From: Caverly, Jill
Sent: Monday, August 31, 2009 1:19 PM
To: Quinn, John
Cc: FermiCOL Resource
Subject: Fermi 3 Cooling Tower Move
Attachments: Site Layout Changes for Cooling Tower exEP.pdf; Site Layout Changes for Cooling Tower EP.pdf

John,
Here is the additional submittal for the Fermi cooling tower changes. Please look it over and forward to Eugene. We should talk about the impact this might have on the review, if any.
Let's plan to talk on Wednesday, once you have had time to look at it.
Thanks,
JILL

Jill S. Caverly, PE
Senior Hydrologist
U.S. Nuclear Regulatory Commission
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Hearing Identifier: Fermi_COL_Public
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Subject: Fermi 3 Cooling Tower Move
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From: Caverly, Jill

Created By: Jill.Caverly@nrc.gov

Recipients:
"FermiCOL Resource" <FermiCOL.Resource@nrc.gov>
Tracking Status: None
"Quinn, John" <quinnj@anl.gov>
Tracking Status: None

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Sensitivity: Normal
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Recipients Received:

DTE Energy Company
2000 2nd Ave., Detroit, MI 48226-1279

DTE Energy

10 CFR 52.79

August 26, 2009
NRC3-09-0020

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

References: 1) Fermi 3
Docket No. 52-033

Subject: Detroit Edison Company Submittal of Final Safety Analysis Report (FSAR) and Emergency Plan Changes Associated with Revised Fermi 3 Site Plan

In order to address environmental concerns relating to wetland impacts of structures associated with the proposed Fermi 3 plant, Detroit Edison recently completed a study of the proposed Fermi site plan. This study was intended to apply best efforts to minimize wetland impacts to the Fermi site and meet the U. S. Army Corps of Engineers requirements for site permitting (33 CFR 320.4). Other applicable regulatory requirements associated with the design and construction of the proposed structures, as well as input from affected stakeholders, were considered in the study. In meeting the objectives stated above, several structures on the Fermi site were relocated. These changes include:

- Relocating the Fermi 3 Circulating Water (CIRC) System Natural Draft Cooling Tower (NDCT) closer to the Fermi 3 power block structures.
- Relocating the Fermi 3 switchyard to the far west side of the property, outside of the present Fermi site Owner Controlled Area fence.
- Adjusting the orientation and location of the Service Water/Water Treatment (SW/WT) Building to provide sufficient distance from other Seismic Category I structures.
- Depicting a possible location for the new meteorological tower as relocation is necessary due to interference with the Fermi 3 NDCT.
- Reflecting locations for ancillary structures such as warehouses.
- Using parking garages in lieu of surface parking lots.

Additional evaluation and supporting information for the relocation of the meteorological tower is being developed. Changes to the Fermi 3 COLA that reflect the meteorological tower relocation and design requirements will be provided by November 16, 2009.

The revised Fermi site plan resulted in several changes to the Fermi 3 COLA, as described below:

- Attachment 1 provides a summary of the changes and markups of the affected Fermi 3 FSAR pages. These changes will be included in the next Fermi 3 COLA revision.
- Attachment 2 provides markups of the affected Fermi 3 Emergency Plan pages. The changes to the Emergency Plan consist of revisions to figures depicting the site layout and do not result in any substantive emergency response related changes.
- Changes to the Fermi 3 Environmental Report will be addressed through responses to associated Requests for Additional Information (RAIs).
- Changes to the Fermi Site Security Plan were also identified. These changes consist of revisions to figures depicting the site layout and general descriptions of the locations of structures on site, and do not result in substantive security related changes. Changes to the Security Plan will be included in the next Fermi Site Security Plan revision.

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 26th day of August, 2009.

Sincerely,

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

Attachments: 1) Summary of Fermi 3 FSAR Changes & Fermi 3 FSAR Markup
2) Fermi 3 Emergency Plan Changes

cc: Jack M. Davis, Senior Vice President and Chief Nuclear Officer
Mark Tonacci, NRC Fermi 3 Project Manager
Stephen Lemont, NRC Fermi 3 Environmental Project Manager
Fermi 2 Resident Inspector
NRC Region III Regional Administrator
NRC Region II Regional Administrator
Supervisor, Electric Operators, Michigan Public Service Commission
Michigan Department of Environmental Quality
Radiological Protection and Medical Waste Section

Attachment 1
NRC3-09-0020

Summary of Fermi 3 FSAR Changes & Fermi 3 FSAR Markup

Summary of Fermi 3 FSAR Changes

A review of the Fermi 3 FSAR was conducted to determine the impacts to the FSAR from the changes to the Fermi site plan. These resultant impacts are summarized in the table below.

FSAR Chapter	Sections Impacted	Topics	Comments
1	1.7	Drawings	Table 1.7-201 is revised to remove Figure 8.2-202.
	1.8	Interface with Standard Design	Table 1.8-202 (Sheet 2 of 2) is revised to identify a CDI item has been added to Section 10.4.5.6.
2	2.1	Site Layout – General Information	Figures 2.1-203 and 2.1-204 are revised to reflect the revised site plan.
	2.3	Cooling Tower Plume Analysis	Section 2.3.2.2 is revised to reflect new location for CIRC System NDCT. The updated text includes the description of the revised NDCT plume analysis. A revised discussion of the requirement to relocate the existing meteorological tower prior to Fermi 3 construction is also included. Additional supporting information regarding the meteorological tower relocation is being developed and corresponding COLA changes will be provided by November 16, 2009. Usually the plumes from the Fermi 2 cooling towers and Fermi 3 NDCT will travel in parallel, non-intersecting directions. However, the potential does exist for the plume from the Fermi 3 NDCT to combine with a plume from one of the Fermi 2 cooling towers for a narrow set of wind directions (on the order of 10 degrees or less). Given the fact that the cooling towers will not be situated in line as to additively impact the facility operations on the main power block, there is expected to be little concern for cumulative effects with

FSAR Chapter	Sections Impacted	Topics	Comments
			existing operations on-site. For situations where the plume overlaps and moves off site either northeast of the Fermi 2 cooling towers or southwest of the Fermi 3 NDCT, the impacts of plume effects on ground-level sources such as salt deposition is expected to be insignificant. The potential for overlapping plumes from Fermi 2 and Fermi 3 cooling towers is discussed in more detail in the Fermi 3 Environmental Report, Subsection 5.3.3.1.5, "Interaction of Vapor Plume with Existing Pollutant Sources Located Within 1.25 Miles of the Site." The effects of the Fermi 3 NDCT location are not included in the atmospheric dispersion analyses. For winds coming out of the southwest direction, the Fermi 3 NDCT could result in increased turbulence and reduce the atmospheric dispersion factors. Thus, for this wind direction, not considering the effects of the Fermi 3 NDCT is conservative. The maximum Exclusion Area Boundary (EAB) and Low Population Zone (LPZ) atmospheric dispersion factors are for a downwind ESE direction; which would not be impacted by the Fermi 3 NDCT. The maximum dose due to normal effluent releases is at the site boundary in the downwind SSE and WNW directions; which would also not be impacted by the Fermi 3 NDCT.
	2.4	Hydrology	Section 2.4.2, including Tables 2.4-213 and 2.4-214 are updated to reflect the changes to areas of the sections of the Fermi 3 grade elevation made due to moving the Service Water/Water Treatment (SW/WT) Building. Figure 2.4-211 is revised to reflect new site layout. Figures 2.4-215 and 2.4-217 are revised to

FSAR Chapter	Sections Impacted	Topics	Comments
			reflect location change for SW/WT Building. Figure 2.4-218 is revised to reflect the new location for the CIRC System NDCT.
	2.5	Geotechnical	Figures 2.5.1-235 and 2.5.1-236 are revised to reflect the new locations of the CIRC System NDCT and SW/WT Building.
3	No Impact		
4	No Impact		
5	No Impact		
6	No Impact		
7	No Impact		
8	Section 8.2	Offsite Power Systems	Sections 8.1 and 8.2 are revised to reflect the new location for the Fermi 3 switchyard. Figure 8.2-201 is revised to reflect the new one-line diagram for the Fermi 3 switchyard. Figure 8.2-202 is deleted as the location of the Fermi 3 switchyard. The Fermi 3 switchyard is adequately depicted on the revised Figure 2.1-204 and the description of the pathway for the transmission lines from the Fermi 3 switchyard is adequately described in Section 8.2.
9	Appendix 9A	Fire Hazards Analysis	Figure 9A.2-33R revised to reflect location change for SW/WT Building.

