Attachment 1
to SD Motion
2012-04-17

Detroit Edison
Fermi 3

Assessment of Fermi 3 discharge impacts on *Lyngbya wollei* and other algal species

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Table of Contents

This analysis provides a technical and scientific basis for addressing the issues raised in the Fermi 3 adjudicatory proceeding as Contention 6, which focuses on the potential for algal blooms from Fermi 3 discharges. In particular, this report describes the ecology of a nuisance algal species in Lake Erie (*Lyngbya wollei*), reports on the results of investigations of the presence of *Lyngbya wollei* near the Fermi site, compares the Fermi 2 and Fermi 3 discharges, and evaluates the potential effect of Fermi 3 discharges on algae in Lake Erie.

Evidence of *Lyngbya wollei* in western Lake Erie was first reported in 2006 along the south shore of Maumee Bay, which is many miles from the Fermi site. This massive wash-in was estimated to contain approximately 200 metric tons of *Lyngbya wollei* along a 100-m stretch of shoreline. Surveys in 2008 documented *Lyngbya wollei* in Lake Erie's western basin. They reported decreasing populations of the alga away from Maumee Bay — further north along the Michigan shoreline and further east along the Ohio shoreline. A review of ship and dive logs and benthic algae samples taken at the existing Fermi 2 discharge location and the proposed Fermi 3 discharge location confirms the absence of *Lyngbya wollei* at the Fermi site.

A comparison of the discharges from Fermi 2 and Fermi 3 by AECOM concludes the ongoing effluent discharge from Fermi 2 provides a reasonable model for the proposed effluent outfall for Unit 3. AECOM concludes that the effluent discharge from Unit 3 will have a smaller influence on Lake Erie water quality near the Fermi site than the existing Unit 2 discharge. The effluent quality for the two units will be essentially the same. The outfalls for the two units differ but both account for important Lake Erie characteristics. The impacts from Fermi 3 discharges are generally considered to be less than for Fermi 2. And, mathematical modeling of the plumes from Units 2 and 3 confirm that the effluent from Unit 3 will be better mixed and the resulting plume will be smaller than that of Unit 2. The plumes do not overlap.

Finally, an assessment of the potential impacts of Fermi 3 discharges concludes that the Fermi 3 discharge is unlikely to cause or exacerbate algal blooms in Lake Erie or support growth of *Lyngbya wollei*. The key contributors to *Lyngbya wollei* growth are not present at Fermi 3. Water at the Fermi site is largely from less nutrient-rich Great Lakes sources to the north than those in Maumee Bay. As a result, *Lyngbya wollei* proliferation or other algal blooms are significantly less likely at the Fermi site than at other locations in Lake Erie. Fermi 3 discharges are also unlikely to increase the potential for *Lyngbya wollei* proliferation or cause other algal blooms because discharges from Fermi 3 do not increase the already-high calcium or phosphorus loads in Lake Erie. Moreover, the conditions at the Fermi discharge sites are more turbulent than the *Lyngbya*-rich sites in Maumee Bay due to the combined effects of wind on lake currents and wave action. The turbulent mixing at the discharge location should also mediate issues of locally increased water temperature. And, the short-term impacts associated with construction of the Fermi 3 discharge structure are unlikely to cause or exacerbate algal blooms in Lake Erie.

1.0 *Introduction and Background*

This analysis provides a technical and scientific basis for addressing the issues raised in the Fermi 3 adjudicatory proceeding as Contention 6. Contention 6 challenges the Environmental Report ("ER") water quality analysis with respect to (1) the potential for increasing algal blooms from Fermi 3 discharges and (2) the proliferation of a newly identified species of harmful algae, *Lyngbya wollei*, in the western Lake Erie basin.

