ORIGINAL

BEFORE THE ILLINOIS POLLUTION CONTROL BOARD

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STATE OF ILLINOIS
Pollution Control Board

PROPOSED ADJUSTED STANDARD APPLICABLE TO ILLINOIS-AMERICAN WATER COMPANY'S ALTON PUBLIC WATER SUPPLY REPLACEMENT FACILITY DISCHARGE TO THE MISSISSIPPI RIVER	)	AS 99- 6 (Adjusted Standard)

NOTICE OF FILING

To: Attached Service List

PLEASE TAKE NOTICE that I have today filed with the Office of the Clerk of the Pollution Control Board the Petition for Adjusted Standard of Illinois-American Water Company and Appearances of Nancy J. Rich and James E. Mitchell, copies of which are herewith served upon you.

Nancy J. Rich

March 19, 1999

Katten Muchin & Zavis
525 W. Monroe Street
Suite 1600
Chicago, Illinois 60661-3693
312-902-5200

THIS FILING IS SUBMITTED ON RECYCLED PAPER

SERVICE LIST

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MAR 19 1999

STATE OF ILLINOIS
Pollution Control Board

BEFORE THE ILLINOIS POLLUTION CONTROL BOARD

IN THE MATTER OF:	)	
PROPOSED ADJUSTED STANDARD	)	
APPLICABLE TO ILLINOIS-	)	
AMERICAN WATER COMPANY'S	)	AS 99-6
ALTON PUBLIC WATER SUPPLY	)	(Adjusted Standard)
REPLACEMENT FACILITY	)	
DISCHARGE TO THE MISSISSIPPI	)	
RIVER	)	

APPEARANCE

I hearby file my appearance in this proceeding, on behalf of Illinois-American Water Company.

Nancy J. Rich
March 19, 1999

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James E. Mitchell

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IN THE MATTER OF:	)	
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PETITION FOR ADJUSTED STANDARD

Petitioner, Illinois-American Water Company ("Water Company"), by its attorneys, Katten Muchin & Zavis, pursuant to Section 28.1 of the Illinois Environmental Protection Act ("the Act"), 415 Ill. Comp. Stat. 5/28.1 (formerly Ill. Rev. Stat. 1991, ch. 111 ½, para. 1028.1), and Part 106 of the Procedural Rules of the Illinois Pollution Control Board ("Board"), 35 Ill. Adm. Code Part 106, respectfully requests the Board to grant an adjusted standard from 35 Ill. Adm. Code 304.124 for discharges of total suspended solids ("TSS") and total iron ("iron") for the Water Company's proposed replacement public water supply treatment facility ("replacement facility") located in Alton, Madison County, Illinois. The Water Company also requests the Board to grant, to any extent it deems necessary to fashion complete relief, an adjusted standard from two additional sections of its regulations: 1) 35 Ill. Adm. Code 304.106, which provides in relevant part that no effluent shall contain settleable solids or sludge solids, and that turbidity must be reduced below obvious levels; and 2) the analogous water quality provision, 35 Ill. Adm. Code 302.203, which provides in relevant part that waters of the State shall be free from sludge or bottom deposits and turbidity of other than natural origin.[1] In support of its Petition for an Adjusted Standard ("Petition"), the Water Company states as follows:

BACKGROUND

1. Section 28.1 of the Act enables the Board to approve adjusted standards to regulations of general applicability for persons who can justify such an adjustment consistent with subsection (a) of Section 27 of the Act. Section 27(a) provides that:

> In promulgating regulations under this Act, the Board shall take into account the existing physical conditions, the character of the area involved, including the character of surrounding land uses, zoning classifications, the nature of the existing air quality, or receiving body of water, as the case may be, and the technical feasibility and economic reasonableness of measuring or reducing the particular type of pollution.

415 Ill. Comp. Stat. 5/27(a).

2. Pursuant to this grant of authority, the Board promulgated procedural regulations for the approval of adjusted standards. *See* 35 Ill. Adm. Code 106.701 *et seq.* Specifically, Section 106.703 of the Board's Procedural Rules provides that any person may singly or jointly with the Illinois Environmental Protection Agency ("Illinois EPA") file a written petition for an adjusted standard. In addition, Section 106.705 identifies the content requirements of the adjusted standard petition. Those requirements

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[1] None of the four public water supply facilities to which the Board has previously granted relief (the existing Alton facility, and the facilities which serve Rock Island, East Moline, and East St. Louis) have sought relief from either of these regulatory provisions. As discussed herein, the Water Company also believes that the replacement facility's discharge will not be substantively different from those of the public water supply facilities to which the Board has already granted relief. The Water Company is also unaware that exemptions from these sections have been sought by any of the other dischargers to waters of the State whose effluent contains settleable solids. Nonetheless, at the suggestion of Illinois EPA the Water Company seeks relief from these regulatory provisions in order to ensure complete relief.

and other relevant regulatory provisions are discussed under the applicable headings below.

3. The Water Company files this Petition because it intends to construct a public water supply treatment facility in Alton, Madison County, Illinois to replace the existing facility in Alton ("existing facility"), which was inundated by the Mississippi River (the "River") in 1993 and threatened again in 1995. The Water Company seeks to relocate its existing facility to minimize the potential for future flooding and to replace the aged facility. The severity of the 1993 flood, which shut down the facility for four days and required consumers to boil their water for ten days, is documented in the photographs provided as Attachment A hereto.

4. The Water Company has conducted a Site-Specific Impact Study ("SSIS"), attached hereto and incorporated by reference as Attachment B, to address the site specific / adjusted standard factors enumerated in Section 27(a) of the Act. These factors include the character of the raw water (*i.e.,* Mississippi River), environmental impact, technical feasibility, and economic reasonableness of potential alternatives.[2] In September, 1996, the Water Company met with Illinois EPA to discuss a draft workplan for conducting the SSIS. The Water Company thereafter developed the draft workplan

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[2] In addition to the adjusted standard factors listed in the Act, the SSIS also anticipated and addressed the Best Professional Judgment ("BPJ") standard that, during any future permit process, Illinois EPA must apply pursuant to Section 402(a) of the federal Clean Water Act's National Pollutant Discharge Elimination System ("NPDES") program, 33 U.S.C. § 1342(a). Please note that even though BPJ is a permit requirement, it provides a means of setting effluent standards for an individual discharger, which is exactly what the Water Company is asking the Board to do here for the replacement facility. As applied to public water supply discharges, the BPJ permit factors overlap many of the adjusted standard factors -- *e.g.*, the technical feasibility and economic reasonableness of reducing the particular type of pollution, and other unique factors such as existing physical conditions. Also note that, with the exception of the Section 28.3 and Best Degree of Treatment ("BDT") (35 Ill. Adm. Code 304.102) factors discussed below, there are no other directly relevant standards for evaluating the merits of a public water supply facility's request for relief from the Board's general industrial effluent standards.

and forwarded it to Illinois EPA for review and comment. The Water Company incorporated Illinois EPA's comments in the final SSIS workplan. Due to a change in project location from Godfrey, Illinois to Alton, Illinois to capture a greater than six million dollars savings in pipeline and construction costs, the Water Company met with Illinois EPA in August, 1997 to revisit the SSIS workplan to identify any additional site-specific factors for the replacement facility. As a result of this meeting, a habitat characterization/protected species survey for mussels was added to the workplan. *See* SSIS at Appendix B. Pursuant to a follow-up meeting and subsequent correspondence with Illinois EPA, the Water Company performed and incorporated into the SSIS a Discharge TSS Modeling Evaluation, which also included a Particle Deposition Study. *See* SSIS at Appendix F.

5. The SSIS provides a brief description of the existing facility and a general design of the proposed replacement facility. The design, together with the results of pilot facility testing, was used to develop estimates of effluent flows and concentrations anticipated from the replacement facility. The proposed 10.5 million gallons per day ("MGD") annual average flow replacement facility will have two processes generating effluent discharges (plus a periodic cleaning-related maintenance discharge), which were identified as potentially requiring treatment to meet TSS and iron standards.

6. Pursuant to the site-specific rule codified at Section 304.206 of the regulations, the existing facility has no effluent limitations for TSS and iron. The Board granted this site specific relief in 1984 as follows:

Section 304.206. Alton Water Company Plant Discharges.

> This Section applies to the existing 18.3 million gallons per day potable drinking water treatment plant owned by the Alton Water Company which is located at, and discharges into, river mile 204.4 on the Mississippi River. Such discharges shall not be subject to the effluent standards for total suspended solids and total iron of 35 Ill. Adm. Code 304.124.

35 Ill. Adm. Code 304.206.

A copy of the Board's final Opinion and Order in that case, PCB 82-3, is appended hereto as Attachment C. The Board subsequently granted relief from its general industrial effluent standards to all of the other public water supply facilities located on the River in Illinois that do not use lime to soften the raw water -- *i.e.*, Rock Island, Moline and East St. Louis. Copies of the Board's final Opinions and Orders in those cases are appended hereto as Attachment D (Rock Island, PCB AS 91-13, October 19, 1995), Attachment E (East Moline, PCB AS 91-9, May 19, 1994) and Attachment F (East St. Louis, PCB AS 91-11, May 20, 1993).

7. Rock Island, East St. Louis and East Moline all obtained adjusted standards pursuant to Section 28.3 of the Act, 415 Ill. Comp. Stat. 5/28.3. Section 28.3 was intended to prompt a quick resolution of existing public water supply facilities' inability to meet the general effluent standards absent installation of potentially economically infeasible technology and thus the filing deadline relief under Section 28.3 has passed. Nonetheless, the factors that the legislature directed the Board to consider under Section 28.3 continue to be relevant to public water supply facilities which do not use lime softening and receive their raw water supply from the highly turbid and variable River. These highly relevant Section 28.3 factors include:

> An adjusted standard ... shall be based upon water quality effects, actual and potential stream uses, and economic considerations, including those of the

discharger and those affected by the discharge. ... Justification based upon discharge impact shall include, as a minimum, an evaluation of receiving stream ratios, known stream uses, accessibility to stream and side land use activities (residential, commercial, agricultural, industrial, recreational), frequency and extent of discharges, inspections of unnatural bottom deposits, odors, unnatural floating material or color, stream morphology and results of stream chemical analyses. Where minimal impact cannot be established, justification shall also include evaluations of stream sediment analyses, biological surveys (including habitat assessment), and thorough stream chemical analyses that may include but are not limited to analysis of parameters regulated in 35 Ill. Adm. Code 302.

415 Ill. Comp. Stat. 5/28.3.

8. The National Pollution Discharge Elimination System ("NPDES") permit for the existing facility requires daily monitoring of flow and monthly monitoring of pH, TSS, iron and total residual chlorine ("TRC"). An effluent limitation exists for pH of 6.0 to 9.0 standard units ("SU"). As a result of the site-specific rule applicable to the existing facility, no treatment is required for the discharge effluent except for dechlorination, which was implemented in November 1998 as required by the facility's NPDES permit.

9. The existing facility directly returns to the River the residual natural silts and sediments contained in the raw River water, along with a very small percentage of water treatment additives used to treat the raw water -- *i.e.*, the percentage of naturally-occurring material in the total solids returned to the River is typically 91% or greater. SSIS at 6-2. The remaining 8.7% of total solids are contributed by the coagulant. Of this, only a trace amount is comprised of any of metals of concern (aluminum), and this is only about **<u>one third of one percent</u>** (0.348%) of the facility's solids discharge. This percentage is comparable to that achieved at the Water Company's East St. Louis water treatment facility, which uses these same coagulants and, pursuant to an adjusted standard

codified at 35 Ill. Adm. Code 304.220, also returns its discharge solids to the River. The other 99 2/3 percent of the discharge solids are derived directly from the raw River water or are from coagulant constituents that are not comprised of any of the metals of concern -- *i.e.*, non-metal, biodegradable polymer constituents, and trace amounts of inorganics (primarily sulfates). SSIS at 6-2. In addition, the mussel habitat characterization found that the area does not support any unionid communities (*Id.* at 4-4 and 5-21), and that there are no discernable impacts from silt deposition (*Id.* at 5-10). The Discharge TSS Modeling Evaluation also found no adverse impacts from the discharge of the residuals into the River. *Id.* at 5-22 to 5-23.

10. Rather than subject the replacement facility to Board regulations with which no other similarly situated public water supply facility has ever been required to comply, an adjusted standard should be developed through analysis of the site-specific factors specified in Sections 28.1, 27(a) and 28.3 of the Act and pursuant to the Best Professional Judgment ("BPJ") requirements of Section 402(a) of the federal Clean Water Act ("CWA"), 33 U.S.C. § 1342(a).[3/]

[3/] BPJ for public water supply facilities is established by applying the factors listed in 40 C.F.R. § 125.3(c)(2), which applies to facilities or categories of facilities for which there are no federal effluent standards. BPJ is reached by considering: (i) the appropriate technology for the category or class of point sources of which the applicant is a member (*e.g.*, public water supplies on large, turbid rivers), and (ii) any unique factors relating to the applicant (*e.g.*, it does not use lime softening). Two other elements must also be considered in determining BPJ: best practicable control technology currently available ("BPT") and best conventional pollutant control technology ("BCT"). 40 C.F.R. § 125.3(d). BPT factors are: (i) the total cost of application of technology in relation to the effluent reduction benefits to be achieved from such application; (ii) the age of equipment and facilities involved; (iii) the process employed; (iv) the engineering aspects of the application of various types of control techniques; (v) process changes; and (vi) non-water quality environmental impact (including energy requirements). 40 C.F.R. § 125.3(d)(1). The BCT analysis includes the BPT issues and one additional factor: the comparison of the cost and level of reduction of such pollutants from the discharge from publicly owned treatment works to the cost and level of reduction of such pollutants from a class or category of industrial sources.

INFORMATIONAL REQUIREMENTS

Description of the Regulation of General Applicability

11. Section 106.705(a) of the Procedural Rules provides that the petition must describe the standard from which an adjusted standard is sought. This shall include the Administrative Code citation to the regulation of general applicability imposing the standard as well as the effective date of that regulation. The regulation of general applicability, Section 304.124 of the Board's Water Pollution Regulations, 35 Ill. Adm. Code 304.124, establishes effluent standards which are applicable to dischargers to the waters of the State of Illinois. The Water Company seeks an adjusted standard for discharges of iron and TSS. Section 304.124 establishes a discharge limitation of 2 mg/l for total iron and 15 mg/l for TSS. Section 304.106 of the Board's effluent standards, 35 Ill. Adm. Code 304.106, provides in relevant part that no effluent shall contain settleable solids or sludge solids, and that turbidity must be reduced below obvious levels. The analogous water quality provision, Section 302.203, 35 Ill. Adm. Code 302.203, provides in relevant part that waters of the State shall be free from sludge or bottom deposits and turbidity of other than natural origin.

12. The effluent limitations provided in Section 304.124 apply to all discharges to waters of the State of Illinois, regardless of the nature of the receiving stream or the environmental impact of the discharge. The Board's effluent standards, including the iron and TSS limitations now codified at Section 304.124, became effective on January 6, 1972. *See* Opinion of the Board, PCB R 70-8 *et al.*, Jan. 6, 1972, a copy of which

is appended hereto as Attachment G.[4/] These standards were not developed on an industrial category basis like the subsequent federal effluent standards. As a result, certain dischargers, such as public water supplies located on large rivers, are subject to two potentially contradictory standards for obtaining their NPDES discharge permit -- the generally applicable Illinois effluent standards and the federal BPJ requirement under the CWA.

[4/] As noted on page 1, above, the Water Company seeks relief, as the Board deems necessary, from the effluent standard of Section 304.106 and the water quality standard of Section 302.203. In 1972, the Board promulgated a general effluent standard for "Offensive Discharges," now codified at Section 304.106. Opinion of the Board, PCB R 70-8 *et al.*, Jan. 6, 1972, at 5; 35 Ill Adm. Code 304.106. This effluent standard was adopted from the earlier Sanitary Water Board prohibition on the discharge of nuisance materials to any waters, which required the equivalent of primary treatment for all discharges. Opinion of the Board, PCB R 70-8 *et al.*, Jan. 6, 1972, at 5. In support of the prohibition of Offensive Discharges, the Board stated that "[a] nuisance anywhere is unacceptable." *Id.*

Specifically, the Offensive Discharge effluent standard, now codified at Section 304.106, provides that:

> No effluent shall contain settleable solids, floating debris, visible oil, grease, scum or sludge solids. Color, odor and turbidity must be reduced to below obvious levels.

35 Ill. Adm. Code 304.106.

In the same 1972 rulemaking, the Board adopted an analogous water quality standard for "Offensive Conditions," which similarly restricted nuisance conditions, and which is now codified at Section 302.203:

> Waters of the State shall be free from sludge or bottom deposits, floating debris, visible oil, odor, plant or algal growth, color or turbidity of other than natural origin.