FSAR Chapter	Sections Impacted	Topics	Comments
10	Section 10.4.	Normal Power Heat Sink	Section 10.4.5.8 indicates that the CIRC System NDCT is located at least a distance equal to its height away from any Seismic Category I or II structures. This statement is valid for the new location for the CIRC System NDCT. The new location for the CIRC System NDCT is much closer to the Fermi 3 power block structures than the previous location. Section 10.4.5.6 has been added to the FSAR to describe that there are no potential flooding concerns to the power block structures from a failure in the CIRC System (including the NDCT basin) in the yard.
11	No Impact		
12	No Impact		
13	No Impact		
14	No Impact		
15	No Impact		
16	No Impact		
17	No Impact		
18	No Impact		
19	No Impact		

Markup of Fermi 3 FSAR

(Following 33 pages)

The attached markup represents Detroit Edison's good faith effort to show how the COLA will be revised in a future COLA submittal. However, the same COLA content may be impacted by revisions to the ESBWR DCD, responses to other COLA RAI's, 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 somewhat different that as presented herein.

Table 1.7-201 Summary of Electrical System Configuration Drawings

[EF3 SUP 1.7.1]

Figure 8.2-201, 345 kV Switchyard Single-Line Diagram
Figure 8.2-202, 345 kV Switchyard Arrangement
Figure 8.2-203, Transmission Line Map

Table 1.7-202 Summary of Mechanical System Configuration Drawings

[EF3 SUP 1.7-1]

Figure 9.2-201, Potable Water System Simplified Diagram
Figure 9.2-202, Sanitary Waste Discharge System Simplified Diagram
Figure 9.2-203, Station Water System - Plant Cooling Tower Makeup System (PCTMS)
Figure 9.2-204, Station Water System - Pretreated Water Supply System (PWSS)
Figure 9.5-201, Fire Protection System Yard Main Loop
Figure 10.4-201, Circ Natural Draft Cooling Tower and Pump Pit
Figure 10.4-202, Condenser and Ball Cleaning System

Table 1.8-202 Conceptual Design Information (CDI) (Sheet 2 of 2) [EF3 SUP 1.8-5]

Item in DCD	CDI in DCD adopted as actual design	CDI in DCD replaced with actual design	Evaluation	FSAR Section
9.2.4 Potable and Sanitary Water Systems		X	Site-specific system description and design characteristics described	9.2.4 Table 9.2-201 Table 9.2-202
9.2.10 Station Water System		X	Site-specific system description and design characteristics described	9.2.10 Table 9.2-204 Table 9.2-205 Figure 9.2-203 Figure 9.2-204
9.3.9 Hydrogen Water Chemistry System		X	Site-specific system description and design characteristics described	9.3.9
9.3.11 Zinc Injection System		X	Zinc Injection System not utilized	9.3.11
9A Appendix 9A Fire Hazards Analysis		X	Site-specific building specified. Site-specific Fire Zone drawing supplied.	Figure 9A.2-33R Figure 9A.2-201
10.4.5 Circulating Water System Table 10.4-3 Figure 10.4-1		X	Site-specific system description and design characteristics described	10.4.5.2.1 10.4.5.2.2 10.4.5.2.3 10.4.5.5 10.4.5.8 Table 10.4-201 Table 10.4-3R Figure 10.4-201 Figure 10.4-202

Figure 2.1-203 Fermi Property Boundary [EF3 COL 2.0-2-A]

Figure 2.1-204 Fermi 3 Site Plan [EF3 COL 2.0-2-A]

thus will not represent a significant alteration to the flat and gently sloping topographic character of the Fermi region. Additionally, construction of new roads to accommodate the construction traffic for the new facility and the addition of buildings, parking areas and other structures should have little to no effect on the local meteorology of the site.

Estimated Impacts of New Structures

The addition of a NDCT, two multi-cell MDCTs, and reactor building will add additional effects to the airflow trajectories downwind of the new structures. Regulatory Guide 1.23 estimates that a meteorological tower located at least a distance of 10-building-heights horizontal distance downwind from the nearest structure will not have adverse wake effects exerted by the structure. Figure 2.1-204 of Section 2.1 provides the location of the proposed NDCT, two multi-cell MDCTs, and reactor building in relation to the current onsite meteorological tower. The Fermi site according to Figure 2.3-258 is located at an elevation approximately 177.7 m (583 ft) above mean sea level. The plant area where the structures will be located is relatively flat with only minor differences in plant grade. The two multi-cell MDCTs are located approximately 426.1 m (1398 ft) east of the onsite meteorological tower. Since most of the cooling tower is located behind the Operation Support Center, turbulent flow downwind of the MDCTs is expected to be minimal. The reactor building is located approximately 339.2 m (1113 ft) east-northeast of the onsite meteorological tower. The height of the reactor building is approximately 48.2 m (158 ft) above plant grade. Using the method suggested by Regulatory Guide 1.23 the zone of turbulent flow created by the reactor building will be limited to approximately 481.6 m (1580 ft). Since the meteorological tower is within a distance of approximately 339.2 m (1113 ft), the reactor building will produce adverse wake effects on the wind direction and speed measurements at the Fermi site when winds blow from the east through northeast directions.

The NDCT is located approximately 1359 ft (414 m) southwest of the onsite meteorological tower and will be built to a height of 182.3 m (600 ft) above plant grade, the tallest structure at the Fermi site. Since the NDCT is hyperbolically-shaped, the downwind wake zone is different than square or rectangular structures and is estimated to be approximately five times the width of the tower at the top of the structure (Reference 2.3-253). Using this method with a width of 89 m (292 ft) at the top of the tower, the downwind wake effect of the NDCT is estimated

Insert 1:

Using this method with a width of 89 m (292 ft) at the top of the tower, the downwind wake effect is estimated to extend 445 m (1460 ft) from the base of the NDCT. The onsite meteorological tower will be required to move to a location that does not experience the turbulent wind conditions downwind of the NDCT.

Annual wind roses for the 10- and 60-m levels on the meteorological tower are provided in Figure 2.3-230 and Figure 2.3-243, respectively. Northeast and east-northeast winds, that would allow wake effects from the Fermi 3 reactor building towards the meteorological tower, occur approximately 10.3 percent and 8.6 percent of the time at the upper and lower levels, respectively. Considering the distance of the onsite meteorological tower from the Fermi 3 structures and the frequency that wind directions blow from the reactor building, wind measurements at the onsite tower are expected to be affected by turbulent flow. Accordingly, the existing meteorological tower will be relocated consistent with Regulatory Guide 1.23 prior to construction of Fermi 3 structures.

to be 445 m (1460 ft). Therefore, the NDCT is also expected to influence air flow trajectories at the onsite meteorological tower.

The dominant wind direction for the 10- and 60-m levels on the meteorological tower, as provided in Figure 2.3-230 and Figure 2.3-243, is southwesterly. Southwest and south-southwest winds, that would allow wake effects from the NDCT towards the meteorological tower, occur approximately 19 percent of the time for both the upper and lower levels. Winds that blow from the Fermi 3 reactor building occur 11 percent and 9 percent of the time at the upper and lower levels, respectively. Considering the distance of the onsite meteorological tower from the Fermi 3 structures and the frequency that wind directions blow from the NDCT and reactor building, wind measurements at the onsite tower are expected to be effected by turbulent flow. Accordingly, the existing meteorological tower would require relocation in conformance with Regulatory Guide 1.23 prior to construction of Fermi 3 structures.

Other Estimated Impacts

Operation of large power generation units can have two distinct effects on the local climate, 1) additional generation of particulates (particulate matter and fog) and 2) effects by cooling tower plumes. Air emissions of particulate matter will be minor given the nature of a nuclear facility and its lack of significant gaseous exhausts of effluents to the air. Sources of air emissions for the proposed facility include two standby diesel generators, an auxiliary boiler, a diesel fire pump, and increased automobile traffic. The combustion sources mentioned above will be designed for efficiency and operated with good combustion practices on a limited basis throughout the year (often only for testing). Given the small magnitude of size and infrequent operation, these emissions will only have a minimal impact on the local and regional air quality, and furthermore the local climate. These emissions will be regulated by the State of Michigan, Department of Environmental Quality.

Plumes emitted from cooling towers can also affect the local climate. Fermi 3 will include a NDCT as the main cooling method and two multi-cell MDCTs as the auxiliary cooling method. The predominant wind direction at the Fermi site is southwesterly at the 10- and 60-m levels. This indicates that the cooling tower plumes will most frequently extend over the Fermi site and towards Lake Erie. A more detailed explanation of the effects of the cooling tower plumes on the local meteorology is provided in the following sub-section.

2.3.2.2.1 Cooling Tower Plumes

Cooling systems depend on evaporation of water to dissipate heat created from the energy production process. In this cooling process the cooling towers often create visible plumes that can produce effects on the local environment. The visible plumes can produce shadows on surfaces such as trees, vegetation and nearby buildings. Cooling tower plumes can also create or enhance ground level fogging or icing, as well as increase salt deposition. An assessment of cooling tower plumes emitted during the operation of a new power production facility at the Fermi site on the local environment and atmosphere was performed. The investigation was performed using the Electric Power Research Institute's Seasonal/Annual Cooling Tower Impact Prediction Code (SACTI), a model endorsed by Section 5.3.3.1 of NUREG-1555 (Reference 2.3-254). The model used meteorological data from the Fermi onsite tower for the available five-year period of 2003 through 2007. The onsite data contains wind direction, wind speed, dew-point temperature, and dry-bulb temperature measurements at 10- and 60-m heights. Since the meteorological tower does not record atmospheric pressure, station pressure data commensurate with the onsite data, was taken from Detroit Metropolitan Airport. Using the dry-bulb and dew-point temperature from the Fermi site, as well as the station pressure from Detroit Metropolitan Airport, the required wet-bulb temperature and relative humidity values were calculated (Reference 2.3-240). Mean monthly mixing height values calculated in Subsection 2.3.2.1.7 were also used as inputs for the SACTI cooling tower model analysis.

