The Detroit Edison Company
One Energy Plaza, Detroit, MI 48226-1279

10 CFR 51.45
10 CFR 52.77

November 23, 2009
NRC3-09-0016

U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, DC 20555-0001

References:
1) Fermi 3
Docket No.: 52-033
2) Letter from Stephen Lemont (USNRC) to Peter W. Smith (Detroit Edison), "Requests for Additional Information Related to the Environmental Review for the Combined License Application for Fermi Nuclear Power Plant, Unit 3," dated May 12, 2009
3) Letter from Peter W. Smith (Detroit Edison) to USNRC, "Detroit Edison Company Response to NRC Requests for Additional Information Related to the Environmental Review," NRC3-09-0015 dated October 30, 2009

Subject: Detroit Edison Company Response to NRC Requests for Additional Information Related to the Environmental Review

In Reference 2, the NRC requested additional information to support the review of Part 3 (Environmental Report) of the Fermi 3 Combined License Application (COLA).

Through October 30, 2009, Detroit Edison has submitted responses to 118 Requests for Additional Information (RAIs) which were provided in Reference 2. This letter provides 25 of the remaining responses.

The detailed schedule previously submitted by Detroit Edison (Reference 3) for responding to the remaining RAIs has been updated, accordingly. Appendix A identifies each of the 25 RAI responses contained in this letter as well as the corresponding attachment numbers. Appendix B identifies the remaining RAI responses that will be included in the December response letter. Changes from

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previous letters are identified by footnotes in the appendices. Detroit Edison intends to respond to all the remaining RAIs by December 30, 2009.

Responses to RAI questions AE2.4.2-2, AE2.4.2-4, SE4.4.2-10, and TE2.4.1-2 included in this letter contain electronic files submitted on disk as separate enclosures. Appendix C provides a list of files contained on each enclosed disk.

The response to RAI TE4.3.1-7 was originally submitted in Detroit Edison Letter NRC3-09-0012 (ML092290662), dated July 31, 2009. This response is being supplemented and re-submitted in this letter with a correction to a table reference that cited an incorrect Environmental Report page number. In addition, requested supplemental information to RAI HY4.2.1-9 is also being provided in this letter.

If you have any questions, or need additional information, please contact me at (313) 235-3341.

I state under penalty of perjury that the foregoing is true and correct. Executed on the 23rd day of November, 2009.

Sincerely,

Peter W. Smith, Director
Nuclear Development – Licensing
and Engineering
Detroit Edison Company

Appendices: Appendix A – List of RAI Responses Contained in this Letter
Appendix B – List of Future RAI Response Dates
Appendix C – List of Electronic Files on Enclosed Disks

Attachments: As listed in Appendix A

cc: Jerry Hale, NRC Fermi 3 Project Manager (w/o attachments)
Ilka T. Berrios, NRC Fermi 3 Project Manager (w/o attachments)
Bruce Olson, NRC Fermi 3 Environmental Project Manager (w/o attachments)
Fermi 2 Resident Inspector (w/o attachments)
NRC Region III Regional Administrator (w/o attachments)
NRC Region II Regional Administrator (w/o attachments)
Supervisor, Electric Operators, Michigan Public Service Commission (w/o attachments)
Michigan Department of Environmental Quality
Radiological Protection and Medical Waste Section (w/o attachments)

Appendix A
NRC3-09-0016

List of RAI Responses Contained in this Letter

RAI Question	Subject	Attachment Number
GE1.2-1	General	1
GE1.2-2	General	1
GE1.2-3	General	2
AE2.4.2-2	Aquatic Ecology[1,2]	3
AE2.4.2-3	Aquatic Ecology[2]	3
AE2.4.2-4	Aquatic Ecology[1,2]	4
AQ2.7-2	Air Quality and Meteorology[2]	5
AQ5.3.3.1-1	Air Quality and Meteorology	6
CR4.1.3-4	Cultural Resources[2]	7
HH5.4.2-2	Human Health	8
HH5.4.3-1	Human Health	9
HY4.2.1-3	Hydrology	10
HY4.2.1-11	Hydrology[2]	11
HY5.2-1	Hydrology	11
HY4.2.1-9	Hydrology[1]	12
LU4.1.1-1	Land Use	12
SE2.5.2-1	Socioeconomics	13
SE2.5.2-2	Socioeconomics[2]	13
SE4.4.2-7	Socioeconomics	14
SE4.4.2-10	Socioeconomics	15
TE2.4.1-2	Terrestrial Ecology[1,2]	16
TE2.4.1-9	Terrestrial Ecology[2]	16
TE2.4.1-10	Terrestrial Ecology	16
TE4.3.1-7	Terrestrial Ecology[1]	17
TR4.8.3-1	Transportation[2]	18

1. Supplemental RAI response
2. Advanced from December

Appendix B
NRC3-09-0016

List of Future RAI Response Dates

Response Date	RAI Question	Subject
12/30/2009	GE3.1-1	General
	GE4-1	General
	AQ2.7-1[2]	Air Quality
	AQ4.4.1-1	Air Quality
	AQ6.4-1	Air Quality
	HY2.3.1-1	Hydrology
	HY2.3.1-2[1]	Hydrology
	HY2.3.1-3	Hydrology
	HY2.3.1-4	Hydrology
	HY2.3.1-7	Hydrology
	HY4.2.1-1	Hydrology
	HY4.2.1-2	Hydrology
	HY4.2.1-4	Hydrology
	HY4.2.1-5	Hydrology
	HY4.2.1-6	Hydrology
	SE4.4.2-8[2]	Socioeconomics
	TE2.4.1-11[1]	Terrestrial Ecology
	TE4.3.1-1	Terrestrial Ecology
	TE4.3.1-4	Terrestrial Ecology
12/30/2009	USACE-1	U.S. Army Corps of Engineers RAI
	USACE-2	U.S. Army Corps of Engineers RAI

1 Supplemental Response
2 Delayed from November

Appendix C
NRC3-09-0016

List of Electronic Files on Enclosed Disks

Directory of NRC3-09-0016 Appendix C Disk

Directory of D:\

11/23/2009 3:49 PM	<DIR>	Aquatic Ecology Characterization
11/23/2009 3:52 PM	<DIR>	Traffic Study
11/23/2009 3:50 PM	<DIR>	Vegetation Survey
11/23/2009 3:45 PM	<DIR>	Water Quality Survey
11/23/2009 3:54 PM	<DIR>	Wildlife Report
0 File(s)	0 bytes	
5 Dir(s)	0 bytes free	

Directory of D:\Aquatic Ecology Characterization

11/23/2009 3:20 PM	36,239,000	001_f3_aquatic_ecology_characterization
1 File(s)	36,239,000 bytes	
0 Dir(s)	0 bytes free	

Directory of D:\Traffic Study

11/20/2009 1:05 PM	14,568,000	001_f3_traffic_study_es_tc_sect01
11/20/2009 1:15 PM	29,972,000	002_f3_traffic_study_sect_02
11/20/2009 1:39 PM	39,841,000	003_f3_traffic_study_sect_03
11/20/2009 1:35 PM	481,000	004_f3_traffic_study_sect_04thru07
11/20/2009 1:43 PM	42,862,000	005_f3_traffic_study_sect08
11/20/2009 1:41 PM	6,695,000	006_f3_traffic_study_sect_09
11/20/2009 3:12 PM	43,560,000	007_f3_traffic_study_appendicies
7 File(s)	177,979,000 bytes	
0 Dir(s)	0 bytes free	

Directory of D:\Vegetation Survey

11/23/2009 2:56 PM	35,448,000	001_f3_vegetation_survey_report-thru-figure_7
11/23/2009 1:29 PM	24,802,000	002_f3_vegetation_survey_figure_8-thru-appendix_D
11/23/2009 11:27 AM	32,025,000	003_f3_vegetation_survey_appendix_E_1of4
11/23/2009 11:23 AM	37,329,000	004_f3_vegetation_survey_appendix_E_2of4
11/23/2009 11:30 AM	38,444,000	005_f3_vegetation_survey_appendix_E_3of4
11/23/2009 1:31 PM	34,711,000	006_f3_vegetation_survey_appendix_E_4of4

11/23/2009 10:51 AM 20,857,000 007_f3_vegetation_survey_appendix_F
7 File(s) 223,616,000 bytes
0 Dir(s) 0 bytes free

Directory of D:\Water Quality Survey

11/23/2009 2:33 PM 8,389,000 001_f3_water_quality_survey_report
11/23/2009 2:33 PM 21,434,000
002_f3_water_quality_survey_attachment_A&B
2 File(s) 29,823,000 bytes
0 Dir(s) 0 bytes free

Directory of D:\Wildlife Report

11/23/2009 7:12 AM 1,563,000
001_f3_wildlife_survey_title_thru_appendix_B
11/23/2009 10:01 AM 31,200,000 002_f3_wildlife_survey_appendix_C1of2
11/23/2009 10:04 AM 37,591,000 003_f3_wildlife_survey_appendix_C2of2
11/23/2009 9:01 AM 31,213,000 004_f3_wildlife_survey_appendix_D_1of7
11/23/2009 9:07 AM 26,640,000 005_f3_wildlife_survey_appendix_D_2of7
11/23/2009 9:08 AM 22,156,000 006_f3_wildlife_survey_appendix_D_3of7
11/23/2009 9:10 AM 29,078,000 007_f3_wildlife_survey_appendix_D_4of7
11/23/2009 9:11 AM 24,246,000 008_f3_wildlife_survey_appendix_D_5of7
11/23/2009 9:12 AM 23,285,000 009_f3_wildlife_survey_appendix_D_6of7
11/23/2009 9:14 AM 23,168,000 010_f3_wildlife_survey_appendix_D_7of7
10 File(s) 250,140,000 bytes
0 Dir(s) 0 bytes free

Attachment 1
NRC3-09-0016

Response to RAI letter related to Fermi 3 ER

RAI Question GE1.2-1
RAI Question GE1.2-2

NRC RAIs

The following two RAIs are very closely tied together. Therefore, the responses are being provided in the same attachment to avoid any unnecessary duplication.

A – RAI GE1.2-1

Provide documentation or a description of the status of Coastal Zone Management (CZM) Certification for Fermi 3.

Documented proof of CZM Certification must be provided to the NRC by Detroit Edison before the NRC can issue a combined license. The current status and process for obtaining CZM Certification will be presented in the EIS.

B – RAI GE1.2-2

Provide documentation or a description of the status of Clean Water Act Section 401 Water Quality Certification for Fermi 3.

Documented proof of Section 401 Water Quality Certification must be provided to the NRC before the NRC can issue a combined license. The current status and process for obtaining Section 401 Water Quality Certification will be presented in the EIS.

Response

A –*Provide documentation or a description of the status of Coastal Zone Management (CZM) Certification for Fermi 3.*

Detroit Edison personnel and consultants met with MDEQ staff on October 16, 2009 to discuss the process for obtaining Coastal Zone Management Certification for Fermi 3. The Coastal Zone Management Act of 1972 (CZMA) imposes State standards for compliance with the CZMA on Federal agencies. It preempts Federal agencies, such as the United States Army Corps of Engineers (USACE), from issuing a permit that the state declines to issue. For example, if the State decides not to issue a wetland permit (Part 303, Wetlands Protection, Natural Resources and Environmental Protection Act, 1994 PA 451, as amended (NREPA)), then the USACE can not supercede the State by issuing a Federal (Part 404) wetland permit. In the case of Fermi 3, the letter of consistency will be issued concurrent with the State 303 permit, which is issued by the Land and Water Management Division (LWMD) of the MDEQ. All LWMD permits are applied for through the Joint Permit application and issued in one permit from the MDEQ (Parts 303, 325, and 301). Therefore, the process for obtaining CZMA certification for Fermi 3 will be to submit a Joint Permit application. Based on feedback from the MDEQ, Detroit Edison is planning to submit the Joint Permit application by July 1, 2010.

B –*Provide documentation or a description of the status of Clean Water Act Section 401 Water Quality Certification for Fermi 3.*

Detroit Edison personnel and consultants met with MDEQ staff on October 16, 2009 to also discuss the process for obtaining Section 401 Water Quality Certification (WQC) for Fermi 3. MDEQ Water Bureau (WB) staff stated that Section 401 WQC is obtained through issuance of a National Pollutant Discharge Elimination System (NPDES) permit in accordance with Part 31 of Public Act 451 of 1994 for projects where there is a discharge to waters of the state. This permit includes any associated groundwater, stormwater, or surface water permits. Permits issued by the LWMD of the MDEQ may require a separate Section 401 WQC issued by that department, or may be covered under the WB Section 401 WQC. Therefore, the process for obtaining Section 401 WQC for Fermi 3 will be to apply for the individual NPDES discharge permit in conjunction with the Joint Permit application to the LWMD. Based on feedback from the MDEQ, Detroit Edison is planning to submit the Joint Permit application by July 1, 2010.

Proposed COLA Revision

None

Attachment 2
NRC3-09-0016

Response to RAI letter related to Fermi 3 ER

RAI Question GE1.2-3

NRC RAI GE1.2-3

Provide documentation or a description of the status of the required Nuclear Waste Fund waste disposal contract with the U.S. Department of Energy (DOE).

Supporting Information

Per the Nuclear Waste Policy Act of 1982, as amended, before a combined license can be issued by the NRC for Fermi 3, Detroit Edison must provide either proof that such a contract is in place with DOE or an official document from DOE stating that Detroit Edison is making a good faith effort to get a contract.

Response

Detroit Edison has discussed the signing of a new Standard Contract with a contracting officer from the U.S. Department of Energy (DOE) Office of Civilian Radioactive Waste Management. Detroit Edison intends to enter into an amendment to the Standard Contract for disposal of Spent Nuclear Fuel and/or High Level Radioactive Waste at Fermi 3 as soon as enough plant-specific data is available to execute the contract documents. Detroit Edison expects to execute the contract documents by July 1, 2010. See the response to RAI 01-1 in Detroit Edison letter NRC3-09-0025 (ML092720656), dated September 24, 2009.

Proposed COLA Revision

None

Attachment 3
NRC3-09-0016

Response to RAI letter related to Fermi 3 ER

RAI Question AE2.4.2-2
RAI Question AE2.4.2-3

NRC RAIs

The following RAIs involve aquatic ecology related issues and are tied very closely together. To avoid unnecessary duplication and achieve as much simplification as possible, Detroit Edison has elected to address these RAIs with a single response.

A – RAI AE2.4.2-2

Provide a copy of the interim monitoring report "Aquatic Ecology Survey, Detroit Edison Company Fermi 3 Project, Interim Report" prepared by AECOM Environment, and dated December 2008. Provide a more recent version and the final report when available.

ER Section 2.4.2 indicated that additional aquatic ecology monitoring was underway and the information in the requested interim report was discussed at the Fermi 3 site audit. This report contains the most recent available information that:

- *evaluates the abundance and occurrence of aquatic organisms in the vicinity of the Fermi site;*
- *identifies the aquatic habitat features in the vicinity of the Fermi site;*
- *provides additional support for statements in the ER that Federal and State-listed threatened and endangered aquatic species have not been observed in the vicinity of the Fermi site; and*
- *evaluates impingement mortality associated with the intake structure based upon the first half of the ongoing one-year monitoring effort.*

The final report is expected to include the results of the entire one-year monitoring effort for aquatic ecology, including results of the entrainment monitoring at the existing Fermi 2 intake.

B – RAI AE2.4.2-3

Provide the most currently available information pertaining to entrainment of aquatic organisms at the Fermi 2 intake.

Entrainment data are needed to understand the potential effects of Fermi 3 operations. The interim report identified in RAI 2.4.2-2 does not contain entrainment data. If there is information available, it would be useful to have a summary of that information.

Response

A - *Provide a copy of the interim monitoring report "Aquatic Ecology Survey, Detroit Edison Company Fermi 3 Project, Interim Report" prepared by AECOM Environment, and dated December 2008. Provide a more recent version and the final report when available.*

The report, "Aquatic Ecology Survey, Detroit Edison Company Fermi 3 Project, Interim Report" was provided in Detroit Edison letter NRC3-09-0010 (ML091940218), dated June 19, 2009. The results of the complete aquatic survey have been provided in the report, "Aquatic Ecology Characterization Report, Detroit Edison Company Fermi 3 Project, Final Report", which is provided on an enclosed CD within this letter.

B - *Provide the most currently available information pertaining to entrainment of aquatic organisms at the Fermi 2 intake.*

The most currently available information pertaining to entrainment of aquatic organisms at the Fermi 2 intake is addressed in the report, "Aquatic Ecology Characterization Report, Detroit Edison Company Fermi 3 Project, Final Report," in the response to RAI AE2.4.2-2.

Proposed COLA Revision

Revisions to the Environmental Report are being made to reflect the information in the final aquatic ecology report. See the attached markup for the proposed COLA revision.

Markup of Detroit Edison COLA
(following 3 pages)

The following markup represents how Detroit Edison intends to reflect this RAI response in a future submittal of the Fermi 3 COLA. However, the same COLA content may be impacted by revisions to the ESBWR DCD, responses to other COLA RAIs, other COLA changes, plant design changes, editorial or typographical corrections, etc. As a result, the final COLA content that appears in a future submittal may be different than presented here.

- Swan Creek, and
- Stony Creek.

Surface-water drainage at the Fermi site is influenced by Swan Creek, Lake Erie, and the waters associated with the surrounding DRIWR including the coastal wetlands and lowlands (Reference 2.4-77 and Reference 2.4-78). Section 2.3 provides a more detailed discussion of the hydrology, water use, and water quality of onsite water bodies.

Insert # 1

The following provides a discussion of the primary aquatic habitats associated with the Fermi site. Information presented in the following sections is supported by current and historic site information, area specific literature, and both academic and industry-generated data summaries of the relative aquatic populations. ~~[START COM 2.4-002]~~ Detroit Edison ~~will perform~~ a confirmatory updated performed aquatic ecological survey of the site that provides ~~at least~~ a year's worth of seasonal sampling data to reflect variations in aquatic populations. ~~A revision to the Environmental Report will be provided to the NRC within one year after docketing of the COL Application that reflects the survey results.~~ ~~[END COM 2.4-002]~~

(Reference 2.4-97)

2.4.2.1 Key Data Source Review

A number of state agencies, federal agencies, and universities were contacted or otherwise utilized in the review of the data currently available for assessing the aquatic ecology of the area. Each entity and a brief description of its relevance to the proposed project are listed below:

- Michigan Department of Environmental Quality (MDEQ) – The MDEQ oversees implementation of environmental quality regulations. The MDEQ includes state and federal government resource managers as well as advisory boards in Michigan. The MDEQ issues annual environmental reports on water and air quality and pollution prevention (Reference 2.4-26).
- Michigan Department of Natural Resources (MDNR) – The MDNR is responsible for the stewardship of Michigan's natural resources and management of outdoor recreational programs. The MDNR promotes diverse recreational outdoor opportunities, wildlife and fisheries management, forest management, state lands and minerals, state parks and recreation areas, and conservation, and law enforcement (Reference 2.4-27).
- Ohio Department of Natural Resources (ODNR) – The ODNR Division of Wildlife contains two Lake Erie Fisheries Units that assess and manage fish populations and fisheries in Lake Erie's Western and Central basins and their tributary streams. Using research vessels, these units monitor the food web and the spread of exotic species in the lake, as well as the abundance, growth, age, diet, and health of fish populations (Reference 2.4-28).
- United States Environmental Protection Agency (EPA) – The EPA manages implementation of federal laws to protect the environment. The EPA focuses on many aspects of the environment including air, water, soils, compliance, research, and control (Reference 2.4-34).
- United States Fish and Wildlife Service (USFWS) –The USFWS enforces federal wildlife laws, protects endangered species, restores significant fisheries, and helps foreign

Insert #1

In addition to using existing data sources,

2.4-88 Reutter J.M., C.E. Herdendorf, and G.W. Sturm, *Impingement and Entrainment Studies at the Bay Shore Power Station, Toledo Edison Company*, Clear Technical Report No. 78b, The Ohio State University Center for Lake Erie Area Research, Columbus, OH, 1978.

2.4-89 Reutter, J.M., C.E. Herdendorf, G.W. Sturm. *Impingement and Entrainment Studies at the Acme Power Station, Toledo Edison Company*, Clear Technical Report No. 78A, The Ohio State University Center for Lake Erie Area Research, Columbus, OH, June 1978.

2.4-90 Michigan Department of Environmental Quality, Surface Water Quality Division, *A Biological Survey of Stony Creek and Amos Palmer Drain, Monroe County, Michigan*, Report Number 151, December 1996.

2.4-91 Michigan Department of Environmental Quality, Surface Water Quality Division, *A Biological Survey of Stony Creek and its Tributaries, Amos Palmer Drain and Ross Drain, Monroe County*, Report Number 087, February 1998.

2.4-92 Makaerwiczl, J.C. et al, "Phytoplankton composition and biomass in the offshore waters of Lake Erie: Pre- and post- Dreissena introduction,1983-1993,". *Journal of Great Lakes Research* 25.1, 1999.

2.4-93 U.S. Army Corps of Engineers, *The Highway Methodology Workbook Supplement: Wetland Functions and Values: A Descriptive Approach*, 1999.

2.4-94 U.S. Environmental Protection Agency, "Ottawa-Stony Watershed," http://cfpub.epa.gov/surf/huc.cfm?huc_code=04100001, accessed 4 August 2008.

2.4-97 AECOM, "Aquatic Ecology Characterization Report, Detroit Edison Company Fermi 3 Project, Final Report," November 2009.

Attachment 4
NRC3-09-0016

Response to RAI letter related to Fermi 3 ER

RAI Question AE2.4.2-4

NRC RAI AE2.4.2-4

Provide a copy of the interim monitoring report "Water Quality Survey Detroit Edison Company Fermi 3 Project, Interim Report," prepared by AECOM Environment, and dated December 2008. Provide a more recent version and the final report when available.

Supporting Information

The requested interim report was discussed at the Fermi 3 site audit and provides the most recent information about water quality in the vicinity of the Fermi site. The report is not publically available and is needed for the analysis of impacts to be presented in the EIS.

Response

The report "Water Quality Survey, Detroit Edison Company, Fermi 3 Project, Interim Report" was provided in Detroit Edison letter NRC3-09-0010 (ML091940218), dated June 19, 2009. The final report, "Water Quality Survey, Detroit Edison Company, Fermi 3 Project, Final Report" is provided on an enclosed CD within this letter.

Proposed COLA Revision

Revisions to the Environmental Report are being made to reflect the information in the final Water Quality Survey Report. See the attached markup for the proposed COLA revision.

Markup of Detroit Edison COLA
(following 3 pages)

The following markup represents how Detroit Edison intends to reflect this RAI response in a future submittal of the Fermi 3 COLA. However, the same COLA content may be impacted by revisions to the ESBWR DCD, responses to other COLA RAIs, other COLA changes, plant design changes, editorial or typographical corrections, etc. As a result, the final COLA content that appears in a future submittal may be different than presented here.

River, and Rouge River. Water quality studies were also conducted by the MDEQ and MDNR at various locations in the Swan Creek Watershed. Figure 2.3-48 shows the locations of the water bodies discussed in this section. ~~[START COM 2.3-001]~~ Detroit Edison ~~will perform~~ performed a confirmatory updated baseline surface water sampling that meets the characteristics described in ESRP 2.3.3. ~~A revision to the Environmental Report will be provided to the NRC within one year after docketing of the COL Application that reflects the survey results.~~ ~~[END COM 2.3-001]~~ Insert # 1

The portion of the Lake Erie watershed within the United States includes sections of Michigan, Indiana, Ohio, Pennsylvania, and New York, and is referred to as the Lake Erie-Lake Saint Clair Drainage, a subbasin of the Great Lakes Drainage Basin. On a regional scale, the Fermi site lies within the Lake Erie-Lake Saint Clair Drainage in Monroe County, Michigan. Land use and human activities greatly influence water quality in this watershed. The most important parameters in terms of evaluating water quality in the Lake Erie-Lake Saint Clair Drainages are nutrient enrichment, pesticide contamination, sedimentation, and chemical contaminants such as organochlorine compounds, mercury, and polychlorinated biphenyls (PCBs). These chemical contaminants are important as they are bioaccumulated in aquatic biota. Stormwater runoff from urban and agricultural areas contributes to elevated herbicide and nutrient concentrations. (Reference 2.3-66) The most probable water pollutant expected during construction would be sediment or dust entering Lake Erie, the surrounding streams, and certain onsite water bodies. It is unlikely that groundwater quality would be affected by sediment or dust since they would tend to filter out rapidly in unconsolidated sediments. Also, since when in bedrock the groundwater would be artesian, it would be unlikely to be impacted by sediments. A summary of Water Quality impairments is included in Table 2.3-67. ~~[START COM 2.3-002]~~ Detroit Edison ~~will~~ perform confirmatory updated baseline groundwater water sampling that meets the characteristics described in ESRP 2.3.3. ~~A revision to the Environmental Report will be provided to the NRC within one year after docketing of the COL Application that reflects the survey results.~~ ~~[END COM 2.3-002]~~ ed Insert # 2

2.3.3.1 Surface-Water Quality

The Fermi site is located within the Swan Creek drainage basin, which is a relatively small basin, and is bordered on the north by the Huron River basin and on the south by the Stony Creek and River Raisin drainage basins. Subsection 2.3.1 describes the surface-water bodies and groundwater aquifers in greater detail.

Water quality data are presented below by watershed. The water bodies in this section were chosen based upon the amount of data available, the proximity to the site, and inclusion in the Fermi 2 Environmental Report. Water quality data available at the Fermi Site and in the immediate vicinity that was available is included as well as representative regional water quality data. USGS/STORET stations in the River Raisin and Huron River contain the largest amount of continuous data available in the area. The stations chosen present a continuous record of water quality over the past 30-40 years.

Lake Erie

Lake Erie is the smallest of the Great Lakes in volume and is the shallowest of the five lakes. Therefore, it warms rapidly in the spring and summer, and frequently freezes over in winter.

Insert #1

(Reference 2.3-106)

Insert #2

And supplements the information described below (Reference 2.3-106).

2.3-105 U.S. Nuclear Regulatory Commission, "Integrated Ground-Water Monitoring Strategy for NRC Licensed Facilities and Sites: Logic, Strategic Approach and Discussion," Advanced Environmental Solutions LLC for Division of Fuel, Engineering, and Radiological Research, Office of Nuclear Regulatory Research, NUREG/CR-6948, November 2007.

2.3-106 AECOM, "Water Quality Survey, Detroit Edison Company Fermi 3 Project, Final Report," November 2009.

Attachment 5
NRC3-09-0016

Response to RAI letter related to Fermi 3 ER

RAI Question AQ2.7-2

NRC RAI AQ2.7-2

Discuss the impacts of lake/land breeze on atmospheric dispersion estimates. Provide the reference Ryznar, E., et al., 1973, "An Investigation of Atmospheric Diffusion in the Vicinity of the Enrico Fermi Atomic Power Plant".

Supporting Information

During the site audit, Detroit Edison showed the NRC staff the reference: Ryznar, E., et al., 1973, "An Investigation of Atmospheric Diffusion in the Vicinity of the Enrico Fermi Atomic Power Plant". This reference presents the potential impacts of lake/land breeze on atmospheric dispersion along the Lake Erie shoreline where the Fermi 3 facility will be situated. The document is not publically available and is needed for the analysis of air emissions dispersion.

Response

The requested report: Ryznar, E., et.al. 1973, "An Investigation of Atmospheric Diffusion in the Vicinity of the Enrico Fermi Atomic Power Plant", is included as Enclosure 1 to this response, and is referred to as the 1973 Ryznar Report. The impacts of lake/land breeze are accounted for within the atmospheric dispersion estimates presented for Fermi 3. Correction factors utilized by the PAVAN and XOQDOQ computer codes were applied to incorporate lake/land breeze impacts into the estimates.

The Fermi 2 UFSAR discusses the subject 1973 Ryznar Report. Fermi 2 UFSAR, Section 2.3.2.4.2, states:

> "A qualitative study of the surface characteristics of lake breezes at and in the near vicinity of the Fermi 2 site has been reported in Reference 25 (*1973 Ryznar Report).* The preliminary results of this study confirm the aforementioned factors. During the summer months, about one-third of the days were determined to give rise to a lake breeze situation. The inland penetration of these airflows averaged about 4 miles with a mean temperature decrease at the site of about 2°F and a relative humidity increase at the site of about 10 percent. The mean wind speed change due to a lake breeze situation was small (1 to 2 mph) when the lake breeze was in a direction so as to enhance the wind speed. Under conditions when the lake breeze occurred in opposition to a gradient wind, some wind direction changes were found. However, the infrequency of these situations makes it doubtful that the lake breeze could significantly change the atmospheric dispersion of effluents on an annual basis."

For the Fermi 3 COLA, atmospheric dispersion factors (X/Q values) are determined for short term potential accident consequence assessments and long term routine releases. Both the short

term and long term X/Q values are determined based on six years (2002 – 2007) of meteorological data collected by the Fermi 2 meteorological tower. The Fermi 2 meteorological tower is currently located in proximity to the planned location of the Fermi 3 Natural Draft Cooling Tower (NDCT).

The short term X/Q values are determined using the PAVAN computer code. The PAVAN code is described in NUREG/CR-2858, PNL-4413, "PAVAN: An Atmospheric Dispersion Program for Evaluating Design Basis Accidental Releases of Radioactive Materials from Nuclear Power Stations." The long term X/Q values are determined using the XOQDOQ computer code. The XOQDOQ code is described in NUREG/CR-2919, PNL-4380, "XOQDOQ: Computer Program for the Meteorological Evaluation of Routine Effluent Releases at Nuclear Power Stations." Both the PAVAN and the XOQDOQ codes provide the capability to include correction factors to represent non-straight line trajectories such as the lake breeze effects described in the 1973 Ryznar Report.

Regarding the use of the correction factor in the PAVAN code, NUREG/CR-2858, Section 4.12, states:

> "OPENTR determines a default correction factor that can be applied to the X/Q values calculated in Subroutine ANNUAL for sites located in open terrain (using KOPT(10) = 1). Figure 4.2 shows a plot of the default correction factor as a function of downwind distance from Regulatory Guide 1.111. This factor need be applied only if the spatial and temporal variations in the air flow in the site vicinity is such that Equations (2), (3), and (4) would underestimate the annual average X/Q value. (See Regulatory Guide 1.111, Section C.1.c, for a discussion on the use of these correction factors)."

Regarding the use of the correction factors in the XOQDOQ code, NUREG/CR-2919, Section 3.6, states:

> "Adjustments to represent non-straight line trajectories (recirculation or stagnation) may be accomplished in two ways. First, standard default correction factors for each directional sector can be implemented by setting KOPT (8) = 1 on Card Type 1. If that option is chosen, all values of X/Q and D/Q will be multiplied by a specific factor as a function of the distance that is given in Figure 3.2. This correction is applied uniformly to all directional sectors.
>
> Second, specific adjustments may be known for a site as a result of field diffusion experiments or comparison of results from a variable trajectory model. If such data does exist, the user should set KOPT (9) = 1 on Card Type 1 and input those factors via Card Types 8 and 9."

NUREG/CR-2858 (PAVAN), Figure 4.2, is the same as Figure 3.2 in NUREG/CR-2919 (XOQDOQ). The explanation in NUREG/CR-2858 states that the correction factor is applied to ensure that RG 1.111, Section C.1.c, is met.

Section C.1.c of RG 1.111, describes the constant mean wind direction model implemented in the XOQDOQ computer code. Basically, the model assumes that the wind direction measured at the meteorological tower for any given sector is the mean for the entire sector, with modifications per the "Gaussian straight line trajectory" model described in its equations. As indicated in Section C.1.c, effects of spatial and temporal variations in airflow are not described by the constant mean wind direction model. As stated in RG1.111 Section C.1.c, examples of spatial and temporal variations of airflow to consider for three basis categories of topography are (paraphrased):

(1) For inland sites near gently rolling hills, consider recirculation and periods of stagnation
(2) For river valley sites, consider the impact of "channeling" of air flows
(3) At coastal sites, consider lake breeze (including distance of penetration, vertical impacts, temporal variations in direction, and periods of flow reversal), variation of mixing layer height with time and distance from shore, and shoreline effects of bluffs or dunes.

As noted in the discussion from Section 4.12 of NUREG/CR-2858, the purposes of using the default correction factor is to account for the spatial and temporal variations discussed in RG 1.111, Section C.1.c. Thus, by using the correction factors specified for PAVAN and XOQDOQ, these variations are accounted for.

For the Fermi 3 COLA, the default adjustment factors are applied to determine both the short term and long term X/Q values, and as such, the determination of the short term and long term atmospheric dispersion factors considers the potential impacts due to lake breeze.

Proposed COLA Revision

None

NRC3-09-0016
RAI Question AQ2.7-2

Enclosure 1

An Investigation of Atmospheric Diffusion in the Vicinity of the Enrico Fermi Atomic Power Plant, Ryznar, E., et.al. 1973
(following 50 pages)

AN INVESTIGATION OF ATMOSPHERIC DIFFUSION IN THE VICINITY OF THE ENRICO FERMI ATOMIC POWER PLANT

Report No. 2: Measurement and Analysis of Surface Characteristics of the Lake Breeze

by

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OFFICE OF RESEARCH ADMINISTRATION ANN ARBOR

March 1973

ABSTRACT

Measurements and analyses of surface lake breeze characteristics inland from the Enrico Fermi Atomic Power Plant are described. Battery-powered wind speed and direction recording systems designed and built for the study and conventional hygrothermographs at 6 locations up to 6 miles inland provide the basic wind, temperature and humidity data for the study and are described in detail. Results of the lake breeze analysis using three years of measurements show that lake breezes occur on about one-third of the days for the months between April and October, over half of which move inland at least 6 miles. Wind direction fluctuations in lake breeze situations are analyzed in relation to wind speed and Pasquill diffusion categories.

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I INTRODUCTION

In 1970, work was begun on Contract No. C-071023 between the University of Michigan and the Detroit Edison Company to determine the nature of atmospheric diffusion in the vicinity of the Enrico Fermi Atomic Power Plant. The power plant is located about 6 miles northeast of Monroe on the western shore of Lake Erie. The specific goal is to determine the frequency of occurrence of different diffusion conditions in order to assess the potential hazard from both routine and accidental releases of radioactive materials. The approach to the goal is through the analysis of atmospheric transport and turbulent diffusion for various meteorological conditions. It emphasizes the acquisition of information on the nature of onshore flow and the resulting transitional diffusion regimes.

A type of onshore flow of special concern is the lake breeze. In a typical lake breeze, air which is thermally stable (inversion) up to several hundred feet because of a trajectory over a cold water surface moves over warm land. As the air moves inland, an unstable layer develops near the ground and grows vertically, with a stable layer above it (Bierly, 1968). At some distance inland, depending on stability and wind conditions over water as well as those over land, the entire layer becomes unstable and well-mixed. If effluent is discharged from a tall stack at the shoreline in a lake breeze situation, very little dispersion takes place downwind as long as it remains in the stable air. At some distance inland, however, where the vertically increasing unstable layer

intersects the plume, material in the plume mixes rapidly downward and may cause unacceptably high concentrations at ground level. It is obviously important to know the frequency of occurrence of the lake breeze, the meteorological changes caused by it in relation to diffusion, and the distance of its penetration inland.

The work described below supplements that reported in the first progress report (Portman, Ryznar and Walter, 1970) which gives a general discussion of wind and temperature conditions near the shoreline, using information available up to that time. It also represents a step forward to oil fog diffusion experiments in onshore flow, accompanied by wind and temperature profile measurements up to 500 feet, scheduled for summer 1973.

II MEASUREMENTS AT INLAND STATIONS

Wind speed and direction system

Because of the importance of the lake breeze in determining diffusion conditions at the Fermi site particularly during spring, summer and early autumn, one of the main requirements for a wind system was that it measure speed and direction as accurately as possible in lake breeze conditions. This requirement meant that a wind speed recording range of 0-15 mph was desirable to provide adequate resolution for the wind speeds most commonly associated with a lake breeze and that the sensor itself should have good response characteristics within this range. Provisions also had to be made, however, for recording significantly higher speeds, such as those which may last for a few minutes during thunderstorms or for a day or two during the passage of intense migratory pressure systems. Associated with a deep low pressure system, for example, strong onshore winds may occur at Fermi which then shift to strong offshore as the system passes.

Another requirement was that the wind system be independent of electrical power from utility lines. With this feature, a wind station could be readily moved to a new location if an analysis of lake breeze situations showed that a different grouping of stations was necessary.