1.1. Overview of Contention 6

The Board initially admitted Contention 6 insofar as it relates to the adequacy of the Applicant's water quality analysis in the ER regarding the potential contribution of chemical and thermal effluent from the proposed Fermi Unit 3 to algal production and the potential proliferation of the newly identified species of harmful algae. The Petitioners asserted that the ER should include an assessment of the algal bloom potential as a result of the proposed chemical discharge (*i.e.*, phosphorus) combined with thermal discharges expected during operation of Fermi Unit 3. The Petitioners maintain that these impacts would contribute to increasing algal blooms. Specifically, the Petitioners highlight a new alga, *Lyngbya wollei* and contend that Detroit Edison should address potential proliferation of this new species in relation to Fermi Unit 3.

1.2. Response to Contention 6

After the contention was admitted, Detroit Edison revised the ER to eliminate the use of phosphoric acid at Fermi Unit 3 (thereby eliminating phosphorus discharges); to incorporate a discussion of the impacts of thermal and chemical discharges on algae; and to include a discussion of *Lyngbya wollei*. These changes are reflected in Revision 1 (and subsequent revisions) of the Fermi 3 ER.

1.3. Motion for Summary Disposition on Contention 6

Detroit Edison sought summary disposition of Contention 6 based on these changes. In its decision denying summary disposition for Contention 6, the Licensing Board acknowledged Detroit Edison's commitment not to use phosphoric acid for control of corrosion and scaling at Fermi 3 and to use replacement chemicals from a list of chemicals previously used for other Michigan facilities. But, in response to motion, the Intervenors asserted that calcium "boosts the growth of Lyngbya [wollei]." The Board determined that Contention 6, as admitted, was not limited to any specific chemical (*e.g.*, phosphorus), but included *all chemical and thermal effluents from Fermi 3 that might contribute to the proliferation of algae, including calcium*.

The Board also addressed the absence of documented algae blooms observed at Fermi Unit 2 and the Monroe Power Plant during visual inspections conducted at the plants and as part of research conducted by company biologists. The Intervenors had asserted that the *methods of* *observation* were not explained in the ER and that *Lyngbya wollei* is a bacterium which grows on lake bottom surfaces and therefore would likely not be visible to the naked eye during visual inspections. The Intervenors also pointed to higher levels of *turbidity* that would be occur during plant construction and operation as causing conditions favorable to *Lyngbya wollei* growth.

The Board also addressed the *impacts of temperature on algal growth*. Detroit Edison acknowledged in the ER that increases in water temperature can increase the rate of algal growth, but stated that it has selected the best available technology for the cooling system of Fermi Unit 3. Detroit Edison further explained that the thermal plume of Fermi 3 is small (9 ft by 12 ft), and that it is unlikely that algal cells would remain in the plume at the higher temperatures for sufficient time to form bloom concentrations. The Intervenors also questioned whether the size of the thermal plume is relevant for a species (*Lyngbya wollei*) that grows on the lake bottom.

1.4. Fermi 3 NPDES Permit

MDEQ issued the NPDES permit to Fermi 3 on February 2, 2012. As part of its review of the NPDES permit application, MDEQ considered the thermal, chemical, and physical impacts of the discharges on Lake Erie, including the potential to cause algal blooms.

2.0 *Lyngbya wollei ecology and history of distribution in Lake Erie*

Lyngbya wollei (Farlow ex Gomont) is a blue green alga (cyanobacterium) that was first reported as an invasive nuisance alga in the southeastern United States. Speziale and Dyck, 1992 (Reference 10); Cowell and Botts, 1994 (Reference 6). It was reported to accumulate in large benthic mats that often float to the water surface in mass and wash to shore. Carmichael et al., 1997 (Reference 4) discovered that *Lyngbya wollei is* capable of producing paralytic shellfish toxins however this has not been documented in Lake Erie populations. More recently this alga has been found in more northern aquatic habitats including the St. Lawrence River. Vis et al., 2008 (Reference 11).