To assess the potential plume impacts, the NDCT was evaluated for Fermi 3. The cooling tower was modeled as if the power generation process was producing the maximum heat load. Tower-specific data used in the SACTI cooling tower model analysis, such as projected cooling tower dimensions, top exit diameter, and total heat rejection rates, are provided in Table 2.3-285. Since the auxiliary Heat Sink (AHS) will use the two multi-cell MDCTs to dissipate heat from the Plant Service Water System mainly during plant shutdown/cool down, the operation of the two multi-cell MDCTs is expected to be minimal. For this reason, the environmental impact associated with the operation of the two multi-cell MDCTs is bounded by the impacts associated with the NDCT. The remainder of this section will provide the potential plume impacts that result from the operation of the NDCT.

Table 2.3-286 displays the average plume lengths by season and direction during NDCT operation. Average plume lengths are longest for the NDCT during winter when average monthly temperatures are coldest (Reference 2.3-201). Table 2.3-287 presents annual plume length frequency for the NDCT. Previously it was stated that the NDCT will be positioned approximately 414 m (1359 ft) southwest from the meteorological tower. It can be reasonably stated that winds that blow from the southwest and south-southwest will allow a plume to travel towards the onsite meteorological tower. Using this method the tables indicate that plumes from the NDCT traveling in the northeast and north-northeast directions reached the onsite meteorological tower 7.66 percent and 7.76 percent, respectively, of the time annually. This evaluation does not account for the height of the plume as it travels from the cooling towers and is likely an overestimate of the number of times a plume reaches the meteorological tower on an annual basis. In addition, plumes from the NDCT are emitted at a height of 182.9 m (600 ft) and after additional plume rise will have negligible effects on the meteorological tower.

2.3.2.2.2 **Cooling Tower Plume Effects on Ground Level Meteorological Variables**

As was discussed previously, the plume effects on the onsite meteorological tower are considered negligible. However, cooling tower plumes will influence some of the ground level meteorological variables very near the base of the cooling tower. This section investigates these influences and their impact at the Fermi site.

<u>Wind</u>

There are two effects of the NDCT on the local wind field. During the operation of the cooling tower air is drawn in at the base of the tower. The air is then heated by evaporation as it passes over the heated water located on the fill, collects moisture, and naturally rises. As the air rises it begins to cool and eventually saturates, forming a plume that exits at the top of the cooling tower. This process is continuous and causes the local wind field to converge toward the base of the cooling towers. The effect of airflow toward the cooling tower is localized and will likely remain within the Fermi property boundary. Hyperbolic shaped cooling towers

Insert 2:

Table 2.3-286 displays the average plume lengths by season and direction during NDCT operation as predicted by the SACTI cooling tower model analysis. Average plume lengths are longest for the NDCT during winter when average monthly temperatures are coldest (Reference 2.3-201). Table 2.3-287 presents annual plume length frequency for the NDCT. The data shown in this table does not account for the height of the plume as it travels from the cooling towers and is likely an overestimate of the number of times a plume reaches the ground at any location onsite on an annual basis. In addition, plumes from the NDCT are emitted at a height of 182.9 m (600 ft) and after additional plume rise will have negligible effects to locations within the Fermi property boundary. Therefore, effects of plumes emitted from the NDCT are expected to be negligible for the future location of any onsite meteorological tower.

also have an effect of lowering the wind speed downwind of the wind direction to a distance of five times the width of the top of the tower. As was mentioned previously in Subsection 2.3.2.2, turbulent wind flow from the cooling towers is expected to affect the onsite meteorological tower. Therefore, the meteorological tower would require relocation in accordance with Regulatory Guide 1.23.

Temperature

The plume that is released from the cooling towers is typically warmer than the ambient air and is mostly dissipated into the atmosphere above the tower height. However, some of the heat is transported downward to the ground downwind of the wind direction. Air temperature at the surface, thereby, is expected to be only slightly warmer within a few hundred feet of the tower. Large plumes may also block the heat from the sun and have the effect of cooling the ambient air at the surface during the day and warming it at night. Once again the effect of the plume on the surface ambient temperature is minimal and cannot be measured beyond a few hundred feet from the tower or plume.

Atmospheric Water Vapor

The vapor plumes increase the absolute and relative humidity values immediately above cooling towers, as indicated by the high frequency of visible plume occurrence. At the surface the absolute humidity only increases slightly as some of the moisture from the plume is transported downward downwind from the cooling tower. During colder temperatures the increase of relative humidity near the cooling tower may be greater due to the relatively lower moisture-bearing capacities of cold air. Overall, the ground level humidity increases from the operation of cooling towers is expected to be very small.

Precipitation

As presented by Huff, drizzle and light snow have been observed within a few hundred feet downwind of cooling towers (Reference 2.3-255). The occurrence of such precipitation events is rare and much localized. Huff compared the fluxes of water vapor from NDCT and MDCT cooling towers to those natural water vapor fluxes ingested into cloud bases of showers and thunderstorms. His results indicate that some enhancement of small rain showers might be expected, as tower fluxes are within an order of magnitude of the shower fluxes. Thunderstorms, with their much

Insert 3:

As was mentioned previously in Subsection 2.3.2.2, turbulent wind flow downwind of the base of the NDCT is expected to extend 445 m (1460 ft).

Storm runoff results for typical design storms, such as the 10-, 25-, 50-, and 100-year storms, are shown in Table 2.4-212 and Table 2.4-213 for the existing sub-basin drainage area and the final grade area, respectively. Table 2.4-214 compares the runoff of the existing site drainage area and the final grade site area for each design storm event. The additional runoff from the typical storm events will have a minimal impact on the site due to the size and slope of the outfall pipe, the final grade design storm flow distribution, and local site topography.

The NRCS Dimensionless Unit Hydrograph Method was also used to calculate the one-hour unit hydrograph and the composite flood hydrograph for the 2.6 km^2 (1 mi^2) drainage area of the Fermi 3 site. This hydrograph is shown on Figure 2.4-216.

Manning's Equation was used to estimate a boundary channel depth that will be required to receive the local runoff from the PMP storm (Reference 2.4-227, Reference 2.4-229 through Reference 2.4-231). Manning's Equation is given by Equation 2, as follows:

$$Q = (k * A * R^{2/3} * s^{1/2}) / n \qquad \text{[Eq. 2]}$$

where:

Q = discharge in cfs
k = constant equal to 1.49 for English units
r = hydraulic radius = A/P_w
A = cross sectional flow area in square ft
P_w = wetted perimeter in ft
s = slope of hydraulic grade line in ft/ft
n = Manning's roughness coefficient for open channel flow

The channel characteristics used for the Manning's Equation were a bottom width of 23 m (75 ft), vertical sides, a slope of 0.006, and a roughness coefficient of 0.013.

Development of the local PMP runoff water level used a PMP depth at five minutes duration, corresponding to an intensity of 177 cm/hr (69.6 inches/hr) (Figure 2.4-213). The most conservative method of calculation evaluates the potential impact on the safety related area of 7.32 hectares (18.09 acres), which is the final grade area without considering discharge section N3 (Table 2.4-213). The area used in the rational method was the combination of the safety related area and drainage area N3 because this total area may potentially impact the safety related structures from backwater during the local PMP storm.

This total area is 17.83 hectares (44.05 acres). Due to the minimal 0.6 percent slope within the 10.51 hectare (25.96 acre) N3 area, the storm-runoff from the local PMP storm could create a backwater scenario due to the storm runoff leaving the 8 percent slope of the safety related area at a higher velocity than the 0.6 percent slope of the N3 drainage area. Using the rational method, the corresponding runoff for this area is 86.8 m^3/s (3,066 cfs). For this discharge, Manning's equation predicts a runoff depth of 0.78 m (2.55 ft), using the channel characteristics described above. This depth is the local PMP runoff water level.

Given that the existing plant grade is at elevation 177.3 m (581.8 ft) NAVD 88, the most conservative water level due to PMP runoff at the Fermi 3 site is approximately 178.1 m (584.4 ft) NAVD 88. The nominal Fermi 3 plant grade of safety related structures is 179.6 m (589.3 ft) NAVD 88. Therefore, the Fermi 3 nominal plant grade elevation is approximately 1.5 m (4.9 ft) above the local PMP runoff flood level. Accordingly, no safety related structures will flood due to PMP runoff.

