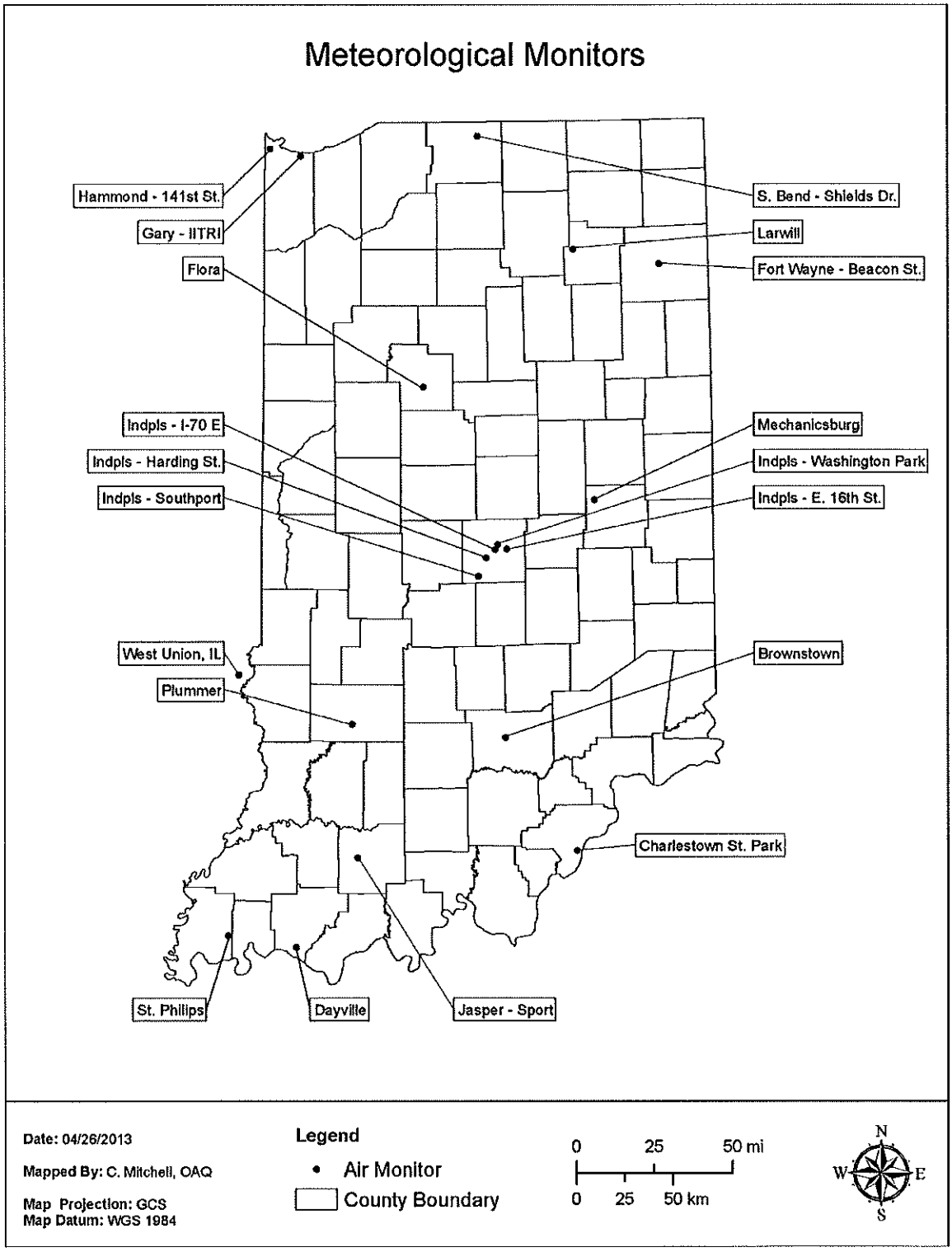

Table 21 – Meteorological Monitoring Network

Meteorological Parameters by Site

RO: 0520 OPERATING AGENCY: Indiana Department of Environmental Management

Site ID	Site Name	County	City	Address	Latitude	Longitude	61101/ 61102 WS / WD	62201 RH	64101 Baro Press	62101 Outside Temp	63302 UV Rad	63301 Solar Rad	61109 Vertical WD	65102 Precip	Site Change Proposed?
170230001	West Union	Clark Co., IL	West Union	416 S. St. Hwy 1	39.210883	-87.668416	■	■	■	■					No
180030004	Ft Wayne - Beacon St.	Allen	Fort Wayne	2022 North Beacon	41.094722	-85.101944	■	■		■					No
180150002	Flora	Carroll		Flora Airport, 481 S. 150 W	40.540556	-86.553056	■	■		■					No
180190008	Charlestown State Park	Clark		Charlestown State Park, 12500 Hwy 62, Charlestown	38.393833	-85.664167	■	■	■	■					No
180370004	Jasper Sport	Dubois	Jasper	Jasper Sport Complex - 1401 12th Ave.	38.369436	-86.959031	■								No
180550001	Plummer	Greene		2500 S. 275 W	38.985578	-86.990120	■	■		■					Add
180650003	Mechanicsburg	Henry		Shenandoah HS, 7354 W. Hwy. 36	40.009525	-85.523455	■	■	■	■			■		Add
180710001	Brownstown	Jackson		225 W & 300 N	38.920798	-86.080523	■	■		■					No
180890022	Gary - IITRI	Lake	Gary	IITRI Bunker, 201 Mississippi St.	41.606667	-87.304722	■	■	■	■	■	■	■	■	No
180892008	Hammond - 141st St.	Lake	Hammond	1300 E. 141st Street	41.639444	-87.493611	■	■		■					No
180970057	Indpls - Harding St.	Marion	Indianapolis	1321 S. Harding St.	39.749019	-86.186314	■	■	■	■					No
180970073	Indpls - E. 16th St.	Marion	Indianapolis	6125 E. 16th St.	39.789167	-86.060833	■	■		■					No
180970078	Indpls - Washington Park	Marion	Indianapolis	Washington Park, 3120 E. 30th St	39.811097	-86.114469	■	■	■	■	■	■		■	No
180970086	Indpls - Southport	Marion	Indianapolis	Southport Advanced Wastewater Treatment Plant, 3800 W. Southport Rd	39.664564	-86.234889	■								No
180970087	Indpls - I-70 E	Marion	Indianapolis	1650 Ludlow Ave.	39.788793	-86.131121	■	■		■					Add
181290003	St Philips	Posey		2027 S. St. Phillips Rd., Evansville	38.005278	-87.718333	■	■	■	■	■	■			No
181410015	South Bend - Shields Dr.	St Joseph	South Bend	2335 Shields Dr.	41.696692	-86.214683	■	■		■			■		No
181730011	Dayville	Warrick		3488 Eble Rd., Newburgh	37.954450	-87.321933	■	■	■	■					No
181830003	Larwill	Whitley		Whitko Middle School, 710 N. State Rd. 5	41.169646	-85.629292	■	■		■					No

NCore

Monitoring Requirements

40 CFR Part 58 Appendix D 3. requires each state to operate at least one NCore site and lists the minimum parameters which must be measured at that site. Currently the required parameters are continuous and intermittent $PM_{2.5}$, $PM_{2.5}$ speciation, $PM_{10-2.5}$ particle mass, CO, O_3, SO_2, NO/NO_y, lead, wind speed, wind direction, relative humidity, and ambient temperature.

Monitoring Network

Indiana's NCore site is Indpls – Washington Park (180970078). The details for all the NCore parameters are listed in Table 22. Except for $PM_{10-2.5}$, the parameters are also listed in the individual parameter sections.

