FENOC
FirstEnergy Nuclear Operating Company

Beaver Valley Power Station
Route 168
P.O. Box 4
Shippingport, PA 15077-0004

January 20, 2014
L-15-032

Ryan Decker
Department of Environmental Protection
Bureau of Water Quality Management
Southwest Region Office
400 Waterfront Drive
Pittsburgh, PA 15222

SUBJECT:
Beaver Valley Power Station Part 2 questions NPDES Permit 0025615

Attachment 1 contains answers to your questions asked in an e-mail from 12-15-2014. The attachment also contains edited pages from the amended Engineers Report that pertain to the questions.

Attachment 2 is an amended drawing No. RM-0430-006 contained in the 8-21-14 Part II application.

Attachment 3 is an amended Engineers Report contained in the 8-21-14 Part II application.

Sincerely,

Charles V. McFeaters
Director, Site Operations

cc: Document Control Desk US NRC *(NOTE: No new US NRC commitments are contained in this letter.)*
US Environmental Protection Agency
Ms. Amanda Schmidt, PA DEP/Bureau of Water Quality Management

IE25
NRR

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Internal Distribution of Letter L-15-032

D. J. Salera
C. J. Weaver
S. F. Brown (A-GO-13)
D. K. Evans-Kanell
D. J. Weber (A-GO-18)
D. C. Bluedorn (BCCZ)
Environmental File
Central File: ***Keyword - DMR***

REGULATORY CORRESPONDENCE CHECKLIST

Letter Number: L-15-032

The reviewers of this correspondence signify the review of the items on the checklist by placing initials in the boxes below. As necessary, explain deviations, exceptions and non-applicable items in the Comments sections provided.

A. Peer Review:

No.	Item Checked	Initials
1.	Correct organizations are listed on the review and routing forms, including organizations providing statements of fact.	RRW
2.	References to Codes and Standards are accurate and in sufficient detail.	N/A
3.	Subject line of an NRC cover letter references the NRC TAC number, if applicable.	N/A
4.	The letter number has been entered on the letter and subsequent pages.	RRW
5.	Format and presentation are consistent with NORM-LP-4003 and any deviations justified.	RRW
6.	Pages containing information pursuant to 10 CFR 2.390 are appropriately marked.	N/A
7.	Oath or affirmation (if required) – unsworn declaration is present.	N/A
8.	Dates are correct and consistent throughout the submittal.	RRW
9.	Grammar, spelling and editorial presentation have been verified to be correct.	RRW
10.	All applicable parts of the submittal are present (e.g. letter, enclosures, attachments, affidavits).	RRW
11.	If Regulatory Commitments are included in NRC correspondence, the regulatory commitments are re-stated on an attachment (Regulatory Commitment List) to the submittal and identified for ownership on the Regulatory Correspondence Review Form (NOP-LP-4007-01). If no regulatory commitments are included in the correspondence, a statement to that effect is provided in the correspondence.	N/A
12.	The letter content is factually complete, is presented logically and supports conclusions reached.	RRW
13.	Enclosures and attachments are appropriately identified and contain all the necessary information to support conclusion of the submittal without the need to obtain other reference material.	RRW
14.	If action is requested of the NRC, the requested action date has been included with appropriate justification.	N/A
15.	If the letter is in response to NRC requests, there is a clear tie between each question/request and the associated response, and each question/request is completely and clearly answered in the response.	N/A
16.	References listed have been reviewed, are available, and support the information contained in the correspondence.	RRW
17.	Statements of fact have been verified to be accurate.	RRW
18.	Actions stated as being complete have been verified to be complete.	RRW
19.	Submittal does not contain information that has a material effect on information previously submitted to the NRC in response to a Notice of Violation or other enforcement action (e.g., Davis-Besse head event) or may significantly affect the NRC's understanding of plant activities. If it does, expedited communication paths with the NRC have been determined.	N/A

Review Performed By (Print Name): ROBERT R WINTERS Date: 1/21/15

Comments:
This letter answers questions posed about the part 2 application concerning the chemical addition upgrade to the PA Department of Environmental Protection.

REGULATORY CORRESPONDENCE CHECKLIST

B. Cognizant Manager Review (Final Submittal Review Prior to Signature Authority):

No.	Item Checked	Initials
1.	Comments obtained during the review cycle have been resolved and incorporated within the applicable sections of the submittal. The submittal remains factual and complete.	DJS
2.	Review signatures, or equivalent, have been obtained on Correspondence Review Forms (NOP-LP-4007-01).	DJS
3.	The correspondence has been reviewed for regulatory commitments, licensing positions, prudency, appropriate wording, and potential regulatory impact.	DJS
4.	If the letter is in response to NRC questions or requests, there is a clear and complete response to each question or request and all questions have been satisfactorily addressed.	N/A

Review Performed By (Print Name): Donald J Salera Date: 1-22-15

Comments: This letter answers questions posed about the part 2 application concerning the chemical addition upgrade to the PA Department of Environmental Protection.

C. Responsible Organization Review (Administrative Support Follow-up):

No.	Item Checked	Initials
1.	Date is on the letter and the letter has been put on the appropriate company letterhead.	LKP
2.	Submittal cover letter is signed correctly.	LKP
3.	Oath or Affirmation (if required) – unsworn declaration is present. If a notarized statement is requested by the signature authority, the statement page is signed and notarized.	N/A
4.	When appropriate, initial notification and copy of submittal has been provided to the NRC via electronic mail.	N/A
5.	Submittal has been mailed, or provided electronically (in accordance with NRC guidance on electronic submittals) to all appropriate recipients, with appropriate enclosures, attachments, etc.	LKP
6.	Internal FENOC distribution is complete.	LKP
7.	Regulatory Commitments have been documented in accordance with FENOC commitment management procedures.	N/A
8.	Additional FENOC actions have been documented, as necessary, in appropriate activity tracking systems.	N/A
9.	Correspondence documentation package is complete, and ready for future referral.	LKP

Review Performed By (Print Name): Lynn K. Petrun Date: 1-26-15

Comments: This letter answers questions posed about the part 2 application concerning the chemical addition upgrade to the PA Department of Environmental Protection.

REGULATORY CORRESPONDENCE REVIEW FORM

NOP-LP-4007-01 Rev. 01

(1) LETTER NUMBER: L-15-032	(2) LETTER SUBJECT: Beaver Valley Power Station, EPA ID # PAR000040485, Residual Waste Biennial Report for Reporting Year 2014	
(3) SUBMITTAL DUE: 03/02/15	(4) PREPARER / PHONE NO.: C. J. Weaver / 724-682-4120	(5) LICENSING BASIS DOCUMENT REVIEW COMPLETED: ☐ YES ☒ N/A CHANGE REQUIRED: ☐ YES ☒ NO
(6) POSTING REQUIRED BY 10CFR19.11 ☐ YES ☒ NO	(7) REGULATORY COMMITMENTS CONTAINED IN SUBMITTAL? ☐ YES ☒ NO	(8) OATH OR AFFIRMATION REQUIRED ☐ YES ☒ NO

(9) PREPARER COMMENTS, SPECIAL INSTRUCTIONS:

1. Residual Waste Report due 03/02/2015 for reporting year 2014.

(10) LICENSING, TECHNICAL STAFF AND MANAGEMENT REVIEW

Signature indicates that the review is complete in accordance with NOP-LP-4007, and to the best of the reviewer's knowledge, the submittal is accurate and complete, and no significant information has been presented in or excluded from the submittal such that the reader could be misled. Management reviewers' signatures also indicate that the level of review provided by their respective organization is acceptable. Where commitment ownership is indicated, signature also indicates acceptance of responsibility for commitment completion.

Print Or Type Name & Organization	Commitment Number for Ownership	Signature	Date	No Comments	Comments Provided
Preparer C. J. Weaver	N/A	[signature]	1/21/15	N/A	N/A
Peer Reviewer R. Winters	N/A	Robert R Winters	1/21/15	☒	☐
				☐	☐
				☐	☐
				☐	☐
				☐	☐
				☐	☐
				☐	☐
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				☐	☐
				☐	☐
				☐	☐
				☐	☐
				☐	☐

(11) RECOMMENDATION FOR SIGNATURE

Print or Type Name	Commitment Number for Ownership	Signature	Date	No Comments	Comments Provided
Donald J. Salera	N/A	Donald J Salera	1-21-15	☒	☐
				☐	☐

(12) REVIEWER COMMENTS – NO RESPONSE REQUIRED (Provide comments requiring response on Form NOP-LP-4007-03):

REGULATORY CORRESPONDENCE REVIEW FORM - INSTRUCTIONS

NOP-LP-4007-01 Rev. 01

TITLE BLOCK	**Page** _2_ **of** _2_ Prior to forwarding for review, Preparer enters page information as indicated.
BLOCK 1	**LETTER NUMBER** – Preparer enters sequential number.
BLOCK 2	**LETTER SUBJECT** – Preparer enters the subject of the correspondence.
BLOCK 3	**SUBMITTAL DUE** – Preparer enters the date the correspondence is due.
BLOCK 4	**PREPARER / PHONE NO.** – Enter the name of the preparer of the correspondence.
BLOCK 5	**LICENSING BASIS DOCUMENT REVIEW COMPLETED** – Preparer indicates whether the licensing basis review was completed (YES or N/A) and whether a licensing basis change is required (YES or NO). (See NOP-LP-4007 Section 4.1.9)
BLOCK 6	**POSTING REQUIRED BY 10 CFR 19.11** – Preparer indicates whether correspondence to the NRC is required to be posted per the requirements of 10 CFR 19.11.
BLOCK 7	**REGULATORY COMMITMENTS CONTAINED IN SUBMITTAL** – Preparer indicates whether Regulatory Commitments are contained in the correspondence.
BLOCK 8	**OATH OR AFFIRMATION REQUIRED** – Preparer indicates the need for an oath or affirmation statement.
BLOCK 9	**PREPARER COMMENTS, SPECIAL INSTRUCTIONS** – Preparer enters any desired additional remarks or instructions regarding the subject correspondence.
BLOCK 10	**LICENSING, TECHNICAL STAFF AND MANAGEMENT REVIEW** – Preparer identifies the desired reviewers and their organization. Reviewers should include organizations that provided input to the correspondence, organizations potentially affected by regulatory decisions, and other knowledgeable technical organizations. If correspondence includes Regulatory Commitments, preparer identifies manager-level commitment owners and lists the commitment numbers. Reviewers sign and date the appropriate fields, and indicate whether or not comments are provided. **Signature indicates that, to the best of the reviewer's knowledge, the submittal is accurate and complete, and that no significant information has been presented in or excluded from the submittal such that the reader could be misled. Management reviewers' signatures also indicate that the level of review provided by their respective organization is acceptable. For reviewers with identified commitments, signature indicates acceptance of responsibility for commitment completion, and will result in assignment of the commitment to that organization.**
BLOCK 11	**RECOMMENDATION FOR SIGNATURE** – The appropriate Fleet Licensing or Regulatory Compliance Manager determines whether the correspondence has received an adequate review and is therefore recommended for final signature and release, signs and dates where appropriate, and indicates whether comments are provided. Additional reviews for signature recommendation may be obtained at management discretion.
BLOCK 12	**REVIEWER COMMENTS – NO RESPONSE REQUIRED** - Reviewers provide any comments that do not require response from preparer. Comments requiring documented response must be provided on a REGULATORY DOCUMENTATION COMMENT FORM (Form NOP-LP-4007-03).

Attachment 1

Questions/Answers for DEP from e-mail 12-15-14

- Will the corrosion inhibitor and dispersant usage rates for the TPRW system be doubled during summer months when two of the TPRW intake pumps are operating at a combined flow rate of 32,000 gpm? I assume they would since the NaClO and NaBr usage rates are doubled for that operating scenario. There weren't any calculations shown in Sections 8.d and 8.e of the Design Engineer's Report for the inhibitor and dispersant at the maximum summer flow rate. Please include those proposed feed rates in the Design Engineer's Report and send me the amended pages so that's it's clear there will be an operational change during summer months for those chemicals.

Yes, those rates will double for those pumps for approximately 4 months in the summer. The Corrosion inhibitor and Dispersant will increase from 43.6 gals/day, to 87.2 gal/day for Corrosion inhibitor, and from 40.3 gals/day, to 80.6 gal/day for Dispersant on the TPRW system only. Corrected pages (23-25) from report at end and in amended Engineers report.

- Are the calculations for the sodium hypochlorite usage rates for the cooling tower water system (Section 8.a.4) for the combined volumes of the Unit 1 and Unit 2 cooling tower basins or per basin (i.e., for both systems or each system)?

These are values for the combined volumes of the Unit 1 and Unit 2 cooling tower basins.

- Is the 700 gal/day dispersant usage rate given in Section 8.e.4 of the Design Engineer's Report the rate for each circulating water system (700 gal/day per system) or both (350 gal/day per system)?

This is actually a typo and should be 700 lbs./day (73.6 gals./day) NALCO 3DT120, it is an estimate for both units. Corrected page (26) from report at end and in amended Engineers report.