EF3 COL 2.0-14-A

2.4.3 **Probable Maximum Flood on Streams and Rivers**

This section determines the PMF of the Swan Creek Watershed, which is located hydrologically above Fermi 3. The guidance of ANSI/ANS-2.8-1992, which is the latest available standard, was used in determining the PMF (Reference 2.4-235).

The Swan Creek Watershed is shown on Figure 2.4-208 (Reference 2.4-260). It has a drainage area of approximately 275 km^2 (106 mi^2). Swan Creek, the main outlet for this watershed and a minor tributary of the western basin of Lake Erie, is located approximately 1.6 km (1 mi) northeast of Fermi 3. Swan Creek is currently ungauged. Consequently, there is no recorded flow data pertaining to historical storm events. However, historical flow rates have been estimated by the Michigan Department of Environmental Quality (MDEQ). The lowest 95 percent and 50 percent exceedance, the harmonic mean, and the 90-day once in 10-year flow (90Q10) for Swan Creek are estimated to be 0, 0.08, 0.13, and 0.03 m^3/s (0, 2.8, 4.6, and 0.9 cfs), respectively. Monthly 50 percent and 95 percent exceedance flows and monthly mean flows are shown on Table 2.4-215.

The MDEQ has estimated Swan Creek's flow rates during typical storm events using the Drainage-Area Ratio (DAR) method on Plum Brook

Table 2.4-213 Discharge (Q) from Final Grade Locations Calculated with the Rational Method [EF3 COL 2.0-13-A]

From Detroit, Michigan Rainfall-Intensity Curves

C = Dimensionless coefficient of discharge
A (acres) = Area
T_t (min) = Time of concentration
I_{10} (in/hr) = 10-year storm intensity
I_{25} (in/hr) = 25-year storm intensity
I_{50} (in/hr) = 50-year storm intensity
I_{100} (in/hr) = 100-year storm intensity
Q (cfs) = Storm runoff flow

Section	C	A	T_t	I_{10}	I_{25}	I_{50}	I_{100}	Q_{10}	Q_{25}	Q_{50}	Q_{100}
S1	1	3.85	6.31	3.00	4.00	4.25	4.90	11.55	15.40	16.36	18.87
S2	1	4.79	9.00	5.40	6.50	7.10	8.00	25.87	31.14	34.01	38.32
S3	1	4.15	8.33	5.50	6.60	7.50	8.00	22.83	27.39	31.13	33.20
N1	1	3.98	7.70	5.60	6.80	7.50	8.25	9.00	27.06	29.85	32.84
N2	1	1.32	5.49	6.50	7.50	8.00	9.00	8.58	9.90	10.56	11.88
N3	1	25.96	20.22	3.75	4.50	5.00	5.50	97.35	116.82	129.80	142.78

Total Discharges

Destination	Q_{10}	Q_{25}	Q_{50}	Q_{100}
North Outfall (S1, S2, S3, N1, N2)	77.82	110.89	121.91	135.10
NW Sump (N3)	97.35	116.82	129.80	142.78
Total	175.17	227.71	251.71	277.88

Insert 4

Section	C	A	T_t	I_{10}	I_{25}	I_{50}	I_{100}	Q_{10}	Q_{25}	Q_{50}	Q_{100}
S1	1	4.48	6.31	3.00	4.00	4.25	4.90	13.43	17.90	19.02	21.93
S2	1	4.60	9	5.40	6.50	7.10	8.00	24.87	29.93	32.69	36.84
S3	1	4.38	8.33	5.50	6.60	7.50	8.00	24.08	28.89	32.83	35.02
N1	1	3.98	7.7	5.60	6.80	7.50	8.25	9.00	27.06	29.85	32.84
N2	1	1.32	5.49	6.50	7.50	8.00	9.00	8.58	9.90	10.56	11.88
N3	1	25.96	20.22	3.75	4.50	5.00	5.50	97.35	116.82	129.80	142.78

Insert 5

Total Discharges

Destination	Q_{10}	Q_{25}	Q_{50}	Q_{100}
North Outfall (S1, S2, S3, N1, N2)	79.95	113.69	124.95	138.50
NW Sump (N3)	97.35	116.82	129.80	142.78
Total	177.30	230.51	254.75	281.28

Table 2.4-214 Existing Site and Final Grade Runoff Comparison [EF3 COL 2.0-13-A]

Total Discharges

	Q_{10}	Q_{25}	Q_{50}	Q_{100}
Existing	131.11	155.45	171.56	189.75
Final Grade	175.17	227.71	251.71	277.88
Additional Runoff	44.06 (33.6%)	72.26 (46.5%)	80.13 (46.7%)	88.13 (46.4%)

Q is storm runoff flow-rate with values of cubic feet per second (cfs)

Insert 6

Total Discharges

	Q_{10}	Q_{25}	Q_{50}	Q_{100}
Existing	131.11	155.45	171.56	189.75
Final Grade	177.30	230.51	254.75	281.28
Additional Runoff	46.19 (35.2%)	75.06 (48.3%)	83.19 (48.5%)	91.53 (48.2%)

Q is storm runoff flow-rate with values of cubic feet per second (cfs)

Figure 2.4-211 Fermi 3 Site Plan [EF3 COL 2.0-12-A]

Figure 2.4-215 Final Grade Drainage Areas [EF3 COL 2.0-12-A]

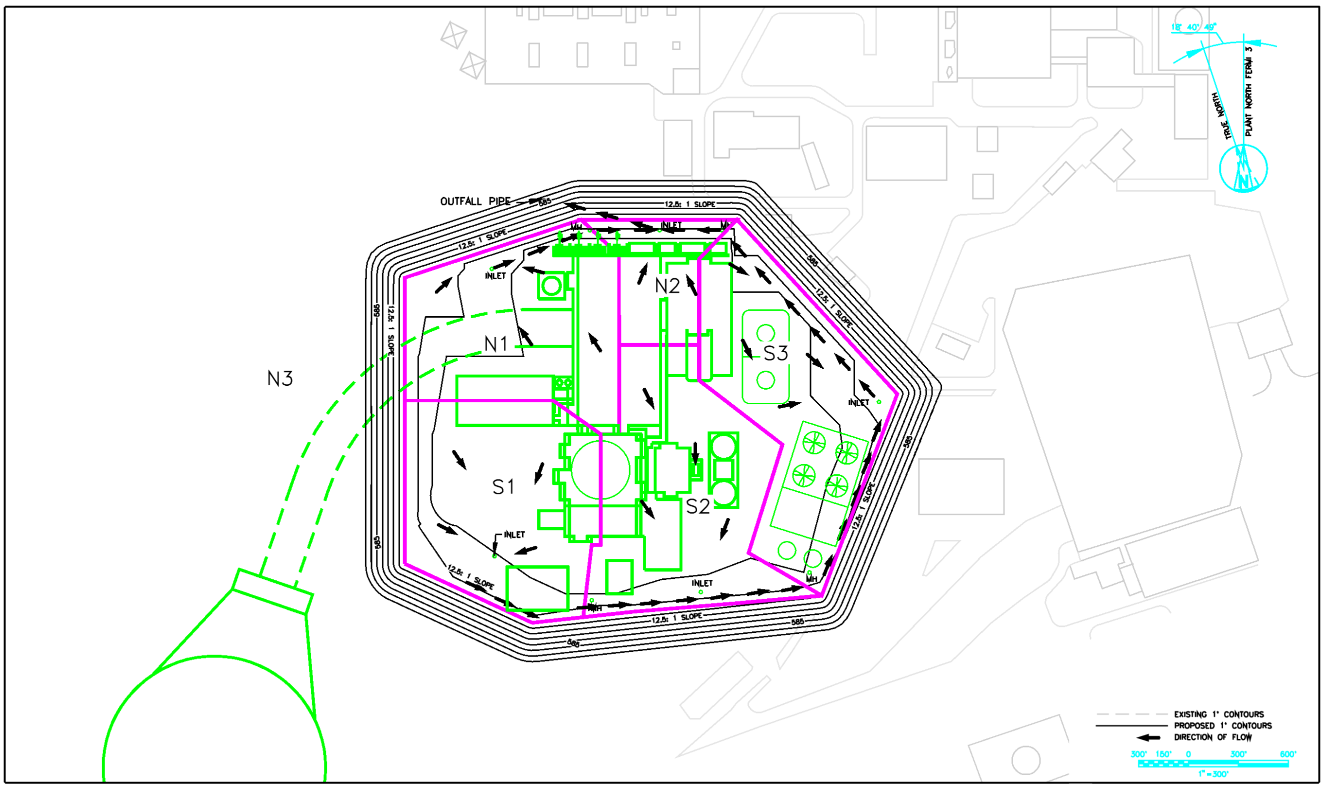


Figure 2.4-217 Final Grade Drainage Areas Assuming Clogged Underground Storm Drains and Culverts [EF3 COL 2.0-12-A]