35 Ill. Adm. Code 302.203.

In 1990, the Board amended the Offensive Conditions water quality standard. *See* Opinion and Order of the Board, PCB R88-21(A), Jan. 25, 1990. The Board determined that the water quality standard of Section 302.203 is equivalent to ("no more restrictive than") the effluent standard of Section 304.106. *Id.* at 12. The proposed discharge will not create a "nuisance" as understood by the Board when it adopted the Offensive Conditions and Offensive Discharge rule. The Water Company's Particle Deposition Study shows that the proposed discharge will not result in an Offensive Condition as defined in Section 302.203. SSIS at 5-22 to 5-23; Appendix F.

Relationship of the Regulation of General
<u>Applicability to Federal Environmental Requirements</u>

13. Section 106.705(b) of the Procedural Rules provides that the petition must state whether the regulation of general applicability was promulgated to implement, in whole or in part, the requirements of certain federal environmental laws or programs under such laws. The effluent standards were reviewed in 1975 and 1976 by the Illinois Effluent Standards Advisory Group ("IESAG"), which was formed at the request of the Director of the State of Illinois Institute for Environmental Quality, which was subsequently renamed the Illinois Department of Energy and Natural Resources. IESAG has concisely explained the ways in which the Illinois effluent standards differ from the subsequently enacted federal effluent discharge control legislation:

> [The federal] ... law required ... that the U.S. Environmental Protection Agency promulgate by industrial category (and subcategory if necessary) effluent limitations guidelines for existing sources and standards of performance for new sources. Thus, PL 92-500 [the federal law] differs from Illinois law, in requiring industrial category-specific guidelines whereas the Illinois standards apply equally to all dischargers.

Evaluation of Effluent Regulations of the State of Illinois ("IESAG Evaluation"), Illinois Institute for Environmental Quality, Document No. 76/21, (1976), Attachment H hereto, at pp. 4-5

14. The United States Environmental Protection Agency ("U.S. EPA") has never enacted effluent standards for public water supply treatment facilities. *See, e.g.*, Opinion and Order of the Board, PCB R85-11, February 2, 1989, attachment I hereto, at p. 10. As a result, the Illinois effluent limitations and subsequent amendments thereto, including the standards for iron and TSS for which the Water Company seeks an adjusted standard, were not promulgated to implement, either in whole or in part, the

requirements of the federal Clean Water Act, the NPDES program, or any other federal environmental laws or programs. Similarly, U.S. EPA has never enacted federal pretreatment regulations for public water supply treatment facilities which discharge to publicly owned treatment works. The Illinois legislature implicitly recognized the lack of categorical pretreatment standards by enacting Section 28.3 of the Act.

Level of Justification Required for an Adjusted Standard

15. Section 106.705(c) of the Procedural Rules provides that the petition must state the level of justification as well as other information or requirements necessary for an adjusted standard as specified by the regulation of general applicability, or a statement that the regulation of general applicability does not specify a level of justification or other requirements.

16. The regulation of general applicability -- that is, the Board's effluent regulations, including Sections 304.124 and 304.106, and water quality criteria of Section 302.203 -- does not specify a level of justification or other requirement for an adjusted standard.

17. The level of justification required for the adjusted standard sought by the Water Company is, however, specified at Section 28.1(c) of the Act:

> 1. factors relating to [the Water Company] are substantially and significantly different from the factors relied upon by the Board in adopting the general regulation applicable to [all industrial dischargers];[5]
>
> 2. the existence of those factors justifies an adjusted standard;

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[5] As noted in paragraph 7 above, Section 28.3(c) of the Act lists a number of the unique factors that are relevant to determining adjusted standard relief for public water supply facilities. As discussed below, the Water Company addressed all of these factors in detail in the SSIS.

3. the requested standard will not result in environmental or health effects substantially and significantly more adverse than the effects considered by the Board in adopting the rule of general applicability; and

4. the adjusted standard is consistent with any applicable federal law.

415 Ill. Comp. Stat. 5/28.1(c).

Nature of the Activity for Which the Proposed Adjusted Standard is Sought

18. Section 106.705(d) of the Procedural Rules provides that the petition must describe the nature of the petitioner's activity which is the subject of the proposed adjusted standard. The operations of the replacement facility will be very similar to the existing facility and, except for being moved up to the bluff to reduce future flooding, will be in the same general location. As a result, operational information regarding the existing facility will also be relevant to the operations of the replacement facility. The SSIS provides a detailed description of both current and anticipated future operations as a prerequisite for the SSIS' analysis of their site specific impacts. Much of the information in the following sections is also addressed in the SSIS, and the following sections will provide citations to the SSIS for reference and completeness.

19. The Water Company's existing public water supply water treatment facility is located along the River at approximately River Mile 204 in Alton, Illinois. The River is the sole public water supply source for the community. There are approximately 265 miles of water main in the distribution system and the system serves a population of approximately 76,430 people and 17,480 households/businesses.

20. The existing facility has been supplying water to the City of Alton and nearby residents -- and discharging to the River in the same general location -- since the

1890s.[6] The original Main Service facility was expanded in the 1930s to 13.3 MGD. An additional 5 MGD High Service facility was constructed in 1981, at the same site. The Main Service facility consists of two mixing tanks, one circular clarifier, two rectangular sedimentation basins, sand filters, 650,000 gallons of filtered water storage and raw and filtered water pumping stations. The High Service facility consists of one mixing tank, two clarifiers, four filters, raw, transfer, and filtered water pump stations, and one million gallons of filtered water storage. The two facilities share a common side channel intake structure at the River. At the existing facility, water is taken from the River through a side channel intake into two wet wells in the facility Gate House. Two travelling screens are located at these wet wells to strain out debris. The screens are regularly cleaned with finished water, and the expelled materials and screen wash water are returned directly to the River. Three pumping units transmit raw water to the two flocculation tanks in the Main Service facility. Three pumping units convey raw water to the mixing tank in the High Service facility.

21. At the Main Service facility, open rectangular steel channels convey raw water from the mixing tanks to the circular clarifier where sand and heavy sediment are removed. From the clarifier, the water is split into approximately equal proportions. The clarified water enters the lower chamber of each of the two parallel rectangular sedimentation basins. From the lower chamber, the water rises to the upper chamber. From the sedimentation basins the treated water enters the former recarbonation tank

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[6] In the event that adjusted standard relief is granted in this proceeding, the Water Company plans to continue to use the same general area of the River for the replacement facility discharge.

where additional treatment chemicals are added. From the recarbonation tank, the treated water flows to nine sand filters.

22. At the High Service facility, flocculation occurs in the mixing tank in which one side wall mixer is mounted. From the mixing tank, water flows by gravity to two Claricone sludge blanket type clarifiers. From the clarifiers, water flows by gravity to fours/and/anthracite filters. Treatment to aid in sedimentation begins as water leaves the intake, where the primary coagulant, Clar$^+$Ion®, is added to coagulate the sediment in the water. Powdered activated carbon may be added at the intake in order to control odor and taste. Lime or caustic may be added at this point as well when alkalinity is low. Based on historical records, alkalinity is low during high flows or high turbidities. In the mixing tanks, the retention time and gentle mixing promote coagulation. The coagulated sediment will then settle in the clarifier and sedimentation basins in the Main Service facility or in the Claricone clarifiers at the High Service facility. Disinfection is provided by chlorine addition immediately after flocculation and again after clarification in the sedimentation basins. Ammonia is added before clarification to promote chloramine formation. SSIS at 3-1 and 3-2.

Current Effluent Discharges

23. As discussed in detail in paragraph 6, the existing facility discharges its effluent directly to the River pursuant to the site specific rule codified at 35 Ill. Adm. Code 304.206. Effluent discharges from the existing facility's treatment system are operational and maintenance discharges. Operational discharges are those flows that occur regularly, on a daily or weekly basis, during periods when the facility is treating

raw water. Maintenance discharges occur during the cleaning of accumulated solids in the clarifier, sedimentation basins, and mixing tanks. Residuals from the existing Alton facility are stored in a dedicated wet well at the Gate House. They can be discharged by gravity or can be discharged by using a dedicated transfer pump during high river levels. All facility residuals are discharged from this location. SSIS at 3-2.

24. The two Main Service operational discharges consist of intermittent clarifier blowdown and filter backwash. *Id.* Approximately 30,000 gallons per day ("gpd") of blowdown are discharged two days a week from the clarifier; however, the frequency and duration of blowdowns are variable, because they are dictated by raw water turbidity. In addition, approximately 630,000 gpd of backwash are discharged from nine sand filters used at the Main Service facility. The sand filters used at the Main Service facility are backwashed daily for approximately 15 minutes. Each filter runs approximately 24 to 30 hours between backwashings. *Id.*

25. Maintenance discharges from the Main Service facility arise from cleaning, three times per year, accumulated solids from the clarifier, sedimentation basins, and mixing tanks. SSIS at 3-3. The two sedimentation basins do not include sludge removal equipment, so the basins are dewatered prior to manual sludge removal. Approximately 72,000 gpd of carrier water with residuals are discharged during the five day long maintenance activity (*i.e.*, total annual discharge is 1,080,000 gallons). *Id.*

26. The High Service operational discharges include Claricone clarifier blowdown, filter backwash and cleaning of the Claricone clarifier. Operators release clarifier residuals based on the condition and thickness of the sludge blanket.

Approximately 12,000 gpd of carrier water with residuals are discharged from the clarifier. Two of the four sand/anthracite filters at the High Service facility are backwashed daily for approximately 15 minutes. Each filter runs approximately 48 hours between backwashings. Approximately 210,000 gpd of backwash are discharged from the filters. Finally, the Claricone clarifiers are cleaned once a year. Approximately 24,000 gpd of cleaning residuals are discharged during two days of maintenance activity. SSIS at 3-3.

Existing Facility History and Replacement Facility

27. The existing facility is located within a physically restricted parcel of level land approximately twenty feet above the normal River summer level. The facility is bounded directly to the northeast by the Norfolk Southern Railroad and Illinois Route 100 and bounded to the southwest by the River. Across the railroad and highway corridor, the land slopes steeply up to the bluffs overlooking the River. Due to its proximity to the River, the existing facility is subject to occasional flooding. In August 1993, the entire site was flooded and both the Main Service and High Service facilities were out of service for four days. Consumers in the Alton service area were required to boil tap water over a ten day period. Limited service was provided initially by the High Service facility. Full service was reinstated soon thereafter. Sandbagging to protect the facility from flooding was required in 1973, 1986, 1993, 1994 and 1995. SSIS at 3-3.

28. In order to avoid future flooding and to replace the aged existing facility, the replacement facility will be constructed approximately sixty (60) feet higher than the existing facility on property located directly across Illinois Route 100 in Alton, Illinois.

The Water Company evaluated nine sites for replacing the water supply facility before choosing this alternative. The site was selected because of its industrial zoning, proximity to the existing facility and infrastructure, favorable site topography for construction, size, and proximity to the existing raw water intake location. SSIS at 3-4.

Replacement Facility Design, Capacity, Flows and Discharges

29. The replacement facility is designed to treat sufficient raw water to make available, on average, 10.5 MGD[7] of potable water for the Alton area. The hydraulic design capacity of the replacement facility is 16 MGD. Based on an internal facility demand (*i.e.*, not going into the Water Company's distribution system) of 1 MGD (for Superpulsator® blowdowns, filter backwash, *etc.*), at a peak potable water demand of 15 MGD, the actual distribution capacity is 15 MGD. The estimated average proportional internal facility demand is 0.7 MGD for the average potable water flow of 10.5 MGD. The combined flow, 10.5 + 0.7 = 11.2 MGD, was therefore used for purposes of evaluating potential discharge impacts in Section 5.0 of the SSIS, discussed below.

30. The replacement facility will consist of a new raw water intake and pumping station, clarification and filtration units, filtered water storage, and chemical feed facilities. Clarification of raw water at the replacement facility will be provided by four Superpulsator® units (high rate sludge-blanket type clarifiers manufactured by Infilco Degremont, Inc.). SSIS at 3-4 and 3-5.

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[7] The 10.5 MGD value was selected as the average daily potable water demand based on projections of future water demand conducted as part of the Water Company's Comprehensive Planning Study (SSIS at Appendix E). The study estimated water demand by using predicted demographic trends through the year 2010, which predict a modest growth in population in Madison County. Population growth is likely to be influenced by the newly constructed multi-lane highway bridge across the River at Alton, highway improvements, continued downtown development in Alton, and increased tourist attractions.

31. Filtration will be provided by six gravity dual media (sand/granular activated carbon) units. Each filter will be equipped with a rate of flow controller, filter to waste piping, an air wash system and automatic monitors for flow rate, head loss and water level. SSIS at 3-5.

32. One additional maintenance discharge will occur at the new facility. This discharge will be from periodic wet well cleaning (once every five (5) years). This discharge, however, will be minor in amount and duration, will use raw water for cleaning, and will not contain process-generated chemicals (*i.e.*, coagulant) and, therefore, it has been eliminated from further consideration in analysis of potential new facility impacts. *Id.*

33. Operation of the replacement facility will be highly automated. The required equipment will include an analyzer, controller, flow proportioning system, an automatic switchover device, diffuser, scale for cylinders, and an SO_2 detector. *Id.* at 3-6. Residual discharges from the replacement facility will consist of Superpulsator® blowdown, filter backwash, and Superpulsator® cleaning water. *Id.* at 3-5. The quantity of residuals discharged will be equal to the sum of the suspended solids introduced in the influent River water and those added as coagulant aids. *Id.*

34. Chlorine may be used at a variety of points within the replacement facility. Chlorine may be added on a seasonal basis prior to Superpulsator® or filter backwash treatments. Ammonia and chlorine will be applied at rates necessary to achieve a TRC sufficient for disinfection in the treatment process and to provide a final TRC for disinfection in the potable water distribution system. The Water Company will use the

process of chloramination at the replacement facility. Ammonia is applied just after chlorine treatment in order to form chloramines rather than free chlorine residual. Chloramines may be added to the raw water prior to the Superpulsator®. Based on similar treatment facilities, a TRC of 3.0 to 4.0 mg/l could be expected at this point. Alternatively, if chlorine is added, the Superpulsator® TRC could range from 1.0 to 1.5 mg/l. The settled solids will be continuously removed from the Superpulsator® and routed to the effluent discharge. *Id.* at 3-5 and 3-6.

35. Water from the Superpulsator® will flow to six carbon/sand dual media filter units. This filtration will cause substantial reduction in free chlorine residuals and TRC. TRC would be expected in the filter backwash water, which constitutes nearly half of the total effluent discharge. *Id.* Chlorine and ammonia will be applied to the filtrate to maintain a disinfectant residual in the potable water distribution system; however, these application points will not affect the discharge, because the discharge stream is split away prior to this part of the process. *Id.* at 3-6.

36. The replacement facility will prevent unacceptable TRC concentrations in the effluent discharge through dechlorination with sulfur dioxide. Two dechlorination systems will be used to treat the Superpulsator® and filter backwash discharges, respectively. Separation of the filter backwash water from the other effluent volumes will allow the Water Company to apply dosages that are appropriate for the residual chlorine in each stream. SSIS at 3-6.

Characteristics of Replacement Facility Site

37. The replacement facility site consists of approximately 22 acres located within the City of Alton, Illinois in Madison County; the suitable area for construction is limited due to existing topography. Alton is located in southwestern Illinois on a bend in the Mississippi River north of St. Louis, Missouri. The property is a former quarry site, with residential subdivisions located along the western and northeastern corners of the property. The site is composed of both hilly and flat areas. The central flat portion of the site, which is the old quarry floor, is largely bedrock with sparsely vegetated open areas. Portions of the site are covered with trees and woody vegetation overlying quarry debris. SSIS at 4-2.

38. 18 acres of the area are zoned M-2, Heavy Industrial District. The remaining four acres are zoned residential and would need to be rezoned if construction of treatment facilities were to occur. In the immediate vicinity of the site, other zoned uses include mostly residential areas. The site is abutted by both single and multi-family residences. Land uses near the site include moderate and higher income single family residences, apartments and industrial sites. Barges tie up along the River banks just downstream of this area prior to or after traveling through the Melvin Price Locks and Dam. SSIS at 4-2.

Hydrologic Characterization of Mississippi River at Alton

39. Hydrologic data are available for the River near Alton from four local United States Geological Survey ("USGS") gaging stations.[8] The stations measure flow emanating from a 171,300-171,500 square mile drainage basin. Based on sixty (60) years of USGS data, the average mean monthly flow of the River is 106,859 cubic feet per second ("cfs"). *Id.* at 4-3. Data were collected at USGS gaging station #05587500 (Alton) from April 1933 through September 1988 and at USGS gaging station #05587450 (Grafton) from October 1990 through September 1995. Recorded mean monthly flows ranged from 20,200 to 469,300 cfs (July 1947 and July 1993, respectively). The minimum seven day, ten year flow ("7Q10") is 21,500 cfs. The data demonstrate that March to June are typical peak flow months and August to January are lower flow months. SSIS at 4-3.