A wind system comprised of the following basic components fulfilled the above requirements:

1) An R. M. Young Co. Model 35001 Gill Propeller Vane (wind speed and direction sensors in one unit).

2) Translator for wind speed and direction.

3) Two Esterline-Angus 0-1 ma spring-wound chart recorders (one for wind speed and one for direction).

4) One 12-volt battery (regulated and rechargeable).

Sensor. The Gill Propeller Vane is shown in Figure 1 . By the use of (1) a fin and propeller molded of low density foamed polystyrene and (2) low torque, stainless steel ball bearings in the construction of a propeller vane, excellent response characteristics for both low and high wind speeds result. The vane and propeller have threshold sensitivities of 0.3 - 0.5 mph and 0.4 - 0.7 mph, respectively. The vane has a delay distance (50% recovery) of 2.9 feet and the propeller has a distance constant* of 2.4 feet.

The vane converts angular position to resistance through a set of gears linked to the shaft of a precision conductive plastic potentiometer. With a constant voltage applied to the potentiometer, the output signal is directly proportional to the vane direction.

Wind speed is sensed by a 2-bladed helicoid propeller. Its shaft is coupled to a d-c tachometer generator whose output voltage is directly proportional to rpm and is linear throughout its working range.

*Distance constant is the length of air required to cause a 63.2 percent response to a square wave change in the variable measured.

Figure 1. Gill propeller vane

Translator. The purpose of a wind speed and direction translator is to adapt and condition the signals from the propeller vane to the requirements of two current-driven recorders, one for wind speed and one for direction. Commercially available translators were considered for use with the sensor described above, but their main disadvantage was that they lacked a low enough wind speed range to provide the resolution desired. In addition, electrical loading effects of the recorders on the sensor were not eliminated to the degree believed necessary for accurate wind recordings. A translator was designed and built in-house, therefore, with the following features:

1) It has wind speed ranges of 0 - 15, 0 - 30, and 0 - 60 mph and automatically switches from one range to the next,
2) It eliminates electrical loading effects of the recorders on the sensor by means of voltage-to-current amplifiers in both the wind speed and direction circuits, and
3) It is operable from a 12-volt battery with very little current drain.

A translator is shown in Figure 2 . Its general operating characteristics are briefly described below.

The automatic wind speed range selection and switching is accomplished by means of 2 voltage level detectors and a voltage-to-current amplifier. When the level detector for the 0 - 15 mph range senses a voltage corresponding to a wind speed equal to or greater than 15 mph, it causes a change in the gain of the voltage-to-current amplifier and a switch to the 30 mph range. If the

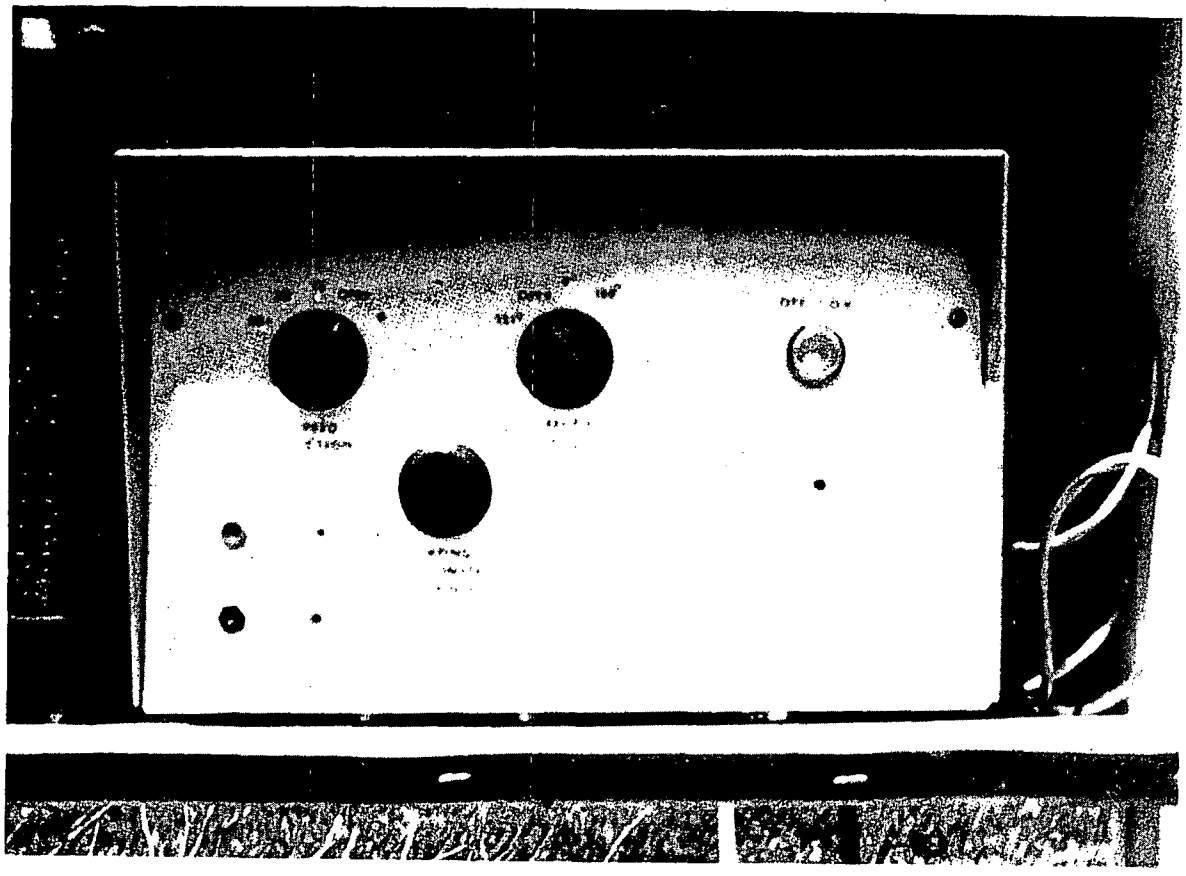

Figure 2. Wind system translator

wind speed decreases to less than 15 mph a switch back to the 15 mph range is prohibited until the level detector senses a voltage equivalent to a speed of about 5 mph. Without this feature, a wind speed fluctuating between 12 and 18 mph, for example, would cause intermittent range switching and a subsequent difficulty in determining the correct wind speed. If the wind speed exceeds 15 mph and continues to increase, the 30 mph range is maintained until the second level detector senses a voltage corresponding to a wind speed equal to or greater than 30 mph. It then causes a gain change in the voltage-to-current amplifier and a switch to the 60 mph range. A switch back to the 30 mph range is prohibited until the wind speed decreases to about 12 mph. The recording of wind speeds greater than 60 mph is not provided for because they occur so seldom.

The 12-volt battery used as a power supply for the translator is regulated by a pair of matched, aged, Zener diodes which provide the necessary $\pm$ 5 volts for the translator. Separate regulators are used for the wind speed and wind direction circuits, thus eliminating any possible interaction of one circuit with the other. The complete translator, including regulators, draws about 10 milliamperes from the 12-volt battery. Tests have shown that this voltage drain on a conventional car battery results in a decrease from 12.35 to 12.00 volts in about three months at normal summertime temperatures and in 2 months at normal wintertime temperatures.

To minimize the effects of temperature extremes on the performance of the translator, its critical components have a very small drift with temperature. The voltage-to-current amplifiers are temperature compensated, for example, and the voltage regulators are encapsulated in an aluminum shell filled with a potting compound having a high thermal conductivity.

Recorders. The recorders chosen for the wind measurement system are Esterline-Angus single channel 0-1 ma recorders with spring-wound chart drives. The chart drive runs at a speed of 6 inches per hour. At this speed, 8 days of recordings are obtained on a single chart roll. The accuracy of the recorder is 1% of full scale reading. The time required for the recorder to respond to 99% of the final value of an input signal is 0.5 second.

A pair of recorders, one for speed and one for direction, is used at each inland station. Synchronization of the wind speed and wind direction recordings is accomplished by means of a chart drive coupling between the two recorders.

Tower and shelter. The supporting equipment for the wind measurement system includes a 10-meter triangular tower 12 inches on a side and an equipment shelter. A 1-inch pipe extends from the top of the tower and supports the propeller vane. The Fermi I pier tower with a propeller vane is shown in Figure 3 .

The shelter for the recorders, translator and battery is approximately 2-feet wide, 1-foot deep, and 2-feet high. It has screened

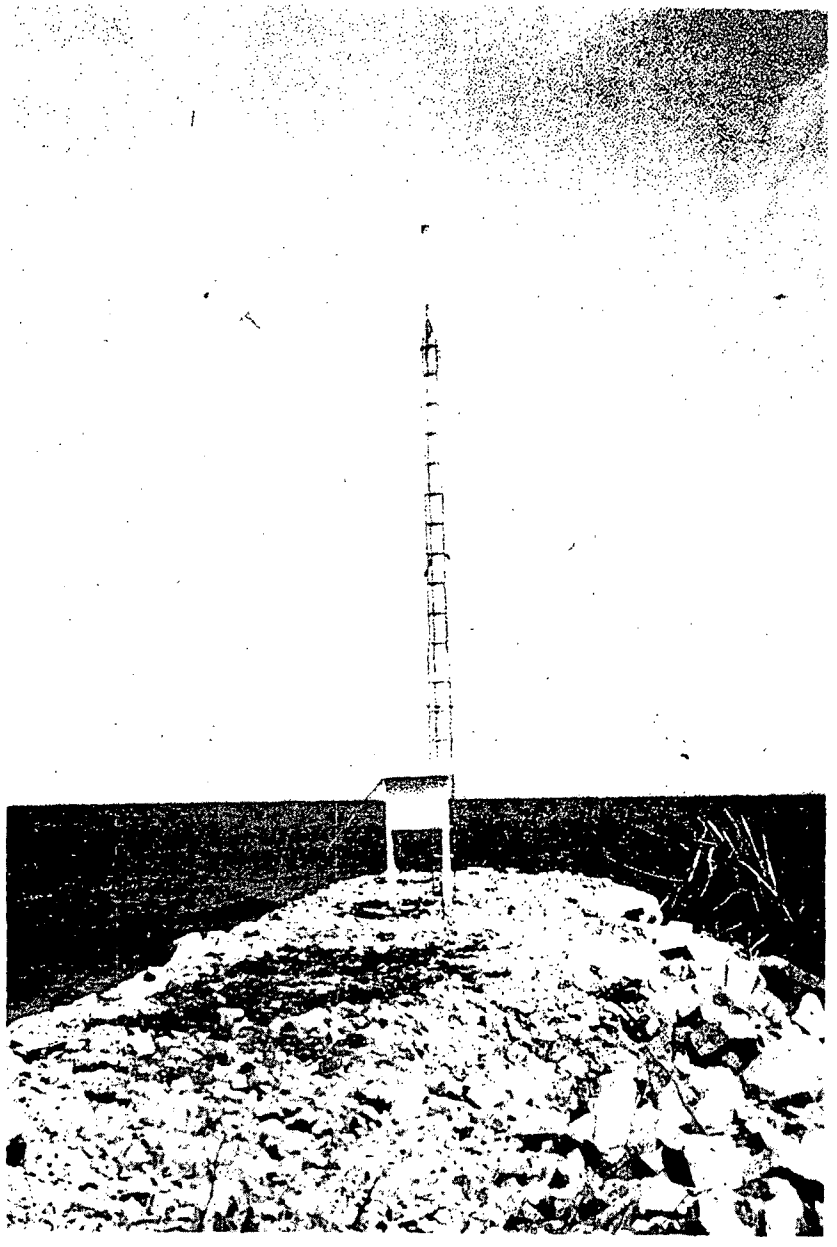

Figure 3. 10-meter tower with propeller vane

vent holes which provide adequate air circulation for the equipment, ventillation for the hydrogen emitted by the lead acid battery, and protection from insects and rodents. The entire shelter is painted white not only for protection from the weather, but also to minimize heating effects of solar radiation in summer. One of the shelters containing the translator, recorders, and battery is shown in Figure 4 .

Temperature and relative humidity equipment

For the continuous recording of temperature and relative humidity, Belfort hygrothermographs Model No. 5-594 were used. A unit is shown in Figure 5 as it was positioned in a standard weather shelter at one of the inland stations. Data are recorded on a single dual-channel chart which has a one-week record length. Air temperature is sensed by a Bourdon tube and relative humidity is sensed by a human hair assembly as described below.

The Bourdon tube is a liquid-in-metal thermometer which consists of a curved, chrome-plated phosphor bronze tube filled with an organic liquid. It expands with an increase in temperature and contracts with a decrease in temperature. The deformation moves a link and lever assembly, causing a pen to respond accordingly. According to the manufacturer's specifications, the accuracy between -20F and 100F is $\pm$ 1F.

The humidity sensing element is a banjo spread human hair element. The hair element lengthens as relative humidity increases and shortens as relative humidity decreases. An appropriate linkage

Figure 4. Shelter containing wind translator, recorders, and battery

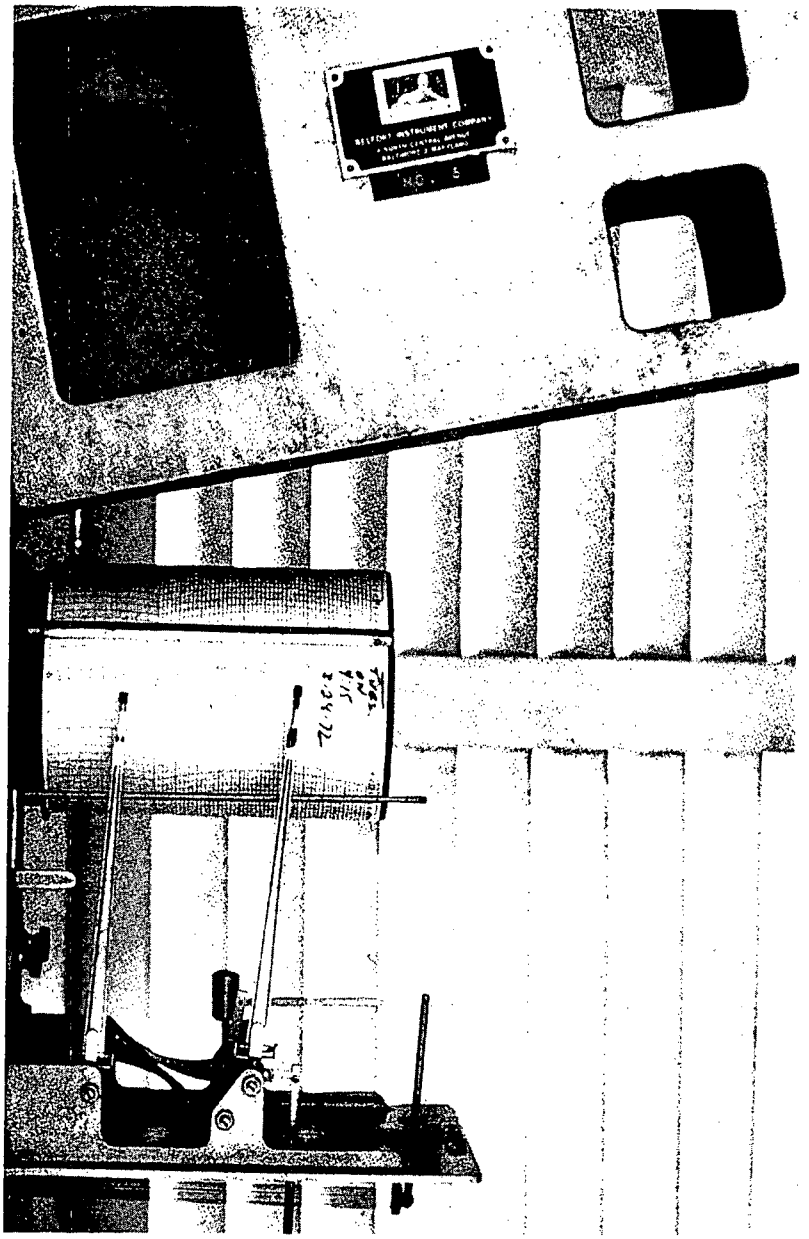

Figure 5. Belfort hygrothermograph in weather shelter at 1.5 mile station

between the element and a movable pen translates hair length into relative humidity. According to the manufacturer's specifications, the accuracy of the humidity element is ± 3% RH between 20% and 95% RH with a sensitivity of 1% RH at room temperature.

Standard U.S. Weather Bureau instrument shelters were used to house the hygrothermographs at the inland stations. In accordance with standard procedure, each shelter was oriented with the door facing north to prohibit solar radiation from striking the instrument when the door was opened.

Calibration of equipment

Hygrothermograph. For several days before their installation in the field, the hygrothermographs were allowed to record in individual instrument shelters outdoors. During steady temperature and humidity conditions, their readings were compared periodically with measurements made with standard dry-bulb and wet-bulb mercury thermometers. After a series of measurements, temperatures and relative humidities measured by the hygrothermographs were adjusted to conform as closely as possible to the standard measurements.

Wind system. The wind speed portion of the wind system was calibrated in a wind tunnel by measuring the output voltage of the propeller-driven d-c tachometer generator at several wind tunnel speeds up to about 25 mph. The resulting calibration curve allowed the translator scale to be set and gave a check of the linearity of the d-c tachometer generator for the above range of wind speeds.

The wind direction portion of the system was calibrated by rotating the propeller vane from 0-360° in ten degree increments and adjusting the translator so that the reading on the recorder chart corresponded to the vane's direction.

Locations and installation

Hygrothermographs and wind systems were installed at 6 locations up to 6 miles inland from Fermi in a general northwesterly direction. This direction is approximately perpendicular to the orientation of the shoreline. The locations of the other stations were based on there being (1) as few obstructions to the wind field in as many directions as possible (2) no standing water nearby, and (3) accessibility to the station from a nearby road. The locations of the stations are shown on the map in Figure 6 . Station numbers and distances inland are given below.

Station Number	Distance Inland (miles)
1. (Fermi I South Pier)	0
2.	0.8
3.	1.5
4.	3
5.	4.5
6.	6

In 1970, recordings of temperature and relative humidity began on 9 June at the Fermi and 0.8 mile stations and on 11 June at the remaining ones. Wind speed and direction recordings began on 13 July at the 1.5 mile station. All equipment was removed from the

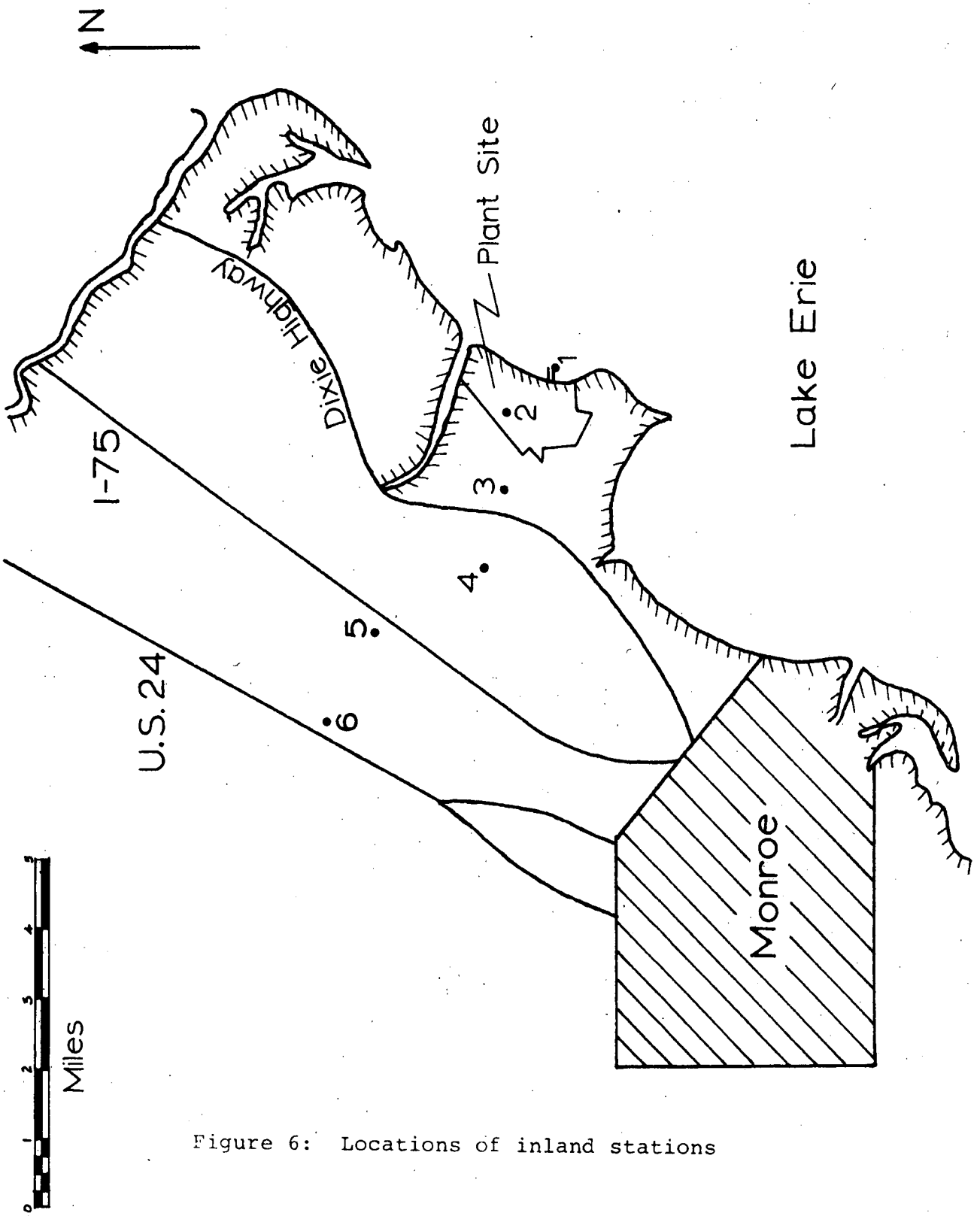

Figure 6: Locations of inland stations

field in the first week of November.

In 1971, temperature and humidity recordings began at all stations on 2 April. Wind systems were installed at a height of 10 meters at the end of the Fermi pier on 22 April and at a height of about 3.5 meters at the other 5 stations shortly thereafter. Recordings continued until the second week in November, when the equipment was removed except for that at Fermi and at the 0.8 and 1.5 mile stations. Wind, temperature and humidity recordings continued throughout the winter of 1971-72 at Fermi and at the 1.5 mile station. Only temperature and humidity were recorded at the 0.9 mile station. Except for missing data caused by the recorders stopping for several days during extremely cold weather, the wintertime records were quite complete.

By 17 April, 1972, all equipment had been reinstalled at the remaining stations with the exception of that at 4.5 miles, which was eliminated because of repeated incidents of vandalism. All wind measurements were made at a height of 10 meters.

Data processing

All wind, temperature, and relative humidity data from the inland stations were screened to determine lake breeze occurrences and the magnitudes of changes in these variables accompanying lake breeze frontal passages. For the screening process and data interpretation, it was necessary to have information available from weather maps as well as more detailed information on cloudiness and wind conditions far enough inland to be out of the influence of the

lake breeze. Observations of wind and cloudiness made on an hourly basis at the National Weather Service Station at Detroit Metropolitan Airport provided the detailed control station weather information, since the station is located about 19 miles northwest of Fermi. Daily weather maps provided other necessary information such as types and positions of fronts and sea level pressure distributions. With the above information, it was possible to distinguish changes in the variables measured at the inland stations which may have been caused by a large scale weather system from those which were caused by a lake breeze.

Prior to a screening of the data, each day was evaluated in terms of the likelihood of formation of a lake breeze, based on the above weather information. For reasons given below, there is a greater likelihood that a lake breeze will occur on a clear day with light winds than on an overcast day or on one with strong offshore winds. Because a shift in wind direction is the most reliable indicator of the passage of a lake breeze front, recordings of this variable were given special attention. The screening process consisted of monitoring and periodically noting average wind direction throughout each day as well as noting the times and magnitudes of significant wind shifts for each of the six stations. Recordings of temperature and relative humidity were then inspected for changes accompanying the wind shifts. In this way it was possible to determine both lake breeze occurrences and their penetrations inland.

Once the preliminary screening was completed, days with lake breezes were selected for more detailed data processing. It consisted of abstracting hourly averages of temperature, relative humidity, wind speed and direction for all stations as well as recording changes in these variables with each lake breeze frontal passage. For most lake breeze days, data were processed for the hours between 0600 and 1900 EST. Data for a total of 99 days between 30 April and 12 December 1971 were processed in this way.

In addition, hourly averages of all wind speed and direction data obtained at a height of 10 meters at the end of the Fermi I south pier were abstracted and tabulated, beginning with its date of installation, 22 April 1971 through December, 1971.

III FIRST RESULTS OF LAKE BREEZE STUDY

Meteorological changes caused by a lake breeze front

A lake breeze front moving inland along the western shore of Lake Erie causes the following simultaneous changes in the variables measured at each inland station:

(1) a decrease or leveling off of temperature

(2) an increase in relative humidity

*(3) a shift in wind direction to the southeast quadrant

(4) an increase in wind speed

Because the lake air is cooler than the land air, it displaces the land air as it moves inland. Vigorous mixing takes place in a transition zone along its leading edge. As a result of the mixing, changes in temperature and relative humidity in the transition zone usually decrease with increasing distance inland. At stations within about 3 miles of the shoreline, temperature decreases as much as 4F and relative humidity increases as much as 12 to 15% within a few minutes after the passage of a lake breeze front. At stations farther inland, however, temperature usually only levels off and humidity increases slightly.

If only temperature and relative humidity are measured, in fact, determining the passage of a lake breeze front at an inland station with any degree of certainty would be possible only if the sky were cloudless or if there were nearly uniform high cloudiness. The reason is that for the months when the frequency of occurrence of the lake breeze is greatest, shading of the sun by a large enough

*a southeast wind is air moving from the southeast

cumulus cloud passing over a station, for example, causes changes in temperature and humidity which are very similar to those caused by a lake breeze front. Of the variables measured at the inland stations, the most certain indicator of a lake breeze frontal passage is a wind shift. A well-defined lake breeze front moving inland along the western shore of Lake Erie causes a wind shift from a direction usually determined by the atmospheric pressure pattern on a synoptic scale to a direction between east and south.

In the discussion below, the wind speed and direction observed at stations outside the influence of the lake breeze, such as at Detroit Metropolitan Airport are called a gradient wind velocity, since they are determined, for the most part, by the horizontal gradient in pressure. Because the orientation of the shoreline in the vicinity of Fermi is approximately north-northeast to south-southwest, a gradient wind from any direction between southwest clockwise to north was considered to be in opposition to the onshore movement of the lake air and a wind from any direction between northeast clockwise to south in support of it.

In a typical lake breeze situation wherein lake air forces its way inland against a gradient wind, the wind shift first occurs at the Fermi station, usually between 0800 and 0900 EST and gradually moves inland. It was found that those lake breeze fronts which moved inland against a gradient wind as far as 6 miles moved with an average speed between 1 and 2 miles per hour.

An example of wind directions recorded at each of the 6 stations during a lake breeze situation on 8 August, 1971, is shown in Figure 7. The top record is for the Fermi site, and progressing downward, the records are for stations at distances of 0.8, 1.5, 3.0, 4.5, and 6.0 miles inland. Time increases from right to left and covers an interval from 0800 to 1600 EST. The numbers 0, 45, 90, 135, 180 . . . 360 printed on each chart are azimuth degrees (proceeding clockwise from north) from which the air is moving. Zero on the chart is the same as 360, or north. The occasional large swings of the wind direction trace across the entire width of a chart are caused by the wind direction fluctuations causing the wind vane contacts to swing back and forth across an electrical gap inherent in the construction of the vane's potentiometer. The gap was oriented to the north, so a variable north wind produces the trace described above.

The corresponding daily recordings of temperature and relative humidity for that week are shown in Figure 8. Temperature (^{o}F) is at the top and relative humidity (percent) is at the bottom of each record. Each scale division represents 2^{o}F in temperature and 2 percent in relative humidity. Time increases from left to right, with each vertical curved line on the chart representing 2 hours. The record for the Fermi station is at the top and that for the 4.5-mile station is at the bottom. The 6-mile station record is missing due to instrument malfunction.

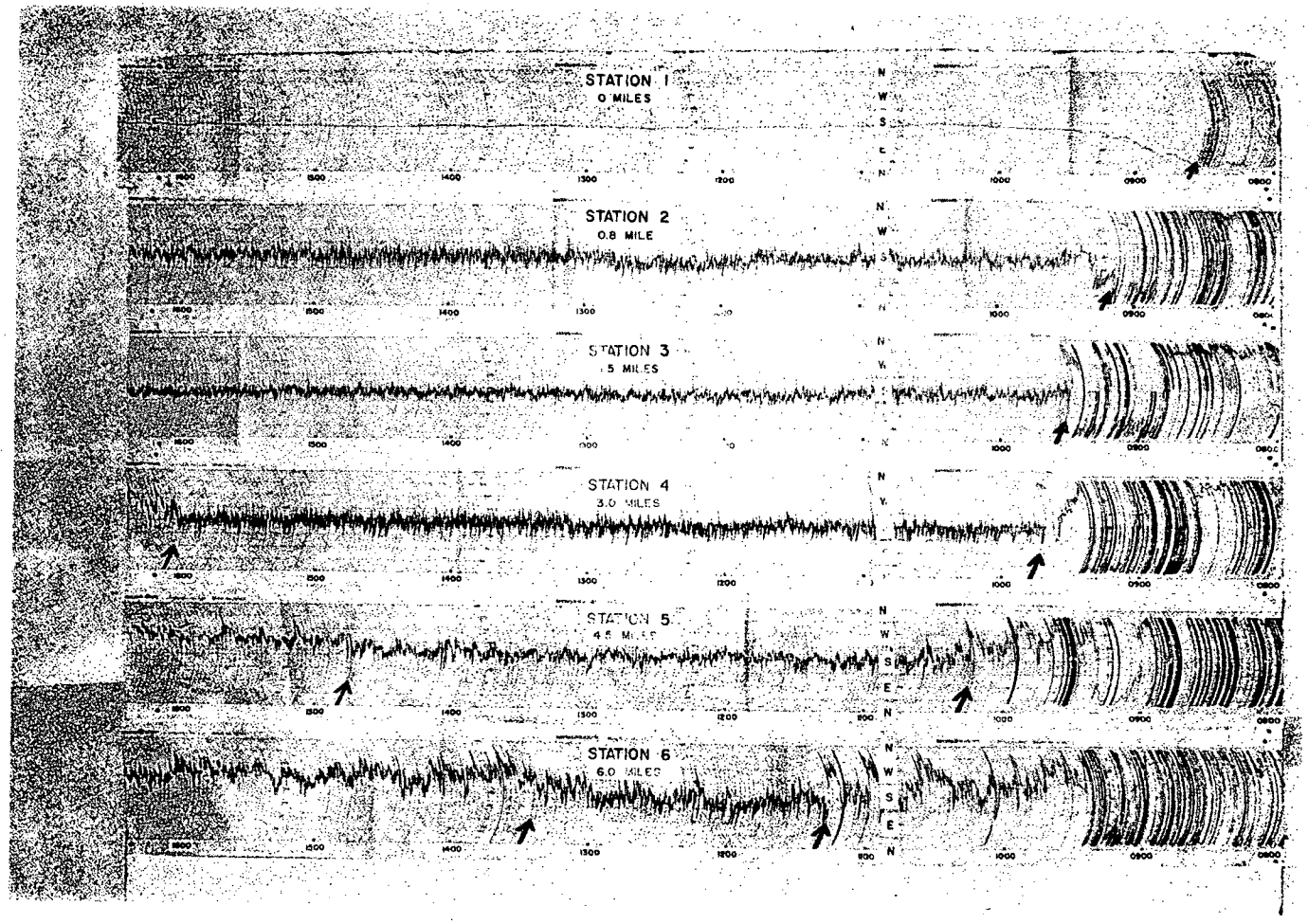

Figure 7. Wind direction recordings for 6 stations during a true lake breeze situation on 8 August 1971

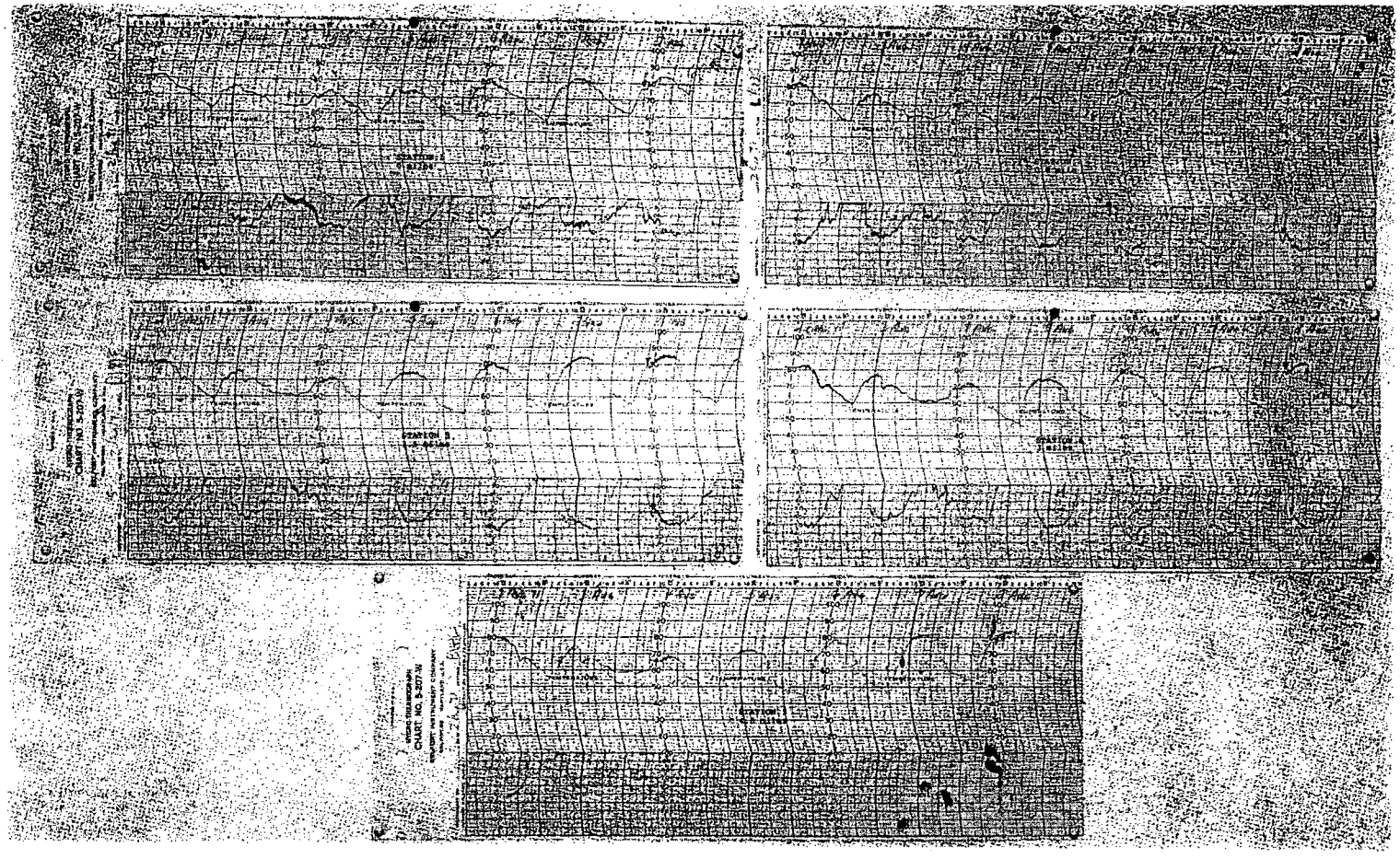

Figure 8. Temperature and relative humidity recordings for the week including the lake breeze situation on 8 August 1971

The weather map for 0700 EST on 8 August, 1971, is shown in Figure 9 . The pressure pattern is given by the solid lines and shows an area of high pressure centered over Ohio and West Virginia. A clockwise circulation around it is occurring, with wind speeds generally less than 5 mph. Based on the location of the high pressure area and a clockwise circulation around it, wind directions from a general southwesterly direction could be expected in southeast lower Michigan. By 1000 EST, average wind velocities at Detroit Metropolitan Airport and at Toledo Express Airport were west-southwest at 7 to 12 mph. They remained from that direction with speeds up to 14 mph throughout the day. The sky was cloudless, and the maximum temperature inland reached 90F at Detroit and 85F at Toledo. The average of 4 water temperatures measured on 8 August at the Fermi water intake was 70F.