Other parameters have also been collected at Indpls – Washington Park over the past 13 years. These are listed in Table 23, as well as in the individual parameter sections.

Network Modifications

No changes are planned for the NCore monitoring network in 2014.

Figure 19 – NCore Monitoring Network

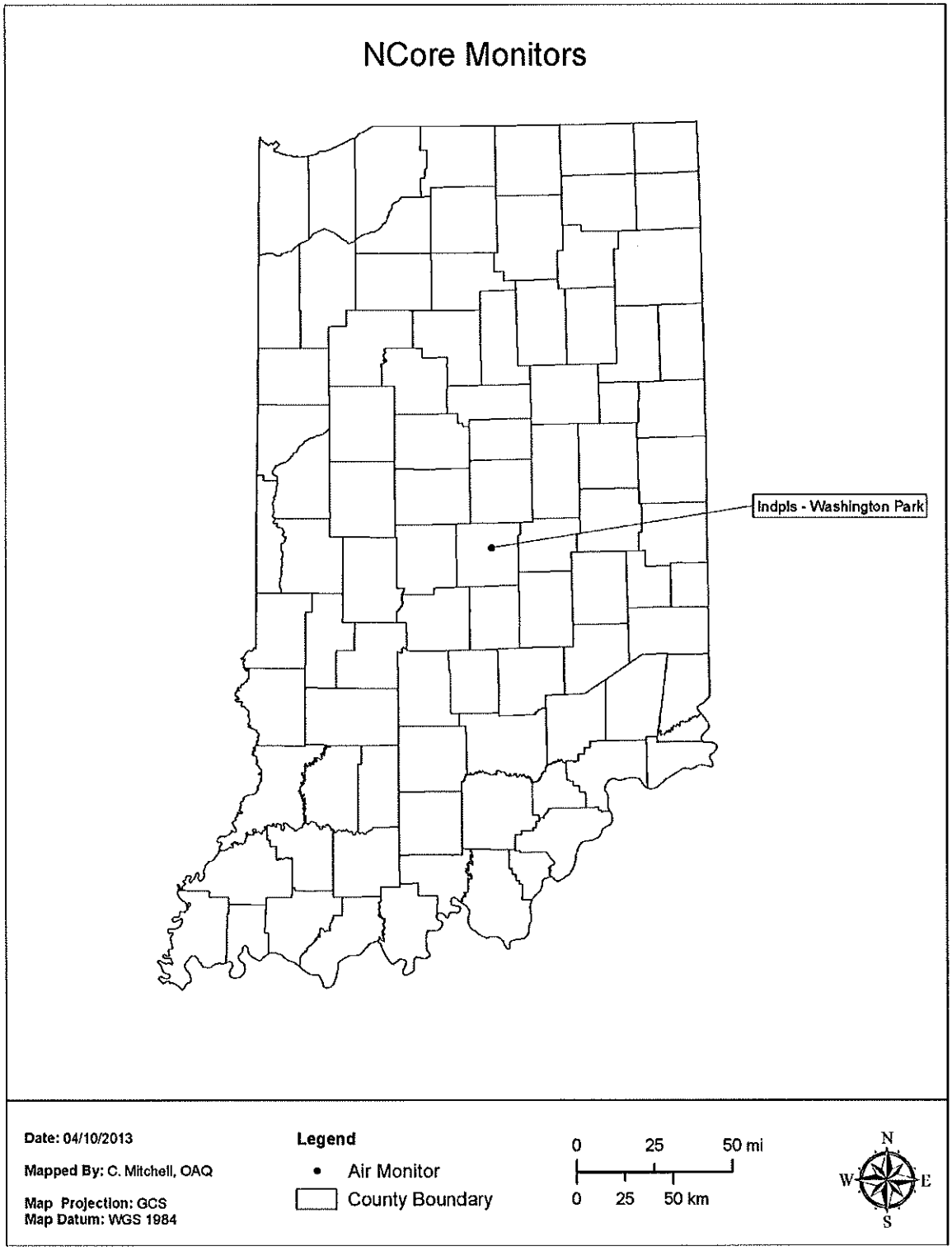

Table 22 – NCore Required Parameters

Parameter	Monitor Type	Start Date	Sampler or Monitor	Method Code	Analysis Method	Sample Frequency
CO – trace level	NCore	1/1/2010	Teledyne API 300EU	593	Automated reference method utilizing trace level non-dispersive infrared analysis.	Continuous
NO	NCore	3/10/2010	Teledyne API 200EU	099	Automated reference method utilizing chemiluminescence analysis.	Continuous
NO_y	NCore	3/10/2010	Teledyne API 200EU	099	Automated reference method utilizing chemiluminescence analysis.	Continuous
O_3	NCore	4/1/2009	Thermo Electron 49i	047	Automated equivalent method utilizing uv photometry analysis.	Continuous
SO_2 – trace level	NCore	1/1/2010	Teledyne API 100EU	600	Automated equivalent method utilizing Trace Level UV Fluorescence Analysis	Continuous
Intermittent $PM_{2.5}$	NCore	3/7/1999	Thermo Electron 2025	145	Manual reference method utilizing gravimetric analysis.	1/1 day
Continuous $PM_{2.5}$	NCore	1/1/2004	Met One Instruments BAM-1020 System	185	Automated equivalent method utilizing beta ray transmission	Continuous
Intermittent $PM_{10-2.5}$	NCore	7/1/2010	Thermo Scientific Partisol-Plus Model 2025 Sequential sampler	176	Manual reference method utilizing gravimetric analysis.	1/1 day
Continuous $PM_{10-2.5}$	NCore	7/22/2011	Met One Instruments BAM-1020 System	185	Automated equivalent method utilizing beta ray transmission	Continuous
$PM_{2.5}$ Speciation	Trends Speciation / NCore	12/13/2000	Met One SASS & URG 3000N	811 / 812 / 833	Multi-species manual collection method utilizing thermal optical, ion chromatography, gravimetric, and x-ray fluorescence analyses.	1/3 day
WS/WD	NCore	10/11/2009	RM Young 05305-AQ	020	Air quality measurements approved instrumentation for wind speed and wind direction	Continuous
OT/RH	NCore	10/11/2009	RM Young 41372VF	040 / 020	Air quality measurements approved instrumentation for humidity and temperature	Continuous

Table 23 – Additional Parameters Collected at NCore Site

Parameter	Designation	Start Date	Sampler or Monitor	Method Code	Analysis Method	Sample Frequency
Intermittent PM_{10}	SLAMS	7/1/2010	Thermo Electron 2025	145	Manual reference method utilizing gravimetric analysis.	1/1 day
Continuous PM_{10}	SLAMS	8/2/2011	Met One Instruments BAM-1020 System	185	Automated equivalent method utilizing beta ray transmission	Continuous
NO	SLAMS	1/1/2013	Thermo Electron 42i	074	Chemiluminescence	Continuous
NO_2	SLAMS	1/1/2013	Thermo Electron 42i	074	Chemiluminescence	Continuous
NO_x	SLAMS	1/1/2013	Thermo Electron 42i	074	Chemiluminescence	Continuous
Continuous Sulfate	Special Purpose	1/1/2006	Thermo Electron 5020 SPA	875	Catalytic thermal reduction fluorescence	Continuous
Continuous Black Carbon	Special Purpose	10/1/2003	Magee AE21	861	Optical Absorption	Continuous
Toxics	Special Purpose	4/18/1999	Meriter MCS-1-R	126 / 150	SS 6l canister with cryogenic GC/MS	1/6 day
Carboynls	Special Purpose	4/18/1999	ATEC 2200 2C	102	Silica DNPH cartridge w/KI O3 scrubber with HPLC (TO-11A)	1/6 day
Lead	SLAMS or NCore	4/18/1999	High Volume Sampler	803	Atomic Absorption with graphite furnace	1/6 day
Metals	Special Purpose	4/18/1999	High Volume Sampler	107	Atomic Absorption with graphite furnace	1/6 day
Precipitation	Other	10/11/2009	RM Young 52202E	014	Air quality measurements approved instrumentation for rainfall	Continuous
BP	Other	10/11/2009	Met One 594	011	Air quality measurements approved instrumentation for barometric pressure	Continuous
Solar Radiation	Other	1/1/2013	Eppley Precision Spectral Pyranometer	011	First Class Radiometer	Continuous
Ultraviolet Radiation	Other	1/1/2013	Eppley Total Ultraviolet Radiometer	011	Hermetically sealed selenium barrier-layer cell	Continuous
PAMS	Special Purpose	7/1/2011	Perkin Elmer Clarus 500 Gas Chromatograph	128	Cryogenic Preconcentration GC/FID Detection	Continuous
Canister	Special Purpose	7/1/2011	Meriter MCS-1-R	146	E.S.A. AC32M / Chemiluminescent	1/6 day

