UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

BEFORE THE ADMINISTRATOR

In the Matter of Blue Plains Sewage Treatment Plant NPDES Permit No. DC0021199	)	Docket No. DC-AH-102

Initial Decision

This proceeding under Section 402 of the Clean Water Act (33 U.S.C. 1342) arises out of the renewal discharge permit issued to the District of Columbia, Department of Environmental Services on July 19, 1979, the original permit having expired by its terms on June 30, 1979. The permit authorizes discharges from point sources 001 through 060 (002 being the primary discharge point at the Blue Plains Plant, and 001 being the primary overflow or bypass at Blue Plains, and 003 through 060 being other overflow points) for the period ending June 30, 1983.

Requests for an adjudicatory hearing to reconsider certain terms of the permit in accordance with 40 CFR 125.36 (1978) were filed by the Virginia State Water Control Board, Montgomery Environmental Coalition and the Citizens Coordinating Committee on Friendship Heights, Inc. (MEC) and the Environmental Defense Fund (EDF). These requests were granted by the Regional Administrator by letters, dated August 20, 1979. Requests to be admitted as parties were filed by the State of Maryland, The Center for Environmental Strategy (CENS), the Metropolitan Washington

Board of Trade, the Washington Suburban Sanitary Commission, Donohoe Construction Company, et al., the District of Columbia, Montgomery and Prince George's Counties, Maryland and Fairfax County, Virginia. These requests were granted by the Regional Administrator by letters, dated October 10, 1979.

As a result of the first prehearing conference, held on November 20, 1979, nine legal and six factual issues were identified as requiring resolution (Attachment A) and the presiding ALJ ruled that neither the legality nor the terms of an administrative order, which had been issued under Section 309 of the Act on July 19, 1979, simultaneous with the issuance of the renewal permit, were for consideration in this proceeding. Delays were experienced in compiling the administrative record and an index thereto[1/] and the hearing originally scheduled to commence on June 9, 1980, was continued to September 8, 1980 and then to October 14, 1980. The hearing was again continued and before a revised hearing date was scheduled, the Court of Appeals rendered its decision[2/] on the petition for review of the Administrator's final decision on the original permit.[3/] The Court's decision necessitated the inclusion of

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1/ The concept of an administrative record was introduced into NPDES proceedings by revised regulations (40 CFR 124.85(d)(2), 1979) issued on June 7, 1979 (44 FR No. 111 at 32899 et seq.) effective August 14, 1979 with certain exceptions (40 CFR 124.135, 1979).

2/ MEC v. Costle, 646 F. 2d 568, 15 ERC 1119 (DC. Cir., 1980).

3/ NPDES Appeal No. 78-4, May 3, 1979.

issues relating to sewer hook-up moratoria[4/] and diversion to land treatment[5/] in the list of factual issues to be decided (Attachment A).

A hearing on this matter was held in Washington, D.C. during the period March 30 to April 6, 1981.

Findings of Fact

Based on the entire record,[6/] including the proposed findings of the parties,[7/] I find that the following facts are established:

1. Applicable requirements in order for the discharges authorized by the permit to comply with the Act are secondary treatment as defined in 40 CFR 133 and any more stringent limitations necessary to comply with water quality standards. These requirements are not applicable to the combined sewer overflow points (CSOs), discharge points 001 and 003 through 060, for which the requirement is best practicable control technology. (See finding 54, infra).

4/ Evidence offered by MEC as to the necessity for sewer hook-up moratoria was excluded at the hearing on the initial permit based on an opinion of EPA's General Counsel (Decision No. 33, October 21, 1975) that the Administrator was without authority to include such a requirement in a permit.

5/ The General Counsel had also concluded that a present permit may not require diversion to land treatment unless there was a direct nexus between that treatment and effluent limitations required in the permit (Id. at 14). The Court of Appeals held that petitioners must be afforded an opportunity to present evidence in support of their contentions, i.e., that diversion to land treatment was a feasible alternative waste management technique.

6/ An index to the administrative record was distributed under dates of May 30 and June 9, 1980. Although Consolidated Permit Regulations were promulgated by EPA on May 19, 1980 (45 FR No. 98 at 33066 et seq.) and these provided with respect to NPDES proceedings that they were applicable to proceedings in progress on July 3, 1980 (40 CFR 124.21(d)), the parties have stipulated the administrative record into evidence in order to remove any doubt due to the fact the permit was issued prior to the effective date of the 1979 regulations (note 1, supra). The effective date of the permit was August 18, 1979.

7/ Proposed findings not adopted are either rejected or considered unnecessary for the decision.

2. To the extent pertinent here, applicable District of Columbia water quality standards consist of general criteria, a narrative statement which may be summarized as requiring that the waters at all times be free from substances which would create a nuisance, interfere with water uses or be harmful to human, animal, plant or aquatic life, and a dissolved oxygen standard, applicable to the Potomac River from the Rochambeau Memorial Bridge to the DC-Prince George's County, Maryland, line, of a minimum daily average of 5.0 mg/l with an absolute minimum of 4.0 mg/l (Administrative Record (AR), Item X). Insofar as pertinent here, Maryland water quality standards appear to be identical (AR, Item X.2). Although Maryland water quality standards specify water contact recreation as a use for Class I waters, none of the waters of the Potomac are in that classification (Maryland Water Pollution Control Regulation 08.05.04.09, Effective September 1, 1974, 1 Environmental Reporter, State Water Laws, at 801:0748-0752). Virginia water quality standards are not applicable because the Virginia boundary apparently follows the shoreline in the areas of concern here.

3. The permit provides in part: "A. Point Source 002 - Instantaneous flows less than or equal to 650 mgd shall receive complete treatment and shall be discharged from Point Source 002. The quality of the effluent shall be limited at all times to the most stringent of the following:

Parameter	"Average Effluent Concentrations 30 Consecutive Day Period	7 Consecutive Day Period	Average Effluent Loadings 30 Consecutive Day Period lbs/day	kg/day
BOD_5	5.0 mg/l	7.5 mg/l	12,700	5,760
Suspended Solids	7.0 mg/l	10.5 mg/l	18,100	8,200
Total Phosphorus	.22 mg/l	10.5 mg/l	18,100	8,200
Total Kjeldahl Nitrogen				
4/1-10/31	2.4 mg/l	3.6 mg/l	560	250
11/1-3/31	5.0 mg/l	7.5 mg/l	12,700	5,760

Dissolved oxygen - 5.0 mg/l minimum daily average; not less than 4.0 mg/l at any time."

4. The Order for Compliance issued under Section 309 of the Act on July 19, 1979 (MEC Exh 2), which the record reflects represents the capabilities of the Blue Plains Treatment Plant, provides that from the date of issuance of the order until May 31, 1981, instantaneous flows up to 370 mgd are to receive complete treatment and are to be discharged from Point Source 002. Instantaneous flows above the 370 mgd discharged from Point Source 002 and up to 289 mgd are to receive at least primary treatment and chlorination and be discharged from Point Source 001. From June 1, 1981, until June 30, 1983, instantaneous flows up to 650 mgd are to receive complete treatment and are to be discharged from Point Source 002. Instantaneous flows above the 650 mgd discharged from Point Source 002 and up to 289 mgd are required to receive at least primary treatment and disinfection and be discharged from Point Source 001.

5. The Order for Compliance set forth a phased schedule for effluent limitations in pertinent part (Point Source 002) as follows:

Parameter	"Average Effluent Concentrations 30 Consecutive Day Period	7 Consecutive Day Period	Average Effluent Loadings 30 Consecutive Day Period lbs/day	kg/day
	[July 19, 1979 to June 1, 1980]			
BOD_5	30 mg/l	45 mg/l	77,400	34,800
Total Phosphorus	1.6 mg/l	2.4 mg/l	4,123	1,857
	[June 1, 1980 to June 1, 1981]			
BOD_5	10.6 mg/l	15.9 mg/l	29,190	13,240
Total Phosphorus	5.3 mg/l	0.80 mg/l	1,460	662
Total Kjeldahl Nitrogen	5.3 mg/l	8.0 mg/l	14,595	6,620
	[June 1, 1981 to June 30, 1983]			
BOD_5	5.3 mg/l	8.0 mg/l	14,595	6,620
Total Phosphorus	.23 mg/l	0.34 mg/l	642	291
Total Kjeldahl Nitrogen				
4/1-10/31	2.5 mg/l	3.8 mg/l	7,005	3,178
11/1-3/31	5.3 mg/l	8.0 mg/l	14,595	6,620"

6. The permit did not contain numerical effluent limitations for the CSOs (Point Sources 001 and 003 through 060). The permit, as did the Order for Compliance (finding 4), required that instantaneous flows of up to 289 mgd above the 370 or 650 mgd required to be discharged from Point Source 002 were to receive at least primary treatment and disinfection and be discharged from Point Source 001. In addition, Special Condition 2 of the permit required the Permittee

to, inter alia, operate the existing treatment and collection system so as to maximize flows delivered to the treatment plant and to eliminate to the maximum extent possible, any discharges from Point Sources 003-060.

7. The initial NPDES permit for the period subsequent to January 1, 1978 provided in pertinent part with respect to discharges from Point Source 002:

Parameter	"Average Effluent Concentrations 30 Consecutive Day Period	7 Consecutive Day Period	Average Effluent Loadings 30 Consecutive Day Period lbs/day	kg/day
BOD_5	5.0 mg/l	5.0 mg/l	12,700	5,760
Total Phosphorus	0.22 mg/l	0.22 mg/l	560	250
Total Nitrogen	2.4 mg/l	2.4 mg/l	6,130	2,780
Dissolved Oxygen	Not less than 5.0 mg/l at all times"			

8. The permit at issue here may be termed a water quality related permit because the permittee's compliance with effluent limitations in the permit should not cause or contribute to violations of water quality standards (Tr. 20, 21).

9. Mr. James R. Hagan, an environmental engineer for EPA's Region III, testified that at the time the 1979 permit was being drafted the best available information as to the effluent limitations which would attain water quality standards was the 1969 Potomac Enforcement Conference and Technical Report No. 35, April 1971 (EPA Exh 2 at 5; Tr. 37, 38). The Conference established loading limits for Blue Plains discharges of 12,700 lbs. a day for BOD_5, 560 lbs. a day for phosphorus and 6,130 lbs. for nitrogen (Potomac River Enforcement Conference (June 1972), Appendix A; Technical Report No. 27, AR, Item F-1). These limits were set based on a freshwater inflow of 705 cfs (7-day low flow with a recurrence interval of once in 10 years after diversions) at a temperature of 29°C and require a removal efficiency or rate of 96% for BOD_5 and phosphorus and 85% for nitrogen (PREC, June 1972, at 4; Potomac Estuary Enforcement Conference Supplementary Data (May 8, 1969), AR, Item F-1). Translated to an effluent water quality level these load limits require BOD_5 of less than 5 mg/l, phosphorus of 0.22 mg/l and 2.4 mg/l total Kjeldahl nitrogen (TKN) at a flow of 309 million gallons a day (mgd) (Wastewater Treatment Plant of the District of Columbia, CENS Exh 2A at 3).

10. The 1969 Enforcement Conference conferees recommended nitrogen removal as well as phosphorus removal because removal of both were thought to be necessary for the control of algae (Fact Sheet, February 12, 1975, AR, Item F-1). Nitrogen removal was supported by Technical Report 35, April 1971 (AR, Item F-1 at II-5), although the report recognized that 90 to 95% nitrogen removal could not readily be met (Id. at XI-1).

In keeping with this recommendation, the 1974 permit for Blue Plains (MEC Exh 1) for the period subsequent to January 1, 1978, limited total nitrogen effluent concentration to 2.4 mg/l for 30- and seven-consecutive-day periods and average 30-consecutive-day period effluent loadings of 6,130 lbs/day or 2,780 kg a day. However, in 1975 the Regional Administrator decided to defer construction of denitrification facilities at Blue Plains for a two-year period because of high construction and operation costs, the amount of energy consumed by denitrification and to allow time for the study of the effectiveness of phosphorus removal to control nuisance algae growth (Fact Sheet). In his Initial Decision (June 2, 1978) following the adjudicatory hearing on the first permit, the Regional Administrator granted the District's request that the requirement for denitrification be deleted, finding that the evidence did not support the conclusion that a nitrogen-limitation was necessary in order for the discharge to meet water quality standards (Id. at 23, 24). This determination was upheld by the Administrator on appeal (NPDES Appeal No. 78-4 (May 3, 1979) at 16-18). The Court of Appeals refused to review the Administrator's determination on this issue, concluding that the expiration of the permit and the pendency of this proceeding made the issue moot (MEC v. Costle, 646 F. 2d 568, 15 ERC 1119 (D.C. Cir. 1980). The two-year study contemplated by the Regional Administrator at the time of the decision to defer denitrification has not yet begun (Tr. 297).

11. The present Blue Plains facility was designed for an annual average flow of 309 mgd (Development Plan for the Water Pollution Control Plant with Implementation Program for 1969-1972 by Metcalf & Eddy

Engineers (February 1969)), AR, Item F-2 at 3-1; Wastewater Treatment Plant of the District of Columbia, CENS Exh 2A, at 2, 3). The plant was also expected to handle peak flows of up to 650 mgd (combined sanitary and stormwater flows) and to have the capacity to partially treat an additional 289 mgd (Metcalf & Eddy, supra, at 3-5, 3-6). The cited Metcalf and Eddy report envisaged an ultimate capacity at Blue Plains for an average annual flow of 419 mgd, anticipated to be adequate for flows expected in the year 2000. However, this expansion required the filling of 51 acres of Potomac mudflats and because of opposition from the Department of Interior, this plan has been abandoned (Capacity Evaluation of the Wastewater Treatment Plant (October 1976), Metcalf and Eddy at 2-1).

12. A report on the Blue Plains treatment facility "Capacity Evaluation of the Wastewater Treatment Plant" (October 1976) by Metcalf and Eddy Engineers (AR, Item F-2) for the Oistrict's Department of Environmental Services concluded, inter alia, that the presently established effluent limitations will only be met at the 309-mgd annual average flow condition with the denitrification system in service (Id. at IX). The report further concluded that if seasonal reductions in effluent quality can be tolerated, annual average flow conditions of up to 330 mgd can be accepted without significantly reducing process reliability, but that annual average flow conditions in excess of 330 mgd would impose unreasonable operating and maintenance requirements on the plant's staff and result in significant deterioration in the reliability of the treatment process.

13. In 1970, the local jurisdictions and the Department of Interior signed a memorandum of understanding (AR, Item Q), which limited Blue Plains to a capacity of 309 mgd average flow. The agreement contemplated construction of a second regional treatment plant in suburban Maryland (Montgomery County). In 1977, the Administrator declined to approve the proposed construction of such a plant at Dickerson in western Montgomery County, because, inter alia, it contemplated discharges to the Potomac River above the water intake for the District of Columbia (Tr. 845; Testimony of Franklin R. Day, WSSC Exh 1, Attachment A). Consequently, the second regional treatment plant envisaged by the 1970 memorandum of understanding has not been constructed.

14. A question has been raised as to whether the 309 mgd annual average capacity of the Blue Plains plant is based on total flows, i.e., sanitary flows plus the stormwater portion of combined flows, or merely sanitary flows. It appears that an annual average flow of 309 mgd may call for maximum monthly flows as high as 373 mgd and that combined flows approximate 40 mgd. Sanitary flows apparently constitute 20 mgd of combined flows (memoranda, dated May 7, and May 14, 1979, attachments, EPA Exh 2). The clear implication of the latter memo is that the 309 mgd design flow included all flows and that the user jurisdictions have a shortage of sanitary capacity (39 mgd) approximating the amount of the combined flows. Mr. Hagan testified that his understanding was that the 309-mgd design flow of the plant included all flows (Tr. 1081, 1089). However, the Blue Plains Sewage Treatment Agreement of 1974 (AR, Item Q),

signed by the District of Columbia, Washington Suburban Sanitary Commission, Fairfax County, Virginia and Montgomery and Prince George's Counties, Maryland, which was incorporated into the consent decree in State Water Control Board, et al. v. Washington Suburban Sanitary Commission, Civil Action No. 1813-73 (D.C. D.C.), expressly provides that the stormwater portion of the combined flows from the District of Columbia is to be deducted from the District's flow and is not to count in computing the District's allotted flow. Moreover, a D.C. Government memo to the files, dated April 27, 1979 (AR, Item J), states that the District's share of the 309 mgd design flow (135 mgd) was calculated on the basis of 180 gallons per capita per day (750,000 people) leaving no allowance for stormwater flows. It is found that the 309 mgd average design flow is based on dry-weather flows, i.e., at a time when stormwater flows would be either nonexistent or insignificant, and that the plant was designed to treat short-term stormwater flows up to twice dry-weather flows (Metcalf & Eddy, AR, Item F-2 at 2-3).

15. The 1969 Development Plan for the Water Pollution Control Plant with Implementation Program for 1969-1972 by Metcalf & Eddy (AR, Item F-2) recommended incineration of dewatered sludge in a new facility. Because of concern over the high cost of sludge handling entailed by incineration, the amount of energy required, possible degradation of air quality and the thought that the sludge contains nutrients possibly usefully as a fertilizer, the incineration recommendation was deferred (Tr. 1071-73; Fact Sheet, February 12, 1975). In the meantime, sludge management alternatives such as composting, lime stabilization, trenching and flash drying were to

be explored (Metcalf & Eddy 1976 Capacity Evaluation of Wastewater Treatment Plant at 2-14).

16. Chlorophyll a is a measure of algal biomass or gross standing crop and thus of eutrophication or over-enrichment (Tr. 219, 279-80, 291, 341, 579, 702; Technical Report 35, AR, Item F-1, at V-38. Technical Report 35 stated that nitrogenous [oxygen] demand is the greatest cause of dissolved oxygen deficit in the critical reach of the Potomac near the wastewater discharges (Pentagon, Arlington, Blue Plains, Alexandria, Fairfax County-Westgate, Little Hunting Creek, Dogue Creek, Ft. Belvoir and WSSD-Piscataway)* and that algal growths have the greatest effect on dissolved oxygen from Piscataway to Indian Head, at times depressing it below 5.0 mg/l (Id. at II-4). The cited report also stated that in order to reduce the effects of excessive algal blooms on water quality, it has been determined that during the summer months, the standing crop should be reduced to a minimum of 75 to 90 percent of the current level or to a chlorophyll a concentration at or below 25 micrograms per liter (ug/l) (Id. at II-5).

17. It is difficult without excessive sampling to determine representative chlorophyll a concentrations because algal blooms are very spotty and are driven or effected by many forces such as winds, flows and tides (Tr. 280-81, 317-18, 667, 687). Accordingly, samples taken at the surface might not be representative of chlorophyll a

* EPA (Annapolis Field Office, now Central Regional Laboratory, but herein AFO) practice is to divide the Potomac into 15-mile segments commencing at Chain Bridge; thus Zone I comprises the segment from Chain Bridge to Broad Creek and Zone II the segment from Broad Creek to Indian Head. The Blue Plains discharge is to Zone I.

concentrations throughout the water column and samples taken at various depths probably would not be representative of surface concentrations. This would be especially true if surface samples happened to be taken from algal mats (Tr. 220, 233, 235-36, 237-38, 242, 669-70, 686-89, 698-99, 704, 765). Accordingly, chlorophyll a concentrations are not in and of themselves good trend indicators (Tr. 264). Chlorophyll a measurements are, nevertheless, taken and used as water quality indicators because they are less time consuming and expensive than other measures and are among the easiest to make (Tr. 342).

18. The effects of permit effluent limitations on water quality were tested through a model utilized by the AFO known as the Dynamic Estuary Model (DEM) (Tr. 162-64, 173, 282, 290). At the time the 1979 permit limits were being developed, the DEM was the most appropriate model available for predicting DO concentrations (Tr. 619). Models are essentially computer decks of cards with one deck representing tidal behavior in the Potomac Estuary, another deck representing quality constituents being modeled such as chlorides, BOD, DO, phosphorus, ammonia, nitrate and nitrite nitrogen, including their dispersion, transportation, decay or other appreciations or depreciations that might effect their mass and the third deck representing physical characteristics of the Potomac, inputs such as pollutant loadings, point and non-point source discharges, combined sewer overflows and other rate-flow coefficients or variables or in some cases constants required to perform a mass balance, for each constituent, for each point in

time and space (Tr. 308, 311-12). See also the testimony of Dr. Robert V. Thomann, a professor of Environmental Engineering and Science at Manhattan College, an expert in mathematical modeling as related to water quality and a principal consultant to HydroQual, Inc. (DC Exhs 1 and 1A). A distinction should be drawn between a model and computer software, the former being a theoretical constituent with numerical specification of system inputs and parameters, while the latter is a computational framework for solving abstract equations and relationships (HydroQual, Inc., EDF Exh 11, at 27 et seq.). Computer software is an essential component of the model. A model is site specific to a particular water body and problem and is not transferable or transportable to another water body (Id. at 29, 64).