- In Sections 8.c.1 and 8.c.2 of the Design Engineer's Report, are the durations specified for chlorination correct? Section 8.c.1 for Unit 1 blow down states that there will be a free chlorine residual of 0.25 mg/L for 2 hours per day and maintenance of 0.2 mg/L for 20 hours a day. This leaves 2 hours per day without chlorination. The mass calculation for the short-term 0.25 mg/L chlorination is then calculated using 4 hours/24 hours. Should this be 2 hours/24 hours and the 0.2 mg/L maintenance be for 22 hours/24 hours? Section 8.c.2 for Unit 1 emergency overflows states that there will be a 0.5 mg/L residual for 2 hours per day and maintenance of 0.2 mg/L for 20 hours a day. This also leaves 2 hours per day without chlorination. The 0.5 mg/L calculation then uses 2 hours/24 hours and states that there will be 1.2 kg of free chlorine per day for 4 hour added chlorination---should this say 2 hours? The mass calculation for the 0.2 mg/L residual maintenance uses 22 hours/24 hours and states that there will be 5.3 kg of free chlorine per day for 20 hour maintenance---should this say 22 hours? Please explain these calculations or, if there are errors, revise and submit the amended pages.

Section 8.c.1 is for Sodium Bisulfite which is added at the Unit 1 blow down for both units, (The Unit #1 and #2 circulating water blow downs run together to Outfall 001) the treatment will be 2 hours per unit, per day (4 hours total) since Unit #1 and Unit #2 cannot be chlorinated at the same time. The maintenance will be 20 hours per day from both units.

Section 8.c.2 is for Sodium Bisulfite at the Unit #1 emergency outfall only, This should be stated as 0.5 mg/L residual for 2 hours per day and maintenance of 0.2 mg/L for 22 hours a day. The mass calculation is correct, the hours are correct in the actual calculations, but are incorrectly stated in the result sentences. Corrected page (21) from report at end and in amended Engineers report.

- Are there surfactant and corrosion inhibitor dosage rates for the Unit 2 circulating water system? If those rates are known, please include them in the Design Engineer's Report and send me the amended pages.

Currently, Corrosion inhibitor NALCO 3DT179 is directly added to Unit #2 circulating water system is approximately 5 gal/day, this will be discontinued after NALCO 3DT177 Corrosion Inhibitor is added to the RW/SW. The surfactant used is approximately 25 gal/day, and is only added normally to the Unit #2 circulating water during normal chlorination. Corrected pages (14, 23, 27) from report at end and in amended Engineers report.

- The Tank TK-2 capacity listed on Drawing No. RM-0430-006 states: Biocide, 3000 gal; however, this tank will be 5300 gallons and contain a corrosion inhibitor under this amendment. Please revise and resubmit this drawing.

Revised Drawing No. RM-0430-006, Amended drawing attached.

- Why are some of the new tanks double-walled (TK-4, 5, 6, 7, 8 and 13) while other tanks that contain similar chemicals are not?

All new outside tanks for this project are double walled. Tanks TK-1 and TK-2 are indoors and have secondary containment in the building.

- If you recall, we discussed language from the federal regulations regarding demonstrations for the need for greater chlorination of cooling water systems. The October 16, 2014 letter from Don Salera mentions an INPO evaluation that noted *inadequate corrosion mitigation strategies* for the river and service water systems at Beaver Valley. Was continuous chlorination a recommendation from INPO or was it FENOC's determination to continuously chlorinate in response to INPO's evaluation?

This was not a direct INPO recommendation, they did point out that there are other stations that control microbiologically induced corrosion (MIC) with continuous chlorination. FENOC made the determination after consulting with our contract chemical vendor, NALCO, and consulting industry experience which shows continuous chlorination as an effective means to control MIC. In addition, continuous chlorination is required to maintain biofilms at acceptable levels to prevent MIC. BVPS has a history of failures of important safety related heat exchangers and other components due to MIC.

8.c.2 Unit 1 Emergency Overflow, Outfall 004

Flow = 7.7E+6 gal/day estimated maximum

Mass of Free Chlorine assuming a 0.5 mg/L free chlorine residual for 2 hours per day and maintenance of 0.2 mg/L for 22 hours a day

m_{freeCl} = 0.5 mg/L x 3.785 L/gal x 7.7E+6 gal/day x 1 g/1000 mg x 1 kg/1000 g x 2hrs/24hrs

m_{freeCl} = 1.2 kg Free Chlorine/day 2 hour added chlorination

m_{freeCl} = 0.2 mg/L x 3.785 L/gal x 7.7E+6 gal/day x 1 g/1000 mg x 1 kg/1000 g x 22hrs/24hrs

m_{freeCl} = 5.3 kg Free Chlorine/day 22 hour maintenance

Total outfall Chlorine = 6.5 kg Free Chlorine/day

On a weight-to-weight basis, approximately 1.45 parts of Sodium Bisulfite are required to dechlorinate 1 part of chlorine.

6.5 kg Free Chlorine needs 9.4 kg Sodium Bisulfite
Nalco Sodium Bisulfite solution is 36% Sodium Bisulfite by weight
36 kg Bisulfite/100 kg Nalco solution x 26.1 kg Nalco solution = 9.4 kg Sodium Bisulfite solid
26.1 kg Nalco solution x 2.2 lbs/1 kg = **57.4 lbs Nalco Sodium Bisulfite solution/day**

8.c.3 Unit 2 Emergency Outfall Structure, Outfall 010

Estimated Average Flow = 3.63E+6 gal/day
Mass of Free Chlorine assuming maintenance of 0.2 mg/L for 24 hrs/day
m_{freeCl} = 0.2 mg/L x 3.785 L/gal x 3.63E+6 gal/day x 1 g/1000 mg x 1 kg/1000 g
m_{freeCl} = 2.8 kg Free Chlorine/day 24 hour maintenance
Total outfall Chlorine = 2.8 kg Free Chlorine/day

m_{Clrprw} = 2.0 mg/L product x 3.785 L/gal x 29,400 gal/min x 1440 min/day

m_{Clrprw} = 3. 205152E+8 mg/day x 1 g/1000 mg x 1 kg/1000 g

m_{Clrprw} = 320.5 kg/day product x 2.2 lbs/1 kg x 1 gal/9.51 lbs

m_{Clrprw} = **74.1 gal/day**

8.e.4 Usage Rate Calculation – Main Cooling Tower Circulating Water Systems:

From past experience the usage rate on the Circulating Water is anticipated to be approximately **700 lbs/day NALCO 3DT120 (73.6 Gal/day).**

8.f 2,2-DIBROMO-3-NITRILOPROPIONAMIDE - DBNPA (NALCO 7320)

Currently a non-oxidizing biocide quaternary amine (NALCO H150M) is added to the Fire Protection System for microbiological control. The biocide is currently permitted under NPDES Permit PA0025615. The proposed engineering change will feed DBNPA (NALCO 7320) to the Fire Protection System for biocide control. Feed will normally occur during performance of Fire Protection Operational Surveillance Testing (OST). Typical OST results in a run of fire pump(s) for approximately sixty (60) minutes. Chemical additive and usage is summarized in Chemical Additive List, Revision 20.

8.f.1 Usage Rate Calculation – Fire Protection System:

To achieve a 30.0 ppm NALCO 7320 product concentration

Given:

- Product Density is 10.4 lbs/gal
- Flow in Fire Protection System is 2,500 gpm
- Assuming 60 minute run time per OST 33.12

treated reactor plant river water, turbine plant river water, and service water systems when free chlorine residual is present.

The total estimated feed is **470 lbs** Sodium Bisulfite solution/day.

The change as proposed does not increase Sodium Bisulfite Chemical additive and usage as summarized in Chemical Additive List, Revision 20.

8.d Corrosion Inhibitor (NALCO 3DT177)

Currently corrosion inhibitor is fed for corrosion control to the Unit 1 and Unit 2 circulating water systems, reactor plant river water, turbine plant river water, and service water systems. Currently, Corrosion inhibitor NALCO 3DT179 is directly added to Unit #2 circulating water system is approximately 5 gal/day, this will be discontinued after NALCO 3DT177 Corrosion Inhibitor is added to the RW/SW. The proposed engineering change will feed corrosion inhibitor (NALCO 3DT177) to treat the reactor plant river water, turbine plant river water, and service water, for corrosion control.

8.d.1 Usage Rate Calculation - Unit 1 Reactor Plant River Water System:

To achieve a 2.5 ppm 3DT177 product concentration
Given:

- Product Density of product is 11.0 lbs/gal
- Flow in Reactor Plant River Water System is 9,000 gpm

m_{CIrprw} = 2.5 mg/L product x 3.785 L/gal x 9,000 gal/min x 1440 min/day

m_{CIrprw} = 1.22634E+8 mg/day x 1 g/1000 mg x 1 kg/1000 g

m_{CIrprw} = 122.6 kg/day product x 2.2 lbs/1 kg x 1 gal/11.0 lbs

m_{CIrprw} = **24.5 gal/day**

8.d.2 Usage Rate Calculation - Unit 1 Turbine Plant River Water System:

To achieve a 2.5 ppm 3DT177 product concentration
Given:

- Product Density is 11.0 lbs/gal
- Flow in Turbine Plant River Water System is 16,000 gpm

m_{Clrprw} = 2.5 mg/L product x 3.785 L/gal x 16,000 gal/min x 1440 min/day

m_{Clrprw} = 2. 18016E+8 mg/day x 1 g/1000 mg x 1 kg/1000 g

m_{Clrprw} = 218.0 kg/day product x 2.2 lbs/1 kg x 1 gal/11.0 lbs

m_{Clrprw} = **43.6 gal/day** – normal operation (approximately 8 months/year)
87.2 gal/day product - maximum (2 pumps in summer) (approximately 4 months/year)

8.d.3 Usage Rate Calculation - Unit 2 Service Water System:

To achieve a 2.5 ppm 3DT177 product concentration
Given:

- Product Density of product is 11.0 lbs/gal
- Flow in Service Water System is 29,400 gpm

m_{Clrprw} = 2.5 mg/L product x 3.785 L/gal x 29,400 gal/min x 1440 min/day

m_{Clrprw} = 4.006044E+8 mg/day x 1 g/1000 mg x 1 kg/1000 g

m_{Clrprw} = 400.6 kg/day product x 2.2 lbs/1 kg x 1 gal/11.0 lbs

m_{Clrprw} = **80.8 gal/day**

The change as proposed adds the Corrosion inhibitor NALCO 3DT177 to the Chemical Additive List for Outfalls 001, 004, 003, and 010.

8.e Dispersant (NALCO 3DT120)

Currently no dispersant is added to the reactor plant river water, turbine plant river, and service water systems. The proposed engineering change will feed dispersant (NALCO 3DT120) to treat the circulating water, reactor plant river water, turbine plant river water, and service water, for silt and deposition control. NALCO 3DT120 is currently on the Approved Chemical Additive Usage List. The circulating water is currently treated by NALCO 3DT121, which has the same active chemical as NALCO 3DT120.

8.e.1 Usage Rate Calculation - Unit 1 Reactor Plant River Water System:

To achieve a 2.0 ppm 3DT120 product concentration
Given:

- Product Density is 9.51 lbs/gal
- Flow in Reactor Plant River Water System is 9,000 gpm

$m_{3DT120rprw}$ = 2.0 mg/L product x 3.785 L/gal x 9,000 gal/min x 1440 min/day

$m_{3DT120rprw}$ = 9.81072E+7 mg/day x 1 g/1000 mg x 1 kg/1000 g

$m_{3DT120rprw}$ = 98.1 kg/day product x 2.2 lbs/1 kg x 1 gal/9.51 lbs

$m_{3DT120rprw}$ = **22.7 gal/day**

8.e.2 Usage Rate Calculation - Unit 1 Turbine Plant River Water System:

To achieve a 2.0 ppm 3DT120 product concentration
Given:

- Product Density is 9.51 lbs/gal
- Flow in Turbine Plant River Water System is 16,000 gpm

m_{Clrprw} = 2.0 mg/L product x 3.785 L/gal x 16,000 gal/min x 1440 min/day

m_{Clrprw} = 1. 744128E+8 mg/day x 1 g/1000 mg x 1 kg/1000 g

m_{Clrprw} = 174.4 kg/day product x 2.2 lbs/1 kg x 1 gal/9.51 lbs

m_{Clrprw} = **40.3 gal/day** normal operation (approximately 8 months/year)
80.6 gal/day product - maximum (2 pumps in summer) (approximately 4 months/year)

8.e.3 Usage Rate Calculation - Unit 2 Service Water System:

To achieve a 2.0 ppm 3DT120 product concentration
Given:

- Product Density is 9.51 lbs/gal
- Flow in Service Water System is 29,400 gpm

8. **Chemical and Additive Usage Summary**

8.a Sodium Hypochlorite
8.b Sodium Bromide
8.c Sodium Bisulfite
8.d Corrosion Inhibitor (NALCO 3DT177)
8.e Dispersant (NALCO 3DT120)
8.f DBNPA (NALCO 7320)
8.g Surfactant (NALCO 73550)

8.a Sodium Hypochlorite

Currently sodium hypochlorite feed is permitted under the current NPDES Permit PA0025615 and fed for disinfection control to the Unit 1 and Unit 2 circulating water systems, periodic oxidation of hydrazine in chemical waste sump, and condensate blow down. The proposed engineering change will feed sodium hypochlorite tank, TK-4 (8700 gallon capacity) to treat the reactor plant river water, turbine plant river water, and service water systems for microfouling and macrofouling (clams and mussels) control. Chemical additive and usage is summarized in Chemical Additive List, Revision 20.