Recently, Bridgeman and Penamon (2010) documented the distribution of *Lyngbya wollei* in western Lake Erie. (Reference 4)[1] They report that the first evidence of thick growth was seen when storm-washed waves deposited quantities of the alga along the south shore of Maumee Bay in 2006. This massive wash-in was estimated to contain approximately 200 metric tons of *Lyngbya wollei* along a 100-m stretch of shoreline. In subsequent surveys in 2008 the distribution and density of *Lyngbya wollei* was measured and documented in Lake Erie's western basin. The survey included shoreline areas from Stony Point along Michigan's shoreline to Camp Perry, the eastern most site sampled along Ohio's shoreline. In general, Bridgeman and Penamon found *Lyngbya wollei* in near-shore areas of Maumee Bay from Sterling State Park in Michigan to Camp Perry in Ohio. They reported decreasing populations of the alga further north along the Michigan shoreline and further east along the Ohio shoreline although Lowe (personal observation) found *Lyngbya* in relatively large quantities in Put-In-Bay, Lake Erie. They also reported that *Lyngbya wollei* was most common in areas containing sand and dreissenid (mussel) shells. *Lyngbya* appears to be intolerant of wave action and turbulent water.

[1] Relied upon in "Statement of Facts Demonstrating Issues of Material Fact, in Support of Intervenors' Opposition to DTE's 'Motion for Summary Disposition of Contention 6'" at ¶¶3, 6.

To assess the potential impact of discharges from Fermi 3 on benthic algae in nearshore waters of Lake Erie, Detroit Edison performed the following activities:

1. Detroit Edison ship and dive logs were reviewed to determine if nuisance levels of algae had been observed in the vicinity of Fermi 2; and

2. Benthic algae near the existing Fermi 2 discharge and at the proposed Fermi 3 discharge site were sampled in late September 2011.

Benthic algae or periphyton live attached to submerged substrates — rocks, wood, or rooted aquatic plants (≈ "seaweed") — or are associated with fine sediment (silt and sand) as opposed to phytoplankton, which are algae that live suspended in the water column.

3.1. Fermi 2 Radiological Environmental Monitoring Program (REMP) Observations

The Detroit Edison Energy research vessel and SCUBA dive team has provided sampling services for the Fermi 2 REMP program since the plant began operation. Detroit Edison, 2011 (Reference 8). The REMP program requires sediment sampling twice per year; in spring and the fall. Three (3) sites are sampled each sampling period: (1) 200' offshore of the decant discharge of Fermi 2; (2) downstream near Stony Point; and (3) a control site up stream in the mouth of the Detroit River. At the control site, sediment is collected with a small dredge (Ponar or Ekman). At the other sites, the sediments are collected by SCUBA diver. The sediment sampling that occurs off shore of Fermi 2 is in an area of "hard pan" consisting of packed sand, clay, or large cobble. The sediment sampling site downstream, near Stony Point, consists of large cobble and boulders.

Records of Research Vessel IV and dive team activities are maintained in boat and dive logs, respectively. In addition to providing details of boat and diving activities, if pertinent, these logs also note meteorological and limnological (*e.g.*, water depth, water clarity, bottom sediment, biota, etc.) conditions. These logs were reviewed to determine if any changes in algae and other aquatic plants in the vicinity of the Fermi 2 had been noted. The dive and boat logs were reviewed as far back as 2006; the year that *Lyngbya wollei* was discovered in Maumee Bay. These logs contained no notations about the appearance/occurrence of algal mats at Fermi 2 REMP sediment sampling sites.

The crew of Research Vessel IV and dive team are also responsible for Fermi 2 security buoy deployment and maintenance. Most of this work occurs at depths where *L. wollei* has been reported to occur: 1.5-3.5 meters (5-12 feet) (Reference 4). Because no log entries were found noting nuisance algae, Company divers were asked if they had ever encountered any nuisance algae similar to *L. wollei* (*i.e.*, filamentous) near the Fermi 2 facility. Based on visual (naked eye) inspection, they confirmed the absence of algae at nuisance levels in the vicinity of Fermi 2.