Appendix A - Comment Submittal Information

The proposed 2014 Ambient Air Monitoring Network Plan is posted on the IDEM website at http://www.in.gov/idem/airquality/2389.htm for review and comment for thirty (30) days.

Comments should be emailed to

Steve Lengerich (slengeri@idem.in.gov)

or mailed to

.

Steve Lengerich
100 North Senate Avenue
MC 61-50-2 Shadeland
Indianapolis, IN 46204-2251

or faxed to

317-308-3239

Network Comments

Response to Comments

Comment #1

Received from Joanne M. Alexandrovich, Ph.D, Vanderburgh County Ozone Officer
e-mail submission on 6/14/2013

Dr. Alexandrovich submitted comments addressing the following areas:

1. Continuous PM2.5

   Dr. Alexandrovich believes that the continuous PM2.5 data should not be used for attainment/nonattainment purposes. She states that the onus should be on USEPA in determining that the methods and data are reliable and accurate. The regulations for exclusion of data from use in compliance determinations state that an exclusion request is to be part of the annual network review. In a guidance document released in March, it stated that the states had the option to submit it with the network plan or separately. Dr. Alexandrovich is concerned that USEPA will not accept any exclusion request if it is not part of the annual plan.

2. Ozone Monitoring

   Dr. Alexandrovich is pleased that Boonville is continuing to operate and collect ozone data for the Evansville area.

   She requests that at least one site in the Evansville area be operated year round to provide data for her analysis.

   Approval is expressed for the plan to locate an ozone monitoring site in the Bloomington MSA. It is requested that the site be in Bloomington as opposed to downwind of the metropolitan area.

   Dr. Alexandrovich asks that IDEM reconsider its plan to locate an ozone monitor at the near-road monitoring location.

3. Plummer

   Dr. Alexandrovich questions the rationale for chemiluminescent ozone monitoring and VOC monitoring at Plummer.

4. Continuous sulfate particulates

   Regret was expressed that continuous sulfate monitoring at Evansville – Buena Vista was discontinued.

Response

1. Continuous PM2.5

   IDEM acknowledges Dr. Alexandrovich's concerns regarding the use of the continuous FEM data for attainment/nonattainment decisions. We have the same concerns, if the data do not show the proper correlation with the intermittent FRM data. IDEM staff have been working on the evaluation of the data from all the sites in Indiana to determine if and/or when the data can be used for this purpose. The evaluation will not be complete to be included in the submittal of the 2014 Network Plan to USEPA on July 1. IDEM has received word from Region 5 that they will accept any exclusion request after submittal of the Network Plan. It is to go out for public comment and be submitted by August 31. IDEM plans to meet this proposed commitment and timeframe.

2. Ozone Monitoring
   Because USEPA denied IDEM's request to discontinue the Boonville ozone monitor, it has continued to operate. Due to temperature control issues in the school building through the summer vacation, and access during that time, IDEM is relocating the monitor to a shelter on the Boonville High School grounds. This will provide easier access and better site temperature control.

   IDEM will work with Dr. Alexandrovich to determine which ozone site in the Evansville area would be considered the most useful to her analysis. IDEM will operate and submit data from that site throughout the calendar year.

   Even though only Greene County is classified as "Attainment with a Maintenance Plan," it had been part of the Bloomington MSA. In February 2013 the MSA boundaries changed and Greene County was no longer part of the MSA. IDEM plans to deploy a monitor in the new Bloomington MSA, where the highest values would be expected to occur, downwind of the prevailing summer wind, northeast of the City of Bloomington. If a site is unable to be procured in that area, then the ozone monitor would be located at the Bloomington – Binford site. The "monitoring objective" and the "scale" will be adjusted according to the actual site location; "Highest Concentration" and "Urban" for the downwind site or "Population Exposure" and "Neighborhood" for the Bloomington – Binford location.

   Even though ozone is not required to be monitored at the near-road NO2 monitoring sites, it is listed as a Primary Priority pollutant recommended by the CASAC AAMMS. The ozone data would not be used for NAAQS determinations, but for the understanding of NO2 concentrations, NO2 formation behavior, and broader photochemistry process in the near-road environment. The ozone monitoring may also support health studies investigating the role of ozone and other co-pollutants on adverse health effects. As IDEM has sufficient ozone monitors, collecting data at this site will not require much additional effort.

3. Plummer
   When the Plummer ozone site was established in 2000 by the City of Indianapolis, its purpose was to provide data regarding possible transport from the Evansville area to Indianapolis. Over the years the fourth high 8-hour average values and the number of days above the NAAQS have tracked very well with both the downwind Evansville sites (Inglefield and Lynnville) and the upwind Indianapolis sites (Monrovia and Trafalgar). In 2011 and 2012, both parameters have been noticeably higher. From the casual observations, more of the oil wells in the surrounding area seem to be in operation over the past several years. In speaking with the instrument vendors, a higher atmospheric VOC concentration could possibly cause an interference with a UV Photometry Ozone Analyzer and produce readings higher than the actual ozone concentration. IDEM plans to investigate this possibility with the use of a chemiluminescent ozone analyzer collocated with the current monitor. In addition, a toxics sampler will be operated to determine if there is a relatively higher concentration of VOCs at this site as opposed to other toxics sites across the state.

4. Continuous sulfate
   In an effort to collect relevant continuous sulfate data, IDEM has operated a Thermo 5020 at Indpls – Washington Park since 2006 and a Thermo 5020i at Evansville – Mill Road and

Evansville – Buena Vista since 2009. These units have been described by Thermo Environmental as research type instruments, as opposed to field ready instruments. The results from these sites have been mixed, at best. Both require more maintenance and time to keep operating, as opposed to a regular ambient monitor. The units have been back to the factory on several occasions, especially the unit from Evansville. When it was returned from the factory, it was not always repaired properly. The data collected from Indpls – Washington Park has been approximately 60% to 80% of the filter based data over the years. The Evansville data had never been that close. Since July 2010, after one of the repairs to the Evansville monitor, the slope of the correlation dropped from around 0.5 to less than 0.2. Neither value is indicative of good reliable data. In January 2013, the unit again needed repairs, at a minimum, a new core. Because of the time and expense to keep the unit operating, and the poor correlation of data, it was decided to discontinue the sulfate monitoring at Evansville. The operator will work with Dr. Alexandrovich to get the requested data to her.