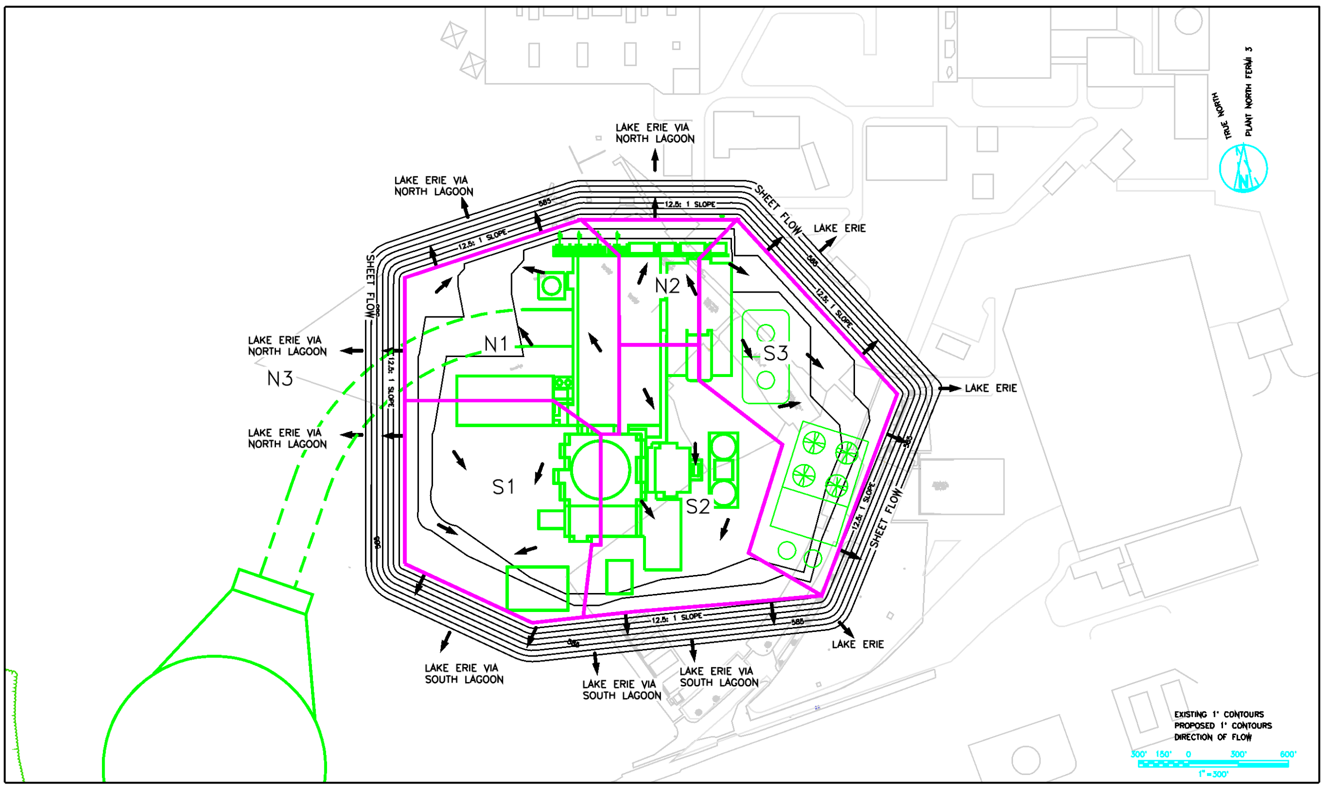


Figure 2.4-218 Swan Creek Cross-Sections [EF3 COL 2.0-14-A]

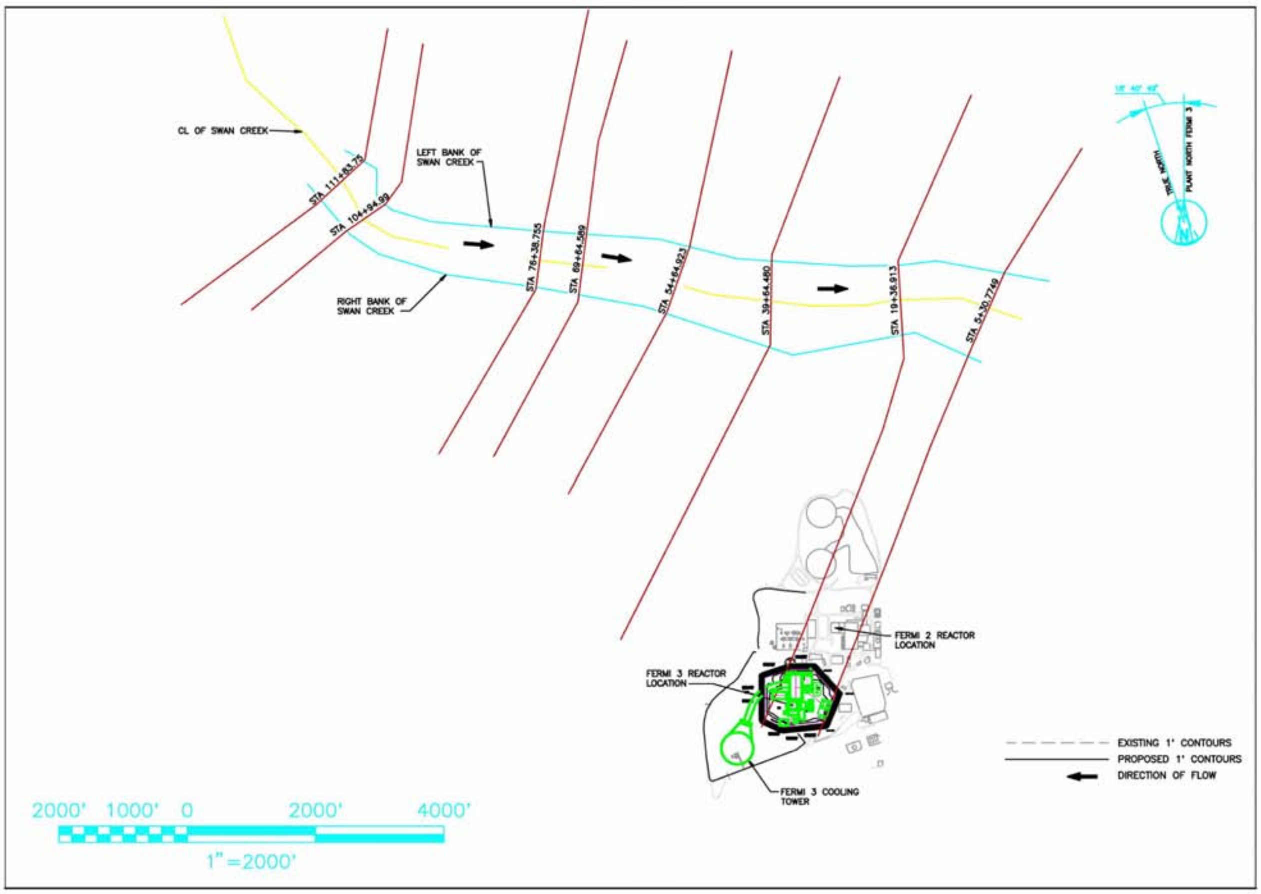


Figure 2.5.1-235 Site Exploration Plan [EF3 COL 2.0-26-A]