A lake breeze front passed Fermi at 0836 EST as indicated by an abrupt wind shift from about 340 degrees to 045 degrees, then gradually to 165 degrees or south southeast by 1000 EST. A 2F temperature drop and a 10% increase in relative humidity accompanied its passage. It passed the 0.8 mile inland station at 0910, the 1.5 mile station at 0936, and the 3 mile station at 0950 with similar wind shifts and changes in temperature and humidity. It passed the 4.5 mile station at 1020 EST, where a wind shift provided the only certain indication of its passage. The fact that temperature only leveled off for a short time before continuing to increase slowly, and humidity increased only about 3% was an indication of the modification taking place in the lake breeze frontal

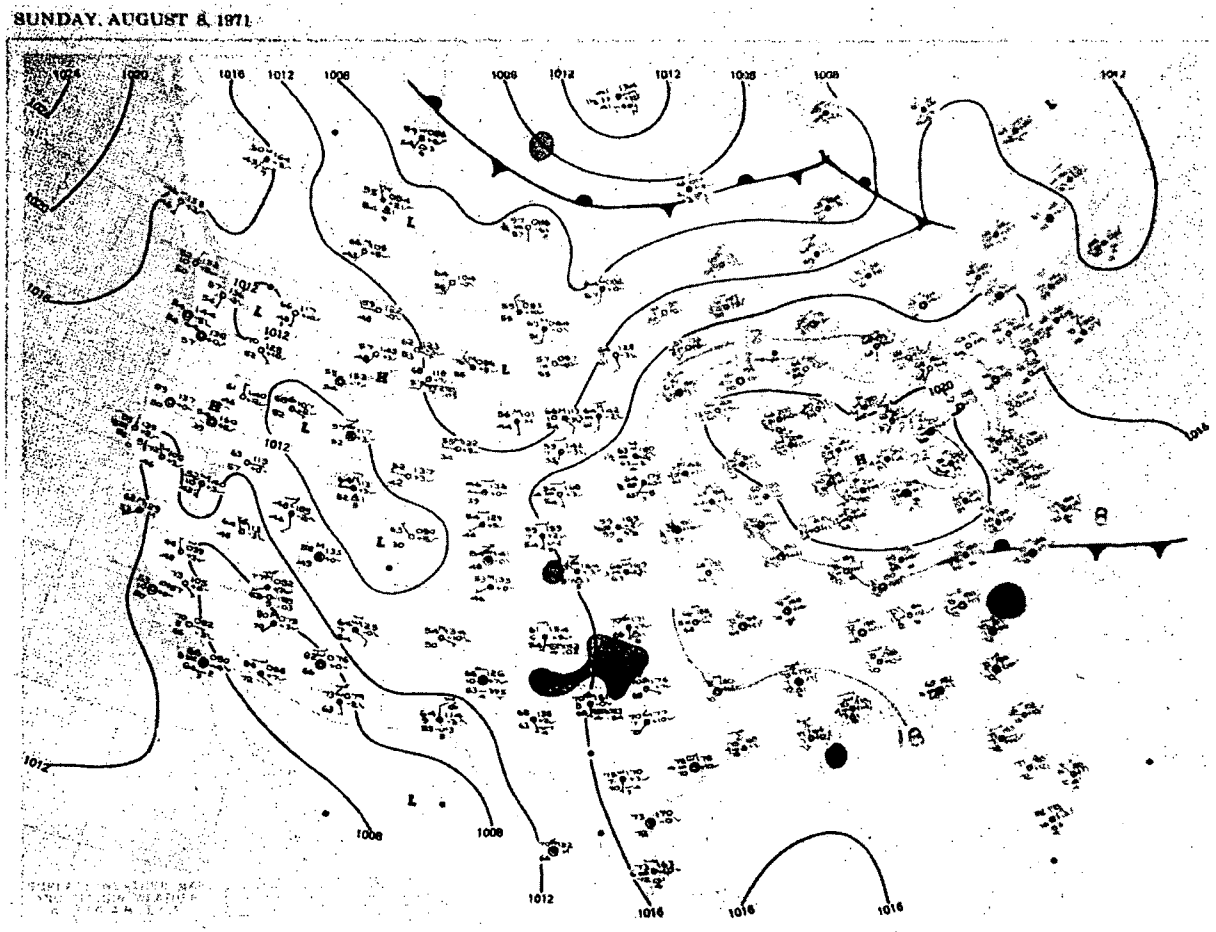

Figure 9. Weather map for 8 August 1971

zone. At 1122 EST, it passed the 6-mile station, but as discussed below, it is evident from the characteristics of the wind direction trace that this distance was near the maximum inland penetration of the lake air.

Between about 1300 and 1330 EST at the 6-mile station a wind shift from 180 degrees back to about 250 degrees occurred, indicating that the southwesterly gradient wind mentioned above was forcing the lake air to retreat lakeward. Accompanying the wind shift was a slight increase in temperature and a decrease in humidity as the warmer and drier land air again moved back over the station. The land air continued to force its way lakeward and moved past the 4.5 mile station at about 1500 EST, causing a wind shift from 180 to about 240 degrees and temperature and humidity changes similar to those observed at the 6-mile station. It passed the 3-mile station at 1620 and produced marked changes in temperature and humidity as well as in wind velocity. Within half an hour after the land air displaced the lake air at this station, the temperature rose from 84 to 88F and relative humidity dropped from 52 to 36%. There is some indication that it passed the 1.5 mile station at about 1800, but by this time of day, the ground was cooling rapidly and the discontinuity in temperature and moisture between land and lake air was rapidly losing its identity.

Of the 65 days in 1971 that had a lake breeze which moved inland when the average gradient wind was between southwest and north, 16 days were similar to the example given above in that lake air was forced to retreat after having moved some distance inland. Of

the 16, 11 were forced back to the lake itself. Of the remaining 5, lake air retreated to between 1 and 1.5 miles from the lake and lost its identity as cooling of the land took place late in the day. Of the 33 occurrences in 1972, 5 were forced back to the lake.

The example described above was a true lake breeze in that the air over land became warm enough in contrast to the colder air over water to set up the pressure distribution needed for the lake air to move inland in opposition to the gradient wind. On some days, however, the synoptic scale pressure pattern in itself produces an onshore gradient wind. In these situations, significant enhancement of the onshore flow occurs if the sky condition is similar to that which in itself leads to the formation of a true lake breeze. As might be expected, a complete absence of cloudiness is the most effective sky condition for this to occur because it results in maximum heating of the land, but a significant enhancement can also occur with scattered to broken cloudiness. There is no discernible enhancement if the sky is completely overcast.

By enhancement is meant that changes in temperature, humidity and wind speed similar to those discussed in the above example move inland with approximately the speed of the onshore wind, but unlike the example, any wind shift is usually small. Because of the breakdown of the wind shift criterion, determining the front's movement inland for any sky condition other than for a cloudless one or one with uniform high cloudiness is difficult, since, as mentioned above, certain types of variable low cloudiness can produce temperature and humidity changes similar to those caused by a

passage of a lake breeze front.

A typical sequence of events with lake breeze enhancement is

(1) light and variable winds early in the morning.

(2) a wind shift to a direction between northeast and south which, unlike a true lake breeze, is nearly simultaneous at all stations and is accompanied by a slight increase in wind speed, usually between 0700 and 0800 EST.

(3) a subsequent drop in temperature and an increase in relative humidity which moves inland.

Unlike the true lake breeze which forces its way inland against a gradient wind and whose inland penetration is limited as a result, it is a rule rather than an exception for the discontinuity in temperature and moisture to move inland at least 6 miles, diminishing in magnitude as it does so.

An example of an enhancement of an onshore gradient wind occurred on 10 June 1971. The onshore gradient wind itself was caused by the synoptic pressure pattern shown on the 0700 EST weather map in Figure 10 . A prominent feature of the map is a large area of high pressure centered in Canada northeast of Georgian Bay. A clockwise wind circulation around it is causing onshore winds along the western shore of Lake Erie. Wind speeds as given on the map are light, but they increased with time of day and by 1000 EST they were easterly at 12 mph at Detroit Metropolitan Airport and east northeast at 12 mph at Toledo Express Airport. The sky was cloudless throughout the day and maximum temperatures reached 73F at Detroit

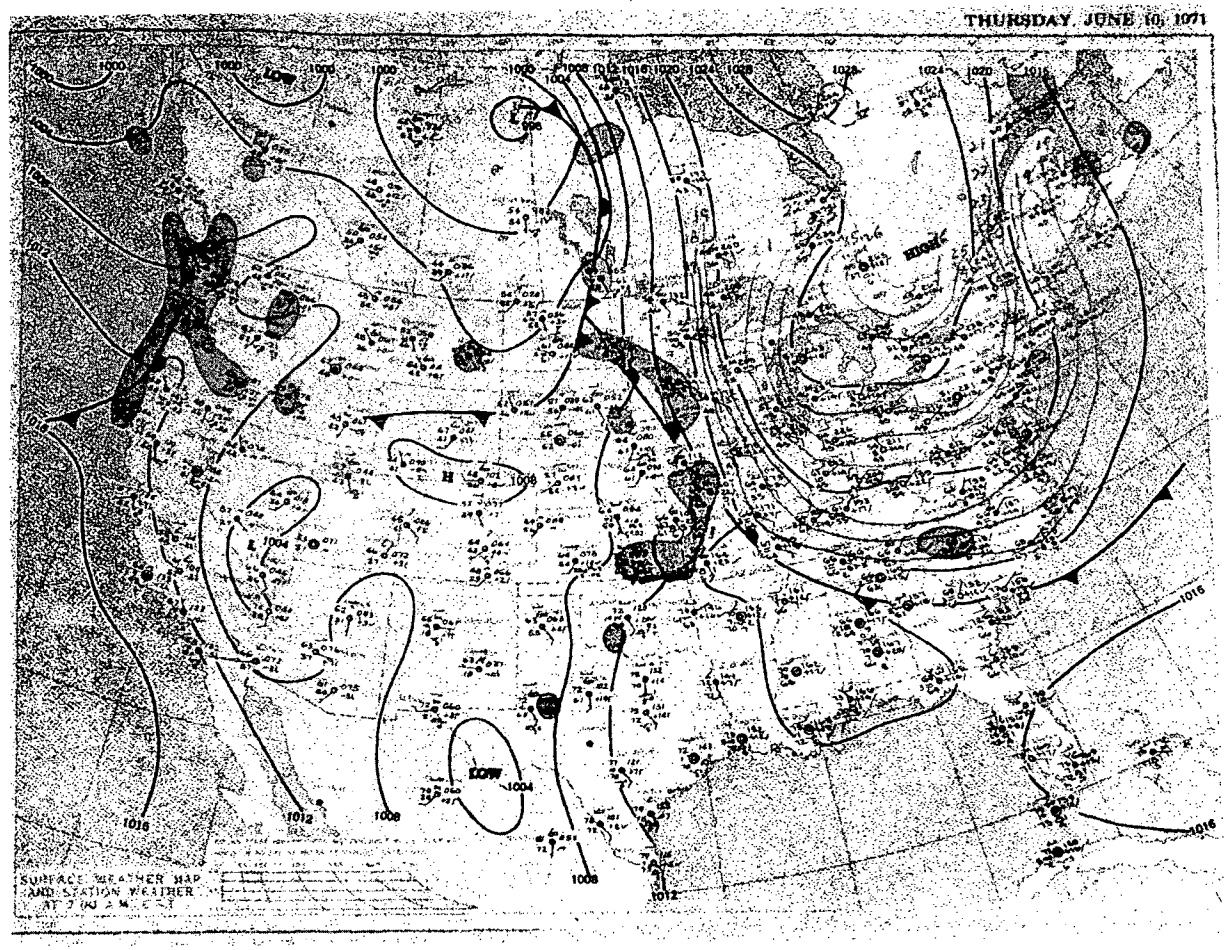

Figure 10. Weather map for 10 June 1971

and 74F at Toledo. The average water temperature at the Fermi intake was 63F.

The wind direction recordings for the inland stations are shown in Figure 11 . They are arranged similarly to those in Figure 10 , with the Fermi record at the top and the 6-mile station record at the bottom. The corresponding recordings of temperature and relative humidity are shown in Figure 12 .

At all stations except Fermi, average wind directions were northerly through the night. The Fermi wind direction remained east northeast. Wind directions at all stations shifted to east northeast between 0700 and 0800 EST and gradually to east southeast by 1300 EST. Average speeds increased from about 3 to 6 mph between 0700 and 0800 EST and gradually to 10-15 mph by 1000 EST.

Accompanying the initial wind shift at each station was a leveling off of temperature and an increase in relative humidity. The most pronounced increase in humidity occurred within 4 miles of the shoreline. A second major increase in humidity occurred between about 1200 and 1300 EST at all stations. It was likely due to a gradual shift in wind direction to east-southeast, since air moving from this direction has a longer fetch over water than an east wind and therefore contains more moisture when it moves inland in the vicinity of Fermi.

Frequency of occurrence and penetration inland

A study was made of the number of occurrences of the lake breeze for June through October, 1970, for April through December, 1971, and for January through September, 1972. As mentioned above, before

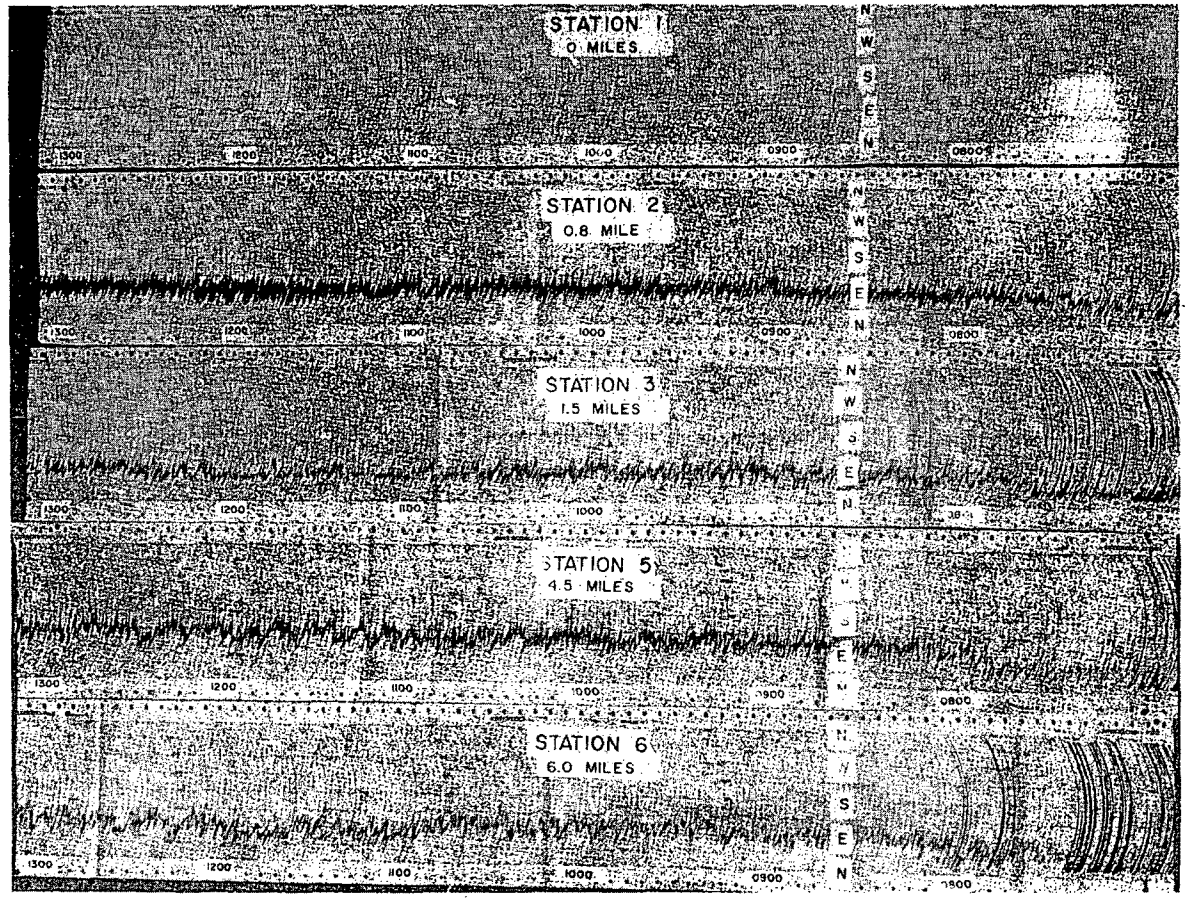

Figure 11. Wind direction recordings for 6 stations during lake breeze enhancement on 10 June 1971

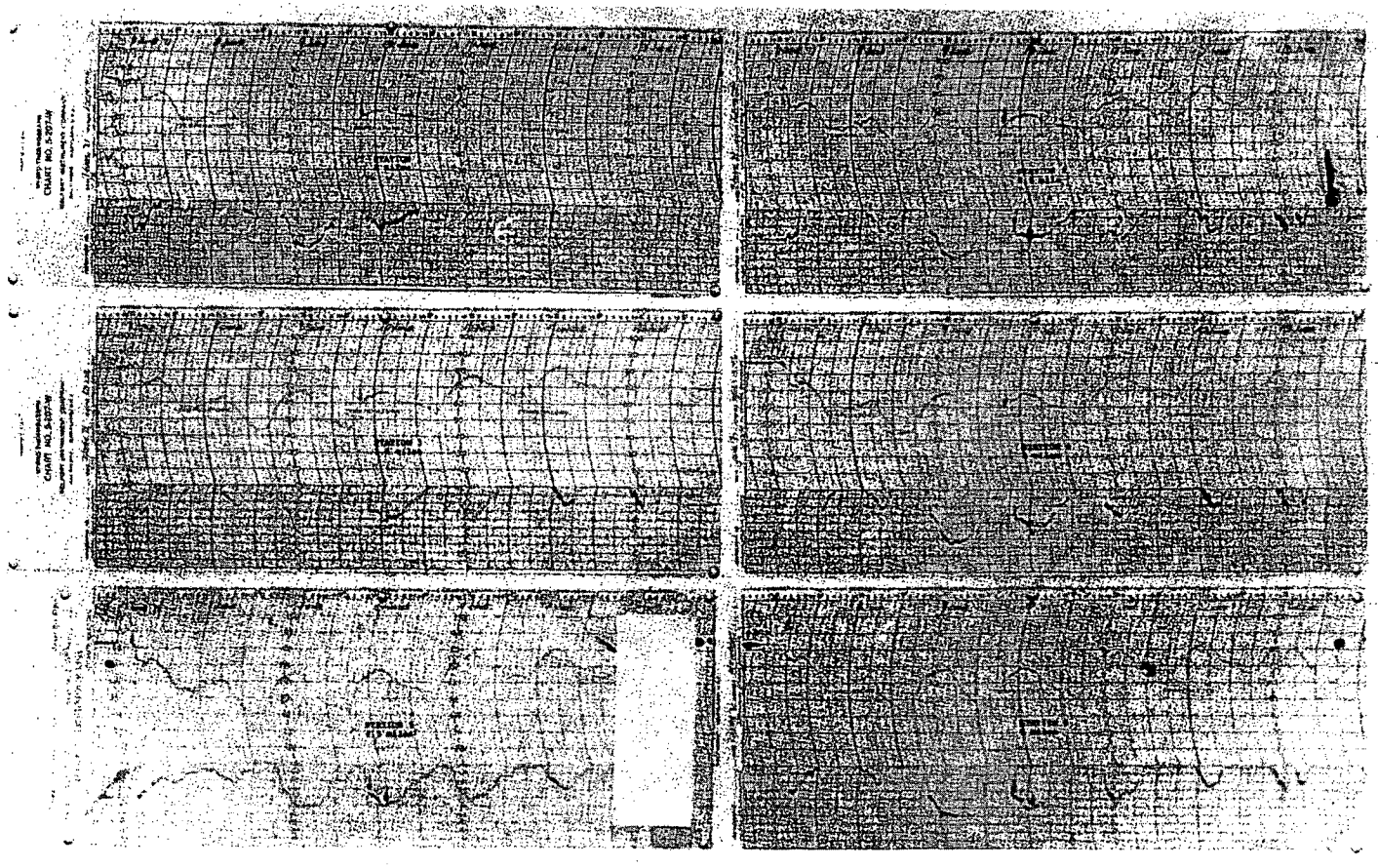

Figure 12. Temperature and relative humidity recordings for the week including lake breeze enhancement on 10 June 1971.

13 July 1970, lake breeze occurrences and their movements inland were determined only on the basis of recordings of temperature and humidity evaluated with respect to information from daily weather maps and hourly observations of cloudiness and wind velocities at Detroit Metropolitan Airport. After 13 July they were based, in addition, on recordings of wind velocity at the 1.5-mile station.

In 1971, temperature and humidity recordings began at all stations on 2 April. Wind systems were installed at the end of the Fermi I south pier on 22 April and at the other stations shortly thereafter. The 1971 study of lake breeze characteristics, then, was based on measurements of wind, temperature, and humidity at 6 stations through November and at 3 stations (0, 0.8 and 1.5 miles) thereafter. The 1972 study was based on measurements at 5 stations, beginning in April. A sixth station, that at 4.5 miles inland, had to be decommissioned because of repeated incidents of vandalism.

Results of the study are summarized in Table 1 and Table 2. Table 1 lists occurrences by month for 1970, 1971, and 1972 for all gradient wind directions. It includes occurrences of the type of lake breeze whose movement inland was enhanced by an onshore gradient wind as well as the true lake breeze which moved inland in opposition to a gradient wind or a component of it.

Table 2 lists only occurrences of the latter. Listed also is a breakdown of occurrences reaching various distances inland. The percent of occurrences at these distances is shown graphically in Figure 13.

To generalize from these results, of the occurrences of a true lake breeze, (1) over half move at least 6 miles inland, (2) about

Table 1

Lake breeze occurrences for all gradient wind directions

Month	Occurrences		
	1970	1971	1972
Jan.	no data	no data	1
Feb.	no data	no data	1
Mar.	no data	no data	7
Apr.	no data	11	11
May	no data	18	15
Jun.	16	20	5
Jul.	13	14	11
Aug.	17	20	12
Sep.	8	11	9
Oct.	5	7	6
Nov.	no data	4	1
Dec.	no data	1	0
TOTAL	59	106	79

Table 2

Lake breeze occurrences in opposition to a gradient wind

Month	Occurrences			Total	Distances moved inland (miles)				
	1970	1971	1972		<0.8	0.8-1.5	1.5-3	3-6	>6
Jan.	no data	no data	1	1		1			
Feb.	no data	no data	1	1		1			
Mar.	no data	no data	4	4			4		
Apr.	no data	7	4	11				4	7
May	no data	8	4	12				4	8
Jun.	12	13	2	27			4	9	14
Jul.	13	10	6	29	1	2		10	16
Aug.	15	18	6	39	1	2	1	13	22
Sep.	2	7	5	14		1	1	2	10
Oct.	1	2	2	5		1			4
Nov.	no data	3	0	3			2		1
Dec.	no data	1	0	1			1		
Total	43	69	33	147	2	8	13	42	82
		Percent			1.4	5.4	8.8	28.6	55.8

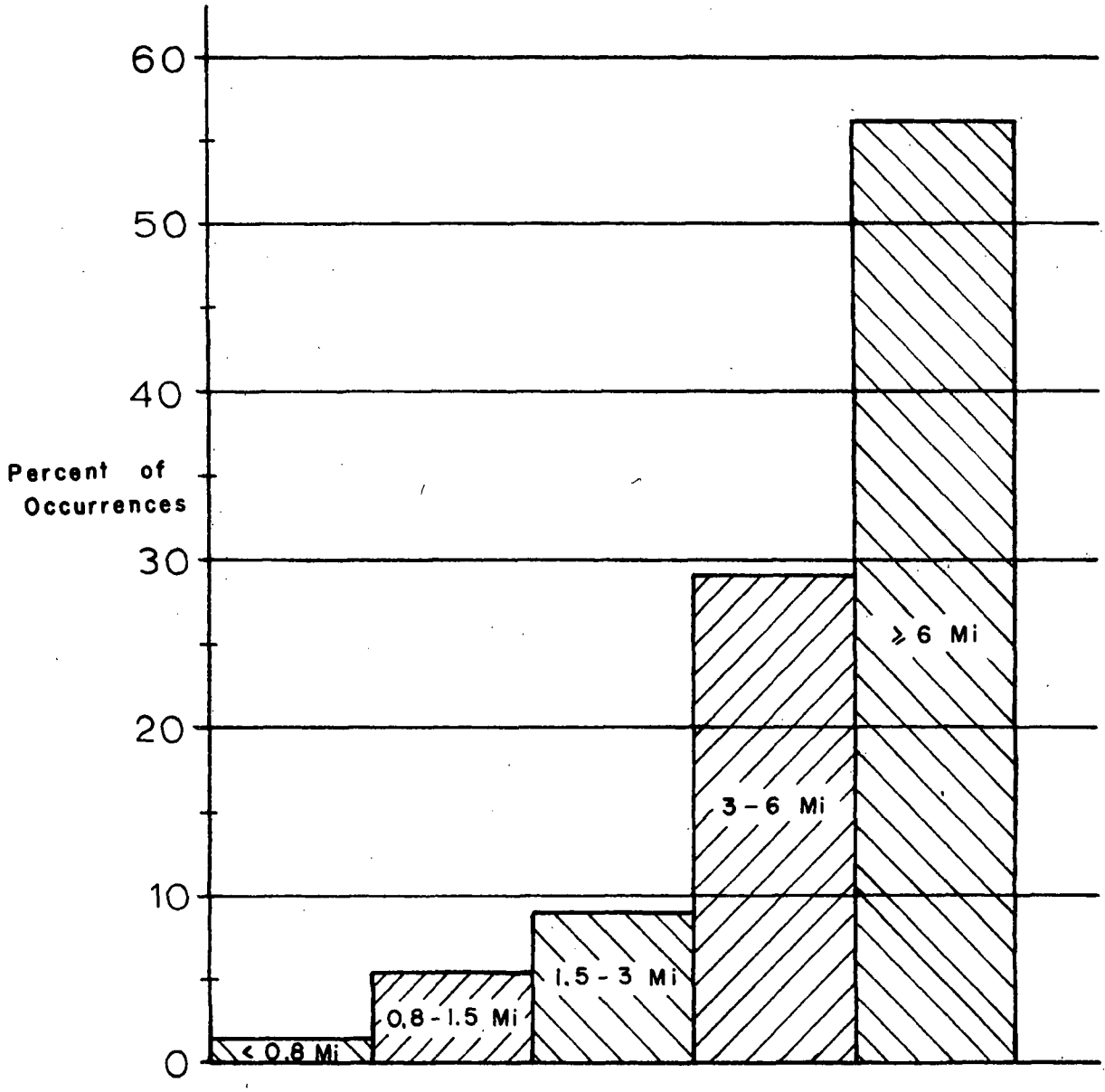

Figure 13. Percent of occurrences of lake breezes at various distances inland.

one out of three move past 3 miles but not as far as 6 miles, (3) about one out of ten more past 1.5 miles but not as far as 3 miles, (4) about one out of twenty move past 0.8 miles but not as far as 1.5 miles, and (5) about one out of one hundred do not move inland more than 0.8 mile.

IV WIND DIRECTION FLUCTUATIONS

Tests of the relationship of standard deviation to range

The standard deviation of fluctuations in horizontal wind direction has been shown to be a reliable index of dispersion (Hay and Pasquill, 1959 and Cramer Record, and Vaughn 1959). Only recently, however, has electronic equipment been developed to measure this parameter directly and accurately on a continuous basis. Standard deviation circuits were recently designed and built for the Fermi study. Because past recordings of wind direction exist for the Langton station, for which it was desirable to obtain standard deviations, a study was made of a method described by Markee (1963) of obtaining estimates of standard deviation from the range of wind direction fluctuations. The range is readily obtainable from the total width of a direction trace over some given time interval. According to his method, dividing the range by 6 gives a good approximation of the standard deviation.

The purpose of the tests was to determine if the factor 6 was valid for the sensor-translator-recorder systems in use at the inland stations described above. In particular, wind direction standard deviation data for the Langton station, located 0.8 mile inland within the plant site boundary were of special interest. The tests were designed to determine how wind direction standard deviations, computed from ranges obtained at a chart speed of 6 inches per minute (ipm), compared with those obtained from recordings made at 6 inches per hour (the normal recording speed at the station).

Prior to the field tests, laboratory tests were conducted with the Esterline-Angus Model 601C recorder used for wind direction recording to determine its response to a fluctuating signal. A sinusoidal input signal of $\pm$0.4 volts was fed into the recorder at frequencies of 0.05, 0.1, 0.25, 0.5, 0.75, 1.0, and 2.0 Hertz for chart speeds of 1.5, 3, 6, and 12 ipm. Ranges were computed for each frequency and chart speed. The results are shown in Figure [14] . Range in degrees is the ordinate and frequency in Hertz is the abscissa. It is evident from the figure that

(1) at frequencies up to 1 Hertz, the faster the chart speed, the larger the range indicated, and

(2) at frequencies greater than about 1 Hertz, the ranges are the same for all chart speeds.

The field tests were conducted by connecting the above recorder running at a chart speed of 6-ipm in series with a permanent one running at the normal year-round speed of 6-iph. Both recorders were connected to the same sensor-translator system at the Langton station, where wind speed and direction recordings at a height of 10 meters were begun in 1971.

Tests were conducted between the hours of 1200 and 1500 EST on 23 and 31 May, 1972. On 23 May, the site was under the influence of onshore flow associated with a lake breeze. The sky was clear, the temperature was about 82F, and the average wind speed was about 5 mph. On 31 May, there were offshore winds averaging 9 mph, there was a 1200-foot overcast, and the temperature was about 48F.

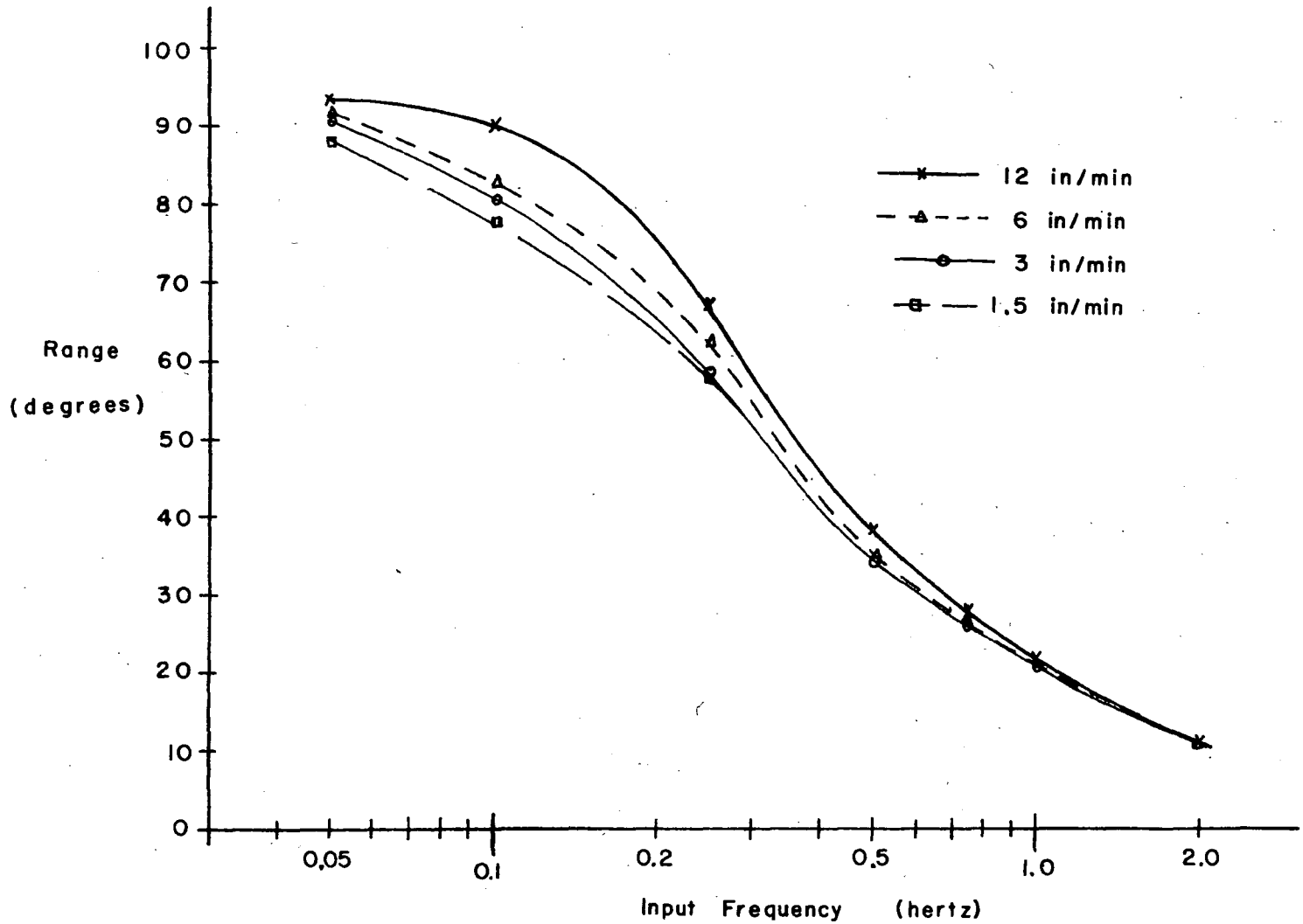

Figure 14. Response of Esterline-Angus Model 601C recorder for various chart speeds.

Values of wind direction for the 6-ipm chart speed were abstracted for every second for one hour of each test and were punched on computer cards for processing. Means, extremes, and standard deviations were computed for consecutive 10-minute intervals. Values of the range divided by their respective standard deviations were also computed for each 10-minute period. For the 6-iph record, values of the range were abstracted for the same consecutive 10-minute periods. Because of the greater resolution of the 6-ipm recordings and consequently more nearly accurate results, they became the standards to which the 6-iph results were compared.

A graph of the ratio of range to standard deviation versus range for the 6-ipm chart speed is shown in Figure 15 . Values of the range vary from 44 to 78 degrees and values of the ratio vary from 4.6 to 7.2. The mean of all ratios is 5.8. To test the applicability of this result to the 6-iph data, each range obtained for the 6-iph data was divided by the corresponding 6-ipm standard deviation and plotted against the 6-iph range values. The results are shown in Figure 16 . Values of range vary from 50 to 74 and values of the ratio vary from 4.8 to 7.4. The mean of all ratios is 5.9.

In each figure there is some indication that the ratio increases with increasing range, but the scatter of points around 6 is evident for the ranges covered by the tests. It was concluded that dividing the range of the fluctuations by 6 would give reliable estimates of standard deviation for the wind systems used.