40. River depths in the vicinity of the proposed facility range to 30 feet. The normal high water level for this section of the River is 419 feet above mean sea level ("MSL") with a low water level of 413 feet above MSL. SSIS at 4-3.

Water Quality of the Mississippi River at Alton

41. The raw water quality of the River at the intake point is highly variable. Based on data from the existing facility (January 1990 through December 1995), the turbidity of the influent varies dramatically on a daily basis. For example, in May 1990 the influent turbidity changed from 39 nephelometric units ("NTU") to 964 NTU (the

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[8] The Alton stations (#05587500 and #05587550) were discontinued after 1989, following relocation and construction of Lock and Dam No. 26. Hydrologic and water quality measurements were resumed at the Grafton stations (#05587450 and #05587455).

maximum value over the six-year period of record) during one month. The minimum daily turbidity value for the period of record was 8 NTU in January 1994. Similarly, the mean of annual averages and the monthly averages differ substantially. The mean of annual averages for the six year period of record is 90 NTU, while the maximum of monthly averages is 430 NTU. SSIS at 3-6.

42. To account for the natural variability of River water quality, three River turbidity conditions were evaluated for conceptual design purposes and to support the potential impact evaluation conducted for the SSIS. The turbidity values were correlated to suspended solids concentrations ("mg/l TSS") using a ratio of 1:2 NTU/TSS. The ratio of turbidity to suspended solids in rivers similar to the Mississippi River ranges from 1:1.8 to 1:2. For purposes of the SSIS, in order to consider maximum solids production, the ratio of 1:2 was selected.[9/] SSIS at 3-7.

43. The long-term River water quality is represented by the mean of the annual turbidity averages, or 90 NTU (180 mg/l TSS). Discharges calculated based on this condition were used to design long-term treatment units, such as lagoons. The medium term River water quality is represented by the maximum of the monthly turbidity values or 430 NTU (860 mg/l TSS). Discharges calculated based on this condition were used to design all the residual handling equipment such as belt filter presses. The short term River water quality is represented by the maximum daily value or 964 NTU (1928 mg/l TSS). Residual discharges calculated based on this condition were used to design the

[9/] Due to the importance of this value for determining potential residual loads, this value was peer-reviewed by two engineering firms: Hazen & Sawyer and Burns and McDonnell.

initial equalization basins so that storage volume would be provided to handle this worst case condition. SSIS at 3-7.

44. The Company conducted modeling of anticipated exceedances of water quality standards using the discharge values in paragraphs 29-36, above. These values include discharge flows and concentrations under defined ambient flow TSS and flow conditions. These values were used to model potential worst-case and average flow scenarios to evaluate the potential for the discharged effluent to exceed Illinois Water Quality or Effluent Standards. SSIS at 3-7.

45. Water quality data were obtained from the USGS District Office in Rolla, Missouri. Data for TSS were available for the four USGS gaging stations noted in paragraph 8, n.8, above. Data were available from two of the four gaging stations (#05587450 and #05587455) in the period following the relocation and construction of Lock and Dam No. 26. The average mean monthly TSS value over the period from October 1989 to September 1995 ranged from 29 to 605 mg/l with an average monthly value of 171 mg/l. SSIS at 4-3. The USGS District Office in Rolla also collected data from individual sampling events. During the period after the relocation and construction of Lock and Dam No. 26, TSS concentrations for single grab samples ranged from 17 to 506 mg/l (January 1990 and April 1994, respectively).[10/] SSIS at 4-4. Despite the greater range of TSS concentration for single grab samples, the mean value of TSS from these data is 156 mg/l, which is consistent with the average monthly value of 171 mg/l

[10/] Data are available from both before and after the relocation and construction of Lock and Dam No. 26, from 1975 to 1994. During the period prior to the relocation and construction of Lock and Dam No. 26, TSS in grab samples ranged from 3 to 1,310 mg/l (July 1987 and June 1981, respectively), with a mean value of 175 mg/l.

and that found in a more intensive sample collection.[11] The raw intake TSS for the current Alton facility (as estimated by turbidity) is 180 mg/L. Therefore the four estimates of annual average TSS at Alton (156, 171, 175, and 180 mg/L) are fairly consistent and representative. *Id.*

46. The data also suggest that TSS concentrations fluctuate seasonally. Peak months for TSS correlate with peak flow months (*i.e.*, March through June). March has the highest TSS, due to spring thawing action and subsequent mobilization of eroded clays and silts in the watershed. SSIS at 4-4. The applicable regulations do not specify any water quality standard for TSS, and the general use water quality standard for total dissolved solids ("TDS") is 1,000 mg/l. 35 Ill. Adm. Code 302.208.

47. Dissolved iron concentrations in the River near Alton were also available from USGS data records. The daily values over the period from March 1989 through September 1994 (based on data collected on individual days in a scheduled month) ranged from 3 to 710 micrograms per liter ("ug/l") (May 1993 and November 1992, respectively), with an average value of 36 ug/l.[12] SSIS at 4-4. The general use water quality standard for dissolved iron is 1 mg/l -- *i.e.*, 1,000 ug/l. 35 Ill. Adm. Code 302.208(g). USGS records of daily aluminum values from March 1989 through September 1994 ranged from 10 to 220 ug/l (the latter on only one occasion in

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[11] The mean value of TSS from grab sample data both before and after the relocation and construction of Lock and Dam No. 26 (the years 1975 to 1994) is 175 mg/l, which also is consistent with the average monthly value of 171 mg/l.

[12] The daily values for dissolved iron over the period both before and after the relocation and construction of Lock and Dam No. 26, based on sampling from January 1975 through September 1994 ranged from 3 to 1,000 ug/l (July 1985 and January 1985, respectively), with an average value of 63 ug/l.

November 1993), with an average of 26 ug/l.[13] SSIS at 4-4. Illinois has no water quality standards for aluminum.

Mussel Habitat Near the Replacement Facility Site

48. Discussions with Illinois EPA in August, 1997 identified the need for a characterization of the potential mussel habitat near River Mile 204 in the vicinity of the proposed intake and discharge pipes. Based on a protocol reviewed and approved by Illinois EPA, the survey was undertaken to characterize the potential mussel habitat found offshore of the replacement facility site and to determine the potential presence of protected (*i.e.*, threatened and endangered) mussel species. Sampling was conducted at six (6) transects bracketing the existing Alton facility. The upstream limit was 100 meters upstream of the existing intake location and the downstream limit was 400 meters below the proposed discharge location. Diver surveys were conducted along these six transects. SSIS at 4-5.

49. The survey results show that the area does not support a unionid community. *See* SSIS at Appendix B ("Unionid Survey"), p. 5. No living animals were found in the study area and only the shells of eight species were collected. None of the collected species were federal or Illinois protected mussel species. Only the shells of *Leptodea fragilis* were represented by freshly dead shells; the remaining shells were weathered or sub-fossil. SSIS at 4-5. The Unionid Survey concludes: "Given that habitat conditions within the study area are unsuitable for unionid colonization, and no

[13] Daily aluminum values from both before and after the relocation and construction of Lock and Dam No. 26, including samples between November 1982 and September 1994, also ranged from 10 to 220 ug/l, but with an average of 42 ug/l.

unionids were found, construction and operation of the water intake and treatment discharge should not impact unionids." *Id.* at Appendix B, p. 8. A follow-up communication from the consultant who performed the study confirmed that both upstream and downstream of the facility, silt deposition was similar at comparable depths. *Id.* at 5-16 to 5-17.

Compliance Alternatives and Efforts Which
Would Be Necessary to Achieve Compliance

50. Section 106.705(e) of the Procedural Rules provides that the petition must describe the efforts which would be necessary if the petitioner were to comply with the regulation of general applicability. Further, the petition must discuss all compliance alternatives, with the corresponding costs for each alternative. The discussion of costs shall include the overall capital costs as well as the annualized capital and operating costs. Illinois EPA suggested, and the Water Company agrees, that the SSIS should evaluate treatment technologies for residual control in detail and determine which treatment technology provides the best degree of treatment ("BDT") for the Superpulsator® and filter residuals using the factors identified in 35 Ill. Adm. Code 304.102.[14]

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[14] This Board regulation also encompasses several integral BPJ factors, including examination of the process employed, the engineering aspects of the application of various types of control techniques, process changes, and a cost-benefit analysis. It requires that dischargers must provide the Best Degree of Treatment ("BDT") consistent with technological feasibility, economic reasonableness and sound engineering judgment. BDT factors considered in this context are: 1) the degree of waste reduction that can be achieved by process change, improved housekeeping and recovery of individual waste components for reuse; and 2) whether individual process wastewater streams should be segregated or combined.

51. As a first step in the determination of BDT, it is necessary to identify available treatment technologies and select appropriate candidate technologies for application at the proposed replacement site. The SSIS identifies a number of residuals management control technologies as available treatment technologies for residual control. One major consideration in the selection of candidate technologies is the turbid and hydrologically variable nature of the River near Alton. This variability is documented in Section 4.3 of the SSIS, based on over 20 years of USGS data and available intake water turbidity of the current Alton facility. The records indicate average TSS levels of 180 mg/l, average turbidity at 90 NTU and extremely dynamic variation on a daily, seasonal, and yearly basis. These environmental conditions constitute a scenario which had been recognized as problematic during the development of proposed national guidelines. The fact that EPA never promulgated industry-wide effluent standards indicates that water supply facilities and their source waters are too different for industry-wide standards to be useful. Consequently, ability to deal with a highly dynamic TSS load is an important selection factor. SSIS at 6-2.

52. Six technologies were screened to select appropriate candidate technologies for application at the replacement facility site: 1) direct discharge to the River; 2) land application; 3) temporary storage and dewatering in lagoons, and off-site landfilling; 4) permanent storage in monofills; 5) discharge to the Alton Publicly Owned Treatment Works ("POTW"); and 6) sludge dewatering and subsequent landfilling. SSIS at 6-2 to 6-7. The technologies were screened based on site-specific factors including the nature

and quantity of settled solids produced, climatic factors, land availability, and past performance history of various technologies.

53. The SSIS provides the following discussion of the respective control technologies.

1) Direct Discharge to River

Direct discharge of all residuals from the proposed replacement facility to the River will serve as the base case. It is predicted that an estimated average of 3,358 dry tons of solids will be discharged from the replacement facility each year. Of the total solids discharged annually (based on a coagulant dosage rate of 40 ppm), approximately 8.7 percent, or 580,000 pounds, are coagulant residuals. That is, they are produced by the addition of the chemical coagulants themselves. Of this amount, metals only constitute a small fraction. For example, Clar^{+}Ion® is approximately 20 percent organic polymer and about 80 percent alum, of which aluminum accounts for 5 percent (based on molecular weight). Therefore, the amount of coagulant-based aluminum in the effluent is 8.7 percent X 0.8 X 0.05 = 0.348 percent, which constitutes a very minor percentage (and is comparable to the East St. Louis drinking water facility). As noted above, the production rates of total suspended solids are highly variable, depending on River suspended solids. The current practice of direct discharge to the River provides operational flexibility when dealing with the wide variations expected in the rate of solids generation.

2) Land Application

The management of residuals by land application includes temporary storage of residuals at the proposed replacement facility site, followed by transportation and application of residuals to local agricultural land. The residuals would be applied either as a liquid form or as dewatered residuals termed "cake." For the former application method, liquid residuals (*e.g.*, 5% solids) would be stored, loaded into 6,000 gallon tanker trucks and hauled to the application area. The liquid residuals would then be injected into the soil (fallow or with crops) by specialized equipment or applied to the soil surface with spray equipment. Residuals applied to the soil surface would then be disked or plowed into the soil within 24 hours of application. Land application of liquid residuals (including hauling and application) can cost between $70 to $300 per dry ton (depending on the hauling distance). Since significant agricultural land is not available in the immediate vicinity of the facility and is less likely to be available in the future (as there is an increasing trend for residential growth in the area), the high end of the cost range was considered more appropriate. The total cost of land application of liquid residuals, including on-site holding facilities, was considered comparable to the cost of dewatering lagoons or belt press dewatering followed by landfilling (*see* Option 6B or 6C discussed below).

Application of dewatered cake was also considered. Dewatered residuals (*e.g.*, 25% solids) would be stored, loaded into lined dump trucks and hauled to the application area. Weather permitting (*i.e.*, ground not frozen or saturated), the residuals could then be applied in thin layers to the soil directly from the truck or by using equipment like a manure spreader. Similar to the liquid form, the cake residuals would then be incorporated into the soil via disking or plowing. Land application of dewatered residuals (including hauling and application) can cost between $20 and $68 per dry ton. This method is very similar to that of Option 6C (*i.e.*, landfill disposal after mechanical dewatering), except that the final destination is widespread application to farm fields rather than to a landfill facility.

For either land application method, weather, public acceptance, permit requirements, and land availability can limit feasibility. In the Alton area, inclement weather does not seriously limit land application, but application or injection to frozen soil may not be feasible for some winter months. Biosolids from the Godfrey wastewater treatment plant have been successfully applied to nearby land ten months of the year for the last 10 years; however, public acceptance of residuals may be considerably less than for biosolids (considered a soil enhancement due to carbon and nutrient content) because the residuals add little to (or detract from) soil fertility. Land application is further complicated by permit regulations concerning the content of applied materials.

Based on the estimated average annual mass of approximately 3,358 tons of residual solids from outfalls potentially containing coagulant residuals, and a representative drinking water facility residual metals content, an estimate of annual metals loading was made. Due to the manganese content of these solids (1760 ppm) and the Illinois (35 Ill. Adm. Code 391.420(c)) lifetime recommended cumulative mass loading of 900 pounds of manganese per acre, 263 acres acquired every twenty years for land application of these residuals to soils would be required. Potential concerns with other heavy metals and elements may also exist in a land application scenario. Due to the potentially large amount of land required for every twenty years of operation (based on the maximum potential manganese load), this technology would be less preferable.

While land application of residuals is technically feasible, it is associated with considerable uncertainty, due to the highly variable nature of the River and the resulting variability of the residuals. Further, the potential costs appear to be similar to other more conventional residuals management techniques. Given these factors, land application was eliminated from further consideration.

3) Temporary Storage and Dewatering in Lagoons, and Offsite Landfilling

This technology would involve the construction of on-site lagoons for dewatering of the water treatment residuals. Residuals flow would be diverted into the dewatering lagoons and would be dewatered to approximately 4% solids. Then, the residuals would be removed and further dewatered by a mechanical dewatering system to approximately 25% solids. Following the second dewatering, the residuals would be shipped to an offsite landfill.

4) Permanent Storage in Monofills

This technology involves the construction of impoundments for permanent storage of the residual solids. The supernatant from the impoundment can either be recycled to the head of the treatment facility or it could be treated if necessary prior to discharge. Based on the average loading of 92 tons of wet residuals (10% solids) per day over a typical 20 year operating period, a 40-acre monofill (14 foot depth) would be required. The proposed Alton facility property is not large enough for such a facility. Additional farmland offsite would have to be purchased (at $6,000 to $10,000 per acre) to implement this option. However, the construction of a large, lined impoundment would cost at least $20 million, based on preliminary estimates. Annual operation and maintenance costs would be approximately $1.3 million. Further drawbacks of this technology are that disposal in monofills will likely limit the future use of the land and replacement monofills will be continually required. Due to these factors, this technology is less preferable and has been eliminated from further consideration.

5) Discharge to Alton POTW

This option was investigated because it is commonly used by many other potential NPDES dischargers; however, the estimated flow and mass of solids could not be treated at the relatively small POTW without POTW expansion. The flexibility of POTW future operations would be severely curtailed by accepting the water treatment facility residuals. This option has been explored on a preliminary basis with the Alton POTW staff who have indicated that it is not feasible, based on potential hydraulic overload of the adjacent sewer system, inadequate slope of the inceptor sewer, elimination of the POTW's reserve capacity, and a quadrupling of the solids loading (*see* letter from James Blaine to Kim Gardner in Appendix A of the SSIS).

The cost and technical feasibility of expansion of the POTW would be similar to that of the petitioner constructing an on-site treatment facility (such as the lagoon or belt press systems described here). Based on consideration of the above factors, the POTW alternative is less preferable and has been eliminated from further consideration.

6) Sludge Dewatering and Subsequent Landfilling

In the screening of this family of technologies, non-mechanical and mechanical dewatering techniques were reviewed as methods to prepare the settled solids for offsite landfilling. Analysis of residuals handling methods was based on industry experiences with alum-based residuals. The proposed replacement facility will use a Clar⁺Ion® type alum-organic polymer coagulant. However, these methods are expected to be directly applicable for treatment of Clar⁺Ion®-based residuals.