8.a.1 Usage Rate Calculation - Unit 1 Reactor Plant River Water System:

To achieve a 0.2 mg/L Free Chlorine Residual

Given:

- 5 ppm of product is required to achieve a 0.2 ppm residual of Free Available Chlorine
- Product contains 12.5% weight of Free Available Chlorine
- Density of product is 10.21 lbs/gal
- Flow in Reactor Plant River Water System is 9,000 gpm

m_{Clrprw} = 5 mg/L product x 3.785 L/gal x 9,000 gal/min x 1440 min/day

m_{Clrprw} = 2.45268E+8 mg/day x 1 g/1000 mg x 1 kg/1000 g

m_{Clrprw} = 245.3 kg/day product x 2.2 lbs/1 kg x 1 gal/10.21 lbs

m_{Clrprw} = **53 gal/day product**

~~$M_{DNBPArprw}$ = 30.0 mg/L product x 3.785 L/gal x 2,500 gal/min x 1440 min/day~~

$m_{DNBPArprw}$ = 4. 0878E+8 mg/day x 1 g/1000 mg x 1 kg/1000 g

$m_{DNBPArprw}$ = 408.8 kg/day product x 2.2 lbs/1 kg x 1 gal/10.4 lbs

$m_{DNBPArprw}$ = 86.4 gal/day x 1 hr run/ 24 hr/day

$m_{DNBPArprw}$ = **3.63 gal/hr**

8.g Surfactant (NALCO 73550)

The surfactant used is approximately **25 gal/day**, and is only normally added to the Unit #2 circulating water.

Attachment 2

Drawing No. RM-0430-006

The drawing(s) specifically referenced in the letter have been processed into ADAMS.

This drawings can be accessed within the ADAMS package or by performing a search on the Document/Report Number.

D01X

Attachment 3

Amended Engineer Report

Beaver Valley Power Station
Unit 1 Reactor Plant and Turbine Plant River Water systems,
Unit 2 Service Water systems and Fire Protection
Chemical Injection and Dechlorination Upgrade

COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
JAMES BENINATI
ENGINEER
PE074509

1/20/15

Chemical Treatment Description

1. Site Location and Description

The Beaver Valley Power Station Unit No. 1 (BVPS-1) is located in Shippingport Borough, Beaver County, Pennsylvania, on the south bank of the Ohio River. The site is approximately one mile from Midland, Pennsylvania, five miles from East Liverpool, Ohio, and approximately 25 miles from Pittsburgh, Pennsylvania. The coordinates are 40°37' 18" north and 80°26' 2" west.

Figure 10-1, Site Map depicts the site location and description. The site comprises approximately 453 acres including 26 acres of right of way. Also on the site and immediately to the west of the reactor location is the former site of Shippingport Atomic Power Station (SAPS) which was managed by Duquesne Light Company for the Department of Energy (DOE). The SAPS terminated operations October 1, 1982, and was dismantled by the USDOE. Immediately to the east of the BVPS-1 reactor location, and also onsite is the Beaver Valley Power Station Unit 2 (BVPS-2).

2. Issue and Background

Degradation of the Beaver Valley Power Station Unit 1 River Water (RPRW), Unit 1 Turbine Plant River Water (TPRW) and Unit 2 Service Water System (SWS) has been increasing as evidenced by the increased occurrence of pin-hole leaks and degradation of river and service water cooled heat exchangers and associated piping. Both systems supply cooling water to plant equipment credited for nuclear safety and shutdown of the reactor.

The current chemical treatment strategy has been less than effective at mitigating the degradation due to the limited effect that current treatment chemicals have on the underlying problems of under-deposit corrosion and microbiologically induced corrosion (MIC). Attempts have been made to increase the effectiveness of the treatment scheme, but system limitations due to tank materials, piping materials, and inadequate injection equipment have prevented the use of more effective chemical treatments.

The use of non-oxidizing biocides, while effective on macrobiological organisms such as Asiatic clams and mussels, is less than effective on microbiological organisms conducive to MIC attack of carbon and stainless steel. More robust corrosion inhibitors are available for use, but the current storage tank liners are not currently compatible with the current improved treatment products. A large portion of the Unit 1 Turbine Plant River Water (TPRW) System remains untreated and susceptible to fouling/corrosion. The treatment equipment that feeds treatment chemicals to the TPRW system mid-system is a long standing temporary modification that utilizes a single feed line, causing feed blockages due to mixing of feed chemicals. Silt/sediment buildup within the systems cannot be prevented due to the lack of flexibility in the treatment system to allow for the feed of dedicated dispersant products.

3. Proposed Solution

The new system will consist of treatment chemicals fed from two locations to provide a robust treatment program including oxidizing biocide, improved corrosion inhibitors, and a true dispersant product. Corrosion rate monitoring is planned to be done on the system to determine corrosion rates on the piping and heat exchangers.

The first portion of the treatment system will modify the equipment in the intake structure. The intake structure current chemical storage tanks will be replaced with two (2) new 5300 gallon tanks, TK-1 and TK-2 with liners compatible with a wider range of treatment chemicals.
Tank, TK-2 will supply a robust corrosion inhibitor providing both anodic and cathodic inhibition and tank, TK-1 will supply a dispersant product. The system concentration of these chemicals can be adjusted as conditions change within the Ohio River, to target specific criteria.

Each 5300 gallon tank will supply a pump skid consisting of three (3) pumps. One pump per skid will supply the Unit 1 running Reactor and Turbine Plant River Water Pumps. One pump will supply the running Unit 2 Service Water Pumps with the third pump available as a standby. A one-hundred ten (110) gallon chemical feed tank, TK-3 will be utilized to provide treatment chemical for treating the Fire Protection System main headers. The Fire Protection system will be treated with a separate biocide.

The second portion of the treatment system will be located at the Unit 1 cooling tower. This portion of the system will consist of a sodium hypochlorite (bleach) storage tank, TK-4 with a capacity of approximately 8,700 gallons, sodium bromide storage tank, TK-6 with a capacity of approximately 2,500 gallons, and a clean water system flush tote. The bleach tank and the bromide tank will each supply a separate skid of three (3) pumps similar to the intake structure with one pump being utilized to feed the Unit 1 pumps, one pump to feed the Unit 2 pumps and a standby/swing pump. The bleach and bromide will be mixed in the injection line at the skids and fed together through Chem Proline polyethylene 100 RC double contained piping to the intake structure.

Asiatic clam and mussel treatment will be performed using a tote connection to the system to feed a non-oxidizing biocide (quaternary amine) from a tote through the bleach/bromide lines following a clean water flush of the lines from the flush tote.

Dechlorination will occur at all system discharge points impacted by the chlorinated water to the Ohio River. Principal dechlorination will still occur at the Unit 1 Cooling Tower blow down, and at the Unit 1 Cooling Tower basin overflow Outfall 004. Alternate cooling tower blow down dechlorination will still be available at the Unit 2 cooling tower to allow for treatment when Unit 1 is offline. A new third dechlorination system will be installed at the Emergency Outfall Structure. A new fourth intermittent dechlorination system will be utilized to dechlorinate the River Water flow from the Unit 1 Emergency Diesel Generators during their operation.

All chemical treatment pumps will be operated manually with adjustments made from chemical analysis to determine proper treatment under various conditions.

Additional design safety and reliability components will be integral to the systems. The principal and alternate cooling tower blow down dechlorination systems will be upgraded with redundant pumps and auto dialers to assure dechlorination occurs at all times that chlorination is in service. The Emergency Outfall Dechlorination system will include a pump auto-switch to swap pumps should the primary feed pump trip. An auto-dialer will also be present at the Emergency Outfall system that will dial out to select phone numbers should a loss of dechlorination occur. The chlorination and dechlorination systems will be installed in structures to protect them from the environment.

4. Beaver Valley System Summary Descriptions

4.a Unit 1 Reactor Plant River Water System (RPRW)

The Reactor Plant River Water system (RPRW) supplies water taken from the Ohio River to supply cooling water to reactor plant heat exchangers and other vital reactor plant components. Three (3) Reactor Plant River Water pumps take submerged suction from screened river water in the main intake structure and discharge through two independent supply headers. The Reactor Plant River Water system supplies river water to various reactor plant heat exchangers for cooling during normal operations and to the Containment Recirculation Spray coolers and Diesel Generators during abnormal operations. The system loads have the capability to receive water from either or both of the supply headers. This arrangement provides maximum reliability and conforms to the single failure criteria.

The discharge lines of the Reactor Plant River Water system flow into the circulating water system between the condenser outlet water boxes and the pumping structure which enters the Unit 1 cooling tower basin. Blowdown from the Unit 1 cooling tower basin is discharged back into the Ohio River via Outfall 001. The discharge is currently permitted under Pennsylvania National Pollutant Discharge Elimination System (NPDES) Permit PA0025615.

Each Reactor Plant River Water pump has a capacity of 9,000 gallons per minute. During normal plant operations one (1) Reactor Plant River Water pump is in-service providing flow to primary plant heat exchangers and cooling loads. Total flow is approximately 9,000 gallons per minute.

4.b Unit 1 Turbine Plant River Water System (TPRW)

The Turbine Plant River Water system (TPRW) supplies water taken from the Ohio River for cooling water to the secondary plant heat exchangers and other secondary plant components. Two (2) Raw Water pumps take submerged suction from screened river water in the main intake structure and discharge through two independent supply headers. The Turbine Plant River Water system supplies river water to various secondary plant heat exchangers for cooling during normal operations.

The discharge lines of the Turbine Plant River Water system flow into the Circulating Water system between the condenser outlet water boxes and the pumping structure which enters the Unit 1 cooling tower basin. Blowdown from the Unit 1 cooling tower basin is discharged back into the Ohio River via Outfall 001. The discharge is currently permitted under Pennsylvania National Pollutant Discharge Elimination System (NPDES) Permit PA0025615.

Each Turbine Plant River Water pump has a capacity of 16,000 gallons per minute. During normal plant operations one (1) Turbine Plant River Water pump is in-service providing flow to Secondary Plant heat exchangers and cooling loads. Total flow is approximately 16,000 gallons per minute. Frequently, during late Spring to early Fall two (2) Turbine Plant River Water pumps are in-service providing flow to Secondary Plant heat exchangers and cooling loads. Total flow is approximately 32,000 gallons per minute at those times.

4.c Unit 2 Service Water System

The Service Water System (SWS) supplies water taken from the Ohio River to supply cooling water to reactor plant heat exchangers and secondary plant heat exchangers and other vital reactor plant components. Three (3) Service Water pumps take submerged suction from screened river water in the Main Intake Structure and discharge through two independent supply headers.

The Service Water System supplies river water to various reactor plant and secondary plant heat exchangers for cooling during normal operations and to the Containment Recirculation Spray coolers and Diesel Generators during abnormal operations. The system loads have the capability to receive water from either or both of the supply headers. This arrangement provides maximum reliability and conforms to the single failure criteria.

Two discharge flow paths exist for the primary component cooling heat exchangers. Under normal conditions, the majority of the flow joins the discharge from the secondary component cooling heat exchangers and flows to the suction of the Unit 2 cooling tower pumps. This provides the necessary makeup for the circulating system in order to compensate for drift, blow down and evaporation in the cooling tower. Blowdown from the Unit 2 cooling tower basin is discharged back into the Ohio River via Outfall 001. The discharge is currently permitted under Pennsylvania National Pollutant Discharge Elimination System (NPDES) Permit PA0025615.

The alternate discharge is through two 24 inch lines tying into two 30 inch Service Water lines, which then lead to the Emergency Outfall System (EOS). Discharge from the Emergency Outfall structure flows into the Ohio River via Outfall 010. The discharge is currently permitted under Pennsylvania National Pollutant Discharge Elimination System (NPDES) Permit PA0025615.

Each Service Water pump has a capacity of 14,700 gallons per minute. During normal plant operations two (2) Service Water pumps are in-service providing flow to both secondary plant and primary plant heat exchangers and cooling loads. Total flow is approximately 29,400 gallons per minute.

4.d Unit 1 Circulating Water System

The Unit 1 Circulating Water System is a closed loop cooling system which utilizes a natural draft hyperbolic cooling tower to dissipate rejected turbine plant heat to the atmosphere.

Cooling water from the Unit 1 cooling tower basin flows to the Unit 1 main unit condenser inlet water boxes. The main unit condenser is a conventional twin shell type with two inlet and two outlet water boxes provided on each shell. This design allows either partial or full isolation of the circulating water flow through the condenser. Water leaves the condenser exit water boxes to the cooling tower pump suctions.

Because of the loss of water from the Circulating Water System due to evaporation and blow down while passing through the cooling tower, a source of makeup water is needed. This need is satisfied by the discharge of the Turbine Plant and Reactor Plant River Water Systems into the Circulating Water System. This constant addition of water to the system adequately replaces the operating water losses, as well as providing sufficient outflow from the cooling tower basin for blow down purposes. The discharges from the cooling tower pumps are routed up to the top of the cooling tower fill area (upper basin) where it is discharged by the cooling tower distribution system.

