

ILLINOIS POLLUTION CONTROL BOARD  
June 23, 1994

IN THE MATTER OF: )  
 )  
PETITION OF RHONE-POULENC BASIC )  
CHEMICALS COMPANY and THORN CREEK ) AS 94-7  
BASIN SANITARY DISTRICT FOR AN ) (Adjusted Standard)  
ADJUSTED STANDARD FROM 35 ILL. )  
ADM. CODE 302.208 and 304.105 )

OPINION AND ORDER OF THE BOARD (by R.C. Flemal):

This matter comes before the Board upon a petition for adjusted standard filed by Rhône-Poulenc Basic Chemicals Company (Rhône-Poulenc) and the Thorn Creek Basin Sanitary District (TCBSD) (collectively as petitioners). Petitioners request an adjusted standard from 35 Ill. Adm. Code 302.208 and 304.105, as those sections apply to the discharge of total dissolved solids (TDS) and sulfate from TCBSD's treatment plant to Thorn Creek and the Little Calumet River.

Rhône-Poulenc desires to construct a new silica production plant. This plant would produce a wastewater with high sodium sulfate content (and hence also high TDS). Petitioners intend to treat this wastewater at TCBSD's wastewater treatment plant (WWTP). Although TCBSD has the capability of treating the projected Rhône-Poulenc discharges to a high degree, petitioners nevertheless believe that the new loadings to the WWTP would contribute to excursions from the water quality standards for TDS and sulfate in Thorn Creek and the Little Calumet River. On this basis, Rhône-Poulenc and TCBSD contend that an adjusted standard from Section 304.105 and Section 302.208 is necessary for TCBSD to be able to accept Rhône-Poulenc projected new discharges.

The Board's responsibility in this matter arises from the Environmental Protection Act (Act) (415 ILCS 5/1 et seq.) The Board is charged therein to "determine, define and implement the environmental control standards applicable in the State of Illinois" (415 ILCS 5/5(b)) and to "grant \*\*\* an adjusted standard for persons who can justify such an adjustment" (415 ILCS 5/28/1(a)). More generally, the Board's responsibility in this matter is based on the system of checks and balances integral to Illinois environmental governance: the Board is charged with the rulemaking and principal adjudicatory functions, and the Agency is responsible for carrying out the principal administrative duties.

Based upon the record before it and upon review of the factors involved in the consideration of adjusted standards, the Board finds that petitioners have demonstrated that grant of an adjusted standard in the instant matter is warranted. The

adjusted standard accordingly will be granted, with conditions consistent with this opinion.

#### PROCEDURAL HISTORY

The petition in this matter was filed on February 18, 1994.

The Illinois Environmental Protection Agency (Agency) filed its statutory response to the adjusted standard petition on March 22, 1994. The Agency recommended that the adjusted standard be granted with conditions.

On April 11, 1994 petitioners filed a response to the Agency's recommended conditions. On May 3, 1994 the Agency filed an amended response to the original adjusted standard petition. The Agency therein continued to recommend that the petition be granted with conditions.

On May 5, 1994 petitioners filed a motion for decision. The Board today grants that motion and issues its decision on the petition.

Petitioners waived hearing; no other person requested a hearing, and the Board did not require a hearing. Consequently no hearing has been held.

#### ADJUSTED STANDARD PROCEDURE

The Act provides that a petitioner may request, and the Board may impose, an environmental standard that is different from the standard that would otherwise apply to the petitioner as the consequence of the operation of a rule of general applicability. Such a standard is called an adjusted standard. The general procedures that govern an adjusted standard proceeding are found at Section 28.1 of the Act and within the Board's procedural rules at 35 Ill. Adm. Code Part 106.

Where, as here, the regulation of general applicability does not specify a level of justification required for a petitioner to qualify for an adjusted standard, the Act at Section 28.1(c) specifies four demonstrations that must be made by a successful petitioner:

- 1) Factors relating to that petitioner are substantially and significantly different from the factors relied upon by the Board in adopting the general regulation applicable to that petitioner;
- 2) The existence of those factors justifies an adjusted standard;

- 3) The requested standard will not result in environmental or health effects substantially or 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.

### FACILITY DESCRIPTIONS<sup>1</sup>

#### Rhône-Poulenc Facility

Rhône-Poulenc owns and operates a plant at 1101 Arnold Street, Chicago Heights, Cook County, Illinois. The facility has been in operation since 1902 when it was Victor Chemical Works. Stauffer Chemical Company bought Victor Chemical in 1959. Rhône-Poulenc purchased the Basic Chemicals Division of Stauffer Chemical Company in December 1987. The name was officially changed to Rhône-Poulenc Basic Chemicals Co. in September 1989. The facility currently employs 328 people and manufactures inorganic phosphate chemicals and sodium bicarbonate, primarily for food use. Most of the manufacturing processes involve the chemical reaction of phosphoric acid with either soda ash or slaked lime. All process wastewaters are discharged to TCBSD. (Pet. at 2, 4.)

Rhône-Poulenc proposes to add a new silica plant, at which it intends to manufacture silica through the reaction of liquid sodium silicate and sulfuric acid. The new facility will produce fused silica, a powder to be used primarily in the production of tires, with a secondary use as toothpaste additive. Rhône-Poulenc has proposed this addition at its Chicago Heights plant because the site is ideally located relative to both the raw materials necessary for the silica process and the receiving market. The silica plant will provide an additional 25 employees, not including construction contractors. The intent is to manufacture 20,000 metric tons of silica per year. (Pet. at 4.) A process flow diagram for the proposed production of silica is set forth at Figure 2-4 of Attachment A to the petition.

A byproduct of the proposed silica production process is sodium sulfate in aqueous solution. Part of the sodium sulfate is recovered, by there remains a residual which constitutes the wastestream at issue here.