6)A) Non-Mechanical Dewatering Processes

Either non-mechanical dewatering or mechanical dewatering (6B, below) would be required for sludge dewatering and subsequent landfilling (alternative 6). Non-mechanical dewatering relies on drainage, decanting, evaporation, and freezing processes. It is commonly used for dewatering residuals, because of its simplicity and low operational costs. However, non-mechanical processes are often subject to disruptions, due to climatic fluctuations. Also, non-mechanical processes, perhaps even more so than mechanical processes, could be plagued by having a low overload capacity in the event that the rate of solids production were to be higher than planned. Potential non-mechanical technologies include sand drying beds and natural freeze-thaw drying beds. The most efficient way to utilize a drying bed system is to combine the freeze-thaw operation and conventional sand drying operations during the course of the year. This option is similar in feasibility and cost to dewatering lagoons. However, because it requires more area than dewatering lagoons and construction costs are slightly higher (based on preliminary unit cost estimates), the drying beds were not considered further.

6)B) Mechanical Dewatering Processes

A variety of mechanical dewatering methods have been screened. These processes are typically utilized in the water industry when insufficient space is available for non-mechanical processes, high solids concentrations are required for disposal, or when economics dictate their use. Mechanical processes are less susceptible than non-mechanical processes to inclement weather conditions. The mechanical processes included in this initial screening included vacuum filtration, filter pressing, and centrifugation.

(i) In the vacuum filtration of residuals, a pre-coated rotating drum surface is subjected to a vacuum to dewater the solids and to form a cake. While vacuum filters have been routinely used in the wastewater treatment industry, they have been reportedly evaluated only on pilot scale for a sludge application due to problems with the conditioning chemicals and the poor cake yield. Therefore, no further consideration will be given to vacuum filtration.

(ii) The belt filter press utilizes a well known and reliable technology which has been used in the water industry for 25 years.

Conditioning of residuals is required prior to press operations, and operational data indicate that a solids concentration of 15 to 25 percent is typically achieved. Despite the higher capital and operating costs associated with a filter press compared to certain non-mechanical means, the higher density sludge may translate into cost savings, due to the lower volume of material to be landfilled. As a result of the belt filter press method's reliability and operational characteristics, further analysis was performed for the filter press dewatering process and subsequent landfilling of the dried cake. Land is available at the proposed site to house the required filter press units and associated tankage.

(iii) Centrifugation is the final mechanical process considered. Several different varieties of centrifuges are commercially available. However, the solid bowl centrifuge is the most common. These units can operate in either the co-current or counter-current flow modes. Centrifuges have become an acceptable mechanical dewatering technology and have proven to be capable of dewatering sludges. The centrifugation and filter press technologies would require similar auxiliary equipment and the resulting costs would likely be the same. However, due to the fact that mechanical belt filter presses are the more common technology, are in use at other public water supply facilities to which Illinois-American has direct technical access (*i.e.*, "sister" operations in other locations in the U.S.) and centrifugation has had a poor success record in dealing with

Mississippi River silts, the belt filter press technology was selected as the mechanical dewatering technique for which further analysis would be performed.

6)C) Landfilling of Dewatered Residuals

Not an alternative in itself, this technology was considered as a potential component of several technology alternatives, such as temporary storage and dewatering in lagoons with offsite landfilling (alternative 3), and the mechanical and non-mechanical dewatering processes (alternatives 6A and 6B). The landfilling of dewatered water treatment facility residuals in Illinois is permissible. Provided that the dewatered solids are not hazardous waste under Resource Conservation and Recover Act ("RCRA") regulations, the dewatered solids can be landfilled in a permitted non-hazardous special waste landfill.

Preliminary discussions with the operator of the nearest landfill (Waste Management Inc.) which accepts water treatment facility residuals, located in Granite City, Illinois, indicate that there is sufficient landfill capacity to receive these residuals for 30 years. However, as landfill capacity diminishes and tipping fees escalate, it is likely that it may become more economical to construct dedicated landfills solely for the management of the water treatment facility residuals. As noted in the discussion of monofills (*i.e.*, Treatment Technology Number 4), the diminishment of existing landfill capacity and the high capital cost of constructing new landfill capacity are major drawbacks to landfill disposal.

54. Based on their technical feasibility and economic reasonableness, two candidate technologies were selected for further evaluation along with the direct discharge option. Application of either of the two candidate technologies would result in the estimated Alton effluent discharges meeting Illinois water quality standards for TSS. The two selected technologies are:

- Construction of four on-site sludge storage lagoons for dewatering of the solids by non-mechanical means, and subsequent offsite landfilling of the dewatered residuals;
- A belt filter press for dewatering of the solids by mechanical means, at the facility, and subsequent offsite landfilling of the dewatered residuals.

SSIS at 6-7.

<u>Temporary Storage and Dewatering in Lagoons</u> was selected for the following reasons:

- Reliable operation with minimal maintenance requirements; and
- Site is large enough to construct lagoon system.

<u>Belt Filter Press Dewatering</u> was selected for the following reasons:

- Site is large enough for buildings required to house the press dewatering system; and
- Reliable operation which produces consistently dense residuals.

55. In order for the facility to produce an average of 10.5 MGD of potable water (forecasted demand in 15 years), 11.2 MGD of water must be withdrawn from the

River. Under average river sediment conditions (TSS = 180 mg/l) at the flows described above, the facility will produce approximately 3,400 tons of dry solids per year from proposed discharges which will require treatment for removal of solids. Under these conditions, the average discharge flow rate of this effluent will be 1.0 MGD. SSIS at 6-8.

56. It is anticipated that temporary storage and dewatering in lagoons (non-mechanical dewatering) with subsequent off-site landfilling would require construction of four on-site lagoons for dewatering the water treatment residuals. Residuals flow would be diverted into one of the four dewatering lagoons. Residuals would be stored in the lagoons to allow dewatering to approximately four percent (4%) solids. The residuals would then be removed and further dewatered by a temporary mechanical dewatering system which would dewater the lagoon residuals to approximately twenty five percent (25%) solids. Following the dewatering the residuals would be transported to an off-site landfill. SSIS at 6-4.

57. The second candidate technology involves belt filter press dewatering -- a permanent mechanical dewatering process which would involve conditioning the residuals prior to press operations. Operational data indicate that a solids concentration of 15 to 25 percent is typically achieved through this process. This candidate technology also requires off-site landfilling of the dewatered residuals.

58. Originally each each of the candidate technologies (lagoons alone and belt filter press dewatering alone) was considered separately. The original lagoon design called for two, three-acre lagoons. Upon consideration of additional site information

(*i.e.*, required site preparation), the lagoon design was refined to include four, one-acre lagoons combined with additional mechanical dewatering equipment. The four lagoons require less subsurface exacavtion and less land area than the previous design. SSIS at 6-8. Cost estimates were made for the lagoon (non-mechanical) dewatering technology alone, for the belt filter press (permanent mechanical) dewatering technology alone, and for the combination of the two. For purposes of comparison, cost estimates for both non-mechanical and mechanical dewatering technologies, as well as the combination of the two are presented in Appendix D of the SSIS.

59. The cost estimate for non-mechanical dewatering as originally designed (two, three-acre on-site lagoons and off-site landfilling) is detailed in Table D-1 of Appendix D of the SSIS. Major cost items associated with this option are: (1) construction of two on-site solids dewatering lagoons; (2) collection of the supernatant from the lagoons and discharge of water to the River; and (3) landfilling dried sludge at a local landfill. The annualized total cost for this option is approximately $1,580,000.[15] The overall capital cost for this option is approximately $4,580,000, the annualized capital cost is approximately $450,000, and the annualized operation cost is approximately $1,130,000.

60. The cost estimate for the refined (combined) technology of four on-site lagoons, permanent mechanical dewatering by belt filter presses, and subsequent landfilling is detailed in Table D-1A of Appendix D of the SSIS. Major cost items associated with this option include: (1) construction of four on-site solids dewatering

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[15] All costs are rounded to the nearest $10,000. The annualized costs figure assumes capital costs are amortized over 30 years at a 9% interest rate.

lagoons; (2) collection of the supernatant from the lagoons and discharge of water to the River; (3) installation of permanent filter presses to mechanically dewater lagoon residuals to a solids concentration of 25%; and (4) landfilling dried sludge at a local landfill. The annualized total cost for this option is approximately $1,140,000. The overall capital cost for this option is approximately $7,380,000, the annualized capital cost is approximately $720,000 and the annualized operation cost is approximately $420,000.

61. The cost estimate for the belt filter press dewatering and subsequent landfilling option (without lagoons) is detailed in Table D-2 of Appendix D of the SSIS. Major cost items associated with this option are: (1) installation of one equalization/storage tank; (2) construction of on-site residual collection tanks and ancillary equipment; (3) installation of one thickener; (4) installation of large filter presses and backup units and associated auxiliary facilities sized to handle peak hydraulic conditions; (5) collection of overflow and discharge to the River; (6) collection of filtrate/washwater and return to the treatment facility; and (7) landfilling sludge at a local landfill at a solids concentration of 25% in the treated sludge. The annualized total cost for this option is approximately $1,630,000. The overall capital cost is for this option is approximately $10,800,000, the annualized capital cost is approximately $1,130,000, and the annualized operation cost is approximately $570,000.

Narrative Description of the Proposed Adjusted Standard

62. Section 106.705(f) of the Procedural Rules provides that the petition must include a narrative description of the proposed adjusted standard as well as proposed language for a Board order which would impose the standard. Efforts necessary to achieve this proposed standard and the corresponding costs must also be presented. Such cost information shall include the overall capital cost as well as the annualized capital and operating costs.

63. The Water Company petitions the Board to adopt the following adjusted standard as Section 304.223 (or other appropriate designation) under the Board's regulations governing effluent standards, 35 Ill. Adm. Code Subtitle C, Part 304:

> This section applies to the replacement potable drinking water treatment facility owned by Illinois-American Water Company ("Company") which will be located near River mile 204 in Alton, Illinois, and which will obtain its raw water supply from, and discharge to, the Mississippi River. Such discharges from the facility shall not be subject to the effluent standards for total suspended solids and total iron of Section 304.124, nor to the regulation of discharge solids or turbidity provided in Sections 304.106 and 302.203.

64. Efforts and costs necessary to achieve the proposed adjusted standard: Achieving the proposed adjusted standard at the replacement facility will require the facility to implement all requirements which may be imposed in its permit, such as BDT requirements. As discussed in the next section, the SSIS data and the replacement facility's use of new, state of the art equipment, such as the Superpulsator®, will ensure that the impact of its discharge is equal to or better than that of the discharge from all of the similarly situated Mississippi River facilities, all of which the Board has allowed

to discharge to the River -- *i.e.*, the existing Alton facility, Rock Island, East Moline and East St. Louis.

The Quantitative and Qualitative Impact of the Petitioner's Activity on the Environment Resulting from Compliance with the Regulation of General Applicability as Compared to Compliance with the Proposed Adjusted Standard

65. Section 106.705(g) of the Procedural Rules provides that the petition must compare the qualitative and quantitative nature of emissions, discharges or releases which would be expected from compliance with the regulation of general applicability as opposed to that which would be expected from compliance with the proposed adjusted standard. To the extent applicable, the petitioner must also discuss cross-media impacts (those which concern subject areas other than those addressed by the regulation of general applicability and the proposed adjusted standard). Finally, Section 28.1(c)(3) of the Act, which applies to all adjusted standard petitions, requires the petitioner to submit adequate proof that "the adjusted standard will not result in environmental or health effects substantially and significantly more adverse than the effects considered by the Board in adopting the rule of general applicability."

66. As a preliminary matter, the Water Company notes that because of a lack of significant adverse environmental impact, combined with significant adverse economic impact and discharge disposal concerns, relief from the generally applicable industrial effluent standards is the appropriate *de facto* rule of general applicability for public water supply treatment facilities which receive their raw water from the River and do not use the lime softening process. This is the category of facilities to which the replacement facility belongs, as do the facilities currently serving Rock Island, Alton, East Moline

and East St. Louis. As a result, the qualitative and quantitative factors pertaining to the replacement facility should be judged similarly to these facilities for purposes of the Act's adjusted standard factors (*i.e.*, Sections 28.1 and 28.3 of the Act and the BPJ and BPT factors).

67. The potential environmental impacts from the effluent of the replacement facility on water quality and biota of the River in the vicinity of the potential discharge are evaluated in the SSIS in significant detail. The SSIS examines impacts to both the water column and sediments. Also, potential impacts to biota are evaluated.

68. Other impacts considered under the site-specific analysis include: identification of frequency and extent of discharges; identification of potential for unnatural bottom deposits, odors, unnatural floating material or color; stream morphology and results of stream chemical analyses; evaluation of stream sediment analyses; and pollution prevention evaluation. As discussed in this section of the Petition, the SSIS found that no adverse environmental impacts will result from the proposed rule.

<u>Modeling Water Quality Effects</u>

69. Water quality effects of the replacement facility discharges were evaluated by analyzing physical and chemical impacts from increases in the dissolved or total suspended load to the River and the effect of materials settling out and accumulating on the bottom of the River. Since it is unlikely that all the discharge TSS will remain completely in suspension or completely settle out, the results of these types of modeling

analyses were used as end points to estimate the potential range of environmental effects. SSIS at 5-2.

70. In addition, the SSIS evaluates the effect of chemical coagulant used in the replacement facility. The primary coagulant proposed to be used at the replacement facility is Clar⁺Ion®, an alum-organic polymer mixture. The SSIS also evaluates the potential for iron (all of which is from the River) and aluminum from the replacement facility to pose any adverse ecological effects. Of these two chemicals, only dissolved iron has an Illinois Water Quality Standard, which is 0.5 mg/l. 35 Ill. Adm. Code 302.208. Aluminum has an Ambient Water Quality Criteria ("AWQC") value of 0.87 mg/l (87 ug/l). *See* 63 Fed. Reg. 68354 (1998).

71. A series of analyses were made of potential impacts on the receiving waters (*i.e.*, the River near River Mile 204) from the proposed Alton facility effluent discharges. The purpose of the modeling was to predict final mixed concentrations of TSS, iron, and aluminum at the edge of the mixing zone and to provide estimates of elevated concentrations of TSS downstream of the Alton discharge. These results were then compared to ambient receiving water conditions to indicate the relative effect of the discharges. SSIS at 5-2.

72. Two types of modeling were conducted: (1) a simple mass balance equation to predict the final mixed concentrations of the Mississippi River; and (2) a dynamic model using CORMIX to predict concentrations within the mixing plume. The former was used to evaluate final concentrations, whereas the latter was used to prove

a visual estimate (or "footprint") of elevated TSS values below the discharge points. Details of the CORMIX modeling are provided in Appendix F of the SSIS.

73. Several models were developed to determine potential impacts on the River from the replacement facility's effluent discharges. Two flow/TSS/coagulant scenarios were examined. Test parameters were as follows: application of coagulant was modeled with two receiving water TSS concentrations (approximate daily minimum and monthly maximum values for the River near Alton) under two receiving water flows (the seven day, ten year low flow and the annual average flow, respectively). Under the low flow model scenario (*i.e.*, low ambient river TSS and 7Q10 low flow), the dimensions of the discharge plume (defined by a limit of a >1.0 mg/l increase in TSS above ambient) are approximately 400 ft. by 25 ft. (0.28 acre), of which about 175 ft. by 30 ft. (0.12 acre) reaches the River surface at TSS concentrations of 1.0 - 2.5 mg/l above ambient levels. Design flows and concentrations of the Superpulsator® and filter backwash for evaluation of the proposed replacement facility were determined by application of removal rates on incoming raw water, based on pilot facility results and the design described in Section 3.0 of the SSIS. The flow amount and effluent TSS concentration of the removal technologies were sensitive to intake TSS amounts. SSIS at 5-2.

74. The modeling results indicate that, under worst case, low flow conditions, incremental increases from the replacement facility's operations will not lead to significant changes in water quality and will not cause violations of ambient water quality criteria ("AWQC"). To test the potential magnitude of change for TSS, design low flow and the daily minimum regime were examined. The test conditions assumed a 7Q10 low

flow and a river TSS of 20 mg/l. Only 25% of the River volume was used for the area of mixing, as allowed by 35 Ill. Adm. Code 302.102 for constituents whose existing ambient levels in the receiving water do not exceed water quality standards.[16] The results indicate that, regardless of the ambient TSS condition, TSS concentrations of the River increase by less than 0.5% over a wide range of ambient conditions. The negligible River TSS increases are well within daily variation and are likely to be analytically undetectable. SSIS at 5-3.