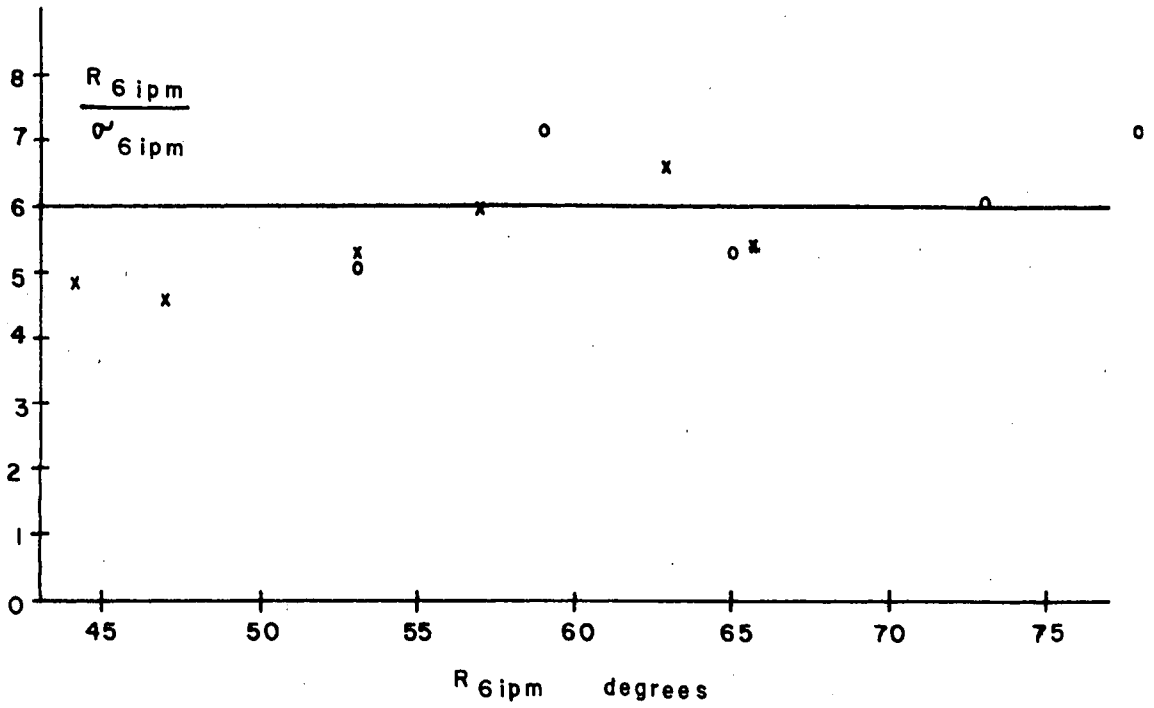

Figure 15. Ratio of wind direction range to standard deviation versus range for 6-ipm chart speed

o 23 May 1972

x 31 May 1972

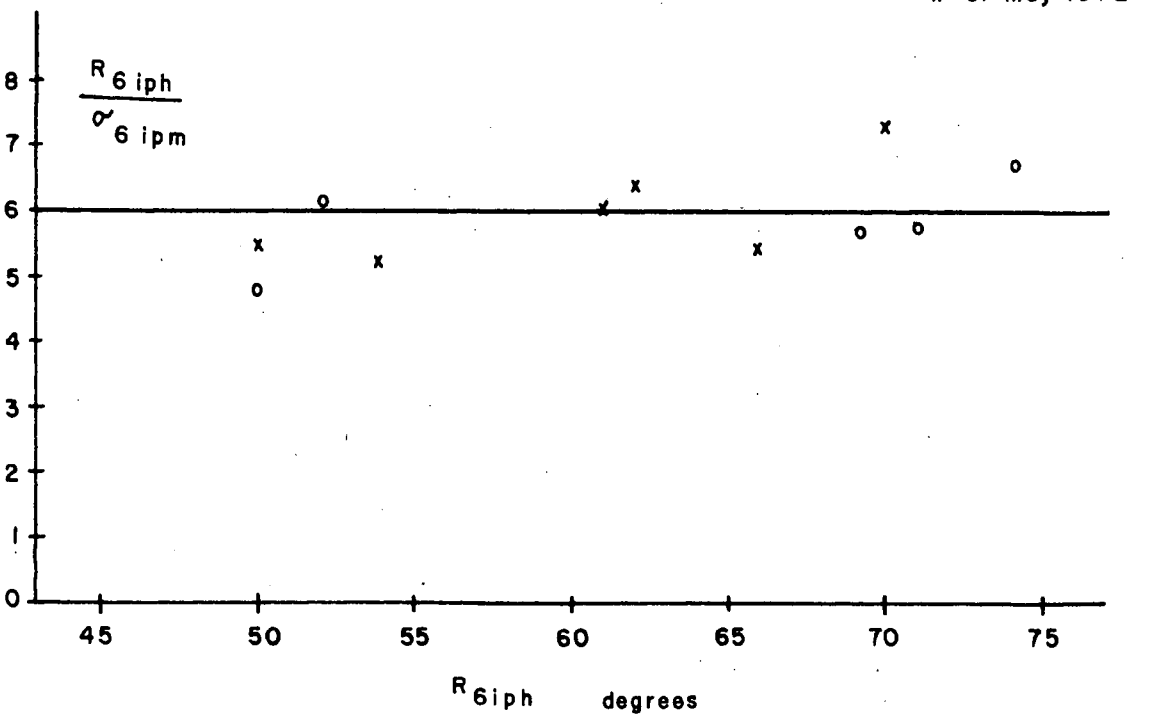

Figure 16. Ratio of wind direction range for 6-iph chart speed to standard deviation for 6-ipm chart speed versus range for 6-iph chart speed

Standard deviation of wind direction in lake breezes

For the period between 26 April and 30 October 1972, 51 days for which either a true lake breeze of lake breeze enhancement was observed were selected for a study of wind direction fluctuations in relation to wind speed. Daytime data from the Langton station were used. Each of the lake breeze days had either a small amount of cloudiness or none at all, so there was a strong likelihood that unstable lapse rates variable in magnitude prevailed in the first few meters.

Wind direction recordings were processed in terms of 10-minute values of range for hourly averages of wind speed and direction. Computations of standard deviation were made by dividing the range by 6. Hourly values of standard deviation were obtained by averaging each set of six 10-minute values. A graph of σ_{10} versus the 10-meter wind speed is shown in Figure 17. The points are about 460 hourly averages of both variables. Pasquill categories in terms of ranges of σ_{10} are labeled and shown by vertical line segments on the abscissa.

It is evident from the scatter of points that an expected decrease of σ_{10} with an increase in wind speed, such as the observed by Singer and Smith (1966) is not indicated. Their data, however, were obtained at a height of 108 m, where surface roughness effects on σ are significantly less than at 10 m. The scatter of values of σ_{10} decreases markedly at wind speeds greater than about 7.5 mph. Above this speed, values are confined to a range between 8 and 13 degrees, which is in the Pasquill C and D categories. About 75% of the values of σ_{10} for all wind speeds in lake breeze situations, in fact, were within this range.

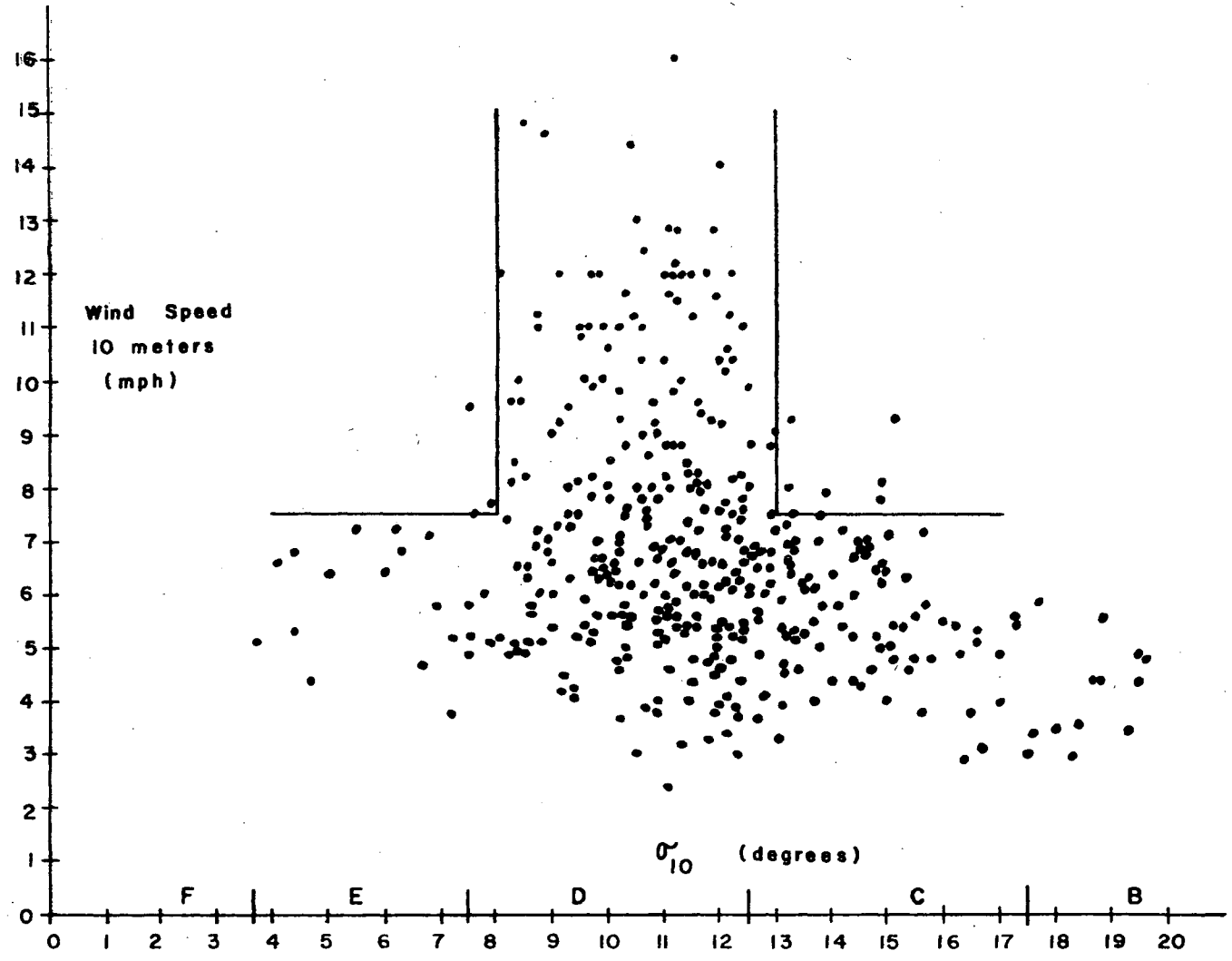

Figure 17. Standard deviation of wind direction at 10 meters versus wind speed for lake breeze situation at 0.8 miles inland. (Capital letters are Pasquill categories).

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Cramer, H.E., F. A. Record, and H. C. Vaughn, 1959: The study of the diffusion of gases or aerosols in the lower atmosphere. Final Report Contract No. AF19(604-3460), Dept. of Meteor., Mass. Inst. of Technology.

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Attachment 6
NRC3-09-0016

Response to RAI letter related to Fermi 3 ER

RAI Question AQ5.3.3.1-1

NRC RAI AQ5.3.3.1-1

Provide information on the four-cell MDCT (similar to that for the NDCT in ER Table 5.3-17) including the typical number of hours per year in operation.

Supporting Information

Detailed information and impact analysis for the NDCT were provided in the ER. Similar information is needed for the MDCT. Even though the MDCT will be operating intermittently, capacity and typical operation patterns are needed for completeness of the impact analysis.

Response

The area of review in NUREG-1555, Section 5.3.3.1, Part I states:

> "This environmental standard review plan (ESRP) directs the staff's consideration of vapor plumes from heat-dissipation systems that may have physical or aesthetic impacts due to the increased moisture and chemical content of the air, the nature and extent of these increases, and the significance of their potential environmental impacts to man's activities in the site vicinity."

The operation, impact, and significance of the Auxiliary Heat Sink (AHS) mechanical draft cooling tower (MDCT) are summarized in Environmental Report (ER) Section 5.3.3.1:

> "In addition to the UHS and NPHS, Fermi 3 will include an Auxiliary Heat Sink (AHS) which will utilize small linear mechanical draft cooling towers to dissipate heat from the Plant Service Water System typically during plant shutdown conditions. However, the heat dissipated by the significantly smaller AHS cooling towers would be orders of magnitude less than the heat dissipated by the NPHS cooling tower. Accordingly, the environmental impact associated with the AHS cooling towers operating in conjunction with the NPHS cooling tower or alone is bounded by the NPHS cooling tower analysis presented in the remainder of this subsection. The NPHS cooling tower analysis uses design conditions which produce the most limiting heat-discharge system environmental impacts."

ER Section 5.3.3.1 analyzes the environmental impacts of heat dissipation to the atmosphere resulting from the vapor plume emitted by the natural draft cooling tower (NDCT) for the Normal Power Heat Sink (NPHS) using design conditions which produce the bounding heat-discharge system environmental impacts. The bounding condition for heat dissipated from the NDCT is a combination of the heat added to the Circulating Water System (CIRC) and the Plant Service Water System (PSWS). Heat can be rejected from the PSWS through either the NDCT or

MDCT. The MDCT is designed for continuous operation. At a minimum, the MDCT is used when the NDCT for the NPHS is either unavailable or unable to supply water at a temperature less than or equal to 88°F (31.1°C). For example, the MDCT would be used during a refueling or maintenance outage, which is approximately 30 days per year (720 hours per year).

The MDCTs for the AHS have a maximum heat rejection load of approximately 80 MW from the PSWS during normal operation and 112 MW during cooldown operations per Table 9.2-1 of ESBWR DCD Tier 2, Chapter 9. As identified in the response to RAI AQ3.6.3-1 in Detroit Edison letter NRC3-09-0013 (ML092400475), dated August 25, 2009, a representative MDCT is model number CFF-423630-4I-30, provided by Cooling Tower Depot. The following information is available for this tower.

Parameter	Mechanical Draft Cooling Tower
Number of Towers	2
Number of Cells	4
Tower Height	30 feet (1)
Stack Height	6 feet (1)
Total Water Flow Rate	40,000 gpm
Drift Loss Rate	0.005% of Water Flow Rate
Air Flow Rate	1,010,170 ACFM per fan
Number of Fans	4
Total Heat Rejection Rate	90 MW
Evaporation Loss	2.28% of Water Flow Rate (1)

(1) Values are based on a non-plume abated tower. As described in FSAR Table 9.201, the MDCT will be plume abated.

FSAR Table 9.2-201 indicates that the MDCTs will be plume abated. Plume abated towers are designed to significantly reduce both the density and persistency of vapor plumes. The NDCT heat rejection from the CIRC system is 3057 MW based on the design heat duty of the main condensers per Table 10.4-1 of ESBWR DCD Tier 2, Chapter 10. The bounding heat rejection rate of the NDCT used in the analysis is shown in ER Table 5.3-17 to be 3142 MW, which is greater than the 3137 MW combined heat load contributions of the PSWS and CIRC. Therefore, given the order of magnitude difference in heat-dissipation between the NDCT and MDCT, the design analysis conditions for the NDCT bound the normal operation design conditions of the MDCT. Therefore, the vapor plume environmental impacts of the MDCT are enveloped by the bounding design conditions used for the analysis of the vapor plume impacts of the NDCT.

Proposed COLA Revision

None

Attachment 7
NRC3-09-0016

Response to RAI letter related to Fermi 3 ER

RAI Question CR4.1.3-4

NRC RAI CR4.1.3-4

Provide a document outlining standard procedures that Detroit Edison would follow in the event that unanticipated archaeological resources or human burials are identified during construction, including procedures required by applicable State and Federal laws for human burials.

Supporting Information

Information included in this documentation will be used to complete the NEPA analysis and to support compliance with the Section 106 process.

Response

Based on surveys conducted, with the exception of those related to Fermi 1, there are no identified historical, archaeological, or cultural resources within the areas impacted by the construction of Fermi 3 on the Fermi site which qualify for NRHP eligibility. The results of the surveys are published in the report, "Phase I Cultural Resources Evaluation of the Fermi Atomic Power Plant Unit 3 (Fermi 3) Projects, Frenchtown and Berlin Townships, Monroe County, Michigan", July 2008, which was provided in the response to RAI CR4.1.3-6 in Detroit Edison letter NRC3-09-0010 (ML091940218), dated June 19, 2009. The Enrico Fermi 1 power plant was evaluated for its eligibility to be included within the National Registry of Historic Places. A report titled "Preliminary National Register of Historic Places Evaluation for The Enrico Fermi Atomic Power Plant Monroe County, Lagoona Beach, Michigan" was provided in the response to RAI CR4.1.3-9 in Detroit Edison letter NRC3-09-0013 (ML09240075), dated August 25, 2009.

The procedure(s) or similar guidance necessary to address the steps that Detroit Edison and its contractors will follow upon unanticipated discovery of archaeological resources or human burials during construction activities will be in place prior to beginning invasive construction activities (e.g. preliminary site work, excavation, grading, etc.) under the COLA for the Fermi 3 power plant.

These procedure(s) or similar guidance will reflect the following protective measures:

1. If during excavation or other construction activities any previously unidentified or unanticipated historical, archaeological, and cultural resources are discovered or found, all activities that may damage or alter such resources will be temporarily suspended. Examples of such resources include: any human skeletal remains or burials; artifacts; shell, midden, bone, charcoal, or other deposits; rock alignments, pavings, wall, or other constructed features; or any indication of agricultural or other human activities older than 50 years.

2. Upon such discovery or find, stop work immediately and notify the EPC Executive or his representative (see FSAR Section 13AA.1.9) so that the appropriate authorities may be notified and a determination made as to the significance of the discovery and what, if any, special disposition of the finds should be made.
3. Cease all activities in the area that may result in impact to or the destruction of these resources.
4. Secure the area and prevent employees or other persons from trespassing on, removing, or otherwise disturbing such resources.
5. Treat any human or skeletal remains with dignity and respect at all times.

References:

1. Unified Facilities Guide Specifications (UFGS), "Historical, Archaeological, and Cultural Resources," UFGS 01 57 20.00 10 Environmental Protection, Section 3.9.

2. National Historic Preservation Act of 1996 (16 UCS 470)

3. 36 CFR Part 800, "Protection of Historic Properties"

Proposed COLA Revision

None

Attachment 8
NRC3-09-0016

Response to RAI letter related to Fermi 3 ER

RAI Question HH5.4.2-2

NRC RAI HH5.4.2-2

Provide a description of the methodology used to calculate doses for the general population, and the population average input values that were used. Provide the consumption/usage rates used in dose calculation for population.

Supporting Information

In Section 5.4.1.2 on page 5-108 of the ER it states that the input parameters for the gaseous pathway are presented in Table 5.4-3. Table 5.4-3 does not appear to contain information on consumption/usage rates for the population. ER Table 5.4-2 lists annual consumption/usage rates for MEI for liquid and gaseous pathways, but is not discussed in the text. Population average values are different from these and are not shown.

Response

Environmental Report (ER) Section 5.4.3 describes the radiological impacts to the general population from liquid and gaseous effluents. As stated therein, the analysis for the general population is performed using the methodologies and parameters specified in Subsection 5.4.1. ER Section 5.4.1 indicates that the analysis is performed using analytical methods based on NRC Regulatory Guide (RG) 1.109, "Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10 CFR 50, Appendix I."

Consumption and usage rates for both the Maximum Exposed Individual (MEI) and the general population are taken from RG 1.109, Tables E-5 and E-4, respectively. The consumption and usage rates for the MEI are included in ER Table 5.4-2, with a footnote indicating that default values from RG 1.109 are used.

For clarity, ER Table 5.4-2 will be modified to include the consumption and usage rates for the average individual. The footnote for ER Table 5.4-2 will apply to the consumption and usage rates for the average individual. In addition, Table 5.4-1 and Table 5.4-3 will be modified to delete "MEI" before "Consumption/Usage Rates" consistent with the change to Table 5.4-2.

Proposed COLA Revision

ER Table 5.4-1, Table 5.4-2, and Table 5.4-3 will be revised as shown in the attached markups to clarify dose estimates.

Markup of Detroit Edison COLA
(following 4 pages)

The following markup represents how Detroit Edison intends to reflect this RAI response in a future submittal of the Fermi 3 COLA. However, the same COLA content may be impacted by revisions to the ESBWR DCD, responses to other COLA RAIs, other COLA changes, plant design changes, editorial or typographical corrections, etc. As a result, the final COLA content that appears in a future submittal may be different than presented here.

Table 5.4-1 Liquid Pathway Input Parameters

Parameter	Value
Release Source Term	Refer to Subsection 3.5.1
Liquid Effluent Discharge Flow Rate	0.234 ft^3/sec (1)
Impoundment Reconcentration Model	None
Dilution Factor for MEI Pathways	115 – (minimum to discharge location) (2) Additional dilution factors after discharge: 45 – Nearest shoreline Northeast (1770 meters) 67 – Nearest shoreline South (1530 meters) – closest drinking water supply 77 – South (3200 meters) 100 – Distances greater than 3200 meters
Transit Time for MEI Pathways (3)	22.6 hours – closest drinking water 24 hours – drinking water for general population 10.6 hours – boating, swimming
~~MEI~~ Consumption/Usage Rates	Table 5.4-2
Population Distribution 50-mile Population	Section 2.5 7,713,709 (4)
Shoreline Recreation Usage	450,000 individuals (10)
50-mile Sport Fish Catch	11.45E6 kg/yr (5)
50-mile Commercial Fish Catch	2.07E6 kg/yr (6)
Dilution Factor for Fish and Invertebrate Catches	115 - minimum to discharge location (2) 10 – additional dilution factor after discharge
Transit Time for Fish and Invertebrate Catches	24 hours (7)
Population Served by Nearest Drinking Water Source	900,000 (8)
Dilution Factor for Population Drinking Water	100
Transit Time for Population Drinking Water	24 hours (9)

Notes:

1. Discharge flow rate is 105 gpm, from Section 3.3
2. Blowdown flowrate (from Section 3.3) divided by discharge flow rate
3. Transit times include time for transit from discharge location to source and the internal LADTAP default values, depending on pathway.
4. Estimated population for the year 2060, from Section 2.5
5. Total sport fish catch from Lake Erie for states of Michigan and Ohio (Subsection 2.4.2), assuming an average of three pounds per fish.
6. Total commercial fish catch from Lake Erie for states of Michigan and Ohio (Subsection 2.4.2)
7. The transit time for both fish and invertebrate harvests are set to a total of 24 hours.
8. Population within 50 mile radius near Lake Erie shoreline (Subsection 2.5.1) not including the City of Detroit. The City of Detroit obtains drinking water up-river from Lake Erie.
9. Includes LADTAP default value of 24 hours
10. Assumed as 50 percent of the total population within 50-mile radius of Fermi 3 that lives in sectors near the lake shore.

Table 5.4-2 Annual Consumption/Usage Rates for MEI Liquid and Gaseous Pathways

MEI Pathway Annual Consumption/Usage [1]	Infant	Child	Teen	Adult
Fruits, Vegetables & grain (kg/yr)	0	520	630	520
Leafy Vegetables (kg/yr)	0	26	42	64
Milk (l/yr)	330	330	400	310
Meat & Poultry (kg/yr)	0	41	65	110
Fish (kg/yr)	0	6.9	16	21
Invertebrates (kg/yr)	0	1.7	3.8	5
Drinking Water (l/yr)	330	510	510	730
Shoreline Recreation (hr/yr)	0	14	67	12
Inhalation (m^3/yr)	1400	3700	8000	8000

~~Notes:~~

~~1. Default values from RG 1.109 are used.~~

Insert 1 Here

Table 5.4-3 Gaseous Pathway Input Parameters

Parameter	Value
Release Source Term	Refer to Subsection 3.5.1
Agricultural Production within 50 mile radius Meat Production Milk Production Vegetable Production (grain, tomatoes, potatoes)	Developed from Section 2.2 1.919E+07 kg/year 6.043E+08 liter/year 9.689E+09 kg/year
Fraction of the year that leafy vegetables are grown	0.33
Fraction of a maximum individual's vegetable intake from own garden	0.76
Fraction of the year milk cows are on pasture	0.58
Fraction of milk cow feed intake from pasture while on pasture	1.0
Fraction of year goats are on pasture	0.67
Fraction of goat feed intake from pasture while on pasture	1.0
Fraction of year meat cows are on pasture	0.58
Fraction of meat cow feed intake from pasture while on pasture	1.0
~~MEI~~ Consumption/Usage Rates	Table 5.4-2
Population Distribution 50-mile Population	Refer to Section 2.5 7,713,709 (1)
Distance and Direction to Receptors and Associated Atmospheric Dispersion Factors	Refer to Section 2.7
Humidity	10.98 g/cm^3

Notes:

1. Estimated population for the year 2060, from Section 2.5

Insert 1

Average Individual Annual Consumption/Usage [2]	Child	Teen	Adult
Fruits, Vegetables & grain (kg/yr)	200	240	190
Milk (l/yr)	170	200	110
Meat & Poultry (kg/yr)	37	59	95
Fish (kg/yr)	2.2	5.2	6.9
Invertebrates (kg/yr)	0.33	0.75	1.0
Drinking Water (l/yr)	260	260	370
Shoreline Recreation (hr/yr)	9.5	47	8.3
Inhalation (m^3/yr)	3700	8000	8000

Notes:

1. Data obtained from RG 1.109, Table E-5.
2. Data obtained from RG 1.109, Table E-4.

Attachment 9
NRC3-09-0016

Response to RAI letter related to Fermi 3 ER

RAI Question HH5.4.3-1

NRC RAI HH5.4.3-1

Provide occupational dose calculations from normal operation of Fermi Unit 3 (The occupational dose should also include dose from existing Fermi 1 and Fermi 2 sources.)

Supporting Information

Provide occupational doses from normal operations. ESRP Section 5.4.3.III(3) recommends inclusion of "an estimate of the collective occupational dose using the format of Table 5.4.3-2." Provide collective occupational doses, or justify their exclusion.

Response

Fermi 3 Environmental Report (ER) Table 5.4-8 provides the information identified in NUREG 1555 (ESRP) Section 5.4.3, and compares the predicted exposure to the public from Fermi 2 and Fermi 3 with the criteria from 40 CFR 190. The occupational exposures identified in this RAI response do not impact the results in ER Table 5.4-8. In lieu of presenting collective occupational dose estimates in the format of ESRP Table 5.4.3-2, an estimate of the Fermi 3 collective occupational dose is presented below and included in markups to ER Section 5.4.3.

Per NUREG 1555, Section 5.4.3, Table 5.4.3-3, an occupational workforce collective total body dose is provided in this response. Per 10 CFR 20.1003, occupational dose is defined as:

> "... the dose received by an individual in the course of employment in which the individual's assigned duties involve exposure to radiation, or to radioactive material from licensed and unlicensed sources of radiation, whether in the possession of the licensee or other person. Occupational dose does not include doses received from background radiation, from any other medical administration the individual has received, from exposure to individuals administered radioactive material and released under 35.75, from voluntary participation in medical research programs, or as a member of the public."

As stated in 10 CFR 20.1201, the annual limit for occupational dose is 5 rem (Total Effective Dose Equivalent) per adult individual. The anticipated occupational radiation exposure due to normal operation and anticipated inspection and maintenance is provided in the ESBWR, Design Control Document (DCD), Rev. 5, Section 12.4. As shown in DCD Table 12.4-1, the estimated annual collective dose is 79.49 man-rem for normal operation with a 24 month refueling cycle. The occupational dose estimate presented in DCD, Rev 5, Section 12.4 was performed consistent with NRC Regulatory Guide 8.19, "Occupational Radiation Dose Assessment In Light-Water Reactor Power Plants Design Stage Man-Rem Estimates." Based on the above noted definition for occupational dose from 10 CFR 20.1003, the dose estimate in DCD, Rev 5, Section 12.4 was limited to individuals working in radiological controlled areas. Other personnel working outside

of radiological controlled areas are considered members of the public and are therefore subject to the dose limits in 10 CFR 20.1301.

Sources of occupational dose at Fermi 3 during normal operation, other than Fermi 3, will be the decommissioned Fermi 1 site, Fermi 2, and the planned Fermi 2 Independent Spent Fuel Storage Installation (ISFSI). The response to RAI HH5.4.3-2 submitted in Detroit Edison letter NRC3-09-0015, dated October 30, 2009, provides the expected dose to Fermi 3 construction workers during construction of the Fermi 3 site including contribution from the decommissioned Fermi 1 site, Fermi 2, and the planned Fermi 2 ISFSI. The response conservatively estimates the annual dose rate to the Fermi 3 construction workers from all these sources to be less than 72.3 mrem/year based on a 40 hour work week (2080 hours per year). The location of the construction worker used for development of the dose estimate presented in the response to RAI HH5.4.3-2, vicinity of the north end of the Turbine Building, is conservative relative to the location of individuals working in radiological controlled areas assessed in DCD, Rev. 5, Section 12.4. The majority of individuals working in radiological controlled areas at Fermi 3 will be located farther from the decommissioned Fermi 1 site, Fermi 2, and the planned Fermi 2 ISFSI than the construction worker used for the dose estimate presented in the response to RAI HH5.4.3-2. Therefore, applying the construction worker dose from the decommissioned Fermi 1 site, Fermi 2, and the planned Fermi 2 ISFSI to the occupational dose for individuals working in radiological controlled areas presented in DCD, Rev. 5, Section 12.4 is conservative.

Dividing the 72.3 mrem/year dose rate by 2080 hours provides the dose rate contribution from the decommissioned Fermi 1 site, Fermi 2, and the planned Fermi 2 ISFSI:

$$\frac{72.3 \text{ mrem/year}}{2080 \text{ hr}} = 0.0347 \text{ mrem/hr } (0.0000347 \text{ rem/hr})$$

The total estimated collective occupational exposure time for individuals working in radiological controlled areas of the ESBWR is 43,931 person-hours annually (DCD, Rev. 5, Table 12.4-1). Multiplying these person-hours times the dose rate contribution from the decommissioned Fermi 1 site, Fermi 2, and the planned Fermi 2 ISFSI, without applying any mitigating factors as discussed below, estimates the total contribution from the decommissioned Fermi 1 site, Fermi 2, and the planned Fermi 2 ISFSI for all individuals working in radiological controlled areas of Fermi 3:

$$0.0000347 \text{ rem/hr} \times 43{,}931 \text{ person-hours} = 1.527 \text{ man-rem/year}$$

This estimate of less than 1.527 man-rem/year does not account for reductions from shielding provided by the Fermi 3 structures. The thick exterior concrete walls of the Fermi 3 structures for the work areas indentified in DCD, Rev. 5, Table 12.4-1 are discussed in DCD, Rev. 5, Chapter 1. These thick exterior concrete walls are generally much thicker than six inches, therefore a conservative assumption that the concrete walls are six inches thick can be used to evaluate the reduction from the shielding provided by the exterior concrete walls. Six inches of

concrete provides sufficient shielding to reduce the exposure rate from a 1 MeV gamma ray by a factor of ten, i.e. 10^{th} thickness. Applying this ten-fold reduction, the previously estimated contribution from the decommissioned Fermi 1 site, Fermi 2, and the planned Fermi 2 ISFSI for all individuals working in radiological controlled areas of Fermi 3 becomes less than 0.1527 man-rem/year.

Thus, the contribution from the decommissioned Fermi 1 site, Fermi 2, and the planned Fermi 2 ISFSI for all individuals working in radiological controlled areas of Fermi 3 is insignificant compared to the collective occupational dose for all individuals working in radiological controlled areas of Fermi 3 provided in DCD, Rev. 5, Section 12.4, of 79.49 man-rem/year.

It should be recognized that the additional shielding from those exterior concrete walls thicker than six inches and interior shielding from systems, structures, and components within the Fermi 3 buildings would further reduce the contribution from the decommissioned Fermi 1 site, Fermi 2, and the planned Fermi 2 ISFSI for all individuals working in radiological controlled areas of Fermi 3.

Proposed COLA Revision

ER Section 5.4.3 will be revised to include a discussion of occupational dose as shown in the attached markups.

Markup of Detroit Edison COLA
(following 3 pages)

The following markup represents how Detroit Edison intends to reflect this RAI response in a future submittal of the Fermi 3 COLA. However, the same COLA content may be impacted by revisions to the ESBWR DCD, responses to other COLA RAIs, other COLA changes, plant design changes, editorial or typographical corrections, etc. As a result, the final COLA content that appears in a future submittal may be different than presented here.

5.4.2.2 Gaseous Pathway Doses

Based on the parameters in Table 5.4-3, the GASPAR II computer program was used to calculate doses to the MEI child, who represents the bounding age group for total body and all organs. GASPAR determined that a child was the MEI because of the greater sensitivity of that age group to internal exposure from vegetables and meat. The gaseous activity releases (source terms) for each radionuclide are described in Subsection 3.5.1. The annual pathway components for the total body, thyroid, and other organ doses calculated by the GASPAR computer program for this individual are presented in Table 5.4-5.

As part of the analysis, several sensitivities were performed to account for potentially limiting combinations of atmospheric dispersion, deposition and ingestion pathways. The SSE direction provides the limiting plume dose. The WNW direction at the site boundary provides the limiting dose for non-milk iodine and particulate sources. This is conservative relative to the doses at the actual residences, vegetable gardens and meat cows. The WNW direction at the actual locations provides the dose contribution due to milk consumption. In this case the cow and goat milk both included for conservatism. The total dose is the sum of these individual contributions.

As shown in Table 5.4-5, the annual total body dose to the MEI is 0.66 mrem to a child, and the maximum annual thyroid dose of 14.2 mrem to a child. Experience at Fermi 2 (Reference 5.4-6) indicates that these calculations are likely very conservative.

5.4.2.3 Summary

The maximum doses due to the liquid and gaseous effluents are summarized in Table 5.4-5. As shown, all results are well within the 10 CFR 50, Appendix I limits. Therefore, the impacts are SMALL and no mitigation actions are necessary.

5.4.3 Impacts to Members of the Public (Individual and Collective Dose to the Public and Comparison with Regulations)

The radiological impacts to individuals and population groups from liquid and gaseous effluents are presented using the methodologies and parameters specified in Subsection 5.4.1. Table 5.4-5 estimates the total body and organ doses to the MEI from liquid effluents and gaseous releases from Fermi 3 for analytical endpoints prescribed in 10 CFR 50, Appendix I. The MEI receptor age group and location are those described in Subsection 5.4.2. As Table 5.4-5 indicates, the predicted doses are below Appendix I limits. These results are discussed in Subsection 5.4.2.3, above.

The total site liquid and gaseous effluent doses from Fermi 2 plus Fermi 3 would be well within the regulatory limits of 40 CFR 190 (Table 5.4-8). As indicated in NUREG-1555, demonstration of compliance with the limits of 40 CFR 190 is considered to be in compliance with the 0.1 rem limit of 10 CFR 20.1301.

Table 5.4-6 and Table 5.4-7 show the total body dose to the population within 50 miles that would be attributable to Fermi 3. Based on the information in these tables, the total whole body dose due to liquid and gaseous effluents from Fermi 3 is 22.2 person-rem/year. As discussed above, the average annual radiation exposure from natural sources to an individual in the United States is

about 300 mrem (Reference 5.4-3). Multiplying this by the population of 7,713,709 (Table 5.4-1), results in 2,300,000 person-rem/year. Thus, the dose from Fermi 3 is less than 0.001 percent of that received by the population from natural causes. Impacts to members of the public from operation of Fermi 3 would be SMALL and would not warrant mitigation.

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5.4.4 Impacts to Biota Other than Members of the Public

Subsection 2.4.1 and Subsection 2.4.2 identify the relevant species within the site area. Radiation exposure pathways to biota are expected to be the same as those to humans, i.e., inhalation, external (from ground, airborne plume, water submersion, and shoreline), drinking water and ingestion. These pathways were examined to determine if they could result in doses to biota significantly greater than those predicted for humans from operation of Fermi 3. This assessment used surrogate species that provide representative information about the various dose pathways potentially affecting broader classes of living organisms. The gaseous pathway doses for muskrats, raccoons, herons and ducks were taken as equivalent to human doses for the inhalation (child), plume (adult), and twice the ground (adult) pathways. The doubling of doses from ground deposition reflects the closer proximity of these organisms to the ground. Doses to those same species plus fish, invertebrate and algae are calculated by the LADTAP II computer program.

Doses to biota from liquid and gaseous effluents from Fermi 3 are shown in Table 5.4-9. The total dose is taken as the sum of the internal and external dose. Annual doses to all of the surrogates meet the requirements of 40 CFR 190.

Use of exposure guidelines, such as 40 CFR 190, which apply to members of the public in unrestricted areas, is considered very conservative when evaluating calculated doses to biota. The International Council on Radiation Protection states that "...if man is adequately protected then other living things are also likely to be sufficiently protected," and uses human protection to infer environmental protection from the effects of ionizing radiation (Reference 5.4-7 and Reference 5.4-8). This assumption is appropriate in cases where humans and other biota inhabit the same environment and have common routes of exposure. It is less appropriate in cases where human access is restricted or pathways exist that are much more important for biota than for humans.

Species in most ecosystems experience dramatically higher mortality rates from natural causes than man, as witnessed by their lesser life spans. From an ecological viewpoint, population stability is considered more important to the survival of the species than the survival of individual organisms. Thus, higher dose limits could be permitted. In addition, no biota has been discovered that show significant changes in morbidity or mortality due to radiation exposures predicted from nuclear power plants.