Cooling tower blow down is discharged to the Ohio River by a 36 inch underground line via NPDES Outfall 001, Unit 1 and 2 Cooling Tower Blow Down. This blow down is necessary to control the buildup of solids in the Circulating Water System due to evaporation by the tower.

Emergency overflow provisions are provided for the cooling tower. A weir, located opposite the blow down weir structure at the cooling tower discharge flume area, transfers the overflow water into a 54" pipeline that directs the water to the Ohio River via NPDES Outfall 004, Unit 1 Cooling Tower Emergency Overflow.

4.e Unit 2 Circulating Water System

The Unit 2 Circulating Water System is a closed loop cooling system designed to dissipate waste heat to the atmosphere from the main condenser, and provide a normal discharge path for the service water system. The system consists of cooling tower pumps, circulating water piping, a main condenser, a mechanical tube cleaning system, a vacuum priming system, and a natural draft cooling tower.

The natural draft cooling tower is a counterflow tower equipped with an icing control system. Circulating water is gravity fed from the cooling tower through fixed panel screens into two circulating water pipes to the inlet water boxes of the condenser. The water passes through the tubes of the condenser to the outlet water box. Two lines carry condenser discharge cooling water to the pumphouse outside the Turbine Building. The discharge lines of the Service Water System tie into the Circulating Water System between the condenser outlet water boxes and the pumphouse and provide make-up for blow down and evaporation. The four cooling tower pumps, mounted in the pumphouse, pump the water to the top of the cooling tower fill where it is discharged into the cooling tower distribution system. The cooling tower blow down is discharged from the circulating water discharge flume to via NPDES Outfall 001, Unit 1 and 2 Cooling Tower Blowdown.

5. Current Treatment Scheme & System Design

5.a River and Service Water System Treatment

The current primary treatment system is composed of a 3000 Gallon Biocide Tank and metering pump and a 5300 Gal Corrosion Inhibitor Tank and metering pump. The single metering pump is aligned to feed treatment chemicals to the running Reactor Plant River Water Pump and Service Water Pump(s). The biocide is fed for 2 hours per day per unit due to NPDES permit restrictions. Corrosion inhibitor is fed continuously.

Biocide – The current biocide is a non-oxidizing biocide. (H150M)
Corrosion Inhibitor – The current corrosion inhibitor is an anodic protection, polyphosphate based inhibitor. (CL-50)

5.b Turbine Plant River Water System

The Turbine Plant River Water System is currently treated from a long standing temporary modification in the Unit 1 North Yard transformer area. The system is composed of Biocide and Corrosion Inhibitor tanks, each with a metering pump fed through a common supply line to the TPRW system.

Biocide – Non-oxidizing biocide. (Nalco H150M)
Corrosion Inhibitor – Combination Anodic and Cathodic Corrosion Inhibitor and Polymeric Dispersant (Nalco 3DT187)

5.c Main Circulating Water systems

Unit 1 – The current treatment system is composed of Sodium Hypochlorite fed to the system for 2 hours per day. During the summer months, Sodium Bromide is also fed at the same time as the Sodium Hypochlorite. NALCO 3DT121 dispersant is also fed to the system.

Unit 2 - The current treatment system is composed of Sodium Hypochlorite fed to the system for 2 hours per day. Sodium Bromide is also fed at the same time as the Sodium Hypochlorite. Surfactant NALCO 73550 is fed to the system approximately 15 minutes a day during the Hypochlorite treatment. NALCO 3DT121 dispersant is also fed to the system.

5.d Wastewater Dechlorination System

Currently Unit 1 and Unit 2 Circulating Water Systems are dechlorinated with sodium bisulfite. Sodium bisulfite is fed from a storage tank located at the Unit 1 cooling tower and a tote for back up conditions at the Unit 2 cooling tower. Sodium bisulfite is fed to the cooling tower blow down at the Unit 1 cooling tower and Unit 2 cooling tower via a chemical addition pump that takes suction from storage tanks and discharges to the cooling tower blow down. Blow down from the Unit 1 and Unit 2 cooling tower basin is discharged back into the Ohio River via Outfall 001, Cooling Tower Blowdown. Depending on plant conditions, intermittent discharge occurs at the Unit 1 cooling tower emergency overflow and discharges to the Ohio River via Outfall 004, Unit 1 Cooling Tower Emergency Overflow. The discharge is currently permitted under Pennsylvania National Pollutant Discharge Elimination System (NPDES) Permit PA0025615.

5.e Fire Protection System

The Fire Protection System is designed in accordance with the standards of the National Fire Protection Association and is generally based on the recommendations of the Nuclear Energy Property Insurance Association and the Factory Insurance Association.

The Fire Protection System is supplied by two vertical turbine type fire pumps with a capacity of 2500 GPM each. One is electric motor driven, and one is diesel driven. Both pumps and drivers are installed and housed in heated pump rooms in the Main Intake Structure. They take suction from the Ohio River, and discharge to the Fire Protection System.

6. Proposed Wastewater Treatment System Summary Description

The proposed wastewater treatment system is described as follows:

6.a Proposed Unit 1 Dechlorination System

The proposed treatment system is an upgrade to the current dechlorination feed system at the Unit 1 cooling tower. The upgrade will consist of a sodium bisulfite storage tank, TK - 5 increasing the capacity to 2,500 gallons. The current chemical feed pump will be replaced with a new chemical feed pump skid. The skid consists of two (2) redundant chemical feed pumps that are manually activated and take suction from sodium bisulfite storage tank, TK-5 and discharge sodium bisulfite into the Unit 1 cooling tower blow down for the purposes of dechlorinating discharge to NPDES Outfall 001, Cooling Tower Blowdown. The pumps will be equipped with alarm functionality to notify the operator of a pump failure. Pumps are designed with the capability to be manually swapped in the event of a pump failure to maintain chemical feed.

The sodium bisulfite feed system will also have a second skid of two (2) redundant chemical feed pumps discharging into the Unit 1 Cooling Tower Emergency Overflow for the purposes of dechlorinating discharge to NPDES Outfall 004, Cooling Tower Emergency Overflow. The proposed Unit 1 treatment system is depicted in Figure 10-8.

In the event of an emergency requiring operation of the Unit 1 Emergency Diesel Generators a portable Dechlorination System will be used to dechlorinate discharge to NPDES Outfall 003. The portable system would consist of a sodium bisulfite tote, and a chemical feed pump. Sodium bisulfite would be fed downstream of the diesel heat exchanger cooling water discharge in the Unit 1 Catch Basin system.

6.b Proposed Unit 2 Dechlorination System

The proposed treatment system consists of upgrading the current dechlorination feed system at the Unit 2 Cooling Tower and the addition of a dechlorination system at the Emergency Outfall Structure to dechlorinate Outfall 010.

The upgrade will utilize the current sodium bisulfite storage tote with a capacity of 275 gallons. The current chemical feed pumps will be upgraded with a new chemical feed pump skid. The skid consists of two (2) redundant chemical feed pumps that take suction from a tote containing sodium bisulfite and discharging the sodium bisulfite into the Unit 2 Cooling Tower Blow down for the purposes of dechlorinating discharge to NPDES Outfall 001, Cooling Tower Blowdown. The pumps will be equipped with alarm functionality to notify operator of pump failure. Pumps are designed with the capability to be manually swapped in the event of pump failure to maintain chemical feed.

The new system allows for dechlorination at the Emergency Outfall Structure. The proposed system consists of a sodium bisulfite storage tank, TK-13 located at the Emergency Outfall Structure with a capacity of 1,550 gallons. New chemical feed pumps will be installed with a new chemical feed pump skid. The skid consists of two (2) redundant chemical feed pumps that are manually activated and take suction from sodium bisulfite storage tank, TK-13 and discharge into the Unit 2 Emergency Outfall Structure for the purposes of dechlorinating discharge to NPDES Outfall 010, Unit 2 Emergency Outfall.

The pumps will be equipped with alarm functionality to notify operator of pump failure. Pumps are designed with the capability to be automatically or manually swapped in the event of pump failure to maintain chemical feed. The proposed Unit 2 treatment system is depicted in Figure 10-8.

7. **Wastewater Flow and Description**

7.a NPDES Outfall 001, Cooling Tower Blowdown

NPDES Outfall 001 discharges to the Ohio River and is currently permitted under NPDES Permit PA0025615. Outfall 001 receives wastewater from Unit 1 and 2 Cooling Tower Blowdown, Unit 1 and 2 Treated Radioactive Liquid Waste, Internal Monitoring Points 301 and 401, Circulating Water Gooseneck, Unit 2 Pumphouse pump seal leak off, Unit 2 chemical sump, and infrequent closed loop cooling water

Discharge occurs 24 hours per day, 7 days per week, 365 days per year. Average discharge flow is 35.3 MGD and maximum flow is 61.8 MGD.

Currently, the following permitted treatment units are permitted under NPDES Permit PA0025615 for Outfall 001. Screening, Disinfection (Chlorine), Disinfection (Other), Dechlorination, Neutralization, Flocculation, Sedimentation, Ion Exchange, Evaporation, and Foam Fractionation.

The proposed wastewater treatment system upgrade will not result in any new source of wastewater to Outfall 001. The proposed wastewater treatment system will not implement any new treatment method or technology. The proposed treatment system will upgrade the existing dechlorination system. The proposed system will introduce a small hypochlorite residual into the cooling towers continuously, (from the chlorination of the cooling tower make up water) and will also be dechlorinated continuously. The cooling towers will continue with 2 hour hypochlorite treatments daily which will also be dechlorinated.

7.b NPDES Outfall 004

NPDES Outfall 004 discharges to the Ohio River and is currently permitted under NPDES Permit PA0025615. Outfall 004 receives wastewater from Unit 1 Cooling Tower Overflow. When discharging, average discharge flow is 2.8 MGD and maximum flow is 7.7 MGD.

Currently, the following permitted treatment units are permitted under NPDES Permit PA0025615 for Outfall 004. Screening and Foam Fractionation.

The proposed wastewater treatment system upgrade will not result in any new source of wastewater to Outfall 004. The proposed wastewater treatment system will install a dechlorination treatment unit at Outfall 004 as described in Section 6.a. The proposed upgrade will introduce a small hypochlorite residual into the cooling towers continuously, (from the chlorination of the cooling tower make up water) and will also be dechlorinated continuously. The cooling towers will continue with 2 hour hypochlorite treatments daily which will also be dechlorinated.

7.c NPDES Outfall 010

NPDES Outfall 010 discharges to the Ohio River and is currently permitted under NPDES Permit PA0025615. Outfall 010 receives wastewater from Non-Contact Cooling Water from the Unit 2 primary heat exchangers. Discharge occurs 24 hours per day, 7 days per week, 365 days per year. Average discharge flow is 3.63 MGD.

Currently, the following permitted treatment units are permitted under NPDES Permit PA0025615 for Outfall 010. Screening, Disinfection (Chlorine) and Foam Fractionation.

The proposed wastewater treatment system upgrade will not result in any new source of wastewater to Outfall 010. The proposed wastewater treatment system will install a dechlorination treatment unit at Outfall 010 as described in Section 6.b. The proposed will introduce hypochlorite residual into the wastewater from Non-Contact Cooling Water from the Unit 2 primary heat exchangers continuously, and will also be dechlorinated continuously.

7.d NPDES Outfall 003

NPDES Outfall 003 discharges to the Ohio River and is currently permitted under NPDES Permit PA0025615. Outfall 003 receives wastewater from Internal Monitoring Points 103, 303, 403, and 503, non-contact cooling water from Unit 1 diesel generator heat exchangers, and demineralized water storage tanks.

Discharge occurs 24 hours per day, 7 days per week, 365 days per year. Average discharge flow is 0.404 MGD and maximum flow rate of 1.193 MGD.

Currently, the following permitted treatment units are permitted under NPDES Permit PA0025615 for Outfall 003. Flocculation, Coagulation, Sedimentation, Slow Sand Filtration, Reverse Osmosis, Ion Exchange, Grinding, Pre-Aeration, Rotating Biological Contactor, Disinfection (Chlorine), and Oil and Grease Removal

The proposed will introduce a small hypochlorite residual into the water treatment system leading to internal NPDES Outfall 103. Due to this water going through a treatment of clarification, filtration, and eventually reject from a Reverse Osmosis unit prior to discharge, the chlorine residual should be minimal and there are no plans to dechlorinate this outfall.

The proposed wastewater treatment system upgrade will not result in any new source of wastewater to Outfall 003. The proposed wastewater treatment system will install a dechlorination treatment unit at Outfall 003 as described in Section 6.a. When in service, the proposed will introduce a hypochlorite residual into the non-contact cooling water from Unit 1 diesel generator heat exchangers service water, and will be dechlorinated when free chlorine residual is present.

8. Chemical and Additive Usage Summary

8.a Sodium Hypochlorite
8.b Sodium Bromide
8.c Sodium Bisulfite
8.d Corrosion Inhibitor (NALCO 3DT177)
8.e Dispersant (NALCO 3DT120)
8.f DBNPA (NALCO 7320)
8.g Surfactant (NALCO 73550)

8.a Sodium Hypochlorite

Currently sodium hypochlorite feed is permitted under the current NPDES Permit PA0025615 and fed for disinfection control to the Unit 1 and Unit 2 circulating water systems, periodic oxidation of hydrazine in chemical waste sump, and condensate blow down. The proposed engineering change will feed sodium hypochlorite tank, TK-4 (8700 gallon capacity) to treat the reactor plant river water, turbine plant river water, and service water systems for microfouling and macrofouling (clams and mussels) control. Chemical additive and usage is summarized in Chemical Additive List, Revision 20.