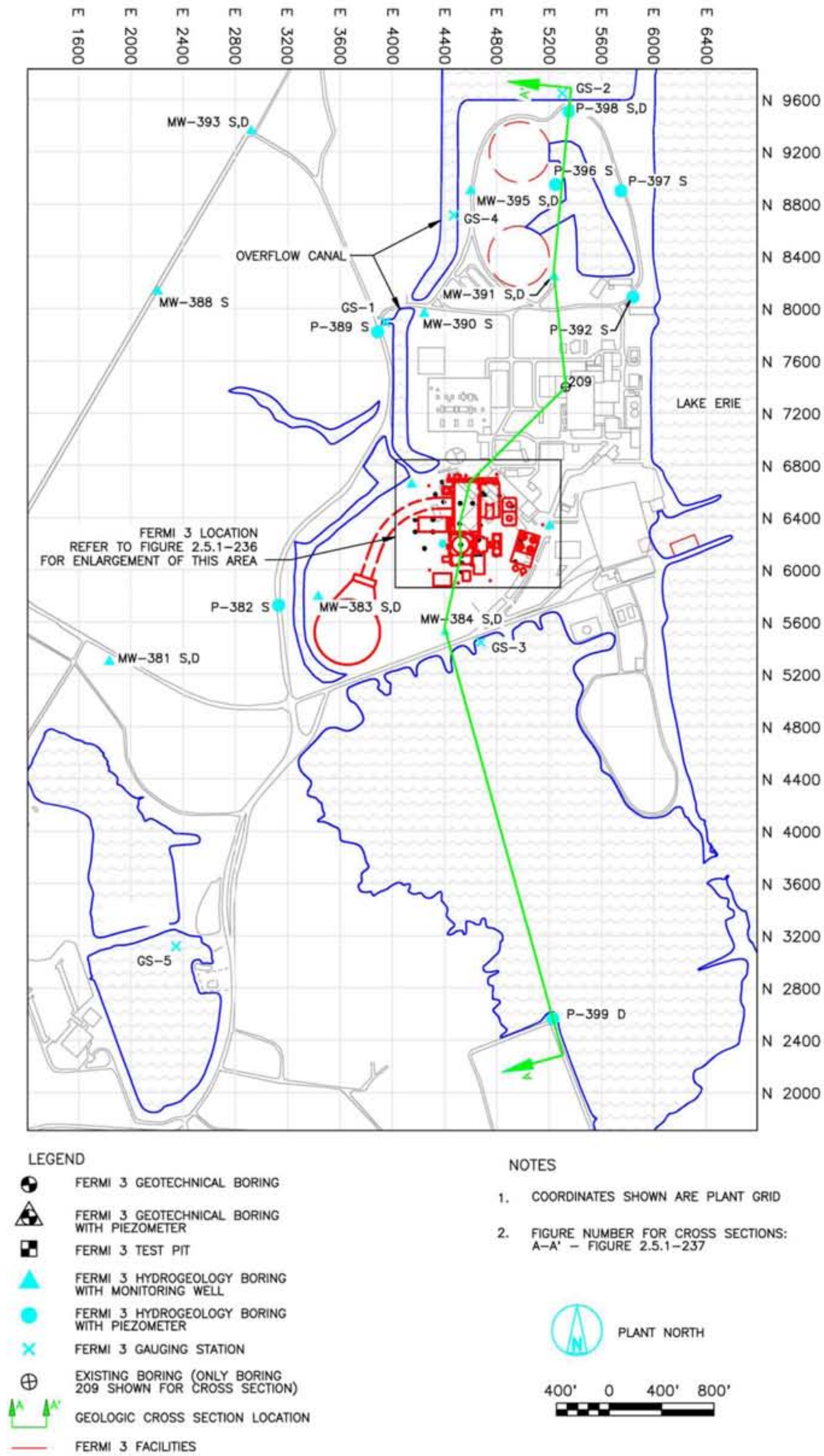
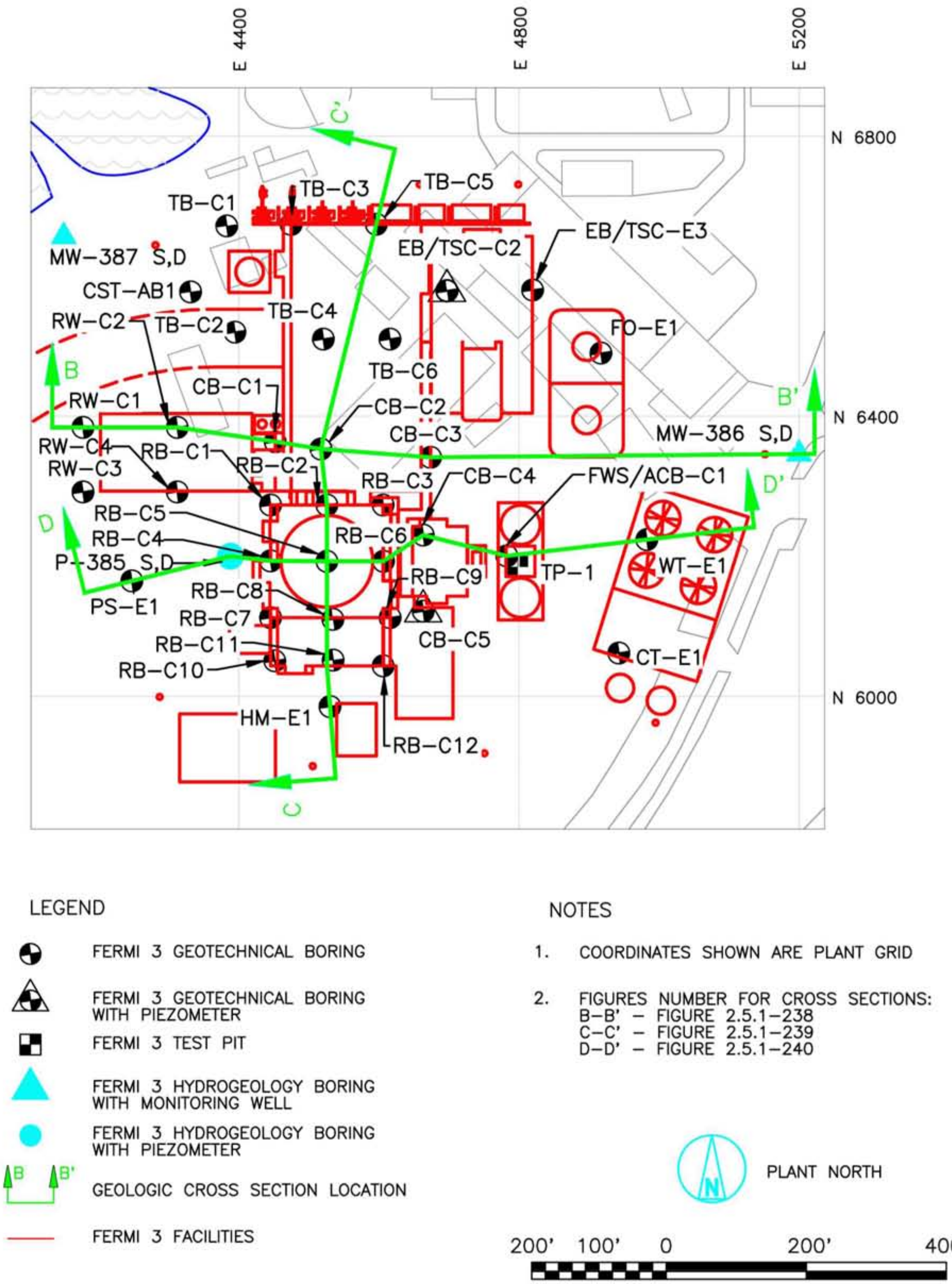


Figure 2.5.1-236 Enlargement of Site Exploration Plan [EF3 COL 2.0-26-A]



Chapter 8 Electrical Power

8.1 Introduction

This section of the referenced DCD is incorporated by reference with the following departures and/or supplements.

8.1.2.1 Utility Power Grid Description

Add the following to the end of the first paragraph.

EF3 SUP 8.1-1

The output of Fermi 3 is delivered to a 345 kV switchyard through the unit main step-up transformers, as described in Section 8.2 and Section 8.3. Fermi 3 is connected to the switchyard by a 345 kV normal preferred transmission line that supplies power to the two unit auxiliary transformers (UAT) and a 345 kV alternate preferred transmission line that supplies power to the two reserve auxiliary transformers (RAT). The switchyard for Fermi 3 serves three 345 kV transmission lines, Fermi-Milan #1, Fermi-Milan #2, and Fermi-Milan #3 which connect this switchyard to the Milan substation. These three transmission lines exit the western side of the switchyard and traverse westward from the site as shown in Figure 8.2-203. The International Transmission Company's (ITC*Transmission*) transmission system and connections to Fermi 3 are further described in Section 8.2.

8.2 Offsite Power Systems

This section of the referenced DCD is incorporated by reference with the following departures and/or supplements.

8.2.1.1 Transmission System

Replace this section with the following.

EF3 COL 8.2.4-1-A

Fermi 3, is connected to the ITC*Transmission* system by three 345 kV lines. These lines are designed and located to minimize the likelihood of simultaneous failure.

The Fermi 3 main generator feeds electric power through a 27 kV isolated-phase bus to a bank of three single-phase transformers, stepping the generator voltage up to the transmission voltage of 345 kV. Figure 8.2-201 provides a one-line diagram that shows the 345 kV switchyard electrical connections to the onsite power system for Fermi 3. The anticipated physical arrangement of power lines from offsite power sources is shown in Figure 8.2-202. Figure 8.2-203 maps the offsite transmission lines.

The transmission lines connecting the 345 kV switchyard for Fermi 3 to the transmission system are as follows:

- A 345 kV Fermi-Milan #1 overhead line to the Milan substation (approximately 47.3 km [29.4 mi])
- A 345 kV Fermi-Milan #2 overhead line to the Milan substation (approximately 47.3 km [29.4 mi])
- A 345 kV Fermi-Milan #3 overhead line to the Milan substation (approximately 47.3 km [29.4 mi])

The three 345 kV lines for Fermi 3 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 run west and north for approximately 19.3 km (12 mi) in a corridor shared with other non-Fermi lines. From this point, all non-Fermi lines turn north and continue on to their respective destinations and the three Fermi-Milan lines continue west for approximately 16 km (10 mi) to the Milan substation.

Transmission tower and steel pole separation, line installation, and clearances are consistent with applicable regulatory standards, typically the National Electrical Safety Code (NESC), and ITC*Transmission* line standards. Design standards and parameters, including number of wires, structure heights, materials and finish are consistent with ITC*Transmission* line design standards.