Four general grades of silica will be produced (termed Z-160, T-73, GT, and Z-45). Z-160 is proposed to be produced 77%

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<sup>1</sup> All information on the facilities is extracted from the petition at pp. 1-4.

of the time, T-73 12% of the time, GT 10% of the time, and Z-45 1% of the time. The process begins by reacting sodium silicate in two 14,700 gallon reactors. Once the reaction is complete, the silica is removed from the solution via filtration. Filtrate from the production of Z-160 or Z-45 is filtered on one of three filter presses operated on a batch basis. For Z-160 and Z-45, the filtration cycle lasts four minutes, and the filtrate will typically contain 4.10% TDS (as sodium sulfate) in 2,700 gallons per batch for Z-160, and 4.75% TDS in 1,600 gallons per batch for the Z-45. The filtrate produced during the filtration cycle is diverted to the mother liquor tank. The filter cake is then washed with water and squeezed to remove residual sodium sulfate, and the filtrate is directed to a 20,000 gallon equalization tank. The wash cycle typically lasts 35 minutes and uses 7,900 gallons of water for Z-160, and lasts 60 minutes and uses 13,000 gallons of water for Z-45. The TDS concentration of these streams declines toward 0 percent sodium sulfate by the end of each cycle. (Pet. at 4-6.)

Two rotary vacuum filters are used to remove the silica from solution for the production of the T-73, GT, and some of the Z-45 grade silica production. The rotary filters operate on a continuous basis during the production of these silica products, and thereby equalize the resulting filtrate stream from these filters. During the production of the T-73, the rotary filter will produce a stream of 256 gallons per minute with a projected TDS concentration of 2.64%. The GT grade silica will produce a stream of 287 gallons per minute with a projected TDS concentration of 2.63% while the Z-45 grade silica, when filtered on the rotary vacuum filters, will produce a stream of 198 gallons per minute with a projected TDS concentration of 1.72%. All streams from the rotary vacuum filters are diverted to the same 20,000 gallon equalization tank as the filter press wash and squeeze streams. The mother liquor tank and equalization tank flows are combined prior to discharge. The net result is a continuous discharge to the sanitary sewer which is relatively consistent with respect to both sodium sulfate concentration and flow rate. (Id.)

Although state-of-the art process controls are part of the proposed facility design, the silica reaction may occur under less than optimal operating conditions from time to time (e.g., fluctuations in pH). Based upon operating experience at Rhône-Poulenc's silica plant in Collonges, France, such occurrences are expected to be infrequent. Silica precipitated under varying process conditions has a different crystalline structure, and therefore different performance characteristics, than that required for the intended product. It is therefore necessary to divert low-grade silica from the process. (Id.)

Low-grade silica batches leaving the reactor will be diverted to a 20,000 gallon process drainage tank. Like normal

batches leaving the reactors (prior to filtration and washing), these batches will typically contain 4.10 to 4.75% TDS, depending on the silica being produced. Because these batches must be diverted prior to filtration, they will also contain precipitated silica (suspended solids). The stream from the process drainage tank would be metered into the combined mother liquor tank/equalization tank flow to maintain a continuous discharge with respect to sodium sulfate, suspended solids and flow rate to the sanitary sewer. (Id.)

### TCBSD Facility

Wastewaters from the new silica plant are proposed to be discharged to TCBSD's WWTP. The WWTP is located in Chicago Heights, Illinois, and provides wastewater treatment for the communities of Chicago Heights, Park Forest, Homewood, South Chicago Heights, Steger, and Crete. The treatment plant was originally constructed in 1933 and has undergone a number of construction projects including an expansion to accept flows from the Homewood Regional Plant. (Pet. at 7.)

In addition to a population of over 100,000, the TCBSD WWTP serves 350 industrial and commercial users. This industrial and commercial sector accounts for one percent of the users and 15 percent of the influent flowrate based upon February 1993 values. The major industrial users are manufacturing facilities, including steel manufacturing and stamping facilities. Included in the industrial users besides Rhône-Poulenc are Ford Motor Company, Calumet Industries, Chicago Heights Steel, Rohm & Hass, and AL Laboratories.

The TCBSD WWTP has been cited as an exemplary treatment plant, based on its overall efficiency and environmental control, by both an independent engineering team of the Agency and the Central States Water Pollution Control Association. The WWTP represents a \$40 million investment, including an on-site laboratory and computer monitoring and control. A schematic of the WWTP is presented in Figure 2-3 of Attachment A to the petition.

TCBSD's WWTP has a design average flow of 15.9 mgd and design maximum flow of 40.25 mgd. Current dry-weather average flow is 12.5 mgd, based upon the average of the lowest three months in 1992. This is 3.4 mgd below the design average flow of 15.9 mgd. Thus, the TCBSD contends that the WWTP has available capacity for future growth, including the proposed Rhône-Poulenc discharges. TCBSD is also capable of treating Rhône-Poulenc's wastes to the degree necessary to achieve the adjusted standard.

Table 2-3 of Attachment A to the petition, repeated below, sets forth the projected quality and quantities of the proposed discharges from Rhône-Poulenc to TCBSD.

TABLE 2-3  
PROJECTED LOADING FROM PROPOSED  
RHÔNE-POULENC SILICA PROJECT

<u>Parameter</u>	<u>Annual Average</u>	<u>Daily Maximum</u>
Flow, gpd	536,000	743,000
TDS, mg/L	18,600	26,500
Sulfate, mg/L	12,500	17,900
TDS, lbs/day	83,100	91,800
Sulfate, lbs/day	56,100	62,100

The peak daily discharge of TDS, 26,500 mg/L, takes into account the wastewater added to the effluent from the process drainage tank after low-grade silica batches are generated<sup>2</sup>.

RULES OF GENERAL APPLICABILITY

The Board's general effluent regulations do not include specific limitations for either TDS<sup>3</sup> or sulfate. However, they

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<sup>2</sup> The feasibility of other options for the handling of low-grade silica batches was investigated by Rhône-Poulenc, including the feasibility of processing (filtering and drying) the batches between product line "campaigns". Marketing personnel indicated that there were no known markets for such a product. Engineering personnel familiar with the Collonges silica plant have indicated that reuse of low-grade silica batches (either processed or unprocessed) in the production of the liquid sodium silicate raw material is not feasible due to its crystalline structure. Absent an identified market for use/reuse, processed low-grade silica would require disposal in an off-site landfill. TCBSD is capable of accepting an unprocessed, low-grade silica batch as an occasional component of the silica plant's effluent. Since TCBSD is capable of removing suspended solids from the silica plant effluent, and since there is no net increase in TDS discharged to Thorn Creek, the high opportunity cost of an additional processing step is not justified. In addition, TCBSD's sludge is used for beneficial land application and does not require disposal in a landfill. Finally, TCBSD has determined that the addition of the proposed silica plant effluent will have no negative impact on the beneficial land application of its sludge.