8.a.1 Usage Rate Calculation - Unit 1 Reactor Plant River Water System:

To achieve a 0.2 mg/L Free Chlorine Residual
Given:

- 5 ppm of product is required to achieve a 0.2 ppm residual of Free Available Chlorine
- Product contains 12.5% weight of Free Available Chlorine
- Density of product is 10.21 lbs/gal
- Flow in Reactor Plant River Water System is 9,000 gpm

m_{Clrprw} = 5 mg/L product x 3.785 L/gal x 9,000 gal/min x 1440 min/day

m_{Clrprw} = 2.45268E+8 mg/day x 1 g/1000 mg x 1 kg/1000 g

m_{Clrprw} = 245.3 kg/day product x 2.2 lbs/1 kg x 1 gal/10.21 lbs

m_{Clrprw} = **53 gal/day product**

8.a.2 Usage Rate Calculation - Unit 1 Turbine Plant River Water System:
To achieve a 0.2 ppm Free Chlorine Residual

Given:

- 5 ppm of product is required to achieve a 0.2 ppm residual of Free Available Chlorine
- Product contains 12.5% weight of Free Available Chlorine
- Density of product is 10.21 lbs/gal
- Flow in Turbine Plant River Water System is 16,000 gpm

m_{Cltprw} = 5 mg/L product x 3.785 L/gal x 16,000 gal/min x 1440 min/day

m_{Cltprw} = 4.6302E+8 mg/day x 1 g/1000 mg x 1 kg/1000 g

m_{Cltprw} = 436.0 kg/day product x 2.2 lbs/1 kg x 1 gal/10.21 lbs

m_{Cltprw} = **94 gal/day** product - normal operation
188 gal/day product - maximum (2 pumps in summer)

8.a.3 Usage Rate Calculation - Unit 2 Service Water System:

To achieve a 0.2 ppm Free Chlorine Residual

Given:

- 5 ppm of product is required to achieve a 0.2 ppm residual of Free Available Chlorine
- Product contains 12.5% weight of Free Available Chlorine
- Density of product is 10.21 lbs/gal
- Flow in Unit 2 Service Water System is 29,400 gpm

m_{Clsws} = 5 mg/L product x 3.785 L/gal x 29,400 gal/min x 1440 min/day

m_{Clsws} = 8.012088E+8 mg/day x 1 g/1000 mg x 1 kg/1000 g

m_{Clsws} = 801.2 kg/day product x 2.2 lbs/1 kg x 1 gal/10.21 lbs

m_{Clsws} = **173 gal/day** product

8.a.4 Usage Rate Calculation – Cooling tower Water System:

Given :

- Current Hypochlorite usage from 2 hour daily treatment of the main circulating water systems is 2.075 million pounds of Sodium Hypochlorite product per year.

<u>Current feed</u>

2,075,000 lbs product/year (2013) divided by 365 days/year =
5685 lbs product/day divided by 10.21 lbs/gal =
557 gal/day product average
420 (winter) - 960 (summer) gal/day product range

<u>Anticipated feed with proposed change</u>

To achieve a 0.5 ppm Free Chlorine Residual for 2 hours a day considering the system will be fed continuously with 0.2 ppm Free Chlorine Residual

Given:

- Anticipated Hypochlorite usage due to treatment with Hypochlorite for the 2 hour daily addition assumes 0.3 ppm Free Chlorine Residual in the Winter months and 0.5 ppm Free Chlorine Residual in the Summer months.
- 7.5 ppm of product is required to achieve an extra 0.3 ppm residual of Free Available Chlorine 12.5 ppm of product is required to achieve an extra 0.5 ppm residual of Free Available Chlorine
- Product contains 12.5% weight of Free Available Chlorine
- Density of product is 10.21 lbs/gal
- Basin Volume is estimated at 26.8 million gals. (13.4 million each)

(Winter)

m_{Clcws} = 7.5 mg/L product x 3.785 L/gal x 26,800,000 gals./day

m_{Clcws} = 7.6E+8 mg/ x 1 g/1000 mg x 1 kg/1000 g

m_{Clcws} = 760 kg/day product x 2.2 lbs/1 kg x 1 gal/10.21 lbs

m_{Clcws} = **164 gal/day** product

(Summer)

m_{Clcws} = 12.5 mg/L product x 3.785 L/gal x 26,800,000 gals./day

m_{Clcws} = 12.7E+8 mg/day x 1 g/1000 mg x 1 kg/1000 g

m_{Clcws} = 1270 kg/day product x 2.2 lbs/1 kg x 1 gal/10.21 lbs

m_{Clcws} = **274 gal/day** product

The proposed change will maintain a free chlorine residual of approximately 0.2 ppm in the reactor plant river water, turbine plant river water, and service water systems for disinfection control. Sodium hypochlorite will be fed 24 hours per day, 7 days per week, 365 days per year to reactor plant river water, turbine plant river water, and service water systems for disinfection control. The 2 hour daily treatments on the main circulating water systems will also continue, but at an anticipated reduced rate due to the chlorination of the make-up water.

Total usage per day on the reactor plant river water, turbine plant river water, and service water systems is **320 to 414 gal/day** product.

Total usage per day on the circulating water system is **164 to 274 gal/day** product.

The change as proposed does not increase Sodium Hypochlorite Chemical additive and usage as summarized in Chemical Additive List, Revision 20.

The change anticipates a slight reduction in the use of Hypochlorite overall from the current usage of 557 gal/day product average, (420 (Winter) - 960 (Summer) gal/day product range) to 553 gal/day product average, (484 (Winter) - 688 (Summer) gal/day product range). This assumes daily treatments will continue, but it is possible that daily treatments could be reduced so that there will be an even greater reduction in the overall Hypochlorite usage.

8.b Sodium Bromide

Currently sodium bromide feed is permitted under the current NPDES Permit PA0025615 and fed for disinfection control to the Unit 1 and Unit 2 circulating water systems. The proposed engineering change will feed Sodium Bromide continuously along with the Sodium Hypochlorite in the circulating water systems in Unit 2 and for 6 months a year in Unit 1. The proposed engineering change will also continuously feed sodium bromide to treat the reactor plant river water, turbine plant river water, and service water systems for microfouling control. Chemical additive and usage is summarized in Chemical Additive List, Revision 20.

8.b.1 Usage Rate Calculation

To achieve a 6:1 molar ratio of Sodium Hypochlorite to Sodium Bromide

Given:

- Vendor dosage calculations use 1.125 lbs Control Brom CB 70/gal of 12.5% Sodium Hypochlorite. CB 70 used in the Circulating Water
- Vendor dosage calculations use 0.825 lbs Actibrom 1318/gal of 12.5% Sodium Hypochlorite. Actibrom 1318 used in the reactor plant river water, turbine plant river water, and service water systems.

Unit 1 Reactor Plant River Water System:
53 Gallons/day Sodium Hypochlorite x 0.825 lbs Actibrom 1318 =
44 lbs Actibrom 1318/day

Unit 1 Turbine Plant River Water System:
94 Gallons/day Sodium Hypochlorite x 0.825 lbs Actibrom 1318 =
78 lbs Actibrom 1318/day (approximately 8 months a year)

188 Gallons/day Sodium Hypochlorite x 0.825 lbs Actibrom 1318 =
156 lbs Actibrom 1318/day (approximately 4 months a year)

Unit 2 Service Water System:
173 Gallons/day Sodium Hypochlorite x 0.825 lbs Actibrom 1318 =
143 lbs Actibrom 1318/day

Unit 1 Cooling tower Water System:
82-137 Gals/day Sodium Hypochlorite x 1.125 lbs Control Brom CB 70 =
92-154 lbs Control Brom CB 70/day

Unit 2 Cooling tower Water System:
82-137 Gal/day Sodium Hypochlorite x 1.125 lbs Control Brom CB 70 =
92-154 lbs Control Brom CB 70/day

Total:

Anticipated Sodium Bromide daily usage range is **357 to 651 lbs.** Sodium Bromide product per day.

The change as proposed does not increase Sodium Bromide Chemical additive and usage as summarized in Chemical Additive List, Revision 20.

8.c Sodium Bisulfite

Currently, sodium bisulfite feed is permitted and fed for dechlorination control of the Unit 1 and Unit 2 cooling tower blow down discharged to the Ohio River via Outfall 001 and Outfall 004. The proposed engineering change will continue feed at Unit 1 and Unit 2 cooling tower blow down and will add feed at Unit 2 Emergency Outfall Structure to dechlorinate wastewater discharged to the Ohio River via Outfall 010. Additionally, sodium bisulfite feed for dechlorination will be fed to the Unit 1 catch basin system in the event of discharge from Unit 1 emergency diesel generator cooling water which is discharged to the Ohio River via Outfall 003.

Usage Rate Calculations:

8.c.1 Unit 1 Cooling Tower Blowdown, Outfall 001

Using typical maximum blow down flow 5.5E+7 gal/day
Mass of Free Chlorine assuming a 0.25 mg/L free chlorine residual for 2 hours per day per unit (at 0.5 ppm) and maintenance of 0.2 mg/L for 20 hours a day

m_{freeCl} = 0.25 mg/L x 3.785 L/gal x 5.5E+7 gal/day x 1 g/1000 mg x 1 kg/1000 g x 4hrs/24hrs

m_{freeCl} = 8.7 kg Free Chlorine/day 4 hour total added chlorination

m_{freeCl} = 0.2 mg/L x 3.785 L/gal x 5.5E+7 gal/day x 1 g/1000 mg x 1 kg/1000 g x 20hrs/24hrs

m_{freeCl} = 34.7 kg Free Chlorine/day 20 hour maintenance

Total outfall Chlorine = 43.4 kg Free Chlorine/day

On a weight-to-weight basis, approximately 1.45 parts of Sodium Bisulfite are required to dechlorinate 1 part of chlorine.

43.4 kg Free Chlorine needs 62.9 kg Sodium Bisulfite
Nalco Sodium Bisulfite solution is 36% Sodium Bisulfite by weight
36 kg Bisulfite/100 kg Nalco solution x 174.7 kg Nalco solution = 62.9 kg Sodium Bisulfite solid
174.7 kg Nalco solution x 2.2 lbs/1 kg = **384.3 lbs Nalco Sodium Bisulfite solution/day** typical usage

8.c.2 Unit 1 Emergency Overflow, Outfall 004

Flow = 7.7E+6 gal/day estimated maximum

Mass of Free Chlorine assuming a 0.5 mg/L free chlorine residual for 2 hours per day and maintenance of 0.2 mg/L for 22 hours a day

m_{freeCl} = 0.5 mg/L x 3.785 L/gal x 7.7E+6 gal/day x 1 g/1000 mg x 1 kg/1000 g x 2hrs/24hrs

m_{freeCl} = 1.2 kg Free Chlorine/day 2 hour added chlorination

m_{freeCl} = 0.2 mg/L x 3.785 L/gal x 7.7E+6 gal/day x 1 g/1000 mg x 1 kg/1000 g x 22hrs/24hrs

m_{freeCl} = 5.3 kg Free Chlorine/day 22 hour maintenance

Total outfall Chlorine = 6.5 kg Free Chlorine/day

On a weight-to-weight basis, approximately 1.45 parts of Sodium Bisulfite are required to dechlorinate 1 part of chlorine.

6.5 kg Free Chlorine needs 9.4 kg Sodium Bisulfite
Nalco Sodium Bisulfite solution is 36% Sodium Bisulfite by weight
36 kg Bisulfite/100 kg Nalco solution x 26.1 kg Nalco solution = 9.4 kg Sodium Bisulfite solid
26.1 kg Nalco solution x 2.2 lbs/1 kg = **57.4 lbs Nalco Sodium Bisulfite solution/day**

8.c.3 Unit 2 Emergency Outfall Structure, Outfall 010

Estimated Average Flow = 3.63E+6 gal/day
Mass of Free Chlorine assuming maintenance of 0.2 mg/L for 24 hrs/day
m_{freeCl} = 0.2 mg/L x 3.785 L/gal x 3.63E+6 gal/day x 1 g/1000 mg x 1 kg/1000 g
m_{freeCl} = 2.8 kg Free Chlorine/day 24 hour maintenance
Total outfall Chlorine = 2.8 kg Free Chlorine/day

On a weight-to-weight basis, approximately 1.45 parts of Sodium Bisulfite are required to dechlorinate 1 part of chlorine.