3.2. Data at Fermi 2 and Fermi 3 Discharge Locations

3.2.1. Methods

On September 28, 2011, algae were collected with a petite Ponar dredge at two sites: Site A at the proposed Fermi 3 diffuser outlet and Site B near the discharge of the active Fermi 2 reactor. Under the direction of Prof. Rex Lowe from Bowling Green State University (BGSU), ten replicate samples were collected at each site by lowering the dredge, lifting the sample onboard the boat then collecting a portion of the top surface of the dredged substrate with a knife. Approximately two to four cm^3 of material was collected from each of the dredge samples at each of the two sites. Following the collection of benthic samples with a dredge, Dr. Lowe surveyed the shoreline near Brest Bay Marina where "green biomass" were observed to have accumulated along the beach.

Prof. Lowe transported all samples to the Algal Ecology Laboratory at BGSU where they were preserved in 5% (final concentration) formaldehyde within 24 hours and later examined microscopically to determine benthic algae present. A few drops of each sample were mounted on microscope slides and examined at 400X magnification with an Olympus BX51 compound microscope with differential interference optics. Each slide was examined in a random fashion and five hundred algal units (cells, colonies or filaments) were identified from each sample.

3.2.2. Results

The substrate collected with the Ponar dredge at each site was a mixture of sand and finer sediment particles that contained no obvious nuisance macroscopic algae such as *Lyngbya* or *Cladophora*. The sediment surface had a distinct golden-brown hue characteristic of a healthy diatom-dominated algal community and there was no evidence of *Lyngbya* mats. Microscopic analyses of the algal communities confirmed that they were heavily dominated by diatoms. The algal communities contained 26 species with 17 taxa of diatoms, 7 taxa of blue green algae, and 2 green algae at both sites A and B (Table 1). The most abundant diatom genus was *Staurosira* comprising over 90% of each sample. This represents a typical and *healthy* assemblage of a benthic algal community. The visual survey along the shoreline of Brest Bay revealed that the "green biomass" that had washed in was not algal but was instead American wild celery (*Vallisneria americana* Michx.). American wild celery is a natural aquatic flowering plant that disappeared from nearshore areas of Lake Erie for much of the past century. Its reappearance is a sign that the lake is becoming less turbid, probably as a result of dreissenid mussels filtering and clearing the water. Schloesser and Manny, 2007 (Reference 9).

3.2.3. Discussion

Algae collected during this survey are representative of a lacustrine (lake) epipsammic (growing attached to sand) algal community. Epipsammic algal communities typically are dominated by diatoms that represented 65.4 % of the taxa and 99.7% of the individuals identified here. Diatoms are extremely important components at the base of the food web and are the preferred food of grazing invertebrates because of their oil-rich storage products. The only potentially toxic alga seen was *Microcystis aeruginosa* (at very low levels — four units out of 10,000 algal units counted), which is a planktonic species unlike *Lyngbya*.

In conclusion, the area near the Fermi 2 outfall and the proposed Fermi 3 discharge location appears to contain a typical and healthy benthic algal community for Lake Erie. There is no evidence of the presence or proliferation of large benthic microalgae such as *Lyngbya* or *Cladophora* at the existing Fermi 2 discharge location or the proposed Fermi 3 discharge location.

4.0 *Comparison of Fermi 2 and Fermi 3 Discharges*

AECOM evaluated several aspects of the effluent discharges from the existing Unit 2 and of the proposed Unit 3 to support the evaluation of potential eutrophication effects due to the Unit 3 discharge. AECOM, 2012 (Reference 1). The evaluation focuses on whether the ongoing effluent discharge from Unit 2 provides a reasonable model for the proposed effluent outfall for Unit 3. AECOM concludes that the effluent discharge from Unit 3 will have a smaller influence on Lake Erie water quality near the Fermi site than the existing Unit 2 discharge. This conclusion is based on the three factors:

- The effluent quality for the two units will be essentially the same, but the rate of effluent discharge from Unit 3 is about 50% less than from Unit 2;
- Relative to natural patterns of water movement in the vicinity of the plant, discharges for both units are designed to facilitate effluent mixing and dispersal; and
- Mathematical modeling of the plumes from Units 2 and 3 confirm that the effluent from Unit 3 will be better mixed and the resulting plume will be smaller than that of Unit 2.