19. Potomac Estuary modeling has progressed significantly since the first wasteload allocations were developed in 1969 and successive versions of the model have added new capabilities to predict impacts of point source discharges on the DO budget of the estuary (Testimony of Leo J. Clark, Chief of the Engineering Section at the AFO, EPA Exh 5 at 2). However, no model has complete certainty and data/knowledge gaps continue to exist despite ongoing efforts to collect more samples. Reasons for these deficiences include the fact that rigorous treatment of algal growth and decay and its impacts on DO have yet to be completely incorporated in the model structure, movement of the Blue Plains outfall has required major recalibration effort as well as structural (network) changes and hydrologic and meteorologic conditions of the past few years when

major sampling efforts were undertaken were generally not reflective of critical stress periods, nor conducive to an expeditious model calibration effort (Id.).

20. Mr. Clark, identified in the preceding finding, referred to certain statements of a qualitative nature in the 1977 and 1978 AFO Water Quality Assessment Reports for the Potomac (AR, Item F-1) and EDF Exh 1), which tended to support the permit limits, and adopted these reports as part of his testimony. The statements referred to apparently concerned improvements in DO concentrations on the order of 1.0 to 2.0 mg/l over those prevailing in the 1968 to 1970 period (Tr. 288), the lack of algal mats which had been present in the late 1960s (Tr. 194, 216), an apparent shift in algal species (Tr. 194), and reductions in maximum phosphorus concentrations over previous years to levels approximating limiting values for algal growth (Tr. 188-89, 192, 288, 304; 1977 Assessment at 17, 37, 38, 47; 1978 Assessment at 17, 29, 31, 41, 51, 58).

21. In testimony at the hearing, Mr. Clark was more positive indicating that modeling results were to the effect that with phosphorus removal to permit levels at Blue Plains water quality standards, specifically DO, would be met (Tr. 145, 152-53, 154, 173, 296). In terms of chlorophyll a levels and assuming other permit parameters in addition to phosphorus were being met, he stated model predictions were that concentrations would be on the order of 50 to 60 ug/l (Tr. 144-45, 151, 154-55). With nitrogen removal in addition to phosphorus removal at Blue Plains, predicted chlorophyll a concentrations were on the order of 40 to 50 ug/l. Mr. Clark indicated, however, that there could be a margin of error as great as 10 ug/l. These

predictions were based on a 7-consecutive day, 10-year low flow hydrograph in the most critical portions of the Potomac. He testified that Zone 1 was the most critically stressed zone with respect to meeting water quality standards, i.e., greatest amount of oxygen depression, under low flow conditions (Tr. 287, 300-01), but that peak chlorophyll a levels occurred in Zone 2 (Tr. 202-03, 300-01, 302). He also testified that there was a greater tendency for phosphorus to be deposited in the sediments in Zone 1, while in the lower regions there would be phosphorus regeneration or release from the bottom sediments (Tr. 287). Limno-Tech, Inc. (LTI) using a revised and updated version of the DEM, confirmed the AFO prediction that water quality standards for DO would be met, finding that in fact permit allocations could be increased by 30% over 7-day average loads and by 90% over 30-day average loads without violating water quality standards (Rebuttal testimony of Dr. Raymond Canale, DC Exh 5, at 5).

22. Mr. Thomas Flaherty, a water quality engineer (Curriculum Vitae, EDF Exh 28), and a witness for MEC & EDF* submitted a report stating that studies indicate that the majority of aquatic scientists consider a body of water to be eutrophic when chlorophyll a levels exceed approximately 10 ug/l (Impacts of Nutrients on the Potomac Estuary, by Thomas P. Flaherty & Robert H. Harris, EDF Exh 22 at ii, 34-44). The report indicates, however, that these studies resulted from research on poorly mixed lakes and that it was reasonable to expect that an estuary with greater mixing energy could sustain a larger standing algal crop by a factor of two to

* For reasons never satisfactorily explained, Mr. Flaherty was unavailable and did not appear at the hearing. His written testimony and reports were nevertheless accepted into evidence, opposing parties having waived their right of cross-examination.

three without being considered eutrophic (Id.). Mr. Flaherty therefore endorsed the maximum 25 ug/l chlorophyll a concentration recommended for the Potomac in Technical Report No. 35 (finding 16). The report further states that standards of water clarity necessary for the protection of swimmers and bathers, visibility of at least four-feet, would require that chlorophyll a concentrations be maintained well below 25 ug/l (Id. at iii-v, 53 et seq.). It is noted that the only portion of the Potomac designated for water contact recreation by District of Columbia Water Quality Standards is the portion from the Montgomery County line to the vicinity of Key Bridge (AR, Item X).

23. Mr. Flaherty, identified in the preceding finding, compared chlorophyll a, nitrogen and phosphorus concentration data for September 21, 1970, with similar data for August 22 and 24, 1977, and September 25 and 27, 1978 (EDF Exh 22 at v, vi, 66-73, 75-84). He concluded that both phosphates and chlorophyll a increased downstream of Blue Plains in 1977 and 1978, that the increase in phosphates was due to contributions from the sediments, that nitrogen concentrations decreased, that nitrogen rather than phosphorus was the algal growth limiting nutrient and that phosphorus removal at Blue Plains was effecting no significant improvement in water quality (Id. at vi). Mr. Flaherty developed and utilized a model called the Potomac Equilibrium Model (EEM) to determine the likely impact of nitrogen removal at point sources. Although this model

is similar to the DEM utilized by AFO (finding 18), the EEM was an improvement according to Mr. Flaherty because it included functions accounting for the role of the sediments in regenerating phosphate and the role of salinity in inhibiting algal growth. The model was used to forecast maximum chlorophyll a concentrations that would result from complete phosphorus removal, but no nitrogen removal, at wastewater facilities, nutrient load limits established by the 1969 PEC (findings 9 & 10) and nutrient load limits recommended in Technical Report No. 35, April 1971 (AR, Item F-1). These model runs purported to demonstrate that removing phosphates at wastewater treatment facilities or banning phosphate in detergents would be relatively ineffective in reversing eutrophication in the Potomac (EDF Exh 22 at vii). The reason for this conclusion was that phosphorus regeneration from the sediments, the source of which was largely deposition during spring high-flow conditions, was sufficient to maintain large standing algal crops (Flaherty Rebuttal, EDF Exh 2 at 7-9).

24. Dr. Raymond P. Canale, an engineer, professor of Civil Engineering at the University of Michigan, and President of Limno-Tech, Inc, a firm specializing in water quality management and mathematical modeling (Statement of Raymond P. Canale, DC Exh 3A), who was accepted as an expert in water quality modeling (Tr. 516), testified that the current NPDES effluent limitations are more than adequate to protect upper Potomac Estuary water quality standards (Technical Support For the Current NPDES Permit, DC Exh 3 at 1). He asserted that the impact of Blue Plains BOD_5 (carbonaceous BOD) and total Kjeldahl nitrogen (nitrogeneous BOD or TKN) on upper Potomac Estuary

dissolved oxygen was the major concern as to the adequacy of the permit. This was because DO was the only relevant parameter for which a specific numerical water quality standard existed (see finding 2). Dr. Canale cited historical evidence showing significant improvements in DO levels in the upper Potomac in response to improvements in treatment at Blue Plains and EPA (AFO) water quality model calculations showing a wide margin of safety for protecting DO even under critical conditions (DC Exh 3 at 3). Historical evidence referred to included the fact that DO violations were observed in the vast majority of water quality surveys between 1966 and 1970, while fewer than 5% of the observations at selected stations in the most critical section of the Estuary were below 4 mg/l and fewer than 14% of these observations were below 5 mg/l between 1975 and 1979. This was in spite of the fact that the average UBOD* effluent concentration level at Blue Plains between 1975 and 1979 was seven times greater than the current permit limit (Id.). AFO model calculations referred to showed minimum daily average oxygen concentration caused by Blue Plains and other sources at critical once in 10-year low flow and 29°C temperature of 6.0 mg/l for 30-day average NPDES loadings. At a 50% increase in loads for seven days, the calculated DO concentration was 5.7 mg/l, above the water quality standard of 5.0 mg/l, and well above the absolute minimum of 4.0 mg/l. Model calculations are conservative because the model underestimates measured DO and phosphorus concentrations (Id. at 24, 30).

* Ultimate biochemical oxygen demand which is composed of carbonaceous and nitrogeneous oxygen demand (Tr. 267).

25. There has been an improvement of 1 to 2 mg/l in DO oxygen concentrations in the upper Potomac Estuary between the periods 1969-71 and 1972-75, with average summer DO concentrations during the latter period being at all times above 5 mg/l (DC Exh 3 at 10). Phosphorus loadings from Blue Plains have been reduced by over 80% between 1971 and 1979 (Id., Tr. 682). During this period total phosphorus and soluble reactive concentrations in the Potomac Estuary have decreased by 77% and 66%, respectively. These figures are apparently based on data from the station at Indian Head. No significant changes were observed in nitrogen concentrations during this period. Concurrent with the reductions in phosphorus concentrations, peak algal populations as measured by chlorophyll a have also declined, chlorophyll a concentrations of over 400 ug/l being measured prior to 1970, while concentrations did not exceed 160 ug/l in 1978 and 1979 (Id. at 11, Figure 5 at 14). Although chlorophyll a concentrations approximating 300 ug/l were measured in 1977, these figures are suspect and actual concentrations may be significantly lower. In addition, algal mats in the Potomac were common prior to 1970, but had disappeared by the late 1970s (Id. at 11, Tr. 679-81, 684). The absence of algal mats has been accompanied by a shift in algal species away from blue-green algae (Anacystis and Anabaena), which can form surface mats, produce obnoxious odors, can produce toxins and do not dissipate through the aquatic food webb, toward the more

desirable greens and diatoms which are regarded as indicators of improved water quality. Blue-green algae are not as susceptible to grazing by zooplankton as are the more desirable greens and diatoms which may be a factor in reducing concentrations of the latter (Tr. 278-79).

26. Dr. Canale was of the opinion that the improvements in Potomac Estuary water quality referred to in the preceding finding were related to more efficient treatment for phosphorus at Blue Plains and that as additional reductions in phosphorus loadings occurred, instream phosphorus concentrations would further limit algal growth (DC Exh 3 at 11; Tr. 713). He concluded that the EPA algal control strategy which focused on phosphorus removal was properly directed. He recognized, however, that benefits from increased treatment at Blue Plains were marginal because other sources of nutrients became more important. He asserted that yearly average phosphorus concentrations in the Potomac upstream of Blue Plains (Chain Bridge) were 0.15 mgP/L and that conservative EPA model calculations showed that the maximum incremental impact of Blue Plains loadings [at permit limits of 0.22 mgP/L] at average summer (60-day) low flow conditions was only 0.020 mgP/L or 6% of total phosphorus to the upper Potomac on an annual average (Id. at 5; Tr. 518, 520-22).

27. As previously indicated (finding 23), Mr. Flaherty submitted rebuttal testimony (EDF Exh 2) to the effect that phosphorus removal at Blue Plains would not be sufficient to ensure water

quality objectives, because even if wastewater discharges of phosphorus were reduced to zero, phosphorus released or regenerated from the sediments would be sufficient to maintain large standing algal crops. He asserted that phosphorus removal at Blue Plains would cost the Washington Metropolitan Region $15,000,000 annually, require the annual disposal of over 200,000 tons of sludge, reduce the quality of all sludges and require the energy equivalent of 60,000 barrels of oil annually (Rebuttal at 9). Stating that costs clearly exceeded benefits, he testified the phosphorus-removal requirement should be removed from the permit even if there were no other alternatives. He disputed the testimony of Dr. Canale (findings 25 and 26) that improvements in Potomac water quality (increased levels of DO; reduced concentrations of chlorophyll a and a shift in algal species away from the blue-greens) could be attributed to phosphorus removal at Blue Plains, asserting that algal mats had disappeared from the Potomac in the early 1970s prior to the institution of significant phosphorus control at Blue Plains, that the shift away from blue-green algae would have had to occur between 1978 and 1979 and was clearly unrelated to phosphorus controls at Blue Plains and that Dr. Canale had compared atypical chlorophyll a values in the late 1960s with typical values in the late 1970s in concluding that peak chlorophyll a concentrations were significantly lower in the latter period (Id. at 17-23).

28. Turning to specifics to support the above contentions, Mr. Flaherty pointed out that algal mats were not observed in the Potomac in 1972 and that there were suggestions in the literature that mats were not present in 1971, which was at a time phosphorus loadings from Blue Plains were only 30% less than in the mid-to-late 1960s (Rebuttal at 17, 18). He doubted that this small reduction could have caused a shift in the ecosystem. In fact, phosphorus loadings from Blue Plains increased in 1971 over those from 1970 (DC Exh 3, Fig. 1, at 8) and there is evidence that algal mats were not present in the Potomac in 1971 (Tr. 217-18, 678-79, 684-851).
A nutrient assessment by the AFO states that since 1972 there has been a noticeable absence of dense blue-green algal blooms of any duration in the upper estuary (Current Assessment No. 1, June 1975, AR, Item F-1 at 10). Dr. Canale's testimony (Fig. 4, at 13) shows blue-green algae constituting almost 100% of all algae in the Potomac in 1970 (specific distribution of other algae such as greens and diatoms, was not available), in excess of 75% in 1977, at approximately 70% in 1978 and at approximately 20% in 1979. Phosphorus loadings from Blue Plains decreased from approximately 6,000 lbs. a day in 1978 to approximately 5,000 lbs. a day in 1979 (Id., Fig. 1, at 8), seemingly insufficient to account for the dramatic reduction in blue-green algae during that period.
Mr. Flaherty attributed the shift in types of algae to the high Potomac flows that existed throughout the summer of 1979.

29. Supporting his contention that chlorophyll a concentrations in the Potomac had increased from the late 1960s to the late 1970s, Mr. Flaherty

asserted that values in excess of 200 ug/l prior to 1970 appeared to be data anomalies, while in 1977 concentrations in excess of 300 ug/l held for several weeks (Short-term Objectives for Wastewater Treatment Plants Potomac Estuary, EDF Exh 2A* at 31; Impact of Nutrients on the Potomac Estuary, EDF Exh 22 at 68). Some support for this position is found in AFO data from samples collected on September 19, and October 19, 1965, and October 14-16, 1969, which show only a single value (120 ug/l, sample collected at Indian Head, October 14-16, 1969) in excess of 100 ug/l (EDF Exh 22 at 24). See also EDF Exh 7 which purportedly shows atypical chlorophyll a readings for June 15/16, and June 29, 1970, August 12, 13 and 14, 1969, August 20, 21 and 22, 1968 and August 22 and 24, 1977. Mr. Flaherty also compared chlorophyll a concentration data from samples collected on September 21, 1970, August 22 and 24, 1977 and September 25 and 27, 1978, observing that maximum concentrations of 130 ug/l in 1970, and 160 ug/l in 1978, were typical of low flow conditions (Id. at 77-79). He pointed out that the highest, sustained chlorophyll a concentrations of record (in excess of 300 ug/l, finding 31, infra) occurred in 1977. He attributed the high concentration to a combination of low flow, high temperature, greater light penetration and long days and asserted that there was no direct connection between the high 1977 values and wastewater discharges (Id.).

30. Table 2 of Mr. Flaherty's rebuttal (EDF Exh 2 at 22) is based on AFO data and shows maximum chlorophyll a concentration readings

* Short-Term Objectives for Wastewater Treatment Plants Potomac Estuary was submitted as part of Mr. Flaherty's rebuttal testimony and marked as EDF Exh 2. In order to avoid confusion, it is herein referred to as EDF Exh 2A.

from samples taken on June 15/16 and June 29, 1970, of 408.8 and 471 ug/l, while all other readings from samples collected on those dates were below 100 ug/l. Mr. Flaherty asserted correctly that Limno-Tech, Inc. (LTI) (Dr. Canale) had used the 408 ug/l figure to characterize chlorophyll a concentrations for 1970 (see DC Exh 3, Fig. 5, at 14). Table 2 of the Flaherty rebuttal also shows chlorophyll a concentrations from samples collected on August 22 and 24, 1977. Of 22 samples collected on August 22, four readings were in excess of 200 ug/l (306, 283.5, 276 and 264) four were in excess of 100 ug/l (198, 172.5, 168.8 and 130.5), while the balance of the readings were less than 100 ug/l. Of 22 samples collected on August 24, three readings were in excess of 300 ug/l (312, 306 and 303), two readings were in excess of 200 ug/l (261 and 228), five readings were in excess of 100 ug/l (168, 147, 137.8, 118.5 and 112.5) and the balance of the readings were under 100 ug/l.

31. Dr. Canale testified that Mr. Flaherty's contention that water quality conditions, specifically chlorophyll a concentrations, in the Potomac had not improved was based on a comparison of very limited data from a non-critical period in 1970 with anomalous data in 1977 (Rebuttal Testimony, DC Exh 5, at 26, 27; Tr. 546, 552, 582). Dr. Canale's belief that the 1977 AFO data relied on by Mr. Flaherty was anomalous is based on a comparison of AFO data and U.S. Geological Survey data for August 22-24, 1977, which shows maximum AFO chlorophyll a concentrations exceeding by a factor of 1.7 to 2 the maximum concentrations reported by USGS for approximately the same sample collection points (Id., Fig. 9, at 28). Dr. Canale explained that he had no way of determining which data report was correct (Tr. 547, 549). He pointed out that LTI model runs had been

unable to replicate chlorophyll a data for 1977 and that this data had not been considered in his analysis (DC Exh 5, Fig. B-1 & B-2, at 72, 73; Tr. 552, 553-54, 742-44; DC Exh 13). Although it appears that an error was made in transcribing dates upon which samples were collected, AFO samples being taken on August 22 and 24, 1977 and USGS data having been collected on August 25 and 26, 1977 (Tr. 572-74), Dr. Canale testified that his opinion the data was anomalous was unchanged because he was looking for general or overall trends and a systematic picture of overall conditions (Tr. 574-75, 580-81). He asserted that a difference of 160 ug/l out of a peak of 300 ug/l was very significant. HydroQual, Inc. also concluded that chlorophyll a data for August 1977 were unreliable (EDF Exh 11 at 21). Dr. Canale's opinion that the September 21, 1970, chlorophyll a concentration data used by Mr. Flaherty was from a non-critical period was based primarily on the fact that flows were more erratic in 1970 as compared to 1977 and that during periods of more stable flows higher chlorophyll a readings would be expected (Tr. 739-40, 788-89, 794; DC Exhs 12 & 13).

32. An AFO memorandum, dated August 26, 1980 (EDF Exh 8) disputes the contention that AFO and USGS chlorophyll a data for August 1977, are contradictory or anomalous pointing out that the shortest distance between the AFO and USGS sampling stations is one-half mile, that algal growths are not uniformly distributed, that sampling from opposite sides of a boat could result in equally large differences in chlorophyll a concentration readings, that the time of day samples were taken could be significant because

chlorophyll concentrations are light dependent, and that the AFO and USGS samples were not taken at the same depth and are therefore not comparable. It was concluded that the only data that should be compared are that which comes from samples taken at the same location, depth and time and which is analyzed by comparable methods (Id. at 2). Mr. Clark (identified, finding 19) did not agree that AFO data for August 1977 were anomalous and agreed with the ultimate conclusion of the mentioned memo, i.e., that the only data that should be compared are that resulting from samples taken at the same location, depth, and time and which are analyzed by comparable methods (Tr. 246-47). It is worthy of note that Dr. Canale prepared a graph (DC Exh 8) comparing USGS and AFO chlorophyll a readings from samples collected on other dates (August 29 and September 8, 1977, and August 30, 1978) with the result that AFO readings, 1977 data, were approximately double those shown by USGS (Tr. 718). Dr. Canale agreed with the memo from the prospective of a laboratory analyst to the extent that it indicated identical results could only be expected from the testing of split samples (Tr. 551-52). For the reasons stated in the preceding finding, however, he disagreed that this afforded a basis for changing his conclusion that the chlorophyll a data for August 1977 were anomalous.

33. It is a generally recognized and well known principle that the assimilative capacity of a river or estuary increases during periods of higher flow and lower temperature (Tr. 666). High flows effect

DO concentrations directly and chlorophyll a concentrations indirectly by their effect on phosphorus concentrations (Tr. 358, 666-67). A table (EPA Exh 6) shows mean monthly flows in the Potomac River in cubic feet per second at Little Falls for the months of June, July, August and September for the years 1966 to 1979, inclusive. Flows for 1970, 1977, 1978 and 1979, the latest period for which data is available, are as follows:

	1970	1977	1978	1979
June	6205	2540	6390	14100
July	8625	1945	8690	5455
August	3605	1430	10830	5435
September	1630	1035	3345	21370

The table indicates that 1977 was the most critical year in terms of flows [summer low-flow period] since 1966 and provides some support for Mr. Flaherty's contention that the shift from blue-green to green algae and to diatoms during 1978-79 is attributable to increased flows.