75. The results of the dynamic mixing zone model are shown graphically in Figures 5-1 and 5-2 of the SSIS. Figure 5-1 presents an aerial view of the location of the predicted TSS plume resulting from the discharge. Figure 5-2 presents a more detailed aerial view of the same predicted TSS plume as presented in Figure 5-1. Contours (or isopleths) are plotted for various TSS concentrations above ambient conditions between 1.0 and 5.0 mg/l. The figure shows that the River velocity quickly overcomes the initial discharge momentum (perpendicular to flow away from the shoreline). The edge of the plume, represented by a 1.0 mg/l contour, reaches approximately 400 feet downstream and achieves a maximum width of approximately 30 feet. The distance at which the plume reaches the surface is approximately 225 feet, and all predicted concentrations are below 2.5 mg/l; therefore this model predicts that a River surface area of approximately 175 ft. by 25 ft. (or 0.12 acre) will be subject to TSS concentrations 1.0 to 2.5 mg/l higher than ambient. This range of TSS concentrations

[16] There is no applicable Illinois Water Quality Standard for TSS, and these test conditions were simply used for comparative purposes.

represents values that are 5 to 13% above ambient levels. The SSIS concludes that the lower end of the range represents a value that will be difficult to visually discern and very difficult to measure with conventional instrumentation. SSIS at 5-4.

76. Similarly, the results of projecting the proposed effluent discharges on ambient dissolved aluminum and iron River concentrations -- representing the annual mean value and daily maximum under low flow conditions -- indicate that the amount of coagulant added will not lead to an exceedance of the respective federal AWQCs for either aluminum or iron, even under low flow conditions. SSIS at 5-4. As such, these incremental increases will not adversely impact water quality. *Id.* In projecting these impacts, the amount of dissolved aluminum or dissolved iron arising from use of Clar$^+$Ion® coagulant was considered. The dissolved fractions were used to address potential ecotoxicological concerns, because particulate fractions are usually considered non-bioavailable. *Id.*

77. To project the impacts of effluent discharges on dissolved aluminum and iron River concentrations, the amount of metal/metalloid in the Superpulsator® effluent was based on coagulant application rates (function of TSS levels) and stoichiometric considerations. For Clar$^+$Ion® type coagulants, the percentage of aluminum is approximately 4%. To estimate dissolved iron, the average value of clarifier and filter backwash effluent discharge concentrations were used. All of the aluminum or iron was assumed to be in the dissolved fraction; as this is unlikely to occur under actual field conditions, this assumption provides a conservative, worst-case scenario. Mean values of iron concentrations from a series of analyses from the filter backwash of the existing

Alton facility were used to estimate metal concentrations in the clarifier backwash. Total and dissolved fractions of iron were measured in samples of the River and the existing Alton facility discharges taken in December 1996 and February 1997. During this period, Clar$^+$Ion® was used as the primary coagulant at the existing Alton facility. The filter backwash had a mean dissolved iron value of 0.009 mg/l, which is below the water quality standard of 0.5 mg/l for the receiving water. This value was judged to be acceptable, because most of the coagulant is added prior to the Superpulsator® and is likely to be mostly discharged with Superpulsator® effluent; the basic filter backwash technology will not be altered in the proposed facility; and the incoming River silts remain the same. SSIS at 5-4.

78. As a further check, the potential for the proposed facility effluent discharge to cause an exceedance of the Illinois Water Quality Standard for total dissolved solids ("TDS") of 1,000 mg/l was also qualitatively evaluated. Review of available USGS water quality data from the gaging station below Grafton from 1990 to 1997 (over 50 observations) indicates that the average TDS concentration in the River at this point is 273 mg/l. There are no TDS data from the existing Alton facility discharge, but it was assumed for purposes of the SSIS that TDS equals TSS discharge levels. This is a highly conservative assumption, because the residual discharge is comprised primarily of settled particulate material. Using these assumed values for discharge and receiving water TDS, the proposed effluent outfall does not lead to an exceedance of the water quality standard even at effluent TDS concentrations two orders of magnitude greater than the conservatively assumed levels; therefore it can be

concluded that the proposed facility discharge will not lead to an exceedance of TDS standards in the receiving waters. SSIS at 5-4.

79. Since average flow conditions are more representative of typical flow conditions, a series of tests similar to those discussed in paragraphs 69 *et seq.*, above for low flow conditions were conducted using average annual flow of the River as the underlying hydrologic conditions, while conservatively assuming maximum monthly TSS discharges from the replacement facility. Under the typical flow model scenario (*i.e.*, monthly maximum TSS and mean River flow) the dimensions of the discharge plume (defined by a limit of a >2.5 mg/l increase in TSS above ambient) are approximately 5,250 ft. by 75 ft. (9.04 acre), of which about 650 ft. by 75 ft. (1.12 acre) reaches the River surface at TSS concentrations of 2.5 - 5.0 mg/l above ambient. These TSS inputs represent a 0.4 - 0.8% increase over ambient levels. As expected, test results for average flow conditions indicate an even lesser impact than under low flow conditions. SSIS at 5-5. The results also indicate that there is no potential that the replacement facility discharge will raise ambient water quality above acceptable levels. *Id.* Water quality is also not adversely impacted under average flow conditions. *Id.*

80. The potential for "turbidity of unnatural origin" was evaluated based on the results of the water quality TSS modeling and the likelihood of such turbidity resulting in an Offensive Condition (35 Ill. Adm. Code 302.203). Based on the level and spatial extent of the predicted turbidity increases, the SSIS concludes that the discharge from the replacement facility will not result in an Offensive Condition. SSIS at 5-22 to 5-23. In conjunction with modeling water column effects, the deposition of settleable

solids in the potential effluent discharges from the Superpulsators® and filter backwash were modeled to determine potential areal distribution in the sediments of the River. The analysis included performing particle deposition modeling based on several very conservative assumptions. SSIS at 5-6 to 5-10. Modeling results demonstrate that the daily residuals buildup is negligible under both critical low flow and average flow conditions. *Id.* at 5-10. The impact of the modeled discharges is hardly measurable. Long-term impact is also negligible, because River velocity and bedload transport also prevent buildup of deposited materials over time. *Id.*

81. The deposition of settleable solids in the potential effluent discharges from the Superpulsator® and filter backwash were modeled to determine potential areal distribution in the sediments of the Mississippi River. Settling velocities of the suspended solids in the discharges were analyzed to provide information on their quiescent settling behavior. Residuals arising from both the Claricone (comparable to proposed Superpulsator®) and filter backwash operations were available for analysis. The cumulative effect of both discharges (Superpulsator®, filters) were used for estimation of the potential benthic deposition from the proposed replacement facility. SSIS at 5-6.

82. The objective of particle deposition modeling was to predict rates of particle deposition on the riverbed as a result of the proposed outfall. A particle deposition model, based on the equations and methodologies presented in the U.S. EPA Section 301(h) Technical Support Document (U.S. EPA, 1994), was selected and applied. *See* Attachment J hereto. This model is recommended by U.S. EPA for screening level particle deposition evaluations. The particle deposition model results in

predictions of particle mass per area per time (*e.g.*, $g/m^2/yr$) deposited onto the riverbed. For details of the particle deposition model, *see* Appendix F of the SSIS. SSIS at 5-6.

83. Particle deposition modeling was focused on predicting long-term rates of particle deposition and accumulation resulting from the proposed outfall. Also, predictions of deposition and accumulation resulting from transient events, such as low river flows and filter backwashing, were required. Thus, a steady-state particle deposition scenario and two transient particle deposition scenarios were developed to evaluate particle deposition resulting from the proposed discharge. The steady-state scenario applied average values for River flowrate, River TSS concentration, discharge flowrate, and discharge TSS concentration, because the objective of the steady-state evaluation was to predict the long-term average rate of deposition. The transient scenarios specify extreme conditions (*e.g.*, high TSS or low flow) with the goal of predicting the impacts of worst-case transient events. Particle deposition modeling scenarios are specified below:

Steady-State Scenario

- River flowrate at average value of 106,589 cfs;
- Average annual discharge flowrate of 1.6 cfs (0.046 m^3/sec); and
- Average daily discharge TSS concentration of 2,092 mg/l.

Transient Scenario #1: 7Q10 River Flowrate

- River flowrate at the seven-day, 10-year low flow (7Q10) value of 21,500 cfs;
- Discharge flowrate of 1.6 cfs (equivalent to 0.046 m^3/sec);

- Average daily discharge TSS concentration of 296 mg/l; and
- Duration of event: 7 days in every 10 years.

Transient Scenario #2: Filter Backwash

- River flowrate at average value of 106,589 cfs;
- Discharge flowrate of 2.5 cfs (0.071 m^3/sec);
- Maximum daily discharge TSS concentration of 4,333 mg/l; and
- Duration of event: 15 minutes every 24 hours.

SSIS at 5-7.

84. The SSIS particle deposition modeling evaluation, however, is based on several very conservative assumptions, which result in the overprediction of the mass of particles settling on the riverbed. It is, for example, assumed that all particles settle out of the water column and onto the riverbed. The presence of large TSS concentrations (*e.g.*, up to 2,000 mg/l) in the ambient Mississippi River clearly indicates that all suspended solids do not settle out of the water column in this waterway. In addition, according to US Army Corps of Engineers ("US ACOE") personnel, suspended solids that are settleable generally settle in harbors or backwater areas, rather than in the main channel of the River. The proposed outfall is located near the main channel of the River. SSIS at 5-7.

85. The SSIS particle deposition modeling evaluation also overpredicts long-term sediment accumulation, because it assumes only average river flows, neglecting above average flows. Above average river flows and especially very large river flows are known to transport particles more effectively than smaller flows. Also, large river

flows are known to produce scour of the riverbed, picking up deposited materials and transporting them downstream. The net result of sediment scour is that more particles are deposited in areas with lower water velocities (*e.g.*, backwater areas) and less particles are deposited in the main channel. The particle deposition modeling evaluation assumes that no sediment scour occurs. SSIS at 5-7.

86. Relevant characteristics of the Mississippi River near the Alton facility were derived from a river stretch depth profile provided by the US ACOE, St. Louis office, and the literature. An estimate of velocity during low flow conditions was made by dividing 7Q10 river flow by the cross-sectional area of the channel near the discharge point at River Mile 204. Three channel cross-sections representing transects above, at, and below River Mile 204 are shown in Figure 4-7 of the SSIS. The average cross-sectional area of the three transects is approximately 63,813 square feet. The estimated velocity is approximately 0.34 ft./s or 0.10 m/s. A similar analysis for flow velocity during average annual flows provides a velocity of 1.35 ft./s or 0.411 m/s. SSIS at 5-8.

87. The exact location and depth of the replacement facility effluent discharge has not been determined. The discharge was assumed approximately 33 feet (10 m) offshore at a depth approximately equal to the maximum elevation for preserving the navigation clearance, or 4.5 feet. This corresponds to a height above bottom of 16.4 feet (5 m). SSIS at 5-8.

88. Five water samples were collected from the discharge of the current Alton facility on five separate dates in December 1996 and another set of four were sampled in February 1997. The first set of samples was collected before, during, and after

commencement of the filter backwash discharge. The second set of samples was taken at the initiation, during, and following clarifier blowdown. During both periods Clar⁺Ion® was being used as the primary coagulant. The initial TSS were measured, as was the final turbidity (in NTU) of the supernatant of the settled sample. Settling behavior of the solids was measured in an Imhoff cone, by monitoring over time the volume of settleable solids in the cone, as determined by observing the interface between the clear supernatant and turbid solids region. The data for these measurements from both clarifier and filter backwash are presented in Appendix C of the SSIS. SSIS at 5-8.

89. The settleable solids volume as a function of time is presented in Figure 5-5 (clarifier) and Figure 5-6 (filter backwash) of the SSIS. The results suggest little settling during the first 10 minutes (note: the settling interface is often hard to visually detect initially), but a major portion of the settling takes place within the first 20 minutes, with hindered settling and compression taking place thereafter. An average settling curve was constructed by averaging the results of the 4 or 5 trials for each process type. The average settling curve was used to estimate settling velocity. SSIS at 5-8.

90. Settling velocity was estimated by dividing a settling distance by an average settling time. The settling distance is the depth of clear supernatant from the top of the one liter mark of the Imhoff cone to the interface with the cloudy settleable solids portion. The settling distance was measured at the time (settling time) at which the initial linear portion of the settling curve ended and hindered settling and compaction began. Dilution of the discharge by River water will likely result in a settling regime more closely associated with discrete settling than with hindered settling or compaction,

which occurs under relatively quiescent conditions of low velocity and within a confined area. Therefore, only the initial linear part of the settling curve was used to compute settling velocities. The calculated settling velocity for the average settle curve was analyzed. From these calculations, an average settling velocity for the clarifier and filter backwash of 2.46 x 10^{-4} m/sec was estimated. SSIS at 5-9.

91. In order to quantify predictions of particle settling behavior resulting from the discharge of residual-associated TSS, three discrete particle sizes were chosen. These three representative particle size groups were then evaluated to determine settling rates, deposition areas, and accumulation rates for the three scenarios described in paragraph 89-90, above. The following three particle size ranges were assumed to characterize discharge TSS:

Large particle size: 25% of discharge TSS, particle size > 0.062 mm in diameter.

Medium particle size: 50% of discharge TSS, particle size between 0.062 mm and 0.039 mm in diameter.

Small particle size: 25% of discharge TSS, particle size between 0.039 mm and 0.0039 mm in diameter.

Particle size groups were assigned based on Imhoff cone settling measurements collected from the present discharge waters as discussed in paragraphs 89-90, above and sieve tests performed by the USGS on River water in Alton. Particle size groups selections are conservative in that all particles are assumed to be settleable. Also, the particle sizes listed above were validated using U.S. EPA guidance documents and were found to be typical of fine sand, silty sand, silt, silty clay, and clay that would be expected to be found in the discharge waters. SSIS at 5-10.

92. Results of modelling for the three scenarios were as follows:

Steady-State Scenario: Results of the steady-state particle deposition modeling scenario are presented in aerial view in Figure 5-7 of the SSIS. Table 5-6 of the SSIS contains the areas, deposition rates, accumulation rates predicted in the steady-state modeling scenario. Particle deposition rates of 4.38 $kg/ft^2/yr$, 0.037 $kg/ft^2/yr$, and 0.012 $kg/ft^2/yr$ were obtained for the three particle size groups, respectively. The large size particles were predicted to settle over an area of 4.1 acres and to accumulate 2.2 in/yr. Medium and small size particles were predicted to accumulate very little (less than 0.01 in/yr) over a larger area (565 acres). Due to the overlap of settling zones for the two smaller particle classes, only two zones of deposition are indicated on Figure 5-7 of the SSIS.

Transient Scenario #1: 7Q10 River Flow: Results of the transient scenario #1 particle deposition modeling are in Table 5-6 of the SSIS. Particle deposition rates of 0.039 kg/ft^2 and accumulation of 0.0275 inch per event over an area of 0.06 acres were predicted for large size particles. Deposition of medium and small size particles was predicted to be negligible. SSIS at 5-10.

Transient Scenario #2: Filter Backwash: Results of the transient scenario #2 particle deposition modeling are in Table 5-6 of the SSIS. Particle deposition rates of 0.003 kg/ft^2 and accumulation of 0.001 inch per event over an area of 1.04 acres were predicted for large size particles. Deposition of medium and small size particles was predicted to be negligible. SSIS at 5-10.

93. The SSIS concludes that the amount of daily buildup is negligible for the residuals either under critical low flow or average flow conditions. The impact of either of these modeled discharges can hardly be measured in the vertical. The current velocity and bedload transport will also tend to prevent buildup of deposited materials over time. SSIS at 5-10.

Characterization of Potential Environmental Impacts

94. The SSIS evaluates, in significant detail, the biological communities and habitats expected to occur in the vicinity of the proposed outfall and evaluates the types of potential impacts. The SSIS also considers sensitive species and habitats.

95. Major habitats near River Mile 204, as classified by the Baker system, include main channel, nearshore bank areas, pools and backwater slough areas. The proposed discharge location is within the nearshore bank habitat and adjacent to the other habitats. SSIS at 5-12. The SSIS also identifies fish and macroinvertebrates likely to occur in the vicinity of the proposed discharge based on their typical occurrence in the types of nearby habitats. The habitats are characterized as follows:

Main Channel Habitat: The main channel forms the major path for water flow in the river and is characterized by high current speeds, a fairly uniform sand and gravel substrate, high bottom bedload movement, and high suspended solids levels. In the vicinity of the proposed discharge, the main channel is actively used for navigation (*i.e.*, river barge traffic) which also leads to disturbance of the bottom and resuspension of materials. Due to the need to maintain navigation depths, the main channel is periodically dredged.

