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Supplement To The Development Document For Effluent Limitations Guidelines And New Source Performance Standards For The Organic Chemicals, Plastics, And Synthetic Fibers Point Source Category

Final

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SUPPLEMENT TO THE DEVELOPMENT DOCUMENT

FOR

EFFLUENT LIMITATIONS GUIDELINES
NEW SOURCE PERFORMANCE STANDARDS
AND
PRETREATMENT STANDARDS

FOR THE

ORGANIC CHEMICALS, PLASTICS, AND SYNTHETIC FIBERS POINT SOURCE CATEGORY

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I. INTRODUCTION

A. SUMMARY

This document describes the supporting information for the Agency's amendments to 40 CFR Part 414, which limits effluent discharges to waters of the United States and the introduction of pollutants into publicly owned treatment works (POTWs) by existing and new sources in the organic chemicals, plastics, and synthetic fibers (OCPSF) point source category. These final amendments are based on the December 6, 1991 Proposal (56 FR 63897), the January 21, 1992 Extension of the Comment Period and Correction Notice (57 FR 2238) and the December 1, 1992 Notice of Availability (NOA) and request for comments (57 FR 56883). The OCPSF guideline was promulgated on November 5, 1987 (55 FR 42522), and is codified at 40 CFR Part 414. These amendments respond to the U. S. Fifth Circuit Court of Appeals' remand decisions on the OCPSF regulation, Chemical Manufacturers Association v. U.S. EPA, 870 F.2d 177 (5th Cir.), modified, 885 F.2d 253 (5th Cir. 1989), cert. denied, PPG Industries, Inc. v. U.S. EPA, 495 U.S. 910 (1990).

The Court remanded three aspects of the OCPSF guideline: (1) the subcategorization of the industry into two subcategories imposing differing limitations based on Best Available Technology Economically Achievable (BAT), on the grounds that the Agency did not provide sufficient notice of the scheme; (2) limitations for 19 of the 20 BAT Subpart J pollutants that were based upon in-plant biological treatment technology (and the corresponding New Source Performance Standards (NSPS) for these pollutants), as well as 13 corresponding Pretreatment Standards for Existing Sources and Pretreatment Standards for New Sources (PSES and PSNS, respectively), on the grounds that the model treatment systems used to estimate the cost of compliance had shorter detention times than the systems on which the limitations were based; and (3) the New Source Performance Standards (NSPS) and the Pretreatment Standards for New Sources (PSNS) for consideration of whether zero discharge limits would be appropriate for new plants in the OCPSF industry based on recycle of wastewater.

In reconsidering the BAT subcategorization scheme for Subpart I and Subpart J. The Agency concluded that this is the most appropriate approach for the OCPSF industry.

EPA is also promulgating the same numerical effluent limitations and standards that were proposed on December 6, 1991 for the 19 remanded BAT Subpart J and NSPS pollutants and for 11 of the 13 corresponding PSES and PSNS pollutants based on revised estimates for the cost of compliance derived from revised model in-plant biological treatment system designs. Pretreatment standards for phenol and 2,4-dimethylphenol are not being promulgated because, based on the revised pass-through analysis results presented in the December 1, 1992 NOA, EPA has concluded they do not pass through POTWs. The final limitations and standards are listed on pages III-48 to II-49 of Section III.

EPA also decided not to revise the NSPS and PSNS standards that were promulgated in the OCPSF guideline because, among other things, EPA's database does not demonstrate that total recycle is a demonstrated technology.

In addition, EPA corrected the criteria for designating "metal-" and "cyanide-bearing" waste streams and is adopting the two nonsubstantive formatting changes that were described in the December 6, 1991 notice. These actions did not arise out of the litigation; rather, they resulted from independent EPA review of the regulation.

B. LEGAL AUTHORITY

This regulation was promulgated under the authority of Sections 301, 304, 306, 307, 308, and 501 of the Clean Water Act (the Federal Water Pollution Control Act Amendments of 1972, 33 U.S.C. 1251 et seq., as amended) also referred to as "the Act" or "CWA". It is also promulgated in response to the Consent Decree in Natural Resources Defense Council, Inc. v. Reilly, D.D.C. Civ. No. 89-2980 (consent decree entered January 31, 1992).

Under the Act, the EPA is required to establish several different kinds of effluent limitations guidelines and standards. These are summarized briefly below.

1. Best Practicable Control Technology Currently Available (BPT)

BPT effluent limitations guidelines are generally based on the average of the best existing performance by plants of various sizes, ages, and unit processes within the category or subcategory for control of familiar (e.g., conventional) pollutants, such as BOD_5, TSS, and pH.

In establishing BPT effluent limitations guidelines, EPA considers the total cost in relation to the effluent reduction benefits, age of equipment and facilities involved, processes employed, process changes required, engineering aspects of the control technologies, and non-water quality environmental impacts (including energy requirements). The Agency balances the category-wide or subcategory-wide cost of applying the technology against the effluent reduction benefits.

2. Best Available Technology Economically Achievable (BAT)

BAT effluent limitations guidelines, in general, represent the best existing performance in the category or subcategory. The Act establishes BAT as the principal national means of controlling the direct discharge of toxic and nonconventional pollutants to navigable waters.

In establishing BAT, the Agency considers the age of equipment and facilities involved, processes employed, engineering aspects of the control technologies, process changes, cost of achieving such effluent reduction, and non-water quality environmental impacts.

3. Best Conventional Pollutant Control Technology (BCT)

The 1977 Amendments to the Clean Water Act added Section 301(b)(2)(E), establishing "best conventional pollutant control technology" (BCT) for the discharge of conventional pollutants from existing industrial point sources. Section 304(a)(4) designated the following as conventional pollutants: BOD_5, TSS, fecal coliform, pH, and any additional pollutants defined by the Administrator as conventional. The Administrator designated oil and grease a conventional pollutant on July 30, 1979 (44 FR 44501).

BCT is not an additional limitation, but replaces BAT for the control of conventional pollutants. In addition to other factors specified in Section 304(b)(4)(B), the Act requires that the BCT effluent limitations guidelines be assessed in light of a two part "cost-reasonableness" test [American Paper Institute v. EPA, 660 F.2d 954 (4th Cir. 1981)]. The first test compares the cost for private industry to reduce its discharge of conventional pollutants with the costs to publicly-owned treatment works (POTWs) for similar levels of reduction in their discharge of these pollutants. The second test examines the cost-effectiveness of additional industrial treatment beyond BPT. EPA must find that limitations are "reasonable" under both tests before establishing them as BCT. In no case may BCT be less stringent than BPT.

EPA has promulgated a methodology for establishing BCT effluent limitations guidelines (51 FR 24974, July 8, 1986).

4. New Source Performance Standards (NSPS)

NSPS are based on the performance of the best available demonstrated technology. New plants have the opportunity to install the best and most efficient production processes and wastewater treatment technologies. As a result, NSPS should represent the most stringent numerical values attainable through the application of best available demonstrated control technology for all pollutants (i.e., toxic, conventional, and nonconventional).

5. Pretreatment Standards for Existing Sources (PSES)

PSES are designed to prevent the discharge of pollutants that pass through, interfere with, or are otherwise incompatible with the operation of POTWs. The legislative history of the 1977 Act indicates that pretreatment standards are to be technology-based and analogous to the BAT effluent limitations guidelines for removal of toxic pollutants. For the purpose of determining whether to promulgate national category-wide PSES, EPA generally determines that there is pass through of pollutants, and thus a need for categorical standards if the nationwide average percentage of pollutants removed by well-operated POTWs achieving secondary treatment is less than the percent removed by the BAT model treatment system. The General Pretreatment Regulations, which serve as the framework for categorical pretreatment standards, are found at 40 CFR Part 403. (These regulations contain a definition of pass through that addresses localized rather than national instances of pass through and does not use the percent removal comparison test described above (52 FR 1586, January 14, 1987).)

6. Pretreatment Standards for New Sources (PSNS)

Like PSES, PSNS are designed to prevent the discharge of pollutants that pass through, interfere with, or are otherwise incompatible with the operation of a POTW. PSNS are to be issued at the same time as NSPS. New indirect dischargers, like new direct dischargers, have the opportunity to incorporate in their plant the best available demonstrated technologies. The Agency considers the same factors in promulgating PSNS as it considers in promulgating NSPS.

C. HISTORY OF THE OCPSF RULEMAKING EFFORTS AND LITIGATION

A detailed history of OCPSF rulemaking efforts and litigation as well as background for the current amendments is contained in the December 6, 1991 Proposal (56 FR 63897).

The Agency received comments from 28 separate commenters on the December 6, 1991 proposal and January 21, 1992 extension of the comment period. These included three trade associations, two POTWs, 22 individual companies, and NRDC. The Agency also received comments from 26 separate commenters on the December 1, 1992 NOA. These included four trade associations, four POTWs, the City of Philadelphia, and 17 individual companies. The Agency's responses to these comments are contained in the "Comment Summary and Response" section of the rulemaking docket. EPA's responses to the principal comments relating to the remand issues are also presented in Section VIII of the Preamble to the Final Regulation.

D. ORGANIZATION OF THE SUPPLEMENT TO THE DEVELOPMENT DOCUMENT

The following sections describe the technical analyses that provide the basis for the Agency's response to the Fifth Circuit's remand:

- BAT Subcategorization Scheme
- In-Plant Biological Treatment for BAT Subpart J Limitations and PSES Standards
- New Source Performance Standards and Pretreatment Standards for New Sources

In addition, Agency guidance in response to two general OCPSF implementation issues, "Laboratory Analysis of Complex Matrices " and "Appropriate Flow Basis for Converting Concentrations into Mass-Based Limitations and Standards" are presented as Appendix I-A and I-B to this document.

II. BAT SUBCATEGORIZATION SCHEME

The original OCPSF guideline had two technology-based BAT subcategories for the control of toxic pollutants: one for any direct discharge point source that uses end-of-pipe biological treatment or installs end-of-pipe biological treatment to comply with BPT effluent limitations (Subpart I, § 414.90), and one for any direct discharge point source that does not use end-of-pipe biological treatment or does not install end-of-pipe biological treatment to comply with BPT effluent limitations (Subpart J, § 414.100). Subparts I and J set limits for 63 and 59 pollutants, respectively. Of the 59 Subpart J Maximum for Monthly Average limitations, 9 are identical to, 20 are more stringent than, and 30 are less stringent than the corresponding Subpart I limitations.

As explained in the proposal, EPA established this scheme based, in part, on its conclusion that there are plants in the OCPSF industry whose wastewaters have such low levels of Biochemical Oxygen Demand (BOD) that they will not be able to operate biological treatment systems effectively and do not need biological treatment systems to comply with the BPT BOD effluent levels (56 FR at 63899). Biological treatment systems rely on microorganisms to biodegrade or "eat" the organic pollutants in the wastewater. BOD, a measure of the organic pollutant strength in water or wastewater, is determined by measuring the oxygen used by microorganisms to oxidize or "eat" the organic contaminants of a sample. Consequently, BOD measures the amount of substrate or "food" available for the survival of microorganisms (id.). Biological treatment systems therefore require sufficient BOD levels to operate (id.).

NRDC challenged the BAT subcategorization scheme in the litigation over the OCPSF guideline, arguing that the Agency had failed to present its BAT subcategorization scheme for comment and also asserting that this type of BAT subcategorization violated the CWA because it allowed a discharger who chooses not to employ end-of-pipe biological treatment to be subject to fewer and less stringent BAT Subcategory J limitations, rather than the more stringent Subcategory I limitations which apply to plants with end-of-pipe biological treatment systems. NRDC also argued that, if it had an opportunity to comment, it would have urged EPA to establish a raw waste BOD "floor" above which plants would not be able to qualify for Subpart J, or to limit the applicability of Subpart J to those categories of OCPSF production that tend to have low raw waste BOD levels (NRDC 6/30/88 Brief at 54).

On March 30, 1989, the Fifth Circuit Court of Appeals, without ruling on NRDC's substantive arguments, remanded the BAT subcategorization of the industry for notice-and-comment proceedings. The Court left the scheme in effect pending further rulemaking, reasoning in part that the notice-and-comment proceedings may disclose that the BOD floor urged by NRDC is neither necessary nor feasible (870 F.2d at 236).

The Agency has reconsidered the issues related to revising the BAT subcategorization scheme or otherwise limiting the applicability of Subpart J and has decided not to revise the existing scheme for the same reasons presented in its December 6, 1991 Proposal. The scheme accommodates the complexity of the industry and encourages source control and rational waste management decisions. In addition, EPA does not believe revision of the scheme is necessary. Plants must comply with low BPT limits, and plants that need to achieve significant BOD reductions will generally install biological treatment because other treatment alternatives are significantly more expensive. EPA does not believe plants' treatment decisions will be motivated by the desire to be subject to Subpart J. In any event, Subpart J is not significantly less stringent than Subpart I.

Moreover, the Agency does not have a technical basis to determine which plants can sustain biological treatment because of the lack of a theoretical BOD floor for sustaining biological treatment and the great variability of OCPSF production and wastewater characteristics. For these reasons, as explained more fully in Section VIII. C of the preamble to the final regulation, the Agency has decided not to establish a BOD floor or otherwise limit the applicability of Subpart J.

III. IN-PLANT BIOLOGICAL TREATMENT RELATED TO BAT SUBPART J LIMITATIONS AND PSES STANDARDS

A. BACKGROUND

At promulgation, BAT Subpart J established direct discharge toxic pollutant limitations for an estimated 23 plants that were projected to comply with BPT limitations without the use of end-of-pipe biological treatment or contract hauling. The BAT Subpart J toxic pollutant numerical limitations were based on the performance of in-plant wastewater treatment technology including steam stripping to remove volatile priority pollutants, chemical precipitation for metals, alkaline chlorination for cyanide, and in-plant biological treatment for removal of selected priority pollutants including polynuclear aromatics, phthalate esters, acrylonitrile, phenol, and 2,4-dimethylphenol (52 FR 42538 - 45, 1987 Dev. Doc. Vol. I, pp. II-8 to 11).

Numerical standards for 20 of the BAT Subpart J pollutants were based on the performance of three biological treatment systems with detention times between 1.6 and 17.2 days. In contrast, detention times between 1 to 2.1 days were used to estimate the costs of compliance based on the model in-plant biological treatment systems [(1987 Dev. Doc., pp. VIII-189); OCPSF Record R. 93970-4020; EPA 9-23-88 Response Brief, pp. 244-59].

CMA challenged the BAT Subpart J limitations based on in-plant biological treatment arguing, in part, that the plants used by EPA to derive the limitations based on in-plant biological treatment have more treatment in place than EPA's model treatment used to estimate costs of compliance and that EPA significantly underestimated the costs of installing in-plant biological treatment (CMA's 4-25-88 Brief, pp. 58-76).

After the Fifth Circuit initially upheld these BAT Subpart J limitations (870 F.2d at 240-2), CMA petitioned for reconsideration, again arguing, in part, that the Agency underestimated the costs of compliance due to the differences between the detention times of the three plants that provided the basis for the numerical standards and the detention times of the model technology that provided the basis for estimating the engineering costs of compliance (CMA's 5-3-89 Petition for Review Brief, pp. 8-11). The Court concluded that the detention time was a key variable in determining the effectiveness of biological treatment and that EPA had failed to demonstrate a reasonable basis to conclude that biological systems with a 1 or 2.1 day detention time would control pollutants as effectively as the biological systems with the 3.5 and 17.2-day detention times (885 F.2d at 265).

The Court remanded limitations for the BAT Subpart J pollutants based on the two plants with these longer detention times. In a June 29, 1990 revocation notice (55 FR 26691), the Agency withdrew the BAT limits for the 19 of the 20 Subpart J limits that were based on these two plants. EPA left in effect the limitations for acrylonitrile, which were based upon the treatment system with the 1.6 day detention time. In this notice, EPA also withdrew the 19 corresponding NSPS standards, and the 13 corresponding PSES and PSNS standards that were based on the remanded BAT Subpart J limits.

The remand was based on the discrepancy between the detention times of the systems that provided the technical basis for the BAT Subpart J limits and the detention times of the costed model in-plant systems, and not on the technical achievability of the limits generally. EPA therefore proposed on December 6, 1991 and January 21, 1992, the same numerical standards with revised estimates of costs of compliance. The revised compliance costs were based on revised model in-plant biological treatment systems with increased detention times as a function of reported or projected raw waste toxic pollutant concentrations.

A large number of comments received on the December 6, 1991 proposal and January 21, 1992 extension of the comment period challenged EPA's proposal. CMA and other commenters raised in comments the same kinds of costing issues arising from their technical critique of the limits as they did in their challenge to the 1987 OCPSF guideline (see, e.g., CMA Brief at 56 n.94, CMA Reply Brief at 61 n.112 (EPA has grossly underestimated cost of compliance and economic impacts because it did not cost sufficiently extensive treatment systems)). These issues were litigated and decided in EPA's favor, and were not re-opened by the Court's remand. Rather, the issues opened by the remand were whether EPA accurately re-costed the model in-plant technology to reflect the longer detention times assigned to the plants and whether EPA adequately accounted for land availability.

A large number of the comments on the proposal also challenged EPA's determination in the original 1987 OCPSF promulgation that phenol -- one of the 13 pollutants for which pretreatment standards were remanded -- passes through POTWs. Several comments raised the same issue with respect to 2,4-dimethylphenol -- another of the 13 pollutants. Based on EPA's assessment that these comments had merit, EPA announced in a Notice of Availability (NOA) published in the Federal Register on December 1, 1992, that it was considering revising its determination that phenol and 2,4-dimethylphenol pass through POTWs, based on a proposed modification to the Agency's traditional pass-through methodology (57 FR 56883). The revised methodology as proposed applied scientific and engineering judgment in conjunction with biological treatment performance data to determine that phenol and 2,4-dimethylphenol do not pass through POTWs.

EPA collected additional POTW phenol removal data and reviewed it in conjunction with the data that EPA used in the 1987 pass through analysis, and performed a chemical and engineering assessment of the fate of phenol and 2,4-dimethylphenol in biological treatment systems. EPA has concluded that these pollutants are highly biodegradable and that the removals of these pollutants achieved by POTWs are essentially equivalent to those achieved by direct dischargers. In addition, since phenol and 2,4-dimethylphenol are low volatility pollutants, the removals achieved by POTWs do not simply result from the transfer of the pollutants to the air.

Based on these conclusions, the final PSES regulation is based on revised engineering costs of compliance and pollutant loading reductions for 11 of the 13 remanded PSES pollutants. Final pretreatment standards for phenol and 2,4-dimethylphenol are not being promulgated today because the Agency has concluded they do not pass through POTWs.

The following sections present the analyses that have been performed since the December 6, 1991 Proposal and the December 1, 1992 NOA.

B. APPLICABILITY OF BAT SUBPART J AND PSES

At promulgation, EPA identified 84 direct discharge plants that relied exclusively upon end-of-pipe physical/chemical treatment or did not report any treatment in-place at all (see Table VII-42 of the DD). At that time, the Agency projected that after compliance with BPT, only 23 plants would remain without end-of-pipe biological treatment in-place. After promulgation, the Agency determined from its 308 Questionnaire data base that one plant (#2660) was not a direct discharger because it did not discharge process wastewater; subsequently, this plant was reclassified as a zero discharge facility and was eliminated from this analysis.

In April of 1991, SAIC contacted the remaining 83 direct dischargers by telephone to determine the accuracy of the projection that 22 plants would be subject to BAT Subpart J limitations, i.e. these plants would not install end-of-pipe biological treatment.

The April 1991 survey (documented in a April 26, 1991 Memo to the OCPSF Record) found that of the 83 direct discharge plants:

a) 14 plants had become indirect dischargers (33, 155, 180, 502, 536, 611, 819, 877, 956, 991, 1593, 1794, 2606, & 2680).

b) 6 plants are closed (87, 614, 876, 1033, 1776, 2606)

c) 12 plants installed EOP biological treatment

d) 7 plants could not be reached (no listings or nobody answered phone, or people would not or could not answer questions 260, 373, 992, 1327, 1670, 1774, 2647); these plants retained their 1987 Subpart I or J assignments.

Based on the results of this survey, there are 44 known Subpart J plants plus 3 plants (260, 373, and 1774) originally categorized as Subpart J plants whose status could not be determined and that have been assumed to be included in BAT Subpart J. Table III-1 presents a list of these 47 Subpart J plants.

Based on comments received on the December 6, 1991 Proposal and the December 1, 1992 NOA, the Agency decided to update its projection of the number of plants subject to BAT Subparts I and J and PSES limitations for the purposes of updating its compliance cost estimates and associated economic impacts for promulgation based on the information obtained. This updated analysis includes the following changes:

- For the 14 plants that switched to indirect discharge status:

  a) delete all direct discharge costs; (BPT and BAT)
  b) develop costs using the PSES trigger values
  c) include these plants and associated costs in PSES

- For the plants that switched from BAT Subpart I to Subpart J:

  a) BPT end-of-pipe biological costs were kept and in-plant biological costs based on BAT Subpart I trigger values were deleted; all other BAT costs were kept. This serves as a conservative estimate to cover whatever these plants did to comply with the BPT/BAT Subpart J limits without installing end-of-pipe biological treatment.

  b) cost in-plant biological using Subpart J trigger values and revised detention time.

- For the plants that closed:

  a) use the same costs estimated for the December 6, 1991 Proposal.

TABLE III-1

LIST OF 47 BAT SUBPART J PLANTS

Plant #	Plant #	Plant #
76	709	2030
105	727	2047
114	775	2062
225	814	2073
259	859	2268
260	913	2400
373	942	2419
412	1249	2527
446	1439	2533
447	1569	2590
451	1618	2668
601	1688	2735
657	1774	2767
663	1785	2771
664	1839	2786
669	1986	

C. PASS-THROUGH ANALYSIS METHODOLOGY

A large number of the comments on the December 6, 1991 proposal and the January 21, 1992 extension of the comment period challenged EPA's determination in the original 1987 OCPSF promulgation thatphenol -- one of the 13 pollutants for which pretreatment standards were remanded -- passes through POTWs. Several comments raised the same issue with respect to 2,4-dimethylphenol -- another of the 13 pollutants. Based on EPA's assessment that these comments had merit, EPA announced in a Notice of Availability (NOA) published in the Federal Register on December 1, 1992, that it was considering revising its determination that phenol and 2,4-dimethylphenol pass through POTWs, based on a proposed modification to the Agency's traditional pass-through methodology (57 FR 56883). The revised methodology as proposed applied scientific and engineering judgment in conjunction with biological treatment performance data to determine that phenol and 2,4-dimethylphenol do not pass through POTWs.

EPA collected additional POTW phenol removal data and reviewed it in conjunction with the data that EPA used in the 1987 pass through analysis, and performed a chemical and engineering assessment of the fate of phenol and 2,4-dimethylphenol in biological treatment systems. EPA concluded that these pollutants are highly biodegradable and that the removals of these pollutants achieved by POTWs were essentially equivalent to those achieved by direct dischargers. In addition, since phenol and 2,4-dimethylphenol are low volatility pollutants, the removals achieved by POTWs do not simply result from the transfer of the pollutants to the air.

A number of industry commenters supported the Agency's proposed conclusion presented in the December 1, 1992 NOA that phenol and 2,4-dimethylphenol do not pass through POTWs, but urged that the modified pass through analysis used to reach that conclusion be applied to the remaining 11 remanded PSES pollutants to determine that they also do not pass through. EPA disagrees, for the reasons explained below.

As the Agency explained in the NOA, EPA generally is continuing to apply the median percent removal methodology used to determine pass through at promulgation of the OCPSF guideline (57 FR at 56885). This methodology was upheld in litigation as an appropriate, conservative approach to determining pass through (870 F.2d at 243-48), and EPA continues to believe it is the correct approach as a general matter. EPA determined that the approach is overly conservative for the highly-biodegradable phenol and 2,4-dimethylphenol, but believes it is appropriate for the other 11 remanded pollutants.

As explained in the NOA and below, EPA believes these pollutants are less biodegradable and, consequently, less readily treatable by POTWs, which typically have biological treatment systems with much shorter detention times than the systems employed by direct dischargers.

1. Assessment of the Remanded Phthalate Esters and Polynuclear Aromatics.

In the NOA and accompanying Technical Support Document (TSD), which is included as Appendix III-A of this document, EPA performed a data review and technical analysis for the other 11 remanded pollutants similar to that performed for phenol and 2,4-dimethylphenol. The Agency reviewed the available data on the removal of the two phenols as well as the two other general pollutant categories covering the remaining 11 pollutants, phthalate esters (PEs) and polynuclear aromatics (PNAs). The Agency also reviewed the available literature on the biochemical mechanisms of biodegradation for all 13 pollutants, and investigated the adequacy of biological treatment systems at POTWs in effectively treating these pollutants via biodegradation. The Agency included all of its performance data from various data sources as well as information collected from the literature on the biochemical mechanisms of biodegradation of these pollutants in the Record supporting the NOA.

EPA's decision to modify its traditional pass through methodology for phenol and 2,4-dimethylphenol is based on EPA's conclusion that <u>both</u> the data available for these two pollutants and the chemical and engineering analysis performed by EPA indicated that the OCPSF pass through methodology is overly conservative for these pollutants. The data and technical analyses do not support a similar conclusion for the other 11 pollutants.

EPA's analysis focused first on the data from the OCPSF Record relating to phenol removal. A comparison of median removals (the original OCPSF methodology) indicated that phenol passes through POTWs (TSD at 11, Table II-2). However, when EPA arrayed all of the direct discharge and POTW data for phenol, it became apparent, as explained in the NOA, that the pass through conclusion was strictly an artifact of the higher influent concentrations for direct dischargers in EPA's database. Viewing the data as a whole, POTWs appeared to achieve removals that are essentially equivalent to those achieved by direct dischargers (NOA at 56886-87). This conclusion was confirmed by additional data EPA solicited from three POTWs, that demonstrated phenol removals from very high influent concentrations (e.g., 4,043 ppb at the Sheboygan Regional Wastewater Treatment Facility) to below the analytical minimum level. In addition, as explained in the NOA and the accompanying TSD, EPA determined that 2,4-dimethylphenol would be removed by POTWs to the same degree as phenol, given its similar molecular structure.

Three of the remaining eleven pollutants -- fluoranthene, bis(2-ethylhexyl) phthalate and di-n-butyl phthalate -- were detected in POTW effluent in the 50 POTW Study (TSD at 11, Table II-2). For these pollutants, the results of the pass through determination clearly are not merely an artifact of differing influent concentrations but reflect worse performance by POTWs. EPA has no basis to conclude that these pollutants do not pass through.

With respect to the remaining eight pollutants, EPA does not have data comparable to the data that provided a basis to modify the pass through methodology for the phenols. In addition, EPA's technical analysis confirmed that phenol and 2,4-dimethylphenol are the most readily treatable by POTWs of the 13 pollutants. EPA noted that while phenols are rapidly biodegraded in biological treatment systems due to their simple molecular structure, PEs and PNAs would be expected to biodegrade at a much slower rate because of the additional time required to convert these pollutants into a form that can be readily biodegraded (TSD at 6).

Biodegradation does not commence until a pollutant is "sorbed" by (i.e., attached to) the microorganisms in the biological treatment system that degrade the pollutant. Once sorbed, pollutants degrade at different rates that depend on structural complexity. In order to be biodegraded, a pollutant must be able to pass through the cell wall of a microorganism. This transfer will occur only if the pollutant is compatible with the proteins in the cell wall. While small, simple molecules are generally compatible, the more complex structures typical of PE and PNA organic pollutants must first be broken down into smaller chemical units by extra-cellular enzymes secreted by the microorganisms. Thus, biodegradation depends on the ability of the microorganisms to structurally alter pollutants outside the cell wall while they are sorbed.

As EPA explained in the NOA, the phenols have simple chemical structures that permit them to be rapidly transferred through the cell wall and biodegraded (NOA at 56888). This molecular-level analysis is confirmed by the fact that wastewaters containing phenol and 2,4-dimethylphenol have high "biodegradation rate constants" (id. at 56887). (As explained in the NOA (57 FR at 56887), "biodegradation rate constant" is a measure of how rapidly a compound or mixture of compounds biodegrades). In addition, these two pollutants have the highest compound-specific estimated biodegradation rate constants of the 13 remanded pollutants (TSD at 11, Table II-2)(biodegradation rate constants can be assigned to both individual pollutants and to waste streams containing mixtures of pollutants). In contrast, the phthalate esters and polynuclear aromatics are structurally more complex, and require additional transformation steps before they can be transferred through the cell wall of the biodegrading microorganisms and biodegraded. These steps require additional time in the aeration basin of a biological treatment system that is generally available at OCPSF direct discharge facilities, which typically have detention times that exceed 24 hours, but may not be available at POTWs, where aeration basin detention times are usually four to eight hours.

Thus, based on rate of biodegradation, EPA believes that phenol and 2,4-dimethylphenol are more readily treatable by POTWs than the eight remaining pollutants. EPA recognizes that organic pollutants may be removed from wastewater by biological treatment systems to varying degrees by removal mechanisms other than biodegradation. In particular, pollutants may be removed by volatilization and by adsorption to sludge. However, EPA believes that a pollutant's biodegradation rate is the most accurate indicator of whether the pollutant will pass through POTWs.

In general, volatile pollutants are not readily treated in POTWs; rather, these pollutants are volatilized or "stripped" to the atmosphere. As EPA explained above, EPA applied the volatile override in the 1987 OCPSF guideline to determine that several volatile and semi-volatile pollutants pass through where POTWs showed equal or better percent removals than direct OCPSF dischargers or where no POTW removal data were available. In determining whether to apply the volatile override, EPA considered total estimated volatilization of a pollutant after leaving an indirect discharge facility -- i.e., volatilization in both the aeration basin (i.e., the treatment basin) of the biological treatment system and volatilization in the sewer systems and pre-biological unit treatment operations that convey the pollutant to the aeration basin (1987 DD at VIII-281).

For five of the PNAs that were remanded -- naphthalene, acenaphthene, anthracene, fluorene, and phenanthrene -- EPA would have applied the volatile override in the 1987 OCPSF rule to determine these pollutants passed through if the percent removal analysis had not shown pass through. These pollutants have overall volatilization rates comparable to the rates for which the override was applied. For example, EPA applied the override to hexachlorobenzene, hexachloroethane and hexachlorobutadiene in promulgating the 1987 guideline (1987 DD at VIII-279). These pollutants have a 5 to 10 percent estimated volatilization rate in the aeration basin; the pre-biological volatilization rates for hexachlorobenzene, hexachloroethane and hexachlorobutadiene are estimated to range from 19 to 39 percent, 59 to 66 percent, and 48 to 73 percent, respectively (1987 DD at VIII-281). Similarly, the estimated aeration basin volatilization rates for the five remanded PNAs at issue range from 10 to 30 percent, and the estimated pre-biological volatilization rates range from 12 to 82 percent (id.) EPA notes that estimated volatilization rates for individual pollutants vary depending on the source of the estimate, and the aeration basin volatilization rates that appear in the TSD, at 11, Table II-2, vary from those presented in the 1987 Development Document because they are based on different technical studies. TSD Table II-2, however, does not account for pre-aeration-basin volatilization, and the overall estimated volatility of the five pollutants at issue is comparable to the estimated volatility of the pollutants to which EPA applied the volatile override in 1987. Because these pollutants are chemically more complex than phenol and 2,4-dimethylphenol and, EPA believes, therefore less readily biodegradable in POTWs, and because much of the "removal" of these pollutants prior to and during POTW biological treatment is likely the result of volatilization, EPA continues to conclude, based on its traditional methodology, that these five pollutants pass through POTWs.

EPA believes the remaining three pollutants -- diethyl phthalate, dimethyl phthalate, and pyrene -- are likely adsorbed to sludge in the biological treatment system. A compound's propensity to separate from the water phase and adsorb to sludge (which includes the microorganisms that degrade the compounds) is predicted by its "octanol/water partition coefficient." Pyrene, in particular, has a high estimated octanol/water partition coefficient, and would be expected to adsorb rapidly to the sludge in a biological system (TSD at 11, Table II-2). However, pollutants that are initially adsorbed onto the sludge may become "desorbed" (i.e., may detach from the sludge) and pass through into the receiving stream if they are not rapidly transferred through the cell wall and biodegraded.

The ability of complex, organic pollutants such as phthalate esters and polynuclear aromatics to remain absorbed prior to being converted to simpler compounds for transfer through the cell wall can be affected by many conditions in the treatment system, including the presence of other pollutants, electrolytes, oils and greases and other more highly adsorbent compounds ("Report to Congress on the Discharge of Hazardous Wastes to Publicly Owned Treatment Works," February 1986, (EPA/530-SW-86-004), p 4-5). This can cause the pollutants to desorb prior to conversion and biodegradation and pass through the POTW to the receiving water. EPA believes this phenomenon explains why organic pollutants which are generally considered highly adsorbable can sometimes be found at detectable levels in the POTW effluent. For example, anthracene and phenanthrene have high estimated octanol-water partition coefficients and therefore would be expected to adsorb rapidly to sludge (TSD at 11, Table II-2). POTW Number 6 from the 50 POTW Study shows an average influent concentration of anthracene and phenanthrene of 62.2 ppb and an average effluent concentration of 16.2 ppb, while POTW Number 52 has a much higher average influent concentration of 225.3 ppb for anthracene and 195.8 ppb for phenanthrene, both reduced to not detected at 10 ppb (1987 Public Record at 115910-115976). Based on these data, the propensity of these pollutants to adsorb to the sludge does not appear to be a good indicator of POTW removal performance. EPA believes that external conditions in a biological treatment system can affect the ability of a POTW to remove more complex pollutants by adsorption or biodegradation.

The overall removal data for the 13 remanded pollutants appears to confirm that octanol/water partition coefficient is not a reliable indicator of pass through. Phenol has the lowest octanol/water partition coefficient of the 13 pollutants but is rapidly and virtually completely removed by biological systems, including POTW systems. In contrast, bis(2-ethylhexyl)phthalate and di-n-butyl phthalate have among the highest octanol/water partition coefficients, but achieved lower POTW removal levels (TSD at 11, Table II-2). In fact, the only pollutants among the 13 remanded that were detected in POTW effluents in the 50 POTW study -- bis(2-ethylhexyl)phthalate, di-n-butyl phthalate and fluoranthene -- also had the highest octanol/water partition coefficients of the 13 pollutants (TSD at 11, Table II-2).

EPA believes that a pollutant's estimated biodegradation rate is the best theoretical indicator of whether it will pass through POTW biological treatment systems. As a result, EPA continues to conclude that diethyl phthalate, dimethyl phthalate, and pyrene pass through based on its traditional pass through methodology. These pollutants are structurally more complex and consequently less readily biodegradable than phenol and 2,4-dimethylphenol, and are therefore more likely to pass through POTW biological treatment systems. Moreover, EPA does not have data demonstrating that these pollutants are adequately treated by POTWs.

Based on these conclusions, final PSES and PSNS limitations are not being promulgated for phenol and 2,4-dimethylphenol because the Agency has concluded that only these two of the 13 remanded PSES pollutants do not pass through POTWs.

D. REVISED BAT SUBPART J AND PSES COMPLIANCE COSTS AND LAND REQUIREMENTS

1. Revised Baseline Costs

For the December 6, 1991 Proposal, EPA presented a set of "revised baseline" OCPSF costs based on the correction of minor inconsistencies discovered in the basis for the 1987 Promulgation cost estimates. The basis for these revised baseline costs is presented below.

The compliance cost estimates and corresponding economic impact analyses summarized in the November 5, 1987 Federal Register notice did not include estimated steam stripper and chemical precipitation upgrade costs. During development of the OCPSF guidelines, the steam stripper upgrade costs were developed for existing in-place treatment for three direct discharge plants without end-of-pipe biological treatment and nine indirect dischargers. The cost estimates associated with the steam stripping upgrades are presented in Table III-2.

The chemical precipitation upgrade costs were developed for 20 direct and nine indirect discharging plants with chemical precipitation in place. The cost estimates associated with these chemical precipitation upgrades are presented in Table III-3.

In addition, another BAT (direct) plant, Plant 399, was costed for a complete lime precipitation system since its in-place precipitation unit utilizes sodium hydroxide to facilitate the recovery of zinc; therefore, the plant would not be able to improve its system with the methods used for costing other plants. The costs associated for the complete lime precipitation system for this plant are also shown in Table III-3.

Prior to promulgation a separate economic impact assessment of these upgrade costs generally demonstrated insignificant incremental economic impacts for these plants (1987 Dev. Doc., pp. VIII-118 to 120 and VIII-174 to 181). However, at this time, EPA is including these upgrade costs in the cost estimates for the final regulation.

The revised total cost estimates for all the plants affected by the steam stripping and chemical precipitation upgrades along with the total cost estimates at promulgation are presented in Table III-4.

The Agency also reassessed the procedures used to estimate the BAT and PSES costs of compliance. The procedures generally included the use of reported or projected raw waste concentrations for each toxic pollutant present in each plant's product/process waste streams. Then, depending on the pollutant groups and pollutant concentrations, the Agency selected in-plant and/or end-of-pipe treatment technology for cost estimating purposes (1987 Dev. Doc. pp. VIII-7 to 28). For example, steam stripping was costed for volatile pollutants above selected concentrations and chemical precipitation for metals above selected concentrations. The treatment technology reassessment, which discovered several errors in transferring individual unit operation costs into the final economic impact analysis, resulted in revised plant costs for one direct discharge plant and 22 indirect discharge plants. These corrections increased costs for some plants and decreased costs for others. For example, the technology basis for plant 1718's cost estimate

TABLE III-2

COMPLIANCE COST ESTIMATES FOR STEAM STRIPPING UPGRADES

BAT (Direct Plants)			PSES (Indirect Plants)		
Plant No.	Capital Cost ($)*	O&M Cost ($)*	Plant No.	Capital Cost ($)*	O&M Cost ($)*
105	4,350	70,000	72	2,600	9,000
913	18,000	600,000	283	9,000	420,000
1785	3,800	48,000	494	7,800	240,000
			702	3,000	20,000
			1657	8,600	295,000
			1740	3,300	30,000
			2635	9,000	420,000
			4014	2,600	5,500
			4047	2,600	5,500

* Cost estimates are presented in 1982 dollars

1987 Dev. Doc. p. VIII-120

TABLE III-3

COMPLIANCE COST ESTIMATES FOR CHEMICAL PRECIPITATION UPGRADES

BAT (Direct Plants)		PSES (Indirect Plants)	
Plant No.	O&M Cost* ($/year)	Plant No.	O&M Cost* ($/year)
63	4,750	72	1,000
190	1,700	206	1,000
485	3,500	212	1,000
695	60,000	293	1,600
775	4,750	905	1,000
871	3,750	1126	1,600
1059	14,500	1357	1,000
1348	1,000	1534	3,500
1522	48,000	1848	1,000
1572	25,000		
1769	29,000		
1785	7,000		
2030	1,600		
2292	1,000		
2429	1,000		
2447	1,000		
2474	2,850		
2692	1,000		
2739	1,000		

PLANT NO.	CAPITAL COST* ($)	O&M COST* ($/YEAR)	LAND COST* ($)
399	2,000,000	335,000	9,100

* Cost estimates are presented in 1982 dollars.

1987 Dev. Doc. p. VIII-181

TABLE III-4
REVISED PLANT-BY-PLANT COST ESTIMATES FOR PLANTS WITH STEAM STRIPPING AND CHEMICAL PRECIPITATION UPGRADES

BAT (Direct Plants):

	COST ESTIMATES AT PROMULGATION			REVISED COST ESTIMATES[1]		
PLANT NO.	TOTAL CAPITAL COST ($)*	TOTAL O&M COSTS ($/YEAR)*	LAND COSTS ($)*	TOTAL CAPITAL COSTS ($)*	TOTAL O&M COSTS ($/YEAR)*	LAND COST ($)*
63	0	0	0	0	4,750	0
105	1,079,744	2,052,382	319,782	4,350	70,000	0
190	731,177	1,071,083	66,000	731,177	1,072,783	66,000
399	0	0	0	2,000,000	335,000	9,100
485	1,866,959	2,951,008	114,488	1,886,959	2,954,508	114,488
695	2,383,893	184,490	94,475	2,383,843	244,440	94,475
775	540,068	644,016	3,151	540,068	648,766	3,151
871	451,103	39,242	6,002	451,103	42,992	6,002
913	965,727	195,760	38,423	983,727	795,760	38,423
1059	0	0	0	0	14,500	0
1348	0	0	0	0	1,000	0
1522	811,772	4,092,048	22,573	811,772	4,140,048	22,573
1572	0	0	0	0	25,000	0
1769	7,875,173	9,689,672	157,155	7,875,173	9,718,672	157,155
1785	804,353	136,003	19,563	808,155	191,003	19,563
2030	1,312,598	1,387,596	79,420	1,312,598	1,389,196	79,420
2292	623,152	160,108	35,602	623,152	161,108	35,602
2429	577,550	116,539	62,203	577,550	117,539	62,203
2447	0	0	0	0	1,000	0
2474	740,217	423,814	28,735	740,217	426,664	28,735
2692	0	0	0	0	1,000	0
2739	117,139	86,578	8,235	117,139	87,578	8,235

PSES (Indirect Plants):

	COST ESTIMATES AT PROMULGATION			REVISED COST ESTIMATES[1]		
PLANT NO.	TOTAL CAPITAL COST ($)*	TOTAL O&M COSTS ($/YEAR)*	LAND COSTS ($)*	TOTAL CAPITAL COSTS ($)*	TOTAL O&M COSTS ($/YEAR)*	LAND COST ($)*
72	108,989	107,576	21,252	111,589	117,576	21,252
206	529,234	47,464	13,519	529,234	48,464	13,519
212	33,247	31,778	949	33,247	32,778	949
283	1,929,490	153,681	68,756	1,938,440	573,681	68,756
293	694,026	180,783	7,103	694,026	182,383	7,103
494	320,686	44,996	5,493	328,486	284,996	5,493
702	45,804	31,778	1,315	48,804	51,778	1,315
905	511,629	81,770	10,353	511,629	82,770	10,353
1126	1,264,676	2,361,477	53,330	1,264,676	2,363,077	53,330
1357	492,562	42,073	8,574	492,562	43,073	8,574
1534	509,230	42,080	4,139	509,230	45,580	4,139
1657	2,124,901	295,903	25,893	2,133,501	590,903	25,893
1740	547,859	101,476	20,347	550,859	131,476	20,347
1848	43,397	25,019	289	43,397	26,019	289
2635	2,287,933	193,123	50,626	2,296,933	613,123	50,626
4014	352,094	63,076	1,328	354,694	68,576	1,328
4047	432,268	88,173	1,892	434,868	93,673	1,892

(1) Cost estimates include both steam stripping and chemical precipitation upgrades cost where applicable.
* Cost estimates are presented in 1982 dollars

a combination of in-plant biological treatment and contract hauling at promulgation (1987 Dev. Doc. pp. VIII-B71), but should have been based on contract hauling alone. The basis for plant 2057's cost estimate was steam stripping and in-plant biological treatment at promulgation (1987 Dev. Doc. pp. VIII-B72), but should have been based on steam stripping alone. However, in the case of other plants such as plant 293, cost estimates at promulgation (1987 Dev. Doc. pp. VIII-B46) were based on steam stripping and in-plant biological but should have also included activated carbon and cyanide destruction (1987 Dev. Doc. pp. VIII-B68). These technology corrections were also included in the new baseline analysis for the current remand study and are presented in Table III-5. The revised total cost estimates based on these corrections versus the cost estimates at promulgation for the plants that were affected by the corrections and are shown in Table III-6.

The Agency also reassessed the flow basis used to estimate costs of compliance and found several errors and inconsistencies in rounding off or truncating reported flows. For the new baseline analysis, the Agency corrected the flows used to estimate costs of compliance for 14 indirect discharge plants.