Appendix B
2014 Indiana Near-Road NO_2 Monitoring Plan

Summary

The State of Indiana through the IDEM is required to operate ambient air monitors in Indiana to meet U.S.EPA monitoring requirements and to determine compliance with the NAAQS. According to recently promulgated monitoring regulations, Indiana must establish and operate one near-road monitoring site, to collect ambient NO_2 concentrations beginning January 1, 2014. IDEM has worked with the INDOT to obtain a location for this site along Interstate 70, between the northeast interchange of I-70 and I-65 and the Keystone Ave. exit. The site's address is 1650 Ludlow Ave. and the name assigned to the site is 'Indpls – I-70 East.' The AQS site id is 180970087.

NO_2 NAAQS

On February 9, 2010 a new hourly primary NAAQS for NO_2 was promulgated in addition to the existing annual standard. The additions are as follows:

> **§ 50.11 National primary and secondary ambient air quality standards for oxides of nitrogen (with nitrogen dioxide as the indicator).**
> (b) The level of the national primary 1-hour ambient air quality standard for oxides of nitrogen is 100 ppb, 1-hour concentration, measured in the ambient air as nitrogen dioxide.
> (f) The 1-hour primary standard is met when the three-year average of the annual 98^{th} percentile of the daily maximum 1-hour average concentration is less than or equal to 100 ppb as determined in Appendix S of this part for the 1-hour standard.

Monitoring Requirements

U.S.EPA also promulgated new NO_2 monitoring requirements at the same time. These included the requirements for establishing near-road NO_2 monitoring stations and area-wide NO_2 monitoring stations. The requirements for the near-road site as they apply to Indiana are as follows:

> **Appendix D to Part 58 4.3.2**
> (a) Within the NO_2 network, there must be one micro scale near-road NO_2 monitoring station in each CBSA with a population of 500,000 or more persons to monitor a location of expected maximum hourly concentrations sited near a major road with high AADT counts as specified in paragraph 4.3.2(a)(1) of this appendix....CBSA populations shall be based on the latest available census figures
> (1) The near-road NO_2 monitoring stations shall be selected by ranking all road segments within a CBSA by AADT and then identifying a location or locations adjacent to those highest ranked road segments, considering fleet mix, roadway design, congestion patterns, terrain, and meteorology, where maximum hourly NO_2 concentrations are expected to occur and siting criteria can be met in accordance with Appendix E of this part. Where a State or local air monitoring agency identifies multiple acceptable candidate sites where maximum hourly NO_2 concentrations are expected to occur, the monitoring agency shall consider the potential for population exposure in the criteria utilized to select the final site location...

The timeframe for establishing the near-road site was amended and finalized on March 14, 2013 and is defined as follows:

> **§ 58.10 Annual monitoring network plan and periodic network assessment.**
> (iii) A plan for establishing a single near-road NO_2 monitor in CBSAs having 1,000,000 or more persons, in accordance with the requirements of Appendix D, section 4.3.2 to this part, shall be submitted as part of the Annual Monitoring Network Plan to the U.S.EPA Regional Administrator by July 1, 2013. The plan shall provide for these required monitors to be operational by January 1, 2014.

From the most recent census data from 2010 for Indiana's CBSAs there are four CBSAs which have more than 1,000,000 persons:

CBSA	Population
Chicago-Naperville-Elgin, IL-IN-WI	9,461,405
Cincinnati, OH-KY-IN	2,114,580
Indianapolis-Carmel-Anderson, IN	1,887,862
Louisville-Jefferson County, KY-IN	1,235,708

Indiana has agreements in place with Ohio, Kentucky, and Illinois with regard to how the monitoring requirements are shared in these multi-state CBSAs. The near-road monitoring in these areas will be the responsibility of the adjoining states. Indiana will be responsible for and deploy the near-road site in the Indianapolis-Carmel-Anderson CBSA.

Site Selection Procedure

IDEM used the Near-road NO_2 Monitoring TAD, finalized in June 2012, as guidance in determining the site location and the parameters to be monitored at the near-road site. Traffic data were collected and analyzed to determine the best possible road segments for the site location. The interstate roadway system in and around Indianapolis provided the top rated road segments for traffic counts. Once the candidate segments were identified, they were surveyed to determine sites which would meet the siting criteria and provide a safe environment for the operators. IDEM worked with INDOT on approval of possible sites located in the right-of-way of the highways. Once the best location was determined, a MOU between the two agencies was drawn up and signed.

IDEM also used the TAD to determine which parameters will be monitored at the site and when data collection of the individual parameters will begin.

AADT

IDEM accessed the 2010 AADT data for the greater Indianapolis area. Using web-based mapping software provided by the INDOT, IDEM located the segments with the greatest traffic counts. Following the guidance of the TAD, IDEM ranked these segments. INDOT also provided commercial traffic counts (vehicle class 3 and above by the Scheme F classification method) for each of the road segments. Using this commercial data and the national average heavy duty to light duty NO_2 emission ratio of 10, the FE_AADT was obtained. From this calculation, the top 25 road segments were identified. Table 1 details these top 25 road segments, the major interstates, their AADT, AADT rank, commercial vehicle counts, FE_AADT, and FE_AADT rankings.

Road Segment Evaluation

After identifying the top 25 road segments in the Indianapolis-Carmel CBSA, IDEM researched each of the segments to determine which ones would be likely candidates for the monitoring station. Several things were looked at in order to determine candidacy. Future or current construction projects; proximity of buildings, structures, trees or the like to the interstate segment; roadway elevation; and accessibility to any potential site were all considered. It was noted that the first roadway segment listed seemed to pass all of the candidacy criteria. Other segments did not fare as well. The second ranked segment along I-465, between I-69 and 56th St, for example, has a large forested area on either side and has been tagged for future construction considerations. It also did not have any good, feasible site locations. The third ranked segment along I-465 on the west side, between Rockville Rd. and Washington St., had recently been upgraded to include sound barrier walls on either side of the interstate creating a possible canyon effect in this area. Essentially, the top seven segments were investigated for possible sites.

Table 1: Road Segments, Adjacent Interstates and 2010 AADT, CV, FE_AADT and Ranking. Ordered by FE_AADT Rank.

Segment	Roadway	AADT (2010)	Rank	CV (2010)	FE_AADT	Rank (FE_AADT)
Keystone/Rural to North Split	Interstate 70	189760	1	19150	362110	1
Interstate 69 to 56th St.	Interstate 465	155620	5	20960	344260	2
Rockville Rd to Washington St	Interstate 465	120680	11	23940	336140	3
Pendleton Pike to Interstate 70	Interstate 465	168770	2	18090	331580	4
56th St. to Pendleton Pike	Interstate 465	167670	3	18090	330480	5
Emerson Ave. to Keystone/Rural	Interstate 70	143970	7	19150	316320	6
Washington St to Sam Jones Expwy	Interstate 465	134540	8	19110	306530	7
Interstate 65 to East St.	Interstate 465	119380	12	20030	299650	8
Southport Rd to Interstate 465	Interstate 65	108930	16	21170	299460	9
Kentucky Ave to Interstate 70	Interstate 465	107130	17	20150	288480	10
Harding St to West St	Interstate 70	111240	15	19130	283410	11
Emerson Ave. to Interstate 65	Interstate 465	121790	9	17670	280820	12
Harding St to Mann Rd	Interstate 465	104720	20	19510	280310	13
Interstate 74 to 10th St	Interstate 465	121180	10	17660	280120	14
10th St to Rockville Rd	Interstate 465	104920	19	18980	275740	15
Post Rd. to Interstate 465	Interstate 70	118670	13	17390	275180	16
Interstate 74 to Emerson Ave.	Interstate 465	112550	14	17670	271580	17
South Split to Fletcher Ave	Interstate 65	157630	4	12450	269680	18
Mann Rd to Kentucky Ave	Interstate 465	90560	23	19510	266150	19
82nd St. to Interstate 465	Interstate 69	144060	6	13000	261060	20
Interstate 70 to Washington St. (East side)	Interstate 465	95380	21	17410	252070	21
Sam Jones Expwy to Interstate 70	Interstate 465	106830	18	16060	251370	22
Marion County Line to Main St (Greenwood)	Interstate 65	77910	25	18400	243510	23
East St to Harding St	Interstate 465	83930	24	17730	243500	24
Brookville Rd. to Shadeland Ave.	Interstate 465	93270	22	16610	242760	25