<sup>3</sup> The Board at one time adopted an effluent standard of 3,500 mg/l for TDS (R70-18, 3 PCB 419, January 7, 1972), but later repealed it after recognition that the treatment processes for TDS are expensive, consume large amounts of energy, and produce dry solids or brines, that themselves require disposal. (see Board's opinion in R76-21, 43 PCB 367, September 24, 1981),

do prohibit any discharge that would cause or contribute to a violation of a water quality standard (35 Ill. Adm. Code 304.105); there are water quality standards for both TDS and sulfate.

In the instant case, the pertinent water quality standards are the Board's General Use Water Quality Standards found at 35 Ill. Adm. Code 302.208. The General Use Water Quality Standard for TDS is 1000 mg/L and the General Use Water Quality Standard for sulfate is 500 mg/L. The intent of these standards is to protect aquatic life and to safeguard the quality of waters of the state for consumptive uses, including public water supply. They apply in most of Thorn Creek and the portion of the Little Calumet River to which Thorn Creek is tributary.

The Board notes that the applicable water quality standard for TDS in a portion of Thorn Creek already departs from the 1,000 mg/L General Use Standard due to an adjusted standard granted by this Board in 1991 in Docket AS 89-3<sup>4</sup>. The TDS standard established in AS 89-3 is 2,100 mg/L. It is applicable on the reach of Thorn Creek between the mouth of Deer Creek at mile 8.1 on Thorn Creek River and the U.S. Geological Survey (USGS) gaging station at mile 4.2 of Thorn Creek. The TCBSD outfall is located upstream of this reach at approximately mile 10.1 of Thorn Creek.

#### RELIEF REQUESTED

Petitioners request adjusted water quality standards for TDS and sulfate. The values that are requested decrease downstream, as follows:

1. 2,100 mg/L for TDS and 1,000 mg/L for sulfate on Thorn Creek from the TCBSD outfall (approximately mile 10.0 on Thorn Creek) to the USGS Gaging Station 05536275 in Thornton (mile 4.2 on Thorn Creek).
2. 1,900 mg/L for TDS and 850 mg/L for sulfate on Thorn Creek from the USGS Gaging Station 05536275 to Thorn Creek's confluence with the Little Calumet River (mile 0.0 on Thorn Creek)

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with final action at 44 PCB 203, December 3, 1981.)

<sup>4</sup> In the matter of: Petition of the Nutrasweet Company and Consumers Illinois Water Company for an Adjusted Standard from 35 Ill. Adm. Code 304.105 and 302.208, AS 89-3, 119 PCB 105, February 28, 1991.

3. 1,700 mg/L for TDS and 750 mg/L for sulfate on the Little Calumet River from Thorn Creek (mile 25.0 on the Little Calumet River) to the Cal-Sag Channel (mile 16.2 on the Little Calumet River).

The existing provision against causing or contributing to violation of any water quality standard at 35 Ill. Adm. Code 304.105 would remain in effect for petitioners. It the only the value of the water quality standards for TDS and sulfate that are at issue here.

### COMPLIANCE ALTERNATIVES

#### Applicable Technologies

It is uncontested that order for Rhône-Poulenc and TCBSD to consistently comply with the instream water quality standards absent the adjusted standard, it would be necessary for Rhône-Poulenc to pretreat its proposed discharge. Rhône-Poulenc accordingly has analyzed various pretreatment processes and assessed their viability.

The proposed silica plant wastewater design characteristics suggest several TDS/sodium sulfate pretreatment removal and disposal technologies. Taking into consideration the flow and variability of the wastewater stream, Rhône-Poulenc considered the following options:

- 1) Electrodialysis;
- 2) Evaporation;
- 3) Evaporation with Mechanical Vapor Recompression (MVR);
- 4) Ion Exchange
- 5) Nanofiltration with Evaporation with MVR; and
- 6) Reverse Osmosis. (Pet. at 8.)

Rhône-Poulenc states that it was informed by vendors that electrodialysis, ion exchange, and reverse osmosis were not suitable for its wastestream due to the high sodium sulfate concentration, and that evaporation schemes would require multiple effects (or evaporators). Rhône-Poulenc also learned that electrodialysis has not yet been adequately developed for this type of industrial use. (Pet. at 8.) Rhône-Poulenc therefore evaluated the remaining technologies:

- 1) Quadruple-Effect Evaporation;
- 2) Double-Effect Evaporation with MVR; and
- 3) Nanofiltration with Double-Effect Evaporation with MVR.

Quadruple-Effect Evaporation (Alternative 1): This technology produces dry sodium sulfate from a dilute aqueous solution. This result is achieved by concentrating and subsequently crystallizing the sodium sulfate out of the process liquor. Four evaporators (effects) are required, and the feed must be pumped through them in series. The aqueous feed stream is preheated prior to its introduction into the evaporators. Backward feed is employed (dilute liquor enters the last and coldest effect, and leaves concentrated in the first effect, which is at the highest temperature). The feed stream is concentrated in the evaporators. Crystallization occurs in the first effect, where the feed undergoes further concentration. Centrifugation and drying steps follow evaporation and crystallization in the evaporators. (Pet. at 9; Attachment B.)

Double-Effect Evaporation with MVR (Alternative 2): This technology also produces dry sodium sulfate from a dilute aqueous solution by concentrating and subsequently crystallizing the sodium sulfate out of the process liquor. However, for energy conservation reasons, both evaporator and crystallizer vessels are used, as well as a centrifugal compressor. The compressor compresses the vapors generated in the evaporator and crystallizer vessels to a higher pressure, and these vapors are then used as the heating steam in the evaporator and crystallizer heating elements. Two evaporators are required. The aqueous feed stream is preheated prior to its introduction into the evaporators where it is concentrated. The concentrated feed stream is then pumped to a crystallizer, where the feed undergoes further concentration. Evaporation of water after concentration in the crystallizer results in sodium sulfate solids precipitation. This is achieved by heating the slurry in the crystallizer (with steam supplied by the compressor). Centrifugation and drying steps follow evaporation and crystallization. (Pet at 9; Attachment C.)