The AECOM analysis of the three key factors is summarized in the paragraphs below.

4.1. Effluent Quality and Rate of Discharge

The primary determinants of effluent quality are concentrations of dissolved substances and water temperature. Dissolved substances include materials already present in cooling water drawn from Lake Erie and chemicals added in the plant to control corrosion. The concentrations of naturally occurring material are greater in the effluent than in the lake because of evaporative losses as water is recycled through the closed cooling system. Consequently, the discharge of higher concentrations of substances, such as calcium, do not constitute *mass additions* to Lake Erie. Overall, concentrations of naturally occurring materials and corrosion inhibitors will be essentially the same in the Unit 2 and 3 effluents. Average monthly temperatures of effluents from Units 2 and 3 are similar, but with slightly lower values for Fermi 3 during spring, summer and fall. Discharge rates for Unit 3 are much less than Unit 2.

Maximum and Average Total Discharge Rates for Units 2 and 3

Unit	Maximum Total Discharge (gpm)	Average Total Discharge (gpm)
2*	31,319	31,250
3**	17,215	14,579

* For Unit 2, maximum value is the permitted maximum and the average value is the average daily value reported in the Fermi 3 NPDES permit application.

** For Unit 3, the maximum value is for summer months and average value is for spring and fall months.

Effluent Temperature Data for Units 2 and 3

Month	Unit 2*	Unit 3**
	Monthly Average Effluent Temperature (˚F)	Estimated Effluent Temperature (˚F)
January	53	54
February	48	55
March	65	59
April	72	66
May	77	73
June	84	78
July	89	82
August	88	81
September	81	76
October	73	69
November	44	63
December	37	57

4.2. Outfall Characteristics

Both Units 2 and 3 are affected by the same Lake Erie seiche-events and currents in the western basin. Both outfalls are configured to handle these situations and are designed appropriately. The proposed Unit 3 outfall is based on a high-rate diffuser that is sited and designed to maximize the rate of effluent mixing with the lake and to avoid plume impingement on the shoreline and the lake bottom.

4.3. Thermal Plume Modeling

Although it is difficult to compare quantitatively the thermal plume analyses performed for Units 2 and 3 in their respective environmental reports given the time that has elapsed since the licensing of Fermi 2, under their respective worst-case analyses, the thermal plume for Unit 3 was predicted to be about an order of magnitude smaller than the thermal plume for Unit 2. The plume for Unit 3 will also occur at a greater distance from the shoreline and will be likely to be less associated with the lake bottom. All of these differences are consistent with the respective configurations of the effluent outfalls. According to the Environmental Report (Rev. 2 at page 5-39) and the Draft Environmental Impact Statement (at page 7-25), the mathematical modeling of the predicted mixing zone for the thermal plume from Fermi 3 affects a very small section of the western lake, is not expected to impinge on the shore, interact with the cooling water intakes, or interact with the existing Fermi 2 outfall discharges.

Overall, the Fermi 3 discharge is unlikely to cause or exacerbate algal blooms in Lake Erie or support growth of *Lyngbya wollei*. This conclusion is based on benthic algal data at the Fermi site, water quality at the Fermi site relative to other locations in Lake Erie, lake conditions at the Fermi site, and the Fermi 3 discharge design. Each of these factors is discussed briefly below.