Primary Site Selection

Surveying the top road segments for potential sites produced a list of five to six sites with varying advantages and disadvantages. The best site turned out to be located in the top ranked road segment. Located on the southeast side of Interstate 70 just east of the downtown area, the site meets the main requirements such as distance from roadway (approximately 20-25 meters), located near roadway elevation, distance from exits, safety, and ease of access. The main site attributes are as follows: Further research revealed other favorable aspects about the first ranked segment, which are detailed below. The Roosevelt Ave site was identified as a possible location that could be the monitoring site. A large flat area in the INDOT right-of-way near electrical power and accessible from a side street all made this site a prime candidate. The site is approximately seven to eight feet below the level of the roadway. Once the shelter is installed, the probes for the instruments will be one to two meters above the roadway. IDEM has detailed the aspects of this location per the comparison table given in the TAD (Table 13-1) and has listed these aspects below.

Location:
Interstate 70 between exit 85 (Keystone Ave/Rural St) and the merger with Interstate 65 (exit 83); south side of the freeway near Roosevelt Ave. The address assigned to the site is 1650 Ludlow Ave. Approximate latitude/longitude is 39.7878, -86.131.

Road Segment Name:
Interstate 70, between mile markers 83 and 85

Road Type:
Controlled access highway

Road Segment end points:
Mile marker 83 and mile marker 85

AADT:
189760, INDOT (2010) (#1 for Indianapolis-Carmel-Anderson CBSA)

HD counts:
19150, INDOT (2010)

FE-AADT:
362110, using national default value of 10. (#1 road-segment FE-AADT in the Indianapolis-Carmel-Anderson CBSA)

Congestion:
Unavailable, frequently congested, anecdotally.

Roadway Design:
Elevated-fill

Terrain:
Gentle slope from the roadway to the surrounding area. Plenty of flat ground nearby.

Meteorology:
Relatively downwind of prevailing winds. Westerly (majority WNW winds) winds allow site, which is located south of a WSW, ENE oriented interstate segment, to capture approximately 50% of non-calm winds.

Population Exposure:
The location is in a U.S.EPA Region V Environmental Justice area based on EJSEAT.

Roadside Structures:
One water pump structure is located nearby (30'x30'x15', 50' to 60' away from site) (not an obstruction).

Safety Features:
Site is protected by a metal barrier.

Infrastructure:
Electric power transformers onsite at water pump station. Other power lines are just to south of site.

Interchanges:
I-70 and I-65 interchange is within ¼ mile west of the proposed site. The Keystone/Rural interchange is approximately 1.5 miles east of the site.

Surrounding Land Use:
Light commercial/industrial and residential

Nearby Sources:
None as reported in the Toxic Release Inventory (TRI)

Current Road Construction:
None

Future Road Construction:
None, this segment of road has recently (past five years) been upgraded. No new construction is expected.

Frontage Roads:
No frontage roads parallel to the interstate. Only local access roads are in the area.

Available Space:
Ample, actual measurements planned shortly.

Property Type:
Right-of-way

Property Owner:
Indiana Department of Transportation (INDOT)

Likelihood of Access:
A signed MOU has been achieved with INDOT.

Proximity to Roadway:
Monitoring probes will be approximately 20-25 meters from nearest traffic lane. Base of site is approximately eight feet below roadway. Final probe height will be approximately two meters above roadway

Other Details/Local Knowledge:
This site is accessible from a side road and has safety barriers. It is ideal for site access safety. It is near an interstate merge which can cause traffic backups in the morning on the westbound lanes (farther lanes from site) and the eastbound lanes are accelerating out of the same merge. The biggest concern with this site is site security due to visibility to the surrounding neighborhood. Precautions are planned with regard to security.

Figure 1 is a map showing the location of the monitoring site in the City of Indianapolis. Figure 2 is an overhead view of the site and its surrounding neighborhood. Figures 3 through 10 show views around the site.