Corrections of these errors also increased costs for some plants and decreased costs for others. For example, the flow for plant 249 was truncated to 0.0162 MGD at promulgation, but should have been 0.01623 MGD; and for plant 438, the flow was rounded off to 0.051 MGD at promulgation, but should have been 0.0508 MGD. The flow corrections for all 14 indirect plants are presented in Table III-7. The revised cost estimates for these 14 plants affected by the flow corrections versus the as-promulgated cost estimates are also shown in Table III-7.

2. Revised In-plant Biological Treatment Costs

Revised compliance costs for BAT Subpart J direct dischargers and PSES indirect dischargers were developed based on in-plant biological treatment systems with 3.5 to 17.2 day detention times (84 hrs. to 413 hrs.). The principal basis for the revised designs includes an analysis of the OCPSF record support related to biological treatment design and performance for the 19 remanded BAT Subpart J pollutants. OCPSF facilities with biological treatment in-place and with relatively high phenol raw waste concentrations were identified from the Verification, 5 CMA/EPA Plant Study, and the EPA 12 Plant Sampling Studies as well as the 308 Questionnaire Data Base. When available, the aeration basin detention time, and the average influent and effluent phenol concentration for each of these plants were identified. Table III-8 presents the results of this analysis. Based on the information obtained, it was

TABLE III-5 TECHNOLOGY CORRECTIONS

A. Direct (BAT) Subpart J Plants:

PLANT NO.	TECHNOLOGIES COSTED AT PROMULGATION(1)	TECHNOLOGIES COSTED BASED ON CORRECTIONS(1)
488	CP, SS, PB	CP, SS, PB, AC, CN
2660	AC, CH	No costs (zero discharge)

B. Indirect (PSES) Plants:

PLANT NO.	TECHNOLOGIES COSTED AT PROMULGATION(1)	TECHNOLOGIES COSTED FOR REVISED BASELINE COST(1)
58	PB	Monitoring Only
161	SS, CP	CP, AC, SS, CN, PB
293	SS, PB	AC, SS, CN, PB
417	PB	Monitoring Only
607	CP, AC	CP, AC, SS, CN, PB
797	CP, AC	CP, AC, SS, CN, PB
1172	SS, CP	SS, PB
1191	SS, CP, PB	CP, AC, SS, CN, PB
1320	SS, CH	SS, PB, CH
1659	CP, AC	CP, AC, SS, CN, PB
1666	CP, AC	CP, AC, SS, CN, PB
1716	CP, AC	CP, AC, SS, CN, PB
1718	PB, CH	CH
1838	SS, BP, CH	CH
1848	CH Cost = $592,249	CH Cost = $396,317
2057	SS, PB	SS
2129	CP, AC	CP, AC, SS, CN, PB
2232	Monitoring Cost=$29,539	Monitoring Cost=$26,827
2507	PB	Monitoring Only
2677	SS, CP, PB	CP, AC, SS, CN, PB
4042	PB	Monitoring Only
4072	SS, CP	CP, AC, SS, CN, PB

(1) CP = Chemical Precipitation
SS = Steam Stripping
AC = Activated Carbon
CN = Cyanide Destruction
PB = In-Plant Biological
CH = Contract Hauling

TABLE III-6 REVISED COST ESTIMATES BASED ON TECHNOLOGY CORRECTIONS

A. Direct (BAT) Plants:

PLANT No.	COST ESTIMATES AT PROMULGATION			REVISED COST ESTIMATES		
	TOTAL CAPITAL COSTS ($)*	TOTAL O&M COSTS ($/YEAR)*	LAND COSTS ($)*	TOTAL CAPITAL COSTS ($)*	TOTAL O&M COSTS ($/YEAR)*	LAND COSTS ($)*
488	893,795	109,571	34,598	1,154,248	468,093	109,650
2660	12,586	18,853	6,437	0	0	0

B. Indirect (PSES) Plants:

PLANT No.	COST ESTIMATES AT PROMULGATION			REVISED COST ESTIMATES		
	TOTAL CAPITAL COSTS ($)*	TOTAL O&M COSTS ($/YEAR)*	LAND COSTS ($)*	TOTAL CAPITAL COSTS ($)*	TOTAL O&M COSTS ($/YEAR)*	LAND COSTS ($)*
58	34,492	31,778	1,342	0	0	0
161	845,849	185,652	16,526	1,578,954	2,291,710	78,272
293(1)	694,026	180,783	7,103	1,247,793	2,292,150	26,785
417	91,684	33,044	23,250	0	0	0
607	418,470	258,962	19,007	988,390	336,991	29,710
797	358,393	82,077	6,596	892,176	149,820	11,198
1172	787,371	91,247	8,989	686,681	205,649	14,714
1191	839,997	78,013	3,581	941,311	228,119	91,402
1320	454,324	10,583	2,988	488,265	42,435	4,327
1659	488,007	521,563	32,462	1,093,815	618,591	49,392
1666	408,385	225,344	105,779	972,755	301,179	166,578
1716	455,843	394,172	29,601	1,044,991	481,746	45,385
1718	74,324	32,282	1,784	0	0	0
1838	454,719	10,410	8,460	0	0	0
1848(1)	43,397	25,019	289	43,397	26,019	289
2057	525,695	62,236	11,176	454,324	29,682	7,056
2129	407,442	222,266	24,552	971,267	297,915	38,692
2232	1,050,903	396,647	18,899	1,050,903	396,647	18,899
2507	73,357	32,245	3,489	0	0	0
2677	913,257	123,267	5,026	1,194,141	920,690	14,997
4042	88,716	32,902	5,308	0	0	0
4072	204,416	74,951	4,316	905,710	170,314	10,817

NOTES:

* Cost estimates presented in 1982 dollars.

(1) Revised cost estimates include upgrades cost also.

TABLE III-7 FLOW CORRECTIONS

PLANT NO.	FLOW AT PROMULGATION (MGD)	FLOW AT REVISED BASELINE COST (1990) (MGD)
249	0.0162	0.01623
310	0.0214	0.02143
438	0.051	0.0508
1194	0.0017	0.00179
1237	0.007	0.00702
1326	0.0161	0.01612
1891	0.233	0.2326
1971	0.016	0.0161
2288	0.00179	0.0018
2293	0.0053	0.00526
2341	0.455	0.4547
2495	0.12	0.1201
2501	0.00794	0.00795
2776	0.00543	0.00551

REVISED COST ESTIMATES BASED ON FLOW CORRECTIONS

PLANT No.	COST ESTIMATES AT PROMULGATION			REVISED COST ESTIMATES		
	TOTAL CAPITAL COSTS ($)*	TOTAL O&M COSTS ($/YEAR)*	LAND COSTS ($)*	TOTAL CAPITAL COSTS ($)*	TOTAL O&M COSTS ($/YEAR)*	LAND COSTS ($/YEAR) *
249	858,441	86,674	6,528	858,497	86,676	6,529
310	538,978	60,478	7,994	539,026	60,480	7,995
438	579,776	87,484	3,957	579,571	87,473	3,955
1194	486,918	42,078	11,555	487,507	42,078	11,562
1237	508,835	46,872	51,844	508,894	46,872	51,852
1326	530,181	43,045	3,403	530,218	43,047	3,404
1891	734,548	290,010	5,986	734,356	290,000	5,984
1971	858,066	84,780	3,676	858,254	84,787	3,678
2288	487,507	42,354	10,208	487,571	42,354	10,209
2293	503,406	46,420	51,142	503,268	46,420	51,125
2341	1,162,583	335,800	29,891	,162,478	335,795	29,886
2495	985,375	222,026	21,924	985,442	222,029	21,927
2501	839,491	77,377	5,048	840,018	77,377	5,048
776	927,294	207,907	33,901	928,028	209,287	33,983

* Cost estimates presented in 1982 dollars.

TABLE III-8

DETENTION TIME VERSUS AVERAGE INFLUENT PHENOL CONCENTRATIONS ANALYSIS

Plant #	Average Influent Phenol Concentration (ppb)	Average Effluent Phenol Concentration (ppb)	Detention Time (Hours)	Source Document for Detention Time
1650 V	117.33	10.9	72 to 1008 hours	308 supplemental
2430 V	157.50	11.17	4.5 hours	308 supplemental
948 F	239.24	10.2	72 hours	Verification report
384 T	266.18	ND (Not Detected)	16.6 hours	12 plant report
2221 V	487.00	ND	30.6 to 35.7 hours	308 questionnaire C12
2536 T	501.13	ND	25.2 hours	12 plant report
948 V	509.67	ND	72 hours	Verification report
2631 V	709.00	ND	45 hours*	Verification report
296 V	730.67	ND	136.8 hours	Verification report
12 F	760.71	14.9	62/41 (summer/winter)	308 questionnaire C12
267 F	1,645.55	10.7	8.4 hours	308 supplemental
2394 T	1,847.25	58.5	129.6 hours	12 plant report
1609 V	1,864.50	ND	24 hours	12 plant report
1769 P	2,108.33	---	8 hours	308 supplemental
1890 V	2,917.00	10.8	360 hours	Verification report
2445 P	5,810.00	---	6 hours	308 questionnaire C12
1494 V	18,500.00	ND	18 hours	308 supplemental
306 V	53,916.70	13.3	36 hours	Verification report
2711 V	237,500.00	ND	130 hours	308 questionnaire C12
1293 T	836,292.77	ND	412.8 hours	12 plant report

* Detention time calculated based on system volume and average of flow reported in report

determined that plants with raw wastewater phenol concentrations of up to 50 mg/l would comply with the numerical phenol limitations with biological treatment system with detention time up to 72 hours (however, 84 hours or 3.5 days was used as a safety factor), plants with raw waste phenol concentrations up to 300 mg/l would comply with detention times up to 130 hours (5.4 days), and plants with raw waste phenol concentrations over 300 mg/l would comply with detention times up to 413 hours (17.3 days). Similar assessments for the remaining 18 remanded pollutants were conducted to determine necessary detention time as a function of reported or modeled raw waste concentrations. Table III-9 presents the analysis of this assessment. Based on the information presented on Table III-9 it was determined that the costing methodology for revised in-plant biological treatment is as follows:

- For Pollutant #34 (2,4-Dimethylphenol), all BAT Subpart J plants with raw waste concentrations greater than 10 mg/l will be costed for an in-plant biological treatment system with a detention time of 413 hours; plants with raw waste concentrations above trigger levels but below 10 mg/l will be costed for an in-plant biological treatment system with a detention time of 84 hours.

- For Pollutant #55 (Naphthalene), all BAT Subpart J and PSES plants with raw waste concentrations greater than 3 mg/l will be costed for an in-plant biological treatment system with a detention time of 413 hours; plants with raw waste concentrations above trigger levels but below 3 mg/l will be costed for an in-plant biological treatment system with a detention time of 84 hours.

- For Pollutant #80 (Fluorene), all BAT Subpart J and PSES plants with raw waste concentrations greater than 0.5 mg/l will be costed for an in-plant biological treatment system with a detention time of 413 hours; plants with raw waste concentrations above trigger levels but below 0.5 mg/l will be costed for an in-plant biological treatment system with a detention time of 84 hours.

- For the remaining 15 remanded BAT Subpart J pollutants (excluding phenol) and the remaining 9 PSES pollutants, all BAT Subpart J and PSES plants with raw waste concentrations above trigger levels will be costed for an in-plant biological treatment system with a detention time of 84 hours.

Raw waste concentrations for phenol and the remaining 18 remanded pollutants were then obtained for each plant from the plant-by-plant pollutant loading estimates described in Chapter VIII of the 1987 Development Document.

Based on the analyses described above, a detention time was then assigned to each BAT Subpart J and PSES plant for purposes of estimating the revised cost of compliance for the remanded pollutants. As a result of these assessments, 24 BAT Subpart J and 176 PSES plants were assigned an 84 hour detention

TABLE III-9

DETENTION TIME ANALYSIS FOR THE REMAINING POLLUTANTS

Pollutant No.	Plant No.	Average Influent Concentration (ppm)	Average Effluent Concentration (ppm)	Detention Times (hours)	Source Document for Detention Time
1 (Acenaphthene)	12 F	0.102	ND (Not Detected)	62	308 Questionnaire C12
	1293 T	0.876	ND	413	12 Plant Report
	306 V	3.850	0.013	36	Verification Report
34 (2,4-Dimethylphenol)	12 F	0.697	0.013	62	308 Questionnaire C12
	3033 T	4.592	0.014	NA	--
	306 V	9.967	0.0102	36	Verification Report
	1293 T	29.868	ND	413	12 Plant Report
39 (Fluoranthene)	851 V	0.133	0.0102	34	Verification Report
	1293 T	1.572	0.0115	413	12 Plant Report
	306 V	5.225	0.0158	36	Verification Report
55 (Naphthalene)	2631 V	0.232	0.017	45	Verification Report
	695 V	0.250	ND	--	--
	2430 V	0.327	0.0112	4.5	308 Supplemental Questionnaire
	3033 T	0.520	ND	--	--
	384 T	1.040	ND	17	12 Plant Report
	1650 V	1.411	ND	72	308 Supplemental Questionnaire
	851 V	2.255	ND	34	Verification Report
	12 F	2.275	0.012	62	308 Questionnaire C12
	1293 T	20.964	ND	413	12 Plant Report
66 (Bis[2-Ethylhexyl] phthalate)	948 F	1.097	0.043	72	Verification Report
	948 V	4.396	0.053	72	Verification Report
68 (Di-n-Butylphthalate)	948 F	0.377	0.013	72	Verification Report
	948 V	2.265	0.03	72	Verification Report
70 (Diethylphthalate)	948 V	0.433	0.061	72	Verification Report
	948 F	1.220	0.023	72	Verification Report
71 (Dimethylphthalate)	948 V	0.134	0.037	72	Verification Report
	948 F	0.207	ND	72	Verification Report
72 (Benzo(α)Anthracene)	1293 T	0.308	ND	413	12 Plant Report
	306 V	1.585	0.056	36	Verification Report

TABLE III-9 (CONTINUED)

DETENTION TIME ANALYSIS FOR THE REMAINING POLLUTANTS

Pollutant No.	Plant No.	Average Influent Concentration (ppm)	Average Effluent Concentration (ppm)	Detention Times (hours)	Source Document for Detention Time
76 (Chrysene)	1293 T	0.266	ND	413	12 Plant Report
	384 T	0.312	ND	17	12 Plant Report
	306 V	1.082	ND	36	Verification Report
77 (Acenaphthylene)	1293 T	0.472	ND	413	12 Plant Report
	1650 V	0.641	ND	72	308 Supplemental Questionnaire
	306 V	9.758	0.013	72	Verification Report
78 (Anthracene)	851 V	0.494	0.0107	34	Verification Report
	1293 T	0.694	ND	413	12 Plant Report
	306 V	2.105	ND	36	Verification Report
80 (Fluorene)	1650 V	0.167	ND	42	308 Supplemental Questionnaire
	851 V	0.475	ND	34	Verification Report
	1293 T	1.232	ND	413	12 Plant Report
81 (Phenanthrene)	1650 V	0.166	ND	72	308 Supplemental Questionnaire
	2313 T	0.612	0.025	72	12 Plant Report
	851 V	2.452	ND	34	Verification Report
	1293 T	3.285	ND	413	12 Plant Report
	306 V	8.450	0.017	36	Verification Report
84 (Pyrene)	851 V	0.246	0.0165	34	Verification Report
	1293 T	1.023	0.0103	413	12 Plant Report
	306 V	3.083	0.016	36	Verification Report

time, and 6 BAT Subpart J and 26 PSES plants were assigned a 413 hour detention time. The detention times assigned for each BAT Subpart J and PSES plants are shown in Table III-10.

The Agency also investigated the effect of higher detention times on the land requirements for estimating the land costs associated with the revised model in-plant biological treatment systems. Land requirements for small facilities (flow ≤0.5 mgd) and costs were estimated applying the same methodologies used at promulgation (1987 Dev. Doc. pp. VIII-35 to 56 and VIII-187 to 196).

For the large facilities (flow ≥ 0.501 mgd) the land requirement calculated applying the same methodologies used at promulgation were considered excessively high (104 acres for a 5.0 mgd flow). An alternative way for estimating land requirements for large plants was investigated and an alternative method was presented in the December 6, 1991 Proposal.

A search of the literature[1] revealed that modern design of aeration tanks requires that the width of the tank be at least 1.5 times its depth and widths as great as 2.15 times the depth have been successfully used. The length of the aeration tanks although not critical are generally 8 to 18 times their widths. Furthermore, for tanks using diffusers, greater widths are permissible. Most diffused-air aeration tanks in the United States have liquor depths of about 15 feet, but it appears that there probably is not much difference in power requirements per million gallons per day of wastewater treated over a practical range in depths. In addition, it has been shown that the transfer efficiency increases with diffuser depth because of increased oxygen partial pressure and increased contact time between the bubble and mixed liquor. Selection of the most economical depth for aeration design must then take into consideration available area, land cost and the difficulty and cost of construction. The most economical depth, especially for large facilities, may be considerably more than 15 feet.

Based on this information, land requirements for large in-plant biological treatment systems were calculated based on 20 feet deep by 45 feet wide diffused aeration tanks. The revised in-plant biological treatment land requirements are presented in Table III-11.

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1 "Sewage Treatment Plant Design" American Society of Civil Engineers and Water Pollution Control Federation (WPCF Manual of Practice No. 8 pg.129-134).

TABLE III-10 PLANT-BY-PLANT DETENTION TIME ASSIGNMENT

A. BAT Subpart J Plants:

84 Hours				130 Hours	413 Hours
76	814	1569	2073		225
105	859	1618	2268		260
114	913	1688	2419		447
412	942	1785	2527		2400
446	1249	2030	2735		2590
657	1439	2047	2767		2786

B. PSES Plants:

84 Hours				130 Hours	413 Hours		
10	717	1361	2250		79	1163	1534
22	724	1426	2259		220	1172	1645
33	743	1432	2261		310	1173	1832
49	749	1450	2288		430	1194	1904
51	768	1478	2293		592	1220	2084
72	771	1504	2311		830	1234	2666
94	791	1560	2318		944	1437	2748
110	797	1575	2341		1047	1507	4027
119	814	1595	2348		1094	1528	
120	819	1608	2350				
149	862	1622	2442				
155	877	1628	2465				
161	887	1657	2469				
163	905	1659	2485				
196	987	1666	2487				
206	992	1667	2498				
212	1018	1706	2517				
214	1052	1716	2524				
221	1053	1744	2539				
240	1057	1751	2548				
249	1083	1773	2565				
262	1085	1788	2635				
266	1086	1793	2646				
283	1091	1826	2677				
293	1117	1853	2714				
326	1126	1876	2736				
334	1181	1891	2741				
354	1191	1894	2756				
433	1197	1899	2776				
438	1202	1931	2793				
458	1219	1971	4001				
468	1236	1993	4006				
492	1237	2004	4007				
494	1249	2007	4008				
522	1264	2037	4014				
536	1310	2070	4024				
543	1313	2093	4026				
567	1320	2117	4032				
607	1322	2129	4044				
611	1326	2176	4047				
624	1351	2184	4050				
658	1352	2232	4057				
661	1356	2241	4070				
706	1357	2243	4072				

TABLE III-11

REVISED LAND REQUIREMENT ESTIMATES FOR IN-PLANT BIOLOGICAL TREATMENT SYSTEMS

REVISED LAND REQUIREMENTS FOR IN-PLANT BIOLOGICAL TREATMENT SYSTEMS			
A. Small Faciliites: Flow < 0.5 MGD			
	td = 84 hours	td = 130 hours	td = 413 hours
FLOW (MGD)	Land Requirement in Acres	Land Requirement in Acres	Land Requirement in Acres
0.001	0.075	0.075	0.075
0.005	0.075	0.100	0.150
0.010	0.100	0.125	0.200
0.050	0.200	0.250	0.500
0.10	0.275	0.375	0.850
0.5	0.350	1.25	3.25
B. Large Facilities: Flow ≥ 0.501 MGD			
0.75	2.2	3.1	8.9
1.0	2.8	3.9	11.7
1.5	4.1	5.7	17.3
2.0	5.3	7.5	22.9
3.0	7.7	10.9	34.2
4.0	10.1	14.4	45.1
5.0	12.5	17.9	56.2

* td = detention time

The Agency then developed cost estimates based on the new detention times using the same methodologies as those used at promulgation (1987 Dev. Doc. pp. VIII-40 to 44, VII-187 to 196). All costs estimates were generated using the CAPDET design program and are presented in Table III-12. Cost equations were developed from the costs presented in Table III-12 using the formula:

$$\text{Cost} = \text{EXP}\ (A + B\ (\text{LN (FLOW)} + C\ (\text{LN (FLOW)}^2)))$$

where Flow = wastewater flow in million gallons per day (MGD)

A simple regression analysis was performed on the data and the resulting coefficients to be used in the cost equations are as follows:

Small Facilities (≤ 0.50 MGD) Capital Cost Equations

Detention Time (hours)	A	B	C
84	13.601423	0.495704	0.006896
130	13.869229	0.534216	0.011285
413	14.614746	0.621062	0.018345

Small Facilities (≤ 0.50 MGD) O&M Cost Equations

Detention Time (hours)	A	B	C
84	10.895981	0.195023	0.018721
130	10.916619	0.196361	0.018704
413	10.979743	0.192164	0.017507

Large Facilities (≥ 0.501 MGD) Capital Cost Equations

Detention Time (hours)	A	B	C
84	15.937751	0.850382	0.038533
130	16.260803	0.899157	0.022164
413	17.334281	0.998243	0.009300

Large Facilities (≥ 0.501 MGD) O&M Cost Equations

Detention Time (hours)	A	B	C
84	12.953531	0.747813	0.035124
130	13.186191	0.765472	0.028102
413	14.027799	0.807600	0.015157

TABLE III-12

REVISED CAPITAL AND O&M COST FOR IN-PLANT BIOLOGICAL TREATMENT SYSTEMS						
SMALL FACILITIES: FLOW < 0.5 MGD						
FLOW (MGD)	td = 84 hours		td = 130 hours		td = 413 hours	
	CAPITAL COST ($)	O&M COST ($/YEAR)	CAPITAL COST ($)	O&M COST ($/YEAR)	CAPITAL COST ($)	O&M COST ($/YEAR)
0.001	36,102	33,207	44,601	33,598	72,640	34,870
0.005	72,640	33,858	87,942	34,238	139,568	35,733
0.01	95,471	34,021	114,023	34,477	189,968	36,762
0.05	193,556	34,953	233,064	35,540	406,610	37,876
0.1	261,944	35,524	324,073	36,245	576,732	38,810
0.5	581,049	49,322	733,979	50,239	1,470,963	53,588
LARGE FACILITIES: FLOW ≥ 0.501 MGD						
0.75	6,565,929	341,867	8,963,250	429,486	25,426,593	982,196
1.0	8,351,329	422,220	11,444,568	531,214	33,663,672	1,234,987
1.5	11,802,309	573,540	16,720,920	730,876	50,522,129	1,719,570
2.0	15,397,620	722,754	21,699,793	918,061	67,338,461	2,182,090
3.0	22,195,087	1,001,554	31,808,299	1,278,526	102,813,111	3,052,376
4.0	29,445,593	1,277,468	42,173,774	1,629,747	138,458,709	3,912,749
5.0	36,097,246	1,538,101	51,645,705	1,960,910	170,742,915	4,709,662

NOTE: Cost estimates are presented in 1982 dollars.

The corresponding cost curves are presented in Figures III-1 through III-12. A series of cost estimation analyses were completed to assist in performing various economic impact analyses to respond to public comments on the December 6, 1991 Proposal. These cost estimation analyses are presented below.

3. The Initial Analysis

This analysis was performed to estimate the economic impacts associated with only the portions of the regulation that were unaffected by the Court's remand decision. This involved updating the applicability of BAT Subpart I and Subpart J and PSES based on the April 1991 survey results, estimating revised compliance costs for those plants whose Subpart applicability had changed and then eliminating all in-plant biological-related treatment costs for the BAT Subpart J and PSES plants. In addition, for the plants that switched from BAT Subpart I to BAT Subpart J based on the April 1991 survey results, the end-of-pipe (EOP) biological treatment costs estimated for compliance with BPT and the in-plant BAT treatment costs (with the exception of any in-plant biological treatment costs) were retained to serve as a conservative cost estimate to cover whatever these plants did to comply with BPT/BAT Subpart J without installing EOP biological treatment. This estimate is conservative because it is unlikely that plants chose a more expensive alternative to the model technology to achieve compliance. Finally, it also includes the corrections as outlined in Sections III.D.1 of this document. "Revised Baseline Costs". This "initial analysis" estimates the cost of compliance with the entire OCPSF rule with the exception of the remanded limitations and standards based on current information on plant status. The compliance costs associated with the "initial analysis" are presented in Appendix III-B.

4. The RIA Analysis

This analysis was performed to determine if an RIA was required for the amendments that were to be promulgated and involved estimating revised in-plant biological treatment costs for the 19 remanded BAT Subpart J and 11 PSES parameters for the all affected PSES plants and BAT Subpart J plants. These plants were determined based on the results of the April 1991 survey. The "RIA Analysis" presents the cost of this rule segregated from the costs of the remainder of the OCPSF regulation. The costs associated with the RIA Analysis are presented in Appendix III-C.

5. The Preamble Economic Impact Analysis

This analysis was performed to estimate the economic impacts associated with the OCPSF regulation as amended by this rule and involved adding the costs from the Initial Analysis and the RIA Analysis. The

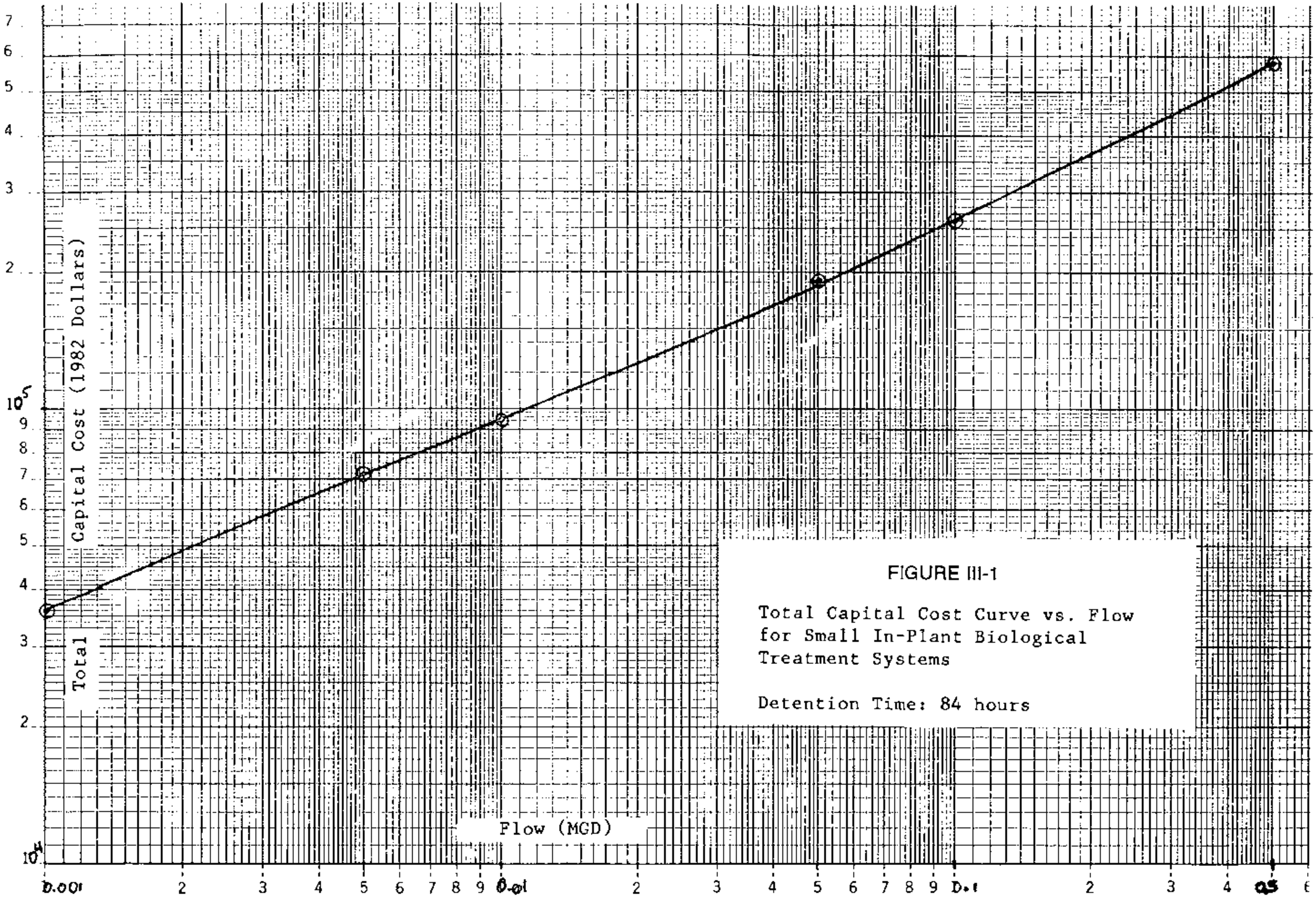

FIGURE III-1

Total Capital Cost Curve vs. Flow for Small In-Plant Biological Treatment Systems

Detention Time: 84 hours

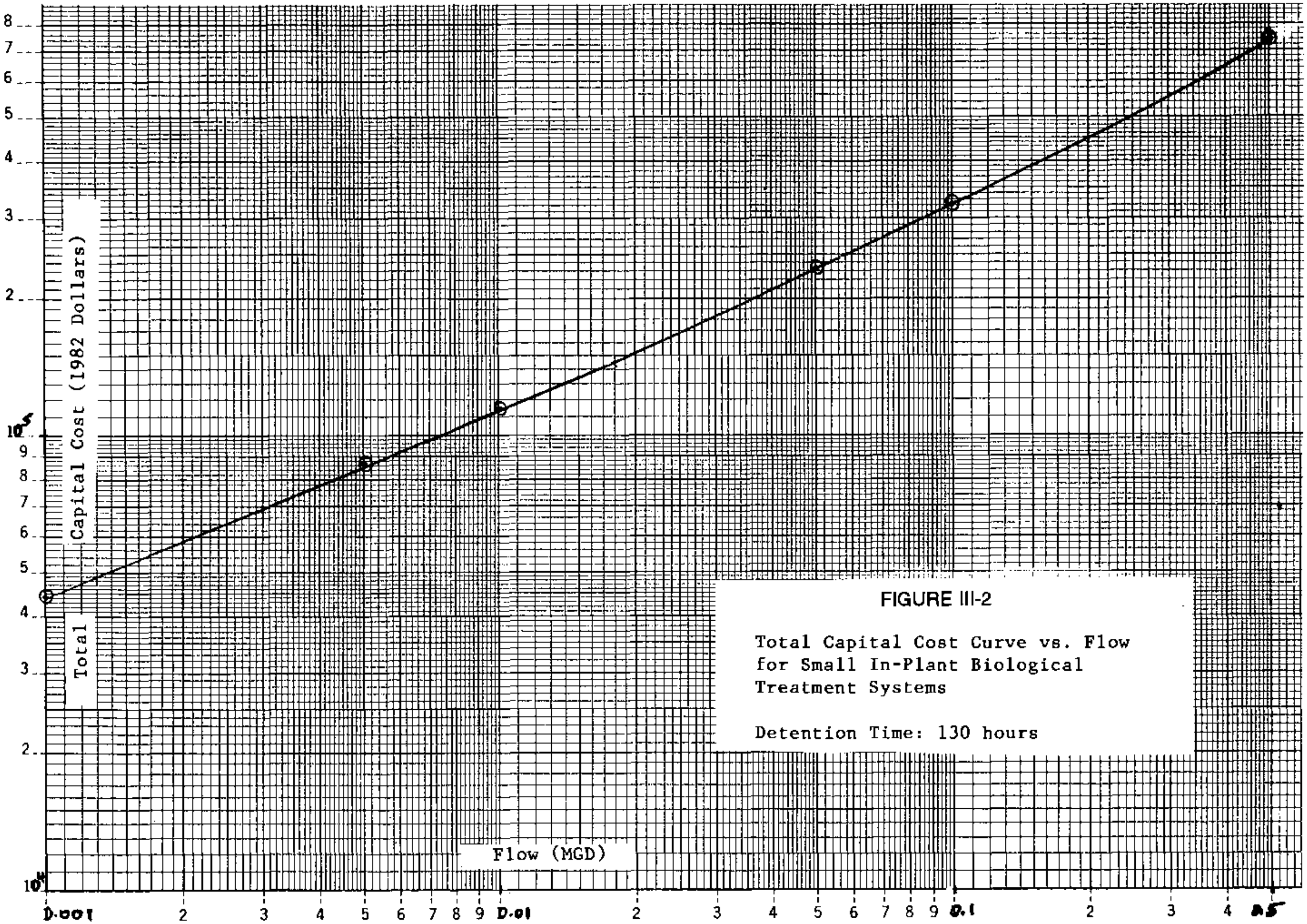

FIGURE III-2

Total Capital Cost Curve vs. Flow for Small In-Plant Biological Treatment Systems

Detention Time: 130 hours

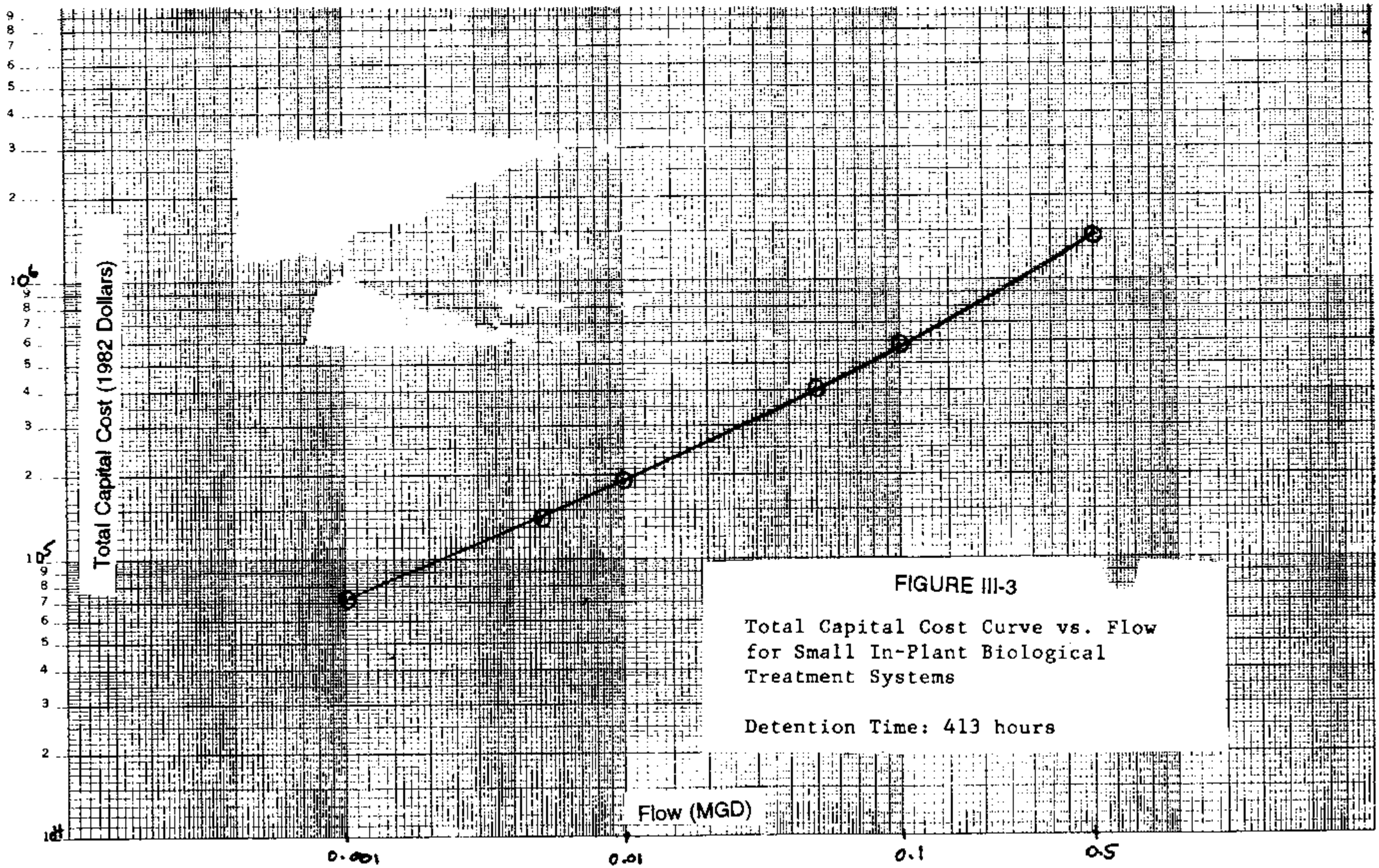

FIGURE III-3

Total Capital Cost Curve vs. Flow for Small In-Plant Biological Treatment Systems