Nanofiltration with Double-Effect Evaporation with MVR (Alternative 3): This technology is a membrane process which lies between ultrafiltration (UF) and reverse osmosis (RO) in terms of salt rejections. As applied to Rhône-Poulenc's process, this technology yields a four-fold concentration of the sodium sulfate with approximately a two percent leakage of the permeate stream. Thus, 75 percent of the feed water volume would be "sodium sulfate free," and 25 percent of the feed water would be enriched in sodium sulfate and, therefore, suitable for evaporation (to dry and concentrate the sodium sulfate). The feed water must be free of any suspended solids and silica must be below 25 ppm in the feed water to prevent precipitation. Therefore, pretreatment via clarification followed by multimedia filtration (and possibly carbon filters) is also required. (Pet. at 10; Attachment D.)

Comparative Costs

A summary comparison of the demonstrated sodium sulfate removal systems discussed above is presented by petitioners as Attachment E to the petition. Attachment E also contains a summary including estimated capital and annualized capital and operating costs for the three alternatives studied<sup>5</sup>. These capital and total annualized costs are as follows:

<u>Compliance Alternative</u>	<u>Capital Cost (in millions)</u>	<u>Annual Cost (in millions)</u>
Quadruple-Effect Evaporation	\$ 9.8	\$3.3
Double-Effect Evaporation with MVR	\$10.8	\$3.5
Nanofiltration with Double- Effect Evaporation & MVR	\$ 8.2	\$1.3

The benchmark against which petitioners compare these costs is the cost of sending the Rhône-Poulenc wastewaters to TCBSD without additional pretreatment. Since TCBSD has adequate capacity to handle Rhône-Poulenc's wastewaters, the no-pretreatment strategy has no significant capital cost; only annual operating costs are significant. TCBSD charges \$0.80/1000 gallons of wastewater treated. Since Rhône-Poulenc's annual average discharge is projected to be 195,534,720 gallons, the operating costs (and annual costs) would be approximately \$156,428 per year. (See Attachment E).

Rhône-Poulenc observes that the first two pretreatment strategies (see table above) would be more than 21 and 15 times, respectively, the cost of simply discharging to the WWTP; these strategies, it is contended, would accordingly add 14 percent and 10 percent, respectively, to the cost of the product silica. Alternative 3 (Nanofiltration with Double-Effect Evaporation with MVR), although it is the most economical pretreatment system, is nevertheless more than 8 times more costly than simple WWTP treatment and would add approximately 5 percent to the cost of the product silica. (Pet. at 11.)

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<sup>5</sup> All of the pretreatment alternatives produce dry sodium sulfate, which requires ultimate disposition, including possible disposal. However, disposal costs are not included in the summary figures since sodium sulfate is a commodity chemical with some resale value (i.e., the possibility exists that a beneficial use might be identified which would eliminate the need for disposal).

On this basis, Rhône-Poulenc contends that, although technically feasible, even the most economical solution for pretreatment sodium sulfate removal would result in considerably higher costs to Rhône-Poulenc. Rhône-Poulenc contends that such cost increases would result in a non-competitive price for its silica and would force it to utilize an alternative location for this plant. (Pet. at 11.)

#### HEALTH AND ENVIRONMENTAL EFFECTS

Much of the analysis of health and environmental effects present in the instant record is provided in a study prepared for Rhône-Poulenc and TCBSD by Huff & Huff, Inc. The Huff & Huff study is presented in a report entitled "Environmental Assessment for the Proposed Total Dissolved Solids Discharge from the Thorn Creek Basin Sanitary District", which is Attachment A to the petition.

Huff & Huff's assessment includes a review of Rhône-Poulenc's proposed silica production processes, as well as the existing treatment processes and influent and effluent flows at TCBSD's WWTP. Based upon that review Huff & Huff was able to project the maximum and average TDS and sulfate concentrations and loadings which would be discharged by TCBSD upon completion of Rhône-Poulenc's proposed facility.

Huff & Huff also reviewed the flows and water quality of Thorn Creek from Thorn Creek's headwaters at Monee to its confluence with the Little Calumet River, and the flows and water quality of the Little Calumet River between Thorn Creek and the Calumet-Sag Channel. With these data, Huff & Huff was able to model the projected water quality for TDS and sulfate in various reaches of Thorn Creek and the Little Calumet River.

Huff & Huff reviewed available acute toxicity data to determine whether the projected water quality would be anticipated to result in any acute toxicity, and it retained IPS, Inc., to perform chronic toxicity testing using Thorn Creek water with various levels of TDS and sulfate added to determine whether any chronic toxicity would be anticipated. (Pet. at 13-14.)

Lastly, Huff & Huff performed a biological assessment of Thorn Creek. This included the sampling of macroinvertebrates and fish in Thorn Creek both upstream and downstream of the TCBSD outfall. Using these data along with other existing data on the stream quality, Huff & Huff determined the stream's

Macroinvertebrate Biotic Index (MBI) and its Index of Biotic Integrity (IBI)<sup>6</sup>.

Based on these studies, Huff & Huff conclude that Thorn Creek in the vicinity of the TCBSD outfall, including both upstream and downstream from the outfall, classifies as a "Limited Aquatic Resource" stream. (Attachment A at 80.) This is a classification common to urban streams.

In detail, there is suggestion, based on slightly lower MBI values, of better water quality below the TCBSD outfall than above (8.3 to 7.3). However, the IBI values of two sampling stations above the outfall and two below the outfall were found to be identical at 28. (Attachment A at 78-80.)

Huff & Huff also concluded that, in light of the urbanized nature of Thorn Creek's basin, there is limited potential for future improvements in the aquatic community of Thorn Creek. Similar conclusions were drawn by Michael Ander of Dames & Moore (1990) during an environmental impact study of Deer Creek. (Attachment A at 104). Deer Creek, a tributary of Thorn Creek, was stated as having limited potential uses due to the limited amount of water and habitat available. The Agency noted a similar water quality classification in its annual water quality report (IEPA 1992). (Id.) The quality of the Little Calumet River was classified in that report as a nonsupport waterway, a lower quality than in Thorn Creek. (Pet. at 14-15.)