An international consensus has been developing with respect to permissible dose exposures to biota. The International Atomic Energy Agency (IAEA) (Reference 5.4-9) evaluated available evidence including the "Recommendations of the International Commission on Radiological Protection" (Reference 5.4-7). The IAEA found that appreciable effects in aquatic populations will not be expected at doses lower than 1 rad per day and that limiting the dose to the maximally exposed individual organisms to less than 1 rad per day will provide adequate protection of the

Insert 1

Occupational exposure to Fermi 3 workers from Fermi 3 sources are described in the ESBWR DCD (Reference 5.4-12), Section 12.4. After consideration of shielding provided by the Fermi 3 facilities, occupational exposure from other sources on-site are relatively insignificant. As described in the Fermi 3 FSAR, Appendix 12AA, occupational exposure at Fermi 3 will be maintained as low as reasonably achievable (ALARA).

Attachment 10
NRC3-09-0016

Response to RAI letter related to Fermi 3 ER

RAI Question HY4.2.1-3

NRC RAI HY4.2.1-3

Model the dewatering effects of Fermi 3 pre-construction and construction activities on groundwater heads of different materials. Provide the input and output files (in electronic format), calibrations, and sensitivity analysis for the model.

Supporting Information

MODFLOW was used to estimate drawdown across the Fermi site during dewatering operations. During the site audit, the NRC staff concluded that the spatial extent of the clay dikes and rock fills at the Fermi site was not fully characterized, but was incorporated into the MODFLOW model. The existing model treats the artificial rock fills, the natural lacustrine clay, and glacial tills as one hydrogeologic unit, though they have very different hydraulic properties according to slug and packer test data. In addition, the parameters used in the model were based on a regional groundwater study and therefore may not reflect the hydrologic characteristics of the local materials near the Fermi site.

The model should use locally measured hydraulic properties of the geologic materials as input parameters and consider the presence and effect of the rock fills and clay dikes under the Fermi site, the extent of the Fermi 3 excavated area, recharge rates, and boundary conditions.

Response

The excavation approaches presented in Final Safety Analysis Report (FSAR) Section 2.5.4 incorporate elements intended to exclude groundwater in the overburden (rock fill, lacustrine soil, and glacial till) from entering the Fermi 3 excavation. Therefore, there will be limited water from the overburden that is removed during dewatering; rather, groundwater will be primarily removed from the Bass Islands Group dolomite. Any drawdown in the overburden will occur as ancillary effects of the drawdown of the potentiometric head in the bedrock. The impact of anticipated Fermi 3 dewatering activities on surface water and groundwater elevations in areas contiguous to the site and wetlands were addressed in the Environmental Report (ER), FSAR, and in the response to RAI TE4.3.1-3 in Detroit Edison letter NRC3-09-0012 (ML092290662), dated July 31, 2009, which addressed the potential effects of dewatering on the site wetlands.

The impact of dewatering during Fermi 3 construction was analyzed using a MODFLOW groundwater model that was originally developed by the U.S. Geological Survey (USGS) to study the effects of quarry dewatering in Monroe County, Michigan (Reeves et al., 2004, ER Reference 2.3- 76). The physical activities of quarry excavation and dewatering represented in the USGS groundwater model are essentially the same as anticipated for Fermi 3 construction. Additionally, the USGS model accurately represents the regional structure of the underlying bedrock. For this reason, the USGS model was judged to be an appropriate tool to evaluate the impact of dewatering the excavation for Fermi 3. Subdivision of both the lateral and vertical model grid was performed to adapt the regional model for use in the local Fermi 3

dewatering application. A summary of the dewatering model is presented in ER Section 2.3.1.2.2.5.1. More detailed information on the dewatering model will be made available on or before November 23, 2009 for review by NRC staff and their contractors at several Detroit Edison locations.

MODFLOW was used to estimate drawdown across the Fermi site during dewatering operations. However MODFLOW was only used to estimate drawdown in the Bass Islands Dolomite. The original USGS model is a ten layer model in which only bedrock units are specifically represented. The glacial materials that lie atop the five dipping bedrock units (represented by ten model layers) are not specifically represented. The regional recharge that is interpreted to occur through downward percolation of groundwater through the surficial glacial units to the bedrock below (primarily where there is significant sand in the glacial till, which is not the case at Fermi 3) is represented using a general head boundary across the top of the model. Therefore, the fill, native lacustrine soil, and glacial till are not specifically represented as discrete layers in the MODFLOW model.

The hydraulic conductivity value used for the Bass Islands Dolomite in the original USGS regional model was 5.0 ft/day. Packer tests performed during the Fermi 3 subsurface investigation indicate the bedrock hydraulic conductivity is variable. The packer test data are evaluated and the results are presented in ER Table 2.3-26. If test data are omitted that display hydraulic connection with adjacent zones (Comments 1 and 2 in Table 2.3-26) or that penetrate the Salina unit (P-398D), the average hydraulic conductivity value is 3.8 ft/day. This value is judged to be acceptably close to the regional value used in the original model. Additionally, it was judged that changing the values of aquifer parameters in the model would invalidate the documented calibration in the original document by Reeves. For these reasons, the parameters in the regional model were maintained.

In summary, a previously developed USGS MODFLOW model was used to analyze groundwater drawdown beneath the site in the Bass Islands Group dolomite. The original conceptual model of the USGS model was maintained, making changes only to the grid discretization, and making no changes to the aquifer parameters. Anticipated dewatering activities will include exclusion methods to minimize groundwater in the overburden from entering the excavation. A more detailed discussion of potential ancillary groundwater drawdown in the overburden is presented in the response to RAI TE4.3.1-3.

Proposed COLA Revision

None

Attachment 11
NRC3-09-0016

Response to RAI letter related to Fermi 3 ER

RAI Question HY4.2.1-11
RAI Question HY5.2-1

NRC RAIs

The following two RAIs are very closely tied together. Therefore, the responses are being provided in the same attachment to avoid any unnecessary duplication.

A – RAI HY4.2.1-11

Provide specific information on groundwater monitoring programs (including the number and location of wells, well depth, aquifers sampled, chemical parameters monitored, and frequency of monitoring) during pre-construction and construction phases of Fermi 3.

Detroit Edison has indicated that specific groundwater monitoring programs for the operational phase will be developed after the layout of Fermi 3 is finalized. This information will used to evaluate the impacts of construction on groundwater.

B – RAI HY5.2-1

Provide specific information on groundwater monitoring (including the number and location of wells, well depth, aquifers sampled, chemical parameters monitored, and frequency of monitoring) during Fermi 3 operations.

Detroit Edison has indicated that specific groundwater monitoring programs for the operational phase will be developed after the layout of Fermi 3 is finalized. These monitoring programs provide an important basis for the assessment of operational impacts.

Response

The approach for establishing groundwater monitoring programs for Fermi 3 during construction, pre-operations, operations, and operational groundwater accident monitoring, are presented in Environmental Report (ER) Section 2.3.1.2.4. The discussion in ER Section 2.3.1.2.4 is based on a conceptual design and presents the general goal of each monitoring program that will be implemented, but does not present specific detail identifying wells in the monitoring program, specific analyses included in water quality sampling, or other logistical discussion. The level of detail provided in the Fermi 3 COLA for the groundwater monitoring programs is consistent with the level of detail provided in other COLAs (e.g., the Dominion COLA for North Anna Unit 3).

The ER references a recently published guidance document titled "Integrated Groundwater Monitoring Strategy for NRC-Licensed Facilities and Sites: Logic, Strategic Approach, and Discussion" (ER Reference 2.3-105, NUREG/CR-6948, November 2007), and states that Detroit Edison will adhere to the guidance published in this document.

Based on the following, the ER does not provide specifics regarding the groundwater monitoring programs:

- Currently, a detailed construction plan has yet to be developed. Without a detailed construction plan, it is difficult to definitively identify the specifics of the construction monitoring program. As some of the monitoring locations used during construction may also be used during operation, this also impacts development of the operating monitoring program.

- Fermi 3 construction activities will likely require abandonment and replacement of some existing wells. Currently, there are monitoring programs for both Fermi 1 and Fermi 2 that could be impacted. This will be factored into a comprehensive monitoring program.

Final details regarding the groundwater monitoring programs to be implemented during construction and operation can be more effectively addressed during final design to account for the Fermi 3 plant layout and the nearby presence of Fermi 1 and Fermi 2.

Proposed COLA Revision

None

Attachment 12
NRC3-09-0016

Response to RAI letter related to Fermi 3 ER

RAI Question HY4.2.1-9
RAI Question LU4.1.1-1

NRC RAIs

The following two RAIs are both tied to spoils disposal. Therefore, they are being addressed in the same attachment to avoid any unnecessary duplication.

A - RAI HY4.2.1-9

Provide descriptions of the best management practices (BMPs) to be used for the disposal of the spoil from Fermi 3.

Detroit Edison has indicated that BMPs will be developed after the layout of Fermi 3 is finalized. These will provide an important basis for the assessment of construction impacts in the EIS.

B - RAI LU4.1.1-1

Provide a statement to confirm that no borrow materials would be obtained onsite. Identify where spoils materials would be disposed of.

At the site audit, Detroit Edison indicated that no borrow materials would be obtained onsite. It is unclear where spoils material would be disposed of. This information is needed for the analysis of land use impacts to be presented in the EIS.

Response

A - *Provide descriptions of the best management practices (BMPs) to be used for the disposal of the spoil from Fermi 3.*

This response is supplementing the previous response to this RAI which was submitted to the NRC in Detroit Edison letter NRC3-09-0010 (ML091940218), dated June 19, 2009.

Excavation of the Fermi 3 site will result in spoils material that is going to be disposed of onsite in three ways as described below. Typical best management practices (BMPs) for soil erosion and sedimentation control (SESC) around the spoil disposal areas are described for each.

1. Excavated material to be reused onsite as engineered backfill or fill will be kept in temporary stockpile(s) onsite near the areas it will be reused and is expected to be controlled using the BMPs of silt fencing and tarping.

2. Excavated spoils material is expected to be used to fill in various canals onsite. Once the canals are filled, BMPs contained in the SESC plan shall be implemented in areas not already covered by new structures or otherwise prepared for construction activities. Examples of BMPs to be followed include: recontouring using heavy construction equipment, mulching, seeding and planting, natural revegation,

pavement, rock, or gravel permanent stabilization, as well as installation of temporary or permanent stormwater management and erosion and sedimentation control measures. These BMPs will be consistent with the practices discussed in "Guidebook of Best Management Practices for Michigan Watersheds," ER Reference 4.1-5.

3. The remaining excavated material will be used to elevate construction laydown and parking areas. The spoils material placed in these areas will use BMPs such as silt fencing for SESC of the spoils materials. In select areas, e.g. delineated wetlands, the top six to twelve inches of soil will be removed and stockpiled onsite before fill is placed in the construction parking and laydown areas. It is expected that the stockpiled topsoil will be covered or seeded to reduce soil erosion. Stockpiled topsoil will then be placed back onto those select construction parking and laydown areas after construction activities are completed. Following replacement of the topsoil, BMPs outlined within the Compensatory Wetland Mitigation Plan and SESC Plan will be implemented. This may include BMPs such as silt fencing and seeding.

B - *Provide a statement to confirm that no borrow materials would be obtained onsite. Identify where spoils materials would be disposed of.*

As stated in ER Section 4.1.1.2.2:

> "The excavated material from the power block and circulating water pipe runs will be processed and used as backfill and structural fill for the cooling tower and circulating water pipe run area. Other than these excavated areas, no onsite borrow pit is anticipated to be used for Fermi 3 construction."

No borrow materials will be obtained onsite for construction of Fermi 3. An estimated 175,000 cubic yards of engineered backfill will need to be imported to the site.

The material to be excavated from the Fermi 3 site will consist of the existing site fill (crushed stone), clay/soil, glacial till, and bedrock. An estimated 265,000 cubic yards of excavated material is not expected to be reused as engineered backfill or structural fill; however, it is expected to be used onsite for fill and laydown preparation as discussed in the RAI response above.

The excavated clay/soil and glacial till that is removed is expected to be used to fill the canals and elevate areas of construction parking and laydown. Currently the overflow canal (northwest of the proposed Fermi 3 site) and the drainage canal (directly west of the proposed Fermi 3 site) drain to wetlands and eventually to Lake Erie, and the canal between the overflow and drainage canals is stagnant. Culverts are to be placed as necessary to convey water to the receiving waterbodies.

The excavated crushed stone is expected to be processed to conform to design specification requirements to be used as engineered backfill around plant structures and to raise the grade in the power block area. Crushed stone may also be used for road improvements.

The excavated bedrock is expected to be processed to conform to design specification requirements to be used as engineered backfill around the plant structures and to raise the grade in the power block area.

If any unsuitable crushed stone or bedrock is found, it is expected to be used as coverage for construction parking and laydown areas.

Proposed COLA Revision

ER Section 4.1.1.2.2 will be revised to reflect the amount of excess material from the Fermi 3 excavation, and the disposal of the material.

Markup of Detroit Edison COLA
(following 1 page)

The following markup represents how Detroit Edison intends to reflect this RAI response in a future submittal of the Fermi 3 COLA. However, the same COLA content may be impacted by revisions to the ESBWR DCD, responses to other COLA RAIs, other COLA changes, plant design changes, editorial or typographical corrections, etc. As a result, the final COLA content that appears in a future submittal may be different than presented here.

during construction activities. The final location of these controls would be based on site conditions prior to and during construction activities.

With the use of construction equipment at the site, there is the potential for spills of gasoline, oil, and other fluids from various possible pollutant sources such as vehicle fueling stations, loading and unloading areas, vehicle equipment maintenance activities, and material storage and handling. Spill prevention, control, and response measures will be implemented as part of the Pollution Incident Prevention Plan (PIPP) for Fermi 3. A more detailed discussion of the PIPP is provided in Subsection 4.2.1. Accordingly, the impacts of hazardous material spills are expected to be SMALL, and no mitigative measures are needed.

Soil compaction will occur as construction machinery traverses the construction areas. However, many of the areas where compaction would occur will eventually be covered with permanent structures or will become areas maintained with grass cover. Those areas used temporarily and allowed to revegetate after construction completion would recover more slowly, but would be able to regenerate vegetation and forest cover despite the soil compaction. Detroit Edison plans to restore as many impacted areas as possible to the natural state they were in before construction of Fermi 3.

Aggregate and equipment storage may be located in the possible laydown area shown on Figure 4.2-1.

265,000

The excavated material from the power block and circulating water pipe runs will be processed and used as backfill and structural fill for the cooling tower and circulating water pipe run area. Other than these excavated areas, no onsite borrow pit is anticipated to be used for Fermi 3 construction. An estimated quantity of ~~500,000~~ yd^3 of excavated material is expected to be excess, which will be disposed of in ~~an onsite area. This onsite disposal area is likely to be an expansion of one of the areas previously used for Fermi 2 spoils disposal. Alternatively, it is possible that a new spoils disposal area may be designated onsite.~~ The use of an onsite construction landfill is not anticipated.

onsite construction laydown and parking areas and used for filling in canals.

Therefore, it is anticipated that the land use impact from excavated material will be SMALL due to the relatively small net excess of spoils materials disposed and the availability of disposal areas ~~previously used for the same purpose during Fermi 2 construction~~.

Dredged material excavated during water intake structure and barge slip or dock construction is expected to be returned to the Spoils Disposal Pond encircled by Boomerang Road, as shown on Figure 4.2-1.

According to the Natural Resources Conservation Service (NRCS), soil types that are considered prime farmland are present on the Fermi site, as discussed in Section 2.2. NRCS online soil survey data and maps show several small areas of prime farmland (Subsection 2.2.1.2.3.1) that may be temporarily affected by Fermi 3 construction (Reference 4.1-2). These small areas of prime farmland are currently on agricultural land in the west-southwest portion of the site. If the agricultural land in the west-southwest portion of the site is used for construction, it would be only as a surface to store construction materials. No permanent impacts should occur to this area, and

Attachment 13
NRC3-09-0016

Response to RAI letter related to Fermi 3 ER

RAI Question SE2.5.2-1
RAI Question SE2.5.2-2

NRC RAIs

The following two RAIs are very closely tied together. Therefore, the responses are being provided in the same attachment to avoid any unnecessary duplication.

A – RAI SE2.5.2-1

Provide information on the size and nature of the heavy construction industry and construction labor force within the region (size of labor force, unemployment rates, wages) specific to the job categories that would be used to support Fermi 3 construction (i.e., boilermakers, pipefitters, electricians, ironworkers, insulators, etc.).

More detailed information is needed to confirm assumptions on the availability of construction workers within the local area to further characterize impacts by jurisdiction on population, housing, public services, education, and public utilities.

B – RAI SE2.5.2-2

Provide information on the job categories that would be recruited for the operations workforce, and the size of the labor force, unemployment rates, and wages for these laborers within the region.

More detailed information is needed to confirm assumptions on the availability of operations workers within the local area to further characterize impacts by jurisdiction on population, housing, public services, education, and public utilities.

Response

A - *Provide information on the size and nature of the heavy construction industry and construction labor force within the region (size of labor force, unemployment rates, wages) specific to the job categories that would be used to support Fermi 3 construction (i.e., boilermakers, pipefitters, electricians, ironworkers, insulators, etc.).*

Construction Workforce

The heavy construction industry job categories expected to be utilized during the construction of the Fermi 3 nuclear power plant correspond to the categories listed in the 2005 study prepared by MPR Associates Inc. for the Department of Energy (DOE) titled, "DOE NP2010 Nuclear Power Plant Construction Infrastructure Assessment", and is listed in Table 1.

Table 1. Craft Construction Workforce Occupations

Boilermakers
Carpenters
Electricians/Instrument Fitters
Iron Workers
Insulators
Laborers
Cement Masons
Millwrights
Operating Engineers
Painters
Pipefitters
Sheetmetal Workers
Truckers Teamsters

Source: *DOE NP2010 Nuclear Power Plant Construction Infrastructure Assessment*

Table 2 lists the sizes of key union craft halls in the region and also lists the respective wages in 2008. The information was collected from local unions in the region having primary and support coverage of the Monroe County area and includes unions based in Monroe County, Detroit, Toledo, and Southeast Michigan.

Table 2. Regional Union Construction Labor Force and Wage by Major Craft Occupation

Primary Coverage Unions	Location	Number of Journeymen	Number of Apprentices	Base Journeyman Wages (2008)
Iron Worker #55	Toledo	661	72	28.00
Boiler Makers #85	Toledo	256	144	33.43
Electrician #8	Toledo	1,520	194	34.00
Operating Eng. #324	Michigan (State wide)	4,500	77	32.75
Brick Layer-Allied	SEM*	1,550	138	29.00
Pipefitter/Plumber #671	Monroe	335	21	32.32
Cement Mason #886	SEM*	400	24	28.00
Sheet Metal Worker #33	SEM*	400	50	29.00
Carpenters	SEM*	4,391	338	30.16
Laborers #959	SEM*	1,091	63	26.28

Insulators #45	Toledo	110	57	29.37
Other Union Hall Locations				
Iron Workers #25	Detroit	2,500	200	29.00
Boiler Makers #169	Detroit	444	146	32.89
Electrician #58	Detroit	4,024	275	35.85
Pipefitter/Plumbers #636	Detroit	1,650	140	36.25
Insulators #25	Detroit	195	35	30.77

*SEM- Southeast Michigan

Table 3 lists the historical and projected employment for workers. This data is at a state level for both Michigan and Ohio and is broken down by craft employment categories.

The construction industry is subject to large fluctuations during economic recessions and expansions, and the unemployment rate in the industry during the current economic downturn is not necessarily related to the unemployment rate expected during peak Fermi 3 construction. The September 2009 national unemployment rate for the construction industry was 17.1 percent (Reference 1).

Table 3. Michigan and Ohio Construction Labor Force

	Michigan 2006 (Actual)	Michigan 2016 (Projected)	Ohio 2006 (Actual)	Ohio 2016 (Projected)
Iron Workers	1,770	1,850	3,590	3,800
Boilermakers	520	580	590	670
Electricians/Instrument Fitters	24,000	25,070	30,190	30,400
Operating Engineers	9,090	9,680	12,080	12,950
Pipefitters	15,060	15,760	18,120	19,110
Cement Masons	4,140	4,940	6,610	7,340
Sheet Metal Workers	4,960	5,190	5,770	5,750
Carpenters	31,710	33,710	41,220	44,930
Laborers	27,240	29,330	32,330	35,270
Insulators	960	1,040	1,720	1,830
Millwrights	5,500	5,520	5,410	4,550
Painters	8,580	9,090	12,620	13,970
Teamsters/Truckers	87,510	96,620	116,930	126,530

Sources: References 2 and 3

B - *Provide information on the job categories that would be recruited for the operations workforce, and the size of the labor force, unemployment rates, and wages for these laborers within the region.*

Operations Workforce

A 2004 study prepared for the Department of Energy (DOE) titled "Study of Construction Technologies and Schedules, O&M Staffing and Cost, Decommissioning Costs and Funding Requirements for Advanced Reactor Designs (Volume 1)" has a list of staffing job categories required for the operational staffing of a nuclear power plant. Section 3 of the document lists more than 200 position categories and is organized into several staffing departments. The primary departments are listed below, and include a summary listing of some of the key job categories for each department:

- Management – includes director positions over O&M and safety, plus various corporate services such as financial support.
- Operations – includes manager of operations positions and support, shift licensed and non-licensed operators, shift supervisors, operations engineers, refueling operators, clerks and administrative support.
- Engineering – includes the engineering manager and administrative support, systems engineers, reactor engineers, component engineers, civil and mechanical engineers, and records clerks.
- Maintenance – includes the maintenance manager and administrative support, electricians and electrical supervisors, mechanics and supervisors, I&C technicians, outage scheduling personnel, outage inspectors, and maintenance procurement workers.
- Outage and Planning – includes the outage and planning manager and administrative support, the nuclear scheduling supervisor, electrical schedulers and planners, mechanical schedulers and planners, I&C schedulers and planners, unit outage coordinator, and turbine maintenance specialists.
- Major Modification and Site Support – includes the nuclear support services manager and administrative support, the construction engineering supervisor, construction engineers, quality inspectors, electrical construction specialists and supervisors, civil/mechanical construction specialists and supervisors, project controls specialists and supervisors, labor support and supervisors, and construction equipment management.
- Organizational Effectiveness – includes the licensing supervisor and engineers, nuclear safety supervisor, and corrective action coordinators.
- Radiation Protection – includes radiation protection manager and administrative support, health physicist technicians and supervisors, radwaste technicians and supervisor, and chemistry technicians and supervisor.
- Training – includes the nuclear training manager and administrative support, operations initial training supervisor and staff, operations continuing training supervisor and staff, and maintenance/rad protection training supervisor and staff.

- Security – includes the protection services manager and administrative support, security supervisors, security officers, safety and loss prevention personnel, and the site emergency planning personnel.
- Supply Chain Management – includes the supply chain manager and administrative support, the warehouse supervisor and storekeepers, receiving and inspection workers, and emergent sourcing specialists.
- Telecommunications – includes the IT manager, business analysts, local area network field services workers, and telecommunications services.

There is data at the state level for several occupations that closely correspond with many of the job categories in the DOE staffing study. Table 4 indicates the historic and projected labor force and wage data for key occupations in Michigan and Ohio that would include many of the Fermi 3 occupational jobs.

In addition, Table 4 shows the average hourly wages for each occupation by state. The average hourly rate in 2009 varied widely by occupation, ranging from a low of $12.21 (2008 dollars) per hour for security guards to $47.98 (2008 dollars) per hour for general and operations managers. The average of these numbers is almost identical to an average direct hourly wage of $32.14 (2008 dollars) per hour assumed in Environmental Report (ER) Section 5.8.2.7. According to the Bureau of Labor Statistics, the overall unemployment rate in July 2009 was 16.4 percent for the Detroit Metropolitan Statistical Area (MSA), 14 percent for the Toledo MSA, and 17 percent for Monroe County.

Table 4. Michigan and Ohio Nuclear Operations Labor Force and Wages

Occupation	Michigan 2006 Actual	Michigan 2016 Projected	Michigan Average Hourly Wage 2008	Ohio 2006 Actual	Ohio 2016 Projected	Ohio Average Hourly Wage 2008
General and Operations Managers	36,460	35,450	$47.98	56,770	54,430	$49.06
Accountants and Auditors	34,290	38,230	$30.79	49,080	54,050	$29.55
Computer Software Engineers Applications and Systems Software	19,420	24,400	$38.63	23,770	31,760	$39.76
Network and Computer System Administrators	7,850	9,270	$30.96	12,020	14,510	$31.18
Chemical Engineers	1,050	1,160	$38.92	1,530	1,570	$41.15
Civil Engineers	6,190	6,870	$33.58	5990	6460	$34.20
Electrical Engineers	6,370	6,790	$37.04	4,440	4,500	$34.93
Mechanical Engineers	24,730	25,970	$38.13	11,350	10,630	$33.25

Nuclear Technicians	90	90	$35.27	400	400	$28.04
Security Guards	25,360	27,600	$12.21	31,390	33,680	$11.99
Office & Administration Support Occupations	699,660	723,590	$15.71	917,670	943,850	$15.11
Nuclear Power Reactor Operators	NA	NA	$33.31	150	160	$31.24
Power Distributors and Dispatches	490	470	$32.19	160	140	$26.27
Power Plant Operators	1,640	1,680	$27.13	1,260	1,220	$28.22
Stationary Engineers and Boiler Operators	1,310	1,320	$26.20	2,080	1,970	$24.07

Source: Reference 2 and 3

References:

1- Bureau of Labor Statistics, "Industries at a Glance, Construction: NAICS 23," available online at: http://www.bls.gov/iag/tgs/iag23.htm, accessed on October 23, 2009.

2- Michigan Government, "Michigan Statewide Construction and Extraction Occupation Forecasts 2006-2016." Available online at: http://www.milmi.org/admin/uploadedPublications/721_occ_g47.htm, accessed on October 21, 2009.

3- Ohio Labor market Information, "2016 Ohio Job Outlook Occupational Projections." Available online at: http://ohiolmi.com/proj/Projections/Ohio/Occupation.pdf, accessed on October 21, 2009.

Proposed COLA Revision

Refer to the attached COLA markup.

Markup of Detroit Edison COLA
(following 9 pages)

The following markup represents how Detroit Edison intends to reflect this RAI response in the next submittal of the Fermi 3 COLA Revision 2. However, the same COLA content may be impacted by revisions to the ESBWR DCD, responses to other COLA RAIs, other COLA changes, plant design changes, editorial or typographical corrections, etc. As a result, the final COLA content that appears in a future submittal may be different than presented here.

Components Holdings, formerly named Visteon Corporation, (approximately 2,000 employees), Detroit Edison Corporation (approximately 1500 employees) and Mercy Memorial Hospital (approximately 1,300 employees). Employment data for 1998 is also listed in the table and reveals a trend toward increased concentration of total county employment among the largest firms. According to the Monroe County Development Corporation, Automotive Components Holding is scheduled to scale down operations in 2008 through a workforce reduction of at least 1,000.

Table 2.5-24 and Table 2.5-25 show the largest employers for Wayne County and Lucas County, respectively. In Wayne County, the largest employer in 2007 was Ford Motor Company with 42,309 employees; down from the 57,659 people employed in 1998. Ford Motor Company was followed by Detroit Public Schools (17,329 employees) and the City of Detroit (13,593 employees). In Lucas County, the three largest employers in 2006 were ProMedica Health Systems (11,265 employees), Mercy Health Partners (6,723 employees), and the University of Toledo (4,987 employees).

Table 2.5-26 lists the industry employment projections for Michigan and the Detroit MSA in 2014, as made by the Michigan Department of Labor and Economic Growth. In making its projections, the department includes Monroe County as part of the Detroit MSA, along with the counties of Wayne, Lapeer, Macomb, Oakland, and St. Clair (note that this list differs from the counties in the Detroit CSA). According to the Michigan Department of Labor and Economic Growth, employment between 2004 and 2014 will increase by 6.9 percent overall in the Detroit MSA, although manufacturing employment will decline by 11.4 percent and the durable goods manufacturing sector is projected to decrease by 13.4 percent. The overall growth will be driven by the service industries, with professional and business services (18.9 percent), educational and health services (11.2 percent), and the leisure and hospitality industry (10.6 percent) projected to experience the largest growth rates. At the state level, the overall growth from 2004 through 2014 is projected to be 7.9 percent.

Table 2.5-27 shows the 2014 industry employment projections for the Toledo MSA. It is projected that by 2014, there will be an employment decrease of 4,230 in the goods producing sector with manufacturing to experience a decrease of 5,030 jobs. However, service producing industries will experience an employment increase of nearly 26,990 jobs within the Toledo MSA.

Table 2.5-28 provides additional employment information for Monroe County by listing recent and expected changes in employment. ~~Additional employment considerations pertaining to the impacts of Fermi 3 during construction and operation will be discussed in Chapter 4 and Chapter 5, respectively.~~

Attach highlighted text to preceding paragraph.

2.5.2.2 **Area Political Structure and Taxation**

Insert 1

The Fermi site is located within the Frenchtown Charter Township in Monroe County. This section discusses the relationship between counties, townships, villages, and cities in Michigan, and provides recent tax information for Monroe County and Frenchtown Township. The main focus of the subsection is Frenchtown Township and Monroe County due to the fact that it is these areas that will be primarily impacted and will receive the majority of the tax benefits generated by Fermi 3.

Insert 1 on page 2-443 of the ER, as indicated on the markup.

Insert1

The most detailed view of the regional workforce in relation to the needs of the Fermi 3 project during construction and operation is seen when comparing the key occupational requirements of the project (in Sections 4.8 and 5.8) with the available labor force for these occupations.

Concerning the available heavy construction industry craft workers in the region, Table 2.5-28(A) lists the key craft and the location of the primary and supporting union halls that will provide key craft workers to the project. Also listed is the number of craft workers at the identified union halls in 2009, and the direct journeyman wages by craft. At the state level, Table 2.5-28(B) lists the 2006 and projected 2016 labor force at the state level for Michigan and Ohio for several craft occupations that will be required on the Fermi 3 project.

Staffing requirements during the Fermi 3 operational phase will consist of multiple occupational classifications. The 2004 study prepared for the Department of Energy (DOE) titled: "Study of Construction Technologies and Schedules, O&M Staffing and Cost, Decommissioning Costs and Funding Requirements for Advanced Reactor Designs (Volume 1)", called the DOE staffing study herein, lists more than 200 staffing job categories required for the operation of a nuclear power plant, organized into several departments. The functional departments are listed below, and some of the key job categories for each department are also identified:

- Management – includes director positions over O&M and safety, plus various corporate services such as financial support.
- Operations – includes manager of operations positions and support, shift licensed and non-licensed operators, shift supervisors, operations engineers, refueling operators, clerks and administrative support.
- Engineering – includes the engineering manager and administrative support, systems engineers, reactor engineers, component engineers, civil and mechanical engineers, and records clerks.
- Maintenance – includes the maintenance manager and administrative support, electricians and electrical supervisors, mechanics and supervisors, I&C technicians, outage scheduling personnel, outage inspectors, and maintenance procurement workers.
- Outage and Planning – includes the outage and planning manager and administrative support, the nuclear scheduling supervisor, electrical schedulers and planners, mechanical schedulers and planners, I&C schedulers and planners, unit outage coordinator, and turbine maintenance specialists.
- Major Modification and Site Support – includes the nuclear support services manager and administrative support, the construction engineering supervisor, construction engineers, quality inspectors, electrical construction specialists and supervisors, civil/mechanical construction specialists and supervisors, project

controls specialists and supervisors, labor support and supervisors, and construction equipment management.

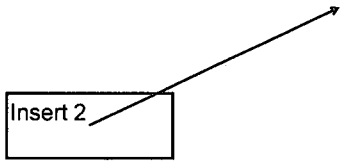
- Organizational Effectiveness – includes the licensing supervisor and engineers, nuclear safety supervisor, and corrective action coordinators.
- Radiation Protection – includes radiation protection manager and administrative support, health physicist technicians and supervisors, radwaste technicians and supervisor, and chemistry technicians and supervisor.
- Training – includes the nuclear training manager and administrative support, operations initial training supervisor and staff, operations continuing training supervisor and staff, and maintenance/rad protection training supervisor and staff.
- Security – includes the protection services manager and administrative support, security supervisors, security officers, safety and loss prevention personnel, and the site emergency planning personnel.
- Supply Chain Management – includes the supply chain manager and administrative support, the warehouse supervisor and storekeepers, receiving and inspection workers, and emergent sourcing specialists.
- Telecommunications – includes the IT manager, business analysts, local area network field services workers, and telecommunications services.

Data at the state level for several occupations that closely correspond with many of the job categories in the DOE staffing study is shown in Table 2.5-28(C). This table indicates the historic and projected labor force and wage data for key occupations in Michigan and Ohio that would include many of the Fermi 3 occupational jobs.

In addition, Table 2.5-28(C) indicates the average hourly wages for each occupation by state. The average hourly rate in 2008 varied widely by occupation, ranging from a low of $12.21 ($2008) per hour for security guards to $47.98 ($2008) per hour for general and operations managers. Additional employment considerations pertaining to the impacts of Fermi 3 during construction and operation will be discussed in Chapter 4 and Chapter 5, respectively.

Table 2.5-28 Recent and Projected Major Employment Changes within Monroe County

Employer	City	Job Change	Source	Notice Date	Effective Date	Comment
Splash Universe	Dundee	200	Monroe News	11/9/2006	1/22/2007	25,000 square foot water park, $25 million investment
Backyard Storage Solutions	Monroe	130	Monroe News	11/6/2006	1/15/2007	Site of vacant Lear Corporation Plant, 1000 Ternes Dr, $5 million investment, consolidating from Warren and Detroit
Ciena Healthcare of Southfield	Frenchtown	100	Monroe News	11/2/2006	12/1/2007	New 120 bed skilled care facility 1971 N. Monroe Street on 11.2 acres
Ford Motor Company	Monroe	-1200	Monroe News	8/25/2007	12/30/2008	Closing Automotive Component Holdings (ACH), 3200 E. Elm Ave, 48162



Insert 2: Insert tables following Table 2.5-28 on page 2-524 of the COLA

Table 2.5-28(A) Regional Union Construction Labor Force and Wage by Major Craft Occupation

Primary Coverage Unions	Location	Area Total Journeymen	Area Total Apprentices	Base Journeyman Wages ($2008)
Iron Worker #55	Toledo	661	72	28.00
Boiler Makers #85	Toledo	256	144	33.43
Electrician #8	Toledo	1,520	194	34.00
Operating Eng. #324	Michigan (State wide)	4,500	77	32.75
Brick Layer-Allied	SEM*	1,550	138	29.00
Pipefitter/Plumber #671	Monroe	335	21	32.32
Cement Mason #886	SEM*	400	24	28.00
Sheet Metal Worker #33	SEM*	400	50	29.00
Carpenters	SEM*	4,391	338	30.16
Laborers #959	SEM*	1,091	63	26.28
Insulators #45	Toledo	110	57	29.37
Other Union Hall Locations				
Iron Workers #25	Detroit	2,500	200	29.00
Boiler Makers #169	Detroit	444	146	32.89
Electrician #58	Detroit	4,024	275	35.85
Pipefitter/Plumbers #636	Detroit	1,650	140	36.25
Insulators #25	Detroit	195	35	30.77

*SEM- Southeast Michigan

Table 2.5-28(B) Michigan and Ohio Construction Labor Force

	Michigan 2006 (Actual)	Michigan 2016 (Projected)	Ohio 2006 (Actual)	Ohio 2016 (Projected)
Iron Workers	1,770	1,850	3,590	3,800
Boilermakers	520	580	590	670
Electricians/Instrument Fitters	24,000	25,070	30,190	30,400
Operating Engineers	9,090	9,680	12,080	12,950
Pipefitters	15,060	15,760	18,120	19,110
Cement Masons	4,140	4,940	6,610	7,340
Sheetmetal Workers	4,960	5,190	5,770	5,750
Carpenters	31,710	33,710	41,220	44,930
Laborers	27,240	29,330	32,330	35,270
Insulators	960	1,040	1,720	1,830
Millwrights	5,500	5,520	5,410	4,550
Painters	8,580	9,090	12,620	13,970
Teamsters/Truckers	87,510	96,620	116,930	126,530

Sources: References 2.5-136 and 2.5-137

Table 2.5-28(C) Michigan and Ohio Nuclear Operations Labor Force and Wages

Occupation	Michigan 2006 Actual	Michigan 2016 Projected	Michigan Average Hourly Wage 2008	Ohio 2006 Actual	Ohio 2016 Projected	Ohio Average Hourly Wage 2008
General and Operations Managers	36,460	35,450	$47.98	56,770	54,430	$49.06
Accountants and Auditors	34,290	38,230	$30.79	49,080	54,050	$29.55
Computer Software Engineers Applications and Systems Software	19,420	24,400	$38.63	23,770	31,760	$39.76
Network and Computer System Administrators	7,850	9,270	$30.96	12,020	14,510	$31.18
Chemical Engineers	1,050	1,160	$38.92	1,530	1,570	$41.15
Civil Engineers	6,190	6,870	$33.58	5990	6460	$34.20
Electrical Engineers	6,370	6,790	$37.04	4,440	4,500	$34.93
Mechanical Engineers	24,730	25,970	$38.13	11,350	10,630	$33.25
Nuclear Technicians	90	90	$35.27	400	400	$28.04
Security Guards	25,360	27,600	$12.21	31,390	33,680	$11.99
Office & Administration Support Occupations	699,660	723,590	$15.71	917,670	943,850	$15.11
Nuclear Power Reactor Operators	NA	NA	$33.31	150	160	$31.24
Power Distributors and Dispatches	490	470	$32.19	160	140	$26.27
Power Plant Operators	1,640	1,680	$27.13	1,260	1,220	$28.22
Stationary Engineers and Boiler Operators	1,310	1,320	$26.20	2,080	1,970	$24.07

Source: References 2.5-136 and 2.5-137

2.5-133 Frenchtown Charter Township, "Noise," Zoning Ordinance No. 200, Article 29.04.1, February 2004.