34. As indicated above (finding 23), Mr. Flaherty developed and utilized a model (EEM) which purported to demonstrate that nitrogen rather than phosphorus was the algal growth or rate limiting nutrient in the Potomac, that denitrification rather than phosphorus removal would be most effective in reversing eutrophication in the Potomac and that the requirement for phosphorus removal should be deleted from the permit. Dr. Thomann, identified finding 18, testified that the EEM did not present a credible analysis because it omitted key interactions between nutrient limitation and phytoplankton growth, calibration to the 1977 data set was conducted with variations in coefficients that were not checked against literature values

and with sediment input values at variance with observed data, no verification was performed and no post-audit (prediction) was performed (DC Exh 1 at 1). Specific interactions omitted from the EEM included non-linear nutrient (nitrogen and phosphorus) limitation of phytoplankton growth, effects of light and temperature upon phytoplankton growth and death and recycling of phytoplankton nutrients upon death of phytoplankton (Id. at 9; Tr. 388-89). Dr. Thomann explained that by including a linear interaction between nitrate uptake and phytoplankton, the growth of biomass is proportional to the nitrate concentration and does not depend upon the phosphorus or biomass concentrations at all and, that as a consequence, it was not possible to properly assess the trade-off between nitrogen and phosphorus removal programs (Id. at 9). Concerning calibration and verification, Dr. Thomann stated that the only step taken by EDF was to fit a set of equations with a variety of coefficients to the data of a single survey period (August 1977) and that the procedure of taking the input values used in the August 1977 calibration and applying the same framework to a different set of data (say 1965-1970 conditions) was not followed. As a consequence, Dr. Thomann concluded that the credibility of the EEM was not even minimally established (Id. at 10).

35. Dr. Thomann explained that because a considerable data base exists for the Potomac, that the proper procedure would be to: calibrate the EEM to a data set for the period 1965-70, validate the model

with a second data set for that period, and post-audit the model (i.e., using the verified model predict the consequences of a phosphorus reduction program) using 1977-78 data (DC Exh 1 at 10).

36. Dr. Thomann stated that numerical specifications used in calibration of the EEM were often not compared to literature values and were apparently chosen randomly to fit the data (Testimony at 10). As examples, he cited the phosphate absorption rate, sedimentation rate and sediment release rate. He pointed out that EDF had used a maximum value of 10 mgP/m^2 a day for the phosphorus release rate, while observed values reported by USGS were considerably less (Id.). Dr. Thomann further pointed out that EDF (Mr. Flaherty) recognized that its calculated phosphorus release rates were two or three times higher than preliminary USGS reported average rates for the period May-September 1978, but dismissed this difference as insignificant (EDF Exh 22 at B-1). Proper modeling procedures for the steady state model used by EDF would dictate using the average rate (DC Exh 1 at 11).

37. Dr. Canale testified that the EEM lacked technical or scientific credibility for what are essentially the same reasons and those advanced by Dr. Thomann (Rebuttal, DC Exh 5 at 2). Dr. Canale stated that the EEM has only been compared to measurements taken during one survey [August 1977], which contain possibly erroneous or anomalous data and that DO model calculations were never compared to data (Id., Tr. 719-721). He stated that standard modeling practice requires validation of model reliability through comparison with

at least two independent data sets and that the EEM was not capable of simulating data beyond those depicted in EDF reports, Exhs 2A and 22. He further stated that the EEM uses antiquated steady-state growth kinetics based solely on nutrient concentrations and that this was totally inconsistent with current scientific understanding of the dynamics of algal growth which is dependent on algal levels, nutrients, light, temperature, and other factors (DC Exh 5 at 2, 13). The EEM simulates chlorophyll a concentrations three times reported September 21-30, 1970, data and was unable to replicate reported DO concentrations for August 22-24, 1977 (Id., Figures 2 and 3). Dr. Canale asserted that the steady-state approach to modeling implies that algal concentrations have reached a constant condition in balance with environmental and loading conditions and stated that precept was totally inconsistent with the dynamic nature of algal growth, measured data and the extended material residence times of the Potomac (Id. at 15). He pointed out that the EEM utilized sediment release values for phosphorus five times greater than those reported by USGS and a nitrogen release rate five times less than USGS measurements (Id. at 21, Figure 7 at 22; Tr. 745-46). See also Thomann at Tr. 396-97. The significance of the use of incorrect sediment release rates is that such use gives a distorted picture, making phosphorus removal seem less effective than it actually is and nitrogen removal seem more effective than it actually would be (Tr. 746-48).

38. Figure 3 at 57 of the Potomac Estuary Study, 1980 Fiscal Year Annual Report by the USGS (EDF Exh 14) shows in situ and diffusive

measurements of phosphate benthic flux in millimoles per square meter per day (mMols/m^2/d). Diffusive calculations in the first 35 miles of the Estuary (miles 60 to 95 as designated by USGS) show the $PO4^{3-}$ flux as -0.04 $\pm$ 01, while in situ measurements, which are normally approximately four times diffusive fluxes, are essentially identical, being -0.05 $\pm$ 0.0T mMols/m^2/d (Pore Water Geochemistry Of Potomac Riverine and Estuarine Sediments, EDF Exh 26, at 6-8). The significance of calculated and measured fluxes being essentially the same is that it reinforces the conclusion that nearly all sedimented phosphorus is trapped within the sediments (Id. at 8). Table 4 of the cited exhibit is not in agreement showing calculated, diffusive phosphorus release rates of -0.45 $\pm$ .005 and -0.04 $\pm$ 0.000 and measured (in situ) release rates of -0.06 $\pm$ 0.06 and 0.05 mMols/m^2/d in the upper or Tidal River portion of the Potomac. Dr. Thomann testified that in converting millimoles to milligrams it was necessary to multiply by approximately 32* and that these translated into rates of approximately one to two mg/m^2/d in the first 30 miles of the Estuary (Tr. 402, 415). This is to be compared with the minimum estimated phosphate release rate of 12mg/m^2/d in that segment and 30 mg/m^2/d for the balance of the Estuary used by Mr. Flaherty, (Impact of Nutrients, EDF Exh 22 at B-5).

* A table shows the conversion factor for phosphate (um/L to mg/l) as 0.0310 (Physical and Chemical Properties of Potomac River and Environs, August - September 1977, EDF Exh 18, at i-25).

39. Dr. Canale compared the phosphorus sediment release rate used by Mr. Flaherty with USGS data on phosphorus release rates (Figure 7, DC Exh 5 at 22). The graph in terms of $mg/m^2/d$ shows USGS reported rates of approximately two at Mile 18 (EPA miles), approximately 2.5 at Miles 38 and 60 and approximately 8 at Mile 52, while the rate used by Mr. Flaherty is shown as 10 $mg/m^2/d$ for the entire length of the River. Actual release rates used by Mr. Flaherty were 12 $mg/m^2/d$ for the first 30 miles and 30 $mg/m^2/d$ for the balance of the River (finding 38). Dr. Canale's source for the USGS data was Pore Water Geochemistry of Potomac Riverine and Estuarine Sediments (EDF Exh 26, Table 4) which apparently contains the data relied upon to prepare Figure 3 in the 1980 USGS Annual Report (EDF Exh 14 at 57) (Tr. 611, 772-73). As noted in the previous finding, Tables 2 and 4 in Pore Water Geochemistry (EDF Exh 26) are not in agreement and it appears that Dr. Canale relied on the lowest in situ measurement (Tr. 777, 782).

40. EDF Exhibit 20 is Figure 7 of Dr. Canale's rebuttal testimony upon which has been superimposed the in situ phosphorus release rates from the 1980 USGS Annual Report (Figure 3, EDF Exh 14). These purport to show readings of approximately three $mg/m^2/d$ at Mile 15, approximately 6.5 at Mile 25 and approximately 15 $mg/m^2/d$ at River Mile 38. While Dr. Canale agreed that as a depiction of the data EDF Exhibit 20 was reasonably accurate (Tr. 767), these figures are almost certainly too high. In the first place, it is not clear that Dr. Canale recognized that the graph (EDF Exh 20) was in terms of

$mg/m^2/d$ rather than $mMols/m^2/d$ as in Figure 3 (EDF Exh 14), the source of the data. Second, as pointed out above, Tables 2 and 4 of Pore Water Geochemistry (EDF Exh 26) are not in agreement, measured (Table 1) and diffusive fluxes (Table 2) being essentially the same for the Tidal River (miles 60-95), while such is not the case in Table 4. Third, Dr. Canale testified that in situ measurements are conducted by placing a dome on the sediments and that in order to obtain a good sample it was necessary to mix the water which could scour phosphorus from the sediments and result in a phosphorus release measurement that was too high (Tr. 780-82). He also pointed out that enclosing water and sediments in a dome could result in oxygen depletion and inflated phosphorus release rates. He was of the opinion that phosphorus release rates used in his model (apparently those shown in Figure 7 of his rebuttal) were too high. It bears repeating that the essential point that Mr. Flaherty used exaggerated phosphate release rates* is established by his own narrative, which indicates he used 12 $mg/m^2/d$ for the first 30 miles of the Estuary and 30 $mg/m^2/d$ for the balance (finding 38). It should be emphasized that there is evidence of phosphorus entrapment in the first 30 to 40 miles of the Estuary and that by far the highest phosphorus release from the sediments occurs toward the mouth.

* In Table V-1 at 107 (EDF Exh 22), Mr. Flaherty indicates that to convert pound loadings of phosphorus to phosphate it is necessary to multiply by three.

41. Regarding nitrogen sediment release rates, Mr. Flaherty used a nitrogen (ammonia) release rate of 10 mg per square meter per day for the full length of the estuary from Chain Bridge to the mouth (EDF Exh 22 at 92; DC Exh 5 at 22). As previously indicated (finding 37), this is five times less than USGS reported data (Canale Rebuttal, Figure 7; EDF Exh 26, Table 4). Although EDF has made strenuous efforts and arguments to establish that phosphorous release rates used by Mr. Flaherty were reasonable, it has made no similar effort as to nitrogen. It is found that the nitrogen release rates used by Mr. Flaherty substantially understate measured rates as reported by USGS and that the effect of this understatement is to make nitrogen removal at Blue Plains appear to give better results than it actually would, if implemented.

42. The EEM did not include a term or constant for algal uptake of ammonia (EDF Exh 22 at 92). The consequence of this is that the nitrification rate constant or coefficient used, 0.6 day^{-1} (EDF Exh 22 at 94), is very high when compared to rates observed by others in the Potomac Estuary and in other similar systems (Canale, DC Exh 5, Table 3, at 23). Mr. Flaherty recognized that the nitrification rate used was very high (Impact of Nutrients at 92). This fact serves to emphasize the unreliability of the EEM as a tool in forecasting the result of particular treatment strategies at Blue Plains (DC Exh 5 at 21).

43. Mr. Flaherty testified that the EEM was structured to be the hydraulic equivalent of the DEM and would forecast results that are nearly identical (EDF Exh 2A at 78, 80, 82; EDF Exh 22 at 86 and

Appendix A). Dr. Canale, while agreeing that the two models were roughly equivalent hydraulically, testified that the EEM had never, to his knowledge, been compared to actual data (Tr. 600-01, 603, 643, 724). He stated that a model was more than just a deck of cards and that its structure and character were defined by its ability to replicate data that may be taken over a long period of time* and that EEM [Mr. Flaherty] has not done that (Tr. 604). He indicated that it would be possible to take a set of coefficients from a model such as EEM and make the results match any other model, but that because EEM model coefficients were not derived by comparison of model results with observed field data, the fact that EEM model results appeared to match DEM results for UBOD and DO (EDF Exh 22 at A12, A13) was irrelevant and projections or predictions made with the EEM were not credible (Tr. 643-44, 647-48, 725-26).

44. Calibration is the initial effort to compare model coefficients with observed data (Tr. 721). Verification is the process of assessing the adequacy of model coefficients under a different set of environmental conditions (Id.).

45. Dr. Joseph Shapiro, an expert limnologist and professor of Geology and Ecogoly at the University of Minnesota, strongly supported the current strategy for the control of algae in the Potomac, which includes phosphorus removal from point sources, and disagreed with the EDF contention that nitrogen removal should be required at Blue Plains

* LTI calibrated and verified an updated DEM using data from 1969 to 1979, which included a wide range of environmental and loading conditions. The ability of the model to simulate current and historical data over a wide range of conditions was established, thereby confirming its ability to project water quality under different loading scenarios (DC Exh 5, Appendix A, at 57-64). Use of the model to assess the effectiveness of various nutrient control strategies indicated that phosphorus removal was the most effective (Id., Appendix B).

(Rebuttal Testimony, DC Exh 2 and 1). The basis for his position was that blue-green algae are known to fix nitrogen from the atmosphere and that nitrogen fixation is favored by high phosphate concentrations. He asserted that phosphorus removal has been a successful method to reduce algal crops elsewhere and is now considered the method of algal control (Id.). He was of the belief that nitrogen fixation is capable of supplying nitrogen needs of blue-green algae in the Potomac and that removal of nitrogen alone would not be effectual in controlling those algae. He reviewed AFO data which convinced him that there has been recent improvement in Potomac Estuary water quality as indicated by reductions in algal biomass in the last ten years and a shift from blue-green algae to greens and diatoms within the last two to three years. He concluded that any attempt to limit the growth of blue-green algae in the Potomac using nitrogen control at Blue Plains would probably result in further degradation of water quality (Id. at 2, 6; Tr. 502-03).

46. In a paper published in 1965, Dr. Shapiro and Roberto Ribiero reported the results of experiments using, inter alia, river water collected at Chain Bridge, effluent from the Blue Plains plant and cultures of green and blue-green algae (Tr. 429-31; Algal Growth and Sewage Effluent In the Potomac Estuary, EDF Exh 17). The experiments were conducted by adding or removing nitrogen and phosphate from various dilutions of river water. They contended that nitrogen removal would control green algae, but that the blue-greens responded only to phosphorus in the effluent, the latter algae being able to provide their own nitrogen supply through fixation of molecular

nitrogen. In fact, it appeared that the removal of nitrogen actually stimulated the growth of blue-green algae, because nitrogen removal involved the removal of ammonia, which was slightly toxic to algae (Tr. 431; Id. at 1041). Although counsel for EDF, using figures on phosphorus and nitrogen concentrations from Dr. Shapiro's paper (EDF Exh 17) and other available data,* purported to demonstrate that the green algae in Dr. Shapiro's experiments were fixing nitrogen, something which Dr. Shapiro stated had never been shown and was obviously absurd, Dr. Shapiro insisted that the only reasonable explanation for the difference in behavior of the green and blue-green algae was that the blue-greens were fixing nitrogen (Tr. 484-94). He asserted that he didn't know if the number reported in his paper for available nitrogen in river water was applicable or real, but that this did not effect the validity of his conclusions (Tr. 494, 503-04). Dr. Shapiro readily agreed that algal concentrations used in his experiments greatly exceeded chlorophyll a (algal) concentrations found in the Potomac Estuary even under bloom conditions (Tr. 491-92). He defended his experiments, however, on the ground that it was common to use elevated concentrations in laboratory work, that the goal of his experiments was the establishment of a principle,

* Data referred to include Table VII-2 on the nitrogen and phosphorus content of algae from the Potomac (Technical Report 35), and an EPA report "Algal Nutrient Studies of the Potomac Estuary (Summer 1977)" issued by the AFO (EDF Exh 10). Counsel appears to have mistakenly identified the latter document as "Biochemical Studies of the Potomac Estuary-Summer 1978" (Tr. 479), which is not in the record. See the EPA report "Assessment of 1978 Water Quality Conditions In the Upper Potomac Estuary" (EDF Exh 1 at 67).

that physiology was physiology regardless of the quantitative aspects and that there appeared to be no alternative explanation to the growth of blue-green algae as reported in his experiments, but that nitrogen fixation occurred (Tr. 493-94).

47. The principle that certain types of blue-green algae have the capacity to fix nitrogen from the atmosphere is an established scientific fact. Technical Report No. 35 while recognizing this fact, concluded that compared to all other sources nitrogen fixation was a minor source of nitrogen in the Potomac Estuary (Id. at VII-26-27). This may simply mean that the algae had adequate sources of nitrogen other than fixation, because there is evidence that algae grown in an environment containing adequate fixed nitrogen (NH_4^+ or NO_3^-) do not fix N_2 without a preliminary starvation period during which nitrogenase enzymes can develop (EDF Exh 10 at 4). The last cited report also states that nitrogen fixation had been observed in marine species of Oscillatoria, a species of blue-green algae, but that fresh water species were considered non-N_2 fixers (Id. at 25). Dr. Shapiro was not aware of any scientific data, other than his experiments described in the preceding finding, that blue-green algae in tidal estuaries fixed nitrogen (Tr. 495, 509-10).

48. Dr. Shapiro testified that phosphorus control has for many years been the keystone of algal control (DC Exh 2 at 12). See also Canale, DC Exh 3 at 26. He stated that phosphorus is easily

removed from wastewater, that while there was a certain amount of phosphorus return from the sediments, there was no inexhaustable supply from the atmosphere as there is for nitrogen, that phosphorus reduction limits nitrogen fixation and that phosphorus control works. He cited data from lakes in Ontario, California and Africa which indicated that fixation contributed from 19% to 43% of total nitrogen supply (Id. at 14). He testified that there were no reported instances where nitrogen removal from sewage effluent by itself has resulted in dominance by blue-green algae for the simple reason that it is not done, because any decrease in the loading of nitrogen, but not phosphorus, would be negated by biological fixation of atmospheric nitrogen. He referred to experimental data from lakes indicating that the addition of fertilizer with low N/P ratios, equivalent to nitrogen removal, resulted in dominance by nitrogen fixing algae and to instances (also lakes) where phosphorus removal from effluent had significantly reduced the proportion of blue-green algae (Id. at 15-17; Tr. 472-73).

49. While EDF correctly points out that all data cited by Dr. Shapiro are from freshwater lakes (Post-Hearing Brief at 47, 48), salt intrusion does not reach as far north in the Potomac as the District of Columbia and because combined flows of the Potomac and its tributary, the Anacostia River, require about 40 days to move 15 miles downstream from Three Sisters Islands to Fort Washington, the Potomac Estuary may be considered akin to a freshwater lake (Shapiro and Ribiero, EDF Exh 17 at 1034). Messrs. Shapiro and Ribiero describe the Potomac

as not actually flowing, but "sloshing back and forth with the tides" (Id. at 1036). In further testimony, Dr. Shapiro described the Potomac as a freshwater body with several months residence time and as essentially a lake (Tr. 465). It is clear that the freshwater portions of the Potomac include Zones 1 and 2 and that these are the zones where most of the algal problems have occurred (Tr. 145-46, 367).

50. Despite the apparently large decrease in phosphorus and soluble reactive concentrations, the substantial improvements in chlorophyll a concentrations and the shift away from the nuisance causing blue-green algae to the more desirable greens and diatoms in the Potomac reported in the last few years* (finding 25), there is no specific data to support the conclusion that phosphorus has become the algal growth rate-limiting nutrient (1977 Water Quality Assessment, AR, Item F-1, at 47, 48; 1978 Water Quality Assessment, EDF Exh 1, at 31; Algal Nutrient Studies of the Potomac Estuary, EOF Exh 10, at 6). Although there is some indication that phosphorus concentrations may have approached levels considered potentially rate limiting for brief periods (Tr. 198-99, 276; 1978 Water Quality Assessment at 31, 32), other data indicate that inorganic nitrogen may be limiting algal growth at least in the area of maximum growth (downstream of Hallowing Point, which is at mile 26.90) (Tr. 149, 202; 1977 Water Quality Assessment at 47; EOF Exh 10 at 6; HydroQual, Inc., EOF Exh 11, at 21). Dr. Shapiro agreed that high river flows such as occurred in 1979 over 1977 (finding 33) would result in

* An even more significant indicator of improved water quality may be the algal cell count data compiled by Dr. Shapiro which shows a reduction from 62,000 cells per milliliter in 1977 to 9,000 in 1979 in samples collected between River Miles 22.3 and 30.6 (DC Exh 2 at 6, Table 2 at 10).

greater mixing and dilution and thus lower phosphorus concentrations (Tr. 437, 459). He attributed the lower average chlorophyll a concentrations (.224 in 1977 to .051 mg/l in 1979-data from river miles 22.3 to 30.6) to lower phosphorus concentrations and the lower phosphorus concentrations to increased flows and phosphorus removal at Blue Plains.