The Agency disagrees with Huff and Huff's conclusion that Thorn Creek has limited potential for improvement. The Agency believes that Thorn Creek has the habitat potential to be classified as a "Highly Valued Aquatic Resource", even though it may not be so classified at present; this is two classification steps higher than the classification claimed by petitioners. The Agency is concerned that allowing TDS that are too high may cause additional stress on the aquatic biota and accordingly delay achievement of the higher status. (Am. Rec.)

Under median flow conditions in Thorn Creek and the Little Calumet River, and average Rhône-Poulenc loadings, petitioners predict that the 500 mg/L sulfate standard would not be exceeded

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<sup>6</sup> MBI values are used by the Illinois Environmental Protection Agency to assess stream water quality. These values range from 1 to 11, with 1 representing the best water quality and 11 the worst. (Attachment A at 63). IBI values are also used by the Illinois Environmental Protection Agency to assess stream quality and are based upon the fish assemblage at a given site. Values of this index range from 12 to 60, with 60 representing the best stream quality and 12 the worst. (Attachment A at 64).

in any reach, and that the existing TDS water quality standard would be exceeded only in the first few miles below the TCBSD outfall. (Pet. at 15.)

However, under worst-case conditions, Huff & Huff's modeling studies indicate that both TDS and sulfate concentrations would exceed the 1,000 and 500 mg/L water quality standards for a distance well downstream of TCBSD outfall. Worst-case would occur under the conditions of low stream flow and peak loadings from Rhône-Poulenc. The modeled worst-case concentrations are as follows, with concentrations in mg/L:

<u>Parameter</u>	<u>Reach #1</u>	<u>Reach #2</u>	<u>Reach #3</u>	<u>Reach #4</u>
TDS	2,120	2,120	1,920	1,680
Sulfate	980	970	850	760

Reach #1 = Thorn Creek mile 10.1 to 8.1 (TCBSD outfall to Deer Creek); Reach #2 = Thorn Creek mile 8.2 to 4.2 (Deer Creek to USGS Thornton Gauge); Reach #3 = Thorn Creek mile 4.2 to 0.0 (USGS gauge to mouth of Thorn Creek); Reach #4 = Little Calumet River mile 25.0 to 16.2 (Thorn Creek to Cal-Sag Channel)

(Table 7-3 of Attachment A at 102).

Petitioner's contend that, whether one looks at either the median or worst-case conditions, the projected increases in TDS and sulfate are not likely to have any adverse environmental impact. (Petition at 15.) In reaching this conclusion, petitioners direct attention to the "uses" that underlie the General Use Standards, and how studies done on the Thorn Creek area and aquatic toxicity support the conclusion of no adverse environmental impact.

Petitioners observe that the General Use Water Quality standards for TDS and sulfate were intended to preserve three specific "uses": aquatic life, crop irrigation, and public water supplies.

As regards aquatic life, petitioners observe that Huff and Huff's review of available acute and chronic toxicity data indicates that no adverse impact on aquatic life is to be expected at concentrations of TDS and sulfate projected for the worse-case scenario (i.e., 2,120 and 980 mg/L, respectively) (Chapter 5 of Attachment A). However, due specifically to the lack of literature regarding chronic toxicity levels for sodium sulfate, Huff and Huff also performed original chronic toxicity bioassays. These used Thorn Creek water, collected downstream of the WWTP discharge, to evaluate the effects of increasing levels

of sodium sulfate on the water flea (Ceriodaphnia dubia) and the fathead minnow (Pimephales promelas). The Thorn Creek water was initially analyzed for sulfate and then spiked with sodium sulfate to obtain seven targeted levels of sulfate. The targeted levels are percentages of the projected peak effluent sulfate concentration of 980 mg/L. The sulfate levels examined are as follows (Pet. at 17; Attachment A at 56):

<u>Measured Sulfate Level, mg/L</u>	<u>% of Projected Peak Effluent Sulfate</u>	<u>Measured TDS Level, mg/L</u>
1,300	133	2,500
1,270	130	
1,010	103	
873	89	
852	87	1,940
710	72	
595	61	

At none of the test levels was chronic toxicity observed in either the waterflea or fathead minnow.

Petitioners next observe that a TDS water quality limit of 2,100 mg/L was supported for Thorn Creek below the TCBSD outfall in the AS 89-3 proceeding (see preceding text and footnote) in part because of the Limited Aquatic Resource Classification of Thorn Creek, and in consideration of the low level of toxicity of TDS. A biological assessment performed in support of the AS 89-3 petition concluded that a TDS water quality level of 3,000 mg/L would not cause any undue stress to the aquatic life (Dames & Moore, 1981). (Attachment A at 104). Petitioners state that this opinion was supported by the Agency (Studer, 1990). (Id.) A toxicity investigation by Reed and Evans (1981) also concluded that water quality sulfate levels of 1,000 mg/L would not be harmful to the aquatic biota. (Id.)

Based upon these results, along with the literature regarding acute toxicity, petitioners conclude that there should be no acute or chronic toxicity impact upon aquatic life in Thorn Creek or the Little Calumet River from the proposed Rhône-Poulenc project.

Moreover, historical TDS concentrations are within the range here being considered as worst-case. (Attachment A at 22). In the early 1980's, TDS concentrations in Thorn Creek averaged 1,559 mg/L. (Id.) In recent years TDS levels have decreased,

apparently as a consequence of communities shifting from well-water to Lake Michigan water<sup>7</sup>.

As regards cropping activity, petitioners observe that the areas surrounding Thorn Creek from TCBSD's outfall to the merger with the Little Calumet River are limited to forest preserves and developed areas. Only two owners/operators grow crops in the Deer Creek Basin. Neither of these owners/operators conduct crop irrigation. No commercial crops are grown, and no evidence of water withdrawal from Thorn Creek for irrigation of crops was observed during the stream study performed by Huff & Huff. (Attachment A at 98).