Detention Time: 413 hours

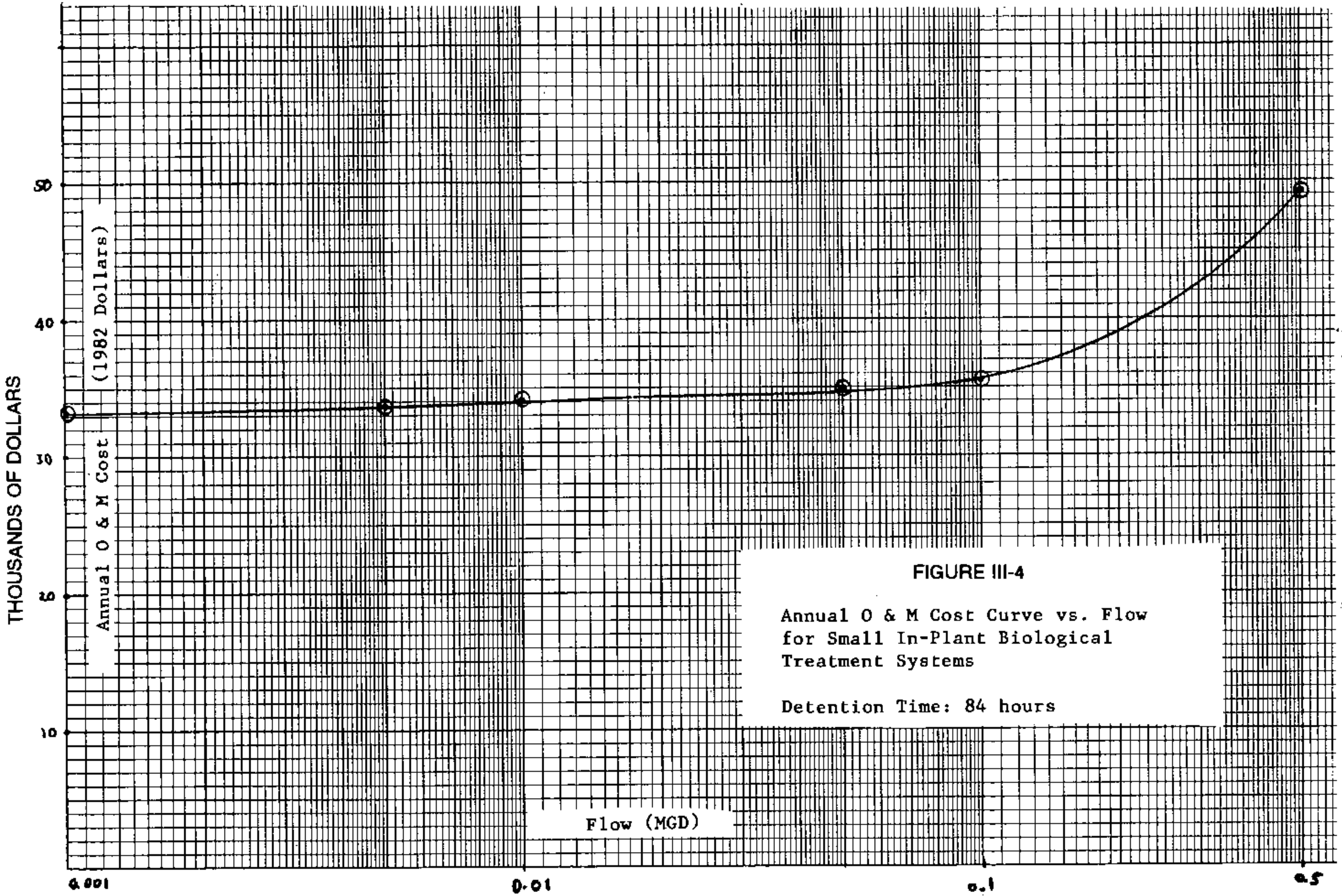

FIGURE III-4

Annual O & M Cost Curve vs. Flow for Small In-Plant Biological Treatment Systems

Detention Time: 84 hours

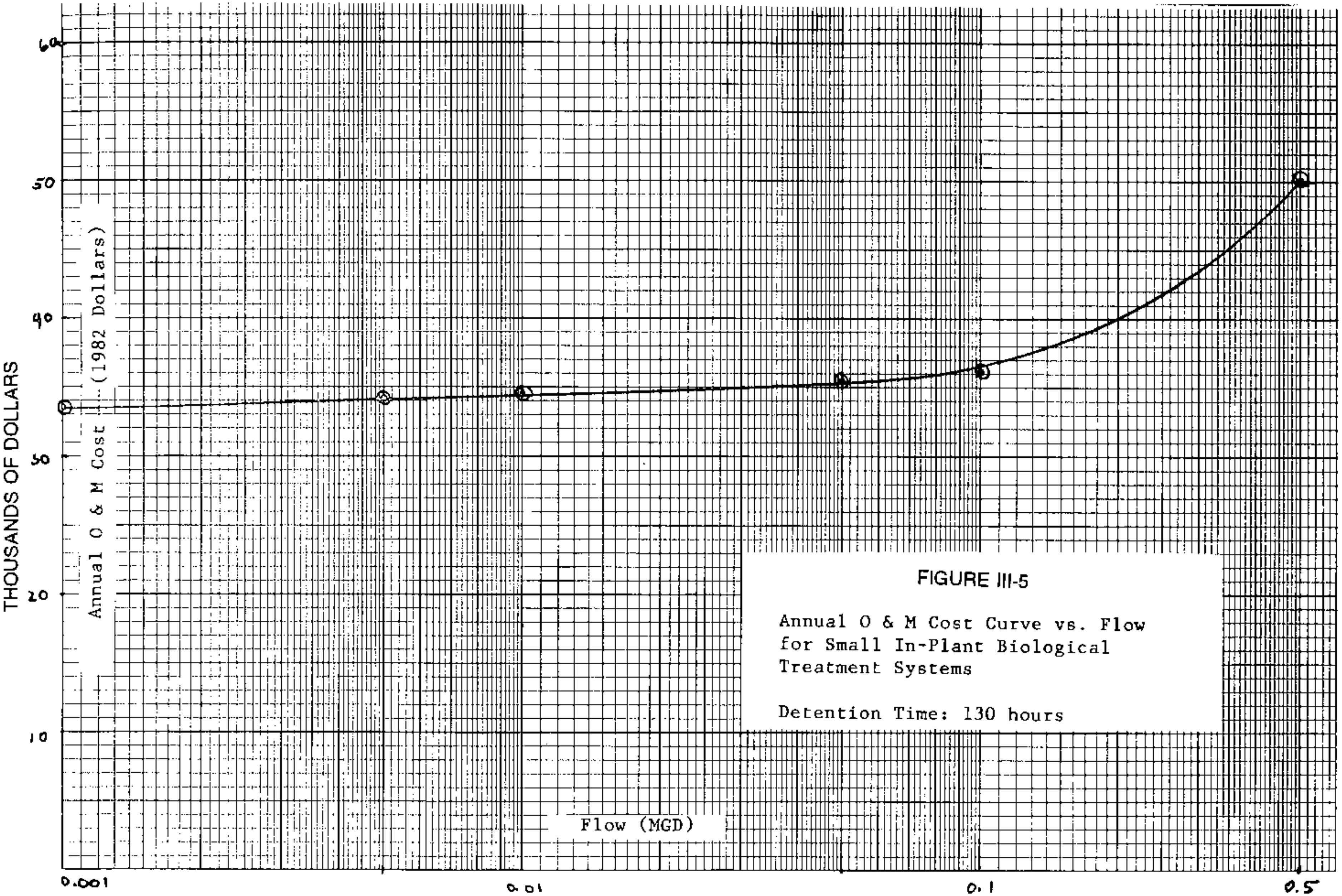

FIGURE III-5

Annual O & M Cost Curve vs. Flow for Small In-Plant Biological Treatment Systems

Detention Time: 130 hours

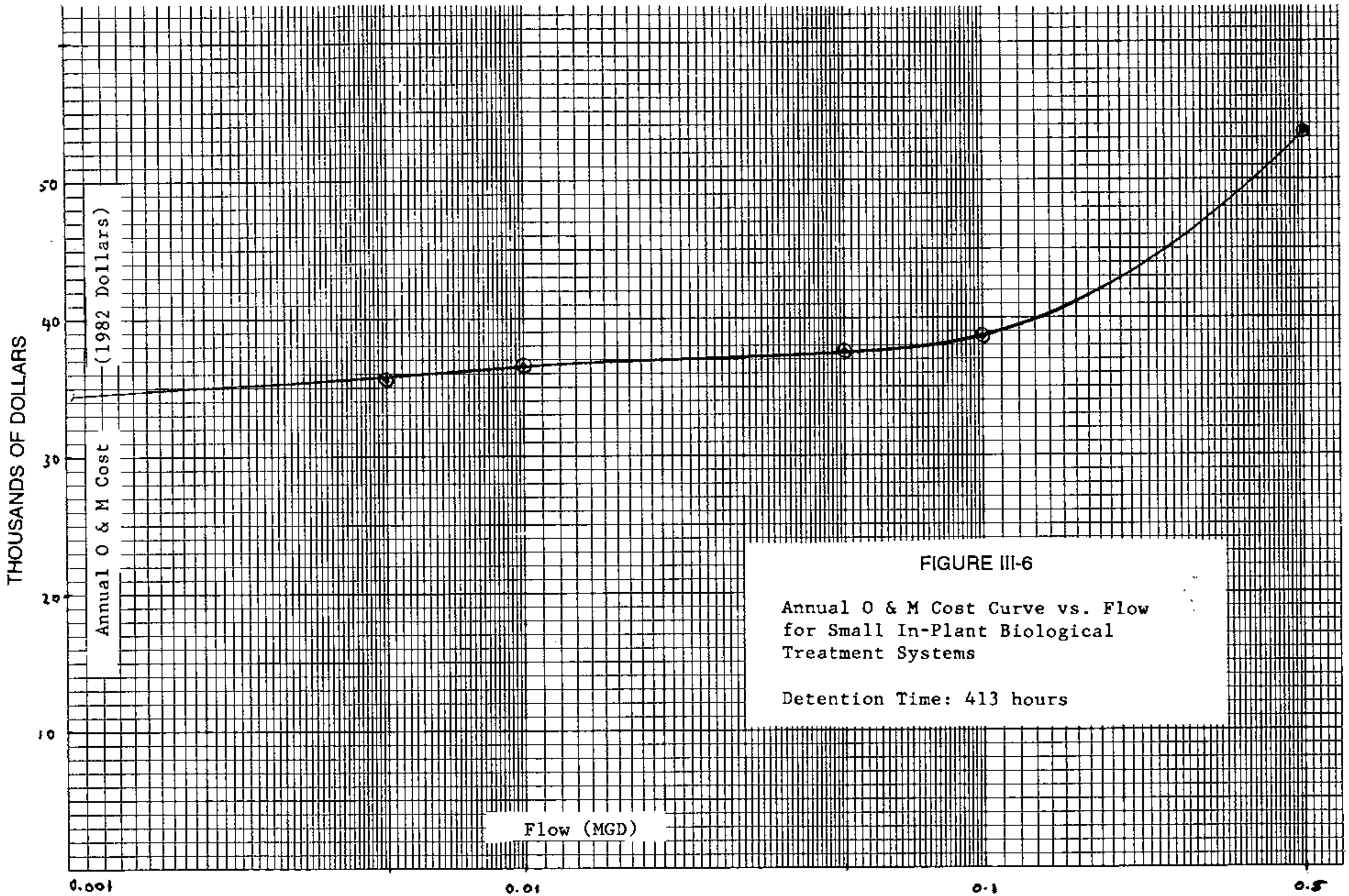

FIGURE III-6

Annual O & M Cost Curve vs. Flow for Small In-Plant Biological Treatment Systems

Detention Time: 413 hours

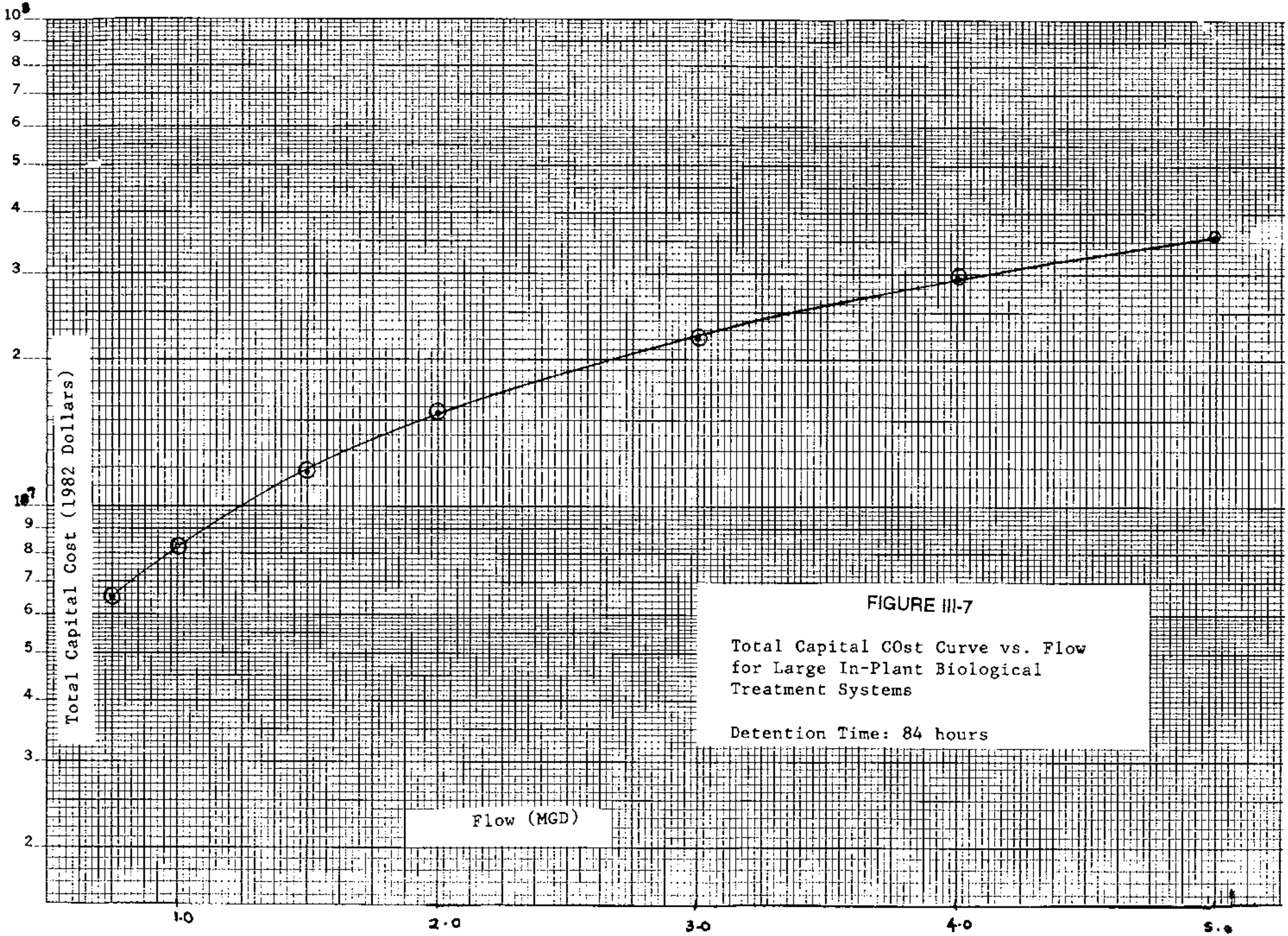

FIGURE III-7

Total Capital COst Curve vs. Flow
for Large In-Plant Biological
Treatment Systems

Detention Time: 84 hours

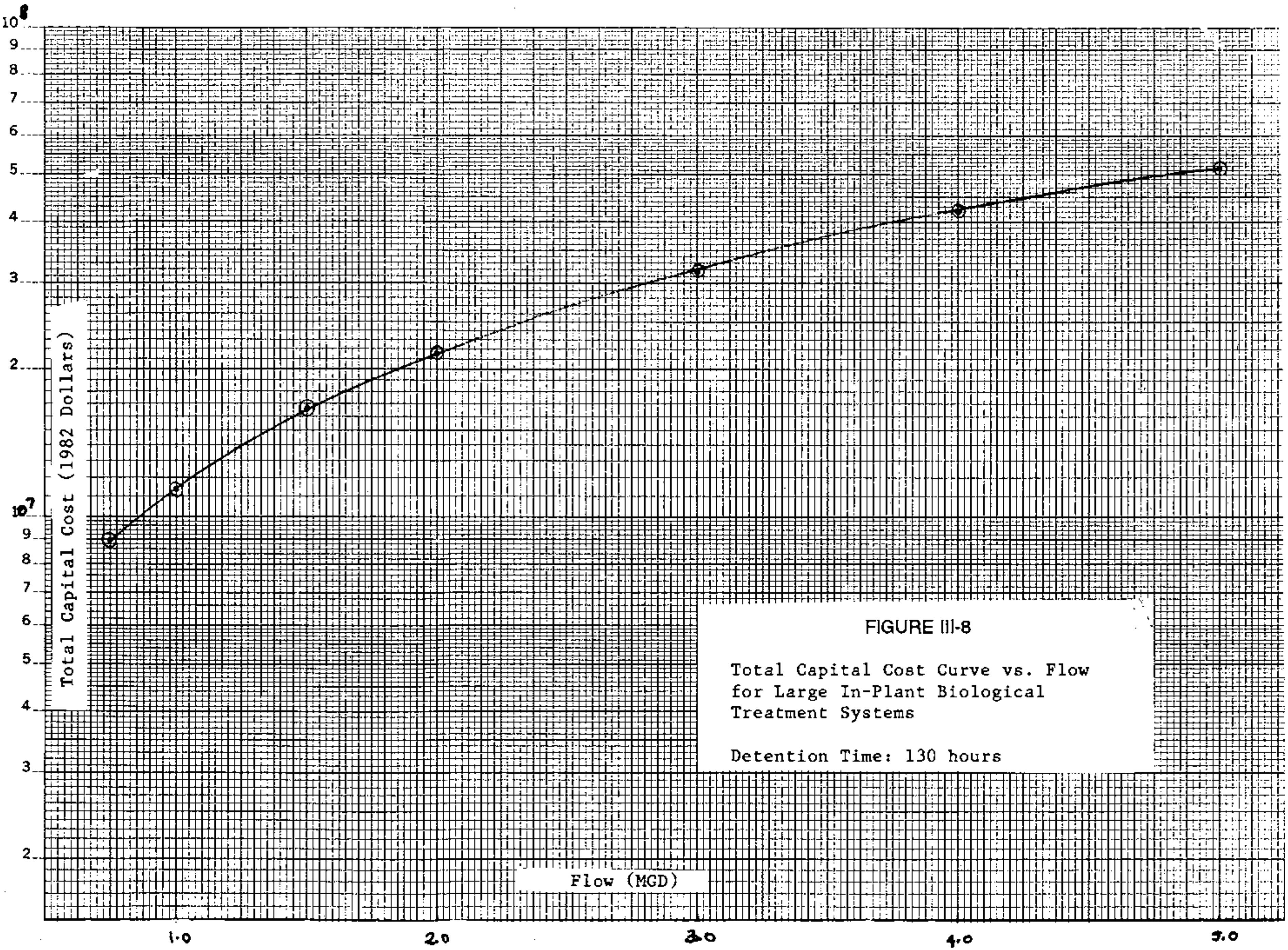

FIGURE III-8

Total Capital Cost Curve vs. Flow for Large In-Plant Biological Treatment Systems

Detention Time: 130 hours

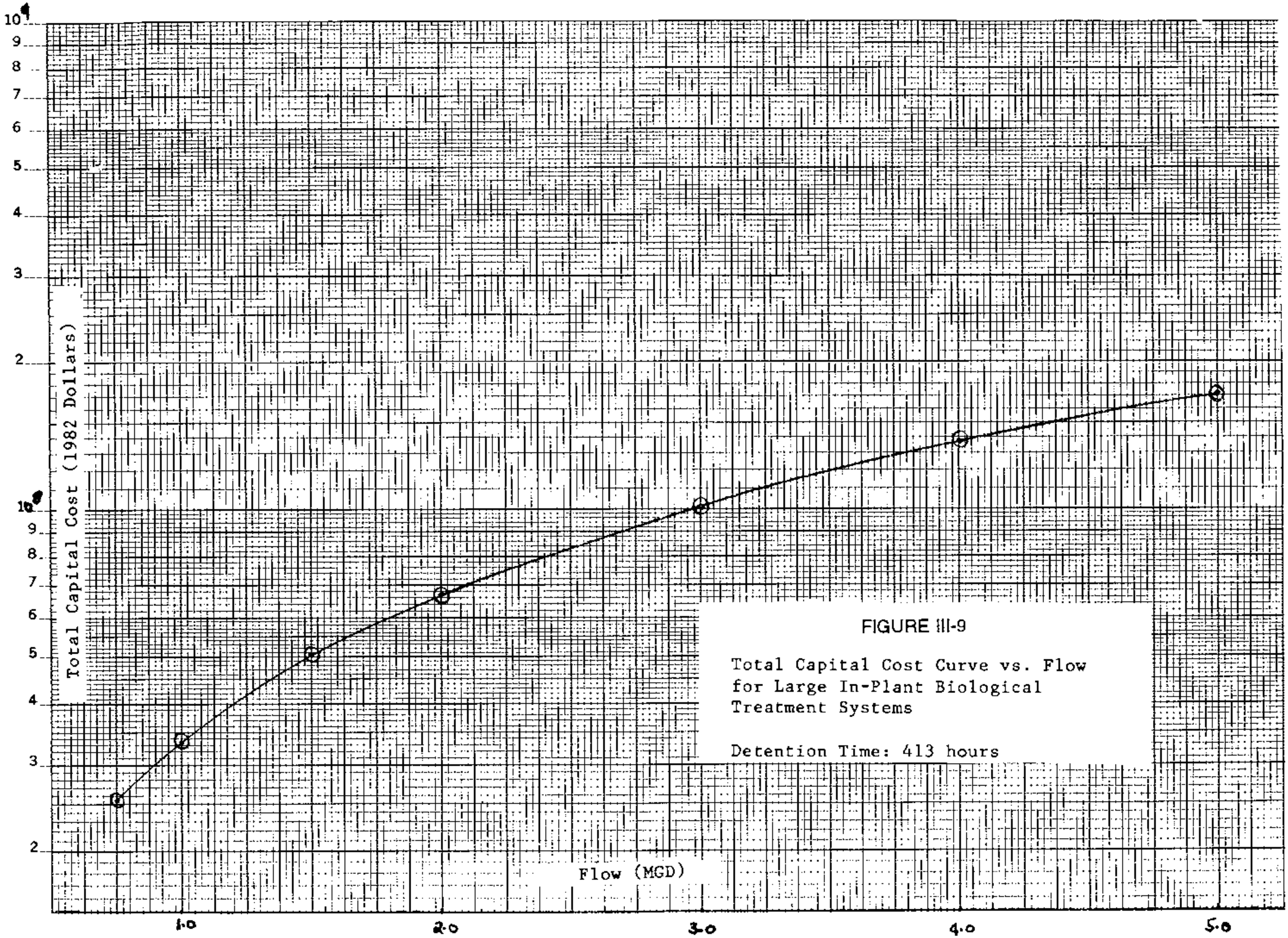

FIGURE III-9

Total Capital Cost Curve vs. Flow for Large In-Plant Biological Treatment Systems

Detention Time: 413 hours

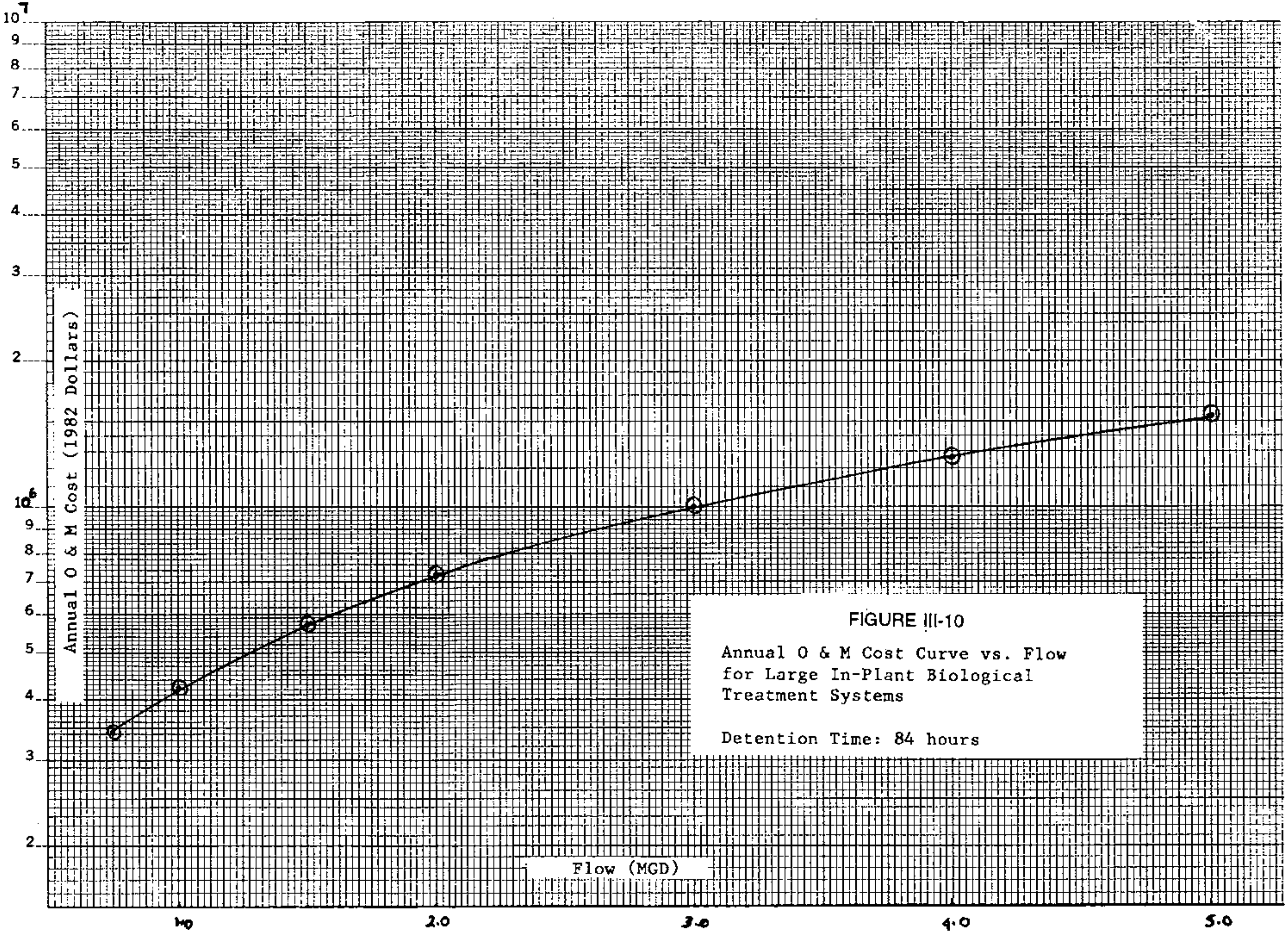

FIGURE III-10

Annual O & M Cost Curve vs. Flow for Large In-Plant Biological Treatment Systems

Detention Time: 84 hours

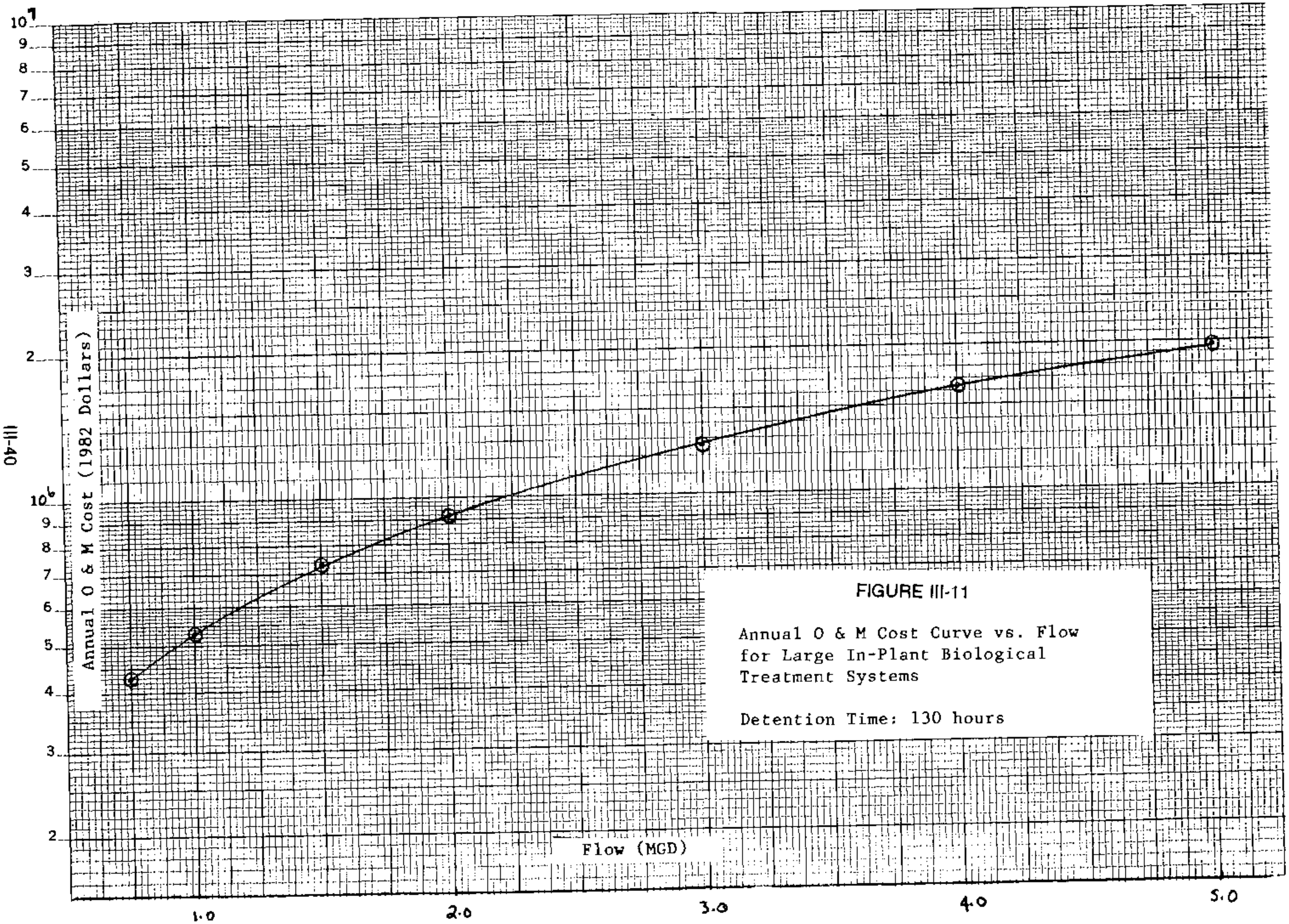

FIGURE III-11

Annual O & M Cost Curve vs. Flow for Large In-Plant Biological Treatment Systems

Detention Time: 130 hours

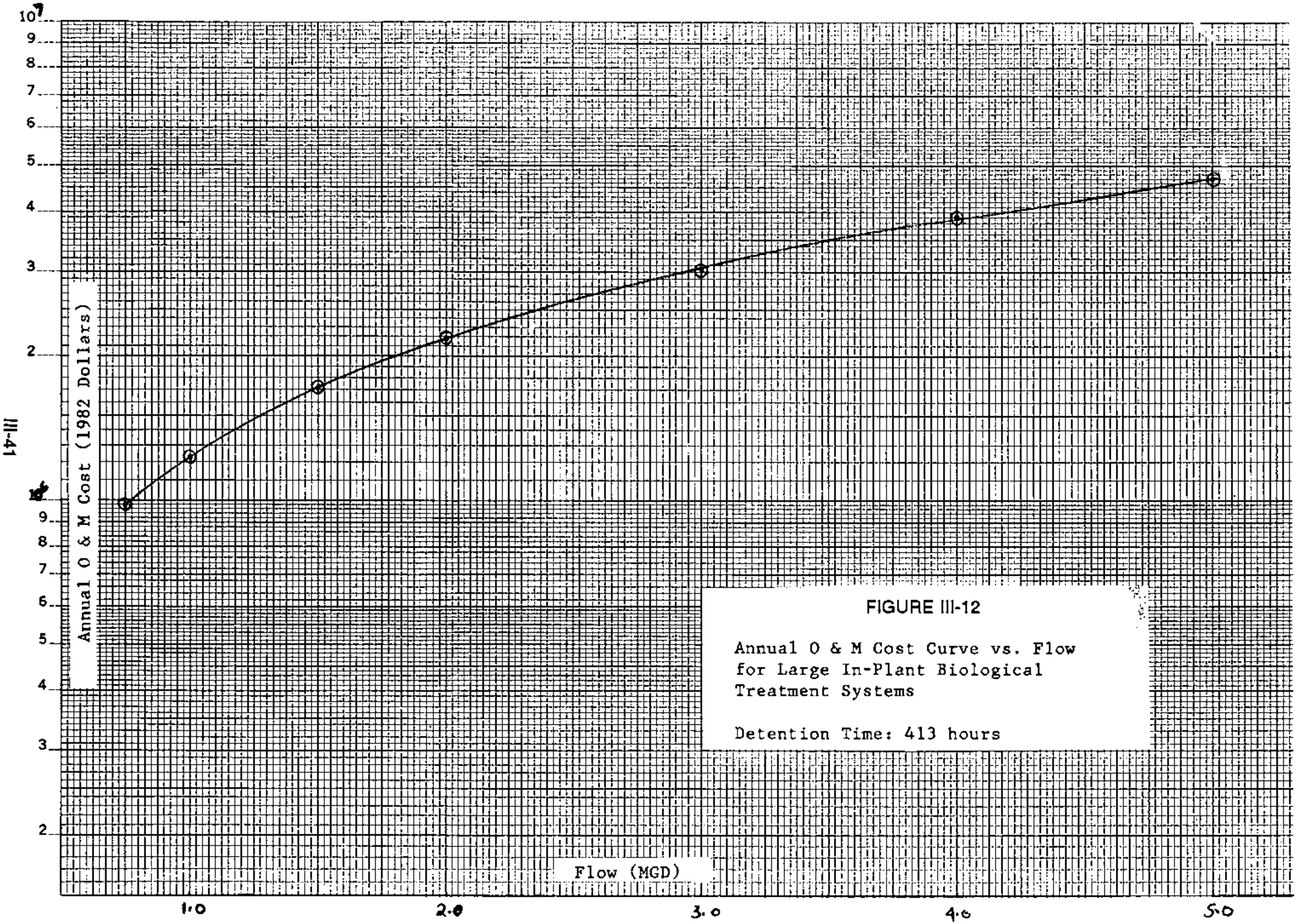

FIGURE III-12

Annual O & M Cost Curve vs. Flow for Large In-Plant Biological Treatment Systems

Detention Time: 413 hours

revised BPT, BAT, and PSES costs estimated for the Preamble Economic Impact Analysis are presentedin Appendix III-D while the technologies associated with these revised BPT, BAT and PSES costs are presented in Appendix III-E.

6. Land Availability

For the December 6, 1991 Proposal, EPA investigated whether land availability would be a constraint on the ability of OCPSF plants to install in-plant biological treatment. EPA's investigation included the land requirements for treatment of all 13 of the remanded PSES pollutants, including phenol and 2,4-dimethylphenol, which are not being regulated in the final regulation. At that time, 20 of the 242 indirect discharge plants costed for in-plant biological treatment were projected to require more than one acre of land. EPA projected land requirements for individual facilities based on the modeled raw waste concentrations for the facilities developed hy the Agency for purposes of costing compliance with the 1987 OCPSF guideline. The Agency visited the eight indirect discharge facilities with land estimates greater than one acre in the three-state area of New York, New Jersey, and Delaware. Indirect discharge facilities were selected because their typical location in urban areas makes them more likely than direct dischargers to have land-availability constraints. EPA believes the combination of large land requirements and an urban setting makes these eight plants a "worst case" sample of land availability. A summary of the results from the site visits is presented in Table III-13.

Five of the plants visited had sufficient land based on the land requirements projected from their modeled raw waste concentrations (the remaining three had from 78 to 96 percent of the projected requirements). The remaining three had enough land based on their actual reported raw waste concentrations (the three plants had from 1.9 times to 3.7 times more than the required land). EPA generally was conservative in projecting raw waste characteristics in order to err on the side of overestimating rather than underestimating plant compliance costs. EPA thus believes its raw waste projections will often be higher than actual loadings (April 19, 1993 Memorandum to the OCPSF Record "Estimation of BAT and PSES Compliance Costs"). Based on this assessment, the Agency concluded that land availability was not a constraint for installing the model treatment technology (56 FR 63904).

CMA comments on the December 6, 1991 Proposal asserted that EPA overestimated the land available for the construction of biological treatment systems in its survey of eight indirect discharge facilities by including in its analysis parcels of non-contiguous land and land that is obstructed by railroad tracks, buildings and other physical obstacles. (CMA Comments at 39-41). This is not true. Each of the eight

TABLE III-13

LAND AVAILABILITY OF SELECTED OCPSF PLANTS

PLANT NO.	LOCATION	ESTIMATED LAND REQUIREMENT REVISED IN-PLANT BIOLOGICAL TREATMENT	LAND AVAILABLE (ACRES)
257	New Jersey	1.93/(0.55)*/(0)**	1.5
2756	New Jersey	1.61	5
1853	New Jersey	8.77/(2.16)**	8
2300	Delaware	1.93/(0)**	11
1706	Delaware	1.8	5.2
1667	New Jersey	1.25/(0.38)**	1.2
2485	New Jersey	6.64/(1.68)**	>20
814	New York	2.19/(1.55)**	13

( )* Land requirement calculated based on reported raw waste concentrations.

( )** Revised land requirement based on Agency decision not to regulate phenol and 2,4-dimethylphenol for PSES.

facilities EPA surveyed has sufficient contiguous, unobstructed land for the installation of the model biological treatment system costed by EPA at proposal. Furthermore, the available land is configured such that it can accommodate the costed biological treatment systems (Plot plans are contained in the Confidential Record).

Three plants for which CMA asserted the record shows insufficient contiguous land -- Plants 257, 1853, and 1667 -- are the plants for which EPA determined that there is sufficient land based on the plants' reported raw waste concentrations (id.). CMA apparently overlooked this portion of the analysis and based its comments on the land estimates based on the plants' projected raw waste concentrations. As described in more detail below, all of the plants EPA visited have more than sufficient contiguous land to install in-plant biological treatment systems to comply with the land requirements estimated by EPA for compliance with the 13 remanded pretreatment standards.

Furthermore, based on the Agency's decision not to promulgate pretreatment standards for phenol and 2,4-dimethylphenol, the estimated land requirements are lower for six of the eight plants visited than the requirements estimated at proposal for these plants based on their projected raw waste concentrations. Two plants no longer require in-plant biological treatment (257 and 2300), reducing their land requirements to zero. The estimated land requirements for four additional plants were reduced by 29, 69, 75 and 74 percent (plants 814, 1667, 1853 and 2485, respectively). The estimated land requirements for the remaining two plants have not changed from the 1991 estimates.

Addressing the plants individually, the commenter states that the available land claimed by the Agency for Plant 257 was made up of three parcels, that one parcel would require demolishing two buildings and that another parcel is crisscrossed by railroad tracks. At the time of the site visit, plant personnel informed EPA that plans called for the demolition of the two buildings in question and in fact demolition was already underway at the time of the site visit; the Agency reasonably concluded that the land made available by the demolition of these two buildings would be available, and notes that the pretreatment standards to which this plant was to be subject do not become effective until three years after the promulgation of today's amendments. The area made available by the demolition of these buildings in addition to the contiguous, open area designated as "A" to the left of the railroad tracks on the plot plan submitted by the facility will more than accommodate EPA's land requirement estimate of 0.55 acres for Plant 257. This land is contiguous and is not intersected by the railroad tracks. Finally, based on the Agency's decision not to promulgate pretreatment standards for phenol and 2,4-dimethylphenol, Plant 257 no longer is projected to install in-plant biological treatment.

The commenter also claims that "part" of one of the parcels of land at Plant 1706 is unavailable because of a nearby flare stack. But the commenter does not explain, and EPA does not understand, how a nearby flare stack would prevent installation of a biological treatment system. Nor did it indicate how much of the four-acre parcel in question it considered to be unavailable, and EPA has no basis to conclude that the presence of a nearby flare stack renders unavailable the 1.8 acres estimated as necessary for Plant 1706 to install the costed biological treatment system.

The commenter also states that the Agency unrealistically utilized two parcels of land (1 acre and 0.2 acres) to meet the estimated land requirement of 1.25 acres for Plant 1667 (CMA Comment at 41). In addition to stating that the two parcels of land are not contiguous, the commenter states that the 0.2 acre parcel contains a 2 story brick building and the 1 acre parcel has a railroad track running through it. Again, the commenter has overlooked portions of the Agency's analyses contained in its Record. Even if the railroad track bisected the 1 acre parcel, the Agency's revised land estimate of 0.38 acres based on the facility's reported raw waste concentration and/or the Agency's decision not to regulate phenol and 2,4-dimethylphenol under PSES (each factor reduces the original land estimate to 0.38 acres) could still be accommodated by either one of the two 0.5 acre parcels. Moreover, the Agency's Record clearly states that the 2 story brick building was confirmed as not in use and available (1991 Proposal Record, p R01236).

In a related argument, the commenter argues that EPA has included land in its analysis that is unavailable because of contamination and related factors. EPA disagrees with this analysis of the record, as explained below.

The commenter states that personnel from Plant 2756 informed EPA that the availability of its land depended on getting clearance from the state agency because contamination was suspected. However, the plant provided no information during EPA's site visit or in comments regarding the likelihood, nature or extent of the suspected contamination, the procedures involved in obtaining clearance from the state, or the extent to which the contamination might preclude the installation of a biological treatment system to comply with today's regulations within the three years allotted. The Agency has conservatively estimated that 32 percent of the facility's unused land (equal to the 1.61 acres required) will be available to accommodate the installation of in-plant biological treatment.

The commenter also states that "... Four of the eight acres identified for Plant 1853 were under investigation for possible contamination. EPA was told by plant personnel that the availability of the land was dependent on the results of the investigation..." (CMA Comment at 41). However, the Agency's Record shows that the uncontaminated 4-acre parcel at the site will accommodate EPA's estimated revised land requirement of 2.16 acres, based on reported raw waste concentrations for Plant 1853 and/or the Agency's decision not to regulate phenol and 2,4-dimethylphenol under PSES (each factor reduces the original land estimate to 2.16 acres). In addition, EPA has insufficient information regarding the "possible" contamination to evaluate its effect on compliance with today's amendments.

The commenter also states that plant personnel informed EPA that of the 130 acre site for Plant 2485, some unspecified portion of the plant site was under investigation for contamination and 30 percent of the site was considered fresh water wetlands. Since 30 percent of the total plant site totals 39 acres and since no accurate estimate of the extent of the contamination at the 130 acre plant site could be made by plant personnel, the Agency has conservatively estimated the amount of land available at 20 acres or about 15 percent of the total plant site, which is more than adequate for the 6.64 acres projected to be required. EPA also notes that no comments have been received to date regarding the results of the site investigation of potential contamination which was scheduled for completion in 1991. Finally, based on the Agency's decision not to promulgate pretreatment standards for phenol and 2,4-dimethylphenol, the land requirements for Plant 2485 have been reduced from 6.64 acres to 1.68 acres.

The commenter also states that plant personnel at Plant 814 informed EPA that 11 of the 13 acres EPA included in its available area was under investigation for possible contamination. Subsequent correspondence from Plant 814 confirmed the presence of contamination but did not detail the extent of the contamination, only that remediation would be necessary and "... a large portion of these areas will not be available for future construction other than that related to remediation..." (1991 Proposal Record, p R01210). However, even according to the plant's information, 2.3 acres of land are not under investigation for contamination. Although this land is comprised of two separate parcels, the larger of the two alone is sufficient to install the costed biological treatment system. Based on the Agency's decision not to promulgate pretreatment standards for phenol and 2,4-dimethylphenol, this plant only requires 1.55 acres of land to install the Agency's current model treatment system. Subtracting the smaller of the two available parcels (designated as area "J" on the facility plot plan, estimated at 0.5 acres) from the 2.3 acre total, approximately 1.8 contiguous, uncontaminated acres remain available, which will accommodate the current land requirement (1991 Proposal Record, p R01243). Moreover, only 14 percent of the 11 contaminated acres would be required to install the <u>entire</u> treatment system, not counting any of the 2.3 acres which the facility admits is available. The information that "a large portion" of the 11 acres is unavailable does not provide a basis to conclude that the facility could not install a biological treatment system to comply with the promulgated pretreatment standards within three years.

Overall, EPA reasonably concluded that each of the plants visited should have sufficient contiguous, unobstructed, uncontaminated land to install the costed biological treatment systems. In addition, even if EPA's analysis indicated a lack of contiguous, available land, this would not necessarily preclude installation of the costed biological treatment systems. Individual pieces of a plant's treatment system, including separate aeration basins, can be physically located on non-contiguous parcels, or on different portions of a single parcel. In the OCPSF industry, plant manufacturing and/or treatment areas are often segmented or separated by such things as utility roads, railroad tracks, canals, parking lots, warehouses, or other unrelated parcels of land. EPA cannot perform a detailed evaluation, in a national guideline, of how individual facilities in the industry can best comply with the promulgated limitations and standards. Especially with considerations as inherently plant-specific as land availability and potential contamination and remediation requirements, EPA can only assess whether, for the industry as a whole, sufficient land should be available to comply with the requirements of the guideline. EPA has performed such an assessment and has concluded that land availability will not be a constraint on compliance with today's limitations and standards. To the extent that an individual plant determines, after making a good faith effort to use the land available to it, that it is unable to comply with the requirements of today's rule, the plant may apply for an FDF variance.

E. FINAL BAT SUBPART J AND PSES LIMITATIONS

The final BAT Subpart J and PSES limitations are presented below.

	BAT Subpart J Effluent Limitations (micrograms per liter)	
Effluent Characteristics	Maximum for any one day	Maximum for monthly average
Acenaphthalene	47	19
2,4-Dimethylphenol	47	19
Fluoranthene	54	22
Naphthalene	47	19
Phenol	47	19
Bis(2-ethylhexyl)phthalate	258	95
Di-n-butyl phthalate	43	20
Diethyl phthalate	113	46
Deimethyl phthalate	47	19
Benzo(a)anthracene	47	19
Benzo(a)pyrene	48	20
3,4-Benzofluoranthene	48	20
Benzo(k)fluoranthene	47	19
Chrysene	47	19
Acenaphthylene	47	19
Anthracene	47	19
Fluorene	47	19
Phenanthrene	47	19
Pyrene	48	20

Effluent Characteristics	Pretreatment Standards for Existing and New Sources (micrograms per liter)	
	Maximum for any one day	Maximum for monthly average
Acenaphthene	47	19
Fluoranthene	54	22
Naphthalene	47	19
Bis (2-ethylhexyl) phthalate	258	95
Di-n-butyl phthalate	43	20
Diethyl phthalate	113	46
Dimethyl phthalate	47	19
Anthracene	47	19
Fluorene	47	19
Phenanthrene	47	19
Pyrene	48	20

IV. NEW SOURCE PERFORMANCE STANDARDS AND PRETREATMENT STANDARDS FOR NEW SOURCES

In the 1987 OCPSF promulgation, the Agency promulgated NSPS for all direct discharging sources based on the best available demonstrated technology, as required by CWA § 306 (52 FR at 42545). NSPS was established for the three conventional pollutants regulated under the OCPSF guideline on the basis of BPT model treatment technology, and for the 63 OCPSF-regulated priority pollutants on the basis of BAT model treatment technology. The numerical standards are equivalent to the BPT and the BAT limitations (52 FR 42545). EPA also promulgated PSNS on the same technology basis as PSES; the numerical standards for 47 priority pollutants that were determined to pass through or otherwise interfere with the operation of publicly owned treatment works (POTWs) are equivalent to the PSES standards (52 FR 42549).

The Natural Resources Defense Council (NRDC) challenged the final NSPS and PSNS standards arguing, in part, that the Agency failed to give adequate consideration to better pollution control technologies that could be used by new sources.

On March 30, 1989, the Fifth Circuit rejected all but one of NRDC's challenges to the NSPS standards and remanded the NSPS standards to EPA "for consideration of whether zero discharge limits would be appropriate for new plants in the OCPSF industry because of the existence of recycling" (870 F.2d at 264). However, the Court left the standards in place during the Agency's response to the remand (870 F.2d at 266).

The Agency has reconsidered the issues related to establishing new source zero discharge standards based on process wastewater recycle and, as proposed, has decided not to revise the existing NSPS and PSNS standards for the same reasons presented in its December 6, 1991 Proposal. EPA received comments from NRDC urging EPA to promulgate zero discharge standards based on recycle of process wastewater, and from numerous industry comments supporting EPA's proposal to retain the existing NSPS and PSNS standards. As explained more fully in Section VIII.B. of the Preamble to the Final Regulation, the Agency has concluded that it has no basis to impose a zero discharge technology-based NSPS standard on any OCPSF source, and that, even if it were to undertake an extensive data collection and technical development effort, it is unlikely EPA could impose a zero discharge standard on more than a few of the 25,000 product/processes in the OCPSF industry. First, the "concentration-based" approach which forms the framework of the OCPSF guideline limits the opportunities for the promotion of recycling and re-use of wastewater through a national guideline, in contrast to the "mass-based" approach adopted in other guidelines. The Agency explicitly recognized this limitation during the guideline development process, but opted for this approach nonetheless, because it provided the basis for a guideline with more expansive coverage. This was a rational regulatory decision made by the Agency. Moreover, because the OCPSF record was imprecise with regard to its use of the term "recycle," both NRDC and the Fifth Circuit in its remand order, misinterpreted the support in the database for zero discharge through recycling. In fact, the record contains very few reports of complete recycle and does not demonstrate that recycle is a demonstrated technology on which EPA can base a zero discharge standard.