51. Dr. Shapiro testified that increases in chlorophyll a were the result of high nutrient concentrations, particularly phosphorus, but that whether the algae were greens or blue-greens was now thought to be a function of the relative proportions of the nutrients (Tr. 464-65). He indicated that the breakpoint or point at which N/P ratios in the Potomac result in a shift in algal species may be close to ten (DC Exh 2 at 6). He pointed out that average phosphorus concentrations declined from .213 mg/l in 1977 to .117 mg/l in 1979, while chlorophyll a concentrations paralleled this decline, going from an average of .205 mg/l in 1977 to .051 mg/l in 1979 (AFO Indian Head data, DC Exh 2, Table 3). Data from Lake Washington, Seattle show a dramatic decline in the percentage of blue-green algae as the nitrogen to phosphorus ratio increased (Id., Table 1, at 18).

52. Although conceding that the matter was not quantifiable, Mr. Clark attributed reduced chlorophyll a concentrations and increased algal diversity primarily to phosphorus removal from Blue Plain's effluent (Tr. 184, 187-189, 192-93, 194-95). Similar opinions were expressed by Dr. Thomann (DC Exh 1 at 1; Tr. 335, 370), Dr. Shapiro (DC Exh 2 at 1; Tr. 435-37, 459-61, 462-63) and Dr. Canale (DC Exh 3 at 4, 10;

Tr. 681-82). An order of magnitude (10 fold) reduction in Blue Plains phosphorus discharges is necessary in order for the discharges to comply with permit limits and it is reasonable to expect further improvements in water quality (including reductions in chlorophyll a levels) as progress is made toward achieving permit limits (Tr. 138-39, 288-89, 304, 369-70, 713; OC Exh 2 at 6; DC Exh 3 at 11).

53. Findings of fact accompanying the Section 309 Order for Compliance, issued on July 19, 1979, amended June 13, 1980, are to the effect that the Permittee is not in compliance with any of the effluent limitations of the permit (MEC Exh 2 at 2; CENS Exh 8A at 3). Evidence at the hearing confirmed that the Permittee's discharges had not been and were not then in compliance with permit limits (Tr. 82, 86, 963, 966-67, 1033-34, 1036-37, 1038-40; EPA Exh 4 at 2). Expanded nitrification, which is to be distinguished from denitrification facilities, scheduled for full operation in August of 1980, was expected to improve plant performance (Technical Comments on Draft NPDES Permit for the Blue Plains Wastewater Treatment Plant, dated May 29, 1979, CENS Exh 5, at 7, 8). No data as to whether this expectation has been realized are in the record.

54. Numerical effluent limitations are not applicable to CSOs (finding 1). The requirement for these flows is best practicable technology (BPT) for which no specific limitations have been defined (EPA Exh 1 at 7; EPA Exh 2 at 8). Because specific data as to the effect of these flows on water quality were not available, EPA's "best professional judgment" was that flows to the treatment plant be maximized so that discharges from CSOs would be permitted only in

the event that the capacity of the plant would be exceeded (findings 4 and 6) and that the matter be studied (EPA Exh 2 at 8, 9). Although flows from Point Source 001 in June 1980 averaged 34 mgd (approximately 10% of the 330 mgd average flows for the month from Point Source 002), pound loadings from 001 in June 1980 exceeded pound loadings from 002 (Tr. 1049-50; NPDES Discharge Condition reports, CENS Exhs 6A and 7A). It is anticipated that flows from Point Source 001 will be substantially eliminated, at least in dry weather, once the so-called "West Primary Rehabilitation Project," scheduled for fall 1981, is completed (Tr. 972, 1058). A preliminary, Phase I, study on CSOs has apparently been completed (Combined Sewer Overflow Study, Potomac-Anacostia Interceptor System, O'Brien and Gere Engineers, DC Exh 9, EDF Exh 21). Although the complete report is not in the record, it apparently recommends additional surveys and data be gathered in order that the effect of the CSOs on water quality can be evaluated through modeling (Tr. 627-29).

55. As indicated (finding 3), the permit (AR, Item B) contains 30 and 7-consecutive-day period average effluent concentrations expressed in mg/l and 30-consecutive-day period average effluent loadings, expressed in pounds and kilograms per day. It does not, however, contain 7-consecutive-day average effluent loadings. It is probable that is because the 1974 permit did not contain 7-day average pound loadings (MEC Exh 1). Regulations effective after the issuance of the permit, but prior to its effective date (notes 1 and 6, supra), specify that "for continuous discharges all interim

and final permit limitations * * shall be stated as * * * average weekly and average monthly discharge limitations for POTWs" (40 CFR 116(c), 1979). The current regulation contains identical language except that it includes the proviso "unless impracticable" (40 CFR 122.63(d), 1980). There is no evidence in the record that requiring effluent loadings to be expressed in terms of 7-consecutive-day period averages would be impracticable. Miss Kathryn Hodgkiss, an environmental scientist for EPA's Region III who managed the process leading to the issuance of the permit at issue here (Tr. 20), testified that 7-day average pound loadings could be derived from 7-consecutive-day effluent concentrations and the 309 mgd design flow of the plant (Tr. 18). Based on 7-consecutive-day period average effluent concentrations, it appears that 7-day average pound loadings should be 1.5 times average 30-consecutive-day pound loadings.

56. Because the Blue Plains treatment plant is unable to properly handle sustained hydraulic loads in excess of 330-mgd (finding 12; memoranda, dated June 28 and July 2, 1979, attachments EPA Exh 2), the requirement that combined flows to the plant be maximized increases the likelihood that the capacity of the plant will be exceeded and reduces the likelihood that the discharges will comply with permit limits (Tr. 54, 57, 978, 1050-51; EPA Exh 2 at 8). Flows from the plant (Point Source 002) in June 1980 and at the time of the hearing were averaging approximately 330 mgd (finding 54). Although Mr. Edgar Jones, Chief Process Engineer, Bureau of Wastewater Treatment, DES, for the District, testified that 330 mgd* was average

* Flows on a rolling annual average basis were 330.690 mgd in May and 338.082 mgd in June 1980 (CENS Exh 4A).

influent (DC Exh 18 at 8; Tr. 955, 970), total flows to the plant averaged 391.067 mgd in May, 376.806 mgd in June, 361.867 mgd in July and 370.742 mgd in August, 1980 (CENS Exhs 4A; 10A, Attachment VI). Mr. John R. Thomas, Chief of the Bureau of Wastewater Treatment for the District, testified that average flows were in the 330 mgd to 350 mgd range (Tr. 1056). He stated that while it could be inferred that the increased flows were attributable to the permit requirement that flows to the plant be maximized, he could not so testify (Tr. 1002, 1004, 1101). Mr. Thomas testified that flows were estimated based on unverified pump curves, are unreliable and may be overstated (Testimony, DC Exh 19, at 3, 4). He stated that the District doubted its own numbers, but lacked a rationale for revising them. Influent to the plant is measured, but effluent is calculated or estimated. Effluent does not necessarily equal influent because of recycle flows in the plant.

57. Effluent limitations in the permit were calculated based on a 30-consecutive-day average flow (apparently 309 mgd) while limitations in the Section 309 Order (finding 5) are based on flows (apparently 330 mgd) as a "rolling annual average total daily flow" (Order for Compliance, dated July 19, 1979, MEC Exh 2 at 8; memoranda, dated May 7, May 14, June 28 and July 2, 1979, attachments, EPA Exh 2; EPA Exh 4 at 4; Tr. 956). The rolling annual average is calculated by averaging total flows over a 365-consecutive-day period. The difference is substantial--compare concentrations and loadings in the permit (finding 3) with initial concentrations and loadings allowed by the order (finding 5). Mr. Hagan was of the opinion that in order for Blue Plains discharges not to cause or contribute to water quality violations, it was necessary

that effluent limitations be met on a 30-day basis (Tr. 56). See also Notice of Permit Issuance, AR Item B, at 5. Although the permit contains no express flow limitation, such a limitation can be calculated from the effluent concentrations and loadings in the permit (EPA Exh 4 at 4). See also the letter, dated September 13, 1979 from J. Hamilton Lambert, Fairfax County Executive, to James E. Ryan, Jr., Deputy Attorney General of Virginia (CENS Exh 14 at 4, 5). As stated previously (finding 55), current regulations (40 CFR 122.63(d), 1980) require that for continuous discharges (POTWs) permit effluent limitations be expressed in average weekly and average monthly limitations unless impracticable. It is clear that limitations in the Order were calculated on a rolling annual average basis to prevent Permittee from being in immediate violation of the Order (memo, dated June 28, 1979, attachment, EPA Exh 2).

58. The permit contains no express conditions or provisions designed to assure compliance with goals and requirements of the Act which are effective July 1, 1983. A requirement for plan of study for the attainment of final effluent limitations after June 30, 1983 is contained in the Order for Compliance. Section 101(a)(2) of the CWA sets forth the so-called "fishable-swimmable" goal which is to be achieved by July 1, 1983, wherever attainable. Section 301(b)(2)(B) provides that not later than July 1, 1983, all POTWs shall comply with the requirements of Section 201(g)(2)(A). The latter section requires the study and evaluation of alternative waste management techniques and that works proposed for grant assistance provide for the application of the best practicable waste management technology

over the life of the works. The draft permit specified an expiration date of June 30, 1984 (AR, Item A). The expiration date in the permit as issued, however, is June 30, 1983. MEC asserts that this is an artifice designed to sidestep the July 1, 1983, deadlines (Proposed Findings of Fact, Conclusions of Law and Argument, dated June 11, 1981, hereinafter Post-Hearing Brief, at 72). EPA's reason for making this change, as explained in the Notice of Permit Issuance (AR, Item B), is to accord with the Interim Municipal National Policy and Strategy which provides for the issuance of short term permits in situations including those in which a discharger will not be in compliance with final effluent limitations by July 1, 1983 (Id. at 10). If was pointed out that the Potomac River Strategy, a draft of which is in the record (AR, Item X), may result in significant changes to final effluent limitations and that a short term permit would permit further scrutiny of effluent limits by EPA, DES and the public in the light of additional information to be obtained over the life of the permit. It appears that the same purpose is served by the "Reopening Clause" of the permit, which provides that the permit may be modified, or alternatively revoked and reissued based on, inter alia, information newly acquired by the Agency (Id. at 11).

59. The Permittee has awarded a contract for the purpose of determining the feasibility of land treatment, an alternative waste management technique, to Greely and Hanson, Engineering Consultants (Testimony of John R. Thomas (finding 56), DC Exh 19 at 4). The study is estimated to require 13 months. However, because of certain unspecified "contract problems", the study had not commenced at the time of the hearing (Tr. 982).

60. Special Condition No. 6, entitled "Solids Disposal" of the permit provides that "Collected screenings, slurries, sludges, and other solids shall be disposed of in such a manner as to prevent entry of those wastes (or runoff from the wastes) into navigable waters on their tributaries." The Order for Compliance issued under Section 309 contains findings to the effect that utilization of the capabilities at Blue Plains to remove pollutants from water depends to a large extent on the ability of solids processing equipment to remove sludge residues prior to discharge, that utilization of solids processing equipment is in turn dependent on the availability of methods for the ultimate disposal of the sludge created, that Permittee and the users have not devised a method for sludge disposal which will enable Permittee to make the fullest uses of treatment processes at Blue Plains, that Permittee has violated Special Condition 6 of the permit requiring that sludges, slurries, etc. be disposed of in such a manner as to prevent entry of these wastes into navigable waters of the United States and that these violations have contributed to reduction in operational efficiency, excessive discharges of pollutants and resulted in or contributed to, violation of effluent limitations contained in the permit (Id. at 3, findings 7 and 8).

61. Paragraph 10 of the Order for Compliance required that the Permittee in consultation with user jurisdictions contributing flows to Blue Plains prepare and submit to EPA a long-term sludge management plan by October 1, 1979 (MEC Exh 2 at 11). The plan was to state in general terms, the methods and locations to be used for long-term management of sludge from Blue Plains. The Order also required the Permittee in

consultation with user jurisdictions to prepare and submit to EPA by January 1, 1980, the detailed sludge management plan required under paragraph 8(b)(6) of the Court Order, dated July 29, 1974.* The plan was to contain a detailed description of specific sites and methods for long-term management of sludge from Blue Plains and a schedule under which the plan would be implemented. In addition, Permittee in consultation with user jurisdictions was to prepare and submit to EPA by September 15, 1979, a schedule indicating the amounts of sludge anticipated under present operations and a plan for the management or disposal of sludge which will not interfere with the attainment of effluent limitations during the period from September 1, 1979 until the long-term plan was fully implemented, effectively managing all sludge from Blue Plains on January 1, 1980, whichever is earlier. The Order provided that upon approval by the permitting authority the detailed long-term sludge management plan and the schedule for sludge management until the long-term plan was implemented would become enforceable conditions of the permit no later than January 1, 1980 (Id. at 12).

62. The amended Order for Compliance, dated June 13, 1980, reiterated the findings to the effect that failure to properly manage and dispose of from Blue Plains had contributed to excessive discharges of pollutants and to violations of effluent limitations in the permit, but deleted the requirement for a detailed long-term sludge management plan, substituting therefor a requirement for the submission to EPA by the 10th of each month a report of the sludge generated by the treatment

* Reference is to the consent decree in State Water Control Board v. Washington Suburban Sanitary Commission, Civil Action No. 1813-73 D.C. D.C.), finding 14.

plant during the previous month, a listing of specific disposal sites, methods of disposal and volume disposed of at each site (CENS Exh 8A at 14, 15). Permittee was also to prepare and submit to EPA on a quarterly basis a monthly log of the raw and digested volume, percent solids and percent volatile solids of sludge generated.

63. There is no probative evidence in the record to contradict the findings in the initial and amended Section 309 Orders to the effect that failure to properly manage and dispose of sludge has resulted in, or contributed to, violations of effluent limitations in the permit. Mr. Hagan's testimony, that his understanding is the District's problems in handling sludge have been somewhat rare (Tr. 1117), is not consistent with other evidence in the record and, in any event, is not definitive. In fact, there is much to support these findings. See e.g., Plan of Action for Control of Flows at Blue Plains, dated February 29, 1980, which provides in pertinent part "Without uninterrupted disposal of sludge, plant design parameters to achieve effluent standards for flows and influent loadings are unattainable since resultant recycled solids loadings would overload wastewater treatment processes (Attachment II, Testimony of Dr. Ruth Allen, CENS Exh 10A). See also the NEIC report entitled "Evaluation Treatment Plant" (December 1978), which states that the most persistent operational problem at Blue Plains is that of dewatering and ultimate disposal of solids (sludges) removed from the wastewater stream and that in simple terms, the plant is sludge bound, the solids handing equipment having insufficient capacity to consistently dewater the amount of solids generated by the treatment processes (AR, Item E-1 at 28).

64. The Blue Plains Sewage Treatment Plan Agreement entered into by the user jurisdictions, including WSSC, and which was incorporated into the

consent decree in State Water Control Board v. WSSC, dated July 29, 1974 (AR, Item Q) provided that the parties would agree, on or before July 1, 1976, on a permanent metropolitan-wide equitable disposal plan which would require the parties thereto to accept sludge, whether digested, undigested, or both on a fair share basis to be effective no later than December 31, 1977 (Id. at 19). For various reasons, this deadline was not met and in December 1977, the parties amended the BP Sewage Treatment Plant Agreement to provide, inter alia, that the parties will agree on a permanent metropolitan-wide equitable sludge disposal plan on or before January 15, 1978. The amended agreement contemplated a site for the composting of undigested sludge at Oxon Cove, District of Columbia. On January 24, 1978, the District Court amended its decree to include the referenced BP Sewage Treatment Plant Amendments.

65. A permanent sludge disposal plan drafted in accordance with the amended agreement mentioned in the preceding finding apparently would have required the District to guarantee that it would manage its proportionate share of sludge generated by the Blue Plains treatment plant after September 21, 1978 (Report To the Court, dated April 17, 1978, AR, 1978 Pleadings). Because of health concerns engendered by locating a composting facility at Oxon Cove adjacent to D.C. Village, a home whose typical resident is elderly, the District found this plan unacceptable. In an order, dated May 18, 1978, the Court, inter alia, ordered each party (user jurisdiction) to take all necessary action for composting or disposal of its proportionate share of sludge in a safe, environmentally

acceptable manner by September 21, 1978, and to begin composting or disposing of its share of sludge on that date. On July 10, 1978, the Court entered an order requiring Montgomery, Prince George's and Fairfax Counties to dispose of their proportionate shares of sludge for a one-year period beginning September 21, 1978 and of their proportionate share of the District's sludge until February 15, 1979. The District was ordered to construct a composting facility at the denitrification site at Blue Plains by February 15, 1979. On the District's appeal of that order, the U.S. Court of Appeals for the District of Columbia on January 12, 1979, remanded the matter for findings as to the desirability of locating the composting facility at Blue Plains and the possible health and environmental effects of that location. In an opinion and order, dated February 2, 1979, the Court rejected the District's contention that composting at Blue Plains would create unacceptable health and environmental problems and ordered the District to compost at the site which was to have been used for denitrification facilities. This order was affirmed by the Court of Appeals on June 2, 1979.

66. The Permittee and the other user jurisdictions have made strenuous and good faith efforts to comply with the requirements of the Order for Compliance (finding 61) for the submission of general and detailed long-term sludge management plans by October 1, 1979 and January 1, 1980, respectively. An "Interim Sludge Management Plan" was drafted, agreed to in principle by the user jurisdictions and submitted to EPA, Region III, under date of September 14, 1979

(CENS Exhs 12, 16, and 19). The plan estimated the production of digested sludge at 350 tons per day and of raw sludge at 900 tons per day during the period September 21, 1979, through May 31, 1980, and production of 350 tons per day of digested sludge and 800 tons per day of raw sludge during the period June 1, 1980, through January 1, 1981. The plan provided that Montgomery, Prince George's and Fairfax Counties would dispose of their proportional shares of digested sludge as provided in the 1974 Blue Plains agreement and amendments thereto, and their respective proportional shares of the District's proportional share of digested sludge only to the extent the District was unable to dispose of its share. With respect to raw sludge, the plan provided that the District would continue to operate its composting facility at Blue Plains at a nominal rate of 300 tons per day and make all efforts to increase its on-site capacity to optimum. As was the case with digested sludge, the plan provided that Montgomery, Prince George's and Fairfax Counties would dispose of their proportional shares of raw sludge, as defined in the 1974 Blue Plains agreement and amendments thereto, and their respective proportional shares of the District's proportional share of raw sludge in excess of that the District was able to compost or otherwise dispose of. The plan stated that within specified timeframes for plan preparation and submittal, specific site identification and permitting adequate to duration of the plan was impossible. It did state the intent of the parties to designate and effectuate the necessary sludge disposal sites and contained a listing of disposal

sites for raw and digested sludge, most of which were unpermitted. The plan also contained a schedule by which a listing of permitted sites for future disposal of raw and undigested sludge would be submitted.

67. Through EPA, a contract was awarded to JRB Associates, Inc. for the study of "Disposal Alternatives for Long-Range Management of Blue Plains Sludge" (CENS Exh 17). The JRB report, submitted under date of September 17, 1979, centered on two primary options, i.e., that each user jurisdiction would manage and dispose of its proportionate share of sludge or that the sludge would be managed totally by the District. Baseline options were stated to be use of the current dewatering system resulting in 2200 tons per day (TPD) at 20% solids or implementation of filter presses, resulting in 1300 TPD of sludge at 35% solids. The report concluded that under either of the disposal options, filter pressing sludge to a 35% solids is desirable. Under the proportionate share option, the most feasible disposal methods were stated to be in-vessel composting for Montgomery and Prince George's Counties' raw sludge, landspreading of digested sludge; for Virginia maintenance of the status quo and for the District mechanical composting at Blue Plains or Oxon Cove, if denitrification become a reality and sufficient space at Blue Plains was not available. Under the total disposal in DC option, the most feasible method was co-disposal incineration with energy recovery at the Blue Plains facility. Co-disposal refers to the incineration of solid waste together with sludge. The report recognizes that

Virginia currently incinerates its share of raw sludge. In order for the JRB recommendation for incineration to be seriously considered, the District would have to revise its regulations under the Clean Air Act (SIP), which prohibit construction of incinerators (EPA memorandum, dated May 15, 1980, CENS Exh 47).