2.5-134 The National Center For Educational Statistics, "Public Elementary and Secondary School Student Enrollment, High School Completions, and Staff From the Common Core of Data: School Year 2005–06," http://nces.ed.gov/pubs2007/pesenroll06/tables/table_6.asp, accessed 9 June 2008.

2.5-135 Transportation Research Board National Research Council, "Highway Capacity Manual Special Report 209," Washington, D.C., 1985.

Insert 3 →

Insert 3

2.5-136 Michigan Government, "Michigan Statewide Construction and Extraction Occupation Forecasts 2006-2016". Available online at: http://www.milmi.org/admin/uploadedPublications/721_occ_g47.htm, accessed on October 21, 2009.

2.5-137 Ohio Labor market Information, "2016 Ohio Job Outlook Occupational Projections" Available online at: http://ohiolmi.com/proj/Projections/Ohio/Occupation.pdf, accessed on October 21, 2009.

Attachment 14
NRC3-09-0016

Response to RAI letter related to Fermi 3 ER

RAI Question SE4.4.2-7

NRC RAI SE4.4.2-7

Provide a list of job categories and wages/salaries of the construction and operations workforce.

Supporting information

The data are needed to confirm assumptions used to estimate local and non-local workforce; further characterize impacts on population, housing, public services, education, and public utilities based on demographic assumptions; and better characterize the economic impacts of the proposed project (ER Sections 4.4.2, 4.4.2.1, 4.4.2.4.6, 5.8.2.1, and 5.8.2.7).

Response

Construction:

The job categories expected to be utilized during the construction of Fermi 3 correspond to the categories listed in the 2005 study prepared by MPR Associates Inc. for the Department of Energy (DOE) entitled: "DOE NP2010 Nuclear Power Plant Construction Infrastructure Assessment" (ER Rev. 0 Reference 4.4-10). DOE NP2010 divides the labor force into two distinct categories: craft and non-craft employment, as shown in Table 1.

Table 1. Construction Workforce Craft and Non-Craft Job Categories

Craft Labor	Non-Craft labor
Boilermakers	Craft Supervision
Carpenters	Site Indirect Labor
Electricians/Instrument Fitters	Quality Control Inspectors
Iron Workers	Steam Supply System Vendor/Subcontractors
Insulators	EPC Contractor's Managers
Laborers	Engineers and Schedulers
Cement Masons	Owner's O&M Staff
Millwrights	Start-Up Personnel
Operating Engineers	NRC Inspectors
Painters	
Pipefitters	
Sheetmetal Workers	
Truckers Teamsters	

Source: *DOE NP2010 Nuclear Power Plant Construction Infrastructure Assessment*

Table 2 shows wages for key craft employment categories. The wage information was collected from local unions in the Fermi region including unions in Monroe County, Detroit, Toledo, and Southeast Michigan. Based on the peak DOE NP2010 craft requirements, a direct weighted average wage of the Fermi 3 construction workforce was then calculated to be $31.37 per hour.

Not including overtime, this hourly wage would result in an annual salary for craft workers of approximately $65,250 (2008 dollars). For the non-craft portion of the labor force, an average of $48.00 per hour was assumed; this equates to an annual salary of approximately $100,000 (2008 dollars).

Table 2. Average Wage Data for Key Craft Occupations in the Fermi Region

Occupation	Weights	Average Wage (2008 dollars)
Iron Workers	19.7%	$28.50
Boiler Makers	4.1%	$33.16
Electricians	19.7%	$34.93
Operating Engineers	8.8%	$32.75
Pipefitters-Plumbers	18.4%	$34.29
Cement Mason	2.0%	$28.00
Sheet Metal Worker	3.4%	$29.00
Carpenters	10.9%	$30.16
Laborers	10.9%	$26.28
Insulators	2.0%	$30.07
Weighted Average		$31.37

Operations:

A 2004 study prepared for the Department of Energy (DOE) titled, "Study of Construction Technologies and Schedules, O&M Staffing and Cost, Decommissioning Costs and Funding Requirements for Advanced Reactor Designs (Volume 1)" (ER Rev. 0 Reference 5.9-4), has a list of staffing job categories for a number of nuclear technologies including the ESBWR technology. Section 3 of the document lists more than 200 position categories and is organized into several staffing departments. The primary departments are listed below and include a summary listing of some of the key job categories for each department:

- Management – includes director positions over O&M and safety, plus various corporate services such as financial support.
- Operations – includes manager of operations positions and support, shift licensed and non-licensed operators, shift supervisors, operations engineers, refueling operators, clerks and administrative support.
- Engineering – includes the engineering manager and administrative support, systems engineers, reactor engineers, component engineers, civil and mechanical engineers, and records clerks.
- Maintenance – includes the maintenance manager and administrative support, electricians and electrical supervisors, mechanics and supervisors, I&C technicians, outage scheduling personnel, outage inspectors, and maintenance procurement workers.

- Outage and Planning – includes the outage and planning manager and administrative support, the nuclear scheduling supervisor, electrical schedulers and planners, mechanical schedulers and planners, I&C schedulers and planners, unit outage coordinator, and turbine maintenance specialists.
- Major Modification and Site Support – includes the nuclear support services manager and administrative support, the construction engineering supervisor, construction engineers, quality inspectors, electrical construction specialists and supervisors, civil/mechanical construction specialists and supervisors, project controls specialists and supervisors, labor support and supervisors, and construction equipment management.
- Organizational Effectiveness – includes the licensing supervisor and engineers, nuclear safety supervisor, and corrective action coordinators.
- Radiation Protection – includes radiation protection manager and administrative support, health physicist technicians and supervisors, radwaste technicians and supervisor, and chemistry technicians and supervisor.
- Training – includes the nuclear training manager and administrative support, operations initial training supervisor and staff, operations continuing training supervisor and staff, and maintenance/rad protection training supervisor and staff.
- Security – includes the protection services manager and administrative support, security supervisors, security officers, safety and loss prevention personnel, and the site emergency planning personnel.
- Supply Chain Management – includes the supply chain manager and administrative support, the warehouse supervisor and storekeepers, receiving and inspection workers, and emergent sourcing specialists.
- Telecommunications – includes the IT manager, business analysts, local area network field services workers, and telecommunications services.

Table 3-7 of the DOE study also contains estimated salary costs of the operational staff for the ESBWR technology[1]. The estimated average direct (on-site and off-site) staffing costs for an ESBWR unit added to an existing nuclear facility were $65,733 (2008 dollars) per staff member. This estimate does not include estimated overtime, which boosts the direct per person salary to $70,634 (2008 dollars). These numbers compare favorably to the estimate of $66,868 (2008 dollars) assumed in Section 5.8.2.7 of the Fermi 3 Environmental Report. Finally, when including other estimated salary related benefits such as retirement, payroll tax, bonuses and incentives, and other benefits, the total staffing cost per person was estimated in the DOE study to be $106,670 (2008 dollars).

Proposed COLA Revision

The proposed COLA markup will be provided with the response to RAI SE4.4.2-8 in December.

[1] These wages were provided in 2004 dollars and they were updated to 2008 dollars using the Bureau of Labors Statistics inflation calculator.

Attachment 15
NRC3-09-0016

Response to RAI letter related to Fermi 3 ER

RAI Question SE4.4.2-10

NRC RAI SE4.4.2-10

Provide a copy of Level of Service (LOS) analysis/traffic study.

Supporting Information

This information is needed to evaluate 1) carrying capacity and condition of roads and highways during construction, operation, and outage periods; 2) relevant transportation and traffic information (i.e., likely commuter [including construction, operation, and periods of outages] and emergency evacuation routes) in Michigan and Ohio; 3) availability and types of public transportation; 4) proposed road modifications that may affect traffic flow to and from the Fermi site; and 5) hourly present and future rates of worker flow through Fermi security gates (ER Sections 4.4.2.4.2 and 5.8.2.4.2). In ER Section 4.4.2.4.2, Detroit Edison committed to supply this information within one year of submittal of the COLA.

Response

A traffic study was conducted in the vicinity of the Fermi site in order to perform a Level of Service analysis. The results of the study have been provided in the report "Traffic Study, Fermi Nuclear Power Plant, Unit 3 Expansion", dated November 10, 2009. That report is provided on an enclosed CD with this letter.

Proposed COLA Revision

Revisions to the Environmental Report are being made to reflect the information in the Level of Service traffic study. See the attached markup for the proposed COLA revision.

Markup of Detroit Edison COLA
(following 7 pages)

The following markup represents how Detroit Edison intends to reflect this RAI response in a future submittal of the Fermi 3 COLA. However, the same COLA content may be impacted by revisions to the ESBWR DCD, responses to other COLA RAIs, other COLA changes, plant design changes, editorial or typographical corrections, etc. As a result, the final COLA content that appears in a future submittal may be different than presented here.

levels, this would result in a 0.33 percent increase. This increase is well within the long-term historical growth rate of population in the county (0.94 percent from 1990 through 2007).

As seen in Table 4.4-4 for Wayne County, the impact of the addition of 109 workers and 55 new students (based on 0.5 students per occupied housing unit for the county in 2006) would hardly be noticeable given the total enrollment of 359,643 students among 700 schools in 2005-2006. Given the decrease in population and employment plus the increase in vacant housing experienced since 2000, the largest concern for Wayne County school districts may be whether some schools will need to be closed due to declining enrollment, and the small increase in students associated with Fermi 3 construction will be a stabilizing benefit.

In Lucas County, the 87 additional workers and 35 students (based on 0.4 students per occupied housing unit for the county in 2006) would likewise present an insignificant increase in the number of students in the 140 schools that had a 2005-2006 enrollment of 73,146 students.

Regarding the capacity of existing schools to accommodate new students, contact was made with the superintendents of Monroe Public Schools and Jefferson Public Schools in Monroe County. Both indicated that their districts should be able to absorb new students joining the system. While some advance planning and coordination could be required, there were no reservations that the districts would be able to accommodate additional students. Given the large number of districts in Lucas and Wayne counties, the insignificant increase in students projected for these counties, and the length of time until the peak construction period in 2017, no districts in these counties were contacted. In summary, the construction impacts on existing schools in Monroe, Wayne, Lucas Counties is expected to be SMALL, and no mitigative measures are needed.

4.4.2.4.2 **Transportation**

Transportation to the Fermi 3 site will include workers and deliveries during the 10-year construction period. These trips will be in addition to the operation staff and deliveries at Fermi 2 that include 800 operational staff, 150 contract supplemental employees, and maintenance workers traveling to the site for scheduled and unscheduled outages. The number of maintenance workers can peak at 1200 to 1500 workers during Fermi 2 refueling, which occurs approximately every 18 months. Thus, in a worst case scenario, should refueling of Fermi 2 coincide with peak Fermi 3 construction employment level of 2900 workers, the total onsite population could reach as high as approximately 5000 personnel, not including deliveries.

With up to 5000 workers commuting to the Fermi site at the time of peak Fermi 3 construction employment, there is the potential for large traffic impacts near the plant entrance, though a number of factors will serve to reduce the number of vehicles entering the site at any one time. First, based on data presented in Table 2.5-56, it is reasonable to expect that at least 10 percent of the workers will carpool. Also, the Fermi 2 operational workforce will be distributed among 24-hour shifts, and it is very possible - as an obvious preventive measure - that shift start times between the Fermi 2 and Fermi 3 work force will be staggered. Another major factor influencing the traffic flow near the site will be the number of Fermi 3 construction shifts. It is possible that multiple shifts will be used at Fermi 3, which would be ideal from a traffic flow standpoint.

~~Traffic flow will also be facilitated by the separate entrances anticipated for Fermi 3 construction staff and Fermi 2 operational and maintenance staff. The Fermi 2 staff will enter the site from a new access road from Dixie Highway. This new access road will parallel and lie adjacent to the existing access road until it enters the Fermi site, but will allow for the segregation of the Fermi 3 construction workers and the Fermi 2 operational staff.~~

~~Even with the measures that will serve to disburse traffic flow to the site, there is still the likelihood that traffic flow on Dixie Highway near the site will be disrupted during shift changes, especially during the months surrounding peak construction. The available traffic count data presented on Figure 2.5-25 consists of average daily traffic counts rather than the hourly traffic flows needed to perform a full Level of Service analysis. Until a full Level of Service analysis is performed and specific assumptions about work schedules for the Fermi workforce are made, a precise description of the impact on traffic flows resulting from Fermi 3 construction is not possible. However, it is safe to state that the probable impact during peak construction activities will be a MODERATE to LARGE negative impact that will require some mitigation activities. Such a finding would be consistent with other power plant project studies. In the EPRI study of twelve power plant projects, for example, "traffic problems and congestion were mentioned as a negative factor in all 12 case studies." (Reference 4.4-12) Accordingly, Detroit Edison will perform a Level of Service analysis. **[START COM 4.4-001]** Detroit Edison will provide an update to the Fermi 3 Environmental Report reflecting the results of a Level of Service analysis performed in coordination with appropriate agencies, including the Michigan Department of Transportation (MDOT) and the Monroe County Road Commission within one year of the docketing of the Fermi 3 COL Application. **[END COM 4.4-001]**~~

Insert 1

~~Information regarding the traffic impact study that will be required is available from the MDOT's document *Traffic and Safety Note 607A*. According to this document, "a traffic impact study is required for any proposed development expected to generate over one hundred (100) peak hour directional trips or at the discretion of the Region/TSA Traffic & Safety Engineer." (Reference 4.4-19) The traffic impact study should include a description of the development and phases, a transportation and traffic inventory including peak hour volumes, and a capacity analysis at each access point. The traffic study is to be performed with and without the project, and while the traffic volumes for the development are to assume a total build out, it is probable that the MDOT will want to understand the traffic impacts during the prolonged construction phase as well. As discussed in Subsection 4.1.1.3, the pavement on roads in the vicinity of the site may be widened or additional surface layers added to support construction related traffic, including heavy construction vehicles and delivery of materials.~~

~~Transportation impacts on the local highway system will be the only significant transportation impacts expected. It is anticipated that there would be no significant impacts on area railways, airports, or bodies of water due to construction activities, although there may be some occasional equipment deliveries over the rail spur leading to the site.~~

4.4.2.4.3 Public Safety and Social Services

The possibility exists that construction activities could result in a slight increase in demand for safety and social services due to relocated workers to the primary impact area counties. These

4.4-14 Malhotra (Malhotra, S., and D. Manninen), 1981a, Migration and Residential Location of Workers at Nuclear Power Plant Construction Sites; Forecasting Methodology (Volume 1) and Profile Analysis of Worker Surveys (Volume 2), Prepared by Pacific Northwest Laboratory for U.S. Nuclear Regulatory Commission, NUREG/CR-2002, PNL-3757, April, NRC Accession Numbers 8105180373 (Volume 1) and 8105180378 (Volume 2).

4.4-15 U.S. Department of Labor, Bureau of Labor Statistics, "Local Unemployment Statistics, Michigan," Series ID LASST26000003, http://data.bls.gov/cgi-bin/surveymost?la+26, accessed 24 April 2008.

4.4-16 U.S. Department of Labor, Bureau of Labor Statistics, "Labor Force Statistics from the Current Population Survey," U.S. Department of Labor, Series ID LNS14000000, http://data.bls.gov/PDQ/servlet/SurveyOutputServlet?data_tool=latest_numbers&series_id=LNS14000000 and Series ID LNU04032231, http://data.bls.gov/PDQ/servlet/SurveyOutputServlet?data_tool=latest_numbers&series_id=LNU04032231, accessed 19 December 2007.

4.4-17 U.S. Department of Labor, Bureau of Labor Statistics, http://www.bls.gov/webapps/legacy/cpsatab1.htm, accessed 29 August 2007.

4.4-18 U.S. Nuclear Regulatory Commission, Office of Nuclear Regulatory Research, "Generic Environmental Impact Statement for License Renewal of Nuclear Plants," Final Report, NUREG-1437 Vol. 1, May 1996.

4.4-19 Michigan Department of Transportation, "Traffic and Safety Note 607A."

4.4-20 Bureau of Economic Analysis, "Regional Multipliers: A User Handbook for the Regional Input-Output System (RIMS II)," http://www.bea.gov/scb/pdf/regional/perinc/meth/rims2.pdf, accessed 25 March 2008.

4.4-21 Bureau of Economic Analysis, "RIMS II Multiplier: Primary Impact Area of Monroe County, Wayne County, and Lucas County," March 2008.

4.4-22 The Mannik and Smith Group, "Traffic Study: Fermi Nuclear Power Plant, Unit 3 Expansion," Prepared for Detroit Edison, November 10, 2009.

Insert 1

According to MDOT's document *Traffic and Safety Note 607A*, "a traffic impact study is required for any proposed development expected to generate over one hundred (100) peak hour directional trips or at the discretion of the Region/ TSA Traffic & Safety Engineer." (Reference 4.4-19) In order to analyze the effects that the construction of Fermi 3 would have on area traffic patterns, Detroit Edison has performed a Level of Service traffic study (Reference 4.4-22). The traffic study involved collecting traffic count data during and after a Fermi 2 refueling outage in order to factor in the fluctuation of vehicles accessing the site during these times. Existing information on area traffic flows was also utilized including average daily traffic counts presented in Figure 2.5-25. Consultations with the Michigan Department of Transportation and the Monroe County Road Commision were made during the course of the analyses.

In the EPRI study of twelve power plant projects, "traffic problems and congestion were mentioned as a negative factor in all 12 case studies." (Reference 4.4-12) The Fermi study analyzes the effects that both the projected operations and construction workforces will have on traffic flows in the vicinity of the Fermi site when combined with existing Fermi 2 traffic. The greatest negative impacts are projected to occur in 2017 when the construction workforce is at its peak of 2900 workers. It has been determined that by implementing potential improvements including signal installations and signal modifications, staggering worker shifts, bussing employees from off-site, minor lane additions and/or a second entrance to the site that a great deal of the increased traffic impacts can be minimized resulting in a SMALL impact.

Table 10.1-1 Unavoidable Adverse Environmental Impacts of Construction (Sheet 4 of 5)

Impact Category	Adverse Impact	Potential Actions to Mitigate Impacts	Unavoidable Adverse Impact
Socioeconomics	Construction workers and local residents are exposed to an increase in noise, dust, exhaust, and emissions from construction and related equipment. These impacts continue through construction.	Implement standard noise control measures for construction equipment (silencers). Limit the types of construction activities during nighttime and weekend hours. Establish a construction noise monitoring program.	Small unavoidable impacts.
		Use dust control measures such as watering, stabilizing disturbed areas, and covering trucks.	
	Construction workers and local residents experience traffic that continues through the construction phase.	~~Detroit Edison will undertake a Level of Service analysis at an appropriate time prior to construction, and will coordinate with the Michigan Department of Transportation and Development (MDOT), the Monroe County Road Commission, and other appropriate agencies regarding the performance of the studies and mitigation activities.~~ ~~Encourage carpooling and stagger shifts.~~ ~~Post signs to notify the public of high traffic areas near construction areas.~~	~~Potential for~~ unavoidable ~~adverse~~ impacts. Small Detroit Edison has performed a Level of Service analysis (Reference 10.2-8). Consultations were made with the Michigan Department of Transportation (MDOT) and the Monroe County Road Commission. Improvements include: signal installations and signal modifications, staggering worker shifts, bussing employees from off-site, minor lane additions and/or a second entrance to the site
	Influx of construction workforce (short-term).	Housing shortages could be mitigated by new home construction. This action is not under the control of the applicant.	Mir imp
	Initially, public services, infrastructure, and area schools are strained by the short-term population influx.	Increased tax revenues can fund additional services, improvements, and schools (or portable classrooms) to mitigate the effects of populations. These actions are not under the control of the applicant.	Some services may be slightly strained and schools could experience crowding. The potential for effect is minimal and short-term.
Radiological	Construction workers may be exposed to radiation sources (through direct radiation, gaseous effluents, or liquid effluents) from the routine operations of Fermi 2.	Monitor doses received by workers to ensure they are within regulatory limits. The site will be in accordance with all radiation safety regulations to ensure that the construction workers are protected.	Small unavoidable adverse impact of radiation exposure for construction workers from existing unit.

Table 10.1-2 Unavoidable Adverse Environmental Impacts of Operation (Sheet 4 of 4)

Impact Category	Adverse Impact	Mitigation Measures	Unavoidable Adverse Impact
	Potential adverse impact to traffic flows on highways and access roads to the Fermi site. Traffic at the site and on surrounding roadways would increase as operational staff for the nits commute to the Fermi site.	~~Level of service analysis conducted by the applicant would indicate potential impacts and appropriate traffic mitigation.~~	~~Potential for unavoidable adverse impacts depending on the level of service analysis results. It is expected, however, that adequate mitigation measures such as staggering work shifts and encouraging carpooling, will reduce traffic impacts to acceptable levels and mitigate the potential for unavoidable adverse impacts.~~
	odic loud noises are generated by i 3 operation and routine tenance on corridors may impact cent workers and residents for the ion of operation.	Noise levels do not typically exceed background levels. Sound attenuation measures (as part of facility and transmission corridor equipment design) reduce noise impacts.[1] Protective equipment is provided to employees. No mitigation measures are expected to be necessary.	Minimal or no unavoidable adverse impacts.
Radiological	Discharges of small amounts of radioactive liquid and gases within regulatory limits.	Potential doses to workers and public will be within regulatory limits. No mitigation measures are necessary.	Small unavoidable adverse impact of radiation exposure.
Atmospheric and Meteorological	Cooling towers emit water vapor plumes that cause fogging/icing, cloud formation, plume shadowing, humidity, and additional precipitation.	The occurrence of plumes and fogging are low. Use Best Available Technology for installing and operating the cooling tower. No mitigation measures are expected to be necessary. The plumes cause little to no effect on humans or surrounding vegetation. No mitigation measures are expected to be necessary.	Minimal or no unavoidable adverse impacts.
	Small quantities of waste salts and chemicals are discharged into the atmosphere.	No mitigation measures are expected to be necessary.	Minimal or no unavoidable adverse impacts.

Detroit Edison has performed a Level of Service analysis (Reference 10.2-8). Consultations were made with the Michigan Department of Transportation (MDOT) and the Monroe County Road Commission. Improvements include: signal installations and signal modifications, staggering worker shifts, bussing employees from off-site, minor lane additions and/or a second entrance to the site

Small unavoidable impacts.

Notes:

1. The 345 kV transmission system and associated corridors are exclusively owned and operated by the ITC*Transmission*. The applicant has no control over the construction or operation of the transmission system. The construction impacts are based on publicly available information and reasonable expectations on the configurations and practices that ITC*Transmission* is likely to use based on standard industry practice. Such efforts would likely include transmission design considerations and Best Management Practices that would minimize the effects on land use.

10.2.3 References

10.2-1 U.S. Department of Energy, "Application of Advanced Construction Technologies to New Nuclear Power Plants," MPR-2610, Rev. 2, September 24, 2004, (Table N-2, N-6, and N-9), http://www.ne.doe.gov/np2010/reports/mpr2610Rev2Final924.pdf, accessed 2 May and 13 May 2008.

10.2-2 Energy Information Administration, "Domestic Uranium Production Report Quarterly," Data for 4th Quarter, 2007, http://www.eia.doe.gov/cneaf/nuclear/dupr/qupd.html, accessed 13 May 2008.

10.2-3 Energy Information Administration, "Uranium Industry Annual 1996," April 1997, http://tonto.eia.doe.gov/FTPROOT/nuclear/047896.pdf, accessed 13 May 2008.

10.2-4 World Nuclear Association, "Supply of Uranium," March, 2007, http://www.world-nuclear.org/info/inf75.html, accessed 18 July 2008.

10.2-5 National Ready Mix Concrete Association, http://www.nrmca.org/concrete/2008.htm, accessed 13 May 2008.

10.2-6 U.S. Census Bureau, Economics and Statistics Administration, "Steel Mill Products: 2006", Issued July 2007, http://www.census.gov/industry/1/ma331b06.pdf, accessed 13 May 2008.

10.2-7 U.S. Census Bureau, Economics and Statistics Administration, "Insulated Wire and Cable: 2006", Issued June 2007, http://www.census.gov/industry/1/ma335j06.pdf, accessed 13 May 2008.

10.2-8 The Mannik and Smith Group, "Traffic Study: Fermi Nuclear Power Plant, Unit 3 Expansion," Prepared for Detroit Edison, November 10, 2009.

Attachment 16
NRC3-09-0016

Response to RAI letter related to Fermi 3 ER

RAI Question TE2.4.1-2
RAI Question TE2.4.1-9
RAI Question TE2.4.1-10

NRC RAIs

The following RAIs involve terrestrial ecology related issues and are tied very closely together. To avoid unnecessary duplication and achieve as much simplification as possible, Detroit Edison has elected to address these RAIs with a single response.

A - TE2.4.1-2

Provide the interim report on the confirmatory updated terrestrial ecology survey for the first six months of study. Provide a more recent version and the final report when available.

The confirmatory terrestrial ecology survey was begun in July 2008 and is to be completed in July 2009. Results of this survey will be critical to the EIS analysis of ecological impacts.

B - TE2.4.1-9

Provide the Michigan DNR protected species assessment report mentioned in a letter from Michigan DNR to Ralph Brooks dated November 28, 2007.

This report on the subject of protected species will be critical to the analysis of ecological impacts that will be presented in the EIS. The report is not available elsewhere.

C - TE2.4.1-10

Provide point maps of any protected species observed by Black & Veatch (B&V) or other contractors in planned spring and summer 2009 field observations.

The confirmatory terrestrial ecology survey was begun in July 2008 and is to be completed in July 2009. Provide point maps of any protected species observed during these surveys. Results will be critical to the EIS analysis of ecological impacts.

Response

A - *Provide the interim report on the confirmatory updated terrestrial ecology survey for the first six months of study. Provide a more recent version and the final report when available.*

The following two interim reports, "Fermi 3 Extended Terrestrial Wildlife Survey Interim Report" and "Fermi 3 Extended Terrestrial Vegetation Survey Interim Report," both dated October 2008, were provided in letter NRC3-09-0010 (ML091940218), dated June 19, 2009. The final two reports, "Fermi 3 Terrestrial Wildlife Survey Final Report" and "Fermi 3 Terrestrial Vegetation Survey Final Report," both dated November 2009 are provided on an enclosed CD with this letter.

B - *Provide the Michigan DNR protected species assessment report mentioned in a letter from Michigan DNR to Ralph Brooks dated November 28, 2007.*

The two reports, "Fermi 3 Terrestrial Wildlife Survey Final Report" and "Fermi 3 Terrestrial Vegetation Survey Final Report," identified above contain the necessary elements of the protected species assessment report requested by the Michigan Department of Natural Resources.

C - *Provide point maps of any protected species observed by Black & Veatch (B&V) or other contractors in planned spring and summer 2009 field observations.*

The two reports, "Fermi 3 Terrestrial Wildlife Survey" and "Fermi 3 Terrestrial Vegetation Survey Final Report," identified above contain maps displaying the locations where protected species were identified.

Proposed COLA Revision

Revisions to the Environmental Report to reflect the information in the terrestrial and vegetative ecology reports are attached and provided at the end of this response.

Markup of Detroit Edison COLA
(following 23 pages)

The following markup represents how Detroit Edison intends to reflect this RAI response in a future submittal of the Fermi 3 COLA. However, the same COLA content may be impacted by revisions to the ESBWR DCD, responses to other COLA RAIs, other COLA changes, plant design changes, editorial or typographical corrections, etc. As a result, the final COLA content that appears in a future submittal may be different than presented here.

2.4 Ecology

The purpose of this section is to describe the terrestrial and aquatic environment and biota of the site and vicinity, transmission corridors, and offsite areas to provide a baseline from which to judge the construction and operational impacts on these areas. Subsection 2.4.1 and Subsection 2.4.2 identify and describe the terrestrial and aquatic species composition, spatial and temporal distribution, abundance, and other structural and functional attributes of biotic assembleges that could be impacted by Fermi 3. Important terrestrial and aquatic natural resources are identified, as well as wildlife sanctuaries, preserves, and other natural areas that are potentially affected.

2.4.1 Terrestrial Ecology

The Fermi 3 project is located on the shore of Lake Erie at the west end of the Lake Erie Basin in the Southern Lower Peninsula Ecoregion (SLPE) (Reference 2.4-1). West of the Fermi site is primarily agricultural land (row crops) with scattered rural residences. The general land use in the vicinity of the Fermi site is illustrated in Figure 2.1-1. To the south the area is equally divided between residential properties and a narrow lagoon off Lake Erie that is surrounded by brushy forest. The general area of interest around the existing Fermi 2 is illustrated in Figure 2.4-1.

The SLPE includes approximately the southern half of the Lower Peninsula of Michigan. The eastern portion of the region where the project is located has a prevalence of flat plains, the Lake Erie basin, that eventually give way to the main body of Lake Erie. The region is underlain by Paleozoic bedrock and was completely glaciated during the late Wisconsin Period, some 18,000 to 20,000 years ago (Reference 2.4-2). Today this type of broad lacustrine plain is found around most areas of the Great Lakes and typically extends several to many miles inland (Reference 2.4-1). Nearly all of Monroe County lies on this plain, making the landward extent of the plain in the project vicinity about 25 miles.

Detailed terrestrial surveys were conducted at the site from 2008 through 2009.

Reconnaissance surveys to the Fermi site and vicinity were made between November 2006 and May 2008. The purpose of these investigations was to observe and assess existing conditions of the ecological resources, including vegetation and wildlife. Several previous wildlife and plant studies have been made on the property. NUS Corporation examined the site between 1973 and 1974 (Reference 2.4-3). In 2000 the Detroit Edison Fermi 2 Plant Wildlife Habitat Team in cooperation with the Wildlife Habitat Council prepared a Wildlilfe Management Plan, which included updated wildlife occurrence lists for the site. The Wildlife Management Plan was re-certified in 2002 and again updated the wildlife occurrence lists. Information from these studies is included and considered in the present study. ~~**[START COM 2.4-001]** Detroit Edison will perform~~ a confirmatory updated terrestrial ecological survey of the site that provides a year's worth of seasonal sampling data to reflect variations in terrestrial populations. ~~A revision to the Environmental Report will be provided to the NRC within one year after docketing of the COL Application that reflects the survey results. **[END COM 2.4-001]**~~

As indicated above,

performed

(References 2.4-95 and 2.4-96

A topographic map of the Fermi area showing the property boundaries is provided in Figure 2.4-2. Figure 2.4-3 is an aerial photograph of the Fermi area taken in 1981 during the construction of Fermi 2. Figure 2.4-4 is an aerial photograph taken in 2005 that is representative of current existing

conditions. The most notable difference in the two photographs is the much higher water conditions in the lagoons in 1981 compared to 2005 and the difference in cover types present due to Fermi 2 construction activities in 1981.

2.4.1.1 Terrestrial Communities

Following are brief discussions of the floral and faunal components found at the Fermi site. The vicinity surrounding Fermi consists of similar habitats but is dominated by Lake Erie (about 50 percent), urban areas, rural residences, and agricultural lands.

2.4.1.1.1 Vegetation on Site and Vicinity

during site reconnaissance

and again in a detailed survey between 2008 and 2009 (Reference 2.4-95).

The flora at the Fermi site was studied between 2006 and 2008. Using current aerial photography of the Fermi property, plant community boundaries were drawn on a provisional basis. The property was then divided into a gridwork of approximately 1,000 feet square parcels. Pedestrian surveys were then made of all areas of the site, using the grid system to effectively examine the habitats on and areas of the property. The surveys were conducted during the spring, summer and fall seasons to account for the variation in flowering time for different plant species. Field inspection of the structure and species composition of these areas was used to refine the boundaries of the plant communities present. Within each terrestrial community identified, point to point transects were examined to determine cover type and dominant species. At least two transects were examined in each habitat area of significant size. For example, if five separated areas of the property were identified as the same habitat, at least two transects were examined in each of these tracts, assuming each tract was large enough to accommodate a 100 meter or longer transect. Random sampling of plants was done within all communities identified to more thoroughly examine microhabitats and better understand the species diversity present. The outcome of the field studies was used to refine the boundaries of the plant communities present and provide an understanding of the character of these communities as they exist on the Fermi property. The discussion that follows is based on the findings of these studies.

The 1260 acre Fermi site is composed of approximately 16.4 percent developed areas and 6.0 percent cropland. Terrestrial habitats account for 60.2 percent of the property. The remaining 17.4 percent are water bodies, e.g. Quarry Lake and the main body of Lake Erie that lies east and north of the site. Figure 2.4-5 illustrates the extent and location of the habitats identified and the developed areas on the Fermi site. Table 2.4-1 provides an accounting of the acres present of each habitat. Plant community descriptions (Table 2.4-1 and Figure 2.4-5) are defined biologically, which may differ from the regulatory definitions used in the wetlands delineation (Figure 2.4-19).

Studies of the flora at Fermi between 2006 and 2008 identified 216 plant species present. This should be considered a conservative number of species since in some instances specimens could not be identified beyond the genus. Table 2.4-2 provides a list of plant species observed during reconnaissance visits or reported as occurring. Plant identifications and nomenclature primarily follow that used in the *Michigan Flora* (Reference 2.4-4). Common names primarily follow those found in the *National List of Plant Species that Occur in Wetlands: North Central (Region 3)* (Reference 2.4-5) and Reference 2.4-95.

Early accounts of the Fermi site indicate that as recently as 1961, most of the site was in cultivation or had been otherwise disturbed. The NUS study (Reference 2.4-3) describes nearly all of the habitats on site as being in relatively early stages of succession. For example, most woodlots present in 1973 and 1974, which remain intact today, were nearly all once cleared land at one time. Over time these areas became revegetated by tree species representative of the area as well as some non-native species. But while the tree flora is mostly representative of other areas of southern Michigan, the ground cover remains diminished, presumably due to the lack of an adequate seed bank for ground cover species and probably alterations to soils conditions (fill material, mixing due to scrapping, shading, etc.). The terrestrial habitats present on the Fermi site today are described in the following paragraphs and the distribution of these is illustrated in Figure 2.4-5. The communities are categorized according to the 2006 Michigan Department of Natural Resources Terrestrial Systems for the Lower Peninsula (Reference 2.4-1) with minor modifications.

Grassland: Row Crops (GRC) (brown areas in Figure 2.4-5)

Grassland: Row Crop (GRC) areas are agricultural fields that are planted with a single species (usually corn or soybeans) and harvested annually. Approximately 55 acres or 6.0 percent of the property is completely GRC.

Grassland: Idle/Old Field/Planted (GOF) (orange areas in Figure 2.4-5)

Grassland: Idle/old fields/planted (GOF) are communities of opportunistic plants that take over ground that had once been cleared for agriculture or other purposes. In some cases, these areas are initially planted with a cover grass, usually perennial brome or fescue when the area is to remain idle permanently or for the long term. The GOF communities at the Fermi site are dominated by smooth brome (*Bromus inermis*), but contain a good mix of opportunistic (weedy and invasive) native and introduced species, such as Canada thistle (*Cirsium arvense*), Canada goldenrod (*Solidago canadensis*), and flattop-fragrant goldenrod (*Euthamia graminifolia*). Invasive shrubs, such as multiflora rose (*Rosa multiflora*) and blackberry (*Rubus* spp.), may also be present but are not dominant. This is a disturbed community and offers limited value to wildlife, although it provides shelter to small mammals, birds, and reptiles and has some forage value. Approximately 75 acres or 5.2 percent of the site is GOF.