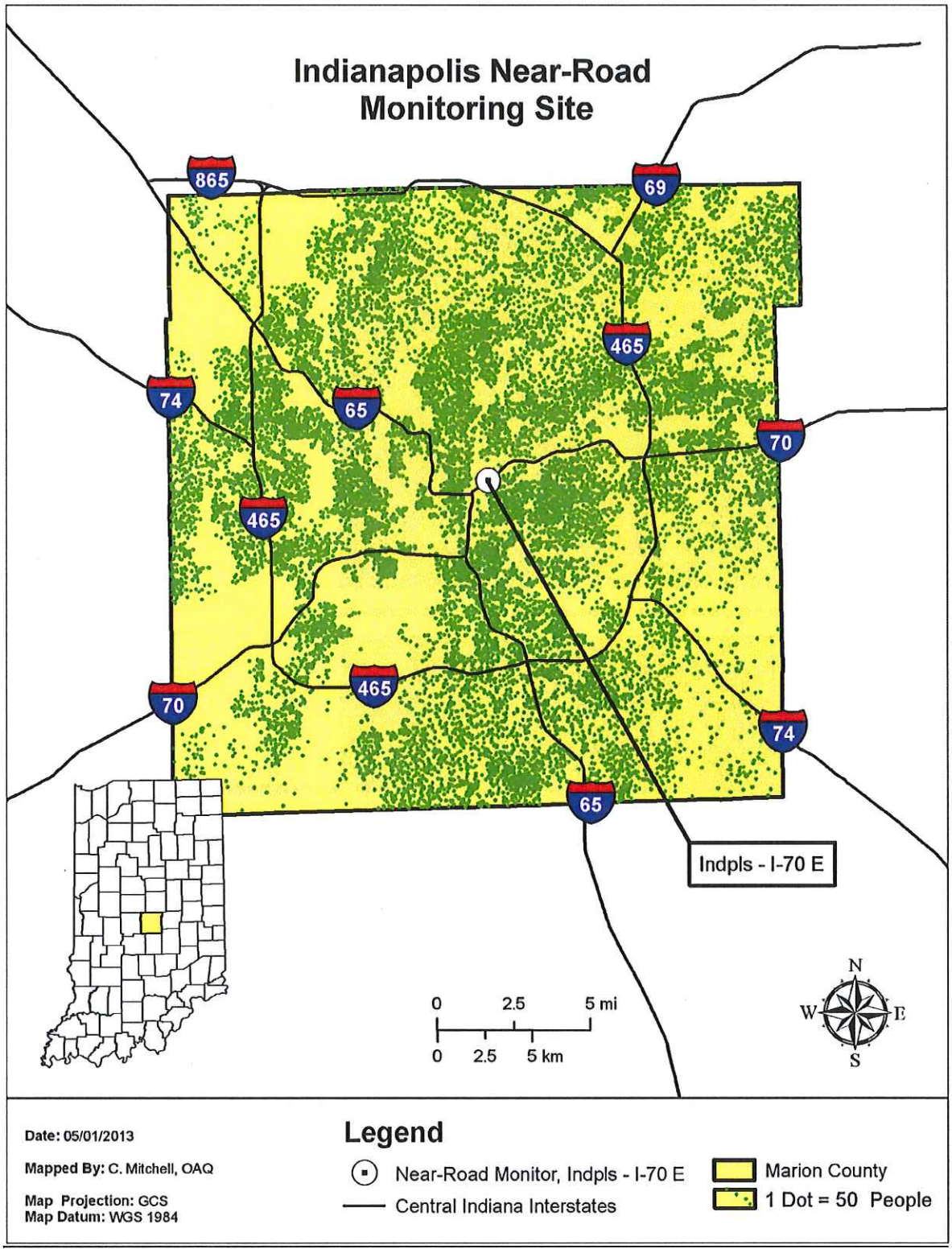

Figure 1: Marion County Population Density Map & Site Location

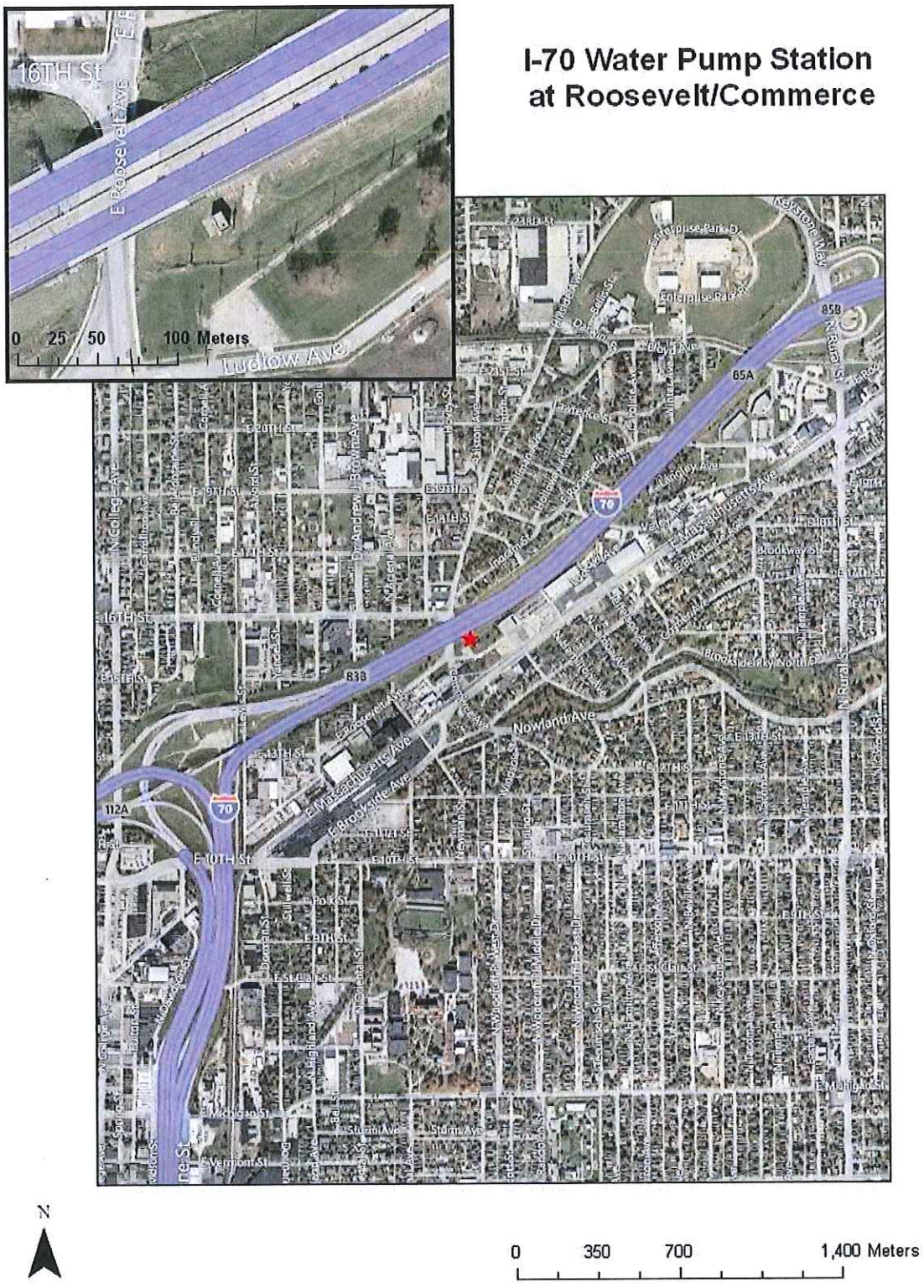

Figure 2: Indpls – I-70 East. Near-Road Site

Figure 3: View towards the North

Figure 4: View towards the Northeast

Figure 5: View towards the East

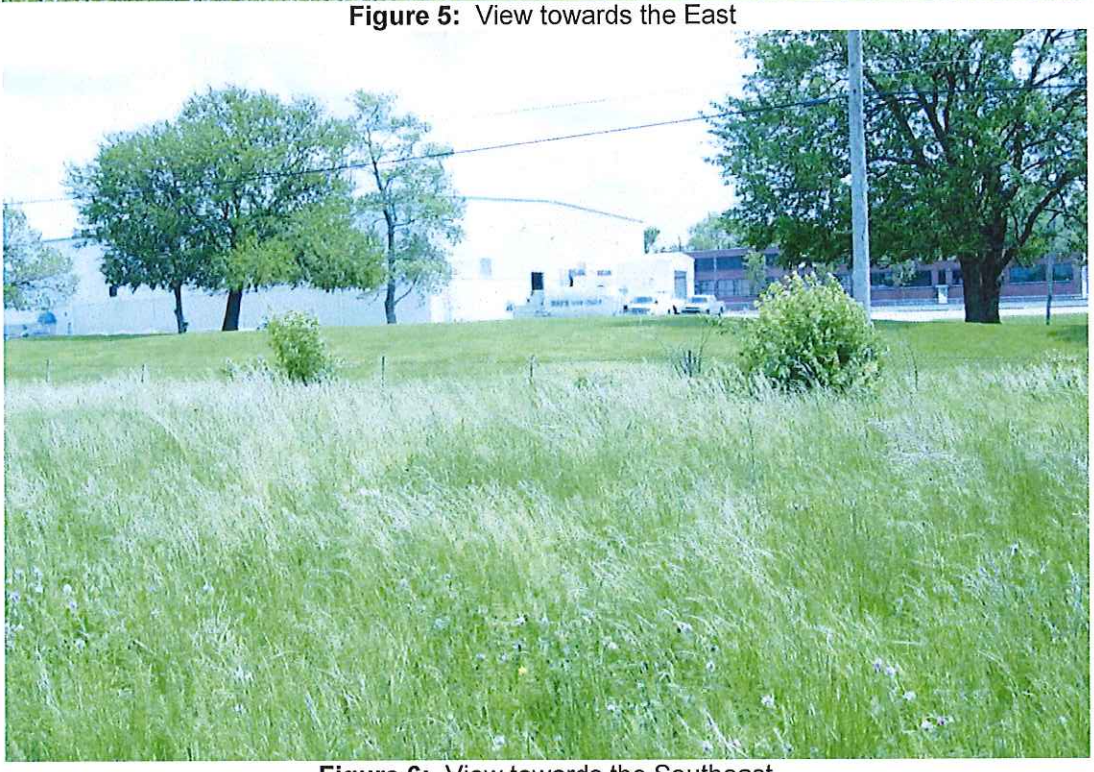

Figure 6: View towards the Southeast

Figure 7: View towards the South

Figure 8: View towards the Southwest

Figure 9: View towards the West

Figure 10: View towards the Northwest

Other Possible Sites

Three other such areas were identified as potential backup monitoring locations. They are all located along the segment of I-465 from I-70 to Pendleton Pike, which is the fourth highest FE_AADT segment.