68. In a memorandum, dated May 1, 1979, J. Hamilton Lambert, Acting County Executive of Fairfax County and Chairman of the Blue Plains Chief Administrative Officer's (CAO) Committee, pointed out that total flows to the plant on a rolling annual average basis would be approximately 350 mgd and expressed the opinion that the proposed permit limitation and requirements were beyond the current design capabilities of the Blue Plains plant (CENS Exh 3). The memorandum noted, however, that pound loading limits proposed in the permit were maximum allowable loads under 7-day, 10-year low-flow conditions and stated that it was unreasonable to impose a discharge limit that must be met continuously on a monthly average to meet a condition that may occur only once every ten years. It was further pointed out that during a 7-day, 10-year low-flow condition actual plant flows would likely be significantly under 300 mgd because of the absence of stormwater and that pound loadings in the permit should be based on a 7-day, 10-year average flow condition (Id. at 3). Additionally, the memorandum stated that there appeared to be an approximate 34 mgd difference between actual sanitary flows and treatment capacity designated for sanitary flows, that outstanding commitments for sewer capacity amounted to approximately 14 mgd, that annual increases in sanitary flows averaged approximately 8 mgd

and that remaining sanitary capacity equalled approximately four years of future flow increases or 2.5 times outstanding commitments. A temporary 5% increase or reallocation of Blue Plains sanitary capacity amounting to 15.45 mgd (5% of 309 mgd) was therefore proposed, contingent upon, inter alia, each party agreeing to vigorously pursue comprehensive infiltration/inflow abatement programs so as to lower actual flows and that the sludge issue be addressed immediately so that a long-term permanent sludge disposal agreement be completed by October 1, 1979.

69. By a memorandum, dated October 18, 1979, the "Blue Plains Users Capacity Distribution Agreement of 1979" was forwarded to the Fairfax County Board of Supervisors for their approval (CENS Exh 20). The agreement provided for the submission to EPA of general and detailed long-term sludge management plans as provided in the administrative order issued by EPA (finding 61) and also provided for a 5% increase in flows to Blue Plains by each of the user jurisdictions for a total of 15.45 mgd. Any jurisdiction actually using the increased allocation had an obligation to repay that amount by June 30, 1983. It was contemplated that the agreement would be an amendment to the Blue Plains Sewage Treatment Plant Agreement of 1974 and thus an amendment to the consent decree in State Water Control Board v. WSSC, finding 14. The memorandum made clear that the purpose of the amended agreement was to protect the river and enhance its water quality to formulate a workable plan and to avoid sewer moratoria in the Washington area.

70. The "Blue Plai s Capacity Oistribution Agreement of 1979" referred to in the preceding finding was approved by all user jurisdictions and forwarded to EPA, Region III, at a date not shown by the record. In a letter, dated February 6, 1980, the Regional Administrator objected to the agreement for reasons, inter alia, that satisfactory interim and final sludge management plans had not been forthcoming and that multi-media filtration had not been constructed according to the schedule in the Order for Compliance, i.e., January 1, 1980 (CENS Exh 34). At a meeting with representatives of user jurisdictions and EPA on March 14, 1980, it was agreed, among other things, that an interim sludge management plan would be submitted covering the period until a long-range sludge management plan was developed and implemented (EPA letter to Mr. Elijah Rogers, City Administrator, dated March 25, 1980, CENS Exh 39). The response to this requirement divided sludge management strategy into three periods: interim: prior to 1982; mid-term: 1982-87; and long-range: 1987-continuing (letter from Chairman CAO Committee to Regional Administrator, dated April 11, 1980, CENS Exh 42). The letter estimated sludge production during the interim and mid-term periods at 1500 wet tons per day (WTPD) and that during the interim period 70 TPD would be composted at Beltsville, 210 TPD would be managed in Virginia, 200 TPD would be composted at Blue Plains and the balance would be disposed of by trenching (raw sludge) and land-spreading in Maryland. During the mid-term period, it was anticipated that a facility to handle an additional 600 TPD at Blue Plains would be operational, that a

composting facility would be constructed in Mongtomery County and that a combined solid waste/sludge management facility would be in operation in Prince George's County. Regarding the long-range period, it was estimated that Blue Plains, in the full AWT mode with multi-media filtration, would produce an average of 2200 WTPD of sludge, that such a quantity of sludge could only be managed at a centralized facility, that in all probability studies would show that the most cost-effective approach would be a combination of solid waste and sludge disposal (finding 67), and that such a facility would cost from $150 million to $300 million. The letter pointed out that before embarking on such large expenditures, the utility of effluent limitations leading to the production of 2200 WTPD of sludge must be addressed, that the Region simply did not have the capability of handling such a large quantity of sludge and suggested that the Blue Plains users apply for a Step 1 grant to develop a long-term sludge management plan. It was also suggested that operation of multi-media filters and effluent limitations which would produce 2200 WTPD of sludge be postponed pending the results of water quality studies and the development of long-term sludge management plan.

71. By letter to the General Manager of the WSSC, dated February 11, 1980, the Acting Director of the Maryland Environmental Health Administration stated that the EHA no longer considered the entrenchment of sewage sludge as a viable means of disposal (CENS Exh 35). The reasons for this policy were stated to be the potential for ground water pollution, escalating costs of site preparation and growing local opposition. The letter indicated that permits would

only be issued where it was clear that trenching was an interim method of sludge disposal or where it was designed as a backup system to be used only in case of an emergency.

72. Montgomery County has experienced increasingly severe problems in managing sludges generated at Blue Plains (memorandum, dated April 29, 1980, from Montgomery Executive to President of Montgomery County Council, CENS Exh 45). The cited memorandum stated that at that time Montgomery County was under no legal obligation to receive sludges generated by other jurisdictions such as the District of Columbia and pointed out that management by the District of its share of sludge would reduce Montgomery County's obligation to receive sludge from about 45% of the total produced (1150 WTPD indigested, 350 WTPD digested) to about 26.7% or 310 WTPD of raw sludge. It was also pointed out that EPA discharge standards would increase undigested sludge production to approximately 1950 WTPD by September 1981 and thus cause Montgomery County's share of such sludge to double. Difficulties in securing permits for trenching of undigested sludge were alluded to (finding 71) and opposition of Prince George's County to the construction of a composting facility, for which a permit had been granted by the Maryland EHA, was cited as a major reason for delay in the construction of such a facility. The memorandum stated that because the County was running out of suitable trenching sites, it could not accommodate sludges other than Montgomery County's after November 1, 1980 (Id. at 4).

73. The "Blue Plains Capacity Distribution Agreement of 1979" (finding 69) was amended to provide in effect that nowithstanding the 5% increased flow allocation therein provided that at no time would any user jurisdiction's actual flow exceed its original allocation which was based on a flow of 309 mgd (Dept. of Justice letter to the Court, dated May 22, 1980, CENS Exh 48 and letter from Chairman of Blue Plains CAO Committee to D.C. Mayor Marion Barry, dated May 28, 1980, CENS Exh 49). The U.S. Government's and EPA's concurrence in the agreement was subject to the understanding that an acceptable sludge disposal plan would be developed and submitted to the Court within 90 days. The District Court approved the agreement on May 22, 1980.

74. By letter, dated August 19, 1980, the Chairman of the CAO Committee reported to the Regional Administrator on progress made in development and implementation of a sludge management strategy (CENS Exh 53). Timeframes were as defined in the letter of April 11, 1980 (finding 70). Regarding the interim period, composting of 70 WTPD of undigested sludge at Beltsville, management of 210 WTPD of digested and undigested sludge in Virginia and composting of 200 WTPD at Blue Plains would continue as previously reported. Composting facilities were to be constructed in Montgomery and Prince George's Counties to handle their share of sludge after January 1, 1981. Permitted sites for trenching through November 1980 were available and the WSSC was committed to finding additional trenching sites in Prince George's County for the period after November 1980, until the composting facilities were operational. As to the mid-term period; the letter stated that composting of 70 WTPD of undigested sludge

at Beltsville would be discontinued by July 15, 1981, but that Virginia would continue to manage 210 WTPD and the District would continue composting 200 WTPD at Blue Plains. It was indicated that the District had awarded a contract to Dano Resources Recovery, Inc. for the composting of 900 WTPD of sludge and 5,400 tons of solid waste per week at Blue Plains. The letter further stated that design and contracting work for the composting facilities to be constructed in Montgomery and Prince George's Counties was continuing and that until the Dano Resource facility at Blue Plains was operational (anticipated to be July 15, 1981), Maryland and Virginia would continue to manage 500 to 600 WTPD of the District's share of sludge. As to long-range sludge management, a Step 1 grant had been applied for and approval was expected.* The letter closed with a statement that the letter constituted a statement of intent by Fairfax County, WSSC, Montgomery and Prince George's Counties and the District of Columbia to draft a legally binding agreement which would, inter alia, commit each party to manage its share of Blue Plains sludge after July 15, 1981 and to impose an immediate and absolute moratorium on sewage hook-ups in those areas serviced by the Blue Plains facility, if a party could not manage its proportionate share of sludge after July 15, 1981. The moratorium would remain in effect until the party was able to manage its proportionate share of sludge. It was anticipated that the agreement would be forwarded to EPA by October 15, 1980.

* DC Exhibit 20 is an undated, unexecuted copy of a contract between the District and Camp Dresser & McKee for a solid waste/sludge management feasibility study. Presumably, this contract, if executed, results from the Step 1 grant.

75. EPA evaluated the sludge management plan referred to in the preceding finding and determined that it essentially complies with the requirements of the letter (finding 73) to the U.S. District Court, dated May 22, 1980 (letter to Mr. Elijah Rogers, City Administrator, dated August 29, 1980).

76. Factual issue No. 6 concerns the District's request for reduced treatment, apparently the only treatment contemplated is for BOD and SS, when flows past Little Falls equal or exceed 10,000 mgd, the so-called tiered permit. The District's proposed tiered permit (30 mg/l BOD_5, 15 mgN/l total Kjeldahl nitrogen and 15 mgP/l total phosphorus) is described in Dr. Canale's testimony (Technical Support for Modifying the Current NPDES Permit * * *, DC Exh 4 at 1). Dr. Canale testified that the environmental impacts of the mentioned treatment levels at flows in excess of 10,000 mgd had been evaluated through water quality models developed by the AFO and through comparisons with other loads in the upper Potomac Estuary system resulting in the conclusion that no significant adverse impacts from the proposed tiered permit would occur (Tr. 525-26). Turning to specifics, Blue Plains pollutant loadings for, inter alia, UBOD were compared with upstream and non-point sources resulting in the conclusion that Blue Plains contributes 31.3% of the total UBOD load to the upper Potomac Estuary under reduced treatment at high flows and 57.3% under advanced treatment at summer critical low

flows (Id. at 3, 8). In terms of concentrations, Blue Plains contributes 3.1 mg/l UBOD under high flow conditions and 6.8 mg/l at low flows and advanced treatment. Model calculations (DEM) show that no violations of DO water quality standards will occur at the proposed tiered permit loadings, calculated DO concentration being 6.2 mg/l at a water temperature of 24.8°C and 5.7 mg/l at 28°C at flows equal to or greater than 10,000 mgd (Id. at 9, 12). The current permit allows an effluent concentration of 5 mgN/l of TKN from November to March and modeling analyses indicate that even during critical low flow conditions during this period the assimilative capacity of the Potomac is sufficient to support UBOD loadings 3.6 times the permitted amount.

77. Concerning nutrients, Dr. Canale testified that it was necessary to control only one algal growth limiting nutrient, that proposed tiered phosphorus loadings from Blue Plains have only a minor impact on phosphorus concentrations in the upper Potomac Estuary because of large contributions from other sources and that as flows increase, the significance of Blue Plains phosphorus loadings on receiving water concentrations decreased (EPA Exh 4 at 3, 4). At high flows, Blue Plains tiered permit effluent contributes a maximum of 22.4% of the total phosphorus load to the upper Potomac and implementation of the tiered treatment scheme proposed by the District would increase total phosphorus load by only 7.5% (Id. at 18). EPA model calculations show that the discharge of 1.5 mgP/l from Blue Plains during periods when River flows exceed 10,000 mgd

would raise peak phosphorus concentrations in the upper Estuary a maximum of 0.044 mgP/l, considerably less than the average upstream concentration at Chain Bridge of 0.15 mgP/l (Id. at 4, 20). Dr. Canale was of the opinion that increased phosphorus discharges as a result of the proposed tiered permit would not significantly effect water quality in the Potomac because other sources of phosphorus were far more important than Blue Plains (Tr. 536-37, 540-41). Further explaining this position, he stated the belief, based on data from various sources, that sediments in many aquatic systems, including the Potomac, act as a trap for phosphorus rather than as a source.

78. Mr. Flaherty (identified finding 22) supported the concept of reduced treatment at Potomac River flows equalling or exceeding 10,000 mgd provided daily average effluent limitations were used for determining compliance and a reasonable definition was developed as to when flows exceeded 10,000 mgd (Rebuttal Testimony, EDF Exh 2, at 10, 11, 14, 15; Short-Term Objectives for Wastewater Treatment Plants, Potomac Estuary, EDF Exh 2A, at V). Although he concluded that temperature was more important than flows in effecting the DO oxygen budget of the Estuary, he asserted that more than sufficient data was available to conclude that the Estuary was neither starved for DO nor eutrophic at flows exceeding 10,000 mgd (Short-Term Objectives, supra, at 76; Rebuttal at 14).

79. Mr. Clark (finding 19), while agreeing that the Blue Plains facility could probably cut-back to secondary treatment during periods of high flow or low water temperatures without causing or contributing to water quality violations (DO in particular), opposed the tiered

permit advocated by the District because the need for continuing phosphorus reductions may render reduced treatment infeasible (Testimony, EPA Exh 5, at 6). He indicated that this should be evaluated from an engineering viewpoint once adequate data on phosphorus deposits and regeneration from the sediments was available.

80. Mr. Edgar Jones (identified finding 56) testified that Blue Plains had from time to time experienced problems in achieving effective treatment due to difficulties in obtaining an adequate qualified operating staff (Tr. 952). The Order for Compliance contains findings to the effect that the Permittee has violated the permit in that qualified technical personnel are not available on site at all times during treatment operation, resulting in increased downtime for critical process equipment (MEC Exh 2 at 3; CENS Exh 8A at 3). Lack of sufficient numbers of qualified maintenance personnel was determined to be a cause of a reduction in operational efficiency and excessive discharges of pollutants. Permittee was ordered to immediately hire a process engineer and to, inter alia, make adequate technical staff available, in addition to normal staff, during start-up of new unit processes (Id. at 11 and 14, respectively). Mr. Jones further testified that start-up and shut-down of process equipment made exceptional demands on the staff (Tr. 952). Mr. Flaherty suggested that start-up and shut-down of nitrification reactors required approximately six weeks (Short-Term Objectives, EDF Exh 2A, at 85). Mr. Jones answered in the affirmative questions as to whether problems had been experienced in the start-up of nitrification equipment and whether severe and lengthy problems had been encountered in the

start-up and operation of the chemical addition process for phosphorus removal (Tr. 953). He agreed that the current staff at the plant was not up to projected numbers for current treatment requirements not to mention ultimate projected treatment levels or requirements (Tr. 954).

81. Mr. S. Buddy Harris, Vice Chairman of the Greater Washington Board of Trade's Community Development Bureau, described the effect of an automatic sewer hook-up moratorium as having drastic economic and social consequences (Testimony, DC Exh 15, at 2). He pointed out that excessive flows [from Blue Plains], absent effluent loadings in excess of permit limits, did not necessarily correlate with degradation of the river and that excessive loadings may be caused by many conditions other than additional sewer hook-ups. He stated that imposition of a moratorium might not solve the problem of excessive loadings. Based on data from the D.C. Office of Planning and Development, he testified that major public and private building and renovation projects under construction represented an investment of approximately $206.9 million (Id. at 3; DC Exhs 16 & 17). He indicated that a moratorium would jeopardize an estimated 19,000 permanent jobs throughout the city. He estimated that projects in the planning stages for construction during the period 1982-86, with an estimated value of $1.3 billion, would provide an additional 48,000 permanent jobs and that an extended moratorium would by 1985 cost the District $75 million annually in lost tax revenues. He asserted that these figures did not include thousands of construction jobs which would be unavailable or lost and did not

include the effects of a moratorium on the surrounding jurisdictions. No attempt was made to substract from these figures the increased costs of water supply, sludge disposal and etc. related to this development (Tr. 935-37).

82. In a study prepared for the WSSC by Metcalf and Eddy-Sheaffer and Roland (October 1977), it was concluded that land treatment was a feasible mid-term alternative for managing wastewater in Montgomery County (Feasibility of Land Treatment of Wastewater in Montgomery County, Maryland, MEC Exh 3, at 2-18). Mid-term in this context included the period to 1985-1990, the time considered to be necessary for reviews of area wastewater requirements and construction of any necessary additional facilities (Id. at 1-1). The study identified six potential sites for land treatment in the County with capacities, depending on treatment options, i.e., irrigation, rapid infiltration, overland flow or combinations thereof, ranging from two mgd to 15 mgd and a combined capacity of 40 mgd (Id. at 2-5-218). The study concluded that the state-of-the-art was such that safe, reliable land treatment systems can be designed, constructed and operated in Montgomery County and that land treatment was cost effective, having costs ranging from 40% to 85% of conventional AWT systems constructed at the same site (2-19). A conclusion was reached that if a decision was made to proceed immediately with one or more land treatment systems, such a system could be operational as early as 1982 (Id. at 2-20). However, the study recognized that additional

detailed studies would be required in connection with preparation of facilities plans and that public opposition could be expected.

83. Mr. Franklin R. Day, a registered professional engineer and a Section Head in the Engineering Projects Section of the WSSC, described the Metcalf and Eddy-Sheaffer and Roland report referred to in the preceding finding as "a good, solid study" (Tr. 804). He testified that sites identified for land treatment were the best available in Montgomery County (Tr. 805). He pointed out, however, that drainage systems would be needed in order to allow adequate time for the wastewater to be treated by soil organisms and vegetation prior to the wastewater reaching the water table and that potential point discharges to the Potomac for three of the sites were above Metropolitan Washington water supply intakes (Testimony, WSSC Exh 1, at 2, 3; Tr. 806-07). He noted that the EPA and Maryland EHA views on discharges above water supply intakes were not fully appreciated at the time the study (MEC Exh 3) was prepared, but that there was no doubt of their present position, citing the Administrator's Dickerson decision (finding 13) and correspondence from EPA and the Maryland EHA concerning the proposed Rock Run AWT (attachments, WSSC Exh 1). He disagreed that a proposed alternate discharge point to the C&O Canal (Mec Exh 3 at 6-49) would discharge to the Potomac below water supply intakes, because "it leaks like a sieve and nobody knows where it discharges" (Tr. 808-09). Regarding two*

* One of the six sites identified in the Metcalf and Eddy-Sheaffer and Roland study was River Road/Dawsonville (each of these being identified separately as a potential site) and Mr. Day apparently did not regard the combination as a separate site.

other of the proposed sites for land treatment in Montgomery County, Mr. Day testified that the Muncaster Road site would discharge into the headwaters of Rock Creek where there were unresolved doubts as to the assimilative capacity of that relatively small waterway and that the other (Columbia Road or Pike) site had been partially developed, and that the remainder was being utilized as a composting site. He acknowledged that all of the sites identified in the Metcalf and Eddy-Sheaffer and Roland study could be constructed so that discharges to the Potomac would be below water supply intakes (Tr. 826). Discharge to the Potomac from the five mgd Seneca Creek AWT plant is at a point above water supply intakes (Tr. 832).

84. Dr. John R. Sheaffer is the "Sheaffer" in the Metcalf and Eddy-Sheaffer and Roland study prepared for the WSSC (MEC Exh 3). Without objection, he was accepted as an expert in water resource management and the planning and design of land treatment systems (Tr. 851; Curriculum Vitae, MEC Exh 3A). He testified that a land treatment system will result in a very high quality of effluent, achieving consistently BOD_5 and suspended solids levels of less than 5 [mg/l], total nitrogen of no more than 3 [mg/l], phosphorus of 0.2 [mg/l] or below and essentially total control of fecal coliform (Tr. 853). He further testified that because a land treatment system has storage capacity built into the system (3 to 19 days for what were referred to as pretreated waters and up to 120 days for treated waters), it had more flexibility and was less susceptible than an AWT plant to biological upsets and bypasses. He stated that land treatment

systems incorporate time into the treatment process, didn't add chemicals to precipitate materials out of the treatment process and generated a much lower quantity of sludge than an AWT plant (Id.).

85. The largest land treatment system currently in operation in the United States is at Muskegon, Michigan, which was designed for a capacity of 42 mgd and at the time of the hearing was processing approximately 30 mgd (Tr. 856, 887-88, 902). Dr. Sheaffer mentioned other smaller facilities operating in the U.S.: Lubbock, Texas; Vineland, New Jersey and Northglenn, Colorado (Tr. 902). He testified that a 135 mgd land treatment facility was in the planning stages in Texas and that the Melbourne, Austrailia facility handled over 200 mgd (Tr. 902-03). He asserted that because of the long winters, requiring extra storage capacity (151 days), and the fact that no attempt to minimize land required for the system was made, Muskegon had acquired a site of approximately 10,000 acres (Tr. 892). He indicated that storage for 47 days would be adequate in the Washington, D.C. area. He acknowledged, however, that the Montgomery County did not have the sandy soils prevalent in the Muskegon area, which means that the water would infiltrate at a slower rate and that more land might be necessary in order to process the same amount of water (Tr. 899).