Nearshore Bank Habitat: Nearshore bank areas adjoin and merge with the channel habitat. These areas include both natural and artificially reinforced (*i.e.*, rip-rapped) shorelines. Current speeds are highly variable along banks, as a function of several factors including water depth, distance from shoreline, substrate type, and both natural (*e.g.*, fallen trees) and man-made (*e.g.*, transverse dike dams) obstructions. Upstream flow eddies may be present. Substrates are variable and may include consolidated clays and silts, sand and gravels, and muds. Water quality is similar to that of the channel habitat. Nearshore bank areas are found on the Illinois side of the River near the proposed discharge.

Pool Habitat: Pools are relatively deep, slack or slow-moving flow areas within the main River banks. Pools often form downstream of islands and usually adjoin sandbar and channel habitat. Pools are characterized by slow currents, relatively greater depths, and generally fine sediments. The areas and depths of river pools are usually dependent on river stage (*i.e.*, elevation). Pool water quality is usually less turbid, slightly warmer, and may exhibit higher primary productivity than the channel.

Slough Habitat: Sloughs are formed from abandoned or secondary river channels, which may be isolated from the main channel for varying periods of time. They are moderate-sized, slackwater habitats which form a continuous connection with the main channel during average to high river stages. Current speeds are often insufficient to scour the bottom so that large amounts of organic debris accumulates at the bottom. The enclosed channel, north of Piasa Island; the former river channels found on the Missouri side; and associated vegetated emergent bars provide slough habitat. SSIS at 5-13.

96. Fish and macroinvertebrates likely to occur in the vicinity of the proposed discharge were identified based on their typical occurrence in the types of habitats described in paragraph 95, above - namely main channel, nearshore bank areas, pools, and sloughs. Fish typically found in these subhabitats are identified in Table 5-7 of the SSIS, which provides both common and scientific names. The fish community in the main channel is comprised of a diverse mixture of open water species (*e.g.*, shads, skipjack herring, goldeneye and white and striped bass) and bottom-dwellers (*e.g.*, shovelnose sturgeon, carp, blue sucker, buffalofishes, catfishes, and freshwater drum). A similar suite of species typically occurs in nearshore bank areas along with American eel, white and black crappie, sauger, and a variety of smaller fishes (*e.g.*, sunfishes, minnows, silversides). Many of the same species listed above occur in pools and slough habitats, but pools may host paddlefish and sloughs may contain bowfin, pirateperch, mosquitofish, and largemouth bass. Macroinvertebrate communities vary among the habitats described above. Macroinvertebrate communities in the main channel are generally found to be low in diversity and abundance, dominated by clams, oligochaetes, chironimids, and nematodes, and concentrated in silt and clay accumulations. Nearshore macroinvertebrate communities in the area are often more diverse, due to more moderate velocity, substrate heterogeneity, and less disturbance, due to decreased bedload transport. Caddisflies (*trichopterans*) often dominate in areas of artificial materials, while mayflies (*ephemeropterans*) are found in natural shorelines with clayey substrates.

Depending on the nature of the substrate clams, oligochaetes, mayflies, caddisflies, or chironimids may be found in high abundance. Sloughs may contain similar types as well as phantom midge larvae (*Chaoborus*), if isolated from the main channel for extended periods. SSIS at 5-14

97. Physical (non-toxic) and toxic potential impacts were considered. Potential non-toxic impacts of suspended solids on biota include light reduction, abrasion feeding interference, sedimentation, and destruction of habitat. SSIS at 5-15 to 5-16. Certain fish species may tend to avoid waters of high TSS levels (*e.g.*, >500 mg/l) such that a small zone of avoidance may exist downstream of the replacement facility discharge. The CORMIX mixing model indicates that high TSS would be restricted to a small area immediately downstream of the discharge. This area should not adversely affect fish movements of migration, due to the small area of elevated TSS, the limited exposure duration during plume transit, and adaptation of the indigenous fish community to naturally-occurring TSS levels. *Id.* at 5-16.

98. Based on the ambient suspended solids content of the River and the minor increase in ambient TSS concentrations, no significant impact to riverine biota is expected in the area of the discharge plume and potential depositional area. This conclusion is based on the magnitude of the incremental increase in TSS (less than 1 percent under low flow conditions), the location and areal extent of above-ambient TSS concentrations, and the nature of the River flora and fauna. The River biota is routinely exposed to ambient TSS levels well above the anticipated incremental level in the vicinity of the discharge and the areal extent of elevated TSS concentrations is very limited.

Inspection of monthly TSS values from 1989-1995 indicates an approximate mean ambient River TSS of 175 mg/l and an average monthly range of 81 to 362 mg/l. Maximum suspended solid concentrations in the spring and early summer can run well above 600 mg/l.[17] SSIS at 5-16.

99. The River fish community is composed of warmwater species which are adapted to the highly turbid conditions which are characteristic of large rivers. Fish movement and migration of local species should be unaffected by the slight increase in suspended solids, which is negligible in magnitude to the seasonal patterns of suspended solids. The incremental increase of less than 1.0 mg/l predicted is unlikely to be discernible to these species. The limited areal distribution of the elevated TSS below the discharge would be easily avoided under any circumstances. The impact of the minor increase in total suspended solids (< 1 percent) on ambient levels under low flow conditions should have no discernible effect on the underwater light regime. The impact of the elevated suspended solids on smaller planktonic organisms should likewise be negligible. The nature of the released solids (mainly raw River solids) should be compatible with the use of the water column by zooplankters and other filter-feeders. Filtration rates may be slightly adjusted in response to higher suspended particle concentrations, but levels are well below the natural range of suspended solids encountered by these species. SSIS at 5-16.

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[17] Monthly TSS values from 1974-1995 (before and after relocation and construction of Lock and Dam No. 26) indicate an approximate mean ambient River TSS of 175 mg/l and an average monthly range of 81 to 464 mg/l. Maximum suspended solid concentrations in the spring and early summer have run above 1,300 mg/l at times from 1974-1995.

100. Finally, the minor rates of deposition of silty material on the River bottom predicted by the SSIS settling analysis are unlikely to bury sessile organisms found there. This conclusion is based on the nature of the bottom habitat characterization conducted by ESI in 1997 indicating unsuitable habitat conditions for unionid colonization and a relatively depauperate unionid community within a silty bottom environment. A follow-up communication from ESI confirmed that silt deposition was uniform with depth from both shoreline upstream and downstream of the facility. *See* letter in Appendix B of SSIS. This indicates that no observable silt accumulation has occurred due to the current facility discharge despite 100 years of operation at the site. These observations are consistent with the predictions of the particle deposition model and the dynamic nature of bottom contours in the River. These factors tend to further mitigate potential impacts to the benthos. SSIS at 5-17.

101. The evaluation of aluminum and iron included considering chemical characteristics of the receiving water, coagulant content of the effluent discharges, potential concentrations of coagulant in the mixing zone, other benchmark values (such as AWQCs), and results from other studies.

102. Aluminum is one of the most common elements in natural materials and is a major component of geologic materials and soils. Aluminum has been shown to be toxic to many types of aquatic life, but the degree of toxicity is highly dependent upon water chemistry and relative proportions of various aluminum forms or species. Studies indicate that the aluminum that is occluded in minerals, clays, and sand or is strongly adsorbed to particulate matter is not toxic, nor is likely to be toxic under natural

conditions. Evaluation of toxicity is made more difficult, because of the complex nature of aluminum geochemistry and its ubiquitous presence in high abundance in the environment. SSIS at 5-17.

103. Despite its abundance in geologic materials and soils, aluminum rarely occurs in solution in natural waters in concentrations above 1.0 mg/l, but exceptions are seen in waters of low pH. Reported concentrations of 1.0 mg/l in neutral pH waters containing no unusual concentrations of complexing ions probably consist of largely particulate material, including aluminum hydroxide and aluminosilicates. Mineral complexes such as gibbsite are very small (near 0.1 μm diameter) and may pass through conventional filters used to operationally separate "dissolved" fractions in water quality analyses. The long term average dissolved aluminum concentration in the River near Alton is 0.026 mg/l (SSIS, Table 4-7), with a range of 0.010 to 0.220 mg/l. It is not known what proportion of this aluminum is in a dissolved, monomeric form. Most toxicity studies of aluminum have been associated with investigations of the environmental effects due to acidic deposition, commonly referred to as "acid rain." Toxicity from aluminum has been shown to occur in dilute, softwater (poorly buffered) lakes or streams with low ambient pH conditions (*e.g.*, pH <6.0 standard units). The literature also indicates that aluminum has little toxic effect at pH >6.5. A recent United States Fish and Wildlife Service (USFW) compendium of the effects of aluminum on wildlife referred to it as being "innocuous under circumneutral or alkaline conditions." Typical pH values in the River near Alton are circumneutral to alkaline, typically between 7.5 and 9.0. SSIS at 5-18.

104. Application of the AWQC for aluminum (87 ug/l) was used for comparison purposes, but has no regulatory standing for the proposed replacement facility. A water quality criterion for aquatic life has regulatory impact only after it has been adopted in a State water quality standard. Illinois Water Quality Standards do not have a standard for aluminum. Comparison of the results described in Section 5.1.1 of the SSIS indicate that under all flow conditions the contribution of the coagulant-generated aluminum does not cause an exceedance of the 87 ug/l AWQC. Inspection of the aluminum AWQC document indicates the criteria value is due, in large part, to potential toxicity to certain salmonid species. Application of the criteria to protect salmonids is inappropriate, because this portion of the River does not contain preferred salmonid habitat. SSIS at 5-18. Further, comparison of AWQC toxicity results based on laboratory experiments in which the aluminum is directly applied as soluble salts (*e.g.*, aluminum chloride or aluminum sulfate) under low hardness conditions to predict toxicity of ambient dissolved aluminum concentrations in the River is probably conservative, due to the potential biologically unavailable aluminum. As indicated earlier, the high pH values found in the River would prevent aluminum toxicity from being a concern. *Id.*

105. A similar analysis was conducted for iron. Modeling of the concentration impact was conducted using the measured clarifier and filter backwash levels. The average filter discharge value of dissolved iron was 0.009 mg/l. The results of these models indicate that the discharge does not pose a threat to exceed the value of Illinois Water Quality Standard for dissolved iron of 1.0 mg/l in the mixing zone. Ill. Adm. Code 302.208(g); SSIS at 5-19.

106. Like aluminum, iron is both ubiquitous and found in a variety of mineral and complexed forms. It is largely biologically unavailable, except for the dissolved form, which is typically found in significant proportion under conditions of low pH and/or low oxygen. The pH levels of the River are consistently above 7.0 and the river stretch in question is unlikely to suffer from low dissolved oxygen due to its shallowness and velocity. SSIS at 5-19.

107. The SSIS reaches the following conclusions regarding toxic potential impacts: (1) site specific (*i.e.*, non-salmonid) species are more tolerant and potential aluminum toxicity is unlikely; (2) the River normal pH range is 7.5-9.0; (3) the hardness of the River is greater than 50 mg/l as $CaCO_3$; (4) impact to the benthic community was addressed by conducting a mussel survey which indicated no unionid community at the discharge location; (5) water velocity at the discharge point is moderate, approximately 1.4 feet per second or higher; and (6) an environmental assessment was made considering water use, sediments, water chemistry, hydrology, and receiving water biology. SSIS at 5-20.

108. The only metal of concern generated by the coagulant is aluminum, and this is only a trace amount of the facility's solids discharge -- about **one third of one percent** (0.348%). As such, based on the high levels of natural complexation of aluminum and the low probability of toxic effects from this very small addition, the replacement facility's discharge poses no significant potential impact to the River environment.

109. The replacement facility's discharge will have no significant impact on the River biota in the area of the discharge plume and potential depositional area because: 1) the discharge will result in only a minor increase in the naturally high suspended solids content of the River; and 2) the River biota is routinely exposed to ambient TSS levels well above the anticipated incremental level in the vicinity of the discharge. SSIS at 5-11; 5-17. Similarly, the iron and aluminum content of the effluent discharge was found to have no significant potential impact on the River environment and its biota. *Id.* at 5-21.

Justification of the Proposed Adjusted Standard

110. Section 106.705(h) of the Procedural Rules provides that the petition must contain a statement which explains how the petitioner seeks to justify, pursuant to the applicable level of justification, the proposed adjusted standard. Section 28.1(c) of the Act explains how this requirement must be met for petitions brought pursuant to Section 28.1.

111. The level of justification required for the adjusted standard sought by the Water Company is specified at Section 28.1(c):

1. factors relating to [the Water Company] are substantially and significantly different from the factors relied upon by the Board in adopting the general regulation applicable to [the Water Company];

2. the existence of those factors justifies an adjusted standard;

3. the requested standard will not result in environmental or health effects substantially and significantly more adverse than the effects considered by the Board in adopting the rule of general applicability; and

4. the adjusted standard is consistent with any applicable federal law.

415 Ill. Comp. Stat. 5/28.1(c).

112. Factors exist relating to the Water Company which are substantially and significantly different from factors relied upon by the Board in adopting the general regulation applicable to the Water Company. The existence of these factors justifies an adjusted standard, and the requested standard will not result in environmental or health effects substantially and significantly more adverse than the effects considered by the Board in adopting the rule of general applicability. As well, the adjusted standard is consistent with applicable federal law (*See* paras. 144-163, below). Specifically:

(i) The iron and TSS content of the Water Company's proposed discharge will not affect domestic uses, nor will it result in significant bottom deposits or excessive turbidity, which are the factors the Board relied upon in adopting these effluent criteria. When the Board adopted effluent criteria for iron (dissolved and total), it relied on the determination that "[w]hile iron's toxicity to man is low, excessive iron can cause a nuisance for domestic uses or undesirable bottom deposits." Opinion of the Board, PCB R 70-8 *et al.*, Jan. 6, 1972, at 16. The Board based the effluent criterion for total suspended solids on the determination that "[t]here is a need to keep down other suspended solids too in order to prevent excessive turbidity and harmful bottom deposits." *Id.* at 19.

(ii) Site specific impacts of the proposed Alton replacement facility will not vary significantly from those which would result from application of candidate control technologies -- *i.e.*, on-site lagoons with subsequent off-site landfilling; and on-site lagoons combined with belt filter press dewatering and subsequent off-site landfilling.

The feasible candidate control technologies therefore do not provide effluent reduction benefits with regard to receiving water quality. The application of TSS treatment technology will not result in perceptible improvements in water quality or sediment quality, will not enhance habitat quality, and has no effect on local biota.

(iii) Although compliance with the regulation of general applicability is technically feasible in the sense that compliance can be achieved if the Water Company is required to implement on-site treatment technologies at considerable expense, direct discharge is warranted on economic grounds.

(iv) As noted above, the Board has granted relief to all similarly situated (non-lime softening) water treatment facilities that use the River as their raw water source. As a result of a lack of significant adverse environmental impact, combined with significant adverse economic impact and discharge disposal concerns, relief from the generally applicable industrial effluent standards is the appropriate *de facto* rule of general applicability for public water supply treatment facilities which receive their raw water from the River and do not use the lime softening process. This is the category of facilities to which the replacement facility belongs.

<u>Discussion of Factors Justifying Adjusted Standard</u>

113. Factors relating to the Water Company that justify the proposed adjusted standard turn on the absence of significant site specific environmental and health impacts of the replacement facility. Moreover, those impacts are not substantially or significantly more adverse than compliance with the generally applicable rule by means of one of the

candidate technologies -- *i.e.*, on-site lagoons with subsequent off-site landfilling and on-site lagoons combined with belt filter press dewatering and subsequent off-site landfilling.

114. To fully evaluate site specific impacts of the proposed Alton replacement facility, it is first necessary to examine what is considered BDT, as guided by the factors identified in 35 Ill. Adm. Code 304.102. Each of these factors is considered in detail below.

1) Technological Feasibility

115. A review of candidate control technologies for TSS control is provided in Section 6.1 of the SSIS and is discussed in specific detail in the Petition, above. *See* paras. 52-61, above. The various technologies assessed included direct discharge (current practice), land application, monofills, discharge to POTW, and various sludge dewatering methods with subsequent landfilling. From this evaluation (*see* Table 6-1 of the SSIS) it was noted that:

- the two options initially identified as most technically feasible (in addition to direct discharge) are: (1) on-site lagoons with subsequent off-site landfilling; and (2) on-site lagoons combined with belt filter press dewatering and subsequent off-site landfilling, and
- control technologies found to be not feasible on a long term basis include land application, monofills, and direct discharge to the Alton POTW. Vacuum filtration and centrifugation, while

feasible, have been shown to be less desirable than filter belt presses (*see* Table 6-1 of the SSIS for summary).