APPENDIX I-A

GUIDANCE FOR LABORATORY ANALYSIS OF COMPLEX MATRICES

APPENDIX I-A GUIDANCE FOR LABORATORY ANALYSIS OF COMPLEX MATRICES

Several commenters stated that they were unable to measure some of the regulated pollutants in OCPSF wastewater at the concentrations required by the regulation due to matrix interferences, i.e., that the composition of wastewater samples complicates measurement of OCPSF-regulated pollutants at the low levels required to show compliance with the rule. They suggested that EPA provide notice that relief is available to the regulated community under this regulation when a permittee is unable to measure pollutants due to matrix problems.

At the time of promulgation of the OCPSF guideline in 1987, EPA found that for well-designed, well-operated treatment systems, matrix interferences should not present a problem. The limitations were based upon data that demonstrated that the pollutants have been and thus can be measured at the regulatory levels (52 FR 42563). EPA's determination that the regulated pollutants could be measured at the compliance levels was upheld by the Fifth Circuit (CMA v. EPA, 870 F.2d at 231).

Since promulgation of the OCPSF guideline, the Analytical Methods Staff of the Engineering and Analysis Division has been assisting EPA Regions and States in evaluating claims of matrix interferences and other analytical difficulties associated with OCPSF compliance monitoring. Since 1990, the Analytical Methods Staff has issued a series of draft reports that provide guidance to control authorities and laboratories for accommodating matrix-related problems that complicate laboratory measurements of the analytes of interest. These documents have been updated and expanded in one final publication, the May 1993 "Guidance on Evaluation, Resolution, and Documentation of Analytical Problems Associated with Compliance Monitoring," (EPA 821-B-93-001) that is available from Mr. William A. Telliard, Chief, Analytical Methods Staff, Engineering and Analysis Division (WH-552), USEPA, Washington, DC 20460. The document includes (1) a checklist of laboratory data required to support a claim that a permittee was unable to measure pollutants due to matrix problems, (2) guidance for analysts attempting to identify and quantify pollutants in wastewaters discharged from plants manufacturing OCPSF products, (3) cost estimates for resolving matrix interferences, (4) guidance for reviewing data from the analysis of organic compounds using EPA 600/1600 series analytical methods, (5) case histories of data submitted for claims of matrix interferences under the OCPSF rule, and (6) guidance on contracting for analytical services.

The Agency's past experience is that nearly all matrix interference problems can be resolved when industries and their laboratories apply the philosophy and techniques suggested in the draft documents. Based on this experience, EPA does not believe matrix interferences will present a problem in demonstrating compliance with the OCPSF guideline.

Finally, EPA notes that this guidance regarding matrix interference is beyond the scope of the Fifth Circuit's remand and today's rule. As stated above, the Fifth Circuit upheld EPA's determination that the OCPSF-regulated pollutants can be measured at the compliance levels, and no issues relating to measurement were remanded. The above discussion is guidance only, and it relates only to implementation and enforcement issues; it does not provide a basis to challenge today's amendment.

APPENDIX I-B

GUIDANCE FOR THE APPROPRIATE FLOW BASIS FOR CONVERTING CONCENTRATIONS INTO MASS-BASED LIMITATIONS AND STANDARDS

APPENDIX I-B GUIDANCE FOR THE APPROPRIATE FLOW BASIS FOR CONVERTING CONCENTRATIONS INTO MASS-BASED LIMITATIONS AND STANDARDS

The Passaic Valley Sewerage Commissioners, referring to supporting correspondence from the State of New Jersey, complained about conflicting guidance and differing interpretations of the appropriate flow basis for calculating the mass-based permit limits. They requested that the Agency clarify its guidance for (1) determining the appropriate flow basis for establishing the permit limitations and standards as well as (2) the appropriate flow basis for converting compliance monitoring concentration data into mass-based figures.

Regarding the first issue -- the appropriate flow basis for establishing permit limits -- the promulgated OCPSF effluent limitations guidelines and standards listed in 40 CFR 414 are concentration-based and thus do not regulate flow. As required by the regulation, the permitting or control authority must multiply a reasonable estimate of a plant's regulated process wastewater discharge by the concentration limitations to develop mass limitations for each NPDES or industrial user permit.

The appropriate process wastewater flow to be used must be determined by the permitting or control authority on a case-by-case basis using current information provided by the applicant and other available data. EPA strongly urges the permit writer or control authority to develop an appropriate process wastewater flow for use in computing the mass effluent or internal plant limitations based on water conservation practices. The factors that should be considered in developing the appropriate process wastewater flow include: review of the component flows to ensure that the claimed flows are, in fact, process wastewater flows as defined by the regulation; review of plant operations to ensure that sound water conservation practices are being followed (examples include minimization of process water uses; cascading or countercurrent washes or rinses, where possible; reuse or recycle of intermediate process waters or treated wastewaters at the process area and in wastewater treatment operations (e.g., pump seals, and equipment and area washdowns)); and review of barometric condenser use at the process level (barometric condensers often generate relatively large volumes of slightly contaminated wastewater; replacement of barometric condensers with surface condensers can reduce wastewater volumes significantly and result in collection of condensates that may be returned to the process). (1987 DD, p IX-9 - 10)

Assuming proper water conservation is being practiced, the 1987 OCPSF Development Document accurately advises the control authority to "use the plant's annual average process wastewater flow to convert the concentration-based limitations into mass-based limitations" (p IX-10). To clarify, the annual average flow is defined as the average of daily flow measurements calculated over at least a year. These average flows could be based on a single year's data; however, if available, multiple years' data are preferable to obtain a representation of annual average flow. The regulated OCPSF process wastewater flows, as defined by 40 CFR 401.11(q), are the process waste streams that are subject to 40 CFR Part 414.

Based on current guidance issued by the Office of Water Enforcement and Compliance, the permitting or control authority is advised to establish, for each direct or indirect point source discharge, a single estimate of the regulated long-term average of daily flow measurements based on three to five years of facility data. In the event that no historical or actual process wastewater flow data exists, such as for a new source, the permitting or control authority is advised to establish a reasonable estimate of the facility's projected flow. Historical or projected daily maximum, weekly maximum, or monthly maximum flows and design-based or plant-capacity-based flows are not recommended as appropriate bases for determining a facility's regulated long-term or annual average of daily flow measurements and corresponding mass limits. The permitting or control authority is advised to establish a flow rate that is expected to be representative during the entire term of the permit or other individual control mechanism. If a plant is planning for significant changes in production during the effective period of the permit, the permitting or control authority may consider establishing multiple tiers of limitations as a function of the significant, projected changes in production. In addition, or in the alternative, a permit may be modified during its term, either at the request of the permittee (or another interested party) or on EPA's initiative, to increase or decrease the flow basis in response to a significant change in production (40 CFR 124.5, 122.62). A change in production could be an "alteration" of the permitted activity or "new information" that would provide the basis for a permit modification (40 CFR 122.62(a)(1), (2)).

Guidance for determining appropriate process wastewater flow is presented in several documents published by the EPA Office of Wastewater Enforcement and Compliance, Washington, DC: "Guidance Manual for the Use of Production-Based Pretreatment Standards and the Combined Wastestream

Formula," 1985 (NTIS Order No. PB92-114438) and "Training Manual for NPDES Permit Writers, 1993 (EPA 833-B-93-003).

Confusion as to the recommended basis for determining appropriate process wastewater flow has arisen, however, due to several OCPSF guidance memoranda that present guidance that is in conflict with the guidance presented in the OCPSF preamble and the above-mentioned guidance documents. Specifically, two EPA guidance memoranda recommend, as a basis for establishing long-term average flow, that the permit writer or control authority use "the highest monthly average flow during the past twelve (12) months or the highest yearly mean of the twelve monthly average flows during the past five (5) years." These incorrect examples were listed in the February 16, 1989 memorandum to Regional Water Management Division Directors and NPDES Authorized State Directors from James R. Elder, Director, Office of Water Enforcement and Permits, entitled "NPDES Permitting Strategy for OCPSF Direct Dischargers" (pp 29, 40, & 44), and in the October 12, 1988 memorandum to Regional Water Management Division Directors and NPDES State Directors from Mr. Elder entitled "Questions and Answers Regarding the OCPSF Effluent Limitations Guidelines" (p 4). This guidance establishes an inappropriate basis for determining permit limits because the promulgated OCPSF maximum daily and maximum monthly average limitations were derived by multiplying the long-term average performance level of well-designed, well-operated treatment systems by the respective variability factors for the treatment system. The variability factors already include, among other components, the variability associated with day-to-day and month-to-month production and flow variations. As a result, the OCPSF limits and standards are, in general, considerably less stringent than the long-term averages achieved by the plants on which the limits and standards were based, and plants that design their operations and treatment systems to achieve the long-term averages for individual pollutants should be able to achieve the OCPSF limits and standards even during high-flow days and months. The data from any given day or month may not be representative of the plant's annual or long-term flow. Use of the highest monthly mean to set permit limits would "double count" the effect of flow variability, since the potential for high flow periods is already accounted for in the promulgated limits and standards. The approach presented in the two memoranda from Mr. Elder results in an overly generous permit limit. Therefore, the time period of the measure of production or flow should correspond to the time period used to derive the promulgated limitations, which is an annual average or long-term average measure.

Regarding the second issue -- the correct flow basis for determining compliance -- the Agency intends that compliance with the OCPSF standards should be evaluated based on the actual total applicable OCPSF-regulated flow discharged during the period for collecting the effluent sample, typically 24 hours. The cumulative 24-hour flow corresponding to the day on which sampling is performed, when combined with concentration data from 24-hour sampling, gives the best indication of the actual mass of pollutants discharged on a given day. The OCPSF mass-based permit limits are calculated using the regulated long-term or annual average of daily flow measurements, adjusted downward as appropriate based on potential for flow reduction, as discussed above. The limits in 40 CFR Part 414 are expressed as maximum for any one day and maximum for monthly average values. Since the limits in the permits are mass-based, the compliance data must also be mass-based. A daily mass value is defined as the total mass discharged over a 24-hour period (unless the operating day is less than 24 hours). Similarly, the monthly average is derived from averaging the available daily mass values in each calendar month. Compliance with the mass-based limits should be based on the actual total applicable OCPSF-regulated flow discharged on the day of sampling, not on the long-term average flow rate that provided the basis for establishing the permit limitations and standards.

Therefore, to determine compliance for OCPSF facilities, the measured concentration of the pollutant in question in the effluent sample should be multiplied by the total applicable OCPSF-regulated flow during the effluent sampling period. For example, if analytical data from a 24-hour sample period for a particular plant demonstrates a pollutant concentration of 0.055 mg/l, and the measured process wastewater flow for the same 24-hour period is 0.600 million gallons, then the plant's reported mass compliance value for that day is 0.275 pounds of the pollutant.

EPA notes that this guidance regarding the proper flow basis is beyond the scope of the Fifth Circuit's remand and today's rule. This guidance simply addresses conflicts in existing guidance and reaffirms that the contemporaneous guidance presented in the 1987 OCPSF Development Document correctly reflects EPA's judgment regarding appropriate implementation of the OCPSF guideline. The above discussion is guidance only, and it relates only to implementation and enforcement issues; it does not provide a basis to challenge today's amendments.

APPENDIX III-A

TECHNICAL SUPPORT DOCUMENT
FOR THE ORGANIC CHEMICALS, PLASTICS AND
SYNTHETIC FIBERS POINT SOURCE
CATEGORY DECEMBER 1, 1992 NOTICE OF AVAILABILITY OF
NEW INFORMATION

TECHNICAL SUPPORT DOCUMENT FOR THE ORGANIC CHEMICALS, PLASTICS AND SYNTHETIC FIBERS POINT SOURCE CATEGORY NOTICE OF AVAILABILITY OF NEW INFORMATION

Engineering and Analysis Division
Office of Water
U.S. Environmental Protection Agency
401 M Street, SW
Washington, DC 20460

November 30, 1992

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I. BACKGROUND

A summary of the regulatory history of the OCPSF guidelines is found in the December 6, 1991 proposal (56 FR 63897). Briefly, on November 5, 1987, EPA promulgated effluent limitations, guidelines, and standards under the Clean Water Act for the OCPSF industry (52 FR 42522). The guidelines were challenged by industry petitioners and the Natural Resources Defense Council in consolidated litigation in the United States Court of Appeals for the Fifth Circuit (CMA v. EPA, 870 F.2d 177, rehearing granted in part, 885 F.2d 253). The Court upheld most of the provisions of the guidelines, but remanded several portions for further proceedings by EPA, including 19 best available technology economically achievable ("BAT") limitations and 13 pretreatment standards (including phenol and 2,4-dimethylphenol) (885 F.2d at 265). EPA based these limits and standards on data demonstrating removals achieved by end-of-pipe biological treatment systems, which typically have longer detention times than in-plant biological treatment systems, but used a detention time more typical of in-plant biological treatment systems to estimate the cost of the technology (id.). The Court concluded that EPA had not demonstrated that the costed system could eliminate pollutants as effectively as the end-of-pipe systems with longer detention times on which the limitations and standards were based (id.).

The December 6, 1991, proposal responded to the Court's remand; for the remanded limitations, EPA re-costed the treatment technology based on the longer detention times of the end-of-pipe systems on which the limitations were based and proposed the same limitations. EPA explained in the preamble to the proposal that it was soliciting comments only on the costing and related issues, based on the fact that the Court had found the limitations to be achievable except for the discrepancy between the detention times of the costed treatment system and the treatment systems on which the limitations were based. Notwithstanding the limited scope of the proposal, a large number of the comments on the proposal challenged EPA's determination on the original 1987 OCPSF promulgation that phenol, one of the 13 pollutants for which pretreatment standards were remanded - passes through POTWs. Several comments raised the same issue with respect to 2,4-dimethylphenol. Despite the fact that the comments were not solicited, EPA has evaluated them and, as explained above, concluded that they may have merit.

EPA recognized in developing the OCPSF rule that the methodology for determining pass through might tend to understate removals of pollutants from POTWs where both POTW and direct discharge effluents were below the analytical minimum level. EPA proposed several modifications of the pass through analysis to address this phenomenon, including applying a "removal differential" under which EPA would determine that a pollutant passed through only if the analysis found a difference in removals achieved by direct dischargers and POTWs that exceeded 5% or 10% (48 Fed. Reg. at 11841-42 (March 21, 1983); 50 Fed. Reg. at 29084-85 (July 17, 1985); 51 Fed. Reg. at 44089-90 (December 8, 1986)). However, after carefully reviewing comments received on these notices arguing, among other things that this approach would bias the analysis against a finding of pass through, EPA decided to employ its historical approach to pass through, with one variation.

In previous effluent guidelines, EPA had made pass through determinations based on data from POTWs with influent concentrations greater than 20 ppb (52 FR 42546). In the final OCPSF rule, EPA edited its database to exclude POTWs at which the influent concentrations were less than ten times the analytical minimum level (typically 100 ppb), unless there was no plant in the data base with influent concentrations that high, in which case EPA retained the 20 ppb cut-off (D.D. at VI-33). With respect to pollutants for which EPA had influent data that were at least ten times the analytical minimum level, this editing rule eliminated the significant underestimation of removals that could occur when comparing lower influent concentrations to the analytical minimum level. EPA determined and the Fifth Circuit agreed, that with this modification, the methodology represented a reasonably conservative, permissible approach to determining pass through (270 F.2d at 246).

EPA is considering augmenting this methodology for phenol and 2,4-dimethylphenol because commentors have focused EPA's attention on these pollutants, and EPA agrees they may not pass through POTWs even though the pass through analysis employed at promulgation indicated they did. EPA has re-evaluated data from the database used in promulgating the 1987 OCPSF rule, and has collected additional data, related to removal of phenol and 2,4-dimethylphenol by POTWs. In addition, EPA has performed an analysis based on the chemical structures of phenol and 2,4-dimethylphenol in relation to other pollutants to determine their fate in biological treatment systems.

The following sections present the results of this analysis.

II. TECHNICAL CONSIDERATIONS

The following sections discuss the fate of all pollutants which were regulated under PSES and the basis for reconsidering the regulation of phenol and 2,4-dimethylphenol.

A. REMOVAL MECHANISMS FOR THE 47 PSES POLLUTANTS

PSES regulations were promulgated for 47 toxic pollutants as part of the final OCPSF regulation. The remaining 79 toxic pollutants were eliminated from regulatory consideration based on the various sections of Paragraph 8 of the NRDC Settlement Agreement. The regulated PSES pollutants are removed from wastewaters by a variety of removal mechanisms and fall into four general groups:

- Pollutants which are primarily volatile and removed by stripping
- Pollutants which are primarily biodegradable.
- Pollutants which are generally adsorbable and can be removed by adsorption.
- Pollutants which can be removed primarily by settling or filtration such as metals.

Table II-1 presents the 47 toxic pollutants regulated under PSES and the technology basis for the final PSES limitations. These technologies generally take advantage of the chemical characteristics of each pollutant, e.g. volatile pollutants are removed via steam stripping, metals are removed via chemical precipitation. Also used as a technology basis was in-plant biological treatment, which included a biological treatment system with longer detention times than a POTW and a biomass which is acclimated to the toxic pollutants being discharged. As noted in Section I, the PSES regulations for these 13 pollutants were remanded by the Fifth Circuit U.S. Court of Appeals.

Since the promulgation of the final OCPSF regulation, the subsequent remand of the PSES limitations for the 13 pollutants controlled by in-plant biological treatment and the reproposal in December, 1991, no additional data has been submitted for alternatives to in-plant biological treatment for polynuclear aromatics (PNAs) and phthalate esters (PEs); however, as noted in previous sections, commentors have noted that biological treatment systems at POTWs can effectively treat phenols without any adverse effects, regardless of the results of the pass through analysis.

TABLE II-1

LIST OF REGULATED TOXIC POLLUTANTS AND THE TECHNOLOGY BASIS FOR PSES

POLL'T NO.	POLLUTANT NAME	PSES TECHNOLOGY BASIS
1	Acenaphthene	In-Plant Biological
4	Benzene	Steam Stripping
6	Carbon Tetrachloride	Steam Stripping*
7	Chlorobenzene	Steam Stripping*
8	1,2,4-Trichlorobenzene	Steam Stripping*
9	Hexachloroethane	Steam Stripping
10	1,2-Dichloroethane	Steam Stripping*
11	1,1,1-Trichloroethane	Steam Stripping
12	Hexachloroethane	Steam Stripping*
13	1,1-Dichloroethane	Steam Stripping
14	1,1,2-Trichloroethane	Steam Stripping
16	Chloroethane	Steam Stripping
23	Chloroform	Steam Stripping
25	1,2-Dichlorobenzene	Steam Stripping*
26	1,3-Dichlorobenzene	Steam Stripping*
27	1,4-Dichlorobenzene	Steam Stripping*
29	1,1-Dichloroethylene	Steam Stripping
30	1,2-Trans-Dichloroethylene	Steam Stripping
32	1,2-Dichloropropane	Steam Stripping*
33	1,3-Dichloropropene	Steam Stripping*
34	2,4-Dimethylphenol	In-Plant Biological
38	Ethylbenzene	Steam Stripping*
39	Fluoranthene	In-Plant Biological
44	Methylene Chloride	Steam Stripping
45	Methyl Chloride	Steam Stripping
52	Hexachlorobutadiene	Steam Stripping*
55	Naphthalene	In-Plant Biological
56	Nitrobenzene	Steam Stripping & Activated Carbon
57	2-Nitrophenol	Activated Carbon
58	4-Nitrophenol	Activated Carbon
60	4,6-Dinitro-o-Cresol	Activated Carbon
65	Phenol	In-Plant Biological
66	Bis(2-Ethylhexyl)Phthalate	In-Plant Biological
68	Di-N-butyl Phthalate	In-Plant Biological
70	Diethyl Phthalate	In-Plant Biological
71	Dimethyl Phthalate	In-Plant Biological
78	Anthracene	In-Plant Biological
80	Fluorene	In-Plant Biological
81	Phenanthrene	In-Plant Biological
84	Pyrene	In-Plant Biological
85	Tetrachloroethylene	Steam Stripping
86	Toluene	Steam Stripping
87	Trichloroethylene	Steam Stripping
88	Vinyl Chloride	Steam Stripping
121	Total Cyanide	Alkaline Chlorination**
122	Total Lead	Hydroxide Precipitation**
128	Total Zinc	Hydroxide Precipitation**

* Steam stripping performance data transferred based on Henry's Law Constant groupings

** Metals and cyanide limitations based on hydroxide precipitation and alkaline chlorination, respectively, only apply at the process source.

The Agency has investigated these commentors' claims regarding the biodegradability of phenol and 2,4-dimethylphenol. EPA has also examined the ability of POTWs to biodegrade the remaining 11 PSES pollutants which are controlled by in-plant biological treatment. The results of this analysis are discussed in the following section.

B. EXTENT OF BIODEGRADATION OF THE REMANDED 13 PSES POLLUTANTS

The following sections describe the mechanisms behind biodegradation of organic chemicals and how these mechanisms act on the three main groups of remanded pollutants--phenols, PNAs and phthalate esters.

1. <u>Biodegradation of Organic Chemicals</u>

All of the 13 remanded pollutants share the same aromatic structure, represented by the so-called benzene nucleus. The degradation of aromatic compounds by aerobic bacteria initially involves chemical reactions catalyzed by extra-cellular enzymes. These reactions occur in several steps and result in cleavage of the benzene nucleus to form compounds that will transfer through the cell wall and be compatible with the intra-cellular tricarboxylic acid (TCA) cycle. Assimilated into this cycle, these compounds serve as substrates for growth and energy production via oxidative phosphorylation (Krebs cycle).

Before the benzene nucleus can be cleaved, it generally must have at least two hydroxyl groups that are either *ortho* (as in catechol) or *para* (as in hydroquinone) to one another. If the substrate (aromatic molecule) does not meet this requirement, one or both hydroxyls must be substituted in the proper position. Enzymes that catalyze placement of <u>one</u> hydroxyl group on a benzene nucleus are called *monooxygenases* (or sometimes hydroxylases). *Dioxygenases* catalyze the substitution of <u>two</u> hydroxyl groups on adjacent carbons of the aromatic ring. In general, monooxygenase-catalyzed reactions are completed more quickly than dioxygenase-catalyzed reactions because only one hydroxyl group needs to be substituted for conversation of the compound.

2. Biodegradation of Phenols

In general, biodegradation rates for phenol and 2,4-dimethylphenol are among the highest of all organic chemicals. Both already have one hydroxyl group on a benzene nucleus; this facilitates the substitution of a second hydroxyl group and the resulting monooxygenase-catalyzed reaction converts the phenol and 2,4-dimethylphenol to catechols. The resulting catechols then undergo inter-hydroxyl cleavage of the benzene nucleus by extra-cellular enzymes secreted by the biomass microorganisms to form unsaturated dicarboxylic acids or semialdehydes which are capable of being transferred through the cell wall and metabolized by the biomass. Figure II-1 illustrates these chemical and biological processes.

3. Biodegradation of Phthalate Esters

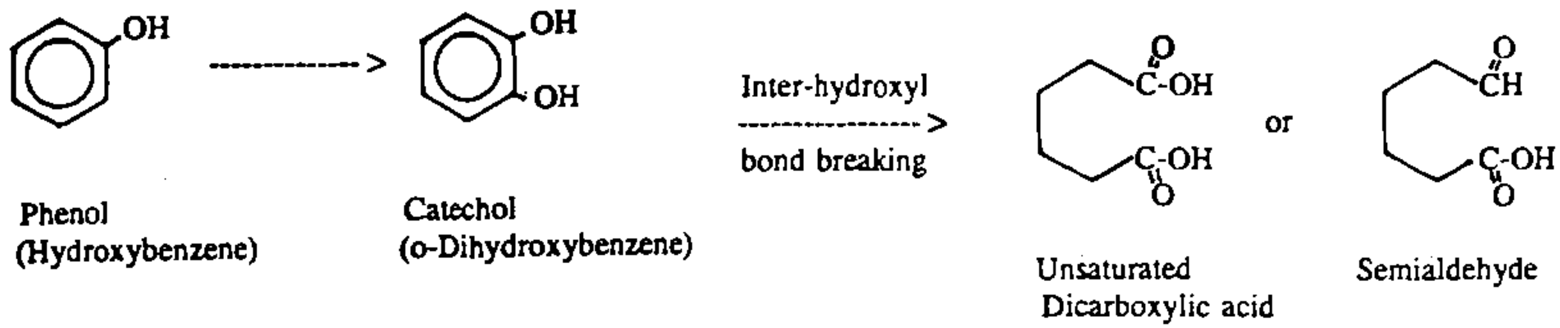
Phthalate esters are considered biodegradable but at a much slower rate than the phenols. This occurs because phthalate esters must first be hydrolyzed into phthalic acid. An extra-cellular enzyme secreted by the biomass microorganisms catalyzes the hydrolysis of the diesters to phthalic acid and alcohol. The phthalic acid then undergoes a dioxygenase-catalyzed reaction (substitution of 2 hydroxyl groups on the benzene nucleus) converting the phthalic acid to catechols and carbon dioxide. The catechols then to follow the same steps detailed above for the phenols, undergoing inter-hydroxyl cleavage of the benzene nucleus by extra-cellular enzymes secreted by the biomass microorganisms. The unsaturated dicarboxylic acids or semialdehydes formed are then capable of transfer through the cell wall and can be metabolized by the biomass. Figure II-2 illustrates these chemical and biological processes.

4. Biodegradation of Polynuclear Aromatics

Polynuclear aromatics (PNAs) are more chemically complex than both phenols and phthalate esters and are generally more difficult to biodegrade. Specifically, PNAs initially have no hydroxyl or carboxyl substituents and require more than one benzene nuclei to be sequentially broken in order to form compounds which are capable of being transferred through the cell wall and metabolized by the biomass. This requires extended detention times under favorable conditions for biodegradation of PNAs to occur. Extended detention times are often present at OCPSF biological treatment systems but seldom occur at POTWs whose detention times generally range from four to eight hours. Therefore, while complete biodegradation of PNAs can occur at OCPSF biological treatment systems, due to the lower detention times at POTWs, PNAs are not adequately biodegraded in biological treatment systems at POTWs.

FIGURE II - 1

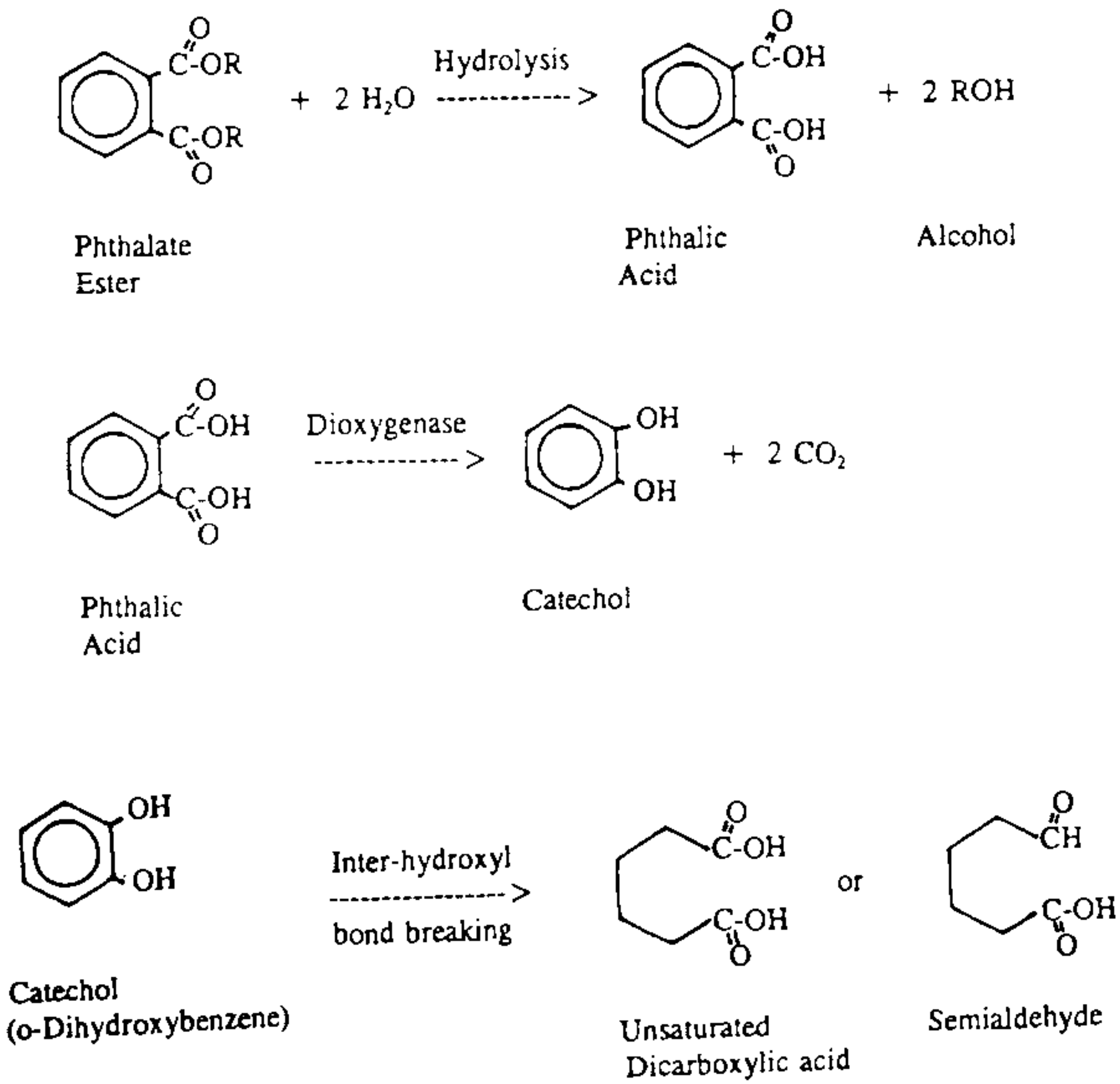
BIODEGRADATION OF PHENOL



SOURCE: H. Wise, USEPA (1992)

FIGURE II - 2

BIODEGRADATION OF PHTHALATE ESTERS



SOURCE: H. Wise, USEPA (1992)

Biodegradation of naphthalene, acenaphthene and fluorene, in addition to being limited by the shorter POTW biological treatment system detention times is further reduced by air stripping in the biological treatment systems at both POTWs and OCPSF facilities. The removal/fate mechanisms for these PNAs are supported by the observed air stripping percentages at POTWs, e.g., naphthalene at 30%, and Henry's Law Constant values that are one to two orders of magnitude higher than the other PNAs.

5. Summary of Biodegradation Potential of 13 Remanded PSES Pollutants

To further confirm the biodegradability of the 13 remanded PSES pollutants, the Agency searched a number of data sources. The most extensive information source was the "Report to Congress on the Discharge of Hazardous Wastes to Publicly Owned Treatment Works" (EPA/530-SW-86-004), also known as the Domestic Sewage Study. This study, which evaluated the fate and effects of the discharge of hazardous waste to municipal sewers, predicted the overall removal of hazardous constituents by POTWs and the mechanisms by which they were removed using all available sampling data, laboratory research and the physical/chemical constants associated with the pollutants of interest. Sampling data reviewed was primarily from the "Fate of Priority Pollutants in Publicly Owned Treatment Works" (EPA 440/1-82/303), also known as the 50 POTW Study. This data base was also used to estimate POTW removals for the OCPSF pass-through analysis. Data from laboratory research performed at the EPA Risk Reduction Engineering Laboratory in Cincinnati, Ohio, were also reviewed. Finally, physical/chemical constants such as Henry's Law Constants (H_c) and Octanol Water Partition Coefficients (K_{ow}) were consulted to confirm the data collected and to identify removal trends for those pollutants with incomplete or missing data. The propensity of an organic chemical to evaporate or air strip from wastewater depends upon both the chemical's volatility (tendency to escape as a gas) and its solubility in wastewater. A relative measure of this propensity is indicated by Henry's Law Constants. The higher the value of this number, the greater the propensity of an organic pollutant to be removed (transferred) from the wastewater by evaporation/air stripping. The relative propensities of organic chemicals in wastewater to be sorbed upon an organic substrate may be estimated by comparing their individual octanol-water partition coefficients. An organic chemical that partitions itself equally between the octanol and water phases will have a K_{ow} of 1. Organic chemicals with values greater than 1 will favor partitioning (transfer) from wastewater to organic substrates.

Table II-2 presents pollutant fate data collected from the Domestic Sewage Study for the 13 remanded PSES pollutants as well as the median influent and effluent concentrations for the POTW and OCPSF data bases used for the pass-through analysis, the median POTW and OCPSF percent removals calculated in the pass-through analysis and Henry's Law Constants and Octanol Water Partition Coefficients obtained from the RREL Treatability Data Base (Version 4.0). Also included when available are estimated biodegradation rate constants which were developed for the "CERCLA Site Discharges to POTWs Treatability Manual" (EPA 540/2-90-007).

Using the overall removal and pollutant fate data collected as well as the individual pollutant biodegradation rate constant, Henry's Law Constant and Octanol Water Partition coefficient values presented in Table II-2 and, based on the previous discussions of biodegradation mechanisms, two pollutants--phenol, and 2,4-dimethylphenol,--are capable of being biodegraded in well-operated biological treatment systems at POTWs. The following section discusses if biodegradation of these compounds actually occurs at POTWs.

C. OCCURRENCE AND FATE OF TWO REMAINING PSES POLLUTANTS AT OCPSF FACILITIES AND POTWs

After determining that the two remaining PSES pollutants--phenol and, 2,4-dimethylphenol,--are highly biodegradable, the remaining task is to determine if OCPSF discharges containing these pollutants are adequately controlled both on a technological basis, i.e., POTW biological treatment systems, and a regulatory basis, i.e., General Pretreatment Regulations (40 CFR 403). This section will discuss the frequency of occurrence of these pollutants in OCPSF discharges to POTWs, the maximum estimated influent concentrations of these pollutants to be treated at POTWs and the observed performance of POTWs in biodegrading these pollutants at the maximum estimated influent levels.

TABLE II-2
POLLUTANT CHARACTERISTIC AND TREATABILITY DATA FOR THE 13 PSES TOXIC POLLUTANTS

Compound	Detection Limit (ppb)	Median POTW		Median OCPSF		Median OCPSF % Removal**	Median POTW % Removal**	Total POTW % Removal**	POTW % Sludge Partition*	POTW % Air Stripping*	Biodegradation Rate Constant[a]	Octanol/ Water Partition Coefficient[b]	Henry's Law Constant (ATMxM^3 mole^{-1})[b]
		Influent (ppb)	Effluent (ppb)	Influent (ppb)	Effluent (ppb)								
Phenol	10	251.25	10.0	1638.00	10.68	98.4	95.2	80 to 95%	15%	0%•	10^{-1}	1.46	$1.3x10^{-6}$@25°C
Dimethyl Phenol-2,4	10	20.5	10.0	2644.2	11.69	99.8	51.2	80 to 95%	8%	0%•	10^{-1}	2.42	$1.7x10^{-5}$@25°C
Naphthalene	10	188.33	10.0	1040.2	10.0	99.0	94.7	70 to 95%	28%	30%•	10^{-2}	3.97	$4.8x10^{-4}$@25°C
Acenaphthene	10	584.17	10.0	513.0	10.0	98.9	98.3	98%**	NA	10%•	10^{-2}	3.92	$2.4x10^{-4}$@25°C
Fluorene	10	33.2	10.0	166.63	10.0	97.9	69.8	70%**	NA	NA	10^{-2}	4.18	$1.2x10^{-4}$@25°C
Anthracene	10	225.33	10.0	693.61	10.0	98.6	95.6	90 to 95%	55%	0%•	10^{-3}	4.45	$8.6x10^{-5}$@25°C
Fluoranthene	10	29.8	17.2	852.49	11.69	99.3	42.2	42%**	NA	NA	$10^{-2.3}$	5.33	$6.5x10^{-6}$@25°C
Phenanthene	10	195.83	10.0	2452.00	10.00	99.6	94.9	95%**	NA	NA	$10^{-2.5}$	4.46	$3.9x10^{-5}$@25°C
Pyrene	10	NA	NA	1022.5	15.92	99.0	95.0***	95%***	NA	NA	$10^{-2.3}$	5.18	$5.1x10^{-6}$@25°C
Bis(2-ethylhexyl)Phthalate	10	213.08	68.00	2746.5	48.2	97.4	59.8	90%	73%	0%•	10^{-3}	5.3	$3.0x10^{-7}$@25°C
Di-n-Butyl Phthalate	10	48.33	10.25	1321.0	21.5	97.6	79.3	90%	22%	0%•	10^{-2}	5.2	$2.8x10^{-7}$@25°C
Diethyl Phthalate	10	24.8	10.0	826.5	42.4	92.0	59.7	70 to 90%	1%	NA	NA	2.96	$1.14x10^{-6}$ •
Dimethyl Phthalate	10	27.2	10.0	170.5	23.4	87.4	63.2	60 to 95%	0%	NA	10^{-3}	1.87	$2.1x10^{-7}$ •

* Source: Domestic Sewage Study, unless otherwise noted
** Source: OCPSF DD, Chapter VI
*** Bench- or Laboratory-Scale Data

NA - Not Available
! - Source: Section 10 of Record Volume for the Pass-Thru Analysis (Volume 8)
- Physical-Chemical Treatment Technology Removals
a - Source: CERCLA Site Discharges to POTWs Treatability Manual
b - Source: RREL Treatability Data Base, Version 4.0, unless otherwise noted

1. Frequency of Occurrence of the Two Remaining PSES Pollutants

Phenol and 2,4-dimethylphenol are commonly used chemicals or products of organic chemicals, plastics, and synthetic fibers processes. 230 OCPSF facilities out of a total of 393 OCPSF indirect dischargers have been estimated to have detectable levels of phenol in their wastewater discharges to POTWs. 46 OCPSF facilities have been estimated to have detectable levels of 2,4 - dimethylphenol. Tables II-3 and II-4 present OCPSF product/processes whose process wastewaters contain phenol and 2,4-dimethylphenol, respectively. (Note: These tables are not complete inventories of product/process wastestreams containing these pollutants but rather a select sample.) Also included are estimated concentrations for these pollutants. The concentrations listed were observed at the process prior to commingling with other process wastewaters at the plant and discharge to either an on-site treatment system or a POTW.

These concentrations were used to estimate OCPSF raw waste and current discharge loadings to POTW. Current loadings of phenol and 2, 4 - dimethylphenol to POTWs have been estimated as follows:

- Phenol - 7,560,962 lbs/yr.
- 2,4-Dimethylphenol 93,052 lbs/yr.

By using the individual OCPSF plant loadings for each of these pollutants and knowing the POTW that each plant discharges to, a conservative estimate of the influent concentration at the POTW headworks can be calculated if the total flow to the POTW can be obtained. The following section discusses how this analysis was performed and its results.

2. Predicted POTW Headworks Concentrations of Phenol and 2,4 - Dimethylphenol

Using OCPSF facility responses to the 1983 308 Questionnaire, a total of 195 and 40 OCPSF indirect dischargers projected to discharge phenol and 2,4-dimethylphenol respectively , were linked to their respective POTWs. Using EPA's Permit Compliance System (PCS) Data Base, the estimated average daily flow for each identified POTW was then determined.