2.8 kg Free Chlorine needs 4.1 kg Sodium Bisulfite
Nalco Sodium Bisulfite solution is 36% Sodium Bisulfite by weight
36 kg Bisulfite/100 kg Nalco solution x 11.4 kg Nalco solution = 4.1 kg Sodium Bisulfite solid
11.4 kg Nalco solution x 2.2 lbs/1 kg = **25.1 lbs Nalco Sodium Bisulfite solution/day**

8.c.4 Unit 1, Outfall 003

Estimated Flow when discharging = 350 gal/min x 1440 min/day
Flow = 5.04E+5 gal/day

Mass of Free Chlorine assuming a maintenance of 0.2 mg/L for 24 hrs/day

m_{freeCl} = 0.2 mg/L x 3.785 L/gal x 5.04E+5 gal/day x 1 g/1000 mgx1 kg/1000 g
m_{freeCl} = 0.4 kg Free Chlorine/day

Total outfall Chlorine = 0.4 kg Free Chlorine/day
On a weight-to-weight basis, approximately 1.45 parts of Sodium Bisulfite are required to dechlorinate 1 part of chlorine.

0.4 kg Free Chlorine needs 0.6 kg Sodium Bisulfite
Nalco Sodium Bisulfite solution is 36% Sodium Bisulfite by weight
36 kg Bisulfite/100 kg Nalco solution x 1.7 kg Nalco solution = 0.6 kg Sodium Bisulfite solid
1.7 kg Nalco solution x 2.2 lbs/1 kg = **3.7 lbs Nalco Sodium Bisulfite solution/day**

The proposed change will maintain a free chlorine residual of approximately 0.2 ppm in the reactor plant river water, turbine plant river, and service water systems for disinfection control. Sodium hypochlorite is planned to be fed 24 hours per day, 7 days per week, 365 days per year, to reactor plant river water, turbine plant river water, and service water systems for disinfection control.

To meet NPDES permit effluent limits for chlorine discharge, it will be necessary to dechlorinate wastewater effluent discharges impacted by the treated reactor plant river water, turbine plant river water, and service water systems when free chlorine residual is present.

The total estimated feed is **470 lbs** Sodium Bisulfite solution/day.

The change as proposed does not increase Sodium Bisulfite Chemical additive and usage as summarized in Chemical Additive List, Revision 20.

8.d Corrosion Inhibitor (NALCO 3DT177)

Currently corrosion inhibitor is fed for corrosion control to the Unit 1 and Unit 2 circulating water systems, reactor plant river water, turbine plant river water, and service water systems. Currently, Corrosion inhibitor NALCO 3DT179 is directly added to Unit #2 circulating water system is approximately 5 gal/day, this will be discontinued after NALCO 3DT177 Corrosion Inhibitor is added to the RW/SW. The proposed engineering change will feed corrosion inhibitor (NALCO 3DT177) to treat the reactor plant river water, turbine plant river water, and service water, for corrosion control.

8.d.1 Usage Rate Calculation - Unit 1 Reactor Plant River Water System:

To achieve a 2.5 ppm 3DT177 product concentration
Given:

- Product Density of product is 11.0 lbs/gal
- Flow in Reactor Plant River Water System is 9,000 gpm

m_{Clrprw} = 2.5 mg/L product x 3.785 L/gal x 9,000 gal/min x 1440 min/day

m_{Clrprw} = 1.22634E+8 mg/day x 1 g/1000 mg x 1 kg/1000 g

m_{Clrprw} = 122.6 kg/day product x 2.2 lbs/1 kg x 1 gal/11.0 lbs

m_{Clrprw} = **24.5 gal/day**

8.d.2 Usage Rate Calculation - Unit 1 Turbine Plant River Water System:

To achieve a 2.5 ppm 3DT177 product concentration
Given:

- Product Density is 11.0 lbs/gal
- Flow in Turbine Plant River Water System is 16,000 gpm

m_{Clrprw} = 2.5 mg/L product x 3.785 L/gal x 16,000 gal/min x 1440 min/day

m_{Clrprw} = 2. 18016E+8 mg/day x 1 g/1000 mg x 1 kg/1000 g

m_{Clrprw} = 218.0 kg/day product x 2.2 lbs/1 kg x 1 gal/11.0 lbs

m_{Clrprw} = **43.6 gal/day** – normal operation (approximately 8 months/year)
87.2 gal/day product - maximum (2 pumps in summer)
(approximately 4 months/year)

8.d.3 Usage Rate Calculation - Unit 2 Service Water System:

To achieve a 2.5 ppm 3DT177 product concentration
Given:

- Product Density of product is 11.0 lbs/gal
- Flow in Service Water System is 29,400 gpm

m_{Clrprw} = 2.5 mg/L product x 3.785 L/gal x 29,400 gal/min x 1440 min/day

m_{Clrprw} = 4.006044E+8 mg/day x 1 g/1000 mg x 1 kg/1000 g

m_{Clrprw} = 400.6 kg/day product x 2.2 lbs/1 kg x 1 gal/11.0 lbs

m_{Clrprw} = **80.8 gal/day**

The change as proposed adds the Corrosion inhibitor NALCO 3DT177 to the Chemical Additive List for Outfalls 001, 004, 003, and 010.

8.e Dispersant (NALCO 3DT120)

Currently no dispersant is added to the reactor plant river water, turbine plant river, and service water systems. The proposed engineering change will feed dispersant (NALCO 3DT120) to treat the circulating water, reactor plant river water, turbine plant river water, and service water, for silt and deposition control. NALCO 3DT120 is currently on the Approved Chemical Additive Usage List. The circulating water is currently treated by NALCO 3DT121, which has the same active chemical as NALCO 3DT120.

8.e.1 Usage Rate Calculation - Unit 1 Reactor Plant River Water System:

To achieve a 2.0 ppm 3DT120 product concentration

Given:

- Product Density is 9.51 lbs/gal
- Flow in Reactor Plant River Water System is 9,000 gpm

$m_{3DT120rprw}$ = 2.0 mg/L product x 3.785 L/gal x 9,000 gal/min x 1440 min/day

$m_{3DT120rprw}$ = 9.81072E+7 mg/day x 1 g/1000 mg x 1 kg/1000 g

$m_{3DT120rprw}$ = 98.1 kg/day product x 2.2 lbs/1 kg x 1 gal/9.51 lbs

$m_{3DT120rprw}$ = **22.7 gal/day**

8.e.2 Usage Rate Calculation - Unit 1 Turbine Plant River Water System:

To achieve a 2.0 ppm 3DT120 product concentration
Given:

- Product Density is 9.51 lbs/gal
- Flow in Turbine Plant River Water System is 16,000 gpm

m_{Clrprw} = 2.0 mg/L product x 3.785 L/gal x 16,000 gal/min x 1440 min/day

m_{Clrprw} = 1. 744128E+8 mg/day x 1 g/1000 mg x 1 kg/1000 g

m_{Clrprw} = 174.4 kg/day product x 2.2 lbs/1 kg x 1 gal/9.51 lbs

m_{Clrprw} = **40.3 gal/day** normal operation (approximately 8 months/year)
80.6 gal/day product - maximum (2 pumps in summer)
(approximately 4 months/year)

8.e.3 Usage Rate Calculation - Unit 2 Service Water System:

To achieve a 2.0 ppm 3DT120 product concentration
Given:

- Product Density is 9.51 lbs/gal
- Flow in Service Water System is 29,400 gpm

m_{Clrprw} = 2.0 mg/L product x 3.785 L/gal x 29,400 gal/min x 1440 min/day

m_{Clrprw} = 3. 205152E+8 mg/day x 1 g/1000 mg x 1 kg/1000 g

m_{Clrprw} = 320.5 kg/day product x 2.2 lbs/1 kg x 1 gal/9.51 lbs

m_{Clrprw} = **74.1 gal/day**

8.e.4 Usage Rate Calculation – Main Cooling Tower Circulating Water Systems:

From past experience the usage rate on the Circulating Water is anticipated to be approximately **700 lbs/day NALCO 3DT120 (73.6 Gal/day).**

8.f 2,2-DIBROMO-3-NITRILOPROPIONAMIDE - DBNPA (NALCO 7320)

Currently a non-oxidizing biocide quaternary amine (NALCO H150M) is added to the Fire Protection System for microbiological control. The biocide is currently permitted under NPDES Permit PA0025615. The proposed engineering change will feed DBNPA (NALCO 7320) to the Fire Protection System for biocide control. Feed will normally occur during performance of Fire Protection Operational Surveillance Testing (OST). Typical OST results in a run of fire pump(s) for approximately sixty (60) minutes. Chemical additive and usage is summarized in Chemical Additive List, Revision 20.

8.f.1 Usage Rate Calculation – Fire Protection System:

To achieve a 30.0 ppm NALCO 7320 product concentration
Given:

- Product Density is 10.4 lbs/gal
- Flow in Fire Protection System is 2,500 gpm
- Assuming 60 minute run time per OST 33.12

$M_{DNBPArprw}$ = 30.0 mg/L product x 3.785 L/gal x 2,500 gal/min x 1440 min/day

$m_{DNBPArprw}$ = 4. 0878E+8 mg/day x 1 g/1000 mg x 1 kg/1000 g

$m_{DNBPArprw}$ = 408.8 kg/day product x 2.2 lbs/1 kg x 1 gal/10.4 lbs

$m_{DNBPArprw}$ = 86.4 gal/day x 1 hr run/ 24 hr/day

$m_{DNBPArprw}$ = **3.63 gal/hr**

8.g Surfactant (NALCO 73550)

The surfactant used is approximately **25 gal/day**, and is only normally added to the Unit #2 circulating water.

9. SUMMARY

The proposed wastewater treatment system upgrade will not result in any new source of wastewater to any Outfalls.

The proposed change will maintain a free chlorine residual of approximately 0.2 ppm in the reactor plant river water, turbine plant river water, and service water systems for disinfection control which is the source of make up for both Circulating water systems.

Sodium Bisulfite will be fed on all the affected outfalls when treated reactor plant river water, turbine plant river water, and service water are present in the outfall.

The plant will continue the 2 hour chlorination daily on the main circulating water as needed for disinfection control, and increased Sodium Bisulfite will be used on the outfalls affected by circulating water during the 2 hour applications.

The result of this modification anticipates that less Sodium Hypochlorite will be used by reducing the time and/or chemical used in daily additions in the Circulating Water due to the continual chlorination in the Circulating Water make up.

PADEP approval needed for treatment change:

1. PADEP approval to add Sodium Hypochlorite/Sodium Bromide from 2 hours daily to continuous chlorination on systems that are make-up to the Circulating water that will affect outfalls 001, 004, 010, and 003.

Key modifications done to allow for PADEP approval:

1. The result of this modification anticipates that less Sodium Hypochlorite will be used by reducing the amount or time and/or chemical used in daily additions in the Circulating Water due to the continual chlorination in the Circulating Water make up.

2. The plant will be adding Sodium Bisulfite to outfalls 001, 004, 010, and 003 when affected water is present to negate the Chlorine residuals.

3. Sodium Bisulfite pumps on outfalls 001, 004, and 010 will be equipped with alarm functionality to notify operator of pump failure. Pumps are designed with the capability to be automatically or manually swapped in the event of pump failure to maintain chemical feed. The principal and alternate cooling tower blow down dechlorination systems will be upgraded with redundant pumps and auto dialers to assure dechlorination occurs at all times that chlorination is in service. The Emergency Outfall Dechlorination system will include a pump auto-switch to swap pumps should the primary feed pump trip. An auto-dialer will also be present at the Emergency Outfall system that will dial out to select phone numbers should a loss of dechlorination occur.

4. The plant will utilize continuous chlorine analyzers at outfalls 001 and 010.

5. Outfall 003 is affected by the treated water very infrequently, and Outfall 004 is seasonal, so there is no plan to have a Chlorine analyzer used on these points, only grab analysis.

6. Tanks TK-4, 5, 6, 7, 8 and 13 installed by this upgrade are double walled. Each SAFE-Tank primary tank and secondary tank are made of a cross-linked polyethylene. The SAFE-Tank is designed to provide a minimum of 110% secondary containment. Each tank has a flexible discharge connection attached to the inner tank to allow the tank to expand and contract and protect from vibrations. Each tank has optical switch leak detection, heat trace and polyfoam insulation.

7. Piping installed by this upgrade containing sodium hypochlorite that is installed outside of the Main Intake Structure and installed underground is double contained Chem Proline polyethylene RC 100 piping.

8. The double contained piping installed underground will have an electronic leak detection system consisting of conductivity probes tied to an alarm.