86. Dr. Sheaffer testified that the Lubbock, Texas and Muskegon, Michigan land treatment systems were planned, designed, constructed and operational in approximately three years (Tr. 894). He acknowledged that land treatment was a volatile subject and that an

educational or awareness process was required in order to overcome public opposition (Tr. 866-68, 870, 895). While agreeing that his report (MEC Exh 3) required updating to account for energy and land costs, to validate current suitability of the sites, to consider environmental factors, and to involve the public, Dr. Sheaffer asserted that a restudy would be a waste of time in the absence of a commitment to implement land treatment (Tr. 900-02). Asked his opinion as to whether land treatment could be successfully used in the District of Columbia, he referred to the Hamilton Center, a project of real estate developer Trammel Crow, located about seven miles west of O'Hare Field, Chicago, Illinois, which was almost as densely populated as the District and where a land treatment system had just become operational (Tr. 868-870). This appears to be a relatively small project, however, because the flow is approximately 250,000 gallons a day (Tr. 869).

Conclusions

1. The ruling that the legality and terms of the initial and amended Order for Compliance issued under Section 309 of the CWA are not issues cognizable in this proceeding was correct and is affirmed. The findings in the Order are, nevertheless, relevant evidence herein.
2. Notwithstanding that the Permittee was not in compliance with requirements of the Act (secondary treatment and any more stringent limitations necessary to comply with water quality standards) which were to be achieved not later than July 1, 1977, the permit was legally issued.
3. Effluent limitations in the permit, if complied with, are adequate to assure compliance with water quality standards and other requirements of the CWA.
4. Thirty-day average effluent loadings in the permit should be expressed additionally in terms of 7-day averages.
5. A flow limitation for Outfall 002 is implicit in the permit and the permit should not contain a flow limitation of 309 mgd, or any other figure, as a rolling annual average.
6. EPA is not bound by the decree entered in State Water Control Board v. Washington Suburban Sanitary Commission, Civil No. 1813-73 (D.C. D.C., 1974) or any provision of law or regulation to establish flow limitations other than those implicit in the permit for Outfall 002.
7. Provisions designed to ensure compliance with provisions of the Act effective July 1, 1983, are not required to be included in the permit.

8. EPA's decision to include requirements for sludge management and disposal in an Order for Compliance under Section 309 of the Act, rather than including such requirements in the permit, has not been shown to be an abuse of discretion.

9. The permit should not be amended to provide for reduced treatment when flows of the Potomac past Little Falls equal or exceed 10,000 mgd.

10. A provision providing for a sewer hook-up moratorium is not required to be included in the permit.

11. Provisions for diversion to land treatment are not required to be included in the permit.

Discussion

Conclusion 1 - Order for Compliance Not An Issue Herein

At the initial prehearing conference held on November 20, 1979, the presiding ALJ ruled that neither the terms nor the legal validity of the Section 309 Order for Compliance, which was issued simultaneously with the permit and which contained a schedule of compliance co-extensive with the term of the permit, were issues cognizable in this proceeding. This ruling was based in part on the regulation (40 CFR 124.71, 124.74 (1979), 44 FR No. 111, June 11, 1979, at 32938-939) limiting requests for evidentiary hearings to challenges to the issuance of final permits.[8/] It is clear that

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8/ The regulation under which requests for an adjudicatory hearing and for party status herein were made (40 CFR 125.36(b)(1), 1978) provided in pertinent part "Within 10 days following the date of determination with regard to a permit ** or any modification thereto, any interested person may submit to the Regional Administrator a request for an adjudicatory hearing ***." The current regulation (40 CFR 124.74, 1980) provides that any interested person may request an evidentiary hearing to reconsider or contest a final permit decision [issuance] under 40 CFR 124.15.

provisions as to the availability of evidentiary hearings are strictly construed.[9/] Accordingly, matters relating to enforcement under Section 309 are not for determination in this proceeding. Although MEC contends that the Order for Compliance constitutes an illegal modification of the permit (Post-Hearing Brief, at 71 et seq.) and it is clear that modifications to permits were appropriate subjects for an adjudicatory hearing under the former regulation,[10/] it is also clear that administrative hearings were not intended to be available under Section 309.[11/] This may create an anomalous situation in that an evidentiary hearing can

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9/ See Pacific Pearl Seafoods (NPDES Appeal No. 80-1, February 25, 1980), holding that under 40 CFR 124.71 and 124.111 (1979) evidentiary hearings were limited to controversies surrounding the issuance of permits and were not available to contest the denial of a requested modification to a previously issued permit.

10/ Note 8, supra. The current regulation (40 CFR 124.74, 1980) does not appear to contemplate evidentiary hearings in connection with permit modifications. It is noted, however, that permits customarily contain provisions to the effect that the permit may be modified, suspended and revoked for specified causes after notice and opportunity for hearing (initial permit, MEC Exh 1, at 18) and the instant permit contains a "Reopening Clause", which, inter alia, allows the permit to be modified after notice and opportunity for hearing based on information newly acquired as a result of various on-going studies (AR, Item B, at 11). Assuming the permittee was satisfied with a proposed permit modification and did not request an evidentiary hearing, it is at least doubtful that a request for such a hearing on the modification by an interested member of the public could properly be denied.

11/ Senate Report No. 95-370 states at 62: "Consequently, decisions by the Administrator pursuant to this provision of law (Sec. 309) should not be the subject of Administrative hearings and appeals but rather, if the Administrator feels he cannot determine that a source meets the requirements of section 309(a)(5)(B) that he will immediately proceed under any of the other enforcement options set out in section 309." See Monongahela Power Company v. EPA, 586 F. 2nd 318, 12 ERC 1440 (4th Cir., 1978) (Petitioner held entitled to a full and fair opportunity to present its case for an extension under Section 309, but the Court carefully refrained from holding that petitioner was entitled to the hearing requested).

proceed as to the appropriate terms of a permit and yet, the proceeding may prove to be more or less irrelevant, because controlling terms are contained in a Section 309 order, which is beyond the reach of an evidentiary hearing. If this be so, the presiding ALJ lacks authority to expand the scope of an evidentiary hearing to include orders issued under Section 309 of the CWA. The ruling that neither the terms nor the legal validity of the Section 309 Order are issues cognizable in this proceeding is affirmed.

Conclusion 2 - The Permit Was Legally Issued

Reduced to essentials, Legal Issue No. 1 (Attachment A) raises the question of whether it was legal to issue the renewal permit and thus allow the continued discharge of pollutants when Permittee's discharges were not in compliance with requirements, specifically limitations necessary to meet secondary treatment and water quality standards, which the Act, Sections 301(b)(1)(B) & (C), required be achieved not later than July 1, 1977.

Section 402(a)(1) of the Act (33 U.S.C. 1342) provides in pertinent part: "Except as provided in sections 318 and 404 of this Act, the Administrator may, after opportunity for public hearing, issue a permit for the discharge of any pollutant or combination of pollutants notwithstanding section 301(a), upon condition that such discharge will meet either all applicable requirements under sections 301, 302, 306, 307, 308, and 403 of this Act, or prior to the taking of necessary implementing actions relating to all such requirements, such conditions as the Administrator determines are necessary to carry out the provisions of this Act."

Citing the quoted statutory language, MEC and EDF argue that EPA may only permit a discharge which will comply with the relevant provisions of the Act (Joint Brief, dated February 8, 1980, at 5, 6). MEC also cites Section 301(b)(1)(B) requiring that publicly owned treatment works (POTWs) achieve effluent limitations based on secondary treatment not later than July 1, 1977 and Section 301(b)(1)(C) requiring that any more stringent limitations necessary to meet water quality standards also be achieved not later than July 1, 1977. Asserting that it is uncontroverted and incontrovertible that the Blue Plains discharge did not meet either of the above requirements on July 1, 1977, or on July 19, 1979, when the renewal permit was issued, MEC argues that EPA was and is without authority to permit the discharge under Section 402 and that, consequently, the renewal permit is illegal (Id. at 6, 7).

Permittee and allied parties, 12/ hereinafter Permittee, point out that the focus of the Clean Water Act is on individual point sources or discharges of pollution and that the central mechanism by which pollution is to be controlled is the NPDES permit system which translates general effluent limitations into specific obligations of a discharger (Joint Brief, dated April 15, 1980 at 2, 3). Permittee asserts that neither the language of the Act nor implementing regulations (40 CFR 122 through 125) prohibit issuance of a renewal permit when the terms of the initial permit have not been strictly met (Id. at 4). Permittee further asserts that nothing in the Act prohibits issuance of a permit to a discharger that cannot comply with effluent limitations at the time of issuance and that to interpret

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12/ Allied parties are Fairfax County, Montgomery County, Prince George's County, Washington Suburban Sanitary Commission, Metropolitan Board of Trade and Donohoe Construction Company, et al.

any provision of the Act as mandating denial of a permit under such circumstances would unduly curtail EPA's discretion to pursue flexible enforcement approaches. EPA and the State of Maryland make similar arguments (EPA Brief, dated February 8, 190, Maryland Memorandum on Issues of Law, dated April 15, 1980).

The language of Sec. 402(a)(1) that "the Administrator may * * * issue a permit for the discharge of any pollutant * * upon condition that such discharge will meet either all applicable requirements under sections 301, * * *" does not on its face prohibit the issuance of a permit to a non-complying discharger.[13/] The words "will meet" obviously relate to the future and not to the present status of the discharge. If prohibition had been the intent, it would have been a simple matter to have the Act read "the Administrator may issue a permit for the discharge of any pollutant, provided that at the time of such issuance the discharge is meeting all applicable requirements under sections * * *." This, of course, would not have been reasonable or logical viewing the situation as of the time the Clean Water Act (Federal Water Pollution Control Act, Public Law 92-500, 86 Stat. 816, October 18, 1972) was enacted. Nevertheless, in providing that permits would be issued for fixed terms not exceeding five years (Sec. 402(b)(1)(B)), Congress was certainly aware that renewal or re-issue permits would of necessity be issued, and could easily have included a specific provision applicable to

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13/ The language of Section 402(a)(1) following the second "this Act": "(O)r prior to the taking of necessary implementing actions relating to all such requirements, such conditions as the Administrator determines are necessary to carry out the provisions of this Act" relates to the period prior to the promulgation of guidelines, standards, effluent limitations or regulations under the listed sections of the Act. Because a regulation defining the minimum level of effluent quality attainable by secondary treatment has been published (40 CFR 133), the quoted language applies herein only to CSOs for which no specific limitations have been established.

renewal permits, if it had intended to preclude the issuance of a permit to a noncomplying discharger.

It should be emphasized that Sec. 402(a)(1) provides the "Administrator may issue a permit" and that the remedies listed in Sec. 402(b)(1)(C) include terminating a permit for violation of any condition thereof. It is well settled that "may" sometimes means shall,[14/] and it may well be that the Administrator could properly refuse to issue a renewal permit to a noncomplying discharger. It is obviously a far cry to conclude that the Administrator is prohibited from issuing a permit to such a discharger. In any event, whatever may be the situation with respect to an industrial discharger when it might be expected that the denial of a permit would mean that the discharges would cease, the same considerations do not apply to a municipal discharger whose discharges could not be abruptly halted without obvious risks to the health of the population concerned.

The fact that some dischargers would not meet the deadline of July 1, 1977, imposed by Sec. 301(b) of the 1972 Act (best practicable control technology currently available for industrial dischargers and secondary treatment for publicly owned treatment works and for both types of dischargers any more stringent limitations necessary to meet water quality standards) was recognized by Congress when it considered the 1977 amendments to the FWPCA. Indeed, among the amendments to Sec. 301 was the addition

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14/ See, e.g., United States v. Lennox Metal Company, 225 F.2d 302 (2nd Cir., 1955). In contrast, "shall" is generally held to be mandatory. South Carolina Wildlife Federation v. Alexander, 457 F. Supp 118, 11 ERC 2055 (D.C.S.C., 1978) and cases cited. See also NRDC v. Costle, 568 F.2d 1369, 10 ERC 2025 (D.C. Cir., 1977) (EPA without authority to exclude point sources from permit program notwithstanding language of Section 402 to the effect that the Administrator may issue a permit).

of Subsection 301(i) which provided with respect to POTWs for an extension of the July 1, 1977 deadline to not later than July 1, 1983, where construction was necessary in order to meet the requirements of Subsections 301(b)(1)(B) (secondary treatment) or (b)(1)(C) (water quality standards) and could not be completed in time to meet the referenced deadline or where the United States had failed to make financial assistance available in time to meet the deadline. The request for such an extension must have been filed not later than 180 days after the date of enactment (December 27, 1977) of the 1977 amendments (Clean Water Act of 1977).[15/] The legislative history of the CWA indicates that Section 301(i) was intended to provide relief to POTWs which through no fault of their operators were unable to meet the 1977 deadline (Senate Report No. 95-370, July 28, 1977 at 46, 47). Significantly, the cited Report also states: "For those industrial and municipal sources which are unable to meet this statutory deadline due to their unwillingness to take appropriate actions and spend necessary amounts of money at the earliest possible time, the committee intends that no extension be granted and that enforcement actions be undertaken under section 309" (Id. at 47). This statement is not consistent with the thought that Congress contemplated that there would be wholesale terminations or revocations of existing permits (as noted previously, the authority for terminating an existing permit for violation of a condition thereof is in Section 402) or that permits could not be issued to noncomplying dischargers.

Section 309 of the Act was amended by the Clean Water Act of 1977. The 1972 Act had limited the time for compliance with an order under that section to a period not exceeding 30 days. Among the amendments is the addition of

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15/ The District of Columbia did not apply for such an extension and thus is not eligible therefor.

Subsection 309(a)(5)(A) providing in pertinent part that: "(5)(A) Any order issued under this subsection shall be by personal service, shall state with reasonable specificity the nature of the violation, and shall specify a time for compliance * * * not to exceed a time the Administrator determines to be reasonable in case of a violation of a final deadline, taking into account the seriousness of the violation and any good faith efforts to comply with applicable requirements." As noted previously, this is the section under which the 309 Order in this case was issued. The legislative history indicates that this section is essentially a codification of EPA's Enforcement Compliance Schedule Letter policy under which dischargers failing to meet statutory deadlines could be placed on schedules intended to assure compliance at the earliest practicable date (Senate Report No. 95-370 at 7). Although MEC and EDF assert that the Act bristles with judicial remedies (Reply Brief, dated March 7, 1980, at 2), it is well settled that the Administrator's resort to such remedies is discretionary notwithstanding the use of the word "shall"[16/] in Section 309(a)(3).[17/]

16/ Section 309(a)(3) provides:

> "Whenever on the basis of any information available to him the Administrator finds that any person is in violation of section 301, 302, 306, 307, [or] 308, 318, or 405 of this Act, or is in violation of any permit condition or limitation implementing any of such sections in a permit issued under section 402 of this Act by him or by a State or in a permit issued under section 404 of this Act by a State, he shall issue an order requiring such person to comply with such section or requirement, or he shall bring a civil action in accordance with subsection (b) of this section."

17/ Sierra Club v. Train, 557 F.2d 485, 10 ERC 1433 (5th Cir., 1977). Cf. South Carolina Wildlife Federal v. Alexander (note 14, supra) (upon a finding of a violation of the Act issuance of an order for compliance under Section 309 is mandatory, but bringing of a civil or criminal action under that section is discretionary). See also State Water Control Board v. Train, 559 F.2d 921, 10 ERC 1321 (4th Cir., 1977) (EPA in exercise of prosecutorial discretion could decline to bring proceedings against municipalities who through no fault of their own were unable to comply with CWA).

Summarizing, it is clear that a permit is the primary mechanism established by the Act for controlling discharges of pollutants,[18/] that neither the language of the Act nor the legislative history support the conclusion that renewal permits could not be issued to dischargers not in compliance with the Act and that the Act contemplates that the various enforcement mechanisms, i.e., permit termination, restrictions on flows (Sec. 402(h))[19/] order for compliance, civil or criminal action, are to a substantial degree discretionary with the Administrator. Accordingly, the contention that the renewal permit was issued in contravention of the Act and is therefore illegal is rejected.

18/ NRDC v. Costle (note 14, supra). See also MEC v. Costle (finding 10). The State of Maryland points out that MEC and EDF have not indicated what device they would find in the CWA to replace the discharge permit and that they are not consistent in arguing for the inclusion of flow limitations in the permit (Memorandum of the State of Maryland on Issues of Law, dated April 15, 1980, footnote 1 at 2). Maryland also points out that although the Act contains ample judicial remedies, it is a basic premise of administrative law that the courts are not to be placed in the position of administering regulatory laws.

19/ Section 402(h) provides as follows:

> "In the event any condition of a permit for discharges from a treatment works (as defined in section 212 of this Act) which is publicly owned is violated, a State with a program approved under subsection (b) of this section or the Administrator, where no State program is approved or where the Administrator determines pursuant to section 309(a) of this Act that a State with an approved program has not commenced appropriate enforcement action with respect to such permit, may proceed in a court of competent jurisdiction to restrict or prohibit the introduction of any pollutant into such treatment works by a source not utilizing such treatment works prior to the finding that such condition was violated."

Conclusion 3 - Effluent Limitations In The Permit, If Complied With, Are Adequate To Assure Compliance With Water Quality Standards

The only numerical standard at issue in the determination of water quality is that for dissolved oxygen (DO), for which the requirement is a minimum daily average of 5.0 mg/l and not less than 4.0 mg/l at any time.[20/] MEC and EDF assert that EPA improperly limited its consideration to the effect of Blue Plains' discharges on water quality in Zone 1 (MEC Post-Hearing Brief at 61; EDF Post-Hearing Brief at 17). This position is not based on a strictly accurate reading of the record,[21/] and its significance, even if true, is not apparent, because applicable water quality standards for these zones do not significantly differ (finding 2).

MEC contends that the permit at issue here improperly relaxes effluent limitations which were contained in the initial (1974) permit (Post-Hearing Brief at 57 et seq.). This contention is based upon the fact that the 1974 permit (MEC Exh 1) for the period subsequent to January 1, 1978, requires a

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20/ Finding 2. Although EDF complains that the failure to set numerical standards for eutrophication thwarts effective citizen monitoring of compliance with the CWA and contends that there is ample evidence justifying a 25 ug/l chlorophyll a standard (Post-Hearing Brief at 9-12), procedures and requirements for revising water quality standards are set forth in Section 303 of the CWA and the desirability of such a revision is beyond the scope of this proceeding.

21/ The MEC/EDF position is based upon the testimony of Mr. Leo Clark. While Mr. Clark did testify that EPA's principal concern in issuing the permit was meeting water quality standards in Zone 1 because under low flow conditions the greatest amount of oxygen depression would occur in Zone 1, he also testified his understanding was that water quality standards in both zones were considered (Tr. 130, 301).

DO concentration of not less than 5.0 mg/l at all times, while the instant permit specifies DO of 5.0 mg/l daily average and not less than 4.0 mg/l at any time. MEC also points out that the nitrogen limitation in the initial permit [for the period subsequent to January 1, 1978] was expressed in terms of total nitrogen, while the only nitrogen limitation in the current permit is in terms of total Kjeldahl nitrogen (TKN). This allegedly will allow a 50% increase in the amount of oxidizable nitrogen being discharged (Id. at 59). The change in the wording of the DO limitation is simply a reflection of the precise language of the water quality standard and the deletion of a total nitrogen limitation results from deletion of the requirement for denitrification, which deletion was affirmed in the decision following the adjudicatory hearing (finding 10).

AFO model predictions were to the effect that if permit limits for phosphorus and other parameters were complied with, water quality standards, specifically DO, would be met.[22/] LTI model runs, utilizing a revised and updated version of the DEM confirmed those predictions, finding that in fact, permit allocations could be increased by 30% over 7-day average loads and 90% over 30-day average loads without violating water quality standards (finding 21). This evidence has not been effectively rebutted, the record establishing that the EEM model developed by Mr. Flaherty, which purportedly shows that nitrogen control rather than phosphorus control would be most effective in reducing eutrophication in the Potomac, has not been compared

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22/ Finding 21. Although EDF complains that no documentation of these model runs appears in the administrative record (Post-Hearing Brief at 11), Mr. Flaherty referred to an EPA memorandum authored by Mr. Clark (June 1975), describing a phosphorus limited algal model which contained DO forecasts (Short-term Objectives for Wastewater Treatment Plants, Potomac Estuary, EDF Exh 2A, at 74).

or validated against actual data and lacks scientific and technical credibility (finding 34-37, 41). It is significant that MEC and EDF do not specifically argue that the Flaherty EEM results should be accepted.