As regards public water supply use, Huff & Huff concludes that there would be no adverse impact upon public water supplies. Communities along Thorn Creek downstream of TCBSD's outfall all derive their water supply from Lake Michigan. Communities including Chicago Heights, Flossmoor, Harvey, Glenwood, Homewood, South Holland, Thornton, Calumet City, Dolton, and Lansing were all contacted and confirmed that each municipal water supply system currently uses Lake Michigan water. Most water supply wells have been capped and taken out of service in these communities. Based upon this investigation, petitioners conclude that Rhône-Poulenc's proposed project will not increase TDS or sulfate in any public water supply. (Attachment A at 98).

As a final facet of their position on health and environmental impact, petitioners assert that adverse cross-media impacts would result in the absence of Rhône-Poulenc's ability to discharge to TCBSD. For example, pretreatment of TDS would produce dry sodium sulfate that would have to be disposed on land if it could not be sold, creating the potential for land pollution and for water pollution should it leach from a landfill to groundwater. Also, pretreatment would necessitate increased energy consumption, which not only would deplete energy resources, but also potentially would result in air pollution from the generation of the necessary energy. Thus, while TDS and sulfate levels in Thorn Creek and the Little Calumet River would increase under the proposed adjusted standard, no adverse environmental impact would result. Conversely, if compliance with the generally applicable standards were to be required, there might be some adverse cross-media impacts. (Pet. at 18-19.)

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<sup>7</sup> Lake Michigan has a lower TDS concentration than most groundwaters. Lake Michigan water is also soft water, and many persons have ceased using water softeners as Lake Michigan water becomes available. This decreases TDS discharges to Thorn Creek.

CONSISTENCY WITH FEDERAL LAW

Both the Agency and petitioners agree that the Board's water quality standards have been approved by U.S. EPA and are consistent with the requirements of the Clean Water Act. Thus, in a sense, these standards exist pursuant to Section 303(a) of the Clean Water Act. (Am.Rec. at 2; Pet. at 3.)

Rhône-Poulenc and TCBSD do not believe that the granting of the requested adjusted standard would be violative of any provisions of the Clean Water Act. The requested relief is predicated solely upon potential violations of the TDS water quality standard and the standard for sulfate. There are no applicable federal or state TDS or sulfate effluent standards.

The adjusted standard is also consistent with federal law in that under 40 C.F.R. 131.4, "states are responsible for reviewing, establishing and revising water quality standards". These standards are to be protective of the designated uses. 40 C.F.R. 131.5(b).

Under 40 C.F.R. 131.4 "states are responsible for reviewing, establishing and revising water quality standards." In turn, pursuant to 40 C.F.R. 131.5, "EPA is to review and to approve and disapprove the State-adopted water quality standards." These standards are to be protective of the designated uses (§131.5(b)) and, where those uses are not protected, this must be supported by "appropriate technical and scientific data and analyses." (§131.5(d)). A state is allowed to remove a designated use, which is not an existing use, if it "can demonstrate that attaining the designated use is not feasible" because of several enumerated causes. (§131.10(g)).

Petitioners believe that the granting of this adjusted standard will not impair any beneficial use of the receiving stream. This, they believe, has been established by the Huff & Huff study discussed above.

Federal Procedural Requirements

The Board's grant of the adjusted standard requested herein arguably requires some mechanism for public participation pursuant to 40 C.F.R. §131.20(b). However, Rhône-Poulenc and TCBSD do not believe that a hearing is necessary and agree with the U.S. EPA's current position that if authorized states follow approved state procedures, those procedures are federally acceptable.

Under federal law, public participation includes a public hearing for the purpose of reviewing the proposed standard in accordance with the provisions of state law, the U.S. EPA's water quality management regulation (40 C.F.R. 130.6(b)) and the U.S.

EPA's public participation regulation (40 C.F.R. Part 25). Notice of such hearing must be well-publicized and must be given at least forty-five (45) days prior to the date of the hearing. The notice must identify the matters to be discussed and should include a discussion of the Board's tentative determination on major issues (if any) and procedures for obtaining further information. Reports, documents and data relevant to the discussion at the public hearing must be available to the public at least thirty (30) days before the hearing. 40 C.F.R. §25.5(b). At the hearing, the Board must inform the audience of the issues involved, considerations the Board will take into account, and information which is particularly solicited from the public. 40 C.F.R. §25.5(e).

Rhône-Poulenc and TCBSD understand that the U.S. EPA has recently changed its position regarding the federal requirement for a hearing in state proceedings involving the potential amendment of water quality standards. The U.S. EPA formerly took the position that hearings were required in all such proceedings. Rhône-Poulenc and TCBSD understand, however, that U.S. EPA's present position is that the fulfillment of the state requirements for notice and hearing is all that is required and that if the state allows for waiver of the hearing requirement, hearing can be waived without conflict with federal laws. 35 Ill. Adm. Code 106.705(j) allows for waiver of hearing.

The Agency agrees that the requested relief is consistent with federal law. (Am.Rec. at 14.)

#### ADJUSTMENT OF WATER QUALITY STANDARDS

The request placed before the Board in this matter involves an alteration of the instream General Use Water Quality Standards. If granted, the request would raise the water quality standards for TDS and sulfate over a 18.9-mile length of waterway that drains a basin of 291 square miles<sup>8</sup>. Most of the basin is urbanized, and industrial development is significant. The basin is mostly within Cook County, but also includes parts of Will County, Illinois, and Lake County, Indiana.

The justification is based on the particular needs and economics faced by Rhône-Poulenc and TCBSD, and upon the limited negative health and environmental effects of the particular quality and quantity of the discharges anticipated as a consequence of Rhône-Poulenc's discharge.

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<sup>8</sup> The drainage area of the Little Calumet River above the Calumet-Sag Channel is 291 square miles. The drainage area of Thorn Creek alone is 107 square miles.

At the onset, the Board observes that it believes that Rhône-Poulenc and TCBSD have adequately justified relief based upon their particular circumstances. The Board further notes, however, that the relief that is being asked of the Board could have the effect of giving other dischargers located on these streams essentially the same relief given to Rhône-Poulenc and TCBSD, even though other dischargers have not made (and may well not be able to make) the same demonstrations.

To understand this circumstance, it is necessary to recognize first that for water at concentration X, any additional amount of water at concentration X may be added, and the resultant concentration will remain at X. Thus, for example under the relief requested, if TCBSD were discharging such as to cause Thorn Creek to have a 2,100 mg/L TDS concentration at the WWTP outfall, all other sources of discharge between the TCBSD outfall and the USGS gauge at Thornton could have a TDS concentration of 2,100 mg/L and the resultant mixed concentration through the whole reach would remain 2,100 mg/L.