List of Table and Figures

ATTACHMENT:

Chemical Additive List, Revision 20

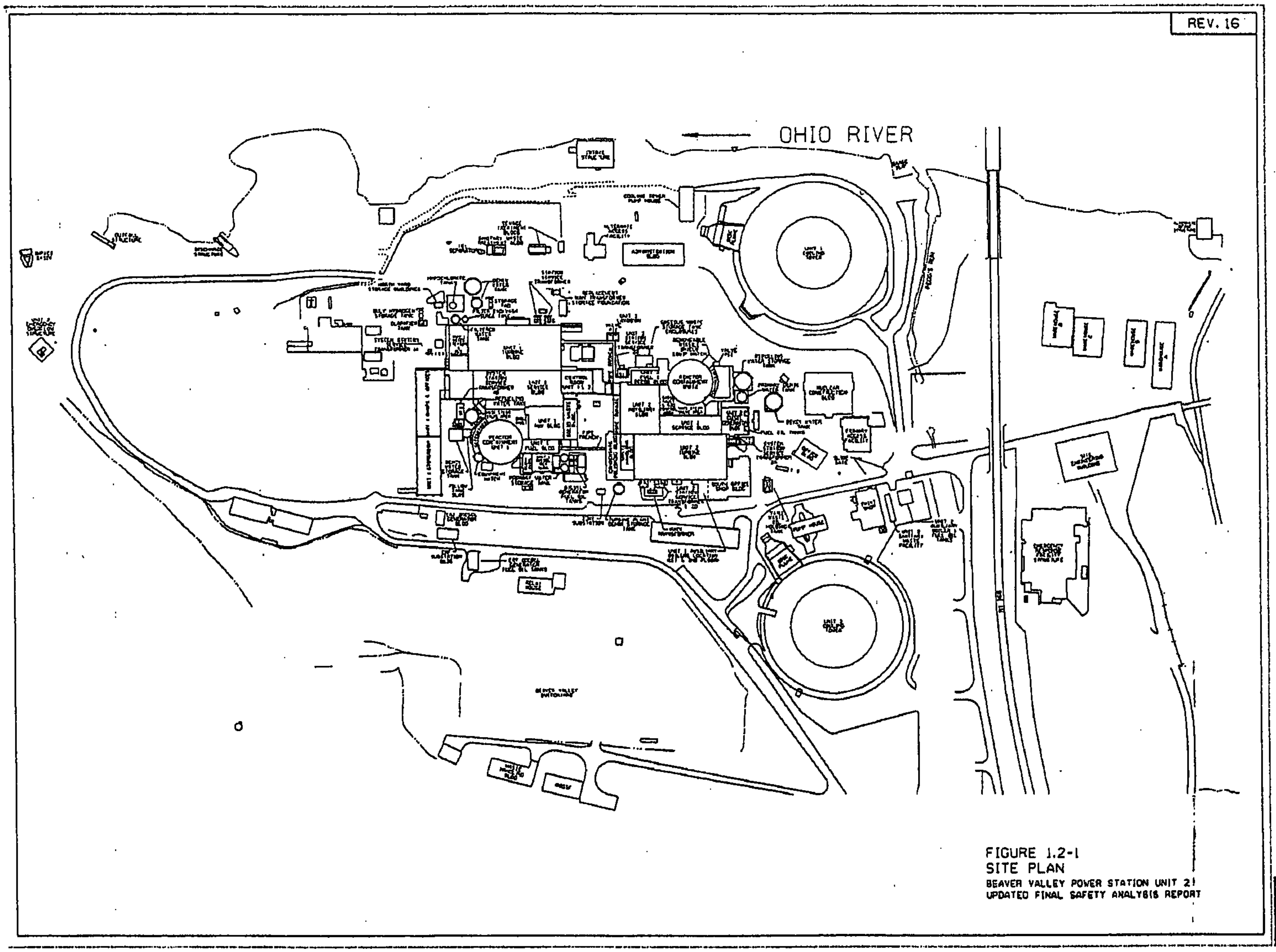

Figure 10-1 Site Map

Figure 10-2, Current Beaver Valley Wastewater Flow Diagram

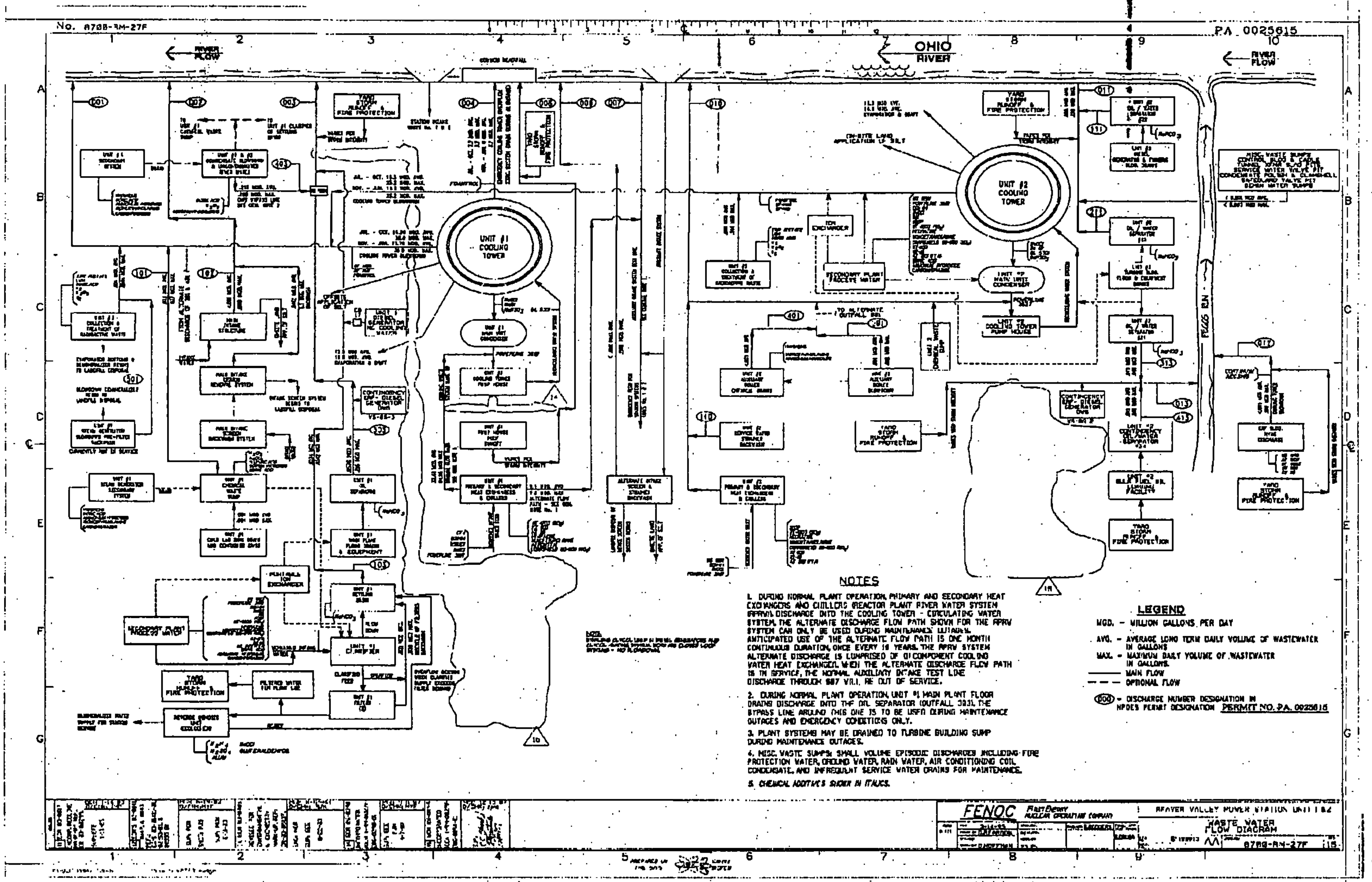

Figure 10-3

Current Unit 1 Circulating Water Treatment Process Flow Diagram

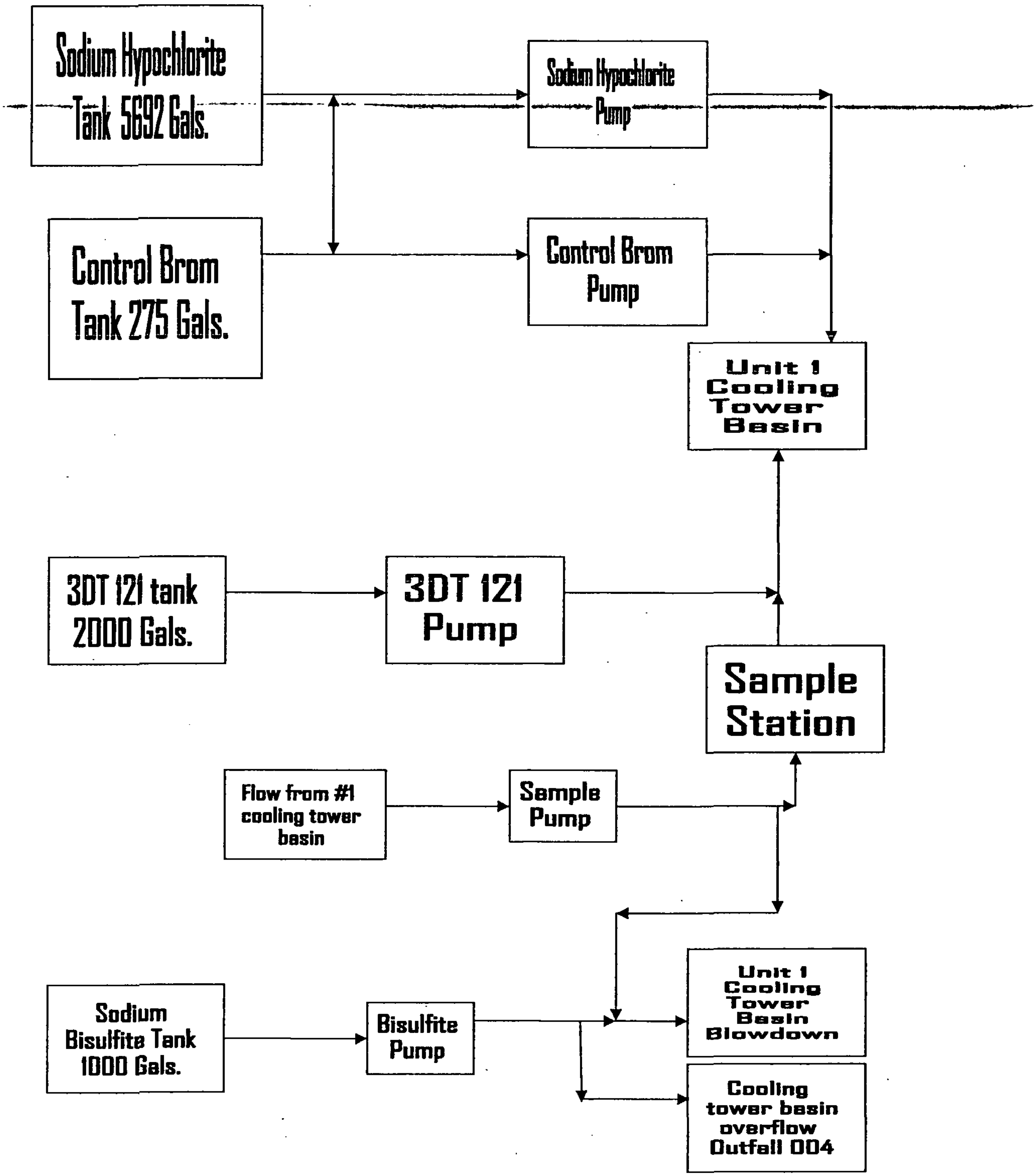

Figure 10-4

Current Unit 2 Circulating Water Treatment Process Flow Diagram

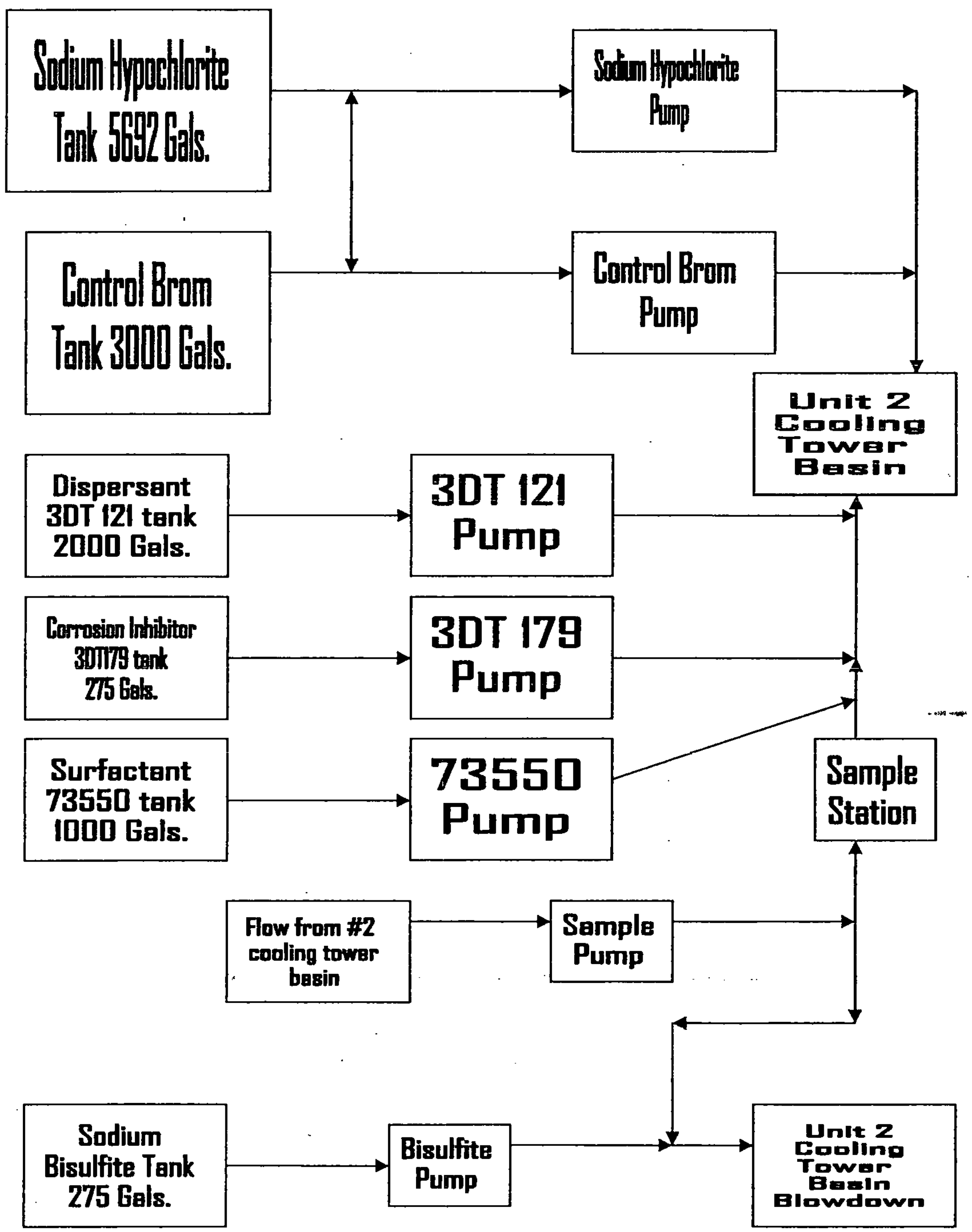