Grassland: Right-of-way (GRW) (yellow areas in Figure 2.4-5)

Grassland: Rights-of-way (GRW) are linear features associated with roadways, railways, power lines, pipelines, etc. At Fermi approximately 29 acres or 2.3 percent of the property is right-of-way, including less than one percent along roadways. An existing power line right-of-way accounts for the majority of this classification. The power line right-of-way is periodically mowed to keep the area free of trees for reasons of safety in relation to line clearance issues. About one-half of the area is a prairie creation area while the remainder is unmanaged. The prairie was planted in 2003 by Detroit Edison with the assistance of a North American Wetland Conservation Act grant managed by Ducks Unlimited and the Natural Resources Conservation Service (NRCS). The area is dominated by big bluestem (*Andropogon gerardii*) and Indiangrass (*Sorghastrum avenaceum*).

Broomsedge (*Andropogon virginicus*) is an undesirable and invasive grass that is relatively common in the area and is even abundant in some localities. Other undesirable plants are also present, including purple loosestrife (*Lythrum salicaria*), common reed (*Phragmites australis*), teasel (*Dipsacus sylvestris*), and all non-native species. Surveys of the area between 2005 and 2008, including species identified prior to the preparation of this document, listed approximately 110 plant species as occurring in this area. To date, management has consisted of periodic mowing of most of the site to discourage the growth of woody species.

In the lowest portions of the GRW, large grasses like the bluestem and Indiangrass become less dominant. Where broomsedge has not overtaken the ground cover, composition tends to be somewhat representative of a perennial, herbaceous wetland. Grass-like bulrushes (*Scirpus* spp.), rushes (*Juncus* spp.), and sedges (*Carex* spp.) are present in some areas, as are broadleaf forbs, such as common boneset (*Eupatorium perfoliatum*) and southern blue flag (*Iris virginica*). An unmanaged portion of the right-of-way is dominated by broomsedge in the driest areas and with cattails (*Typha* spp.) in the lowest areas. The variation in hydrologic conditions across this area has encouraged the growth of a substantial variety of forbs representative of native and introduced species.

The GRW is a previously disturbed area that presently provides some limited value to wildlife in the form of diverse foraging and shelter for small mammals, birds, and reptiles and perhaps some grazing for larger mammals.

Shrubland (SHB) (red areas in Figure 2.4-5)

Shrubland (SHB) communities at the Fermi site are upland areas with relatively dry soils that are dominated by deciduous shrubs. Approximately 113 acres or 9.0 percent of the site is SHB. On the Fermi property, all shrublands are located in areas that were filled or otherwise severely disturbed by construction activities for Fermi 1 and 2, with the possible exception of SHB in the extreme southeastern corner of the property. Shrub species, like dogwood (*Cornus* spp.), common buckthorn (*Rhamnus cathcartica*), mulltiflora rose (*Rosa multiflora*), and blackberries (*Rubus* spp.), dominate the site. Saplings of trees in the area are also common, such as honey locust (*Gleditsia triacanthos*), cottonwood (*Populus deltoides*), and green ash (*Fraxinus pennsylvanica*). Despite the cover of shrubs and saplings there generally is substantial ground cover in the form of grasses and coarse forbs are common. Since these areas have been previously disturbed, it is not surprising to find that many of the species present are introduced or native increasers (i.e., plants native to the area but tending to be opportunistic in where they grow). Examples include smooth brome (*Bromus inermis*), prickly lettuce (*Lactuca serriola*), Canada goldenrod (*Solidago canadensis*), and Missouri ironweed (*Vernonia missurica*). Wildlife use in the SHB would include cover, nesting sites, and bedding areas but is expected to be limited for foraging due to lack of appropriate plant species.

Thicket (TKT) (light orange areas in Figure 2.4-5)

Areas identified as Thicket (TKT) on the Fermi property are generally located in areas between wetlands and upland. Approximately 23 acres or 1.8 percent of the site is designated TKT. These areas are densely populated with small trees, such as hawthorn (*Crataegus* spp.), and box elder

(*Acer negundo*). Shrubs are also common, including European privet (*Ligustrum vulgare*), dogwoods (*Cornus* spp.). Saplings of eastern cottonwood *(Populus deltoides*), peach-leaved willow (*Salix amygdaloides*), and green ash are also prevalent and poison ivy (*Toxicodendron radicans*) is abundant. Ground cover is sparse to lacking except in a few open areas. The low quality species composition present suggests that the area was disturbed in the past. A comparison of the 1981 (Figure 2.4-3) and 2005 (Figure 2.4-4) aerial photographs of the site illustrates the change that has occurred from shrub/grassland habitat to thicket. Regarding wildlife, the TKT area is probably most beneficial to small mammals and birds for shelter and foraging, since large mammals would find it difficult to move through the dense brush.

Forest: Coastal Shoreline (FCS) (dark green hatched areas in Figure 2.4-5)

The Forest: Coastal Shoreline (FCS) community occurs in a narrow, interrupted band along the east side of the property adjacent to the main body of Lake Erie. The area includes about 47 acres of land or 3.7 percent of the property. The area is dominated by large cottonwoods (*Populus deltoides*) and peach-leaved willow (*Salix amygdaloides*), some as much as two feet or more in diameter. Box elder (*Acer negundo*) and green ash (*Fraxinus pennsylvanica*) are also scattered in the area. Shrub growth varies from dense to sparse depending on lake exposure and the extent of high water ponding that occurs. Ground cover is sparse in heavily shaded areas and on the edges includes dense stands of reed canarygrass (*Phalaris arundinacea*). Forbs include primarily species capable of withstanding fluctuations in moisture availability and generally sandy soil conditions, such as stinging nettle (*Urtica dioica*). In this area it is also common to discover unexpected native and introduced species that have likely been dispersed here from other areas via the waters of Lake Erie. Examples include jimson-weed (*Datura strumonium*) and clammy-weed (*Polanisia dodecandra*). Overall, the FCS at Fermi is a dynamic community composed of opportunistic, early succession species. Wildlife value of the area is primarily limited to birds roosting or nesting in the trees.

Forest: Lowland Hardwood (FLH) (dark green areas in Figure 2.4-5)

The Forest: Lowland Hardwood (FLH) community represents the most mature habitat on the Fermi property. The FLH accounts for about 92 acres or 7.3 percent of the site located in areas immediately northeast of Quarry Lake and the south-central portion of the site along the west side of the south lagoon. Like the FCS, cottonwood (*Populus deltoides*) and peach-leaved willow (*Salix amygdaloides*) are present but oaks (*Quercus* spp.), American basswood (*Tilia americana*), and hickory (*Carya* spp.) are well represented. Overall, the habitat is drier and more stable than that found in the FCS and the topsoil is organic to even clayey rather than sandy. The largest trees are found in the area northeast of Quarry Lake where numerous specimens can be found in the range of 18 to 26 inches in diameter. In the south-central area, scattered trees reach this size but most are less than 14 inches in diameter. Larger specimens appear to have been logged out of the area years ago, as evidenced by scattered old stumps. Shrubs are widely scattered in the FLH, so it is generally easy to move about the habitat. Ground cover is overall sparse, but consists of a variety of woodland species, such as woodland bluegrass (*Poa sylvestris*), scattered sedges (*Carex* spp.), enchanter's nightshade (*Circaea lutetiana*), false spikenard (*Smilacina racemosa*), and Virginia stickseed (*Hackelia virginiana*). Poison ivy (*Toxicodendron radicans*) is common as are grape vines

(*Vitis* spp.). The habitat provides substantial cover, shelter and foraging for a variety of wildlife in the area, as evidenced by tracks, nests, and scat observed in the area.

Forest: Woodlot (FWL) (light green areas in Figure 2.4-5)

The Forest: Woodlot (FWL) community is found in the east-central and northwestern portions of the Fermi property and account for about 117 acres or 9.3 percent of the site. The FWL developed over fill material from Fermi 1 and 2 construction or on land otherwise heavily disturbed by Fermi 1 and 2 activities. The canopy is well developed and is composed of Cottonwood (*Populus deltoides*), box elder (*Acer negundo*), and green ash (*Fraxinus pennsylvanica*). Introduced species, such as the tree-of-heaven (*Ailanthus altissimus*) can also be observed. The understory is composed of saplings of the same species, dense in some areas and less dense in other places. Vines of poison ivy (*Toxicodendron radicans*), grape (*Vitis* spp.) and trumpet creeper sometimes form localized thickets. Introduced European privet (*Ligustrum vulgare*) and common buckthorn (*Rhamnus cathcartica*) are relatively common. The ground cover is overall sparse and composed entirely of native and non-native invasive or otherwise undesirable species. Some of the more common herbaceous species include burdock (*Arctium minus*), heal-all (*Prunella vulgaris*), and garlic mustard (*Alliaria petiolata*). The value of FWL to wildlife is limited to nesting areas and den areas and sheltered resting areas. Few native species in the community are provided adequate foraging opportunities because of the dominance by non-native species.

Coastal Emergent Wetland (CEW) (light blue and blue hatched areas in Figure 2.4-5)

The Coastal Emergent Wetland (CEW) is the largest plant community represented on site, covering about 273 acres or 21.6 percent of the site. The area is divided between a north and south lagoon and an unnamed drainage corridor entering the site from the west. From the most recent study, it is estimated that 238 acres is vegetated and 35 acres is open water. The extent of aquatic vegetation present fluctuates annually depending on water conditions in Lake Erie. High water years result in more open water and less in low water years. The 1981 aerial photograph in Figure 2.4-3 illustrates relatively high water conditions, while the 2005 photograph in Figure 2.4-4 shows a marked increase in vegetation in the lagoons during low water periods. At the present time the lagoon is dominated by dense and extensive stands of common reed (*Phragmites australis*) and cattail (*Typha* spp.). The introduced and undesirable purple loosestrife (*Lythrum salicaria*) is present throughout most of the area. The west-side drainage corridor has virtually no open water because of these plant communities. Because these stands are so dense, they provide minimal habitat for wildlife, especially waterfowl. In the south lagoon, and to a lesser extent in the north lagoon, are large stands of American lotus (*Nelumbo lutea*), which is a state listed threatened species. The status of the lotus is discussed in detail in Subsection 2.4.1.2. Most of the lagoon is quite shallow. The south lagoon has fill deposits scattered throughout. Wading birds utilize the shallow water areas for foraging. A few songbirds use the cattails and reeds for nesting.

Developed Areas (DA) (white areas in Figure 2.4-5)

Developed areas (DA) include buildings, parking areas, equipment storage areas, roadways, maintained lawns, and similar areas. Approximately 206 acres or 16.4 percent of the site is

developed. Plant species present are those planted for ornamental value or undesirable weeds. Wildlife value is very low because of poor plant species diversity, poor cover and exposure to frequent disturbance.

Lakes, Ponds and Rivers (LPR) (dark blue areas in Figure 2.4-5)

Lakes, Ponds and Rivers (LPR) account for 44 acres or 3.5 percent of the site. These water bodies include an unnamed stream draining east across the central portion of the site and Quarry Lake, an abandoned rock quarry from Fermi 1 construction. No significant plant communities as discussed here are present, except for noting that cut-leaf water-milfoil (*Myriophyllum pinnatum*), a noxious plant native to Europe, has been observed in the waters. These waters are discussed further in Subsection 2.4.2.

Lake Erie (main body)

The main body of Lake Erie lies north and east of the project. Lake Erie accounts for about 186 acres or 13.9 percent of the site. These aquatic areas are addressed in Subsection 2.4.2.

2.4.1.1.2 Wildlife on the Site and Vicinity

Habitat diversity in an area generally contributes directly to the diversity of wildlife present in the same area. The more diverse the habitat, the greater the number of wildlife species that can be supported. The Fermi site and vicinity provide primarily a rural agricultural setting with small parcels of disturbed grassland, forest, and wetland habitats scattered throughout the area. The majority of the Fermi site proper is occupied by disturbed forest, lagoons, thickets, and developed areas. The site was ~~last~~ extensively surveyed for wildlife in 1973 and 1974 by NUS Corporation (Reference 2.4-3). Wildlife observations were made during site reconnaissance between late 2006 and mid 2008 to evaluate the diversity of species potentially present.

The following discussions are based on the findings of these studies.

and during a detailed wildlife survey from mid-2008 until 2009 (Reference 2.4-96).

Mammals

The 1973-74 NUS study (Reference 2.4-3) listed 17 species of mammals directly or indirectly observed. The 2000 Wildlife Management Plan listed 41 species as potentially occurring on the property; 14 species were observed, 3 of which were newly observed. In 2002, Wildlife Habitat Program Re-certification document listed one additional newly observed mammal, bringing the total number of mammals observed on the property to 21. Field studies were made for the Fermi 3 work from late 2006 to mid 2008. Mammals were recorded on the basis of direct observation, tracks, and scat, anytime while on the property, but the most intense study periods occurred concurrently with the flora studies described in Subsection 2.4.1.1.1. During the 2007-2008 studies, 13 of the 21 species listed for the site were observed. Table 2.4-3 provides a composite list of mammals observed at the site.

The area surrounding the existing units is a mosaic of developed land, mowed grass, woodlots and second generation forest that do not appear to provide significant travel corridors as might be found along watercourses or entry/exit locations for desirable foraging or resting habitats. The Fermi property is surrounded by high chain-link fence in terrestrial areas, which is expected to inhibit larger mammals from access to the site. Because the property is fenced, wildlife corridors in the

truest sense are not present on the property. However, the Lake Erie waterfront and north lagoon areas may provide access via water. White-tailed deer, for instance, are frequently seen on the site. The varied habitats around the site, however, are well suited to small mammals, although the diminished quality of most of the communities discussed provides less than ideal foraging opportunities. None of the wildlife species observed or reported at the site is unusual for the region.

Birds

Birds in the Fermi region include year-round residents, seasonal residents and transients (birds stopping briefly during migration). A large percentage of the species occurring in Michigan are migratory, and because Fermi lies on the western shore of Lake Erie, it lies within the Atlantic flyway which is one of several major migratory flyways in North America. Avian surveys conducted at the Fermi site between 1973 and 1974 by NUS Corporation (Reference 2.4-3) listed about 150 species of birds occurring on the site. Although the 2000 Wildlife Management Plan provided a list of 287 species potentially occurring in the Fermi vicinity, only 150 were noted as observed on the Fermi property, the same 150 noted in the 1973-74 NUS study. The list of 287 species was derived from surveys conducted at the Ottawa National Wildlife Refuges located along Lake Erie about 30 miles southeast of Fermi near Oak Harbor, Ohio. In 2002, the Wildlife Habitat Program Re-certification added 6 new species to the list of species provided in the 2002 Wildlife Management Plan. According to the Michigan Natural Feature Inventory, the potential number of resident and transient birds in the region is much higher depending on the reporting resource group (Reference 2.4-6). In 2002, an April bird survey by the Detroit Edison Wildlife Habitat Team at Fermi counted 293 individuals and 31 species. Five (5) species accounted for 50% of the birds counted: common grackle, red-winged blackbird, herring gull, brown-headed cowbird, and northern pintail. The 2007 National Audubon Society Christmas Bird Count for Monroe, Michigan, covered a 15 mile diameter area centered on Monroe and was conducted between December 15, 2007 and January 4, 2008. The northeast edge of the study area lies less than 3.5 miles from the Fermi property. The count recorded 27,609 individuals and 71 species. 71% of the individuals recorded were one of 7 species: European starling (18%), ring-billed gull (15%), Canada goose (11%), common merganser (9%), rock pigeon (7%), herring gull (7%), and house sparrow (4%).

Fermi 3 avian studies were conducted between late-2006 and mid-2008. Point surveys were conducted early and late in the day in different areas across the Fermi property that were representative of the variety of habitats present. The sampling periods included seasonal variation, such as spring and fall migration periods. These surveys confirm that the avian fauna at Fermi, especially songbirds and certain water bird, remains diverse, but that a small number of common species make up a large percent of individuals present. The most common species observed were the European starling, Canada goose, gulls, and red-winged blackbirds. Table 2.4-4 provides a list of the birds that have been recorded at Fermi and notes those species recently observed. The following are brief discussions of different bird guilds at Fermi.

Forest, Shrub and Grassland Community Birds

These birds nest in trees, shrubs or grasses and include year-round and seasonal residents. Examples include the American robin (*Turdus migratorius*), blue jay (*Cyanocitta cristata*), brown

thrasher (*Toxostoma rufum*) and Eastern meadowlark (*Sturnella magna*). During the spring and fall, large flocks of European starlings pass through the area. Open areas, such as the transmission line prairie and grass/shrub habitats are used by many of the species present to forage for seeds, insects or other forms of food.

Water Dependent Birds

Approximately 38 percent of the observed bird species fall into this classification. These birds are mostly found in association with the shoreline area of Lake Erie and areas designated as Coastal Emergent Wetlands in Figure 2.4-5, since they require surface water to complete at least part of their life cycle. Great blue herons (*Ardea herodias*), great egrets (*Casmerodius albus*), and American common mergansers (*Mergus merganser americanus*). American coots and mallards can be readily observed foraging in the shallow open water areas of the lagoons. Red-winged and yellow-headed blackbirds (*Ageliaus phoeniceus* and *Xanthocephalus xanthocephalus*) nest in the tall cattail and reeds. The red-winged blackbird normally accounts for a large percentage of the birds observed on the Fermi property. Many more birds were typically observed in the lagoons than along the shore of Lake Erie, where the most common sighting is that of gulls.

Birds of Prey

Birds of prey were not frequently observed on the Fermi site but the most common sightings were that of the turkey vulture (*Cathartes aura*) and red-tailed hawk (*Buteo jamaicensis).* In 1973 a single peregrine falcon (*Falco peregrinus*) and a single osprey (*Pandion haliaetrus*) were observed over the lagoon (Reference 2.4-3). No peregrine falcons were observed in recent studies, but several ospreys were observed at the site. No evidence of nesting on the property was encountered.

The bald eagle (*Haliaeetus leucocephalus*) occurs in the area. In the fourth quarter of 2007 three nests were observed on the property, two are north and one is south of Fermi 2 in the large trees of the coastal shoreline forest (FCS) adjacent to Lake Erie. Eagles may be more common during the winter months around the plant where the warmer cooling water keeps some areas ice free. Additional discussion regarding legislated protection of this species is found in Subsection 2.4.1.2.2.1. By May 2008, only the two nests north of Fermi 2 remained, as the southernmost nest had been destroyed by winter storms. Only one of the remaining nests was occupied.

Upland Game Birds

The mourning dove (*Zenaida macroura)* is the only upland game bird observed on the Fermi property. Wild turkey (*Meleagris gallopavo*) may be in the area but none were observed directly or indirectly (tracks, feathers, etc.) during site evaluations between 2006 and 2008.

Reptiles and Amphibians

The lagoons, other wetlands areas and adjacent habitats provide a significant amount of potential habitat for amphibians and reptiles on the Fermi property. Direct and indirect observations of a diversity of these species, however, have been infrequent both in recent studies and past studies.

The 2000 Wildlife Management Plan listed 18 species of amphibians whose geographical ranges include the Fermi site, but only 3 species were observed. The same report did not list any reptiles. The 2002 wildlife habitat Re-certification document listed 3 additional amphibians and 3 reptiles. No intense surveys were made for the Fermi 3 project but observations were recorded during the course of other studies conducted for terrestrial resources. During the 2007-08 study period 2 amphibians were observed and 6 reptiles. Table 2.4-5 provides a list of species observed and others that potentially occur in the area based on past studies (Reference 2.4-3).

2.4.1.2 Important Terrestrial Species and Habitats

NUREG-1555 defines "important species" as: 1) species listed or proposed for listing as threatened, endangered, candidate, or species of special concern in 50 CFR 17.11 and 50 CFR 17.12, by the USFWS, or the state in which the project is located; 2) commercially or recreationally valuable species: 3) species essential to the maintenance and survival of rare or commercially or recreationally valuable species; 4) species critical to the structural and function of local terrestrial ecosystems; or 5) species that could serve as biological indicators of effects on local terrestrial ecosystems. From the above definition, only element 1) is applicable to the species found on the Fermi site and vicinity. "Important habitat" is defined by the NRC in NUREG-1555 as wildlife sanctuaries, refuges, or preserves, wetland, floodplains and areas identified as critical habitat by the USFWS. The terrestrial species and habitats deemed important by these definitions are addressed in the sections that follow. Subsection 4.3.1 describes the construction impacts on the terrestrial ecosystem and potential needs for preventative measures.

2.4.1.2.1 Federal Protected Species

The following discussion reflects the results of the detailed wildlife survey conducted in 2008 and 2009 (Reference 2.4-96) and other information sources as cited.

The USFWS was consulted concerning the occurrence or potential occurrence of species on or in the vicinity of the Fermi property that are protected under the Endangered Species Act of 1973 (ESA) (Reference 2.4-7). The USFWS stated that the project occurs within the potential range of some federally listed species, but that the USFWS had no records of occurrence nor was there any designated critical habitat in the area. The USFWS further stated that because of the types of habitat present at Fermi, no further action is required under ESA. The USFWS did state that if more than six months pass before the project is initiated, then the USFWS should again be contacted to ensure there have been no changes from the regulatory perspective. Detroit Edison will continue consultations with the USFWS per their recommendations.

A broad range of bird species, over 800 total, are protected by the Migratory Bird Treaty Act of 1918 (MBTA) (Reference 2.4-8). The statute makes it unlawful to pursue, hunt, take, capture, kill or sell birds listed and grants protection to any bird parts including feathers, eggs and nests. Detroit Edison is remaining in contact with the USFWS to keep abreast of future changes in the regulatory environment regarding compliance with the MBTA. Based on avian surveys conducted during the 2006-2008 reconnaissance visits, the bald eagle appears to be the only migratory species of note that has been observed to date on the Fermi property, or in the site vicinity. The Indiana bat is also of interest, as it has been sited within the Fermi region.

Bald Eagle

The USFWS de-listed the bald eagle (*Haliaeetus leucocephalus*) as federally threatened under the Endangered Species Act, effective August 8, 2007 (Reference 2.4-9). However, the species continues to receive federal protection under the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act (Reference 2.4-10), which prohibits the take, transport, sale, barter, trade, import and export, and possession of eagles, making it illegal for anyone to collect eagles and eagle parts, nests, or eggs without an USFWS permit.

Two nests were observed on the Fermi property in May 2008. Both nests are located north of Fermi 2 in the large trees of the forested coastline immediately adjacent to Lake Erie. Biologists from the USFWS usually check the nests in late winter for young. If present, the young are banded and blood samples taken. One of the nests was occupied in May 2008. As long as there is open water where they can forage, the bald eagle typically will remain in the region throughout the year (Reference 2.4-6). Protection of the bald eagle is discussed in more detail in Subsection 2.4.1.2.2.1.

Bald eagles are found throughout the United States. Their breeding range extends from Alaska and Newfoundland south to Baja California and Florida, although many areas in the interior of the continent have few, if any nesting pairs. Nests are usually constructed near seacoasts, lakes or large rivers to be near their most common food supply: fish. Although they are quite capable of catching their own, sometimes even wading in shallow water to stalk fish like herons, they have often been seen stealing fish from other birds such as osprey. When fish are not available, such as in winter, eagles will also feed on waterfowl, small mammals (up to rabbit-size) and carrion (even road-kill). During Michigan winters, bald eagles are seen throughout the state. They nest mainly in the Upper Peninsula and the northern portion of the Lower Peninsula. Bald eagles reach maturity at four to five years of age. The beginning of the breeding season, from mid-February to mid-March, consists of the establishment of a territory, nest building and mating displays. The nest is usually located in the tallest tree in the area, often a white pine or dead snag. From late March to early April, one to four eggs are laid. Both male and female bald eagles participate in the incubation and the feeding of the chicks that hatch around seven weeks later. In about three months, by late summer, the fledglings are ready for flight. When it is time to move for the winter, the young birds are abandoned by their parents. A 1999 survey in Michigan found 343 nests that produced 321 young. The productivity was calculated as 96 percent, i.e., young per nest with known outcomes. (Reference 2.4-82)

Indiana Bat

The Indiana bat (*Myotis sodalist*) is a federal endangered species. The species has not been observed on the Fermi property, nor has it been reported from Monroe County, Michigan, according to the Michigan Natural Features Inventory (MNFI) (Reference 2.4-46). However, MNFI records do indicate that the Indiana bat has been observed in counties to the north and west of Monroe County. The bat is distributed from the Ozarks of Oklahoma east to Tennessee and northern Florida, and north to Vermont, northern Indiana and southern Michigan. The Indiana bat spends the winter hibernating in limestone caves (hibernacula) to the south of Michigan. From late spring

to early fall, bats returning to Michigan typically roost in forested areas under the loose bark of large trees or in hollow snags. They leave their roosts to forage for insects from a half hour to one hour before dark in or near forested areas. (Reference 2.4-81). The Indiana bat is discussed further in Subsection 2.4.1.2.2.1.

2.4.1.2.2 State-Listed Protected Species

The MDNR and the Michigan Natural Features Inventory (Reference 2.4-6) was consulted regarding the presence of known or potential occurrences of state-listed threatened and endangered animals and plants in and around the project area. Eight terrestrial species were identified by MDNR as occurring or potentially present. Organisms listed by MDNR as "species of special concern" are not protected under state endangered species legislation. Terrestrial species listed by MDNR are discussed below.

2.4.1.2.2.1 Animals

Bald Eagle

The bald eagle (*Haliaeetus leucocephalus*) is a state threatened species, although as of March 24, 2008, Michigan is moving toward removing the bald eagle from the state list of threatened and endangered species. As long as the bald eagle remains protected under Michigan law, MDNR offers the following recommendations:

> To avoid disturbing nesting bald eagles, we recommend the following if an active bald eagle nest tree is within 400 meters (1/4 mile) of the project area: 1) avoid land altering activities during the critical nesting period from January 1 to June 1 in the Lower Peninsula and January 10 to June 10 in the Upper Peninsula, 2) retain the nest tree as long as the tree is healthy and not a safety concern, and 3) maintain a forested buffer (preferred) or natural buffer as wide as possible around the nest tree. Ideally, the buffer would protect the existing nest tree and provide for alternative or replacement nest trees. If the nest tree will be disturbed, an Endangered Species Permit may be needed from the Michigan Department of Natural Resources.
>
> Each nest within a breeding area is protected by three zones that become less restrictive to human activity as the distance from the nest increases. The first zone, or Primary Zone, is defined as 330 feet (5 chains) around the nest. All land use activities, including human entry, motorized access, and low-level aircraft operations, should be prohibited during the most critical period described above. Exceptions are actions necessary to protect or improve the nest site, eagle researchers, or management by qualified individuals.
>
> The Secondary Zone extends 660 feet (10 chains) from the nest (additional 330 feet from the Primary Zone). Land-use activities that result in significant changes in the landscape such as clear cutting, land clearing, or major construction should be prohibited during the most critical period described above. Actions such as thinning tree stands, maintenance of existing improvements, human entry, low-level aircraft operations, and construction of trails, are permitted but not during the most critical period. Exceptions are the same as above.

> The Tertiary Zone extends 1/4 mile (or 20 chains) from the nest, but may extend up to 1/2 mile (40 chains) if topography and vegetation permit a direct line of sight from the nest to potential activities at that distance. The configuration of this zone therefore, may be variable. Many activities are permissible in this zone with some exceptions during the most critical period. Please contact the U.S. Fish and Wildlife Division, East Lansing Field Office at (517) 351-2555 for activities that are permissible in this zone, if your project is 1/4 to 1/2 mile from a known nest.

MDNR further noted that following Michigan de-listing, MDNR guidelines for bald eagle management would follow those provided by the USFWS *National Bald Eagle Management Guidelines* (Reference 2.4-11).

Indiana Bat

The Indiana bat (*Myotis sodalist*) is state endangered. The species is only found in Michigan during late spring to early fall when it would roost in forested areas beneath loose bark of large trees or in hollow snags. During the winter these bats migrate south to hibernate in caves in the Ohio Valley or more southern areas. Although portions of the Fermi site are forested, large trees with loose bark that would provide roosting habitat for the Indiana bat are not common. As such, suitable habitat for the Indiana bat at Fermi is scarce. MDNR expressed no concern for the species during consultations, and according to MNFI, there are no reported occurrences of the Indiana bat for Monroe County. Accordingly, this species is not being considered in Chapter 4 and Chapter 5 for Fermi 3 construction or operational impacts.

Barn Owl

The barn owl (*Tyto alba*) is state endangered. The barn owl is a distinctive species that uses a wide array of natural community types, including agricultural lands and buildings. These resident birds may be found year-round if prey species are abundant. Although reported in the region in the early 1980s (Reference 2.4-6), there appear to be no recent reports of occurrence and no observations were made during project related studies. The project would have no effect on the continued existence of the barn owl in the region, since neither prey species nor nesting/roosting habitat would be adversely affected. Accordingly, no further consideration is being given to this species as being potentially affected by Fermi 3.

Common Tern

The common tern (*Sterna hirundo*) is state threatened. The species prefers nesting on islands to avoid terrestrial predators but may be observed using gravelly shores and bars (Reference 2.4-6). This small bird has been observed in Monroe County (Reference 2.4-6) but none were observed during site studies and there have been no recent observances reported. There is no known reason to believe that the project would adversely affect the continued existence of the common tern in the project region. Accordingly, no further consideration is being given to this species as being potentially affected by Fermi 3.

Eastern Fox Snake

The Eastern fox snake (*Pantherophis gloydi*) is state threatened. Primarily an open wetland species, this snake inhabits emergent wetlands along Great Lakes shorelines and associated drainages where cattails (*Typha* spp.) are common. Little is known about the life history of the Eastern fox snake. They are typically active from mid-April to late October, usually throughout the day except during periods of intense heat. Breeding probably occurs annually beginning at two to four years of age with mating occurring in June or early July. The eggs are deposited in rotten stumps, mammal burrows, soft soil or mats of decaying vegetation. Eastern fox snakes eat small rodents and amphibians, insects and earthworms. (Reference 2.4-12)

In 2007, nine occurrences were reported in Monroe County (Reference 2.4-8). The snake was sighted two times on the Fermi property in June 2008.

2.4.1.2.2.2 **Plants**

American Lotus

The American lotus (*Nelumbo lutea*) is state threatened. Healthy populations of American lotus are found in scattered areas of southern Michigan. The species is distributed from New England to Florida and west to Michigan and Texas. It occurs in shallow water, usually in marshes, quiet backwaters, and near-shore areas of large rivers and lakes. The large perennial plant grows from thick tubers and flowers in mid summer. American lotus is abundant in the south and north lagoons on the project site.

Arrowhead

The arrowhead (*Sagittaria montevidensis*) is state threatened. The species is primarily distributed sporadically along the Mississippi River drainage, but is reported in other areas of the eastern United States. Southeastern Michigan populations represent a northern limit of distribution for the species (Reference 2.4-4 and Reference 2.4-6). This perennial grows in wet to shallowly inundated mud flats and banks, lagoons, and estuaries. It flowers in mid to late summer and sets fruit by fall. This wetland species was not observed on the Fermi property during the recent field survey, but has been observed in Monroe County as recently as 2001 (Reference 2.4-6).

Franks Sedge

It was delisted in 2009 because it is more common than originally thought.

Frank's sedge (*Carex frankii*) was listed in the MDNR report as state threatened (Reference 2.4-5). Consultation with MDNR Endangered Species Permitting group revealed that the correct classification for Frank's sedge is 'special concern' species. Special concern species have no legislated state protection. The species was observed in the GRW transmission line prairie in 2005, but there is no specimen documentation by which the occurrence can be verified. It was not observed during a separate 2007 study, or in observations associated with this Environmental Report. Accordingly, no further consideration is being given to this species as being potentially affected by Fermi 3.

including the detailed terrestrial surveys from mid-2008 to 2009 (References 2.4-95 and 2.4-96).

2.4.1.2.3 **Habitats**

No areas of the Fermi property are designated as critical habitat for listed wildlife species. Other important habitats present on the property are discussed below.

Wetlands

In 1984, Michigan received authorization from the Federal government to administer Section 404 of the Federal Clean Water Act in most areas of the state. A state-administered 404 program must be consistent with the requirements of the Federal Clean Water Act and associated regulations set forth in the Section 404(b)(1) guidelines. Unlike other states where applicants must submit wetland permit applications to both the U.S. Army Corps of Engineers (USACE) and a state agency, applicants in Michigan generally submit only one wetland permit application to the MDEQ to obtain the necessary authorizations from both the MDEQ and the USACE.

In 1979, the Michigan legislature passed the Geomare-Anderson Wetlands Protection Act, 1979 PA 203, which is now Part 303, Wetlands Protection, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended. The MDEQ has adopted administrative rules which provide clarification and guidance on interpreting Part 303. Some wetlands in coastal areas are given further protection under Part 323, Shorelands Protection and Management, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended. This includes the Fermi site since the lagoons are connected to one of the Great Lakes, Lake Erie (Reference 2.4-13). Standard USACE guidelines with minor modifications are used for the delineation of wetlands in Michigan (Reference 2.4-14).

State and Federal authorities overlap in a coastal situation such as that at Fermi, according to Section 10 of the Federal Rivers and Harbors Act. Activities in these waters require a joint permit application, which minimizes time and effort for applicants. In accordance with the Clean Water Act, Section 404(g), USACE retains Federal jurisdiction over traditionally navigable waters. This jurisdiction includes the Great Lakes, connecting channels, other waters connected to the Great Lakes where navigational conditions are maintained, and wetlands directly adjacent to these waters.

In June 2008, a field delineation and assessment of wetlands on the Fermi property was completed. Flagging of wetland boundaries and data collection along the boundaries were performed between May 16, 2008 and June 13, 2008. The boundaries were delineated in accordance with procedures outlined in the USACE 1987 Wetland Delineation Manual (Reference 2.4-14). The boundaries between each type of wetland were identified and flagged to facilitate a functions and values assessment. The delineated wetlands were surveyed and acreage was calculated for each wetland. Data was collected on wetland vegetation, and on primary and secondary indicators of hydrology and soils. Wetlands delineated on the Fermi property were evaluated using USACE–recommended methodology (Reference 2.4-93), supplemented with vegetation community measurements for species richness, diversity and cover and wildlife observations. Thirteen functions and values typically considered by regulatory and conservation agencies when evaluating wetlands are used as part of the New England Method. These include: groundwater

recharge/discharge, floodflow alteration, fish habitat, sediment/toxicant retention, nutrient removal, production export, sediment/shoreline stabilization, wildlife habitat, recreation, educational/scientific value, uniqueness/heritage, visual quality/aesthetics and endangered species habitat.

Thirty-seven wetland units covering 505 acres of wetlands and 98 acres of open water were delineated on the Fermi property (Figure 2.4-19). Areas within the delineation boundary did not include open water areas in Lake Erie. The primary wetland type on the Fermi property is palustrine emergent marsh (PEM) comprising 322 acres followed by palustrine forested (PFO, 167 acres) and palustrine scrub-shrub (PSS, 16 acres).

Wetlands dominated by woody vegetation having a basal area larger than 3" diameter at breast height (dbh) were classified as PFO. Some herbaceous and woody vegetation with <3" dbh may be present, but contribute less than 50% combined of the basal area. Dominant vegetation in the PFO wetlands include silver maple (*Acer saccharinum*), shellbark hickory (*Carya laciniosa*), swamp white oak (*Quercus bicolor*), American elm (*Ulmus americana*), and eastern cottonwood (*Populus deltoides*). The shrub layer in PFO wetlands was dominated by American elm saplings, silky dogwood (*Cornus amomum*), and green ash (*Fraxinus pennsylvanica*) saplings. Herbaceous vegetation was sparse during delineation. Common species included black raspberry (*Rubus* spp.), mayapple (*Podophyllum peltatum*), reed canary grass (*Phalaris arundinacea*), poison ivy (*Toxicodendron radicans*), and Virginia creeper (*Parthenocissus quinquefolia*). Due to the intermittent hydrology of these PFO wetlands, a significant proportion of herbaceous species were plants that favor upland areas. Soils are hydric and saturated with pockets of standing water throughout the PFO wetlands. Approximately 167 acres of wetland were delineated as PFO including: B, D, F, G, I, L, O, P, S, T, V, X, Y, BB, GG, and KK (Figure 2.4-19).