TABLE 11-3
PRODUCT/PROCESS WASTESTREAMS WITH PHENOL

PRODUCT/PROCESS NAME	PHENOL CONCENTRATION (MG/L)
007695707PHENOLIC RESINS	16995.30
P-NITROPHENOL & SODIUM SALT/PROCESS UNDER REVIEW	9647.78
M-XYLENE (IMPURE)/FRACTIONATION OF MIXED XYLENES	3748.33
ALKYL PHENOLS/NONYL-OCTYL ALKYLATION OF PHENOL	3594.79
ETHOXYLATES/ALKYLPHENOL & ETHYLENE OXIDE	3594.79
SALICYLIC ACID/PROCESS UNDER REVIEW	2016.72
CREOSOTE/DIST. OF COAL TAR LIGHT OIL	1210.57
PITCH TAR RESIDUE/SEP.FROM COAL TAR LIGHT OIL DISTILLATE	1210.57
EPOXY RESINS/EPICHLOROHYDRIN AND NOVOLAK RESINS	892.74
EPOXY RESINS/EPOXIDATION OF POLYMERS	892.74
BENZENE/DIST. OF BTX EXTRACT-COAL TAR LIGHT OIL	883.19
NAPHTHALENE/SEPARATION FROM COAL TAR DISTILLATE	883.19
TOLUENE/DIST. OF BTX EXTRACT-COAL TAR LIGHT OIL	883.19
XYLENES,MIXED/BOTTOM BTX EXTRACY-COAL TAR LIGHT OIL	883.19
POLYCARBONATES/PROCESS UNDER REVIEW	537.00
008007452COAL TAR	535.42
EPOXY RESINS/EPICHLOROHYDRIN + BISPHENOL A	450.20
NONYL PHENOL/ALKYLATION OF PHENOL WITH PROPYLENE TRIMER	410.29
POLYESTER FIBER/MELT SPINNING FROM PURCHASED RESIN	340.34
PHENOLIC RESINS/POLYCONDENSATION OF PHENOL WITH FORMALDEHYDE	309.79
ALKYLPHENOLS, T-AMYL/ALKYLATION OF PHENOL WITH ISOAMYLENE	249.00
EPOXY RESINS	232.69
DIPHENYL PHTHALATE ESTER/PHENOL&PHTHALYL CHLORIDE ESTERIFICATION	217.35
POLYESTER RESIN/POLYCOND. FROM TPA & ETHYLENE GLYCOL	121.15
BISPHENOL-A/CONDENSATION OF ACETONE WITH PHENOL	80.98
CYCLOHEXANE/HYDROGENATION OF BENZENE	76.53
ACETALDEHYDE/BY-PRODUCT OF ACROLEIN BY PROPYLENE OXID	62.64
ACROLEIN/OXIDATION OF PROPYLENE	62.64
METHYL SALICYLATE/ESTERIFICATION OF SALICYLIC ACID	50.26
CHLOROBENZENE/PROCESS UNDER REVIEW	49.98
BTX-BENZENE,TOLUENE,XYLENE(MIXED)/PYROLYSIS GASOLINE FROM OLEFINS MANUFACTURE	49.15
BENZOIC ACID/OXIDATION OF TOLUENE	32.15
ALKYD RESIN/CONDENSATION POLYMERIZATION	30.99
ALLYL ALCOHOL/REDOX OF ACROLEIN AND SEC-BUTANOL	19.25
METHYL ETHYL KETONE/REDOX,OF ACROLEIN & SEC-BUTANOL	19.25
CYCLOHEXANOL/ONE(MIXED)/OXIDATION OF CYCLOHEXANE	16.01
VINYL ACETATE/LIQUID PHASE ETHYLENE & ACETIC ACID	14.71
CAPROLACTAM/FROM PHENOL VIA CYCLOHEXANONE OXIME	8.03
C11-C14 PHTHALATE ESTER/ESTERIFICATION OF PHTHALIC ANHYDRIDE + C11-C14 ALCOHOLS	7.66
STYRENE/DEHYDROGENATION OF ETHYLBENZENE	7.47
METHANOL/H.P. SYNTHESIS FROM NAT GAS VIA SYN GAS	6.41
UNSATURATED POLYESTER RESIN/REACT MALEIC ANHYD + PHTHALIC ANHYD. + PROPYLENE GLY	6.23
HYDROXYPROPYL CELLULOSE/ESTERIFICATION OF CELLULOSE	4.92
ETHYLENE/PYROLYSIS OF ETHANE/PROPANE/BUTANE/LPG	3.59
PROPYLENE/PYROLYSIS OF ETHANE/PROPANE/BUTANE/LPG	3.59
POLYESTER FIBER	3.34
ANTHRACENE/COAL TAR DISTILLATION	3.30
VINYL ACETATE/REDUCTION OF ACETYLENE + ACETIC ACID	2.75
PHOSPHATE ESTERS/DIPHENYLISODECYL - POCL3&PHENOL&ISODECANOL	2.32
ACETYLENE/BY-PRODUCT OF ETHYLENE BY PROPANE PYROLYSIS	2.25
ETHYLENE/PYROLYSIS OF NAPHTHA,PROPANE,ETHANE,BUTANE	2.25
PROPYLENE/PYROLYSIS OF NAPHTHA,PROPANE,ETHANE,BUTANE	2.25
ACRYLAMIDE/CATALYTIC HYDRATION OF ACRYLONITRILE	2.02
ACRYLONITRILE/PROPYLENE AMMOXIDATION	2.02

TABLE II-3

PRODUCT/PROCESS WASTESTREAMS WITH PHENOL

PRODUCT/PROCESS NAME	PHENOL CONCENTRATION (MG/L)
ETHYLENE/PYROLYSIS OF NAPHTHA AND-OR GAS OIL	1.832
PROPYLENE/PYROLYSIS OF NAPHTHA AND OR GAS OIL	1.832
BENZYL ALCOHOL/HYDROLYSIS OF BENZYL CHLORIDE	1.732
ETHYLBENZENE/BENZENE ALKYLATION LIQ. PHASE	1.643
DIMETHYL TEREPHTHALATE/ESTERIFICATION OF TPA+METHANOL	1.426
ADIPONITRILE/AMMONOLYSIS AND DEHYDRATION OF ADIPIC ACID	1.243
STYRENE-BUTADIENE RESIN/ EMULSION POLYMERIZATION	0.924
CAPROLACTAM/FROM CYCLOHEXANE VIA CYCLOHEXANONE AND OXIME	0.728
HYDROXYETHYL CELLULOSE/ETHOXYLATION OF ALKALI CELLULOSE	0.683
A-METHYLSTYRENE/BY-PROD OF ACETONE&PHENOL BY CUMENE OXID	0.386
ACETONE/CUMENE OXIDATION AND ACID CAT. CLEAVAGE OF CUMENE HYDROPEROXIDE	0.386
PHENOL/CUMENE OXIDATION AND CLEAVAGE	0.386
SAN RESIN/SUSPENSION POLYMERIZATION	0.374
ETHYLENE GLYCOL/HYDROLYSIS OF ETHYLENE OXIDE	0.354
ETHYLENE OXIDE/DIRECT OXIDATION OF ETHYLENE	0.354
PETROLEUM HYDROCARBON RESINS/FROM C5-C8 UNSATURATES	0.354
POLYOXYPROPYLENE GLYCOL/REACTION OF PROPYLENE GLYCOL & PROPY OXIDE	0.224
POLYSTYRENE + COPOLYMERS/BULK POLYMERIZATION W-O RUBBER	0.224
N-BUTYL ALCOHOL/HYDROGENATION OF N-BUTYRALDEHYDE, OXO PROCESS	0.220
BENZENE/DIST OF BTX EXTRACT.CAT. REFORMATE	0.182
TOLUENE/DIST OF BTX EXTRACT-CAT REFORMATE	0.182
XYLENES,MIXED/BOTTOM BTX EXTRACT-CAT REFORMATE	0.182
POLYMERIC METHYLENE DIANILINE/REACTION OF ANILINE & FORMALDEHYDE	0.143
NEOPENTONOIC ACID/FROM ISOBUTYLENE VIA OXO PROCESS	0.142
MODACRYLIC FIBER/POLYACRYLONITRILE & COMONOMER	0.109
ACETYLENE/PARTIAL OXIDATION OF METHANE	0.107
ABS RESIN/EMULSION POLYMERIZATION	0.096
NITROBENZENE/NITRATION OF BENZENE	0.091
POLYSTYRENE + COPOLYMERS/SUSP POLYMERIZATION W-O RUBBER	0.090
TRICHLOROETHYLENE/CHLOR.OF EDC AND OTHER CHLORINATED HC	0.082
PHTHALIC ANHYDRIDE/OXIDATION OF NAPHTHALENE	0.073
ADIPIC ACID/OXIDATION OF CYCLOHEXANOL	0.071
VINYL ACETATE/VAPOR PHASE RX OF ETHYLENE & ACETIC ACID	0.066
GLYCERINE (SYNTHETIC)/HYDROXYLATION OF ALLYL ALCOHOL	0.063
BENZYL CHLORIDE/CHLORINATION OF TOLUENE	0.060
BUTYLBENZYL PHTHALATE ESTER/PHTHALIC ANHYD. + BENZYL CHLORIDE + BUTANOL	0.060
AMINO RESINS	0.048
ACETALDEHYDE/OXIDATION OF ETHYLENE WITH CUCL2 CATALYST	0.046
BIS 2-ETHYLHEXYL PHTHALATE ESTER/ESTERIFICATION OF PHTHALICANHYD + 2-ETHYL HEXAN	0.045
DI-ETHYL PHTHALATE ESTER/ESTERIFICATION OF PHTHALIC ANHYD. WITH ETHANOL	0.043
AMYL ACETATES/RXN OF ACETIC ACID & AMYL ALCOHOLS	0.042
METHYL METHACRYLATE/METHANOLYSIS OF ACETONE CYANOHYDRIN	0.042
ACRYLIC ACID/FROM ACETYLENE,CARBON MONOXIDE AND WATER	0.036
DIKETENE/DIMERIZATION OF KETENE-ACETIC ACID	0.036
SEC-BUTYL ALCOHOL/INDIRECT HYDRATION OF BUTENES	0.034
2,4-TOLUENE DIISOCYANATE/PHOSGENATN OF 2,4-TOLUENE DIAMINE	0.029
BENZENE/HYDRODEALKYLIZATION OF TOLUENE AND/OR XYLENE	0.025
HYDROQUINONE/OXIDATION OF ANILINE VIA QUINONE	0.024
POLYETHYLENE RESINS/HIGH PRESSURE POLYMERIZATION (LDPE)	0.024
ANILINE/NITROBENZENE HYDROGENATION	0.023
TOLUENE/DIST OF BTX EXT-PYROLYSIS GASOLINE	0.019
XYLENES-MIXED/BOTTOM BTX EXT-PYROLYSIS GASOLINE	0.019
ISOPRENE/EXTRACTIVE DIST C5 PYROLYZATE	0.018
ETHOXYLATES/C11,C12-LINEAR ALCOHOLS AND ETHYLENE OXIDE	0.017

TABLE II-3
PRODUCT/PROCESS WASTESTREAMS WITH PHENOL

PRODUCT/PROCESS NAME	PHENOL CONCENTRATION (MG/L)
TETRAETHYLENE GLYCOL/FROM ETHYLENE GLYCOL STILL BOTTOMS	0.017
ACETIC ACID/OXIDATION OF ACETALDEHYDE	0.016
BENZENE/DIST OF BTX EXTRACT-PYROLYSIS GASOLINE	0.013
P-XYLENE/ISOMERIZAT-CRYSTALLIZAT OF MIXED XYLENES	0.012
PITCH TAR RESIDUE, ROD PITCH/DISTILATION OF COAL TAR CONDENSATE	0.011
CELLULOSE ACETATES FIBERS/SPINNING FROM ACEYYLATED CELLU	0.009
POLYETHYLENE RESINS/SOLUTION POLYMERIZATION(HDPE)	0.009
BUTADIENE (1,3)/EXT.DIST. OF C-4 PYROLYZATES	0.008
CELLULOSE ACETATE RESIN/ACETYLATION OF CELLULOSE W/ACETIC ANHYDRIDE	0.004
POLYETHYLENE GLYCOL/ETHYLENE GLYCOL + ETHYLENE OXIDE	0.003
ACETIC ACID/BY-PRODUCT OF POLYVINYL ALCOHOL	0.000
ACETIC ANHYDRIDE/FROM ACETIC ACID BY KETENE PROCESS	0.000
ACETONE/BYPRODUCT OF H2O2 BY OXIDATION OF ISOPROPANOL	0.000
ACRYLIC FIBER(85% POLYACRYLONITRILE)/SUSP POLY-WET SPINN	0.000
ACRYLIC LATEX/EMULSION POLYMERIZATION	0.000
CARBON TETRACHLORIDE/CHLORINATION OF METHANE	0.000
CARBON TETRACHLORIDE/CO-PRODUCTION OF TETRACHLOROETHYLENE	0.000
CHLOROBENZENE/CHLORINATION OF BENZENE	0.000
CHLOROFORM/CHLORINATION OF METHANE	0.000
ETHYLENE OXIDE/VIA ETHYLENE CHLOROHYDRIN PROCESS	0.000
GLYCERINE(SYN)/HYDROL OF EPICHLOROHY VIA ALLYL CHLORIDE	0.000
ISOBUTYLENE/EXTRACT FROM C4 PYROLYZATE	0.000
M-CHLORONITROBENZENE/CHLORINATION OF NITROBENZENE	0.000
MALEIC ANHYDRIDE/BENZENE OXIDATION	0.000
METHACRYLIC ACID ESTERS/BUTYMETHACRYLATES - ESTERIFICATION OF METHACRYLIC ACID W	0.000
METHYL CHLORIDE/CHLORINATION OF METHANE	0.000
METHYL ISOBUTYL CARBINAL/PROCESS UNDER REVIEW	0.000
METHYLENE CHLORIDE/CHLORINATION OF METHANE	0.000
NYLON 6 RESIN/POLYCONDENSATION FROM CAPROLACTAM	0.000
O-DICHLOROBENZENE/CHLORINATION OF BENZENE	0.000
OXO ALDEHYDES-ALCOHOLS/AMYL ALCOHOL (MIXED)	0.000
P-DICHLOROBENZENE/CHLORINATION OF BENZENE	0.000
POLYOXYPROPYLENE GLYCOL/PROPOXYLATION OF GLYCERINE	0.000
POLYPROPYLENE RESIN/SOLUTION POLYMERIZATION	0.000
POLYVINYL ALCOHOL RESIN/SOLN POLYM(METHANOL)OF VINYLACETATE - CAUSTIC METHANOLYS	0.000
POLYVINYL CHLORIDE/BULK POLYMERIZATION	0.000
POLYVINYL CHLORIDE/EMULSION POLYMERIZATION	0.000
PROPYLENE OXIDE/FROM PROPYLENE VIA CHLOROHYDRIN	0.000
TETRACHLOROETHYLENE/CHLORINATION OF EDC AND OTHER CHLORINATED HYDROCARBONS	0.000
TETRAETHYL LEAD/ALKYL HALIDE + SODIUM-LEAD ALLOY	0.000
1,2-DICHLOROETHANE/DIRECT CHLORINATION OF ETHYLENE	0.000
1,2,4-TRICHLOROBENZENE/CHLORINATION OF 1,4-DICHLOROBENZ.	0.000

TABLE II-6
PRODUCT/PROCESS WASTESTREAMS WITH 2,4-DIMETHYLPHENOL

-- POLLUTANT CODE=34(2,4-DIMETHYLPHENOL) --

PRODUCT PROCESS NAME	CONCENTRATION	UNITS
	2398320.000	MG/L
CREOSOTE/DIST. OF COAL TAR LIGHT OIL	922205.000	MG/L
PITCH TAR RESIDUE/SEP.FROM COAL TAR LIGHT OIL DISTILLATE	922205.000	MG/L
BENZENE/DIST. OF BTX EXTRACT-COAL TAR LIGHT OIL	154571.000	MG/L
NAPHTHALENE/SEPARATION FROM COAL TAR DISTILLATE	154571.000	MG/L
TOLUENE/DIST. OF BTX EXTRACT-COAL TAR LIGHT OIL	154571.000	MG/L
XYLENES,MIXED/BOTTOM BTX EXTRACT-COAL TAR LIGHT OIL	154571.000	MG/L
ETHYLENE/PYROLYSIS OF NAPHTHA AND-OR GAS OIL	1407.000	MG/L
PROPYLENE/PYROLYSIS OF NAPHTHA AND OR GAS OIL	1407.000	MG/L
C11-C14 PHTHALATE ESTER/ESTERIFICATION OF PHTHALIC ANHYDRIDE + C11-C14 ALCOHOLS	588.000	MG/L
COAL TAR PRODUCTS (MISC.)/COAL TAR DISTILLATION	490.000	MG/L
P-XYLENE/ISOMERIZAT-CRYSTALLIZAT OF MIXED XYLENES	56.000	MG/L
MALEIC ANHYDRIDE/BENZENE OXIDATION	30.000	MG/L
METHANOL/L.P. SYTHESIS FROM NAT GAS VIA SYN GAS	10.000	MG/L
ACETYLENE/BY-PRODUCT OF ETHYLENE BY PROPANE PYROLYSIS	5.000	MG/L
ETHYLENE/PYROLYSIS OF NAPHTHA,PROPANE,ETHANE,BUTANE	5.000	MG/L
PROPYLENE/PYROLYSIS OF NAPHTHA,PROPANE,ETHANE,BUTANE	5.000	MG/L
AMINO RESINS	3.000	MG/L
ACETIC ACID/BY-PRODUCT OF POLYVINYL ALCOHOL	0.000	MG/L
BENZENE/DIST OF BTX EXTRACT.CAT. REFORMATE	0.000	MG/L
BISPHENOL-A/CONDENSATION OF ACETONE WITH PHENOL	0.000	MG/L
N-BUTYL ALCOHOL/HYDROGENATION OF N-BUTYRALDEHYDE, OXO PROCESS	0.000	MG/L
CHLOROBENZENE/CHLORINATION OF BENZENE	0.000	MG/L
M-CHLORONITROBENZENE/CHLORINATION OF NITROBENZENE	0.000	MG/L
O-DICHLOROBENZENE/CHLORINATION OF BENZENE	0.000	MG/L
P-DICHLOROBENZENE/CHLORINATION OF BENZENE	0.000	MG/L
ISOBUTANOL/HYDROG OF ISOBUTYRALDEHYDE-OXO PROCESS	0.000	MG/L
ISOBUTYLENE/EXTRACT FROM C4 PYROLYZATE	0.000	MG/L
ISOBUTYLENE/DEHYDRATION OF PURCHASED TERT-BUTANOL	0.000	MG/L
ISOPRENE/EXTRACTIVE DIST C5 PYROLYZATE	0.000	MG/L
ISOPROPANOL/DIRECT HYDRATION OF PROPYLENE	0.000	MG/L
NEOPENTONOIC ALICD/FROM ISOBUTYLENE VIA OXO PROCESS	0.000	MG/L
PETROLEUM HYDROCARBON RESINS/FROM C5-C8 UNSATURATES	0.000	MG/L
POLYPROPYLENE RESIN/SOLUTION POLYMERIZATION	0.000	MG/L
POLYVINYL ALCOHOL RESIN/SOLN POLYM(METHANOL)OF VINYLACETATE - CAUSTIC METHANOLYS	0.000	MG/L
TOLUENE/DIST OF BTX EXTRACT-CAT REFORMATE	0.000	MG/L
1,2,4-TRICHLOROBENZENE/CHLORINATION OF 1,4-DICHLOROBENZ.	0.000	MG/L
XYLENES,MIXED/BOTTOM BTX EXTRACT-CAT REFORMATE	0.000	MG/L

By aggregating the loadings for the OCPSF facilities discharging to a POTW, an estimated total annual loading to the POTW (in lbs/yr) for each pollutant can be determined. Using this loading estimate and the average daily flow to the POTW, an influent concentration for each pollutant at the POTW headworks can be calculated as follows:

$$HC = \frac{TAL}{APF \times 365 \text{ days/year} \times 8.34}$$

where: HC = Estimated POTW Headworks Concentration (in mg/l)

TAL = Total Annual Pollutant Loading (in lbs/year)

APF = Average POTW Flow (in million gallons per day)

The results of this analysis, which are presented in Table II-5, show that a total of 11 POTWs had estimated influent headworks concentrations greater than 1,000 ppb out of a total of 105 POTWs included in the analysis. A total of 10 POTWs had estimated influent headworks concentrations of 2,4-dimethylphenol greater than the analytical minimum level of 10 ppb, with only 2 being greater than 100 ppb. Two POTWs showed influent headworks concentrations of phenol greater than 10,000 ppb (one of these POTWs also showed 2, 4 - dimethylphenol greater than 10,000 ppb); based on the size and location of the POTWs and the basis for the OCPSF loadings estimates (one POTW's cumulative headworks loading was made up of loadings from four OCPSF facilities with Part A loadings estimates (DD at VIII-260) which were estimated conservatively on the high side), these two POTWs were contacted to confirm the accuracy of their estimated influent headworks concentrations. Representatives from both POTWs (located in Tennessee and New Jersey) confirmed that the predicted influent headworks concentrations were overestimates; although actual influent headworks concentration data were not available for these two POTWs, plant contacts believed that influent phenol concentrations were well below 1000 ppb.

Based on the results of this analysis, a concentration range of phenol of 1,000 to 4,000 ppb will generally be the highest raw waste level that the average POTW receiving OCPSF wastewaters will have to treat. The following section discusses the ability of POTWs receiving OCPSF wastewaters to treat phenol and 2,4 - dimethylphenol.

TABLE II-5
RESULTS OF POTW HEADWORKS ANALYSIS

---------- Chemical Number=34(2,4-DIMETHYLPHENOL) ----------

POTW	OCPSF Plants Discharging to this POTW	Annual Current Load (lbs/YR)	Daily Flow (MGD)	Concentration (mg/l)
1	4066	0.01	385.00	0.000
2	1793	61.77	37.50	0.001
3	326	617.73	15.60	0.013
4	2465	200.76	90.00	0.001
5	1888	0.00	10.00	0.000
6	196	7258.38	13.50	0.177
7	4009	0.01	5.50	0.000
8	110,508	115.84	1200.00	0.000
9	1126	7876.12	27.00	0.096
10	2677	3505.64	60.00	0.019
11	1437	11732.35	920.00	0.004
12	240,2548	8443.07	248.00	0.011
13	293	9729.32	40.00	0.080
14	149,1085,1848	598.28	120.00	0.002
15	51,72,1666,1716,1766,4026	7356.42	330.00	0.007
16	1026	0.01	3.60	0.000
17	768	46.33	4.00	0.004
18	4064	0.00	16.50	0.000
19	618	0.01	75.00	0.000
20	162	0.00	48.00	0.000
21	2184	25743.69	155.00	0.055
22	468	1166.24	120.00	0.003
23	2609	20.81	3.75	0.002
24	4006	540.52	8.30	0.021
25	433,1361,1608,1876	6270.01	0.05	45.772
26	2007	262.54	6.50	0.013
27	1560	77.22	17.18	0.001

---------- Chemical Number=65(PHENOL) ----------

POTW	OCPSF Plants Discharging to this POTW	Annual Current Load (lbs/YR)	Daily Flow (MGD)	Concentration (mg/l)
1	1117	497.01	1.30	0.126
2	1195	24.36	6.00	0.001
3	2037	2444.14	24.00	0.033
4	929,1931,2033,2241,4066	163074.88	385.00	0.139
5	79,220,321,1173,1628,1793,2086,2659	34777.15	37.50	0.305
6	2108	0.75	1.81	0.000
7	1808	0.02	227.00	0.000
8	326	5468.62	15.60	0.115
9	2300,2465	2555.00	90.00	0.009
10	2796	336.51	15.00	0.007
11	1507	7083.94	1.00	2.327
12	111	0.00	36.00	0.000
13	1888	0.00	10.00	0.000
14	196	64256.25	13.50	1.564
15	1791	1.12	40.00	0.000
16	1812	0.00	6.20	0.000
17	4009	0.01	5.50	0.000
18	1861	1334.80	37.00	0.012

TABLE II-5
RESULTS OF POTW HEADWORKS ANALYSIS

-- Chemical Number=65(PHENOL) --
(continued)

POTW	CCPSF Plants Discharging to this POTW	Annual Current Load (lbs/YR)	Daily Flow (MGD)	Concentration (mg/l)
19	1083,2517	11893.09	25.00	0.156
20	2810	0.01	7.25	0.000
21	71	0.56	15.94	0.000
22	110,508,791,2050,2232,2608,2646	132021.90	1200.00	0.036
23	1234,2022	375.06	354.00	0.000
24	1357	3988.09	19.60	0.067
25	1126	69724.87	27.00	0.848
26	1226,2677	31114.37	60.00	0.170
27	1313	805.68	120.00	0.002
28	1220	68.28	48.00	0.000
29	2359	0.03	12.00	0.000
30	2635	22.21	105.00	0.000
31	1899	33878.49	52.00	0.216
32	2288	6.24	8.60	0.000
33	1505	19.89	17.50	0.000
34	1223	43.86	1.60	0.009
35	1333	149040.51	66.70	0.734
36	221	80297.06	6.50	4.058
37	22,1437	79693.16	920.00	0.028
38	4050	3.03	50.00	0.000
39	605	0.01	53.30	0.000
40	1052	38.73	56.00	0.000
41	661,763,2371	1.62	87.50	0.000
42	1595	3.97	0.30	0.004
43	240,592,2548	427384.18	248.00	0.566
44	1832	66.17	4.60	0.005
45	2318	1552.65	4.00	0.128
46	143	8.42	7.50	0.000
47	2793	22345.22	22.00	0.334
48	293	86130.72	40.00	0.707
49	1993	6445.29	15.00	0.141
50	2642	0.00	8.00	0.000
51	2442	49.49	35.00	0.000
52	285	0.00	2.60	0.000
53	149,1085,1219,1352,1539,1667,1848,2348,	412087.55	120.00	1.128
54	2485,2495	.	.	.
55	51,72,257,796,944,997,1047,1181,1426,	1138109.80	330.00	1.133
56	1664,1716,1764,1853,2539,4026	.	.	.
57	1936	8.21	0.85	0.003
58	771,1026,1575	4.78	3.60	0.000
59	768	610.15	4.00	0.034
60	1322	2945.52	3.00	0.323
61	4064	0.00	16.50	0.000
62	618,1194	90.99	75.00	0.000
63	1528	506.69	6.00	0.042
64	1432	611762.76	10.00	13.526
65	2117	646.19	36.40	0.006
66	209	0.01	200.00	0.000
67	1773	29415.49	13.00	0.743
68	1433	0.00	6.00	0.000
69	162,343	354679.50	48.00	2.427

TABLE II-5

RESULTS OF POTW HEADWORKS ANALYSIS

-------------------- Chemical Number=65(PHENOL) --------------------

(continued)

POTW	OCPSF Plants Discharging to this POTW	Annual Current Load (lbs/YR)	Daily Flow (MGD)	Concentration (mg/l)
70	1351	813.02	92.00	0.003
71	2191	275.90	1.60	0.057
72	1320	657.04	14.08	0.015
73	2261	363.23	135.00	0.001
74	1069	209167.08	180.00	0.382
75	199,702	13351.78	90.00	0.049
76	1316	5.78	12.00	0.000
77	2184,4014,4070	39110.96	155.00	0.083
78	4026	1434.10	4.40	0.107
79	468,749,1534,2243	36583.61	120.00	0.100
80	2609	2861.86	3.75	0.251
81	987	1160.17	8.00	0.048
82	2147	0.00	1.67	0.000
83	830	6.46	108.30	0.000
84	4006	4785.04	8.30	0.189
85	4047	22259.66	3.75	1.950
86	1971,2666	15.20	200.00	0.000
87	1255	27.82	26.00	0.000
88	1057	126.09	42.75	0.001
89	887,975	55676.92	200.00	0.091
90	93	15.83	10.00	0.001
91	2018	19801.48	6.00	1.084
92	214	4772.96	40.00	0.039
93	1277	8602.72	65.00	0.043
94	433,1361,1608,1876	55506.46	0.05	405.203
95	1202	190.40	7.14	0.009
96	206	24170.26	30.00	0.265
97	958	0.99	20.00	0.000
98	2259	1568.45	120.00	0.004
99	2007	2324.16	6.50	0.117
100	2250	1503.86	24.00	0.021
101	976	40.73	10.00	0.001
102	269,722	10767.11	50.00	0.071
103	4048	0.00	0.40	0.000
104	1450	805.68	5.00	0.053
105	2498	12085.13	120.00	0.033
106	458,706	174069.78	18.39	3.109
107	1560	683.58	17.18	0.013

3. <u>Ability of POTWs to Biodegrade the Two Remaining PSES Pollutants</u>

In theory, most organic pollutants can be biodegraded with adequate detention times and favorable operating conditions. The general design equation for an activated sludge system is:

$$\frac{So - Se}{Xv\ t} = k \frac{Se}{So}$$

where: So = influent concentration
Se = effluent concentration
Xv = mixed liquor volatile suspended solids
k = biodegradation rate constants
t = detention time

Given that pollutant influent concentration will remain fairly constant with steady industrial user discharges, that permit conditions fix the pollutant effluent concentration and that the POTW is already built with a given aeration basin volume and detention time, the parameters k, biodegradation rate constant and Xv, mixed liquor volatile suspended solids, generally will control the removal of organic pollutants.

The biodegradation rate constant, k, is a measure of the growth rate of biomass microorganisms based on a given substrate or food source and varies depending on the composition of the wastewater to be treated. When designing a biological treatment system, laboratory-scale pilot studies are performed on the wastewater to determine the value to be assigned to the biodegradation rate constant. However, after the rate constant has been established and the treatment system has been designed and constructed, changes in the composition of the wastewater to be treated are accommodated by adjustment of operational parameters such as mixed liquor suspended solids.

Table II-6 presents biodegradation rate constants for various types of wastewaters; in general the higher the value of k, the more biodegradable the wastewater. For example, potato processing wastewater, which contains simple carbohydrates and starches that are easy to biodegrade, has a biodegradation rate constant of 36.0 day^{-1}, while wastewaters generated in the manufacture of cellulose acetate, a more chemically complex compound, has a biodegradation rate constant of 2.6 $days^{-1}$. Rate constants for organic chemicals intermediates wastewaters, which can include a wide variety of compounds, range from 5.8 to 20.6 $days^{-1}$.

TABLE II-6

BIODEGRADATION RATE CONSTANTS FOR VARIOUS TYPES OF WASTEWATERS

Wastewater	k $days^{-1}$
Potato processing	36.0
Peptone	4.03
Sulfite paper mill	5.0
Vinyl acetate monamer	5.3
Polyester fiber	14.0
Formaldehyde, propanol, methanol	19.0
Cellulose acetate	2.6
AZO dyes, epoxy, optical brighteners	2.2
Petroleum refinery	9.1
Vegetable tannery	1.2
Organic phosphates	5.0
High nitrogen organics	22.2
Organic intermediates	20.6
	5.8
Viscose rayon and nylon	8.2
	6.7
Soluble fraction of domestic sewage	8.0

Source: Eckenfelder, Biological Waste Treatment

OCPSF wastewaters with known concentrations of phenol and 2,4-dimethylphenol are highly biodegradable and, in fact, appear to be comparable in biodegradability to domestic sewage based on biodegradation rate constants. For example, from Table II-3, polyester fiber is listed as generating raw wastewater with a phenol concentration of 340,300 ppb; polyester fiber is also listed in Table II-6 as generating wastewaters with an associated biodegradation rate constant of 14.0 $days^{-1}$ which would be considered more biodegradable than domestic sewage at 8.0 $days^{-1}$. Also, production of methanol is listed in Table II-4 as generating raw wastewater with a 2,4-dimethylphenol concentration of 10,000 ppb; methanol production is also listed as generating wastewaters with an associated biodegradation rate constant of 19.0 day^{-1} which would also be considered more biodegradable than domestic sewage.

Thus, even at concentrations higher than those estimated to occur at POTW headworks, phenol and 2,4-dimethylphenol should biodegrade more easily than the typical constituents of domestic sewage, which POTWs were specifically designed to handle.

4. **POTW Performance Data**

In 1978, EPA initiated a program to study the occurrence and fate of the then 129 priority pollutants in 40 POTWs. This study was subsequently expanded to include ten additional plants to support the Agency's database. In 1982, EPA published the findings of the 50 POTW Study (EPA 440/1-82/303), which provided the data that was the basis for the pass through determination for priority pollutants in the OCPSF guidelines and the proposed pesticide guidelines.

Sampling data collected during the 50 POTW Study showed that biological treatment systems at POTWs are capable of reducing influent phenol concentrations of over 1,000 ppb to below the analytical minimum level in the effluent. The main reason for the finding of pass through for phenol and 2,4-dimethylphenol at promulgation of the OCPSF guideline was the significantly higher influent concentrations used to calculate direct discharger removals in comparison with concentrations used to calculate POTW removals. Table II-7 presents the data to perform this comparison.

Out of a total of 28 POTWs that had phenol detected at least once in their influent, only 15 POTWs had average influent phenol concentrations greater than 20 ppb and only eight POTWs had average influent phenol concentrations greater than 100 ppb. Of these eight, six had concentrations between 100 and 500 ppb, and only two had concentrations between 500 and 1,000 ppb. In contrast, out of 25 OCPSF direct discharge facilities that had phenol concentrations detected in their influent, 23 OCPSF plants had influent concentrations greater than 20 ppb and 19 OCPSF plants had influent phenol

TABLE II-7

OCPSF AND POTW INFLUENT AND EFFLUENT DATA FOR PHENOL AND 2,4-DIMETHYLPHENOL USED IN THE PASS-THROUGH ANALYSIS AT PROMULGATION

-- POLLUTANT='65. PHENOL' -- DETECTION LIMIT(PPB)=10 --

OCPSF NUMBER	# OBS. OF INFLUENT	NUMBER INFLUENT (>DL)	MINIMUM INFLUENT (PPB)	MEAN INFLUENT (PPB)	MEDIAN INFLUENT (PPB)	MAXIMUM INFLUENT (PPB)	# OBS. OF EFFLUENT	NUMBER EFFLUENT (>DL)	MINIMUM EFFLUENT (PPB)	MEAN EFFLUENT (PPB)	MEDIAN EFFLUENT (PPB)	MAXIMUM EFFLUENT (PPB)
2394T	4	4	616	1847	2088	2597	20	20	13	58.500	43.50	205.000
2536T	15	15	257	501	525	715	15	.	10	10.000	10.00	10.000
3033T	13	13	245	5059	3116	15961	12	2	10	13.167	10.00	42.000
384T	13	11	10	227	162	985	15	.	10	10.000	10.00	10.000
2481F	7	7	13	28	23	54	7	.	10	10.000	10.00	10.000
948P	34	34	19	233	149	1040	33	3	10	10.162	10.00	14.333
267F	12	12	20	1638	1679	4300	11	2	10	10.682	10.00	15.000
12F	7	7	324	761	651	1477	7	4	10	14.929	17.50	22.000
1293T	13	13	698564	836293	847027	978672	15	.	10	10.000	10.00	10.000
1769P	4	3	10	1584	1093	4140	4	2	10	25.250	12.00	67.000
2445P	10	10	2100	5860	3225	10000	10	4	10	20.900	10.00	60.000
2221V	3	3	140	292	250	487	1	.	10	10.000	10.00	10.000
2711V	3	3	190000	221667	230000	245000	2	.	10	10.000	10.00	10.000
444V	3	3	31	48	35	78	3	1	10	12.000	10.00	16.000
695V	3	3	3900	5667	5600	7500	3	3	100	120.000	120.00	140.000
1650V	3	3	50	117	111	191	3	1	10	10.867	10.00	12.600
948V	6	6	38	510	172	1675	6	.	10	10.000	10.00	10.000
883V	3	3	62	64	63	67	2	1	10	10.250	10.25	10.500
1890V	3	3	46	84	56	150	3	2	10	13.733	17.20	20.000
*1890V	3	3	290	2917	1727	6734	3	2	10	10.867	10.02	12.400
2631V	3	3	637	709	680	810	3	.	10	10.000	10.00	10.000
296V	3	3	259	731	636	1297	3	.	10	10.000	10.00	10.000
306V	3	3	28500	53917	58000	75250	3	1	10	13.333	10.00	20.000

POTW NUMBER	# OBS. OF INFLUENT	NUMBER INFLUENT (>DL)	MINIMUM INFLUENT (PPB)	MEAN INFLUENT (PPB)	MEDIAN INFLUENT (PPB)	MAXIMUM INFLUENT (PPB)	# OBS. OF EFFLUENT	NUMBER EFFLUENT (>DL)	MINIMUM EFFLUENT (PPB)	MEAN EFFLUENT (PPB)	MEDIAN EFFLUENT (PPB)	MAXIMUM EFFLUENT (PPB)
16	6	5	10	44.833	43.5	72	6	0	10	10.0000	10.0	10
18	6	2	10	25.333	10.0	88	6	0	10	10.0000	10.0	10
19	6	6	19	130.000	115.0	300	6	0	10	10.0000	10.0	10
21	6	6	34	56.667	55.0	76	6	0	10	10.0000	10.0	10
28	6	6	640	908.333	775.0	1400	6	0	10	10.0000	10.0	10
30	6	6	16	123.667	64.5	382	6	0	10	10.0000	10.0	10
31	6	5	20	58.833	58.0	110	6	0	10	10.0000	10.0	10
36	6	6	220	448.333	405.0	720	6	3	10	27.3333	12.5	76
38	6	6	46	185.667	180.0	320	6	0	10	10.0000	10.0	10
52	6	6	30	260.000	244.0	700	6	0	10	10.0000	10.0	10
53	6	6	28	51.167	48.0	97	6	0	10	10.0000	10.0	10
55	6	5	10	43.500	42.5	90	6	0	10	10.0000	10.0	10
58	6	6	320	795.000	770.0	1200	6	1	10	14.1667	10.0	35
59	6	6	23	69.833	52.0	140	6	0	10	10.0000	10.0	10
60	6	5	10	242.500	120.0	650	6	0	10	10.0000	10.0	10

TABLE II-7

OCPSF AND POTW INFLUENT AND EFFLUENT DATA FOR PHENOL AND 2,4-DIMETHYLPHENOL USED IN THE PASS-THROUGH ANALYSIS AT PROMULGATION

-------------------------------- POLLUTANT='34. 2,4-DIMETHYLPHENOL' -- DETECTION LIMIT(PPB)=10 --------------------------------

OCPSF NUMBER	# OBS. OF INFLUENT	NUMBER INFLUENT (>DL)	MINIMUM INFLUENT (PPB)	MEAN INFLUENT (PPB)	MEDIAN INFLUENT (PPB)	MAXIMUM INFLUENT (PPB)	# OBS. OF EFFLUENT	NUMBER EFFLUENT (>DL)	MINIMUM EFFLUENT (PPB)	MEAN EFFLUENT (PPB)	MEDIAN EFFLUENT (PPB)	MAXIMUM EFFLUENT (PPB)
3033T	13	13	542	4592	3640	8787	12	3	10	14.9167	10	40.0
12F	7	7	386	697	618	1136	7	3	10	13.2143	10	17.5
1293T	14	14	16216	29868	26637	73537	15	.	10	10.0000	10	10.0
306V	3	3	5600	9967	9800	14500	3	1	10	10.1667	10	10.5

POTW NUMBER	# OBS. OF INFLUENT	NUMBER INFLUENT (>DL)	MINIMUM INFLUENT (PPB)	MEAN INFLUENT (PPB)	MEDIAN INFLUENT (PPB)	MAXIMUM INFLUENT (PPB)	# OBS. OF EFFLUENT	NUMBER EFFLUENT (>DL)	MINIMUM EFFLUENT (PPB)	MEAN EFFLUENT (PPB)	MEDIAN EFFLUENT (PPB)	MAXIMUM EFFLUENT (PPB)
52	6	3	10	20.5	11.5	56	6	0	10	10	10	10

concentrations greater than 100 ppb. Of these 19, only four plants had influent phenol concentrations between 100 and 500 ppb, five had influent phenol concentrations between 500 and 1000 ppb, and 10 had influent phenol concentrations greater than 1000 ppb. The direct discharge facility with the highest percentage removal (99.9988%) had an influent concentration of over 836,000 ppb, which was 836% higher than the highest POTW influent concentration. For 2,4-dimethylphenol, the median percent removal of this pollutant demonstrated by direct dischargers was 99.8%. This was based on data from four OCPSF plants with average influent concentrations ranging from 697 to 29,868 ppb, and with 30 of 37 effluent values of 10 ppb. For POTW performance, EPA had a single observation of a POTW with an average influent concentration of 20.5 ppb and an average effluent concentration below the analytical minimum level, which was also assigned a value of 10 ppb. Thus, POTW removal was calculated at 51.2%, and the pollutant was determined to pass through.

Given the far higher influent concentrations for the direct dischargers in comparison with the POTWs, and the fact that many of the effluent values for both the direct dischargers and POTWs were below the analytical minimum level, it was inevitable that the analysis would conclude that phenol and 2,4-dimethylphenol pass through.

Stating that the analysis in the proposal did not present a fair comparison of percent removals, the Allied Signal Co. and other commentors on the December 6, 1991 proposed rule identified three POTWs currently treating wastewaters with high OCPSF contributions of phenol while still discharging below the analytical minimum level. The Agency solicited data from these POTWs. A discussion of their submissions is presented below.

A. Philadelphia, Pennsylvania

The Northeast Water Pollution Control Plant (NEWPCP) in Philadelphia, Pennsylvania currently receives wastewater containing phenol from two OCPSF facilities; NEWPCP identified Allied Chemical as the major contributor of phenol to its system.

The NEWPCP operates under NPDES Permit Number PA0026689, issued by the Pennsylvania Department of Environmental Resources. Unit operations of the plant include grit removal, primary gravity settling, activated sludge (both fixed film and suspended in one system), secondary gravity settling, anaerobic digestion after dissolved air flotation and raw sludge thickening and chlorination of the effluent prior to discharge to the Delaware River.

The NEWPCP has indicated no problems in handling and treating its current phenol levels. Allied Chemical phenol loadings to the NEWPCP average 239.57 pounds per day which equate to an average concentration at the NEWPCP headworks of 162.71 ppb. (Allied is currently required to monitor its discharge for phenol every 2 hours, 24 hours per day.) Data submitted by the NEWPCP indicate that effluent phenol concentrations were not detected above the analytical minimum level by either the 4AAP Method (50 ppb) or GC/MS Method 625 (5 ppb and 10 ppb).

Control of phenol discharges to the NEWPCP by Allied is set out in the local wastewater discharge permit issued to Allied under NEWPCP's pretreatment program. In addition to setting monitoring requirements, local limitations for phenol have been set at levels that NEWPCP feels will adequately protect the facility.

B. <u>Hopewell, Virginia</u>

The Hopewell Regional Wastewater Treatment Facility (HRWTF) currently receives wastewater discharges containing phenol for two OCPSF facilities. HRWTF identified one of these dischargers as the Allied Chemical facility in Hopewell, Virginia.

The HRWTF operates under NPDES Permit Number VA 0066630, issued by the Virginia State Water Pollution Control Board. Unit operations of the plant consist of screening, grit removal, primary settling, covered aeration basins and secondary settling tanks. Primary sludge is thickened in gravity thickeners with the overflow being returned to the head of the aeration basins. Waste secondary sludge is thickened with the underflow being sent to the gravity thickeners. Thickened sludge is sent to sludge holding tanks where it is pumped through heat exchangers to a sludge heat treatment unit. Heat treated sludge is sent to a decant tank and then through vacuum filters to incineration, with decant and filtrate water being returned to the gravity thickeners.

The HRWTF has reported no problems in handling and treating its current levels of phenol. Current industrial loadings of phenol to the HRWTF as calculated from industrial user data is 132.31 pounds per day which equates to an average concentration at the HRTWF headworks of approximately 500 ppb. Data submitted by HRWTF indicate that effluent phenol concentrations were not detected above the analytical minimum level by GC/MS Method 625, which ranged from 1.5 ppb to 50 ppb.

Control of all industrial discharges to the HRWTF is set out in local wastewater discharge permits issued under HRWTF's approved pretreatment program. This program has been audited and found to be satisfactory by the State Water Pollution Control Board. Pretreatment Program Annual Reports for 1989, 1990, and 1991 state that "...there were no known industrial user discharges which interfered with the Regional plant and caused a violation of any requirement of the NPDES permit."

C. **Sheboygan, Wisconsin**

The Sheboygan, Regional Wastewater Treatment Facility (SRWTF) in Sheboygan, Wisconsin currently receives wastewater containing phenol from two OCPSF facilities; SRWTF identified PLENCO as the major contributor of phenol to their system.

The SRWTF operates under NPDES Permit Number WI 0025411, issued by the Wisconsin Department of Natural Resources. Unit operations of the plant include bar screens, grit removal, primary clarification, diffused aeration activated sludge, secondary clarification and effluent chlorination; primary sludge is thickened in gravity thickeners and combined with thickened waste secondary sludge (dissolved air flotation) prior to anaerobic digestion.

The SRWTF has indicated no problems in handling and treating its current levels of phenol. PLENCO concentrations measured at their discharge manhole ranged from not detected (10 ppb) up to a high of 10,842 ppb. Phenol concentration measured at the SRWTF headworks ranged from 23.3 ppb up to a high of 4043 ppb. Data submitted by SRWTF indicate that phenol concentrations in their effluent discharge during this same sampling period were never found above the analytical minimum level for GC/MS Method 625 (5 ppb and 10 ppb) demonstrating removals of at least 99.8 percent. Control of phenol discharges to SRWTF by PLENCO is set out in their approved pretreatment programs.

These three POTWs represent typical POTW performance in treating phenol; each has classic textbook secondary treatment which consists of primary and secondary clarification along with some form of biological treatment. 80 percent of the POTWs sampled in the 50 POTW study had the same treatment train (The remaining 20% had some form of advanced wastewater treatment (AWT) in addition to this treatment train). In addition, EPA believes these three POTWs represent examples of typical pretreatment programs. All three POTWs report having approved pretreatment programs with wastewater discharge permits issued to significant industrial users (SIUs) that specify monitoring and reporting requirements and in some situations, discharge limitations for certain pollutants. It should be noted that despite the relatively low phenol concentrations in the raw wastewaters of two of the three POTWs, fairly sophisticated pretreatment programs were developed and are in place; it seems that the presence of SIUs with large discharges and not the POTW influent concentrations of toxic pollutants drives the implementation of effective pretreatment programs. The Agency believes that POTWs with significant industrial contributions have established local pretreatment programs that will ensure that pass through of pollutants will not occur.

The data from these three POTWs are consistent with the performance shown in the 50 POTW Study data, with 13 POTWs out of 15 POTWs with influent phenol concentrations above 20 ppb having effluent concentrations below the analytical minimum level. The 50 POTW Study plant (#28) with the highest average influent phenol concentration, 908 ppb, consistently removed phenol to below the analytical minimum level, thus achieving at least 98.8 percent removal.

Of the two POTWs with measurable phenol in the effluent, one (#36) had 3 of 6 effluent phenol concentration values greater than the analytical minimum level with an average phenol percent removal of only 93 percent. Although this POTW was initially selected for sampling in the 50 Plant POTW Study because it was considered a good performer, there is evidence that the POTW was not a well-operated, good performer during the sampling period. At the time of the sampling, this POTW was receiving 2.5 million gallons per day (MGD) over its design capacity. In addition, BOD and TSS effluent concentrations for this POTW (87 ppm and 38 ppm, respectively) were significantly above secondary treatment requirements of 30 ppm for both BOD and TSS.

The other POTW (#58) had only one effluent phenol concentration value above the analytical minimum level out of a total of six effluent phenol concentration measurements with an average percent removal of at least 98 percent. This POTW was a good performer during the sampling period attaining BOD and TSS effluent concentrations of 16 and 11 ppm, respectively.

Overall, EPA's data from the 50 POTW Study and the three additional POTWs show only four phenol effluent data points above the analytical minimum level out of a total of 83 measurements, and three of these points are from a plant that does not appear to have been well operated. Eleven direct discharge plants out of a total of 25 OCPSF facilities that had phenol detected in their influent had measurable phenol in one or more effluent measurements, with removals ranging from 91.5% to 99.9988%. While seven of these plants showed phenol removals slightly higher than that demonstrated by any POTW (ranging from 99.3% to 99.9988%, compared to 99.2% for the Sheboygan Regional Wastewater Treatment Facility), these levels of removals could not be demonstrated by POTWs because, as explained above, none had influent concentrations high enough to demonstrate removals at these higher levels. Overall, EPA believes the data demonstrate comparable removals of phenol by direct dischargers with BAT-level treatment and POTWs.