Lyngbya and other nuisance algal species are not present at the current Fermi 2 discharge location or the proposed Fermi 3 discharge location. In studies conducted near the Bayshore Power Plant in the Western Basin of Lake Erie, benthic sediments supported abundant growth of *Lyngbya wollei*. The quantity growing there was impressive even before microscopic analysis. In contrast, Fermi site divers have not reported seeing *Lyngbya wollei* which is very apparent and visible when growing at nuisance levels.[2] To confirm these anecdotal observations, benthic algal samples were collected in September 2011 and analyzed under a research-grade light microscope with differential interference optics. These samples indicated that a healthy algal community typical of sandy-bottom areas of Lake Erie was present with no evidence of *Lyngbya wollei*.

In Florida, where *Lyngbya wollei* is a nuisance, it has been reported to respond to increased concentrations of nitrate-nitrogen with maximal growth rates at concentration between 0.6 and 1.5 ppm. Cowell, B. C. and Dawes, C. J., 2004 (Reference 7). The Western Basin of Lake Erie receives significant inflow from the Maumee River that drains agro-ecosystems to the west. These nutrient-rich waters likely contribute to the *Lyngbya wollei* proliferations in the Maumee Bay area. In contrast, water at the Fermi site is largely from less nutrient-rich Great Lakes sources to the north. As a result, *Lyngbya wollei* proliferation or other algal blooms are less likely at the Fermi site than at other locations in Lake Erie.

Fermi 3 discharges are also unlikely to increase the potential or *Lyngbya wollei* proliferation or cause other algal blooms. Calcium addition and its role in stimulation of *Lyngbya wollei* biomass and toxicity has been cited by the Intervenors as a potential negative impact of the Fermi 3 discharge. But, Lake Erie is located in a basin of limestone and dolomite, both calcium-rich minerals, and already retains relatively high concentrations of calcium. Levels of dissolved calcium are normally at or near the saturation point in waters of Lake Erie. If large doses of calcium are added to this aquatic system that elevate concentrations beyond the saturation point calcium will precipitate as calcium carbonate in this well-buffered system. And, as noted above, the Fermi discharge will not result in any mass addition of calcium to Lake Erie. Phosphorus, a second nutrient of concern cited by the Intervenors as stimulating algal proliferation, will also not be added to discharge waters of Fermi 3. As a result, Fermi 3

[2] Also, *Lyngbya wollei*, which is intolerant of turbulent water, is easily removed from sediments by strong wave action and deposited on adjacent shores. We saw no evidence of *Lyngbya wollei* at shoreline areas adjacent to the Fermi site.

discharges are unlikely to increase the potential for *Lyngbya wollei* proliferation or cause other algal blooms.

Local lake conditions also affect the potential for algal growth. The Bayshore sites with the greatest densities of *Lyngbya wollei* were in areas more sheltered from wave action. The conditions at the Fermi discharge sites are more turbulent than the *Lyngbya*-rich sites in Maumee Bay due to the combined effects of wind on lake currents and wave action, as well as the turbulent discharge from the Fermi 3 diffuser. Instead of *Lyngbya wollei*, the benthic algal communities at the Fermi site were dominated by small diatoms typical of healthy sandy lake bottoms that are adapted to resist turbulent flow.

The turbulent mixing at the discharge location should mediate any issues of locally increased water temperature or chemical concentrations from the diffuser. The impact of the diffusers on benthic algal communities should be minimal because diffusers discharge water upward and at a high velocity. Mixing occurs quickly. Elevated concentrations of chemicals or temperatures are unlikely to occur on the lakebed. As a result, the thermal discharges from Fermi 3 are not expected to cause or exacerbate algal blooms, including benthic alga like *Lyngbya wollei.*

Finally, the short-term impacts associated with construction of the Fermi 3 discharge structure are unlikely to cause or exacerbate algal blooms in Lake Erie. Underwater construction of the Fermi 3 discharge may lead to temporarily increased turbidity in the immediate area (suspended sediments from barge slip and outfall construction will be contained by a floating turbidity curtain). Reduced light penetration will impact all benthic algal communities negatively. However, the typical diatom-dominated community present at the discharge location should quickly recover following construction given the current healthy benthic algae community and the fact that diatom populations under ideal lake conditions can double once or twice a day.