8.2.1.2 Offsite Power System

Replace the first paragraph with the following.

EF3 COL 8.2.4-3-A
EF3 COL 8.2.4-4-A

The offsite power system is a non-safety related system. Power is supplied to Fermi 3 from three independent and physically separate offsite power sources. The normal preferred power source is any one of the three 345 kV Fermi-Milan transmission lines, and the alternate preferred power source is any other one of the three 345 kV lines.

Insert 7

From the Fermi 3 345 kV switchyard the three transmission lines leave the site heading west in a common corridor with the Fermi 2 transmission lines. The corridor is described in more detail below.

Delete the last paragraph and add the following paragraph.

Normal and alternate preferred power to the UATs and RATs, respectively, is via overhead conductors. To maintain their independence from each other, the conductors are routed such that they are physically and electrically separate from each other.

8.2.1.2.1 **Switchyard**

Replace the last paragraph with the following.

EF3 COL 8.2.4-2-A
EF3 COL 8.2.4-6-A
EF3 COL 8.2.4-7-A
EF3 COL 8.2.4-8-A

The Fermi 3 switchyard, prior to the point of interconnection with Fermi 3, is a 345 kV, air-insulated, breaker-and-a-half bus arrangement. Fermi 3 is connected to this switchyard by overhead conductors, the normal preferred and alternate preferred power conductors.

The anticipated physical location and electrical interconnection of the 345 kV switchyard for Fermi 3 is shown on Figure 8.2-201 and Figure 8.2-202.

The 345 kV switchyard for Fermi 3 receives two sources of AC auxiliary power from the 6.9 kV Plant Investment Protection (PIP) buses for the normal preferred switchyard power center and alternate preferred switchyard power center, as shown on DCD Figure 8.1-1. The switchyard auxiliary power system is designed with adequate equipment, standby power, and protection to provide maximum continuity of service for operation of the essential switchyard equipment during both normal and abnormal conditions. There are two independent sets of 125 V DC batteries, chargers, and DC panels for the switchyard relay and control systems DC supply requirements. Each charger is powered from a separate AC source with an automatic switchover to the alternate source, in the event the preferred source is lost. The distribution systems for the two battery systems are physically separated.

Control and relay protection systems are provided. Support systems, such as grounding, raceway, lighting, AC/DC station service, and switchyard lightning protection, are also provided.

Figure 8.2-201 345 kV Switchyard Single-Line Diagram [EF3 COL 8.2.4-1-A]

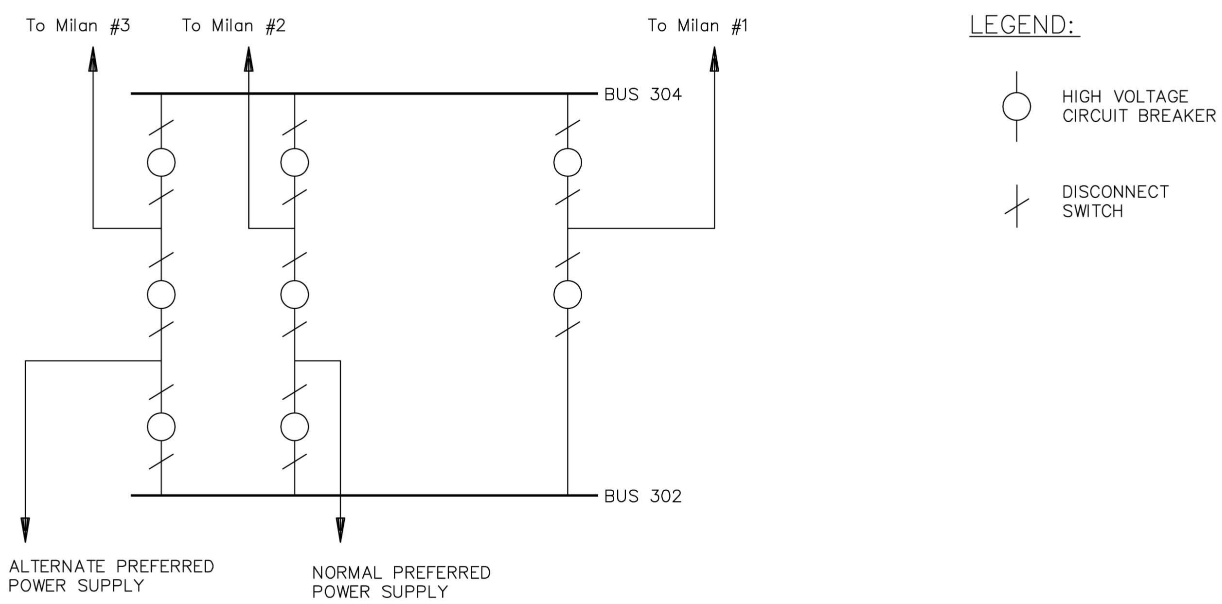


Figure 8.2-202 345 kV Switchyard Arrangement [EF3 COL 8.2.4-1-A]

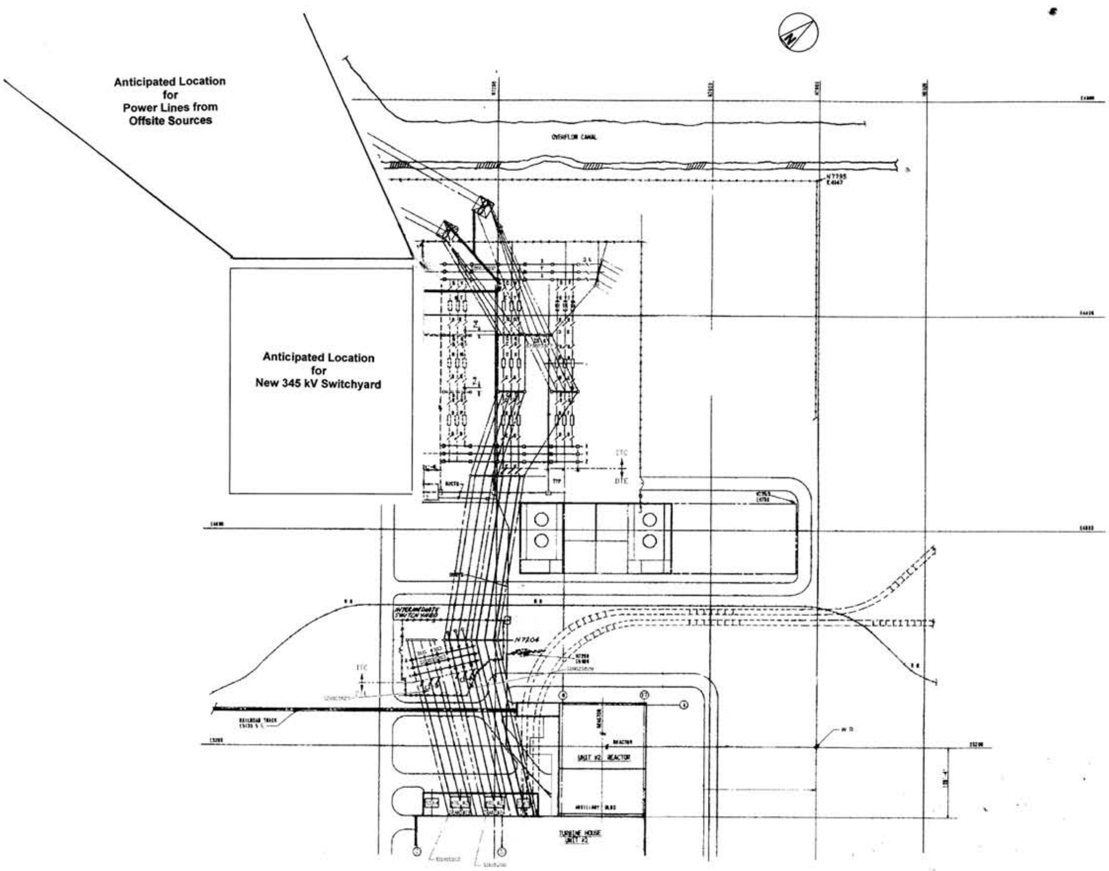
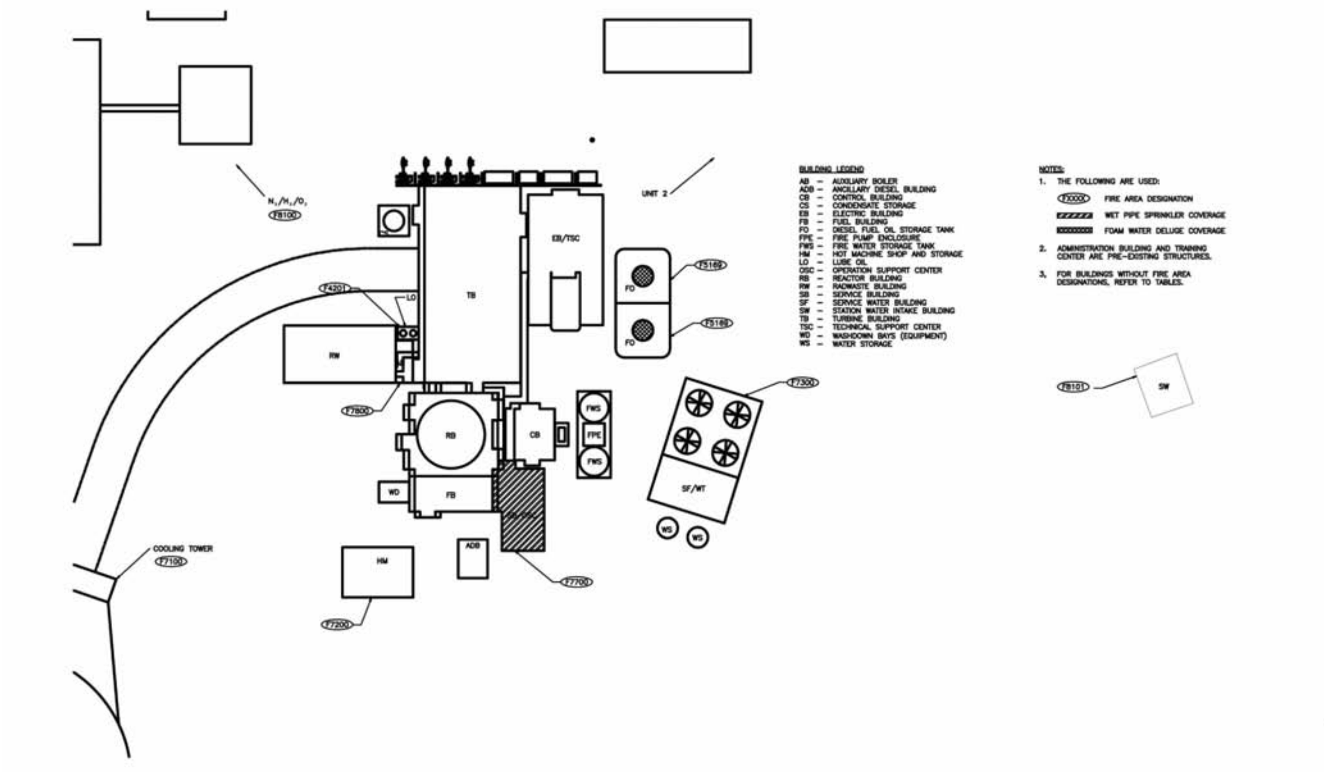