D. Summary of Technical Findings

Based on the analyses presented above, EPA believes that phenol and 2,4-dimethylphenol are simple, easily treated, highly biodegradable compounds that are readily consumed (treated) by the microorganisms cultured in biological treatment systems. Thus, a well operated POTW biological treatment system should be able to rapidly achieve almost complete biodegradation of phenol and 2, 4 - dimethylphenol, and should therefore achieve removal levels that are essentially equivalent to those achieved by direct dischargers employing BAT-level treatment. Based on these conclusions, phenol and 2,4-dimethylphenol should not be considered to pass through POTWs and should not be regulated by categorical pretreatment standards.

III REFERENCES

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- CERCLA Site Discharges to POTWs Treatability Manual, EPA 540/2-90-007, August 1990

- Fate of Priority Pollutants in Publicly Owned Treatment Works, EPA 440/1-82/303, September 1982

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- Environmental Engineering, Howard S. Peavy, Donald R. Rowe, George Tchobanoglous, McGraw-Hill, 1985

- Biological Waste Treatment, W. W. Eckenfelder, McGraw-Hill

- Letter to George M. Jett, USEPA, from City of Philadelphia, Mr. Thomas F. Healey, Manager, Industrial Waste, September 17, 1992

- Letter to George M. Jett, USEPA, from City of Hopewell, Virginia, Mr. Mark A. Haley, Director, September 14, 1992

- Letter to Dave Griffin, Plastics Engineering Company (PLENCO), from Donohue Engineers, Architects, Scientists, Loren C. Trick, Project Manager, May 19, 1989

APPENDIX III-B

BAT AND PSES INITIAL ANALYSIS COST DATA

BAT Initial Analysis Cost Data

PLANT NUMBER	TOTAL CAPITAL COSTS	TOTAL O&M COSTS	TOTAL LAND COSTS	CAPITAL SLUDGE COSTS	O & M SLUDGE COSTS	CONTRACT HAULING COSTS	ANNUAL MONITORING COSTS
1	0	0	0	0	0	0	29539
12	583212	77154	8994	0	0	0	29539
15	881544	128618	4324	3536	762	0	29539
61	912274	115757	4653	37220	8016	0	29539
63	0	4750	0	0	0	0	33782
76	1277396	1524624	39928	193544	41683	0	29539
83	328468	31298	310	11724	2525	0	33782
87	541052	196316	1937	0	0	0	26827
101	0	0	0	0	0	222650	26827
102	0	0	0	0	0	0	29539
105	903191	2084544	280375	276731	59599	0	41206
112	0	0	0	0	0	111325	26827
114	865094	330915	20022	472694	101803	0	26827
154	328468	33389	2412	74440	16032	0	26827
159	0	0	0	0	0	0	29539
177	1011495	103592	21556	48386	10421	0	29539
183	862959	451849	27831	0	0	0	29539
190	731177	1072783	66000	0	0	0	41206
205	821587	757824	86733	193544	41683	0	29539
225	401831	76617	2557	375178	80801	0	29539
227	454726	28989	2124	0	0	0	41206
250	354104	50601	8063	385227	82966	0	33782
254	366729	54659	3248	470833	101402	0	26827
259	0	0	0	0	0	0	33782
260	849575	109273	15994	81884	17635	0	29539
267	1411929	651263	13206	776832	193075	0	51259
269	60026	31856	626	0	0	0	29539
284	384432	67491	5018	111660	24048	0	26827
294	0	0	0	0	0	0	29539
296	594489	119654	21801	661521	164416	0	41206
301	8973044	3754917	96349	329397	116988	0	41206
352	405958	63704	1466	3908	842	0	29539
384	6856767	3047519	248419	358431	127299	0	51259
387	2969660	841368	37964	1827258	888306	0	65286
392	450142	33874	2736	0	0	0	26827
394	461491	47794	8211	0	0	0	26827
399	2000000	335000	9100	0	0	0	36574
412	456840	47620	35205	0	0	0	26827
415	3551871	3621418	129088	660906	234725	0	51259
443	868975	154617	28737	7816	1683	0	29539
444	110889	34022	6542	0	0	0	29539
446	785050	49105	3386	28101	6052	0	26827
447	1186543	897933	15644	545805	135655	0	41206
451	0	0	0	0	0	44530	26827
481	498116	37693	2374	0	0	0	29539
485	1866959	2954508	114488	0	0	0	41206
486	872185	102024	27793	10608	2285	0	29539
488	1154248	468093	109650	82256	17715	0	29539
500	328709	38823	5380	163396	35190	0	29539
518	1950998	2281636	14440	329397	70942	0	26827
523	72315	42686	7095	0	0	0	29539
525	0	0	0	0	0	0	29539
569	0	0	0	0	0	0	29539

BAT Initial Analysis Cost Data

PLANT NUMBER	TOTAL CAPITAL COSTS	TOTAL O&M COSTS	TOTAL LAND COSTS	CAPITAL SLUDGE COSTS	O & M SLUDGE COSTS	CONTRACT HAULING COSTS	ANNUAL MONITORING COSTS
580	116439	34318	2395	0	0	0	29539
602	0	0	0	0	0	57889	29539
608	655540	1052470	14970	0	0	0	41206
614	328468	34168	1578	87095	18757	0	29539
633	809133	73458	12751	2680	577	0	29539
657	652872	134407	23673	374795	133111	0	29539
659	454557	52002	2826	0	0	0	33782
662	1247646	428399	22673	764871	164729	0	29539
663	858500	692391	18605	115382	24850	0	26827
664	919793	530584	10537	716485	154308	0	26827
669	0	0	0	0	0	124684	29539
682	697987	146981	15825	429694	152609	0	51259
683	1403937	781729	40680	866856	215450	0	51259
695	2383893	244490	94475	0	0	0	51259
709	0	0	0	0	0	151402	29539
727	471403	84419	5792	651406	161902	0	51259
741	0	0	0	0	0	0	41206
758	0	0	0	0	0	0	29539
775	540068	648766	3151	0	0	0	29539
802	551554	106422	6680	984190	244612	0	29539
811	0	0	0	0	0	0	33782
814	1462857	1074671	22443	604877	150337	0	41206
825	837227	151315	4430	346146	74549	0	29539
844	0	0	0	0	0	0	33782
851	3377409	3155331	138805	0	0	0	41206
859	0	0	0	0	0	0	41206
866	0	0	0	0	0	0	33782
871	451103	42992	6002	0	0	0	33782
876	552177	305539	6730	0	0	0	29539
883	0	0	0	0	0	0	29539
888	0	0	0	0	0	0	26827
908	448303	78050	8660	560371	139276	0	51259
909	2743896	1079582	101930	372200	80160	0	41206
913	743895	754798	26684	464270	164889	0	41206
938	115653	84916	1951	0	0	0	29539
942	0	0	0	0	0	0	29539
948	1291236	448579	13690	850672	211427	0	51259
962	782986	67022	2865	55830	12024	0	26827
970	469119	83791	6785	642303	159639	0	29539
973	828624	275200	45089	604825	130260	0	41206
984	328468	32299	1695	55830	12024	0	26827
990	328468	35924	1112	115382	24850	0	33782
992	454719	22868	2736	0	0	0	29539
1012	454779	79839	6443	585659	145561	0	29539
1020	349821	49140	8310	355451	76553	0	29539
1033	0	0	0	0	0	89060	29539
1038	972717	207113	14621	524713	186355	0	51259
1059	0	14500	0	0	0	0	41206
1061	458705	113196	8284	488885	105290	0	26827
1062	0	0	0	0	0	0	29539
1067	438206	65409	6155	37220	8016	0	29539
1133	139529	35574	1079	0	0	0	29539
1137	2219293	246146	24383	278325	98849	0	51259

BAT Initial Analysis Cost Data

PLANT NUMBER	TOTAL CAPITAL COSTS	TOTAL O&M COSTS	TOTAL LAND COSTS	CAPITAL SLUDGE COSTS	O & M SLUDGE COSTS	CONTRACT HAULING COSTS	ANNUAL MONITORING COSTS
1139	479801	60911	12220	0	0	0	33782
1148	835903	185891	4611	604423	214665	0	41206
1149	833465	4798387	23760	0	0	0	41206
1157	0	0	0	0	0	44530	33782
1203	332097	41724	2210	214015	46092	0	26827
1241	635556	99018	24064	521080	112224	0	26827
1249	850371	88671	15310	24565	5291	0	33782
1267	0	0	0	0	0	0	26827
1299	0	0	0	0	0	0	29539
1319	0	0	0	0	0	0	29539
1323	544754	69758	1879	0	0	0	26827
1327	2953691	1186459	117597	617015	153354	0	41206
1340	1199794	466637	24908	409104	88108	0	33782
1343	1740987	2625061	58497	541551	116633	0	33782
1348	0	1000	0	0	0	0	26827
1349	0	0	0	0	0	0	26827
1389	411405	67752	3220	772315	166332	0	26827
1407	1002773	580864	9225	772315	166332	0	29539
1409	4106377	2354667	147923	287695	102177	0	41206
1414	454719	14197	8460	0	0	0	26827
1438	373116	56619	3606	513636	110621	0	33782
1439	1470942	1876635	68080	195405	42084	0	29539
1446	350850	718244	42480	0	0	0	26827
1464	482849	89871	8602	0	0	0	29539
1494	8463828	2288557	84297	340219	120831	0	41206
1520	1004495	252421	45473	30334	6533	0	29539
1522	811772	4140048	22573	0	0	0	57597
1524	328468	36119	2583	118546	25531	0	26827
1532	425575	75044	11239	217737	46894	0	29539
1569	841538	138813	5073	186100	40080	0	29539
1572	0	25000	0	0	0	0	51259
1609	905355	288820	19941	502470	108216	0	29539
1616	331423	41307	3524	206571	44489	0	26827
1617	576429	1291980	4296	0	0	0	29539
1618	461939	68188	6231	0	0	0	26827
1624	778349	41593	2855	1359	293	0	33782
1643	0	0	0	0	0	0	26827
1647	912609	479951	10155	232625	50100	0	29539
1650	20575507	4527482	1058825	1732309	645153	0	57597
1656	0	0	0	0	0	0	29539
1670	0	0	0	0	0	4453	29539
1684	73357	32245	694	0	0	133590	33782
1688	343107	46699	7103	307065	66132	0	26827
1695	4893992	1257500	26851	276873	98333	0	51259
1698	449881	13302	13086	0	0	0	26827
1714	778349	56004	9912	33684	7254	0	26827
1717	328468	31437	826	36848	7936	0	26827
1724	841150	105982	21038	3350	721	0	29539
1753	671437	139572	15144	397230	141079	0	41206
1766	378121	58125	6076	547134	117835	0	26827
1769	7875173	9718672	157155	0	0	0	41206
1774	1035891	243484	13226	871002	309342	0	29539
1785	501701	146697	10258	758625	188550	0	51259

BAT Initial Analysis Cost Data

PLANT NUMBER	TOTAL CAPITAL COSTS	TOTAL O&M COSTS	TOTAL LAND COSTS	CAPITAL SLUDGE COSTS	O & M SLUDGE COSTS	CONTRACT HAULING COSTS	ANNUAL MONITORING COSTS
1802	444655	77041	13785	546210	135756	0	29539
1839	782792	44868	8886	9863	2124	0	26827
1869	618340	705348	3628	0	0	0	51259
1877	1389291	881655	27052	183867	39599	0	29539
1881	328468	31617	631	41873	9018	0	33782
1890	529854	113692	19606	290316	62525	0	33782
1905	386297	63117	5875	15204	3275	0	33782
1910	1135742	1255931	11405	308740	66493	0	41206
1911	686981	106868	27170	666238	143486	0	33782
1928	826194	75304	5583	7072	1523	0	26827
1937	1251214	628168	61880	121523	26172	0	29539
1943	0	0	0	0	0	0	33782
1973	599338	119580	5777	311449	110613	0	29539
1977	0	0	0	0	0	0	51259
1986	0	0	0	0	0	0	26827
2009	674383	80766	9318	0	0	0	29539
2020	0	0	0	0	0	0	29539
2026	454719	17720	2736	0	0	0	33782
2030	1120249	1350740	69884	0	0	0	41206
2047	328468	34770	3724	96772	20842	0	26827
2049	378242	59210	6012	57691	12425	0	29539
2055	0	0	0	0	0	0	26827
2062	785050	50058	5652	14330	3086	0	29539
2073	1006755	2060393	30819	878392	189178	0	29539
2090	63318	35647	1953	0	0	0	29539
2110	362960	63158	6065	34801	7495	0	29539
2148	657716	216786	28974	816281	202880	0	29539
2181	0	0	0	0	0	0	26827
2193	0	0	0	0	0	89060	33782
2198	355187	50962	3103	392671	84569	0	29539
2206	674950	135546	5916	0	0	0	26827
2221	861504	222780	7759	320092	68938	0	26827
2222	670350	139270	6606	395910	140610	0	29539
2227	1717297	1113595	57123	1047842	372148	0	29539
2228	783187	42842	5329	5620	1210	0	29539
2236	458966	66378	8085	10515	2265	0	29539
2242	794313	66472	9040	280267	60360	0	29539
2254	564000	115855	12674	622275	154661	0	29539
2268	1430431	2902047	61784	65135	14028	0	29539
2272	1521382	2272954	53161	814763	202503	0	51259
2281	414832	118514	3459	9119	1964	0	29539
2292	623153	161108	35602	0	0	0	29539
2296	0	0	0	0	0	0	26827
2307	0	0	0	0	0	0	26827
2313	0	0	0	0	0	0	29539
2315	424577	90041	6312	411281	88577	0	26827
2316	864597	117054	7232	1489	321	0	29539
2322	2093797	2526055	109087	566116	121923	0	41206
2328	0	0	0	0	0	0	33782
2345	341793	46190	7518	297202	64008	0	29539
2353	0	0	0	0	0	0	29539
2360	426189	71906	3452	874670	188376	0	26827
2364	328468	31298	624	16563	3567	0	33782

BAT Initial Analysis Cost Data

PLANT NUMBER	TOTAL CAPITAL COSTS	TOTAL O&M COSTS	TOTAL LAND COSTS	CAPITAL SLUDGE COSTS	O & M SLUDGE COSTS	CONTRACT HAULING COSTS	ANNUAL MONITORING COSTS
2365	537219	47124	3521	0	0	0	29539
2368	543298	104153	5081	948787	235813	0	41206
2376	464098	52884	2830	0	0	0	33782
2390	0	0	0	0	0	0	29539
2394	1228402	182965	13864	524449	186261	0	41206
2399	0	0	0	0	0	0	29539
2400	0	0	0	0	0	0	26827
2419	328468	32929	1874	66810	14389	0	26827
2429	577551	117539	62203	0	0	0	29539
2430	6501134	6661361	215084	344970	122518	0	41206
2445	415461	68897	3285	800230	172344	0	33782
2447	0	1000	0	0	0	0	29539
2450	1160796	1420471	31753	691866	171958	0	41206
2461	356565	63076	2973	15446	3327	0	33782
2471	0	0	0	0	0	0	41206
2474	740217	426664	28735	0	0	0	26827
2481	1068738	320795	17744	930580	231288	0	51259
2527	870231	417182	56775	329925	117175	0	51259
2528	1614132	1128181	57991	363445	129080	0	51259
2531	521479	190457	3733	0	0	0	26827
2533	366452	54573	9703	468972	101002	0	26827
2536	0	0	0	0	0	0	29539
2537	328468	32169	723	53411	11503	0	26827
2541	1718347	2295209	31514	465250	100200	0	29539
2551	0	0	0	0	0	0	26827
2556	0	0	0	0	0	0	26827
2573	1207405	376056	23701	407559	87775	0	29539
2590	785050	41593	8900	1861	401	0	29539
2592	422449	70859	3394	848616	182765	0	26827
2626	0	0	0	0	0	0	29539
2631	1268164	2667176	37870	289758	62405	0	41206
2633	672524	139875	26412	398549	141547	0	41206
2668	0	0	0	0	0	0	26827
2673	818854	84752	12964	4094	882	0	29539
2678	339927	45444	2365	282872	60922	0	26827
2692	0	1000	0	0	0	0	26827
2693	0	0	0	0	0	0	29539
2695	1257905	1803263	39263	990259	246121	0	41206
2701	613699	669010	14248	0	0	0	41206
2711	458155	40786	4960	0	0	0	26827
2735	1477470	597552	44941	571430	202947	0	29539
2739	117139	87578	8235	0	0	0	51259
2763	464278	82458	5650	623084	154862	0	29539
2764	506987	94189	18345	796051	197852	0	41206
2767	328468	31298	1646	21774	4689	0	29539
2770	778726	67022	6555	55830	12024	0	29539
2771	458155	40786	8157	0	0	0	33782
2781	917047	157462	33873	9119	1964	0	29539
2786	328468	31404	1321	35731	7695	0	29539
2795	1080229	865104	6742	575544	143047	0	41206
2816	1236899	268670	16958	792876	281595	0	41206
2818	62529	31909	4280	0	0	0	29539
3033	189850	38322	5836	0	0	0	29539

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PLANT NUMBER	TOTAL CAPITAL COSTS	TOTAL O&M COSTS	TOTAL LAND COSTS	CAPITAL SLUDGE COSTS	O & M SLUDGE COSTS	CONTRACT HAULING COSTS	ANNUAL MONITORING COSTS
4002	0	0	0	0	0	0	29539
4010	0	0	0	0	0	0	29539
4017	0	0	0	0	0	0	26827
4018	992916	238249	41090	27171	5852	0	29539
4021	542838	109519	17926	158929	34228	0	26827
4037	1137313	745696	38271	72579	15631	0	29539
4040	553899	72254	14185	0	0	0	29539
4051	332273	41828	1578	215876	46493	0	26827
4055	53273	60681	20687	0	0	0	29539
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	225638806	123017104	6194378	56447691	15079793	1073173	9047340

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PLANT NUMBER	TOTAL CAPITAL COSTS	TOTAL O&M COSTS	TOTAL LAND COSTS	CAPITAL SLUDGE COSTS	O & M SLUDGE COSTS	CONTRACT HAULING COSTS	ANNUAL MONITORING COSTS
2	328468	31298	451	3722	802	0	29539
5	454351	32339	7848	0	0	0	26827
10	838120	74081	11933	3461	745	0	26827
22	1158657	737121	11836	52666	11343	0	26827
30	527873	211506	3608	0	0	0	29539
33	6310032	1110003	74627	139575	30060	0	41206
49	762984	156290	97412	0	0	0	26827
51	1284376	967461	59222	116126	25010	0	29539
52	782792	44438	6371	4224	910	0	29539
58	0	0	0	0	0	0	26827
71	0	0	0	0	0	222650	33782
72	126249	118269	20925	0	0	0	29539
79	609506	49394	64822	0	0	0	33782
88	0	0	0	0	0	89060	26827
93	0	0	0	0	0	0	29539
94	890205	158512	133606	7444	1603	0	26827
110	897722	140753	21157	3722	802	0	29539
111	0	0	0	0	0	44530	26827
119	503698	43340	18439	0	0	0	26827
120	853663	77070	4347	9305	2004	0	29539
122	454324	22613	34272	0	0	0	29539
143	826189	67843	3446	3722	802	0	29539
149	964222	228716	35100	14330	3086	0	29539
158	0	0	0	0	0	89060	26827
161	1700118	2292917	83596	298691	64328	0	29539
162	0	0	0	0	0	133590	29539
163	957582	218398	34291	11166	2405	0	29539
166	97912	254896	14951	0	0	0	29539
196	1546498	1771089	73757	227414	48978	0	29539
199	333811	1291428	13412	0	0	0	26827
203	454324	10462	34272	0	0	0	26827
206	570380	49320	13787	0	0	0	26827
209	0	0	0	0	0	0	29539
212	46352	34901	860	0	0	1157780	33782
214	1229290	306572	13004	182378	39278	0	29539
220	572588	46503	57081	0	0	0	33782
221	1244195	150504	9043	133062	28657	0	33782
232	489168	103636	7899	0	0	0	29539
240	8529556	1742469	100470	213085	45892	0	41206
244	0	0	0	0	0	0	29539
249	900479	87538	6653	30148	6493	0	26827
257	702046	1529422	44291	74440	16032	0	29539
262	884891	128711	117513	2419	521	0	29539
266	823404	74097	6493	2419	521	0	26827
276	655540	1052470	15244	0	0	0	41206
283	6182704	743893	80500	0	0	0	29539
285	0	0	0	0	0	8906	26827
292	836315	98522	14996	64018	13788	0	29539
293	1370183	2293361	28820	0	0	0	29539
297	328468	33502	3260	76301	16433	22265	26827
299	340166	45542	1843	284733	61322	0	29539
302	454712	36424	2788	0	0	0	29539
310	722381	64072	13098	0	0	0	26827

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PLANT NUMBER	TOTAL CAPITAL COSTS	TOTAL O&M COSTS	TOTAL LAND COSTS	CAPITAL SLUDGE COSTS	O & M SLUDGE COSTS	CONTRACT HAULING COSTS	ANNUAL MONITORING COSTS
321	454324	10410	34272	0	0	0	33782
326	986711	265703	31942	19354	4168	0	29539
334	846329	74064	4447	1675	361	0	33782
348	0	0	0	0	0	0	26827
354	1185345	816919	46075	84303	18156	0	26827
357	0	0	0	0	0	89060	29539
417	0	0	0	0	0	0	26827
423	901018	436183	8888	55830	12024	0	29539
428	0	0	0	0	0	222650	26827
430	42169485	2030712	709662	748510	186036	0	41206
433	1086496	465081	15519	46525	10020	0	29539
438	654024	88519	4423	0	0	0	26827
449	0	0	0	0	0	0	26827
451	0	0	0	0	0	44530	26827
458	7708191	1894189	559957	0	0	0	51259
468	888651	105285	4889	16377	3527	0	33782
492	51712	32471	2431	0	0	102419	29539
494	542307	286402	11697	0	0	0	33782
508	0	0	0	0	0	89060	29539
522	1347880	1155668	62622	120965	26052	0	29539
529	454324	11526	2736	0	0	0	26827
543	553646	51355	4666	0	0	0	26827
544	0	0	0	0	0	22265	26827
567	839052	101627	7089	1861	401	0	26827
592	728736	64784	16158	0	0	0	33782
605	0	0	0	0	0	164761	26827
607	1026181	337820	29818	29032	6252	0	29539
618	0	0	0	0	0	222650	29539
624	9126969	1606568	152704	263145	56673	0	41206
658	1064238	102242	20885	50433	10862	0	33782
661	881439	125809	6383	1787	385	0	29539
667	0	0	0	0	0	13359	29539
702	3000	20000	0	0	0	0	29539
706	515331	45324	10114	0	0	0	26827
717	422301	43021	11241	0	0	0	26827
720	460286	45359	3062	0	0	0	29539
722	1195361	4746667	25664	472694	101803	0	41206
724	498503	42933	9895	0	0	0	26827
743	892807	162068	7421	7816	1683	0	29539
749	914467	82156	5281	26426	5691	0	26827
768	874295	120197	26365	1489	321	0	29539
771	686809	590259	40983	61599	13266	0	29539
777	0	0	0	0	0	44530	29539
791	512322	44084	8394	0	0	0	26827
796	0	0	0	0	0	133590	26827
797	906836	150513	11076	4839	1042	0	29539
814	5965508	1128834	41968	604877	150337	0	41206
830	62290	34628	5816	0	0	142496	33782
845	408855	226882	6529	20657	4449	0	29539
846	0	0	0	0	0	133590	26827
862	1264502	1046233	56858	111697	24056	0	26827
874	866397	335120	21295	478277	103006	0	26827
880	0	0	0	0	0	26718	29539

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PLANT NUMBER	TOTAL CAPITAL COSTS	TOTAL O&M COSTS	TOTAL LAND COSTS	CAPITAL SLUDGE COSTS	O & M SLUDGE COSTS	CONTRACT HAULING COSTS	ANNUAL MONITORING COSTS
887	1188068	288290	9275	198755	42805	0	29539
905	523889	83463	10226	0	0	0	26827
912	0	0	0	0	0	129137	26827
917	328468	31351	2095	33498	7214	0	29539
929	454324	10295	34272	0	0	0	26827
931	0	0	0	0	0	218197	26827
932	0	0	0	0	0	4453	29539
944	70364	34628	3552	0	0	200385	33782
958	0	0	0	0	0	0	29539
975	454719	19450	2124	0	0	0	33782
976	473643	118860	4038	0	0	0	26827
987	31708	32471	1064	0	0	400770	26827
988	0	0	0	0	0	178120	26827
992	571672	56046	4474	0	0	0	29539
997	783187	42404	8687	4653	1002	0	29539
1006	356808	78386	4597	3722	802	0	26827
1011	333002	42241	6053	223320	48096	0	29539
1018	1035194	148806	8063	88584	19078	0	29539
1026	0	0	0	0	0	222650	29539
1047	1148662	141110	53794	0	0	0	33782
1052	950444	89666	4147	45408	9780	0	26827
1053	844090	84506	1209	6588	1419	0	33782
1057	29838	32471	735	0	0	89060	33782
1064	0	0	0	0	0	66795	29539
1069	422716	70934	4781	850477	183166	0	29539
1076	0	0	0	0	0	62342	26827
1083	838784	74097	8802	3536	762	0	26827
1085	39321	32471	3196	0	0	267180	33782
1086	694350	109625	80194	0	0	0	26827
1091	1356486	1176154	38810	145158	31262	0	29539
1094	762934	1077848	69366	0	0	0	29539
1107	457746	39842	2167	0	0	8906	26827
1117	486388	45522	1625	0	0	0	26827
1126	1388966	2364293	57473	0	0	0	29539
1162	475122	126133	8948	0	0	0	26827
1163	1140424	114112	19813	9863	2124	0	29539
1172	1251348	210464	48045	0	0	0	26827
1173	60899	34628	12704	0	0	223986	33782
1175	0	0	0	0	0	178120	26827
1181	609675	470739	36416	46711	10060	0	29539
1188	792566	84182	7428	26054	5611	0	29539
1191	970141	228860	9377	14516	3126	0	29539
1194	545470	44928	12135	0	0	51210	33782
1195	0	0	0	0	0	0	26827
1197	841185	74134	8858	3908	842	0	26827
1202	568015	57237	13714	0	0	0	26827
1219	1372926	4807680	86775	0	0	0	26827
1220	553161	46415	3312	0	0	0	33782
1223	328468	31298	313	4839	1042	0	29539
1224	434036	1819206	11597	0	0	0	26827
1234	642231	52824	12400	0	0	0	33782
1236	1081319	106108	21961	57133	12305	0	33782
1237	536188	47595	51292	0	0	0	29539

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PLANT NUMBER	TOTAL CAPITAL COSTS	TOTAL O&M COSTS	TOTAL LAND COSTS	CAPITAL SLUDGE COSTS	O & M SLUDGE COSTS	CONTRACT HAULING COSTS	ANNUAL MONITORING COSTS
1249	1029111	112348	20143	24565	5291	0	33782
1253	454324	15794	8460	0	0	0	29539
1255	454719	27484	2124	0	0	0	29539
1264	884891	128711	27404	2419	521	0	29539
1277	782792	51607	3334	24193	5210	0	29539
1310	1557381	13052723	21744	148880	32064	0	41206
1313	28208	32471	826	0	0	115778	33782
1314	0	0	0	0	0	0	26827
1320	501815	43128	4202	0	0	48983	26827
1322	887785	94672	14371	23263	5010	0	26827
1326	572056	43908	3477	0	0	0	33782
1351	936204	187088	12078	7816	1683	0	29539
1352	28208	32471	3108	0	0	115778	33782
1356	905097	148521	29332	3908	842	0	29539
1357	508635	43766	8342	0	0	0	33782
1361	1300614	1013283	20632	122454	26373	0	29539
1371	0	0	0	0	0	222650	26827
1386	0	0	0	0	0	44530	26827
1426	652080	113060	22286	174190	37515	0	29539
1432	925372	92522	17069	65879	14188	0	26827
1433	0	0	0	0	0	14250	29539
1437	1096862	159394	10922	0	0	0	29539
1450	28208	32471	6097	0	0	115778	26827
1478	882449	126646	10160	2233	481	0	29539
1504	900140	91582	5145	29776	6413	0	26827
1507	1287795	212558	54190	0	0	0	33782
1528	533208	44935	11618	0	0	0	26827
1534	615016	48592	5264	0	0	0	26827
1535	0	0	0	0	0	8906	26827
1539	813332	179737	15858	253468	54589	0	29539
1548	0	0	0	0	0	75701	29539
1556	454479	34298	2736	0	0	0	29539
1560	884891	128711	24193	2419	521	0	29539
1562	795401	95553	3438	136970	29499	0	29539
1564	0	0	0	0	0	75701	29539
1566	0	0	0	0	0	44530	29539
1575	28208	32470	3108	0	0	262727	26827
1595	601768	65959	6967	0	0	0	29539
1601	47664	25803	2420	0	0	0	29539
1608	1035239	355617	14116	31451	6774	0	29539
1621	784293	69261	11491	93050	20040	0	29539
1622	1014583	92314	14925	33312	7174	0	33782
1628	919622	165423	131776	5583	1202	0	29539
1645	947272	102996	13371	6700	1443	0	29539
1653	657531	1074092	15332	0	0	0	41206
1657	5591066	732489	26848	546210	135756	0	41206
1659	1151806	619556	50306	67740	14589	0	29539
1666	1007179	301977	166784	24193	5210	0	29539
1667	1192611	252633	33636	304274	65531	0	26827
1706	6097260	1137104	33346	0	0	0	41206
1716	1094181	482658	45928	48944	10541	0	29539
1718	0	0	0	0	0	133590	29539
1718	0	0	0	0	0	0	29539

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PLANT NUMBER	TOTAL CAPITAL COSTS	TOTAL O&M COSTS	TOTAL LAND COSTS	CAPITAL SLUDGE COSTS	O & M SLUDGE COSTS	CONTRACT HAULING COSTS	ANNUAL MONITORING COSTS
1740	407361	95668	12352	722068	155510	0	26827
1742	783231	61376	44824	44664	9619	0	29539
1743	826584	68288	9498	6532	1407	0	26827
1744	884891	128711	27404	2419	521	0	29539
1748	2257611	7860591	98815	660655	142284	0	29539
1751	365591	63768	3387	1303	281	222650	26827
1764	783187	59247	3703	28473	6132	0	33782
1773	519234	44877	4311	0	0	0	26827
1788	634649	62389	16553	0	0	0	29539
1793	880044	124117	124800	19354	4168	0	29539
1797	0	0	0	0	0	0	29539
1801	782792	42739	3270	5397	1162	0	29539
1805	466333	86018	7687	0	0	0	26827
1808	0	0	0	0	0	155855	26827
1812	0	0	0	0	0	89060	33782
1826	1077619	446297	16555	37220	8016	0	29539
1832	580427	45654	10085	0	0	0	33782
1833	795824	94115	5392	100494	21643	0	29539
1838	0	0	0	0	0	129137	29539
1843	0	0	0	0	0	44530	26827
1848	43397	26019	289	0	0	396317	29539
1853	7780971	1681480	145118	748004	185910	0	41206
1861	375681	57177	3426	40384	8697	0	29539
1876	1005368	298711	13259	23635	5090	0	29539
1887	0	0	0	0	0	178120	29539
1888	0	0	0	0	0	71248	29539
1891	892291	291299	8488	0	0	0	26827
1894	971648	240640	37880	16005	3447	0	29539
1899	976873	120020	17659	89328	19238	0	26827
1904	44007030	3688304	734492	273759	97227	0	41206
1924	459292	43282	2798	0	0	0	29539
1931	862406	75312	55070	8188	1764	0	26827
1936	471124	452466	29913	24379	5250	0	29539
1945	454324	17894	8460	0	0	0	26827
1948	455222	39756	4957	0	0	0	26827
1970	454324	12406	2124	0	0	0	26827
1971	900065	85649	3751	9491	2044	0	29539
1974	0	0	0	0	0	0	29539
1988	0	0	0	0	0	178120	26827
1993	545396	49906	4571	0	0	111325	26827
2001	454324	15971	3600	0	0	0	26827
2004	702369	51581	81880	0	0	0	29539
2007	929589	178248	33722	8188	1764	0	26827
2018	875984	2428793	14540	297760	64128	0	26827
2022	0	0	0	0	0	31171	26827
2033	0	0	0	0	0	84607	33782
2037	873822	74706	55144	4094	882	0	33782
2050	0	0	0	0	0	222650	26827
2057	454324	29682	7056	0	0	0	33782
2070	2081896	3999167	104847	446640	96192	0	29539
2075	793256	85650	10493	36922	7952	0	29539
2080	328468	32940	3087	66996	14429	0	29539
2084	854280	68111	131138	0	0	0	33782

PSES Initial Analysis Cost Data

PLANT NUMBER	TOTAL CAPITAL COSTS	TOTAL O&M COSTS	TOTAL LAND COSTS	CAPITAL SLUDGE COSTS	O & M SLUDGE COSTS	CONTRACT HAULING COSTS	ANNUAL MONITORING COSTS
2093	1214161	546905	34381	232625	50100	0	29539
2108	0	0	0	0	0	0	26827
2117	949125	106449	18175	65135	14028	0	29539
2123	340647	45736	1856	288455	62124	0	26827
2129	1005368	298711	38731	23635	5090	0	29539
2147	0	0	0	0	0	178120	26827
2176	884429	83219	4859	21588	4649	0	29539
2177	742090	2351856	19326	0	0	0	41206
2184	613322	80174	5083	0	0	0	29539
2191	0	0	0	0	0	0	29539
2214	0	0	0	0	0	138043	29539
2232	1155073	397803	21716	26054	5611	0	26827
2241	1422177	527241	236385	660655	142284	0	29539
2243	2289594	4709998	38645	524802	113026	0	29539
2250	856975	74098	6803	2419	521	0	33782
2253	0	0	0	0	0	222650	26827
2259	902715	176125	34095	9305	2004	0	26827
2261	1289010	1120787	21785	120593	25972	0	29539
2262	0	0	0	0	0	44530	29539
2288	500676	43047	9912	0	0	111325	29539
2293	526731	47113	50230	0	0	0	26827
2300	905212	472469	8086	649489	139879	0	26827
2311	882117	77343	58940	13827	2978	0	26827
2318	875983	74893	4838	4280	922	0	33782
2341	1381989	337211	46828	277289	59719	0	33782
2346	577963	113686	7760	286771	101849	0	41206
2348	544620	328371	31732	29032	6252	0	29539
2350	909702	186512	12260	10422	2244	0	26827
2359	454324	10295	4860	0	0	0	26827
2402	0	0	0	0	0	35624	29539
2411	402421	65201	11567	710902	153106	0	29539
2426	0	0	0	0	0	0	29539
2432	121867	341512	26581	0	0	0	29539
2436	703983	148658	26272	437085	155233	0	29539
2442	834882	98240	18076	1563	337	0	29539
2459	783187	47269	39980	14888	3206	0	29539
2462	789713	101712	4355	120965	26052	0	33782
2465	1003573	295353	10253	23263	5010	0	29539
2469	832561	74063	4027	2605	561	0	26827
2485	6102520	1083901	97359	452223	97394	0	41206
2487	1206920	877659	7829	91561	19719	0	33782
2495	808270	184394	12906	78162	16834	0	29539
2498	868827	75896	11587	9863	2124	0	26827
2501	782792	45566	3484	14814	3190	8906	26827
2507	0	0	0	0	0	0	26827
2517	964664	93303	13581	54527	11743	0	26827
2521	0	0	0	0	0	142496	26827
2524	866432	74402	4108	3350	721	0	33782
2539	1190941	833188	52053	60669	13066	0	26827
2548	1137440	584668	36187	62902	13547	0	29539
2565	1700075	2550120	79840	288455	62124	0	26827
2571	0	0	0	0	0	222650	29539
2578	0	0	0	0	0	0	29539

PSES Initial Analysis Cost Data

PLANT NUMBER	TOTAL CAPITAL COSTS	TOTAL O&M COSTS	TOTAL LAND COSTS	CAPITAL SLUDGE COSTS	O & M SLUDGE COSTS	CONTRACT HAULING COSTS	ANNUAL MONITORING COSTS
2581	0	0	0	0	0	4453	26827
2608	0	0	0	0	0	89060	33782
2609	328468	32496	988	59347	12782	0	29539
2634	84565	209379	8736	0	0	0	26827
2635	6605815	785653	59184	139575	30060	0	29539
2636	782792	44626	9033	2978	641	0	29539
2641	459282	57682	3112	0	0	0	29539
2642	0	0	0	0	0	28499	26827
2646	1079430	165947	15866	3722	802	0	29539
2647	0	0	0	0	0	0	29539
2666	580427	44923	3639	0	0	0	33782
2677	1267935	921733	15456	109799	23647	0	29539
2679	328468	36211	4277	120034	25852	0	29539
2685	505281	143156	6960	0	0	0	29539
2699	39243	73800	6260	0	0	0	29539
2714	814895	74064	11441	1303	281	0	29539
2736	781792	171741	8944	0	0	0	29539
2741	937016	101097	17269	55458	11944	0	26827
2748	1194885	140087	13793	0	0	0	29539
2756	9842187	1882475	185390	535084	132991	0	41206
2776	1074510	213155	38422	10254	2208	0	29539
2779	485880	96366	8849	0	0	0	29539
2793	647543	119265	6126	0	0	0	26827
2794	4171026	838656	76755	0	0	0	41206
2796	0	0	0	0	0	0	26827
2805	0	0	0	0	0	0	29539
2810	0	0	0	0	0	218197	26827
2814	0	0	0	0	0	89060	33782
4001	969477	290214	33136	22016	4741	0	33782
4003	798660	100687	13412	119104	25651	0	29539
4006	975771	247360	59205	16935	3647	0	29539
4007	671472	97065	9737	0	0	0	29539
4008	988307	127971	86137	55830	12024	0	29539
4009	0	0	0	0	0	89060	29539
4014	361861	69268	1176	1210	261	0	29539
4022	0	0	0	0	0	0	29539
4023	738562	2282384	6771	0	0	0	41206
4024	363505	63769	1171	1117	240	178120	26827
4026	1122802	549639	48074	58063	12505	0	29539
4027	1210395	144097	35244	76673	16513	0	29539
4032	887229	130753	29243	2233	481	0	29539
4042	0	0	0	0	0	0	26827
4043	328468	34584	2744	93794	20200	0	29539
4044	1537378	1758984	19641	191869	41322	0	29539
4046	0	0	0	0	0	44530	33782
4047	465914	94438	1881	16749	3607	0	29539
4048	0	0	0	0	0	24046	26827
4050	838784	74097	2826	3536	762	0	26827
4052	0	0	0	0	0	133590	26827
4057	855184	74771	12547	6588	1419	0	26827
4064	0	0	0	0	0	22265	29539
4066	0	0	0	0	0	93513	29539
4070	843829	74064	4048	1563	337	0	33782

PSES Initial Analysis Cost Data

PLANT NUMBER	TOTAL CAPITAL COSTS	TOTAL O&M COSTS	TOTAL LAND COSTS	CAPITAL SLUDGE COSTS	O & M SLUDGE COSTS	CONTRACT HAULING COSTS	ANNUAL MONITORING COSTS
4072	924008	171007	10718	7258	1563	0	29539
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	381860942	129991306	9121323	20247968	4605802	10833259	11098169

APPENDIX III-C

BAT AND PSES RIA ANALYSIS COST DATA

BAT RIA Analysis Cost Data

PLANT NUMBER	TOTAL CAPITAL COSTS	TOTAL O&M COSTS	TOTAL LAND COSTS	CAPITAL SLUDGE COSTS	O & M SLUDGE COSTS	CONTRACT HAULING COSTS
76	252052	37518	6889	0	0	0
105	297579	39032	60439	0	0	0
114	253372	37562	11405	0	0	0
225	790910	44194	13670	0	0	0
260	382240	38190	22560	0	0	0
412	185445	35286	33795	0	0	0
446	134851	33678	1963	0	0	0
447	18292055	755653	107682	0	0	0
657	11304160	551323	168975	0	0	0
814	4762754	257920	25775	0	0	0
859	6919904	358044	24348	0	0	0
913	397900	42261	21010	0	0	0
942	383833	41818	19904	0	0	0
1249	201116	35808	8629	0	0	0
1439	292673	38870	13780	0	0	0
1569	194525	35588	2938	0	0	0
1618	223839	36571	7205	0	0	0
1688	7063911	364583	103336	0	0	0
1785	510552	45696	19266	0	0	0
2030	317109	39673	15106	0	0	0
2047	183568	35223	7653	0	0	0
2073	558577	47104	36112	0	0	0
2268	311072	39476	14708	0	0	0
2400	155182	34752	2663	0	0	0
2419	154508	34280	3964	0	0	0
2527	5240412	280483	80937	0	0	0
2590	73128	34628	3616	0	0	0
2735	14018248	666365	227194	0	0	0
2767	102017	32824	4574	0	0	0
2786	1409588	51295	81960	0	0	0
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	75367080	4125698	1152056	0	0	0

PSES RIA Analysis Cost Data

PLANT NUMBER	TOTAL CAPITAL COSTS	TOTAL O&M COSTS	TOTAL LAND COSTS	CAPITAL SLUDGE COSTS	O & M SLUDGE COSTS	CONTRACT HAULING COSTS
10	54933	32470	3352	0	0	0
22	178776	35065	1791	0	0	0
33	5756909	304610	51447	0	0	0
49	289619	38769	58262	0	0	0
51	199405	35751	8545	0	0	0
72	50327	32471	3282	0	0	0
79	155182	34752	30550	0	0	0
94	64515	32471	15170	0	0	0
110	45284	32471	2375	0	0	0
119	49374	32471	5353	0	0	0
120	70871	32470	1261	0	0	0
149	79736	32492	3911	0	0	0
155	513686	45789	14127	0	0	0
161	308416	39389	14802	0	0	0
163	76565	32475	3827	0	0	0
196	271605	38171	12251	0	0	0
206	115661	33145	5327	0	0	0
212	46352	32471	860	0	0	0
214	408317	42587	7618	0	0	0
220	117869	34628	22809	0	0	0
221	442785	43653	5965	0	0	0
240	7637509	390477	84173	0	0	0
249	117687	33197	2253	0	0	0
262	37968	32471	13328	0	0	0
266	40612	32470	1779	0	0	0
283	6173704	323893	80500	0	0	0
293	311378	39486	5608	0	0	0
310	268057	36309	8238	0	0	0
326	90195	32608	3620	0	0	0
334	63142	32471	1312	0	0	0
354	186004	35304	6981	0	0	0
430	41028499	1448808	664833	0	0	0
433	132115	33597	1927	0	0	0
438	195933	35635	2226	0	0	0
458	6919904	358038	441516	0	0	0
468	61730	32470	1191	0	0	0
492	51712	32471	2431	0	0	0
494	534507	46402	11697	0	0	0
522	219258	36417	9543	0	0	0
536	162987	34822	3389	0	0	0
543	99322	32768	1678	0	0	0
567	36544	32471	826	0	0	0
592	274412	36412	10272	0	0	0
607	107516	32946	3501	0	0	0
611	47389	33157	1111	0	0	0
624	8125233	412320	129133	0	0	0
658	280710	38474	11504	0	0	0
661	35952	32471	735	0	0	0
706	61007	32471	3058	0	0	0
717	422301	43021	11241	0	0	0
724	44179	32471	2839	0	0	0
743	65850	32470	844	0	0	0
749	131280	33573	1917	0	0	0