MEC criticizes the DEM model for failing to take into account in a rigorous manner algal growth and decay and faults EPA for relying on information over a decade old (Post-Hearing Brief at 62-63, 67-68). EDF makes similar arguments (Post-Hearing Brief at 15 et seq.) Although the first criticism is accurate (finding 19), Mr. Flaherty pointed out that modeling was an iterative process and that resources (time) would be exhausted and the data base stretched to its credible limit before the last obvious iteration was performed (Impact Of Nutrients On The Potomac Estuary, EDF Exh 22, at 87). He also noted that an ideal solution, i.e., the incorporation of all practicable factors into the model in a reasonable time, was impracticable and perhaps, impossible. Accordingly, the fact that revisions or modifications are necessary or desirable to a model does not mean that model forecasted results may properly be disregarded. Moreover, LTI updated the DEM to include factors for algal growth and decay (DC Exh 5 at 33; Tr. 729) and these results confirm the validity of the AFO forecasts.

The primary complaint of MEC and EDF concerning EPA's reliance on outmoded data appears to be that both the 1969 Potomac Enforcement Conference[23/] and

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23/ EDF characterizes as "unbelievable" Mr. Clark's testimony (Tr. 168-69, 171-72) to the effect that the 1969 PEC recommendation for total nitrogen removal may have been the result of a misunderstanding and asserts that EPA has not explained why such a requirement was included in TR 35 or in the 1974 permit (Post-Hearing Brief at 16-17). Mr. Flaherty, however, tended to support Mr. Clark in this respect when he testified that it was not clear whether the 1969 conferees understood all the differences between TKN and total nitrogen when they adopted TKN as a total nitrogen limitation and allowed for a margin of safety or whether it was an oversight (Short-Term Objectives, EDF Exh 2A, at 70). It is therefore likely that a total nitrogen limitation was included in the first permit simply because existing data appeared to support the need therefor.

Technical Report 35 recommended nitrogen limitations and that nitrogen controls are also contained in the draft Section 208 Plan and supposedly in the Maryland Section 303(e) Basin Plan.[24/] As noted previously, deletion of the requirement for denitrification was upheld in the decision following the adjudicatory hearing on the first permit based on a determination the evidence did not support the conclusion such a requirement was necessary to meet water quality standards. As discussed infra, the evidence herein also does not support a determination that nitrogen limitations are required in order for water quality standards to be met. EDF recognizes that the 208 Plan has not been approved and thus is not binding in accordance with Section 208(e) of the CWA (Post-Hearing Brief at 15). EDF argues, however, that a requirement for denitrification should be accepted or rejected based on a sound scientific analysis. The requirement for denitrification having been deleted from the original permit, it obviously would have been inappropriate to include such a requirement in the instant permit in the absence of data that such a requirement was necessary to comply with water quality standards.

MEC and in particular EDF concentrate their arguments on the contention that phosphorus removal without nitrogen removal from Blue Plains effluent will not reduce or eliminate eutrophication in the Potomac Estuary. EDF asserts that algal mats were not reported in the Potomac during the period 1971 - 1979, that phosphorus control at Blue Plains did not begin until 1972, that significant reductions in phosphorus from Blue Plains effluent

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24/ Only portions of the draft Section 208 Plan are in the record (EDF Exh 23). Mr. Hagan testified that it was his understanding the Plan included a requirement for denitrification (Tr. 42). The Section 303(e) Basin Plan is not in the record and neither Miss Hodgkiss nor Mr. Hagan was familiar therewith (Tr. 41). In MEC v. Costle (finding 10, supra), the Court rejected the contention that EPA was bound by the Section 303(e) Basin Plan to include a denitrification requirement in the permit.

were not achieved until the period 1975-1978 and that consequently, the disappearance of algal mats cannot be related to phosphorus control at Blue Plains (Post-Hearing Brief at 21 et seq.). EOF also asserts that the high chlorophyll a concentrations reported by Or. Canale for 1970 (finding 25) represent the sampling of algal mats and cannot be considered representative of conditions in the Estuary. EDF contends that the downward trend in chlorophyll a readings represents nothing more than the disappearance of algal mats (Post-Hearing Brief at 24). As proof that even advanced phosphorus control at Blue Plains cannot be related to the disappearance of algal mats, EDF points to a very high chlorophyll a reading of over 12,000 ug/l reported by USGS at Hallowing Point (EPA River Mile 26.90) in July, 1980.[25/] EDF, relying on Mr. Flaherty (finding 28), argues that reductions in maximum chlorophyll a concentrations are related to changes in flow (Post-Hearing Brief at 26 et seq.).

Although EOF cites no specific record evidence to support its assertion that phosphorus removal at Blue Plains did not commence until 1972, this allegation has not been disputed and appears to be accurate. It is also true that there is no evidence of algal mats being reported in the Estuary in 1971 (finding 28). Moreover, it is at least highly probable that some of the high chlorophyll a concentrations reported for 1970 represent the sampling of algal mats (finding 30) and a comparison of flow data for the years 1970 and 1977 through 1979 affords some support for the contention

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25/ A surface chlorophyll a concentration of 12,375 ug/l was reported at Hallowing Point on July 30, 1980 (Potomac Estuary Study, 1980 Fiscal Year Annual Report, USGS, EDF Exh 14, at 174). The report characterizes this as an extreme situation and as warranting special note (Id. at 201). Algae comprising the mats was identified as Anabaena.

the shift in algal species from blue-greens to greens and diatoms is attributable to increased flows in the Potomac.[26/] Having said all this, it does not follow that the phosphorus control program is not soundly based or that the evidence justifies the conclusion that this requirement should be deleted from the permit and a nitrogen limitation substituted therefor.

Phenomena responsible for shifts in algal species are not completely understood. Mr. Clark related improvements in Potomac water quality i.e., decreased chlorophyll a concentrations and an increased diversity of algal species, to reduced levels of BOD, suspended solids and phosphorus (Tr. 188-89). Dr. Shapiro testified that while chlorophyll a increases are the result of high nutrient concentrations, particularly phosphorus, whether the algae are greens or blue-greens is now thought to be a function of the relative proportions of the nutrients, that is, the N to P ratio (finding 51). Accordingly, it may well be that focusing exclusively on

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26/ Finding 33. EDF also relies on a graph (EDF Exh 16) purportedly demonstrating a correlation between flows, chlorophyll a concentrations, percent blue-green algae and cell count (Post-Hearing Brief at 28). The significance of this graph is cast into doubt, if not completely negated, by Dr. Shapiro's demonstration that these indicators also correlate with phosphorus concentrations (Tr. 458; DC Exh 6). An objection to a document allegedly prepared by Dr. Sheaffer using "multivariant regression analyses," which purportedly shows a high correlation between flows and chlorophyll a concentrations (EDF proffered Exh 12) was sustained upon the ground Dr. Sheaffer's testimony related to the feasibility of land treatment (Tr. 349-354). The District and allied parties have submitted a motion to strike EDF proposed findings of fact Nos. 26 and 27, which are based in part on Dr. Sheaffer's testimony that he found the relationship between chlorophyll a and phosphorus loadings not to be statistically significant, but that there was some significance when he compared chlorophyll a and river flows (Tr. 881). Even if accepted, this testimony is too indefinite and equivocal to rebut the testimony of Dr. Shapiro and other evidence in the record. See, e.g., the 1980 Fiscal Year Annual Report (EDF Exh 14 at 54) stating that chlorophyll a values correlate well with particulate phosphorus.

phosphorus concentrations or controls is not the way to an adequate understanding or explanation of shifts in algal species. Be that as it may, concentration on the appearance or disappearance of algal mats and the lack of scientific data connecting that disappearance to phosphorus control at Blue Plains should not be allowed to obscure the fact that dramatic reductions in chlorophyll a concentrations have been reported and that these reductions coincide with an 80% reduction in phosphorus loadings from Blue Plains (findings 25, 50, 51).

EDF attempts to discount the significance of reduced chlorophyll a concentrations in the major algal bloom producing area (Zone II), by citing higher chlorophyll a readings reported in 1977 and the unusually high reading of over 12,000 ug/l reported by USGS off of Hallowing Point in 1980 (note 25, supra). As indicated, (findings 31 and 32), there is a serious question as to the reliability of the 1977 AFO data. Although EDF argues that LTI model runs for the years 1968-1969 and 1978-1979 (DC Exh 5, Figure B2, at 73) show little difference in chlorophyll a concentrations, this is clearly inaccurate for 1979 and difficulty with the 1977 AFO data is emphasized by the inability of the LTI model to replicate such data (finding 31). Moreover, if the contention that the disappearance of algal mats related solely to flows was accurate, it would seem that the mats would have been observed in the Estuary in the low-flow year of 1977. There is no evidence that such is the case. The high chlorophyll a reading reported at Hallowing Point in 1980 is simply an isolated incident and may not be accepted as proof chlorophyll a concentrations in the Estuary have increased or remained the same, rather than declining. Dr. Canale testified that algae can form in windrows and that a temporary patch of high chlorophyll or phytoplankton could occur in any natural body of water, including very pristine bodies (Tr. 687).

Data demonstrating a dramatic improvement (reduction) in chlorophyll a concentrations and algal cell counts have been summarized above (findings 25, 47, 48), and will not be repeated here. This improvement has occurred simultaneously with an 80% reduction in phosphorus loads from Blue Plains and reductions in phosphorus and soluble reactive concentrations in the Estuary of 77% and 66%, respectively (finding 25). Although the evidence does not permit a finding that reductions in chlorophyll a are related to reductions in phosphorus at Blue Plains, it is certainly reasonable and logical to do so (finding 52). This is especially true in view of the fact that phosphorus control or removal has significantly reduced the percentage of blue-green algae in freshwater lakes and that phosphorus control is now the accepted method of algal control (finding 48). Although it is true that an estuary may be expected to have greater mixing energy than a lake, Dr. Shapiro described the Potomac Estuary as essentially a lake (finding 49). It is also true that an undeterminable portion of the reduced phosphorus concentrations may be attributable to greater dilution caused by increased flows in 1979.

EDF's principal contention is that phosphorus control at Blue Plains will not reduce eutrophication in the Potomac, because phosphorus regeneration from the sediments is sufficient to supply nutrient requirements of algae (Post-Hearing Brief at 36 et seq.). The first answer to this argument is that while the evidence does not permit a finding that reductions in chlorophyll a concentrations in the Estuary are related to phosphorus control at Blue Plains, it is reasonable and logical to do so. All witnesses, who appeared at the hearing and expressed an opinion on the issue, supported the phosphorus control strategy and were of the opinion that, as more progress

was made at Blue Plains toward meeting permit limits for phosphorus, further improvements in Potomac water quality would result (finding 52).

Although the significance or extent of phosphorus release from the sediments is not completely understood, it appears to be an established scientific fact. EDF is correct that the DEM used to check or test permit limits did not contain a term or factor for phosphorus regeneration from the sediments (finding 23). The updated DEM utilized by LTI, however, did contain such a factor, actual reported values being used (Tr. 609, 754-55, 779) and it will be recalled that these model runs supported the permit limits (findings 21 & 43). HydroQual Inc., utilizing 1977 AFO data for phosphorus and chlorophyll a, concluded that an additional source of phosphorus, i.e., the sediments, was indicated by the fact observed levels of reactive phosphorus in the Estuary did not appear to be sufficient to support the observed algal bloom (EDF Exh 11 at 17). Other evidence, however, supports the conclusion that phosphorus inputs to the Estuary, at least in the upper 30 or 40 miles, become permanently incorporated into the sediments and do not return to the water column.[27/] Dr. Canale supported this position, being of the opinion that the sediments in many aquatic systems, including the Potomac, act as a trap for phosphorus rather than a source (finding 77). See also finding 38. EDF's vigorous arguments to the

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27/ See USGS 1980 Fiscal Year Annual Report (EDF Exh 14) at 62, providing in pertinent part: "A tentative conclusion from analysis of these phosphorus geochemistry data is that a large proportion of the phosphorus inputs to the Tidal Potomac River become incorporated permanently in the sediment and do not return to the water column. This suggests that increased efficiency of P removal from STP effluents will eventually result in lower water-column concentrations of P in the Tidal River water column (a result we have observed in the last few years). However, the slow return of dissolved P from the sediments (benthic recycling) will 'buffer' water column P concentrations at levels that will maintain natural plankton and algae populations. * *."

effect that phosphorous release or regeneration rates used by Mr. Flaherty more nearly comport with available data than those used by Dr. Canale (Post-Hearing Brief at 38-41) are not persuasive because EDF overlooks or ignores Flaherty's narrative which reflects use of an average rate of 12 $mg/m^2/d$ for the first 30 miles of the Estuary and use of a rate of 30 $mg/m^2/d$ for the balance (finding 38). Moreover, Mr. Flaherty recognized that his release rates were two or three times preliminarily reported release rates, but dismissed the difference as insignificant (finding 36).

EDF is incorrect when it asserts that evidence of nitrogen fixation in the Estuary is lacking (Post-Hearing Brief at 45 et seq.). Technical Report 35 recognized the occurrence of nitrogen fixation, but concluded that it was a minor source of nitrogen in the Estuary compared to all other sources (finding 47). This may simply mean that the algae had adequate sources of nitrogen other than fixation because it appears that fixation may not occur in the absence of a preliminary starvation period (Id.). Dr. Shapiro's experiments with Potomac River water and Blue Plains' effluent provide additional evidence of nitrogen fixation (finding 46). Although counsel for EDF purported to demonstrate that some of the numbers reported by Dr. Shapiro were erroneous or anomalous, because green algae appeared to be fixing nitrogen, something Dr. Shapiro agreed was absurd, the essential point that the only reasonable explanation is that nitrogen fixation by blue-green algae occurred has not been altered. EDF is correct when it points out that Water Quality Assessments contain statements to the effect that the Estuary or certain segments thereof, appears to be nitrogen limited (finding 50). These reports, however, also contain statements to the effect that phosphorus concentrations are approaching or approximating values known to be limiting to algal growth (findings 20 & 50).

In summation, while the validity of phosphorus removal at Blue Plains to control eutrophication and meet water quality standards has not been established, the evidence permits an inference that substantial reductions in chlorophyll a concentrations are related to the 80% reduction in phosphorus loads from Blue Plains. All witnesses who appeared at the hearing and who addressed the issue testified that further improvements in water quality were expected as progress is made toward meeting permit limits for phosphorus. The MEC/EDF position that nitrogen removal should be instituted at Blue Plains flies in the face of evidence that phosphorus control has worked in other areas[28/] and that nitrogen control, to the exclusion of phosphorus control, has not been attempted, let alone succeeded.

The Court of Appeals decision in MEC v. Costle (finding 10) has laid to rest the question of whether CSOs constitute parts of POTWs and are thus subject to the secondary treatment requirements of Section 301(b)(1)(B) of the CWA. This question has been answered in the negative and no specific limitations have been defined, permit requirements for CSOs are best practicable technology (BPT) which were established by "best professional judgment." This was the requirement that flows to the treatment plant be maximized and that flows from CSOs be permitted only in the event the capacity of the plant was exceeded, while the effect of CSOs on water quality was studied (finding 54). Although the requirement that flows to the plant be maximized, reduces the likelihood that Blue Plains' discharges will comply with permit limits and it is

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28/ In addition to the lakes referred to by Dr. Shapiro (finding 48), it appears that Lake Erie has been returned to an acceptable state by limiting phosphorus discharges (Pore Water Geochemistry Of Potomac Riverine and Estuarine Sediments, EDF Exh 26, at 2).

clear that at times pound loadings from Point Source 001 exceed those from Point Source 002 (findings 54 and 56), evidence in the record does not permit a determination that numerical concentration and load limits must be applied to such discharges in order to comply with water quality standards. It is significant that, while MEC argues that CSO discharges should be limited in order to ensure attainment of water quality standards (Post-Hearing Brief at 69, 70), it does not state what those limits should be. MEC appears to be correct in complaining that EPA has been studying the effect of CSOs for approximately seven years and still lacks sufficient information to establish either technology based or water quality based limitations. It also appears to be true that the Potomac Estuary is the most studied body of water in the United States (Impact of Nutrients, EDF Exh 22, at 9). Although a preliminary study on CSOs has been completed, which apparently concludes that more data are necessary (finding 54), the status of additional studies in this regard is not clear from the record. Lacking information that additional requirements or limitations on CSOs are necessary in order to ensure attainment of water quality standards, EPA's determination of BPT with respect to these flows may not be disturbed.

Conclusion 4 - Permit Loadings In the Permit Should Be Expressed Additionally In Terms of 7-day Averages

Regulations effective prior to the effective date of the permit (40 CFR 116(c), 1979) require that permit limitations be stated as average weekly and average monthly discharge limitations in the case of POTWs (finding 55). The current regulation (40 CFR 122.63(d), 1980) contains identical language, but includes the proviso "unless impracticable."

There is no evidence that stating permit loadings in the permit in terms of 7-day averages in addition to 30-consecutive-day averages is impracticable. It appears that 7-day average loadings would be 1.5 times 30-consecutive-day loadings.

Conclusions 5 and 6 - Flow Limitations Are Not Required To Be Included In The Permit

Factual issue No. 3 concerns whether the permit should contain a flow limitation of 309 mgd as a rolling annual average and legal issues 2, 6 and 7 concern whether as a matter of law a flow limitation of 309 mgd should be established until compliance with permit limits is achieved, whether the decree in State Water Control Board v. WSSC, Civil No. 1813-73 (D.C. DC, 1974) requires a flow limitation and whether flow limitations are required by any other provision of law or regulation (Attachment A).

A "rolling annual average" daily flow is calculated by averaging total flows over a 365-consecutive-day period (finding 57). Effluent limitations in the permit were apparently calculated based on 309 mgd as a 30-consecutive-day average flow, while those in the Order for Compliance are apparently based on 330 mgd as a "rolling annual average daily flow." The difference between effluent limitations in the permit and those in the Order for Compliance is substantial, the latter allowing far greater effluent concentrations and loadings at least for initial periods of the Order (findings 3 and 5). A "rolling annual average" was included in the Order to prevent Permittee from being in immediate violation thereof (finding 57). Permit limitations calculated on a 30-day average basis are in accordance with applicable regulations (finding 55) and no basis has been suggested or shown for including the more lenient limitations of the Order in the permit.

MEC contends that the Order constitutes an illegal modification of the permit and that the presiding ALJ must order the "rolling annual average" stricken from the Order (Post-Hearing Brief at 80, 81). As pointed out above, however, the terms of an order under Section 309 of the CWA are beyond the scope of evidentiary hearings and thus the ALJ is without authority to issue such an order (Conclusion 1).

Although the permit contains no express flow limitation, such a limitation is readily calculated from effluent concentrations and loadings (see formula at 5 of the permit) and thus is inherent in the permit (finding 57). No provision of law or regulation requiring that a flow limitation be included in the permit has been cited and none has been found.

The Virginia State Water Control Board (SWCB) argues that the provision in the decree in State Water Control Board v. WSSC (finding 14), to the effect that EPA does not waive its authority or obligations under the CWA, does not contemplate EPA's abandonment of CWA requirements and that the provision is only applicable where some provision of the decree might prevent compliance with or interfere with enforcement of the Act (Brief, dated February 8, 1980, at 5, 6). The SWCB asserts that such is clearly not the case here, compliance with the decree facilitating compliance with the Act, that even if EPA is not subject to the decree, the Permittee clearly is and that to enforce the CWA, the Blue Plains permitted flow must be limited to 309 mgd, the accepted capacity of the plant (Id.). It has been found above that the 309 mgd design flow of the plant was based on dry weather flows, thus at least by implication excluding storm water flows, and it is clear that the consent decree contemplates storm water

quality standards is properly directed. It must be acknowledged, however, that this strategy generates enormous quantities of sludge, due in part to the use of chemicals to precipitate phosphorus from the waste stream, and thus the quantity of sludge which must be disposed of appears to represent a serious drawback to phosphorus removal. The vexing problems associated with sludge disposal are not readily susceptible to resolution. It is worthy of note that the 1969 Development Plan for Blue Plains recommended that sludge be incinerated, but that implementation of this recommendation was deferred (finding 15). It should also be noted that Fairfax County is incinerating its share of raw sludge without, insofar as appears from the record, apparent environmental or other difficulties (finding 67).

CENS argues that the permit must contain an enforceable sludge management plan and must automatically require a [sewer hook-up] moratorium to prevent additional flows when failure to properly dispose of sludge causes violations of effluent limitations (Post-Hearing Brief, dated June 1, 1981, at 31). EPA asserts that requirements for sludge management or disposal are only reasonable terms of an NPDES permit if violations are occurring or expected to occur because of failure to properly dispose of sludge (Post-Hearing Brief at 28 et seq.). This position appears to overlook the fact that the initial Order for Compliance contemplated that the sludge management plan required by the Order would become an enforceable condition of the permit (finding 61). Although inclusion of a sludge management plan in the permit is no longer contemplated, the requirement therefor having been deleted in the amended Order for Compliance, this does not make the decision to address sludge management and disposal through an

flows are not to be counted in determining the District's share of sanitary flows (finding 14).