Moreover, it is within the mathematics of the situation that, if TCBSD were to discharge so as to cause Thorn Creek to have a TDS concentration below 2,100 mg/L (as the Agency would have TCBSD strive for), all of the other sources of discharge between the outfall and the USGS gauge could have a TDS concentration above 2,100 mg/L without causing violation of a 2,100 mg/L instream standard<sup>9</sup>.

Based on these considerations, the Board finds that the potential license that would result from altering the water quality standards as Rhône-Poulenc and TCBSD plead is beyond the justification that has been presented to the Board. In a regular rulemaking, either general or site-specific, the Board would not likely amend a water quality standard for so large an active stream segment without knowing more about other dischargers and sources of flow. Here we don't know how many or what kind of dischargers there are now, or are likely to be in the future; neither do we know the nature of the TDS that might be contributed by them or the impact their loadings might have.

The Board believes that the resolution of this matter is to let the water quality standards of 35 Ill. Adm. Code 302.208 remain unaltered, and to grant the adjusted standard solely to the "cause or contribute to a water quality violation" provision of 35 Ill. Adm. Code 304.105 up to the concentration limits proposed by petitioners. We intend that this stratagem present no practical consequences for Rhône-Poulenc and TCBSD different

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<sup>9</sup> The Board notes that it is here not making judgement on whether potential other discharger's permits would or should allow for such discharge.

from those which would flow from modification of the water quality standards: TCBSD would have an exception to causing or contributing to water quality violations up to the concentration limits proposed.

Conversely, we explicitly intend that this stratagem have a different effect than that which would follow from modification of the water quality standards as regards other existing or potential dischargers: these dischargers would have no increased license or potential for discharge based on the case made by Rhône-Poulenc and TCBSD.

The Board is aware that in the short history of adjusted standards relating to discharges to water, it has been the practice, unlike what we do here, to modify the water quality standards. The Board does not here reconsider the merits of these other decisions. We do believe that the instant matter is distinguishable on the basis of the nature of the drainage basin and dischargers to it, and on the particular character of the contaminants at issue. On this basis, we conclude that today's course of action is correct as regards Thorn Creek and the Little Calumet River.

The Board is also aware that water quality standards have a two-fold purpose. They stand as the limiting measure of quality that is expected of a waterbody. They also serve, however, through the NPDES permitting process, as the basis of determination of effluent limits. Since we here do not change the water quality standards, we are interested that TCBSD not encounter NPDES difficulties that would deny the relief they have justified. We desire that the additional conditions to the grant of adjusted standard, as we next discuss, will form the basis for granting TCBSD's NPDES permit consistent with the relief granted in this adjusted standard.

#### ADDITIONAL CONDITIONS

It is agreed by both petitioners and the Agency that grant of adjusted standard be conditioned upon two general considerations: (1) that the adjusted standard terminate if the justification for it terminates, and (2) that operations at TCBSD and Rhône-Poulenc be such as to minimize the TDS and sulfate loadings, and hence their impact on the receiving waterway.

The Board accepts that conditions effectuating these ends are necessary. The Board accordingly will add them as conditions of grant of the adjusted standard. In general, the Board has attempted to preserve the actual language recommended to it by petitioners and the Agency, modifying only to accommodate the issue of the water quality standards discussed above, and a few grammatical matters.

There are two matters regarding the conditions that warrant observation. The first is that the Agency proposes, and the petitioners accept, that the adjusted standard be effective only if Rhône-Poulenc actually constructs and operates the planned facility, and that the adjusted standard terminate if Rhône-Poulenc ceases to operate the facility or other certain process changes occur such that the relief is no longer needed. (Am. Rec. at 15.) In the proposed language directed to this condition, the parties recommended that the Board be served with periodic status reports assessing Rhône-Poulenc's progress, as well as monitoring reports. The Board has deleted these service provisions as unnecessary. It is sufficient that the Agency, as the administrative agency, be served, and the Board be re-entered in the process only when its adjudicative or rulemaking authorities are required.

The second matter is related to calculation of load limits. The Agency believes, and petitioners accept, that the adjusted standard should be granted only with conditions intended to maintain the TDS and sulfate concentrations at the lowest values consistent with allowing Rhône-Poulenc to construct and operate its proposed silica facility. (Am. Rec. at 5.) This would occur by the imposition of load limits, as based on petitioners Attachment 5. The Agency believes that absent actual discharge data, it is appropriate to use these projected loadings as monthly averages. (Id. at 6.)

The Agency further recommends that monitoring be done to establish limits based on actual operating data, utilizing a procedure also used by petitioner's consultant and included in Attachment 5. (Am. Rec. at 7.)

Petitioners agree to the load limit provisions recommended by the Agency with the exception of "the development and potential appeal of daily maximum and revised monthly average load limits as set forth in requested [c]ondition #6 and as discussed at pages 10 and 11 of the [Agency's] [a]mended [r]esponse". (Motion for Decision at 1.)

In their reply to the Agency's response, petitioners state that there should be some mechanism for petitioners to appeal the load limits determined by the Agency from the monitoring data. While the proposed procedure for determination of such limits is acceptable to petitioners, petitioners are concerned about possible disagreement in the future. Petitioners recommend that the Board include language concerning the right to appeal in the order or opinion in this matter, or alternatively, that the Board retain jurisdiction and provide for disputes over the propriety of the limits to be brought before the Board by motion. Petitioner's point to Section 5(d) of the Act as authority for

bringing an appeal of the Agency's determination of limits<sup>10</sup>. (Pet. Reply at 3.)

The Agency does not believe including language concerning the right to appeal is necessary or desirable. The Agency believes that including such language would set a precedent for subsequent adjusted standards and could result in more conflict over acceptable language, and may result in language conferring "rights" that do not exist pursuant to the Act. (Am. Rec. at 10-11.)