The first is located at an accident investigation site along southbound I-465 just north of the interchange with I-70. The site fits most criteria with the largest drawbacks being that it is located mostly upwind of the traffic lanes and there is some space limitations for the site footprint. Otherwise the site is located off of the main traffic lanes within 50 m and has safety barriers in place. In addition, there is electrical onsite due to the presence of traffic monitoring devices and the property is owned by INDOT. Figure 11 is an overhead view of this site.

The second site is located slightly further north on the eastside of the interstate. This solves the upwind issue of the other site. However, there is less right-of-way owned by INDOT to use and there is some possible interference from bridges and sound barriers. Space limitations can also be an issue with this site. Figure 12 provides an overhead view of this proposed site.

The third is slightly further south than the other two and is on the east side of the highway. It does have plenty of available footprint space. However, it lacks proximity to the main traffic lanes and safe access from a side street and is in a current construction area. An overhead view of this site is in Figure 13.

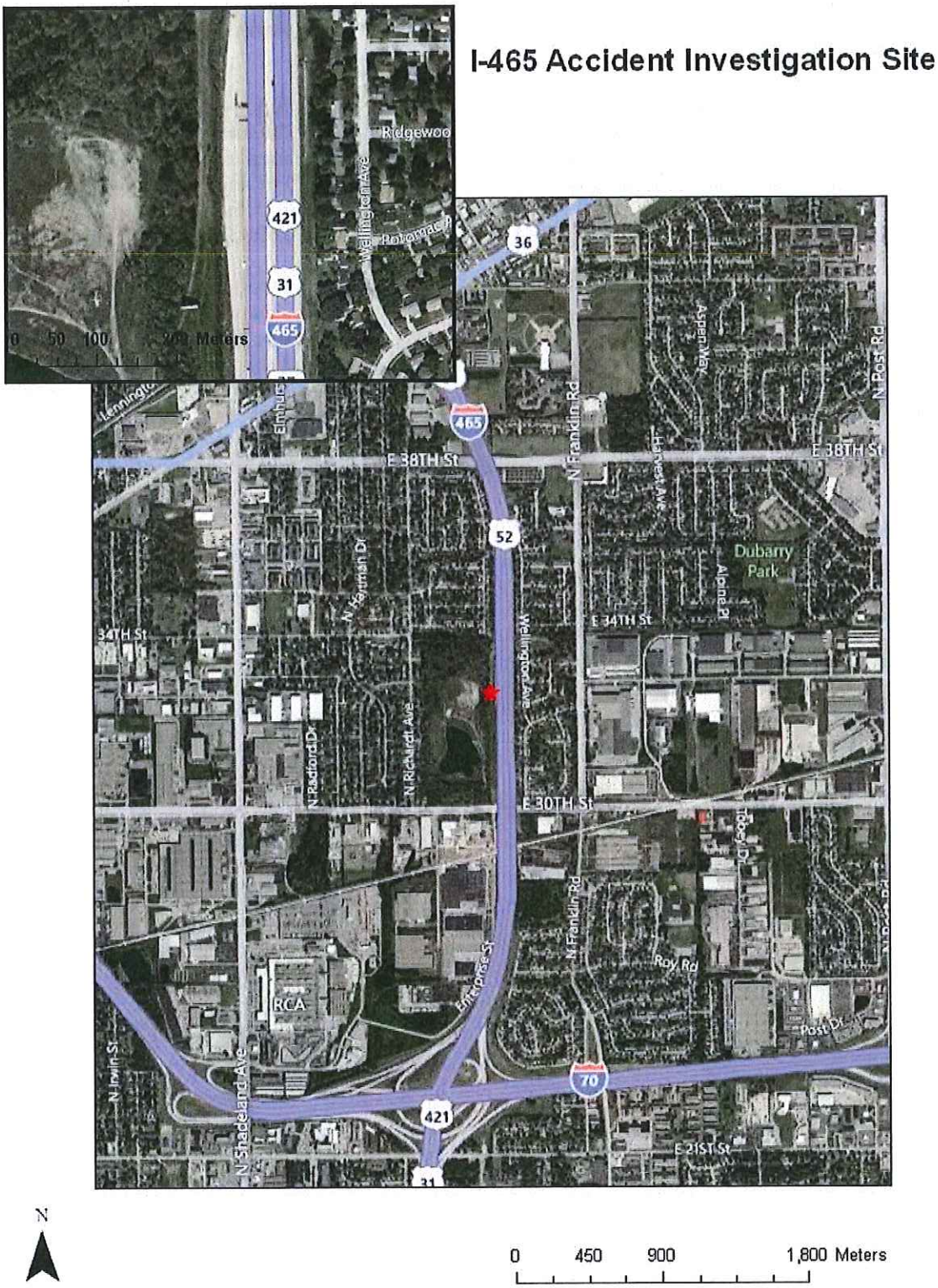

Figure 11: Accident Investigation site possibility

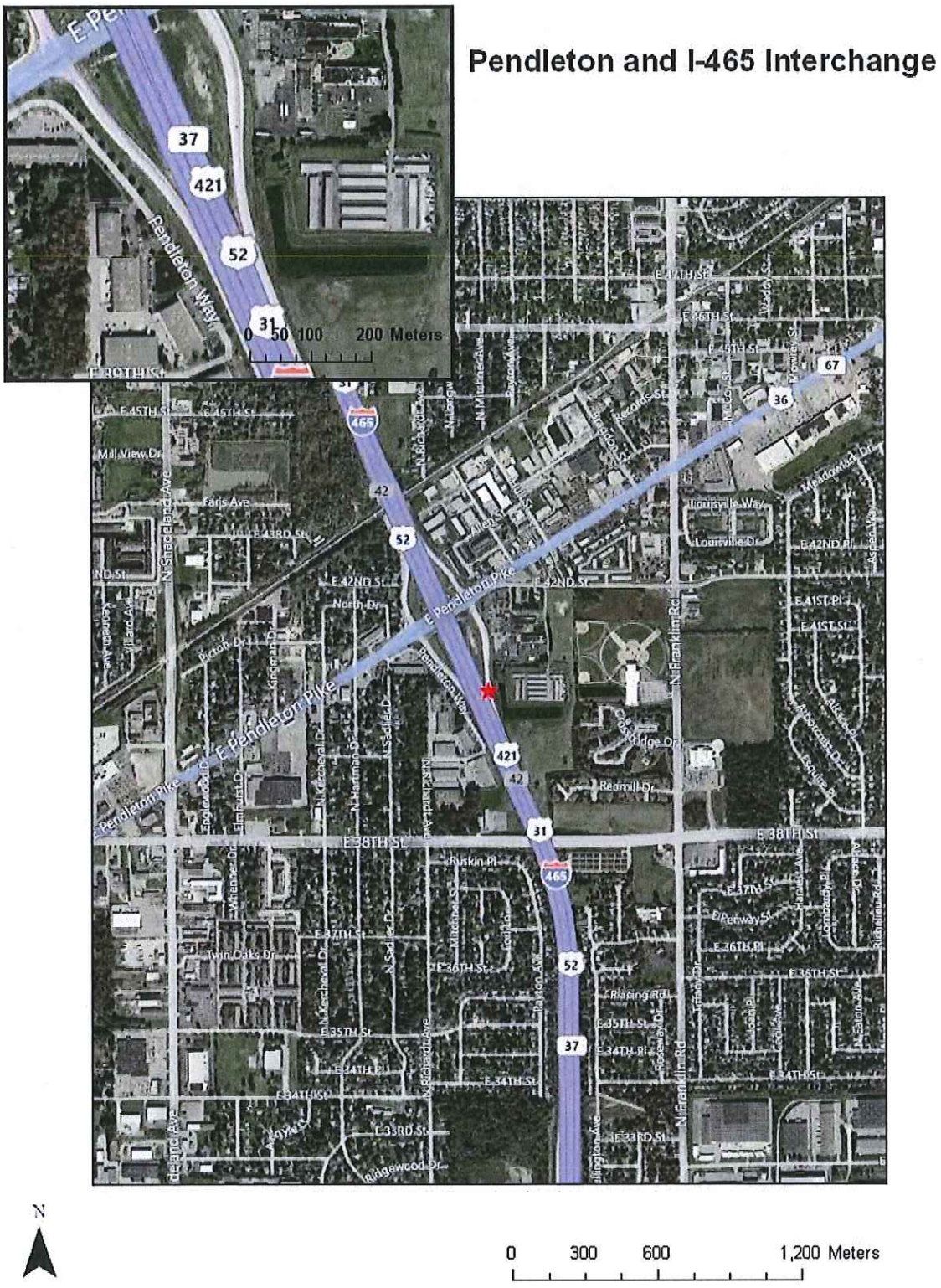

Figure 12: Interstate 465 and Pendleton Pike site possibility.

Figure 13: Interstates 70 and 465 interchange on the Eastside, northeast corner possibility.

Parameters to be Monitored

Table 16-1 in the Near-Road TAD lists the CASAC AAMMS recommended priorities for the parameters to be monitored at a near-road site. They are ranked as primary, secondary, or tertiary. Table 2 lists the parameters and Indiana's planned monitoring.

Table 2 - CASAC AAMMS's Recommended Monitoring Priorities With Indiana's Planned Monitoring

Priority	Parameter	Indiana's Plan	Monitor Availability
Primary			
	NO & NO_2	Monitoring to begin 1/1/2014	Purchase monitor with grant monies
	CO	Monitoring to begin 1/1/2014	Purchase monitor with grant monies
	O_3	Monitoring to begin 4/1/2014	Monitor is available
	WS/WD (10m)	Monitoring to begin 1/1/2014	Purchase system with grant monies
Secondary			
	Air Toxics	Monitoring planned to begin 1/1/2015	Monitor is available
	Black Carbon	Monitoring to begin 1/1/2014	Purchase monitor with grant monies
	Ultrafine particle distribution or ultrafine particle number concentration	Will investigate future monitoring	Monitor would need to be purchased
	Traffic Count	No plans to monitor	
Tertiary			
	Intermittent $PM_{2.5}$	Monitoring to begin 1/1/2014	Monitor is available
	Continuous PM2.5	Monitoring planned to begin 1/1/2015	Monitor would need to be purchased
	$PM_{10-2.5}$	Will investigate future monitoring	Monitor would need to be purchased
	CO_2	No plans to monitor	
	Organic and Elemental Carbon	Will investigate future monitoring	Monitor is available
Other – (EPA recommended)			
	OT/RH	Monitoring to begin 1/1/14	Purchase monitor with grant funds
	Precipitation, SR, & BP	No plans to monitor as these are monitored at nearby NCore site.	

Activities

In late 2010 and in 2011 IDEM met with INDOT about the scope of the monitoring project. Discussions regarding regulations, traffic counts and flows, potential sites, agreements, logistics, etc. took place between the two agencies in a very cooperative environment. Field survey work was conducted and several potential sites emerged. In early 2012, IDEM determined which site to pursue, gained permission from INDOT to locate the site, and prepared an MOU between the two agencies. The MOU is set to be effective on July 1, 2013. This Near-Road Monitoring Plan will be made available for a 30-day comment period prior to submittal to U.S.EPA on July 1, 2013 as part of Indiana's 2014 Ambient Air Monitoring Network Plan.