PSES RIA Analysis Cost Data

PLANT NUMBER	TOTAL CAPITAL COSTS	TOTAL O&M COSTS	TOTAL LAND COSTS	CAPITAL SLUDGE COSTS	O & M SLUDGE COSTS	CONTRACT HAULING COSTS
768	31708	32471	3108	0	0	0
771	190590	35457	8122	0	0	0
791	57998	32471	2508	0	0	0
797	50327	32471	1227	0	0	0
814	4762754	257908	25775	0	0	0
819	8463379	427372	56207	0	0	0
830	62290	34628	5816	0	0	0
862	211407	36153	9141	0	0	0
877	197851	35699	3167	0	0	0
887	368502	41331	5071	0	0	0
905	44179	32471	1202	0	0	0
944	70364	34628	3552	0	0	0
987	31708	32471	1064	0	0	0
992	116953	33178	1738	0	0	0
1018	190228	35445	2775	0	0	0
1047	661727	42440	44914	0	0	0
1052	167257	34688	1670	0	0	0
1053	61298	32471	341	0	0	0
1057	29838	32471	735	0	0	0
1083	55597	32470	2477	0	0	0
1085	39321	32471	3196	0	0	0
1086	231251	36820	43640	0	0	0
1091	220797	36468	5852	0	0	0
1094	480384	39757	30587	0	0	0
1117	32064	32471	455	0	0	0
1126	315972	39636	11273	0	0	0
1163	313614	37058	12154	0	0	0
1172	768788	43902	40884	0	0	0
1173	60899	34628	12704	0	0	0
1181	142692	33913	6039	0	0	0
1191	85640	32547	1083	0	0	0
1194	91146	34628	4143	0	0	0
1197	57998	32471	2508	0	0	0
1202	113691	33095	5254	0	0	0
1219	460246	44186	26807	0	0	0
1220	98837	34628	1188	0	0	0
1234	187907	35104	6514	0	0	0
1236	297026	39014	12412	0	0	0
1237	81864	32508	17020	0	0	0
1249	201116	35808	8629	0	0	0
1264	37968	32471	3108	0	0	0
1310	241205	37154	4732	0	0	0
1313	28208	32471	826	0	0	0
1320	47491	32471	1214	0	0	0
1322	104993	32888	4671	0	0	0
1326	117337	33188	1353	0	0	0
1351	65850	32471	1334	0	0	0
1352	28208	32471	3108	0	0	0
1356	49374	32471	3269	0	0	0
1357	53916	32471	2456	0	0	0
1361	204321	35915	3008	0	0	0
1426	259349	37762	11750	0	0	0
1432	142185	33897	6019	0	0	0

PSES RIA Analysis Cost Data

PLANT NUMBER	TOTAL CAPITAL COSTS	TOTAL O&M COSTS	TOTAL LAND COSTS	CAPITAL SLUDGE COSTS	O & M SLUDGE COSTS	CONTRACT HAULING COSTS
1437	569017	41103	8611	0	0	0
1450	28208	32471	6097	0	0	0
1478	36544	32471	1162	0	0	0
1504	116953	33178	1738	0	0	0
1507	773454	43964	46156	0	0	0
1528	78489	34628	3626	0	0	0
1534	160297	34797	2528	0	0	0
1560	37968	32471	2744	0	0	0
1575	28208	32470	3108	0	0	0
1595	146674	34035	3043	0	0	0
1608	111339	33037	1672	0	0	0
1622	231396	36825	7501	0	0	0
1628	57212	32470	14543	0	0	0
1645	120688	34628	4811	0	0	0
1657	5017226	269961	19386	0	0	0
1659	156338	34338	6595	0	0	0
1666	99322	32768	19244	0	0	0
1667	336498	40304	16726	0	0	0
1706	5462456	290888	28274	0	0	0
1716	135121	33685	5745	0	0	0
1718	0	0	0	0	0	133590
1744	37968	32471	3108	0	0	0
1751	37123	32470	3052	0	0	0
1773	64515	32471	1323	0	0	0
1788	180325	35116	8093	0	0	0
1793	34725	32471	13328	0	0	0
1826	129024	33508	2062	0	0	0
1832	126103	34628	4199	0	0	0
1848	0	0	0	0	0	195932
1853	6482593	338079	96054	0	0	0
1876	98535	32753	1528	0	0	0
1891	397575	42251	5679	0	0	0
1894	83245	32521	4242	0	0	0
1899	190952	35469	7186	0	0	0
1904	42858273	1501079	693389	0	0	0
1931	79219	32488	16712	0	0	0
1971	117273	33187	1352	0	0	0
1993	91072	32621	1583	0	0	0
2004	248045	37384	47608	0	0	0
2007	62441	32471	3698	0	0	0
2037	90635	32615	18099	0	0	0
2070	403544	42438	21857	0	0	0
2084	399517	38471	96866	0	0	0
2093	296693	39003	14859	0	0	0
2117	165566	34634	6988	0	0	0
2129	98535	32753	4463	0	0	0
2176	101637	32816	1562	0	0	0
2184	113691	33095	1699	0	0	0
2232	267422	38032	9004	0	0	0
2241	514560	45815	137613	0	0	0
2243	435821	43439	8423	0	0	0
2250	73788	32471	2089	0	0	0
2259	70871	32471	3900	0	0	0

PSES RIA Analysis Cost Data

PLANT NUMBER	TOTAL CAPITAL COSTS	TOTAL O&M COSTS	TOTAL LAND COSTS	CAPITAL SLUDGE COSTS	O & M SLUDGE COSTS	CONTRACT HAULING COSTS
2261	218949	36406	3562	0	0	0
2288	46352	32471	2856	0	0	0
2293	72407	32471	15958	0	0	0
2311	98930	32761	19191	0	0	0
2318	92796	32649	1602	0	0	0
2341	548550	46813	31497	0	0	0
2348	115661	33145	4987	0	0	0
2350	74354	32471	1410	0	0	0
2442	34087	32470	2135	0	0	0
2465	97741	32737	1179	0	0	0
2469	49374	32470	1119	0	0	0
2485	5114088	274530	74470	0	0	0
2487	193105	35540	1207	0	0	0
2498	85640	32547	3598	0	0	0
2517	181477	35154	5669	0	0	0
2524	83245	32521	1309	0	0	0
2539	190409	35451	8114	0	0	0
2548	151242	34177	4702	0	0	0
2565	328153	40033	16140	0	0	0
2635	6268347	328251	56354	0	0	0
2646	264928	37949	8895	0	0	0
2666	126103	34628	1515	0	0	0
2677	194348	35582	2206	0	0	0
2714	31708	32471	3108	0	0	0
2736	305423	39290	5460	0	0	0
2741	154046	34265	6500	0	0	0
2748	708716	43092	11698	0	0	0
2756	4935083	266090	71652	0	0	0
2776	196283	35646	8394	0	0	0
2793	181669	35161	2881	0	0	0
4001	102508	32834	4052	0	0	0
4006	85168	32541	6650	0	0	0
4007	211375	36152	5084	0	0	0
4008	154508	34280	27955	0	0	0
4014	30793	32470	1064	0	0	0
4024	35037	32471	1064	0	0	0
4026	145937	34012	6169	0	0	0
4027	369750	37985	20406	0	0	0
4032	39321	32470	3383	0	0	0
4044	271239	38159	3310	0	0	0
4047	91072	32621	1125	0	0	0
4050	55597	32470	795	0	0	0
4057	71997	32471	3711	0	0	0
4070	60642	32471	1183	0	0	0
4072	59527	32471	1176	0	0	0
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	195730775	13735953	4189312	0	0	329522

APPENDIX III-D

BPT, BAT, AND PSES PREAMBLE ANALYSIS COST DATA

List of BPT Cost Data by Option I

PLANT	TOTAL CAPITAL COSTS	TOTAL O&M COSTS	TOTAL LAND COSTS	CAPITAL SLUDGE COSTS	O & M SLUDGE COSTS	CONTRACT HAULING COSTS
1	2148497	184672	141330	1100630	390896	.
12	180874	18790	2797	63274	13627	.
15	0	0	0	0	0	.
61	84151	33440	1347	37220	8016	.
63	0	0	0	0	0	.
76	281469	34471	4672	744400	160320	.
83	381862	42663	2044	746261	160721	.
87	265566	42407	1936	539690	116232	.
101	.	.	.	.	.	4453
102	0	0	0	0	0	.
105	323707	40812	38018	578275	143725	.
112	.	.	.	.	.	111325
114	241351	28357	6566	472694	101803	.
154	0	0	0	0	0	.
159	358407	69134	2006	139389	30020	.
177	818190	77191	82527	816179	202855	.
183	357748	40346	7774	658794	141883	.
190	0	0	0	0	0	.
205	0	0	0	0	0	.
225	229464	39653	2693	388949	83767	.
227	1935676	185623	88293	1138637	404394	.
250	866127	82093	87754	910350	226260	.
254	0	0	0	0	0	.
259	276458	43077	8326	580632	125050	.
260	0	0	0	0	0	.
267	0	0	0	0	0	.
269	68749	33280	661	22332	4810	.
284	113202	8618	0	0	0	.
294	106642	33670	2038	67368	14509	.
296	2425129	299145	301084	1057344	375522	.
301	0	0	0	0	0	.
352	249389	28887	1520	289013	62244	.
384	0	0	0	0	0	.
387	0	0	0	0	0	.
392	0	0	0	0	0	.
394	0	0	0	0	0	.
399	2289537	262234	7000	1685950	627888	.
412	117697	33793	27282	83745	18036	.
415	1872048	201524	34159	1117344	416125	.
443	0	0	0	0	0	.
444	296959	36804	8590	857921	184769	.
446	87942	33470	1798	42877	9234	.
447	233064	39920	4320	401976	86573	.
451	834724	62589	48915	333145	118319	.
481	27229	32795	944	1861	401	.
485	0	0	0	0	0	.
486	194535	21206	9336	101611	21884	.
488	0	0	0	0	0	.
500	1373260	124032	284601	933028	331371	.
518	3746	2001	0	0	0	.

List of BPT Cost Data by Option I

PLANT	TOTAL CAPITAL COSTS	TOTAL O&M COSTS	TOTAL LAND COSTS	CAPITAL SLUDGE COSTS	O & M SLUDGE COSTS	CONTRACT HAULING COSTS
523	256452	29711	6170	311718	67134	.
525	0	0	0	0	0	.
569	200730	37442	9882	292177	62926	.
580	604454	57750	3630	711085	176734	.
601	72640	33317	1744	26054	5611	.
602	106642	33674	1576	66475	14317	.
608	785303	76098	12794	336260	119425	.
614	117697	33782	2843	87095	18757	.
633	188254	20688	5061	106077	22846	.
657	0	0	0	0	0	.
659	631575	59683	3424	758625	188550	.
662	584467	20379	0	0	0	.
663	179503	24522	5161	124687	26854	.
664	0	0	0	0	0	.
669	110338	33721	5931	70718	15230	.
682	1085016	152559	18792	951020	354182	.
683	0	0	0	0	0	.
695	3099055	439795	97195	2533003	1231398	.
709	.	.	.	.	.	133590
727	1507133	137189	85264	791820	281220	.
741	899892	82239	101117	298780	106114	.
758	381354	42615	8132	744400	160320	.
775	342597	47565	4059	915612	197194	.
802	0	0	0	0	0	.
811	0	0	0	0	0	.
814	654241	89646	6845	607062	215602	.
825	218681	38745	2875	346146	74549	.
844	26890	70000	0	0	0	.
851	1109521	116141	21610	722008	256426	.
859	1015264	97928	19782	809200	201120	.
866	0	0	0	0	0	.
871	909184	84912	5348	398813	141641	.
876	313017	46650	9504	761149	163927	.
883	13128	3379	0	0	0	.
888	302005	44924	6651	707180	152304	.
908	233064	40018	7070	407559	87775	.
909	513324	68914	15085	396174	140704	.
913	893264	124634	24811	996374	353869	.
938	265566	42407	1936	539690	116232	.
942	236664	40150	11486	413142	88978	.
948	0	0	0	0	0	.
962	99208	33598	1499	55830	12024	.
970	466572	62014	5701	330717	117456	.
973	0	0	0	0	0	.
984	429711	50874	5650	644326	160142	.
990	0	0	0	0	0	.
992	60872	33204	1452	16042	3455	.
1012	572058	63566	4965	969017	240841	.
1020	0	4312	0	0	0	.
1033	.	.	.	.	.	89060

List of BPT Cost Data by Option I

PLANT	TOTAL CAPITAL COSTS	TOTAL O&M COSTS	TOTAL LAND COSTS	CAPITAL SLUDGE COSTS	O & M SLUDGE COSTS	CONTRACT HAULING COSTS
1038	0	0	0	0	0	.
1059	617533	21643	0	0	0	.
1061	0	0	0	0	0	.
1062	498529	55630	7275	738395	183522	.
1067	225869	39313	8224	372200	80160	.
1133	0	0	0	0	0	.
1137	553812	68369	3342	314458	111682	.
1139	2647	1733	0	0	0	.
1148	876578	83708	2078	393271	139673	.
1149	697317	95967	19203	674763	239646	.
1157	10000	14000	0	0	0	.
1203	11640	19000	0	0	0	.
1241	0	0	0	0	0	.
1249	184239	19037	5002	148880	32064	.
1267	58679	6428	0	0	0	.
1299	0	0	0	0	0	.
1319	64828	33202	1059	21402	4609	.
1323	110338	33703	899	74626	16072	.
1327	796198	82652	73103	617015	153354	.
1340	0	0	0	0	0	.
1343	284565	34938	5721	766732	165130	.
1348	0	0	0	0	0	.
1349	17680	44500	0	0	0	.
1389	653985	48654	19703	636234	158131	.
1407	0	0	0	0	0	.
1409	0	0	0	0	0	.
1414	170074	15107	4700	20471	4409	.
1438	15000	30000	3428	625107	155365	.
1439	236664	40244	11767	418725	90180	.
1446	409598	53586	11954	976806	242777	.
1464	908830	91177	15421	469813	166857	.
1494	1174531	101012	105959	592545	210446	.
1520	0	0	0	0	0	.
1522	795838	37783	0	0	0	.
1524	215088	38487	6486	334980	72144	.
1532	1023159	101572	124128	399869	142016	.
1569	225316	25861	2165	374061	80561	.
1572	1392807	140903	3493	915872	325278	.
1609	734465	59464	81394	768740	191064	.
1616	261944	42102	7911	521080	112224	.
1617	975301	81895	33603	400001	142063	.
1618	0	0	0	0	0	.
1624	157632	34229	2775	169351	36473	.
1643	453201	60038	12533	312505	110988	.
1647	688818	52168	44999	759637	188801	.
1650	1835050	260709	56409	1348463	655544	.
1656	117697	33787	6406	85606	18437	.
1670	.	.	.	.	.	4453
1684	10000	13000	0	0	0	.
1688	1068593	106304	112509	349457	124112	.

List of BPT Cost Data by Option I

PLANT	TOTAL CAPITAL COSTS	TOTAL O&M COSTS	TOTAL LAND COSTS	CAPITAL SLUDGE COSTS	O & M SLUDGE COSTS	CONTRACT HAULING COSTS
1695	0	0	0	0	0	.
1698	68750	33252	7520	24193	5210	.
1714	168984	15610	4523	65135	14028	.
1717	188703	20581	1774	98633	21242	.
1724	0	0	0	0	0	.
1753	1685179	169888	18180	1266912	449952	.
1766	305671	45132	9258	722068	155510	.
1769	322330	1300000	0	0	0	.
1774	0	0	0	0	0	.
1776	68749	33280	1597	22332	4810	.
1785	364027	46822	6082	758625	188550	.
1802	810485	65222	97501	282416	100302	.
1839	243874	40790	11905	447198	96312	.
1869	0	0	0	0	0	.
1877	0	0	0	0	0	.
1881	135942	33984	1904	120034	25852	.
1890	1032804	109344	20182	1369268	340320	.
1905	0	0	0	0	0	.
1910	0	0	0	0	0	.
1911	956147	117666	23834	800087	246695	.
1928	132307	33947	3085	111660	24048	.
1937	0	0	0	0	0	.
1943	46613	5812	0	0	0	.
1973	0	0	0	0	0	.
1977	1869736	207459	9856	1216685	453122	.
1986	56877	33124	2547	14888	3206	.
2009	806271	70103	44444	930580	231288	.
2020	171655	16343	4700	37220	8016	.
2026	942791	80047	4565	351040	124674	.
2030	342907	43678	9236	662533	164667	.
2047	225869	39313	10966	372200	80160	.
2049	200321	21837	5756	232625	50100	.
2055	99208	33586	2564	57691	12425	.
2062	72640	33317	2837	26054	5611	.
2073	0	9530	0	0	0	.
2090	168427	34578	3188	193544	41683	.
2110	676510	59533	71352	508785	126454	.
2148	0	0	0	0	0	.
2181	250595	29778	1137	532246	114629	.
2193	27229	32795	944	1861	401	.
2198	218681	38887	4082	353590	76152	.
2206	110338	33703	2100	74440	16032	.
2221	0	0	0	0	0	.
2222	0	0	0	0	0	.
2227	1871009	163118	316833	1090072	387146	.
2228	48749	33057	2374	9305	2004	.
2236	154027	34191	7870	156324	33667	.
2242	0	0	0	0	0	.
2254	839183	82156	28434	671636	166930	.
2268	117697	33781	6334	87467	18838	.

List of BPT Cost Data by Option I

PLANT	TOTAL CAPITAL COSTS	TOTAL O&M COSTS	TOTAL LAND COSTS	CAPITAL SLUDGE COSTS	O & M SLUDGE COSTS	CONTRACT HAULING COSTS
2272	1073402	109277	20036	640582	227507	.
2281	0	0	0	0	0	.
2292	0	0	0	0	0	.
2296	316205	39690	3060	546210	135756	.
2307	106642	33853	3178	42059	9058	.
2313	324073	46472	7337	826284	177955	.
2315	20180	54000	0	0	0	.
2316	0	0	0	0	0	.
2322	0	0	0	0	0	.
2328	179597	35630	3270	26054	5611	.
2345	204318	37634	10761	299249	64449	.
2353	128667	33900	6785	107938	23246	.
2360	0	0	0	0	0	.
2364	397686	51820	4836	918442	228271	.
2365	329541	37851	1863	576724	124208	.
2368	828090	66044	27970	308810	109676	.
2376	154750	9942	0	0	0	.
2390	172020	34986	3267	206199	44409	.
2394	1187913	104361	69897	641110	227694	.
2399	1356450	118223	11726	659850	234350	.
2400	233064	40049	4355	409420	88176	.
2419	189968	36510	5802	256818	55310	.
2429	0	0	0	0	0	.
2430	0	0	0	0	0	.
2445	1690705	152499	6636	979217	347775	.
2447	0	0	0	0	0	.
2450	0	0	0	0	0	.
2461	1029598	86321	8598	390631	138735	.
2471	0	0	0	0	0	.
2474	251092	41370	13248	479394	103246	.
2481	0	0	0	0	0	.
2527	309342	45427	16361	744400	160320	.
2528	1758608	134850	382142	1227321	435891	.
2531	236664	40244	4400	418725	90180	.
2533	276458	43180	14583	588076	126653	.
2536	0	0	0	0	0	.
2537	150420	34148	2064	150741	32465	.
2541	656361	53354	26126	556325	138270	.
2551	0	0	0	0	0	.
2556	218670	24812	5833	334980	72144	.
2573	276458	43256	8415	593659	127855	.
2590	0	0	0	0	0	.
2592	908572	87132	3922	421512	149703	.
2626	0	0	0	0	0	.
2631	0	0	0	0	0	.
2633	1086614	101045	146635	450282	159920	.
2647	952532	78105	137946	447906	159077	.
2660	0	0	0	0	0	.
2668	218681	38745	4776	346146	74549	.
2673	189968	36556	10129	258679	55711	.

List of BPT Cost Data by Option I

PLANT	TOTAL CAPITAL COSTS	TOTAL O&M COSTS	TOTAL LAND COSTS	CAPITAL SLUDGE COSTS	O & M SLUDGE COSTS	CONTRACT HAULING COSTS
2678	916456	75978	35720	304824	108260	.
2692	0	0	0	0	0	.
2693	712482	59792	45282	642303	159639	.
2695	0	0	0	0	0	.
2701	374284	45170	8897	508785	126454	.
2711	143192	34072	4498	131573	28337	.
2735	0	0	0	0	0	.
2739	797094	63463	56810	981155	243858	.
2763	0	0	0	0	0	.
2764	416596	54622	12164	1011500	251400	.
2767	0	0	0	0	0	.
2770	258323	41792	7778	502470	108216	.
2771	327767	46704	16473	844894	181963	.
2781	0	0	0	0	0	.
2786	995226	88807	78256	409450	145419	.
2795	298203	36991	1927	867226	186773	.
2816	0	0	0	0	0	.
2818	294684	44545	14525	681126	146693	.
3033	236664	40150	7113	413142	88978	.
4002	247481	41173	12166	468972	101002	.
4010	324070	46534	6110	831867	179158	.
4017	0	0	0	0	0	.
4018	0	0	0	0	0	.
4021	11582	3205	0	0	0	.
4037	0	0	0	0	0	.
4040	52838	33114	4237	11166	2405	.
4051	227522	26136	1422	215876	46493	.
4055	0	0	0	0	0	.
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	96911856	12806125	4567824	86107401	24534145	342881

BAT Preamble Economic Impact Analysis Cost Data

PLANT NUMBER	TOTAL CAPITAL COSTS	TOTAL O&M COSTS	TOTAL LAND COSTS	CAPITAL SLUDGE COSTS	O & M SLUDGE COSTS	CONTRACT HAULING COSTS	ANNUAL MONITORING COSTS
1	0	0	0	0	0	0	29539
12	583212	77154	8994	0	0	0	29539
15	881544	128618	4324	3536	762	0	29539
61	912274	115757	4653	37220	8016	0	29539
63	0	4750	0	0	0	0	33782
76	1529448	1562142	46817	193544	41683	0	29539
83	328468	31298	310	11724	2525	0	33782
87	541052	196316	1937	0	0	0	26827
101	0	0	0	0	0	222650	26827
102	0	0	0	0	0	0	29539
105	1200770	2123576	340814	276731	59599	0	41206
112	0	0	0	0	0	111325	26827
114	1118466	368477	31427	472694	101803	0	26827
154	328468	33389	2412	74440	16032	0	26827
159	0	0	0	0	0	0	29539
177	1011495	103592	21556	48386	10421	0	29539
183	862959	451849	27831	0	0	0	29539
190	731177	1072783	66000	0	0	0	41206
205	821587	757824	86733	193544	41683	0	29539
225	1192741	120811	16227	373178	80801	0	29539
227	454726	28989	2124	0	0	0	41206
250	354104	50601	8063	385227	82966	0	33782
254	366729	54659	3248	470833	101402	0	26827
259	0	0	0	0	0	0	33782
260	1231815	147463	38554	81884	17635	0	29539
267	1411929	651263	13206	776832	193075	0	51259
269	60026	31856	626	0	0	0	29539
284	384432	67491	5018	111660	24048	0	26827
294	0	0	0	0	0	0	29539
296	594489	119654	21801	661521	164416	0	41206
301	8973044	3754917	96349	329397	116988	0	41206
352	405958	63704	1466	3908	842	0	29539
384	6856767	3047519	248419	358431	127299	0	51259
387	2969660	841368	37964	1827258	888306	0	65286
392	450142	33874	2736	0	0	0	26827
394	461491	47794	8211	0	0	0	26827
399	2000000	335000	9100	0	0	0	36574
412	642285	82906	69000	0	0	0	26827
415	3551871	3621418	129088	660906	234725	0	51259
443	868975	154617	28737	7816	1683	0	29539
444	110889	34022	6542	0	0	0	29539
446	919901	82783	5349	28101	6052	0	26827
447	19478598	1653586	123326	545805	135655	0	41206
451	0	0	0	0	0	44530	26827
481	498116	37693	2374	0	0	0	29539
485	1866959	2954508	114488	0	0	0	41206
486	872185	102024	27793	10608	2285	0	29539
488	1154248	468093	109650	82256	17715	0	29539
500	328709	38823	5380	163396	35190	0	29539
518	1950998	2281636	14440	329397	70942	0	26827
523	72315	42686	7095	0	0	0	29539
525	0	0	0	0	0	0	29539
569	0	0	0	0	0	0	29539

PLANT NUMBER	TOTAL CAPITAL COSTS	TOTAL O&M COSTS	TOTAL LAND COSTS	CAPITAL SLUDGE COSTS	O & M SLUDGE COSTS	CONTRACT HAULING COSTS	ANNUAL MONITORING COSTS
580	116439	34318	2395	0	0	0	29539
602	0	0	0	0	0	57889	29539
608	655540	1052470	14970	0	0	0	41206
614	328468	34168	1578	87095	18757	0	29539
633	809133	73458	12751	2680	577	0	29539
657	11957032	685730	192648	374795	133111	0	29539
659	454557	52002	2826	0	0	0	33782
662	1247646	428399	22673	764871	164729	0	29539
663	858500	692391	18605	115382	24850	0	26827
664	919793	530584	10537	716485	154308	0	26827
669	0	0	0	0	0	124684	29539
682	697987	146981	15825	429694	152609	0	51259
683	1403937	781729	40680	866856	215450	0	51259
695	2383893	244490	94475	0	0	0	51259
709	0	0	0	0	0	151402	29539
727	471403	84419	5792	651406	161902	0	51259
741	0	0	0	0	0	0	41206
758	0	0	0	0	0	0	29539
775	540068	648766	3151	0	0	0	29539
802	551554	106422	6680	984190	244612	0	29539
811	0	0	0	0	0	0	33782
814	6225611	1332591	48218	604877	150337	0	41206
825	837227	151315	4430	346146	74549	0	29539
844	0	0	0	0	0	0	33782
851	3377409	3155331	138805	0	0	0	41206
859	6919904	358044	24348	0	0	0	41206
866	0	0	0	0	0	0	33782
871	451103	42992	6002	0	0	0	33782
876	552177	305539	6730	0	0	0	29539
883	0	0	0	0	0	0	29539
888	0	0	0	0	0	0	26827
908	448303	78050	8660	560371	139276	0	51259
909	2743896	1079582	101930	372200	80160	0	41206
913	1141795	797059	47694	464270	164889	0	41206
938	115653	84916	1951	0	0	0	29539
942	383833	41818	19904	0	0	0	29539
948	1291236	448579	13690	850672	211427	0	51259
962	782986	67022	2865	55830	12024	0	26827
970	469119	83791	6785	642303	159639	0	29539
973	828624	275200	45089	604825	130260	0	41206
984	328468	32299	1695	55830	12024	0	26827
990	328468	35924	1112	115382	24850	0	33782
992	454719	22868	2736	0	0	0	29539
1012	454779	79839	6443	585659	145561	0	29539
1020	349821	49140	8310	355451	76553	0	29539
1033	0	0	0	0	0	89060	29539
1038	972717	207113	14621	524713	186355	0	51259
1059	0	14500	0	0	0	0	41206
1061	458705	113196	8284	488885	105290	0	26827
1062	0	0	0	0	0	0	29539
1067	438206	65409	6155	37220	8016	0	29539
1133	139529	35574	1079	0	0	0	29539
1137	2219293	246146	24383	278325	98849	0	51259

BAT Preamble Economic Impact Analysis Cost Data

PLANT NUMBER	TOTAL CAPITAL COSTS	TOTAL O&M COSTS	TOTAL LAND COSTS	CAPITAL SLUDGE COSTS	O & M SLUDGE COSTS	CONTRACT HAULING COSTS	ANNUAL MONITORING COSTS
1139	479801	60911	12220	0	0	0	33782
1148	835903	185891	4611	604423	214665	0	41206
1149	833465	4798387	23760	0	0	0	41206
1157	0	0	0	0	0	44530	33782
1203	332097	41724	2210	214015	46092	0	26827
1241	635556	99018	24064	521080	112224	0	26827
1249	1051487	124479	23939	24565	5291	0	33782
1267	0	0	0	0	0	0	26827
1299	0	0	0	0	0	0	29539
1319	0	0	0	0	0	0	29539
1323	544754	69758	1879	0	0	0	26827
1327	2953691	1186459	117597	617015	153354	0	41206
1340	1199794	466637	24908	409104	88108	0	33782
1343	1740987	2625061	58497	541551	116633	0	33782
1348	0	1000	0	0	0	0	26827
1349	0	0	0	0	0	0	26827
1389	411405	67752	3220	772315	166332	0	26827
1407	1002773	580864	9225	772315	166332	0	29539
1409	4106377	2354667	147923	287695	102177	0	41206
1414	454719	14197	8460	0	0	0	26827
1438	373116	56619	3606	513636	110621	0	33782
1439	1763615	1915505	81860	195405	42084	0	29539
1446	350850	718244	42480	0	0	0	26827
1464	482849	89871	8602	0	0	0	29539
1494	8463828	2288557	84297	340219	120831	0	41206
1520	1004495	252421	45473	30334	6533	0	29539
1522	811772	4140048	22573	0	0	0	57597
1524	328468	36119	2583	118546	25531	0	26827
1532	425575	75044	11239	217737	46894	0	29539
1569	1036063	174401	8011	186100	40080	0	29539
1572	0	25000	0	0	0	0	51259
1609	905355	288820	19941	502470	108216	0	29539
1616	331423	41307	3524	206571	44489	0	26827
1617	576429	1291980	4296	0	0	0	29539
1618	683778	104759	13436	0	0	0	26827
1624	778349	41593	2855	1359	293	0	33782
1643	0	0	0	0	0	0	26827
1647	912609	479951	10155	232625	50100	0	29539
1650	20575507	4527482	1058825	1732309	645153	0	57597
1656	0	0	0	0	0	0	29539
1670	0	0	0	0	0	4453	29539
1684	73357	32245	694	0	0	133590	33782
1688	7407018	411282	110439	307065	66132	0	29539
1695	4893992	1257500	26851	276873	98333	0	51259
1698	449881	13302	13086	0	0	0	26827
1714	778349	56004	9912	33684	7254	0	26827
1717	328468	31437	826	36848	7936	0	26827
1724	841150	105982	21038	3350	721	0	29539
1753	671437	139572	15144	397230	141079	0	41206
1766	378121	58125	6076	547134	117835	0	26827
1769	7875173	9718672	157155	0	0	0	41206
1774	1035891	243484	13226	871002	309342	0	29539
1785	1012253	192393	29524	758625	188550	0	51259

BAT Preamble Economic Impact Analysis Cost Data

PLANT NUMBER	TOTAL CAPITAL COSTS	TOTAL O&M COSTS	TOTAL LAND COSTS	CAPITAL SLUDGE COSTS	O & M SLUDGE COSTS	CONTRACT HAULING COSTS	ANNUAL MONITORING COSTS
1802	444655	77041	13785	546210	135756	0	29539
1839	782792	44868	8886	9863	2124	0	26827
1869	618340	705348	3628	0	0	0	51259
1877	1389291	881655	27052	183867	39599	0	29539
1881	328468	31617	631	41873	9018	0	33782
1890	529854	113692	19606	290316	62525	0	33782
1905	386297	63117	5875	15204	3275	0	33782
1910	1135742	1255931	11405	308740	66493	0	41206
1911	686981	106868	27170	666238	143486	0	33782
1928	826194	75304	5583	7072	1523	0	26827
1937	1251214	628168	61880	121523	26172	0	29539
1943	0	0	0	0	0	0	33782
1973	599338	119580	5777	311449	110613	0	29539
1977	0	0	0	0	0	0	51259
1986	0	0	0	0	0	0	26827
2009	674383	80766	9318	0	0	0	29539
2020	0	0	0	0	0	0	29539
2026	454719	17720	2736	0	0	0	33782
2030	1437358	1390413	84990	0	0	0	41206
2047	512036	69993	11377	96772	20842	0	26827
2049	378242	59210	6012	57691	12425	0	29539
2055	0	0	0	0	0	0	26827
2062	785050	50058	5652	14330	3086	0	29539
2073	1565332	2107497	66931	878392	189178	0	29539
2090	63318	35647	1953	0	0	0	29539
2110	362960	63158	6065	34801	7495	0	29539
2148	657716	216786	28974	816281	202880	0	29539
2181	0	0	0	0	0	0	26827
2193	0	0	0	0	0	89060	33782
2198	355187	50962	3103	392671	84569	0	29539
2206	674950	135546	5916	0	0	0	26827
2221	861504	222780	7759	320092	68938	0	26827
2222	670350	139270	6606	395910	140610	0	29539
2227	1717297	1113595	57123	1047842	372148	0	29539
2228	783187	42842	5329	5620	1210	0	29539
2236	458966	66378	8085	10515	2265	0	29539
2242	794313	66472	9040	280267	60360	0	29539
2254	564000	115855	12674	622275	154661	0	29539
2268	1741503	2941523	76492	65135	14028	0	29539
2272	1521382	2272954	53161	814763	202503	0	51259
2281	414832	118514	3459	9119	1964	0	29539
2292	623153	161108	35602	0	0	0	29539
2296	0	0	0	0	0	0	26827
2307	0	0	0	0	0	0	26827
2313	0	0	0	0	0	0	29539
2315	424577	90041	6312	411281	88577	0	26827
2316	864597	117054	7232	1489	321	0	29539
2322	2093797	2526055	109087	566116	121923	0	41206
2328	0	0	0	0	0	0	33782
2345	341793	46190	7518	297202	64008	0	29539
2353	0	0	0	0	0	0	29539
2360	426189	71906	3452	874670	188376	0	26827
2364	328468	31298	624	16563	3567	0	33782

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PLANT NUMBER	TOTAL CAPITAL COSTS	TOTAL O&M COSTS	TOTAL LAND COSTS	CAPITAL SLUDGE COSTS	O & M SLUDGE COSTS	CONTRACT HAULING COSTS	ANNUAL MONITORING COSTS
2365	537219	47124	3521	0	0	0	29539
2368	543298	104153	5081	948787	235813	0	41206
2376	464098	52884	2830	0	0	0	33782
2390	0	0	0	0	0	0	29539
2394	1228402	182965	13864	524449	186261	0	41206
2399	0	0	0	0	0	0	29539
2400	155182	34752	2663	0	0	0	26827
2419	482976	67209	5838	66810	14389	0	26827
2429	577551	117539	62203	0	0	0	29539
2430	6501134	6661361	215084	344970	122518	0	41206
2445	415461	68897	3285	800230	172344	0	33782
2447	0	1000	0	0	0	0	29539
2450	1160796	1420471	31753	691866	171958	0	41206
2461	356565	63076	2973	15446	3327	0	33782
2471	0	0	0	0	0	0	41206
2474	740217	426664	28735	0	0	0	26827
2481	1068738	320795	17744	930580	231288	0	51259
2527	6110643	697665	137712	329925	117175	0	51259
2528	1614132	1128181	57991	363445	129080	0	51259
2531	521479	190457	3733	0	0	0	26827
2533	366452	54573	9703	468972	101002	0	26827
2536	0	0	0	0	0	0	29539
2537	328468	32169	723	53411	11503	0	26827
2541	1718347	2295209	31514	465250	100200	0	29539
2551	0	0	0	0	0	0	26827
2556	0	0	0	0	0	0	26827
2573	1207405	376056	23701	407559	87775	0	29539
2590	858178	76221	12516	1861	401	0	29539
2592	422449	70859	3394	848616	182765	0	26827
2626	0	0	0	0	0	0	29539
2631	1268164	2667176	37870	289758	62405	0	41206
2633	672524	139875	26412	398549	141547	0	41206
2668	0	0	0	0	0	0	26827
2673	818854	84752	12964	4094	882	0	29539
2678	339927	45444	2365	282872	60922	0	26827
2692	0	1000	0	0	0	0	26827
2693	0	0	0	0	0	0	29539
2695	1257905	1803263	39263	990259	246121	0	41206
2701	613699	669010	14248	0	0	0	41206
2711	458155	40786	4960	0	0	0	26827
2735	15495718	1263917	272135	571430	202947	0	29539
2739	117139	87578	8235	0	0	0	51259
2763	464278	82458	5650	623084	154862	0	29539
2764	506987	94189	18345	796051	197852	0	41206
2767	430485	64122	6220	21774	4689	0	29539
2770	778726	67022	6555	55830	12024	0	29539
2771	458155	40786	8157	0	0	0	33782
2781	917047	157462	33873	9119	1964	0	29539
2786	1738056	82699	83281	35731	7695	0	29539
2795	1080229	865104	6742	573544	143047	0	41206
2816	1236899	268670	16958	792876	281595	0	41206
2818	62529	31909	4280	0	0	0	29539
3033	189850	38322	5836	0	0	0	29539

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PLANT NUMBER	TOTAL CAPITAL COSTS	TOTAL O&M COSTS	TOTAL LAND COSTS	CAPITAL SLUDGE COSTS	O & M SLUDGE COSTS	CONTRACT HAULING COSTS	ANNUAL MONITORING COSTS
4002	0	0	0	0	0	0	29539
4010	0	0	0	0	0	0	29539
4017	0	0	0	0	0	0	26827
4018	992916	238249	41090	27171	5852	0	29539
4021	542838	109519	17926	158929	34228	0	26827
4037	1137313	745696	38271	72579	15631	0	29539
4040	553899	72254	14185	0	0	0	29539
4051	332273	41828	1578	215876	46493	0	26827
4055	53273	60681	20687	0	0	0	29539
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	301005886	127142802	7346434	56447691	15079793	1073173	9050052

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PLANT NUMBER	TOTAL CAPITAL COSTS	TOTAL O&M COSTS	TOTAL LAND COSTS	CAPITAL SLUDGE COSTS	O & M SLUDGE COSTS	CONTRACT HAULING COSTS	ANNUAL MONITORING COSTS
2	328468	31298	451	3722	802	0	29539
5	454351	32339	7848	0	0	0	26827
10	838120	74081	11933	3461	745	0	26827
22	1158657	737121	11836	52666	11343	0	26827
30	527873	211506	3608	0	0	0	29539
33	6310032	1110003	74627	139575	30060	0	51259
49	762984	156290	97412	0	0	0	26827
51	1284376	967461	59222	116126	25010	0	29539
52	782792	44438	6371	4224	910	0	29539
58	0	0	0	0	0	0	26827
71	0	0	0	0	0	222650	33782
72	126249	118269	20925	0	0	0	29539
79	609506	49394	64822	0	0	0	33782
88	0	0	0	0	0	89060	26827
93	0	0	0	0	0	0	29539
94	890205	158512	133606	7444	1603	0	26827
110	897722	140753	21157	3722	802	0	29539
111	0	0	0	0	0	44530	26827
119	503698	43340	18439	0	0	0	26827
120	853663	77070	4347	9305	2004	0	29539
122	454324	22613	34272	0	0	0	29539
143	826189	67843	3446	3722	802	0	29539
149	964222	228716	35100	14330	3086	0	29539
155	1612273	670083	30023	738817	159118	0	29539
158	0	0	0	0	0	89060	26827
161	1700118	2292917	83596	298691	64328	0	29539
162	0	0	0	0	0	133590	29539
163	957582	218398	34291	11166	2405	0	29539
166	97912	254896	14951	0	0	0	29539
180	0	0	0	0	0	222650	26827
196	1546498	1771089	73757	227414	48978	0	29539
199	333811	1291428	13412	0	0	0	26827
203	454324	10462	34272	0	0	0	26827
206	570380	49320	13787	0	0	0	26827
209	0	0	0	0	0	0	29539
212	46352	33471	860	0	0	356240	33782
214	1229290	306372	13004	182378	39278	0	29539
220	572588	46503	57081	0	0	0	33782
221	1244195	150504	9043	133062	28657	0	33782
232	489168	103636	7899	0	0	0	29539
240	8529536	1742469	100470	213085	45892	0	41206
244	0	0	0	0	0	0	29539
249	900479	87538	6653	30148	6493	0	26827
257	702046	1529422	44291	74440	16032	0	29539
262	884891	128711	117513	2419	521	0	29539
266	823404	74097	6493	2419	521	0	26827
276	655540	1052470	15244	0	0	0	41206
283	6182704	743893	80500	0	0	0	29539
285	0	0	0	0	0	8906	26827
292	836315	98522	14996	64018	13788	0	29539
293	1370183	2293361	28820	0	0	0	29539
297	328468	33502	3260	76301	16433	22265	26827
299	340166	45542	1843	284733	61322	0	29539

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PLANT NUMBER	TOTAL CAPITAL COSTS	TOTAL O&M COSTS	TOTAL LAND COSTS	CAPITAL SLUDGE COSTS	O & M SLUDGE COSTS	CONTRACT HAULING COSTS	ANNUAL MONITORING COSTS
302	454712	36424	2788	0	0	0	29539
310	722381	64072	13098	0	0	0	26827
321	454324	10410	34272	0	0	0	33782
326	986711	265703	31942	19354	4168	0	29539
334	846329	74064	4447	1675	361	0	33782
348	0	0	0	0	0	0	26827
354	1185345	816919	46075	84303	18156	0	26827
357	0	0	0	0	0	89060	29539
417	0	0	0	0	0	0	26827
423	901018	436183	8888	55830	12024	0	29539
428	0	0	0	0	0	222650	26827
430	42169485	2030712	709662	748510	186036	0	41206
433	1086496	465081	15519	46525	10020	0	29539
438	654024	88519	4423	0	0	0	26827
449	0	0	0	0	0	0	26827
451	0	0	0	0	0	44530	26827
458	7708191	1894189	559957	0	0	0	51259
468	888651	105285	4889	16377	3527	0	33782
492	51712	32471	2431	0	0	102419	29539
494	542307	286402	11697	0	0	0	33782
502	0	0	0	0	0	12468	29539
508	0	0	0	0	0	89060	29539
522	1347880	1155668	62622	120965	26052	0	29539
529	454324	11526	2736	0	0	0	26827
536	1051020	242260	17583	13529	2914	0	33782
543	553646	51355	4666	0	0	0	26827
544	0	0	0	0	0	22265	26827
567	839052	101627	7089	1861	401	0	26827
592	728736	64784	16158	0	0	0	33782
605	0	0	0	0	0	164761	26827
607	1026181	337820	29818	29032	6252	0	29539
611	901500	144991	9978	2419	521	0	26827
618	0	0	0	0	0	222650	29539
624	9126969	1606568	152704	263145	56673	0	41206
658	1064238	102242	20885	50433	10862	0	33782
661	881439	125809	6383	1787	385	0	29539
667	0	0	0	0	0	13359	29539
702	3000	20000	0	0	0	0	29539
706	515331	45324	10114	0	0	0	26827
717	422301	43021	11241	0	0	0	26827
720	460286	45359	3062	0	0	0	29539
722	1195361	4746667	25664	472694	101803	0	41206
724	498503	42933	9895	0	0	0	26827
743	892807	162068	7421	7816	1683	0	29539
749	914467	82156	5281	26426	5691	0	26827
768	874295	120197	26365	1489	321	0	29539
771	686809	590259	40983	61599	13266	0	29539
777	0	0	0	0	0	44530	29539
791	512322	44084	8394	0	0	0	26827
796	0	0	0	0	0	133590	26827
797	906836	150513	11076	4839	1042	0	29539
814	5965508	1128834	41968	604877	150337	0	41206
819	15913299	3748429	122821	268163	95240	0	41206