The Board believes that is unadvisable for it to retain jurisdiction and consequently leave this docket open for years to come simply on the prospect that petitioners may bring a motion challenging the limits determined by the Agency. The Board further concludes that whether or not appeal rights language is included in the order or opinion in this matter, jurisdictional issues concerning subsequent appeals would be determined at the time of the filing of any future appeal based on the information in that future petition and the language of the Act at the time of the filing of that petition. The Board also notes that condition #6 has a provision that requires the Agency to revise TCBSD's NPDES permit consistent with this adjusted standard, "including such load limits and monitoring requirements as are required by this adjusted standard". Denial of NPDES permits or a grant of permit with conditions are currently appealable to the Board under Section 40 of the Act.

#### CONCLUSION

The Board finds that petitioners, in cooperation with the Agency, have demonstrated that grant of adjusted standard is warranted. The Board accordingly will grant the adjusted standard consistent with this opinion.

The Board additionally observes that in this instant action we attempt to find resolution between granting the relief that Rhône-Poulenc and TCBSD have justified and the larger effects that would seem to be consequent to a modification of the water quality standards. If our resolution should prove to be

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<sup>10</sup> Section 5(d) of the Act states "[t]he Board shall have authority to conduct hearings upon complaints charging violations of this Act or of regulations thereunder, upon petitions for variances; upon petitions for review of the Agency's denial of a permit in accordance with Title X of this Act; upon other petitions for review of final determinations which are made pursuant to the Act or Board rule and which involve a subject which the Board is authorized to regulate; and such other hearings as may be provided by rule".

unworkable, or should there be an alternative more commendatory than that which we here provide, the Board as always stands willing to give reconsideration.

This opinion constitutes the Board findings of fact and conclusions of law in this matter.

ORDER

The Thorn Creek Basin Sanitary District (TCBSD) and Rhône-Poulenc Basic Chemicals Company (Rhône-Poulenc) are hereby granted a partial adjusted standard from 35 Ill. Adm. Code 304.105. Pursuant to this grant, 35 Ill. Adm. Code 304.105 does not apply to discharges from TCBSD's wastewater treatment plant located at mile 10.1 of Thorn Creek as regards total dissolved solids (TDS) or sulfate for TDS or sulfate instream concentrations that are less than or equal to:

2,100 mg/L for TDS and 1,000 mg/L for sulfate in Thorn Creek from the TCBSD wastewater treatment plant discharge to the U.S. Geological (USGS) Survey Gaging Station 05536275.

1,900 mg/L for TDS and 850 mg/L for sulfate in Thorn Creek from the USGS Gauging Station 05536275 to Thorn Creek's confluence with the Little Calumet River.

1,700 mg/L for TDS and 750 mg/L for sulfate in the Little Calumet River from Thorn Creek to the Cal-Sag Channel.

This grant of adjusted standard is contingent upon each of the following conditions being met:

1. The adjusted standard is effective upon the commencement of operation of the silica production facility proposed by Rhône-Poulenc. Rhône-Poulenc shall provide the Agency notice of its decision to construct the silica production facility, and shall provide an expected timetable for completing construction of the silica facility to the Agency, as soon as this information is available to Rhône-Poulenc. Further, Rhône-Poulenc shall provide the Agency with notice of any production process changes or similar changes that eliminate the need for continued relief as soon as this information is available to Rhône-Poulenc.
2. The adjusted standard terminates in the event that production process changes or other similar changes occur that eliminate the need for continued adjusted

standard relief. Relief will terminate upon filing of any such notice with the Board.

3. Until the monthly load limits described in condition 4, below, become effective, TDS discharges and sulfate discharges from Rhône-Poulenc's production facility may not exceed, on a monthly average basis, 91,800 pounds per day (lbs/day) and 62,100 lbs/day, respectively.
4. Rhône-Poulenc shall monitor its TDS and sulfate discharges to TCBSD seven days a week the first three years of operation of its silica production facility, and shall submit this information to the Agency at the end of the first three years of discharge from its silica production facility. At the discretion of the Agency, the recording of conductivity may satisfy this requirement two (2) days per week, if Rhône-Poulenc can document the relationship between TDS and conductivity and sulfate and conductivity. The Agency shall determine daily maximum load limits and adjust monthly average load limits for TDS and sulfate using the method described in the Agency's response to the adjusted standard petition of Rhône-Poulenc and TCBSD filed in AS 94-7. The Agency shall notify Rhône-Poulenc and TCBSD of these limits in writing. In addition to the load limits described in paragraph 3 of this adjusted standard, Rhône-Poulenc shall not exceed these daily maximum and monthly average load limits for TDS and sulfate once determined by the Agency.
5. Rhône-Poulenc and TCBSD shall perform a Macroinvertebrate Biotic Index (MBI) survey of Thorn Creek prior to Rhône-Poulenc discharging from its silica production facility to TCBSD. A second MBI survey shall be conducted twelve to twenty-four months after Rhône-Poulenc begins to discharge from its expanded facility. The second survey shall be performed during the same month of the year as the first survey and use the same sampling locations as in the first survey so that a before-discharge and after-discharge comparison can be made of Thorn Creek. The results of these surveys must be submitted to the Agency within sixty (60) days of their completion.
6. Rhône-Poulenc shall obtain all required permits from the Agency prior to the start of operation of its silica production facility, including an Agency permit for the sewer connection of the silica production facility to TCBSD. The Agency shall revise TCBSD's National Pollutant Discharge Elimination System (NPDES) permit consistent with this adjusted standard, including such load limits and monitoring requirements

as are required by this adjusted standard. Rhône-Poulenc and TCBSD shall perform all monitoring requirements for the discharge of TDS and sulfate, and monitoring of the water quality in Thorn Creek and the Little Calumet River, as may be required pursuant to TCBSD's NPDES permit.

IT IS SO ORDERED.

Section 41 of the Environmental Protection Act (415 ILCS 5/41 (1992) provides for the appeal of final Board orders within 35 days of the date of service of this order. The Rules of the Supreme Court of Illinois establish filing requirements. (See also 35 Ill. Adm. Code 101.246, Motions for Reconsideration)

I, Dorothy M. Gunn, Clerk of the Illinois Pollution Control Board, hereby certify that the above opinion and order was adopted on the 9<sup>th</sup> day of June, 1994, by a vote of 6-0.



Dorothy M. Gunn, Clerk  
Illinois Pollution Control Board