1) Economic Reasonableness

116. This factor requires the examination of the cost-benefit relationship between removal of effluent TSS to resulting effluent reduction benefits. Important factors for site specific relief include:

- the unusually high, naturally-occurring level of silt and suspended solids indigenous to the Mississippi River near Alton;
- statements by EPA that natural conditions found in larger highly turbid rivers may result in unreasonable cost-benefit relationship;
- EPA's acknowledgement that returning raw waste sludge to a highly turbid source can result in an imperceptible increase in TSS above ambient levels;
- the difficulty of handling alum-based residuals and its poor performance as landfill material;
- identification of two candidate technologies which are potentially capable of treating large volumes of effluent TSS -- *i.e.*, on-site lagoons with subsequent off-site landfilling; and on-site lagoons combined with belt filter press dewatering and subsequent off-site landfilling;
- total capital cost estimates for candidate control technologies which range in the millions of dollars; and

- operation and maintenance costs, which represent a continuing and potentially escalating cost for future facility operation. SSIS at 6-10.

117. Application of either of the candidate technologies discussed above would result in the estimated Alton effluent discharges meeting Illinois water quality standards for TSS. A cost-benefit analysis, however, demonstrates that considerable costs would be incurred by the proposed replacement facility to meet these effluent limitations without a clearly-defined improvement to the aquatic environment. In other words, application of candidate control technologies does not provide effluent reduction benefits with regard to receiving water quality. The application of TSS treatment technology will not result in perceptible improvements in water quality or sediment quality, will not enhance habitat quality, and has no effect on local biota. These factors are controlled by the nature of the receiving water, the River. Further, the TSS treatment: (i) is not needed for control of sludge or bottom deposits, visible oily odors, or plant or algal growth; and (ii) has no effect on stream morphology, and *de minimis* effect on stream chemistry and sediment chemistry. Because the discharge is comprised (>91%) of river silts, it will exhibit little or no differences in color. Turbidity was evaluated through water quality modeling (*see* Section 5.1 of the SSIS). The results of the CORMIX model indicate small areas (<0.5 acres) where surface receiving water TSS is predicted to be >5% above ambient conditions (*see* SSIS Figures 5-2, 5-4). As noted earlier, these areas may be interpreted as representing introduction of turbidity of "unnatural origin" but the level and spatial

extent of these areas does not result in an "Offensive Condition" exceedance. SSIS at 6-11.

118. The operation and maintenance ("O&M") costs for residual management for the proposed candidate technologies (*i.e.*, belt presses and lagoons) represent an increase of approximately 60% to 70%, respectively, of the current operational costs for potable water production at the existing Alton facility. In other words, for the same volume of potable water produced, the additional O&M costs of residual management will increase the facility's operational costs 1.6 to 1.7 times their current level. SSIS at 6-11.

119. Rate payer and community impacts are factors in considering the economic reasonableness of the BDT option. The costs of the control technology will be borne by Water Company rate payers. Annualized costs for the candidate technologies range from $1.14 to $1.63 million dollars per year. If these costs are divided by the number of households/businesses served (rounded to 17,500 people), the per unit cost ranges from $65 to $93 per year. In addition, some individual families could be adversely impacted as a result of construction, operation and transportation activities associated with a nearby residuals treatment facility.

120. Socioeconomic costs may be incurred by the potential loss of real estate value due to the presence of a lagoon in a residential area. Neighborhood concerns regarding lagoons have already been identified in recent public meetings, namely noise, odor, and traffic problems. The potential number of truck trips necessary to dispose of the treated sludge is estimated at approximately 750 trips per year. Additional truck

traffic results in potential noise, congestion, and increased traffic hazard. Some individual families could be particularly adversely impacted (*e.g.*, houses which potentially abut or overlook lagoons). Additional community impacts may be incurred due to the effect of increased traffic to activities associated with the newly-authorized City of Alton Park located next to the proposed facility entrance road. The park contains the natural bluff area and features a cliff painting of the "Piasa Bird." Potential conflicts exist for trucks entering and exiting the site to park traffic, park visitors, and bike park traffic. Better delineation of potential conflicts will require finalization of the park design. SSIS at 6-12.

121. As part of determining the appropriate discharge requirements, the Company considered the potential for pollution prevention and waste minimization. The following two factors were considered:

- waste reduction opportunities by process change, improved housekeeping and recovery of waste components for reuse; and
- segregation or combining of process wastewater streams.[18]

122. The type of process employed to make potable water is a critical factor which helps determine the nature, amount, and treatability of residuals produced. In the "Draft Development Document For Effluent Limitations Guidelines and Standards of Performance, Water Supply Industry," sub-categories for the water supply industry were based on the type of processes or combinations of processes used at a facility (U.S. EPA, 1975). *See* Attachment K hereto. The proposed replacement facility will rely on

[18] These are also required factors in the BDT determination.

coagulation of river silt by Clar+Ion® to achieve potable water. This type of process means that:

- the percentage of naturally-occurring material in the total solids returned to the River is typically 91% or greater;
- only a trace amount of the 8.7 percent discharge solids contributed by the coagulant is comprised of the metals of concern (*i.e.*, only 0.348 percent of the total discharge volume is comprised of aluminum or iron);
- conversely, the residual solids contain a minor amount of process-derived chemicals; and
- use of an alum-organic polymer such as Clar+Ion® leads to potentially greater disposal costs due to its poor storage and handling characteristics.

123. The possibility of incorporating a number of process changes to reduce the quantity of and to improve the quality of the effluent was considered for the proposed replacement facility. Evaluation of these process changes indicated that:

- stringent housekeeping measures (in effect at the existing facility) will be implemented at the proposed replacement facility;
- recovery of the small percentage of alum in the Clar+Ion® is not practicable at the proposed replacement facility due to the high silt content in the residuals; and
- segregation of waste streams will not reduce the treatment required nor improve the effluent quality.

Thus, no process design changes were identified to significantly reduce the quantity and improve the quality of the effluent. SSIS at 6-13.

124. As part of the BDT determination, sound engineering judgment was applied to integrate the various site specific factors and technical elements. A review of the cost-benefit analysis of the factors considered above indicates that technologically feasible methods exist for reducing TSS in discharge effluent to Illinois Water Quality Standards (*i.e.*, 15 mg/l daily average). The capital cost of these options could range from approximately $7.38 million to $10.8 million to implement. As discussed in paragraphs 59-61, above, operating costs would be substantial. SSIS at 6-13.

125. Important factors in determining the appropriate site specific discharge standards for the proposed replacement facility include the large amounts of naturally-derived TSS in the discharge with only minor quantities of process-generated TSS, and the discharge's lack of discernable environmental impact. The lack of discernable environmental impact is significant, because the economic reasonableness analysis on which BDT is based (and thus reasonably also on which site specific relief is based) presumes the existence of such impacts. Conventional treatment of process-generated TSS typically contends with only a small fraction of silt in the process influent water. In contrast, the River provides large volumes of silt in the intake water. This volume of silt translates into large residual volumes which must be disposed. Little environmental purpose is served in retaining these residuals and disposing of them on land at considerable economic cost to the Water Company, and ultimately its rate-paying customers. SSIS at 6-14.

126. Based on a review of modeled physical, chemical, and biological impacts to the River, the large naturally-occurring volumes of TSS and the lack of discharge environmental impact make the technically feasible treatment options unwarranted under BDT. It appears that little, if any, tangible environmental benefit will be derived from solids reduction. Water quality and biological communities will not be measurably enhanced by this solids reduction nor do they appear impacted by the cumulative impact of current discharges. These findings are similar to those reported from water treatment facilities on similar large, turbid rivers. Available aluminum and iron data indicates that dissolved concentrations of either are highly unlikely to impact biological communities in the River. SSIS at 6-14.

127. Benefits usually associated with solids reduction are improvement or enhancement of water quality of receiving waters. Solids reduction in this case will provide negligible improvement to the water quality parameters in question and no enhancement of existing biological communities or designated uses of the River. In addition, continuation of the return of effluent TSS from residuals does not result in degradation of the receiving water, as judged by potential impacts. SSIS at 6-14.

128. Application of the candidate control technologies -- *i.e.*, on-site lagoons with subsequent off-site landfilling; and on-site lagoons combined with belt filter press dewatering and subsequent off-site landfilling -- provides negligible reduction benefits. Based on a careful weighing of these factors, a determination of no treatment of TSS in the discharge is BDT for the proposed replacement facility. SSIS at 6-14.

129. Although compliance with the regulation of general applicability is

technically feasible (in the sense that compliance can be achieved, if the Water Company is required to implement on-site treatment technologies at considerable expense), direct discharge is warranted on economic grounds. As noted above, the Board has granted relief to all similarly situated (non-lime softening) water treatment facilities that use the River as their raw water source -- *i.e.*, the facilities that currently serve Rock Island, East Moline, Alton and East St. Louis. The replacement facility is not significantly different from these other facilities when analyzed pursuant to the factors relevant to evaluating adjusted standard relief for these types of public water supply facilities under the Act -- *i.e.*, Sections 28.1 and 28.3, BPJ, and BPT. Recent U.S. EPA action for a similar Missouri River facility also supports granting relief for the replacement facility on grounds including economic infeasibility. *See* Attachments M and N hereto.

3. Specific reasons for selection of direct discharge option

(i) Direct discharge is appropriate, because the effluent from the replacement facility will not adversely impact water quality of the River or the River environment.

130. As discussed in detail in paragraphs 65 *et seq.*, above, the replacement facility's direct discharge of residuals to the River will not adversely impact the River's water quality, or the environment. Water quality data on the River indicate that TSS and iron concentrations of the raw River water exceed the general effluent standards. As noted in paragraphs 107-109, above, the replacement facility's discharge will cause an imperceptible increase in the ambient water quality and will pose no significant impact on the River and the River environment. Therefore, the application of treatment technologies will not result in perceptible improvements in water or sediment quality,

will not enhance habitat quality, and will have no effect on local biota. As such, the current direct discharge allowed for the existing facility is also appropriate for the replacement facility.

(ii) U.S. EPA regulations, guidance documents and its recent determination for a similar facility recognize that direct discharge is appropriate.

131. U.S. EPA's decision not to promulgate effluent standards for the water industry and two key U.S. EPA guidance documents also suggest, like the Board's prior grant of relief to the facilities serving Rock Island, Alton, East Moline and East St. Louis, that residuals from raw water in large, highly turbid rivers should not be governed by general effluent standards. As a result, effluent standards for the water industry must be determined on a site-specific basis. U.S. EPA regulations and key guidance documents provide that discharge limitations should be determined on a site-specific basis and should take into account unique factors of the site. The guidance documents also support the proposition that silt removed from raw water may appropriately be returned to the River. Those documents are the U.S. EPA Permit Policy Statement #13 issued September 18, 1974 ("Permit Policy #13") and the Draft Development Document for Effluent Limitation Guidelines and Standards of Performance - Water Supply Industry (1975) ("Draft Development Document"). Permit Policy #13 and the Draft Development Document are attached hereto and incorporated by reference as Attachments L and K, respectively.

132. Permit Policy #13 concerns "Disposal of Supply Water Treatment Sludges"

and the following excerpts directly relate to the replacement facility:

- It is inappropriate to arbitrarily prohibit silt removed from public water supply streams from being returned to the stream. Rather, one must consider the "supply water silt burden, nature and quantity of chemical clarification aids used, availability of land disposal sites, economic impact, navigational considerations and water quality standards, to mention a few." (Page 1); and

- U.S. EPA recognized that in some instances the general effluent standards need not apply to the Mississippi River. "Because silt is indigenous to certain River waters, notably the Mississippi and Missouri Rivers, and because our priority concern is process generated pollutants, and because unreasonable cost-benefit relationships may result in some areas of these Rivers and others, it would be within the intent of best practicable control technology currently available to authorize, in some instances, either the partial or total return of silt type sludge to the receiving waters." (Page 2).

133. These excerpts emphasize two important points. First, U.S. EPA distinguishes sludges composed mainly of naturally occurring silts from water treatment sludges with high concentrations of process generated chemicals. This implies that discharge of the naturally occurring silt is not the type intended to be restricted and need not necessarily conform to the general effluent standards. Second, U.S. EPA acknowledges that because of the high silt content of the Mississippi River, return of these silts to the River can constitute the best technology option.

134. The Draft Development Document provides further insight into U.S. EPA's position on water supply treatment effluents. The document establishes TSS as a pollutant parameter for all subcategories of water treatment facilities. The Draft Development Document also acknowledges that: 1) return of residuals to a highly turbid

River will cause an imperceptible increase in turbidity; 2) treating such discharges is not cost-effective; and 3) alum-containing coagulant sludges present unique handling and disposal problems. Specifically, the Draft Development Document notes that:

- Extensive studies made at facilities along one highly turbid River have shown that returning the raw waste sludge to the highly turbid source increases the turbidity of the stream by an insignificant increment. In some instances the incremental increase in turbidity is less than the precision of many turbidimeters used for routine monitoring. (Page 46);

- These studies have also shown that the benefit-cost ratio for dewatering the sludge and hauling to landfills is very low, and that the amount of energy used in treating and hauling it is very high. Because of these factors the disposal of sludge from facilities that must use highly turbid water as feeds (>200 JTU on an annual average basis) should be judged on an individual basis. (Page 46); and

- Alum sludge is difficult to dewater by lagooning. However, it will gradually consolidate sufficiently to provide a 10% to 15% solids content. Water removal is normally by decantation or by evaporation with some drainage. Evaporation may provide a hard crust on the surface but the sludge below the crust is thixotropic, capable of turning into a viscous liquid upon agitation with near zero shear resistance under static load. Therefore, lagooned alum sludge cannot be easily handled nor will it make good landfill material. (Pages 75-76).

135. These excerpts demonstrate U.S. EPA's recognition that the costs of imposing TSS limitations on water treatment supply facility effluents, especially coagulant or alum sludges, outweigh the negligible improvement in water quality resulting from control technology. These U.S. EPA documents directly apply to the discharge by the replacement facility, and support direct discharge for the facility's process residuals.

136. The case for direct discharge is further supported by U.S. EPA's own recent determination that direct discharge is BPJ for Missouri-American Water Company's public water supply treatment facility located on the Missouri River in St. Joseph, Missouri. A copy of U.S. EPA's letter stating that direct discharge is BPJ is attached hereto and incorporated by reference as Attachment M. The Best Professional Judgment Study Report on which U.S. EPA's determination was based is attached hereto and incorporated by reference as Attachment N.

(iii) The Water Company's discharge will contain only trace elements of the metals of concern (aluminum and iron), which is insignificant as compared to the alum and iron returned by two other water treatment facilities currently permitted for direct discharge.

137. The U.S. EPA guidance documents confirm that the process employed to treat water is a critical factor which helps determine the nature, amount and treatability of residuals. As noted in paragraph 22, above, the replacement facility intends to rely on coagulation of river silt by Clar^{+}Ion® to achieve potable water. This process generally means that the percentage of naturally-occurring materials in the total solids returned to the River is typically 91% or greater. SSIS at 6-12. The coagulant contributes approximately 8.7% of the total solids content of the discharge. *Id.* Only 4% of the 8.7% coagulant total solids content is comprised of the metals of concern (*i.e.*, aluminum and iron), and none of the iron is generated by the coagulant. Aluminum contributes approximately only 0.348% -- approximately one third of one percent, by weight -- of the total solids content returned to the River. *Id.* at 6-2.

138. This minute fraction presents a marked contrast to the Board's findings regarding the Rock Island and East Moline public water supply facilities. The Board found that "it is undisputed" that 25 percent of the solids in East Moline's discharge are "added in the course of treatment." Opinion and Order of the Board, R87-35, March 8, 1990, Attachment O hereto, at p. 4. The percentage of solids discharged resulting from treatment additives was even worse in Rock Island. In analyzing Rock Island's proposal in its Petition to convert from an indirect to a direct discharge to the Mississippi River, the Board stated that:

> We do know that in this case the city's contribution of solids, as a percentage of the total solid content of its discharge, would be substantial, *on the order of 50%*; this is not merely a case of returning solids to the River.

Opinion and Order of the Board, R87-34, March 22, 1990, Attachment P hereto, at p. 13, emphasis added. Although the final orders granting direct discharge relief to the Rock Island and East Moline facilities required these facilities to attempt to reduce their volumes of coagulant based solids, the Water Company's replacement facility is already designed to implement state of the art best management practices to limit its discharges as much as possible to the solids it has withdrawn from the River, while still treating the river water in a manner which results in potable water that meets safety requirements under the federal Safe Drinking Water Act. The Water Company's discharge will unquestionably contain far less metal-based treatment additives than that of Rock Island and East Moline.

(iv) The costs, economic and non-economic, of the two candidate technologies significantly outweigh the negligible benefit of eliminating an imperceptible impact to the River's water quality.

139. Little environmental purpose is served in retaining the process residuals and disposing of them on land at considerable economic cost to the Water Company, and ultimately its rate paying customers. The imperceptible improvement to the water quality and aquatic environment of the River does not justify the considerable costs associated with the two candidate technologies -- *i.e.*, on-site lagoons with subsequent off-site landfilling; and belt filter press dewatering with subsequent off-site landfilling. As demonstrated in the SSIS, the direct discharge of process residuals will have no significant impact on water quality or sediment quality and will have no effect on local biota. As such, the application of the candidate technologies will not result in perceptible improvements to the water quality or local biota. Therefore, the significant annualized costs for the candidate technologies -- approximately $1,140,000 to $1,630,000 -- cannot be justified.