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PLANT NUMBER	TOTAL CAPITAL COSTS	TOTAL O&M COSTS	TOTAL LAND COSTS	CAPITAL SLUDGE COSTS	O & M SLUDGE COSTS	CONTRACT HAULING COSTS	ANNUAL MONITORING COSTS
830	62290	34628	5816	0	0	142496	33782
845	408855	226882	6529	20657	4449	0	29539
846	0	0	0	0	0	133590	26827
862	1264502	1046233	56858	111697	24056	0	26827
874	866397	335120	21295	478277	103006	0	26827
877	1276593	930268	21985	65879	14188	0	33782
880	0	0	0	0	0	26718	29539
887	1188068	288290	9275	198755	42805	0	29539
905	523889	83463	10226	0	0	0	26827
912	0	0	0	0	0	129137	26827
917	328468	31351	2095	33498	7214	0	29539
929	454324	10295	34272	0	0	0	26827
931	0	0	0	0	0	218197	26827
932	0	0	0	0	0	4453	29539
944	70364	34628	3552	0	0	200385	33782
956	0	0	0	0	0	71248	26827
958	0	0	0	0	0	0	29539
975	454719	19450	2124	0	0	0	33782
976	473643	118860	4038	0	0	0	26827
987	31708	32471	1064	0	0	400770	26827
988	0	0	0	0	0	178120	26827
991	0	0	0	0	0	4453	26827
992	571672	56046	4474	0	0	0	29539
997	783187	42404	8687	4653	1002	0	29539
1006	356808	78386	4597	3722	802	0	26827
1011	333002	42241	6053	223320	48096	0	29539
1018	1035194	148806	8063	88584	19078	0	29539
1026	0	0	0	0	0	222650	29539
1047	1148662	141110	53794	0	0	0	33782
1052	950444	89666	4147	45408	9780	0	26827
1053	844090	84506	1209	6588	1419	0	33782
1057	29838	32471	735	0	0	89060	33782
1064	0	0	0	0	0	66795	29539
1069	422716	70934	4781	850477	183166	0	29539
1076	0	0	0	0	0	62342	26827
1083	838784	74097	8802	3536	762	0	26827
1085	39321	32471	3196	0	0	267180	33782
1086	694350	109625	80194	0	0	0	26827
1091	1356486	1176154	38810	145158	31262	0	29539
1094	762934	1077848	69366	0	0	0	29539
1107	457746	39842	2167	0	0	8906	26827
1117	486388	45522	1625	0	0	0	26827
1126	1388966	2364293	57473	0	0	0	29539
1162	475122	126133	8948	0	0	0	26827
1163	1140424	114112	19813	9863	2124	0	29539
1172	1251348	210464	48045	0	0	0	26827
1175	60899	34628	12704	0	0	223986	33782
1175	0	0	0	0	0	178120	26827
1181	609675	470739	36416	46711	10060	0	29539
1188	792566	84182	7428	26054	5611	0	29539
1191	970161	228860	9377	14516	3126	0	29539
1194	545470	44928	12135	0	0	51210	33782
1195	0	0	0	0	0	0	26827

PSES Preamble Economic Impact Analysis Cost Data

PLANT NUMBER	TOTAL CAPITAL COSTS	TOTAL O&M COSTS	TOTAL LAND COSTS	CAPITAL SLUDGE COSTS	O & M SLUDGE COSTS	CONTRACT HAULING COSTS	ANNUAL MONITORING COSTS
1197	841185	74134	8858	3908	842	0	26827
1202	568015	57237	13714	0	0	0	26827
1219	1372926	4807680	86775	0	0	0	26827
1220	553161	46415	3312	0	0	0	33782
1223	328468	31298	313	4839	1042	0	29539
1224	434036	1819206	11597	0	0	0	26827
1234	642231	52824	12400	0	0	0	33782
1236	1081319	106108	21961	57133	12305	0	33782
1237	536188	47595	51292	0	0	0	29539
1249	1029111	112348	20143	24565	5291	0	33782
1253	454324	15794	8460	0	0	0	29539
1255	454719	27484	2124	0	0	0	29539
1264	884891	128711	27404	2419	521	0	29539
1277	782792	51607	3334	24193	5210	0	29539
1310	1557381	13052723	21744	148880	32064	0	41206
1313	28208	32471	826	0	0	115778	33782
1314	0	0	0	0	0	0	26827
1320	501815	43128	4202	0	0	48983	26827
1322	887785	94672	14371	23263	5010	0	26827
1326	572056	43908	3477	0	0	0	33782
1351	936204	187088	12078	7816	1683	0	29539
1352	28208	32471	3108	0	0	115778	33782
1356	905097	148521	29332	3908	842	0	29539
1357	508635	43766	8342	0	0	0	33782
1361	1300614	1013283	20632	122454	26373	0	29539
1371	0	0	0	0	0	222650	26827
1386	0	0	0	0	0	44530	26827
1426	652080	113060	22286	174190	37515	0	29539
1432	925372	92522	17069	65879	14188	0	26827
1433	0	0	0	0	0	14250	29539
1437	1096862	159394	10922	0	0	0	29539
1450	28208	32471	6097	0	0	115778	26827
1478	882449	126646	10160	2233	481	0	29539
1504	900140	91582	5145	29776	6413	0	26827
1507	1287795	212558	54190	0	0	0	33782
1528	533208	44935	11618	0	0	0	26827
1534	615016	48592	5264	0	0	0	26827
1535	0	0	0	0	0	8906	26827
1539	813332	179737	15858	253468	54589	0	29539
1548	0	0	0	0	0	75701	29539
1556	454479	34298	2736	0	0	0	29539
1560	884891	128711	24193	2419	521	0	29539
1562	795401	95553	3438	136970	29499	0	29539
1564	0	0	0	0	0	75701	29539
1566	0	0	0	0	0	44530	29539
1575	28208	32470	3108	0	0	262727	26827
1593	0	0	0	0	0	0	29539
1595	601768	65959	6967	0	0	0	29539
1601	47664	25803	2420	0	0	0	29539
1608	1035239	355617	14116	31451	6774	0	29539
1621	784293	69261	11491	93050	20040	0	29539
1622	1014583	92314	14925	33312	7174	0	33782
1628	919622	165423	131776	5583	1202	0	29539

PSES Preamble Economic Impact Analysis Cost Data

PLANT NUMBER	TOTAL CAPITAL COSTS	TOTAL O&M COSTS	TOTAL LAND COSTS	CAPITAL SLUDGE COSTS	O & M SLUDGE COSTS	CONTRACT HAULING COSTS	ANNUAL MONITORING COSTS
1645	947272	102996	13371	6700	1443	0	29539
1653	657531	1074092	15332	0	0	0	41206
1657	5591066	732489	26848	546210	135756	0	41206
1659	1151806	619556	50306	67740	14589	0	29539
1666	1007179	301977	166784	24193	5210	0	29539
1667	1192611	252633	33636	304274	65531	0	26827
1706	6097260	1137104	33346	0	0	0	41206
1716	1094181	482658	45928	48944	10541	0	29539
1718	0	0	0	0	0	133590	29539
1740	407361	95668	12352	722068	155510	0	26827
1742	783231	61376	44824	44664	9619	0	29539
1743	826584	68288	9498	6532	1407	0	26827
1744	884891	128711	27404	2419	521	0	29539
1748	2257611	7860591	98815	660655	142284	0	29539
1751	365591	63768	3387	1303	281	222650	26827
1764	783187	59247	3703	28473	6132	0	33782
1773	519234	44877	4311	0	0	0	26827
1788	634649	62389	16553	0	0	0	29539
1793	880044	124117	124800	19354	4168	0	29539
1797	0	0	0	0	0	0	29539
1801	782792	42739	3270	5397	1162	0	29539
1805	466333	86018	7687	0	0	0	26827
1808	0	0	0	0	0	155855	26827
1812	0	0	0	0	0	89060	33782
1826	1077619	446297	16555	37220	8016	0	29539
1832	580427	45654	10085	0	0	0	33782
1833	795824	94115	5392	100494	21643	0	29539
1838	0	0	0	0	0	129137	29539
1843	0	0	0	0	0	44530	26827
1848	43397	26019	289	0	0	396317	29539
1853	7780971	1681480	145118	748004	185910	0	41206
1861	375681	57177	3426	40384	8697	0	29539
1876	1005368	298711	13259	23635	5090	0	29539
1887	0	0	0	0	0	178120	29539
1888	0	0	0	0	0	71248	29539
1891	892291	291299	8488	0	0	0	26827
1894	971648	240640	37880	16005	3447	0	29539
1899	976873	120020	17659	89328	19238	0	26827
1904	44007030	3688304	734492	273759	97227	0	41206
1924	459292	43282	2798	0	0	0	29539
1931	862406	75312	55070	8188	1764	0	26827
1936	471124	452466	29913	24379	5250	0	29539
1945	454324	17894	8460	0	0	0	26827
1948	455222	39756	4957	0	0	0	26827
1970	454324	12406	2124	0	0	0	26827
1971	900065	85649	3751	9491	2044	0	29539
1974	0	0	0	0	0	0	29539
1988	0	0	0	0	0	178120	26827
1993	545396	49906	4571	0	0	111325	26827
2001	654324	15971	3600	0	0	0	26827
2004	702369	51581	81880	0	0	0	29539
2007	929589	178248	33722	8188	1764	0	26827
2018	875984	2428793	14540	297760	64128	0	26827

PSES Preamble Economic Impact Analysis Cost Data

PLANT NUMBER	TOTAL CAPITAL COSTS	TOTAL O&M COSTS	TOTAL LAND COSTS	CAPITAL SLUDGE COSTS	O & M SLUDGE COSTS	CONTRACT HAULING COSTS	ANNUAL MONITORING COSTS
2022	0	0	0	0	0	31171	26827
2033	0	0	0	0	0	84607	33782
2037	873822	74706	55144	4094	882	0	33782
2050	0	0	0	0	0	222650	26827
2057	454324	29682	7056	0	0	0	33782
2070	2081896	3999167	104847	446640	96192	0	29539
2075	793256	85650	10493	36922	7952	0	29539
2080	328468	32940	3087	66996	14429	0	29539
2084	854280	68111	131138	0	0	0	33782
2093	1214161	546905	34381	232625	50100	0	29539
2108	0	0	0	0	0	0	26827
2117	949125	106449	18175	65135	14028	0	29539
2123	340647	45736	1856	288455	62124	0	26827
2129	1005368	298711	38731	23635	5090	0	29539
2147	0	0	0	0	0	178120	26827
2176	884429	83219	4859	21588	4649	0	29539
2177	742090	2351856	19326	0	0	0	41206
2184	613322	80174	5083	0	0	0	29539
2191	0	0	0	0	0	0	29539
2214	0	0	0	0	0	138043	29539
2232	1155073	397803	21716	26054	5611	0	26827
2241	1422177	527241	236385	660655	142284	0	29539
2243	2289594	4709998	38645	524802	113026	0	29539
2250	856975	74098	6803	2419	521	0	33782
2253	0	0	0	0	0	222650	26827
2259	902715	176125	34095	9305	2004	0	26827
2261	1289010	1120787	21785	120593	25972	0	29539
2262	0	0	0	0	0	44530	29539
2288	500676	43047	9912	0	0	111325	29539
2293	526731	47113	50230	0	0	0	26827
2300	905212	472469	8086	649489	139879	0	26827
2311	882117	77343	58940	13827	2978	0	26827
2318	875983	74893	4838	4280	922	0	33782
2341	1381989	337211	46828	277289	59719	0	33782
2346	577963	113686	7760	286771	101849	0	41206
2348	544620	328371	31732	29032	6252	0	29539
2350	909702	186512	12260	10422	2244	0	26827
2359	454324	10295	4860	0	0	0	26827
2402	0	0	0	0	0	35624	29539
2411	402421	65201	11567	710902	153106	0	29539
2426	0	0	0	0	0	0	29539
2432	121867	341512	26581	0	0	0	29539
2436	703983	148658	26272	437085	155233	0	29539
2442	834882	98240	18076	1563	337	0	29539
2459	783187	47269	39980	14888	3206	0	29539
2462	789713	101712	4355	120965	26052	0	33782
2465	1003573	295353	10253	23263	5010	0	29539
2469	832561	74063	4027	2605	561	0	26827
2485	6102520	1083901	97359	452223	97394	0	41206
2487	1206920	877659	7829	91561	19719	0	33782
2495	808270	184394	12906	78162	16834	0	29539
2498	868827	75896	11587	9863	2124	0	26827
2501	782792	45566	3484	14814	3190	8906	26827

PSES Preamble Economic Impact Analysis Cost Data

PLANT NUMBER	TOTAL CAPITAL COSTS	TOTAL O&M COSTS	TOTAL LAND COSTS	CAPITAL SLUDGE COSTS	O & M SLUDGE COSTS	CONTRACT HAULING COSTS	ANNUAL MONITORING COSTS
2507	0	0	0	0	0	0	26827
2517	964664	93303	13581	54527	11743	0	26827
2521	0	0	0	0	0	142496	26827
2524	866432	74402	4108	3350	721	0	33782
2539	1190941	833188	52053	60669	13066	0	26827
2548	1137440	584668	36187	62902	13547	0	29539
2565	1700075	2550120	79840	288455	62124	0	26827
2571	0	0	0	0	0	222650	29539
2578	0	0	0	0	0	0	29539
2581	0	0	0	0	0	4453	26827
2606	0	0	0	0	0	4453	29539
2608	0	0	0	0	0	89060	33782
2609	328468	32496	988	59347	12782	0	29539
2634	84565	209379	8736	0	0	0	26827
2635	6605815	785653	59184	139575	30060	0	29539
2636	782792	44626	9033	2978	641	0	29539
2641	459282	57682	3112	0	0	0	29539
2642	0	0	0	0	0	28499	26827
2646	1079430	165947	15866	3722	802	0	29539
2647	0	0	0	0	0	0	29539
2666	580427	44923	3639	0	0	0	33782
2677	1267935	921733	15456	109799	23647	0	29539
2679	328468	36211	4277	120034	25852	0	29539
2680	1071067	890252	28271	11166	2405	0	29539
2685	505281	143156	6960	0	0	0	29539
2699	39243	73800	6260	0	0	0	29539
2714	814895	74064	11441	1303	281	0	29539
2736	781792	171741	8944	0	0	0	29539
2741	937016	101097	17269	55458	11944	0	26827
2748	1194885	140087	13793	0	0	0	29539
2756	9842187	1882475	185390	535084	132991	0	41206
2776	1074510	213155	38422	10254	2208	0	29539
2779	485880	96366	8849	0	0	0	29539
2793	647543	119265	6126	0	0	0	26827
2794	4171026	838656	76755	0	0	0	41206
2796	0	0	0	0	0	0	26827
2805	0	0	0	0	0	0	29539
2810	0	0	0	0	0	218197	26827
2814	0	0	0	0	0	89060	33782
4001	969477	290214	33136	22016	4741	0	33782
4003	798660	100687	13412	119104	25651	0	29539
4006	975771	247360	59205	16935	3647	0	29539
4007	671472	97065	9737	0	0	0	29539
4008	988307	127971	86137	55830	12024	0	29539
4009	0	0	0	0	0	89060	29539
4014	361861	69268	1176	1210	261	0	29539
4022	0	0	0	0	0	0	29539
4023	738562	2282384	6771	0	0	0	41206
4024	363505	63769	1171	1117	240	178120	26827
4026	1122802	549639	48074	58063	12505	0	29539
4027	1210395	144097	35244	76673	16513	0	29539
4032	887229	130753	29243	2233	481	0	29539
4042	0	0	0	0	0	0	26827

PSES Preamble Economic Impact Analysis Cost Data

PLANT NUMBER	TOTAL CAPITAL COSTS	TOTAL O&M COSTS	TOTAL LAND COSTS	CAPITAL SLUDGE COSTS	O & M SLUDGE COSTS	CONTRACT HAULING COSTS	ANNUAL MONITORING COSTS
4043	328468	34584	2744	93794	20200	0	29539
4044	1537378	1758984	19641	191869	41322	0	29539
4046	0	0	0	0	0	44530	33782
4047	465914	94438	1881	16749	3607	0	29539
4048	0	0	0	0	0	24046	26827
4050	838784	74097	2826	3536	762	0	26827
4052	0	0	0	0	0	133590	26827
4057	855184	74771	12547	6588	1419	0	26827
4064	0	0	0	0	0	22265	29539
4066	0	0	0	0	0	93513	29539
4070	843829	74064	4048	1563	337	0	33782
4072	924008	171007	10718	7258	1563	0	29539
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	403686694	136616159	9351984	21347942	4880188	10346991	11442458

APPENDIX III-E

BPT, BAT, AND PSES TECHNOLOGIES COSTED FOR THE PREAMBLE ANALYSIS COST DATA

TECHNOLOGIES ASSOCIATED WITH BPT COST
FOR THE PREAMBLE ANALYSIS

PLANT NUMBER	BPT TECHNOLOGY COSTED				
1		2SB			
12			BU	CAC	
15					
61		2SB			
63					
76				CAC	
83			BU	CAC	
87	AS				
101					CH
102					
105				CAC	
112					CH
114				CAC	
154					
159	AS				
177		2SB			
183			BU	CAC	
190					
205					
225	AS				
227		2SB			
250		2SB			
254					
259	AS				
260					
267					
269		2SB			
284			BU		
294	AS				
296		2SB			
301					
352			BU	CAC	
384					
387					
392					
394					
399			BU	CAC	
412	AS				
415			BU	CAC	
443					
444				CAC	
446	AS				
447	AS				
451	AS				
481		2SB			

TECHNOLOGIES ASSOCIATED WITH BPT COST
FOR THE PREAMBLE ANALYSIS

PLANT NUMBER	BPT TECHNOLOGY COSTED					
485						
486			BU	CAC		
488						
500		2SB				
518			BU			
523			BU	CAC		
525						
569	AS					
580			BU	CAC		
601	AS					
602		2SB				
608			BU	CAC		
614	AS					
633			BU	CAC		
657						
659			BU	CAC		
662			BU			
663				CAC	CTPP	
664						
669	AS					
682				CAC		
683						
695				CAC		
709						CH
727	AS					
741		2SB				
758			BU	CAC		
775	AS					
802						
811						
814				CAC		
825		2SB				
844					CTPP	
851			BU	CAC		
859	AS					
866						
871			BU	CAC		
876	AS					
883			BU			
888		2SB				
908		2SB				
909				CAC		
913				CAC		
938	AS					
942	AS					

TECHNOLOGIES ASSOCIATED WITH BPT COST
FOR THE PREAMBLE ANALYSIS

PLANT NUMBER	BPT TECHNOLOGY COSTED					
948						
962	AS					
970				CAC		
973						
984			BU	CAC		
990						
992	AS					
1012			BU	CAC		
1020					CTPP	
1033						CH
1038						
1059			BU			
1061						
1062			BU	CAC		
1067		2SB				
1133						
1137			BU	CAC		
1139			BU			
1148			BU	CAC		
1149				CAG		
1157					CTPP	
1203					CTPP	
1241						
1249				CAC		
1267			BU			
1299						
1319		2SB				
1323		2SB				
1327	AS					
1340						
1343				CAC		
1348						
1349					CTPP	
1389	AS					
1407						
1409						
1414			BU	CAC		
1438					CTPP	
1439	AS					
1446				CAC		
1464			BU	CAC		
1494		2SB				
1520						
1522			BU			
1524		2SB				

TECHNOLOGIES ASSOCIATED WITH BPT COST
FOR THE PREAMBLE ANALYSIS

PLANT NUMBER	BPT TECHNOLOGY COSTED					
1532	AS					
1569				CAC		
1572			BU	CAC		
1609		2SB				
1616		2SB				
1617		2SB				
1618						
1624		2SB				
1643				CAC		
1647		2SB				
1650				CAC		
1656		2SB				
1670						CH
1684					CTPP	
1688	AS					
1695						
1698		2SB				
1714				CAC		
1717			BU	CAC		
1724						
1753			BU	CAC		
1766		2SB				
1769					CTPP	
1774						
1785				CAC		
1802		2SB				
1839	AS					
1869						
1877						
1881		2SB				
1890			BU	CAC		
1905						
1910						
1911			BU	CAC		
1928	AS					
1937						
1943			BU			
1973						
1977			BU	CAC		
1986	AS					
2009		2SB				
2020			BU	CAC		
2026			BU	CAC		
2030				CAC		
2047	AS					

TECHNOLOGIES ASSOCIATED WITH BPT COST
FOR THE PREAMBLE ANALYSIS

PLANT NUMBER	BPT TECHNOLOGY COSTED				
2049				CAC	
2055	AS				
2062	AS				
2073					CTPP
2090	AS				
2110		2SB			
2148					
2181				CAC	
2193		2SB			
2198		2SB			
2206	AS				
2221					
2222					
2227		2SB			
2228		2SB			
2236		2SB			
2242					
2254		2SB			
2268	AS				
2272			BU	CAC	
2281					
2292					
2296				CAC	
2307		2SB			
2313		2SB			
2315					CTPP
2316					
2322					
2328					CTPP
2345	AS				
2353		2SB			
2360					
2364				CAC	
2365			BU	CAC	
2368		2SB			
2376			BU		
2390		2SB			
2394		2SB			
2399			BU	CAC	
2400	AS				
2419	AS				
2429					
2430					
2445			BU	CAC	
2447					

TECHNOLOGIES ASSOCIATED WITH BPT COST
FOR THE PREAMBLE ANALYSIS

PLANT NUMBER	BPT TECHNOLOGY COSTED			
2450				
2461			BU	CAC
2471				
2474		2SB		
2481				
2527	AS			
2528	AS			
2531	AS			
2533	AS			
2536				
2537		2SB		
2541		2SB		
2551				
2556				CAC
2573	AS			
2590				
2592			BU	CAC
2626				
2631				
2633		2SB		
2647	AS			
2668	AS			
2673		2SB		
2678		2SB		
2692				
2693		2SB		
2695				
2701			BU	CAC
2711	AS			
2735				
2739		2SB		
2763				
2764				CAC
2767				
2770	AS			
2771	AS			
2781				
2786	AS			
2795				CAC
2816				
2818		2SB		
3033		2SB		
4002		2SB		
4010	AS			
4017				

TECHNOLOGIES ASSOCIATED WITH BPT COST
FOR THE PREAMBLE ANALYSIS

PLANT NUMBER	BPT TECHNOLOGY COSTED	
4018		
4021	BU	
4037		
4040	2SB	
4051	BU	CAC
4055		

NOTES:

AS - ACTIVATED SLUDGE
2SB - SECONDARY STAGE BIOLOGICAL
BU - BIOLOGICAL UPGRADES
CAC - CHEMICALLY ASSISTED CLARIFICATION
CTPP - CHEMICAL TREATMENT OF POLISHING PON
CH - CONTRACT HAULING

TECHNOLOGIES ASSOCIATED WITH BAT COST
FOR THE PREAMBLE ANALYSIS

PLANT NUMBER	BAT TECHNOLOGY COSTED					
1	MONITORING COSTS ONLY					
12		SS		CN	BP	
15	CP	SS	AC	CN	BP	
61	CP	SS		CN	BP	
63	CPU					
76	CP	SS	AC	CN	BP	
83	CP					
87		SS			BP	
101	MONITORING COSTS ONLY					
102	MONITORING COSTS ONLY					
105	CP	SSU	AC	CN	BP	
112						CH
114	CP	SS			BP	
154	CP					
159	MONITORING COSTS ONLY					
177	CP	SS			BP	
183		SS			BP	
190	CPU		AC	CN	BP	
205	CP		AC		BP	
225	CP			CN	BP	
227		SS				
250	CP					
254	CP					
259	MONITORING COSTS ONLY					
260	CP	SS		CN	BP	
267	CP	SS		CN	BP	
269					BP	
284	CP				BP	
294	MONITORING COSTS ONLY					
296	CP				BP	
301	CP	SS	AC	CN	BP	
352	CP				BP	
384	CP	SS			BP	
387	CP					
392		SS				
394		SS				
399	CPU					
412		SS			BP	
415	CP	SS			BP	
443	CP	SS	AC	CN		
444					BP	
446	CP	SS			BP	
447	CP	SS		CN	BP	
451	MONITORING COSTS ONLY					
481		SS		CN		

TECHNOLOGIES ASSOCIATED WITH BAT COST
FOR THE PREAMBLE ANALYSIS

PLANT NUMBER	BAT TECHNOLOGY COSTED					
485	CPU	SS	AC	CN	BP	
486	CP	SS		CN	BP	
488	CP	SS	AC	CN	BP	
500	CP					
518	CP	SS	AC	CN	BP	
523				CN		
525	MONITORING COSTS ONLY					
569	MONITORING COSTS ONLY					
580					BP	
602						CH
608		SS				
614	CP					
633	CP	SS			BP	
657	CP				BP	
659		SS				
662	CP	SS			BP	
663	CP	SS				
664	CP	SS				
669						CH
682	CP					
683	CP	SS			BP	
695	CPU				BP	
709						CH
727	CP					
741	MONITORING COSTS ONLY					
758	MONITORING COSTS ONLY					
775	CPU	SS				
802	CP					
811	MONITORING COSTS ONLY					
814	CP	SS		CN	BP	
825	CP	SS				
844	MONITORING COSTS ONLY					
851		SS		CN	BP	
859					BP	
866	MONITORING COSTS ONLY					
871	CPU	SS				
876		SS				
883	MONITORING COSTS ONLY					
888	MONITORING COSTS ONLY					
908	CP					
909	CP	SS			BP	
913	CP	SSU			BP	
938				CN		
942					BP	
948	CP	SS			BP	

TECHNOLOGIES ASSOCIATED WITH BAT COST
FOR THE PREAMBLE ANALYSIS

PLANT NUMBER	BAT TECHNOLOGY COSTED					
962	CP	SS				
970	CP					
973	CP			CN	BP	
984	CP					
990	CP					
992		SS				
1012	CP					
1020	CP					
1033						CH
1038	CP				BP	
1059	CPU					
1061	CP			CN		
1062	MONITORING COSTS ONLY					
1067	CP				BP	
1133					BP	
1137	CP				BP	
1139		SS			BP	
1148	CP					
1149		SS				
1157						CH
1203	CP					
1241	CP				BP	
1249	CP	SS		CN	BP	
1267	MONITORING COSTS ONLY					
1299	MONITORING COSTS ONLY					
1319	MONITORING COSTS ONLY					
1323		SS		CN	BP	
1327	CP	SS		CN	BP	
1340	CP	SS			BP	
1343	CP	SS	AC			
1348	CPU					
1349	MONITORING COSTS ONLY					
1389	CP					
1407	CP	SS				
1409	CP	SS			BP	
1414		SS				
1438	CP					
1439	CP	SS	AC		BP	
1446			AC			
1464		SS				
1494	CP	SS	AC			
1520	CP	SS	AC	CN	BP	
1522	CPU	SS				
1524	CP					
1532	CP				BP	

TECHNOLOGIES ASSOCIATED WITH BAT COST
FOR THE PREAMBLE ANALYSIS

PLANT NUMBER	BAT TECHNOLOGY COSTED					
1569	CP	SS			BP	
1572	CPU					
1609	CP	SS				
1616	CP					
1617		SS				
1618		SS			BP	
1624	CP	SS				
1643	MONITORING COSTS ONLY					
1647	CP	SS				
1650	CP	SS		CN	BP	
1656	MONITORING COSTS ONLY					
1670						CH
1684					BP	CH
1688	CP				BP	
1695	CP	SS			BP	
1698		SS				
1714	CP	SS				
1717	CP					
1724	CP	SS	AC		BP	
1753	CP					
1766	CP					
1769	CPU	SS	AC			
1774	CP					
1785	CPU	SSU			BP	
1802	CP					
1839	CP	SS				
1869		SS				
1877	CP	SS	AC	CN	BP	
1881	CP					
1890	CP			CN	BP	
1905	CP				BP	
1910	CP		AC	CN	BP	
1911	CP				BP	
1928	CP	SS			BP	
1937	CP	SS	AC	CN	BP	
1943	MONITORING COSTS ONLY					
1973	CP					
1977	MONITORING COSTS ONLY					
1986	MONITORING COSTS ONLY					
2009		SS			BP	
2020	MONITORING COSTS ONLY					
2026		SS				
2030	CPU	SS	AC	CN	BP	
2047	CP				BP	
2049	CP			CN		

TECHNOLOGIES ASSOCIATED WITH BAT COST
FOR THE PREAMBLE ANALYSIS

PLANT NUMBER	BAT TECHNOLOGY COSTED					
2055	MONITORING COSTS ONLY					
2062	CP	SS				
2073	CP	SS			BP	
2090				CN		
2110	CP				BP	
2148	CP			CN		
2181	MONITORING COSTS ONLY					
2193						CH
2198	CP					
2206		SS			BP	
2221	CP	SS				
2222	CP					
2227	CP	SS				
2228	CP	SS				
2236	CP				BP	
2242	CP	SS				
2254	CP				BP	
2268	CP	SS	AC		BP	
2272	CP	SS			BP	
2281	CP		AC		BP	
2292	CPU	SS	AC	CN	BP	
2296	MONITORING COSTS ONLY					
2307	MONITORING COSTS ONLY					
2313	MONITORING COSTS ONLY					
2315	CP			CN		
2316	CP	SS	AC	CN	BP	
2322	CP	SS	AC	CN	BP	
2328	MONITORING COSTS ONLY					
2345	CP					
2353	MONITORING COSTS ONLY					
2360	CP					
2364	CP					
2365		SS			BP	
2368	CP					
2376		SS				
2390	MONITORING COSTS ONLY					
2394	CP	SS				
2399	MONITORING COSTS ONLY					
2400					BP	
2419	CP				BP	
2429	CPU	SS	AG	CN	BP	
2430	CP	SS			BP	
2445	CP					
2447	CPU					
2450	CP	SS				

TECHNOLOGIES ASSOCIATED WITH BAT COST
FOR THE PREAMBLE ANALYSIS

PLANT NUMBER	BAT TECHNOLOGY COSTED				
2461	CP				BP
2471	MONITORING COSTS ONLY				
2474	CPU	SS		CN	BP
2481	CP	SS			
2527	CP			CN	BP
2528	CP	SS			BP
2531		SS			
2533	CP				
2536	MONITORING COSTS ONLY				
2537	CP				
2541	CP	SS	AC	CN	
2551	MONITORING COSTS ONLY				
2556	MONITORING COSTS ONLY				
2573	CP	SS		CN	BP
2590	CP	SS			BP
2592	CP				
2626	MONITORING COSTS ONLY				
2631	CP	SS			BP
2633	CP				
2668	MONITORING COSTS ONLY				
2673	CP	SS			BP
2678	CP				
2692	CPU				
2693	MONITORING COSTS ONLY				
2695	CP	SS			
2701		SS			
2711		SS			
2735	CP	SS			BP
2739	CPU			CN	
2763	CP				
2764	CP				
2767	CP				BP
2770	CP	SS			
2771		SS			
2781	CP	SS	AC	CN	BP
2786	CP				BP
2795	CP	SS			
2816	CP				BP
2818					BP
3033					BP
4002	MONITORING COSTS ONLY				
4010	MONITORING COSTS ONLY				
4017	MONITORING COSTS ONLY				
4018	CP	SS	AC	CN	BP
4021	CP			CN	BP

TECHNOLOGIES ASSOCIATED WITH BAT COST
FOR THE PREAMBLE ANALYSIS

PLANT NUMBER	BAT TECHNOLOGY COSTED				
4037	CP	SS	AC	CN	BP
4040		SS		CN	BP
4051	CP				
4055			AC		BP

NOTES:

- CP - CHEMICAL PRECIPITATION
- CPU - CHEMICAL PRECIPITATION UPGRADES
- SS - STEAM STRIPPING
- SSU - STEAM STRIPPING UPGRADES
- AC - ACTIVATED CARBON
- CN - CYANIDE DESTRUCTION
- BP - IN-PLANT BIOLOGICAL
- CH - CONTRACT HAULING

TECHNOLOGIES ASSOCIATED WITH PSES COST
FOR THE PREAMBLE ANALYSIS

PLANT NUMBER	PSES TECHNOLOGY COSTED				
2	CP					
5		SS				
10	CP	SS			BP	
22	CP	SS	AC		BP	
30		SS				
33	CP		AC		BP	
49		SS				
51	CP	SS	AC	CN	BP	
52	CP	SS				
58	MONITORING COSTS ONLY					
71						CH
72	CPU	SSU	AC	CN	BP	
79		SS			BP	
88						CH
93	MONITORING COSTS ONLY					
94	CP	SS	AC		BP	
110	CP	SS	AC	CN	BP	
111						CH
119		SS			BP	
120	CP	SS			BP	
122		SS				
143	CP	SS		CN		
149	CP	SS	AC	CN	BP	
155	CP	SS		CN	BP	
158						CH
161	CP	SS	AC	CN	BP	
162						CH
163	CP	SS	AC	CN	BP	
166			AC			
180						CH
196	CP	SS	AC	CN	BP	
199			AC			
203		SS				
206	CPU	SS			BP	
209	MONITORING COSTS ONLY					
212	CPU				BP	CH
214	CP	SS			BP	
220		SS			BP	
221	CP	SS			BP	
232		SS				
240	CP	SS			BP	
244	MONITORING COSTS ONLY					
249	CP	SS			BP	
257	CP		AC			
262	CP	SS	AC	CN	BP	
266	CP	SS			BP	

TECHNOLOGIES ASSOCIATED WITH PSES COST
FOR THE PREAMBLE ANALYSIS

PLANT NUMBER	PSES TECHNOLOGY COSTED					
276		SS				
283		SSU			BP	
285						CH
292	CP	SS		CN		
293	CPU	SS	AC	CN	BP	
297	CP					CH
299	CP					
302		SS				
310		SS			BP	
321		SS				
326	CP	SS	AC	CN	BP	
334	CP	SS			BP	
348	MONITORING COSTS ONLY					
354	CP	SS	AC		BP	
357						CH
417	MONITORING COSTS ONLY					
423	CP	SS				
428						CH
430	CP	SS		CN	BP	
433	CP	SS	AC	CN	BP	
438		SS			BP	
449	MONITORING COSTS ONLY					
451						CH
458		SS		CN	BP	
468	CP	SS		CN	BP	
492					BP	CH
494		SSU			BP	
502						CH
508						CH
522	CP	SS	AC	CN	BP	
529		SS				
536	CP	SS	AC	CN	BP	
543		SS			BP	
544						CH
567	CP	SS	AC		BP	
592		SS			BP	
605						CH
607	CP	SS	AC	CN	BP	
611	CP	SS	AC	CN	BP	
618						CH
624	CP	SS			BP	
658	CP	SS			BP	
661	CP	SS	AC	CN	BP	
667						CH
702		SSU				
706		SS			BP	

TECHNOLOGIES ASSOCIATED WITH PSES COST
FOR THE PREAMBLE ANALYSIS

PLANT NUMBER	PSES TECHNOLOGY COSTED					
717					BP	
720		SS				
722	CP	SS		CN		
724		SS			BP	
743	CP	SS	AC		BP	
749	CP	SS			BP	
768	CP	SS	AC	CN	BP	
771	CP		AC		BP	
777						CH
791		SS			BP	
796						CH
797	CP	SS	AC	CN	BP	
814	CP	SS		CN	BP	
819	CP	SS	AC	CN	BP	
830					BP	CH
845	CP		AC			
846						CH
862	CP	SS	AC		BP	
874	CP	SS				
880						CH
877	CP	SS	AC	CN	BP	
887	CP	SS			BP	
905	CPU	SS	AC		BP	
912						CH
917	CP					
929		SS				
931						CH
932						CH
944					BP	CH
956						CH
958	MONITORING COST ONLY					
975		SS				
976		SS				
987					BP	CH
988						CH
991						CH
992		SS			BP	
997	CP	SS				
1006	CP		AC			
1011	CP					
1018	CP	SS		CN	BP	
1026						CH
1047		SS			BP	
1052	CP	SS			BP	
1053	CP	SS			BP	
1057					BP	CH

TECHNOLOGIES ASSOCIATED WITH PSES COST
FOR THE PREAMBLE ANALYSIS

PLANT NUMBER	PSES TECHNOLOGY COSTED					
1064						CH
1069	CP					
1076						CH
1083	CP	SS			BP	
1085					BP	CH
1086		SS			BP	
1091	CP	SS	AC	CN	BP	
1094			AC		BP	
1107		SS				CH
1117		SS			BP	
1126	CPU	SS	AC	CN	BP	
1162		SS				
1163	CP	SS		CN	BP	
1172		SS			BP	
1173					BP	CH
1175						CH
1181	CP		AC		BP	
1188	CP	SS				
1191	CP	SS	AC	CN	BP	
1194		SS			BP	CH
1195	MONITORING COST ONLY					
1197	CP	SS			BP	
1202		SS			BP	
1219			AC		BP	
1220		SS			BP	
1223	CP					
1224			AC			
1234		SS			BP	
1236	CP	SS			BP	
1237		SS			BP	
1249	CP	SS		CN	BP	
1253		SS				
1255		SS				
1264	CP	SS	AC	CN	BP	
1277	CP	SS				
1310	CP	SS			BP	
1313					BP	CH
1314	MONITORING COST ONLY					
1320		SS			BP	CH
1322	CP	SS			BP	
1326		SS			BP	
1351	CP	SS	AC	CN	BP	
1352					BP	CH
1356	CP	SS	AC	CN	BP	
1357	CPU	SS			BP	
1361	CP	SS	AC	CN	BP	

TECHNOLOGIES ASSOCIATED WITH PSES COST
FOR THE PREAMBLE ANALYSIS

PLANT NUMBER	PSES TECHNOLOGY COSTED					
1371						CH
1386						CH
1426	CP			CN	BP	
1432	CP	SS			BP	
1433						CH
1437		SS		CN	BP	
1450					BP	CH
1478	CP	SS	AC	CN	BP	
1504	CP	SS			BP	
1507		SS			BP	
1528		SS			BP	
1534	CPU	SS			BP	
1535						CH
1539	CP	SS				
1548						CH
1556		SS				
1560	CP	SS	AC	CN	BP	
1562	CP	SS				
1564						CH
1566						CH
1575					BP	CH
1593	MONITORING COST ONLY					
1595		SS			BP	
1601				CN		
1608	CP	SS	AC	CN	BP	
1621	CP	SS				
1622	CP	SS			BP	
1628	CP	SS	AC	CN	BP	
1645	CP	SS		CN	BP	
1653		SS				
1657	CP	SSU		CN	BP	
1659	CP	SS	AC	CN	BP	
1666	CP	SS	AC	CN	BP	
1667	CP	SS			BP	
1706		SS			BP	
1716	CP	SS	AC	CN	BP	
1718						CH
1740	CP	SSU				
1742	CP	SS				
1743	CP	SS		CN		
1744	CP	SS	AC	CN	BP	
1748	CP	SS	AC			
1751	CP				BP	CH
1764	CP	SS				
1773		SS			BP	
1788		SS			BP	

TECHNOLOGIES ASSOCIATED WITH PSES COST
FOR THE PREAMBLE ANALYSIS

PLANT NUMBER	PSES TECHNOLOGY COSTED					
1793	CP	SS	AC	CN	BP	
1797	MONITORING COSTS ONLY					
1801	CP	SS				
1805		SS				
1808						CH
1812						CH
1826	CP	SS	AC	CN	BP	
1832		SS			BP	
1833	CP	SS				
1838						CH
1843						CH
1848	CPU			CN		CH
1853	CP	SS		CN	BP	
1861	CP			CN		
1876	CP	SS	AC	CN	BP	
1887						CH
1888						CH
1891		SS			BP	
1894	CP	SS	AC	CN	BP	
1899	CP	SS			BP	
1904	CP	SS			BP	
1924		SS				
1931	CP	SS			BP	
1936	CP		AC			
1945		SS				
1948		SS				
1970		SS				
1971	CP	SS			BP	
1974	MONITORING COSTS ONLY					
1988						CH
1993		SS			BP	CH
2001		SS				
2004		SS			BP	
2007	CP	SS	AC	CN	BP	
2018	CP		AC			
2022						CH
2033						CH
2037	CP	SS			BP	
2050						CH
2057		SS				
2070	CP	SS	AC	CN	BP	
2075	CP	SS				
2080	CP					
2084		SS			BP	
2093	CP	SS			BP	
2108	MONITORING COSTS ONLY					

TECHNOLOGIES ASSOCIATED WITH PSES COST
FOR THE PREAMBLE ANALYSIS

PLANT NUMBER	PSES TECHNOLOGY COSTED					
2117	CP	SS			BP	
2123	CP					
2129	CP	SS	AC	CN	BP	
2147						CH
2176	CP	SS			BP	
2177		SS				
2184		SS		CN	BP	
2191	MONITORING COSTS ONLY					
2214						CH
2232	CP	SS		CN	BP	
2241	CP	SS			BP	
2243	CP	SS	AC	CN	BP	
2250	CP	SS			BP	
2253						CH
2259	CP	SS	AC		BP	
2261	CP	SS	AG		BP	
2262						CH
2288		SS			BP	CH
2293		SS			BP	
2300	CP	SS				
2311	CP	SS			BP	
2318	CP	SS			BP	
2341	CP	SS			BP	
2346	CP					
2348	CP		AC		BP	
2350	CP	SS	AC		BP	
2359		SS				
2402						CH
2411	CP					
2426	MONITORING COSTS ONLY					
2432			AC			
2436	CP					
2442	CP	SS	AC		BP	
2459	CP	SS				
2462	CP	SS				
2465	CP	SS	AC	CN	BP	
2469	CP	SS			BP	
2485	CP	SS			BP	
2487	CP	SS	AC		BP	
2495	CP	SS				
2498	CP	SS			BP	
2501	CP	SS				CH
2507	MONITORING COSTS ONLY					
2517	CP	SS			BP	
2521						CH
2524	CP	SS			BP	

TECHNOLOGIES ASSOCIATED WITH PSES COST
FOR THE PREAMBLE ANALYSIS

PLANT NUMBER	PSES TECHNOLOGY COSTED					
2539	CP	SS	AC		BP	
2548	CP	SS	AC	CN	BP	
2565	CP	SS	AC		BP	
2571						CH
2578	MONITORING COSTS ONLY					
2581						CH
2606						CH
2608						CH
2609	CP					
2634			AC			
2635	CP	SSU			BP	
2636	CP	SS				
2641		SS				
2642						CH
2646	CP	SS			BP	
2647	MONITORING COSTS ONLY					
2666		SS			BP	
2677	CP	SS	AC	CN	BP	
2679	CP					
2680	CP	SS	AC	CN		
2685		SS				
2699			AC			
2714	CP	SS			BP	
2736		SS			BP	
2741	CP	SS			BP	
2748		SS			BP	
2756	CP	SS	AC	CN	BP	
2776	CP	SS	AC	CN	BP	
2779		SS				
2793		SS			BP	
2794			AC			
2796	MONITORING COSTS ONLY					
2805	MONITORING COSTS ONLY					
2810						CH
2814						CH
4001	CP	SS	AC		BP	
4003	CP	SS				
4006	CP	SS	AC	CN	BP	
4007		SS			BP	
4008	CP	SS		CN	BP	
4009						CH
4014	CP	SSU			BP	
4022	MONITORING COSTS ONLY					
4023		SS				
4024	CP				BP	CH
4026	CP	SS	AC	CN	BP	

TECHNOLOGIES ASSOCIATED WITH PSES COST
FOR THE PREAMBLE ANALYSIS

PLANT NUMBER	PSES TECHNOLOGY COSTED					
4027	CP	SS		CN	BP	
4032	CP	SS	AC	CN	BP	
4042	MONITORING COSTS ONLY					
4043	CP					
4044	CP	SS	AC	CN	BP	
4046						CH
4047	CP	SSU		CN	BP	
4048						CH
4050	CP	SS			BP	
4052						CH
4057	CP	SS			BP	
4064						CH
4066						CH
4070	CP	SS			BP	
4072	CP	SS	AC	CN	BP	

NOTES:

CP - CHEMICAL PRECIPITATION
CPU - CHEMICAL PRECIPITATION UPGRADES
SS - STEAM STRIPPING
SSU - STEAM STRIPPING UPGRADES
AC - ACTIVATED CARBON
CN - CYANIDE DESTRUCTION
BP - IN-PLANT BIOLOGICAL
CH - CONTRACT HAULING