A flow limitation being inherent in the permit because readily calculable from effluent concentrations and loadings, it is concluded that no provision of law or regulation or the decree in State Water Control Board, supra, requires an express flow limitation in the permit.

Conclusion 7 - Provisions Designed to Ensure Compliance With Provisions Of The Act Effective July 1, 1983, Are Not Required To Be Included In The Permit

MEC argues that EPA was required to include in the permit provisions to ensure compliance with the "fishable-swimmable" requirement of Section 101(a)(2) of the CWA and provisions for study of alternative waste management techniques are required by Sections 301(b)(2)(B) and 201(g)(2)(A) (Post-Hearing, Brief at 82 et seq.) The "fishable swimmable" reference in Section 101(a)(2) of the CWA is simply a goal to be met wherever attainable and nothing in the Court of Appeals decision in MEC v. Costle (finding 10), can properly be read as being contra, the Court merely remarking that "it is too early to despair of that goal," 646 F.2d at 595, 15 ERC at 1138.

Regarding the requirement of Section 201(g)(2)(A) for the study of alternative waste management techniques, it is true that the permit does not contain provision requiring such studies. The Order for Compliance, however, contains a requirement for a plan of study for the attainment of final effluent limitations after June 30, 1983 (finding 58). Moreover, a contract for the purpose of determining the feasibility of land treatment

has been warded to a consulting firm, but because of unspecified "contract problems," the study had not commenced at the time of the hearing (finding 59). Under these circumstances, to include such a requirement in the permit would not appear to serve any useful purpose. In any event, the Regional Administrator's failure to include such a requirement has not been shown to be an abuse of discretion.

Conclusion 8 - Failure To Include Provisions For Sludge Management and Disposal In The Permit Have Not Been Shown To Be An Abuse of Discretion

Findings in the initial and amended Order for Compliance establish that the Permittee's failure to properly manage and dispose of sludge generated by the treatment process has contributed to excessive discharges of pollutants and resulted in or contributed to violations of effluent limitations in the permit (findings 60 and 62). These findings have not been rebutted and are amply supported by other evidence in the record (finding 63). It is also clear that despite strenuous and good faith efforts by Permittee and user jurisdictions, a viable and practicable long-range sludge management has not been forthcoming (findings 66, 74, 75). As has been seen the requirement for the production of such a plan was deleted in the amended Order for Compliance and the end result of many meetings, voluminous correspondence and much travail appears to have been the award of a contract for yet another study so that a suitable sludge management plan could be developed (findings 62, 70 and 74).

The evidence herein supports the conclusion that the strategy of removing phosphorus from Blue Plains' effluent in order to attain water

order under Section 309, rather than in the permit, unreasonable. It is recognized that the primary enforcement mechanism contemplated by the Act is a permit. Nevertheless, it is clear that the choice of remedies for permit violations is to a substantial degree discretionary with the Administrator or Regional Administrator (notes 17 and 18 and accompanying text).

CENS has not submitted terms or conditions concerning sludge management and disposal, which it considers should be included in the permit and has not demonstrated how any such provisions in the permit would aid or achieve compliance beyond the orders entered by the District Court in State Water Control Board v. WSSC (finding 73). As EPA points out in connection with the issue of a sewer hook-up moratorium (Post-Hearing Brief at 37), enforcement of any such provision would require court action. CENS did join in submitting conditions for the imposition of a sewer hook-up moratorium and for diversion to land treatment (Joint Proposal of MEC, EDF and CENS, dated December 3, 1980). While it may well be that enforcement of sludge management and disposal could appropriately be accomplished or expedited through the medium of a sewer hook-up moratorium, for reasons discussed infra, it is concluded that this sanction is not required. The decision to address sludge management and disposal outside of the permit has not been shown to be an abuse of discretion and accordingly, will not be disturbed.

Conclusion 9 - The Permit Should Not Be Amended To Provide For Reduced Treatment When Flows Of The Potomac Equal or Exceed 10,000 MGD

It is a well known and established fact that higher flows and lower temperatures increase the assimilative capacity of a river or estuary (finding 33). Temperatures are apparently more important in this respect than are flows (finding 78). Nevertheless, the evidence establishes that reduced treatment (secondary) when flows past Little Falls equal or exceed 10,000 mgd would not contribute to or cause violations of water quality standards (findings 76-78). It is also clear, however, that there are staffing and operational problems at Blue Plains and that the operational feasibility of reducing and then increasing the level of treatment on a short-term basis has not been demonstrated (finding 80). The precise measuring or monitoring device which would trigger reduced treatment has not been explained. In view thereof, and in view of the fact that Permittee is not in compliance with permit limitations, it is concluded that the permit should not provide for reduced treatment, other than seasonal treatment for total Kjeldahl nitrogen (finding 3).

Conclusion 10 - A Provision For A Sewer Hook-Up Moratorium Is Not Required To Be Included In The Permit

The Court of Appeals in MEC v. Costle (finding 10), held that imposition of a sewer hook-up moratorium was within the authority of the Administrator under Section 402 of the CWA, if necessary to assure compliance with the Act, and that imposition of such a moratorium may be necessary to enable a treatment plant to meet applicable effluent limitations. This, of course, is a far cry from a holding that imposition of a moratorium is mandatory.

Permittee contends that increased flows are probably due to the permit requirement that CSO flows to the treatment plant be maximized, that there is evidence that flow figures are in error, that current flows are in the range of 330 mgd and that there is evidence that the plant can meet permit pound loadings at flows as high as 330 mgd (Post-Hearing Brief at 42 et seq.).

Regarding the first point, Permittee's own witness, Mr. Thomas, noted a general upward trend in flows to the plant and stated that he could not testify that the increase was due to the permit requirement flows to the plant be maximized (finding 56; Tr. 1002-03). While there appears to be a basis for inferring that flow figures are in error,[29/] no such errors have been established and in the absence of such evidence, it would seem that reported flow figures must be accepted. Evidence that the treatment plant can meet permit limits at flows as high as 330 mgd is equivocal at best, consisting of Mr. Thomas' opinion that permit loadings could be met at flows on the order of 330 mgd (Tr. 1051). The Metcalf and Eddy capacity evaluation study indicated only that flows up to that level could be accepted without significantly reducing process reliability (findings 12 and 56). The testimony of Mr. Jones, Chief Process Engineer for the District, was of similar import (Tr. 962).

EPA's argument that offloading and further construction at the treatment plant are among alternatives to a sewer hook-up moratorium (Post-Hearing

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29/ Flow figures reported for the summer of 1980 (finding 56) appear high in that rainfall for that period was below normal--a fact of which official notice is taken. An NEIC report of investigation of Permittee's flow calcuation methods has apparently been received by EPA Region III, but is not in the record and its conclusions have apparently not been released (Tr. 981).

Brief at 36) is rejected, because there is no evidence that planning of either of these alleged alternatives is sufficiently advanced that either may realistically be expected to alleviate flow and capacity problems at Blue Plains during the life of the permit, or indeed, at any specific time thereafter. EPA further argues that such multijurisdictional issues as flows and sludge disposal should be resolved in the ongoing litigation, State Water Control Board v. WSSC (findings 14 and 69) (Post-Hearing Brief at 37 et seq.). This argument does not appear to recognize the decision in MEC v. Costle (finding 10), where the Court agreed with petitioners that EPA had exhibited an undue tolerance in achieving Congressionally mandated water quality goals and that imposition of a sewer hook-up moratorium might be required. Nevertheless, for reasons hereinafter appearing, it is concluded that the difficulty in fashioning a sewer hook-up moratorium provision that would apply equitably to the several jurisdictions as users of the treatment plant and the lack of evidence that such a moratorium would materially aid Permittee in achieving compliance with the Act, warrants sustaining the Regional Administrator's judgment that such provision should not be included in the permit.

EPA points out that none of the parties has submitted evidence as to how a sewer hook-up moratorium would be constructed. The Court in MEC v. Costle, supra, did not address the issue of fashioning a permit condition that would impose such a moratorium on the multiple jurisdictions as users of the facility, but clearly recognized that such a moratorium might be

imposed on users in addition to Permittee.[30] The Joint Proposal of MEC, EDF and CENS, dated December 3, 1980, provided essentially that when flows exceeded 309 mgd on a monthly average basis or loadings in excess of permit conditions, the Administrator shall impose a sewer hook-up moratorium without detailing the mechanism by which the moratorium would be imposed.

The moratorium provision presently suggested by MEC[31] is phrased in terms of an absolute prohibition on sewer hook-ups and, save for the length of the demonstration of compliance, might be appropriate as applied to Permittee. It seems apparent, however, that any such provision as applied to user jurisdictions, other than Permittee, must be phrased in terms of the prevention of increased flows. This is, of course, because the permit operates directly only on the Permittee. Permittee's flows are not directly measured, but are determined by substracting other users' flows, which are metered, from the total (Tr. 1008). A moratorium phrased in terms of an absolute prohibition on sewer hook-ups until compliance with the permit is achieved as to Permittee, while other users are merely prohibited from increasing flows, would be unduly punitive as to Permittee, because

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30/ "(W)e would be very uncomfortable deciding, for example, whether a sewer moratorium should now be imposed on Maryland suburbs." 646 F.2d at 585, 15 ERC at 1130.

31/ "Until such time as the District of Columbia Department of Environmental Services demonstrates through the submission of independently performed analyses based on actual (and not estimated) calculations of effluent flows and pollutant concentrations that the Blue Plains sewage treatment plant has been in compliance with the effluent limitations in the permit, as well as all other permit conditions, for a period of nine consecutive months, the connection of additional sewer hookups, whether committed or not, shall be prohibited." Post-Hearing Brief at 86)

the other users might escape the consequences of a moratorium through abatement of infiltration/inflow techniques, water conservation or other means. On the other hand, a provision phrased in terms of prohibiting increased flows as to Permittee may have little consequence, because of the magnitude of CSOs.[32/] In any event a permit provision so phrased would add little of consequence to the order entered by the Court in State Water Control Board v. WSSC, which prohibits the parties from increasing sanitary flows beyond their allocated share of 309 mgd (finding 73).

It appears that the annual increase in sanitary flows approximates eight mgd (finding 68). Although Permittee's share of this increase is not specified, it almost certainly does not exceed 50%. The drastic consequences of a sewer hook-up moratorium are evident (finding 81) and it has not been shown that cessation of an annual increase of four mgd would materially aid Permittee in achieving compliance with the Act. Because construction of a second regional treatment plant has not been accomplished (finding 13), present capacity problems at Blue Plains may not be attributed entirely to Permittee's inaction. In view thereof, and because imposition of a sewer hook-up moratorium might unduly penalize Permittee, while leaving other users relatively unaffected, and has not been shown to materially aid in achieving compliance with the Act, the

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32/ The only apparent solution to this problem is an agreement among the user jurisdictions and it will be recalled that a proposal was made that the users enter into a binding agreement which would, inter alia, prohibit further sewer hook-ups in jurisdictions unable to properly manage their share of sludge after July 15, 1981 (finding 74). The status of this proposal is not revealed by the record.

Regional Administrator's judgment in declining to include such a provision in the permit will not be disturbed.

Conclusion 11 - Provisions For Diversion To Land Treatment Are Not Required To Be Included In The Permit

The evidence establishes at least in a general way that diversion to land treatment is a feasible method of wastewater treatment in Montgomery County (findings 82-86). Although none of the land treatment facilities discussed by Dr. Sheaffer (finding 85) approach the size of Blue Plains, there can be little doubt that diverting from Blue Plains flows of the capacity of a facility such as Muskegon, Michigan, which at the time of the hearing was processing approximately 30 mgd, would go along way toward alleviating, if not eliminating, capacity problems at Blue Plains. It is clear, however, that further detailed site studies are required before land treatment could be planned, designed and constructed and that an informational and educational process is required in order to overcome public opposition (findings 82 and 86). A requirement for a plan of study for the attainment of effluent limitations after July 1, 1983, is contained in the Order for Compliance (finding 58). The record reflects that a contract for a further study of land treatment as a wastewater management technique has been awarded, but that because of unspecified "contract problems," the study had not commenced at the time of the hearing (finding 59). The study is estimated to require 13 months. The July 1, 1983 requirements have been addressed in the Order for Compliance and have not been ignored. In view thereof, it is concluded that there is little to be gained by including a requirement for a feasibility study of

land treatment and other alternatives in the permit as requested by MEC, and the Regional Administrator's judgment not to include such a requirement is upheld.

Conclusion

The permit will be modified to include effluent loadings in terms of 7-day averages as well as 30-day averages. In all other respects, requests for permit modifications are denied[33/] and the terms of the permit are upheld.[34/]

Dated this 3rd day of September 1981.

Spencer T. Nissen
Administrative Law Judge

Attachments A & B

33/ CENS motions to supplement the record to include a newspaper article published subsequent to the close of the hearing concerning a possible rise in water and sewer rates as a result of the District's termination of a contract for sludge disposal and to include a report concerning sludge management, dated Decemeber 11, 1978, prepared for then Major Elect Barry, which allegedly should have been furnished on discovery, are denied. CENS has made no showing that these documents add anything material to the record or would in any material way alter the findings and conclusions herein. For the same reasons, a newspaper article concerning the collapse of a wall at Blue Plains, published subsequent to the close of the hearing, attached to MEC's post-hearing brief is struck.

34/ Unless an appeal of this decision is made to the Administrator in accordance with 40 CFR 124.91 or unless the Administrator elects, sua sponte, to review the same as therein provided, this decision shall become the final decision of the Agency.

Legal Issues

1. May the discharge from Blue Plains be lawfully permitted when at the time of issuance of the renewal permit (July 19, 1979) the permittee is unable to comply and is not complying with effluent limitations and other requirements which the Clean Water Act required to be achieved not later than July 1, 1977 and when simultaneously with the issuance of the permit EPA issues a Sec. 309 order containing a schedule of compliance which is coextensive with the term of the permit?

2. Must the permit issued to Blue Plains prohibit any increase in flow above the 309 MGD capacity previously accepted as necessary to prevent overloading the plant, unless it is determined that the increase in flow results from diversion of stormwaters that would otherwise be discharged untreated to the Potomac or its tributaries, until treatment of existing flows has achieved, at a minimum, the level required by the permit, as now in force or as modified following this hearing?

3. Are outfalls 001 and 003 through 060 a publicly owned treatment works or parts thereof as a matter of law?

4. If outfalls 001 and 003 through 060 are not a POTW or portions thereof, what are relevant statutory and regulatory requirements governing such discharges?

5. May an NPDES renewal permit, issued on July 19, 1979, contain a schedule of compliance having implementation dates for effluent limitations imposed pursuant to Sec. 301(b)(1)(A)(B) (secondary treatment) and (c) (water quality standards) after July 1, 1977?

6. Is EPA bound by the decree entered in the civil action, State Water Control Board, et al. v. Washington Suburban Sanitary Commission, No. 1813-73 (D.C. D.C.) to establish flow limitations in the permit in accordance with the decree?

7. Are flow limitations required by law or regulation to be included in the permit?

8. May EPA legally issue a permit scheduled to expire on June 30, 1983, to a municipal discharger, which does not contain conditions necessary to assure that the discharger will comply with the requirements of the Clean Water Act which the Act requires be achieved not later than July 1, 1983?

9. Is EPA authorized to impose effluent limitations more stringent than secondary treatment at specified dates after July 1, 1977, when it has not been established that the effluent limitations contained in the permit are necessary to achieve water quality standards or other requirements of the Act?

Factual Issues

1. Are the effluent limitations and other conditions contained in the permit sufficient to ensure the statutorially required compliance with applicable water quality standards and other requirements and, in particular the water quality standards for dissolved oxygen and nuisance algal growth? If not, what effluent limitations and other conditions are required to assure such compliance?

2. Should 30-day average wasteload allocations and pollutant concentrations contained in Special Condition 1 of the permit be made 7-day average effluent limitations as well?

3. Whether the permit should contain a flow limitation of 309 mgd as a rolling annual average?

4. What permit conditions are required to ensure that the discharge from Blue Plains will comply with all applicable requirements of the Clean Water Act on July 1, 1983?

5. Whether provisions for sludge disposal or management are necessary in order for the discharge to comply with the requirements of the Act and if so what should those provisions be?

6. Whether treatment to achieve average 30 day load effluent levels of 30 mg/l of BOD_5 and suspended solids are sufficient to meet the District of Columbia Water Quality Standards during periods when the measured flow of the Potomac River past Little Falls dam equals or exceeds 10 billion gallons/day?

7. Are sewer hookup moratoria necessary in order for the Blue Plains facility to meet the requirements of the CWA? If so, what conditions should be included in the permit in order to enforce such moratoria?

8. Whether provisions for diversion to land treatment are required to be included in the permit in order for the Blue Plains discharges to meet the requirements of the CWA? If so, what should these provisions be?

ATTACHMENT B

Corrections to Transcript

Kathryn Hodgkiss & James R. Hagan

Page	Line	
19	20	insert "not" between is and objections
25	19	insert "you" between would and then
26	13	"1974" for 1979
31	11 & 24	"Kjeldahl" for Kelton
46	15	"duty" for jury
51	13	"were to" for will
59	7	"so that 309 mgd" for as treated and non-treated
65	4	"plans" for plants
79	21	"anomalous" for analogous
85	1	"requirements" for permit
114	10	"Gere" for Gera
121	2	"Gere" for Gera

Leo J. Clark

127	14	"tidal" for title
127	19	"Broad" for BOD
142	4, 8, 10, 11, 13, 16, 19	"eutrophication" for nutrification
143	1, 13, 16	same
144	3	same
145	10	"zone" for on
145	18	"eutrophication" for nutrification
146	6	same

Leo J. Clark continued

Page	Line	
146	6, 9, 22	"saline" for salient
147	15	insert "year" between 10 and low
153	5	"attainment" for detainment
162	25	delete "7"
189	14	insert "increase" after to and "dissolved" for dissolve
199	23	"ratios" for rations
218	10	"ferric" for fair
231	13	"anomalous" for analogous
235	1	same
235	11 & 12	"Hallowing" for Halloween
235	18	"underlying" for underlining
236	11	"anomalous" for analogous
239	9 & 13	"Hallowing" for Halloween
240	1	same
241	16	"anomalous" for analogous
243	20	same
243	25	"Hallowing" for Halloween
244	7	"anomalous" for analogous
246	17	same
261	13	same
264	20	"eutrophication" for nutrification
297	10	insert "my" between believe and involvement

Dr. Robert Thomann

Page	Line	
325	5	"Dec" for Tech
405	8	"Canale" for Kanalli
406	16	same
408	1	same
411	16	"1,430" for 14,030

Dr. Joseph Shapiro

429	15	"Ribiero" for Rivero
431	8	"stimulating" for simulating
431	20	"Canale" for Canali
435	25	"algal" for algo
436	13 & 14	same
442	9	"mile" for model
444	20	"date" for data
467	20	insert "they" between that and hope
469	15 & 16	"reduce" for produce
482	7	"it" for he
483	23	"Ribiero" for Rivero
509	12	"DC" for EPA
510	5 & 8	"mesosaline" for mesohaline

Dr. Raymond Canale

526	9	"Kjeldahl" for kel del
562	19	"no" for not
567	14	"shown on" for should
585	16	"57,000" for 50,000

Dr. Raymond Canale continued

Page	Line	
611	19	"Pore Water" for coldwater
627	17 & 20	"Gere" for Gare
647	18	"calculator" for calculated
670	18	"chlorophyll" for phosphorus
691	11	insert "use" between you and chlorophyll a
692	7	insert "be" after probably
698	14	insert "is that" between liter and below
702	24	"stocks" for stacks
718	9	"1977" for 1978
723	23	"track" for trap
726	6	"A-5" for A-13
727	3	"EEM" for DEM
729	21	"Gere" for Gera
731	22	same
732	16	"advective" for evetive
732	17	"dispersive" for disbursive
734	10	"simplified" for simple fact
735	5	"Gere" for Gera
740	9	"if" for is
752	13	"Gere" for Gera
753	7	"P" for T
765	15	"Hallowing" for Halloween
779	14	"spatially" for specially

Dr. John Sheaffer

Page	Line	
857	11	"Kjeldahl" for Keldol
863	15	"bar" for ball
868	17	"big" for bit
877	21	"$50,000 an acre" for $50

Edgar Jones

948	10	"Werther" for Notarius

John Thomas

986	6	"illustrates" for negates
987	21	"shed" for sed
993	23	"elutriate" for alleviate

David Elliott

1013	9	insert "no" between have and knowledge
1025	16	"The Witness" for Ms. Werther

James Hagan

1097	11 & 12	insert "to" between question & ask
1100	12	"saying" for say
1104	24 & 25	2200 for 220
1122	7	"sacrosanct" for sancrosont
1125	14	"the" for to
1131	16	"disregard" for regard