Obtaining monitoring equipment began in April 2013 and will continue through the third quarter of the calendar year. Preliminary proposals for shelter procurement and site preparation have been received. These items will be released for bids after July 1. Complete installation of the site is planned for November 1, 2013, which allows two months for installing equipment and testing before the anticipated site operation begins on January 1, 2014. The tasks and timeline of events are in Table 3.

Table 3 - Near-Road Activity Timeline

Activity	Milestone	Time Period or Completion Date
Dialogue between IDEM and INDOT on concept of monitoring	Understanding of the type of area required	January – June 2011
Gathering traffic information	List of potential road segments	June – September 2011
INDOT/IDEM survey trip	Potential areas located along high traffic road segments	December 7, 2011
Prepare near-road grant application	Completed grant application	December 2011 – January 2012
Identify list of potential sites	Potential Sites	January 1, 2012
Submit application for near-road grant	Submitted grant application	January 17, 2012
Identify preferred site	Final site determined	February 1, 2012
Prepare draft Monitoring Plan	Draft Monitoring Plan	March 2012
Draft Memorandum of Understanding	MOU ready for signature	November 2012
Submit MOU for signature	Signed MOU between INDOT and IDEM	December 5, 2012
Extend length of grant to address revised site timetable	Grant extension to 1/30/2014	January 2013
Edit and revise Near-Road NO2 Monitoring Plan	Revised Monitoring Plan	March – April 2013
Work with IPL to provide electrical power to site	New transformer set to provide power	April – May 2013
Prepare and submit equipment and supply requisitions	Requisitions entered into PeopleSoft	April – July 2013
MOU signing	Signed MOU	May 1, 2013
Finalize Near-Road NO_2 Monitoring Plan	Near-Road NO_2 Monitoring Plan ready for public comment	May 15, 2013
Submit Near-Road NO_2 Monitoring Plan to U.S.EPA	Submitted plan	July 1, 2013
Work with vendors to obtain bids and have POs issued	POs issued for equipment and site work	July – September 2013
Conduct site prep and install monitoring shelter	Monitoring site established	November 1, 2013
Install monitoring equipment	Equipment set up at site	November 2013
Begin monitor testing	Monitoring equipment tested	December 1, 2013
Determine monitors are operating properly and data collection is valid	Operational Monitoring Site	January 1, 2014

Conclusion

Indiana plans to have its near-road monitoring site ready, operational, and collecting valid on January 1, 2014.

Appendix C
USEPA Near-Road Site Approval Letter

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5
77 WEST JACKSON BOULEVARD
CHICAGO, IL 60604-3590

REPLY TO THE ATTENTION OF:

Mr. Steve Lengerich, Manager
Ambient Monitoring Section 1
Indiana Department of Environmental Management
100 North Senate Avenue
MC 61-50-2 Shadeland
Indianapolis, IN 46204-2251

Dear Mr. Lengerich,

We have reviewed the Indiana Department of Environmental Management proposal to locate the Indianapolis- Carmel-Anderson near road NO2 monitoring site at 1650 Ludlow Avenue Indianapolis. USEPA Region 5 approves of the general location of the proposed site. The monitoring trailer must be located within fifty meters of the expressway lane and situated so existing building structures do not hamper the airflow. The monitoring trailer and any existing structure must be separated by a distance greater or equal to twice the height of existing building structures. The pictures attached to the proposal suggest these requirements can be met. In addition to the trailer, meteorological gear and the monitors, grant money may also be used to purchase fencing or safety barriers should the site need them.

If you have questions concerning this letter please contact Patricia Schraufnagel at 312-886-5955.

Sincerely,

Loretta Lehman, Manager
Air Monitoring and Analysis Section

Cc: Cynthia Meyer

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Appendix D
Evaluation of Continuous FEM Monitoring Data

To be submit to USEPA by August 31, 2013.