Based on the above, I conclude that the Fermi 3 discharge is unlikely to cause or exacerbate algal blooms in Lake Erie or support growth of *Lyngbya wollei*.

6.0 *References*

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7.0 *Appendices*

Appendix A <u>Table 1</u>: Results of Algal Sampling Near Proposed Fermi 3 Discharge (Site A) and Existing Fermi 2 Discharge (Site B)

Table 1: Site A: At area of proposed diffuser for Fermi 3

Algal Species	1A	2A	3A	4A	5A	6A	7A	8A	9A	10A
DIATOMS										
Amphora ovalis	1		1	1		1			1	
Amphora sp.						1		1		
Aulicoseira granulata	16	6	6	17	7	10	8	13	15	5
Cocconeis placentula			1							1
Cyclotella sp.										
Cymatopleura solea										
Encyonema minutum					1					
Epithemia turgida			1							
Gyrosigma sp.								1		
Melosira varians					2	2				1
Navicula reinhardii	5	1		1		2	1		1	
Navicula sp.	1		3	8	2			5	2	2
Nitzschia sp.	1		3			1		3	2	
Sellophora pupula										
Staurosira construens & varieties	475	492	480	468	483	478	487	461	477	488
Stephanodiscus binderanus							3			
Surirella sp.			1							
% diatoms	99.8%	99.8%	99.2%	99.0%	99.0%	99.0%	99.8%	96.8%	99.6%	99.4%
BLUE GREEN ALGAE										
Anabaena sp.		1								
Gomphosphaeria sp.						1				
Merismopedia sp.										
Microcystis aeruginosa				1	1					2
Oscillatoria sp.										
Phormidium sp.			1	1	3	1	1	15		
Pseudanabaena sp.					1					
% blue greens	0.00%	0.20%	0.20%	0.40%	1.00%	0.40%	0.20%	3.00%	0.00%	0.40%
GREEN ALGAE										
Ankistrodesmis falcatus						1				
Scenedesmus quadricauda	1		3	3		2		1	2	1
% green algae	0.20%	0.00%	0.60%	0.60%	0.00%	0.60%	0.00%	0.20%	0.40%	0.20%

Table 1: Site B: At area near current water outflow from Fermi

Algal Species	1B	2B	3B	4B	5B	6B	7B	8B	9B	10B
DIATOMS										
Amphora ovalis	2	2	2	2	1	2		1	1	
Amphora sp.										1
Aulicoseira granulata								1		
Cocconeis placentula										
Cyclotella sp.								1		
Cymatopleura solea					1					
Encyonema minutum										
Epithemia turgida										
Gyrosigma sp.			1							
Melosira varians										
Navicula reinhardii	2	2		1	1	2	1		1	1
Navicula sp.	1	1			1		2	2		
Nitzschia sp.										
Sellophora pupula		1								
Staurosira construens & varieties	494	494	496	497	496	496	497	494	497	498
Stephanodiscus binderanus										
Surirella sp.										
% diatoms	99.8%	100.0%	99.8%	100.0%	100.0%	100.0%	100.0%	99.8%	99.8%	100.0%
BLUE GREEN ALGAE										
Anabaena sp.										
Gomphosphaeria sp.										
Merismopedia sp.	1									
Microcystis aeruginosa									1	
Oscillatoria sp.								1		
Phormidium sp.										
Pseudanabaena sp.			1							
% blue greens	0.20%	0.00%	0.20%	0.00%	0.00%	0.00%	0.00%	0.20%	0.20%	0.00%
GREEN ALGAE										
Ankistrodesmis falcatus										
Scenedesmus quadricauda										
% green algae	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%