140. Furthermore, in considering economic reasonableness, rate payer and community impacts must be considered. The costs of residuals handling/treatment will be passed on to rate payers. Since the annualized costs of the candidate technologies are approximately $1,140,000 and $1,630,000, the annual cost per household/business served would be approximately $65 and $93, respectively -- a 22% to 31% annual water bill increase.[19/] Again, the significant rate payer cost increase is not justified by the

[19/] This calculation assumes the costs are spread across the approximately 17,500 rate payers within the Company's Alton District (*i.e.*, households and businesses to be served from the replacement facility) and that costs are spread equally among the rate payers.

negligible improvement to the River water quality (or State or federal regulations) which would result from residuals treatment/handling.

141. Finally, the cost-benefit analysis must also consider other intangible factors including, but not limited to, reduced and/or more expensive landfill capacity in the future, potential operational problems with the candidate technologies, and other socioeconomic costs.

(i) First, the candidate technologies would require significant landfill space to dispose of the process residuals. The use of available landfill space to dispose of what is largely naturally-occurring River silt would be an extremely ineffective use of landfill capacity.

(ii) Second, the candidate technologies could potentially experience operational difficulties. Operational difficulties should be anticipated, because of the wide range of TSS concentrations in the raw water and the variable quantity of solids to be handled. The likelihood of inclement weather would also lead to operating difficulties. These potential operating difficulties also argue against selecting either of the candidate technologies.

(iii) Finally, other socioeconomic costs and community impacts must be considered. Neighborhood concerns over potential loss of real estate value, noise, odor and traffic problems are likely to be associated with lagoons and site-related operations. For example, the number of truck trips necessary to dispose of the treated sludge is estimated at approximately 750 trips per year. This truck traffic could cause congestion, road degradation, and likely would be an increased traffic hazard. These traffic concerns are heightened by the City of Alton's plans to use the road over which the trucks would travel as the entry and exit road for a tourist attraction which features a painting of the legendary Piasa Bird.[20]

142. As noted in paragraphs 66; 129-138, above, Rock Island and East Moline have received Board relief from the generally applicable standards. The Board has also provided relief from the general effluent standards for water treatment facilities owned by the Water Company on two previous occasions. First, the Board promulgated a site-specific rule for the Water Company's existing water treatment facility in Alton. 35 Ill. Adm. Code 304.206. The Board provided that the existing facility's discharge into the River would not be subject to the effluent standards for TSS and iron of 35 Ill. Adm. Code 304.124. Similarly, the Board granted an adjusted standard for the Water Company's water treatment facility located in East St. Louis. 35 Ill. Adm. Code 304.220. There, the Board provided that the facility's discharge into the River would not be subject to the effluent standards for TSS and iron of 35 Ill. Adm. Code 304.124, provided that the Water Company used only biodegradable coagulants approved by U.S. EPA. The Water Company currently uses such biodegradable coagulants at the existing Alton facility and intends to continue to do so at the replacement facility.

143. As shown by the Water Company's detailed evaluation of all appropriate state and federal requirements for the replacement facility, relief from the general effluent standards is also warranted in this case.

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[20] The Piasa Bird is a legendary creature traditionally believed to have inhabited the bluffs.

Consistency with Federal Law

144. Section 106.705(i) of the Procedural Rules provides that the petition must contain a statement with supporting reasons that the Board may grant the proposed adjusted standard consistent with federal law. The petitioner must inform the Board of all procedural requirements imposed by federal law, but not by the Board's adjusted standard procedural requirements, which are applicable to the Board's decision on the petition. Citations to relevant regulatory and statutory authorities should also be included.

145. As noted in paragraph 14, above, the federal government has not promulgated any NPDES effluent standards for public water supply treatment facilities. As discussed below, recent U.S. EPA action for a similar Missouri River water treatment facility also supports the consistency of the proposed relief with federal law. The Board has noted that there are no federal effluent regulations for public water supply treatment facilities and has concluded that:

> In the absence of such regulations, effluent limitations are to be established on a case by case basis under Section 402(a)(1) of the Clean Water Act. (33 U.S.C. 1342(a)(1).) The Board continues to believe that directives from U.S. EPA give the Board and the Agency (as permitting authorities) broad discretion in determining the level of control to apply to discharges from water treatment plants.

Proposed Opinion and Order of the Board, PCB R85-11, June 16, 1988, at p. 8. *See* Attachment I hereto. In addition, U.S. EPA has found that direct discharge is appropriate for the St. Joseph, Missouri facility. *See* Attachment M hereto. Therefore, the proposed adjusted standard is consistent with federal law. As noted in paragraph 6, above, pursuant to this authority the Board has granted relief to all similarly situated non-lime softening facilities on the River when they have sought such relief.

146. As noted in paragraph 12, above, the need for an adjusted standard for the replacement facility is in part based on the need to apply the federal BPJ requirements in the replacement facility's NPDES permit. U.S. EPA guidance documents, discussed below, also provide that discharge limitations should be determined on a site-specific basis and must take into account unique factors, such as the turbid nature of the raw water. The guidance documents state that, in appropriate instances, residuals from public water supply systems may be returned to the River.

147. Pursuant to Section 402(a) of the CWA, developing effluent limitations on a case-by-case basis requires application of the BPJ factors listed in 40 C.F.R. § 125.3(d) and consideration of: (i) the appropriate technology for the category or class of point sources of which the applicant is a member, based on available information; and (ii) any unique factors relating to the applicant. 40 C.F.R. § 125.3(c)(2).[21/] Evaluation of two specific elements is also required in setting BPJ for the replacement facility -- best practicable control technology currently available ("BPT") and best conventional pollutant control technology ("BCT"). 40 C.F.R. § 125.3(d).

148. BPT factors are: (i) the total cost of application of technology in relation to the effluent reduction benefits to be achieved from such application; (ii) the age of

[21/] As noted, the BPJ permit factors overlap many of the factors the Board will apply to adjusted standards pursuant to Section 28.1 of the Act -- *e.g.*, the technical feasibility and economic reasonableness of reducing the particular type of pollution, and other unique factors such as existing physical conditions. Along with the Section 28.3(c) factors and BDT (35 Ill. Adm. Code 304.102) factors, these are the directly relevant factors for evaluating the merits of a public water supply facility's request for relief from the Board's general industrial effluent standards.

equipment and facilities involved; (iii) the process employed; (iv) the engineering aspects of the application of various types of control techniques; (v) process changes; and (vi) non-water quality environmental impact (including energy requirements). 40 C.F.R. § 125.3(d)(1). The BCT analysis includes the BPT issues and one additional factor: the comparison of the cost and level of reduction of such pollutants from the discharge from publicly owned treatment works to the cost and level of reduction of such pollutants from a class or category of industrial sources. *Id.*

149. Developing effluent limits on a case-by-case basis pursuant to federal law requires consideration of: (i) the appropriate technology for the category or class of point sources of which the applicant is a member, based on available information; and (ii) any unique factors relating to the applicant. 40 C.F.R. § 125.3(c)(2). It is also necessary to consider the appropriate factors listed in 40 C.F.R. § 125.3(d) in developing these effluent limits.

Consideration of Appropriate Technology and Unique Factors

150. Paragraphs 52 through 61 and 18 through 49, above, discuss appropriate technologies for water treatment facilities and unique factors relating to the Water Company. The Water Company respectfully refers the Board to those sections for a full discussion of the Water Company's compliance with these federal requirements.

Determination of BPT Under Best Professional Judgment

151. As noted in paragraph 148, above, 40 C.F.R. § 125.3(d)(1) provides the factors necessary for the determination of BPT. Many of these factors have been

previously considered in this Petition and the relevant paragraphs will be referenced as appropriate. The remainder of the factors will be discussed in detail below.

152. The first factor to consider for BPT is the total cost of application of technology in relation to the effluent reduction benefits to be achieved from such application. 40 C.F.R. § 125.3(d)(1)(i). Essentially, this factor examines the cost-benefit relationship between removal of effluent TSS to resulting effluent reduction benefits and has been evaluated in paragraphs 139-141, above; see also, SSIS at 6-15 to 6-20.

153. The second factor to consider under BPT is the age of equipment and facilities involved. 40 C.F.R. § 125.3(d)(1)(ii). All equipment at the replacement facility will be new; therefore, this factor is not a constraint for the facility.

154. The third factor under BPT is the process employed. 40 C.F.R. § 125.3(d)(1)(iii). The type of process employed to treat the raw River water is a critical factor which helps determine the nature, amount, and treatability of residuals produced. As noted in paragraph 22, above, the replacement facility intends to rely on coagulation of River sediments by Clar⁺Ion® to achieve potable water. Under this type of process, the percentage of naturally-occurring material in the total solids returned to the River is typically 91% or greater. SSIS at 6-12. Of the 8.7% total solids which is contributed by the coagulant, only a trace amount is comprised of aluminum -- only about **one third of one percent** (0.348%), by weight, of the facility's solids discharge. SSIS at 6-2.

155. The fourth factor to consider under BPT is the engineering aspects of the application of various types of control techniques. 40 C.F.R. § 125.3(d)(1)(iv).

Consideration of this factor is provided in paragraphs 52-58, above; *see also*, SSIS at 6-1 to 6-9.

156. The fifth factor under BPT is process changes. 40 C.F.R. § 125.3(d)(1)(v). As part of the BDT consideration, pollution prevention and/or waste minimization at the replacement facility was investigated. However, there is little or nothing the Water Company can do to further minimize waste or prevent pollution for the following reasons:

- There is limited potential for treatment process change, as the replacement facility must treat the River water to a potable level which meets Safe Drinking Water Act requirements.

- Process changes, including minimization of the amount or the nature of chemicals added, have already been implemented by the Water Company to the extent feasible. In any event, process changes in themselves will not greatly reduce the amount of residuals, because the quantity of residuals will always be dictated by the differences between raw water quality and the drinking water standards.

- Operational improvements, such as the continuous discharge of residuals through the use of Superpulsators® instead of conventional clarifiers have already been incorporated.

- Stringent housekeeping measures (in effect at the existing facility) will be implemented at the replacement facility.

- Recovery of the small percentage of aluminum in the Clar$^+$Ion® is not practicable at the replacement facility, due to the high silt content in the residuals.

- Segregation of waste streams will not reduce the treatment required nor improve the effluent quality.

See SSIS at 5-23 to 5-24 and 6-12 to 6-13. Thus, no process design changes exist to significantly reduce the quantity or improve the quality of the effluent.

157. The last factor to consider under BPT is the non-water quality environmental impact (including energy requirements). 40 C.F.R. § 125.3(d)(1)(vi). Non-water quality environmental impacts, most of which were discussed above (*e.g.*, paras. 118-121; 141), include: 1) landfill space requirements for the dewatering lagoon and mechanical filter press techniques; 2) land acreage needed for storage lagoons; 3) potential energy requirements for handling and pumping sludges; 4) loss of viable farm land during the foreseeable future (*i.e.*, next 30 years); 5) approximately 750 truckloads per year to transport and dispose of treated sludge; and 6) community stakeholder issues regarding noise, odor, and aesthetic concerns.

158. Based on consideration of the statutory and unique factors, BPT for the facility, determined through BPJ, is no treatment of the discharge.

Determination of BCT Under Best Professional Judgment

159. 40 C.F.R. § 125.3(d)(1) provides the factors necessary for the determination of BCT. All but one of the factors have been previously considered in this Petition. The remaining factor will be discussed below.

160. The additional factor under BCT is the comparison of the cost and level of reduction of such pollutants from the discharge from POTWs to the cost and level of reduction of such pollutants from a class or category of industrial sources. 40 C.F.R. § 125.3(d)(2)(ii). This factor examines the cost reasonableness of the TSS control technology (*i.e.*, pressure filtration) as it compares to the cost and level of reduction of TSS from the discharge from POTWs.

161. The BCT methodology is undertaken to determine whether it is cost-reasonable for industry to control conventional pollutants at levels more stringent than BPT limitations. To "pass" the POTW portion of the cost test, the cost per pound of conventional pollutant removed by industrial dischargers in upgrading from BPT to the candidate BCT must be less than the cost per pound of conventional pollutant removed in upgrading POTWs from secondary treatment to advanced secondary treatment. 51 Fed. Reg. 24974-25002 (1986). In general, the upgrade cost to industry must be less than EPA's POTW benchmark cost of $0.25 per pound of TSS (in 1976 dollars). *Id.*

162. For the replacement facility, a final unit operation process of pressure filtration will reduce the TSS concentration of the effluent from the generally applicable regulatory limit of 15 mg/l TSS[22/] to essentially zero.[23/] SSIS at 6-18, 6-19. The annualized costs (in 1976 dollars) per pound of TSS removed by the pressure filtration process amounts to $4.38 per pound of TSS.[24/] *Id.* at 6-23. When compared to EPA's benchmark of $0.25 per pound of TSS, the pressure filtration candidate technology fails the cost reasonableness test by orders of magnitude.

22/ As explained in the SSIS, U.S. EPA suggested in the St. Joseph permit proceeding that when the BPJ process indicates that BPT is direct discharge, the cost-reasonableness issue under BCT should nonetheless (for this purpose only) presume that BPT is conventional treatment. Thus, the BPT number for this calculation is the generally applicable effluent standard of 15 mg/l.

23/ The pressure filtration system has been sized based on an estimated hydraulic flow rate of the total residuals.

24/ The annualized cost for a pressure filtration system was calculated by amortizing the capital costs over 30 years at a 9 percent interest rate and adding the yearly operation and maintenance costs. This cost was then indexed to 1976 dollars.

163. Based on the results of the POTW cost test, the candidate BCT technology is not cost-reasonable. As a result, direct discharge is the appropriate control technology under both BPT and BCT.

Hearing Request or Waiver

164. Section 106.705(j) of the Procedural Rules provides that the petition must state whether the petitioner requests or waives its right to a hearing on the petition. Hearings are evidentiary in nature and are held before a hearing officer appointed by the Board and are transcribed before a court reporter. Pursuant to the requirements of Section 106.713 of the Procedural Rules; the Water Company requests that the Board give notice of the petition and schedule a hearing in accordance with 35 Ill. Adm. Code Part 103.

Supporting Documents and Legal Authorities

165. Section 106.705(k) of the Procedural Rules provides that the petition must cite to supporting documents or legal authorities whenever such are used as a basis for the petitioner's proof. Relevant portions of such documents and legal authorities other than Board decisions, state regulations, statutes and reported cases shall be appended to the petition. The Water Company has appended to the Petition the following documents:

Attachment A--Photographs of River Flood at the Existing Facility, Summer 1993
Attachment B--Site Specific Analysis for Replacement Facility, March 1999
Attachment C--Final Opinion and Order of the Board, PCB R82-3, March 9, 1994
Attachment D--Opinion and Order of the Board, PCB AS 91-13, Oct. 19, 1995
Attachment E--Opinion and Order of the Board, PCB AS 91-9, May 19, 1994
Attachment F--Opinion and Order of the Board, PCB AS 91-11, May 20, 1993
Attachment G--Opinion of the Board, PCB R70-8 et al., January 6, 1972
Attachment H--Illinois Institute for Environmental Quality's Evaluation of Effluent Regulations of the State of Illinois, June 1976

Attachment I--Proposed Opinion and Order of the Board, PCB R85-11, June 16, 1988

Attachment J--U.S. EPA's Amended Section 301(h) Technical Support Document, Sept. 1994

Attachment K--U.S. EPA's Draft Development Document for Effluent Limitations Guidelines and Standards of Performance, March 1975

Attachment L--U.S. EPA's Permit Policy 13, Sept. 1974

Attachment M--Memo and letter from John Dunn (U.S. EPA) to Gale Hutton (Missouri Department of Natural Resources)

Attachment N--BPJ Evaluation of Existing NPDES Effluent Limitations at Missouri-American Facility, St. Joseph, MO

Attachment O--Final Opinion and Order of the Board, PCB R87-35, March 8, 1990

Attachment P--Opinion and Order of the Board, PCB R87-34, March 22, 1990

CONCLUSION

WHEREFORE, for all the reasons stated above, Illinois-American Water Company respectfully requests that the Board set this Petition for hearing and grant the adjusted standard specified herein for the Water Company's replacement public water supply treatment facility in Alton, Madison County, Illinois.

Respectfully Submitted,

ILLINOIS-AMERICAN
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CERTIFICATE OF SERVICE

I, the undersigned, certify that I have served the attached Petition for Adjusted Standard of Illinois-American Water Company and Appearances of Nancy J. Rich and James E. Mitchell, by Messenger upon:

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