Wetlands dominated by woody vegetation smaller than 3" dbh but greater than 3.2' in height were classified as PSS. PSS wetlands may have some woody plants >3" dbh or some herbaceous vegetation that, combined, contribute less than 50% of ground cover. Common shrub species in PSS wetlands include silky dogwood, green ash, and Hawthorn (*Crataegus* spp.). PSS wetlands on the Site were largely early successional woody communities located on the fringes of PFO and upland or PFO and PEM wetland habitats. Approximately 16 acres of wetland were delineated as PSS including: E, K, Q, HH, and JJ (Figure 2.4-19).

PEM wetlands are characterized by greater than 50% of the ground surface covered by herbaceous vegetation, or woody vegetation less than 3.2' tall. PEM wetlands were dominated by reed canary grass, common reed (*Phragmites australis*), sedge species (*Carex* spp.), narrow-leaf cattail (*Typha angustifolia*), water lily (*Nymphaea* spp.), and coontail (*Ceratophyllum demersum*). Approximately 322 acres of wetlands were delineated as PEM and include: A, C, J, M, N, R, W, Z, AA, CC, DD, EE, FF, and II (Figure 2.4-19). Wetlands delineated as PEM span a range of periodically inundated wet meadows to deep water marsh systems. Due to the well-developed stands of invasive plants including common reed and reed canary grass, vegetation diversity was relatively low in PEM wetlands. There is significant build up of plant duff in PEM wetlands primarily from large, persistent stands of common reed.

Open water habitat is characterized by inundation to a depth greater than 4 feet with no emergent vegetation present. Several open water habitats are located within the delineation boundary. Some open water habitats were delineated with an aerial photograph. Most open water habitats are not flagged and do not have data points within their boundaries. There are more than 100 acres of open water habitat within the site property. Open water habitats that were flagged include H and U (Figure 2.4-19).

With the exception of a few wetlands isolated by berms or roads, the majority of wetland communities at the Fermi property are hydrologically connected and thus, for the purposes of the functions-values assessment, considered one wetland system. A functions-values assessment was completed for woody (PFO and PSS) and non-woody (PEM) wetland communities to provide distinctions in functions and values where necessary to complete an overall assessment for the wetland system at the Fermi property. The principal functions of the wetland system include floodflow alteration, sediment/toxicant retention, nutrient removal and fish and wildlife habitat. Additional functions and values this wetland system is suitable to provide, though not considered principal functions, are production export, sediment/shoreline stabilization, uniqueness/heritage and endangered species habitat. The wetland system was not considered well suited for groundwater recharge/discharge, recreation, educational/scientific value, or visual quality/aesthetics.

Floodflow alteration, sediment/toxicant retention and nutrient removal: The Fermi property's wetland complex is large relative to the watershed, relatively flat with storage potential and contains hydric soils and dense vegetation suitable to absorb and slow water flow. The wetland system is highly suitable to reduce flood damage by retaining and gradually releasing floodwater following precipitation events. Fermi 2, including cooling towers and control centers, is located downstream and in the floodplain of the wetland system. In the event of a large storm that results in floodflow from the watershed and excess water backing in from Lake Erie, the wetland system could slow and detain floodwaters for gradual release. The wetland system is highly suitable for trapping sediments, toxicants and pathogens as well as nutrient retention. There are potential sources of excess sediment, toxins, and nutrients upstream in the agriculturally dominated watershed. The Clean Water Act status for the Monroe County portion of the Ottawa-Stony watershed cites excessive nutrient levels as a documented impairment in waterbodies (Reference 2.4-94). There is opportunity for sediment trapping and nutrient uptake in diffuse, slow moving and deepwater areas of the Fermi property wetlands that are edged or interspersed with dense herbaceous and woody vegetation.

Fish and wildlife habitat: The deepwater PEM of the Fermi wetland system is suitable to support fish habitat. There is an abundance of cover objects, the wetland is large and part of a larger, persistent, contiguous watercourse with slow velocity. The wetlands have sufficient size and depth to retain open water areas during the winter. Direct observation of fish species were observed in the wetland. The diverse wetland communities present across the entire wetland system provide suitable habitat for a significant number of wildlife species. While there has been notable direct and indirect disturbance in all wetlands observed, there remains significant abundance and diversity in habitat cover to support wildlife. With the exception of the buildings and roadways associated with

the nuclear plant, the landscape is largely undeveloped with relatively large parcels of vegetated wetlands and uplands. The majority of the wetlands evaluated are connected hydrologically in spite of fragmentation by multiple roadways. The wetland system presents an interspersion of open water areas with dense emergent vegetation grading into shrub dominated and tree dominated communities. Some portions of the wetlands have a high degree of diversity in vegetation structure and species. The Clean Water Act Status Report for the Monroe County portion of the Ottawa-Stony watershed cites loss of aquatic life benefits as the most common impairment of waterbodies in the watershed (Reference 2.4-94).

Detroit River International Wildlife Refuge (DRIWR)

Detroit Edison entered into a cooperative agreement with the USFWS on September 25, 2003, placing portions of the Fermi property into the DRIWR (Reference 2.4-15). Lands on the Fermi property constitute the DRIWR Lagoona Beach Unit and the extent of these is illustrated in Figure 2.4-6. The general public does not have access to this land without the permission of the USFWS and Detroit Edison, since all areas are within the outer fenced area of the facility. The agreement can be cancelled by either party at any time.

Transmission Line Corridor Prairie Planting

The USFWS, ITC*Transmission*, and Detroit Edison cooperatively funded the restoration and planting of a 29 acre prairie area in the on-site transmission corridor along the north side of the existing facility approach road. The restoration was begun in 2005 and completed in 2006. The area is described earlier in Subsection 2.4.1.1 as Grassland: Right-of-Way community and illustrated in Figure 2.4-5. Surveys of the restoration area were conducted in 2005 and 2007 to determine the plant species present in 2005 and 2007.

2.4.1.3 **Habitat Importance**

Forest, shrub, grass and wetland communities on the Fermi property provide habitat to a variety of wildlife. However, there are no unique attributes of the Fermi site and vicinity as habitats to the important species described in Subsection 2.4.1.2, as compared with the habitats of these species across their entire range.

2.4.1.4 **Disease Vectors and Pests**

No unusual disease vectors or pest species were listed for the site and none were identified by federal or state agencies. Mosquitoes and ticks are in the area that could be carriers of West Nile disease and Lyme disease, respectively.

The emerald ash borer (EAB) (*Agrilus planipennis*), is an exotic beetle discovered in southeastern Michigan near Detroit in the summer of 2002. It probably arrived in the United States on solid wood packing material carried in cargo ships or airplanes originating in its native Asia. Because ash trees (*Fraxinus* spp.) in North America have no immunity to the insect, EAB has the potential to wipe out more than 700 million ash trees in Michigan. Since 2002, it has killed more than 10 million ash trees in southeastern Michigan alone. State and federal agencies in Michigan, and researchers in Michigan universities, are working to stop EAB from spreading. This includes the initiation of

quarantines to stop the movement of infested ash wood and wood products, research to understand the pest's life cycle and what methods and strategies can control or eradicate it, and development of educational and informational materials to help communities detect and deal with EAB infestations. Michigan now requires that any re-forestation efforts exclude ash from species planted. (Reference 2.4-16)

Dutch elm disease first entered Michigan about 1950. This disease probably accounts for the lack of large specimens on the site and the remains of old, fallen specimens (Reference 2.4-3).

2.4.1.5 **Wildlife Travel Areas**

The entire land portion of the study area is surrounded by an eight-foot tall chain-linked fence topped in most places with barbed wire. As such, wildlife movement to and from the site is severely restricted for larger mammals. Entry by way of water routes through the lagoons or from Lake Erie are the only available option for larger wildlife. Onsite wildlife can move freely around woodlots and shrub areas but roadways and transmission corridors fragment the area and may create barriers for some species.

The site lies within the Atlantic Flyway for migrating birds. Woodlots provide forested resting areas. For water birds, the lagoons, wetlands, and lakes provide resting and foraging areas.

2.4.1.6 **Existing Natural and Man-Made Ecological Effects**

While portions of the Fermi site consist of a mosaic of forest, shrub and grassland, the area is fragmented by roads and other development (e.g., the shooting range). Portions of the site, described in Subsection 2.4.1.1, were once cleared and or covered by fill materials. Some of the forested areas, such as those along the southern edge of the property, have experienced logging in the past. The south lagoon contains large deposits of dredged and other fill materials. These activities have degraded the habitat value of essentially all the plant communities on the property. While there is no adequate quantitative data available with which to compare today's conditions, this disturbance suggests a diminished habitat for wildlife. With regard to certain wildlife, the area is completely fenced, which restricts movement and habitat use.

The existing hyperbolic cooling towers (approximately 400 feet tall) may have a small impact on avian wildlife in the area. Avian collisions are not monitored by Detroit Edison, but deceased birds are occasionally found around the towers. Typically only a few birds are observed at any one time, but on one occasion in September 1973, 15 dead birds were found (with as many as 50 potentially killed) at the Fermi 2 south cooling tower. More recently, 45 dead birds were found at the Fermi 2 south cooling tower; occuring during a one-week period during October 2007.

Noise can be a deterrent to wildlife when it is abrupt and irregular. However, most wildlife tends to adapt to constant noise and this appears to be the case at Fermi. For example, song birds, wading birds, and waterfowl were always observed in the north lagoon immediately west of the cooling towers, an area which has one of the highest outdoor noise levels on the site. In addition, it is not unusual to observe groups of turkey vultures soaring above the cooling towers.

Other than the terrestrial site reconnaissance survey conducted in 2007 and 2008, and the detailed terrestrial surveys conducted in 2008 and 2009, no

2.4.1.7 Ongoing Ecological and Biological Studies

~~No~~ formal monitoring of the terrestrial environment has been conducted on the Fermi site since the construction of Fermi 2. The only recent study is that of the Detroit Edison/NAWCA transmission right-of-way prairie planting that was surveyed for plant species occurrences in 2005 and 2007.

2.4.1.8 Regulatory Consultation

The USFWS and MDNR were consulted for information on known occurrences of federal and state listed protected species and habitats. The identification and discussion of important species above was based in part on the information provided by these consultations.

2.4.1.9 Transmission Corridors and Offsite Areas

The 345 kV transmission system and associated corridors are exclusively owned and operated by ITC*Transmission*. The Applicant has no control over the design of the transmission system. Accordingly, the terrestrial ecology that interfaces with the transmission corridors is based on publicly available information, and reasonable expectations of the configurations that ITC*Transmission* would likely follow based on standard industry practice. However, the information described in this subsection does not imply commitments made by ITC*Transmission* or Detroit Edison, unless specifically noted.

The offsite transmission system will consist of three 345 kV lines running from the Fermi site north, then west to the Milan Substation, located approximately 1.5 miles northwest of Milan, a distance of about 29.4 miles. The route is located in portions of Monroe, Wayne and Washtenaw counties and is illustrated in Figure 2.2-3. The three 345 kV lines for Fermi 3 will run in a common corridor, with transmission lines for Fermi 2, to a point just east of I-75. From the intersection of this Fermi site corridor and I-75, the three Fermi-Milan lines will run west and north for approximately 12 miles in a corridor shared with other non-Fermi lines within an assumed 300-foot wide right-of way (ROW) in which the vegetation has been managed to exclude tall woody vegetation. In this section of the route, reconfiguration of existing conductors would allow for the use of existing transmission infrastructure to create the new lines. In Wayne County, where Arkona Road and Haggerty Road intersect, all non-Fermi lines turn north and continue on to their respective destinations and the three Fermi-Milan lines will continue west for approximately 10.8 miles to the Milan Substation. To accommodate the new transmission lines, it is assumed the Milan Substation may be expanded from its current size of 350 by 500 feet to an area approximately 1,000 by 1,000 feet, utilizing maintained grassed areas and cropland.

2.4.1.9.1 Vegetation

Major vegetation types occurring in and adjacent to the transmission corridor are illustrated in Figure 2.2-3. The plant communities found in and along the corridor are similar to those described in Subsection 2.4.1.1.1. Table 2.4-17 provides an accounting of the area of each land use/vegetation type found within the corridor, using a 300-foot width.

The eatern section of the corridor is dominated by cropland, including the areas beneath the existing transmission lines. Non-cropland areas are generally pasture, open developed space and

emergent wetlands. No forested areas are present within the corridor in this section as normal maintenance includes the removal of large woody species. The corridor passes only a few small forested areas. Emergent wetlands and other waters crossed by the existing lines are generally narrow. None of the existing towers are located in wetlands, with the exception of one set of towers at Stony Creek (north of Stony Creek Road), where the crossing is in excess of 1,300 feet, one set of towers is located in the wetland. Further discussion of wetlands is found in Subsection 2.4.1.9.4.

The western section of the transmission corridor is dominated by a mosaic of pastures, forest, shrubs or scrub, cultivated, and developed land. Corridor maintenance in this section is minimal, since no towers or lines are present. Wetlands are present and three are in excess of 900 feet in length, where it is expected a tower may need to be placed.

The Milan Substation site is located entirely in an area of cropland and planted grassland.

2.4.1.9.2 Wildlife

The diversity of wildlife found along the new transmission route is expected to be similar to that found on and in the vicinity of the Fermi property as described in Subsection 2.4.1.1.2, since the habitats in and along the ROW are representative of the areas on the Fermi property. The exception is the lack of lake shore habitat along the ROW, that is present at Fermi. Certain birds in particular, such as the bald eagle, are less likely to be found along the new transmission route than they are on the Fermi property because of the proximity of Fermi to the coastline of Lake Erie.

2.4.1.9.3 Important Species

Important species potentially occurring along the new transmission route are the same as those described in Subsection 2.4.1.2. Based on information obtained from the USFWS and MDNR, there are currently no reported occurrences of Michigan or Federal important species or designated critical habitat along the route.

2.4.1.9.4 Important Habitats

NUREG-1555 defines 'important habitats' as including wildlife sanctuaries, refuges or preserves, wetlands, floodplains, and areas identified as critical habitat for protected species identified by the USFWS. With the exception of wetlands, none of these features are known to occur within the assumed 300-foot ROW of the transmission corridor or immediately adjacent to the ROW.

The new transmission route crosses about 30 wetlands or other waters that may be regulated by the USACE and MDEQ, according to USFWS National Wetland Inventory mapping (Reference 2.4-48). The western 10.8-mile section of the route crosses 8 wetlands and 9 drains or narrow streams (Figure 2.4-18). The majority of the wetlands are 100 to 400 feet long but 3 wetlands are much longer at 1,302 feet, 903 feet, and 1,339 feet (Figure 2.2-3). Since the upper limit of spans between transmission structures is typically 900 feet, it is anticipated that construction of this undeveloped section of corridor will require the placement of one tower or pole within each of these wetlands. The wetlands present include woody and emergent herbaceous community types.

The 18.6-mile eastern section of the route crosses 2 wetlands and 12 narrow drains or small streams. The existing lines span all of these wetlands, with the exception of a 1,386 long wetland crossing at Stony Creek, where one set of towers is currently located.

2.4.1.9.5 Existing Stresses

The 18.6-mile eastern section of the ROW is located in a region dominated by crop and pasture land, or other land uses resulting from development. This coupled with ROW maintenance including the removal of undesirable vegetation by mechanical means and herbicides imposes a substantial level of existing stress on the existing terrestrial resources. In the western portion of the ROW, these stresses appear to be less intense. Although large woody vegetation is not allowed to grow in the ROW that is owned by ITC*Transmission*, privately held adjacent areas may be impacted by construction as these areas do support woody vegetation. Other areas of this ROW section support herbaceous plant communities, however, rural residences are common and cropland is scattered throughout the section.

Disease vectors and pests are the same as those discussed in Subsection 2.4.1.4

2.4.1.9.6 Regulatory Consultation

The USFWS and MDNR were consulted for information on known occurrences of federal and state listed protected species on the Fermi property and in the project vicinity for a radius of 7.5 miles around the facility. Although no regulatory contact has occurred for the more western portion of the transmission route, Federal and State web sites have been consulted. As the transmission system design is formalized, it is expected that agency contacts will be initiated by ITC*Transmission* to ensure the protection of terrestrial resources.

2.4.2 Aquatic Ecology

The Fermi site is located within a coastal wetland ecosystem near Newport (Frenchtown Township) in Monroe County, Michigan. The Fermi site consists of 1260 acres of developed and undeveloped land on the shoreline of the western basin of Lake Erie between Swan Creek and Stony Creek (see Figure 2.4-7 and Figure 2.4-8). Approximately 656 acres of this land is designated as a portion of the DRIWR. Coastal wetlands are common to areas surrounding the Great Lakes. Great Lakes coastal wetland systems contain morphological components of both riverine and lacustrine systems, and can be described as "freshwater estuaries." Such freshwater estuaries are formed at river mouths drowned by the postglacial rise in lake level, and are influenced by both the lake level and riverine inflows (Reference 2.4-17).

Aquatic habitats onsite and in the vicinity of the Fermi site with the potential to be impacted by the construction and operation of Fermi 3 include:

- Man-made circulating water reservoir, canals, and drainage ditches,
- Quarry lakes and other waters and wetlands within the DRIWR,
- Lake Erie and its associated bays,

2.4-88 Reutter J.M., C.E. Herdendorf, and G.W. Sturm, *Impingement and Entrainment Studies at the Bay Shore Power Station, Toledo Edison Company*, Clear Technical Report No. 78b, The Ohio State University Center for Lake Erie Area Research, Columbus, OH, 1978.

2.4-89 Reutter, J.M., C.E. Herdendorf, G.W. Sturm. *Impingement and Entrainment Studies at the Acme Power Station, Toledo Edison Company*, Clear Technical Report No. 78A, The Ohio State University Center for Lake Erie Area Research, Columbus, OH, June 1978.

2.4-90 Michigan Department of Environmental Quality, Surface Water Quality Division, *A Biological Survey of Stony Creek and Amos Palmer Drain, Monroe County, Michigan*, Report Number 151, December 1996.

2.4-91 Michigan Department of Environmental Quality, Surface Water Quality Division, *A Biological Survey of Stony Creek and its Tributaries, Amos Palmer Drain and Ross Drain, Monroe County*, Report Number 087, February 1998.

2.4-92 Makaerwiczl, J.C. et al, "Phytoplankton composition and biomass in the offshore waters of Lake Erie: Pre- and post- Dreissena introduction,1983-1993,". *Journal of Great Lakes Research* 25.1, 1999.

2.4-93 U.S. Army Corps of Engineers, *The Highway Methodology Workbook Supplement: Wetland Functions and Values: A Descriptive Approach*, 1999.

2.4-94 U.S. Environmental Protection Agency, "Ottawa-Stony Watershed," http://cfpub.epa.gov/surf/huc.cfm?huc_code=04100001, accessed 4 August 2008.

2.4-95 Black & Veatch Corporation, Fermi 3 Terrestrial Vegetation Survey Final Report, Prepared for The Detroit Edison Company, November 2009.

2.4-96 Black & Veatch Corporation, Fermi 3 Terrestrial Wildlife Survey Final Report, Prepared for The Detroit Edison Company, November 2009.

Attachment 17
NRC3-09-0016

Supplemental Response to RAI letter related to Fermi 3 ER

RAI Question TE4.3.1-7

NRC RAI TE4.3.1-7

Clarify that the column in ER Table 4.3-4 that is currently labeled "Acres Impacted" represents the percentage of the acreage of that type in the region, not the actual acres impacted.

Supporting Information

The values in this table appear to be too small to represent the number of acres affected. These data are needed to complete the analysis to be presented in the EIS.

Supplemental Response

The values included within the "Acres Impacted" column of Environmental Report (ER) Table 4.3-4, on page 4-60, identify the percentage of the region's acreage, by land use, expected to be impacted by use of the transmission corridor. The acreage values provided in "Acres in Region" column are taken from ER Table 2.2-7; therefore the second footnote in the markup of ER Table 4.3-4 reflects this. An additional footnote is being added to clarify that the "Percentage of Acres in Region Impacted" column is specific to the 10.8 mile tract of existing undeveloped corridor along the route to the Milan substation. This clarification is made in the revised ER Sections 4.3.1.5.1 and 4.2.1.6.

Proposed COLA Revision

Revise the "Acres Impacted" column heading to read "Percentage of Acres in Region Impacted."

Revise ER Table 4.3-4 note so that ER Table 2.2-7 is referenced instead of Subsection 2.2.2.

Add a note to the ER Table 4.3-4 and revise references to it on pages 4-27 and 4-48 to clarify that it only applies to the 10.8 mile tract of existing undeveloped corridor along the route to the Milan substation. The proposed note on ER Table 4.3-4 should read "Information within Table 4.3-4 is specific to the 10.8 mile tract of existing undeveloped corridor along the route to the Milan substation."

See attached markups of page 4-27, page 4-48, and ER Table 4.3-4.

Markup of Detroit Edison COLA
(following 5 pages)

The following markup represents how Detroit Edison intends to reflect this RAI response in a future submittal of the Fermi 3 COLA. However, the same COLA content may be impacted by revisions to the ESBWR DCD, responses to other COLA RAIs, other COLA changes, plant design changes, editorial or typographical corrections, etc. As a result, the final COLA content that appears in a future submittal may be different than presented here.

Table 4.3-4 Vegetation Communities Occurring along the Transmission Corridor 1

Plant Community	Acres in Corridor	~~Acres Impacted~~ Percentage of Acres in Region Impacted	Acres in Region 2
United States			
Open Water	0	0	725,910
Developed	68	0.006	1,089,795
Barren Land	0	0	10,346
Deciduous Forest	209	0.07	282,046
Evergreen Forest	0	0	6717
Mixed Forest	0	0	5765
Shrub/Scrub	6	0.19	3179
Grassland/Herbaceous	38	0.09	41,308
Pasture/Hay	110	0.05	219,241
Cultivated Crops	465	0.04	1,217,689
Woody Wetlands	108	0.08	128,090
Emergent Herbaceous Wetland	13	0.02	56,711
Canada			
Open Water	0	0	678,492
Urban	0	0	60,749
Woodlot	0	0	22,173
Agriculture	0	0	413,285
Wetlands	0	0	6826

Notes:

~~1. The description and size of communities present in a 50-mile radius of the Fermi site is based on Subsection 2.2.2.~~

1. Information within Table 4.3-4 is specific to the 10.8 mile tract of existing undeveloped corridor along the route to the Milan substation.

2. The plant communities and acreages of communities present in the 50-mile radius (region) of the Fermi site in this table is taken from Table 2.2-7.

condition. Table 4.3-4 provides an accounting of the vegetative communities/land use within the corridor and a comparison of the quantity of the community types to that found within the region (50 mile radius around Fermi). Since ITC*Transmsission* will determine the type of structures used (as well as quantity) at a time closer to construction of the new lines, the placement is not known at this time. Therefore, the type of habitats impacted cannot reasonably be determined. However, since the habitats along the western portion of the corridor are mostly previously disturbed, impacts to vegetation are expected to be SMALL when compared to cover types existing in the region (Table 2.4-17), and no mitigative measures are expected.

4.3.1.5.2 **Wildlife**

Wildlife occurring in the vicinity of the transmission corridor is similar to that discussed in Subsection 2.4.1.9.2 and the impacts to these similar to that discussed in Subsection 4.3.1.1.2. Construction in the eastern portion of the route is expected to have negligible effect on wildlife as this area contains existing transmission infrastructure. The western portion of the route follows a minimally maintained ROW that will require some clearing to accommodate the anticipated tower and steel pole construction. Habitat along this section is dominated by disturbed vegetative communities, cropland, and developed areas. Most wildlife present is expected to be sufficiently mobile and will move to avoid construction activity. Because of existing levels of activity in the area, wildlife is expected to return to the ROW and adjacent lands following construction. The impact to terrestrial wildlife resources from transmission system construction is considered SMALL, and no mitigative measures are anticipated.

4.3.1.5.3 **Important Terrestrial Species**

Important species potentially occurring in or along the transmission corridor are considered in Subsection 2.4.1.2 and Subsection 2.4.1.9.3. No Federal protected plant or animal species or designated critical habitat listed by the USFWS will be impacted. There are no known occurrences of State-listed species but potential exists for the occurrence of the eastern fox snake which is discussed in Subsection 4.3.1.2.1. The impact to important terrestrial species from transmission system construction is considered SMALL, and no mitigative measures are expected.

4.3.1.5.4 **Important Habitats**

Important habitats are defined in Subsection 2.4.1.2 and discussed for the transmission system in Subsection 2.4.1.9.4. Wetlands are the only resource considered an important habitat that is found within the transmission ROW. The locality of these wetlands is illustrated in Figure 2.4-8. No wetlands will be impacted in the eastern section of the route, since towers to accommodate new lines are already present. No wetlands are present at the Milan Substation site. The western section could require the placement of towers in wetlands that are longer than 900 feet and cannot be spanned. The total potential permanent impact to wetlands from installation of the towers is expected to be approximately 0.5 acres. Clearing ROW wetlands is discussed in Subsection 4.3.1.5.1. The impacts to wetlands from the construction of the transmission system are considered SMALL. Any mitigation required for the impacts are expected to be determined by ITC*Transmission* in consultation with applicable regulatory agencies, including the USACE, at the time permit applications are submitted.

Insert Language in Insert #1

10.8 mile undeveloped portion of the

Insert Language in Insert #2

Table 4.3-4 also provides

Insert Language in Insert #3
within the 10.8 mile undeveloped portion that would be impacted by the transmission line

so Lake Erie water levels will control water levels in the wetlands. Accordingly, impacts to wetlands in the site vicinity will be SMALL, and no mitigative measures are needed.

4.2.1.6 Transmission Facilities

Subsection 3.7 describes the three new 345 kV transmission lines proposed to serve Fermi 3. The 29.4-mile route of the new 345 kV transmission lines would use 18.6 miles of an existing route running along a corridor already used for transmission structures and lines. Additionally, a short (10.8-mile) tract of an existing undeveloped corridor would be used along the route to the Milan substation. Assuming a nominal 300-foot width along the entire proposed transmission corridor, a total of approximately 1069 acres could potentially be disturbed for construction activities. Laydown and other areas potentially located outside the corridor may be defined by ITC*Transmisssion* at a time closer to construction of the lines. Use of existing roads are expected for access and construction traffic as much as possible, and no new access roads are anticipated because the topography of the area is flat.

Table 2.2-6 shows the land uses within 0.5 miles of Fermi associated with the existing corridors, including the proposed transmission routes. Table 4.3-4 shows the vegetation communities along the route to the Milan substation, including the impacted areas. These tables show that open water and wetland areas comprise a relatively small portion of the total area both within the transmission corridors and within the impacted areas. 1

Due to the minimal acreage of open water and wetlands along the proposed route, hydrological impacts resulting from the new transmission line route are expected to be minimal. ITC*Transmission* plans to use available existing rights-of-way (ROW) for the new route rather than using a route that would convert open space to transmission use. This plan will aid in minimizing the environmental impacts of the proposed new transmission infrastructure.

4.2.1.7 Floodplains and Wetlands

Figure 2.3-16 shows the Federal Emergency Management Agency (FEMA) flood map for the Fermi site. As shown, the location for Fermi 3 is located in Zone X, which represents areas outside the 500-year flood zone. As shown in Table 2.3-1, based on the IGLD 1985 datum, the 10-year flood level is 576.3 feet, the 50-year flood level is 577.4 feet, the 100-year flood level is 577.9 feet and the 500-year flood level is 578.8 feet. All of these flood levels are less than the current site grade elevation of approximately 581.5 feet. Therefore, based on design and configuration, the site is adequately protected from flooding during construction.

Wetlands and Open Waters comprise approximately 60 percent of the area within the Fermi site (see Figure 2.4-19). The majority of the Fermi site that is not developed is included as part of the DRIWR at the time of this COL application. The DRIWR encompasses a 656 acre portion of the site. Of the 7.5 mile vicinity, about four percent is comprised of wetlands. Figure 2.2-1 depicts land use of the vicinity.

Dewatering is confined to the confined Bass Islands Group aquifer and will, therefore, have a minimal effect on wetlands, as described in Subsection 4.2.1.5. Appropriate permits and

Insert Language in Insert #1

10.8 mile undeveloped portion of the

Attachment 18
NRC3-09-0016

Response to RAI letter related to Fermi 3 ER

RAI Question TR4.8.3-1

NRC RAI TR4.8.3-1

Provide a list of the major types and quantities of construction materials required to construct the proposed 1600 MWe reactor similar to that provided in Section 10.2.2.1 of the ER for a 1300 MWe reactor.

Supporting Information

This information provides the basis for estimation of the transportation impacts of construction material shipments for presentation in Section 4.8.3 of the EIS.

Response

The irretrievable commitment of material resources during construction of Fermi 3 would be generally similar to commitments associated with other large power generating facilities. "DOE NP2010 Nuclear Power Plant Construction Infrastructure Assessment," MPR-2776, provides estimates for types and quantities of materials for the construction of Generation III+ plants, including the ESBWR. The report provides the following Generation III+ construction estimate:

- Concrete: 460,000 cubic yards (not including concrete for site preparation)
- Reinforcing steel and embedded parts: 46,000 tons
- Structural steel, miscellaneous steel, and decking: 25,000 tons
- Large bore pipe (greater than 2.5 inches): 260,000 feet
- Small bore pipe: 430,000 feet
- Cable tray: 220,000 feet
- Conduit: 1,200,000 feet
- Power cable: 1,400,000 feet
- Control wire: 5,400,000 feet
- Process and instrument tubing: 740,000 feet

Proposed COLA Revision

ER Section 10.2.2.1 will be revised to reflect the estimates for types and quantities of materials for the construction of Generation III+ plants from U.S. Department of Energy, "DOE NP2010 Nuclear Power Plant Construction Infrastructure Assessment," MPR-2776, Rev. 0, October 21, 2005, (Section 3.5), http://www.ne.doe.gov/np2010/reports/mpr2776Rev0102105.pdf, accessed November 16, 2009.

ER Table 10.2-2 will be revised to reflect these estimates for types and quantities of materials and provide an associated estimate of annual U.S. production for each.

Markup of Detroit Edison COLA
(following 4 pages)

The following markup represents how Detroit Edison intends to reflect this RAI response in a future submittal of the Fermi 3 COLA. However, the same COLA content may be impacted by revisions to the ESBWR DCD, responses to other COLA RAIs, other COLA changes, plant design changes, editorial or typographical corrections, etc. As a result, the final COLA content that appears in a future submittal may be different than presented here.

Air quality can also become slightly degraded as chemical and radioactive air emissions enter the atmosphere. The degree of impact depends on how quickly a chemical or radioactive constituent breaks down and is filtered out of the air.

Chemical and radioactive emissions and effluents occur in accordance with applicable permits and are regularly monitored. As a result, water and air quality are not expected to be substantially impacted.

10.2.1.5 **Resource Commitments of the Uranium Fuel Cycle**

The Uranium Fuel Cycle is defined as the total of those options and processes associated with the provision, utilization, and ultimate disposition of fuel for nuclear power reactors. This cycle inherently contributes to environmental effects. Table 5.7-2 presents environmental effects related to uranium mining, conversion, and enrichment; fabrication of nuclear fuel; use of this fuel; and disposal of the spent fuel.

10.2.2 **Irretrievable Commitments of Material Resources**

Irretrievable environmental commitments resulting from construction and operation of Fermi 3 encompass the following:

- Construction Materials
- Water Consumption
- Energy Consumption
- Uranium Fuel Consumption

10.2.2.1 **Construction Materials**

The irretrievable commitment of material resources during construction of Fermi 3 would be generally similar to commitments associated with other large power-generating facilities, such as hydroelectric and coal-fired power plants that are constructed throughout the United States. A U.S. Department of Energy report (Reference 10.2-1) estimates the materials used during new reactor construction. The report provides the following new reactor construction estimates:

- ~~12,239 cubic yards of concrete and 3107 tons of rebar for a reactor building~~
- ~~2,500,000 linear feet of cable for a reactor building~~ (Insert 1)
- ~~6,500,000 linear feet of cable for a single unit~~
- ~~Up to 275,000 linear feet of piping (>2.5") for a single 1300 MWe unit~~

Table 10.2-2 compares these estimates of common irretrievable commitments of materials against overall production. While the amount of materials used in construction is large, the irretrievable commitment of construction materials in these quantities would be of small consequence given the availability of such resources.

10.2.3 References

Insert 2

10.2-1 U.S. Department of Energy, "Application of Advanced Construction Technologies to New Nuclear Power Plants," MPR-2610, Rev. 2, September 24, 2004, (Table N-2, N-6, and N-9), http://www.ne.doe.gov/np2010/reports/mpr2610Rev2Final924.pdf, accessed 2 May and 13 May 2008.

10.2-2 Energy Information Administration, "Domestic Uranium Production Report Quarterly," Data for 4th Quarter, 2007, http://www.eia.doe.gov/cneaf/nuclear/dupr/qupd.html, accessed 13 May 2008.

10.2-3 Energy Information Administration, "Uranium Industry Annual 1996," April 1997, http://tonto.eia.doe.gov/FTPROOT/nuclear/047896.pdf, accessed 13 May 2008.

10.2-4 World Nuclear Association, "Supply of Uranium," March, 2007, http://www.world-nuclear.org/info/inf75.html, accessed 18 July 2008.

10.2-5 National Ready Mix Concrete Association, http://www.nrmca.org/concrete/2008.htm, accessed 13 May 2008.

10.2-6 U.S. Census Bureau, Economics and Statistics Administration, "Steel Mill Products: 2006", Issued July 2007, http://www.census.gov/industry/1/ma331b06.pdf, accessed 13 May 2008.

10.2-7 U.S. Census Bureau, Economics and Statistics Administration, "Insulated Wire and Cable: 2006", Issued June 2007, http://www.census.gov/industry/1/ma335j06.pdf, accessed 13 May 2008.

Table 10.2-2 Commitment of Materials

Insert 3

Material	Quantities Used 1300 MWe unit	U.S. Production Estimated per Year
Concrete for Reactor Building	12,239 cubic yards	413,251,000 cubic yards of ready mix concrete
Rebar for Reactor Building	3,107 tons	6,969,893 metric tons
Cable for Reactor Building	2,500,000 linear feet	315,030 thousands of pounds (copper-containing) 308,173 thousands of pounds (aluminum-containing)
Cable for Single Unit	6,500,000 linear feet	315,030 thousands of pounds (copper-containing) 308,173 thousands of pounds (aluminum-containing)
Pipe >2.5 in. diameter	275,000 linear feet	1,151,882 metric tons (alloy steel: oil country goods and line pipe; mechanical tubing)

Source: Reference 10.2-1, Reference 10.2-5, Reference 10.2-6, Reference 10.2-7

Insert 1

- 460,000 cubic yard of concrete
- 46,000 tons of reinforcing steel
- 25,000 tons of structural, decking and miscellaneous steel
- 260,000 feet of large bore pipe (greater than 2.5 inches)
- 430, 000 feet of small bore pipe
- 222,000 feet of cable tray
- 1,200,000 feet of conduit
- 1,400,000 feet of power cable
- 5,400,000 feet of control wire
- 740,000 feet of process and instrument tubing for a GEN III+ reactor.

Insert 2

10.2-1 U.S. Department of Energy, "DOE NP2010 Nuclear Power Plant Construction Infrastructure Assessment," MPR-2776, Rev. 0, October 21, 2005, (Section 3.5), http://www.ne.doe.gov/np2010/reports/mpr2776Rev0102105.pdf, assessed November 16, 2009

Insert 3

Table 10.2-2 Commitment of Materials

Material	Quantities Used GEN III+	U.S. Production Estimated per Year
Concrete	460,000 cubic yards	413,251,000 cubic yards
Reinforcing Steel	46,000 tons	6,969,893 metric tons
Structural, Decking & Misc Steel	25,000 tons	5,297,920 metric tons (structural shapes-heavy)
Large Bore Pipe (greater than 2.5 inches in diameter)	260,000 feet	1,195,812 metric tons (carbon steel: cold rolled line pipe)
Small Bore Pipe	430,000	1,151,882 metric tons (alloy steel: oil country goods and line pipe; mechanical tubing
Process & Instrument Tubing	740,000	203,540 metric tons (stainless steel: pressure tubing, mechanical tubing, & other pipe and tubing)
Power Cable	1,400,000	315, 030 thousands of pounds (copper-containing)
Control Wire	5,400,000	308,173 thousands of pounds (aluminum – containing)

Source: Reference 10.2-1, Reference 10.2-5, Reference 10.2-6, Reference 10.2-7