Figure 9A.2-33R Site Fire Protection Zone ESBWR Plot Plan [EF3 COL 9A.7-1-A]



the pump pit initiates alarms in the main control room on abnormally low or high water level.

Pressure indication is provided on the circulating water pump discharge. Differential pressure instrumentation is provided across the inlet and outlet to the condenser and is used to determine the frequency of operating the condenser tube cleaning system.

Local grab samples are used to periodically test the circulating water quality.

Replace the last paragraph with the following.

The temperature in each condenser cooling water supply line is indicated in the MCR. Based on these indications, warm water recirculation is controlled to maintain a minimum inlet temperature of approximately 0°C (32°F).

10.4.5.8 **Normal Power Heat Sink**

Replace the text with the following.

EF3 CDI

The cooling tower arrangement includes a single natural draft cooling tower. The NDCT supports a maximum cold water temperature of 35.6°C (96°F) for 100% turbine bypass capacity.

The NDCT design flow rate is 163,500 m3/hr (720,000 gpm), including Plant Service Water System supply. The operating flow rate varies depending on ambient conditions and heat load.

The NDCT is located at least a distance equal to its height away from any seismic Category 1 or 2 structures. Thus, if there were any structural failure of the cooling tower, no seismic Category 1 or 2 structures or any safety-related systems or components would be affected or damaged. The NDCT is made of non-combustible material.

10.4.6.3 **Evaluation**

Replace the second sentence in the third paragraph with the following.

Insert 8 Located after Section 10.4.5.

10.4.5.6 Flood Protection

Add the following to the end of this section.

EF3 CDI Failure of a pipe or other component in the CIRC, including the NDCT cooling tower basin, in the yard would not have an adverse impact on the intended design functions of safety related SSCs.

The NDCT is located at an elevation lower than the power block structures. The relative location of the NDCT with respect to the power block structures is shown on Figure 2.1-204. As discussed in Section 2.5.5.1.1, grade elevation at the power block area where the Category I structures are located is approximately 589.3 NAVD 88; which is raised to more than seven feet above the current elevation in this area of the site. Figure 2.4-215 shows the extent of the area that is raised. Comparing Figure 2.4-215 with Figure 2.1-204 shows that the NDCT is not in the area that is being raised. Thus, the NDCT is located lower than the power block structures. Therefore, failure of a pipe or component in the CIRC, including the NDCT basin, would not adversely impact the intended design functions of safety related SSCs.

Attachment 2
NRC3-09-0020

Fermi 3 Emergency Plan Changes

Attachment 2
NRC3-09-0020

Fermi 3 Emergency Plan Changes

Markup of Fermi 3 Emergency Plan

(Following 2 pages)

The attached markup represents Detroit Edison's good faith effort to show how the COLA will be revised in a future COLA submittal. However, the same COLA content may be impacted by revisions to the ESBWR DCD, responses to other COLA RAI's, 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 somewhat different that as presented herein.

Figure I-3: Fermi 3 Site Layout

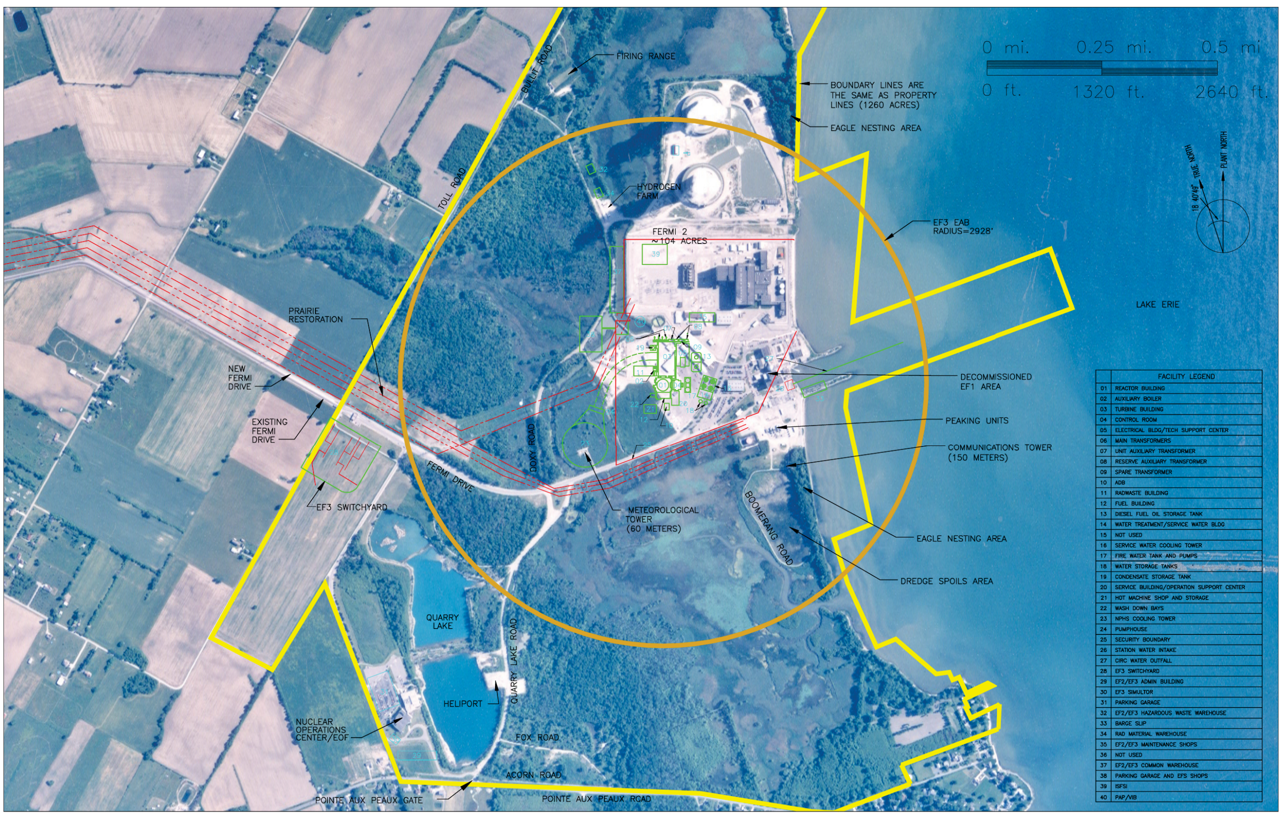


Figure II.J-1 Fermi 3 Owner Controlled Area