Figure 10-5

Proposed Unit 1 Circulating Water Treatment Process Flow Diagram

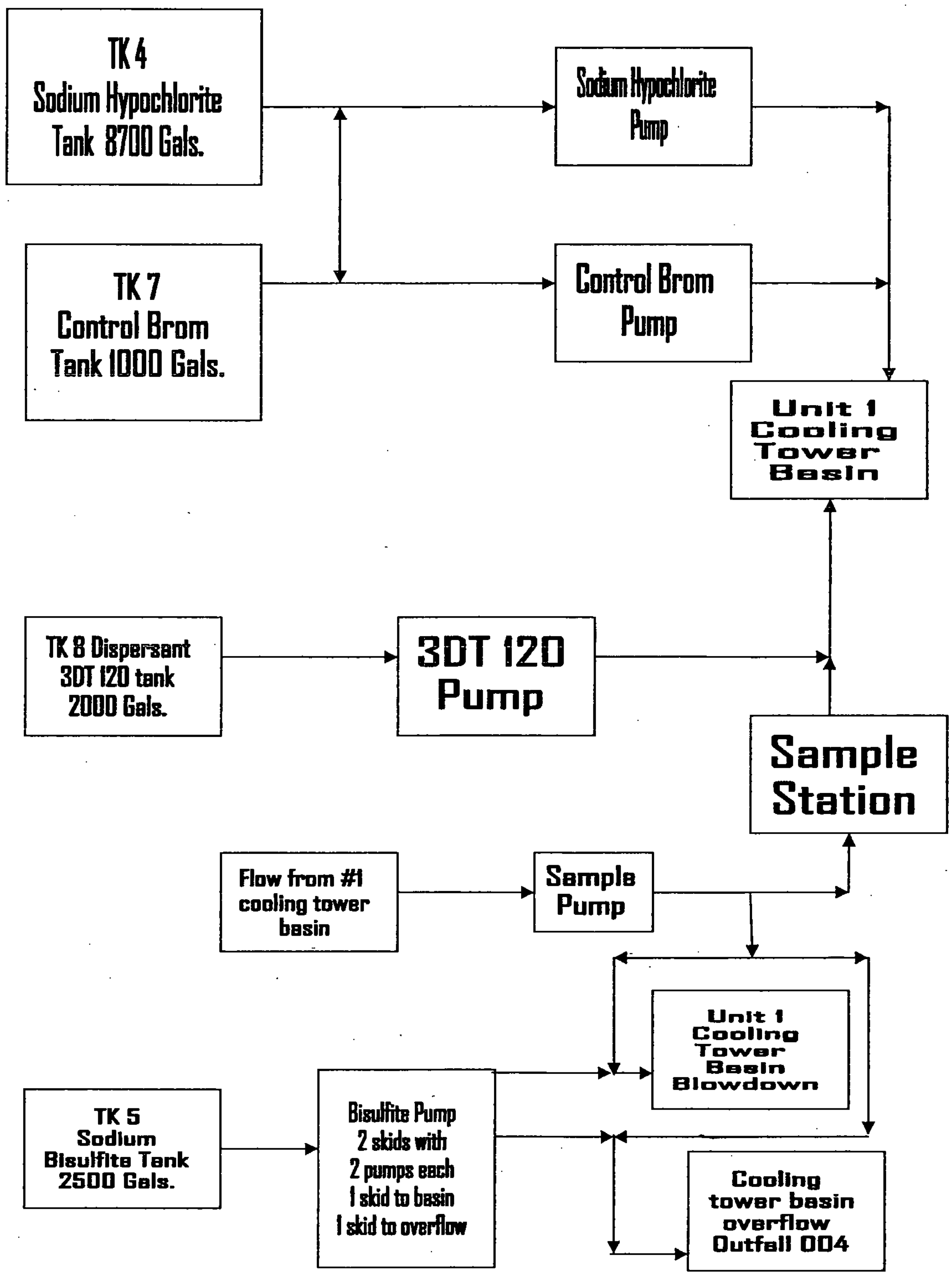

Figure 10-6

Proposed Unit 2 Circulating Water Treatment Process Flow Diagram

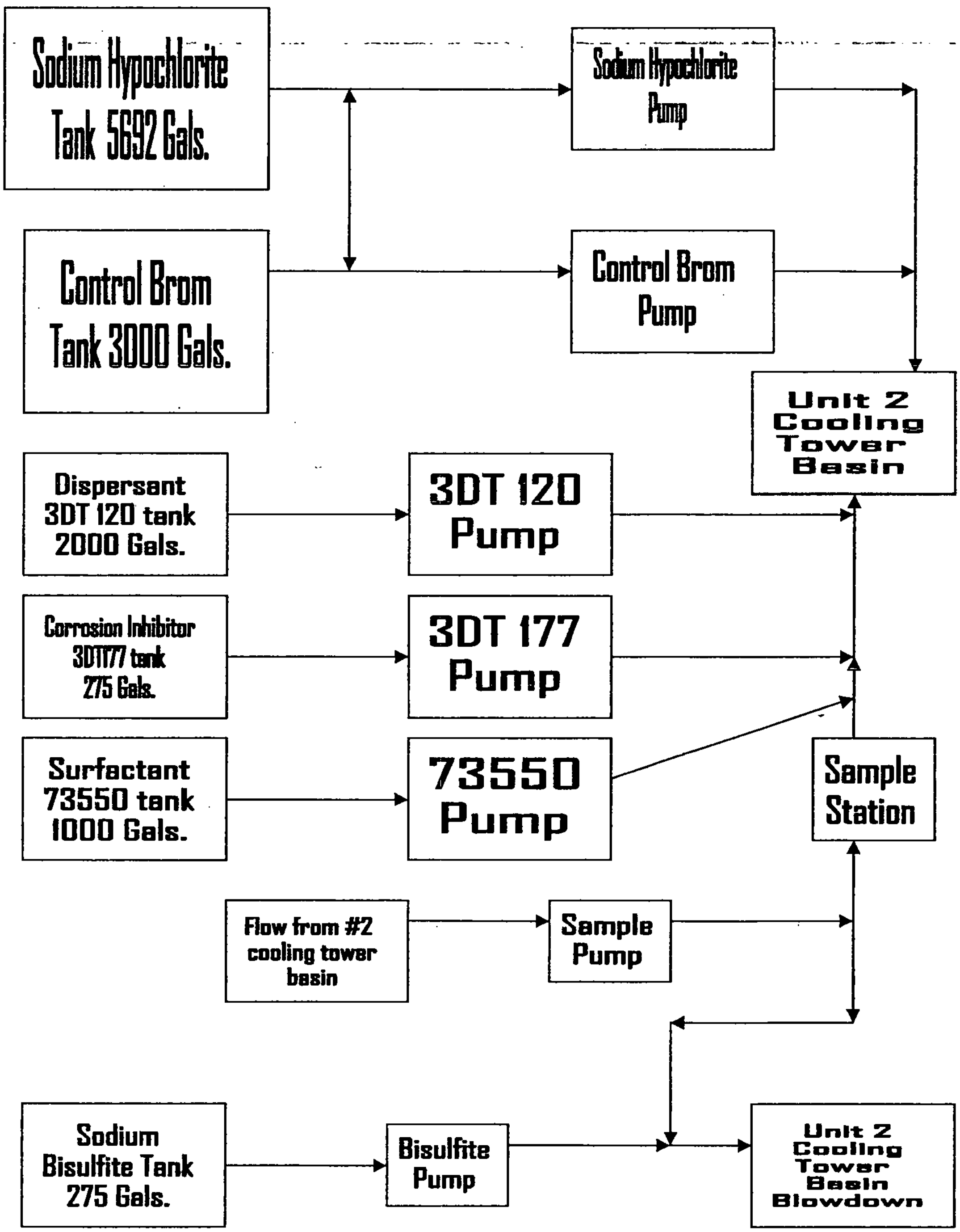

Figure 10-7

Proposed chemical treatment of River Water and Service Water Process Flow Diagram

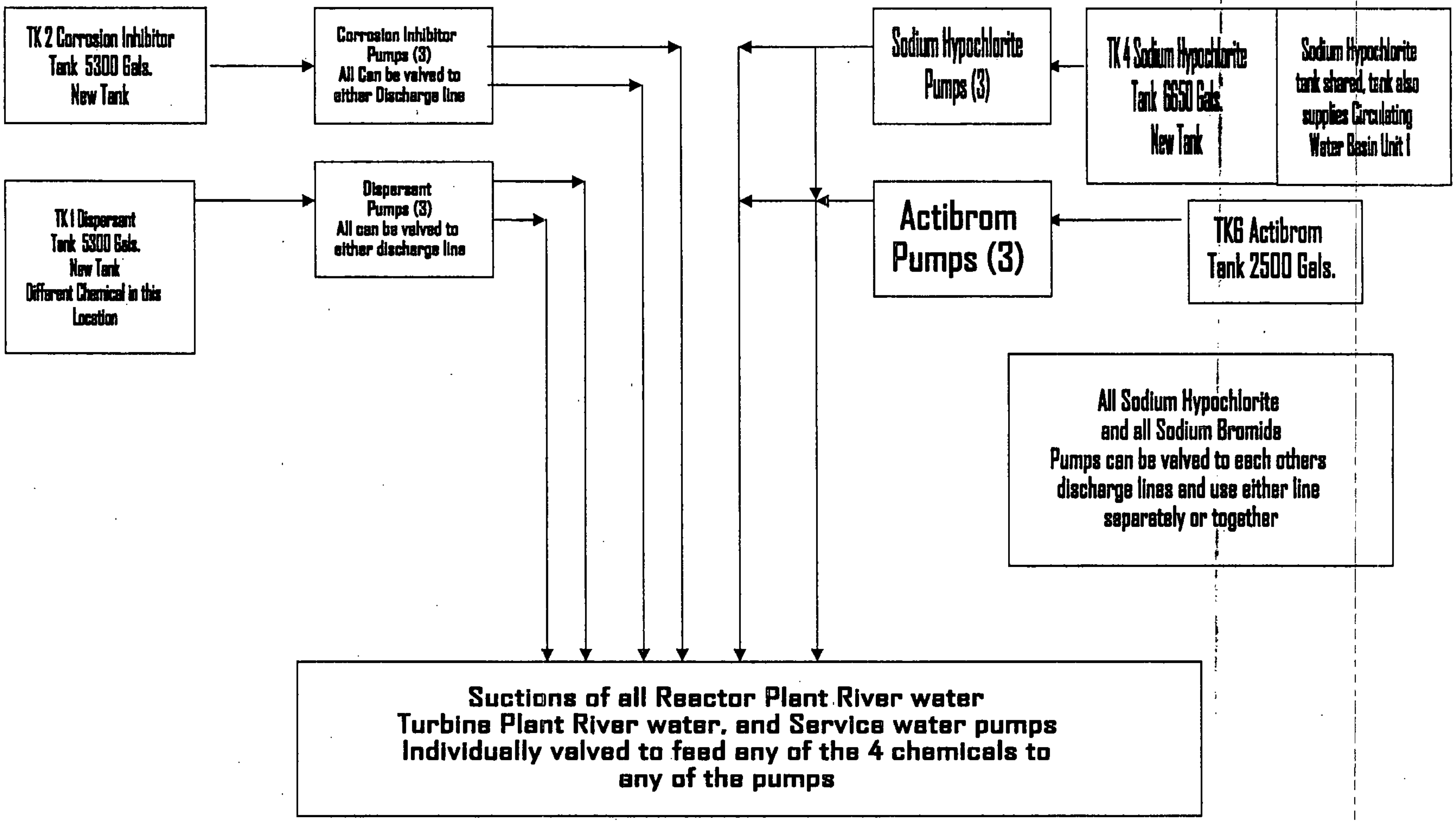

Figure 10-8
Proposed Sodium Bisulfite Dechlorination Treatment Process Flow Diagram